Dear Reader,

On March 14, 2014, the Fishlake and Manti-La Sal National Forests and Bureau of Land Management will publish the Notice of Availability in the Federal Register for the Draft Supplemental Environmental Impact Statement (DSEIS) for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract UTU-84102. This Draft SEIS is jointly prepared by the United States Department of Agriculture (USDA), Forest Service (FS), and the Bureau of Land Management (BLM) to inform agency decision makers, publicly disclose the potential benefits and environmental impacts of leasing the coal reserves, and establish protections in the form of special coal lease conditions for protection of surface resources. You will have 45 days after publication of the Notice of Availability in the Federal Register to review and comment on this DSEIS document. After full consideration of all comments received, a Final SEIS will be prepared. If the FS consents to lease, the BLM will issue a Record of Decision determining whether or not to offer the tract for competitive lease, and if so, under what terms, conditions, and stipulations.

Project Information

This DSEIS documents the environmental analysis of the potential effects of the Forest Service consenting to the BLM to lease the Greens Hollow Federal Coal Lease-by-Application (LBA) Tract for competitive bid by the United States Department of the Interior, BLM, Utah State Office. The BLM manages the federal mineral estate for coal leases. Where leasing federal coal resources involves National Forest System lands, the BLM must have the consent of the United States Department of Agriculture, Forest Service, before leasing can occur. This DSEIS is jointly prepared by the BLM and the FS and was prepared in accordance with the National Environmental Policy Act (NEPA) and provides a forum for public review and comment on the proposed lease. Within this DSEIS the federal agencies evaluate the effects of subsidence and identify which surface resources may require specific protection from subsidence and conceptual surface uses. Leasing is a competitive process and no one party is assured of being the highest bidder; therefore a conceptual mine plan was developed to facilitate analysis for indirect and cumulative effects.

The proposed Greens Hollow tract encompasses approximately 6,175 acres on the Manti-La Sal and Fishlake National Forests on the southern end of the Wasatch Plateau in the Wasatch Plateau Known Recoverable Coal Resource Area. The lease tract is located approximately 10.5 air miles west of the town of Emery, Utah. Coal reserves in the Greens Hollow tract are estimated at 73
million in-place-tons, and it is projected that approximately 56 million tons of coal are recoverable. The Greens Hollow tract lies immediately adjacent to and northwest of the existing SUFCO Mine near Salina, UT.

The surface and coal resources are both federally managed: the Manti-La Sal and Fishlake National Forests manage all surface resources, while the BLM manages all mineral resources.

The Draft SEIS outlines three alternatives for your review:
1. A No Leasing Alternative (No Action)
2. A Leasing Proposed Action
3. An alternative to the Proposed Action (Alternative 3)

The agencies’ preferred alternative is Alternative 3 – which was developed to provide additional protection for important non-mineral surface resources from the effects of subsidence.

Background

An EIS process was initiated by the BLM and Forest Service and a Draft EIS was released for comment in September 2009. A Final EIS was completed and the Record of Decision was signed December 13, 2011. The decision was appealed February 13, 2012, and was withdrawn to conduct additional analysis and clarify agency authority.

In 2012, the agencies initiated a Supplemental Environmental Impact Statement (SEIS) for the Greens Hollow Federal Coal Lease Tract (UTU-84102). The SEIS will replace the December 2011 Final Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract UTU-84102 (FEIS) and is written to be a stand-alone document.

Responsible Officials

The Responsible Officials have the following decisions:

As Responsible Official for the surface managing agency, Allen Rowley, Forest Supervisor, Fishlake and Manti-La Sal National Forests, must decide:
1. Whether or not to consent to the BLM issuing Federal Coal Lease UTU-84102 according to the MLA of 1920; as amended by the FCCLA of 1976 and Energy Policy Act of 2005.
2. If the FS consents to issue the lease, they will prescribe stipulations needed for protection of non-mineral surface resources on National Forest lands.

The BLM must decide:
1. Whether or not to recommend offering the tract for competitive leasing and under what terms, conditions, and stipulations, contingent on the consent of the surface managing agency.

Coal leasing decisions do not authorize surface disturbance, but do convey certain rights and responsibilities in subsequent review and approval procedures by other agencies such as the State
of Utah Division of Oil, Gas, and Mining (DOGM) and the U.S. Office of Surface Mining (OSM). The FS consent authority includes prescribing necessary conditions to protect non-mineral resources on the surface lands involved. The FS will propose stipulations that the BLM can then attach to the coal lease, should it be offered for sale, to ensure the protection of non-mineral resources (see Appendix B).

If the Greens Hollow tract is leased, it will be done competitively by bid, at a lease sale. Granting the lease would give the successful bidder (the lessee) exclusive rights to mine the coal but would not authorize actual mining or surface disturbing activities. If the lease is granted, the process will follow as outlined under the Surface Mining Control and Reclamation Act of 1977.

**Forest Service Opportunity to Comment on the DSEIS (36 CFR 218.24)**

The decision to be made by the Forest Service for this proposed project is subject to 36 CFR 218, Subparts A and B. Only individuals or organizations who submit timely and specific written comments regarding the proposed project during a public comment period established by the Responsible Official are eligible to file an objection. Opportunity for public comment on a DSEIS includes the 40 CFR 1506.10 comment period, or other public involvement opportunities where written comment are requested by the responsible official (36 CFR 218.5(a)).

This project was originally scoped under the provisions of 36 CFR 215. For this project, individuals or organizations who submitted written comments in response to scoping conducted under 36 CFR 215 will be considered to have standing to object under 36 CFR 218, Subparts A and B. Those individuals or organizations that did not provide written comments during scoping must provide specific written comments (as defined in 36 CFR 218.2) on the DSEIS in order to have standing to object.

The opportunity to comment on the DSEIS ends 45 days following the date of publication of the notice of availability (NOA) of the DSEIS in the Federal Register (36 CFR 218.25(a)(2)). For this project, the Forest Service Responsible Official does not anticipate requesting written comments through any additional public involvement opportunities. Comments submitted by individuals or organizations must have evidence of timely submission, as defined by 36 CFR 218.25(a)(4), and meet the following requirements outlined in 36 CFR 218.25(a)(3):

- Name and postal address (Email recommended but not required)
- Title of the proposed project or activity
- Specific written comments as defined in 36 CFR 218.2 regarding the proposed project or activity, along with supporting reasons
- Signature or other verification of identity upon request and identification of the individual or entity who authored the comments. For comments listing multiple entities or multiple individuals, a signature or other means of verification must be provided for the individual authorized to represent each entity and for each individual in the case of multiple names. A scanned signature or other means of verifying the identity of the individual or entity representative may be used for electronically submitted comments.
• Individual members of an entity must submit their own comments to establish personal eligibility; comments received on behalf of an entity are considered as those of the entity only.

You may send comments by the following means:

Send comments via mail, fax, or email:
Mail:  Marianne Breeze Orton
       Forest Environmental Coordinator
       115 East 900 North
       Richfield, UT 84701
Fax:  435-896-9347
Email: comments-intermtn-fishlake@fs.fed.us

Please type “Leasing of the Greens Hollow Federal Coal Leasing Tract” in the subject line.

The document is available on the Fishlake Forest web page at http://www.fs.usda.gov/projects/fishlake/landmanagement/projects. These documents are also available in other formats upon request. Questions concerning this project may be directed to Marianne Breeze Orton, Forest Service, at (435) 896-1090 or Steve Rigby, BLM, at (435) 636-3604.

Sincerely,

[Signature]

ALLEN ROWLEY
Forest Supervisor
DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
FOR THE LEASING AND UNDERGROUND MINING OF THE
GREENS HOLLOW FEDERAL COAL LEASE TRACT
UTU-84102
SANPETE AND SEVIER COUNTIES, UTAH

Lead Agencies:

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Price, Utah 84501
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Forest Service
Manti-La Sal National Forest
Price, Utah

U.S. Department of Agriculture
Forest Service
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Richfield, Utah

Cooperating Agency:

U.S. Department of Interior
Office of Surface Mining Reclamation and Enforcement
Denver, Colorado

March 2014
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DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
FOR THE LEASING AND UNDERGROUND MINING OF THE
GREENS HOLLOW FEDERAL COAL LEASE TRACT
UTU-84102

Bureau of Land Management, Price Field Office
Manti-La Sal National Forest
Fishlake National Forest
Sanpete and Sevier Counties, Utah

Joint Lead Agencies: USDI, Bureau of Land Management
Price Field Office

USDA Forest Service
Manti-La Sal National Forest
Fishlake National Forest

Responsible Officials: Michael Stiewig, Acting District Manager, BLM
Allen Rowley, Forest Supervisor, Manti-La Sal and
Fishlake National Forests

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ABSTRACT:
This Draft Supplemental Environmental Impact Statement (Draft SEIS) was prepared in response to an application to lease federal coal reserves in the Greens Hollow Coal Lease Tract (UTU-84102). The Proposed Action is to offer the tract through competitive leasing with conditions for the protection of non-mineral resources. The Draft SEIS discloses the effects of offering the tract for lease by BLM, and the potential effects of mining and surface use based on a Conceptual Mine Plan and Reasonably Foreseeable Surface Use Scenario. The conceptual mine plan projects underground mining and the reasonably foreseeable surface use scenario describes potential surface uses including two ventilation shafts (one with a fan), intake shafts, utility boreholes, a power transmission line, and associated road
access. Based on the analysis, the responsible agency officials must decide whether or not to offer the tract for competitive leasing, and if offered, what conditions to include for access to the coal resources and protection of other natural resources on national forest system lands.

To address potential effects on the multiple resources which make up the affected environment, the BLM and the US Forest Service (FS), in coordination with cooperating agencies, have developed three alternatives in the Final EIS. The alternatives include a No Action Alternative, the Proposed Action, and a third Alternative, which modifies components of the Proposed Action. The alternatives incorporate best management practices for underground coal mining and other measures necessary to adequately address impacts to geology, water resources, wildlife, vegetation, Threatened and Endangered Species, cultural resources, socioeconomics, recreational opportunities, visual resources, air quality, and other relevant issues.

This Draft SEIS addresses concerns that were identified after releasing the FEIS and FS Record of Decision (ROD) in December 2011. The FS consented to BLM’s decision to offer a federal coal lease with conditions. The consent decision was appealed February 13, 2012. Following the appeal, the FS withdrew the ROD in order to clarify the decisions to be made and agency decision authority; analyze the environmental consequences of potential actions to be taken by each agency; make technical corrections; and address agency compliance actions and resource concerns not previously analyzed in the original 2011 FEIS. The analysis clarifies potential effects within the Greens Hollow tract and those that may be reasonably foreseeable on adjacent National Forest System lands, mostly under active coal leases.
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LIST OF ACRONYMS AND ABBREVIATIONS

AMP    Allotment Management Plan
AOI    Annual Operating Instructions
AQRV   Air Quality Related Values
AUM    Animal Unit Month
BA     Biological Assessment
BCI    Biotic Condition Index
BE     Biological Evaluation
BLM    Bureau of Land Management
BMP    Best Management Practices
BO     Biological Opinion
BTU    British Thermal Units
BVCT   Bonneville Cutthroat Trout
CAA    Clean Air Act
CBM    Coalbed Methane
CDOW   Colorado Division of Wildlife
CEQ    Council on Environmental Quality
CH₄    Methane
CHIA   Cumulative Hydrologic Impact Assessment
CO     Carbon Monoxide
CO₂    Carbon Dioxide
CRCT   Colorado River Cutthroat Trout
dBA    A-weighted Decibels
DOGM   Division of Oil, Gas, & Mining
DEIS   Draft Environmental Impact Statement
DWQ    Division of Water Quality
EAC    Early Action Compact
ENBB   Environmental Notification Bulletin Board
ESA    Endangered Species Act
FCLAA  Federal Coal Leasing Amendments Act
Final EIS  Final Environmental Impact Statement
FLNF   Fishlake National Forest
Forest Plan  Land and Resource Management Plan
FS     US Forest Service
FWS    US Fish and Wildlife Service
GHG    Green House Gases
gpm    gallons per minute
GWP    Global Warming Potential
GWR    General Big Game Winter Range
HAPs   Hazardous Air Pollutants
HCI    Habitat Condition Index
HUC    Hydrologic Unit Code
ID Team  Interdisciplinary Team
IRA    Inventoried Roadless Area
Kbh    Blackhawk Formation
Kc     Castlegate Sandstone
Kpr    Price River Formation
KRCRA  Known Recoverable Coal Resource Areas

Greens Hollow Federal Coal Lease Tract    xi    Draft Supplemental Environmental Impact Statement
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>kV</td>
<td>Kilovolts</td>
</tr>
<tr>
<td>KWR</td>
<td>Key Big Game Winter Range</td>
</tr>
<tr>
<td>LBA</td>
<td>Lease by Application</td>
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<tr>
<td>LRMP</td>
<td>Land and Resource Management Plan</td>
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<tr>
<td>MER</td>
<td>Maximum Economic Recovery</td>
</tr>
<tr>
<td>mgd</td>
<td>million gallons per day</td>
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<tr>
<td>MIS</td>
<td>Management Indicator Species</td>
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<tr>
<td>MLA</td>
<td>Mineral Leasing Act of 1920</td>
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<tr>
<td>MLNF</td>
<td>Manti-La Sal National Forest</td>
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<tr>
<td>MOA</td>
<td>Memorandum of Agreement</td>
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<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
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<tr>
<td>MSHA</td>
<td>Federal Mine Safety and Health Administration</td>
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<tr>
<td>N2O</td>
<td>Nitrous Oxide</td>
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<td>NAAQS</td>
<td>National Ambient Air Quality Standards</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>NFS</td>
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<td>NMOC</td>
<td>Nonmethane Organic Compounds</td>
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<td>NOI</td>
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<td>NOx</td>
<td>Nitrogen Oxides</td>
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<td>NO2</td>
<td>Nitrogen Dioxide</td>
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<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<td>O3</td>
<td>Ozone</td>
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<tr>
<td>OHV</td>
<td>Off-highway Vehicle</td>
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<tr>
<td>OSM</td>
<td>USDI, Office of Surface Mining, Reclamation and Enforcement</td>
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<tr>
<td>PAP</td>
<td>Permit Application Package</td>
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<tr>
<td>Pb</td>
<td>Lead</td>
</tr>
<tr>
<td>PFYC</td>
<td>Probable Fossil Yield Classification</td>
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<tr>
<td>PHC</td>
<td>Probable Hydrologic Consequences</td>
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<tr>
<td>PM</td>
<td>Particulate Matter</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Particulate Matter with an Aerodynamic Diameter of 2.5 Micrometers or Less</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate Matter with an Aerodynamic Diameter of 10 Micrometers or Less</td>
</tr>
<tr>
<td>PSD</td>
<td>Prevention of Significant Deterioration</td>
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<tr>
<td>R2P2</td>
<td>Resource Recovery and Protection Plan</td>
</tr>
<tr>
<td>RACR</td>
<td>Roadless Area Conservation Rule</td>
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<tr>
<td>RARE II</td>
<td>National Roadless Area Review and Evaluation</td>
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<tr>
<td>RN</td>
<td>Roaded Natural</td>
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<tr>
<td>RNA</td>
<td>Research Natural Area</td>
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<td>RNG</td>
<td>Range Forage Production</td>
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<td>Record of Decision</td>
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<td>Recreation Opportunity Spectrum</td>
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<td>Significant Impact Levels</td>
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<td>SIO</td>
<td>Scenic Integrity Objectives</td>
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<tr>
<td>SIP</td>
<td>State Implementation Plan</td>
</tr>
<tr>
<td>SITLA</td>
<td>Utah School and Institutional Trust Lands Administration</td>
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</table>
SMUA  Sustainable Multiple Use Alternative  
SOx  Sulfur oxides  
SO2  Sulfur Dioxide  
SPCC  Spill Prevention, Control and Countermeasure  
SPM  Semi-Primitive Motorized  
SPR  Semi-Primitive Areas  
SMCRA  Surface Mining Control and Reclamation Act  
SUFCO  Southern Utah Fuel Company  
TBR  Wood Fiber Production and Utilization  
TDS  Total Dissolved Solids  
TEPCS  Threatened, Endangered, Proposed, Candidate, and Forest Service Sensitive Species  
TES  Threatened, Endangered, and Sensitive  
TKn  North Horn Formation  
TPY  Tons per Year  
UDWR  Utah Division of Wildlife Resources  
UPDES  Utah Pollution Discharge Elimination System  
USDA  US Department of Agriculture  
USDI  US Department of the Interior  
USEPA  United States Environmental Protection Agency  
Utah DWR  Utah Division of Water Resources  
VAM  Ventilation-Air Methane  
VMS  Visual Management System  
VOC  Volatile Organic Carbons  
VQO  Visual Quality Objective  
WET  Whole Effluent Toxicity
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SUMMARY OF THE EIS

SUMMARY 1.1 INTRODUCTION

The Supplemental Environmental Impact Statement (SEIS) for the Greens Hollow Federal Coal Lease Tract (UTU-84102) documents the environmental analysis pertaining to the potential leasing of the Greens Hollow Federal Coal Lease-By-Application (LBA) Tract (Greens Hollow tract) for competitive bid by the United States Department of the Interior (USDI), Bureau of Land Management (BLM), Utah State Office. Where Federal coal is being considered for lease on National Forest System (NFS) lands, the BLM must have the consent of the United States Department of Agriculture (USDA), Forest Service (FS) before doing so. This SEIS also documents the process used to analyze the LBA submittal, the environmental impacts, and possible conditions to protect non-coal surface resources in the event the lease is issued. The SEIS for the Greens Hollow tract was prepared jointly by the BLM, Price Field Office, and the FS, specifically the Manti-La Sal National Forest (MLNF) and Fishlake National Forest (FLNF). The USDA Office of Surface Mining Reclamation and Enforcement (OSM) is a cooperating agency in the preparation of the EIS. This document replaces the December 2011 Final Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract UTU-84102 (FEIS) in its entirety.

This SEIS addresses concerns that were identified after releasing the FEIS and FS Record of Decision (ROD) in December 2011. The FS consented to BLM’s decision to offer a federal coal lease with conditions. The consent decision was appealed February 13, 2012. Following the appeal, the FS withdrew the ROD in order to clarify the decisions to be made and agency decision authority, analyze the environmental consequences of potential actions to be taken by each agency, make technical corrections, and address agency compliance actions and resource concerns not previously analyzed in the original 2011 FEIS. The analysis clarifies potential effects within the Greens Hollow tract and those that may be reasonably foreseeable on adjacent NFS lands, mostly under active coal leases.

A review of the applicable federal and state legal and regulatory framework regarding decision authority resulted in changes to the analysis. The decision authority for the FS pertains only to whether or not to consent to the BLM’s decision to offer for lease the Greens Hollow tract and to identify which conditions are necessary to protect non-mineral resources. The decision authority of the BLM is to determine (based on FS consent) whether or not to offer the lease tract for competitive bid and under what terms, conditions, and stipulations.

The SEIS specifically addresses the consequences of implementing three alternatives including the No Action Alternative (the lease tract would not be offered for leasing), the Proposed Action in which the FS would consent to BLM offering for lease the tract with conditions and the BLM would offer it for lease, and another alternative similar to the Proposed Action, but which includes additional measures (areas where subsidence mining could not occur) to further protect specific resources. The analysis was initiated by the agencies in response to a lease-by-application (LBA) for the Greens Hollow tract submitted by Ark Land Company to the BLM, Utah State Office.

This LBA tract is being processed under authority of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments Act (FCLAA) of 1976, and according to the processes in 43 CFR Part 3400. If approved, the tract would be offered at a competitive lease sale.
SUMMARY 1.2 PROPOSED ACTION

The FS proposes to consent to the BLM offering for lease the NFS lands in the Greens Hollow tract (approximately 6,175 acres) for production of federal coal reserves, with conditions for protecting non-mineral resources (Figure 1.3). Based on FS consent, the BLM proposes to offer the Greens Hollow tract for competitive bid and issue a lease with terms, conditions, and special stipulations. Under this alternative, about 56.6 million tons of recoverable coal reserves, representing some 8.8 years of mining would be offered for lease.

For the NFS lands administered by the MLNF, the Proposed Action includes conditions (all special coal lease stipulations from the MLNF Forest Plan), except for Stipulation #9. Stipulation #9 includes provisions to protect certain surface resources such as escarpments, surface structures, and perennial streams from adverse effects of underground coal mine subsidence unless specifically approved. The Proposed Action does not include this stipulation, and therefore these features where they exist on the Green Hollow tract, could be subsided. For the NFS lands administered by the FLNF, resource conditions related to coal exploration and development that require special attention are addressed through standard lease terms and conditions and special coal lease stipulations developed by the MLNF that are included in Appendix B.

For the purposes of analysis, the Proposed Action assumes a Conceptual Mine Plan and a reasonably foreseeable Surface Use Scenario (Section 2.6). The Conceptual Mine Plan assumes the tract would be mined using underground longwall mining techniques, and that full extraction mining would occur across the tract.

SUMMARY 1.3 PURPOSE AND NEED

FS PURPOSE AND NEED

The FS has a need to respond to a request from the BLM for consent to offering a federal coal lease to comply with the MLA of 1920, as amended by the FCLAA of 1976 and supplemented in 1978. The FS action responds to the MLNF and FLNF plans in Chapter 1, Sections 1.8.1 and 1.8.2. The FS must assess whether or not to consent to the BLM offering certain NFS lands for lease for coal resources.

BLM PURPOSE AND NEED

The BLM is considering the Proposed Action because coal energy development is recognized as an appropriate use of public lands and is an integral part of the nation’s energy independence, and authorized under the authority of the Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976 and supplemented in 1978, and by implementing regulations at 43 CFR 3425, Lease By Application.

The purpose of the BLM action is to facilitate continued development and Maximum Economic Recovery (MER) of federally managed coal energy resources in a safe and environmentally sound manner.

The agencies actions respond to the federal government’s overall policy to foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of domestic and industrial energy needs, national security interests, and environmental needs (Mining and Minerals Policy Act of 1970).
SUMMARY 1.4 DECISIONS FRAMEWORK

The Responsible Officials have the following decisions:

FS – As Responsible Official for the surface managing agency, the Forest Supervisor, Manti-La Sal and the Fishlake National Forests must decide:

- Whether or not to consent to the BLM issuing Federal Coal Lease UTU-84102 according to the MLA of 1920; as amended by the FCLAA of 1976.

- If the FS consents to issue the lease, they will prescribe conditions needed for protection of non-mineral surface resources on NFS lands. The conditions of FS consent would become stipulations on the BLM lease, should it be issued.

BLM – The District Manager of the BLM must decide:

- Whether or not to offer the tract for competitive leasing and under what terms, conditions, and stipulations, contingent on the consent of the surface managing agency.

If leased, the plans for mining would be reviewed by the BLM to ensure they fulfill the requirement of Maximum Economic Recovery (MER) and that mining is consistent with all lease terms, conditions, and stipulations. If leased, OSM would also use this analysis to support its review and associated recommendation on approval actions to the USDI Assistant Secretary for Lands and Minerals on a federal mine plan provided by the BLM if and when one is brought forward.

SUMMARY 1.5 EXISTING MINE AND RELATIONSHIP TO THE GREENS HOLLOW TRACT

The Greens Hollow tract lies to the north and west of the SITLA Coal Lease Tract and the Quitchupah Lease Tract as well as other lease tracts (Figure 1.2). The coal in the Greens Hollow tract could be directly accessed from the south and east through an extension of underground workings in the SUFCO mine. The Greens Hollow tract could also be accessed from other sites, including Muddy Creek Canyon on the north end of the tract, but would require the development of new portals in adjacent undisturbed areas.

SUMMARY 1.6 PUBLIC INVOLVEMENT

NEPA requires that the public and agency personnel be involved from an early stage in decision making on federal lands. Public involvement is an important part of the environmental and socioeconomic analysis process. A public involvement plan (communications plan) was developed to describe the protocol that would be used to involve the public in the environmental and socioeconomic analysis. The plan allows the public to actively participate in the NEPA process and to communicate issues of support, benefit, and concern regarding the proposed action. In addition, involvement of local, State, and other Federal agencies help to anticipate the potential effects and benefits that could result from the project. The public involvement plan is part of the project record located in the BLM Price Field Office, the Manti-La Sal National Forest Supervisors Office, Price, Utah, and Fishlake National Forest Supervisors Office, Richfield, Utah.

The Notice of Intent (NOI) for the Greens Hollow tract EIS was printed in the Federal Register (Vol. 73, No. 29, pp. 8060-8062) on Tuesday, February 12, 2008 (Appendix A). The NOI designated a 45-day
comment period ending March 28, 2008. A public scoping notice was also prepared and distributed on February 22, 2008 to interested individuals on the BLM, Price Field Office and Manti-La Sal and Fishlake National Forests mailing list. A legal notice was also sent to local newspapers (Richfield Reaper, Sun Advocate, Emery County Progress, and Salina Sun) to notify the general public through newspaper releases and media coverage. Comments were directed to the agency project manager in the BLM, Price Field Office.

In addition, in 2004 the FS initiated the preparation of an EIS for the Muddy Creek tract which involved the same lands as the Greens Hollow tract. Public scoping was conducted from March 5, 2004, through April 12, 2004, and a total of 10 responses were received. Based on the scoping comments and internal agency review, four resources were identified for detailed analysis in the Muddy Creek EIS: water resources, wildlife and wildlife habitat, vegetation, and cultural/paleontological resources.

**COMMENTS ANALYZED AND RESPONDED TO IN THE PREPARATION OF THE EIS**

A content analysis of the comments received was prepared. A summary of issues and concerns, grouped by discipline or resource, that were identified during the scoping process follows, while a more detailed record of responses received is provided in the scoping report developed for the project.

**COMMENTS ON THE DRAFT EIS**

A DEIS for the Greens Hollow tract was released and distributed on March 26, 2009. The EPA Notice of Availability (NOA) appeared in the Federal Register on April 3, 2009, initiating the formal comment period on the DEIS. The BLM NOA appeared in the Federal Register on April 6, 2009. The FS Legal Notice of Proposed Action appeared in the Emery County Progress and Sun Advocate newspapers on April 14, 2009 and in the Richfield Reaper and Salina Sun newspapers on April 15, 2009. The 45-day comment period established in the EPA NOA in the Federal Register ended May 18, 2009. The NOA was also posted on the BLM’s Environmental Notification Bulletin Board (ENBB) on April 3, 2009. An electronic copy of the DEIS was made available on the BLM’s website. Hard copies of the DEIS were mailed to the project mailing list and additional copies were made available at the BLM and FS offices.

Following the release of the DEIS, a public comment meeting was held in conjunction with the Fair Market Value Hearing at Salina, Utah on May 6, 2009.

Instructions were given to those receiving a copy of the DEIS and those attending the public meeting as to how to submit comments. Comment letters were sent to the agency project manager at the BLM Price Field Office in Price, Utah. All comment letters were added to the project record for the EIS.

The analysis of the comments focused on substantive comments on the DEIS as directed in 40 CFR 1503.4(b). Substantive comments included those which challenge the information in the DEIS as being accurate or inadequate or which offer specific information that may have bearing on the decision. Resource specialists prepared draft responses to each substantive comment. Those responses on the DEIS are located in the project record.

**COMMENTS RECEIVED DURING THE APPEAL OF THE RECORD OF DECISION**

A FEIS and FS Record of Decision (ROD) for the Greens Hollow tract were released by the FS in December 2011. The ROD consented to the BLM offering for lease the Greens Hollow tract. Interested parties on the mailing list were sent a notification dated December 14, 2011 of the release of the FEIS and FS ROD. The notification informed the interested parties where the FEIS and FS ROD could be located...
electronically and included the documents or CD, if requested. An EPA NOA was published in the Federal Register on December 23, 2011.

An appeal of the FS ROD was filed with the Regional Forester on February 13, 2012 by the Utah Environmental Congress, Grand Canyon Trust, and Center for Biological Diversity.

The FS withdrew the ROD for the Greens Hollow tract on March 20, 2012. Concerns raised in the appeal were further addressed in this SEIS.

**NOTICE OF INTENT TO PREPARE A SUPPLEMENTAL EIS**

An EPA NOI was published in the Federal Register on October 18, 2012 announcing the intent to prepare a supplemental EIS on the Greens Hollow tract. Additional scoping was not conducted in accordance with 40 CFR 1502.9(c) (4). There will be a 45-day comment period after the draft Supplemental EIS is issued.

**COMMENTS LEADING TO ALTERNATIVES**

All of the above mentioned comments have been taken into consideration when developing alternatives to the proposed action and are discussed in Chapter 2 under Alternatives Development.

**SUMMARY 1.7 ISSUES TO BE ANALYZED**

Results of public scoping and ID Team deliberation resulted in issues being raised about the following: Mining-induced subsidence or potential post-leasing surface use effects on the ground surface, seismicity, surface and groundwater resources, surface structures, wildlife (includes threatened, endangered, sensitive and management indicator species) habitat and viability, vegetation resources (including Threatened, Endangered, and Special Status species), heritage resources, paleontological resources, socioeconomics, recreation, visual quality, range resources, roadless areas and air quality.

Full issue statements are described in Section 1.11.2.

**SUMMARY 1.8 ALTERNATIVES ANALYZED**

Chapter 2 describes and compares the No Action and other alternatives evaluated in the Greens Hollow tract EIS. The agencies preferred alternative is Alternative 3.

**Alternative 1 – No Action**

Under the No Action alternative, the FS would not consent to the BLM offering for lease the Greens Hollow tract, the lease tract would not be offered by the BLM for leasing, and it was assumed there would be no coal mining within the tract at this time. Other approved activities and on-going natural processes would continue.

**Alternative 2 – Proposed Action**

Under the Proposed Action, the FS would consent to BLM’s leasing approximately 6,175 acres of NFS lands in the Greens Hollow tract to develop federal coal resources, and prescribe conditions to protect non-mineral resources. For NFS lands, special coal lease stipulations described in the MLNF Forest Plan, except Stipulation #9 (current special coal lease stipulations are attached as Appendix B) would be included as terms of FS consent for lands administered by both the MLNF and FLNF. Excluding Stipulation #9 from this alternative allows for analyzing the effects of subsidence on all lands in the tract.
Since this alternative includes that Stipulation #9 would not be a condition of FS consent, the analysis is therefore based on the assumption that full extraction mining could occur, and in turn lead to subsidence on all lands in the tract. Figure 1.3 identifies the largest possible subsidence area boundary (Area of Subsidence Mining) assuming that full extraction mining and associated subsidence might occur, and where surface effects might occur within the angle of draw. Thus full subsidence mining will be analyzed to occur anywhere within the Area of Subsidence Mining under this alternative. In this way, this alternative represents a maximum impact scenario in terms of subsidence impacts. Subsidence mining outside the proposed Greens Hollow tract would occur within previously approved adjoining lease tracts.

The BLM would offer and issue the lease with standard BLM lease terms, conditions, and special coal lease stipulations from the FS consent for an estimated 56.6 million tons of recoverable federal coal reserves representing about 8.8 years of mining. The lease terms and conditions include a general provision to prevent “damage or degradation to any land, air, water, heritage, biological, visual, and other resources…” (BLM 1986).

For the purposes of analysis, the Proposed Action assumes a Conceptual Mine Plan and a reasonably foreseeable Surface Use Scenario (Section 2.6). The Conceptual Mine Plan assumes the tract would be mined using underground longwall mining techniques, and that full extraction mining would occur across the tract.

**Alternative 3**

Alternative 3 was developed to protect certain critical surface resources from the effects of subsidence within the lease tract boundary. The areas requiring additional protection are displayed on Figure 1.4 as Area of No Subsidence Mining. Issues driving this alternative include potential impacts to water, geology, vegetation, wildlife habitat, and cultural resources. This alternative assumes the Conceptual Mine Plan and reasonably foreseeable Surface Use Scenario (Section 2.6) and specifies the use of non-subidence (e.g. full-support) mining in specific locations to protect surface resources from subsidence. Areas considered for specific protection include perennial streams where surface flow could be lost to subsidence-induced cracking of Castlegate Sandstone or where escarpments could fail.

Like the Proposed Action, under Alternative 3 the FS would consent to the BLM offering for lease approximately 6,175 acres of NFS lands in the Greens Hollow tract with conditions for the protection of non-mineral resources. However, site-specific exceptions to Stipulation #9 authorizations would not be considered for areas identified for specific protection in this alternative.

Under Alternative 3, the BLM would offer, sell, and issue the Greens Hollow tract by competitive bid for development of about 55.7 million tons of recoverable federal coal reserves (approximately 900,000 tons less than Alternative 2), representing about 8.7 years of mining. All special coal lease stipulations described in the MLNF Forest Plan would be included (Appendix B) as part of FS consent for lands administered by both the MLNF and FLNF.

**SUMMARY 1.9 AFFECTED ENVIRONMENT**

The affected environment chapter of the EIS describes the physical, biological, social, and economic conditions of the existing environment potentially affected by implementation of alternative actions. The Council on Environmental Quality (CEQ) regulations directs agencies to describe the environment that could be affected commensurate with the importance of the impacts (40 CFR 1502.15). The data and level of detail presented are, therefore, based on the information necessary for the reader to compare the existing situation with the potential effects of the alternatives. The description of the existing environment is structured by resource. The resources discussed include Geology, Mining, Subsidence, Greens Hollow Federal Coal Lease Tract S-6 Draft Supplemental Environmental Impact Statement
Seismicity, and Structures and Facilities; surface and ground water resources; aquatic and terrestrial wildlife resources; vegetation resources; heritage resources; paleontological resources; socioeconomics; recreation resources; visual quality; rangeland resources; roadless resources; and air quality.

The assessment (i.e., effects analysis) area for the EIS varies by resource according to the natural limits of influence for each resource. For all resources, it includes a mining analysis area boundary, which is defined by the maximum area of potential subsidence impact and the other associated elements or where cumulative effects of off lease activities might occur. Each resource area defines the limits of the applicable assessment area or areas.

**SUMMARY 1.10 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES**

The environmental consequences associated with implementation of the proposed action and the alternatives are discussed in detail. This analytical discussion compares the impacts associated with each action alternative to the No Action Alternative. Under NEPA, actions which could significantly affect the quality of the human environment must be disclosed and analyzed in terms of the “context and intensity” that makes them significant. For an action to have an effect, it must have a demonstrable causal relationship, which can be direct, indirect, or cumulative in nature (40 CFR 1508.27). The potential effects of each alternative are identified and discussed by each resource discipline reviewed in the affected environment chapter. Impacts are discussed with respect to each issue statement developed from public and agency scoping. A summary of the treatment of direct and indirect effects for the alternatives and elements is shown in Table 2.2. Cumulative effects are described for each resource as identified in Chapter 2 of the EIS (Table 2.1). Where pertinent, each resource section also describes unavoidable adverse impacts, effects related to short-term uses versus long-term productivity, and the irreversible or irretrievable commitment of resources.
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1.0 CHAPTER 1 – PURPOSE AND NEED

1.1 INTRODUCTION

This Draft Supplemental Environmental Impact Statement (Draft SEIS) for the Greens Hollow Federal Coal Lease Tract (UTU-84102) documents the environmental analysis pertaining to the potential leasing of the Greens Hollow Federal Coal Lease-By-Application (LBA) Tract (Greens Hollow tract) for competitive bid by the United States Department of the Interior (USDI), Bureau of Land Management (BLM), Utah State Office. Where leasing federal coal resources involves national forest system (NFS) lands, the BLM must have the consent of the United States Department of Agriculture (USDA), Forest Service (FS), before doing so. This Draft SEIS was prepared in accordance with the National Environmental Policy Act (NEPA) and provides a forum for public review and comment on the proposed lease. This Draft SEIS also documents the process used to analyze the LBA submittal, the environmental impacts, and possible stipulations to protect non-coal surface resources in the event the lease is issued. The environmental analyses for the Greens Hollow tract in this Draft SEIS was prepared jointly by the BLM Price Field Office, and the FS, specifically the Manti-La Sal National Forest (MLNF) and Fishlake National Forest (FLNF). The USDI-Office of Surface Mining, Reclamation and Enforcement (OSM) is a cooperating agency with the authority to review and comment on the content of this EIS. This document replaces the December 2011 Final Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract UTU-84102 (FEIS) in its entirety.

1.1.1 ORIGINAL EIS HISTORY

This Draft SEIS addresses concerns that were identified after releasing the FEIS and FS Record of Decision (ROD) in December 2011. The FS issued a decision to consent to BLM offering the lease; with conditions. The consent decision was appealed February 13, 2012. Following the appeal, the FS withdrew the ROD in order to clarify the decisions to be made and agency decision authority; analyze the environmental consequences of potential actions to be taken by each agency; make technical corrections; and address agency compliance actions and resource concerns not previously analyzed in the original 2011 FEIS. There was a need to clarify compliance with current USDA and FS policy regarding management of Inventoried Roadless Areas, other potential unroaded/undeveloped areas, update the analysis for aquatic management indicator species, and update the analysis of greater sage-grouse based on new information and new agency direction. The analysis clarifies potential effects of leasing the Greens Hollow tract based on preliminary data on mining method and potential surface uses that may be needed to facilitate mining. Additionally, the analysis discloses effects of other potential surface uses that may be needed to facilitate mining, but that would likely lie off the Greens Hollow tract on existing adjacent coal leases.

A review of the applicable federal and state legal and regulatory framework regarding decision authority resulted in changes to the analysis. The decision authority for the FS pertains only to whether or not to consent to the BLM offering to lease the Greens Hollow tract and to prescribe which conditions are necessary to protect non-mineral resources. The decision authority of the BLM is to determine (based on FS consent) whether or not to competitively offer to lease the tract and under what terms, conditions, and stipulations.
1.2 PROJECT BACKGROUND

1.2.1 PROJECT HISTORY

On September 7, 2006, Ark Land Company filed a competitive coal lease application with the USDI-BLM, Utah State Office under the Mineral Leasing Act of 1920, as amended (30 USC Section 201), and implemented by regulations found at 43 CFR 3425. The BLM accepted the application, prepared a tract delineation report (February 26, 2007), and has assigned the Greens Hollow tract with Serial Number UTU-84102. The tract is adjacent to the existing underground workings of the Southern Utah Fuel Company (SUFCO) Mine operated by Canyon Fuel Company. If leased, coal resources in the tract would be recovered by underground mining methods due to the depth of the coal.

1.2.2 PROJECT LOCATION

The proposed Greens Hollow tract is located on the Manti-La Sal and Fishlake National Forests on the southern end of the Wasatch Plateau, in the Wasatch Plateau Known Recoverable Coal Resource Area. The surface and coal resources are both federally managed: the Manti-La Sal and Fishlake National Forests administer the surface resources, while the BLM manages all mineral resources.

More specifically, the Greens Hollow tract is located in the Muddy Creek and North Fork Quitchupah Creek drainages. The tract is approximately 10.5 air miles west of the town of Emery, Utah. The final coal lease tract, as amended by the BLM Tract Delineation Team, encompasses approximately 6,175 acres of federal coal estate. Approximately 6,096 acres of the tract lies on the Manti-La Sal National Forest; while 79 acres on the southern edge of the tract lie on the Fishlake National Forest. Figure 1.1 shows the location of the proposed lease tract.

1.2.3 RESOURCES REQUESTED

Two or more coal seams occur in the lease area, primarily in the Upper and Lower Hiawatha. The Lower Hiawatha coal seam has mineable coal thickness throughout the lease; the Upper Hiawatha does not. Therefore, it is foreseen that all mining would occur in the Lower Hiawatha seam. Coal reserves in the Greens Hollow tract are estimated at 73.4 million in-place tons of coal. Based on these estimates, it is projected that approximately 56.6 million tons of coal are recoverable. The lease application indicated the purpose was to lease reserves to continue production at the SUFCO Mine. The tract lies adjacent to and north and west of the existing SUFCO Mine.

1.2.4 LEASING HISTORY

Lands in the Greens Hollow tract were previously evaluated in a regional leasing effort as the Federal Muddy Tract (along with several other tracts), for competitive leasing in the Uinta-Southeastern Utah Coal Region, Round Two Final Environmental Impact Statement, 1983. However, this tract area was never leased. Currently, BLM leases federal coal solely under the lease-by-application process at 43 CFR 3425, which requires site-specific environmental analysis. Portions of the Regional analyses are no longer valid due to changes in resource concerns and issues, and thus need to be reevaluated. Further, the Land and Resource Management Plan for the Manti-La Sal National Forest (Forest Plan), completed in 1986, contains specific directions for coal leasing and supersedes much of the leasing-related information contained in these earlier analyses. Additionally, the tract boundaries as applied for in the current lease-by-application are different than those evaluated earlier.
Figure 1.1. Project location map.

Legend
- Greens Hollow Coal Lease Tract
- Manti-La Sal National Forest
- Fishlake National Forest
- Private Land
1.2.5 TRACT DELINEATION
The initial application for 6,175.39 acres was reviewed by the BLM, who then assembled a tract delineation team. The team reviewed land and mineral status, among other factors, and amended the tract boundaries by adding 521.02 acres (6,696.41 acres total) to comply with competitive leasing requirements, increasing the Federal Reserve base that could likely be mined, allowing for lease modification or new leasing should further exploration and mining in this area prove viable, and allowing the recovery of additional reserves from adjacent SITLA lands/lease. Further, lands in the tract were evaluated using the Unsuitability Criteria for Coal Mining cited at 43 CFR 3461 and attached in Appendix A. Application of the criteria did not result in any lands being identified as unsuitable or the identification of additional stipulations. Prior to completing the NEPA analysis, the decision was made by the BLM to remove a 41-acre and 480-acre parcel in the southwest portion of the tract since the area did not meet data adequacy standards at that time. It was determined that coal in these areas would not be isolated and could still be mined in the future under a separate leasing process. The Greens Hollow tract as delineated by the BLM is shown in Figure 1.2.

1.2.6 DATA ADEQUACY STANDARDS MET
The FS and the BLM have determined that there is enough information available to meet the Data Adequacy Standards for Federal Coal Leasing, Uinta-Southwestern Utah Coal Region for the Greens Hollow tract. Field resource data was collected for three years (2001 to 2003) in an area that included the former Muddy Creek coal tract and a 2-mile buffer around it, in which the Greens Hollow tract falls. In 2004, the FS initiated a technical review of the Muddy Creek tract and four resources were identified as being of specific concern: water resources, wildlife and wildlife habitat, vegetation, and cultural/paleontological resources. This data was reviewed and updated to ensure its validity for the Greens Hollow tract SEIS analysis.

1.3 LEASE-BY-APPLICATION

1.3.1 LEASE RIGHTS
A coal lease provides “…the right to use such on-lease rights-of-way which may be necessary or convenient…” but does not authorize specific surface disturbing activities. Rather, the decisions related to post-lease surface activities are made when and if site-specific surface use proposals are submitted. If the tract is leased, actual approval for detailed surface uses would be subject to subsequent review and approval procedures by Utah Division of Oil, Gas, & Mining (DOGM) and OSM. Actual mining must be approved by the state. Any future mining and surface uses must be conducted consistent with lease terms, conditions, and special stipulations for each specific lease.

Leasing is a competitive process and results in a conveyance of rights and responsibilities. It represents a commitment of resources for which projections of conceptual post-leasing development (both underground mining and surface uses) are used to facilitate indirect and cumulative effect analyses, and establishes a baseline for stipulations to protect the surface resources.

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1 United States Department of the Interior Bureau of Land Management Coal Lease Form 3400-12.
Figure 1.2. Leases near the Greens Hollow tract.
1.3.2 CONCEPTUAL MINE PLAN AND REASONABLY FORESEEABLE SURFACE USE SCENARIO

A conceptual mine plan and reasonably foreseeable surface use scenario was envisioned for purposes of this analysis and is delineated in Section 2.6.

1.4 AGENCY PURPOSE AND NEED

1.4.1 FS PURPOSE AND NEED

The FS has a need to respond to a request from the BLM for consent to a federal coal lease to comply with the MLA of 1920, as amended by the FCLAA of 1976 and supplemented in 1978. The FS action responds to the MLNF and FLNF plans described below in Sections 1.8.1 and 1.8.2. The FS must assess whether or not to consent to the BLM offering certain NFS lands for lease for coal resources.

1.4.2 BLM PURPOSE AND NEED

The BLM is considering the Proposed Action because coal energy development is recognized as an appropriate use of public lands and is an integral part of the nation’s energy independence, and authorized under the authority of the Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976 and supplemented in 1978, and by implementing regulations at 43 CFR 3425, Lease By Application.

The purpose of the BLM action is to facilitate continued development and Maximum Economic Recovery (MER) of federally managed coal energy resources in a safe and environmentally sound manner. The agencies actions respond to the federal government’s overall policy to foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of domestic and industrial energy needs, national security interests, and environmental needs (Mining and Minerals Policy Act of 1970).

1.5 LEASING PROCESS, AGENCY ROLES, AUTHORITIES, AND RESPONSIBILITIES

1.5.1 GENERAL LEASE PROCESS

This Draft SEIS is prepared to inform federal agency decision makers, publicly disclose the probable benefits and environmental impacts of leasing the coal reserves, and establish protections in the form of lease stipulations for surface resources. The leasing process is as follows: First, an applicant submits an application to the BLM identifying the federal lands needed to develop the coal resource (43 CFR 3425). Second, the BLM initiates the lease consideration process, ensuring the NEPA analysis is completed and submits the lease application to the FS for consent and attachment of stipulations (43 CFR 3425.3). Third, BLM reviews and ensures that federal coal is offered a configuration to assure the maximum economic recovery of mineable federal coal reserves. BLM, and FS as the surface management agency, are jointly completing the required environmental analysis.

There are three aspects to BLM’s oversight: 1) The State Office administers coal leasing, 2) the Richfield Field Office oversees lands within their office area, and 3) the Price Field Office oversees the mineral and engineering aspects of mining. Since the Greens Hollow tract lies within Sevier County and Sanpete...
Count, Utah, it is overseen by the BLM Richfield Field Office and governed by their Resource Management Plan (RMP) (RMP’s follow county boundaries within the state).

Operations are managed out of the BLM Price Field Office where technical mining expertise is located near the majority of the coal fields and mining operations in the State of Utah (these are within Emery and Carbon Counties).

The Manti-La Sal and Fishlake NF offices are working cooperatively in their review and consent process.

1.5.2 AUTHORIZING LAWS, POLICIES, AND RESPONSIBILITIES ASSOCIATED WITH THIS POTENTIAL ACTION.

Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976
This federal coal lease application (the Greens Hollow tract) is being processed under the authority of the Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976, and implementing regulations at 43 CFR 3425, Lease-By-Application. Under this legal framework, the BLM has the mineral leasing authority, and since the Greens Hollow tract contains surface NFS lands, the FS is the surface management agency with consent authority for leasing.

The FS consent authority includes prescribing necessary conditions to protect non-mineral resources on the surface lands involved. The FS will prescribe conditions that the BLM can then attach as stipulations to the coal lease, should it be offered for sale, to ensure the protection of non-mineral resources (see Appendix B).

If the Greens Hollow tract is leased, it will be done competitively by bid, at a lease sale. Granting the lease would give the successful bidder (the lessee) exclusive rights to mine the coal but would not authorize actual mining or surface disturbing activities. If the lease is granted, the process will follow as outlined below under the Surface Mining Control and Reclamation Act of 1977 discussion.

Mining and Minerals Policy Act of 1970
The Mining and Minerals Policy Act of 1970 states in part that it is the “continuing policy of the Federal government in the national interest to foster and encourage private enterprise in the development of economically sound and stable domestic mining minerals and mineral reclamation industries, … [and] the orderly and economic development of domestic mineral resources…”.

FS Manual Direction
The FS administers its minerals program (FS Manual 2800 ZERO Code – WO Amendment 2800-91-1 Page 3) to:

1. Encourage and facilitate the orderly exploration, development, and production of mineral and energy resources within the NFS in order to maintain a viable, healthy minerals industry and to promote self-sufficiency in those mineral and energy resources necessary for economic growth and national defense;

2. Ensure that exploration, development, and production of mineral resources are conducted in an environmentally sound manner and that these activities are considered fully in the planning and management of other NFS resources; and

3. Ensure that lands disturbed by mineral and energy activities are reclaimed for other productive uses.

Surface Mining Control and Reclamation Act of 1977 (SMCRA)
The purpose of SMCRA was to establish a nationwide program to protect society and the environment from adverse effects of surface coal mining operations, and provide for the cooperation between the Secretary of the Interior and the States with respect to the regulation of surface coal mining operations, among other purposes. SMCRA balances the need to protect the environment from the adverse effects of surface coal mining with the nation's need for coal as an essential energy source. It established coal mining and reclamation standards to ensure that coal mining operations are conducted in an environmentally responsible manner and that the land is adequately reclaimed during and following the mining process. Requirements of SMCRA are codified at 30 CFR 700 to end. In essence, SMCRA guides the coal mine permitting process which occurs subsequent to the leasing process.

SMCRA also established within the Department of the Interior, the federal OSM. SMCRA recognized that ‘because of the diversity in terrain, climate, biologic, chemical, and other physical conditions in areas subject to mining operations, the primary governmental responsibility for developing, authorizing, issuing, and enforcing regulations for surface mining and reclamation operations subject to this Act should rest with the States’. For federal lands, the regulations provide a process whereby OSM can delegate to a state the authority to regulate and permit coal mining via a cooperative agreement. To that end, OSM approved a permanent program for Utah in which the State was designated as the regulatory authority for federal coal operations in the state (30 CFR 944). The State of Utah, Department of Natural Resources, through its agency the DOGM is responsible for issuing coal mining permits. The State codified state-specific coal rules in the Utah Administrative Code R645.

SMCRA, its implementing regulations, along with the Utah Coal Rules, provide the framework under which actual coal mining, surface uses, and its potential effects on the environment are managed. These requirements include protecting water resources, wildlife habitat, air quality, vegetation, and cultural and historic resources, among others. These requirements also include monitoring and mitigation requirements, as well as set standards for returning the land to acceptable uses after mining (termed post-mining land use). DOGM and OSM (through oversight of the State program) are responsible for compliance and enforcement actions during the life of a mine.

Collectively, DOGM and OSM are responsible for managing the coal mine permitting process. The permitting process would occur subsequent to leasing. Thus, if the Greens Hollow tract is offered for lease and a lease issued, the lessee or operator would be required to submit a Permit Application Package (PAP) to DOGM and OSM for required approvals before any mining could occur on the lease tract.

Pursuant to the Utah cooperative agreement with OSM (30 CFR 944), federal coal lease holders in Utah must submit a PAP to Utah DOGM for proposed site-specific surface mining and reclamation operations on federal lands in the State. Utah DOGM reviews the PAP to ensure that it complies with the approved Utah State permit program and other statutes and evaluate the need for resource monitoring. The monitoring requirements include a water resources monitoring plan, among others.

If the PAP does comply, Utah DOGM issues the applicant a permit to conduct site-specific surface coal mining operations. As part of this process, OSM, BLM, and USDA FS personnel review the PAP to ensure it contains the necessary information to comply with the coal lease, the Mineral Leasing Act of 1920, as amended (MLA), the National Environmental Policy Act of 1969, as amended (NEPA), and other applicable federal laws and their attendant regulations. The FS has a review and concurrence role during this step. As deemed necessary, OSM (under the MLA) recommends to the Assistant Secretary of the Interior, Land and Minerals Management, one of three options: 1) approval of the MLA mining plan (prepared by the BLM), 2) approval of the MLA mining plan with conditions, or 3) disapproval of the MLA mining plan. Any specific needs for surface facilities, when they are known and have been identified in the formal PAP, would be evaluated through this process. Any surface uses must be designed to be consistent with the terms, conditions, and stipulations on the federal coal lease.
At the permitting stage, the FS is the Federal Land Managing Agency (FLMA), as defined by SMCRA. In that role, the agency participates with DOGM and/or OSM to determine the post-mining land use, protect non-mineral resources, and require appropriate terms and conditions for surface mining and reclamation within its jurisdiction. When OSM is considering whether or not to approve a federal mining plan, the FLMA has the responsibility to concur with the terms of the mining plan as it applies to the surface estate.

Specific to actions under the purview of DOGM, the DOGM process has provisions for FLMA to provide input and comments to permitting actions, including input on post-mining land use and any special requirements necessary to protect non-coal resources of the surface estate affected by coal mining operations and reclamation (30 CFR 944.30 Article VI.C). DOGM then includes, as part of the permit approval, applicable terms and conditions required by the lease contract, and applicable federal laws and regulations, including conditions imposed by the FLMA relating to post-mining land use, and those of other affected agencies, and will be conditioned on compliance with the requirements of the FLMA with jurisdiction (30 CFR 944.30 Article VI.C(4)(g)).

The BLM is responsible for monitoring and enforcing lease terms and conditions, and for including appropriate leasing contract stipulations. The BLM is also responsible for reviewing and recommending the approval of the resource recovery and protection plan (R2P2) and ensuring that coal resources are efficiently recovered. The R2P2 recommendation is part of the PAP which is reviewed by DOGM and OSM in preparation of the federal mining plan recommendation. The FS cooperates with the BLM by inspecting the lease surface estate and surface operations.

Utah DOGM enforces the performance standards and permit requirements during the mine's operation for site-specific surface coal mining activities and has primacy in environmental emergencies. OSM retains oversight responsibility of this enforcement. The surface management agency or the BLM have authority to act in emergency situations in which Utah DOGM or OSM inspectors cannot act before environmental harm or damage occurs. Utah DOGM conducts frequent inspections of operations for compliance. The FS cooperates with enforcement.

Resource monitoring, including subsidence, water sources, wildlife populations, and vegetation communities is conducted by the lessee/operator in compliance with the surface mining permit and other permits issued for operations. The regulatory agencies take periodic samples to verify the lessee/operator monitoring data.

As part of the DOGM permitting process, an amendment to an existing mine plan would be developed to show how new activities proposed in the lease tract would occur and be reclaimed. Specific impacts that would occur would be addressed in the permit or revision, and specific measures for anticipated impacts would be identified at that time.

SMCRA has a requirement in Section 522(a) regarding application of the general unsuitability criteria. This requirement is considered at the coal leasing stage by following regulations at 43 CFR 3461. The Unsuitability Analysis review for the tract in the respective forest plans specifically for the Greens Hollow tract satisfies this requirement (Greens Hollow Unsuitability Assessment for Federal Coal Lease-By-Application UTU-84102 located in Appendix A).

Multiple-Use Sustained Yield Act of 1960
The Multiple-Use Sustained Yield Act of 1960 declared that NFS lands are to be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. The Act also expressly provides that it shall not be construed to affect the use or administration of mineral resources on NFS lands.
This Act has a general purpose to ensure jobs for the future with secure and affordable energy. Related to coal, this Act served to promote national energy policy and energy security that results from use of coal.

1.6 EXISTING MINE AND RELATIONSHIP TO THE GREENS HOLLOW TRACT

The Greens Hollow tract lies to the north and west of an existing SITLA Coal Lease Tract (ML 49443-OBA) and the Quitchupah Federal Coal Lease Tract (U-63214) as well as other existing coal leases (Figure 1.2). These existing leases are currently being developed as part of the SUFCO Mine. The coal in the Greens Hollow tract could be directly accessed from the south and east through an extension of underground workings in the SUFCO mine. The Greens Hollow tract could also be accessed from other sites, including Muddy Creek Canyon on the north end of the tract, but would require the development of new portals in adjacent relatively undisturbed areas.

1.7 ALTERNATIVES INCLUDING THE PROPOSED ACTION

1.7.1 NO ACTION

Under the No Action alternative, the FS would not consent to the BLM offering for lease the Greens Hollow tract, the lease tract would not be offered by BLM for leasing, and it was assumed there would be no coal mining within the tract at this time. Other approved activities and on-going natural processes would continue.

1.7.2 PROPOSED ACTION

The FS proposes to consent to the BLM offering for lease coal minerals under approximately 6,175 acres of NFS lands in the Greens Hollow tract for production of federal coal reserves, with conditions for protecting non-mineral resources (Figure 1.3). Based on FS consent, the BLM proposes to offer the Greens Hollow tract for competitive bid and issue a lease with terms, conditions, and special stipulations. Under this alternative, about 56.6 million tons of recoverable coal reserves, representing some 8.8 years of mining would be offered for lease.

For the NFS lands administered by the MLNF, the Proposed Action includes all special coal lease stipulations (conditions) from the MLNF Forest Plan, except for Stipulation #9. Stipulation #9 includes provisions to protect certain surface resources such as escarpments, surface structures, and perennial streams from adverse effects of underground coal mine subsidence. The Proposed Action does not include this stipulation, and therefore these resources where they exist on the Green Hollow tract, could be subsided. Since this alternative includes that Stipulation #9 would not be a condition of FS consent, the analysis is therefore based on the assumption that full extraction mining could occur, and in turn lead to subsidence on all lands within the tract. For the NFS lands administered by the FLNF, resource conditions related to coal exploration and development that require special attention are addressed through standard lease terms and conditions and special coal lease stipulations developed by the MLNF that are included in Appendix B.
Figure 1.3. Alternative 2 - Proposed Action.

Legend
- National Forest System Roads
- Substation Locations
- SUFCO Water Discharge
- Existing Fan Locations
- SUFCO Mine Portal

Greens Hollow Coal Lease Tract
Conceptual Mining Area
Area of Subsidence Mining
Mining Analysis Area Boundary
Manti-La Sal/Fishlake Forest Boundary
For the purposes of analysis, the Proposed Action assumes a Conceptual Mine Plan and a reasonably foreseeable Surface Use Scenario (Section 2.6). The Conceptual Mine Plan assumes the tract would be mined using underground longwall mining techniques, and that full extraction mining would occur across the tract.

1.7.3 ALTERNATIVE 3

Alternative 3 was developed to protect certain critical surface resources from the effects of subsidence within the lease tract boundary (Figure 1.4). This alternative assumes the Conceptual Mine Plan and reasonably foreseeable Surface Use Scenario (Section 2.6) with the exception of specifying the use of non-subsidence (e.g. full-support) mining in specific locations to protect surface resources from subsidence. Areas considered for specific protection include perennial streams where surface flow could be lost to subsidence-induced cracking of Castlegate Sandstone or where escarpments could fail.

Like the Proposed Action, under Alternative 3 the FS would consent to the BLM offering for lease coal minerals under approximately 6,175 acres of NFS lands in the Greens Hollow tract with conditions for the protection of non-mineral resources. Under Alternative 3, the BLM would offer, sell, and issue the Greens Hollow tract by competitive bid for development of about 55.7 million tons of recoverable federal coal reserves, representing about 8.7 years of mining. All special coal lease stipulations described in the MLNF Forest Plan, would be included as part of FS consent for lands administered by both the MLNF and FLNF. However, site-specific exceptions to Stipulation #9 authorizations would not be considered for areas identified for specific protection in this alternative.

1.8 CONFORMANCE WITH LAND USE PLANS

The Forest Plans provide the overall guidance (Goals, Objectives, Standards, and Management Area Direction) to achieve the Desired Future Condition for the area being analyzed, and contain specific management area prescriptions for each Forest. The proposed lease tract is in management areas that are acceptable for further consideration for coal leasing.

1.8.1 MANTI-LA SAL NATIONAL FOREST

1.8.1.1 Lands Acceptable for Further Consideration for Coal Leasing

Leasing of the Greens Hollow tract would be in conformance with the unsuitability criteria and multiple land use decisions established in Appendix C of the Land and Resource Management Plan, Manti-La Sal National Forest, 1986 (Forest Service 1986a). Consequently, the tract is acceptable for further consideration for coal leasing under the Record of Decision for the MLNF Land and Resource Management Plan, dated November 5, 1986 (Forest Service 1986c).

1.8.1.2 Forest Plan Emphasis and Direction

General Forest Plan Direction states that leasing may be limited or denied where certain conditions occur (MLNF Forest Plan, page III-36, Standards & Guides, d.). The potential for these conditions to occur are addressed in this EIS. These include: degradation of water quantity or quality, impairment to quality of recreation, occurrence of National Recreation Trails, unacceptable or unacceptable with mitigation impacts to wildlife and fish, operations that could aggravate land instability, need for the coal cannot be demonstrated, unacceptable or unacceptable with mitigation impacts to communities, or unacceptable or unstable traffic flows. Additionally, this section states that mining be conducted using underground methods (Forest Service 1986a, page III-36, Standards & Guides, e.).
Figure 1.4. Alternative 3.
The entire 6,096 acres of the Manti-La Sal portion of the lease tract is within the Range Management Unit. “Emphasis is on production of forage and cover for domestic livestock and wildlife” (Forest Service 1986a, page III-64). Coal leasing would be consistent with the range management unit direction. Direction specific to minerals management (Forest Service 1986a, page III-66) include:

- 01 “Provide appropriate mitigation measures to assure continued livestock access and use.”
- 02 “Those authorized to conduct developments will be required to replace losses through appropriate mitigations, where a site specific development adversely affects long-term production or management.”

The Riparian Management Unit occurs in parts of the tract identified in this Draft SEIS as perennial streams and wetlands (see Figures 4.1, 4.6, and 4.8). The Riparian Management Unit is not mapped in the Forest Plan. These areas overlap with acreages within the Range Management Unit. “Emphasis is on management of riparian areas, and all the component ecosystems. These components include the aquatic (including fish) ecosystem, the riparian (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet measured horizontally from edge of all perennial streams and springs, and from the shores of lakes and other still water bodies, i.e., from seeps, bogs, and wet meadows. All of the components are managed together as a land unit comprising an integrated riparian area, and not a separate component.” (Forest Service 1986a, page III-69).

“The goals of management [for the Riparian Management Unit] are to (1) maintain water-flows to provide free and unbound water within the soil needed to create the distinct vegetative community, (2) provide healthy self-perpetuating plant communities, (3) meet water quality standards, (4) provide habitats for viable populations of wildlife and fish, (5) provide stable stream channels and still water body shorelines, and (6) restore riparian habitats that have been lost through the down-cutting of stream channels and wet meadows.” (Forest Service 1986a, page III-69).

Direction specific to minerals management within the Riparian Management Unit (Forest Service 1986a, page III-72) include:

- 01 “Avoid and mitigate detrimental disturbance to the riparian area by minerals activities. Initiate timely and effective rehabilitation of disturbed sites”.
- 02 “Where possible, mineral activities are to be located outside the riparian unit”.
- 03 “Design and locate settling ponds to prevent washout during high water. Locate settling ponds outside of the active channel. Restore channel changes to hydraulic geometry standards for each stream type”.

Additionally, direction specific to Riparian, Flood Plain, & Wetlands management for the Riparian management that would apply (MLNF Forest Plan, page III-71, F00) include:

- 01 “Prior to implementation of project activities, delineate and evaluate riparian areas and or wetlands that may be impacted.”
- 01 b. “Where site-specific development adversely affects long-term productivity or management, those authorized to conduct development will be required to replace loss through appropriate mitigations.”

### 1.8.1.3 Minerals Stipulations and Mitigations Statements

Appendix B of the MLNF Forest Plan (Forest Service 1986a) contains standard FS coal leasing stipulations to be applied as appropriate. They are not the result of this Draft SEIS analysis; rather they are part of the Proposed Action and alternatives. These stipulations are provided in Appendix B of this Draft SEIS. Stipulations #9 and #17 as written in this Draft SEIS are consistent with those in the MLNF Forest Plan and have been adjusted specifically for this analysis to provide greater clarity of agency responsibilities and resources involved.
1.8.2 FISHLAKE NATIONAL FOREST

1.8.2.1 Lands Acceptable for Further Consideration for Coal Leasing

Approximately 79 acres of the proposed Greens Hollow tract occurs on the FLNF. The FS consent to lease this tract would be in conformance with the unsuitability criteria and multiple land use decisions established in Appendix O of the Land and Resource Management Plan, Fishlake National Forest, 1986 (Forest Service 1986b). Consequently the tract is acceptable for further consideration for coal leasing under the Record of Decision for the FLNF Land and Resource Management Plan, dated June 13, 1986 (Forest Service 1986d).

1.8.2.2 Forest Plan Emphasis and Direction

General FLNF Plan direction related to minerals management (FLNF Plan page IV-5) is to:

- Protect surface resources and environmental quality.
- Encourage mineral exploration, development, and extraction consistent with management of surface resources.
- Coordinate minerals management with State and other Federal agencies.
- Inventory geologic hazards and groundwater resources.

Direction is also given to “Complete abandoned mine land rehabilitation in the priority listed in Table Q-4 by the year 2000” (FLNF Plan page IV-5):

General direction specific to leasable minerals requires that leasing…of NFS lands will be based on site specific considerations. Related actions should minimize impacts on or conflicts with other resource uses and should return disturbed lands to planned surface resources or uses. Recommendations of consent to BLM for issuance of leases…will include all standard and regionally approved special stipulations. In addition, direction is given to deny consent or concurrence to BLM for issuance of leases…where operational damages on surface resources…would be either 1) irreversible or irretrievable, or 2) with low potential for reclamation (FLNF Plan page IV-37). Related standards and guidelines state: a) leasable activities may be denied or limited where activities may result in exceeding the standards outlined in the FLNF Plan; b) coal activities may be limited where slopes are steeper than 40% or geologic or erosion hazard ratings are high; c) coal…activities may be limited where terrain doesn’t provide for adequate waste dumps, surface based access or facilities are on slopes steeper than 40% or where mining is not in conformance with laws (FLNF Plan page IV-37 to 38).

The portion of this lease tract on the FLNF is found within Management Prescription Area 6-B (Emphasis is on livestock grazing) where intensive range resource management is applied consistent with maintaining the environment and providing for multiple use. Structural and non-structural improvements are to benefit or at least not adversely affect wildlife. Management activities are evident but harmonize and blend with the natural setting (FLNF Plan page IV-109).

No direction specific to minerals management is given for this Management Prescription Area.

Issues related to mineral and energy development which were identified during the planning process are to be resolved through the use of stipulations (FLNF Plan page III-2).

Coal leasing as proposed in the Greens Hollow tract would be consistent with direction in the FLNF Plan.
1.8.2.3 Minerals Stipulations and Mitigations Statements
The FLNF Plan requires that recommendations of consent to BLM for issuance of leases will include standard stipulations found on BLM Form 3109-3. In addition, special stipulations were developed to address concerns not covered by standard stipulations or where protection is not otherwise provided. Examples of the special stipulations the forest uses are found in Appendix H-1 of the Forest Plan. Resource conditions found on the FLNF related to coal exploration and development that require special attention are addressed through stipulations. In addition, the conditions developed by the MLNF and agreed to by the FLNF for this project (Appendix B) are incorporated into the action alternatives in this EIS.

1.8.3 BUREAU OF LAND MANAGEMENT
Coal leasing is also addressed in BLM’s Resource Management Plans (RMP) for federal mineral estates with potential for leasing and development (BLM 2008). The area of the Greens Hollow tract lies entirely in Sevier County, Utah which is covered by the BLM Richfield Field Office RMP (RMP’s follow county boundaries in the state). The Richfield RMP shows the Greens Hollow tract within areas marked on Map 25 as coal resources inside the Wasatch Plateau Known Recoverable Coal Resource Area (KRCRA) and open for further leasing considerations with FS constraints. Management actions MIN-24 has the Greens Hollow tract acreage in NFS lands acceptable for consideration for leasing by underground mining methods.

1.8.4 UTAH DIVISION OF OIL, GAS, AND MINING
The administration of coal mining activities on adjacent lands is managed under separate permits administered by the Utah DOGM consistent with stipulations and management requirements within each particular lease.

1.9 DECISIONS FRAMEWORK
The Responsible Officials have the following decisions:

FS – As Responsible Official for the surface managing agency, the Forest Supervisor, Manti-La Sal and the Fishlake National Forests must decide:

- Whether or not to consent to the BLM issuing Federal Coal Lease UTU-84102 according to the MLA of 1920; as amended by the FCLAA of 1976.
- If the FS consents to issue the lease, they will prescribe conditions needed for protection of non-mineral surface resources on NFS lands. The conditions of FS consent would become stipulations on the BLM lease, should it be issued.

BLM – The District Manager of the BLM must decide:

- Whether or not to offer the tract for competitive leasing and under what terms, conditions, and stipulations, contingent on the consent of the surface managing agency.

The Price Field Office Manager will make recommendations to the District Manager with respect to offering the tract for leasing and the applicable terms and conditions. The Instruction Memorandum No. UT 2013- 006 was issued that transmitted the Utah Bureau of Land Management (BLM) Delegation of Authority Manual Supplement. According to the Utah BLM 1203 Manual Supplement, the District
Manager is the Authorized Officer and has the authority to sign the Record of Decision for an EIS generated within the District.

If leased, the mining plans would be reviewed by BLM to ensure they are consistent with Maximum Economic Recovery (MER) regulations and that mining is consistent with all lease terms, conditions, and stipulations.

Subsequent to leasing, OSM would use this analysis to support its review and recommendations to the USDI Assistant Secretary for Lands and Minerals regarding the approval of the mining plan provided by the BLM if and when one is brought forward.

1.10 PUBLIC INVOLVEMENT

1.10.1 GENERAL PUBLIC INVOLVEMENT

NEPA requires that the public and agency personnel be involved from an early stage in decision making on federal lands (40 CFR 1501). Public involvement is an important part of the environmental and socioeconomic analysis process. A public involvement plan (communications plan) was developed to describe the protocol that would be used to involve the public in the environmental and socioeconomic analysis. The plan allows the public to actively participate in the NEPA process and to communicate issues of support, benefit, and concern regarding the proposed action. In addition, involvement of local, State, and other Federal agencies help to anticipate the potential effects and benefits that could result from the project. The public involvement plan is part of the project record located in the BLM Price Field Office, the Manti-La Sal National Forest Supervisors Office, Price, Utah, and Fishlake National Forest Supervisors Office, Richfield, Utah.

1.10.2 SCOPING PROCESS

1.10.2.1 General Scoping

An important part of the public involvement process is scoping, which the Council on Environmental Quality (CEQ) regulations describe as the process for determining the “scope of the issues to be addressed and for identifying the significant issues related to a proposed action” (40 CFR § 1501.7). In addition to disclosing potentially significant issues of support, benefit, and concern, this process can also identify possible alternatives related to the Proposed Action for consideration in analyzing the impacts of the proposal.

1.10.2.2 Original EIS Scoping

The Notice of Intent (NOI) for the Greens Hollow tract EIS was printed in the Federal Register (Vol. 73, No. 29, pp. 8060-8062) on Tuesday, February 12, 2008 (Appendix C). The NOI designated a 45-day comment period ending March 28, 2008. A public scoping notice was also prepared and distributed on February 22, 2008 to interested individuals on the BLM, Price Field Office and Manti-La Sal and Fishlake National Forests mailing list. A legal notice was also sent to local newspapers (Richfield Reaper, Sun Advocate, Emery County Progress, and Salina Sun) to notify the general public through newspaper releases and media coverage. Comments were directed to the agency project manager in the BLM, Price Field Office.
1.10.2.3 Scoping for the Muddy Creek Tract
In addition, in 2004 the FS initiated the preparation of an EIS for the Muddy Creek tract. Public scoping was conducted from March 5, 2004, through April 12, 2004, and a total of 10 responses were received. Based on the scoping comments and internal agency review, four resources were identified for detailed analysis in the Muddy Creek EIS: water resources, wildlife and wildlife habitat, vegetation, and cultural/paleontological resources.

1.10.3 COMMENTS

1.10.3.1 Comments Analyzed and Responded to in the Preparation of the EIS
A content analysis of the comments received was prepared. Comments received were used to identify issues and concerns as well as assist with developing the alternatives to be analyzed. A summary of issues and concerns, grouped by discipline or resource, that were identified during the scoping process follows, while a more detailed record of responses received is provided in the scoping report developed for the project. Issues and concerns expressed in response to the release of the original Draft Environmental Impact Statement (DEIS) and FEIS were also addressed.

1.10.3.2 Comments on the Draft EIS
A DEIS for the Greens Hollow tract was released and distributed on March 26, 2009. The EPA Notice of Availability (NOA) appeared in the Federal Register (Vol. 74, No. 63, pp. 15264) on Friday, April 3, 2009, initiating the formal comment period on the DEIS (Appendix C). The BLM NOA appeared in the Federal Register (Vol. 74, No. 64, pp. 15517) on Monday, April 6, 2009 (Appendix C). The FS Legal Notice of Proposed Action appeared in the Emery County Progress and Sun Advocate newspapers on April 14, 2009 and in the Richfield Reaper and Salina Sun newspapers on April 15, 2009. The 45-day comment period established in the EPA NOA in the Federal Register ended May 18, 2009. The NOA was also posted on the BLM’s Environmental Notification Bulletin Board (ENBB) on April 3, 2009. An electronic copy of the DEIS was made available on the BLM’s website. Approximately 60 hard copies of the DEIS were mailed to the project mailing list and additional copies were made available at the BLM and FS offices. The project mailing list was compiled from required agencies, interested individuals, scoping activities, and subsequent requests for the DEIS.

Following the release of the DEIS, a public comment meeting was held in conjunction with the Fair Market Value Hearing at Salina, Utah on May 6, 2009.

Instructions were given to those receiving a copy of the DEIS and those attending the public meeting as to how to submit comments. Written comments were included in the FEIS and oral comments and remarks during the meeting were used to clarify and index written comments. The public was told that in order for their comments to be included in the FEIS, they would have to be submitted in writing and signed. The public was advised that comments which raised concerns with specific areas of the DEIS would be most useful to the process rather than simply voicing opposition or support. Comment letters were sent to the agency project manager at the BLM Price Field Office in Price, Utah. All comment letters were added to the project record for the EIS.

The analysis of the comments focused on substantive comments on the DEIS as directed in 40 CFR 1503.4(b). Substantive comments included those which challenge the information in the DEIS as being accurate or inadequate or which offer specific information that may have bearing on the decision. Comments which merely express an opinion for or against the project were not identified as a comment requiring a response. In cases where the comment was not substantive but appeared to indicate that information in the EIS was either misunderstood or unclear, a response was prepared to clarify the
information. Resource specialists prepared draft responses to each substantive comment. Those responses on the DEIS are located in the project record.

1.10.3.3 Comments Received During the Appeal of the Forest Service Record of Decision
A FEIS and FS Record of Decision (ROD) for the Greens Hollow tract were released by the FS in December 2011. Interested parties on the mailing list were sent a notification dated December 14, 2011 of the release of the FEIS and FS ROD. The notification informed the interested parties where the FEIS and FS ROD could be located electronically and included the documents or CD, if requested. An EPA NOA was published in the Federal Register (Vol. 76, No. 247, pp.80367) on Friday, December 23, 2011 (Appendix C).

An appeal of the FS ROD was filed with the Regional Forester on February 13, 2012 by the Utah Environmental Congress, Grand Canyon Trust, and Center for Biological Diversity.

The FS withdrew the ROD for the Greens Hollow tract on March 20, 2012. Concerns raised in the appeal were further addressed in this Draft SEIS.

1.10.4 NOTICE OF INTENT TO PREPARE A SUPPLEMENTAL EIS
An EPA NOI was published in the Federal Register (Vol. 77, No. 202, pp. 64097-64099) on Thursday, October 18, 2012 announcing the intent to prepare a supplemental EIS on the Greens Hollow tract (Appendix C). Additional scoping was not conducted in accordance with 40 CFR 1502.9(c) (4). There will be a 45-day comment period after the draft Supplemental EIS is issued.

1.10.5 COMMENTS LEADING TO ALTERNATIVES
All of the above mentioned comments have been taken into consideration when developing alternatives to the proposed action and are discussed in Chapter 2 under Alternatives Development.

1.11 ISSUES
1.11.1 ISSUES DEVELOPMENT
Some of the public’s comments centered on surface disturbances related to potential post-leasing surface activities such as ventilation shafts, road reconstruction and/or maintenance, and power line construction. Issues related to leasing and subsequent underground mining, and reasonably foreseeable surface uses are included in this discussion of issues.

Potential environmental and socioeconomic issues associated with this project were determined in various ways. First, by reviewing public scoping comments from the original Greens Hollow tract EIS. Second, comments were considered from the 2004 scoping efforts for the Muddy Creek lease proposal. Third, comments were reviewed from the March 2009 DEIS and December 2011 FEIS comment periods and its appeal. And fourth, the BLM and FS reviewed maps, GIS data, agency documents and preliminary analysis, and the proposal, before proposing the following list of potential issues.

1.11.2 ISSUES IDENTIFIED
Issues and concerns were divided into three categories: 1) conceptual underground mining and subsidence, 2) reasonably foreseeable post-lease surface use on the Greens Hollow tract, and 3) reasonably foreseeable post-lease surface use outside the Greens Hollow tract. These three categories
Issues were also sub-categorized by resource. The issues and concerns in each sub-category are discussed below. More detailed information on comments can be found in the scoping summary and in the response to comments on the DEIS.

1.11.2.1 Issues or Concerns Related to Conceptual Underground Mining and Subsidence

The following lists public and agency issues and concerns related to the effects of subsidence and underground mining. These impacts are considered in the direct and indirect effects analysis of each resource section in Chapter 4. The analysis of these issues is based on the Conceptual Mine Plan discussed in Chapter 2, Section 2.6.

1.11.2.1.1 Geology, Mining, Subsidence, and Seismicity

- Mining of the underground coal reserves can cause subsidence, non-uniform subsidence features, seismicity, and cracking of the ground surface.

1.11.2.1.2 Structures and Facilities

- Mining-induced subsidence could damage the Rough Brothers’ Cabin.

1.11.2.1.3 Surface and Ground Water

1.11.2.1.3.1 Water Quantity

- Mining-induced subsidence could intercept ground water in underground mine workings, and subsequent discharge to Quitchupah Creek (Existing National Pollutant Discharge Elimination System [NPDES] Permit) could cause transbasin diversions of surface and ground water from the Muddy and Greens Hollow drainages to the Quitchupah Creek drainage. This could affect downstream agricultural, domestic, and industrial water supplies as well as ecosystems.

- Mining-induced subsidence could change the flow of springs and seeps, affecting the flow of springs and their receiving streams. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

- Mining-induced subsidence of perennial streams could intercept flowing/impounded water and divert it underground, changing the hydrology. Changes in stream gradient could cause changes in stream morphology (see wildlife). Each tributary potentially affected must be specifically addressed by subheading.

1.11.2.1.3.2 Water Quality

- Foreseeable continued discharge of mine water into Quitchupah Creek could change water quality in Quitchupah Creek and other downstream drainages. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

- Equipment and materials spilled, used, and/or abandoned in underground mine workings could change ground water quality and any connected surface water sources. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.
1.11.2.1.4 Terrestrial and Aquatic Wildlife Resources [including Threatened, Endangered, and Special Status species]
- Subsidence-induced changes in water flow, including but not limited to flow at points of diversion or use and/or change in water quality in perennial drainages to riparian vegetation/wetlands could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.
- Subsidence-caused changes of perennial streams could cause changes in stream morphology and aquatic habitat.

1.11.2.1.5 Vegetation Resources [including Threatened, Endangered, and Special Status species]
- Subsidence and other mining-caused changes to surface and ground water could affect riparian, wetland, and upland vegetation.

1.11.2.1.6 Heritage Resources
- Mining and subsequent subsidence could cause surface disruption and adversely impact both known and unidentified heritage resources.

1.11.2.1.7 Paleontological Resources
- Mining and subsequent subsidence could impact unidentified paleontological resources.

1.11.2.1.8 Socioeconomics
- Leasing of the tract could provide an important energy resource for the public and result in social and economic benefits.

1.11.2.1.9 Recreation
- Subsidence could cause damage to roads and trails through surface disruption, resulting in safety risks and disruption of the recreation experience.

1.11.2.1.10 Visual Quality
- Subsidence may affect visual quality.

1.11.2.1.11 Range
- Subsidence could damage range improvements and facilities, including spring developments.
- Subsidence impacts to water resources could affect livestock permit operations. Direct, indirect, and cumulative impacts to water resources including but not limited to points of diversion or use and vegetation may change all or a portion of the area from primary range to secondary range, and impact grazing capacity.

1.11.2.1.12 Roadless
- Surface-related impacts from underground mining may change characteristics of inventoried roadless areas and other unroaded areas.
1.11.2.1.13 Air Quality
- Extended life of coal handling and hauling, mine ventilation, coal stockpiles, etc. could impact air quality.
- Coal mine methane released through vent shafts could be converted into electrical power.

1.11.2.2 Issues or Concerns Related to Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract
The following lists public issues and concerns related to potential surface uses on the Greens Hollow tract that could be needed to facilitate development of the tract. These potential post-leasing surface effects are considered in the cumulative effects analyses of each resource section in Chapter 4. The analysis of these issues will be based on the Reasonably Foreseeable Post-Lease Surface Use on the Greens Hollow tract scenario discussed in Chapter 2, Section 2.6.2.

1.11.2.2.1 Surface and Ground Water
1.11.2.2.1.1 Water Quality
- Reasonably foreseeable construction of a ventilation shaft and access road use and maintenance could increase soil erosion and sedimentation of adjacent waterways.

1.11.2.2.2 Terrestrial and Aquatic Wildlife Resources [including Threatened, Endangered, and Special Status species]
- Changes in water flow due to reasonably foreseeable construction of a vent shaft, including but not limited to flow at points of diversion or use could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.
- Access road use and maintenance and reasonably foreseeable activities such as construction of a mine ventilation shaft could temporarily disrupt existing seasonal closures; use of summer habitat by terrestrial species such as sage-grouse; and deer and elk use of winter range.

1.11.2.2.3 Vegetation Resources [including Threatened, Endangered, and Special Status species]
- Reasonably foreseeable access road use and maintenance and construction of a vent shaft facility could impact native vegetation and introduce and/or spread noxious weeds.

1.11.2.2.4 Heritage Resources
- Reasonably foreseeable ground-disturbance associated with construction of surface facilities could adversely affect cultural resources and sacred sites in the areas of potential affect for those facilities.

1.11.2.2.5 Paleontological Resources
- Reasonably foreseeable ground disturbing activities associated with a vent shaft and possible access roads could impact paleontological resources.

1.11.2.2.6 Recreation
- Reasonably foreseeable construction of a ventilation shaft may result in traffic and heavy equipment operation that could temporarily disrupt dispersed recreation.
• Reasonably foreseeable need for a ventilation shaft may result in noise from the vent fan that could impact recreation.

• Reasonably foreseeable access road use and maintenance may lead to increased recreational traffic.

1.11.2.7 Visual Quality
• Reasonably foreseeable need for surface facilities and ground disturbance could result in a temporary (construction phase) decrease in visual quality.

• Reasonably foreseeable ventilation shaft facility (excavated rock, fences, etc.), access road use and maintenance, and any visible emissions (water vapor) could decrease visual quality during and after the life of the facilities.

1.11.2.8 Range
• Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

1.11.2.9 Roadless
• Surface related impacts incident to mining such as the reasonably foreseeable need for a ventilation shaft may affect roadless characteristics and wilderness attributes of inventoried roadless areas and other draft unroaded/undeveloped areas.

1.11.2.10 Air Quality
• Reasonably foreseeable surface construction activities and mine ventilation could impact air quality.

1.11.3 Issues or Concerns Related to Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract
The following lists public issues and concerns related to potential surface uses outside the Greens Hollow tract that could be needed to facilitate development of the tract. These uses would likely occur on adjacent leases. These potential post-leasing surface effects are considered in the cumulative effects analyses of each resource section in Chapter 4. The analysis of these issues will be based on the Reasonably Foreseeable Post-Lease Surface Use Outside the Greens Hollow Tract scenario discussed in Chapter 2, Section 2.6.3.

1.11.3.1 Surface and Ground Water
1.11.3.1.1 Water Quality
• Reasonably foreseeable construction of a power line and ventilation shaft facility and access road use and maintenance could increase soil erosion and sedimentation of adjacent waterways.

1.11.3.2 Terrestrial and Aquatic Wildlife Resources [including Threatened, Endangered, and Special Status species]
• Changes in water flow due to reasonably foreseeable construction of a vent shaft facility, including but not limited to flow at points of diversion or use could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.
• Access road use and maintenance and reasonably foreseeable activities such as construction of a mine ventilation shaft facility could temporarily disrupt existing seasonal closures; use of summer habitat by terrestrial species such as sage-grouse; and deer and elk use of winter range.

• Reasonably foreseeable construction and operation of a power line and poles could cause electrocution of raptors, increase predation of sage-grouse by raptors, and cause sage-grouse mortality through direct collision with power lines.

• Reasonably foreseeable need for a ventilation shaft and fan system could create constant background sound which may negatively impact lekking sage-grouse.

• Intermittent traffic associated with maintaining a reasonably foreseeable fan system at a ventilation shaft may result in disturbance impacts to terrestrial species.

1.11.2.3.3 Vegetation Resources [including Threatened, Endangered, and Special Status species]

• Reasonably foreseeable access road use and maintenance and construction of a vent shaft facility could impact native vegetation and introduce and/or spread noxious weeds.

• Reasonably foreseeable construction of a power line could result in removal of ponderosa pine and associated habitat.

1.11.2.3.4 Heritage Resources

• Reasonably foreseeable ground-disturbance associated with construction of surface facilities could adversely affect cultural resources and sacred sites in the areas of potential affect for those facilities.

1.11.2.3.5 Paleontological Resources

• Reasonably foreseeable ground disturbing activities associated with a vent shaft facility, fan system, and possible access roads for fan(s) and power supplies could impact paleontological resources.

1.11.2.3.6 Recreation

• Reasonably foreseeable construction of a ventilation shaft facility may result in traffic and heavy equipment operation that could temporarily disrupt dispersed recreation.

• Reasonably foreseeable need for a ventilation shaft facility may result in noise from the vent fan system that could impact recreation.

• Reasonably foreseeable access road use and maintenance may lead to increased recreational traffic.

1.11.2.3.7 Visual Quality

• Reasonably foreseeable need for surface facilities and ground disturbance could result in a temporary (construction phase) decrease in visual quality.

• Reasonably foreseeable ventilation shaft facility (excavated rock, fences, fan(s), generators, fuel storage tank, etc.), access road use and maintenance, the power line, and any visible emissions (water vapor) could decrease visual quality during and after the life of the facilities.
- Reasonably foreseeable power line construction could affect visual quality objectives.

1.11.2.3.8 Range
- Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

1.11.2.3.9 Roadless
- Surface related impacts incident to mining such as the reasonably foreseeable need for a power line and a ventilation shaft facility may affect roadless characteristics and wilderness attributes of inventoried roadless areas and other draft unroaded/undeveloped areas.

1.11.2.3.10 Air Quality
- Reasonably foreseeable surface construction activities and mine ventilation could impact air quality.
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2.0 CHAPTER 2 – THE ALTERNATIVES

2.1 INTRODUCTION
This chapter describes three alternatives, including the Proposed Action, and how they were developed. This represents a reasonable range of alternatives. It describes the conceptual mining plan and the reasonably foreseeable surface use scenario used in the analysis. It includes a description of each alternative considered, and presents the alternatives in comparative form, differentiating between each alternative and provides a clear basis for choice by the deciding officials. Alternatives to the proposed action are based on comments received and issues raised during scoping. The agency preferred alternative is Alternative 3. This chapter also discusses other alternatives considered but eliminated from detailed analysis.

2.2 ALTERNATIVES DEVELOPMENT

2.2.1 COMMENTS FROM THE PUBLIC
Comments from the public were taken into consideration when developing alternatives to the proposed action. Some comments expressed general opposition to coal mining while others were supportive of mining and development. Still others suggested evaluating an alternative that does not impact, temporarily or otherwise, the Wildcat Knolls and White Mountain IRA’s and other areas identified in a 2005 draft inventory of unroaded/undeveloped areas. These comments are addressed in Alternative 1, the No Action Alternative.

Alternative 3 was developed to address concerns raised regarding the protection of certain critical surface resources from the effects of subsidence within the lease tract boundary. Issues driving this alternative include specific geographic areas where potential impacts to water, vegetation, wildlife habitat, and cultural resources may occur. This alternative evaluates the use of non-subsidence mining in specific locations to protect surface resources from subsidence. Areas of potential substantial surface impact include perennial streams where surface flow could be lost to subsidence-induced cracking of the relatively brittle Castlegate Sandstone or where escarpments could fail.

Some comments were received regarding IRAs and other potential unroaded/undeveloped areas. All action alternatives were designed to be consistent with current USDA direction regarding the management of IRAs.

2.3 ALTERNATIVE 1 – NO ACTION
The No Action Alternative provides a baseline for estimating effects of the action alternatives. Under the No Action alternative, the FS would not consent to the BLM offering for lease the Greens Hollow tract, the lease tract would not be offered for lease by the BLM, and there would be no coal mining within the tract at this time. The opportunity to recover up to 56.6 million tons of recoverable coal would not be realized at this time. Other approved activities and on-going natural processes would continue.
2.4 ALTERNATIVE 2 – PROPOSED ACTION

Under the Proposed Action, the FS would consent to BLM’s leasing approximately 6,175 acres of NFS lands in the Greens Hollow tract to develop federal coal resources, and include conditions to protect non-mineral resources. For NFS lands, special coal lease stipulations described in the MLNF Forest Plan, except Stipulation #9 (current special coal lease stipulations are attached as Appendix B) would be included as conditions of FS consent for lands administered by both the MLNF and FLNF. Excluding Stipulation #9 from this alternative allows for analyzing the effects of subsidence on all lands in the tract. The full text of Stipulation #9 states:

Except at locations specifically approved by the Authorized Officer, with the concurrence of the Forest Service, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (l) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. Where the Forest Service specifically approves exceptions to the above restrictions on subsidence, the Lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

Since this alternative includes that Stipulation #9 would not be a condition of FS consent, the analysis is therefore based on the assumption that full extraction mining could occur, and in turn may lead to subsidence on all lands in the tract. Figure 1.3 identifies the largest possible subsidence analysis area boundary (Mining Analysis Area Boundary) assuming that full extraction mining and associated subsidence might occur, and where surface effects might occur within the angle of draw. Thus full subsidence mining will be analyzed to occur anywhere within the Area of Subsidence Mining under this alternative. In this way, this alternative represents a maximum impact scenario in terms of subsidence impacts. Mining that could cause subsidence outside the proposed Greens Hollow tract would occur within previously approved adjoining lease tracts.

The BLM would offer and issue the lease with BLM coal lease terms and conditions, and special coal lease stipulations from the FS consent for an estimated 56.6 million tons of recoverable federal coal reserves. Leasing by competitive bid could result in varying rates of coal production. Coal production could vary depending on the lease, price of coal, and numerous other factors. Under the current mining scenario at the SUFCO Mine, the recoverable coal reserves would represent some 8.8 years of mining. While the life of mining could vary widely, it is assumed for the analyses in this document that current mining rates would continue. The coal lease terms and conditions include a general provision to prevent “damage or degradation to any land, air, water, heritage, biological, visual, and other resources…” (BLM 1986).

For the purposes of analysis, the Proposed Action assumes a Conceptual Mine Plan and a reasonably foreseeable Surface Use Scenario (Section 2.6). The Conceptual Mine Plan assumes the tract would be mined using underground longwall mining techniques, and that full extraction mining would occur across the tract.
2.5 ALTERNATIVE 3

Alternative 3 was developed to protect certain critical surface resources from the effects of subsidence within the lease tract boundary. The areas requiring specific protection are displayed on Figure 1.4 as Area of No Subsidence Mining. Issues driving this alternative include potential impacts to water, geology, vegetation, wildlife habitat, and cultural resources. This alternative assumes the Conceptual Mine Plan and reasonably foreseeable Surface Use Scenario (Section 2.6) and specifies the use of non-subsidence (e.g. full-support) mining in specific locations to protect surface resources from subsidence. Areas considered for specific protection include perennial streams where surface flow could be lost to subsidence-induced cracking of Castlegate Sandstone or where escarpments could fail.

Like the Proposed Action, under Alternative 3 the FS would consent to the BLM offering for lease approximately 6,175 acres of NFS lands in the Greens Hollow tract with conditions for the protection of non-mineral resources. However, site-specific exceptions to Stipulation #9 authorizations would not be considered for areas identified for specific protection in this alternative.

Under Alternative 3, the BLM would offer, sell, and issue the Greens Hollow tract by competitive bid for development of about 55.7 million tons of recoverable federal coal reserves (approximately 900,000 tons less than Alternative 2). As discussed above, leasing by competitive bid could result in varying rates of coal production. Under the current mining scenario at the SUFCO Mine, the recoverable coal reserves for this alternative would represent some 8.7 years of mining. While the life of mining could vary widely, it is assumed for this alternative that current mining rates would continue. All special coal lease stipulations described in the MLNF Forest Plan would be included (Appendix B) as part of FS consent for lands administered by both the MLNF and FLNF.

2.6 CONCEPTUAL MINE PLAN AND REASONABLY FORESEEABLE SURFACE USE SCENARIO

Analysis of the Proposed Action and the action alternative to it, projects effects based on a Conceptual Mine Plan and a reasonably foreseeable Surface Use Scenario (i.e., preliminary data on mining and surface use). For the Proposed Action, the Conceptual Mine Plan assumes that underground longwall mining would result in full extraction of the coal resource over the entire tract. Given this mining method, the analysis also assumes that all lands in the tract could be subsided as a result. This assumption also facilitates analyzing the effects of excluding Stipulation #9 from the MLNF Plan from conditions of the FS consent under Alternative 2. Figure 1.3 identifies the largest possible subsidence analysis area boundary (Mining Analysis Area Boundary) assuming that full extraction mining and associated subsidence might occur, and where surface effects might occur within the angle of draw. Thus full subsidence mining will be analyzed to occur anywhere within the Area of Subsidence Mining under this alternative. In this way, this alternative represents a maximum impact scenario in terms of subsidence impacts. For Alternative 3, the Conceptual Mine Plan assumes full extraction mining could occur over most of the tract within the Area of Subsidence Mining (Figure 1.4). No subsidence mining would be allowed within the Area of No Subsidence Mining. Subsidence mining outside the proposed Greens Hollow tract would occur within previously approved adjoining lease tracts.

Leasing results in a conveyance of rights. It represents a commitment of resources for which projections of conceptual post-leasing development (both underground mining and surface uses) are used to facilitate indirect and cumulative effect analyses, and establishes a baseline for stipulations to protect the surface resources.
To analyze potential surface impacts due to underground mine subsidence or surface uses, this Draft SEIS assumes a Conceptual Mine Plan for this leasing decision which includes both surface and subsurface activities. In order to analyze potential post-lease activities on the land surface, the Draft SEIS assumes a reasonably foreseeable surface use scenario. Post-lease surface uses occur after the coal tract lease is issued and should not be confused with post-mining activities once mining is complete. Agency decisions pertaining to surface use and disturbance are not made at the leasing stage. Rather, the decisions related to post-lease surface activities are made when and if site-specific surface use proposals are submitted. If the tract is leased, actual approval of specific mine plans and surface uses would be subject to subsequent review and approval procedures of Utah DOGM, and OSM (refer to Section 1.5). Any future mining and surface uses would need to be conducted consistent with lease terms, conditions, and special stipulations of the specific lease. After mining, final reclamation, and lease relinquishment, the land surface would be returned to the pre-lease use.

Therefore, this analysis assumes the following mining and surface use scenarios for each action alternative, except that full support mining is assumed for areas of specific protection in Alternative 3. The Conceptual Mine Plan and reasonably foreseeable Surface Use Scenario projects potential activities in three distinct components: 1) subsurface on-lease, 2) surface on-lease, and 3) surface off-lease, and were analyzed as follows:

1) Subsurface On-Lease – Subsurface longwall or other full extraction mining and resulting subsidence within the Greens Hollow tract. The potential effects of subsidence on surface and subsurface resources within the tract were analyzed for each action alternative as direct and indirect impacts.

2) Surface On-Lease - Reasonably foreseeable surface uses that may be needed to facilitate development of the Greens Hollow tract that fall within the lease tract boundaries were analyzed as cumulative effects.

3) Surface Off-Lease – Reasonably foreseeable surface uses that may be needed to facilitate development of the Greens Hollow tract which would lie outside the tract boundaries; however, which fall primarily within boundaries of existing adjacent federal coal leases were analyzed as cumulative effects.

Although the reasonably foreseeable activities falling under Item 2 and 3 above are included for analysis and disclosure purposes, there are no formal applications for them at the present time. To facilitate analysis, it is assumed that those activities falling under Item 3 above would be subject to the terms, conditions, and special stipulations on the existing federal coal leases on which they might fall, and if they are ever formally proposed, they would be subject to review procedures under the DOGM permitting process (see Section 1.5).

2.6.1 Conceptual Underground Mining and Subsidence

While full extraction mining could occur anywhere within the Area of Subsidence Mining under the Proposed Action (as delineated in Figure 1.3), an example of a conceptual mining plan for full extraction mining was developed to analyze potential impacts of leasing and mining the Greens Hollow tract. This conceptual mine plan fits within the analysis of full subsidence mining across the entire tract assumed for analysis of the Proposed Action. The boundary of that conceptual mining area is also shown in Figure 1.3. The conceptual mining plan consists of longwall or other full extraction mining using current technology and has been developed to avoid some subsidence impacts on surface resources. The conceptual mining plan assumes that mining would be done through the existing SUFCO mine workings for economic reasons and to reduce potential surface impacts that could occur if accessed from another location (if the LBA proponent is the successful bidder for the Greens Hollow tract).
2.6.1.1 Underground Access Constraints

For the purposes of analysis, it was assumed that the coal in the Greens Hollow tract could be directly accessed from the south and east through an extension of underground workings in the existing SUFCO mine. Two seams of coal occur in the lease area, the Upper and Lower Hiawatha. The Lower Hiawatha coal seam has mineable coal thickness throughout the lease tract and all mining is assumed to occur in this seam.

2.6.1.2 Underground Access Route-Mains and Sub-Mains

According to the conceptual mine plan, underground workings could extend through the western portion of the existing federal Quitchupah Lease and adjacent State lease (these lie within the existing DOGM-approved permit area for the SUFCO Mine, but are not included as part of the currently approved mine plan) to access coal in the Greens Hollow tract. This could involve driving two sets of main entries from the existing mines into the Greens Hollow tract. One set of mains could be developed to the west and nearly parallel under the South Fork of Quitchupah Creek. A second set of mains could be driven to the north, crossing under the North Fork of Quitchupah Creek. Sub-mains could then be driven to the west to set up longwall panels that would extend into the Greens Hollow tract (Figure 1.3). The mains and sub-mains could remain open to avoid subsidence above them. Longwall or full-extraction mining could occur throughout the conceptual mine plan area.

The coal would be recovered using the longwall or other full extraction mining method. Conceptual mining of the tract includes longwall panels oriented to northeast-southwest directions, but could ultimately be oriented in a different direction. Overburden in the area ranges from between 1,000 and 2,200 feet. The anticipated mining height is approximately 12 feet for the Lower Hiawatha Seam. Based on experience with mines adjacent to the tract area and mining elsewhere in the Wasatch Plateau Coalfield, it is projected that the land surface would subside approximately 4.3 to 8 feet based on the overburden thickness and projected approximate mining height. Surface subsidence (i.e., the amount of topographic elevation change pre-and post-mining) typically varies from 36 to 66 percent of the mining height.

This conceptual mine plan scenario assumes that no expansion of the existing surface portal facilities in Quitchupah Canyon would be needed and water discharge would continue from existing permitted discharge points.

For Alternative 3, it is assumed that non-subsidence (i.e. room-and-pillar) mining could occur under the geographic areas of specific resource concern to prevent subsidence of the land surface (see Figure 1.4; Area of No Subsidence Mining).

2.6.2 REASONABLY FORESEEABLE POST-LEASE SURFACE USE ON THE GREENS HOLLOW TRACT

2.6.2.1 Potential Surface Facility

Reasonably foreseeable post-lease surface activities to facilitate development of the Greens Hollow tract that could be anticipated within the lease area include a ventilation and escape-way facility which would require the use of existing access roads for construction. No new road construction is anticipated. Due to its distance from the mine portal, the shaft site would be used for intake ventilation only and would not likely require a fan or electricity. Site-specific locations of anticipated disturbance cannot be identified at the leasing stage, due to the competitive nature of coal leasing and the fact that a mine operations plan has
not been submitted or approved (see Section 1.5 Leasing Process, Agency Roles, Authorities, and Responsibilities).

Facilities visible on the surface associated with a ventilation shaft could include shaft collars, ventilation equipment, and fencing/barriers. A ventilation shaft facility could be approximately 15-30 feet in shaft diameter and occupy up to 10 acres of land at the surface. Ventilation shafts are essential for ventilating air for safe mine operations and could include a means for an escape-way for mine personnel in an emergency. Location of the vent shaft facility would be limited to areas that have not been subsided and would provide adequate ventilation and an escapeway option for mine operations.

Material removed while excavating the shaft is typically stored onsite, at the surface, split into topsoil and sub-soil piles, and later used for reclamation. Once construction of a shaft is complete, the topsoil and cutting stockpiles would be stabilized for long-term storage while mining continues. The site would contain a drainage system, including a sediment pond, to control water runoff and prevent sediment from leaving the site. By lease contract stipulation, once the mine is closed, the sub-soil material would be placed back into the shaft and compacted, the topsoil replaced and contoured, and the area reseeded – permanently stabilizing the site.

Shaft construction could require approximately 600 gallons of water a day, year-round, for about 12 to 14 months.

2.6.2.2 Reclamation

DOGM would approve, bond, and monitor reclamation of surface facilities when they are no longer needed for mine operations. Complete reclamation would include removing all surface facilities, re-grading the surface contour, and restoring the area to the approved post mining land use. Re-vegetation would be accomplished with an approved seed mix.

2.6.3 REASONABLY FORESEEABLE POST-LEASE SURFACE USE OUTSIDE THE GREENS HOLLOW TRACT

2.6.3.1 Potential Surface Facilities

There are reasonably foreseeable post-lease surface facilities and improvements that may be needed to facilitate development of the Greens Hollow tract which could lie outside the tract boundaries, falling primarily within boundaries of other existing federal coal leases. These include a ventilation and escape-way facility, a ventilation fan system, reserve diesel generator(s) for power, power line for the ventilation fan system and the mine itself, and road access on existing roads. No new road construction is anticipated.

Facilities visible on the surface associated with a ventilation shaft and fan(s) could include utility borehole structures, diesel generators, electrical transformers, fuel storage tanks, shaft collars, ventilation fan equipment, and fencing/barriers. The ventilation shaft facility could consist of approximately one, 15-30-foot diameter lined shaft and occupy up to 10 acres of land at the surface. Ventilation shafts are essential for ventilating air for safe mine operations and could include a means for an escape-way for mine personnel in an emergency. The vent shaft could be used solely as an exhaust vent or could be partitioned for use as an exhaust/intake vent. Exhaust vents usually require ventilation fans to drive air out from the mine, and thus produce noise, while intake vents typically do not require fans and are usually noiseless (Anderson 2004c). An exhaust vent for the mine would be required and would therefore require a fan and associated power. Additional power within the mine would also be required for operation of the longwall panel which would come from offsite. Location of the vent shaft facility would be limited to
areas that have not been subsided and would provide adequate ventilation and escapeway option for mine operations.

Shaft construction would require approximately 600 gallons of water a day, year-round, for about 12 to 14 months.

The post-lease surface use scenario includes a likely overhead electrical power line to supply power to operate the mine and the vent shaft fan(s). For the purposes of analysis, it was assumed that the power line would cross multiple existing federal coal leases, but would most likely not extend into the Greens Hollow tract above the surface, but would enter the mine at the vent shaft site through a utility bore hole.

Surface activities on existing leases that may be proposed in the future would be required to be consistent with the Coal Lease Stipulations identified in the specific lease. Further, actual approval of any surface uses on existing leases would be subject to review and approval procedures of Utah DOGM and OSM (refer to Section 1.5). Stipulations from current existing leases are found in Appendix D to this Draft SEIS.

2.6.3.2 Reclamation
DOGM would approve, bond, and monitor reclamation of surface facilities when they are no longer needed for mine operations. Complete reclamation would include removing all surface facilities, re-grading the surface contour, and restoring the area to the approved land use. Re-vegetation would be accomplished with an approved seed mix.

2.7 OTHER ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

2.7.1 LEASE THE TRACT AS IN ORIGINAL APPLICATION

The original Greens Hollow tract contained 5,636.79 acres and was revised by the BLM to include an additional 538.60 acres for a total of 6,175.39 acres. After review by the BLM, and additional review by the Tract Delineation Team, the tract was increased by 521.02 acres (6,696.41 acres total) to comply with competitive leasing requirements, increase the Federal Reserve base, allow for lease modifications or new leasing (should further exploration and mining in this area prove viable) and allow the recovery of additional reserves from adjacent SITLA lands/lease.

Prior to completing the NEPA analysis, the decision was made by the BLM to remove a 480-acre and a 41-acre parcel in the southwest and west portions of the tract because the areas did not meet data adequacy standards at that time. It was determined that the coal in this area would not be isolated and could still be mined in the future under a separate process. Thus, the originally proposed lease was not analyzed in this Draft SEIS because it was modified to meet conditions required by applicable laws and regulations.
2.7.2 Change Lease Tract Boundaries Resulting from Application of the Unsuitability Criteria

As required by law and regulation, the Unsuitability Criteria for Coal Mining described at 43 CFR 3461 was applied site-specifically to lands in the Greens Hollow tract. Application of the criteria did not result in a new alternative because no lands were identified as unsuitable and no additional stipulations were identified.

2.7.3 Lease Without Special Coal Lease Stipulations

Consideration was given to developing an alternative that would analyze leasing without stipulations to protect surface resources. This alternative was not carried forward for detailed analysis as it would be inconsistent with the Manti-La Sal and Fishlake Forest Plans and the legal and regulatory framework governing coal resource management and other federal laws for specific resource protection.

2.7.4 Sustainable Multiple Use Alternative

A Sustainable Multiple Use Alternative (SMUA) was suggested during public scoping. This alternative contained provisions that the commenter felt should be included in an alternative for mining activities.

A detailed review and analysis of the objectives of the SMUA was completed and is found in the project record. Most of the extensive list of terms contained in the SMUA reflected the range of stipulations and mitigation measures which are currently available to the agency in developing, assessing, and approving any alternative considered in an EIS. Thus, some aspects of SMUA were employed, as appropriate, to avoid or mitigate impacts identified through the analysis. However, other listed terms in the alternative were either too general to be of use in formulating a separate alternative (e.g., require site-specific environmental review of any proposal to lease particular lands for mineral extraction) or too subjective (e.g., accommodate the public’s increasing sensitivity to development within currently natural landscapes). The suggested alternative was more suitable to a programmatic level than to a specific proposed action. Therefore, the noted terms of the SMUA were considered in this analysis but no alternative embracing them all was developed for detailed analysis.

2.7.5 Underground Mining from Another Portal

Underground mining as conceptualized was developed following review and consideration of plans to mine adjacent coal leases or known resources in the Muddy Creek mine plan, the Quitchupah Coal Lease Tract, the SITLA Coal Lease Tract, and the existing mine workings. Using this information, it was anticipated that the Greens Hollow tract could most efficiently and economically be mined through the existing mine workings with the least environmental effects. It is possible for a company other than the proponent to lease, hold or re-sell, or propose portals off-site and located where SUFCO does not have current leases; however, the Proposed Action and alternatives were developed assuming that access to coal reserves would be from SUFCO’s existing workings rather than via a new mine portal.

Access to underground mining activities in the Greens Hollow tract through Muddy Creek Canyon where a new mine portal could possibly be located, or from another underground location from a future to-be-leased area, were considered. If the Greens Hollow tract were to be accessed from the Muddy Creek Canyon, it would require building a new mine portal in a narrow canyon with a perennial stream. Because the canyon becomes narrow and steep-sided, the portal could have to be located some 2 miles or more from the tract boundary and require driving mains from the portal to reach the tract. Accessing the coal reserves from another future to-be-leased area could require the construction of a new portal and associated infrastructure resulting in additional surface impacts. Non-mineral resources would be impacted much more extensively if an entry location other than the existing Convulsion Canyon access...
were chosen. Given these projected effects, access from Muddy Creek Canyon was not considered in the conceptual mine plan, and was eliminated from detailed analysis. A new portal is not reasonably foreseeable. However, if after leasing, an alternative mine plan is submitted which included a new portal, additional environmental analysis would occur in the permitting process.

2.8 PAST, PRESENT, AND OTHER REASONABLY FORESEEABLE FUTURE ACTIONS

The CEQ regulations (40 CFR 1508.7) define cumulative impact as “the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

Past, present, and reasonably foreseeable future actions within and surrounding the Greens Hollow tract analysis area are discussed in Chapter 4 of the SEIS. The action and estimates of residual, current, or anticipated effects are presented in Table 2.1. Actions are grouped by resource. The sum of the effects of these actions, in addition to the anticipated direct and indirect effects of the proposed action, will form the basis for the cumulative effects analysis.

2.9 SUMMARY COMPARISON OF ALTERNATIVES RELATIVE TO ISSUES

Table 2.2 displays a summary comparison of the alternatives in relation to each issue statement. The analysis is organized by resource discipline.
### Table 2.1. Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.

<table>
<thead>
<tr>
<th>Manti-La Sal National Forest</th>
<th>Past Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actions</strong></td>
<td>Implementation Dates (begin to end)</td>
</tr>
<tr>
<td><strong>Minerals</strong></td>
<td></td>
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<tr>
<td>Ricci Coal Mine (Muddy Creek). Located on the north slope of Muddy Creek and the confluence with Last Water Canyon (NE¼NE¼, Section 35, T.20S., R.5E., SLBM). Mine accessed by an old road in the bottom of Muddy Creek Canyon from SR-10 (about 8 miles). Underground room-and-pillar workings which were not very extensive.</td>
<td>1941-1953</td>
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<tr>
<td>Link Canyon Coal Mine (NW¼SW¼, Section 26, T.21S., R.5E., SLBM). Accessed by Link Canyon road which provides motorized access to the project area (National Forest System Road (NFSR) 50044, single lane, native surface). Collapsed portals and partial access roads are still evident but no longer used. Old scale house (cave in rock outcrop), old coal loadout chute, rock structures, and some coal piles are still visible at the portal area. Some coal dust and truck runaround areas still evident along Link Canyon road. Disturbed area has revegetated well. Underground room-and-pillar workings not very extensive and one small portion is in use for ventilation entries for the SUFCO Mine.</td>
<td>1940-1952</td>
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<tr>
<td>Coal exploration drill holes have been adequately plugged, reclaimed, and revegetated.</td>
<td>1900s to present</td>
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<tr>
<td>Geophysical surveys. Many miles of geophysical surveys were conducted through the area in the 1980s. No roads were constructed. Off-road access was by foot and helicopter.</td>
<td>1980-1990</td>
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<tr>
<td>Issuance of Quitchupah Federal Coal Lease UTU 6314 and subsequent DOGM Mine Permitting Actions.</td>
<td>1988 to present</td>
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<tr>
<td>Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.</td>
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<td>-------------------------------------------------</td>
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<tr>
<td><strong>Issuance of Pines Federal Coal Lease UTU-76195 and subsequent DOGM Mine Permitting Actions.</strong></td>
<td>1999 to present</td>
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</table>
| **Longwall mining under North Water Area (Pines Tract).** | 2003-2006 | 1) Flows ceased in four springs shortly after mining (late 2003), but reemerged the following year down slope.  
2) Discharge from a total of three springs lost following two separate subsidence mining occurrences (2005 and 2006). Water not restored following mitigation (i.e., installation of grout curtains). Local riparian ecosystem is decreasing. A mitigation plan to restore the North Water spring area has been finalized by Canyon Fuel Company and recently approved by DOGM (2013b).  
3) Flow was lost to some segments of the East Fork of Box Canyon. Mitigation implemented in 2004. Stream flow restored following mitigation (2005). Approximately 10,000 gallons per day of stock water is trucked throughout the North Water area during the grazing season resulting in increased dust and road maintenance, and increased disturbance to wildlife. |
<p>| <strong>Weather Station, East Fork of Box Canyon.</strong> | 2004 | Approximate 15x15 foot fenced exclosure and installed weather station. |
| <strong>Installation of water monitoring wells.</strong> | 2006-2007 | Piezometer and ground water monitoring wells in the North Water Canyon and Joes Mill Pond area (Pines Tract) installed for bi-weekly monitoring. |
| <strong>Helicopter exploration drilling.</strong> | 2008 | Temporary minimal occupation of the surface. |
| <strong>Timber</strong> | | |
| <strong>East Fork Box Creek timber sale.</strong> | 1981 | 322 thousand board feet of ponderosa pine were cut over 400 acres followed by spot planting of seedlings. Regeneration/ reforestation has met objectives. |
| <strong>Link Canyon timber sale.</strong> | 1982 | 1.4 million board feet of Ponderosa pine cut on 900 acres followed by spot planting of seedlings. Regeneration/ reforestation has met objectives. |
| <strong>Rangeland/Watershed/Vegetation</strong> | | |
| <strong>Livestock grazing, spring developments, and other water improvements.</strong> | 1850s to present | Changes in vegetative species composition. Non-native species introduced. At least 13 springs were developed for livestock use, and 43 other livestock water improvements including stock ponds have been built. |</p>
<table>
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<tr>
<th>Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.</th>
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<tbody>
<tr>
<td><strong>Noxious weed monitoring/control.</strong></td>
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<td><strong>Christmas tree cutting</strong></td>
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<td><strong>Cowboy Hollow waterline.</strong></td>
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<td><strong>Gully erosion controls in Greens Hollow Creek.</strong></td>
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<tr>
<td><strong>North Water Solar Pump</strong></td>
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<tr>
<td><strong>Vegetation manipulation using Dixie Harrow &amp; seeding.</strong></td>
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**Wildlife**

<p>| <strong>Habitat improvements in the adjacent Pines Tract include 400 acres of sagebrush burned for improvement of elk winter range.</strong> | Late 1980s to early 1990s | Satisfactory regrowth of grass species/shrubs. Some loss of sage-grouse nesting habitat. |
| <strong>Development of stock ponds for livestock.</strong> | 1960s to present | Sage-grouse and other wildlife species also use ponds as a water source. |
| <strong>Three wildlife guzzlers.</strong> | 2005 | One-half acre disturbance each. Includes water gathering apron, tank and enclosure. Excludes livestock and has created additional opportunities for water particularly for sage-grouse and increased habitat value for the species. |
| <strong>Created one mesic area.</strong> | 2007 | Total ½ acre disturbance. Created sage-grouse brood rearing habitat. |
| <strong>Disked and Dixie harrowed to restore sage-grouse habitat for nesting and brood rearing. The project is funded in part by SUFCO to increase habitat value for sage-grouse and big game species in and around their mining sites and will continue through 2014 (Forest Service 2008a).</strong> | 2008 | 530 acres were double disked and 270 acres were harrowed within crested wheatgrass and smooth brome monocultures. These treated areas were re-seeded with sagebrush, native grasses, and native forbs to increase species diversity. |
| <strong>Wildcat Knolls habitat improvement projects funded in part by SUFCO to improve sage-grouse and big game habitat near their mining operations.</strong> | 2009-2010 | Continued habitat improvement project that was begun in 2008 and continued in 2009 and 2010. Effects include increased forage values for the sage-grouse population around the Wildcat Knolls lekking area as well as for big game species. |</p>
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<tr>
<th>Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.</th>
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<tr>
<td><strong>Transportation</strong></td>
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<td>Forest roads developed for grazing, mining, recreation, timber operations, and private land access.</td>
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<td><strong>Recreation</strong></td>
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<tr>
<td>Dispersed camping and hunting.</td>
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<td><strong>Cultural</strong></td>
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<tr>
<td>Cultural resource surveys.</td>
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<td>Subsidence of rock shelters.</td>
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<tr>
<td><strong>Present Actions</strong></td>
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<tr>
<td><strong>Actions</strong></td>
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<tr>
<td><strong>Minerals</strong></td>
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<tr>
<td>SUFCO Coal Mine. FS concurrence to mine permitting action. Portal and coal handling facilities located on the FLNF (Section 12, T.22S., R.4E., SLBM). Access via paved Accord Lakes road (County Road 40008) from Interstate 70. Road is under Sevier County jurisdiction and will remain after the mine is reclaimed for access to fee lands and recreational properties. Existing permit area totals 25,290.14 acres, including 22,462.92 acres of Federal coal leases, 2,134.19 acres of Utah State coal leases, 640 acres of fee coal leases, a 40-acre waste rock disposal site, and 13.03 acres under FS special use permits. Much of the area has been mined and subsided (see SUFCO MRP and Annual Subsidence Monitoring reports). Mine production life as presently permitted would extend to 2015. Consent to current leases include the Quitchupah Lease Tract, Pines Tract, and SITLA Lease.</td>
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<tr>
<td>Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.</td>
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<td>Vent fan operating in the North Fork of the Quitchupah Canyon.</td>
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<td>Link Canyon power line and substation.</td>
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<td>Link Canyon intake ventilation breakout and access.</td>
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<tr>
<td><strong>Livestock</strong></td>
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<tr>
<td>Livestock grazing.</td>
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<tr>
<td><strong>Recreation</strong></td>
</tr>
<tr>
<td>Recreation impacts.</td>
</tr>
<tr>
<td><strong>Special Use</strong></td>
</tr>
<tr>
<td>Rough Brothers of the Hills cabin.</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
</tr>
<tr>
<td>Motorized vehicle travel management with associated road and trail closure and restricted access enforcement.</td>
</tr>
<tr>
<td><strong>Future Actions</strong></td>
</tr>
<tr>
<td><strong>Minerals</strong></td>
</tr>
<tr>
<td>Drill holes are used in the coal development process to determine geologic factors including coal bed structure, quality, and thickness. Data gathered from drill holes is used for the development of the final mine plan. In order to finalize a mine plan, approximately 12 drill holes may be completed under a separate process. Drill holes would be considered a cumulative action since their authorization occurs independently.</td>
</tr>
<tr>
<td>Ventilation (vent) shaft(s) would be a reasonably foreseeable future action to provide adequate ventilation to mine workings underground and for safety escapeways. Two vent shafts could be necessary for operation of the Greens Hollow tract. Vent shaft(s) would be essential for ventilating air for safe mine</td>
</tr>
</tbody>
</table>
Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.

<table>
<thead>
<tr>
<th>Operations and could include a means for an escapeway for mine personnel in an emergency. The specific locations of vent shafts would be determined depending on the successful bidder mine design and their determination of the specific needs for ventilation and emergency access. A vent shaft could require a large electric fan, and the site could also house intake shafts, utility boreholes (for conveying electricity, communications, and other utilities into the mine), diesel generators, electrical transformers, and fuel storage tanks. Construction of a shaft could take up to 12 months or longer. It is foreseeable that construction would occur daily on a 24-hour basis and workers would access the site daily during construction. The sites would be fenced.</th>
<th>Include an area for equipment to construct and operate the ventilation system, and store onsite the removed waste rock for later reclamation of the shaft. Vent shaft facilities visible on the surface could be generators, transformers, fuel storage tanks, collars, ventilation equipment, and fencing/barriers. Anticipated noise and vibration issues during construction include frequent blasts, hoisting machinery, and muck (broken rock material) handling. However, once the shaft construction proceeded underground, blasting would proceed out of sight and of hearing from the surface. Following construction, noise would be produced by the ventilation fan system and as needed, by the large diesel powered generators (for standby electrical supply). Long term effects projected to be minimal following mining and reclamation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material removed in shaft excavations is typically stored onsite and then used for reclamation to fill in and to secure the shaft openings once the mine is closed (by lease contract stipulation). Standard permitted practice is to store and replace the topsoil separately from the cuttings stockpile. The site would also contain a drainage system and sediment pond to control runoff and prevent sediments from leaving the site. Once construction of a shaft is complete, the topsoil and cutting stockpiles would be stabilized for long-term storage. Access to the site would be reclaimed along with the shaft construction site to reestablish soil productivity.</td>
<td>It is reasonably foreseeable that construction of a shaft could require approximately 600 gallons of water a day year-round for 12 to 14 months. This water would likely be drawn from creeks on or near the analysis area, as authorized. Water could be pumped through an above-ground line directly if the source area is close to the site or it could be pumped into a tank and then transported to a site further away. It is expected that a diversion would occur year-round until the construction is complete. This constitutes approximately 255,500 gallons (0.784 acre-feet), assuming a 14 month construction period.</td>
</tr>
<tr>
<td>An electrical power line to supply adequate power to operate the mine and the vent fan would be reasonably foreseeable. The power could be provided along a number of possible routes. The specific location of a power line would be determined depending on the mine design by the successful bidder.</td>
<td>It is reasonably foreseeable that a power line would require a 100-foot wide corridor. Power line construction and maintenance would likely require vehicle access, and some cross-country travel would be anticipated during the construction of the power line for accessing pole locations and stringing wires, and potentially during the life of the power line for future maintenance. No new road construction would be allowed. Power line design would include methods to minimize effects to raptors.</td>
</tr>
</tbody>
</table>
Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.

<table>
<thead>
<tr>
<th>Wildlife and Livestock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled burns in ponderosa pine.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fishlake National Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Actions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actions</th>
<th>Implementation Dates (begin to end)</th>
<th>Residual Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical surveys where off-road access is accomplished by helicopter and foot.</td>
<td>1980-1990</td>
<td>None.</td>
</tr>
<tr>
<td>Prescribed burning for vegetation improvement.</td>
<td>2005-2007</td>
<td>Improvement in quantity and type of vegetation. Temporary change in vegetation and habitat and associated species use of the area.</td>
</tr>
<tr>
<td>Vegetation manipulation using Dixie Harrow &amp; seeding.</td>
<td>2008-2009</td>
<td>Temporary habitat change/destruction. Some change in wildlife habitat and associated values.</td>
</tr>
<tr>
<td>Firewood gathering</td>
<td>Since 1900</td>
<td>Travel off designated routes with associated resource disturbance.</td>
</tr>
<tr>
<td>Christmas tree cutting</td>
<td>Since 1900</td>
<td>Travel off designated routes with associated resource disturbance.</td>
</tr>
</tbody>
</table>

It is reasonably foreseeable that the use of access roads would be required to access vent shaft site(s) during construction and to the vent shaft site containing a fan for inspections and maintenance after construction. Vehicle access to the vent shaft site(s) would be required on a daily basis for the duration of the construction period (12 months or more). Maintenance activities would be required for a ventilation fan system for the life of the mine. Snow removal from the access roads throughout the winter might also be needed. A Road Use Permit (RUP) would be required pursuant to the National Forest Roads and Trails Act, 16 U.S.C. 535 and 537, and 36 CFR Part 212, Subpart A, as amended. Use of Forest System Roads would be subject to provisions within the RUP.

It would be reasonably foreseeable that construction access to a vent shaft site would use existing National Forest System Roads. It would be reasonably foreseeable that use of the roads for vent shaft construction and maintenance activities would require routine road maintenance efforts for the duration of mining.
### Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.

<table>
<thead>
<tr>
<th>Recreation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Camping in undeveloped areas and hunting.</td>
<td>Since 1850</td>
<td>Increased human presence. Some campsites visible. Some habitat disturbance due to illegal OHV use.</td>
</tr>
</tbody>
</table>

#### Present Actions

<table>
<thead>
<tr>
<th>Actions</th>
<th>Date</th>
<th>Current Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minerals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal exploration drill holes that have been adequately plugged, reclaimed, and re-vegetated.</td>
<td>1990s to present</td>
<td>None; other than some vegetation change in associated reclaimed areas.</td>
</tr>
<tr>
<td>West Coal Lease Modifications – Three lease modifications using longwall methods south of the Quitchupah Lease Tract containing about 2,316 acres. Coal extracted through the existing SUFCO mine portal.</td>
<td>2009-2017 (approximate)</td>
<td>Effects included subsidence of the ground surface. Impacts are disclosed under a separate environmental review process.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Livestock</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock grazing.</td>
<td>1850s to present</td>
<td>Some change in quantity and type of vegetation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transportation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorized vehicle travel management with associated road and trail closure and restricted access enforcement.</td>
<td>2006- present</td>
<td>Improvement in vegetation and associated habitat.</td>
</tr>
<tr>
<td>Construction of Quitchupah Creek Road from SUFCO Mine west to Highway 10. Project upgrades existing road/trail to provide a shorter alternate access route from SUFCO Mine to Highway 10. The road will be approximately 2.4 miles long and 28 feet wide with a paved surface. The road crosses NFS land and other public land administered by the BLM.</td>
<td>2006-present</td>
<td>Primary effects include big game road crossings between winter and summer ranges, cut and fill activities in two wetlands totaling 0.33 acres, airborne and waterborne sediments entering the stream system, road surface scavenging by raptors, livestock movement restrictions within allotments, riparian impacts due to livestock movement restrictions, etc.</td>
</tr>
</tbody>
</table>

#### Future Actions

<table>
<thead>
<tr>
<th>Actions</th>
<th>Date</th>
<th>Anticipated Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guzzler installation.</td>
<td></td>
<td>Improvement in water availability and possible change in associated wildlife species using the area.</td>
</tr>
</tbody>
</table>
Table 2.1. (cont’d) Past, present, and reasonably foreseeable future actions within and surrounding the proposed Greens Hollow tract.

<table>
<thead>
<tr>
<th>Minerals</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Longwall mining under South Fork Quitchupah Creek.</td>
<td>Subsidence expected. No change in quantity or quality of surface water anticipated though if it occurs, mitigation measures will be implemented.</td>
<td></td>
</tr>
<tr>
<td>Longwall mining of area between North and South Fork Quitchupah Creek.</td>
<td>Subsidence expected. No change in quantity or quality of surface water anticipated though if it occurs, mitigation measures will be implemented.</td>
<td></td>
</tr>
<tr>
<td>SUFCO special use permit modification</td>
<td>Addition of approximately 100 acres to the existing special use permit to facilitate coal quality segregation, relocation of settling ponds, and infrastructure. Short term increase in sedimentation during construction. Long term benefits due to relocating settling pond out of intermittent drainage. Minor impacts to livestock management and ATV use. Safety hazards due to recreational vehicles and coal truck traffic reduced near the existing mine portal.</td>
<td></td>
</tr>
</tbody>
</table>
Table 2.2. Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology, Mining, Subsidence, Seismicity, and Structures and Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Geology, Mining, Subsidence, and Seismicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Issue 1:</strong> Mining of the underground coal reserves can cause subsidence, non-uniform subsidence features, seismicity, and cracking of the ground surface.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The tract would not be leased, therefore mining would not occur in the Greens Hollow tract and natural weathering and erosion of the Wasatch Plateau would continue. Spalling of the Castlegate Sandstone cliffs (and other smaller cliff faces) would occur across the entire tract at a rate similar to the last 10,000 years. The coal resource found on the tract would remain in place and continue to have future value. Future access to the coal would likely require a new portal, increasing the surface impacts in order to extract the coal resource at a later date.

Several coal beds exist above the bed conceptualized for mining (Hiawatha) and represent a presently uneconomic coal reserve. Future mining technologies may be developed to economically extract more of the coal resource in the strata. Under the Proposed Action, these overlying coal beds would be subject to caving, fracturing, potential water flooding, and severely altered rock stresses, which will impair and/or eliminate any future potential extraction.

Subsidence on the Greens Hollow tract is predicted to be the trough type, which is characterized by the formation of a relatively smooth basin over each panel, producing a series of parallel basins. The individual basins would be separated by permanent zones of tension. The subsidence process occurs on the surface as the upper strata bend and settle. Surface subsidence processes result in both vertical and horizontal displacement of rocks. The subsidence process is expected to be complete within a few years after mining.

Predicted subsidence would be up to approximately 8 feet in the northern half of the tract and up to 4.3 feet on the southern half of the tract. Subsidence would increase with increasing extraction height and decreasing overburden cover. Predicted tensile strains would reach levels that could cause surface fractures, particularly above longwall gateroads and near shallow block boundaries to the northeast. Fractures are more likely to occur over panel boundaries and gateroads. Many fractures should close due to compression and settling of the surface, but fractures in tension zones along panel boundaries are likely to remain open. Expected decreasing surface movement extending beyond the underground mining boundaries would be approximately 270 feet for shallow workings and 800 feet for deep workings. Change in surface slopes would be moderate (generally less than 2 to 3 percent).

Perennial segments of Cowboy Creek, Greens Hollow, and Muddy Creek would also be undermined. The minimum amount of overburden cover above the coal to be mined along Cowboy Creek and Greens Hollow is predicted to be approximately 1,200 feet. Surface and ground water resources may be impacted.

The total recoverable coal would decrease and the potential lost in-place resource would increase.

Mining would be excluded from sensitive areas, including stream segments with shallow overburden over the Castlegate Sandstone and along cliff escarpments. Mining would be restricted in the North Fork of Quitchupah Creek, Muddy Creek, Cowboy Creek, and Greens Hollow drainages where the overburden is insufficient in thickness or rock types to facilitate healing of surface tensile cracks. Excluding mining from these areas would minimize the risk of water displacement, or loss in the case of Muddy Creek.

Excluding mining from within less than 350 feet of cliff escarpments would reduce the risk of spalling and rock fall that would be present under Alternative 2 if these features are undermined.

Seismicity would essentially be the same as described under Alternative 2.
Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The overburden cover is less than 900 feet where Muddy Creek crosses the eastern boundary of the Greens Hollow tract. Along this segment of Muddy Creek, there is potential for mining-induced subsidence to result in water loss from the creek into underground mine workings. Mining within less than 350 horizontal feet of escarpments could result in destabilizing ground movements.</td>
<td>Seismic impacts of concern for Greens Hollow tract include perception of seismic events by National Forest System users, potential damage to stock ponds, and potential damage to structures and facilities. The maximum probable seismic event is expected to be 3.4 on the Richter scale where mining occurs under thicker cover. The level of perception of seismic events by National Forest System users, including recreational users, is expected to be low. Potential for damage to stock ponds due to seismicity is expected to be low.</td>
<td></td>
</tr>
</tbody>
</table>

**Structures and Facilities**

**Issue 2:** Mining-induced subsidence could damage the Rough Brothers’ Cabin.

The tract would not be leased, therefore mining would not occur in the Greens Hollow tract and there would be no impacts to structures and facilities. The permanent strains may cause slight damage to Rough Brothers of the Hills cabin, a wooden structure. The potential damage may not be noticeable on the exterior because of its wood construction. However, the concrete slab may crack. Slight damage may result in the long-term due to permanent tensile strains including cracks and deformation of doors (sticking) and windows. The Special Use Permit for this cabin will not be renewed by the FS. The cabin must be removed from the forest by 12/31/2016.

<table>
<thead>
<tr>
<th>Surface and Ground Water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Quantity</strong></td>
</tr>
</tbody>
</table>

**Issue 1:** Mining-induced subsidence could intercept ground water in underground mine workings and subsequent discharge to Quitchupah Creek (Existing National Pollutant Discharge Elimination [NPDES] Permit) could cause transbasin diversions of surface and ground water from the Muddy and Greens Hollow drainages to the Quitchupah Creek drainage. This could affect downstream agricultural, domestic, and industrial water supplies as well as ecosystems.

The tract would not be leased, therefore mining would not occur in the Greens Hollow tract and there would be no impacts to ground water resulting from interception or transbasin diversions by underground mine workings.

Mine water inflows would occur as a result of ground water inflow from inactive storage and perched zones that have virtually no hydraulic connection with surface water systems. Base flows in North Fork Quitchupah Creek would continue to be supplemented by mine water discharge collected from mine water inflow. Transbasin diversion of water from Muddy Creek to the mine could occur through subsidence fractures that connect the mine to the surface. This impact would be limited to areas where overburden is less than 60 times mine thickness.

Exclusion of mining from areas inside of stream buffers and angle of draw buffers would eliminate subsidence fractures that result in transbasin diversions from Muddy Creek to underground mine workings. Other impacts would be similar to Alternative 2.
<table>
<thead>
<tr>
<th><strong>Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.</strong></th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issue 2:</strong> Mining-induced subsidence could change the flow of springs and seeps, affecting the flow of springs and their receiving streams. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.</td>
<td>The tract would not be leased, therefore mining would not occur in the Greens Hollow tract and there would be no subsidence impacts to the flow of springs and seeps.</td>
<td>A total of 33 springs, eight stock ponds, and eleven natural ponds are located in or immediately adjacent to the analysis area. Loss of water from these features to underground mine workings would be unlikely due to the depth of overburden cover. Shallow subsurface ground water flow and surface runoff that supports springs, seeps, and ponds could be affected by the development of surface tensile fractures. These fractures could develop above gate roads and longwall panel boundaries, particularly in areas of brittle Castlegate Sandstone, including spring M_SP87 located at the contact between the Castlegate and Blackhawk formations (see Figure 3.4). As seen in the past, surface tensile fractures that appear in areas where shales and swelling clays are present would likely heal, thereby reducing the risk for long-term flow impacts. However, surface cracks in the sandstone units may persist. If surface discharge from a spring is permanently affected, the ground water would be expected to discharge at a downslope location. A total of 19 springs would be at risk of impacts from subsidence and related surface tensile fractures including seven high value springs and nine moderate value springs. Changes in the amount or location of spring discharge would impact the amount or location of adjacent wetlands or riparian vegetation and associated wildlife species.</td>
<td>Exclusion of mining from areas with less than about 50 feet of Price River Formation above Castlegate Sandstone would protect spring M_SP87 from water loss to surface tensile fractures. All other impacts to springs, seeps, and ponds would be the same for Alternatives 2 and 3.</td>
</tr>
<tr>
<td><strong>Issue 3:</strong> Mining-induced subsidence of perennial streams could intercept flowing/impounded water and divert it underground, changing the hydrology. Changes in stream gradient could cause changes in stream morphology (see wildlife). Each tributary potentially affected must be specifically addressed by subheading.</td>
<td>The tract would not be leased, therefore mining would not occur in the Greens Hollow tract and there would be no subsidence impacts to perennial streams or diversion of surface waters.</td>
<td>Perennial stream segments that would be undermined include portions of North and South Fork Quitchupah Creek, Cowboy Creek, Greens Hollow and Muddy Creek. With the exception of Muddy Creek, permanent loss of water to the underground mine workings would be unlikely due to the depth of overburden cover. Segments of Muddy Creek where overburden is less than 60 times mine thickness would be at risk for loss of water through subsidence fractures that connect the mine to the surface. Surface tensile fractures could develop in areas above gate roads and longwall panel boundaries and particularly in areas of brittle Castlegate Sandstone. Mining in areas with less than about 50 feet of Price River Formation or alluvial material above Castlegate Sandstone could result in surface tensile fractures that may be slow to heal. Impacts from enhanced surface fracturing would be to shift the location of perennial segments further upstream with a possible</td>
<td>Exclusion of mining from areas inside of stream buffers and angle of draw buffers would eliminate subsidence fractures that divert water from Muddy Creek to underground mine workings. Buffers would also eliminate the occurrence of surface tensile fractures in areas with less than about 50 feet of Price River Formation above Castlegate Sandstone.</td>
</tr>
<tr>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Proposed Action</td>
<td>Alternative 3</td>
<td></td>
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<tr>
<td>--------------------------</td>
<td>---------------------------------</td>
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<tr>
<td>decrease in stream flows and length of downstream perennial segments. Changes in flows could result in changes to riparian vegetation along affected stream reaches and changes to aquatic and riparian-associated species utilizing the streams and riparian habitat.</td>
<td>Differential subsidence would change stream gradient as streams enter and leave the subsidence zone. Changes in surface slope following differential subsidence could increase channel incision across the over steepened section and sediment deposition along flatter slope segments. Given the variability of most stream channels in the analysis area, these changes may not be visually apparent. Functional changes in channel morphology are not likely to occur.</td>
<td></td>
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</tbody>
</table>

**Water Quality**

**Issue 4:** Foreseeable continued discharge of mine water into Quitchupah Creek could change water quality in Quitchupah Creek and other downstream drainages. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

The tract would not be leased, therefore mining would not occur and there would be no changes associated with mining the Greens Hollow tract that would change discharge and water quality into Quitchupah Creek.

Water quality of future mine discharge under Alternative 2 would be similar to current mine discharge collected from other mined areas. Mine discharge is regulated by Utah Pollution Discharge Elimination System (UPDES) permit requirements. Past and current water quality measurements of mine discharge have met applicable standards. Mine water discharged into the North Fork Quitchupah Creek from the Greens Hollow tract should continue to meet the current UPDES discharge limits and stream standards.

The potential water quality impacts from mined areas and mine discharge waters would be the same for Alternatives 2 and 3.

**Issue 5:** Equipment and materials spilled, used, and/or abandoned in underground mine workings could change ground water quality and any connected surface water sources. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

The tract would not be leased, therefore mining would not occur and there would be no potential impacts to water quality from spills and abandoned equipment in the Greens Hollow tract.

The quality of mine water that accumulates in mined out areas in the Greens Hollow tract is expected to be similar to that found in other adjacent mined areas such as at the SUFCO mine, and similar to the quality of ground water in the overlying and underlying units. Increased concentrations of some constituents would occur due to oxidation of sulfide minerals in exposed rock and chemical interactions with roof bolts and other supporting materials introduced into the mine. Constituents influenced by these processes primarily include sulfate, iron, and manganese. pH levels are also typically reduced. Some metals would remain in the mine and initially oxidize over time, resulting in some increase in metal concentrations in mine water (primarily iron). However, much of the iron increase in mine water is due to sulfide oxidation and not deterioration of metals remaining in the mine. Most, if not all, iron released through oxidation is removed through precipitation as concentrations are neutralized by mine water. The quality of mine water discharge would experience spikes in dissolved metals.

The potential water quality impacts from mine equipment and materials used would be the same for Alternatives 2 and 3.
### Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
</table>
| (primarily iron) and other constituents (primarily TDS comprised of sulfate, calcium, magnesium, and bicarbonate salts) that enter solution as the mine floods. This flushing effect would diminish over time as the mine completely floods and dissolved oxygen levels drop. | Terrestrial and Aquatic Wildlife

**Issue 1:** Subsidence-induced changes in water flow, including but not limited to flow at points of diversion or use and/or change in water quality in perennial drainages to riparian vegetation/wetlands could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.

No changes in water flow or quality of perennial streams and drainages or to riparian and wetland ecosystems would be expected. Habitat for aquatic and wildlife species would not be affected.

Subsidence-induced water loss would have no effect on the four Colorado River endangered fishes since any water locally diverted would resurface within the watershed resulting in no net loss of water to the Colorado River Basin.

Flow reductions caused by diversion of water to underground workings or streambed subsidence may impact the Colorado River cutthroat trout. The magnitude of this impact would depend on the volume of surface water lost to subsurface flows. Effects are expected to be temporary, as seasonal flows are likely to transport substrates downstream and thus fill in cracks within a short time period. According to the Geology Technical Report prepared for this project (Cirrus 2013a); the natural recovery of tension cracks in a streambed could range from a few weeks to one or two years. Should water be lost for the full two years (longest anticipated timeframe), impacts on fish populations could occur.

Flow reductions in perennial streams could modify the species composition of macroinvertebrates due to changes in the available habitat types (e.g., riffles and pools of various depths).

If flow is reduced riparian vegetation used as habitat for birds, small mammals, and big-game could be lost.

Some impacts of water loss on amphibians could occur; however, most amphibians in the analysis area are associated with ponds and springs outside the subsidence zone.

The effects of the Proposed Action are expected to be avoided under Alternative 3 where the perennial Muddy Creek, lower Greens Hollow, and lower Cowboy Creek portions of the project area would be excluded from subsidence mining. It is expected that by excluding these areas of perennial drainages, any associated riparian habitat and wetlands, potential cutthroat trout, other aquatic species, or their habitat would not be impacted by mining operations as subsidence effects and escarpment failures would be avoided in these areas.

Any riparian areas not protected under this alternative would likely develop impacts similar to those expected under the Proposed Action Alternative. |
<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2: Subsidence-induced changes of perennial streams could cause changes in stream morphology and aquatic habitat.</td>
<td>If the degree of subsidence is such that flow would be interrupted, this obstruction could isolate approximately 20 miles of tributaries above the subsidence zone from the lower portion of Muddy Creek and could lead to decline of the cutthroat trout populations in the isolated area. It would be unlikely that a gradient change of 1 to 2 percent could change the composition and ratios of habitat types. The natural input of sediment to streams is a normal component of salmonid habitat. However, increased sediment delivery to streams can cause major disruptions to the aquatic habitat. These disruptions can lead to the movement and redistribution of spawning gravels, additions of new sediments, changes in accessibility to fish of spawning habitats, changes in availability of food organisms, and changes in seasonal and diurnal water temperatures. Short-term impacts (days to months) could result in increases in availability, transport, and deposition of sediment. The accumulation of fine sediment on spawning gravels could reduce the availability of spawning habitat and reduce spawning/hatching success. Increasing the amounts of suspended and bedload sediments could reduce light penetration and thus photosynthesis and primary production, as well as reduce survival by delaying fish movements (migration), disrupting fish feeding and thus growth, interfering with respiration, and increasing gill irritation and the potential for infection. Conversely, long-term impacts (years to decades) include changes that may actually improve habitat quality and productivity by increasing the total area available for spawning and rearing habitat. The addition of boulders, rubble, and gravel to the stream could lead to increases in habitat diversity and thus to the available habitat for fish. Obstructions caused by boulders and bedrock outcrops could modify channel velocity and direction, thus leading to the creation of pools, gravel bars, and side-channel rearing areas. The potential also exists for wildlife that use aquatic habitat, such as bird and mammal species, to be impacted by changes in stream morphology and aquatic habitat. Changes could alter riparian vegetation, water availability and distribution, and natural travel corridors—all of which could impact wildlife species.</td>
<td>The effects of the Proposed Action are expected to be avoided under Alternative 3 where the perennial Muddy Creek, lower Greens Hollow, and lower Cowboy Creek portions of the analysis area would be excluded from subsidence mining. It is expected that by excluding these areas of perennial drainages, any associated riparian habitat and wetlands, potential cutthroat trout, other aquatic species, or their habitat would not be impacted by mining operations as subsidence effects and escarpment failures would be avoided in these areas. Any riparian areas not protected under this alternative would likely develop impacts similar to those expected under the Proposed Action Alternative.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Proposed Action</td>
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<tr>
<td>Issue 1:</td>
<td>Subsidence could potentially affect up to 6,175 acres within the Greens Hollow tract boundary. Inside the Greens Hollow Area of Subsidence Mining, the Proposed Action could affect up to 8,887 acres. Subsidence effects would extend beyond this boundary, but would be wholly contained within a 900-foot extended subsidence zone around the analysis area (Mining Analysis Area Boundary), corresponding to 11,025 acres. In general, effects of subsidence on vegetation would be minor to non-existent and would not lead to the loss of vegetation or other changes in upland plant communities because the changes in surface topography would be very slight. Where mining does occur under escarpments, subsidence could result in escarpment failures and rock falls. These events could result in areas of impacts to the vegetation communities that occur under or above the escarpments and would be based on the extent of the area affected. There would be no known impacts to TES species. Eighty wetlands that occur within the Greens Hollow tract boundary, totaling approximately 11.7 acres, could be subsided as a result of mining. In the analysis area, there are an additional 15 wetlands, totaling approximately 3.2 acres that could be subsided. The 900-foot extended subsidence zone adds an additional 43 wetlands within the area potentially affected by subsidence, totaling approximately 7.2 acres. The risk of lost hydrology is relatively low due to the depth of overburden, but if a spring occurs on a panel boundary, the risk that the water regime could be affected is much higher. If water is lost due to subsidence, wetland vegetation dependent on that water could be stressed or could contract depending on the severity of the impact. However, Stipulation #17 would require the replacement of water in quantity and quality. The Muddy Creek, North Fork of Quitchupah Creek, Greens Hollow, and Cowboy Creek could be undermined and subsided. The potential magnitude of stream flow loss is not known with certainty. Overburden cover in the 700 to 900 foot range could result in water loss but the stream may not dry up during low flows. Thicker overburden reduces the risk of water loss. Where subsidence reduces stream flows and enhances the rates of subsurface flow in the fractured bedrock and alluvium, there may be a contraction of the riparian zone, Protecting sensitive areas and escarpments from subsidence would reduce the acres of vegetation potentially affected by subsidence by approximately 698 acres in the Greens Hollow tract and by approximately 860 acres in the larger analysis area. Any impacts to upland vegetation due to subsidence are expected to be minor to non-existent, as noted under Alternative 2. Three wetlands potentially subsided under Alternative 2 would fall in the area that would not be mined. Otherwise, the impacts to wetlands would be the same as under Alternative 2. Excluding subsidence mining from sensitive areas and escarpments would protect the narrow riparian corridors along Muddy Creek, Horse Creek, Greens Hollow, Cowboy Creek, and the North Fork of Quitchupah Creek from subsidence in the area where they are most vulnerable to subsidence.</td>
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</table>

Greens Hollow Federal Coal Lease Tract

Draft Supplemental Environmental Impact Statement
Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
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<tbody>
<tr>
<td>depending on the severity, season, and duration of the water loss. Shallow-rooted herbaceous species would be more susceptible to this impact. Changes in surface slopes resulting from differential subsidence could result in an increase in the length of cascades and an increase in pool volumes of the stream. These changes in channel gradient could also affect riparian vegetation, potentially expanding it in areas where pools form and contracting it where the gradient increases. Note again that Stipulation # 17 would require the replacement of water in quantity and quality.</td>
<td>impact, i.e., where the Castlegate Sandstone outcrops.</td>
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</table>

Heritage Resources

**Issue 1:** Mining and subsequent subsidence could cause surface disruption and adversely impact both known and unidentified heritage resources.

The lease would not be issued, thus no heritage resources would be affected by related coal mining activities.

Surface cracking associated with the subsurface longwall mining could adversely affect seven sites that are eligible for inclusion in the NRHP, including four rock shelters. The most pronounced effects could be in the form of bedrock collapse or movement near the edge and along the walls of canyons and escarpments.

The Paiute, Ute, and Hopi Indian Tribes have expressed concerns about impacts to area sites including the potential for subsidence to affect prehistoric (ancient American Indian) sites, particularly rock shelters.

Surface cracking associated with the subsurface longwall mining could adversely affect the one eligible site, which is a lithic scatter that does not contain a rock shelter.

The Paiute, Ute, and Hopi Indian Tribes have expressed concerns about impacts to area sites including the potential for subsidence to affect prehistoric (ancient American Indian) sites, particularly rock shelters.

Paleontological Resources

**Issue 1:** Mining and subsequent subsidence could impact unidentified paleontological resources.

No paleontological resources would be affected by related coal mining activities. Paleontological resources could still be affected adversely by erosion and could be subject to theft and vandalism. Discovery and recovery of fossils resources by scientists could continue through the existing permitting processes.

Paleontological resources in and above the Blackhawk Formation could be directly affected via escarpment failure. The northern boundary of the Greens Hollow tract consists of approximately 6,000 linear feet of steep slopes and cliffs in Muddy Creek Canyon. The eastern boundary of the tract intersects Greens Hollow Canyon and adds approximately 500 feet to areas that have mass movement potential.

Subsidence along these escarpments could initiate rock falls, small rock slides, soil creep, and other mass-wasting processes. The exact location and lateral extent of any event is not possible to predict, but would occur directly above the subsiding area at the time of mining and continue for several months as the rock subsides.

Adverse impacts to paleontological resources are similar to those considered under Alternative 2; with the exception that Alternative 3 reduces the minable area based on potential for perennial stream impacts and escarpment failure and thereby should lessen the extent of potential adverse effects to fossil resources preserved at the surface.
### Table 2.2. Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
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<th>Alternative 3</th>
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<tbody>
<tr>
<td>mass subsides. The magnitude of these mass movements would be small and localized. Assuming subsidence affects the entire escarpment, there could be paleontological impacts only if vertebrate fossils are present, though the Blackhawk is an important vertebrate fossil bearing formation, most of the fossils are in the coal bearing seams and noteworthy finds are rare. Stipulation #1 (Appendix B) and HR 146 (Public Land Management Act of 2009) protects paleontological resources. Providing that paleontological surveys are conducted if escarpments fail, and if paleontological resources are discovered and the FS is notified of the discovery, there would be no negative impacts to paleontological resources due to subsidence on the Greens Hollow tract. Discovery and recovery of fossil resources by scientists could continue through existing permitting processes.</td>
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### Socioeconomics

#### Issue 1: Leasing of the tract could provide an important energy resource for the public and result in social and economic benefits.

The expected SUFCO Mine life would be some 7 years. For the purposes of analysis, it is assumed the conceptual mine plan would mine coal at the current rates, The mine would close 8.8 years sooner than under the Proposed Action (15.8 years sooner in total). The No Action would result in the lost opportunity for about 1,199 mine employee household persons and 873 trucking employee household persons. Therefore, total direct displacement would be just over 2,000 household persons with an influence area mostly concentrated in the Richfield, Salina, and Gunnison areas.

Issuance of the lease could result in 8.8 years of mining. Continuing opportunity for 383 mining jobs and 279 truck driving jobs and the 1,034 indirect mine support jobs.

The approximately 56.6 million tons (at an estimated rate of 6.43 million tons per year) of coal could be recovered and provide revenue generated from property, income, sales taxes, and mine royalties through the extended period. The State of Utah would receive a 50 percent share of the royalties and the counties would receive a proportionate share.

Issuance of the lease could result in 8.7 years of mining. About 900,000 tons of coal left in place. Job effects would be the same as Alternative 2. The approximately 55.7 million tons (about 6.43 million tons per year) of coal could be recovered and provide revenue generated from property, income, sales taxes, and mine royalties through the extended period. The State of Utah would receive a 50 percent share of the royalties and the counties would receive a proportionate share.
<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The lease would not be issued at this time. Total market value of coal at current rates would be $1.47 billion. Total royalties and tax revenues not realized would be $194 million.</td>
<td>The approximate 56.6 million tons of coal produced would generate about $1.87 billion in response to market needs (The five-year [2008-2012] average price of coal for Utah is $32.96 per short ton in real dollars (USDL 2012)). Total royalties and tax revenues from the additional coal would be about $194 million.</td>
<td>The approximate 55.7 million tons of coal produced would generate about $1.84 billion in response to market needs (The five-year [2008-2012] average price of coal for Utah is $32.96 per short ton in real dollars (USDL 2012)). Total royalties and tax revenues from the additional coal would be about $189 million.</td>
</tr>
<tr>
<td>Electrical needs of approximately 1.34 million U.S. households or 3.48 million U.S. citizens would not be realized annually for approximately 8.8 and 8.7 years less than under alternatives 2 and 3, respectively.</td>
<td>If all the coal is converted into electrical energy, the annual equivalent electrical needs of approximately 1.34 million (11.81 million total) U.S. households or 3.48 million (30.59 million total) U.S. citizens would be realized. These numbers show how many households and citizens would be affected if all coal was converted into electricity.</td>
<td>If all the coal is converted into electrical energy, the annual equivalent electrical needs of approximately 1.34 million (11.62 million total) U.S. households or 3.48 million (30.10 million total) U.S. citizens would be realized. These numbers show how many households and citizens would be affected if all coal was converted into electricity.</td>
</tr>
<tr>
<td>Not leasing would result in the early loss of employment providing some 383 direct mining jobs. Assuming most mine employees and supporting employment would be within Sanpete and Sevier counties, these direct mine jobs represent some 3.6 percent of the non-farm employment levels in the counties. A like percentage in Salt Lake County would represent over 17,800 non-farm jobs (U.S. Department of Commerce 2011). Some 1,307 jobs in total would be provided in the United States through direct and induced economic activity (Ernst &amp; Young 2013).</td>
<td>Leasing would continue employment providing some 383 direct mining jobs. Assuming most mine employees and supporting employment would be within Sanpete and Sevier counties, these direct mine jobs represent some 3.6 percent of the non-farm employment levels in the counties. A like percentage in Salt Lake County would represent over 17,800 non-farm jobs (U.S. Department of Commerce 2011). Some 1,307 jobs in total would be provided in the United States through direct and induced economic activity (Ernst &amp; Young 2013).</td>
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Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

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<tbody>
<tr>
<td>In 2011, jobs related to coal mining in the State of Utah have been shown to support more jobs in the service industry (2,107) than in the mining industry (1,778), which includes coal mining (1,748). Also, wages supported in the mining sector are almost three times as large as those in the service sector. This is because average mining wages in general, and average coal mining wages ($77,520/year) in particular, are almost double the average wages in the state ($40,898/year), whereas average service sector wages are lower than overall average wages. (Hogue 2012)</td>
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</tr>
</tbody>
</table>

Recreation

**Issue 1:** Subsidence could cause damage to roads and trails through surface disruption resulting in safety risks and disruption of the recreation experience.

| The recreation environment would remain unchanged. Recreational use and activities would remain at current levels. | Subsidence would have limited impacts to the road network within the analysis area. Subsidence and displacement of surface features would be distributed over a fairly extensive area. Permanent surface cracks would primarily occur over mine panels and gate roads, as well as in the shallow areas in the northeast part of the tract. The road network would not be substantially impacted, except where road alignments traverse and parallel the edges of mining mains and mining districts, where the potential for subsidence related damage would be possible. However, Stipulation #13 requires replacement/repair of FS owned or permitted facilities. | Same as Alternative 2. |

Visual Quality

**Issue 1:** Subsidence may affect visual quality.

<p>| Lease Tract would not be offered for leasing and there would be no subsurface mining activities to SUFCO or any other entity within the tract at this time. Natural processes would continue. The visual quality would remain similar to current | Surface fractures due to subsidence could impact up to 80 individual wetlands (totaling approximately 11.7 acres) and the riparian along reaches of North Fork of Quitchupah Creek, Greens Hollow, and Cowboy Creek on the east side of the analysis area due to changes in hydrology, as noted in Section 4.5.2.2. Although water is unlikely to be permanently lost from the area, it could shift to a new location. The likelihood of these impacts occurring would be greater where there is shallow cover over Castlegate Sandstone, and at the edge of panel boundary | Same as Alternative 2 in areas allowed to subside. Wetlands/riparian areas in areas of no subsidence mining would be unaffected and similar to the No Action Alternative. |</p>
<table>
<thead>
<tr>
<th>Issue 1: Subsidence could damage range improvements and facilities, including spring developments.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leasing would not occur, thus subsidence-related damage to range improvements would not occur.</strong></td>
</tr>
<tr>
<td>The risk of loss of ground water at an individual spring is very low, but there is potential for impacts due to surface tensile cracking for four springs with water troughs: M_SP02, which feeds Greens Hollow Trough (202018), as well as Greens Pasture #1 Pond; M.SP08, which feeds Aspen Spring Trough (202007); M.SP18, which feeds Greens Seeding Trough (202014), as well as Greens Seeding Trough (202014A) via the Greens Seeding pipeline; and the White Mountain Spring which has a springbox and feeds a trough. Note that Stipulation #13 requires repair/replacement of facilities and Stipulation #17 requires replacement of water in quantity and quality.</td>
</tr>
<tr>
<td>Stock ponds overlying mine panels could be impacted due to subsidence-induced tensile fractures and cracking and experience water loss. Most of the ponds in the analysis area are filled by surface water runoff, although Greens Pasture #1 Pond is fed by spring M.SP02. If subsidence reduced flows from the spring, or alters runoff patterns to the other ponds, the water level in those ponds would be affected. Because of the depth of overburden, the actual risk of cracking would be low, so damage would be unlikely. If cracking did occur, the impacts would likely be of short duration, as cracks are projected to heal relatively quickly due to the silts and clays in the soil. Stipulation #13 requires repair/replacement of facilities.</td>
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<td>Same as Alternative 2.</td>
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<table>
<thead>
<tr>
<th>Issue 2: Subsidence impacts to water resources could affect livestock permit operations. Direct, indirect and cumulative impacts to water resources including but not limited to points of diversion or use and vegetation may change all or a portion of the area from primary range to secondary range, and impact grazing capacity.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leasing would not occur; therefore water resources would not be affected. Grazing would likely</strong></td>
</tr>
<tr>
<td>The likelihood of losing water sources for the allotments due to mine subsidence impacts would be very low due to the depth of overburden and the clays and shales present in the area. It is more likely that if springs were affected, these</td>
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<td>Same as Alternative 2.</td>
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</table>
Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

<table>
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<th>Alternative 2 – Proposed Action</th>
<th>Alternative 3</th>
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<tbody>
<tr>
<td>continue as under the current management practices.</td>
<td>impacts would be short term because cracks would tend to heal due to the clays and shales present in the analysis area. The discharge points for some springs may move down slope as the cracks heal. This would compromise the function of the existing water developments, but there is not expected to be a net loss of water. Springs that do coincide with gate roads may be more at risk of a long-term impact. The Forest Plan does not consider any water loss to be acceptable. Stipulation #13 requires existing FS owned or permitted surface improvements need to be protected, restored, or replaced to provide for the continuance of current land uses.</td>
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**Roadless**

**Issue 1:** Surface-related impacts from underground mining may change characteristics of inventoried roadless areas and other unroaded areas.

| There would be no effect to wilderness attributes and roadless character (or characteristics) because no leasing or subsequent development would occur. | Approximately 48 percent of the Greens Hollow tract occurs within areas designated as IRAs. No road construction or reconstruction would be allowed in the IRA per the 2001 RACR. The area above the longwall panels in the IRAs would be allowed to subside. Thus portions of the IRAs would be subsided. The lease tract is outside of the boundaries of the Wildcat Knolls IRA; thus this IRA would not be affected by subsidence mining. The effects of subsidence on the wilderness attributes and roadless area characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs were analyzed. Implementation of the Proposed Action could have adverse effects on some roadless characteristics (soil, water, and air resources; sources of public drinking water; landscape character and integrity; and traditional cultural properties and sacred sites) and wilderness attributes (untrammeled, natural, and manageability [as wilderness]) and their potential for wilderness consideration in the future. The Proposed Action would also affect the White Mountain and Muddy Creek draft unroaed-undeveloped areas. Approximately 5,457 acres in the White Mountain and approximately 802 acres in the Muddy Creek draft unroaed-undeveloped areas occur within the Greens Hollow mining analysis area boundary and would potentially be subsided. Potential adverse effects to three wilderness attributes (untrammeled, natural, and manageability [as wilderness]) could occur. | Same as Alternative 2. |
### Table 2.2. (cont’d) Comparison of direct and indirect effects on resource issues.

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1 – No Action</th>
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<th>Alternative 3</th>
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<tr>
<td><strong>Air Quality</strong></td>
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<tr>
<td><strong>Issue 1:</strong> Extended life of coal handling and hauling, mine ventilation, coal stockpiles, etc. could impact air quality.</td>
<td>No mining-related impacts to air quality from the Greens Hollow tract, but the existing SUFCO mine operation and other mines in the area would continue to operate as would other regional point sources. Other air quality impacts would continue and may increase slightly from general regional growth.</td>
<td>The emissions inventory indicates that air quality would be minimally impacted by the addition of particulate matter, CO, SO(_2), NO(_x), and VOC from mining operations from this alternative. The pollutant emission rates from the combustion sources would be very similar to current operations resulting in minor adverse impact to air quality resources. This project would not notably impact the Capitol Reef National Park Class I Area. Emissions from this alternative are less than the Prevention of Significant Deterioration (PSD) threshold of 250 tons per year, so PSD requirements do not apply. Air Quality Related Values (visibility, acid rain, flora and fauna) would not be notably impacted by this project.</td>
<td>Same as Alternative 2.</td>
</tr>
<tr>
<td><strong>Issue 2:</strong> Coal mine methane released through vent shafts could be converted into electrical power.</td>
<td>Coal mine methane production would be unchanged but would stop about 8.8 years sooner.</td>
<td>Methane concentrations recorded at the existing SUFCO mine are in the range of 0.01 to 0.03 percent in the exhaust gas at several vent locations. These concentrations are at levels that would be infeasible to capture and utilize given current technologies.</td>
<td>Same as Alternative 2.</td>
</tr>
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3.0 CHAPTER 3 – AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the physical, biological, social, and economic conditions of the existing environment potentially affected by implementation of alternative actions. The CEQ regulations direct agencies to describe the environment that could be affected commensurate with the importance of the impacts (40 CFR 1502.15). The data and level of detail presented in this chapter are, therefore, based on the information necessary for the reader to compare the existing situation with the potential effects of the alternatives. The description of the existing environment is structured by resource. The resources are discussed in the same order in chapters 3 and 4 to facilitate comparison. To fully understand the impacts of alternative actions on a specific resource, the reader should first read the applicable section of Chapter 3 and then the corresponding section in Chapter 4.

The assessment area for this Draft Supplemental EIS (Draft SEIS) varies by resource according to the natural limits of influence for each resource. For all resources, it includes the mining analysis area boundary, which is defined by the maximum area of potential subsidence impact as well as other areas which could be disturbed by associated elements. Each resource area defines the limits of the applicable assessment area or areas.

The data used in this chapter provides information for establishing a detailed baseline condition reflecting the general circumstances, environments, surroundings, trends, and resources for the area of analysis. The established baseline then provides a point in time from which a comprehensive analysis can be based throughout this document.

3.2 GEOLOGY, MINING, SUBSIDENCE, SEISMICITY, AND STRUCTURES AND FACILITIES

3.2.1 TOPOGRAPHY

The Greens Hollow tract and the mining analysis area boundary (hereafter referred to as the “study area”) lies in the Wasatch Plateau physiographic sub province of Utah (Stokes 1988), which is part of the Basin and Range-Colorado Plateau Transition physiographic province.

The topography in the study area varies greatly in character and elevation. The eastern portion of the study area lies at the eastern edge of the Wasatch Plateau. Muddy Creek cuts a deep canyon in the plateau (Figure 3.1). The eastern edge of the Wasatch Plateau is formed by a serrated resistant to semi-resistant line of cliffs. The coals of the Wasatch Plateau occur about midway in the escarpment in a series of ledges (up to 25 feet high) and steep slopes. A cliff-forming sandstone cap overlies much of the eastern escarpment, with very gentle to flat terrain on top of the plateau near the cliff’s eastern edge and along drainages. Further back from the escarpment’s edge and to the west are moderately steep slopes, some with occasional sandstone ledges forming step-like topography. Much of this topography is dominated by mass movement, including landslides and incised by moderate to deeply eroded stream channels. Hummocky topography is associated with the landslides and to a lesser degree with the areas of mass movement. West of the study area, the plateau is capped by flat-topped white limestone cliffs, up to 250 feet high. Where these are erosional remnants, they form buttes and mesa-like features all along the top of the Wasatch Plateau. (Cirrus 2013a).
Muddy Creek and Quitchupah Creek are the two major drainages eroding into the tract. Muddy Creek lies along the northern boundary of the tract (Figure 3.1). In the northeast portion of the study area, Greens Canyon is a major tributary to Muddy Creek which bifurcates into Greens Hollow and Cowboy Canyon. These drainages are steep-sided and have no valley floor in their upper reaches. The North Fork of Quitchupah Creek lies within the tract boundary on the southeast. Unnamed tributaries of the North Fork of Quitchupah drain the very southern portion of the tract. A large ridge called “Big Ridge” is present about a third of the north-south distance north from the southern boundary of the tract. This ridge forms the drainage divide between Muddy Creek and Quitchupah Creek (to the south).

Surface elevations range from approximately 7,400 feet in the eastern portion of the study area in Muddy Canyon to 9,760 feet at the western edge of the study area east of White Mountain. Overall net topographic relief is approximately 2,360 feet with the greatest local relief at the escarpment of the Wasatch Plateau on the east side of the study area.

### 3.2.2 Stratigraphy

All rocks exposed in the study area are sedimentary and include conglomerate, sandstone, siltstone, shale, coal and limestone. The rocks range in age from Late Cretaceous to Paleocene (Early Tertiary) (Hintze 1988). The rock units exposed on the surface include, in ascending order –the Blackhawk Formation, the Castlegate Sandstone, the Price River Formation, the North Horn Formation, and the Flagstaff Limestone. Section 4.1.1 explains how stratigraphy influences the effect that subsidence has on hydrology. On the cross section on Figure 3.1, some additional subsurface units are shown and include the Masuk Shale Member of the Mancos Shale (sometimes referred to as the Upper Blue Gate Shale Member and simply as “Mancos Shale” when no other members are within the mapped area) and the Star Point Sandstone. Figure 3.2 is a generalized stratigraphic section for the Greens Hollow tract area and Figure 3.3 is a fence diagram of the stratigraphic section constructed using drill-hole data in the area. Quaternary and Recent deposits include slumps, rock falls, landslides and mass movement deposits, and thin alluvium in canyon bottoms.

### 3.2.3 Structure

The study area is located between the San Rafael Swell to the east and the Basin and Range Province to the west. The rocks in the study area have inherited structural characteristics of both areas. The rocks generally strike N 38° E and dip gently approximately 2° to the northwest. A slight anticlinal feature is present in the center of the tract and its axis is approximately parallel to the structural dip. An oil and gas dry hole lying just east of the study area in section 23, T21S, R5E, tested this structural high.

Faulting within the study area is minimal. No faults have been mapped within the area on published geologic maps (see references for mapping, Figure 3.1). Coal mining is impacted by even minor faulting, and underground mapping by company geologists for SUFCO mine have detected minor faults in the Pines Tract to the east of the study area (Bunnell 2003). These faults trend N 26° W and have vertical displacements less than 7 feet. These faults occur in the southeastern portion of the study area and are likely to continue some unknown distance into the Greens Hollow tract in that general area.
Figure 3.1. Geologic Map
Cirrus Ecological Solutions, LC
Greens Hollow Tract

EXPLANATION
Land Boundaries

- Greens Hollow Coal Lease Tract
- Ark Land Proposed Mine Area
- Area of Subsidence Mining (Alt. 2)
- Mining Analysis Area Boundary

Explanation
- Landslide/mass movement
- Flagstaff Limestone
- North Horn Formation
- Price River Formation
- Castlegate Sandstone
- Blackhawk Formation
- Star Point Sandstone (cross section only)
- Mancos Shale (cross section only)

- Rock fall potential areas
- Jointing
- Formational contact
- Structure contour (top Upper Hiawatha coal)
- (Contour interval 100 feet - elevation)
- Coal exploration drill hole
- Coal cross section (USGS, PP 1625-B)
- Cross section A - A'

Cross Section A - A'
(no vertical exaggeration)

Greens Hollow Federal Coal Lease Tract

Paul B. Anderson
Consulting Geologist
By: Date:
Greens Hollow Tract
Ark Land Proposed Mine Area
Area of Subsidence Mining (Alt. 2)
Mining Analysis Area Boundary

Cirrus Ecological Solutions, LC
807 East South Temple, Suite 101
Salt Lake City, Utah 84102
(801) 741-8097 fax
(801) 364-6613

Paul B. Anderson
Consulting Geologist

6000'
7000'
8000'
9000'
6000'
7000'
8000'
9000'

0 2000 4000 6000 8000 feet

Scale

Greens Hollow Federal Coal Lease Tract
Draft Supplemental Environmental Impact Statement
Figure 3.2.
General Stratigraphy of the Greens Hollow Coal Lease Tract

Alluvium
Landslide deposits
Limestone with interbedded sandstone, shale, and volcanic ash

Shale with interbedded sandstone, siltstone, conglomerate, and limestone

Sandstone with interbedded shale, siltstone, and conglomerate

Sandstone with interbedded conglomerate

Interbedded sandstone, siltstone, shale and coal

Upper Hiawatha coal seam
Lower Hiawatha coal seam

Sandstone with interbedded shale and siltstone

Shale with interbedded sandstone and siltstone
Figure 3.3. Geologic fence diagram.
Greens Hollow Tract
Cirrus Ecological Solutions, LC

Map Information
Public Land Survey Unit Tract Lands.
Lease area boundary from Wright, 1979, National Forest.
Coordinate data in the 15° Central Projection, Zone 15UTM
Meridian System, Values are in thousand of meters north or east.

Source of Geologic Mapping Information
(compile citations given in the geology chapter)

Wright, Shinn, and Bixley, 1979
Sanchez and Hayes, 1979
Sanchez and Doelling, 2004

Explanation
- Abandoned mine
- Abandoned mine entrance
- Abandoned mine exit
- Mine headframe
- Mine entrance
- Mine ventilation
- Abandoned mine
- Abandoned mine drift tunnel
- Oil and gas exploration drill hole
- Coal exploration drill hole
- Coal cross section (USGS PP 1625-B)

Legend
- Abandoned mine
- Abandoned mine entrance
- Abandoned mine exit
- Mine headframe
- Mine entrance
- Mine ventilation
- Abandoned mine
- Abandoned mine drift tunnel
- Oil and gas exploration drill hole
- Coal exploration drill hole
- Coal cross section (USGS PP 1625-B)

Horizontal Scale
1:24,000

Source of Geologic Mapping Information
(compile citations given in the geology chapter)

Wright, Shinn, and Bixley, 1979
Sanchez and Hayes, 1979
Sanchez and Doelling, 2004

Explanation
- Abandoned mine
- Abandoned mine entrance
- Abandoned mine exit
- Mine headframe
- Mine entrance
- Mine ventilation
- Abandoned mine
- Abandoned mine drift tunnel
- Oil and gas exploration drill hole
- Coal exploration drill hole
- Coal cross section (USGS PP 1625-B)

Legend
- Abandoned mine
- Abandoned mine entrance
- Abandoned mine exit
- Mine headframe
- Mine entrance
- Mine ventilation
- Abandoned mine
- Abandoned mine drift tunnel
- Oil and gas exploration drill hole
- Coal exploration drill hole
- Coal cross section (USGS PP 1625-B)
3.2.4 COAL GEOLOGY

The potentially mineable coal seams in the tract are the Hiawatha, Upper Hiawatha, and the Muddy No. 1. The Hiawatha seam occurs directly above the Star Point Sandstone and below the Upper Hiawatha seam (Figure 3.2). The Hiawatha seam varies in thickness from 5 to 18 feet (BLM 2007). Generally mineable thicknesses of the Hiawatha are obtained on the tract. This seam is presently not mined at the adjacent SUFCO mine. Interburden between the Hiawatha and overlying Upper Hiawatha coal seam varies from 10 to 55 feet (based on drilling in 2003), with the interburden thickness increasing to the northwest. Current planning for the Greens Hollow tract is for mining only in the Hiawatha seam due to relatively thin interburden between the Upper Hiawatha and the Hiawatha seams and partings in the Upper Hiawatha. The Upper Hiawatha seam is presently mined in areas both south and east of the tract by the SUFCO mine. On the Greens Hollow tract, the Upper Hiawatha coal seam attains mineable (presently 6 to 14 feet) thickness, with an average thickness of 6.2 feet (from available drill hole data as of 2003). The Upper Hiawatha attains mineable thickness in the southern and eastern portions of the tract. The interburden between the Upper Hiawatha and Muddy No. 1 coal seam ranges from 19 to 54 feet with an average thickness of 34.3 feet (from available drill hole data as of 2003). The Muddy No. 1 coal seam is only thicker than the minimum mineable cutoff (6 feet) in the very northern part of the tract (less than 640 acres) and is not included in any mineable reserves for the tract. Overburden varies from less than 600 feet to over 2,500 feet in areas where the coal seams are mineable.

3.3 SURFACE AND GROUND WATER RESOURCES

The Greens Hollow tract comprises an area of about 10 square miles located in the southern Wasatch Coal Field, approximately 60 miles southwest of Price, Utah, and about 6 miles northwest of Emery, Utah. The baseline study area is 17.2 square miles including the Greens Hollow tract and a buffer zone surrounding the coal tract. Elevations within the study area range from approximately 7,400 feet along Muddy Creek on the east side of the study area to about 9,700 feet on the east flank of White Mountain located on the west side of the study area. The two primary streams draining the study area are Muddy Creek and North Fork Quitchupah Creek. The drainage area of Muddy Creek above USGS Station 09330500, Muddy Creek near Emery, Utah, is approximately 108 square miles. The drainage area of the North Fork Quitchupah Creek above the SUFCO Mine monitoring station 042 is approximately 24 square miles. Approximately 10.8 square miles (63 percent) of the analysis area is contained in the Muddy Creek drainage and 6.4 square miles (37 percent) are found in the North Fork Quitchupah Creek drainage.

Water resources in the study area include springs, streams, and ponds that are primarily used for wildlife and stock watering purposes. There are no registered water supply wells in the study area and ground water is only used at the point of surface discharge at springs and seeps. Water yield from upper watersheds, including the study area, provides most of the domestic and agricultural water needs for the lower valley. This section describes surface and ground water resources in the study area and establishes a foundation for determining potential effects of the conceptual mine operation on these resources. Much of the data used in this description is based on an extensive three-year study of the Muddy Creek Tract and a 2-mile buffer surrounding the tract (Cirrus 2004). Additional data were obtained from government and private entities and a review of previous work completed on areas adjacent to the Greens Hollow tract. Based on the results of the potential impact assessment (Section 4.3), recommendations for other monitoring and mitigation measures beyond special stipulations are developed to protect the water resources of the study area.
Information describing the analysis area was obtained from a review of reports and data from Utah and Federal agencies concerning water resources of the region. Canyon Fuel’s SUFCO Mine has extracted coal from lease tracts adjacent to the Greens Hollow tract including parts of the SITLA Tract, Pines Tract, and the Quitchupah Tract leases. Consequently, existing information has also been obtained from the Permit Application Package (PAP) and the Hydrologic Monitoring Reports for the SUFCO Mine, USGS investigations (Thiros and Cordy 1991), the Probable Hydrologic Consequences for the SUFCO Mine (Mayo and Associates 1999), the hydrologic information developed for the Final EIS of the Pines Tract (Forest Service 1999), the Cumulative Hydrologic Impact Assessment prepared by DOGM (2003a) for the SUFCO Mine, water quality monitoring assessments completed in the Muddy Creek drainage (Utah DWQ 2004), the Muddy Creek Water Resources technical report (Cirrus 2004), ongoing monitoring data collected by SUFCO (DOGM 2013a), field geology surveys (Anderson 2008a), and evaluations of exploratory drill hole log information (Anderson 2008b).

3.3.1 GROUND WATER AQUIFERS AND SPRINGS

The ground water baseline assessment provides a description of pre-mine conditions for each water-bearing stratum, including the coal seam, and any potentially impacted strata above and below the coal seam. Lithology and structure of the study area have been described by Anderson (2004a) and include the Blackhawk, Price River, Castlegate, and North Horn geologic formations as well as landslide deposits overlaying the North Horn formation.

A total of 33 springs with measurable flow were monitored in the study area. A summary of field monitoring efforts for all springs with measurable flow is included below in Table 3.1. The location of each spring is shown in Figure 3.4. Springs were identified on three geologic formations including Castlegate, Price River, and North Horn formations. Field measurements of flow and water quality were collected from each spring during the spring and fall seasons from 2001-2004. Additional monitoring was completed by the SUFCO mine from six of the springs during 2006-2012. Water quality samples were collected for laboratory testing from eight springs at regular intervals during 2001-2004. Monitoring results from springs indicate that the relevant State of Utah criteria for field parameters are met in most cases. Many of the dissolved oxygen values from springs do not meet the relevant water quality criteria. This is not unexpected because spring discharge is derived from ground water that is typically very low in dissolved oxygen. Each of the eight springs sampled for baseline water quality generally met the relevant criteria for all constituents except for slight exceedances of arsenic, cadmium, lead, total dissolved solids (TDS), selenium, and zinc. These violations are infrequent and do not follow any recognizable spatial or temporal patterns. Based on knowledge of local geology, soil, and land use/development in the analysis area, water chemistry measured at these eight sites generally reflects natural conditions, is not a danger to animal or human health, and is in support of the assigned beneficial use. A full review of water quality data can be found in Cirrus (2013c) in the project record.

The general pattern for ground water flow within the study area is from the recharge areas at higher topographic elevations to the discharge areas at the lower topographic elevations along the stream valleys. At individual locations the site geology controls patterns, pathways, and rates of ground water flow. Within the North Horn and Price River Formations, ground water recharge and discharge is localized. These geologic units contain the majority of springs found in the study area. The location of springs has no apparent relationship with geologic structure and no preference as to the slope direction. It is apparent that the clays and shales in the North Horn and Price River Formations restrict vertical flow of ground water to deeper units in the study area, causing springs to appear at higher topographic positions. Water level measurements collected from local wells indicate that ground water flow in the Blackhawk formation is likely a combination of downward flow into the Starpoint Sandstone or lateral flow towards outcrop locations to the east and southeast of the Greens Hollow tract (Thiros and Cordy 1991).
Figure 3.4. Greens Hollow water resources and geology.

Legend
- Greens Hollow Coal Lease Tract
- Mining Analysis Area Boundary
- National Forest Boundary
- Stream monitor sites
- Perennial Streams (USGS)
- Intermittent Streams (USGS)
- Perennial Flow 2001
- Cattle Troughs
- Natural Ponds
- Stock Ponds
- High Value
- Moderate Value
- Unknown Value

Geology
- Qi Landslide/mass movement
- Tf Flagstaff Limestone
- Tk North Horn Formation
- Kpr Price River Formation
- Kbg Castlegate Sandstone
- Kbh Blackhawk Formation

Greens Hollow Federal Coal Lease Tract
Draft Supplemental Environmental Impact Statement
<table>
<thead>
<tr>
<th>Formation</th>
<th>Castlegate</th>
<th>Price River</th>
<th>North Horn</th>
<th>Analysis Area</th>
</tr>
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<td>Number of Springs</td>
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<td>5</td>
<td>27</td>
<td>33</td>
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</tbody>
</table>

**Discharge (gpm)**

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<th>Analysis Area</th>
</tr>
</thead>
<tbody>
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<td>13.40</td>
<td>61.40</td>
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<td>1.52</td>
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**pH - Criteria: 6.5 - 9.0**

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<th>Analysis Area</th>
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</thead>
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<td>Number of Measurements</td>
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<td>298</td>
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<tr>
<td>Maximum</td>
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<td>8.49</td>
<td>8.72</td>
<td>8.72</td>
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<tr>
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<td>7.86</td>
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<td>6.96</td>
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<tr>
<td>Median</td>
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<td>7.72</td>
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<tr>
<td>Average</td>
<td>8.17</td>
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<td>7.76</td>
<td>7.65</td>
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</tbody>
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**Dissolved Oxygen (mg/l) - Criteria : >3**

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<th>Price River</th>
<th>North Horn</th>
<th>Analysis Area</th>
</tr>
</thead>
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<td>Maximum</td>
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<tr>
<td>Minimum</td>
<td>6.60</td>
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<td>0.69</td>
<td>0.69</td>
</tr>
<tr>
<td>Median</td>
<td>6.60</td>
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<td>6.03</td>
<td>5.21</td>
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<td>Average</td>
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<td>4.47</td>
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<td>5.02</td>
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</tbody>
</table>

**Water Temperature (Degree C) - Criteria : <27**

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<th>Castlegate</th>
<th>Price River</th>
<th>North Horn</th>
<th>Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Measurements</td>
<td>5</td>
<td>113</td>
<td>180</td>
<td>298</td>
</tr>
<tr>
<td>Maximum</td>
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<tr>
<td>Minimum</td>
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<tr>
<td>Median</td>
<td>5.20</td>
<td>6.30</td>
<td>7.25</td>
<td>6.70</td>
</tr>
<tr>
<td>Average</td>
<td>4.84</td>
<td>7.08</td>
<td>7.75</td>
<td>7.45</td>
</tr>
</tbody>
</table>

**Specific Conductivity (uS/cm)**

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<th>Castlegate</th>
<th>Price River</th>
<th>North Horn</th>
<th>Analysis Area</th>
</tr>
</thead>
<tbody>
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<td>Number of Measurements</td>
<td>5</td>
<td>36</td>
<td>140</td>
<td>181</td>
</tr>
<tr>
<td>Maximum</td>
<td>1,277</td>
<td>1,276</td>
<td>1,013</td>
<td>1,277</td>
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<tr>
<td>Minimum</td>
<td>627</td>
<td>369</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Median</td>
<td>699</td>
<td>588</td>
<td>479</td>
<td>499</td>
</tr>
<tr>
<td>Average</td>
<td>811</td>
<td>680</td>
<td>528</td>
<td>566</td>
</tr>
</tbody>
</table>

Geologic structure appears to influence the location of springs issuing from the Castlegate Sandstone. Spring M.SP87 is the only Castlegate Sandstone spring in the Greens Hollow tract. This spring is located south of Muddy Creek on the north side of the coal tract and exhibits much higher specific conductance than the other Castlegate Sandstone springs located east of the study area in the Box Canyon.
drainage and a somewhat higher pH that is similar to the Price River Formation. These results, together with the consistent flow of the spring, suggest that the recharge for this spring passes through the Price River Formation. Spring M_SP87 is located near the mouth of an unnamed tributary to Muddy Creek and it is likely that much of the recharge for this spring occurs along this stream valley. No springs were identified that discharge from the Blackhawk Formation in the Greens Hollow tract.

All springs in the study area are considered important. However, some springs can be considered to have a higher value as a result of investments in development or due to the support provided by these springs to dependent ecosystems. Systematically identifying the values associated with individual springs can provide guidance for mine plan development and/or mitigation measures. While it is unlikely that mining developments can occur in a way that would avoid all springs, some knowledge of the value of individual springs could be used to design a practical mine plan with a relatively high probability of minimizing impacts to high value springs. Springs located adjacent to wetlands are a significant source of water to vegetation and wildlife that utilize these areas as primary or secondary habitat. Improvements to livestock management can result following spring development as animals are drawn to troughs located away from fragile areas of ground water discharge. Springs located in upgradient source areas for wetlands and riparian corridors can be some distance away, yet still provide seasonal or perennial flows that support these features. The following factors were used to define the value of each spring in the analysis area.

High Value: Springs that are located within 25 feet of wetland areas, provide surface tributary flow to the adjacent wetland, or developed in support of human or livestock use.

Moderate Value: Springs located within 500 feet of wetland areas or riparian corridors.

Unknown Value: Springs not classified as High or Moderate Value.

Table 3.2 and Figure 3.4 indicate the classification of each spring. Note that four springs were classified as Unknown value. The remaining springs are either located in source areas, adjacent to wetlands and riparian corridors, or provide tributary support to these features. A total of 14 springs were classified as High value and 15 springs were classified as Moderate value. A total of eight springs in the analysis area have been developed for human use (Rough Brothers of the Hills cabin) or livestock use. Additional detail on vegetation and wildlife species that depend on springs as a primary source of water are provided in their respective sections of the Greens Hollow EIS.

3.3.2 SURFACE WATER

Surface water resources include streams and associated floodplains, and ponds (Figure 3.4). Springs are considered to be a surface manifestation of ground water flow as discussed above. The divide between the Muddy Creek and North Fork Quitchupah Creek drainages is locally known as Big Ridge and extends across the southern end of the analysis area. This feature separates headwater areas of Cowboy Creek and North Fork Quitchupah Creek.

3.3.2.1 Streams

Surface runoff from the Greens Hollow tract flows into tributaries of Muddy Creek and North Fork Quitchupah Creek. The surface water resources for the study area encompass most of the watersheds of Greens Canyon, Greens Hollow, Cowboy Creek, North Fork Quitchupah Creek, and South Fork Quitchupah Creek. Minor portions of other tributaries are also contained in the analysis area.
Table 3.2. Value of springs in the Greens Hollow tract analysis area.

<table>
<thead>
<tr>
<th>Spring Site ID</th>
<th>&lt; 500 ft to Wetland</th>
<th>&lt; 25 ft to Wetland</th>
<th>&lt; 500 ft to Riparian</th>
<th>Developed</th>
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<tbody>
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<td>M_SP01</td>
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<td>M_SP03</td>
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</tbody>
</table>
Baseline stream monitoring stations were established at several locations along Greens Canyon (M_STR1, M_STR2), Greens Hollow (M_STR6), and Cowboy Creek (M_STR3, M_STR4, M_STR5) as shown in Figure 3.4. Additional monitoring locations were established on the South Fork Muddy Creek just above its confluence with the North Fork Muddy Creek (M_STR8) and on the unnamed tributary that enters Muddy Creek near the north boundary of the analysis area (M_STR7). Other monitoring has been performed by the SUFCO Mine at two locations on North Fork Quitchupah Creek inside the analysis area. These stations are identified in Figure 3.4 as M_STR9 and M_STR10. Each site was visited periodically to obtain measurements of flow and water quality. Stations located on Greens Canyon, Greens Hollow, and Cowboy Creek were also monitored with continuous flow devices during the 2001-2004 survey of the Muddy Creek tract (Cirrus 2004). A summary of field water quality parameters and manual flow measurements at stream monitoring stations is provided below in Table 3.3.

The mainstem of Muddy Creek is perennial as it passes across the northern end of the Greens Hollow tract. During 2001-2004, Greens Canyon contributed seasonal flow into the mainstem of Muddy Creek, while upper portions of Cowboy Creek and Greens Hollow were noted to be perennial. North Fork Quitchupah Creek is the only perennial stream located within the Greens Hollow tract that does not flow into Muddy Creek. The extent of perennial flow was observed during the fall of 2001 through 2003. The most extensive coverage of perennial flow was observed during fall 2001 and will be used to assess impacts to perennial streams (Figure 3.4). Annual streamflow levels recorded from Muddy Creek indicate that water years 2001-2003 were below historic averages. Based on approved data records, the historic (1952-2012) annual average flow for Muddy Creek near Emery is 37.5 cfs (USGS 2013). Annual average streamflow during the 2001 water year was 33.2 cfs or approximately 11 percent lower than the historic average.

Streamflow at several of the monitoring stations located within the mine tract boundary was seasonal in nature. No streamflow was observed at M_STR7, a tributary to Muddy Creek.

A gain/loss study for Greens Canyon and its tributaries, Greens Hollow and Cowboy Creek was conducted in September, 2001. The only Greens Hollow inflow noted was from Springs M_SP04, M_SP05, and M_SP06. The stream was flowing until the Castlegate Sandstone below M_STR6, where it was dry to the confluence with Greens Canyon. There was a loss of approximately 1.7 gpm where the stream flowed primarily over the Price River Formation and another loss of 1.9 gpm in the Castlegate Sandstone downstream of M_STR6.

Flow was noted in Cowboy Canyon until the middle of the Price River Formation. The Canyon was dry again until approximately 300 feet upstream of M_STR5, where water is coming from below a rock outcrop associated with the Blackhawk Formation. The stream loses and then gains water from M_STR5 to M_STR2 all along the Blackhawk Formation with flow disappearing below M_STR2. This study showed losses for both streams in the Blackhawk Formation and the Castlegate Sandstone. Greens Hollow did not flow in the Blackhawk Formation. Cowboy Creek and Greens Canyon had both gains and losses in the Blackhawk Formation. This was not unexpected given the variability in geologic conditions within these formations. Also, given the seasonal and year-to-year fluctuations in spring flows and associated ground water conditions within these formations, the results may not be representative of the gains and losses that may occur during other seasons or other years.
A longitudinal survey was conducted for Greens Canyon and its tributaries, Greens Hollow and Cowboy Creek. The survey indicated that Cowboy Creek was steeper in the headwaters and near the confluence with Greens Canyon, as the creek enters the Castlegate and Blackhawk formations. Greens Hollow has a relatively consistent slope until it enters the Blackhawk formation. Greens Canyon stays in the Blackhawk formation, with a noticeable increase in the channel slope approximately 2,500 feet above the confluence with Muddy Creek.

### 3.3.2.2 Floodplains

As it traverses across the northern edge of the analysis area from the confluence of the North and South Fork, Muddy Creek flows in a narrow, deep canyon with steep cliffs formed by the Castlegate Sandstone and bedrock channel conditions. Below its confluence with lower Box Canyon Creek, the valley bottom becomes somewhat wider (averaging about 300 feet) and the channel’s sinuosity increases. However, the

**Table 3.3. Field monitoring summary for Greens Hollow tract surface water monitoring stations.**

<table>
<thead>
<tr>
<th>Station ID</th>
<th>M_STR</th>
<th>M_STR</th>
<th>M_STR</th>
<th>M_STR</th>
<th>M_STR</th>
<th>M_STR</th>
<th>M_STR</th>
<th>South Fork Muddy Ck.</th>
<th>S. Fork of N. Fork Quitchupah Ck.</th>
<th>Upper N. Fork Quitchupah Ck.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Greens Canyon</td>
<td>Greens Canyon</td>
<td>Lower Cowboy Creek</td>
<td>Upper Cowboy Creek</td>
<td>Cowboy Creek</td>
<td>Greens Hollow</td>
<td>Unnamed Drainage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start</td>
<td>6/6/01</td>
<td>8/7/02</td>
<td>6/6/01</td>
<td>6/7/01</td>
<td>8/8/02</td>
<td>6/7/01</td>
<td>9/25/02</td>
<td>9/26/02</td>
<td>10/5/79</td>
<td>10/5/79</td>
</tr>
<tr>
<td># Visits</td>
<td>16</td>
<td>8</td>
<td>16</td>
<td>8</td>
<td>11</td>
<td>16</td>
<td>6</td>
<td>6</td>
<td>94</td>
<td>98</td>
</tr>
</tbody>
</table>

**Flow (GPM)**

- # NOF: 13, 1, 2, 21, 1, 5, 6, 0, 1, 0
- # Samples: 3, 7, 14, 16, 7, 11, 0, 6, 90, 91
- Maximum: 672, 460, 491, 717, 598, 27, 0, 15,644, 1,116, 6,032
- Minimum: 9.7, 1.2, 0.5, 0.7, 1.4, 1.9, 0.0, 967.7, 0.1, 0.2
- Median: 50.1, 2.9, 2.6, 12.6, 2.0, 5.7, 0.0, 2,767.0, 112.2, 188.5
- Average: 243.9, 78.1, 44.2, 69.2, 95.6, 10.0, 0.0, 5,225.5, 196.5, 715.9

**pH - Criteria: 6.5-9.0**

- # Samples: 3, 7, 13, 15, 7, 10, 0, 6, 90, 91
- Maximum: 8.92, 8.84, 8.73, 8.87, 8.82, 8.77, 0.00, 8.90, 8.89, 9.20
- Minimum: 8.48, 7.97, 7.72, 8.48, 6.50, 7.92, 0.00, 8.69, 7.10, 7.30
- Median: 8.61, 8.25, 8.01, 8.72, 8.47, 8.52, 0.00, 8.73, 8.34, 8.40
- Average: 8.7, 8.3, 8.1, 8.7, 8.3, 8.5, 0.00, 8.8, 8.3, 8.3

**Dissolved Oxygen (mg/l) - Criteria >4 (or >8 when early life stages are present)**

- # Samples: 3, 7, 13, 14, 7, 10, 0, 6, 43, 44
- Maximum: 8.65, 11.19, 9.70, 10.40, 9.04, 8.73, 0.00, 13.66, 10.60, 10.60
- Minimum: 7.53, 5.84, 3.58, 5.23, 7.23, 3.14, 0.00, 7.51, 5.00, 5.65
- Median: 8.6, 8.4, 5.6, 7.9, 8.2, 7.1, 0.00, 9.5, 7.4, 7.7
- Average: 8.3, 8.3, 6.1, 7.8, 8.2, 6.8, 0.00, 9.9, 7.5, 7.8

**Water Temperature (Degree C) - Criteria: <20**

- # Samples: 3, 7, 13, 15, 7, 10, 0, 6, 90, 91
- Maximum: 13.6, 14.9, 13.0, 21.2, 10.3, 23.3, 0.0, 16.2, 22.8, 22.5
- Minimum: 0.7, 0.8, 3.6, 0.3, 6.0, 2.7, 0.0, 1.0, 0.3, 0.0
- Median: 9.9, 9.3, 8.4, 12.1, 9.5, 12.1, 0.0, 4.9, 14.7, 12.5
- Average: 8.1, 8.8, 8.4, 12.6, 8.4, 12.8, 0.0, 6.6, 13.5, 12.5

**Specific Conductivity (us/cm)**

- # Samples: 2, 7, 13, 7, 7, 10, 0, 6, 58, 63
- Maximum: 567, 722, 659, 869, 616, 822, 0, 371, 1,300, 1,384
- Minimum: 448, 416, 202, 386, 346, 439, 0, 65, 398, 294
- Median: 507.7, 509.0, 404.7, 514.0, 445.8, 572.0, 0.0, 240.4, 710.0, 490.0
- Average: 507.7, 554.5, 434.6, 582.1, 475.9, 615.3, 0.0, 250.0, 729.6, 500.8
channel is still entrenched and confined within a narrow valley bottom. A small floodplain occurs within this reach of Muddy Creek immediately below the confluence with Box Canyon and just downstream of Greens Canyon.

### 3.3.2.3 Ponds

A total of 19 ponds were identified in or adjacent to the analysis area including 11 natural ponds and eight stock ponds. Natural ponds are formed in depressions that occur at topographic breaks in slope (e.g. benches, slumps, etc.) or in low lying areas of drainages. Natural ponds are filled through a combination of surface runoff from snowmelt and high intensity precipitation events as well as shallow ground water discharge. The presence of water in natural ponds throughout the summer is more likely influenced by the rate of ground water discharge than the ability to capture surface runoff. Natural ponds are also utilized by livestock as a water source. Although water levels in natural ponds were noted to decrease during the summer, few natural ponds dried up entirely. Stock ponds are designed and constructed by humans. All stock ponds are fed by surface runoff from snowmelt and high intensity precipitation events. A total of nine cattle troughs were also identified in the analysis area. The location of stock ponds, natural ponds, and cattle troughs are shown on Figure 3.4. Quarterly field visits to stock ponds in the Muddy Creek Tract boundary from summer 2002 through fall 2003 (including several in the Greens Hollow tract) indicated that most stock ponds were dry by the early summer season.

### 3.3.2.4 Water Rights

Water on National Forest System lands is used consumptively for livestock and wildlife watering. Some, but not all, springs have been developed. FS claims for water rights were prepared in the 1980’s as part of a general adjudication process. It appears that there was direction at the time of the filings to emphasize point to point claims on streams. Since that time, the FS has continued to work with the Division of Water Rights to develop an efficient and comprehensive method for documenting and claiming water uses on lands administered by the FS. To that end, subbasin claims are being developed that would assert a claim of right for all developed and undeveloped waters on National Forest System lands. Therefore, all developed and undeveloped springs in the permit modification area should be assumed to have a claim of right associated with them, irrespective of whether there is a specific filing in the Division of Water Rights database.

There are no registered water rights for water production wells used for municipal, domestic, or irrigation purposes in the analysis area. A complete listing of all water rights in the study area and their associated water features is provided in the Muddy Creek Tract technical reports (Cirrus 2004-Appendix A). A more recent review of all water rights in the mining analysis area boundary identified additional perfected or approved water rights acquired on springs and streams during the past 10 years. These additional water rights included 28 held by the FS and 1 additional water right held by Canyon Fuel Company (Cirrus 2014). Spring M_SP01 is located adjacent to Rough Brothers of the Hills cabin on the south side of Greens Hollow. The water right number associated with this spring is 94-472, as shown on the Heliotrope Mountain hydrographic survey map. The water use for water right 94-472 described in the Utah DWR database is stockwatering. The owner of this water right is listed as the USFS. As mentioned above in Section 3.3.1, this spring has been developed with a spring box and pipeline system and is currently used for culinary water and irrigation use.

A total of 70 water rights that are approved or perfected were identified in the study area (Cirrus 2014). The majority of these rights, 65, belong to the USFS for stock watering along streams and from springs. Canyon Fuel Company holds 5 water rights that are approved or perfected in the analysis area. Water is used by Canyon Fuel Company for temporary water mitigation and exploratory drilling incident to coal mining.
A search of all water rights associated with Muddy Creek down to the confluence with the Dirty Devil River indicated that water is primarily used for irrigation purposes. The Utah Division of Water Resources (Utah DWR) has identified a total of 17,000 ac-ft/yr that are diverted from Muddy Creek for irrigation purposes (Utah DWR 2000). Use of culinary water is described below in Section 3.3.2.5. Industrial use of water from Muddy Creek is limited to temporary (short-term) use by construction and privately owned mining operations. These water rights are generally limited to less than 2 ac-ft/yr. Applications for large water rights (>1,000 ac-ft/yr) have been submitted in the past by Utah Power and Light and Consolidation Coal Company. These applications were denied.

3.3.2.5 Drinking Water Source Areas

Drinking water source protection zones are designated areas surrounding a well, spring, tunnel or surface water body through which pollution could move and eventually contaminate a water source (Utah DDW 2005, Utah DDW 2012). These areas are typically divided into zones that define the time of travel to the intake structure. Analysis of drinking water source protection zones was restricted to only those zones that intercepted the study area. Three surface water protection zones were identified in the study area for a diversion from Muddy Creek near the town of Emery. Water from Muddy Creek is initially diverted into a canal at a point immediately below a USGS streamgage (Station 09330500) located near the mouth of Muddy Creek Canyon. Water is then diverted from the canal at a site located approximately 2,000 feet north of the town. Information from the Utah DDW indicates this diversion is capable of supplying 250 gpm and serves a population of 293 individuals. All domestic water used from this source is fully treated before entering the culinary water system. Culinary water is supplied to Emery and other nearby towns by the Castle Valley Special Service District. Per capita use of culinary water for the District has been calculated at 191 gallons/day (Utah DWR 2001). Based on the population numbers above, the annual culinary water use for Emery is approximately 63 acre-ft per year.

3.4 AQUATIC AND TERRESTRIAL WILDLIFE RESOURCES

Ten wildlife habitat types are used in this analysis, of which one is aquatic and the rest terrestrial. The digital coverage of vegetation types for the Manti-La Sal National Forest was used as a guide to define these types, and similar vegetation cover types in this coverage were consolidated. A brief description of habitat types used in this analysis follows. Further discussion of vegetation types can be found in the Vegetation Resources Technical Report (Cirrus 2013b) prepared for the Greens Hollow tract.

3.4.1 AQUATIC HABITAT

The primary perennial streams in and around the analysis area include Muddy Creek, North and South Forks of Muddy Creek, and the North Fork of Quitchupah Creek. In addition, perennial flow is present intermittently in portions of Cowboy Creek, Greens Hollow, Greens Canyon, and North Fork of Quitchupah Creek. Of these streams, only portions of Muddy Creek and its north and south forks, Cowboy Creek, Greens Hollow, and the North Fork of Quitchupah Creek occur within the mining analysis area boundary. Most streams in the analysis area are intermittent and do not provide good quality fish habitat. Intermittent streams are unlikely to contain cutthroat trout or other fish species. A complete list of perennial streams in the analysis area is included in the Surface and Ground Water Technical Report (Cirrus 2013c).

The analysis area includes a riparian habitat component which comprises less than one percent of the entire analysis area; however, it is of critical importance to wildlife species. Included in this habitat component are wetlands; dry and wet meadows; willow and tree dominated riparian areas; lakes, ponds, and reservoirs; and springs and seeps. These habitats are important for a variety of wildlife species, as
many wildlife use riparian areas for at least some part of their life cycle. The extent of wetlands in the analysis area is detailed in the Vegetation Resources Technical Report (Cirrus 2013b).

### 3.4.2 Terrestrial Habitat

The analysis area contains a variety of terrestrial habitats, including sagebrush, pinyon-juniper, mahogany and mountain brush, grassland and forbland, aspen and aspen-mixed conifers, mixed conifers, ponderosa pine, limber pine, and rock outcrops and barren areas (Figure 3.5).

Mahogany and mountain brush (9,092.8 acres or 27.4 percent) constitute the most abundant habitat type, occurring throughout the analysis area. Sagebrush (7,740.6 acres or 23.3 percent) is the second most widespread and abundant habitat type in the analysis area. The aspen and aspen-mixed conifer (5,724.4 acres or 17.2 percent) habitat type is common throughout the analysis area as well. Grassland/forbland (3,891.6 acres or 11.7 percent) habitats are relatively common in the analysis area, occurring primarily in patches adjacent to pinyon-juniper and sagebrush habitat types. Mixed conifers (371.3 acres or 1.1 percent, mostly Douglas-fir, subalpine fir, and Englemann spruce) represent a small component of the analysis area and are associated primarily with the perennial drainages. Ponderosa pine represents a minor component (1,754.1 acres or 5.3 percent) in the analysis area, occurring throughout the tract. However, this is one of the only locations where ponderosa pine occurs on the North Zone of the MLNF. The pinyon-juniper (977.6 acres or 2.9 percent) and limber and/or bristlecone pine (344.6 acres or 1.0 percent) habitat types are rare in the analysis area, occurring mostly outside the tract. Rock outcrops and barren areas (706.7 acres or 2.1 percent) are also rare in the analysis area, being limited primarily to the canyon walls of the Muddy drainage.

### 3.4.3 Threatened, Endangered, and Sensitive (TES) Species

The U.S. Fish and Wildlife Service’s (FWS) annual list of federally listed and proposed endangered, threatened, and candidate species and habitat in Utah by County (USFWS 2013) indicates that two terrestrial threatened or endangered species (endangered: California condor, and threatened: Utah prairie dog), and two candidate species for listing (yellow-billed cuckoo and greater sage-grouse) could potentially occur in Sanpete and/or Sevier counties. Four aquatic Colorado River endangered fishes (bonytail, Colorado pikeminnow, humpback chub, and razorback sucker), have recently been listed for Sanpete and Sevier Counties since water from drainages in these counties ultimately reaches the Colorado River (USFWS 2009a). The FS document titled Intermountain Region Threatened, Endangered, Proposed, and Sensitive Species: Known/Suspected Distribution by Forest (Forest Service 2013a) indicates FS Sensitive species that could occur on the MLNF and FLNF. The species that could occur on one or both forests and their status are listed in Table 3.4.
Figure 3.5. Wildlife habitat types.

Legend

- **National Forest System Roads**
- **Sage Grouse Lek 2008**
- **Substation Locations**
- **Greens Hollow Coal Lease Tract**
- **Mining Analysis Area Boundary**
- **Manti-La Sal/Fishlake Forest Boundary**

**Habitat Types**

- **WildHabs**
  - Aspen and Aspen/Mixed Conifer
  - Barren Rock Outcrop or Ledge
  - Cottonwood/Brush
  - Douglas Fir Forest
  - Grasslands
  - Intermittent Wet/Dry Meadow
  - Limber and/or Bristlecone Pine Forest
  - Mahogany and Mountain Brush
  - Rocky Mountain Juniper Woodland
  - Sagebrush
  - Spruce/Fir Forest
  - White Fir Forest
  - Willow Dominated Riparian Area

- **Manzanita**
- **Mixed Conifer**
- **Perennial Wetland or Meadow**
- **Pinon Juniper Woodland**
- **Ponderosa Pine Forest**
- **Rocky Mountain Juniper Woodland**

**1:54,500**

Greens Hollow Federal Coal Lease Tract

Draft Supplemental Environmental Impact Statement
Table 3.4. Federally listed threatened and endangered and candidate species and Forest Service sensitive species potentially occurring on the MLNF and FLNF in Sanpete and/or Sevier counties.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fishes</strong></td>
<td></td>
</tr>
<tr>
<td>Bonytail (<em>Gila elegans</em></td>
<td>Endangered</td>
</tr>
<tr>
<td>Colorado pikeminnow (<em>Ptychocheilus lucius</em>)</td>
<td>Endangered</td>
</tr>
<tr>
<td>Humpback chub (<em>Gila cypha</em>)</td>
<td>Endangered</td>
</tr>
<tr>
<td>Razorback sucker (<em>Xyrauchen texanus</em>)</td>
<td>Endangered</td>
</tr>
<tr>
<td>Colorado River cutthroat trout (<em>Oncorhynchus clarki pleuriticus</em>)</td>
<td>Sensitive (FLNF and MLNF)</td>
</tr>
<tr>
<td>Bonneville cutthroat trout (<em>Oncorhynchus clarki utah</em>)</td>
<td>Sensitive (FLNF and MLNF)</td>
</tr>
<tr>
<td>Southern leatherside chub (<em>Leidomeda aliciae</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
</tr>
<tr>
<td>California condor (<em>Gymnogyps californianus</em>)</td>
<td>Endangered</td>
</tr>
<tr>
<td>Bald eagle (<em>Haliaeetus leucocephalus</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo (<em>Coccyzus americanus occidentalis</em>)</td>
<td>Candidate (Sanpete and Sevier counties)</td>
</tr>
<tr>
<td>Northern goshawk (<em>Accipiter gentilis</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Flammulated owl (<em>Otus flammeolus</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Peregrine falcon (<em>Falco peregrinus</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Three-toed woodpecker (<em>Picoides ridactytus</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Greater sage-grouse (<em>Centrocercus urophasianus</em>)</td>
<td>Candidate (Sanpete and Sevier counties) and Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
</tr>
<tr>
<td>Utah prairie dog (<em>Cynomys parvidens</em>)</td>
<td>Threatened</td>
</tr>
<tr>
<td>Bighorn sheep (<em>Ovis canadensis</em>)</td>
<td>Sensitive (FLNF and MLNF)</td>
</tr>
<tr>
<td>Pygmy rabbit (<em>Brachylagus idahoensis</em>)</td>
<td>Sensitive (FLNF)</td>
</tr>
<tr>
<td>Spotted bat (<em>Euderma maculatum</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td>Townsend’s big-eared bat (<em>Corynorhinus townsendi pallescens</em>)</td>
<td>Sensitive (MLNF and FLNF)</td>
</tr>
<tr>
<td><strong>Amphibians</strong></td>
<td></td>
</tr>
<tr>
<td>Columbia spotted frog (<em>Rana luteiventris</em>)</td>
<td>Sensitive (MLNF)</td>
</tr>
<tr>
<td>Western boreal toad (<em>Bufo boreas boreas</em>)</td>
<td>Sensitive (FLNF and MLNF)</td>
</tr>
</tbody>
</table>

3.4.3.1 TES Amphibians

Columbia spotted frogs are most commonly found in cold, still, permanent water in such habitats as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, and near flat-water springs with emergent vegetation. The spotted frog may move considerable distances from water after breeding, often frequenting mixed conifer and sub alpine forests, grasslands, and brush lands of sage and rabbit brush. (Crockett et al. 2006). The Columbia spotted frog is not addressed in detail in Chapter 4 because the analysis area is outside of the habitat range for this species. No spotted frogs have been found on the MLNF, and they are not known or thought to occur on the MLNF. Although this species does occur in Sanpete County, it has only been found in the Sanpete Valley along the San Pitch River. This population is geographically isolated from all other populations and is known only from 11 spring complexes on private agricultural land (USFWS 2002a).

The western boreal toad inhabits western Canada and much of the western (especially northwestern) United States. It occurs throughout most of Utah, and can be found in a variety of habitats, including slow moving streams, wetlands, desert springs, ponds, lakes, meadows, and woodlands. The western toad, which is inactive during cold winter months, may either dig its own burrow in loose soil or use the burrows of other small animals (Utah Gap Analysis 1997). Surveys of potentially suitable amphibian habitat completed as part of the inventory work for the Muddy Tract analysis observed boreal toad larvae
in July of 2001, approximately 150 yards SSW of the White Mountain Cabin (Cirrus 2004). This pond site is located within the old 2004 Muddy Creek analysis area, but is 1.3 miles west of the current Greens Hollow tract boundary. This is the only site where boreal toads were observed.

3.4.3.2 TES Fishes
Habitat requirements and life history characteristics of the fish species present within the analysis area or in the vicinity of it are described below. Special emphasis is given to Threatened, Endangered, and Sensitive species. However, although the bonytail, Colorado pikeminnow, humpback chub, and razorback sucker do not occur within the analysis area, it is reasonably foreseeable that water from the Colorado River drainage could be used for conceptual implementation of surface resources. Within the analysis area, Colorado River and Bonneville cutthroat trout are the only fish species listed as sensitive by R4 of the FS. No other TES fish are present within the analysis area.

The results of fish surveys conducted in 2001 and 2002 on perennial streams by the Utah Division of Wildlife Resources (UDWR) indicated that native cutthroat trout are present in Muddy Creek and the South Fork of Muddy Creek (Berg 2002a, Berg 2002b, Berg 2002c, and Hart and Berg 2003). Surveys in 2010 confirmed the persistence of cutthroat trout in tributaries of the South Fork of Muddy Creek although surveys downstream, near the MLNF border detected no fish in Muddy Creek (Jewkes 2013b). Cutthroat trout were also observed incidentally on the North Fork of Muddy Creek, but formal surveys have not yet occurred there. This cutthroat trout is thought to be of the Colorado River subspecies based on their known distribution in Utah. No cutthroat trout were observed at the North Fork of Quitchupah Creek (Berg 2002a, Berg 2002b, Berg 2002c, and Hart and Berg 2003).

3.4.3.2.1 Bonytail
The bony tail evolved 3 to 5 million years ago and is a member of the minnow family (USFWS undated). Historically, they were probably the most abundant fish species in the main river channels of the Colorado and Green rivers. They thrived in open areas of large river channels of uniform depth and current velocity. This species is considered to be adapted to pools and eddies of mainstream rivers that have moderately swift currents and shifting sand bottoms. They were once common in portions of the upper and lower Colorado River basins. It has been extirpated from most of its historic range, and nearly extinct upstream of Lake Powell. Currently, a small number of adults exist in Lake Mohave and Lake Havasu in the Lower Colorado River Basin, and there are small numbers of individuals in the Green and Yampa Rivers and in sub-basins of the Upper Colorado River Basin (USFWS 2002b). This species was given full protection under the Endangered Species Act (ESA) when it was listed as endangered by the U.S. Fish and Wildlife Service (FWS) in 1980, and it was given protection under Utah law in 1974. There are no known reproducing populations in the wild; however bonytail are being hatchery raised, and reintroduced into the wild through stocking in the Colorado, Green, and Yampa rivers (USFWS undated). They have been known to live nearly 50 years, are capable of spawning at 5 to 7 years of age, and are thought to spawn during late June and early July in warm water reaches.

3.4.3.2.2 Colorado Pikeminnow
The Colorado pikeminnow is the largest minnow in North America, and is endemic to the Colorado River Basin. It historically extended from the Green River in Wyoming, to the Gulf of California; it was widespread and abundant in warm-water rivers and tributaries. Currently in Utah, they exist in the Green River from Lodore Canyon to the confluence of the Colorado River, and in the lower Duchesne River. It is a long-distance migrator (hundreds of miles to and from spawning areas). Adults require deep pool and eddie habitats in streams that have high spring flows (USFWS 2002c). This species was listed as endangered by the Service in 1967 and given full protection under ESA in 1973, and it was given protection under Utah law in 1973. They live 50 or more years, begin spawning by 6 years of age, and spawn between Late July and early September.
3.4.3.2.3 **Humpback Chub**

The humpback chub is thought to have evolved 3 to 5 million years ago. It is restricted to deep, swift mainstems and large tributaries in relatively inaccessible canyons of the Colorado River Basin. Adults require eddies and sheltered shorelines in streams that maintain high spring flows that flush sediments from spawning areas and form clean gravel deposits. Young require low-velocity shoreline habitats (USFWS 2002d). Historically, this species inhabited white water canyons of the Colorado River and four of its tributaries: the Green, Yampa, White and Little Colorado rivers. Currently there are two stable populations in canyons in the upper Colorado River and one in the Grand Canyon. There are smaller populations in the Yampa and Green rivers (USFWS undated). This species was listed as endangered by the Service in 1964 and given full protection under the ESA in 1973, and given protection under Utah law in 1973. They may live more than 30 years in the wild, can reproduce by 2 to 3 years of age, and spawn between March and July.

3.4.3.2.4 **Razorback Sucker**

Historically the razorback sucker was widely distributed in warm-water reaches of the Colorado River and its tributaries from Wyoming to Mexico. Adults require deep pools, eddies and backwaters in the spring; shallow water associated with sandbars in summer; and low velocity pools and eddies in winter. Young require quiet, warm, shallow water found at tributary mouths and in coves or shorelines in reservoirs. Currently, within the Upper Colorado River Basin this species is only found in small numbers in the middle Green River between the confluence of the Duchesne and Yampa rivers, and in the lower reaches of those two tributaries (USFWS 2002e). This species was listed as endangered by the Service in 1991, and it was given protection under Utah law in 1973. They have been known to live 40 years or more. They can begin reproducing as early as age 3 or 4, and typically spawn between mid-April and Mid June, but have known to spawn as early as November.

3.4.3.2.5 **Colorado River Cutthroat Trout**

The distribution and abundance of Colorado River Cutthroat Trout (CRCT) have declined and it is now believed that this species occupies less than 14 percent of its historical range. CRCT historically occupied about 21,386 miles of habitat in the western U.S. CRCT currently occupy about 3,022 miles of habitat, of which 1,111 miles are within the state of Utah. Of the 3,022 miles of habitat currently occupied by CRCT, 2,248 miles are administered by Federal agencies. Two-thirds of all occupied habitats occur on National Forests (Hirsch et al. 2005). Within the Lower Colorado Geographic Unit, there are 14 CRCT conservation populations in 50 miles of stream and 5 conservation populations in 21 acres of lakes throughout the state (CRCT Coordination Team 2006). As noted previously, CRCT are thought to occur in the analysis area in the South Fork of Muddy Creek.

3.4.3.2.6 **Bonneville Cutthroat Trout**

A total of 153 separate Bonneville Cutthroat Trout (BVCT) populations occupy 2,061 miles of habitat which were designated as “conservation populations” (87 percent of currently occupied habitat). These conservation populations were spread throughout the historical range, occurring in 19 of the 23 hydrologic units historically occupied by BVCT (May and Albeke 2005). Currently, there are only four streams on the MLNF with populations of BVCT. There are no BVCT populations within the analysis area (Jewkes 2008a).

3.4.3.2.7 **Southern Leatherside Chub**

Southern leatherside chub inhabit desert streams of the Bonneville Basin. Southern leatherside require flowing water and do not persist in lakes or reservoirs. Stream systems occupied by this species have a broad range of widely varying physical conditions including high variability of stream flow, annual precipitation, gradient, elevation, conductivity, and pH. The elevational range of observations for southern leatherside is from 3,700 to 8,600 feet (UDWR 2010). Southern leatherside chub have been documented in three 4th level HUCs (Hydrologic Unit Code) in the Utah Lake drainage and six 4th level...
HUCs in the Sevier River Drainage (UDWR 2010). There are no populations of southern leatherside chub present within the analysis area. The southern leatherside chub is not addressed in detail in Chapter 4 because the analysis area is outside of the range for this species.

3.4.3.3 TES Birds

3.4.3.3.1 California Condor

California condors were recently added to the Sanpete and Sevier County lists (USFWS 2013) of federally endangered species in Utah. Not a habitat specialist, the species demonstrates very broad habitat and climatic tolerances. Historically, condors covered a large portion of western North America from British Columbia to Baja Mexico and as far east as western Colorado and Wyoming. Currently, the species inhabits a much smaller range, but still, diverse habitats within that range are occupied (Snyder and Schmitt 2002).

Nesting habitats have ranged from scrubby chaparral to forested montane regions subject to winter snowfalls. Most foraging activity has been documented in relatively open grassland regions. In recent times, primary foraging regions have been separate from the primary nesting regions, necessitating substantial commutes between nests and food supplies. The most critical habitat requirements may be adequate food supplies, open-enough habitat that food can be readily found and accessed, and reliable air movements allowing extended soaring flight (Snyder and Schmitt 2002).

3.4.3.3.2 Bald Eagle

In Utah, the bald eagle is primarily a winter resident, with only eleven known pairs of nesting eagles in the state, none of which occur on the MLNF or FLNF (UDWR 2009). An eagle nest does occur on private land about 18 miles east of the northeastern boundary of the analysis area, near the town of Castledale. It is unlikely that individuals from this eagle pair would utilize portions of the analysis area for foraging, since suitable habitat is available closer to the nest site.

Only one observation of bald eagles was recorded in the analysis area during the 2001 to 2003 analysis period (Cirrus 2004). Five bald eagle individuals (3 adults and 2 juveniles) were sighted in November 2003 along Cowboy Creek, presumably during fall migration (Cirrus 2004). Winter roosting habitat is limited in the analysis area due to the high elevation and lack of roost trees. In general, use of the permit area would be incidental and likely in connection with fall or spring migration.

3.4.3.3.3 Northern Goshawk

Suitable habitat is present in the analysis area, but is limited primarily to the aspen and aspen-mixed conifer cover types on the western portion of the tract buffer. Two years of surveys were conducted for goshawks in suitable habitat in the analysis area from 2001 to 2003 (see Section 2.4.1.4 in Cirrus 2013d). During the survey period for the Muddy Creek analysis, goshawks were heard and/or seen at three calling stations within the analysis area (Cirrus 2004).

The FS has been monitoring two goshawk nests near the analysis area. One occurs north of Julius Flat Reservoir. This territory was unoccupied during the 2000, 2004, 2005, 2007, and 2010 breeding seasons, but found to be occupied in 2006 and 2008 (Forest Service 2010c). The other nest occurs near Meadow Gulch, about four miles northeast of the Greens Hollow tract. This territory has been unoccupied since 1996 (Forest Service 2010d). In 2009, a goshawk was observed on two different occasions during breeding bird surveys (Forest Service 2009e). In spite of these observations, in 2009, occupancy of total nests checked was approximately 19.5 percent on the Sanpete and Price-Ferron Ranger Districts (Forest Service 2009a), but rebounded dramatically in 2010 to 37 percent. In 2011 occupancy fell again to 34.7 percent only to rise to 42.4 percent in 2012. The occupancy rate in 2012 is the highest since the rate of
45.5 percent in 2000 (Forest Service 2013b). The fluctuations in occupancy are believed to be related to inclement spring weather and drought and weather conditions during the nesting season.

3.4.3.3.4 Flammulated Owl
Preferred habitat is present in and around the southeastern portion of the analysis area. In addition, aspen stands to the west provide suitable habitat for this species. Two years of surveys were conducted for flammulated owls in suitable habitat in the Muddy Creek analysis area between 2001 and 2003 as well as surveys in 2008 in suitable habitat that crossed the conceptual power line alignment (see section 2.4.1.2 in Cirrus 2013d). Flammulated owls were heard and/or seen at 26 calling stations (section 2.4.1.2 in Cirrus 2013d). Surveys were also conducted in 2008 in suitable habitat crossed by the conceptual power line alignment; no responses were obtained (Cirrus 2008). Surveys were also conducted on the Pines Tract in 2008, 2009, and 2010 by MLNF personnel (Forest Service 2010a). This area is directly north and east of the Wildcat Knolls sage-grouse leks. Surveys were conducted in the Wildcat Knolls area in 2009, 2010, and 2011 (Forest Service 2013c). Detections were recorded during these survey efforts at the Pines Tract but not at Wildcat Knolls (Jewkes 2008b, Forest Service 2010b, Forest Service 2013c).

3.4.3.3.5 Peregrine Falcon
Suitable nesting habitat is present in the analysis area on the rock escarpments bordering parts of Muddy Creek and its tributaries. A pair of peregrine falcons was observed in 2002 near the rim of Muddy Creek Canyon outside of the expected subsidence zone to the east of the analysis area. The pair was exhibiting territorial behavior and it was presumed that a nest was nearby within the cliff faces. A peregrine falcon was observed circling above an inactive golden eagle nest during UDWR aerial surveys in 2003, less than one-half mile from the 2002 observation. No falcons were observed in 2001 (Cirrus 2004). Additional peregrine falcon surveys have not been completed in the project vicinity since 2003.

3.4.3.3.6 Three-Toed Woodpecker
Surveys for this woodpecker in the analysis area from June 21 to July 19 in 2001 and May 24 to June 23 in 2002 resulted in 16 individual responses at 13 separate locations (see section 2.4.1.7 in Cirrus 2013d). Additionally, a female was observed incidentally in the area during a goshawk survey in 2002. All woodpecker observations were in or within two miles of the western portion of the analysis area boundary and associated with the aspen and aspen mixed conifer habitat type (Cirrus 2004). During 2010 surveys, no three-toed woodpeckers were observed in the Wildcat Knolls area (Forest Service 2010e); however two were observed in The Pines area (Forest Service 2013c).

3.4.3.3.7 Greater Sage-Grouse
Sage-grouse were recently listed by the FWS as a candidate species throughout their range (USFWS 2010). Sage-grouse will continue to be analyzed throughout this document as R4 sensitive which will provide enough detail and analysis to satisfy that required for candidate species as well as satisfying BLM requirements under WO IM 2012-043.

Sage-grouse were historically abundant in the analysis area, and one known lek complex adjacent to the analysis area (the Wildcat Knolls strutting ground) is currently used by the species (Forest Service 2013d). While no formal surveys of this population were conducted prior to 1991, biologists in the area observed a decline in the sage-grouse population to the point where it was suspected that there were only a few remaining individuals in the area. In order to reverse this decline, 48 sage-grouse were transplanted to the southern portion of the analysis area by UDWR between 1987 and 1990 (Cirrus 2004). UDWR and the FS have been annually monitoring the Wildcat Knolls lek complex since 1991. The site has received use by 3 to 36 cocks on a given year, with the lowest numbers observed in 2003. In recent years (2011 to 2013), higher grouse numbers have been observed (Forest Service 2013d). Sage-grouse counts in 2013 show numbers at 24 birds (Forest Service 2013d).
Winter surveys for strutting greater sage-grouse on the Wildcat Knolls lek have been ongoing since 1991 (Forest Service 2013d). Section 2.4.1.3 of the Wildlife Technical Report discusses the results of these surveys and includes the numbers of sage-grouse observed each year (Cirrus 2013d).

Sage-grouse habitat is fairly limited on the Greens Hollow tract (Figure 3.6). According to the UDWR “sage-grouse habitat” map there are 3,840 acres of sage-grouse habitat on the Greens Hollow tract. However, the UDWR layer was created with a very coarse resolution and includes many areas that are not sage-grouse habitat (e.g., ponderosa pine stands, cliff areas, aspen stands); therefore, another layer was created for use on this project that more accurately reflects sage-grouse habitat in the area (see Cirrus 2013d for details of revised sage-grouse habitat layer creation). The revised sage grouse habitat map shows a total of 1,617 acres of sage-grouse habitat on the Greens Hollow tract (Figure 3.6).

Research on the Wildcat Knolls sage-grouse population has been recently concluded by Utah State University graduate students. This research not only supports lek counts collected by FS personnel, but has mapped nesting and brood-rearing locations in the area as well. Their findings indicate that the Wildcat Knolls area not only serves as good lekking habitat but sage-grouse use the area year round and are nonmigratory (Perkins 2010). The USU research suggests that given the nonmigratory, isolated nature of this population, great care should be taken to protect this habitat (Perkins 2010).

### 3.4.3.4 TES Mammals

#### 3.4.3.4.1 Spotted Bat

Suitable roosting habitat for spotted bats is abundant in vertical cracks of the sandstone cliff faces of steep canyons in the analysis area. Riparian habitat and forest edges in this area also provide potential foraging opportunities. Several spotted bats were identified in the analysis area in 2001 and 2002 by audible vocalizations (Cirrus 2004).

#### 3.4.3.4.2 Townsend’s Big-eared Bat

Townsend’s big-eared bats prefer roosting habitat that is open with more room than many bat species that tuck into small cracks and crevices. No substantial caves have been observed in the analysis area and no other structures are considered potentially suitable for Townsend’s big-eared bat hibernacula (Cirrus 2004). However, there are some rock alcoves in or near the area that may serve as suitable habitat. The diet of this species specializes in moths, beetles, wasps, and other insects along the edges of vegetation. The analysis area could provide suitable foraging habitat for the species.

### 3.4.4 MANAGEMENT INDICATOR SPECIES

Rocky Mountain elk, mule deer, golden eagles, aquatic macroinvertebrates, sage nesters, cavity nesters, and riparian nesters are Manti-La Sal and/or Fishlake National Forest MIS discussed in the following sections and summarized in Table 3.5. The MIS are specific to the individual Forests and their Forest Plans, i.e., Fishlake MIS are applicable only to that portion of the analysis area that is in the FLNF. The northern goshawk is also a MIS; however, it is addressed above as a FS sensitive species in Section 3.4.3.3.3.
Figure 3.6  Sage-grouse habitat.

Legend
- Greens Hollow Coal Lease Tract
- Revised Sage-Grouse Habitat
- UDWR Sage-Grouse Habitat
- Mining Analysis Area Boundary
- Manti-La Sal/Fishlake Forest Boundary
- Sage-Grouse Lek

1:74,500
### Table 3.5. Suitability of habitat for Manti-La Sal (MLNF)\(^1\) and Fishlake (FLNF)\(^2\) National Forest Management Indicator Species.

<table>
<thead>
<tr>
<th>Species</th>
<th>National Forest</th>
<th>Suitability of Habitat for Management Indicator Species</th>
<th>Habitat Unsuitable Based on the Following</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk</td>
<td>MLNF &amp; FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Mule deer</td>
<td>MLNF &amp; FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>MLNF &amp; FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>MLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Macroinvertebrates</td>
<td>MLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Cavity nesters(^3)</td>
<td>FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Sage nesters(^4)</td>
<td>FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Riparian nesters(^5)</td>
<td>FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Fish(^6)</td>
<td>FLNF</td>
<td>X</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

\(^1\)UDWR 2007a, 2007b.
\(^2\)Habitat characteristics for each of the following species was reviewed and based on information found within Rodriguez et al. (2006), and UDWR (2007b).
\(^3\)Hairy woodpecker, western bluebird, and mountain bluebird.
\(^4\)Brewer’s sparrow, vesper sparrow, and sage thrasher.
\(^5\)Lincoln’s sparrow, yellow warbler, song sparrow, and MacGillivray’s warbler.
\(^6\)Bonneville cutthroat, Colorado River cutthroat, rainbow, brown, brook, cutthroat, and lake trout.

### 3.4.4.1 Rocky Mountain Elk (Manti-La Sal and Fishlake National Forest MIS)

The analysis area contains substantial winter and crucial summer range for elk (UDWR 2013) as well as General and Key Winter Range as designated by the Forest Plan. The winter aerial census for elk conducted in 2004 showed that the elk populations in the South Manti Sub-Unit of the Manti Management Unit were below UDWR objectives and lower than they were when analyzed for the 2001 to 2003 Muddy Creek study (Cirrus 2004). However, elk numbers were purposely decreased, through increasing the number of cow tags issued, to compensate for the effects of the drought from 2000 to 2003 (UDWR 2007a). The MLNF Forest Plan sets a minimum viable population for elk at 2,125 (Forest Service 1986a). The current population estimate of elk on the Manti Division is 12,500 (Bernales et al. 2012).

### 3.4.4.2 Mule Deer (Manti-La Sal and Fishlake National Forest MIS)

The analysis area contains crucial winter and crucial summer range for mule deer (UDWR 2013) as well as General and Key Winter Range as designated by the Manti-La Sal Forest Plan. Annual winter counts of deer are not conducted by the UDWR. However, population data is modeled using harvest data for the entire Manti Deer Management Unit, which contains the analysis area. The mule deer population counts in 2011 for the state of Utah estimated population levels at 286,100 animals which were below the objective of 411,900 (Bernales et al 2012). The mule deer population on the Manti Division is estimated at 20,900 animals, which is below the objective of 38,000 (UDWR 2007a, 2007b, Bernales et al. 2012). The deer population is far below the UDWR objectives for this unit and has been so for several years. The decline in deer populations is attributed to the drought and other natural environmental factors (UDWR 2007a, 2007b, 2008, Bernales et al. 2009).

### 3.4.4.3 Golden Eagle (Manti-La Sal National Forest MIS)

Suitable nesting habitat is present in the northern and northeastern portions of the analysis area on rock escarpments along Muddy Creek Canyon and some of its tributaries. Aerial surveys for eagles have been conducted by UDWR since 1998 (Cirrus 2004). Surveys from 1998 to 2007 show approximately 10.7
percent of golden eagle nests on the MLNF have been active. In 2002 to 2004, nesting activity was extremely low, but appeared to rebound beginning in 2004 and was above the ten-year (1998-2007) average in 2005 and 2006 (UDWR 2007a). In 2007 and 2008, however, the population trend again declined. In 2012 (the next year surveys were conducted on the MLNF), activity rates for nests were up to 11.7 percent (Forest Service 2013b). Annual nesting variation is likely a result of precipitation rates (drought) and declines in prey availability (rabbits, prairie dogs, etc.).

3.4.4.4 Aquatic Macroinvertebrates (Manti-La Sal National Forest MIS)

Macroinvertebrates are benthic organisms including aquatic insects (mayflies, caddis flies, daphnia, cyclops, stoneflies and others), mollusks, and worms. The 1986 Forest Plan’s monitoring and evaluation program includes aquatic macroinvertebrates as a management indicator species and calls for monitoring at baseline stations or as needed for select project activities (page IV-6). Aquatic habitat is to be monitored and evaluated under the Forest Plan. Macroinvertebrates serve as natural indicators of management activities undertaken within each watershed. The Forest Plan (page E-9), in defining macroinvertebrates states, “the composition of the [macroinvertebrate] community is an indication of the quality of the aquatic habitat and reflects the condition of the entire drainage”. Representative baseline locations were selected for sampling.

Most monitoring locations are near the Forest boundary and are designed to reflect the overall water quality and aquatic habitat quality of the stream system and watershed above the monitoring point. The sampling locations are not designed to monitor the effects of a single land use or activity. These locations are not suitable for project-level monitoring or evaluation.

Freshwater macroinvertebrate communities are highly variable. In a stream system, many physical, chemical, and biotic factors interact to affect macroinvertebrate communities in ways that are not fully understood. The effects of landslides, wildfires, floods and droughts may take several years to affect these communities. The effects may persist for several years and may outweigh the effects of human activities in the watershed. “Cause and effect are often separated in time and space, concealing linkages in a complex series of physical and biological interactions. Consequently, it is often difficult to: 1) clearly link land use or management effects to environmental impacts and 2) separate man caused impacts from those that result from natural phenomena” (Larsen and Herlihy 1998).

The monitoring techniques of the 1986 Forest Plan were the Biotic Condition Index (BCI), a macroinvertebrate community index, and the Habitat Condition Index (HCI); the measurement frequency was 5 years. The BCI data indicated highly variable communities across the Forest; probably in response to droughts, floods, and landslides in addition to land management activities. There were no statistically significant trends in the data. There revealed no apparent upward trend in the number of streams that did not meet the Forest Plan standard, nor was there an apparent downward trend in the number of streams that surpassed the standard. Over the entire period of record, only 5% of the samples have not met the Forest Plan BCI standard (Forest Service 2006).

The Forest Plan was amended in 2006 to update the protocols used to collect macroinvertebrate data and to change the method used to analyze the data. The 2006 amendment did not alter the language regarding macroinvertebrate monitoring as an optional technique for selected projects. The Manti-La Sal National Forest will continue monitoring aquatic habitat using macroinvertebrate sampling, but change the type of appraisal method used. The methodology is similar to that being used by the Utah Division of Water Quality for macroinvertebrate monitoring. The State program has selected relatively unimpaired representative streams as reference sites for different stream types. Monitoring will continue at baseline stations to characterize Forest-wide conditions; data analysis will be in cooperation with the Utah Division of Water Quality.
The closest Forest-wide monitoring site is located at the Forest Boundary where Muddy Creek leaves the National Forest. In 2009, samples were collected and the results were analyzed by the UDWQ and the O/E percentages determined. O is the number of species predicted and E is number of taxa present. Those results were compared to the 2004 results. Currently, Muddy Creek is meeting Forest Plan standards (Jewkes 2013a).

No site-specific surveys of aquatic macroinvertebrates have been conducted and no site-specific monitoring is proposed for this project.

### 3.4.4.5 Sage Nesters (Fishlake National Forest MIS)

Sage nesting species are species that require sagebrush during at least part of the year for survival. Sage nesters are represented by Brewer’s sparrow (*Spizella breweri*), vesper sparrow (*Pooecetes gramineus*), and sage thrasher (*Oreoscoptes montanus*). The analysis area as a whole (including both FLNF and MLNF lands), contains approximately 7,741 acres (or 23.3 percent) sagebrush habitat potentially suitable for the various sage nesting MIS. Each of these species has been detected recently on the MLNF in close proximity to the analysis area (Forest Service 2009b, 2010f, 2010g, 2013c).

### 3.4.4.6 Cavity Nesters (Fishlake National Forest MIS)

Cavity nesting species are represented by hairy woodpeckers (*Picoides villosus*), western bluebirds (*Sialia mexicana*), and mountain bluebirds (*Sialia currucoides*). Generally speaking, cavity nesting species favor open woodlands with a well-developed understory of shrubs and/or herbaceous vegetation. The analysis area includes approximately 8,193 acres (or 24.7 percent), of potential cavity-nesting habitat, and there are many more square miles of similar habitat outside the analysis area boundaries. Migratory bird surveys were conducted in proximity to the analysis area in 2009. Western and mountain bluebirds were observed nearby in the adjacent Pines Tract, but not inside the analysis area during these survey efforts (Forest Service 2009e, 2013c). The close proximity of this tract suggests that the species may use nearby habitat in the analysis area as well.

### 3.4.4.7 Riparian Nesters (Fishlake National Forest MIS)

Riparian nesting species are represented by Lincoln’s sparrow (*Melospiza lincolnii*), song sparrows (*Melospiza melodia*), yellow warblers (*Dendroica petechia*), and MacGillivray’s warblers (*Oporornis townei*). The analysis area as a whole (including both FLNF and MLNF lands) contains approximately 48 acres (or 0.1 percent) of willow-dominated riparian habitat potentially suitable for the various avian, riparian MIS as listed by the FLNF Forest Plan. Migratory bird surveys were conducted in proximity to the analysis area in 2009. Song sparrows were observed near (on the adjacent Pines Tract), but not inside the analysis area during these survey efforts (Forest Service 2009e, 2013c). The close proximity of this tract suggests that the species may use nearby habitat in the analysis area as well.

### 3.4.4.8 Fish (Fishlake National Forest MIS)

Fish are represented by Bonneville cutthroat trout, Colorado River cutthroat trout, rainbow trout, brook trout, brown trout, cutthroat trout, and lake trout. Colorado River cutthroat trout and Bonneville cutthroat trout are discussed as sensitive species in section 3.4.3.2. Populations of the remaining trout species on the Fishlake National Forest are stable and viable, although a reduced number of lake trout become larger (greater than 22 to 26 inches) trophy size (Rodriguez et al 2006). Lake trout are restricted to Fish Lake and no project activity would occur in this area.
3.4.5 SPECIES OF HIGH FEDERAL INTEREST

Species of high federal interest, as defined by the FWS, include several migratory birds. No other categories of wildlife were identified by the FWS.

3.4.5.1 Migratory Birds

Thirty high priority migratory bird species and bird species of concern that could occur on the Manti Division of the Manti-La Sal National Forest were reviewed for this analysis. The list of species was gathered from the Avian Conservation Strategy (PIF, Parrish et al. 2002), Birds of Conservation Concern (BOCC, USFWS 2008), and the Utah Comprehensive Wildlife Conservation Strategy (CWCS, UDWR 2005). Of the thirty possible species on the Manti Division, ten were determined not to have suitable habitat that could be impacted by the Proposed Action. These ten species were removed from further analysis: bald eagle (also listed as sensitive in Section 3.4.3.3.2), black rosy finch, black swift, juniper titmouse, long-billed curlew, osprey, short-eared owl, southwestern willow flycatcher, veery, and yellow-billed cuckoo (also discussed as a candidate species in Section 3.4.3 with a determination made for impact on the species in Section 4.4.4.2.2.1). The remaining species that could potentially be impacted by the Proposed Action are listed in Table 3.6.

Many other species of non-game migratory birds use the analysis area and surrounding habitat. In addition to the species listed in Table 3.6, surveys in the Wildcat Knolls areas have recorded the following species: vesper sparrow, lark sparrow, chipping sparrow, American robin, northern flicker, western meadowlark, mountain bluebird, yellow-rumped warbler, violet-green swallow, tree swallow, horned lark, unknown hummingbird, hermit thrush, Clark’s nutcracker, and green-tailed towhee (Forest Service 2008e, 2009d, 2010f, 2013c). Additionally, migratory bird surveys in The Pines area (Forest Service 2009e, 2010g, 2013c), have recorded American robin, chipping sparrow, song sparrow, mountain chickadee, unidentified woodpecker, northern flicker, red-naped sapsucker, vesper sparrow, lark sparrow, Clark’s nutcracker, dark-eyed junco, unknown hummingbird, mourning dove, warbling vireo, Townsend’s solitaire, Wilson’s warbler, red-breasted nuthatch, dusky flycatcher, red-tailed hawk, olive-sided flycatcher, house wren, western bluebird, plumbeous warbler, black-capped chickadee, mountain bluebird, ruby-crowned kinglet, green-tailed towhee, white-breasted nuthatch, western tanager, yellow warbler, yellow-rumped warbler, violet-green swallow, northern mockingbird, pine grosbeak, pine siskin, unknown jay, hermit thrush, western meadowlark, and western wood-pewee.

3.4.6 OTHER SPECIES

Other species of wildlife that are not classified as TES, MIS, or species of high federal interest are discussed below.

3.4.6.1 Fishes

Rainbow and brook trout were also observed during fish surveys conducted by UDWR on perennial streams in the analysis area (Berg 2002a, 2002b, and 2002c, Hart and Berg 2003). Rainbow trout were observed in Muddy Creek and South Fork of Muddy Creek, while Brook trout were only observed in Muddy Creek. The streams where cutthroat trout were observed (i.e., Muddy Creek and its South and North forks) represent moderate- to high-quality trout habitat. Erosion, siltation, and low water flows have led to the poor trout habitat in Muddy Creek. Speckled dace (Rhinichthys osculus) have been observed on mainstem sections of Quitchupah Creek outside of the analysis area (Cirrus 2004).
<table>
<thead>
<tr>
<th>Species</th>
<th>Lists</th>
<th>Primary and Secondary Habitat Types</th>
<th>Observations Near/In the Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-throated gray warbler <em>Dendroica nigrescens</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Pinyon-juniper, Mountain Shrub</td>
<td>E</td>
</tr>
<tr>
<td>Brewer’s Sparrow <em>Spizella breweri</em></td>
<td>PIF, CWCS</td>
<td>Shrub steppe, High-desert scrub</td>
<td>A, B, C, E, I, M, N, O</td>
</tr>
<tr>
<td>Broad-tailed hummingbird <em>Selasphorus platycercus</em></td>
<td>PIF, CWCS</td>
<td>Lowland riparian, Mountain riparian</td>
<td>B, C, E, O</td>
</tr>
<tr>
<td>Cassin’s finch <em>Carpodacus cassinii</em></td>
<td>BOCC</td>
<td>Aspen, Sub-alpine conifer</td>
<td>B, C, I, N, O</td>
</tr>
<tr>
<td>Ferruginous hawk <em>Buteo regalis</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Pinyon-juniper, Shrub-steppe</td>
<td>K</td>
</tr>
<tr>
<td>Flammulated owl <em>Otus flammeolus</em></td>
<td>BOCC</td>
<td>Ponderosa pine, Sub-alpine conifer</td>
<td>E, G, H, I, J, N</td>
</tr>
<tr>
<td>Golden eagle <em>Aquila chrysaetos</em></td>
<td>BOCC</td>
<td>Cliff, High desert scrub</td>
<td>E</td>
</tr>
<tr>
<td>Grace’s warbler <em>Dendroica gracieae</em></td>
<td>CWCS</td>
<td>Ponderosa pine, Mixed conifer</td>
<td>C, I, N, O</td>
</tr>
<tr>
<td>Gray vireo <em>Vireo vicinior</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Pinyon-juniper, Oak</td>
<td>B, C, E, I, N, O</td>
</tr>
<tr>
<td>Greater sage-grouse <em>Centrocercus urophasianus</em></td>
<td>CWCS</td>
<td>Sagebrush, Shrub-steppe</td>
<td>A, B, E, F, O</td>
</tr>
<tr>
<td>Lewis’s woodpecker <em>Melanerpes lewis</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Ponderosa pine, Lowland riparian</td>
<td>L</td>
</tr>
<tr>
<td>Northern goshawk <em>Accipiter gentilis</em></td>
<td>CWCS</td>
<td>Mixed conifer, Aspen</td>
<td>C, D, E, O</td>
</tr>
<tr>
<td>Peregrine falcon <em>Falco peregrinus</em></td>
<td>CWCS</td>
<td>Cliff, Lowland riparian</td>
<td>E</td>
</tr>
<tr>
<td>Pinyon jay <em>Gymnorhina cyanoccephalus</em></td>
<td>CWCS</td>
<td>Pinyon-juniper, Ponderosa pine</td>
<td>B, E, I, M, N</td>
</tr>
<tr>
<td>Sage sparrow <em>Amphispiza belli</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Shrub-steppe, High desert scrub</td>
<td>B, C, E, I, M, N, O</td>
</tr>
<tr>
<td>Sage thrasher <em>Oreoscoptes montanus</em></td>
<td>CWCS</td>
<td>Shrub-steppe, High desert scrub</td>
<td>A, B, C, E, I, M, N</td>
</tr>
<tr>
<td>Three-toed woodpecker <em>Picoides tridactylus</em></td>
<td>CWCS</td>
<td>Sub-alpine conifer</td>
<td>E, I</td>
</tr>
<tr>
<td>Virginia’s warbler <em>Vermivora virginiae</em></td>
<td>PIF, BOCC, CWCS</td>
<td>Oak, Pinyon-juniper</td>
<td>C, E, O</td>
</tr>
<tr>
<td>Williamson’s sapsucker <em>Sphyrapicus thyroideus</em></td>
<td>BOCC, CWCS</td>
<td>Sub-alpine conifer, Aspen</td>
<td>E</td>
</tr>
<tr>
<td>Willow flycatcher <em>Empidonax traillii</em></td>
<td>BOCC</td>
<td>Lowland riparian, Mountain riparian</td>
<td>K</td>
</tr>
</tbody>
</table>

2Where both primary and secondary habitat types are applicable.
3A = Ferron/Price Ranger District Migratory Bird Survey Summary 2008-Wildcat Knolls (Forest Service 2008e), B = Ferron/Price/Sanpete Ranger Districts Migratory Bird Survey Summary 2009-Wildcat Knolls (Forest Service 2009d), C = Ferron/Price/Sanpete Ranger Districts Migratory Bird Survey Summary 2009-The Pines (Forest Service 2009e), D = Greens Hollow Goshawk Trend Data (Forest Service 2009a), E = Muddy Creek Technical Report-Wildlife (Cirrus 2004), F = Sage-Grouse Strutting Ground Counts (Forest Service 2009b), G = Flammulated Owl Survey Data Form-The Pines 2008 (Forest Service 2008a, Forest Service 2008d), H = Flammulated Owl Survey Data Form-The Pines 2009 (Forest Service 2009c), I = 2010 Breeding Bird Survey (Forest Service 2010e, 2010g), J = 2010 Flammulated Owl Survey (Forest Service 2010a, 2010b), K = Not observed, but presence is suspected (Cirrus 2004), L = Not observed, and presence is not suspected (Cirrus 2004).
### Table 3.6 (cont’d) Migratory bird species that could occur on the Manti Division of the MLNF.

<table>
<thead>
<tr>
<th>Species</th>
<th>Lists&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Primary and Secondary Habitat Types&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Observations Near/In the Analysis Area&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferron/Price Ranger District Migratory Bird Survey Summary 2010-Wildcat Knolls (Forest Service 2013c), N = Ferron/Price Ranger District Migratory Bird Survey Summary 2010-The Pines (Forest Service 2013c), O = 2008 and 2009 Breeding Bird Survey (Forest Service 2013c).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Also discussed as a sage nesting MIS for the FLNF in Section 3.4.4.5.</td>
<td>Also discussed as a TES avian species for the project in Section 3.4.3.3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3.4.6.2 Amphibians

Amphibian habitat is limited in the analysis area, consisting of wetlands, ponds (natural and stock), edges of lakes and reservoirs, springs and seeps, and pooled habitat adjacent to streams. Potentially suitable amphibian habitat surveyed during the analysis period resulted in observations of boreal toads, chorus frogs, tiger salamanders, and possibly Great Basin spadefoot toads. Chorus frogs were the most abundant species observed (see section 2.4.4.1 in Cirrus 2013d). All life stages of chorus frogs and tiger salamanders (eggs, tadpoles, and adults) were observed in ponds. Great Basin spadefoot toads were potentially heard at a pond and at the bottom of a canyon (Cirrus 2004).

Other amphibian species that could potentially occur in the analysis area include the Great Plains toad, Woodhouse's toad, and northern leopard frog. The R4 sensitive species Columbian spotted frog is not expected to occur as far south as the analysis area (USFWS 2002a, Crockett et al. 2006).

### 3.4.6.3 Reptiles

Suitable habitat for several reptile species is present in the analysis area. Lizard, whiptail, and skink species primarily occur in desert and semi-desert areas with sandy or rocky soil and sparse vegetation, such as pinyon-juniper and sagebrush, but also occur in grasslands and the lower edge of the spruce-fir zone. Habitat for snake species is also variable, ranging from lowlands to high mountains, with some species having an affinity for riparian habitats, and others for more arid environments. (Dalton et al. 1990).

Five reptile species were incidentally observed in the analysis area during the 2001 to 2004 field surveys: the eastern fence lizard, tree lizard, sagebrush lizard, short-horned lizard, and western terrestrial garter snake (Cirrus 2004). Reptile species not observed but likely present include the common side-blotched lizard, gopher snake, night snake, striped whipsnake, and western rattlesnake. Other species possibly present include the Great Basin collared lizard, long-nosed leopard lizard, desert spiny lizard, western whiptail, western skink, eastern racer, milk snake, southwestern blackheaded snake, and ground snake.

### 3.4.6.4 Small Mammals

Seventy species of small mammals could potentially occur in the study area, including 5 shrews, 15 bats, 8 small carnivores, 36 rodents, and 6 lagomorphs (see section 2.4.4.3 in Cirrus 2013d). Of these, 16 were observed during the 2001 to 2003 surveys for the Muddy Creek inventory (1 bat, 1 carnivore, 10 rodents, and 4 lagomorphs; Cirrus 2004). All habitats in the analysis area are potentially used by at least some small mammals, with riparian habitats being used by the largest number of species. (Cirrus 2004).

### 3.4.6.5 Non-Game Birds

A total of 203 species of non-game birds could potentially occur in the study area (see section 2.4.4.4 in Cirrus 2013d). Of these, 84 were observed during the 2001 to 2003 surveys for the Muddy Creek inventory (Cirrus 2004). All habitats in the analysis area are potentially used by at least some non-game species.
birds, with riparian habitats being used by the largest number of species. Non-game species that potentially use cliffs in the analysis area for nesting include, but are not limited to, the golden eagle, prairie falcon, peregrine falcon, red-tailed hawk, raven, white-throated swifts, cliff swallows, and canyon wren.

Surveys in the area are ongoing. The 2008 Wildcat Knolls survey near the analysis area recorded vesper, lark, and chipping sparrows; American robins; and Northern flickers. Also, three bird species of interest were observed: Brewer’s sparrow, greater sage-grouse, and sage thrasher (Forest Service 2013c).

The survey efforts in 2009 and 2010 recorded a greater variety of migratory bird species including: Vesper sparrow, western meadowlark, mountain bluebird, an unknown species of hummingbird, hermit thrush, Clark’s nutcracker, chipping sparrow, and green-tailed towhee. A larger variety of species of interest were also observed in 2009 and 2010. These species included: greater sage-grouse, broad-tailed hummingbird, gray vireo, pinyon jay, sage thrasher, sage sparrow, Brewer’s sparrow, and Cassin’s finch (Forest Service 2009b, 2010f, 2010g, 2013c).

3.5 VEGETATION RESOURCES
3.5.1 GENERAL VEGETATION

Based on the FS vegetation cover type mapping of the project as described in the Vegetation Technical Report (Section 2.2, Cirrus 2013b), 30 vegetation cover types occur within the general Greens Hollow area (Table 3.7). Note that the general Greens Hollow area is larger than the Greens Hollow tract to provide a landscape-scale setting to provide a larger context for describing the analysis area. The cover types occurring in this area represent a range of plant communities, including forested, woodland, shrubland, grassland, and forbland, and occur in response to changes in elevation, aspect, moisture, soils, disturbance, and past management practices. Table 3.7 also lists the acreage and percentage of each vegetation cover type in the general Greens Hollow area. Big mountain sagebrush is the dominant cover type in the area at 16 percent, followed by mountain brush at 14 percent. Aspen mixed conifer is the dominant forested cover type within the general Greens Hollow area at 10 percent and perennial grassland (low elevation) is the dominant grassland type at 9 percent.

3.5.2 SPECIAL STATUS PLANT SPECIES

Table 3.8 presents the list of Threatened, Endangered, Proposed, Candidate, and FS Sensitive (TEPCS) species identified by the FS to be addressed in the Greens Hollow analysis. This list includes the federally-listed endangered and threatened species as well as the FS sensitive species for both the Manti-La Sal and Fishlake National Forests. Table 3.8 also identifies the Forest where each species is listed, summarizes habitat requirements and known distribution, and analyzes potential occurrence in the analysis area. Only those species known to occur in the analysis area or that have potential habitat in the analysis area are considered in subsequent analysis. Habitat and distribution information is taken from the literature, including Rodriguez et al. (2006), Welsh et al. (2003), Utah Native Plant Society (2003-2010), and Arizona Willow Interagency Technical Team (1995).

No federally-listed threatened, endangered, proposed, or candidate species are known to occur in the analysis area. The analysis area is outside of the geographical range and habitat type for Winkler cactus, San Rafael cactus, Wright’s fishhook cactus, and Last Chance townsendia. Habitat for Heliotrope milkvetch is restricted to Flagstaff limestone in high-elevation openings in spruce-fir forests and alpine areas. While this habitat occurs in the Muddy Creek area on the higher ridges, it does not occur within the Greens Hollow analysis area, which is well below the elevation range for this species.
One FS sensitive species for the Manti-La Sal National Forest, Link Trail columbine, occurs near the analysis area in Link Canyon, Box Canyon, and Greens Canyon, growing in seepy areas or along fractures where moisture seeps through the Castlegate Sandstone formation near the rim of these canyons. Additional potential habitat extends along the rim of Muddy Creek and its tributaries where the Castlegate formation outcrops, but has not been surveyed to determine if it is occupied. A segment of Muddy Creek occurs in the analysis area.

<table>
<thead>
<tr>
<th>Vegetation Cover Type</th>
<th>Acres</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>2,319.00</td>
<td>6.98</td>
</tr>
<tr>
<td>Aspen mixed Conifer</td>
<td>3,405.41</td>
<td>10.25</td>
</tr>
<tr>
<td>Barren Rock Outcrop or Ledge</td>
<td>706.67</td>
<td>2.13</td>
</tr>
<tr>
<td>Basin Big Sagebrush</td>
<td>145.07</td>
<td>0.44</td>
</tr>
<tr>
<td>Big Mountain Sagebrush</td>
<td>5,355.08</td>
<td>16.11</td>
</tr>
<tr>
<td>Black Sagebrush</td>
<td>2,225.20</td>
<td>6.69</td>
</tr>
<tr>
<td>Cottonwood/Brush</td>
<td>28.18</td>
<td>0.08</td>
</tr>
<tr>
<td>Curl-leaf Mountain Mahogany</td>
<td>2,357.86</td>
<td>7.09</td>
</tr>
<tr>
<td>Douglas Fir Forest</td>
<td>2,253.69</td>
<td>6.78</td>
</tr>
<tr>
<td>High Mountain Brush</td>
<td>378.77</td>
<td>1.14</td>
</tr>
<tr>
<td>Intermittent Wet/Dry Meadow</td>
<td>5.38</td>
<td>0.02</td>
</tr>
<tr>
<td>Juniper/Curl-leaf Mohogany</td>
<td>37.49</td>
<td>0.11</td>
</tr>
<tr>
<td>Limber and/or Bristlecone Pine Forest</td>
<td>344.64</td>
<td>1.04</td>
</tr>
<tr>
<td>Manzanita</td>
<td>12.39</td>
<td>0.04</td>
</tr>
<tr>
<td>Mixed Conifer</td>
<td>371.33</td>
<td>1.12</td>
</tr>
<tr>
<td>Mountain Brush</td>
<td>4,485.31</td>
<td>13.49</td>
</tr>
<tr>
<td>Oakbrush</td>
<td>1,476.58</td>
<td>4.44</td>
</tr>
<tr>
<td>Perennial Forb Land (high &amp; mid elevation)</td>
<td>18.49</td>
<td>0.06</td>
</tr>
<tr>
<td>Perennial Forb Land (mid to low elevation)</td>
<td>906.22</td>
<td>2.73</td>
</tr>
<tr>
<td>Perennial Grassland (low elevation)</td>
<td>2,889.77</td>
<td>8.69</td>
</tr>
<tr>
<td>Perennial Grassland (mid elevation)</td>
<td>77.08</td>
<td>0.23</td>
</tr>
<tr>
<td>Perennial Wetland or Meadow</td>
<td>125.58</td>
<td>0.38</td>
</tr>
<tr>
<td>Pinyon Juniper Woodland</td>
<td>977.55</td>
<td>2.94</td>
</tr>
<tr>
<td>Ponderosa Pine Forest</td>
<td>1,754.12</td>
<td>5.28</td>
</tr>
<tr>
<td>Rocky Mountain Juniper Woodland</td>
<td>126.00</td>
<td>0.38</td>
</tr>
<tr>
<td>Silver Sagebrush</td>
<td>15.20</td>
<td>0.05</td>
</tr>
<tr>
<td>Spruce/Fir Forest</td>
<td>39.50</td>
<td>0.12</td>
</tr>
<tr>
<td>True Mountain Mahogany</td>
<td>328.61</td>
<td>0.99</td>
</tr>
<tr>
<td>White Fir Forest</td>
<td>24.62</td>
<td>0.07</td>
</tr>
<tr>
<td>Willow Dominated Riparian Area</td>
<td>47.63</td>
<td>0.14</td>
</tr>
<tr>
<td>Grand Total</td>
<td>33,238.41</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Table 3.8. Threatened, Endangered, Proposed, Candidate, and Forest Service Sensitive Species, habitat requirements, and presence in the analysis area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Forest</th>
<th>Habitat Requirements/ Distribution</th>
<th>Presence in the Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Federally Listed- Endangered</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pediocactus despainii</em></td>
<td>Fishlake</td>
<td>Open pinyon-juniper and salt desert shrub communities on limestone gravels between 6,000 and 6,700 feet on tops and sides of hills and benches and on the flats, typically in full or partial sunlight. Endemic to the Capitol Reef area in Emery County.</td>
<td>Analysis area is outside of the geographical range and habitat constraints of this species.</td>
</tr>
<tr>
<td>San Rafael cactus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sclerocactus wrightiae</em></td>
<td>Manti-La Sal</td>
<td>Exposed, highly alkaline, often bare clay hills, desert grasslands or saltbush flats between 4,250 and 6,000 feet near the Fremont River and San Rafael Swell.</td>
<td>Analysis area is outside of the elevational range and habitat constraints of this species.</td>
</tr>
<tr>
<td>Wright fishhook cactus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Federally Listed- Threatened</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Astragalus montii</em></td>
<td>Manti-La Sal</td>
<td>Sanpete and Sevier counties. Flagstaff limestone in openings in spruce-fir forests and in mixed grass-forb communities on wind-blown ridges and snow drift sites at 10,988 to 11,316 feet.</td>
<td>Analysis area is outside of the elevational range and habitat constraints of this species.</td>
</tr>
<tr>
<td>Heliotrope milkvetch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pediocactus winkleri</em></td>
<td>Manti-La Sal</td>
<td>Wayne County. Salt desert shrub communities at 4,800 to 5,215 feet.</td>
<td>Analysis area is outside of the geographical range and habitat constraints of this species.</td>
</tr>
<tr>
<td>Winkler cactus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Townsendia aprica</em></td>
<td>Fishlake</td>
<td>Salt desert shrub and pinyon-juniper communities on clay or clay-silt soils of the Mancos Shale formations between 6,100 and 8,000 feet. Endemic to central Utah in Emery, Wayne, and Sevier counties.</td>
<td>Species is restricted to Castle Valley and adjacent environs in western Emery County and closely adjacent eastern Sevier County; does not occur in the geographic area of the proposed project.</td>
</tr>
<tr>
<td>Last Chance townsendia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Forest Service Sensitive</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Alicellia caespitosa</em></td>
<td>Fishlake</td>
<td>Cliffs, ledges, and exposed outcrops on Navajo and Wingate Sandstone in Wayne County.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Wonderland Alice-flower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chatterley onion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Androsace chamaejasme ssp. carinata</em></td>
<td>Manti-La Sal</td>
<td>Grand and San Juan counties. Alpine tundra at 10,000 - 12,680 feet in the La Sal mountains.</td>
<td>Outside of known range and above elevation of analysis area.</td>
</tr>
<tr>
<td>Sweet-flowered rock jasmine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Aquilegia flavescens var. rubincunda</em></td>
<td>Manti-La Sal</td>
<td>Emery and Sevier counties. East margins of the Wasatch Plateau in ponderosa pine, aspen, and spruce-fir communities, generally associated with seeps at the base of Mesa Verde group sandstones adjacent to coal measures, 6,900 to 8,500 feet.</td>
<td>Species is present in Box Canyon and Greens Canyon outside of the analysis area. It is also present in nearby Link Canyon as well.</td>
</tr>
<tr>
<td>Species</td>
<td>Forest</td>
<td>Habitat Requirements/Distribution</td>
<td>Presence in the Analysis Area</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><em>Aster kingii var. barnebyana</em></td>
<td>Fishlake</td>
<td>Mountain mahogany and oak communities on rock outcrops.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Barneby woody aster</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Astragalus consobrinus</em></td>
<td>Fishlake</td>
<td>Sagebrush-grassland and pinyon-juniper communities on the Mancos Shale Formation; Volcanic gravel to barren stony hillsides on the upper forks of the Sevier River and the east slope of the Utah Plateaus from southeast Emery and Sevier to southwest Garfield counties between 6,000 to 8,500 feet.</td>
<td>Sagebrush and pinyon-juniper habitat is present in analysis area. However, there are no records of this species in the analysis area.</td>
</tr>
<tr>
<td>Bicknell milkvetch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Castilleja parvula var. parvula</em></td>
<td>Fishlake</td>
<td>Endemic to the Tushar Mountain, Beaver and Piute counties, Utah.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Tushar Mountain paintbrush</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cryptantha creutzfeldtii</em></td>
<td>Manti-La Sal Fishlake</td>
<td>Western Carbon and Emery counties. Shadescale and mat atriplex communities on shadescale formations between 5,200 and 6,500 feet.</td>
<td>Analysis area is outside of the habitat constraints for this species.</td>
</tr>
<tr>
<td>Creutzfeldtii flower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cymopterus beckii</em></td>
<td>Fishlake</td>
<td>Cliff faces in sandstone canyon bottoms of Navajo Sandstone. Endemic to San Juan and Wayne counties.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Pinnate spring parsley</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Draba sobolifera</em></td>
<td>Fishlake</td>
<td>Endemic to the Tushar Mountains, Beaver, and Piute counties, Utah.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Creeping draba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Epilobium nevadense</em></td>
<td>Fishlake</td>
<td>Pinyon-juniper and mountain brush communities on limestone outcrops in Millard and Washington counties.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Nevada willowherb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abajo daisy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Erigeron carringtonae</em></td>
<td>Manti-La Sal Fishlake</td>
<td>Emery and Sanpete counties. Meadow and escarpment margins on Flagstaff limestone between 10,000 and 11,000 feet.</td>
<td>Analysis area is outside the habitat constraints for this species. Flagstaff limestone outcrops at the appropriate elevation are not present.</td>
</tr>
<tr>
<td>Carrington daisy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Erigeron kachinensis</em></td>
<td>Manti-La Sal</td>
<td>San Juan County. Montane sites with mountain brush, pinyon-juniper, and ponderosa pine, Douglas fir, and Manzanita communities at 5,250 - 8,000 feet.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Kachina daisy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Forest</td>
<td>Habitat Requirements/Distribution</td>
<td>Presence in the Analysis Area</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><em>Erigeron maguirei</em> Maguire’s daisy</td>
<td>Fishlake</td>
<td>Cliff faces or sandy canyon bottoms on Navajo and Wingate sandstone at 5,300 to 7,100 feet elevation. Endemic species to Wayne and Emery counties.</td>
<td>Endemic to the San Rafael Swell in Emery County and Capital Reef National Park in Wayne County; does not occur in the geographic area of the proposed project.</td>
</tr>
<tr>
<td><em>Erigeron mancus</em> LaSal daisy</td>
<td>Manti-La Sal</td>
<td>Grand and San Juan counties. Subalpine fir, and alpine forb and grass-sedge communities, frequently in rockstripes at 10,000 – 12,240 feet.</td>
<td>Outside of known range and above elevation of analysis area.</td>
</tr>
<tr>
<td><em>Eriogonum batemanii var. ostlundii</em> Elsinore buckwheat</td>
<td>Fishlake</td>
<td>Igneous outcrops and gravels in shadscale, sagebrush, ponderosa pine, mixed desert shrub, and pinyon-juniper communities at 5,500 to 6,500 feet elevation. Endemic to Piute and Sevier Counties in central Utah.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td><em>Hedysarum occidentale var. canone</em> Canyon sweetvetch</td>
<td>Manti-La Sal</td>
<td>Carbon, Duchesne, and Emery counties. Pinyon-juniper, sagebrush, serviceberry, maple, mountain mahogany, and wash communities between 6,400 and 8,315 feet.</td>
<td>Potential habitat is present in the analysis area.</td>
</tr>
<tr>
<td><em>Najas caespitosa</em> Fish Lake naiad</td>
<td>Fishlake</td>
<td>Riparian corridors above 8,000 feet in unshaded or partially shaded wet meadows, streamsides, and cienegas, typically in or adjacent to perennial water.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td><em>Penstemon wardii</em> Ward’s penstemon</td>
<td>Fishlake</td>
<td>Desert shrub, pinyon-juniper, sagebrush, shadscale, and greasewood communities on the Bald Knoll and Arapien Shale formations at the 5,200 to 6,810 feet elevations.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td><em>Salix arizonica</em> Arizona willow</td>
<td>Manti-La Sal Fishlake</td>
<td>Riparian corridors above 8,000 feet in unshaded or partially shaded wet meadows, streamsides, and cienegas, typically in or adjacent to perennial water.</td>
<td>Potential habitat is present in the analysis area.</td>
</tr>
<tr>
<td><em>Senecio castoreus</em> Beaver Mountain groundsel</td>
<td>Fishlake</td>
<td>Endemic to the Tushar Mountains on windswept ridges downward to spruce-fir communities in Piute County.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td><em>Senecio musiniensis</em> Musinea groundsel</td>
<td>Manti-La Sal</td>
<td>Sanpete County. Ridge tops on Flagstaff limestone barrens and talus slopes at Musinea Peak and on margins of the Wasatch Plateau between 9,700 and 10,900 feet.</td>
<td>Analysis area is outside the habitat constraints for this species. Flagstaff limestone outcrops at the appropriate elevation are not present.</td>
</tr>
</tbody>
</table>
Table 3.8. (cont’d) Threatened, Endangered, Proposed, Candidate, and Forest Service Sensitive Species, habitat requirements, and presence in the analysis area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Forest</th>
<th>Habitat Requirements/Distribution</th>
<th>Presence in the Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silene petersonii</td>
<td>Manti-La Sal Fishlake</td>
<td>Ponderosa pine, aspen, and spruce-fir communities between 7,000 and 11,300 feet on Flagstaff limestone and Claron Formation, mainly at plateau margins. Known from the Manti-La Sal National Forest.</td>
<td>Potential habitat does not occur in the analysis area.</td>
</tr>
<tr>
<td>Maguire campion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thelesperma subnudum var. alpinum</td>
<td>Fishlake</td>
<td>Navajo Sandstone and Carmel Limestone between 6,888 and 9,000 feet. Endemic to Wayne County.</td>
<td>Outside of range.</td>
</tr>
<tr>
<td>Bicknell thelesperma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Townsendia jonesii var. lutea</td>
<td>Fishlake</td>
<td>Salt desert shrub and juniper communities 5,500 to 6,400 feet in the Arapien shale and Arapien clays in volcanic rubble.</td>
<td>Outside of known range.</td>
</tr>
<tr>
<td>Sevier townsendia</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No other sensitive species are known to occur in the analysis area, although potential habitat for Bicknell milkvetch, canyon sweetvetch, and Arizona willow does exist within the analysis area, as noted in Table 3.8. The analysis area was not surveyed for these species because the Forest botanist determined that the low likelihood of the habitat actually being occupied did not warrant surveys. Further, the level of impact to the potential habitat of these species that would be caused by subsidence would not affect the suitability of this habitat to support these species. Additional information on sensitive species for the Fishlake National Forest can be found in the *Life Histories and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest* (Rodriquez et al. 2006).

### 3.5.3 WETLANDS AND RIPARIAN AREAS

The analysis area is generally upland with small, discrete wetlands. The term “wetland” is used to describe communities across the analysis area that have been influenced by the presence of water long enough to develop hydric soil conditions and support wetland vegetation. Based on the wetland mapping, there are 136 wetlands, totaling approximately 23 acres, in the analysis area (locations are shown in Figure 4.7). The majority of these wetlands occur in the upper North Fork of Quitchupah Creek watershed. Additional wetlands occur in the Cowboy Creek and Greens Hollow drainages.

Wetlands tend to occur along the streams, in concave settings in the landscape, and at the toe of slopes, or where confining geologic layers force ground water to the surface. The range of hydrologic regimes in these wetlands varies from being permanently saturated or inundated to seasonally wet and drying as the season progresses. Hydrology that maintains the wetland characteristics primarily comes from seeps and springs (ground water) or streams (surface water). Specific inventory work of springs and seeps completed in the analysis area (Cirrus 2013c) documented 33 springs in the analysis area. Twenty-seven of these springs originate in the North Horn Formation, five originate in the Price River Formation, and one originates in the Castlegate Sandstone Formation. Additional ground water discharge areas or areas with seasonally high water tables are associated with many of the 106 other wetlands that also occur in the analysis area. Ground water in many instances may be augmented by surface runoff.

The plant community in many wetlands is dominated by herbaceous wetland species. Wetlands with a more perennial water regime may be dominated by plants such as water sedge (*Carex aquatilis*) and
beaked sedge (*C. rostrata*), while wetlands with a more seasonally wet hydrologic regime may be dominated by species such as Baltic rush (*Juncus articus*) and small-winged sedge (*C. microptera*). Willows (*Salix* spp.) occur as scattered clumps and patches and are common along streams.

Riparian areas occur along the streams, including Muddy Creek, Cowboy Creek, Greens Hollow, and the North Fork Quitchupah Creek and their perennial and seasonal tributaries. Typically, the streams have a defined channel and the riparian vegetation occurs along the margin of the channel. Herbaceous wetland plants grow along the wet fringe. Willows also occur along some stretches of the stream channels and may extend further away from the channel. The width of the riparian area varies, based on the hydrology and topography and may be confined to a relatively narrow margin along the edge of the channel that may not be continuous along some reaches. Stream reaches that have a low bench or where a spring or seep area is located adjacent to the stream have extended riparian zones.

Wetlands in the analysis area have been classified according to the Cowardin System (Cowardin et al. 1979) used by the US Fish and Wildlife Service for the National Wetland Inventory. Based on this classification, wetlands in the analysis area fall into the palustrine system, emergent class, and persistent subclass. Water regimes are saturated and seasonally flooded, water chemistry is fresh, and soils are typically dark due to high organic matter content. Riparian areas adjacent to the streams include both the emergent and shrub-scrub classes depending on the dominance of willows.

### 3.5.4 Weeds

The Manti-La Sal National Forest 2006 noxious weed inventory shows three noxious weed occurrences within the Greens Hollow analysis area. These include two locations of white top (*Cardaria draba*), one in the Cowboy Creek drainage and the other in Greens Hollow, and one location of musk thistle (*Cardus nutans*) in Greens Hollow.

Other information of noxious weeds comes from the 2004 Muddy Creek Vegetation Technical report (Cirrus 2004). It notes that Cananda thistle (*Circium arvens*) was established in many of the drainages and around wetlands in the area north of Julius Flat Reservoir, but Canada thistle was not noted in the Greens Hollow analysis area.

### 3.6 Heritage Resources

#### 3.6.1 Background

##### 3.6.1.1 Regional Culture History

Studying the known culture history of an analysis area assists in predicting the type of cultural resources that may be encountered in the region and provides a context within which to assess the relative importance of encountered resources. The prehistory (or ancient American Indian era) of the Colorado Plateau area is usually divided into four main periods: Paleoindian, Archaic, Formative, and Late Prehistoric. The following is a brief summary of the region’s culture history.

The Paleoindian period coincided with the end of the Pleistocene epoch. Thus, many of the cultural adaptations and technological advances were developed in response to a changing environment. The climate of the Pleistocene was cooler and drier than that of modern day. This was due to the influence of the large, polar glacial ice sheets present at the time. Throughout this period, there was a series of prehistoric cultural traditions that concentrated on and exploited available resources (Tankersley 2002). These traditions were largely identified by associated projectile points (Fagan 2000).
The end of the Pleistocene was the hallmark for the beginning of the Holocene, which was characterized by the recession of glaciers and development of the modern-day climate (Grayson 1993). Throughout this time, human adaptations increasingly diversified into generalized hunting and gathering strategies (Bishop 1997). Stemmed and notched projectile points began to replace the Paleoindian points, which possibly reflect the introduction and eventual widespread use of the atlatl to propel spears (Grayson 1993).

Approximately 2,000 years ago, people within the region experimented with early forms of horticulture (Bishop 1997). Eventually, this trend developed and people became increasingly dependent upon crops such as corn, beans, and squash (Antrei and Roberts 1999; Grayson 1993). The Sevier variant of the Fremont Culture is the region’s first recognized agriculturally-based sedentary society (Bishop 1997). Some of the characterizing traits of the Sevier variant of the Fremont are construction of small permanent buildings, adoption of the bow and arrow, production of a variety of grayware and black on gray ceramic vessels, manufacture of rod and bundle basketry, creation of jewelry, ceramic figurines, and rock art (Antrei and Roberts 1999; Bishop 1997; Cordell 1997; Grayson 1993).

The Fremont peoples appear to have occupied the region until about A.D. 1300, when evidence of the agriculturally based societies essentially disappears from the archaeological record (Antrei and Roberts 1999). The people occupying the area once again turned to hunting and gathering as their primary means of subsistence, which may have been associated with new culture groups migrating into the southern Colorado Plateau and southeastern Great Basin. One of these new groups was affiliated with the Numic language family and was the ancestor of the modern Southern Paiute, Shoshone, Goshute, and Ute tribes (Antrei and Roberts 1999; Grayson 1993). Associated cultural material includes the remains of wickiups, small-side notched projectile points, basketry, and conical brownware ceramic jars. This Late Prehistoric period lasted until contact with Euroamerican explorers and trappers in the late 18th Century, at which point the historical record for the region begins (Bishop 1997; Grayson 1993).

The earliest documented incursion of Europeans into the region was the Dominguez-Escalante expedition, seeking an overland route from Santa Fe, New Mexico, to Monterey, California (Bishop 1997; Grayson 1993). Their path took them near the Sevier River which is west of the current analysis area (Bishop 1997). These explorers were instrumental in opening the region to others who eventually established the “Old Spanish Trail.” The “Old Spanish Trail” was primarily a pack route, but later in the 19th Century, its western branch in Utah was the main immigration route to California (Bishop 1997; Grayson 1993).

The analysis area has been used historically by residents of Emery, Sanpete, and Sevier counties. The first European settlements occurred in Sanpete County, starting in 1849. In 1864, the first Mormon settlers established the town of Richfield (Bishop 1997). Thereafter, several bands of Ute Indians led by Black Hawk began raiding for food and supplies throughout the region. The ensuing Black Hawk War disrupted settlement of the surrounding regions (Bishop 1997). Due to the growing hostilities, the Mormon Church advised settlers of Sevier Valley to vacate the region. Most of the evacuees settled temporarily in Sanpete County (Bishop 1997). Not until 1870, following several attempts and eventual acceptance of a peace treaty, were Sevier Valley and surrounding areas again resettled (Bishop 1997). It was during this era that nearby towns in Emery County were settled, largely by families from Sanpete County.

Through the construction of canals and roads, the development of mining, and eventually the coming of the railroad, Sevier, Emery, and nearby Carbon counties became regional commercial hubs (Bishop 1997). For the next century, all of these counties experienced several “boom and bust” cycles; all related to farming, ranching, and mineral and resource exploitation (Bishop 1997).
3.6.1.2 Tribal Consultation

Consultation with Indian Tribes on this project is ongoing and is being conducted on a government-to-government basis. It is considered ongoing because it includes consultation on the effects of the proposed alternatives in this document, as well as discussions on how to reduce effects to sites through the design of specific project proposals. As a result, the potential effects of this project were resolved through a Memorandum of Agreement that in part addresses Tribal concerns. However, Tribal representatives will remain involved in the subsequent stages of project planning associated with the PAP.

Consultation on the proposed Greens Hollow tract began in 2008 by notifying several tribes of the project: the Paiute Indian Tribe of Utah, Northern Ute, Navajo Nation, Hopi Tribe, Skull Valley Goshute, Confederated Tribes of the Goshute Reservation, Moapa Band of Paiutes, Navajo Utah Commission, Southern Ute, Kaibab Band of Paiutes, Ute Mountain Ute, and the Northwestern Band of the Shoshone. Only three tribes expressed interest in this proposal: the Paiute Indian Tribe of Utah in Cedar City, the Ute Indian Tribe located in Ft. Duchesne, Utah, and the Navajo Nation located in Window Rock, Arizona. The Navajo were going to tour the Greens Hollow area, but were unable to do so because of other pressing project needs. They remain interested, but are willing to defer to the Paiutes. The Utes wanted to review all pertinent materials on the Greens Hollow EIS, so specific project proposals were forwarded to them. All tribes except the Ute deferred to the Paiute Indian Tribe of Utah.

The Paiute Tribe initially expressed concern with this project, mainly because of its proximity to Quitchupah Creek that was a major concern to them on another project. Tribal representatives indicated that they were interested in direct as well as indirect effects to both sites and the overall landscape in the analysis area. They wanted to see this area in person and familiarize themselves with it; they also wanted to see how past subsidence has affected archaeological sites. The Utes also expressed some concerns with the Greens Hollow tract project and wanted to visit the area As a result, two field tours of the proposed project for interested tribes were held. The first was attended by representatives from the Paiute Indian Tribe of Utah and the Ute Tribe. A Tribal Consultation representative from the BLM and officials and staff from the Manti-La Sal National Forest attended as well. The second trip involved the Utes, as well as staff from the Manti-La Sal National Forest and BLM.

Most of the discussions during the field trips focused on the impacts associated with the reasonably foreseeable power line and vent shaft outside the Greens Hollow tract. After the first field meeting, the conceptual power line route was relocated in order to avoid impacts to one particular site. This eliminated any additional Tribal concerns about the potential effect of the power line on sites.

There are several archaeological sites in the general area originally proposed for the reasonably foreseeable vent shaft. Although it is possible to eliminate direct impacts to these sites through careful placement of the vent shaft construction area between these sites, the Utes regard the entire area where the sites are located as a cultural landscape. This landscape includes sites that may not qualify for the National Register of Historic Places, but are nonetheless of value to the Tribes as part of that landscape. As a result, they remain concerned about the effect of the vent shaft construction and its subsequent reclamation on the overall appearance and feel of the landscape (and the sites within it). The Paiutes did not identify this area as one having the same issues they had previously identified in the main fork of Quitchupah Creek.

A follow-up meeting with the Utes was held to further discuss this landscape concept and the specific effects of the reasonably foreseeable vent shaft construction footprint. SUFCO project engineers provided a map showing several possible footprints for the vent shaft construction area, and tribal representatives identified an area for the fenced ventilation system that avoided direct impacts to sites that
was acceptable to them. They also proposed measures that would minimize direct impacts to other sites in the analysis area or help mitigate potential indirect impacts to other sites. These proposals include:

1. Do 100 percent data recovery on any rock shelters that might potentially be affected by subsidence.
2. Annual monitoring (including photographic documentation) of sites in the analysis area that might be affected by illegal artifact collecting.
3. Enlist the help of SUFCO employees and security personnel in watching for illegal artifact collecting or vandalism on area sites.

Both tribes remain concerned about the potential effect of subsidence on archaeological sites, particularly rock shelters. Although the impacts to known area rock shelters can be eliminated through application of Stipulation #9 (under Alternative 3), any potential for rock shelter subsidence remains a key concern for the Tribes. Any further concerns about project impacts will be addressed through development of the PAP. Also, one of the Ute elders would like to visit the area again in order to conduct traditional activities. No sacred sites were identified in the course of tribal consultation.

3.6.1.3 Memorandum of Agreement
A Memorandum of Agreement (MOA) between the State Historic Preservation Office (SHPO), the Tribes, SUFCO, the FS, and the Advisory Council on Historic Preservation accounts for the concerns that Native Americans have for the sites that are being affected by this project. Both the Paiute Tribe of Utah and the Ute Indian Tribe agree that potential effects to both specific sites and to the overall area landscape, although not desirable, could be resolved through application of special stipulations. This completes the Tribal consultation needs of the Greens Hollow Draft SEIS. Tribes will continue to be involved in development of the PAP and in the implementation of that plan.

3.6.2 Result of the Heritage Resources Inventory in the Greens Hollow Tract EIS Analysis Area

3.6.2.1 Results of the Intensive Files Search
A search of the cultural files and GIS database housed at the Utah Division of State History, SHPO in Salt Lake City was completed on June 3, 2008. In addition to the SHPO file search, on July 14 and 15, 2008 files searches were conducted at the offices of all regulatory agencies involved: Bureau of Land Management, Richfield Field Office; Fishlake National Forest, Richfield Ranger District; Bureau of Land Management, Price Field Office; and Manti-La Sal National Forest Supervisor’s Office. Combining these files searches ensured a complete data set of information was collected regarding identified cultural resources within the Greens Hollow tract analysis area.

The first archaeological survey of the specific actions associated with this proposal occurred during the summer of 2008. An additional survey was conducted in July 2009. Twenty-nine heritage resource inventories (including the two associated with this project) were completed within one mile of the Greens Hollow tract analysis area between 1977 and 2009. Most of the other archaeological projects were conducted in association with mining. Some projects were conducted by the FS in advance of vegetation improvements or livestock watering developments. Over 1,820 acres have been surveyed within the maximum area of subsidence mining proposed by this project. These surveys show that site densities are highly variable across the analysis area, with significantly lower site densities in the steep and rugged terrain that constitutes the majority of the analysis area.
One of the previous surveys was a large-scale project sponsored by the SUFCO mine that focused on settings within the Muddy and Box Canyon drainage areas that have the highest potential to contain archaeological sites. This survey also took in most of the escarpments and canyon edges that might be affected by subsidence mining on this project. The survey associated with this Draft SEIS included the rest of the canyon edges. As a result, all of the canyon edges within the analysis area, where the surface subsidence effects from underground mining might be greatest, have been surveyed for archaeological sites.

There are 18 previously identified sites within the area of potential effect for subsidence mining under both the Proposed Action and Alternative 3 (Figures 1.3 and 1.4). These sites and the component(s) of the project by alternative that might affect them are summarized in Table 3.9. There are a total of 75 additional previously identified sites within one mile of the boundary of the Greens Hollow tract area of potential effect (Table 3.10). The majority of these sites are the result of ancient American Indian (prehistoric) activity, and highlights the importance of this part of the Wasatch Plateau for ancient peoples. Site densities tend to be greater outside the area of potential effect than within it, in part due to the steep terrain that makes up much of the area of potential subsidence mining.

### Table 3.9. Cultural resources within the Greens Hollow tract analysis area.

<table>
<thead>
<tr>
<th>Cultural Resource</th>
<th>Description</th>
<th>NRHP Eligibility</th>
<th>Associated project component and general location</th>
</tr>
</thead>
<tbody>
<tr>
<td>42SP179</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td>Area of potential mining effect. Alternatives 2 and 3 northwest quarter of proposed action boundary.</td>
</tr>
<tr>
<td>42SP492</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td>Area of potential mining effect, Alternatives 2 and 3 northwest quarter of proposed action boundary.</td>
</tr>
<tr>
<td>42SV1566</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>42SV2584</td>
<td>Prehistoric rock shelters and lithic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>42SV2586</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>42SV2589</td>
<td>Prehistoric rock shelters and lithic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>42SV2774</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td>Area of potential mining effect, Alternatives 2 and 3.</td>
</tr>
<tr>
<td>42SV2949</td>
<td>Multicomponent prehistoric lithic scatter and historic artifact scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>42SV3217</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td>Area of potential mining effect, Alternatives 2 and 3.</td>
</tr>
<tr>
<td>42SV3224</td>
<td>Prehistoric lithic and ceramic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternatives 2 and 3.</td>
</tr>
<tr>
<td>42SV3226</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td>Area of potential mining effect, Alternative 2.</td>
</tr>
<tr>
<td>Cultural Resource</td>
<td>Description</td>
<td>NRHP Eligibility</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>42SV491</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SP493</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SP500</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SP501</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SP502</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SP503</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SP504</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV896</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV984</td>
<td>Prehistoric lithic scatter.</td>
<td>Unevaluated</td>
<td></td>
</tr>
<tr>
<td>42SV1029</td>
<td>Prehistoric lithic and ceramic scatter.</td>
<td>Unevaluated</td>
<td></td>
</tr>
<tr>
<td>42SV1030</td>
<td>Prehistoric lithic scatter.</td>
<td>Unevaluated</td>
<td></td>
</tr>
<tr>
<td>42SV1435</td>
<td>Prehistoric rock shelter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1436</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1437</td>
<td>Prehistoric lithic and ceramic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1438</td>
<td>Prehistoric lithic and ceramic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1439</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1440</td>
<td>Historic monument.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1441</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1453</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1454</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1455</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1561</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1562</td>
<td>Prehistoric ceramic and lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1563</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1565</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1567</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1569</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1570</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1571</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1572</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV1575</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2073</td>
<td>Historic camp and corral.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2309</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2310</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2311</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2341</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2371</td>
<td>Historic coal mine.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2373</td>
<td>Prehistoric rock art.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2378</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2386</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2387</td>
<td>Prehistoric rock shelters.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2388</td>
<td>Prehistoric lithic scatter/ kill site.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2389</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2390</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2391</td>
<td>Historic artifact scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2392</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
<td></td>
</tr>
<tr>
<td>42SV2393</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.10. (cont’d) Cultural resources within one mile outside of the Greens Hollow tract analysis area.

<table>
<thead>
<tr>
<th>Cultural Resource</th>
<th>Description</th>
<th>NRHP Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>42SV2394</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2395</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2423</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2425</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2431</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2432</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2433</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2434</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2481</td>
<td>Historic road.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2492</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2493</td>
<td>Prehistoric ceramic scatter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2494</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2495</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2556</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2587</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2588</td>
<td>Prehistoric rock shelter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2590</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2591</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2592</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2593</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2596</td>
<td>Prehistoric rock shelter and lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2615</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2687</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2688</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2689</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
<tr>
<td>42SV2690</td>
<td>Prehistoric lithic scatter.</td>
<td>Eligible</td>
</tr>
<tr>
<td>42SV2691</td>
<td>Prehistoric lithic scatter.</td>
<td>Not eligible</td>
</tr>
</tbody>
</table>

3.6.2.2 Heritage Resources Inventory within Proposed Action Boundary

There are 18 archaeological sites within the Proposed Action boundary (Alternative 2) that might be affected by subsidence mining. Of these sites, seven (42SV1566, 42SV2584, 42SV2586, 42SV2589, 42SV2949, 42SV3224, and 42SV3226) are recommended as eligible for inclusion in the National Register of Historic Places (NRHP). Five of these are lithic scatters and two each contain rock shelters as well as lithic scatters. All of these sites range in size, density, and artifact assemblage. However, all are likely to yield information important in prehistory. The remaining 11 sites (42SP179, 42SP492, 42SP497, 42SP498, 42SV2585, 42SV2774, 42SV3217, 42SV3219, 42SV3220, 42SV3222, and 42SV3223) are not eligible for inclusion in the NRHP.

3.6.2.3 Heritage Resources Inventory within Alternative 3

There are 5 archaeological sites within the Alternative 3 boundary that might be affected by subsidence mining. Of these sites, only one (42SV3224) is recommended as eligible for inclusion in the NRHP. This site is a lithic and ceramic scatter with features visible on the site surface that are likely to yield information important in prehistory. The remaining 4 sites (42SP179, 42SP492, 42SV2774 and 42SV3217) are not eligible for inclusion in the NRHP.
3.7 PALEONTOLOGICAL RESOURCES

Geologic mapping documents bedrock sedimentary deposits of late Cretaceous to early Tertiary age in the Greens Hollow tract (Figure 3.1). Table 3.11 shows geologic formations of concern for paleontological resources in the analysis area. These include the Blackhawk Formation, the Castlegate Sandstone, the Price River Formation, and the North Horn Formation. Information for each geologic formation that crops out as bedrock, their depositional environment, contained fossils, and their paleontology rating is provided.

The North Horn Formation makes up approximately 50 percent of the analysis area’s surface stratigraphy; the Price River Formation represents approximately 45 percent, the Castlegate Sandstone one percent, and Blackhawk Formation approximately four percent. The Castlegate and Blackhawk are only exposed along Muddy Creek and Greens Hollow canyons. The Castlegate Sandstone is very resistant, is a major cliff former in the region, and overlies the less resistant slope forming Blackhawk Formation.

In general, the FS and the BLM treat fossil resources similarly. Vertebrate fossils are considered to be scientifically significant and a permit is needed to collect them from land under the administration of either agency. Both use the Probable Fossil Yield Classification (PFYC) which is designed to “objectively” determine the potential of geologic units to produce certain kinds of fossils. This system supersedes the previously used BLM “Paleontological Condition System” in 2007.

The BLM and FS rank geologic units with the PFYC according to their potential in five class categories with Class 5 having the highest potential and Class 1 having the lowest potential to yield significant fossil resources. As defined by the FS these classes include:

- **Class 1** – Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservational environments that are not likely to contain recognizable fossil remains.

- **Class 2** – Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.

- **Class 3** – Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.

- **Class 4** – Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.

- **Class 5** – Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.

Paleontological resources are known to exist in these formations and the North Horn and Blackhawk have the highest potential. Many trace fossils, vertebrates: sauropods, marsupials, lizards, turtles, and presumably dinosaur egg shells have been discovered in the North Horn Formation (Cifelli et al, 1999); and sauropods, footprint molds and casts, and petrified wood have been collected from the Blackhawk, mostly from coal seams; however, discoveries have been made throughout the stratigraphic section.
Table 3.11. Summary of surface geologic deposits and paleontological resources in the Greens Hollow area.

<table>
<thead>
<tr>
<th>Deposit/Map Symbol</th>
<th>Geologic Age</th>
<th>Type of Deposit/Environment of Deposition</th>
<th>Fossil Resources¹</th>
<th>Interpreted PFYC² ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvial sediments</td>
<td>Quaternary</td>
<td>Thin, unconsolidated silts, sands of valleys, and plains; terrestrial, eolian.</td>
<td>None</td>
<td>Class 2</td>
</tr>
<tr>
<td>(unmapped)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Horn Formation (TKn)</td>
<td>Late Cretaceous to Paleocene</td>
<td>Chiefly mudstone, siltstone, sandstone, and conglomerate; some limestone, coal and shale. Terrestrial-fluvial and lacustrine/paludal.</td>
<td>Vertebrates, invertebrates, plants, trace fossils</td>
<td>Class 5</td>
</tr>
<tr>
<td>Price River Formation (Kpr)</td>
<td>Late Cretaceous</td>
<td>Chiefly conglomerate and sandstone with minor beds of mudstone. Terrestrial-fluvial in origin.</td>
<td>Vertebrates, invertebrates, trace fossils</td>
<td>Class 3</td>
</tr>
<tr>
<td>Castlegate Sandstone (Kc)</td>
<td>Late Cretaceous</td>
<td>Chiefly conglomerate and sandstone with minor amounts of mudstone and shale. Terrestrial-fluvial in origin.</td>
<td>Vertebrates, plants</td>
<td>Class 3</td>
</tr>
<tr>
<td>Blackhawk Formation (Kbh)</td>
<td>Late Cretaceous</td>
<td>Sandstone, shale, mudstone, and coal. Terrestrial, fluvial, and deltaic.</td>
<td>Vertebrates, invertebrates, plants, trace fossils</td>
<td>Class 5</td>
</tr>
</tbody>
</table>

¹ Based on database and literature review.
² Probable Fossil Yield Classification.

This is not to say that there are identified paleontological sites on the Greens Hollow analysis area; paleontological surveys have not been conducted, and it is a rare event when a significant vertebrate discovery is made, even in formations with high statistical occurrences.

Sedimentary deposits can have fossil: pollen, spores, resin, seeds, woody plant material, invertebrates: clams, insects, annelids, gastropods, ammonoids, and more, but these are not paleontological resources that are protected. Only vertebrate fossils have regulations protecting them as part of the US Vertebrate Paleontological Resources Preservation Act signed in 2009.

### 3.8 SOCIOECONOMICS

The socioeconomic study area encompasses the SUFCO Mine area (including the Quitchupah, Pines, and SITLA coal lease tracts), the Greens Hollow tract area, and the communities in Sevier, Sanpete, and Emery counties where most employees live. Because the existing mine and associated facilities have been operational and part of these communities for many years, many of the long-term socioeconomic effects, such as employment and population growth, demands on public facilities and services, tax revenue, and housing acquisition, have already occurred and are components of the existing conditions. Approximately 383 people are employed at the local mine as of January 2014 (Byars 2014). Employment levels at the mine have remained relatively constant over the past few years. The coal energy produced at the local mine provides for established electrical and other energy needs in many western states.

The management goals for the Manti-La Sal and Fishlake National Forests do not address specific socioeconomic parameters. However, the Manti-La Sal National Forest Land and Resource Management Plan (Forest Service 1986a) does provide for leasing and developing mineral and energy resources, for public participation in the evaluation of proposed Forest activities, and for sustained economic growth of
industries and communities dependent upon Forest outputs. The leasing and development of the coal resources within the Greens Hollow tract is consistent with these management goals.

3.8.1 Population and Housing

The majority of the employees of the local mine live in Sevier, Sanpete, and Emery counties. These are relatively sparsely populated, rural counties in east-central Utah. Table 3.12 shows population trends for the study area from 1990 to 2012. The Emery County population increased by 5.82 percent during this period, or an average of 0.26 percent per year. The population of Sanpete and Sevier counties increased by 71.63 and 34.69 percent, respectively, for the same period, or an average of 3.26 and 1.58 percent per year, respectively. The greatest rates of change have occurred in Sanpete County, with towns of Gunnison, Ephraim, and Centerfield growing the fastest. The local mine provides a relatively high percentage of employment personal income for these communities.

Future population projections, based on projected continued growth for Emery, Sanpete, and Sevier counties through 2060, are shown in Table 3.13. The annual rates of growth are projected to be highest for Sanpete County and lowest for Emery County for the three counties included in the study area. The annual growth rate for Sanpete County is projected to be the greatest (average annual rate change of 1.27 percent over the fifty year time period).

Housing in the study area varies by county. Table 3.14 displays housing in the study area for 1990, 2000, and 2010 and estimated housing for 2003, 2006, and 2011. Housing in each of the three counties correlates directly to the county populations, as expected.

3.8.2 Employment and Income

The local mine is a large employer in the study area in terms of number of employees, employing 383 workers; and the level of personal income. Mine employees live primarily in Sevier (227 employees), Sanpete (113 employees), and Emery (23 employees) counties, with fewer employees living in Juab (10 employees), Carbon (5 employees), Millard (3 employees), Salt Lake (1 employee), and Washington (1 employee) counties (Byars 2014).

Table 3.15 shows the estimated effect of the local mine workforce on the area population for Sevier, Sanpete, and Emery counties, the counties with the largest numbers of local mine employees. Direct mine employment comprises between approximately 0.5 to 2.6 percent of the three-county workforce.

The local mine also uses 279 local truck drivers to haul the coal from the mine, with most of the drivers living in Sanpete and Sevier counties. The local mine accounts for approximately 61 percent of the total mining sector employment in Sevier County, and approximately 11 percent of the employment in the trade, transportation, and utilities sector (State of Utah 2012).

Indirect employment generated by the coal mining industry in 2005 was studied by Moore Economics (2007). That study found that for each job in coal mining in Utah, an additional 2.7 jobs were created elsewhere in the economy. Therefore, a total of 3.7 jobs were created for each coal mine employee or some 1,417 jobs (comprising between approximately 14.7 to 30.7 percent of the three-county work force, or 6.1 percent total for three counties). This percentage in Salt Lake County would represent over 28,700 non-farm jobs in 2011 (U.S. Department of Commerce 2013). The 3.7 multiplier is likely a conservative projection because the local mine transports the coal produced a relatively long distance which could require more coal trucking support than for which the multiplier was based. The multiplier also excludes the relatively high percent of total employment in the local economy and public when compared to a metropolitan area.
Table 3.12. Study area population trends.

<table>
<thead>
<tr>
<th>Area</th>
<th>1990 (^a)</th>
<th>2000 (^b)</th>
<th>2006 (^c)</th>
<th>2012 (^d)</th>
<th>% Change 1990-2012</th>
<th>Average Annual Rate of Change 1990-2012 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery County</td>
<td>10,332</td>
<td>10,860</td>
<td>10,698</td>
<td>10,933</td>
<td>5.82</td>
<td>0.26</td>
</tr>
<tr>
<td>Castle Dale</td>
<td>1,704</td>
<td>1,657</td>
<td>1,617</td>
<td>1,624</td>
<td>-4.69</td>
<td>-0.21</td>
</tr>
<tr>
<td>Clawson</td>
<td>151</td>
<td>153</td>
<td>173</td>
<td>165</td>
<td>9.27</td>
<td>0.42</td>
</tr>
<tr>
<td>Cleveland</td>
<td>498</td>
<td>508</td>
<td>507</td>
<td>466</td>
<td>-6.42</td>
<td>-0.29</td>
</tr>
<tr>
<td>Elmo</td>
<td>267</td>
<td>368</td>
<td>366</td>
<td>418</td>
<td>56.55</td>
<td>2.57</td>
</tr>
<tr>
<td>Emery</td>
<td>300</td>
<td>308</td>
<td>303</td>
<td>286</td>
<td>-4.67</td>
<td>-0.21</td>
</tr>
<tr>
<td>Ferron</td>
<td>1,606</td>
<td>1,623</td>
<td>1,569</td>
<td>1,626</td>
<td>1.25</td>
<td>0.06</td>
</tr>
<tr>
<td>Green River</td>
<td>866</td>
<td>973</td>
<td>949</td>
<td>949</td>
<td>9.58</td>
<td>0.44</td>
</tr>
<tr>
<td>Huntington</td>
<td>1,875</td>
<td>2,131</td>
<td>2,061</td>
<td>2,111</td>
<td>12.59</td>
<td>0.57</td>
</tr>
<tr>
<td>Orangeville</td>
<td>1,459</td>
<td>1,398</td>
<td>1,344</td>
<td>1,466</td>
<td>0.48</td>
<td>0.02</td>
</tr>
<tr>
<td>Balance of Emery County</td>
<td>1,606</td>
<td>1,741</td>
<td>1,809</td>
<td>1,822</td>
<td>13.45</td>
<td>0.61</td>
</tr>
<tr>
<td>Sanpete County</td>
<td>16,259</td>
<td>22,763</td>
<td>24,196</td>
<td>27,906</td>
<td>71.63</td>
<td>3.26</td>
</tr>
<tr>
<td>Centerfield</td>
<td>766</td>
<td>1,048</td>
<td>1,049</td>
<td>1,372</td>
<td>79.11</td>
<td>3.60</td>
</tr>
<tr>
<td>Ephraim</td>
<td>3,363</td>
<td>4,505</td>
<td>5,085</td>
<td>6,146</td>
<td>82.75</td>
<td>3.76</td>
</tr>
<tr>
<td>Fairview</td>
<td>960</td>
<td>1,160</td>
<td>1,161</td>
<td>1,252</td>
<td>30.42</td>
<td>1.38</td>
</tr>
<tr>
<td>Fayette</td>
<td>183</td>
<td>204</td>
<td>203</td>
<td>243</td>
<td>32.78</td>
<td>1.49</td>
</tr>
<tr>
<td>Fountain Green</td>
<td>578</td>
<td>945</td>
<td>939</td>
<td>1,077</td>
<td>62.46</td>
<td>3.67</td>
</tr>
<tr>
<td>Gunnison</td>
<td>1,298</td>
<td>2,394</td>
<td>2,717</td>
<td>3,250</td>
<td>150.38</td>
<td>6.84</td>
</tr>
<tr>
<td>Manti</td>
<td>2,268</td>
<td>3,040</td>
<td>3,180</td>
<td>3,300</td>
<td>45.50</td>
<td>2.07</td>
</tr>
<tr>
<td>Mayfield</td>
<td>438</td>
<td>420</td>
<td>424</td>
<td>499</td>
<td>13.93</td>
<td>0.63</td>
</tr>
<tr>
<td>Moroni</td>
<td>1,115</td>
<td>1,280</td>
<td>1,273</td>
<td>1,429</td>
<td>28.16</td>
<td>1.28</td>
</tr>
<tr>
<td>Mount Pleasant</td>
<td>2,092</td>
<td>2,707</td>
<td>2,698</td>
<td>3,278</td>
<td>56.69</td>
<td>2.58</td>
</tr>
<tr>
<td>Spring City</td>
<td>715</td>
<td>956</td>
<td>1,001</td>
<td>994</td>
<td>39.02</td>
<td>1.77</td>
</tr>
<tr>
<td>Sterling</td>
<td>191</td>
<td>235</td>
<td>251</td>
<td>274</td>
<td>43.46</td>
<td>1.98</td>
</tr>
<tr>
<td>Wales</td>
<td>189</td>
<td>219</td>
<td>224</td>
<td>297</td>
<td>57.14</td>
<td>2.60</td>
</tr>
<tr>
<td>Balance of Sanpete County</td>
<td>2,103</td>
<td>3,650</td>
<td>3,991</td>
<td>4,495</td>
<td>113.74</td>
<td>5.17</td>
</tr>
<tr>
<td>Sevier County</td>
<td>15,431</td>
<td>18,842</td>
<td>19,640</td>
<td>20,784</td>
<td>34.69</td>
<td>1.58</td>
</tr>
<tr>
<td>Annabellae</td>
<td>487</td>
<td>603</td>
<td>648</td>
<td>797</td>
<td>63.66</td>
<td>2.89</td>
</tr>
<tr>
<td>Aurora</td>
<td>911</td>
<td>947</td>
<td>947</td>
<td>1,017</td>
<td>11.64</td>
<td>0.53</td>
</tr>
<tr>
<td>Central Valley</td>
<td>-</td>
<td>-</td>
<td>413</td>
<td>528</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Elsinore</td>
<td>608</td>
<td>733</td>
<td>740</td>
<td>845</td>
<td>38.98</td>
<td>1.77</td>
</tr>
<tr>
<td>Glenwood</td>
<td>437</td>
<td>437</td>
<td>436</td>
<td>464</td>
<td>6.18</td>
<td>0.28</td>
</tr>
<tr>
<td>Joseph</td>
<td>198</td>
<td>269</td>
<td>271</td>
<td>342</td>
<td>36.87</td>
<td>2.17</td>
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<tr>
<td>Koosharem</td>
<td>266</td>
<td>276</td>
<td>290</td>
<td>327</td>
<td>22.93</td>
<td>1.04</td>
</tr>
<tr>
<td>Monroe</td>
<td>1,472</td>
<td>1,845</td>
<td>1,842</td>
<td>2,260</td>
<td>53.53</td>
<td>2.43</td>
</tr>
<tr>
<td>Redmond</td>
<td>648</td>
<td>788</td>
<td>798</td>
<td>732</td>
<td>12.96</td>
<td>0.59</td>
</tr>
<tr>
<td>Richfield</td>
<td>5,593</td>
<td>6,847</td>
<td>7,104</td>
<td>7,520</td>
<td>34.45</td>
<td>1.57</td>
</tr>
<tr>
<td>Selina</td>
<td>1,943</td>
<td>2,393</td>
<td>2,399</td>
<td>2,492</td>
<td>28.26</td>
<td>1.28</td>
</tr>
<tr>
<td>Sigurd</td>
<td>385</td>
<td>430</td>
<td>429</td>
<td>432</td>
<td>12.21</td>
<td>0.56</td>
</tr>
<tr>
<td>Balance of Sevier County</td>
<td>2,483</td>
<td>3,274</td>
<td>3,323</td>
<td>3,028</td>
<td>21.95</td>
<td>1.00</td>
</tr>
</tbody>
</table>

\(^a\) April 1 data. Source: U.S. Bureau of the Census (1990).
\(^b\) April 1 data. Source: U.S. Census Bureau (2006).
\(^c\) July 1 estimate. Source: U.S. Census Bureau (2006).
\(^d\) July 1 estimate. Source: U.S. Census Bureau (2013).
Table 3.13. Study area population projections. a

<table>
<thead>
<tr>
<th>Area</th>
<th>Census 2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>% Change 2010-2060</th>
<th>Average Annual Rate of Change 2010-2060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery County</td>
<td>10,976</td>
<td>11,230</td>
<td>11,930</td>
<td>12,207</td>
<td>12,016</td>
<td>12,141</td>
<td>10.61</td>
<td>0.21</td>
</tr>
<tr>
<td>Castle Dale</td>
<td>1,630</td>
<td>1,668</td>
<td>1,772</td>
<td>1,813</td>
<td>1,784</td>
<td>1,803</td>
<td>10.61</td>
<td>0.21</td>
</tr>
<tr>
<td>Clawson</td>
<td>163</td>
<td>167</td>
<td>177</td>
<td>181</td>
<td>178</td>
<td>180</td>
<td>10.43</td>
<td>0.21</td>
</tr>
<tr>
<td>Cleveland</td>
<td>464</td>
<td>475</td>
<td>504</td>
<td>516</td>
<td>508</td>
<td>513</td>
<td>10.56</td>
<td>0.21</td>
</tr>
<tr>
<td>Elmo</td>
<td>418</td>
<td>428</td>
<td>454</td>
<td>465</td>
<td>458</td>
<td>462</td>
<td>10.53</td>
<td>0.21</td>
</tr>
<tr>
<td>Emery</td>
<td>288</td>
<td>295</td>
<td>313</td>
<td>320</td>
<td>315</td>
<td>319</td>
<td>10.76</td>
<td>0.22</td>
</tr>
<tr>
<td>Ferron</td>
<td>1,626</td>
<td>1,664</td>
<td>1,767</td>
<td>1,808</td>
<td>1,780</td>
<td>1,799</td>
<td>10.64</td>
<td>0.21</td>
</tr>
<tr>
<td>Green River</td>
<td>952</td>
<td>974</td>
<td>1,035</td>
<td>1,059</td>
<td>1,042</td>
<td>1,053</td>
<td>10.61</td>
<td>0.21</td>
</tr>
<tr>
<td>Huntington</td>
<td>2,129</td>
<td>2,178</td>
<td>2,314</td>
<td>2,368</td>
<td>2,331</td>
<td>2,355</td>
<td>10.62</td>
<td>0.21</td>
</tr>
<tr>
<td>Orangeville</td>
<td>1,470</td>
<td>1,504</td>
<td>1,598</td>
<td>1,635</td>
<td>1,609</td>
<td>1,626</td>
<td>10.61</td>
<td>0.21</td>
</tr>
<tr>
<td>Balance of Emery County</td>
<td>1,836</td>
<td>1,878</td>
<td>1,996</td>
<td>2,042</td>
<td>2,010</td>
<td>2,031</td>
<td>10.62</td>
<td>0.21</td>
</tr>
<tr>
<td>Sanpete County</td>
<td>27,822</td>
<td>31,637</td>
<td>35,279</td>
<td>37,879</td>
<td>40,689</td>
<td>45,494</td>
<td>63.52</td>
<td>1.27</td>
</tr>
<tr>
<td>Centerfield</td>
<td>1,367</td>
<td>1,554</td>
<td>1,733</td>
<td>1,861</td>
<td>1,999</td>
<td>2,235</td>
<td>63.50</td>
<td>1.27</td>
</tr>
<tr>
<td>Ephraim</td>
<td>6,135</td>
<td>6,976</td>
<td>7,779</td>
<td>8,353</td>
<td>8,972</td>
<td>10,032</td>
<td>63.52</td>
<td>1.27</td>
</tr>
<tr>
<td>Fairview</td>
<td>1,247</td>
<td>1,418</td>
<td>1,581</td>
<td>1,698</td>
<td>1,824</td>
<td>2,039</td>
<td>63.51</td>
<td>1.27</td>
</tr>
<tr>
<td>Fayette</td>
<td>242</td>
<td>275</td>
<td>307</td>
<td>329</td>
<td>354</td>
<td>396</td>
<td>63.64</td>
<td>1.27</td>
</tr>
<tr>
<td>Fountain Green</td>
<td>1,071</td>
<td>1,218</td>
<td>1,358</td>
<td>1,458</td>
<td>1,566</td>
<td>1,751</td>
<td>63.49</td>
<td>1.27</td>
</tr>
<tr>
<td>Gunnison</td>
<td>3,285</td>
<td>3,735</td>
<td>4,165</td>
<td>4,472</td>
<td>4,804</td>
<td>5,372</td>
<td>63.53</td>
<td>1.27</td>
</tr>
<tr>
<td>Manti</td>
<td>3,276</td>
<td>3,725</td>
<td>4,154</td>
<td>4,460</td>
<td>4,791</td>
<td>5,357</td>
<td>63.52</td>
<td>1.27</td>
</tr>
<tr>
<td>Mayfield</td>
<td>496</td>
<td>564</td>
<td>629</td>
<td>675</td>
<td>725</td>
<td>811</td>
<td>63.51</td>
<td>1.27</td>
</tr>
<tr>
<td>Moroni</td>
<td>1,423</td>
<td>1,618</td>
<td>1,804</td>
<td>1,937</td>
<td>2,081</td>
<td>2,357</td>
<td>65.64</td>
<td>1.27</td>
</tr>
<tr>
<td>Mount Pleasant</td>
<td>3,260</td>
<td>3,707</td>
<td>4,134</td>
<td>4,438</td>
<td>4,768</td>
<td>5,331</td>
<td>63.53</td>
<td>1.27</td>
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<tr>
<td>Spring City</td>
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<td>1,123</td>
<td>1,253</td>
<td>1,345</td>
<td>1,445</td>
<td>1,616</td>
<td>63.56</td>
<td>1.27</td>
</tr>
<tr>
<td>Sterling</td>
<td>262</td>
<td>298</td>
<td>332</td>
<td>357</td>
<td>383</td>
<td>428</td>
<td>63.36</td>
<td>1.27</td>
</tr>
<tr>
<td>Wales</td>
<td>302</td>
<td>343</td>
<td>383</td>
<td>411</td>
<td>442</td>
<td>494</td>
<td>63.58</td>
<td>1.27</td>
</tr>
<tr>
<td>Balance of Sanpete County</td>
<td>4,468</td>
<td>5,081</td>
<td>5,666</td>
<td>6,083</td>
<td>6,534</td>
<td>7,306</td>
<td>63.52</td>
<td>1.27</td>
</tr>
<tr>
<td>Sevier County</td>
<td>20,802</td>
<td>22,380</td>
<td>24,329</td>
<td>26,142</td>
<td>28,241</td>
<td>31,549</td>
<td>50.70</td>
<td>1.01</td>
</tr>
<tr>
<td>Annabellia</td>
<td>795</td>
<td>855</td>
<td>930</td>
<td>999</td>
<td>1,079</td>
<td>1,198</td>
<td>50.69</td>
<td>1.01</td>
</tr>
<tr>
<td>Aurora</td>
<td>1,016</td>
<td>1,093</td>
<td>1,188</td>
<td>1,277</td>
<td>1,379</td>
<td>1,531</td>
<td>50.69</td>
<td>1.01</td>
</tr>
<tr>
<td>Central Valley</td>
<td>528</td>
<td>568</td>
<td>618</td>
<td>664</td>
<td>717</td>
<td>796</td>
<td>50.76</td>
<td>1.02</td>
</tr>
<tr>
<td>Elsinore</td>
<td>847</td>
<td>911</td>
<td>991</td>
<td>1,064</td>
<td>1,150</td>
<td>1,276</td>
<td>50.65</td>
<td>1.01</td>
</tr>
<tr>
<td>Glenwood</td>
<td>464</td>
<td>499</td>
<td>543</td>
<td>583</td>
<td>630</td>
<td>699</td>
<td>50.65</td>
<td>1.01</td>
</tr>
<tr>
<td>Joseph</td>
<td>344</td>
<td>370</td>
<td>402</td>
<td>432</td>
<td>467</td>
<td>518</td>
<td>50.58</td>
<td>1.01</td>
</tr>
<tr>
<td>Koosharem</td>
<td>327</td>
<td>352</td>
<td>382</td>
<td>411</td>
<td>444</td>
<td>493</td>
<td>50.76</td>
<td>1.02</td>
</tr>
<tr>
<td>Monroe</td>
<td>2,256</td>
<td>2,427</td>
<td>2,639</td>
<td>2,835</td>
<td>3,063</td>
<td>3,400</td>
<td>50.71</td>
<td>1.01</td>
</tr>
<tr>
<td>Redmond</td>
<td>730</td>
<td>785</td>
<td>854</td>
<td>917</td>
<td>991</td>
<td>1,100</td>
<td>50.68</td>
<td>1.01</td>
</tr>
<tr>
<td>Richfield</td>
<td>7,551</td>
<td>8,124</td>
<td>8,831</td>
<td>9,489</td>
<td>10,251</td>
<td>11,379</td>
<td>50.70</td>
<td>1.01</td>
</tr>
<tr>
<td>Salina</td>
<td>2,489</td>
<td>2,678</td>
<td>2,911</td>
<td>3,128</td>
<td>3,379</td>
<td>3,751</td>
<td>50.70</td>
<td>1.01</td>
</tr>
<tr>
<td>Sigurd</td>
<td>429</td>
<td>462</td>
<td>502</td>
<td>539</td>
<td>582</td>
<td>647</td>
<td>50.82</td>
<td>1.02</td>
</tr>
<tr>
<td>Balance of Sevier County</td>
<td>3,026</td>
<td>3,256</td>
<td>3,539</td>
<td>3,803</td>
<td>4,108</td>
<td>4,560</td>
<td>50.69</td>
<td>1.01</td>
</tr>
</tbody>
</table>

a Source: Utah Governor’s Office of Planning and Budget (2013).
Table 3.14. Study area housing (number of units).

<table>
<thead>
<tr>
<th>County</th>
<th>1990 a</th>
<th>2000 b</th>
<th>2003 c</th>
<th>2006 c</th>
<th>2010 d</th>
<th>2011 e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery</td>
<td>2,998</td>
<td>4,093</td>
<td>4,253</td>
<td>4,288</td>
<td>4,489</td>
<td>4,516</td>
</tr>
<tr>
<td>Sanpete</td>
<td>4,859</td>
<td>7,879</td>
<td>8,321</td>
<td>8,529</td>
<td>10,379</td>
<td>10,637</td>
</tr>
<tr>
<td>Sevier</td>
<td>4,877</td>
<td>7,016</td>
<td>7,344</td>
<td>7,605</td>
<td>8,449</td>
<td>8,544</td>
</tr>
</tbody>
</table>

b April 1 data. Source: U.S. Census Bureau (2007).
c July 1 estimate. Source: U.S. Census Bureau (2007).
d April 1 census. Source: U.S. Census Bureau (2012).
e July 1 estimate. Source: U.S. Census Bureau (2012).

Table 3.15. Estimated effect of SUFCO Mine employees on the study area.

**Emery County**
- 23 employees x 3.13 people per household = 72 people
- 72 people = 0.66% of Emery County’s 2012 population (10,933)
- 23 employees = 3.84% of Sevier County’s 2011 mining sector employment (599)
- 23 employees = 0.50% of Emery County’s 2011 workforce (4,617)

**Sanpete County**
- 113 employees x 3.13 people per household = 354 people
- 354 people = 1.27% of Sanpete County’s 2012 population (27,906)
- 113 employees = 18.86% of Sevier County’s 2011 mining sector employment (599)
- 113 employees = 1.17% of Sanpete County’s 2011 workforce (9,638)

**Sevier County**
- 227 employees x 3.13 people per household = 711 people
- 711 people = 3.42% of Sevier County’s 2012 population (20,784)
- 227 employees = 37.90% of Sevier County’s 2011 mining sector employment (599)
- 227 employees = 2.56% of Sevier County’s 2011 workforce (8,872)

Sources: Byars (2014); State of Utah (2012).

The average monthly non-agricultural payroll wages by major industry for each of the three counties is shown in Table 3.16. Mining supplied the highest wage across all three counties in the study area in 2012. In 2012, mining in Emery, Sanpete, and Sevier counties provided 76, 223, and 49 percent higher monthly wages than the total average non-agricultural payroll wage, respectively for each county.

In 2011, jobs related to coal mining in the State of Utah have been shown to support more jobs in the service industry (2,107) than in the mining industry (1,778), which includes coal mining (1,748). Also, wages supported in the mining sector are almost three times as large as those in the service sector. This is because average mining wages in general, and average coal mining wages ($77,520/year) in particular, are almost double the average wages in the state ($40,898/year), whereas average service sector wages are lower than overall average wages. (Hogue 2012)

For 2012, mining in Sevier County employed 599 people, or 8.2 percent of the non-agricultural employment (7,288 workers). However, it accounted for 14.8 percent ($30.8 million) of the non-agricultural payroll wages in Sevier County ($208.2 million). (State of Utah 2012)
Table 3.16. Average monthly non-agricultural payroll wages ($) by county, 2012.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Emery County</th>
<th>Sanpete County</th>
<th>Sevier County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>6,412</td>
<td>7,063</td>
<td>3,798</td>
</tr>
<tr>
<td>Construction</td>
<td>4,031</td>
<td>2,572</td>
<td>2,262</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3,101</td>
<td>2,651</td>
<td>2,857</td>
</tr>
<tr>
<td>Trade, Transportation &amp; Utilities</td>
<td>4,319</td>
<td>1,805</td>
<td>2,612</td>
</tr>
<tr>
<td>Information</td>
<td>3,792</td>
<td>3,393</td>
<td>2,292</td>
</tr>
<tr>
<td>Financial Activities</td>
<td>2,679</td>
<td>2,544</td>
<td>2,890</td>
</tr>
<tr>
<td>Professional &amp; Business Services</td>
<td>3,471</td>
<td>2,499</td>
<td>2,761</td>
</tr>
<tr>
<td>Education &amp; Health Services</td>
<td>1,790</td>
<td>2,346</td>
<td>2,579</td>
</tr>
<tr>
<td>Leisure &amp; Hospitality</td>
<td>1,016</td>
<td>713</td>
<td>919</td>
</tr>
<tr>
<td>Other Services</td>
<td>2,850</td>
<td>2,420</td>
<td>2,407</td>
</tr>
<tr>
<td>Government</td>
<td>2,510</td>
<td>2,174</td>
<td>2,734</td>
</tr>
<tr>
<td>Total Average Wage</td>
<td>3,639</td>
<td>2,187</td>
<td>2,547</td>
</tr>
</tbody>
</table>

* Source: Utah Department of Workforce Services (2012).

3.8.2.1 Fiscal Resources

The existing mine operations at the local mine provide revenue to various local, state, and Federal government agencies through royalties and taxes. They are summarized in Table 3.17 for the years 2006 and 2007. Similar royalties and taxes would be paid if another company acquired SITLA and Federal leases and began mining operations in the Greens Hollow tract.

Federal lease royalties are collected for coal reserves on federally administered public lands. Fifty percent of the revenue collected is returned to the State of Utah, which goes into the Mineral Leasing Fund. The State then allocates 33 percent of that revenue to the Permanent Community Impact Fund, from which cities in the analysis area can obtain funding for various infrastructure-related projects. The State allocates another 25 percent to the county in which the coal is mined.

Royalties collected for coal reserves on SITLA tracts are administered by SITLA. SITLA takes a 3 percent administrative fee, and then divides the remaining amount equally between SITLA and the State Mineral Leasing Fund. The SITLA portion is used to fund state schools and institutions. The State Mineral Leasing Fund portion is distributed as described above.

Table 3.17. Existing local mine fiscal effects.

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Lease Royalty and Bonus Monies</td>
<td>$ 13,132,000</td>
<td>$ 13,961,000</td>
</tr>
<tr>
<td><strong>Property Taxes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid by SUFCO Mine to Sevier County</td>
<td>1,797,000</td>
<td>1,055,000</td>
</tr>
<tr>
<td>Paid by contract trucking companies to Sevier County</td>
<td>179,200</td>
<td>212,700</td>
</tr>
<tr>
<td><strong>Sales Taxes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid by SUFCO Mine</td>
<td>3,586,000</td>
<td>3,365,000</td>
</tr>
<tr>
<td>Paid by contract trucking companies</td>
<td>186,000</td>
<td>191,000</td>
</tr>
<tr>
<td>Fuel and use taxes, paid by contract trucking companies</td>
<td>3,589,000</td>
<td>4,060,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$ 22,469,200</td>
<td>$ 22,844,700</td>
</tr>
</tbody>
</table>

The local mine contributes to the local economy, the counties involved, and the state in the purchase of goods and services to operate the mine. Employees and their families also contribute to their respective local economies.

The value of coal in real dollars has varied widely since 1960. From 1960 to 1012, the price for a short ton of coal in real dollars has ranged from $20.41 in 2003 to $92.52 in 1976 with an average price during that same period of $54.02 (USDL 2012). The average price per short ton of coal in real dollars over the past 5, 10, 20, 30, and 40 years has been $32.96, $27.99, $27.23, $52.34 and $57.41, respectively.

In terms of energy resources, much of the coal produced is used for the production of electricity. As an example of the amount of electrical energy produced from coal, one million tons of coal would be able to supply, 208,665 U.S. households with residential electricity for one year, corresponding to 540,442 people (Table 3.18). Nationwide over the past 10 years approximately 46.5 percent of the electrical energy produced comes from coal with a range of 50.8 percent in 2003 and 37.4 percent in 2012 (EIA 2013). In Utah, approximately 95 percent of the electricity produced is generated by coal (EIA 2004). More recently this estimate has reduced to approximately 82 percent with more electricity being produced by natural gas (EIA 2013).

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons of coal produced</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Total British thermal units (BTU)s at 11,300 BTUs per pound of coal</td>
<td>22,600,000,000,000</td>
</tr>
<tr>
<td>Average heat rate (BTUs per kilowatt hour)</td>
<td>10,164^b</td>
</tr>
<tr>
<td>Kilowatt hours of electrical generation</td>
<td>2,223,534,042</td>
</tr>
<tr>
<td>Physical units (kilowatt hours) of total consumption per household (in 2001)</td>
<td>10,656^c</td>
</tr>
<tr>
<td>Number of U.S. households provided with one year of residential electrical energy</td>
<td>208,665</td>
</tr>
<tr>
<td>Persons per household in the U.S.</td>
<td>2.59^d</td>
</tr>
<tr>
<td>Number of persons provided with one year of residential electrical energy</td>
<td>540,442</td>
</tr>
</tbody>
</table>

^a BTU estimate from coal at the SUFCO Mine.
^b EIA (2007).
^c EIA (2001).
^d U.S. Census Bureau (2000).

### 3.8.3 SOCIAL PERCEPTIONS

Perceptions from the public are important considerations when determining activities that could be applied to public lands. The Governor’s Public Lands Policy Coordination Office website contains library information that was reviewed for pertinence with the proposed project and analysis area (State of Utah 2009). The Krannich (2008) survey report on the website dealt most closely with socioeconomic issues related to the proposed lease. That report showed survey respondents’ attitudes about the importance of energy resources such as oil, gas, coal, or uranium that are being developed or likely to be developed on public lands to the overall quality of life for people living in their community. For Emery, Sanpete, and Sevier counties, the significant majority of the respondents (greater than 76 percent) felt energy resource development was very important or moderately important. Krannich (2008) also obtained views regarding whether public land managers should reduce or increase the extent to which mineral exploration and extraction activities occur on Utah’s public lands. For Emery, Sanpete, and Sevier counties most of the respondents (greater than 75 percent) wanted those activities to stay about the same or increase. In Emery, Sanpete, and Sevier counties Krannich (2008) also found that 72 and 76 percent of the respondents were either neutral or agreed that National Forest System and BLM lands,
respectively, should be managed to provide for economic uses like grazing or mining to help encourage local economic development. Krannich (2008) concluded “On the balance, it is clear that economic linkages to public lands and resources are of substantial importance in Utah, especially in several of the more rural portions of the state where livestock grazing, mining, oil and gas production, and tourism-based activities are most heavily concentrated.”

3.9 RECREATION RESOURCES

The analysis area for the recreation resources analysis includes the proposed Greens Hollow tract, a 900-foot extended subsidence zone around the potentially mined areas that could be affected by subsidence, and adjacent coal tracts that could be mined in conjunction with the Greens Hollow tract (Figures 1.3 and 1.4). However, the Greens Hollow analysis area is part of a larger geographic area in terms of recreation resources and use patterns. Therefore, the geographic scope for the recreation resources analysis encompasses a much larger area in which recreation occurs on the Forest. This area includes adjacent areas that are used together with the recreation resources in the analysis area through the numerous forest roads and motorized and non-motorized trails throughout the MLNF and the FLNF.

Forest-wide recreational visits were last surveyed during the 2006 summer season. This survey estimated recreation visits for the entire MLNF at 533,700 with a 90 percent confidence interval. This is a drop of about one-third from the 804,301 visits in 2001. The average stay was 14 hours. The most popular recreational activities were viewing natural features, relaxing, hiking/walking, and driving for pleasure (Forest Service 2007). Similar recreational activities also occur on the FLNF.

The analysis area is not proximate to local communities, and access to the area is time consuming. Overall recreation use can be characterized as light compared to total recreation use on the MLNF, where numerous areas of concentrated recreation use occur on small reservoirs and along collector roads, neither of which exist in the analysis area (Broadbear 2004). FS staff have observed no user group conflicts. Recreational activities which do occur in the analysis area, ranked by most popular, include viewing wildlife, hunting, off-highway vehicle (OHV) use, viewing natural features, and driving for pleasure (Broadbear 2008). While there are a number of FS roads in the analysis area, there are no developed FS facilities on the tract.

Seasonal use of the area usually begins in May, when snowmelt allows vehicular access to the analysis area, until late October, when the hunting season ends and snow cover precludes vehicle use. Weekends and holidays are, generally, the more popular periods of use of the site, although the hunting season is the time period that sees the most concentrated use of the analysis area during the entire year. Deer and elk constitute almost all of the big game taken. The archery seasons for deer and elk are open from mid-August through mid-September. The general season for deer occurs in late October, while elk season is in the early part of October. The muzzleloader deer hunt occurs in late September to early October, while general muzzleloader elk occurs in late October and early November.

Approximately 24 miles of forest roads are accessible and used by OHV’s, 4WD’s, and conventional vehicles that traverse the Greens Hollow tract. Approximately 6 miles of user-developed unclassified roads exist on the tract as well (Broadbear 2008). Some of these lead to water developments. The primary forest road on the tract, National Forest System Road (NFSR) 50044, comes through from Link Canyon and provides access to the popular Skyline Trail. The road is reasonably well maintained and receives a good deal of use by visitors traveling to Julius Flat Reservoir. NFSR 50007 intersects NFSR 50044 east of the tract and provides access to Interstate 70 after passing through the southeast part of the tract. Other forest roads in the analysis area, including NFSR 50132, all dead end within one to two miles from their respective intersections with NFSR 50044. A designated trail exists along Big Ridge (Forest Greens Hollow Federal Coal Lease Tract 110 Draft Supplemental Environmental Impact Statement
Development Trail 025) where it begins and ends on NFSR 50044. The 7-mile trail is designated for motorized use. Portions of the Greens Hollow road system are part of the Arapeen OHV Trail System (Sanpete County 2011). The Arapeen trail system is a forest-wide motorized recreation trail system encompassing the southern half of the Wasatch Plateau. The Big Ridge Trail is open to vehicles 50 inches or less in width as per the 2008 Motor Vehicle Use Map for the Ferron/Price Ranger District, while NFSR 50044 is open to all vehicles. Use of the Black Fork Trail (Trail #003) west of the tract averaged 1,354 users per season from 2005 – 2007. The Big Ridge Trail is estimated to receive comparable use (Broadbear 2008).

Existing noise levels vary across the study area. Excluding recreational vehicles, the primary sound source within the southern portion of the analysis area is the existing SUFCO exhaust fan in Quitchupah Canyon. A noise survey was conducted to quantify the existing noise levels in the analysis area. NFSR 50044 runs approximately 2.7 miles to the east of the source. Sound level measurements taken on the road ranged between 27.6 A-weighted decibels (dBA) and 55.6 dBA. No sound impacts associated with the operation of the existing fan were identified for NFSR 50044. Sound level measurements taken on NFSR 50007 ranged between 32.8 dBA and 70.3 dBA. The existing ventilation fan is audible (at background sound levels) from portions of NFSR 50007 along the eastern side of Quitchupah Canyon. Recreational vehicle traffic was present during the time of the sound survey. At one sound survey location, a recreational vehicle being driven on the road 33 feet from the sound survey instrument recorded a maximum decibel reading of 70.3 dBA. Forest Development Trail 025 runs east and west on Big Ridge approximately 2.8 miles to the north of the source. Sound level measurements near the road ranged between 29.4 dBA and 54.1 dBA. No sound impacts associated with the operation of the existing fan were identified for this trail. NFSR 52284 runs along the eastern rim of Quitchupah Canyon and experiences sound-related impacts from the existing fan. The existing fan is audible from portions of this road, however most sound level measurements fell near background sound levels. Sound level measurements taken from this road ranged between 32.3dBA and 61.2dBA. Higher sound level measurements taken at this location could be a result of wind gusts. Wind measurements taken during the sound level recording were reported between 5 and 8 miles per hour. It is likely that wind gusts through the trees could have influenced sound levels at this monitoring location. (Tetra Tech 2008).

The Greens Hollow tract overlaps with two inventoried roadless areas: the Muddy Creek-Nelson Mountain IRA on the north end of the tract and the White Mountain IRA on the south end. The Wildcat Knolls IRA lies just east of the tract boundary. Intrusions from historical use of the land have reduced the natural integrity of the area and the landscape has lost some of its natural appearance.

The types of Recreation Opportunity Spectrum (ROS) classes found on the tract are Semi-Primitive Motorized (SPM) and Roaded Natural (RN). The SPM class provides for motorized recreation opportunities in semi-primitive settings. In areas seen from travelways, a natural-appearing setting dominates the outdoor physical environment, with only subtle or minor evidence of human-caused modifications. In that these areas are generally larger than 2,500 acres, they offer opportunities for solitude, remoteness, and risk (potentially extended periods of time before help could arrive in the event of an emergency), with little on-site controls and restrictions. Other user encounters should generally be low; however, the sounds of other users may be evident due to motorized uses.

RN areas provide for a wide range of recreational activities that are generally focused along the primary and secondary travel routes in a naturally-appearing, roaded, motorized setting. Visitors to these areas are likely to encounter other users in these areas. Opportunities for isolation, challenge, or risk are generally not very important, although opportunities for practicing outdoor skills may be important. The RN class is found along Greens Hollow, Cowboy Creek, and the east part of North Fork Quitchupah Creek, including the part of the tract on the FLNF. The SPM class is found in the rest of the tract.
3.10 VISUAL QUALITY

The analysis area for the proposed Greens Hollow tract includes the lease tract itself, a 900-foot extended subsidence zone around the potentially mined areas that could be affected by subsidence, and adjacent coal tracts that could be mined in conjunction with the Greens Hollow tract (Figures 1.3 and 1.4). However, the geographic scope for the visual resources analysis encompasses a larger area of influence. This includes viewpoints along numerous forest roads and motorized and non-motorized trails throughout the analysis area.

Based on Forest Planning, two Visual Quality Objectives (VQOs) occur in the Manti-La Sal portion of the Greens Hollow analysis area: Modification and Partial Retention (Forest Service 1986a). Modification is the dominate VQO in the analysis area, but Partial Retention is specified in the northern part of the analysis area for the Muddy Creek Canyon and for a corridor along NFSR 50044 west of the Greens Hollow stream crossing (Figure 3.7).

The Fishlake Forest Plan (Forest Service 1986b) specifies VQO objectives; specifically, 6B as Modification (page IV-110) and 4B as Modification (page IV-110). However, the Fishlake NF has developed draft desired conditions for Scenic Integrity Objectives (SIO). The southern part of the analysis area on the Fishlake National Forest falls in areas with moderate and high draft SIOs (Figure 3.7).

The VQO of Modification accommodates management activities that may visually dominate the characteristic landscape. However, landform and vegetative alterations must borrow from naturally established form, line, color, and texture so as to blend in with the surrounding landscape character. The VQO of Partial Retention requires that management activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color, and texture must be reduced as soon after project completion as possible.

Physical and man-made features are evaluated within the context of the local physiographic character type in terms of three Variety Classes based on degrees of quality: A (Distinctive), B (Common), and C (Minimal). The Variety Classes in the analysis area include lands mapped as A, B, and C. Variety Class A is mapped along the Muddy Creek, Link, and Quitchupah Creek canyons. Variety Class B occurs where topography or other attributes enhance the landscape slightly, while Variety Class C occurs in the large sagebrush flats.

Public concern for scenic quality is assessed in terms of the number and type of users and the distance from which they view the landscape from travelways and use areas. Sensitivity Levels reflect the number and types of users. Level 2 (moderate) is the most common across the area where visitors have relatively easy access along the forest road network. Sensitivity Level 3 (seldom seen) is restricted to the Muddy Creek, Quitchupah, and Link canyons because fewer people access these areas. Distance zones are broken into three zones: foreground (0 to 0.5 miles), middleground (0.5 to 4 miles), and background (greater than 4 miles). Foreground views are the closest and most critical in terms of visitor sensitivity.
Figure 3.7. Visual quality assessment.
The Manti-La Sal portion of the analysis area is completely within the Range Management prescription (emphasis on Production of Forage) (Forest Service 1986a). The Fishlake portion of the analysis area is split between 4B Habitat for Management Indicator Species and 6B Intensive Livestock Management (Forest Service 1986b).

Relevant to this project, the Forest Plan for the Manti-La Sal National Forest (Forest Service 1986a) provides two levels of direction for VQO. The Forest-Wide General Direction for implementing VQO states that Forest resource uses or activities should meet the adopted VQO as displayed on the Planned Visual Quality Objective Map (III-17). The management unit direction for Range does not provide additional direction for visual resource management. However, the General Big Game Winter Range management unit direction does provide additional direction: “meet Forest Direction Visual Quality Objectives except where habitat improvement activities occur. Treated sites must be returned to the planned VQO within 10 years” (III-62).

### 3.11 RANGELAND RESOURCES

The analysis area for rangeland resources analysis includes the Greens Hollow tract and additional adjacent land that could be mined as part of the Greens Hollow tract (Area of Subsidence Mining), as shown on Figure 3.8 and totaling 8,887 acres. The analysis area also includes a 900-foot extended subsidence zone around the area that may be subject to mining that would encompass the subsidence impacts (Mining Analysis Area Boundary), bringing the total acreage considered in this analysis to 11,051 acres. The majority of the analysis area, 9,107 acres, lies within the Emery Cattle and Horse Grazing Allotment on the Manti-La Sal National Forest. A small parcel on the north is on the Ferron Cattle and Horse Grazing Allotment, also on the Manti-La Sal National Forest. A larger parcel on the south end of the analysis area lies within the Quitchupah Cattle and Horse Grazing Allotment on the Fishlake National Forest. Table 3.19 indicates the acreage of the analysis area within each of the three allotments.

<table>
<thead>
<tr>
<th>Allotment</th>
<th>Acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery allotment – MLNF</td>
<td>9,107</td>
</tr>
<tr>
<td>Quitchupah allotment – FLNF</td>
<td>1,714</td>
</tr>
<tr>
<td>Ferron allotment - MLNF</td>
<td>203</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,051</strong></td>
</tr>
</tbody>
</table>

### 3.11.1 EMERY ALLOTMENT

The management emphasis for most of the Emery Allotment according to the Forest Plan is forage production. There are small areas designated for timber production, but there are no plans for timber harvest at this time. The management goals specified in the allotment management plan (AMP; p. 3) for the Emery allotment (Forest Service undated) are:

1. Bring forage use in line with rangeland carrying capacity.
2. Maintain upward or stable trends in vegetation and soil condition.
3. Invest in range improvements where they will improve livestock and resource management.
4. Monitor riparian areas to determine the trend and uses and improve existing conditions.
5. Maintain a program to treat and control noxious weeds.
6. Perpetuate aspen and sagebrush communities.
7. Control unauthorized livestock use.
8. Monitor big game populations and their impact on the forage resource.
Figure 3.8. Greens Hollow range allotments.

Legend
- National Forest System Roads
- Greens Hollow Coal Lease Tract
- Area of Subsidence Mining
- Ferron Allotment
- Emery Allotment
- Quitchupah Allotment
- Mining Analysis Area Boundary
- Manti-La Sal/Fishlake Forest Boundary

1:82,000
The Emery allotment includes 31,305 acres that are suitable for grazing and 18,207 acres that have been identified by the agency as not suitable because of physical characteristics (e.g., topography or access) or other land use priorities (Forest Service 2004a). Suitable grazing lands within the allotment produce an estimated 6,441 animal unit months (AUMs) of forage. An AUM is the amount of forage necessary to support a 1000 pound cow for one month. This equates to an average of 4.9 acres per AUM. Twelve livestock operators are permitted to graze 1,387 cows with calves on the allotment from June 16 through September 30.

Cattle are trailed on and off the allotment via Link Canyon. No trailing is allowed in Muddy Creek due to the narrow bottom, lack of forage, and importance of the area as big game winter range. The allotment is managed under a five-unit deferred rest rotation grazing system as per an approved AMP. Annually the FS and livestock operators review the rotation schedule and document it in annual operating instructions (AOIs). Modifications to the allotment management plan are made in these AOIs as necessary based on annual water availability and forage production.

Long-term trend studies indicate that soil and vegetation conditions on the allotment as a whole are improving. The higher elevation portions are much more productive than lower lying areas. Soil trends are improving nonetheless (AMP, pp. 1 – 3). The coal tract generally lies at higher elevation, including portions of the Cowboy, Greens, and Mike’s Ridge units.

Costs of range improvement work are shared with benefiting permittees and cooperators such as the Division of Wildlife Resources and the Rocky Mountain Elk Foundation, in the form of labor or funding, as negotiated prior to project implementation. Vegetation manipulation efforts may require closure to grazing for periods up to three years following completion. (AMP, p. 7)

3.11.2 FERRON ALLOTMENT

The management emphasis for most of the allotment according to the Forest Plan is forage production. The management goals specified in the AMP (p. 2) for the Ferron allotment (Forest Service 1994) are:

1. Bring forage use in line with rangeland carrying capacity and continue to monitor capacity.
2. Maintain upward or stable trends in vegetation and soil condition.
3. Invest in range improvements where they will improve livestock and resource management.
4. Maintain winter elk habitat and reduce livestock/elk conflicts.
5. Monitor riparian areas to determine the trend and uses and improve existing conditions.
6. Maintain a program to treat and control noxious weeds.
7. Perpetuate aspen and sagebrush densities.
8. Control unauthorized livestock use.
9. Monitor big game populations and continue to make recommendations for numbers according to their impact on the forage resource.

The Ferron allotment includes 26,763 acres suitable for grazing and 41,869 acres considered unsuitable (Forest Service 2004b). Suitable lands within the allotment produce 7,463 AUMs of forage. This equates to an average of 3.6 acres per AUM. Sixteen permittees graze 1,607 cow/calf pairs from June 21 through October 5.

Trailing onto and off of the allotment is permitted via Hole Trail, Dry Wash, and Ferron Canyon Road. Trailing schedules are arranged prior to the entry date. The northern part of the allotment is managed under a four-unit rest rotation grazing system. The southern part is under a rest/deferred system (AMP, p. 4). The northern buffer zone around the Greens Hollow tract includes a small portion of the southern part of the allotment (Figure 3.8). The schedule of rotation is determined in the allotment management plan.
and documented in AOIs, based on water availability, forage production, and coordination with other resource management activities.

Long-term trend studies indicate that soil and vegetation conditions on the allotment as a whole are in a stable to upward trending condition. Some of the lower units are subject to sagebrush and conifer invasion that reduce forage production, but soil trends are still improving (AMP, p. 1). The coal tract extends into a portion of the Last Water unit.

3.11.3 QUITCHUPAH ALLOTMENT

The management emphases for the Quitchupah allotment include habitat for indicator species, livestock, and watersheds. The resource objectives specified in the AMP (p. 2) for the Quitchupah allotment (Forest Service 1977) are:

1. A minimum ground cover of 60 percent. Some areas of the allotment are capable of 100 percent cover and the goal will be to achieve the maximum possible for the specific location.
2. Avoid livestock use on bare ridge areas. Through management practices these ridge areas should be improved and eventually brought back into production.
3. Control duration and season of use by livestock in the respective units.
4. Provide proper maintenance of range developments.
5. Maintain big game populations at a level commensurate with capacity of winter range areas.

The coal tract and buffer extend into the northern portion of the Quitchupah allotment in the Fishlake National Forest. This allotment contains 27,985 acres, and provides 4,052 AUMs of forage (no information on suitability/unsuitability is available on this allotment). This equates to an average of 6.9 acres per AUM. Five permittees graze 813 cow/calf pairs on the allotment from June 11 through September 30.

Trailing on and off the allotment is permitted via Quitchupah Creek and Convulsion Canyon. The allotment is managed under a four-unit rest-rotation grazing system, with each unit receiving complete rest one out of every four years. The schedule of rotation is determined annually and documented in AOIs.

All indications are that the vegetation trend on the allotment is stable to upward. In terms of vegetation, it is one of the best allotments in the Richfield District of the FLNF (Tuttle 2008). The portion of the allotment in the analysis area generally lies at higher elevations (>8,300 feet), and is within the Quitchupah unit.

3.11.4 OTHER INFORMATION

The portion of the Emery allotment within the analysis area includes 6,243 acres suitable for grazing. Calculated as a proportion of the allotment’s total, the portion of the allotment in the analysis area produces approximately 1,551 AUMs of forage. The portion of the Ferron allotment in the analysis area includes 1,074 acres suitable for grazing, or about 30 AUMs of forage. The portion of the Quitchupah allotment in the analysis area includes 1,714 acres, or about 248 AUMs of forage.

In terms of livestock grazing, stock water is the limiting factor on these allotments. Both water developments and undeveloped springs and creeks provide water for livestock. Extensive development of spring-fed troughs, stock ponds, and pipelines has occurred over time, and these water developments are in various states of repair. Most remain functional or potentially functional. Spring-fed troughs, of which there are 13 in the analysis area, provide the most reliable sources of stock water (Table 3.20). These are
concentrated in the central portion of the analysis area, overlying the proposed mining. A pipeline system, the Greens Seeding pipeline (Improvement No. 202013), delivers water to multiple troughs at the north end of the tract.

Undeveloped springs and creeks also provide important water sources for grazing livestock. Undeveloped springs include both springs that have adequate flow for livestock to drink but have not been developed yet as well as springs that do not have sufficient flow to warrant development. The upper reaches of Cowboy Creek often provide adequate water for livestock grazing purposes without development.

Developed stock ponds and natural ponds probably provide more water but on a less reliable basis. There are eight developed stock ponds in the analysis area (Table 3.20). These ponds collect runoff from spring snowmelt and summer/fall rainstorms. As a result, the amount of water and spatial coverage they provide is highly dependent on climatic conditions. During the five years of drought which occurred in the early 2000’s, many of the stock ponds were periodically dry during the course of the grazing season. All stock ponds were empty during a July 2008 site visit. The presence of water in natural ponds throughout the summer is more likely influenced by the rate of ground water discharge than the ability to capture surface runoff. Although water levels in natural ponds were noted to decrease during the summer, few natural ponds dried up entirely. In regard to other range improvements, there are about 8.8 miles of fence in the analysis area.

<table>
<thead>
<tr>
<th>Improvement No.</th>
<th>Type</th>
<th>Name</th>
<th>Condition/Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>202007</td>
<td>Trough</td>
<td>Aspen Spring and Dugout Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>202011</td>
<td>Trough</td>
<td>Cowboy Trail #1</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202012</td>
<td>Trough</td>
<td>Cowboy Trail #2</td>
<td>Good</td>
</tr>
<tr>
<td>202014</td>
<td>Trough</td>
<td>Greens Seeding Trough #1</td>
<td>Good</td>
</tr>
<tr>
<td>202014A</td>
<td>Trough</td>
<td>Greens Seeding Trough #2</td>
<td>Good</td>
</tr>
<tr>
<td>202015</td>
<td>Trough</td>
<td>Greens Reseed Trough #1</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202018</td>
<td>Trough</td>
<td>Greens Hollow Trough</td>
<td>Good</td>
</tr>
<tr>
<td>202037</td>
<td>Trough</td>
<td>Cowboy Hollow Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>202037A</td>
<td>Trough</td>
<td>Cowboy Hollow Extension</td>
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</tr>
<tr>
<td>No Number</td>
<td>Trough</td>
<td>Cowboy hb Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>No Number</td>
<td>Trough</td>
<td>Big Ridge Spring and Trough</td>
<td>Not Rated</td>
</tr>
<tr>
<td>No Number</td>
<td>Trough</td>
<td>Dugout Trough</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202006</td>
<td>Trough</td>
<td>White Mountain Spring</td>
<td>Not Rated</td>
</tr>
<tr>
<td>M_SP02</td>
<td>Springbox</td>
<td>M_SP02</td>
<td>Good</td>
</tr>
<tr>
<td>M_SP08</td>
<td>Springbox</td>
<td>M_SP08</td>
<td>Not Rated</td>
</tr>
<tr>
<td>M_SP14</td>
<td>Springbox</td>
<td>M_SP14</td>
<td>Not Rated</td>
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<td>M_SP18</td>
<td>Springbox</td>
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<tr>
<td>No Number</td>
<td>Springbox</td>
<td>White Mountain Spring</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202017</td>
<td>Stock Pond</td>
<td>White Knolls</td>
<td>Fair</td>
</tr>
<tr>
<td>202033</td>
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<td>Greens Pasture Pond #1</td>
<td>Good</td>
</tr>
<tr>
<td>202036</td>
<td>Stock Pond</td>
<td>Greens Pasture #2</td>
<td>Fair</td>
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<tr>
<td>202038</td>
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<td>Green Pasture Pond</td>
<td>Good</td>
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<td>202040</td>
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<td>Cowboy Pond</td>
<td>Good</td>
</tr>
<tr>
<td>202044</td>
<td>Stock Pond</td>
<td>Greens Pasture #3</td>
<td>Fair</td>
</tr>
<tr>
<td>202048</td>
<td>Stock Pond</td>
<td>Greens Hollow Trough Pond</td>
<td>Good</td>
</tr>
<tr>
<td>Unassigned</td>
<td>Stock Pond</td>
<td>North tributary on S. Fork Quitchupah Cr.</td>
<td>Not Rated</td>
</tr>
</tbody>
</table>

Table 3.20. Stock water developments recorded in the Greens Hollow analysis area.
3.12 ROADLESS RESOURCES

3.12.1 BACKGROUND

The analysis area for the proposed Greens Hollow tract includes the Greens Hollow tract, and an approximate 900-foot extended subsidence zone around the potentially mined areas that could be affected by subsidence (Figures 1.3 and 1.4). The scope for the roadless analysis focuses specifically on the portions of the inventoried roadless areas (IRA) and the draft unroaded-undeveloped areas that occur within the Greens Hollow tract analysis area, but also considers the entire IRA units in terms of impact to each IRA.

3.12.1.1 Inventoried Roadless Areas

IRAs are those “areas identified in a set of inventoried roadless area maps contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, and any subsequent update or revision of those maps through the land management planning process which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps.” (36 CFR 294.11)

The term IRA refers to an area usually of at least 5,000 acres without developed and maintained roads, in a substantially natural condition. IRAs were initially identified during the Roadless Area Resource Evaluation of 1979 (RARE II). These inventories were updated and areas were re-evaluated as part of the forest planning effort in the mid 1980’s; as required by regulations (36 CFR 219.17 (a)(1)). However, the 1984 Utah Wilderness Act released the National Forest from the requirement to complete this evaluation until the forest plan revision process.

Areas containing less than 5,000 acres can be classified as IRAs if they do not contain forest roads or other permanently authorized roads and meet one of the following criteria: (1) areas can be preserved due to physical terrain and natural conditions, (2) area is a self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of wilderness, or; (3) areas are contiguous to existing wilderness, primitive areas, recommended wilderness, or potential wilderness in other Federal ownership regardless of their size.

The Roadless Area Conservation Rule was initially adopted in 2001 and is often referred to as the 2001 Roadless Rule. In general, the roadless rule prohibits “road construction, reconstruction, and timber harvest in inventoried roadless areas” on the grounds that those activities would result in “altering and fragmenting landscapes,” and create “immediate, long-term loss of roadless area values and characteristics” (Roadless Rule Record of Decision, 36 CFR 294, 66 Fed. Reg. 3244 (Jan. 12, 2001)). Since its adoption, the rule has been subject to opposing court decisions. Federal court actions considering the legality of the 2001 Roadless Rule have been resolved, allowing nation-wide implementation of the rule. FS direction for implementing the 2001 Roadless Rule include:

…(T)he Chief (of the Forest Service) will review all projects involving road construction or reconstruction and the cutting, sale, or removal of timber in those areas identified in the set of inventoried roadless area maps contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement Volume 2 dated November 2000 (Memo, Thomas Tidwell, Chief, May 31, 2012).

Under the Utah Wilderness Act enacted by Congress in 1984, IRAs identified under the RARE II inventory within the State of Utah were considered by Congress for designation as Wilderness Areas. Within the FLNF, no RARE II areas were designated as Wilderness Areas. On the MLNF, only the Dark
Canyon RARE II area on the Monticello Ranger District was designated as Wilderness. The Dark Canyon Wilderness area is distant from the analysis area. A number of other Wilderness Areas have been designated in the State of Utah on National Forest System (NFS) and Bureau of Land Management lands. However, these designated areas are also distant from the analysis area and would not be influenced by the proposed Greens Hollow tract lease.

The Utah Wilderness Acts released all other RARE II areas on NFS lands to other multiple-use management until the next planning cycle. The Utah Wilderness Act deferred further wilderness consideration until the next round of Land and Resource Management Plan revisions when the inventory of roadless areas and the need for additional wilderness could be reevaluated. However, these areas are now subject to the 2001 roadless rule management requirements. This analysis does not evaluate the Wilderness suitability (36 CFR 219.17 (a)(2)) of the IRAs that occur in the analysis area.

Areas designated as IRAs under the 2001 Roadless Rule have been evaluated on the six wilderness attributes that characterize wilderness potential and nine values or features identified in the Roadless Area Conservation Rule that characterize IRAs. Roadless area characteristics include:

- High quality or undisturbed soil, water, and air;
- Sources of public drinking water;
- Diversity of plant and animal communities;
- Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;
- Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation;
- Reference landscapes;
- Natural appearing landscapes with high scenic quality;
- Traditional cultural properties and sacred sites;
- Other locally identified unique characteristics.

Nationally, 58.5 million acres of NFS lands have been classified as IRAs. On the MLNF, 646,000 acres have been classified as IRAs while 713,000 acres on the FLNF have been thus classified (Forest Service 2008b). Mapping for IRAs is maintained at the Roadless Area Conservation website (http://roadless.fs.fed.us/). As noted above, activities on IRAs are subject to restrictions specified in the 2001 roadless rule.

**3.12.1.2 Draft Unroaded-Undeveloped Areas**

On the MLNF and FLNF, draft unroaded-undeveloped areas are areas that were identified as part of the inventory of potential wilderness areas during the forest plan revision process. Wilderness attributes were used to evaluate unroaded areas for wilderness potential. However, it should be noted that the forest planning process was not completed and the draft unroaded-undeveloped areas have no official status. Consequently, there is no policy, law, or directive guiding the management of unroaded and undeveloped areas that lie outside of IRAs or wilderness areas. Currently, the only guidance for these areas is general forest or management area direction. It is the intent of the Forest to manage these unroaded-undeveloped areas for multiple resource benefits while maintaining their undeveloped character to the extent possible.

**3.12.2 DESCRIPTION OF THE AFFECTED ENVIRONMENT**

The Greens Hollow tract encompasses portions of two IRAs, as shown on Figure 3.9. These include the Muddy Creek-Nelson Mountain IRA on the MLNF and the White Mountain IRA that occurs on both the MLNF and FLNF. Total acreage of the IRAs within the analysis area is 5,341 acres, or approximately 48
percent of the analysis area. In addition, the Wildcat Knolls IRA is located to the southeast of the Greens Hollow tract.

Table 3.21 summarizes the capability of the three IRAs as potential wilderness areas, as stated in the RAREII evaluation documentation for each IRA. The RAREII evaluation is an assessment of the degree to which an IRA contains the basic characteristics that make it suitable for wilderness.

Forest Plan Management Areas (Forest Service 1986a) on the Muddy Creek-Nelson Mountain IRA includes management prescription Range Forage Production (RNG) within the analysis area and General Big Game Winter Range (GWR) and Key Big Game Winter Range (KWR) outside the analysis area. The MLNF portion of the White Mountain IRA includes RNG within the analysis area and Wood Fiber Production and Utilization (TBR) outside the analysis area. The FLNF portion of the White Mountain IRA includes management areas 4B (wildlife habitat emphasis) and 6B (range management emphasis) within the analysis area (Forest Service 1986b). The Wildcat Knolls IRA includes RNG, GWR, and TBR. Management areas RNG, GWR, and TBR permit road construction for management uses while KWR does not. Figure 3.7 shows locations of the various management areas in the analysis area.

Table 3.21. Summary of the evaluation of capability of Inventoried Roadless Areas which occur in the analysis area as potential wilderness areas. a

<table>
<thead>
<tr>
<th></th>
<th>Wildcat Knolls</th>
<th>Muddy Creek-Nelson Mountain</th>
<th>White Mountain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (acres)</td>
<td>5,209</td>
<td>59,033</td>
<td>31,070</td>
</tr>
<tr>
<td>Manageability and Boundaries</td>
<td>Very Low</td>
<td>Very Low</td>
<td>Very Low</td>
</tr>
<tr>
<td>Natural Integrity/Appearance</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Opportunities for Solitude</td>
<td>Low</td>
<td>Low, but good in the Muddy Creek Drainage and on Nelson Mountain.</td>
<td>Low</td>
</tr>
<tr>
<td>Opportunities for Primitive Recreation</td>
<td>Low</td>
<td>Low, but good in the Muddy Creek Drainage and on Nelson Mountain.</td>
<td>Low</td>
</tr>
<tr>
<td>Challenging Experiences</td>
<td>Low</td>
<td>Limited to the Muddy Creek Drainage and Nelson Mountain.</td>
<td>Low</td>
</tr>
<tr>
<td>Special Features</td>
<td>None present. Watersheds provide irrigation for Emery.</td>
<td>Contains the Nelson Mountain Ecological Research Natural Area. Muddy Creek drainage provides some attractive canyon walls and related canyon features. Nelson Mountain provides a unique vegetative composition, containing several plant associations including large areas of curlleaf mahogany and old growth pinyon pine and juniper stands.</td>
<td>Known occurrences of Heliotrope milkvetch, (Astragalus montii), a federally listed threatened plant species. (Note that the IRA is much larger than the Greens Hollow tract analysis area. Consequently, this habitat does not occur in the analysis area.) Prospective Research Natural Area. Watersheds provide irrigation and municipal water for Emery and Salina.</td>
</tr>
</tbody>
</table>

a These ratings are summarized from the RAREII evaluations.
Figure 3.9. Inventoried roadless areas.

Legend
- National Forest System Roads
- Greens Hollow Coal Lease Tract
- Area of Subsidence Mining
- Mining Analysis Area Boundary
- Manti-La Sal/Fishlake Forest Boundary
- Inventoried Roadless Area (IRA)
  - Muddy Creek - Nelson Mt. IRA
  - White Mountain IRA
  - Wildcat Knolls IRA
- Unroaded-Undeveloped
  - Horse Creek
  - Muddy Creek
  - White Mountain
The Greens Hollow analysis area includes parts of the White Mountain and Muddy Creek-Nelson Mountain draft unroaded-undeveloped area as shown on Figure 3.9. Combined, these units represent approximately 57 percent of the analysis area, or approximately 6,259 acres.

Table 3.22 summarizes the capability of the draft White Mountain and Muddy Creek-Nelson Mountain unroaded-undeveloped areas. This summary is based on the assessment during the forest plan revision process (which was not completed) to determine the degree to which the area contains basic characteristics that make it suitable for wilderness.

<table>
<thead>
<tr>
<th></th>
<th>White Mountain</th>
<th>Muddy Creek-Nelson Mountain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (acres)</td>
<td>15,575</td>
<td>34,173</td>
</tr>
<tr>
<td>Manageability and Boundaries</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Natural Integrity/Appearance</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Opportunities for Solitude</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Opportunities for Primitive Recreation</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Challenging Experiences</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Special Features</td>
<td>Known occurrences of Heliotrope milkvetch (<em>Astragalus montii</em>), a federally listed threatened plant species. (Note that the draft unroaded-undeveloped area is much larger than the Greens Hollow tract analysis area. Consequently this habitat does not occur in the analysis area.)</td>
<td>Contains the Nelson Mountain Ecological Research Natural Area. Muddy Creek drainage provides some attractive canyon walls and related canyon features. Nelson Mountain provides a unique vegetative composition, containing several plant associations including large areas of curlleaf mahogany and old growth pinyon pine and juniper stands.</td>
</tr>
</tbody>
</table>

**3.13 AIR QUALITY**

The air quality evaluation includes review of the Manti-La Sal Coal Tracts Air Quality Evaluation Muddy Creek Technical Report (MESI 2004), the area of significant impacts based on stationary and mobile sources, and potential receptors within a 100-kilometer (62 mile) radius of the surface facility. The air quality of a given airshed or region is determined by the topography, meteorology, location of air pollutant sources, and type, quantity, and combination of air pollutants. The calculated or measured concentrations of various pollutants are compared to established standards to evaluate the impact of a given source and to evaluate regional air quality.

Because the proposed action falls within the Muddy Creek Tract analysis area and will be part of the permitted facility, this analysis relies on the previous analysis performed for the Muddy Creek Tract (MESI 2004). This review revises/updates that analysis to evaluate the impacts from the proposed Greens Hollow tract.
The following sections address the local weather and climate, the air quality regulatory requirements, and the air quality of the affected environment. Air quality and atmospheric conditions in the vicinity of the analysis area have been previously studied and reported and are taken from the Muddy Creek air quality report (MESI 2004).

3.13.1 CLIMATE

Utah’s weather and climate are governed by altitude, latitude, and location with respect to major mountain chains. These climate characteristics affect the dispersion potential of air emissions from the proposed project. The main chain of the Rocky Mountains presents a barrier from cold Arctic weather, experienced by the northern plains, while the Sierra Nevada and Cascade Mountains often prevent low level moisture from Pacific storms from reaching Utah. The proximity to the Wasatch Range and Plateau exerts a strong influence. The prevailing winds are westerly. Storms moving into Utah from the west impact against the high Wasatch and south central mountains, causing orographic lifting which squeezes out moisture that otherwise would pass over the area. These mountain chains also act as barriers to air mass flow and are responsible for areas to the east being arid. Areas east of the Wasatch Range are characterized by hot, dry summers, and cold dry winters. (Forest Service 1999).

Synoptic flow dominates the airflow on the mesa. In the absence of strong prevailing winds, wind movement within the valleys, canyons, and gulches is extremely complex. The terrain features suggest that there is a daily exchange of downslope and upslope flows oriented along the valley axis, which are controlled by surface heating and cooling. Downslope, or drainage flows, which last longer, occur during the evening, night and early morning hours, while the upslope flows occur during mid-day during the warmest part of the day. Significant diurnal drainage flows can be expected within the analysis area. Drainage flows (slope and valley winds) are likely with local geological features and may be accompanied by temperature inversions (Forest Service 1999).

Air temperatures vary considerably both diurnally and annually throughout the area and can vary greatly depending on elevation as evidenced by monitoring data. Temperature, as recorded at the Salina Station, located about 25 miles west of the analysis area has annual normal highs and lows ranging from 66.3 to 32.4 degrees F, respectively, with July being the hottest month (Forest Service 1999). At a higher elevation, recorded temperatures at Hiawatha, located about 46 miles northeast of the analysis area, has annual normal highs and lows ranging from 56.7 to 33.9 degrees F (NOAA 1980).

Temperature data collected at the SUFCO facility over a ten year period show annual normal highs and lows ranging from 53.8 to 31.2 degrees F, respectively (SUFCO 2003). The SUFCO facility is at a higher elevation than both Salina and Hiawatha.

According to Hiawatha data, average annual rainfall is 14.1 inches (NOAA 1980). This compares well with the SUFCO data which show average annual precipitation of 13.8 inches (SUFCO 2003).

Complete meteorological data at the proposed facility are not available. Data recorded from 1997 through 1999 at the Hunter Power Station (Hunter 2003), located near Castle Dale, Utah are considered representative of the project location and these data comprise the only meteorological data set available for air dispersion modeling in the vicinity of the project.

Wind data collected from the Hunter Power Station are consistent with previous studies and suggest air movements are predominantly from the northwest and west. The data indicate that the average wind speed is 2.9 meters per second (5.6 knots), the winds rarely exceed 11.1 meters per second (21.6 knots) and 35 to 40 percent of the winds are less than 1.8 meters per second (3.5 knots).
3.13.2 Regulatory Requirements

3.13.2.1 National Ambient Air Quality Standards (NAAQS)

The United States Environmental Protection Agency (USEPA) established National Ambient Air Quality Standards (NAAQS) for six pollutants known as “criteria” pollutants. They are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), lead (Pb), sulfur dioxide (SO₂), and particulate matter (PM) defined as fine particulates with an aerodynamic diameter of 10 micrometers or less (PM₁₀) as well as fine particulates with an aerodynamic diameter of 2.5 micrometers or less (PM₂.₅). The primary standards for the criteria pollutants are “health effects” standards. That is, they are set at levels to protect the health of the most susceptible individuals in the population: the very young, the very old, and those with respiratory problems or other ailments. The USEPA also established secondary standards for the criteria pollutants. These are the “quality of life standards” that are the same as, or less stringent than, the primary standards. All of the standards are expressed as concentration and duration of exposure and most address both short-term and long-term exposure. NAAQS for the criteria pollutants are presented in Table 3.23. In addition, the USEPA has provided the significant impact levels (SIL) which are based on the averaging time of each pollutant. These levels are used to estimate whether or not a significant impact is predicted in the Prevention of Significant Deterioration (PSD) Class I and nonattainment areas (USC 1990).

When a designated air quality area or airshed within a state exceeds a NAAQS, that area may be designated as a “nonattainment” area. Areas in which levels of a criteria pollutant measure below the health-based standard are designated as “attainment areas.” It is possible for a geographic area to be an attainment area for one criteria pollutant, but a nonattainment area for another. To determine whether an area meets the NAAQS, air-monitoring networks have been established and are used to measure ambient air quality. Monitoring sites, by design, are located in areas where high concentrations within a region are expected to occur.

3.13.2.2 Class I Areas and Class II Areas

Clean air designations were established under the federal Clean Air Act (CAA) Title I, Part C, “Prevention of Significant Deterioration of Air Quality”. Generally, the Class I air quality/land use classification is the designation for clean, pristine airsheds and would permit little or no development, and the Class II designation is applied to all other clean air areas (in attainment of the NAAQS) where development is permitted under the authority of the state. Class I areas include national parks larger than 6,000 acres, national wilderness areas greater than 5,000 acres, and international parks and national memorial parks that exceed 5,000 acres. Except for fires and wind erosion, the only potential for adverse air quality impacts is from anthropogenic pollutants transported into these areas by gradient and/or local winds. Areas in the country that have ambient air quality concentrations greater than those specified in the NAAQS are designated as nonattainment areas; the remainder of the country is designated Class II.

3.13.2.3 Prevention of Significant Deterioration (PSD)

In addition to the NAAQS discussed above, the USEPA promulgated PSD regulations to further protect and enhance air quality. The PSD provisions use an incremental approach and are intended to help maintain good air quality in areas that attain the national standards and to provide special protections for national parks. These increments establish the maximum increase in pollutant concentration allowed above a baseline level. Complete consumption of an increment would impose a restriction to growth for the affected area. It does not necessarily indicate an adverse health impact. PSD permits are required for major new stationary sources of emissions that emit 250 tons (100 tons for some specific sources) or more per year of an air pollutant. The maximum allowable PSD increments over baseline are displayed in Table 3.24.
### Table 3.23. USEPA National Ambient Air Quality Standards (NAAQS), Significant Impact Levels (SIL) and Recorded Concentrations.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Standard Value[a,f]</th>
<th>SIL</th>
<th>Recorded Concentration[c]</th>
<th>Location[c]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide (CO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-hour Average</td>
<td>9 ppm (10 mg/m³) b</td>
<td></td>
<td>1150 µg/m³ (estimate)</td>
<td>Sanpete/Sevier Counties c</td>
</tr>
<tr>
<td>1-hour Average</td>
<td>35 ppm (40 mg/m³) b</td>
<td>500 µg/m³</td>
<td>1150 µg/m³ (estimate)</td>
<td></td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO₂)</td>
<td>0.053 ppm (100 µg/m³) b</td>
<td>1 µg/m³</td>
<td>10 µg/m³ (estimate)</td>
<td>Sanpete/Sevier Counties c</td>
</tr>
<tr>
<td>Annual Arithmetic Mean</td>
<td>0.1 ppm (188 µg/m³) b</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>1-hour Average</td>
<td></td>
<td>2000 µg/m³</td>
<td>1150 µg/m³ (estimate)</td>
<td></td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>0.12 ppm g</td>
<td>NA</td>
<td>0.094 ppm</td>
<td>Canyonlands NP 4th Max i</td>
</tr>
<tr>
<td>1-hour Average</td>
<td>0.075 ppm</td>
<td>NA</td>
<td>0.072 ppm</td>
<td></td>
</tr>
<tr>
<td>8-hour Average</td>
<td></td>
<td>10 µg/m³ (estimate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>1.5 µg/m³</td>
<td>NA</td>
<td>0.08 µg/m³</td>
<td>Salt Lake County d</td>
</tr>
<tr>
<td>Particulate &lt; 10 micrometers (PM₁₀)</td>
<td>Revoked e</td>
<td>NA</td>
<td>29.2 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Annual Arithmetic Mean</td>
<td>150 µg/m³</td>
<td>5 µg/m³</td>
<td>78 µg/m³</td>
<td></td>
</tr>
<tr>
<td>24-hour Average</td>
<td></td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulate &lt; 2.5 micrometers (PM₂₅)</td>
<td>12 µg/m³</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Arithmetic Mean-P</td>
<td>15 µg/m³</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Arithmetic Mean-S</td>
<td>35 µg/m³</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-hour Average</td>
<td></td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂)</td>
<td>0.03 ppm (80 µg/m³) b</td>
<td>1 µg/m³</td>
<td>5 µg/m³ (estimate)</td>
<td>Sanpete/Sevier Counties c</td>
</tr>
<tr>
<td>Annual Arithmetic Mean</td>
<td>0.14 ppm (365 µg/m³) b</td>
<td>5 µg/m³</td>
<td>10 µg/m³ (estimate)</td>
<td></td>
</tr>
<tr>
<td>24-hour Average</td>
<td>0.5 ppm (1300 µg/m³) b</td>
<td>25 µg/m³</td>
<td>20 µg/m³ (estimate)</td>
<td></td>
</tr>
<tr>
<td>3-hour Average (secondary)</td>
<td>0.075 ppm (195 µg/m³) b</td>
<td>3 ppb b</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>1-hour Average</td>
<td></td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[a] CO – primary standard; NO₂, O₃, Pb, and PM – primary (P) and secondary (S) standards; SO₂ – Arith. Mean and 24-hr avg. are primary standards, 3-hr avg. is a secondary standard.

[b] Parenthetical value is an approximately equivalent concentration in micrograms per cubic meter, with the exception of carbon monoxide which is in milligrams per cubic meter.


[g] Applies only in limited areas; as of June 15, 2005, EPA revoked the 1-hr ozone standard in all areas except the fourteen 8-hr ozone nonattainment Early Action Compact (EAC) Areas. The proposed project is not in an EAC area. CFR 2008.

[h] FR 2013a – primary and secondary standards. The SILS for PM₂₅ have not been finalized.


[j] Utah DEQ 2008. PM₂₅ data for rural areas are not available.

[k] USEPA 2010, SO₂ interim SIL.

[l] FR 2010a. The annual and 24-hour standards were revoked on June 2, 2010.

### 3.13.3 Background Air Quality and Regional Sources

Coal is currently mined at the SUFCO mine by Canyon Fuel Company, LLC with a current permitted production of 10 million tons per year (Utah DEQ 2006). The allowable emissions from this source, as stated in approval order DAQE-AN0665008-06 issued by the Utah Department of Air Quality, are presented in Table 3.25. While there are no short term permit limits, the PM₁₀ emission limit of 20.19 tons per year is about 4.6 lb/hr PM10 on an annual average basis. These emissions are small compared to the other regional sources. Air quality in the area is affected by emissions from this existing mine, trucks used in hauling the coal, and two power plants in the area: the Hunter Power Plant located near Castle...
Dale and the Huntington Power Plant located in Huntington. Regional air quality may occasionally be impacted by the Carbon Power Plant located in Helper, however, due to its distance and proximity to the analysis area, this facility would be expected to have a lower air quality impact. All three power plants have state issued Title V Air Quality Permits (Utah DEQ 2000). Other potential local sources of air pollution include minor point sources, automobiles, trains, generators, and wood stoves/fireplaces (in the winter). These sources typically generate CO, NO\textsubscript{2} and other nitrous oxides, volatile organic carbons (VOC), and PM\textsubscript{10}. Additionally, ozone, a highly reactive form of oxygen, forms when nitrogen oxides (NO\textsubscript{x}) and VOC emissions from these sources react with sunlight. With the removal of leaded gasoline in the marketplace, and the absence of industries such as nonferrous smelters and battery plants, airborne lead pollution is not an issue of concern in the area. In fact, lead is currently monitored only in Salt Lake County, Utah (Utah DEQ 2009).

### Table 3.24. Prevention of Significant Deterioration (PSD) of Air Quality Increments: Maximum Allowable Increase (μg/m\textsuperscript{3}).

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Class I</th>
<th>Class II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate as PM\textsubscript{10}</td>
<td>24 hour</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Particulate as PM\textsubscript{2.5}</td>
<td>Annual</td>
<td>1 \textsuperscript{a}</td>
<td>4 \textsuperscript{a}</td>
</tr>
<tr>
<td></td>
<td>24 hour</td>
<td>2 \textsuperscript{a}</td>
<td>9 \textsuperscript{a}</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>Annual</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>24 hour</td>
<td>5</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>3 hour</td>
<td>25</td>
<td>512</td>
</tr>
<tr>
<td>NO\textsubscript{2}</td>
<td>Annual</td>
<td>2.5</td>
<td>25</td>
</tr>
</tbody>
</table>

\textsuperscript{a} FR 2010b.

### Table 3.25. Sources Near Capitol Reef National Park Class I Area (WRAP 1996, Utah DEQ 2006).

<table>
<thead>
<tr>
<th>Facility</th>
<th>VOC</th>
<th>NO\textsubscript{x}</th>
<th>SO\textsubscript{2}</th>
<th>PM\textsubscript{10}</th>
<th>PM\textsubscript{2.5}</th>
<th>NH\textsubscript{3}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermountain Generation Station (Delta, UT)</td>
<td>0.4</td>
<td>19,688.3</td>
<td>3,758.8</td>
<td>100.5</td>
<td>19.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Southwestern Portland Cement</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Navajo Power Plant (Page, AZ)</td>
<td>196.4</td>
<td>25,244.6</td>
<td>63,878.3</td>
<td>1,560.7</td>
<td>708.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Escalante Micro Enr.</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Bentonite Production</td>
<td>0.3</td>
<td>2.6</td>
<td>0.5</td>
<td>3.1</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Redmond Clay And Salt Co., Inc. (Redmond, UT)</td>
<td>0.5</td>
<td>4.3</td>
<td>0.4</td>
<td>2.9</td>
<td>2.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Cox Rock Products - Mt Pleasant Concrete</td>
<td>0.1</td>
<td>0.3</td>
<td>0.0</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Cox Rock Products - Centerfield Plant</td>
<td>4.5</td>
<td>7.6</td>
<td>3.7</td>
<td>3.4</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Mountain Fuel - Indianola Compressor Station</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Nuclear Fuel Service (southeast of Capitol Reef)</td>
<td>8.0</td>
<td>100.0</td>
<td>17.0</td>
<td>4.4</td>
<td>3.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Hunter Power Plant (Castle Dale, UT)</td>
<td>125.5</td>
<td>19,241.9</td>
<td>6,279.3</td>
<td>1,438.0</td>
<td>583.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Huntington Power Plant (Huntington, UT)</td>
<td>87.7</td>
<td>15,226.7</td>
<td>12,620.5</td>
<td>856.9</td>
<td>341.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Carbon Power Plant (Helper, UT)</td>
<td>19.5</td>
<td>3,345.3</td>
<td>4,918.3</td>
<td>115.8</td>
<td>38.8</td>
<td>0.7</td>
</tr>
<tr>
<td>East Carbon Landfill (East Carbon, UT)</td>
<td>221.7</td>
<td>119.6</td>
<td>14.3</td>
<td>11.4</td>
<td>10.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Mustang Unit (southeast corner of Utah)</td>
<td>1.8</td>
<td>1.5</td>
<td>0.0</td>
<td>0.7</td>
<td>0.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Moab Compressor Station (Moab, UT)</td>
<td>17.1</td>
<td>470.4</td>
<td>0.0</td>
<td>2.3</td>
<td>2.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Wood Furniture Mfg. Facility (northeast of Capitol Reef)</td>
<td>44.9</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Canyon Fuel Co, SUFCO Mine (Sevier County, UT)</td>
<td>4.61</td>
<td>63.52</td>
<td>5.25</td>
<td>20.19</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
The analysis area is classified as attainment for all criteria pollutants. No state monitoring stations exist near the analysis area, background air quality levels, therefore, are based on data from surrounding areas and information provided by the state (Utah DEQ 2008). Table 3.23 presents locally recorded concentrations.

The location of the Greens Hollow tract is designated as a Class II area for the criteria pollutants. The Capitol Reef National Park is 43 kilometers (27 miles) from the analysis area and is the only Class I area within 100 kilometers (62 miles). There are many regional sources that may impact the Capitol Reef Class I area. Table 3.25 lists point source emissions within 50 kilometers (31 miles) of Capitol Reef. This table lists Minor Sources (emissions less than 100 tons per year of an air pollutant), Title V Major Sources (emissions greater than 100 tons per year of an air pollutant), and PSD Sources (emissions greater than 250 tons per year of an air pollutant) as they existed during a 1996 study. PSD sources are normally considered to have the potential for significant impact and more restrictive permitting requirements are generally imposed. The largest contributors to air pollutant emissions in the region around Capitol Reef are power plants and generating stations. The Hunter Power Plant near Castle Dale, which is also close to the analysis area, emitted over 19,000 tons per year of NOx and over 1,400 tons per year of PM10. (WRAP 1996).

Ambient air pollution concentrations in some rural areas are rising as evidenced by recent ozone and PM2.5 monitoring in the Uintah Basin. The locations, however, appear to be tied to oil and gas operations within the Uintah Basin (UDAQ 2010). The Greens Hollow tract is not in the counties monitored in the study and is removed from oil and gas operations. To better track air pollution trends in rural areas, the UDAQ, BLM, and USFS are deploying new monitors; however, data are not currently available (UDAQ 2010).

The existing SUFCO mine operation is permitted as a Minor Source with emissions less than 100 tons per year; therefore, it is neither subject to Title V Major Source permitting rules nor the PSD program. The Hunter and Huntington Power Plants are permitted under the PSD Program because they have emissions exceeding 250 tons per year (Utah DEQ 2000).

3.13.4 AIR QUALITY RELATED VALUES

The USFS identified Air Quality Related Values (AQRV) to be protected in National Forest Class I areas. AQRVs are scenic, cultural, physical, biological, ecological, or recreational resources which may be affected by a change in air quality as defined by the Federal Land Manager for federal lands. The specific AQRVs of concern are dependent on a number of variables including the evolving state of the science, project-specific pollutants, site-specific management concerns, and the existing condition of the AQRVs.

3.13.4.1 Visibility

Visibility is the degree to which the atmosphere is transparent to visible light. It is an important air quality value, particularly in scenic and recreational areas. Scenic vistas in most U.S. parklands can be diminished by haze that reduces contrast, dilutes colors, and reduces the distinctness or visibility of distant landscape features. Visibility degradation in National Park Lands and Forests is a consequence of broader, regional-scale visibility impairment from visibility-reducing particles and their precursors often carried long distances to these remote locations.

Sulfates, organic matter, elemental carbon (soot), nitrogen compounds, soil dust, and their interaction with water cause most anthropogenic visibility impairment. The causes and severity of visibility impairment vary over time and from one place to another, depending on meteorological conditions, sunlight, and the size and proximity of emission sources.
Visibility protection requirements are included in USEPA PSD regulations requiring protection of AQRVs for Class I areas. A change in contrast of not more than 5 percent at sensitive view areas is considered acceptable. As discussed in the previous section, the Capitol Reef National Park Class I Area is in close proximity to the analysis area.

The state of Utah has addressed both visibility and regional haze in the Class I areas in two state implementation plans (SIP). The Visibility Protection SIP (Utah 1993) addresses visibility protection of Utah’s natural features and uses a two phased approach. The first phase was to implement a visibility monitoring strategy and to consider direct plume impacts on visibility from proposed new sources. The second phase addressed the development of a long-term plan to show progress toward national visibility protection goals. This document is still in force but has not been revised since 1993.

More current information is available in the Regional Haze SIP (Utah 2011). This document contains measures addressing regional haze visibility impairment to ensure the state makes reasonable progress toward national goals. The state has implemented long term strategies to reduce regional haze resulting from various air pollution sources. For the majority of Class I Areas in the region, stationary source NO\textsubscript{x} and PM emissions are not considered a major contributor to visibility impairment on the average 20 percent best and 20 percent worst days, although, on some of the worst days, nitrates and PM are the main components of visibility impairment. Pollutant projections affecting regional haze include:

- Reduction in sulfur dioxide emissions from stationary sources.
- Four percent increase in stationary source NO\textsubscript{x} emissions between 1996 and 2018.
- Twenty-nine percent increase in stationary PM emissions between 1996 and 2018.
- Visibility improvement for the 20 percent best and worst days for each of the Class I areas in Utah from the base year 1996 to the year 2018.

### 3.13.4.2 Acid Rain

Air pollution produced when acid chemicals are incorporated into rain, snow, fog or mist is generally referred to as acid rain. The acid in the rain comes from sulfur oxides, and nitrogen oxides, products of burning coal and other fuels and from certain industrial processes.

Acid rain sources in the region include the Hunter Power Plant (Phase II Acid Rain Source), the Huntington Power Plant (Phase II Acid Rain Source), and the Carbon Power Plant (Phase II Acid Rain Source that has been issued a Phase I Acid Rain permit by USEPA for early NO\textsubscript{x} reduction) (Utah DEQ 2000). The Acid Rain provisions for these facilities refer to coal-fired utility units that are subject to an Acid Rain emissions limitation or reduction requirement for SO\textsubscript{2} under the Clean Air Act.

While there are significant acid rain sources in the region, the proposed project is not considered a significant acid rain source and therefore, this is not an important air quality issue for the project.

### 3.13.4.3 Flora and Fauna

Pollutant emissions from larger point sources may impact flora and fauna at the Class I areas, however, the sensitivity of ecosystem response to increased pollutant emissions from these particular sources is not well documented. Because emissions from the proposed project are anticipated to be a small percentage of the existing regional sources, an in depth review of these regional sources was not performed.

### 3.13.5 General Conformity

In an effort to eliminate or reduce the severity and number of violations of the NAAQS in nonattainment areas and to achieve expeditious attainment of the NAAQS, the USEPA promulgated the Conformity Rule (CFR 1993). The Conformity Regulations apply to federal actions and environmental analyses, in
nonattainment areas, completed after March 15, 1994. These regulations contain a variety of substantive and procedural requirements to show conformance with both the NAAQS and State Implementation Plans. The nonattainment/maintenance areas in Utah (Utah 2010) are:

- **PM\textsubscript{10}:** Salt Lake and Utah Counties, and Ogden City (Weber County). Re-designations are pending for all three locations.

- **PM\textsubscript{2.5}:** Part of Utah County, Part of Cache County in Utah (extends into Franklin County Idaho), Salt Lake, Davis, and parts of Weber, Box Elder, and Tooele Counties.

- **SO\textsubscript{2}:** Salt Lake County and East Tooele County (above 5,600 feet). Re-designation is pending for Salt Lake County.

- **CO:** Ogden City (maintenance area re-designated 2001); Salt Lake City (maintenance area re-designated 1999); Provo/Orem in Utah County (maintenance area re-designated 2006).

- **Ozone:** Davis and Salt Lake Counties (maintenance areas re-designated 1997).

The Greens Hollow tract is located in Sevier and Sanpete Counties and is near Emery County. All three of these counties are in attainment of the NAAQS for all criteria pollutants as defined under the USEPA National Ambient Air Quality Standards.

### 3.13.6 Ventilation Emissions

#### 3.13.6.1 Air Methane

The exhaust air from underground coal mines known as ventilation-air methane (VAM) is the largest source of coal mine methane, accounting for about half of the methane emitted from coal mines in the United States. Typical VAM concentrations are from 0.3 to 1.5 percent, which makes its beneficial use difficult. New technologies have emerged in recent years to harness the dilute methane in VAM exhaust systems; however, they face technological, operational and financial challenges. One such technology is oxidation, which captures energy during the conversion of methane to electricity (COSPP 2007). Some oxidizer technologies have been shown to be self-sustaining at very dilute methane concentrations greater than 0.2 percent (Consol 2008). Methane concentrations recorded at the existing SUFCO mine are in the range of 0.01 to 0.03 percent in the exhaust gas at several vent locations (USDL 2007). These concentrations are at levels that would be infeasible to capture and utilize given current technologies.

The current amount of methane produced at the SUFCO Mine is 1,950 tons per year based on 2007 sampling (USDL 2007). This estimate assumes year-round operation and continuous steady state venting and is based on direct mine vent emissions only (includes mining process and underground equipment air methane emissions) and does not include the indirect emissions from the end use of the coal produced. A margin was added to account for operational variability so this is considered to be a conservative estimate. No standards currently exist to compare to this amount of methane production.

#### 3.13.6.2 CO\textsubscript{2}

The exhaust air from underground coal mines also includes CO\textsubscript{2} from equipment operation. The current amount of CO\textsubscript{2} produced at the SUFCO Mine is 58,549 tons per year based on 2007 sampling (USDL 2007). This estimate assumes year-round operation and continuous steady state venting and is based on direct mine vent emissions only (includes mining process and underground equipment CO\textsubscript{2} emissions) and does not include the indirect emissions from the end use of the coal produced. A margin was added to account for operational variability so this is considered to be a conservative estimate. No standards currently exist to compare to this amount of CO\textsubscript{2} production.
3.13.6.3 Nonmethane Organic Compounds

There are no compositional analyses for the existing vented emissions. Nonmethane organic compounds (NMOCs) were calculated based on 2007 sampling (USDL 2007) in conjunction with the average composition of gas from coalbeds in the western U.S. (Duel 1988) with a margin added to account for operational variability. The result is 2.5 tons per year NMOC. The majority of the total NMOC is ethane (2.1 tons per year) with the remainder being propane and butane (0.4 tons per year combined).

3.13.7 GLOBAL CLIMATE CHANGE

3.13.7.1 Greenhouse Gases

Many chemical compounds found in the earth’s atmosphere act as greenhouse gases. These gases absorb infrared radiation and trap its heat in the atmosphere. Many gases exhibit greenhouse gas properties; some occur naturally and some are produced by anthropogenic (human) activities. The study of global climate change is complex as there are many factors that may contribute to changes in the earth’s temperature, including the emission of greenhouse gases as well as the earth’s ability to remove these gases from the atmosphere through mechanisms such as photosynthesis and ocean uptake among others. The most abundant greenhouse gas is water vapor. The predominant greenhouse gases emitted in the United States are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. In the United States, anthropogenic greenhouse gas emissions come primarily from burning of fossil fuels. Energy related CO₂ emissions from the combustion of petroleum, coal, and natural gas account for 81% of total US anthropogenic greenhouse gas emissions in 2008. “Although the industrial sector is the largest consumer of energy (including direct fuel use and purchased electricity), the transportation sector emits more carbon dioxide because of its near complete dependence on petroleum fuels”. (USDOE 2010).

Anthropogenic methane emissions from landfills, coal mines, oil and natural gas operations, and agriculture account for 11 percent of total emissions. Nitrous oxide emitted through fertilizers, burning fossil fuels, and from industrial and waste management processes, accounts for 4 percent of total emissions. Several human-made gases account for 3 percent of the total. (USDOE 2010).

Greenhouse gas inventories are usually reported in terms of “CO₂ equivalents” to account for the relative global warming potential (GWP), or a given pollutant’s ability to trap heat. For example, methane has a GWP of 25, meaning it is 25 times more effective at trapping heat than CO₂. Nitrous oxide has a GWP of 298 meaning it is 298 times more effective at trapping heat than CO₂. The hydrofluorocarbons range from 11 to 14,900 GWP, while the perfluorinated compounds range from 7,500 to 17,340 GWP (FR 2013b).

There are many regional sources that may contribute to global climate change, including those sources presented in Table 3.25. It is likely that all of the sources discussed above for the U.S. as a whole would be found within the vicinity of the analysis area or within the state of Utah. Ventilation emissions directly associated with the existing mine are discussed above in section 3.13.6. At the current time, most of the coal from the SUFCO Mine is burned in Utah for electricity generation. Some is also used for home heating, producing cement, for export, and for other industrial uses. The user of the coal is responsible for complying with all applicable laws and regulations. The following is what is known about air quality related to coal production and use in Utah, especially that related to coal from the existing SUFCO Mine.

The annual coal production from the SUFCO Mine is approximately 10 million tons (permitted, actual is about 7 million tons) with a heat content of 11,400 BTU/lb coal (UP 2010). The annual worldwide coal production is approximately 7.5 billion tons (EIA 2009). The coal produced by SUFCO would therefore be expected to constitute approximately 0.1 percent of the total worldwide production. Because heat content varies by the coal’s BTU and chemical properties, there is not a constant relationship between the
amount of coal burned and the emissions produced; however, the percent of emissions from burning the coal would be expected to be of similar magnitude. More complete data are available for US coal production. The annual US coal production in 2008 was 1.2 billion tons (EIA 2010), with an average heat content of 10,104 BTU/lb coal (EIA 2010). The coal from the SUFCO mine would therefore represent approximately 0.9 percent of the total U.S. coal production but account for about 1 percent of the energy from burning coal. The difference is due to the slightly higher heat value of the SUFCO coal as compared to the U.S. average.

The existing SUFCO mine supplies about four million tons of coal per year to the Hunter Power Plant, making the Hunter Plant the largest consumer of coal from the mine. For informational purposes, data from that plant are provided below to illustrate the potential magnitude of emissions that may occur from the combustion of the coal produced. The remainder of the coal is transported to a rail head in Levan, Utah, and from there to multiple end users. The ultimate consumption of future coal produced is subject to change.

Based on emission inventory data, the following emissions are produced in the Hunter Power Plant (Pacificorp 2001), per ton of coal burned. These emissions are based on actual reported emissions and are expected to continue for the life of the plant regardless of the outcome of the proposed action.

<table>
<thead>
<tr>
<th>Emission</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>4,810 pounds</td>
</tr>
<tr>
<td>Methane</td>
<td>0.04 pounds</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>0.08 pounds</td>
</tr>
<tr>
<td>Hydrofluorocarbons</td>
<td>No emission factor available</td>
</tr>
<tr>
<td>Perfluorocarbons</td>
<td>No emission factor available</td>
</tr>
<tr>
<td>Sulfur hexafluoride</td>
<td>None</td>
</tr>
</tbody>
</table>

### 3.13.7.2 Black Carbon

Black carbon is a form of particulate air pollution and is a by-product of incomplete combustion of fossil fuels, biofuels, and biomass. It has recently emerged as a major contributor to global climate change. It has a relatively short residence time in the atmosphere (about one to four weeks), so its affects are strongly regional. It acts as a warming agent in two ways: in air, black carbon absorbs sunlight and generates heat in the atmosphere; when deposited on snow and ice, it absorbs sunlight, generating heat. Different types of soot contain different amounts of black carbon. Generally, the blacker the soot, the more of a warming agent it is. Fossil fuel and biofuel soot are blacker than soot from biomass burning. Current information suggests that the United States is responsible for about six percent of global black carbon emissions; the majority of black carbon emissions come from the developing world. (Pew 2010).

Black carbon can be emitted when coal is burned as well as through tailpipe emissions from engines that use diesel fuel (such as diesel trucks and locomotives). Black carbon is a likely by-product emitted from haul trucks used during coal mining operations. Black carbon emissions from diesel tailpipe emissions are largely dependent upon the content of the diesel fuel and not upon the type of engine used. Black carbon is an unregulated pollutant; however, the EPA regulates diesel fuel quality.

Black carbon is not emitted from the coal when it is being mined; rather, black carbon emissions would be associated with coal combustion and would occur at the facility where the coal is being burned. This analysis did not quantify indirect emissions of black carbon associated with the combustion of coal because most coal fired power plants contain emission control devices, such as baghouses and cyclone separators, that would greatly reduce black carbon emissions. Since power plant facilities may have numerous variations in structure and emission control devices, it is beyond the scope of this analysis to address black carbon emissions from the combustion of coal; however, due to the various control technologies used in coal fired power plants, black carbon emissions would be insignificant.
4.0 CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

4.1 INTRODUCTION

This chapter discusses the environmental consequences of implementing the Proposed Action and alternatives as described in Chapter 2. It compares the impacts associated with each action alternative to the No Action Alternative. Under NEPA, actions which could significantly affect the quality of the human environment must be disclosed and analyzed in terms of the “context and intensity” that makes them significant. For an action to have an effect, it must have a demonstrable causal relationship, which can be direct, indirect, or cumulative in nature (40 CFR 1508.27). In the discussion that follows, the potential effects of each alternative are identified and discussed by each resource described in Chapter 3. Impacts are discussed with respect to each issue statement developed from public and agency scoping. The treatment of effects for the alternatives and elements is considerably more detailed than the summary of potential impacts in Chapter 2 (Table 2.2).

Leasing results in a conveyance of rights to the mineral resource, and thus has no direct effects on the ground; however, indirect effects could occur as a result of leasing and subsequent receipt of a permit for development. This analysis includes conditions for the Proposed Action and Alternative 3. Recommended measures to reduce the potential effects of the action alternatives and the likely effectiveness of these measures are presented at the end of each resource discipline discussion of direct and indirect impacts. In addition, cumulative effects are described for each resource as identified in Chapter 2 (Table 2.1). Where pertinent, each resource section also includes sections describing unavoidable adverse impacts, effects related to short-term uses versus long-term productivity, and the irreversible or irretrievable commitment of resources.

4.1.1 EXISTING MINE AND RELATIONSHIP TO THE GREENS HOLLOW TRACT

The Greens Hollow tract is located in the southern Wasatch Plateau where there are other coal leases, including the Quitchupah, Pines, and SITLA leases. These existing leases have been mined using longwall methods, and mining is continuing in portions of these leases. Subsidence impacts of the mining have been studied and documented in Anderson (2008a), Bigelow (2009), Canyon Fuel Company (2007), Mayo and Associates (1999), Petersen (2006, 2007, and 2009), and Thiros and Cordy (1991). A primary concern with subsidence mining is potential impacts to water resources and corresponding impacts on dependent resources, including vegetation, wildlife, and rangelands.

Beginning in late 2003, mining in the Pines Coal Lease undermined and subsequently subsided the North Water area, a tributary to the East Fork of Box Canyon (see Figure 4.1). Subsidence of the North Water Canyon area of the East Fork of Box Canyon in the winter of 2005 to 2006 resulted in the loss of flow at three springs (Pines 105, Pines 311, and Pines 310 Lower), the loss of water in two ponds, relocation of spring discharge at 3 springs and the depletion of surface and alluvial (subsurface) flow supporting a major riparian area (Petersen 2009). No flow to these areas has been restored (Weiser 2009). A mitigation plan to restore the North Water spring area has been finalized (Canyon Fuel Company 2013) and recently approved (DOGM 2013b). Although surface discharge is currently lost from 3 springs, stream monitoring below the springs has indicated the Castlegate Sandstone groundwater system that supported surface discharge from these springs, continues to function and provides groundwater flow at pre-subsidence levels in the East Fork of Box Canyon Creek (Petersen 2009). Subsidence has also
occurred beneath many other springs along the East Fork of Box Canyon in the Pines Coal Lease without impacting discharge.

Surface tensile cracks also occur in upland areas post subsidence, particularly where cover above the Castlegate Sandstone is limited. In these areas, hydrologic impacts could occur during periods of overland flow if cracks remain open. Due to the lack of overburden above the Castlegate Sandstone layer, “healing” of the cracks has been much slower. In order to draw inferences between the impacts that were observed in the North Water area and the potential for similar impacts to occur in the Greens Hollow tract, this section compares the geology and hydrology of the North Water Canyon area of the Pines Coal Lease with the Greens Hollow tract.

The sedimentary geology is the dominant factor influencing the hydrologic system of the area. The geology also determines how subsidence affects the surface resources of the area. The geologic units of importance for this comparison, listed from bottom to top (oldest to youngest), with their dominant characteristics that could influence hydrology and other resources, are as follows (see also Figure 3.2):

**Blackhawk Formation:** This unit consists of interbedded sandstone, siltstone, shale, and coal. The economic coal seams occur near the base of the Blackhawk Formation. The shale from the Blackhawk Formation was examined by X-ray diffraction and found to contain an average of 24 percent smectite, a swelling clay. (DOGM 2005). These swelling clays decrease the vertical hydraulic conductivity, which impedes the vertical flow of ground water in the Blackhawk Formation. Therefore, the upper portion of this formation is nearly impervious and generally perches water in the basal portion of the Castlegate Sandstone.

**Castlegate Sandstone:** This unit is a massive (blocky) fluvial sandstone with minor interbedded conglomerate and rare siltstone or shale. The unit is porous and permeable and is an important aquifer. The Castlegate Sandstone has a prominent fracture pattern and prominent bedding planes. Minor thin lenses of gray to carbonaceous shale as well as coal pods may be present. Weathered Castlegate Sandstone results in sandy sediments that are ineffective in sealing cracks in the surface-exposed, consolidated sandstone and does not prevent the downward flow of water. Abundant swelling clays at the contact border with the Blackhawk Formation impede downward movement of ground water and result in lateral movement. Structure appears to influence groundwater flow in the Castlegate Sandstone in the Greens Hollow and Pines Lease tracts as all of the springs are located on the east or southeast side of the canyons in these areas (Cirrus 2004), as would be expected for ground water following the dip slope.

**Price River Formation:** This unit is a deposit of chiefly sandstone with interbedded siltstone and shale, with minor conglomerate. Where it occurs, shale deposits severely restrict vertical flow of ground water to deeper units. This process is indicated by the relatively larger number of springs that issue from the Price River Formation in comparison to other geologic formations such as the Castlegate Sandstone. Indications of extensive unsaturated horizons in the Price River and Castlegate Sandstone Formations found in drill holes and wells in the Pines Coal Lease Tract, suggest that perched ground water conditions are likely (Forest Service 1999).
Figure 4.1. Bedrock geologic map of the Greens Hollow tract and adjoining leases.
North Horn Formation: This unit is similar to the Price River Formation, but is mostly shale with interbedded siltstone and sandstone. The shaley nature of the formation and its occurrence at higher elevations that receive more precipitation make it vulnerable to mass movement, slope failures, and landslides. The shales and clays of the North Horn Formation serve to retard the vertical flow of water causing ground water to move horizontally along bedding planes or through fractures. Similar to the Price River Formation, this process is evident due to the relatively larger number of springs that discharge from this formation in comparison to the Castlegate Sandstone Formation.

A primary difference between the Greens Hollow tract and the Pines Tract is the geologic units or stratigraphy exposed on the surface of the tracts (Figure 4.1). The Price River Formation is present over only about 25 percent of the Pines Tract. The majority of the Price River Formation in the Pines Coal Lease Tract ranges in depth from 0 to 50 feet with some areas ranging in depth from 100 to 500 feet. Most of the surface of the tract consists of Castlegate Sandstone with little soil cover. The North Water Canyon area of the Pines Coal Lease, where the springs, ponds, and alluvial flow were lost, is very near the top of the Castlegate Sandstone where the unit is exposed at the surface (Figure 4.1). Hence, soils in the North Water Canyon area are derived from the Castlegate Sandstone and predominantly clean, well-sorted sand with very little silt or clay-sized material. When undermined, fractures form in zones of permanent tension, around the margins of each longwall panel, which tend to remain open. Over time, the surface tension fractures tend to fill with the available sandy soil. However, because this material is sand, with little silt and clay, it has a high porosity and permeability and has little potential to hydraulically seal the fractures. Therefore, springs and drainages lost to the subsidence cracks or fractures can be permanently dewatered and surface fractures outside the riparian habitat can remain permanently open to water flow.

In contrast, over most of the Greens Hollow tract, the Price River and North Horn Formations are mapped as the surface-exposed bedrock units and overlay the Castlegate Sandstone (Figure 4.1). Exposed or shallowly buried Castlegate Sandstone layers in the Greens Hollow tract are limited to the extreme north and northeast edge of the tract in the lower Cowboy Creek, lower Greens Hollow, and Muddy Creek drainages. These areas, approximately 3 percent of the tract, correspond to the upper extent of the Castlegate Sandstone and are the only places on the tract where it is exposed on the surface. South and west of these areas the Price River Formation thickness increases quickly and then transitions to the North Horn Formation (gaining up to 1,700 feet in thickness above the top of the Castlegate Sandstone). The soils formed on the Price River and North Horn Formations contain abundant silts and clays. When compared to the Castlegate Sandstone, the silts and clays in the Price River and North Horn Formations are more likely to deform and are less likely to propagate subsidence-caused tension fractures to the surface. Thicker cover above the Castlegate Sandstone reduces the severity of subsidence impacts at the surface due to the dampening effect of the increased thickness.

It is the judgment of professionals (i.e., Hamid Maleki [mining engineer], Paul Anderson [project geologist], Katherine Foster [FS Hydrologist], and Art O’Hayre [hydrogeologist]), that where the Castlegate Sandstone is buried by 50 feet or more of overburden of the Price River and North Horn Formations, silts and clays are present in sufficient quantities to seal subsidence cracks over time (the period varies depending on precipitation levels and erosion rates) through the processes of weathering, surface erosion, and deposition. The clays contain about 24 percent smectite clay (DOGM 2005), which swells when hydrated, effectively sealing fractures and stopping the downward flow of water. Therefore, the areas where hydrologic impacts similar to those experienced in the North Water Canyon area could occur are limited to the lower Cowboy Creek, lower Greens Hollow, and Muddy Creek drainages where the Castlegate Sandstone is at or near the surface. Widespread subsidence impacts across the Greens Hollow tract similar to those experienced in the North Water Canyon area would not be expected.
Excluding areas where hydrologic impacts could be similar to those experienced in the North Water Canyon area was a large factor in the formulation of Alternative 3. The potential impacts for Alternative 2, however, in the area where the Castlegate Sandstone is at or near the surface could be similar to those experienced in the North Water Canyon area.

Based on the geology/stratigraphy and hydrology of the two tracts, anticipated impacts to other resources would also be quite different between the Pines Tract and the Greens Hollow tract and are discussed in this EIS on a resource by resource basis.

4.2 GEOLOGY, MINING, SUBSIDENCE, SEISMICITY, AND STRUCTURES AND FACILITIES

4.2.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under Alternative 1, the tract would not be leased so natural weathering and erosion of the Wasatch Plateau would continue. Spalling of the Castlegate Sandstone cliffs (and other smaller cliff faces) would occur across the entire tract at a rate similar to the last 10,000 years. Flash floods would occur with normal frequency of intensity, changing the stream bottom characteristics such as pool riffle ratio and local stream profile. The coal resource found on the tract would remain in place and continue to have future value. Should no action be taken for an extended period of time (approximately > ten years), one potential scenario could have the SUFCO mine close because of lack of mineable reserves. With the closing and abandonment of the existing mine, future access to the coal would likely require a new portal in Muddy Canyon or another location, potentially dramatically increasing the surface impacts in order to extract the coal resource at a later date. Other uses such as foraging by wildlife, livestock grazing, timber harvesting, oil and gas extraction, and recreation activities would result in similar impacts on geologic resources as those presently occurring throughout the analysis area.

4.2.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Issue 1: Mining of the underground coal reserves can cause subsidence, non-uniform subsidence features, seismicity, and cracking of the ground surface.

The most important impact related to geology is the extraction of coal and related subsidence of the land with a potential impact of additional rock falls and accelerated spalling of the Castlegate Sandstone cliffs (and other smaller cliff faces). In addition, the disruption of the integrity of the stratal layers above the coal seams due to mining could impact the local flow of ground water. Changes in the topography of the surface may also impact surface water patterns and stream profiles. These impacts are covered in other resource sections in this EIS.

4.2.2.1 Coal Resources

The Muddy #1, Muddy #2, Upper Hiawatha, and several thin uncorrelated coal seams as well as areas where the Hiawatha is less than 6 feet thick would be impacted by the Proposed Action. Future mineability or recoverability of these coal seams by a potential future method would be reduced or eliminated in areas that would be subsided. At present, these coal seams are either too thin, have too little interburden, or are of such limited extent that they are not considered mineable in today’s market. Should future mining methods or markets make such thin coals recoverable, this resource would likely be greatly reduced or lost because of the caving, fractures, stresses, and impounded water left by mining the presently economic portions of the Hiawatha coal seam within the tract. Additionally, coal left behind as unrecoverable as roof, floor, and pillar coal would likely be unrecoverable for the foreseeable future.
4.2.2.2 Oil and Gas Resources

Exploration for oil and gas and coalbed methane could be reduced by mining the coal. Coalbed methane (CBM) is likely present in the Ferron Sandstone Member of the Mancos Shale beneath the coal tract. Current data (Gloyn et al. 2003 and Smith 1985) indicate that the gas content of the Blackhawk coals is too low to be considered a resource. The underlying Ferron Sandstone coalbed gas contents are higher than the Blackhawk coals but at present, uneconomic. In addition to the depressed gas contents of the Ferron coals in the southern Castle Valley/Wasatch Plateau area, the Ferron coals lie at a depth of about 4,700 feet below the surface of the tract. Few commercial coalbed gas wells produce at those depths today. The nearest commercial gas production is from Ferron coals about 25 miles to the northeast in the Drunkards Wash and Buzzards Bench fields at depths between about 1,000 to 3,500 feet. Drilling for Ferron CBM below the Wasatch Plateau escarpment near the tract has yet to produce any commercial wells, but it should be noted that natural gas prices have risen substantially, which could drive CBM activity further south and perhaps west along Castle Valley/Wasatch Plateau trend.

Conventional oil and gas resources lying stratigraphically below the coal in both the Emery Sandstone and Ferron Sandstone members of the Mancos Shale have potential. The nearest oil and gas test well was drilled in T21S, R5E, section 23 in 1981 (API number 4304130024) about 2 miles southeast of the tract. No tests were run in the well. The total depth drilled was 5,730 feet with the bottom of the hole in the Tununk Shale Member of the Mancos Shale (Tripp 1989). The well tested the Ferron and Emery sandstone reservoir potential, but deeper potential horizons remain and are locally untested.

The probability of future drilling for oil and gas on the mined portion of the tract is moderate to low (Gautier et al. 1996). Undermining would increase the difficulty of drilling. Directional drilling could be utilized to explore from off-site locations.

4.2.2.3 Subsidence

Surface subsidence occurs because of downward rock mass movement caused by the closure and collapse of mined-out coal seams. The subsidence process is discussed in detail in the Mining, Subsidence, Seismicity, and Structures and Facilities Technical Report (Maleki 2008). Two major mechanisms of surface subsidence associated with mining are the formation of sinkholes and the formation of troughs. Subsidence on the Greens Hollow tract is predicted to be the trough type, which is characterized by the formation of a relatively smooth basin and is much less damaging than sinkhole subsidence. The subsidence process occurs on the surface as the upper strata bend and settle. Surface subsidence processes result in both vertical and horizontal displacement of rocks. In general, impacts from vertical displacement are less damaging to surface features than differential horizontal displacement. The subsidence process is expected to be complete within a few years after mining.

Impacts of concern due to subsidence on the Greens Hollow tract would include damage to structures and facilities, stock ponds, roads and trails, and natural ponds, springs, and streams. Potential damage to stock ponds is discussed in more detail in the Rangeland Resources Section (Section 4.11). Impacts to roads and trails are discussed in the Recreation Section (Section 4.9). Damage to structures and facilities is discussed in Section 4.2.2.5. Potential impacts to natural ponds, springs, and streams are discussed in Section 4.3.

Predicted surface subsidence would be up to approximately 8 feet in the northern half of the tract and up to 4.3 feet on the southern half of the tract. Subsidence would increase with increasing extraction height and decreasing overburden cover. Predicted tensile strains would reach levels that could cause surface fractures, particularly above longwall gateroads and near shallow block boundaries in the northeast part of the tract. Fractures are more likely to occur over panel boundaries and gateroads. Many fractures within the panels, if they break the surface, should close due to compression and settling of the surface, but the
fractures along the panel margins are more likely to remain open. These fractures could intercept surface run-off water and could create a public hazard in some areas.

Expected surface movement extending horizontally beyond (outside of) the underground mining boundaries would be approximately 270 feet for shallow workings and 800 feet for deep workings. Change in surface slopes would be a direct impact of subsidence. These changes would be moderate (generally less than 2 to 3 percent) and thus vertical subsidence would not be visually discernable because of gradual changes in surface slopes. However, the consequences of subsidence may be noticeable (such as rock falls from escarpments, ponding, visible surface cracks, etc.).

The potential for damage from “permanent” tensile strains would be greatest at longwall block boundaries, particularly at the shallow depths in the northeast part of the tract near the Muddy Canyon. The North Fork of Quitchupah Creek and its tributaries would be undermined and potentially impacted under Alternative 2. The minimum amount of overburden distance between the coal seam and the North Fork of Quitchupah Creek and its perennial tributaries is approximately 1,300 feet. Based on a very conservative estimate for the depth of the fractured zone (60 times a possible extraction thickness or 900 feet), minimal impacts on North Fork of Quitchupah Creek and its tributaries would be expected (the overburden thickness numbers, such as “900 feet” are dependent on the actual full extraction mining height and local rock characteristics). However, the overburden distance between the coal seam and portions of Muddy Creek is less than 900-feet under Alternative 2, so that stream flow loss to mine workings could occur as a result of longwall mining under Muddy Creek in these locations. The risk of this occurring could be greatly minimized by reducing the mining heights through the immediate areas. Furthermore, because of differential settling along the stream, the pre-mining gradient of both the North Fork of Quitchupah Creek and Muddy Creek would both increase (approaching panel boundary) and decrease (leaving panel boundary) as a result of longwall mining under these streams. The maximum expected change in streambed gradient would be approximately 1 percent over the Greens Hollow tract.

Perennial segments of Cowboy Creek, Greens Hollow, and Muddy Creek could also be undermined. The minimum amount of overburden cover above the coal to be mined along Cowboy Creek and Greens Hollow would be approximately 1,200 feet. Using the estimate provided by Maleki (2008) for the maximum extension and expansion of existing fracture systems and upward propagation of new fractures of 60 times extraction coal thickness, permanent loss of water from Cowboy Creek and Greens Hollow to the underground workings due to mine subsidence would be very unlikely. Nevertheless, surface tensile fractures could develop near the edges of the longwall panels, resulting in some localized displacement of water from the streams where they cross shallow fractures. Surface tensile fractures would tend to develop in areas where bedrock tension is permanent, such as along the edges of mine subsidence panels. Fractures would pose a risk of permanent displacement of water in stream channels where the Castlegate Sandstone is exposed or has insufficient depth of overburden containing clays and shale to heal the cracks (see additional discussion in Section 4.1.1).

The overburden cover is less than 900 feet where Muddy Creek crosses the eastern boundary of the Greens Hollow tract, which is the maximum predicted height of the rock fracture zone. However, 900 feet is based on mining 15 feet of the coal seam which can be reduced locally as necessary. Along this segment of Muddy Creek, there is potential for mining-induced subsidence to result in water loss from the creek into underground mine workings. This risk is further compounded where the Castlegate Sandstone is exposed or has insufficient overburden depth with clays or shales to heal cracks (see Figure 4.1). In this case, water displacement due to surface tensile cracks could actually be lost to the mine workings rather than displaced within the stream channel.

Mining to within 350 feet or less of escarpments could result in destabilizing ground movements. Small, marginally stable rock overhangs, for instance, could fail in some canyons, depending on geometry of the Greens Hollow Federal Coal Lease Tract 139 Draft Supplemental Environmental Impact Statement
block. The blocks at the leading edges of overhangs are most likely to spall because of reduced rock confinement in these areas.

4.2.2.4 Seismicity
Removal of the coal seam by the longwall mining technique usually results in caving of overburden rocks and load transfer to panel boundaries. Load transfer would result in the accumulation of stress at the longwall face and would contribute to rock noise (low level seismicity). Seismic impacts of concern for Greens Hollow tract include the following: perception of seismic events by National Forest System users, potential damage to stock ponds, and potential damage to structures and facilities. Structures and facilities would be protected under the lease contract, Stipulation #13 states: “Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses”.

Based on the results of modeling presented in the Mining, Subsidence, Seismicity, and Structures and Facilities Technical Report (Maleki 2008), the maximum probable seismic event is expected to be 3.4 on the Richter scale where mining occurs under thicker cover. At shallower cover, seismicity would be even more moderate, similar to that experienced in the permitted areas at the Pines Tract. These levels of seismicity are considered normal and acceptable for Wasatch Plateau coal fields, particularly where major surface structures, such as dams, are not present nearby. Thus, level of perception of seismic events by National Forest System users, including recreational users, is expected to be low. Potential for damage to stock ponds due to seismicity is expected to be low, and is discussed further in the Rangeland Resources section (Section 4.9). Potential for damage to other facilities is discussed in Section 4.2.2.5. Structures and facilities would be protected under Stipulation #13.

*Issue 2*: Mining-induced subsidence could damage the Rough Brothers’ Cabin.

4.2.2.5 Structures and Facilities
The permanent strains may cause slight damage to Rough Brothers of the Hills cabin, a wooden structure. The potential damage may not be noticeable on the exterior because of its construction of flexible material (wood instead of steel). However, the concrete slab may show signs of strain (cracks). Slight damage may result in the long-term due to permanent tensile strains including cracks and deformation of doors (sticking) and windows. However, the FS is not renewing the special use permit for the Rough Brothers’ cabin and its associated facilities, and the facility is scheduled to be removed by December 31, 2016.

4.2.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

*Issue 1*: Mining of the underground coal reserves can cause subsidence, non-uniform subsidence features, seismicity, and cracking of the ground surface.

As with Alternative 2, the most important impact related to geology is the extraction of coal and related subsidence of the land with a minor potential impact of additional rock falls and accelerated spalling of the Castlegate Sandstone cliffs (and other smaller cliff faces). Alternative 3 would reduce the area of full subsidence in the Muddy Canyon, Greens Hollow, and North Fork of Quitchupah areas. Only the Muddy Canyon area alterations would likely decrease the potential for rock falls, due to the proximity of mining to the canyon edge.

4.2.3.1 Coal Resources
Under Alternative 3, coal resource-related impacts would change relative to Alternative 2. The total recoverable coal would decrease and the potential lost in-place resource would increase in the perimeter绿地Hollow Federal Coal Lease Tract 140 Draft Supplemental Environmental Impact Statement
areas surrounding Alternative 2 (net small reduction). The result would be an economic loss since the in-place resource has not been assigned a value.

4.2.3.2 Oil and Gas Resources
Impacts to oil and gas resources would be similar to those described under Alternative 2. In this alternative, drilling would be less difficult due to the areas which would not be undermined, providing slightly more potentially drillable area which would not encounter subsurface mine workings.

4.2.3.3 Subsidence
Under Alternative 3, subsidence mining would be excluded from areas identified for protection, including stream segments with shallow overburden over the Castlegate Sandstone and along cliff escarpments, as shown in Figure 1.4. Subsidence mining would be restricted in the North Fork of Quitchupah Creek, Muddy Creek, Cowboy Creek, and Greens Hollow drainages where the overburden is insufficient in thickness or rock types to facilitate healing of surface tensile cracks. Excluding subsidence mining from these areas would minimize the risk of water displacement, or loss in the case of Muddy Creek. Excluding subsidence mining from within 350 feet of cliff escarpments would minimize/eliminate the risk of spalling and rock fall that would be present under Alternative 2 if these features are undermined.

4.2.3.4 Seismicity
Seismicity would essentially be the same as described under Alternative 2.

Issue 2: Mining-induced subsidence could damage the Rough Brothers’ Cabin.

4.2.3.5 Structures and Facilities
Potential impact to structures and facilities would essentially be the same as described under Alternative 2.

4.2.4 SPECIAL STIPULATIONS AND DESIGN CRITERIA
Monitoring and requirements to protect non-mineral resources are specified in the attached Special Coal Lease Stipulations (Appendix B). The Utah Coal Mining Rules at R645-525 require a pre-subsidence survey of all structures prior to mining. After mining, the coal operator would promptly repair or compensate the owners for any subsidence-caused damage. Other design criteria to address impacts due to subsidence are listed in the specific resource section where the impacts are analyzed.

4.2.5 CUMULATIVE EFFECTS
This section considers the cumulative effects of the Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have affected, or are likely to affect the geologic resources in the cumulative effects analysis area. The cumulative effects analysis area as defined for the geology analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

The effects of this project would be cumulative with other impacts occurring in the area. Subsidence effects would be limited to the full extraction areas (panels) and a perimeter area related to the angle of draw and depth of overburden. Impacts from adjacent tracts could cross tract boundaries on both the east and southern boundaries of the Greens Hollow tract. This would occur if the full extraction areas of the existing neighboring leases were near enough to common lease boundaries with the Greens Hollow tract.
Cumulative subsidence impacts from adjacent tracts and the Greens Hollow tract would be less than or equal to those from full extraction areas on either side of the boundary.

On the east, only in the north-central part of Section 3 would the workings of the Greens Hollow tract come close enough to the Pines Tract lease to see subsidence east of the tract boundary. This would only be applicable for Alternative 2. In Alternative 3, mining on the Greens Hollow tract would be far enough from the tract boundary to cause no subsidence at the east boundary with the Pines Tract. There are no adjacent mines to the north or west of the tract.

Also related to coal mining is exploratory drilling. This drilling has been conducted in the cumulative effects analysis area to describe the geology and coal reserves. Additional exploratory drilling is anticipated to occur, including during the development of the Greens Hollow tract. This information would add to the geologic understanding of the cumulative effects area.

Cumulative impacts associated with livestock grazing, both historic and ongoing, and wildlife habitat improvements, including water developments, controlled burns, and sagebrush treatments would not affect geologic resources to any notable degree.

Recreation use has resulted in primarily localized impacts, usually associated with campsites and ATV/off-road vehicle use. In some cases, geologic resources have been exposed to erosive forces as surface materials are removed by these activities.

4.3 SURFACE AND GROUND WATER RESOURCES

4.3.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under this alternative, the Greens Hollow tract would not be offered for lease. As a result, no mining-related impacts to surface and ground water resources would occur in the lease area.

4.3.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

The FS proposes to consent to the BLM offering for lease NFS lands in the Greens Hollow tract (approximately 6,175 acres) for production of federal coal reserves, with conditions for protecting non-mineral resources. Based on FS consent, the BLM decision would be to offer the Greens Hollow tract for competitive bid and issue a lease with terms, conditions, and special stipulations. The Greens Hollow tract would be made available for competitive leasing and underground coal mining in the entire tract. Figure 4.2 identifies the area that would be designated for subsidence mining (Area of Subsidence Mining) and the subsidence analysis area boundary (Mining Analysis Area Boundary). Subsidence mining would be allowed anywhere in the Area of Subsidence Mining.

While mining could occur anywhere in the area of potential subsidence mining under this alternative, an example of a conceptual mining plan for full extraction mining was developed that was used to evaluate potential impacts to water resources. The boundary of that mining plan is shown in Figure 4.2. The conceptual mining plan consists of longwall mining using current technology. The conceptual mining plan has been developed to avoid some subsidence impacts on surface resources. The conceptual mining plan assumes that mining would be done through the existing SUFCO mine workings.
Figure 4.2. Surface and ground water features with proposed mine area and overburden thickness.

Legend
- Greens Hollow Coal Lease Tract
- Conceptual Mining Area
- Area of Subsidence Mining
- Mining Analysis Area Boundary
- National Forest Boundary
- Overburden contours (200 ft)
- Springs
  - High Value
  - Moderate Value
  - Unknown Value
- Perennial Streams (USGS)
- Intermittent Streams (USGS)
- Cattle Troughs
- Natural Ponds
- Stock Ponds

Greens Hollow Federal Coal Lease Tract
1:53,500
0 1 0.5
Miles

Draft Supplemental Environmental Impact Statement
4.3.2.1 Interception of Ground water

**Issue 1:** Mining-induced subsidence could intercept ground water in underground mine workings, and subsequent discharge to Quitchupah Creek (Existing National Pollutant Discharge Elimination System [NPDES] Permit) could cause transbasin diversions of surface and ground water from the Muddy and Greens Hollow drainages to the Quitchupah Creek drainage. This could affect downstream agricultural, domestic, and industrial water supplies as well as ecosystems.

4.3.2.1.1 Mine Water Inflow and Discharge

Ground water in the coal and in the geologic units above and below the mine would enter the underground workings during mine development and longwall mining. Mine discharge rates would be lower than mine water inflow rates because some of the mine inflow would be removed with the mined coal or by evaporation through the mine ventilation system. Also, as underground mining advances, active mine inflow water could migrate down into mined out areas of the underground workings. Excess water that interferes with mining operations is pumped from the mine, treated and discharged at the surface.

Water conveying faults are not expected to be encountered during underground mining in the Greens Hollow tract, although larger inflows may still occur where longwall subsidence causes fracturing that can drain isolated sands that may have been separated from the coal by shales and clays with relatively low permeability. Anderson (2004a) found that faulting in the study area was minimal. Geologists for the SUFCO mine detected minor faults in the Pines Tract to the east of the Greens Hollow tract. However, the displacement on these faults is less than 1.5 feet and not conducive to the formation of a brecciated zone that would transmit water. Also, analysis of the tritium and radiocarbon of ground water performed for the Pines Coal Tract EIS (Forest Service 1999) found ground water in the Blackhawk Formation coals to be very old (greater than 7,000 and up to 20,000 years), as compared to the relatively young waters in the Castlegate Sandstone springs. Thiros and Cordy (1991) also report a tritium concentration of less than detection on water inflows along a fault in the SUFCO mine. Age estimates based on the concentration at the detection limit indicated that the inflow water entered the groundwater system at least 70 years prior to the time of sampling. Given the large vertical downward pressure gradients, these significant differences in water age would not exist if highly transmissive faults were present.

In the East Mountain Cumulative Hydrologic Impact Assessment (CHIA) issued by DOGM in March 2003, the Division concludes that the Star Point Sandstone and Blackhawk Formation do not constitute a regional aquifer (DOGM 2003b, DOGM 2007). The direction of flow in these formations is vertically downward as noted by Thiros and Cordy (1991) based on the large vertical gradients between the shallow groundwater and the water levels observed in four monitoring wells completed in the Upper Hiawatha coal seam by SUFCO in the vicinity of Duncan Mountain. Similar to what is observed on the Pines Tract, the rate of vertical flow is extremely slow. The magnitude of flow is related to the rate of flow, so it is also very low.

Since 1983, SUFCO has been discharging excess intercepted ground water from their underground workings into North Fork Quitchupah Creek. This permitted discharge averaged approximately 2.2 million gallons per day (mgd) or approximately 3.3 cfs or 1,500 gallons per minute (gpm) during the period between 1994 and 1996 (Forest Service 1999). By year 2000, the mine was discharging about 3 mgd (4.6 cfs or 2,080 gpm) and ranged from about 3.3 mgd (5 cfs or 2,300 gpm) to 5 mgd (7.7 cfs or 3,450 gpm) during 2003 – 2012 (DOGM 2013a). In the recent 12-month monitoring period January 1, 2012 through December 31, 2012, mine discharge has varied from 1.7 to 5.6 mgd (2.6–8.7 cfs or 1,177–3,889 gpm).
Most water entering the SUFCO mine located south and east of Greens Hollow tract comes through leaks in the mine roof. The Pines Coal Tract EIS (Forest Service 1999) documented variations in roof drip chemistry in the SUFCO Mine and steady declines in roof drip rates during mining. These results indicate that most of the excess water in the mine is related to the amount of area recently mined and recently subsided. Thus, the ground water inflows induced directly by mining or by subsidence fractures for a particular location in the mine declines significantly with time. These results indicate that the units above or below the coal seam have limited ground water storage, as would be expected with water in isolated sandstone paleochannels or localized perched zones, and that continued mine expansion would be needed to maintain flow rates that have been observed over the past year.

The rate of discharge resulting from mining in the Greens Hollow tract is best estimated from the mine discharge experienced in the adjacent SUFCO Mine. Historic information summarized in the CHIA (DOGM 2003a) provides estimates of the mine water discharge per ton of coal produced. Assuming an annual coal production of approximately 7 million tons per year from the mine, average mine water discharge as high as 4.9 mgd (7.6 cfs or 3,425 gpm) can be expected based on the maximum estimate of 300 gallons of discharge water per ton of coal produced. Not all of this mine water discharge would be from the Greens Hollow tract, but most of the water would be from areas of active mining.

The pre-mine heads in the coal in the vicinity of the Greens Hollow tract have been assessed in Cirrus (2013c). Heads in the coal have been measured in four observation wells completed in the Upper Hiawatha coal seam by SUFCO in the vicinity of Duncan Mountain. Three other monitoring wells completed in the Upper Hiawatha coal near the edge of the Wasatch Plateau were found to be dry. The heads in the mine following cessation of mining and pumping are expected to recover to perhaps as much as 80 to 90 percent of the pre-mine level, although final levels may be less than pre-mine conditions given the removal of water from storage during pumping and the very slow rate of groundwater flow in the Blackhawk Formation that may prevent full recovery. Based on these results, the heads in the mined-out gob in the Greens Hollow tract would be expected to remain below the elevation at the outcrop of the Hiawatha coal near the edge of the Wasatch Plateau.

Upon termination of mining operations in the Greens Hollow tract, pumping of ground water from the tract would be discontinued and the mine would begin to flood. However, some mine pumping may be needed to continue to maintain access to other lease holdings. When all mining in the area has ended and mine discharge has ceased, there would be a reduction in surface flow in the receiving stream due to termination of mine discharge. However, if water levels in the flooded mine workings recover to the elevation of the portal, there could be a component of flow from the closed mine that reaches the stream. Stream geomorphology and riparian vegetation supported by mine discharge from the tract would be impacted to the extent these flows contribute to total stream flow. Water quality in North Fork Quitchupah Creek would be similar to existing conditions after mining operations are terminated. Additional detail on water quality impacts are provided below in section 4.3.2.4. In regards to geomorphology, lower stream flows would result in less available energy for channel forming processes of erosion, transport, and deposition that are currently influenced by augmented flows. It is unlikely decreased flows would eliminate downstream riparian corridors although vegetation would be reduced to the extent it is currently dependent upon mine discharge. Water rights claims to mine discharge water would also need to be revised or withdrawn following a decrease or elimination of mine discharge.

In brief, the primary impact on surface water resulting from mine dewatering and drawdown of ground water is the direct discharge to surface water. Drawdown or water pressure reductions in the coal due to mine dewatering creates a potentiometric and ground water flow gradient toward the mine. However, the flow rates are very low due to the low vertical permeability of the interbedded silts, shale, sandstones and coals of the Blackhawk Formation. Pressure redistribution within the coal supports rapid recovery of
However, subsidence cracks can propagate vertically as the roof collapses into the mine void and provide a mechanism for enhancing the rate of vertical flow from ground water bearing units positioned above the subsidence zone. Reduction of ground water potentiometric heads in these zones could result in diminished flows at any springs that issue from the affected ground water bearing unit. Studies of mine subsidence have found that the fractured zone that results from mine subsidence can extend vertically for a distance between 30 to 60 times the mining height above the coal. Enhanced hydraulic communication between the mine and overburden ground water would not be expected to occur above this fractured zone.

The 60-times mining height is believed to be a very conservative estimate of the maximum vertical extent of subsidence fractures above longwall mining in this area. This conservative guideline has been used for mining under the sea and to establish a safe vertical distance above coal seams to protect an overlying coal seam from mine subsidence (Society of Mining Engineers 1992).

4.3.2.1.2 Transbasin Diversion of Surface or Ground Water

Interception of water in underground mine workings and subsequent discharge to surface drainages could cause transbasin diversions of surface and/or ground water from one drainage to another. Transbasin diversions can be defined as the means of diverting or exporting water from a river system or basin to another hydrologic basin (Utah DWR 2001, Utah Division of Water Rights 2008). This process removes water from its natural source and can involve streams, rivers or ground water. A hydrologic basin is generally considered to be a geographic area that captures surface and ground water flow into a single major stream. (Utah DWR 2001, Utah Division of Water Rights 2008).

Legal use of surface and ground water is appropriated and distributed by the Utah Division of Water Rights. Establishment of water rights in Utah are based on the Doctrine of Prior Appropriation where those holding water rights with earlier priority dates have right to a given water source before others with water rights having later priority dates (Utah Division of Water Rights 2008). Senior water rights in Utah are typically used for livestock and irrigation purposes. Subbasin claims are currently being developed by the Forest that could assert a claim of right for all developed and undeveloped waters on National Forest System lands. Therefore, all springs in the analysis area may have a claim of right associated with them. Water rights held by individuals downstream of the analysis area also have legal claim to water whose source originates in or near the Greens Hollow tract. Loss of water resulting from transbasin diversions could have legal implications associated with water rights in the tract as well as areas downstream of the tract. Legal right to water in Muddy Creek requires that any water lost through subsidence impacts would need to be replaced to the stream channel in terms of quantity and quality.

The potential for transbasin diversion of mine water discharge depends upon the location of the discharge to the surface and the ultimate fate of the water intercepted by mine workings. The location for mine water discharge for this project would be at the current SUFCO mine discharge location along the North Fork Quitchupah Creek. Thus, the issue for transbasin diversions addressed in this section is the potential risk for diversion of surface water or ground water from the Muddy Creek drainage to the Quitchupah Creek drainage by pumping of mine water inflows to the discharge point on the North Fork Quitchupah Creek.
For the Greens Hollow tract, the potential for transbasin diversion of water is greatest where longwall mining might occur directly beneath a perennial stream, where depth of overburden cover is conservatively less than 60 times the mining thickness, and characteristics of the overburden types do not facilitate healing of surface tension cracks. The only location in the tract where depth of overburden cover is less than 60 times the mining thickness is where Muddy Creek crosses the northeast corner of the tract. Therefore, this segment would have potential for mine-induced subsidence to result in a loss of water from Muddy Creek to the underground mine workings. Without intervention, any loss of water from Muddy Creek in these areas of lesser overburden could be diverted through the underground mine workings to North Fork Quitchupah Creek. The volume and rate of water loss from Muddy Creek would be dependent on the size and extent of surface cracks and the ability of these cracks to transmit water. Flow in North Fork Quitchupah Creek would increase in response to this diverted water. Flows would potentially be affected in both creeks during the period when cracks are not healed, which could potentially extend through the lifetime of the mine. Although the size and extent of these features cannot be quantified at this time, the known conditions (including shallower overburden cover (<600 ft) and measured flow rates from USGS gage stations) indicate the amount of water diverted to the mine could potentially influence downstream water rights on Muddy Creek during periods of low flow. Surface fracture occurrence would diminish with overburden cover greater than 600 feet.

Any reduction of base flows in Muddy Creek would adversely impact downstream ecosystems and associated resources including aquatic and terrestrial wildlife species and vegetation. Additional discussion on impacts to these resources can be found in Section 4.4 Aquatic and Terrestrial Wildlife Resources and Section 4.5 Vegetation Resources.

The nature and extent of disturbance of rock strata resulting from longwall mine subsidence is shown in Figure 4.3. Subsidence induced fractures from longwall mine panels can drain the ground water stored in the caved zone or the fractured zone as shown in Figure 4.3. The height of the caved zone is dependent upon the bulking ratio, overburden rock types, and height of extraction and is considered to be less than 10 times seam height (Kendorski 1993, Kendorski 2006). The height of the fractured zone is dependent on the height of extraction and overburden rock types and is expected to extend above the seam between 30 to a maximum of 60 times the minable thickness (Maleki 2008). Changes to the rock mass in the fracture zone can change water transmitting capabilities of the rock by creating new fractures and enlarging existing fractures. This typically results in projected changes in permeability, storage capacity, ground water flow direction, ground water chemistry, and ground water levels. In Appalachia and Illinois, water levels in wells screened in the lower subsidence fractured zone generally do not recover following subsidence (Booth 2006). Booth (2006) also points out:

“Groundwater impacts are a common reason for opposition to longwall mining. Most impacts are due to subsidence-related fracturing. Although upper aquifers are protected from drainage to the mine by a confining zone, water levels decline due to fracture dilation, and drawdown expands outward a few hundred meters. Recovery of water levels is common.”

Subsidence of the 3LPE, 5LPE, and 6LPE panels in the Pines Tract lease area has resulted in decreased or elimination of flow from several springs. While discharge from some springs reappeared shortly downslope of the original location, discharge from other springs did not, including Pines 105, Pines 311, Pines 310 Lower, and one unnamed seep contributing to a pond in the Joes Mill Pond area (Petersen 2007). Mitigation efforts to restore flow to these features included installing a grout curtain to raise groundwater levels, collecting groundwater in a perforated pipe, and pumping water from a down canyon spring to livestock troughs near Pines 105 (Weiser 2009). None of these efforts were successful in restoring groundwater to pre-disturbance conditions. A mitigation plan to restore the North Water spring area has been finalized (Canyon Fuel Company 2013) and recently approved (DOGM 2013b). Stream monitoring below these springs has indicated that groundwater contributions from the Castlegate...
Figure 4.3. Subsidence zones above a longwall panel.

Sandstone in the East Fork Box Canyon Creek continue to function and support groundwater flow at pre-subsidence levels in East Fork Box Canyon Creek (Petersen 2007).

Figure 4.3 also shows a zone of continuous deformation located at more than 60 times the seam thickness above the longwall panel but more than 50-feet below the surface where the rock mass is constrained. Little or no vertical fracturing occurs within this zone (Kendorski et al. 1979, Hasenfus et al. 1988, and Peng 1992). There may be temporary subsidence effects on ground water levels in this zone due to horizontal slippage (Hasenfus et al. 1988). There is also a zone of increased fracturing, which extends from the surface to a depth of approximately 50 feet that occurs as a result of compressional and tensional stresses (Kendorski et al. 1979, Kendorski 2006).

The risk of subsidence induced fractures connecting the mine with the Castlegate Sandstone is low as the Castlegate Sandstone occurs more than a very conservative 60 times mine thickness above the coal that would be mined over most of the Greens Hollow tract. Mine subsidence under Alternative 2 could affect surface flows in the segment of Muddy Creek discussed above, resulting in a transbasin diversion. However, spring and seep discharges would not likely be diverted from the Muddy Creek watershed into North Fork Quitchupah Creek.

Mine water inflows in the Greens Hollow tract are expected to occur as a result of ground water inflow from storage in sandstone lenses or paleochannels and perched zones in the Blackhawk Formation that have virtually no hydraulic connection with surface water systems at the Greens Hollow location due to depth of overburden cover. There may also be a component of upward vertical flow to the mined area from underlying zones, such as the Star Point Sandstone (Thiros and Cordy 1991). Any localized depressurization of the Star Point Sandstone in the vicinity of the mine cannot extend below the coal or upward flow would not occur. Potential inflows from the Star Point Sandstone are believed to be low based on observations in the SUFCO Mine and restrictions due to the permeability of the strata between the coal and the Star Point Sandstone. Any localized drawdown in the Star Point Sandstone is expected to
have a relatively limited effect on ground water discharge from this formation. This is due to the large horizontal distance between the mine depressurization zone and potential discharge locations and adverse dip of the formation relative to Muddy Creek plus the very low potentiometric gradients in the Star Point Sandstone.

The low gradients are based on the head observations in the Upper Hiawatha coal seam in the vicinity of Duncan Mountain near the Greens Hollow tract (Thiros and Cordy 1991). The relatively low heads and gradients in the Hiawatha coal seam in the vicinity of the Greens Hollow tract were confirmed by water level measurements in the Hiawatha coals at SUFCO monitoring wells located near the tract. The data indicate vertical downward gradients. The data are insufficient to construct a potentiometric surface for the Hiawatha coals or the ground water flow network in the Blackhawk Formation but suggest a possible horizontal flow direction from the Greens Hollow tract toward the outcrop locations in addition to flow in a vertical direction. Any horizontal flow in the Blackhawk Formation within and adjacent to the Greens Hollow tract is quite low as indicated by the absence of springs issuing from the Blackhawk, the relatively low rates of mine inflow from the coals, and the presence of several dry Blackhawk wells near the outcrop (Thiros and Cordy 1991). Thus, ground water flow in the lower portions of the Blackhawk Formation is very slow and thought to be moving primarily vertically downward into the Star Point Sandstone. Vertical flow in the Blackhawk Formation may be substantially increased temporarily by subsidence fractures as the overlying groundwater in perched zones and sandstone lenses in the Blackhawk Formation are drained. Lateral flow may also occur in the Blackhawk coals, although the rate of flow is low and is limited by the relatively low heads and low transmissivity of the coals. The baseline gradients in the Blackhawk Formation and in the underlying Star Point Sandstone are believed to be primarily moving from the tract toward the outcrop locations to the east and southeast of the tract. This pattern is considered to be localized and does not characterize regional flow patterns in the Star Point Sandstone.

There is currently insufficient information to fully characterize regional flow associated with the Star Point Sandstone. There does appear to be some localized component of flow toward the outcrop along Muddy Creek and North Quitchupah Creek as gain-loss studies indicate that streams gain water crossing the Star Point Sandstone. There could also be a component of regional flow that moves down dip, assuming that there is a regional point of discharge. The regional dip of the formations is toward the northwest. The potential discharge area toward the northwest could be the Joes Valley Fault. However, a regional study with potentiometric information for the Star Point Sandstone would be needed to provide further characterization of regional flow in this unit.

Mine drainage of water from storage in the Blackhawk Formation results in a reduction of potentiometric levels in the geologic units above and below the mine and laterally with distance from the mine. Most of this water is removed from compressible storage. After mining is complete and the underground workings begin to flood, potentiometric levels adjust until eventually a new long-term equilibrium is established. Using a cone of depression analogy, the magnitude of change and adjustment decreases with distance from the mine. Vertical leakage and recharge influences further damp out the drawdown influence of the water removed during mining.

Removal of ground water from storage during mining results in depressurization of the Blackhawk Formation in the vicinity of the mine. This would affect vertical flow to the Star Point Sandstone as well as lateral flows in the Blackhawk. Changes in the potentiometric levels of ground water in the Blackhawk Formation would be expected to have little or no effect on the flow of perennial streams. This is due to distance from the mine to outcrops of the Blackhawk Formation along perennial stream segments as well as observations from stream gain loss studies that indicate little or no baseflow contributions to North Fork Quitchupah Creek from the Blackhawk Formation (see Figure 13 in Thiros and Cordy 1991).
Nevertheless, depressurization of the Blackhawk Formation in the vicinity of the mine could function to flatten potentiometric gradients in the Star Point Sandstone, which would reduce the rate of ground water flow in this unit. However, any reduction in flow is expected to be small, perhaps on the order of a gallon per minute or less for the entire lease tract.

Regional groundwater flow through the Star Point Sandstone is believed to be quite low due to the very low regional potentiometric gradients as depicted in Figure 38 of the Surface and Groundwater Technical Report. A potentiometric gradient on the order of 1 percent is inferred from the outcrop elevations, the hydrostatic pressures observation in the Upper Hiawatha coal seam in the vicinity of Duncan Mountain near the Greens Hollow tract, and the large downward pressure gradients through the Blackhawk Formation. The transmissivity of the Star Point Sandstone is believed to be on the order of 3 ft²/day based on the sandstone thickness and aquifer test results reported in Lines (1985). Based on these assumptions regional flow through the Star Point Sandstone is estimated to be on the order of 0.03 ft³/ft. Thus, for a north-south transect of approximately 20,000 feet across the Greens Hollow tract, the regional groundwater flow toward the outcrop areas east of the lease is estimated to be on the order of 600 ft³/day or 3.1 gpm.

Potential drawdown influences of mine subsidence would not intercept all of the regional groundwater flow, especially given the large horizontal distance between the lease tract and the outcrop of the Star Point Sandstone. The 1 gpm approximate estimate is based on an assumption of a 30 percent reduction in regional flow due to the drawdown influence that could occur as a result of mining the overlying coal. The assumption of a 30 percent reduction in regional groundwater flow does not result in a 30 percent reduction in flow at Star Point Sandstone springs as most of the discharge at bedrock springs is associated with recharge closer to the outcrop and not from regional groundwater flow through bedrock units. This conceptual model of groundwater for the bedrock units in the study area is supported by the results of isotope and water quality sampling from Blackhawk and Star Point Sandstone springs compared to groundwater samples collected from roof drippers (DOGM 2007). This characteristic demonstrates the localized recharge mechanism for much of the groundwater observed in the Blackhawk and Star Point Sandstone Springs.

However, the duration of any influence could be extended over a number of centuries and distributed between the two drainage basins given the extremely slow rate of flow in the deeper ground water system. Thus, there would be some future diminution of ground water discharges as a result of the readjustment of potentiometric levels. This impact would be low but would be dispersed geographically and perhaps over centuries of time, such that hydrologic changes would not be measurable. This conclusion is based on several factors including the conceptual model of the hydrogeologic system in the analysis area, slow ground water flow rates in the lower portions of the Blackhawk Formation, age of water in the Blackhawk Formation, and the distance from the mine to the outcrop of the lower Blackhawk Formation.

4.3.2.2 Potential Impacts of Subsidence on Springs, Seeps, and Ponds

Issue 2: Mining-induced subsidence could change the flow of springs and seeps, affecting the flow of springs and their receiving streams. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

Potential impacts of subsidence on springs and seeps can be assessed from data defining the vertical distance between the surface and mined coal layers, physical characteristics of geologic formations that underlay springs, seeps, and source areas, along with the subsidence experienced from mines in the same coal field. Ecological impacts to aquatic and terrestrial wildlife resources are addressed in Section 4.4. Ecological impacts to vegetation resources (including riparian habitat and wetlands) are addressed in Section 4.5.
Subsidence induced fractures would drain ground water from storage in the Blackhawk Formation in the caved and fractured zones above longwall panels. Using a conservative estimate for the height of the fractured zone above the coal seam of up to a very conservative 60 times extraction thickness, the maximum vertical extent of the fracture zone would be less than 900 feet (Maleki 2008) based on a mining height of 15 feet (the height of the fractured zone, such as “900 feet” is dependent on the actual full extraction mining height and local rock characteristics). The actual maximum vertical extent of the fracture zone would depend on the mining height used in the Greens Hollow tract and the local overburden rock types. Existing single seam mining height in the adjacent Pines Tract is less than 12 feet (Hansen 2009a). Based on Figure 4.2, the risk that springs would be permanently drained by fractures in the caved and fractured zone would be extremely low because the overburden thickness at the spring locations in and adjacent to the Greens Hollow tract is greater than 1,000 feet. The fracture zone would not extend into the Castlegate Sandstone or the overlying Price River and North Horn Formations so that ground water sources for springs issuing from these units would not be drained into the mine. This statement is supported by water level measurements at the SUFCO wells completed in the Castlegate Sandstone and in the Hiawatha coal in the nearby Pines Tract and Quitchupah Tract. Water levels in the Castlegate Sandstone are on the order of 800 to 900 feet higher than in the Hiawatha coal at the same location as indicated by the observations at monitoring wells in the Pines Tract. Furthermore, water levels in Castlegate Sandstone wells show no change with mining and mine subsidence that has occurred immediately adjacent to these wells.

Nevertheless, near surface influences of subsidence can affect both permeability and porosity within the upper 50-feet of the surface which can, in turn, affect the flow at individual springs. With subsidence resulting from extraction of coal from a longwall panel, the shallow strata bend, bedding separations open, and fractures in the overburden that are parallel or oblique to the flexure open up in tension at the ground surface. Fracturing and bedding separation generally increase permeability and porosity. In the subsequent compressional stress phase, fractures partially close with corresponding decreases in permeability (Booth 2006). However, along the outer margins of the subsidence trough the tensional phase remains and results in higher permeabilities that can persist, providing a mechanism for long-term changes. This impact can include changes in hydraulic gradients, groundwater levels and flow at some springs depending upon the location of the spring and its ground water source relative to the tension zone found along margins of the longwall panel. The nature and extent of the fracture process is partially influenced by physical properties of each geologic formation. The occurrence of surface tensile cracking can impact both surface and subsurface flow processes. Ground water flowpaths to springs can be affected not only by the occurrence of surface tensile cracking but also by possible changes in natural fractures and joints that are affected by deformation. The effects of these changes caused by subsidence may be to diminish the flow of a particular spring or to increase the flow of a spring. However, the water is not lost or gained from the larger watershed but may be locally displaced.

All springs located in the area of disturbance by mine subsidence could potentially be affected by bed separation or surface tensile cracking that may develop parallel to the subsidence front as the mine advances. Tensile cracks that form in the soils, shales and mudstone layers near the surface over much of the Greens Hollow tract would be expected to close. However, surface tensile cracks in the sandstone units may persist.

The depth of surface tensile cracking is typically on the order of a few feet to as much as 50 feet (Maleki 2008). No measurements of the actual depth of surface tensile fractures are known to have been made in the Utah coal fields. Nevertheless, it is understood through geomechanics that surface tensile fractures are shallow (typically less than 50 feet). They are not connected with subsidence fractures above the cave zone. The factors influencing their extent and development have been well defined and validated through research, computer modeling, and field observations. Therefore, the 50 foot threshold incorporates these
factors as well as the professional opinion of mining engineers and geologists with experience in the analysis area. (Kendorski et al. 1979; Kendorski 1993; Kendorski 2006; and Maleki 2008). Surface tensile cracks generally close in the wake of subsidence. The time needed for an individual crack to heal is based in part on the size of the crack and in the geologic formation that it appears. Panel boundaries, defined by gateroads, panel ends, and non-yielding or stiff pillars that remain following mining result in permanent tension and development of surface cracks that sometimes do not “heal” (self-close) or heal only partially (Maleki 2008). Horizontal displacement of surface tensile cracks may vary locally from hairline up to 12 inches in width.

The Pines Tract EIS (Forest Service 1999) notes that the exact locations of surface tensile cracks “cannot be predicted, but predictions of expected size and duration can be made. Where cover depths are in the 900-foot range, the typical crack width is expected to be one inch or less, and time for formation is limited to about six months after undermining. However, these types of surface tension cracks appear to be relatively short-lived, tending to “self-heal” at a measurable rate of near 1/16 inch per week (Dimick 1991).”

While much of the information on healing of subsidence fractures and surface tensile cracks has been based on observations and experience at underground operations, there has been some research performed in the vicinity of the Greens Hollow tract. The Pines Tract EIS states that “Twenty-two tension cracks studied by the FS in 1978 over the SUFCO Mine ranged in width from 1/8 inch to 6 inches. Results of the study indicate most cracks self-heal or close from 13 percent to 100 percent of their original width. The following excerpt was provided from DeGraff (1978).

...Monitoring stations were installed along twenty-two different cracks widely distributed over the subsiding area. Weekly measurements were taken from mid-June to October. Cracks range in width from 6 inches to 1/8 inch. Preliminary analysis confirms the “self-healing” activity. Several cracks closed to less than 1/16 inch. “Self-healing” rate averages slightly more than 1/16 inch per week of closure. Measured rates ranged from less than 1/32 inch to more than 1/4 inch per week. The average amount of crack closure is 56 percent...

The field site examined by DeGraff (1978) was located near the north end of East Spring Canyon and south of Duncan Mountain. A review of geologic mapping indicates this area is located in areas of exposed Castlegate or shallowly buried Castlegate by slope wash or alluvial material. Observations made in the Pines Tract indicate that surface expression of cracks is strongly influenced by the immediate and subsurface soil depths and or rock types. Based on these observations, it is anticipated that without adequate cover above the Castlegate, fractures in zones of permanent tension may never heal. Field visits in 2005 to the upper end of East Fork Box Canyon between Joes Mill ponds and North Water spring (Panels 4LPE and 5LPE) identified cracks that measured from several inches to several feet in width (Lloyd 2010). Where necessary, cracks were backfilled with topsoil to facilitate healing and as a safety precaution for livestock, wildlife and recreational use. A second follow up visit to the area in 2009 indicated that some open cavities had reappeared within backfilled cracks and needed additional fill material (Lloyd 2010). This could be the result of settled fill material or limited additional movement and expansion of cracks. Area 12 (including much of the Pines Tract) was last mined during February 2007. Surface monitoring of Area 12 has indicated the north end of the last panel (6LPE) showed limited movement during the 2007, 2008, and 2009 surveys. No other movement was noted in Area 12 (SUFCO 2009). At present, all of Area 12 is considered dormant (SUFCO 2009). It is evident that the persistence of surface tensile cracks near North Water springs and Joes Mill ponds and much of the area south of this location is influenced by the presence of Castlegate Sandstone.
The flows at three springs in the Pines Tract (EFB-12, EFB-13, EFB-14) were all impacted by surface tensile cracks related to longwall mine subsidence that occurred in 2003 (Petersen 2009). During monitoring visits to the Pines Lease tract, it was noted that flow had ceased from each spring in December 2003 totaling about 3 gpm. New locations of groundwater discharge were noted at that time, downslope of the original spring locations and closer to the stream channel. Discharge was also observed at these same locations during 2008. All three springs issue from the Castlegate Sandstone and sustained base flows in the drainage below the springs. As mentioned previously, subsidence impacts in the North Water Area eliminated discharge from Pines 105, Pines 311, Pines 310 Lower and one unnamed seep contributing to a pond in the Joes Mill Pond area (Petersen 2007). As a result, lowered groundwater levels and subsequent loss of riparian vegetation in the localized area surrounding Pines 105 has occurred (Zobell 2007). Mitigation efforts to restore flow to these features included installing a grout curtain to raise groundwater levels, collecting groundwater in a perforated pipe, and pumping water from a down canyon spring to livestock troughs near Pines 105 (Weiser 2009). None of these efforts were successful in restoring groundwater to pre-disturbance conditions. A mitigation plan to restore the North Water spring area has been finalized (Canyon Fuel Company 2013) and recently approved (DOGM 2013b). Stream monitoring below these springs has indicated that groundwater contributions from the Castlegate Sandstone in the East Fork Box Canyon Creek continue to function and support groundwater flow at pre-subsidence levels in East Fork Box Canyon Creek (Petersen 2007).

Surface tensile cracks in the Castlegate Sandstone are less likely to heal given the absence of swelling clays and fine grained sediments in this unit. Spring M_SP87 issues from the base of the Castlegate Sandstone and is the only spring in the Greens Hollow tract that discharges from this formation. The source area located to the south of the spring is not expected to be affected by surface tensile cracking where the depth of the overlying Price River formation is greater than 50 feet. Nevertheless, the flow at this spring would be at risk for impact by surface tensile cracking that could occur under Alternative 2 in the locations closer to the spring, where the overlying cover on the Castlegate Sandstone is less than 50 feet. Other springs that could be at potential risk for impact by subsidence and related surface tensile fractures under Alternative 2 are Price River Formation springs M_SP01, MSP02, M_SP18, M_SP39, and M_SP45, and the North Horn Formation springs M_SP04, M_SP06, M_SP07, M_SP08, M_SP09, M_SP12, M_SP15, M_SP19, M_SP60, M_SP100, M_SP103, M_SP104, M_SP105, and M_SP106. As defined in Table 3.2, this list includes seven high value springs, nine moderate value springs, and three springs of unknown value.

Depending upon the final mine plan, any of the springs with groundwater source areas located near the edges of longwall panels could be impacted. Without reference to a specific mine plan, it is not possible to assess which of the springs may be at potential risk of impact due to tensile fractures or compression. The overburden depths at the springs within the tract are all greater than 1,300 feet; therefore, the potential risk would be lower in comparison to water features located at shallow overburden depths.

The overall risk for permanent water loss at any spring located within the tract would be relatively low. If the flow at a particular spring is diminished as a result of subsidence-induced surface tensile fractures, the ground water would not be drained to the mine or lost from the hydrogeologic system. The ground water affected by surface tensile fractures would be expected to remain shallow given the occurrence of clay and shale interbeds in the North Horn and Price River Formations, which influence the occurrence of numerous springs issuing from these Formations. The springs presently occur where there is a significant difference between the lateral and vertical permeability, which results in lateral ground water flow. Generally, the clays and shales provide the greatest restriction to vertical flow while the sands, particularly where fractured, serve to enhance lateral flow. The interbedded nature of clays and sands results in a significant preference for lateral flow and a restriction of vertical flow in the North Horn and...
the Price River Formations. The large number of springs and the perennial stream flow in these geologic units would not occur if the hydrogeologic system did not support lateral flow. Surface tensile fractures that appear in areas where shales and swelling clays are present would likely heal, thereby reducing the risk for long-term impact to the flow at these springs. If surface discharge from a spring is permanently affected, the ground water would be expected to discharge at another location. This discharge could be diffuse or concentrated depending upon the site-specific geologic conditions. Nevertheless, any changes in flow at a particular spring could impact wetlands, riparian vegetation, and beneficial use at that location. With this alternative, it is likely that some springs and their dependent ecosystems would be adversely affected by subsidence through diminishment or loss of flow at the current point of discharge. Impacts to aquatic ecosystems are addressed in detail under Section 4.4 Aquatic and Terrestrial Wildlife Resources. The probability of effect is generally related to the overburden depth and the location of the spring and its source area relative to the mine panel.

The water quality of springs could be affected by subsidence, if the flow paths for ground water issuing from the springs were significantly altered. Generally, any alteration of ground water flow paths would be relatively minor as discussed above. Therefore, water quality changes would be expected to be minor and imperceptible.

A total of eight stock ponds and 11 natural ponds are located in or near the analysis area (Figure 4.2). Stock ponds are located on overburden depths ranging from 1,000-1,400 feet. All natural ponds are located in areas with overburden depths greater than 1,600 feet. Two stock ponds are located on or immediately adjacent to areas of Castlegate Sandstone, which is more susceptible to impacts from subsidence.

It is possible that surface tensile fractures could temporarily intercept surface or shallow subsurface flows that discharge to stock ponds and natural ponds, or even the water in a pond. For most ponds, these tensile fractures would be expected to quickly heal and plug with sediment such that it would be unlikely for the source of water to a pond or the water in a pond to be affected beyond the first year. The two stock ponds located on or immediately adjacent to Castlegate Sandstone would be more susceptible to water loss from tensile fractures due to the brittle nature of this geologic formation. Without intervention, healing of fractures in Castlegate Sandstone and the associated loss of water from stock ponds could extend well beyond a single year. Due to the overburden depths at all pond locations, it is very unlikely that water loss to mine operations would occur following subsidence. Stipulations #13 and #17 would protect water sources and improvements.

### 4.3.2.3 Potential Impacts of Subsidence on Perennial Streams

**Issue 3:** Mining-induced subsidence of perennial streams could intercept flowing/impounded water and divert it underground, changing the hydrology. Changes in stream gradient could cause changes in stream morphology (see wildlife). Each tributary potentially affected must be specifically addressed by subheading.

Mining activities would result in subsidence-induced ground movements and other changes in geology and topography. Environmental impacts resulting from mining-induced subsidence include lower surface elevations, changes in the gradient of streams, tension cracks, and rock failure. The potential for mine subsidence to impact streams can be evaluated in a similar manner as for springs and ponds. The vertical distance between the surface water body and the mined coal and the geology underlying the stream channel are relevant considerations, along with experience gained through observing subsidence processes at other mines in the same coal field. Figure 4.2 also shows the mine plan for Alternative 2 and the overburden thickness above the Upper Hiawatha coal seam with respect to the mapped location of perennial stream reaches, cattle troughs, and ponds.
Perennial streams that could be undermined in Alternative 2 (maximum extraction scenario) and thus may be affected include North Fork and South Fork Quitchupah Creek, Cowboy Creek, Greens Hollow, and Muddy Creek. With the exception of Muddy Creek, the minimum amount of overburden thickness between the coal seam that would be mined and the stream channels is 1,200-1,300 ft. Using a very conservative estimate for the depth of the fractured zone (60 times an estimated extraction thickness of 15 ft, or a maximum depth of less than 900 ft), Maleki (2008) predicts that the extension and expansion of existing fracture systems and upward propagation of new fractures resulting from mine subsidence would not affect North Fork and South Fork Quitchupah Creek, Cowboy Creek, or Greens Hollow. Extraction thickness in the adjacent Pines Lease Tract is less than 12 feet.

Where Muddy Creek crosses the eastern tract boundary, the overburden cover is less than 900 feet. Along this segment of lower overburden cover, there is potential for mining-induced subsidence from longwall mining to result in loss of water from Muddy Creek to the underground mine workings. In accordance with the DOGM mine regulations, any impact to water rights on Muddy Creek must be replaced with equal amounts and quality in an alternate water supply. Furthermore, any permanent loss of base flows that sustain low flow in Muddy Creek would adversely impact other uses, including recreation and habitat for fish and wildlife. A detailed discussion of subsidence impacts to these resources can be found in Section 4.9 Recreation, Section 4.4 Aquatic and Terrestrial Wildlife Resources, and Section 4.5 Vegetation. Although the potential magnitude of flow loss is not known with certainty, some inferences can be drawn from adjacent mined areas. A perennial segment of Miller Creek (overlying the Blackhawk Formation) experienced significant flow losses and even dried up during low flow periods in locations where the overburden cover was less than approximately 600 feet (Wilkowske et al. 2007). However, perennial segments continued to flow in areas where overburden cover was greater than approximately 600 feet (Wilkowske et al. 2007). Under Alternative 2, the proposed Area of Subsidence Mining includes a segment of Muddy Creek with 400-900 feet of overburden cover. Thus, the potential exists for water loss to occur due to subsidence beneath Muddy Creek in this area. However, the stream may not dry up during low flows. It is noted there may be limits to the application of Wilkowske et al. (2007) as the study was located more than 40 miles northeast of the analysis area and was associated with multiple seam mining. In any case, the fracture occurrence is likely to diminish with overburden cover greater than 600 feet. Furthermore, montmorillonite clays in the upper portions of the Blackhawk Formation may heal fractures because of the expanding nature of these clays. This appears to be the case in the East Fork of Box Canyon above the adjacent SUFCO mine workings.

Petersen (2009) provides an assessment of subsidence impacts observed in the adjacent Pines Lease Tract and local confirmation of Wilkowske et al. (2007) indicates that there is minimal risk of water loss from perennial streams where overburden cover is greater than 600 feet and on the order of 60 times mining height. However, these reports do not eliminate potential for water loss at the minimum extent of the fracture zone (overburden cover of 30 times mining height). Petersen (2009) also notes that surface tensile fractures in the Castlegate Sandstone were slow to heal in areas where stream channels encounter this formation. Other observations included several short reaches of East Fork Box Canyon that were dry following mine subsidence yet supported water flowing through shallow bedrock and within “tension fractures that were largely oriented parallel or sub-parallel to the direction of the stream flow. The dry stream reaches were typically only a few feet to a few tens of feet of topographic elevation difference between the upper and lower extents of the dry reaches before the water re-emerged as surface flow. Typically, surface water re-emerged in the stream drainage where the first or second low-permeability shaley horizon intersected the channel bottom.” Follow-up restoration efforts by the mine operator (SUFCO Mine) successfully restored the surface flow although the pattern was altered.

Subsidence impacts would occur at the surface under Alternative 2, resulting in differential subsidence where longwall panels extend under stream channels. Consequently, the pre-mining gradient of
undermined stream channels would both increase and decrease, depending upon the location of longwall panels beneath the stream. Channel slopes would increase where streams enter the subsidence zone and decrease where channels leave the subsidence zone. Changes in surface slopes resulting from differential subsidence would be moderate at the estimated overburden cover (generally less than 1 to 2 percent). Localized ponding could occur along channels where slope reductions occur. However, these changes may not be apparent along steeper channel segments as natural pools, steep segments and large boulders are common along these bedrock-dominated channels. Some channel erosion followed by deposition could occur as stream flows seek to establish a new channel gradient that is in balance with the energy and sediment load of incoming and outgoing flows. Given the nature of stream channels in the analysis area and the level of surface impacts that would occur following subsidence, functional changes in channel morphology would not be expected under Alternative 2.

Sidle et al. (2000) assessed mine subsidence-induced channel changes in Burnout Creek at the Skyline Mine. The changes in channel characteristics were subtle with the most conspicuous change being an increase in the length of cascades and some increase in pool volumes. Subsidence had no effect on base flows or near-channel landslides. Although there are limits to application of this study, located more than 40 miles north of the study area, stream channels in the analysis area are located in similar geology and have similar slopes to the segments of Burnout Creek that were subsided at the Skyline mine. It is possible that differential subsidence of this magnitude may result in channel incision across the over steepened segments or in sediment deposition and ponding along low-slope segments of analysis area streams. Obvious channel changes, such as channel incision, can be minimized, although based on observation of mine subsidence-induced channel changes in Burnout Creek at the Skyline Mine, intervention is not likely to be required (Sidle et al. 2000).

Tensile fractures can also occur at the surface near edges of longwall panels where cover is more than approximately 60 times minable coal thickness. As discussed above, surface tensile fractures are typically shallow, not more than 50 ft deep, and are often self-healing if there are shales and clays in the overburden (Maleki 2008). Loss of water to the underground mine workings would not occur through surface tensile fractures. Water loss associated with surface tensile fractures would be minor, of short duration, and limited to relatively shallow, subsurface depths. Shale and clays in the Price River Formation and in the colluvial/alluvial materials overlaying the Castlegate Sandstone would serve to promote healing of surface tensile fractures in areas where they occur. This self-healing potential is particularly evident in the Cowboy Creek and Greens Hollow drainage due to the high clay content found in soils developed from the lower Price River Formation (Anderson 2008a, Anderson 2008b). However, surface tensile cracks in the sandstone units may persist where the Castlegate Sandstone is exposed or insufficiently covered.

Surface tensile fractures in the Castlegate Sandstone would most likely persist and be very slow to heal in areas where stream channels encounter this formation. Any subsidence mining that takes place beneath channel segments with less than about 50 feet of Price River Formation or alluvial material above Castlegate Sandstone could result in surface tensile fractures that may be slow to heal. In the short term, surface tensile fractures could extend down into the Castlegate and divert stream water to the sandstone formation where it would be expected to return to the stream channel further down the valley. Thus, the possible effects of enhanced surface tensile fracturing in the Castlegate Sandstone and lower portions of the Price River Formation would be to shift the location of perennial flow segments further downstream with a possible decrease in stream flows and the length of the perennial reach in the downstream channel segments.

The perennial flow segments in Cowboy Creek and Greens Hollow end in the general vicinity of where stream channels cross the Castlegate Sandstone. Surface tensile fractures in these reaches would be
expected to heal with clays and fine grained sediments so that any impact on perennial flow segments would be temporary or limited to a short segment 100 to 200 feet upstream of where channel segments cross the Castlegate Sandstone outcrop. Although the stream channel and flows could be affected, permanent loss of water to the underground workings would not occur. Any local loss of flow from stream channels near the Castlegate Sandstone outcrop would enhance the rate of subsurface flow in fractured bedrock and alluvium underlying downstream channel segments. Any long-term shifts in perennial stream segments could result in a corresponding shift in riparian vegetation. Temporary changes in flow are unlikely to affect riparian vegetation any more than the normal fluctuations between wet and dry years.

Potential impacts to escarpments adjacent to segments of Muddy Creek and other perennial streams in the area are discussed in the Geology section (Section 4.2). Impacts to water resources would occur if material resulting from escarpment failure enters the stream channel or riparian areas adjacent to stream channels. Any material that blocks stream channels would result in channel bank and bed erosion and downstream deposition as flows move around the obstruction. Riparian vegetation destroyed by escarpment failure could also result in a loss of rooted material that helps stabilize channel banks.

4.3.2.4 Potential Water Quality Impacts from Mine Areas and Mine Discharge

**Issue 4:** Foreseeable continued discharge of mine water into Quitchupah Creek could change water quality in Quitchupah Creek and other downstream drainages. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

Water quality impacts can be addressed in part with baseline monitoring data collected from springs and streams in the proposed mine area as well as discharge monitoring from existing mine effluent. Springs and streams in the Greens Hollow tract and surrounding areas (including areas mined by SUFCO) were monitored during 2001-2004 (Cirrus 2004). A few of these spring and stream sites were monitored from 1979-2012 (DOGM 2013a). The parameters measured for groundwater quality were selected from monitoring requirements established by DOGM. These parameters provide a means for determining baseline water quality and comparison to samples from other areas with similar geology that have not experienced subsidence impacts. A more detailed review and assessment of groundwater quality in the analysis area is included in Cirrus (2013c). This report includes an assessment of surface and groundwater quality data collected during a period of more than 20 years from 33 springs and 10 stream sites (Cirrus 2004; DOGM 2013a). Some of these locations are a subset of spring and stream sites that were monitored in the Muddy Creek drainage (Cirrus 2004).

The locations for groundwater monitoring were selected by the FS following an initial survey to identify all springs in the analysis area (Cirrus 2013c). Springs were located in all geologic formations within or adjacent to the Greens Hollow tract with the exception of the Starpoint Sandstone Formation. No springs were identified from the Starpoint Sandstone Formation. Springs were monitored every spring and fall during 2001-2004 for field parameters. Additional parameters were measured at 10 springs selected for intensive monitoring during each quarter of the year, including seven springs located in or immediately adjacent to the Greens Hollow tract. Springs were selected for monitoring based on the aquifer source (geologic formation), flow volume, and flow duration.

Discharges of mine water and facility area runoff would occur at locations beyond the outer limits of the National Forest boundary. These discharges would need to meet the technology-based limits for iron, settleable solids and total suspended solids. Elevated dissolved solids in ground water have been observed at the SUFCO waste rock disposal facility. Localized impacts on ground water quality are expected to continue from mine facilities, including waste rock disposal sites and coal storage sites at levels that will meet water quality standards associated with DOGM permitting requirements.
If mine water from the Greens Hollow tract is discharged into North Fork Quitchupah Creek, the discharge would continue to meet the current UPDES discharge limits and stream standards. The calculated TDS pollutant load for the SUFCO mine is currently 2,500 tons/year, and well below the allowable load of 10,044 tons/year defined in the TMDL (Utah DWQ 2004).

The water quality of the current mine discharge is thought to be most representative of future mine water discharges or accumulation in the mine. Analysis results of discharge from the SUFCO Mine into North Fork Quitchupah Creek at permitted discharge point 003 are reported in the Utah Coal Mine Water Quality Database maintained by DOGM at http://linux1.ogm.utah.gov/cgi-bin/appx-ogm.cgi. These results show that TDS concentration in mine water discharge during the past decade (2003-2012) averaged 674 mg/l and never exceeded the permitted limit of 1,200 mg/l based on the agricultural use criterion (DOGM 2013a). The water quality criterion for dissolved iron is 1.0 mg/l, based on the designated aquatic life uses for North Fork Quitchupah Creek. UPDES rules require permit limits for total iron. A total iron discharge limit of 1.0 mg/l has been established, based on an assumption that total and dissolved iron concentrations are the same. With approval from the Division of Water Quality, up to 2 mg/L total iron could be discharged under certain circumstances as long as dissolved iron concentrations remain at or below 1.0 mg/L. Discharge limits are also established for pH, settleable solids, and total suspended solids. The discharge monitoring results show compliance with these permitted limits.

Criteria defined in the existing SUFCO mine permit are designed to protect the beneficial use assigned to receiving water bodies by DWQ. In addition, Whole Effluent Toxicity (WET) testing is required to insure that mine discharge is not toxic to aquatic life. The results of WET testing reported in the DOGM Water Quality Database show compliance with applicable standards. However, if water quality of mine discharge were to deteriorate and consistently violate permit limits, impacts would occur to aquatic and terrestrial ecosystems located downstream of the point of discharge, and would be commensurate with the change in water quality and quantity. Such impacts could be long-lasting and fatal to some species in the absence of mitigation efforts. If monitoring data indicates that permit limits are violated, mitigation will be required of SUFCO by DOGM to restore water quality.

Currently, waste rock generated by SUFCO mining operations and sludge from sediment ponds are disposed of at a permitted waste rock disposal site near the mine surface facility and outside of the National Forest boundary on private land (Forest Service 1999). It is expected that this facility would continue to be used for disposal of waste rock and sludge under Alternative 2 or Alternative 3. The site is monitored and under the regulatory control of the Utah DOGM. Materials that are disposed of at the SUFCO Mine waste rock site have been tested for acid- and toxic-forming potential. Data indicate that boron, sodium absorption ratio, and specific conductance exceed Federal and State guidelines for the management of topsoil and overburden (Forest Service 1999). As a result, in order for this material to be used as topsoil at other locations, it would need to be treated to meet applicable standards. At the present time, SUFCO intends to store waste rock material at the existing site (located on private land) in an approved design that will meet Federal and State standards and specifications for landfills and prevent future contamination to surface or ground water resources. Ground water at the waste rock disposal site currently contains TDS concentrations that are above the natural TDS concentrations of other ground waters in the area. Monitoring wells located around the facility have indicated that contamination is localized and remains within acceptable limits. All ground water monitoring activities at this location are under the regulation of DOGM and DWQ and will be enforced according to state law.

Under Alternative 2, the waste rock site would continue to slowly expand throughout the life of the mine. The site has not reached its permitted design capacity at the present time. SUFCO does not anticipate a need to relocate the existing waste rock pile or construct a new site under Alternative 2 or 3 (Hansen...
Waste rock material under Alternative 2, would continue to contribute TDS concentrations that are above natural levels for groundwater in the area. The extent of elevated TDS concentrations would continue to remain localized and not result in pollutant loading that would substantially influence surface or ground water quality.

Under Alternative 2, material in the SUFCO waste rock pile that exceeds federal and state guidelines and directives would be contained within the existing storage facility that is designed to prevent contamination with the surrounding environment. Routine monitoring of groundwater wells will continue and would determine if concentrations of TDS or other chemical constituents are meeting state and federal criteria for groundwater, and if these concentrations are remaining within the footprint of the storage facility. If elevated concentrations are allowed to move offsite, impacts to aquatic and terrestrial ecosystems would occur. Such impacts could be long-lasting and fatal to some species in the absence of mitigation efforts to restore groundwater quality. If monitoring data collected from groundwater wells indicate that pollutants are moving offsite, mitigation will be required of SUFCO to restore groundwater quality to acceptable levels that support the assigned beneficial use of water resources. Such mitigation will be enforced by DOGM. Based on existing monitoring data and the location of this facility, the potential for groundwater contamination to surface water bodies located down gradient of this site is minimal.

4.3.2.5 Potential Water Quality Impacts from Mine Equipment and Materials

Issue 5: Equipment and materials spilled, used, and/or abandoned in underground mine workings could change groundwater quality and any connected surface water sources. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

The quality of mine water discharge or mine water that accumulates in mined-out areas would be similar to the quality of ground water in the overlying and underlying units, with increases in the concentrations of some constituents due to oxidation of sulfide minerals in exposed rock and chemical interactions with roof bolts and other supporting materials introduced into the mine. The oxidation of sulfide minerals (primarily pyrite) in coal mine environments typically results in increased sulfate, iron, manganese and reduced pH. Dissolved iron may also increase, although most if not all of the iron released by sulfide oxidation is removed from solution by precipitation in neutralized mine water.

At most coal mines in the western United States, including the coal mines in the Wasatch Plateau, the presence of carbonate minerals neutralizes the hydrogen ions from sulfide oxidation such that acid mine drainage conditions do not occur. The iron and manganese released by sulfide oxidation generally precipitate from the neutralized water prior to leaving the mine. The net effect is generally an increase in TDS due to increases in concentrations of sulfate, calcium, magnesium and bicarbonate. Any increase in concentrations of sulfate, calcium and magnesium in mine water drainage is often difficult to distinguish from background levels due to the presence of gypsum and other oxidized sulfate minerals, which produce high levels of these constituents (Mayo et al. 2000). At the SUFCO mine, TDS concentrations in groundwater typically range from about 300 to 550 mg/l (Mayo et al. 2000). As a result of sulfide oxidation within the mine, TDS concentrations in mine drainage increase. Mean TDS concentration in mine discharge during 2003–2012 ranged between 600–800 mg/L (DOGM 2013a). Mine water in the SUFCO mine is saturated with respect to carbonate minerals (Forest Service 1999).

During the course of mining operations, many tons of ferrous metals are utilized. Much of this metal, particularly the roof-bolts, wire mesh and cribbing, cannot be removed as the mine retreats due to safety concerns. Where necessary, these metals would remain in the mine and initially oxidize over time as long as oxygen is present, resulting in some increase in metal concentrations in mine water. Acidic byproducts of pyrite oxidation are neutralized by carbonate minerals and help precipitate dissolved metals (e.g. iron and manganese) contained in mine waters. In general, iron concentrations in neutral mine discharge from Greens Hollow Federal Coal Lease Tract
Utah coal mines remain low (Mayo et al. 2000). Concentrations of other primary metals that may increase as a result of chemical evolution within the mine are calcium and magnesium.

After mining is completed, the underground mine workings are flooded. As water levels rise, additional ions would be dissolved into the mine pool. The potential for these constituents to eventually discharge from the mine would be a function of the rate of discharge and distance from the mine portal. The quality of mine water discharge would experience spikes in dissolved metals (primarily iron) and other constituents that enter solution during the flooding process. This flushing effect would diminish over time as the mine completely floods and dissolved oxygen levels drop. As this occurs, the rate of oxidation of sulfide minerals and ferrous metals would also decline and eventually cease. At some point, dissolved metals could begin to precipitate as sulfide minerals that would be contained within the underground workings or in adjacent coal beds. Water quality monitoring from the discharge stream would continue as long as discharge exists, to ensure compliance with UPDES regulations and support of beneficial use.

It is not certain at this time if discharge from the mine will cease when pumping is terminated. As mentioned previously and based on monitoring data and known features of regional geologic formations, the likelihood does exist that discharge will cease at some point in time. However, development of the Greens Hollow tract is down-dip of the SUFCO mine portal and it is reasonable to conclude that discharge would stop soon after cessation of mining and may never occur, depending upon the final hydrogeologic equilibrium and portal closure plans. Under this scenario, mine inflows from the coal, the overburden, or the underburden could cause water levels to rise within the caved zone and the fractured zone above and adjacent to subsidence panels after mining ceases. Hydraulic heads would increase as the mine floods and a small amount of seepage would begin to occur through the underburden and the coal. Eventually, a new equilibrium would be established at a level where gravity flow may or may not occur at the mine portal location along the North Fork Quitchupah Creek. Mine reclamation does require that the mine portals be sealed to prevent access. Portal seals may also be designed and constructed to prevent long-term point source discharge from the mine portal.

4.3.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Under Alternative 3, the FS would consent to the BLM offering for lease the Greens Hollow tract with BLM standard lease terms and conditions (BLM 1986) and special coal lease stipulations (Appendix B). This alternative emphasizes protection of surface resources that are specific to the Greens Hollow tract. Subsidence of escarpments, and significant cultural resources would not be allowed. Under this alternative full support mining (no subsidence allowed) would be required in specific “stream buffer” locations to minimize the potential for long-term loss or displacement of water from perennial streams due to mine subsidence in the tract boundary. There would, however, be no specific prohibition on subsidence of roads, trails, or range improvements. This is the most restrictive alternative and would likely result in the least environmental impact. Nevertheless, Alternative 3 does not eliminate potential effects on surface water resources. Rather, it minimizes the risk for a long-term loss of water from the perennial stream segments in the tract, including Muddy Creek, Greens Hollow, Cowboy Creek, and North Fork and South Fork Quitchupah Creek. A description of buffers that can be used to protect escarpments adjacent to segments of Muddy Creek and other perennial streams is provided in the Geology section of Chapter 4 (Section 4.2).

The primary issue in the subsidence impact risk assessment for protection of surface water resources under Alternative 3 is how much of the Price River Formation and/or alluvial/colluvial material in the drainages is needed between the Castlegate Sandstone and the streams to ensure that tensile fractures would heal and thereby minimize the potential for water loss from streams.
Alternative 3 establishes stream protection buffer zones along Muddy Creek, perennial and intermittent segments of North Fork Quitchupah Creek, Greens Hollow, Cowboy Creek, and intermittent tributaries to Muddy Creek. Buffers were only developed for intermittent segments that supported riparian vegetation. These buffers protect each channel to a point upstream of the Castlegate Sandstone outcrop a sufficient distance such that at least 50 feet of alluvial and or Price River Formation materials overlie the Castlegate Sandstone. Buffers also extend a distance of 200 feet either side of the stream centerline.

The vertical distance of 50 feet would likely contain enough clay material to be capable of healing surface tensile fractures. Based on principles of geomechanics, it is generally assumed that surface tensile fractures are typically shallow and not like subsidence fractures that develop above the cave zone. As discussed previously, the factors influencing their extent and development have been well defined and validated through research, computer modeling of fracture development and other subsidence impacts, and field observations. The 50-foot threshold used to estimate a typical maximum vertical depth of surface tensile fractures incorporates these factors as well as the professional opinion of mining engineers and geologists with experience in the analysis area. Based on field observations (Anderson 2008a) and an evaluation of drill hole logs (Anderson 2008b), it is anticipated that thick, resistant sandstone beds are not present in the lower 50-foot section of the Price River Formation and that there is sufficient clay and shale in the alluvium and lower portions of the Price River Formation to promote self-healing of surface tensile fractures.

Selection of the 200 foot buffer on either side of the stream centerline is based on field observations (Cirrus 2004) as well as a review of high-resolution aerial photography, historic and existing meander patterns, and a conservative estimate of the accuracy associated with stream mapping. This width is conservative in that it exceeds recommendations for 100 foot stream buffers included in the Surface Mining Control and Reclamation Act (SMCRA) and in Federal Code 30 CFR817.57. This code states (emphasis added) “No land within 100 feet of a perennial stream or an intermittent stream shall be disturbed by underground mining activities, unless the regulatory authority specifically authorizes underground mining activities closer…”.

The 200-foot stream buffer zone is designed to protect stream channels from impacts (including surface tensile cracks or any changes in surface elevation) immediately following subsidence or in the future during periods of natural lateral migration that stream channels experience over time. The stream buffer is based on a distance of 200 feet from a stream centerline that was digitized with high resolution aerial photos. The exact location of this line is associated with a certain amount of human error created during the digitizing process. Where possible, old meander channels were identified and measured during review of aerial photography. These measurements provided some indication of the extent of historic lateral movement. The final buffer width is an estimate based on the level of error associated with digitizing and the distance between existing stream channels and old meander channels.

As shown in Figure 4.4, buffers parallel stream channels to a point upstream where more than 50 feet of overburden above Castlegate Sandstone exists. The buffer does not extend upstream beyond this point. Additional protection is added through a second buffer based on a conservative 20 degree angle of draw beginning at the elevation of the coal seam directly below the 200 foot buffer and extending outward into the analysis area. This additional buffer insures that even in the most extreme situation, surface disturbance (as defined by changes in surface elevation and surface tensile cracks) would not extend to the surface within 200 feet of the stream channel. The angle of draw measured at the nearby Pines Tract following subsidence was 10-15 degrees (Forest Service 1999). In effect, the additional angle of draw buffer defines the limits of full extraction underground mining that would be required to ensure that surface tensile cracking would not occur within 200 feet of either side of the perennial stream or in channel segments where overburden depths above Castlegate Sandstone are less than 50 feet.
Finally, the 200-foot buffer supports FS desires to protect perennial stream channels and adjacent riparian ecosystems from long-term relocation and water loss. Stipulation #17 requires replacement of water in quantity and quality to maintain existing habitat and land uses.

4.3.3.1 Interception of Ground Water

**Issue 1:** Mining-induced subsidence could intercept ground water in underground mine workings, and subsequent discharge to Quitchupah Creek (Existing National Pollutant Discharge Elimination System [NPDES] Permit) could cause transbasin diversions of surface and ground water from the Muddy and Greens Hollow drainages to the Quitchupah Creek drainage. This could affect downstream agricultural, domestic, and industrial water supplies as well as ecosystems.

Restricted longwall mining beneath Muddy Creek under Alternative 3 would reduce any potential for interception of surface flow and shallow alluvial/colluvial ground water and diversion to underground workings by subsidence induced fractures above longwall panels. Overburden depths are greater than 900 feet at other locations in the Greens Hollow tract where longwall mining may occur under Alternative 3.

The high overburden cover in these areas minimizes any potential for interception of surface flow and shallow alluvial/colluvial ground water by the fracture zone connected with mine workings. The possible interception and transbasin diversion of deep ground water by mining and mine subsidence would be low in these areas under Alternative 3 and similar to impacts associated with Alternative 2. The deep ground water intercepted at the SUFCO Mine was shown to be extremely old and not a significant part of the active hydrologic system. The same conditions would be expected in the areas of deep overburden cover in the analysis area for Alternative 3. All ground water impacts following termination of mining operations in the Greens Hollow tract under Alternative 3 would be similar to or slightly less than impacts associated with Alternative 2 due to restrictions placed on the total area of longwall mining.

4.3.3.2 Potential Impacts of Subsidence on Springs, Seeps, and Ponds

**Issue 2:** Mining-induced subsidence could change the flow of springs and seeps, affecting the flow of springs and their receiving streams. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

Potential impacts of subsidence to springs under Alternative 3 would include the springs mentioned above under Alternative 2 with the exception of spring M_SP87. Spring M_SP87 would not be impacted under Alternative 3 as it is located in the proposed buffer zones designed to protect perennial streams. Spring M_SP87 issues from the Castlegate Sandstone similar to the three springs noted in Section 4.1.1 that are continuing to experience loss of flow to surface tensile fractures at the Pines Tract (Canyon Fuel Company 2007). In order to prevent subsidence impacts and loss of flow, the stream protection buffer has been extended upgradient of spring M_SP87 to ensure that areas of Castlegate Sandstone Formation with less than 50 feet of overburden cover are not disturbed by subsidence. Figure 4.4 shows the Alternative 3 boundary with respect to location of nearby springs and the overburden thickness above the Upper Hiawatha coal seam.

The location of stock ponds, natural ponds, and cattle troughs are shown in Figure 4.4. All stock ponds are filled by surface runoff occurring from snowmelt and high intensity precipitation events while natural ponds are filled by ground water discharge as well as surface runoff. It is possible that surface tensile fractures from subsidence could temporarily intercept surface flows upstream of the ponds or even the water in a pond. However, given the nature of the soils and sediments in these drainages, tensile fractures would be expected to quickly heal and plug with sediment such that it would be unlikely for the source of water to a pond or the water in a pond to be affected beyond the first year.
Figure 4.4. Alternative 3 - surface and ground water features with stream buffers and overburden thickness.

Legend
- Greens Hollow Coal Lease Tract
- Mining Analysis Area Boundary
- Area of Subsidence Mining
- National Forest Boundary
- Conceptual Mining Area
- GreensHollowSectionsPLSS

- Overburden contours (200 ft)
- Springs
  - High
  - Moderate
  - Unknown
- Cattle Troughs
- Natural Ponds
- Stock Ponds
- Stream Buffer
- Angle of Draw Buffer

1:53,500
The flow at a particular spring may also be at risk for impact if its ground water flow path intersects this zone of surface tension. This alternative would reduce the likely number of springs and their dependent ecosystems adversely affected by subsidence by considering high value springs during development of the mine plan and incorporating panel layouts that reduce risk to high value springs.

The two ponds located adjacent to the Castlegate Sandstone in Greens Hollow and along North Fork Quitchupah Creek would be protected in Alternative 3. Stipulation #13 would require improvements damaged or destroyed by mining operations to be restored or replaced by the Lessee as directed by the FS.

4.3.3.3 Potential Impacts of Subsidence on Perennial Streams

**Issue 3:** Mining-induced subsidence of perennial streams could intercept flowing/impounded water and divert it underground, changing the hydrology. Changes in stream gradient could cause changes in stream morphology (see wildlife). Each tributary potentially affected must be specifically addressed by subheading.

Alternative 3 establishes stream protection buffer zones along Muddy Creek as well as along Greens Hollow and Cowboy Creek, where these streams cross the Castlegate Sandstone outcrop. Figure 4.4 shows the Alternative 3 boundary and the overburden thickness above the Upper Hiawatha coal seam with respect to the mapped location of perennial stream reaches, ponds, and troughs.

In the North Fork Quitchupah Creek drainage, Anderson (2008a) found unconsolidated deposits above bedrock that included clay-rich material as well as young alluvium comprised of a matrix of clay, sand, and pebble-boulder sized clasts. The unconsolidated material above the Castlegate Sandstone was found to occur only in a relatively narrow band and generally less than a quarter mile upstream of the exposed top of the Castlegate in the drainage. Above this point there were exposures of both the Price River Formation and the unconsolidated deposits in the cutbanks of the perennial and intermittent streams. The shale content of the Price River Formation was found to be substantial but variable in exposures of the Price River Formation in cutbanks of both the main North Fork Quitchupah Creek and a tributary. Field observations indicated that the lowest 20 to 40 feet of Price River Formation consists of about 50 percent shale and 50 percent sandstone, silty sandstone, and muddy sandstone for outcrops found in the North Fork drainage and along the road to the southwest of North Fork Quitchupah Creek.

In contrast, the field assessment of Anderson (2008a) found alluvial/colluvial materials along Cowboy Creek and Greens Hollow which indicates that bedrock in this drainage is overlain by deposits of unconsolidated material comprised of greater than 90 percent clay-sized particles. There appears to be sufficient clay in the alluvial/colluvial material along these streams that subsidence fractures would be unlikely to stay open.

Based on Anderson’s (2008a) observation of alluvial/colluvial materials upgradient from the outcrop of the Castlegate Sandstone along Cowboy Creek and Greens Hollow, and the variable clay content noted in some areas, a stream buffer zone would be needed to minimize the risk of potential loss of flow due to subsidence induced tensile fractures. The buffer zone should extend a distance upstream to where more than 50 vertical feet of Price River Formation above Castlegate Sandstone is present to ensure that surface tensile fractures do not extend down to the Castlegate Sandstone and that sufficient clay and shale is present to seal surface tensile fractures. In order to minimize the risk of surface tensile fractures in areas with less than 50 vertical feet of Price River Formation above Castlegate Sandstone, an additional angle of draw buffer should be incorporated into the buffer zone. This would extend upstream a distance defined by the depth of overburden cover from the coal to the surface and a conservative 20° angle of draw. Finally, the buffer would need to extend outward a horizontal distance of 200 feet either side of the...
stream centerline, plus an additional angle of draw buffer. This buffer would minimize the risk of surface tensile fractures developing in areas where channel migration might occur. Buffers would need to extend downstream to where streams begin to cross the Castlegate Sandstone formation in order to ensure protection along the full extent of the analysis area.

The stream protection buffer within the Greens Hollow tract for Muddy Creek, Cowboy Creek, and Greens Hollow is shown in Figure 4.4. Under Alternative 3, the buffer zone extends up to the Greens Hollow tract boundary. Therefore, no buffer on the North Fork Quitchupah Creek drainage is shown within the tract boundary in Figure 4.4, as well as buffers outside the boundary on Muddy Creek, Cowboy Creek, and Greens Hollow. Buffers include all areas where there is less than a 50-foot vertical interval of Price River Formation above the Castlegate Sandstone plus an additional angle of draw buffer that extends up from the coal bed to the surface at an angle of 20°. Note the 20° angle of draw used to define stream buffers is more conservative than the 10° to 15° angle measured on the Pines Tract following subsidence (Forest Service 1999). The conservative 20° angle of draw was used to ensure that surface tensile cracking would not extend to the surface within 200 feet of the stream channel. Also note that Figure 4.4 does not include the buffer associated with escarpments along the Muddy Creek which were considered during the formulation of Alternative 3.

The risk of water loss from perennial or intermittent streams is low for segments upgradient of the stream protection buffer. However, there could be a temporary displacement of water from some segments of the channel beyond the stream protection buffer until the surface tensile fractures heal. All tensile fractures should heal in areas outside of the buffer zone, although the rate of healing would vary with the crack width and the clay content of the alluvial materials.

In summary, Alternative 3 does not eliminate all potential effects on surface water resources. Rather, it minimizes the risk for a permanent loss of water from the perennial stream segments of Muddy Creek, Greens Hollow, and Cowboy Creek within the Greens Hollow tract. With this stream protection buffer, the potential for surface tensile fractures would still exist along the perennial stream segment upstream of the buffer on Greens Hollow and Cowboy Creek, but any surface tensile fractures that may develop in these areas would be expected to quickly heal. Water could be temporarily lost from a segment of channel but would not be lost to the drainage and would reemerge downstream. Any temporary loss or diminution of flow in the channel segment of less than a year would be within the range of fluctuations observed between wet and dry years and would not be expected to result in a large long-term adverse impact on riparian vegetation and wildlife. This conclusion is based on the assessment of perennial flow and observations of riparian vegetation conducted during baseline monitoring (Cirrus 2004; Cirrus 2013b). Locations where flow started and stopped were measured using GPS technology or marked on 1:24,000 scale USGS quad maps. Several stream channels that were noted to be continuously flowing in fall 2001 became intermittent in fall 2002 and fall 2003 with some segments drying up completely. The extent of perennial flow segments were compared with the Palmer Drought Index and these results suggest a climatic influence on the extent of perennial flow segments at the tract.

Alternative 3 does not prevent potential changes in channel gradient due to differential subsidence along undermined stream segments. Maleki’s (2008) report indicates that differential subsidence may occur over distances of 500 to 1000 feet where the stream channels are perpendicular to longwall panels. It is possible that differential subsidence of this magnitude may result in channel incision across the over steepened segments or in sediment deposition and ponding along low slope segments of some stream channels. However, some changes may not be apparent as natural pools, riffles, boulders and rock outcrops occur along these channels. Obvious channel changes, such as channel incision, can be minimized, although based on observation of mine subsidence-induced channel changes in Burnout Creek at the Skyline Mine, intervention is not likely to be required (Sidle et al. 2000). There could also be a
temporary displacement of water from some locations in the channel until the surface tensile fractures heal. As mentioned above, displacement of water does not reflect a loss of water directly to the mine but instead results in relocating water from upstream to downstream segments of the same stream channel. In consideration of subsidence impact risk to water resources, one needs to consider that subsidence is fairly uniform over longwall panels and that surface tensile fractures occur along the edges of panels in the locations of greatest differential subsidence. Thus, the highest risk for potential impact from subsidence on surface water resources occurs along the edges of panels, which are mine plan specific. Stipulation #17 would require replacement of water lost due to mining.

### 4.3.3.4 Potential Water Quality Impacts from Mine Areas and Mine Discharge

**Issue 4:** Foreseeable continued discharge of mine water into Quitchupah Creek could change water quality in Quitchupah Creek and other downstream drainages. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

The potential water quality impacts from mined areas and mine discharge waters would be the same for Alternatives 2 and 3.

### 4.3.3.5 Potential Water Quality Impacts from Mine Equipment and Materials

**Issue 5:** Equipment and materials spilled, used, and/or abandoned in underground mine workings could change ground water quality and any connected surface water sources. This could affect agricultural, domestic, and industrial water supplies as well as ecosystems.

The potential water quality impacts from mine equipment and materials used would be the same for Alternatives 2 and 3.

### 4.3.4 SPECIAL STIPULATIONS AND DESIGN CRITERIA

Special Coal Lease Stipulations designed to protect human health and the environment from degradation are identified to protect the air, water, soil, plant, and animal populations (Appendix B). The implementation of these stipulations is not always clear or straight-forward. Therefore, listed below are BMPs, examples, and practicable strategies for their implementation. These listed practices also help clarify to other agencies what is intended when considering future permitting actions.

Design criteria presented in this section include conservative design measures that prevent impacts from occurring to water resources or required efforts that minimize impacts following subsidence. Conservative design measures have been incorporated into the buffer areas defined in Alternative 3. Some of these measures include angle of draw (20 degrees), vertical extent of the fracture zone (60 times mining height), and stream buffer width (200 feet either side of stream channel). Required mapping of the LBA that define the extent of subsidence through monitoring and then work to minimize these impacts are discussed in this section. The final required set of design criteria would be determined during review of the mine plan submitted with the mine permit application. This review would identify risks to water resources based on features of the mine plan such as zones of permanent tension, development of surface tensile cracks, maximum depth of subsidence, and development of subsurface fractures. Based on this information, the FS would require compliance with specific design criteria prior to approval of the permit application. Other agencies, such as the Utah DOGM, may require that additional monitoring take place prior to approving the mine application. The most recent list of monitoring guidelines recommended by the Utah DOGM for coal mines is included in *Coal Regulatory Program Guideline Technical Memo 004– Water Monitoring Programs for Coal Mines* (DOGM 2006).
Some of the more critical design criteria that could be required by the FS are discussed below. These criteria have been successful in many instances in similar coal fields located throughout Utah. However, as noted previously, some measures have been unsuccessful to date for some water features located in the Pines Tract. However, these same efforts have also been successful in other lease tracts of the SUFCO mine. The list of environmental protection measures presented in this section should not be considered comprehensive. The FS/DOGM reserves the right to finalize the list of required mitigation and monitoring measures during review of the mine permit application. This is due to the need to review specific mine plan features associated with the permit and potential implications to water resources.

1. Identify high value springs.
The initial value assigned to springs in Chapter 3 could be verified as part of the monitoring identified in Stipulation #7, and refined if necessary, prior to mine plan development. This could include the field verification of ecological value and development status of each spring.

2. Avoid high-value springs.
Impoundments, springs, and perennial streams in the study area provide water for wildlife and livestock consumption. They also provide water needed to sustain riparian and wetland vegetation which in turn provides wildlife habitat. High-value springs have been identified by the FS. Mine plans must consider these springs and be designed to minimize potential impacts by locating gateroads, panel boundaries, and other features that result in permanent surface tension away from high value springs where practical. Under Alternative 3, Stipulation #9 could prevent impacts to high-value springs with conservative design measures.

3. Restore or replace groundwater discharge from springs.
In regards to impacts to groundwater discharge rates from springs, Utah Code 40-10-18 (15c) requires that “…the permittee shall promptly replace any state-appropriated water in existence prior to the application for a surface coal mining and reclamation permit, which has been affected by contamination, diminution, or interruption resulting from underground coal mining operations”. Based on ongoing development of subbasin claims on National Forest System lands, all developed and undeveloped springs on the MLNF are assumed to have a claim of right associated with them, irrespective of whether there is a specific filing currently in the Division of Water Rights database. Therefore any loss of flow from springs resulting from subsidence impacts must be replaced in terms of quantity and quality. Surface and groundwater replacement is also specified in Stipulation #17.

Replacing diverted flow at springs is dependent upon existing use of water, longevity and magnitude of flow impacts, flow characteristics of the spring, and the role the spring provides in supporting livestock, wildlife, and wetland vegetation. Spring flow at developed and undeveloped springs may support all of these roles simultaneously. Specific measures would need to be designed to meet physical conditions at each spring where flows were diverted.

If the location of a spring has changed as a result of subsidence with little change in flow, BMP may consist of improvements to support previous stock water use at the new location along with enhancements to support wildlife use and wetland vegetation comparable to conditions at the original spring location. Some options that could be used under different scenarios in Greens Hollow could include:

a. Developed springs: Import water by pipeline or truck to the location of the trough or spring box.

b. Undeveloped springs: Replace flow with engineered structures that would return groundwater discharge to the surface at or near the original location or import through an outside source.
c. **Restore spring flow at previous location:** Utilize grout sealing of subsidence fractures combined with groundwater collection systems, which incorporate trenches, permeable fill material and anchored synthetic fabric.

d. **Springs/seeps with relatively low flows:** Install wildlife guzzlers comprised of a catchment and storage cistern to support the livestock and wildlife uses that occurred at the spring prior to impact.

### 4. Evaluate diversion zone surrounding springs.

As part of Stipulation #7, prior to and immediately following undermining any of the identified springs, an inspection of the spring and locations in a 70-foot elevation zone downslope of the spring could be performed. The 70 foot elevation zone was developed to include a surface tensile crack of up to 50-feet plus a sand interval of up to 20-feet. If a spring is impacted by surface tensile fractures, the water is not lost but may reappear lower on the slope. The purpose of the inspection is to help determine if this has occurred. Although it is expected that the water from an impacted spring is likely to reissue in this zone, it is possible the water could reissue elsewhere. The spring and location inspection should be repeated after the subsidence wave has passed the spring location.

### 5. Restore or replace flow in stream channels.

The same legislative code protecting water rights is also applicable to stream channels. Per Utah Code 40-10-18, any loss of flow from stream segments associated with state-appropriated water rights would also need to be replaced in terms of quantity and quality.

Furthermore, FS Special Coal Lease Stipulation #17 states (Appendix B):

“The Lessees, at their expense, will be responsible to replace any surface and/or groundwater sources identified for protection that may be lost or adversely affected by mining operations with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses. All surface and ground water resources within the Greens Hollow Lease Tract and on adjacent National Forest System lands are identified for protection.”

Flow can be replaced in stream channels through some of the following measures:

- **Grouting tensile cracks that appear in the channel bed.**
- **Expose subsurface flows by removing minor amounts of material as completed in East Fork Box Canyon (Petersen 2007).**
- **Install grout curtains near channel to increase groundwater discharge to stream.**
- **Restore flow by pumping water to channel segments from wells or other sources.**


In accordance with Stipulation #7, the FS could require long-term monitoring (three years of baseline data before leasing and either quarterly or annual monitoring thereafter) prior to mine subsidence at identified spring locations that would define flow characteristics over a wider variety of climatic conditions and serve as a basis for determining the nature and magnitude of any potential impact on flows. The majority of baseline data may have already been collected during the hydrologic survey for the Greens Hollow and greater Muddy Creek area (Cirrus 2013c and Cirrus 2004, respectively). Adequacy of baseline data will be evaluated by the FS during review of the mine application and they may require that additional data be collected. Monitoring in the vicinity of the spring both prior to and following mine subsidence would also reveal whether the spring has reappeared and where. These data would also provide the targets for achievement in the site-specific Plan of Operations and associated permits that would be required under the permit to mine.
7. Operational monitoring – Spring flow.
The FS, as part of Stipulation #7 could require that flows and field parameters continue to be monitored in the spring and fall at all springs. Particular emphasis could be made on any springs located near longwall panel boundaries. These springs would be under highest risk of subsidence impacts due to development of permanent tension zones and may require higher frequency monitoring or measurements of additional parameters. A minimum of two to four springs and/or wetlands are required to be instrumented to continuously monitor groundwater levels. A final decision on the number of features would be made by the FS during review of the specific mine plan. Preference would be given to water features associated with a higher risk of impact. The long-term monitoring record prior to mine subsidence at these springs would allow an accurate characterization of flow over a wider variety of climatic conditions. Again, a final decision on the adequacy of baseline data collection would be made by the FS during review of the mine application. Finally, the FS would also require that all parameters included in DOGM (2006) be monitored during the operational and post-mining phases.

Similar to springs and as described in Stipulation #7, the FS could require long-term monitoring (three years of baseline data before leasing and either quarterly or annual monitoring thereafter) prior to mine subsidence at identified locations on perennial and intermittent stream channels. These measurements would serve to define flow characteristics over a wider variety of climatic conditions and serve as a basis for determining the nature and magnitude of any potential impact on flows. Baseline data presented in Cirrus (2013c) and Cirrus (2004) may partially or entirely meet this need. Adequacy of baseline data would be evaluated by the FS during review of the mine application and they may require that additional data be collected.

As part of Stipulation #7, the FS could require automated stream flow monitoring at a select number of locations sufficient to determine subsidence impacts to perennial and intermittent stream channels. Approval of final locations would be made during FS review of the specific mine plan submitted as part of the application process. Likewise, the perennial flow segments of Greens Canyon, Greens Hollow, and Cowboy Creek in the lease area would be identified and mapped during the fall of each year to compare to baseline records. Similar to springs, the FS would also require that all parameters included in DOGM (2006) be monitored at recommended stream monitoring sites during the operational and post-mining phases.

10. Surface tensile cracks monitoring – stream channels.
Stream channels would be monitored for evidence of surface tensile cracking (Stipulation #7). If inspection of stream channels reveals obvious surface tensile cracks, monitoring of flows up and down stream would be performed to estimate the magnitude of loss. Water could be restored to stream channels by grouting cracks or implementing structures (e.g. grout curtains) that would move diverted shallow groundwater to the surface of stream channels. The exact design of the remediation would be dependent upon site-specific conditions that are unknown at this time. Regardless of the technique and/or technology selected, any lost water must be replaced in quantity and quality as stated in Stipulation #17.

11. Stream channel profile monitoring.
As part of Stipulation #7, longitudinal profile monitoring of perennial stream segments in the Greens Hollow tract area could be completed during the subsidence phase of mining. An initial longitudinal survey of perennial stream segments in the Greens Hollow tract area has already been completed (Cirrus 2013c). This survey would be used as a baseline comparison for additional longitudinal monitoring. The survey would focus on particularly sensitive areas such as gate roads and longwall panel boundaries.
12. Establish compliance with 50 foot overburden depth above Castlegate Sandstone.
Prior to mining beneath areas determined to have high potential for subsidence impacts to perennial stream channels, existing and/or new data from drill holes could be collected and presented to the FS. This information would verify that at least 50 feet of clay and shale is present above the Castlegate Sandstone formation that was used to determine the boundary for Alternative 3. At a minimum, this information could be collected in the following locations (see also Figure 4.4):

- Section 13, T21S, R4E - North Fork Quitchupah Creek
- Section 32 and 33, T20S, R5E – Greens Hollow and Cowboy Creek

13. Ponds and wetlands.
As part of Stipulation #7, prior to undermining any of the ponds and wetlands, an inspection of the pond and wetland and photo documentation of its condition could be performed. The inspection and photo documentation could be repeated after the subsidence wave has passed. In the event that there is water loss to or from an impoundment, one of the following remediation measures could be implemented to replace/repair structures and replace water in quality and quantity:

- Repair fractures in surface/tributary area to ponds and wetlands utilizing bentonite or grout.
- Line the existing pond or grout segments of impacted channels to prevent water loss.
- Construct a replacement impoundment on a comparable drainage that is not impacted or is less affected.
- Transport water to ponds and troughs at levels needed to meet livestock watering requirements.
- Restore lost water volumes to wetland areas using pumps or wells in sufficient quantities able to support growth of wetland and riparian vegetation.

Additional efforts could be required if water could not be restored following implementation of these strategies.

Similar to springs, all ponds and wetlands could be monitored for water level and discharge (if applicable) in the spring and fall of each year during the operational period of the mine. Additional water quality parameters may be added during review of the mine application.

All surface disturbances associated with potential impacts to surface water quality should follow soil and water conservation practices adhered to by the Manti-La Sal and Fishlake National Forests and Region 4, including but not limited to those procedures and guidelines outlined in the Soil and Water Conservation Practices Handbook (Forest Service 1988). Activities associated with these measures include but are not limited to cracking of the surface due to subsidence. Monitoring of surface water quality (as guided by Stipulation #7) would also follow all recommended guidelines included in DOGM (2006). Additional water quality parameters may be added to this list following review of the mine permit application. The number of locations for monitoring surface water quality could include all locations recommended above for surface flow monitoring in streams during the operational and post-mining phases. As discussed previously, adequacy of baseline data would be evaluated during review of the mine permit application.

15. Post-mining monitoring.
Requirements for post-mining monitoring of springs, streams, ponds, and wetlands as directed in Stipulation #7 would initially be determined by the FS and DOGM during review of the mine application. Requirements for post-mining monitoring may be revised by the FS or DOGM during the operational period, based on resource concerns that arise during this time.
4.3.5 Cumulative Effects

This section considers the cumulative effects of subsidence mining the Greens Hollow tract in the context of other past, ongoing, and reasonably foreseeable projects that have affected the water resources of the cumulative effects analysis area. The cumulative effects analysis area as defined for the analysis of water resources includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass areas within and surrounding the Greens Hollow tract project.

Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis. Projects and activities that have occurred, are occurring, or could occur in the cumulative effects analysis area include:

- Reasonably foreseeable post-lease surface uses on and outside the Greens Hollow tract;
- Coal leasing, mining, and subsidence of lease tract areas which have or could result in collection of stored (inactive) ground water and subsequent discharge to streams through a mine portal, development of surface tensile fractures leading to relocation of surface and shallow subsurface flows and discharge at other locations within the same basin;
- Coal leasing, mining, and subsidence of lease tract areas which have or could result in loss or reduction of flow at a spring;
- Development of springs and surface water resources to be used for livestock watering purposes;
- Use of streams and roads for transporting water to livestock watering troughs by SUFCO to meet mitigation requirements (for the Pines Tract);
- Wildlife habitat improvement and restoration projects, including the controlled burns in the Pines area, water improvements, and the construction of wildlife guzzlers; and
- Recreational uses, including user-created roads and dispersed camping sites.

The effects of this project would be cumulative with other impacts occurring in the area.

4.3.5.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

- Reasonably foreseeable construction of a ventilation shaft and access road use and maintenance could increase soil erosion and sedimentation of adjacent waterways.

Reasonably foreseeable construction and operation of a ventilation shaft could influence surface runoff patterns and the water quality of receiving waters. One ventilation shaft could be located inside the Greens Hollow tract.

Existing NFS roads would be used to access the ventilation shaft. The roads would be maintained as needed. While potential would continue to exist for road segments located near stream channels to contribute sediment loading during maintenance activities, the chance of that occurring would be low given the existing standards that regulate FS road maintenance.

Construction of mine ventilation structures would disturb up to approximately 10 acres including storage of excavated material from the constructed vent shaft. The site would contain a drainage system to control surface runoff and prevent sediment from being transported off site. Construction of this facility could take up to 12 months or more. The facility should be more than 500 feet from any perennial or
intermittent stream channel, if possible. After mining, final reclamation, and lease relinquishment, the land surface would be returned to the pre-lease use.

4.3.5.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

- Reasonably foreseeable construction of a power line and ventilation shaft and access road use and maintenance could increase soil erosion and sedimentation of adjacent waterways.

Reasonably foreseeable construction and operation of the power line and ventilation shaft facility could influence surface runoff patterns and the water quality of receiving waters. The ventilation shaft area and portions of the power line are facilities that would conceptually be located outside the Greens Hollow tract, but on adjacent existing coal lease areas.

The surface disturbance resulting from construction of the reasonably foreseeable power line should take place at distances greater than 200 feet from riparian areas (Forest Service 1986a, page III-72; Forest Service 1986d, IV-33), if possible. Disturbance footprints would be associated with temporary access along the power line corridor as well as placement of individual towers. Placement of towers should occur well outside of the stream corridor and not result in disturbance to the channel itself.

Existing NFS roads would be used to access the ventilation shaft facility. The roads would be maintained as needed. While potential would continue to exist for road segments near stream channels to contribute sediment loading during maintenance activities, the chance of that occurring would be low given the existing standards that regulate FS road maintenance.

Mine ventilation structures would disturb up to approximately 10 acres including storage of excavated material from the constructed vent shaft and utility boreholes. The site would contain a drainage system to control surface runoff and prevent sediment from being transported off site. Construction of these facilities could take up to 12 months or more.

The effects of this project would be cumulative with other impacts occurring in the area. The Pines Tract coal mine to the east of the Greens Hollow tract and the SUFCO mines to the south have been actively mined for some time. Although these two lease tracts are adjacent to each other, physical characteristics unique to each area would cause subsidence impacts to occur differently. A comparison of the two areas is described above in Section 4.1.1. After mining, final reclamation, and lease relinquishment, the land surface would be returned to the pre-lease use.

Mining development in the Pines Tract has produced subsidence impacts, including loss of discharge from three springs (Pines 105, Pines 310 Lower, and Pines 311) and one unnamed seep contributing to a pond in the Joes Mill Pond area, relocation of discharge from three springs (EFB-12, EFB-13, and EFB-14) and decreased flow from one spring (Pines 214)(Petersen 2007, Petersen 2009). Mitigation efforts to restore flow to these features included installing a grout curtain to raise groundwater levels, collecting groundwater in a perforated pipe, and pumping water from a down canyon spring to livestock troughs near Pines 105 (Weiser 2009). None of these efforts were successful in restoring groundwater to pre-disturbance conditions. A mitigation plan to restore the North Water spring area has been finalized (Canyon Fuel Company 2013) and recently approved (DOGM 2013b). Stream monitoring below these springs has indicated that groundwater contributions from the Castlegate Sandstone in the East Fork Box Canyon Creek continue to function and support groundwater discharge to the creek at pre-subsidence levels (Petersen 2007). However, groundwater levels have dropped in the immediate area surrounding Pines 105 and caused the vegetation cover to change from a riparian community to vegetation dominated by upland species (Zobell 2007). Loss of riparian vegetation has impacted wildlife resources through a loss of habitat as well as economic losses from reduced AUMs.
Water discharged from springs impacted by subsidence was used for livestock watering. Replacement of livestock water has resulted in concentration of livestock and adverse effects at the locations where replacement water was provided, including loss of vegetation, soil compaction, and displacement of other wildlife. However, this practice has maintained livestock distribution across the grazing allotment and reduced potential livestock impacts to areas where livestock would compete for limited sources of water. In addition, the two troughs near North Water Springs where SUFCO currently replaces water were originally placed and maintained by the Emery County Livestock Growers Association for several years prior to SUFCO involvement. SUFCO has transported water since 1995 to grazing allotments located in and around the Greens Hollow tract. During this same time period, SUFCO has also provided new additional troughs at the northern and southern end of the Pines Lease Tract in areas where water was not available. This effort was completed to support FS and livestock permittees in their efforts to distribute livestock herds evenly across grazing allotments. In addition to loss of water in Joes Mill Ponds, loss of water to surface cracks were also noted from Verdus Pond and Slab Pond, located in subsided areas near the Greens Hollow tract (Sudweeks 2005). Surface tensile cracks have appeared in swales and other areas that drain to these ponds. In general, interception of sheet flow runoff by surface tensile cracks in open rangeland would increase infiltration and introduce additional moisture to the soil profile. However, cracks that appear in swales or other contributing areas can divert surface runoff and decrease the amount of water reaching the pond. Mitigation efforts in these areas have been partially successful in healing cracks (Lloyd 2010). It is currently not known if mitigation efforts for ponds have been completely successful due to drought conditions and limited surface runoff in these areas. A mitigation plan to restore the North Water spring area has been finalized (Canyon Fuel Company 2013) and recently approved (DOGM 2013b).

Perennial flow in some segments of East Fork Box Canyon was temporarily lost and restored following mitigation. Monitoring completed before, during, and after subsidence indicated that there is no apparent net loss of water from the East Fork Box Canyon drainage (Petersen 2007). Development of water resources to serve as drinking water for livestock and wildlife has also occurred in and around the Greens Hollow tract. These developments concentrate and divert water from natural flow paths to other areas in support of management purposes.

Other activities can result in water quality impacts such as nutrient or sediment loading to streams and ponds. Livestock grazing, both historic and ongoing, can deliver loads of nutrients and sediment as livestock utilize areas that contribute runoff to streams and ponds. The cumulative effect of these activities occurs in the same areas as the effects due to coal mining. Controlled burns can produce temporary conditions that are susceptible to erosion and result in limited sedimentation if they are not kept within prescribed limits. Recreation use has resulted in primarily localized impacts including dispersed camping and user created trails for hiking or ATV use. The impacts of developing and mining the Greens Hollow tract would be cumulative with these additional impacts.

4.4 AQUATIC AND TERRESTRIAL WILDLIFE RESOURCES

The majority of the impacts associated with mining would be associated with the tract, although potential reasonably foreseeable impacts could occur along a power line corridor and at vent shaft locations. Further, noise impacts associated with reasonably foreseeable construction activities, continuous running of a vent fan, and maintenance visits could impact wildlife activities outside of the tract.

4.4.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under this alternative, the Greens Hollow tract would not be offered for lease. As a result, this alternative would have no impacts on aquatic or terrestrial wildlife resources.
4.4.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Under Alternative 2, the entire Greens Hollow tract would potentially be mined and subjected to subsidence. Maleki (2008) reports that surface subsidence would occur over the longwall panels, with surface fractures along the panel margins. In general, subsidence would be expected to result in slight changes in the surface topography. The change in slope would be expected to be between 1 and 2 percent (Maleki 2008) and may be noticeable as minor rock falls from escarpments and ponding. This would affect approximately 6,175 acres. Surface fractures may occur, particularly over longwall gate roads and near shallow block boundaries. Many of the fractures should close over time, but some would remain open.

4.4.2.1 Changes in Water Flow

**Issue 1:** Subsidence-induced changes in water flow, including but not limited to flow at points of diversion or use and/or change in water quality in perennial drainages to riparian vegetation/wetlands could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.

**4.4.2.1.1 Fishes**

The four Colorado River endangered fish are not found in the analysis area; however, they have been federally listed in the counties in which the project occurs. Further, all the streams in the analysis area drain into the Colorado River drainage. The cutthroat trout, thought to belong to the native Colorado River subspecies, is the only fish species of concern within the analysis area. This native species occurs in parts of Muddy Creek and thus flow reductions caused by diversion of water to underground workings or streambed subsidence may impact the species. The magnitude of this impact would depend on the volume of surface water lost to subsurface flows. Fish migrating upstream to spawn require suitable water velocities and depths to succeed. Reductions in depth and velocity could impact the spawning success of cutthroat trout. Consequently, potential reductions in flow and water depth could lead to more negative impacts on small cutthroat trout than on larger fish (Bjornn and Reiser 1991). These effects are expected to be temporary, as seasonal flows are likely to transport substrates downstream and thus fill in cracks within a short time period. According to the Geology Technical Report prepared for this project (Cirrus 2013a); the natural recovery of tension cracks in a streambed could range from a few weeks to one or two years. Should water be lost for the full two years (longest anticipated timeframe), impacts on fish populations could occur.

Furthermore, it is possible that larger surface tensile fractures could develop near the edges of the longwall panels, resulting in some localized displacement of water from the streams where they cross shallow fractures. Surface tensile fractures would tend to develop in areas where bedrock tension is permanent, such as along the edges of mine subsidence panels. Fractures would pose a risk of permanent displacement of water in stream channels where the Castlegate Sandstone is exposed or has insufficient depth of overburden containing clays and shale to heal the cracks. This would lead to a permanent loss of aquatic habitat for native cutthroat trout species. Also, it could divert water from the system (if permanently lost underground), which would result in a consumptive loss of flow into the Colorado River system and indirectly impact the four endangered Colorado River fish.

As stated, subsidence due to mining below Muddy Creek could result in water loss from the stream directly to the mine due to the shallow overburden in this area (see Section 4.3.2.1.2). This would be a transbasin loss. Although the magnitude of potential flow loss is not known with certainty, it is likely that fish habitat would be degraded leading to lost individuals, lowered population numbers, degraded or lost habitat, and decreased breeding success of fish species in the general analysis area. Stipulation #17 (Appendix B) requires that the lessee replace any water (in quantity and quality), lost due to mining operations. This and other stipulations ensure that habitat quantity and value are maintained and fish.
species are protected from potential adverse effects of the mining operations. However, under this alternative, perennial streams could be undermined and subsided.

4.4.2.1.2 Aquatic Macroinvertebrates
Potential flow reductions in localized areas in Muddy Creek could modify the species composition and abundance due to the anticipated transbasin loss. Impacts on aquatic invertebrates within the tributaries of Cowboy Creek (perennial sections of Greens Hollow and Greens Canyon) and Muddy Creek would be expected to be similar to those discussed above in Section 4.4.2.1.1 (Fishes). Similar impacts such as lost individuals, lowered population numbers, degraded or lost habitat, and decreased breeding success have the potential to occur.

Under the Proposed Action, potential damage from tensile strains that could cause surface cracks and spall of escarpments could occur along all Castlegate Sandstone escarpment areas. Surface tensile fractures in the Castlegate Sandstone would most likely persist and be very slow to heal in areas where North Fork Quitchupah Creek encounters this formation. However, generally, subsidence induced surface tensile fractures are typically shallow (not more than 50 feet deep), and are often self-healing if there are shales and clays in the overburden (Maleki 2008, Cirrus 2013c). Under this alternative, potential flow losses or reductions in this stream could affect invertebrate habitat to the point where it is degraded or lost altogether for a time which would likely decrease not only abundance but diversity of aquatic invertebrate populations in the area. This in turn could indirectly impact fish species that depend on this prey base. Stream conditions of 20 percent or more flow loss outside of those expected from reference streams would require further evaluation and possibly a change in management direction as required by the Standards and Guidelines defined in the Forest Management Plan (Amended) for the MLNF (Forest Service 2006). Stipulation #17 (Appendix B) requires that the lessee replace any water (in quantity and quality), lost due to mining operations. With this stipulation in force, any potential loss or degradation of aquatic macroinvertebrate habitat would be replaced and habitat values maintained.

Water loss from transbasin diversions in the Muddy Creek would likely occur due to the shallow overburden located underneath the creek itself (see Section 4.3.2.1.2). Although the magnitude of flow loss is not known with certainty, it is likely that aquatic macroinvertebrate habitat would be lost or degraded. This would lead to lost individuals, lowered population numbers, and decreased breeding success in the general analysis area. This in turn would impact the prey base for aquatic predators in the basin. Note that under this alternative, perennial streams could be undermined and subsided.

4.4.2.1.3 Birds
Potential stress on the riparian vegetation from diversion of surface water could reduce the function and value of riparian habitat for many bird species. However, since subsidence induced surface tensile fractures are typically shallow (not more than 50 feet deep), and are often self-healing (Cirrus 2013c) the impacts to surface water would likely be short-term (see Section 4.1.1). This is particularly true if the underlying Castlegate Sandstone layer has at least 50 feet of overburden comprised of Price River or North Horn Formation soils which contain abundant silts and clays which speed healing of tensile cracks. Although the associated impacts on vegetation and wildlife are expected to be temporary (as discussed above) some areas could experience permanent water, riparian vegetation, and avian habitat loss. This would occur if Castlegate Sandstone is subsided where there is not sufficient overburden to heal cracks. However, as stated above in Section 4.4.2.1.1, a special coal lease stipulation (Appendix B) has been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative.

Riparian habitats provide important brood-rearing habitat for sage-grouse, as the young rely on insects and succulent forbs (Rodriguez et al. 2006). A reduction in riparian habitat or surface water availability
could, therefore, seriously impact brood-rearing habitat for sage-grouse if it occurred in areas sage-grouse were using for brood rearing. A large portion of the analysis area is classified as “priority” sage-grouse habitat (Figure 4.5). Under Alternative 2, approximately 1,617 acres of “priority” sage-grouse habitat would be allowed to subside. Wet meadow habitat potentially suitable for brood-rearing within the subsidence zone could be affected; however, no sage-grouse brood rearing activity is known to occur in this area and, although data on brood rearing activity in the area is limited, the nearest known brood-rearing activity occurred approximately 1.8 miles from subsided habitat on the Greens Hollow tract (Perkins 2010). Such habitat could dry up as a result of surface cracks redirecting shallow ground water to other surface areas (see Section 4.3.2.2). These other surface areas could provide similar suitable brood-rearing habitat or ground water could reach the surface in areas not conducive to sage-grouse brood rearing.

Several bird species also rely on pooled or flowing water as a water source. Although riparian habitat only accounts for 0.1 percent (48 acres), of the analysis area, it has high local value to wildlife. The loss of surface water, even temporarily, could cause degradation or loss of habitat and could drive species from the local area until the resource was re-established. Changes in the availability of free water may result in modification in behavior of birds as they search for alternative water sources.

Riparian habitat represents a component of several non-game bird species, including many warblers (Parrish et al. 2002). Stress on riparian vegetation could reduce the availability or quality of nesting and/or foraging habitat for these species. Many resident and migratory birds use ponds and springs and their associated riparian areas during part of their life cycle. There are numerous natural and stock ponds located within the projected subsidence zone of the analysis area as well as springs and cattle troughs. It is possible that surface tensile fractures could temporarily intercept surface or shallow subsurface flows that discharge to stock ponds and natural ponds, or even drain the water in a pond. For most ponds, these tensile fractures would be expected to quickly heal and plug with sediment such that it would be unlikely for the source of water to most ponds or the water in a pond to be affected beyond the first year (Cirrus 2013c). An in-depth discussion of the type of areas where this could potentially happen can be found in Section 4.1.1. There is a strong possibility of ponds, springs, and other water sources becoming permanently lost due to surface fissures and water being diverted underground. This would not only stress and impact bird species in the area that require open water, it would degrade the value of, convert to a different type, or completely remove habitat required by many avian species in the area for cover, breeding, and foraging.

With FS consent and BLM offering for lease mining operations under perennial streams, water loss from transbasin diversions in the Muddy Creek would likely occur due to the shallow overburden located underneath the creek itself (see Section 4.3.2.1.2). Although the magnitude of flow loss is not known with certainty, it is likely that riparian avian habitat could be severely degraded or lost altogether leading to displaced individuals, lowered local population numbers, and decreased breeding success of riparian-dependent avian species in the general analysis area.

Potential impacts to eagle nests due to subsidence mining are minimal. Subsidence would be expected to be limited to the portion of the analysis area disclosed as such in Figure 1.3. No known golden eagle nests occur within this expected limit of subsidence and little habitat occurs as well, so no loss of eagle nests are expected due to sloughing of escarpment walls if under mining is specifically approved.
Figure 4.5 Subsided sage-grouse habitat on the Greens Hollow tract.
4.4.2.1.4 Mammals
Any loss of surface water could impact all mammals inside the analysis area but particularly deer and elk in seasons when snow and succulent forage are not available. As the analysis area and surrounding lands are important deer and elk habitat, a permanent loss of water could locally impact the usability of forage in the area by big game. As stated above in Section 4.4.2.1.1, a special coal lease stipulation (Appendix B) has been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative. Although subsidence-induced surface tensile fractures are typically shallow (not more than 50 feet deep), and are often self-healing (Cirrus 2013c), the impacts could last longer than expected and even become permanent (depending on substrate, availability of organic materials, and other factors). Temporary modification in behavior and daily movements of mammal species could be likely in such a scenario as they search for alternative water sources and suitable habitat.

The potential stress on riparian vegetation and temporary or permanent reductions of surface waters could impact the quality of habitat for several small mammals, particularly those that rely on riparian habitats for foraging, such as some shrew and bat species. Although these impacts are expected to be temporary, potentially longer-term impacts could occur and mammal species could lose habitat locally. This could be a minor impact to highly-mobile species such as bats, but highly-deleterious to less-mobile species such as shrews, mice, voles, and other small mammals that provide a prey base for other species.

Many mammals use ponds during part of their life cycle. There are numerous natural and stock ponds located within the projected subsidence zone of the analysis area as well as springs and cattle troughs. It is possible that surface tensile fractures could temporarily intercept surface or shallow subsurface flows that discharge to stock ponds and natural ponds, or even the water in a pond. For most ponds, these tensile fractures would be expected to quickly heal and plug with sediment such that it would be unlikely for the source of water to a pond or the water in a pond to be affected beyond the first year (Cirrus 2013c). An in-depth discussion of areas where this could happen can be found in Section 4.1.1. There is the possibility of ponds, springs, and other water sources becoming permanently lost due to surface fissures and water being diverted underground. This would not only stress and impact mammal species in the area that require open water; it would degrade the value of, convert to a different type, or completely remove habitat required by many mammal species in the area for cover, foraging, or drinking.

Under this alternative, perennial streams could be undermined and subsided. Thus, Muddy Creek could be undermined and subsided. Due to shallow overburden depths between the mine and the stream transbasin water loss could occur (see Section 4.3.2.1.2). Although the magnitude of potential flow loss is not known with certainty, it is possible that riparian habitat used primarily by small mammals would be severely degraded or lost all together; leading to lost and displaced individuals, lowered local population numbers, and decreased breeding success of riparian-dependent mammal species in the general analysis area. Further, big game species often use this type of habitat for thermal cover and concealment purposes as well as foraging. As riparian habitat is limited in the area and the range is designated as containing crucial and substantial habitat value for both deer and elk year round, the loss of open water and riparian vegetation due to transbasin diversion would negatively impact big game species in the area.

4.4.2.1.5 Amphibians
Changes in water flow and quality could reduce the amount of habitat available to amphibians in the analysis area. Because amphibians are dependent on water for at least part of their life cycle, a decline in number of individuals would be expected if a substantial loss of flow resulted from mining-induced subsidence. It is possible that surface tensile fractures could temporarily intercept surface or shallow subsurface flows that discharge to stock ponds and natural ponds, or even drain the water in a pond. For most ponds, these tensile fractures would be expected to quickly heal and plug with sediment such that it
would be unlikely for the source of water to a pond or the water in a pond to be affected beyond the first year (Cirrus 2013c). There is the possibility of ponds, springs, and other water sources becoming permanently lost due to surface fissures and water being diverted underground. This would not only stress and impact amphibian species in the area as most require open water; it would degrade the value of, convert to a different type, or completely remove habitat required by amphibians in the area that are dependent on aquatic habitats for cover, breeding, and foraging. As stated above in Section 4.4.2.1.1, a special coal lease stipulation (Appendix B) has been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative.

The majority of amphibians observed in the analysis area were in ponds and springs and their associated riparian zones (Cirrus 2004). The majority of these ponds and springs, including those where boreal toads were observed, were near the perimeter of the former Muddy Creek buffer boundary, outside of the subsidence zone, and would therefore not be impacted. However, there are numerous natural and stock ponds located within the projected subsidence zone of the analysis area as well as springs and cattle troughs that would be undermined (Cirrus 2013c). An in-depth discussion of areas where this could potentially happen can be found in Section 4.1.1. If cracks occurred in these ponds, it is expected that surface flow could be temporarily reduced or eliminated, thus eliminating potential amphibian breeding habitat for the duration of the effect. Furthermore, it is possible that the effect could become permanent as discussed above and habitat lost completely. However, as stated above a special coal lease stipulation (Appendix B), has been put in place to replace in quantity and quality any water lost due to mining operations (Stipulation #17).

Water loss from transbasin diversions in the Muddy Creek would likely occur due to the shallow overburden located underneath the creek itself (see Section 4.3.2.1.2). Although the magnitude of flow loss is not known with certainty, it is likely that open water and its associated habitat used by amphibians in the area would be severely degraded or lost altogether leading to lost and displaced individuals, lowered local population numbers, and decreased breeding success of amphibian species in the general analysis area.

4.4.2.1.6 Reptiles
Reptiles would be minimally impacted, if at all, by changes in water flow and quality, as very few reptile species in the area rely on riparian habitats. Species that commonly use riparian areas, such as the western terrestrial garter snake, could potentially be impacted. Not all reptiles are mobile and can search out new habitat and permanent (or even temporary) loss of riparian flow or dried ponds could create stress and habitat loss and potentially mortality.

Water loss from transbasin diversions in the Muddy Creek would likely occur due to the shallow overburden located underneath the creek itself (see Section 4.3.2.1.2), but not necessarily create substantial impacts to reptile species in the area. It is expected that water loss associated with transbasin diversions could stress reptile species and lead to potential mortality of individuals.

4.4.2.2 Changes in Stream Morphology
Issue 2: Subsidence-caused changes of perennial streams could cause changes in stream morphology and aquatic habitat.

4.4.2.2.1 Fishes
The cutthroat trout, thought to belong to the native Colorado River subspecies, is the only fish species of concern within the analysis area. This native species occurs in parts of Muddy Creek and changes in stream morphology and aquatic habitat may impact the species. The severity of these impacts depends on the magnitude of the disturbance of escarpments near streambeds, as well as to the potential changes in stream flow. A subsidence of less than 2 percent, or 8 feet, the maximum expected, could have the
potential to affect fish movements above this stream reach. This could potentially isolate approximately 20 miles of tributaries above the subsidence zone from the lower portion of Muddy Creek and could lead to decline of the cutthroat trout populations in the isolated area. It would be unlikely that a gradient change of 1 to 2 percent could change the composition and ratios of habitat types (Maleki 2008). As stated above in Section 4.4.2.1.1, a special coal lease stipulation (Appendix B) has been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative.

Additional inputs of sediment to streams, led by subsidence and the potential disturbance of escarpments near streambeds, could cause short-term and long-term changes to aquatic organisms and their habitat. Short-term impacts (days to months) could cause increases in availability, transport, and deposition of sediment. The accumulation of fine sediment on spawning gravels could reduce the availability of spawning habitat and reduce spawning/hatching success. Increasing the amounts of suspended and bedload sediments could reduce light penetration causing a reduction of photosynthesis and primary production, reduce survival by delaying fish movements (migration), disrupt fish feeding and growth, interfere with respiration, and increase gill irritation and the potential for infection. Conversely, long-term impacts (years to decades) include changes that may actually improve habitat quality and productivity by increasing the total area available for spawning and juvenile habitat. If Alternative 2 is selected and leasing and mining operations are allowed to proceed under perennial streams, the addition of boulders, rubble, and gravel to the stream could lead to increases in habitat diversity and available habitat for fish. Obstructions caused by boulders and bedrock outcrops could modify channel velocity and direction, thus leading to the creation of pools, gravel bars, and side-channel juvenile habitat (Swanston 1991).

4.4.2.2 Aquatic Macroinvertebrates
Potential changes in sediment inputs to Muddy Creek could modify the species composition and abundance at a stream-reach scale. Minimal impacts to aquatic invertebrates within the perennial stretches of Cowboy Creek would be expected, as the effects of stream gradient changes from subsidence on these streams are expected to be minimal (Maleki 2008).

Potential damage from spall of escarpments also exists throughout the tract should mining operations be approved near perennial streams. Near Castlegate Sandstone escarpment areas increased bedload sediment could eliminate habitat for aquatic macroinvertebrates, reduce their abundance, and could ultimately lead to reductions in fish production (Bjornn and Reiser 1991). Any damages to stream habitat could pose short-term and long-term effects. While short-term impacts may include a reduction in abundance and biodiversity of aquatic macroinvertebrates, the addition of boulders and rubble to the stream could result in a more complex habitat and thus increase species diversity in the long-term.

Under this alternative, potential increases to sediment loading in Greens Canyon could affect macroinvertebrate communities. Potential damage from tensile strains that could cause surface cracks and spall of escarpments could occur along all Castlegate Sandstone escarpment areas. Surface tensile fractures in the Castlegate Sandstone would most likely persist and be very slow to heal in areas where North Fork Quitchupah Creek encounters this formation. However, generally, subsidence-induced surface tensile fractures are typically shallow (not more than 50 feet deep), and are often self-healing if there are shales and clays in the overburden (Maleki 2008, Cirrus 2013c). Under this alternative, potential flow losses or reductions in the stream could affect invertebrate habitat, abundance, and diversity. Stream conditions of 20 percent or more flow loss outside of those expected from reference streams would require further evaluation and possibly a change in management direction as required by the Standards and Guidelines defined in the Forest Management Plan (Amended) for the MLNF (Forest Service 2006). As stated above in Section 4.4.2.1.1, a special coal lease stipulation (Appendix B) has
been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative.

**4.4.2.2.3 Other species**
The potential exists for wildlife that utilize aquatic habitat such as bird, amphibian, and mammal species to be impacted by changes in stream morphology and aquatic habitat. Changes could alter riparian vegetation, water availability and distribution, and natural travel corridors—all of which could impact wildlife species.

The degradation or complete loss of riparian vegetation could impact many different types of wildlife species. As discussed above in Section 4.4.2.1, riparian habitat loss could impact important breeding, foraging, and cover habitat for avian species in the area. Further, potential increased mineral, sediment, or other loads in the system could impact the viability of breeding, and pre-adult/larval stage habitat requirements for amphibian species.

With the potential loss of riparian habitat comes the potential loss of continuous travel corridors. Not only do avian species travel along bands of vegetation adjacent to waterways, these corridors are used by mammals, reptiles, and amphibians as well. The loss of these corridors would fragment habitat and present problems of decreased dispersal, lowered reproductive rates, and lowered genetic diversity. A special coal lease stipulation (Appendix B) has been put in place to replace in quantity and quality any water lost (Stipulation #17). Perennial streams could be undermined and subsided under this alternative.

**4.4.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS**
Only potential impacts that would differ from those described in the discussion of impacts of the Proposed Action will be discussed below.

**4.4.3.1 Changes in Water Flow**

*Issue 1:* Subsidence-induced changes in water flow, including but not limited to flow at points of diversion or use and/or change in water quality in perennial drainages to riparian vegetation/wetlands could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.

**4.4.3.1.1 Fishes**
The cutthroat trout, thought to belong to the native Colorado River subspecies, is the only fish species of concern within the analysis area. This native species occurs in parts of Muddy Creek and thus flow reductions caused by streambed subsidence could impact the species. The magnitude of this impact would depend on the volume of surface water lost to subsurface flows. These effects are expected to be avoided under Alternative 3 where the perennial Muddy Creek, lower Greens Hollow, and lower Cowboy Creek portions of the analysis area would be excluded from subsidence mining. It is expected that by excluding these areas, any potential cutthroat trout or their habitat would not be impacted by mining operations as subsidence effects and escarpment failures would be avoided. No impacts from transbasin diversions would occur due to design buffers and special coal lease stipulations (Appendix B) set in place to avoid areas of shallow overburden that cross Muddy Creek.

**4.4.3.1.2 Aquatic Macroinvertebrates**
Aquatic macroinvertebrates depend on the flow of seasonal and perennial waters. Potential flow reductions in localized areas in Muddy Creek could modify the species composition and abundance at a stream reach scale. However, impacts to aquatic invertebrates within the tributaries of Cowboy Creek (perennial sections of Greens Hollow and Greens Canyon), and Muddy Creek are not expected under Alternative 3 as portions of these perennial streams (with less than 50 feet overburden cover above the Greens Hollow Federal Coal Lease Tract)
Castlegate Sandstone) would be excluded from subsidence mining. It is expected that subsidence impacts and escarpment failures would not occur in areas identified for protection under Alternative 3. However, other creeks, ponds, springs, and aquatic habitat would be undermined. The impacts on these areas not preserved by the buffers associated with Alternative 3 would be similar to those discussed above in the Proposed Action. No impacts from transbasin diversions would occur due to design buffers set in place to avoid areas of shallow overburden that cross Muddy Creek.

4.4.3.1.3 Birds
Potential stress on the riparian vegetation from diversion of surface water could reduce the function and value of riparian habitat to several local and migratory bird species (Parrish et al. 2002). However, since this alternative excludes perennial stream stretches and escarpments of Castlegate Sandstone, it is expected that high-value riparian habitat that is important to avian species would not be impacted by subsidence events. However, other creeks, ponds, springs, and aquatic habitat would be undermined. The impacts on these areas not preserved by the buffers associated with Alternative 3 would be similar to those discussed above in the Proposed Action including the same anticipated effects to avian habitat.

Riparian habitats provide important brood-rearing habitat for sage-grouse, as their young rely on insects and succulent forbs. This is particularly important in the analysis area as there is an active sage-grouse lek complex. A large portion of the analysis area is classified as “priority” sage-grouse habitat (Figure 4.5). Under Alternative 3, approximately 1,555 acres of “priority” sage-grouse habitat would be allowed to subside. Wet meadow habitat potentially suitable for brood-rearing within the subsidence zone could be affected; however, no sage-grouse brood rearing activity is known to occur in this area and, although data on brood rearing activity in the area is limited, the nearest known brood-rearing activity occurred approximately 2.3 miles from the nearest potentially subsided sage-grouse habitat on the Greens Hollow tract (Perkins 2010). Such habitat could dry up as a result of surface cracks redirecting shallow ground water to other surface areas (see Section 4.3.2.2). These other surface areas could provide similar suitable brood-rearing habitat or ground water could reach the surface in areas not conducive to sage-grouse brood rearing. Under Alternative 3, it is expected that potential sage-grouse brood-rearing habitat within the perennial riparian habitats excluded from subsidence mining (stream reaches with less than 50 feet overburden cover above the Castlegate Sandstone) would not be impacted by subsidence events.

Riparian habitat represents a critical component of several non-game bird species habitats, including many warblers. Stress on riparian vegetation could reduce the availability or quality of nesting and/or foraging habitat for these species. Several bird species also rely on pooled or flowing water as a water source. Changes in the availability of free water would not be expected to result and riparian-dependent avian species would not likely modify their behavior to search for alternative water sources within that perennial riparian habitat excluded from subsidence mining.

No impacts from transbasin diversions would occur due to design buffers set in place to avoid areas of shallow overburden that cross Muddy Creek. This would prevent the diversion of water and loss of riparian habitat that is important to avian species in the area.

Currently, no known golden eagle nests occur within the lease tract boundary; however, potential habitat does occur. To minimize potential impacts, Special Coal Lease Stipulations (Appendix B), were developed by the FS to insure the use and protection of all lands including potential golden eagle nesting habitat. Stipulation #9 specifically outlines the requirements for protection of cliff and escarpment habitat from subsidence. Further, Alternative 3 places protections on cliff and escarpment areas within the lease tract boundary that could potentially be suitable nesting habitat for golden eagles.
4.4.3.2 Changes in Stream Morphology

**Issue 2:** Subsidence-caused changes of perennial streams could cause changes in stream morphology and aquatic habitat.

4.4.3.2.1 Fishes

The cutthroat trout, thought to belong to the native Colorado River subspecies, is the only fish species of concern within the analysis area. This native species occurs in parts of Muddy Creek and thus flow reductions caused by streambed subsidence may impact the species. The magnitude of this impact depends on the volume of surface water that could be lost to subsurface flows. These effects are expected to be avoided under Alternative 3 where the perennial Muddy Creek portion of the analysis area would be excluded from subsidence mining. It is expected that by excluding this area, any potential cutthroat trout or their aquatic habitat would not be impacted by mining operations as subsidence effects and escarpment failures would be avoided. Further, no impacts from transbasin diversions would occur due to design buffers set in place to avoid areas of shallow overburden crossing Muddy Creek.

4.4.3.2.2 Aquatic Macroinvertebrates

Potential flow reductions in localized areas of Muddy Creek could modify the species composition and abundance at a stream reach scale. However, impacts to aquatic invertebrates within the subsidence exclusion zones on tributaries of Cowboy Creek and Muddy Creek are not expected under Alternative 3. It is expected that subsidence impacts and escarpment failures would not occur in these sensitive resource areas under Alternative 3 and thus, aquatic macroinvertebrates and their habitat would not be impacted by underground mining activities. Further, no impacts from transbasin diversions would occur due to design buffers set in place to avoid areas of shallow overburden crossing Muddy Creek.

4.4.4 Determinations

The impact analysis summary for special status species including federally-listed threatened, endangered, and candidate species; USDA FS Region 4 sensitive species; and MLNF and FLNF management indicator species for each alternative are presented below.

4.4.4.1 Alternative 1 – No Action

Under this alternative, the Greens Hollow tract would not be offered for lease. As a result, we determine this alternative would have no impacts or effects on special status wildlife or aquatic species.

4.4.4.2 Alternative 2 – Proposed Action

4.4.4.2.1 Federally-listed Threatened and Endangered Species

This section analyzes all federally-listed species in Sevier and Sanpete Counties, Utah with the potential to be impacted by Alternative 2 – Proposed Action. The findings are detailed in the Greens Hollow tract Biological Assessment (BA, Cirrus 2013e) prepared for this project and outlined in Table 4.1 and below.

Rationale for Utah prairie dog determination:

1. There is no evidence of historical occupation or current and likely recurring presence of prairie dog towns or complexes in the analysis area (NatureServe 2013).

2. Suitable habitat is present near the town of Emery, however, the last record of this species in this area was in 1929 (Utah Gap Analysis 1997).
<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Determination</th>
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</thead>
<tbody>
<tr>
<td>Utah prairie dog</td>
<td>Threatened</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Cynomys parvidens)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California condor</td>
<td>Endangered</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Gymnogyps californianus)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonytail</td>
<td>Endangered</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Gila elegans)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado pikeminnow</td>
<td>Endangered</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Ptychocheilus lucius)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humpback chub</td>
<td>Endangered</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Gila cypha)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Razorback sucker</td>
<td>Endangered</td>
<td>No effect</td>
</tr>
<tr>
<td><em>(Xyrauchen texanus)</em></td>
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</table>

Rationale for California condor:

1. There is no evidence of historical occupation or current and likely recurring presence of California condors in the analysis area.

2. There are no modern records of California condors as far north as the analysis area and most condors reside at the far southern edge of Utah in Washington county or further south in Arizona.

Rationale for bonytail, Colorado pikeminnow, humpback chub, and razorback sucker determinations:

1. The project could cause localized diversion of water lasting for up to two years; however, any water locally diverted would resurface somewhere within the watershed resulting in no net loss of water to the Colorado River Basin (see Section 4.3.2.2).

2. These fish species do not occur in the analysis area and local diversion of water from one area within the analysis area to another would have no effect on these species.

3. Water needed for this project would come from existing water rights and would not result in any additional net loss within the Colorado River Basin.

### 4.4.4.2.2 Forest Service R4 Sensitive Species

The Biological Evaluation (BE) prepared for this project (Cirrus 2013f), tiers off the analysis completed in this document. The determinations outlined below are that the Proposed Action would affect Region 4 sensitive species in one of four ways: (1) no impact, (2) beneficial impact, (3) may adversely impact individuals, but not likely to result in a trend toward Federal listing, or (4) likely to result in a loss of viability in the planning area or in a trend toward Federal listing. The determinations are based on specific habitat requirements of the different species in relation to anticipated effects of the Proposed Action.

A no-impact determination was made for 11 of the species analyzed. For four species, the Proposed Action may adversely impact individuals, but is not likely to result in a trend toward Federal listing. For one species, the Proposed Action may adversely impact individuals and it is likely to result in a trend toward Federal listing. Rationale specific to each determination is disclosed below.
4.4.4.2.2.1 “No Impacts” Determination
Based on the analysis provided in this document, it is determined that the Proposed Action would have no impacts on the following Region 4 species:

- Bald eagle
- Bonneville cutthroat trout
- Columbia spotted frog
- Pygmy rabbit
- Bighorn Sheep
- Southern leatherside chub
- Western boreal toad
- Flammulated owl
- Northern goshawk
- Three-toed woodpecker
- Yellow-billed cuckoo

These “no impacts” determinations (shown in Table 4.2) are based on at least one of the following rationales:

1. Species are not likely to occur in the analysis area due to habitat and/or elevation requirements not found in the area.
2. Species have never been known in the analysis area.
3. Species or suitable habitat may occur within the analysis area, but no elements of the Proposed Action would affect them.
4. The immediate and greater surrounding area is currently subject to similar activities as those in the Proposed Action. There is documented history and on-the-ground evidence to support this determination.
5. Species occur outside of the analysis area, and elements of the conceptual project would not affect the species.

<table>
<thead>
<tr>
<th>Table 4.2. Rationale for “No Impacts” determination on USDA Forest Service R4 sensitive species.</th>
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<tbody>
<tr>
<td>Species</td>
</tr>
<tr>
<td>Bald eagle</td>
</tr>
<tr>
<td>Bonneville cutthroat trout</td>
</tr>
<tr>
<td>Columbia spotted frog</td>
</tr>
<tr>
<td>Pygmy rabbit</td>
</tr>
<tr>
<td>Bighorn sheep</td>
</tr>
<tr>
<td>Southern leatherside chub</td>
</tr>
<tr>
<td>Western boreal toad</td>
</tr>
<tr>
<td>Flammulated owl</td>
</tr>
<tr>
<td>Northern goshawk</td>
</tr>
<tr>
<td>Three-toed woodpecker</td>
</tr>
<tr>
<td>Yellow-billed cuckoo</td>
</tr>
</tbody>
</table>
4.4.4.2.2.2 “May Impact” Determination

Based on the analysis provided in this document, it is determined that the Proposed Action may impact individuals but is not likely cause a trend to federal listing or loss of viability.

- Peregrine falcon
- Spotted bat
- Townsend’s big-eared bat

Further, based on the analysis provided in this document, it is determined that the Proposed Action may adversely impact individuals of the following species and is likely to result in a trend toward Federal listing or loss of viability.

- Colorado River cutthroat trout

These “may impact” determinations (shown in Table 4.3) are based on the following rationale:

1. As described above throughout Section 4.4, an extremely small amount of habitat compared to the analysis area as a whole as well as the larger, connected landscape would be destroyed/ altered/impacted by the Proposed Action. This small amount of lost or altered habitat is expected to impact a small number of individuals but is not likely to result in a loss of viability in the planning area.

2. The immediate and greater surrounding area is currently subject to similar activities as those in the Proposed Action. Some serious issues such as loss of water needed by sensitive species have occurred in these surrounding areas under similar activities. However, special coal lease stipulations have been put in place to protect these resources and ensure this determination remains true, that populations would remain viable should the analysis area experience negative impacts to wildlife. There is documented history and on-the-ground evidence to support this determination.

3. Streams within the subsidence zone with insufficient overburden to heal cracks could experience permanent water loss which would result in the permanent loss of riparian vegetation. This would eliminate fish habitat.

4. Potential loss of surface flows due to subsidence could eliminate fish habitat for up to two years.

5. Potential escarpment failure due to subsidence mining activities could impact individuals and destroy existing habitat although new habitat would likely be revealed after outer layers of escarpments fell away.

| Table 4.3. Rationale for “May Impact” determination on USDA Forest Service R4 sensitive species. |
|-------------------------------------------------|----------------------------------|
| Species                                         | Rationale                      |
| Colorado River cutthroat trout                  | 3, 4                            |
| Peregrine falcon                                | 1, 2, 5                         |
| Spotted bat                                     | 1, 2, 5                         |
| Townsend’s big-eared bat                        | 1, 2, 5                         |

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4.4.4.2.3 Greater Sage-Grouse (R4 Sensitive and Candidate for Federal Listing)
In accordance with FS guidance for species proposed for listing and compliance with BLM WO IM 2012-043 the determination for greater sage-grouse is made separately from other sensitive species in this section.

Subsidence mining under wet meadow or stream associated riparian habitat could divert water to other areas causing the initial areas to dry up. This diversion would cause new riparian or wet meadow areas to form where the water resurfaced (see Section 4.3.2.2). This diversion and resurfacing of water is unlikely to occur in a way that results in a net loss of sage-grouse brood-rearing habitat as water would have to resurface in an area unsuitable for sage-grouse for this to occur.

Streams within the subsidence zone with insufficient overburden to heal cracks could experience permanent water loss which would result in the permanent loss of riparian vegetation that could support brood-rearing activities. The nearest known brood-rearing use sites are approximately 1.8 miles from riparian areas that could be permanently lost (Perkins 2010); nevertheless the possibility remains that there is unknown sage-grouse brood-rearing activity occurring in the subsidence zone and these activities could be displaced to new brood-rearing sites that may or may not have value equal to those lost. These impacts to brood-rearing habitat, should they occur, would be insignificant to sage-grouse persistence in the analysis area. None of the areas within the Greens Hollow tract have been proposed as critical habitat. Additionally, according to Stipulation #14, mining “shall be consistent with the most current regulations and direction regarding management of greater sage-grouse habitat.” This would also include compliance with the Utah Greater Sage-Grouse Land Use Plan Amendment and Environmental Impact Statement, once finalized. Therefore, our determination for sage-grouse is that Alternative 2 is not likely to jeopardize continued existence or adversely modify proposed critical habitat.

4.4.4.2.4 Manti-La Sal and Fishlake National Forest Management Indicator Species
This section analyzes all MIS selected for the MLNF and FLNF. The findings are discussed in detail in the Greens Hollow tract Management Indicator Species Report (Cirrus 2013g) prepared for this project. Table 4.4 and Table 4.5 summarize MIS population trends for the MLNF and FLNF, respectively.

| Table 4.4. Impact analysis summary for MIS population trends on the MLNF. |
|---|---|---|
| Species | Current Trend | Impacts due to Proposed Action |
| Rocky Mountain elk | Slightly increasing | No population trend change |
| Mule deer | Stable | No population trend change |
| Northern goshawk | Increasing | No population trend change |
| Golden eagle | Increasing | No population trend change |
| Aquatic macroinvertebrates | Insufficient data to determine | Populations could potentially be impacted through loss of surface flow which, if it occurred, would contribute to a downward trend forest wide. |

1Forest Service 2013b
3Trend from 2008 to 2011, down from 10-year high in 2005.
4Jewkes 2013a, Section 3.4.4.4.
### Table 4.5. Impact analysis summary for MIS population trends on the FLNF.

<table>
<thead>
<tr>
<th>Species</th>
<th>Current Trend</th>
<th>Impacts due to Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocky Mountain elk</td>
<td>Stable/Slightly Increasing</td>
<td>No population trend change</td>
</tr>
<tr>
<td>Mule deer</td>
<td>Stable</td>
<td>No population trend change</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Decreasing Slightly/Under Review</td>
<td>No population trend change</td>
</tr>
</tbody>
</table>
| Sage nesters             | *Brewer’s sparrow*—Slightly down/viable  
                          | *Vesper sparrow*—Slightly down/viable         
                          | *Sage thrasher*—Downward                      | No population trend change |
| Cavity nesters           | *Hairy woodpecker*—Stable/viable   
                          | *Western bluebird*—Stable/viable             
                          | *Mountain bluebird*—Stable/viable            | No population trend change |
| Riparian nesters         | *Lincoln’s sparrow*—Stable/viable  
                          | *Song sparrow*—Stable/slightly down/viable    
                          | *Yellow warbler*—Stable/viable               
                          | *MacGillivray’s warbler*—Stable/viable       | No population trend change |
| Fish                     | *Bonneville cutthroat trout*—Upward/viable 
                          | *Colorado River cutthroat trout*—Unknown      
                          | *Rainbow trout*—Stable/viable                
                          | *Cutthroat trout*—Stable/increasing/viable   
                          | *Brown trout*—Stable/increasing/viable       
                          | *Brook trout*—Stable/increasing/viable       
                          | *Lake trout*—Stable                        | No population trend change |

1Rodriguez et al. 2006.

### 4.4.4.2.5 BLM and State Sensitive Species

BLM and State sensitive wildlife species were considered for Sanpete and Sevier counties (Appendix E). The greater sage-grouse, bald eagle, pygmy rabbit, southern leatherside chub, three-toed woodpecker, Townsend’s big-eared bat, and boreal (western) toad were addressed above. The big free-tailed bat and burrowing owl are not known to occur in the analysis area, but have similar habitat to the spotted bat and Utah prairie dog, respectively which were also addressed above. The remaining species were considered, were not known to exist in the analysis area, and were not analyzed further.

### 4.4.4.3 Alternative 3

Only determinations different from those in Section 4.4.4.2 Alternative 2 – Proposed Action are presented below.

#### 4.4.4.3.1 Federally-listed threatened and endangered species

This section analyzes all federally-listed species in Sevier and Sanpete counties, Utah with the potential to be impacted by Alternative 3. The findings are detailed in the Greens Hollow tract Biological Assessment (BA, Cirrus 2013e) prepared for this project and outlined in Table 4.6 and below.

Rationale for bonytail, Colorado pikeminnow, humpback chub, and razorback sucker determinations:

1. Streams in the analysis area contributing to the Colorado River basin would be protected from subsidence mining related water depletions under this alternative.
2. No change in water pollutants from mine water discharge or waste rock storage that would affect these species are expected to occur under this alternative (see sections 4.3.2.4 and 4.3.3.4).

| Table 4.6. Impact analysis summary for federally-listed endangered and threatened species. |
|-------------|---------|--------|
| **Species**       | **Status** | **Determination** |
| Bonytail  
  (*Gila elegans*) | Endangered | No effect |
| Colorado pikeminnow  
  (*Ptychocheilus lucius*) | Endangered | No effect |
| Humpback chub  
  (*Gila cypha*) | Endangered | No effect |
| Razorback sucker  
  (*Xyrauchen texanus*) | Endangered | No effect |

### 4.4.4.3.2 Forest Service R4 Sensitive Species

Under Alternative 3, one FS Region 4 sensitive species could be potentially impacted; greater sage-grouse. Under Alternative 3 subsidence mining activities would be restricted in areas where such activities could result in escarpment failure or permanent stream subsidence; thus eliminating the impacts on peregrine falcons, spotted bats, Townsend’s big-eared bats, and Colorado River cutthroat trout that would occur under Alternative 2.

### 4.4.4.3.3 Greater Sage-Grouse (R4 Sensitive and Candidate for Federal Listing)

In accordance with FS guidance for species proposed for listing and compliance with BLM WO IM 2012-043 the determination for greater sage-grouse is made separately from other sensitive species in this section.

Subsidence mining under wet meadow or stream associated riparian habitat could divert water to other areas causing the initial areas to dry up. This diversion would cause new riparian or wet meadow areas to form where the water resurfaced (see Section 4.3.2.2). This diversion and resurfacing of water is unlikely to occur in a way that results in a net loss of sage-grouse brood-rearing habitat as water would have to resurface in an area unsuitable for sage-grouse for this to occur. Even if detrimental water loss did occur, Stipulation #17 (Appendix B) states that any surface water lost will be replaced “in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.”

Under this alternative, no permanent loss of riparian habitat that could support brood-rearing activities would occur as perennial streams that could be permanently subsided would be excluded from the potential subsidence zone.

The nearest known brood-rearing use sites are approximately 2.3 miles from potential brood-rearing habitat in the subsidence zone for Alternative 3 (Perkins 2010); nevertheless the possibility remains that there is unknown sage-grouse brood-rearing activity occurring in the subsidence zone and these activities could be displaced to new brood-rearing sites that may or may not have value equal to those lost. These impacts to brood-rearing habitat are extremely unlikely to occur and, should they occur, would be insignificant to sage-grouse persistence in the analysis area. None of the areas within the Greens Hollow tract have been proposed as critical habitat. Additionally, according to Stipulation #14, mining “shall be consistent with the most current regulations and direction regarding management of greater sage-grouse habitat.” This would also include compliance with the Utah Greater Sage-Grouse Land Use Plan.
Amendment and Environmental Impact Statement, once finalized. Therefore, our determination for sage-grouse is that Alternative 3 is not likely to jeopardize continued existence or adversely modify proposed critical habitat.

### 4.4.4.3.4 Manti-La Sal and Fishlake National Forest Management Indicator Species

Under Alternative 3 subsidence mining activities would be restricted in areas where such activities could result in permanent stream subsidence. Therefore, this alternative would not have the potential to contribute to a downward trend for aquatic macroinvertebrates forest wide.

### 4.4.4.3.5 BLM and State Sensitive Species

BLM and State sensitive wildlife species were considered for Sanpete and Sevier counties (Appendix E). The greater sage-grouse, bald eagle, pygmy rabbit, southern leatherside chub, three-toed woodpecker, Townsend's big-eared bat, and boreal (western) toad were addressed above. The big free-tailed bat and burrowing owl are not known to occur in the analysis area, but have similar habitat to the spotted bat and Utah prairie dog, respectively, which were also addressed above. The remaining species considered were not known to exist in the analysis area, and were not analyzed further.

### 4.4.5 Cumulative Effects

Table 2.1 in this EIS prepared for this project outlines the past, present, and future actions with the potential to cumulatively impact wildlife and wildlife habitat. Each action found in Table 2.1 is discussed below and each project and its cumulative effects in relation to this Proposed Action were considered and weighed during the development of effects this project would have on special status wildlife species. How this was done is different for each individual species as home ranges, viable and climax population sizes, management objectives, and other factors differ among different species. Additionally, the cumulative effects analysis area for wildlife species is variable and fluid as wildlife species have varying degrees of mobility and territory sizes. Generally speaking, the impacts analysis area includes territory-size areas for terrestrial wildlife species in and around the analysis area. This includes area around all surface-disturbing portions of the Proposed Action (expected subsidence zone). For aquatic species, actions taken at the watershed level will be analyzed.

Measures that could be recommended to DOGM that would reduce or eliminate potential impacts of reasonably foreseeable post-lease surface use on or outside the Greens Hollow tract are found in Appendix B.

### 4.4.5.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

#### 4.4.5.1.1 Changes in Water Flow

- Changes in water flow due to reasonably foreseeable construction of a vent shaft, including but not limited to flow at points of diversion or use could affect wildlife and aquatic species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.

#### 4.4.5.1.1 TES Fishes

Water would need to be diverted from the North Fork of the Quitchupah Creek for construction of the above-ground vent shaft. The mine company would likely divert approximately 600 gallons of water per day for construction of the vent shaft. This would constitute approximately 255,500 gallons used in 14 months for the shaft (or 0.784 acre feet) for construction. Water depletions of less than one hundred acre-feet constitute a small depletion. It is expected that this diversion would occur year-round until construction is complete. All water would be consumed in this use and none would return to the system.
The water used for the construction would come from an existing agricultural water right that would be reassigned for this use.

Annual flow of the North Fork of the Quitchupah has been monitored by SUFCO just above the road crossing (NFSR 50007). Monitoring from 1982 through 2009 reveals an average of 1,239 acre-feet of annual flow (3.4 acre-feet of daily flow; DOGM 2010). These average flows over 14 months of construction time would account for approximately 1,443 acre-feet of water past the diversion point. As stated above, a total of approximately 0.784 acre-feet of water would be diverted and depleted from the system over this time frame.

4.4.5.1.2 Access Road Use and Maintenance

- Access road use and maintenance and reasonably foreseeable activities such as construction of a mine ventilation shaft could temporarily disrupt existing seasonal closures; use of summer habitat by terrestrial species such as sage-grouse; and deer and elk use of winter range.

Potential impacts to wildlife associated with drilling and construction of a mine vent shaft are discussed below. Increased traffic on the access roads are estimated at roughly 25 extra trips per day (10 per day for light vehicles and 10 to 15 per day for heavy vehicles), during the duration of the construction of the vent shaft (Forest Service 2008c).

4.4.5.1.2.1 TES Birds

4.4.5.1.2.1.1 Bald Eagle

There are no known bald eagle nests in or around the analysis area. Although incidental observations in the general area were recorded during the 2001 to 2003 survey effort, eagle occurrences are rare in the area. No potential eagle nesting habitat would be removed or altered under this project. Up to 10 acres of vegetation would be disturbed for construction of the vent shaft pad site. It is expected that removal and/or alteration of 10 acres of vegetation would have no impact on bald eagles.

4.4.5.1.2.1.2 Northern Goshawk and Flammulated Owls

The vent shaft drill pad could be in the vicinity of historic northern goshawk response sites and numerous flammulated owl territories (Cirrus 2004). Noise associated with construction of the pad and drilling of the shaft could disrupt nesting, roosting, and foraging behavior. The magnitude of behavior modification would vary depending on the distance of the disturbance from the birds and nest sites, and the intensity and duration of the disturbance. Responses could vary from temporary startle responses/flushing (as explosives would be used in construction of the vent shaft and would be evident at the initial stages of shaft construction) and short avoidance flights, to longer-term avoidance of territories, and potential abandonment for a given year or permanent abandonment of the area. As the drilling activities would occur year-round, breeding birds would either become habituated to the noise and disturbance or move to another location for that breeding period or permanently. It is assumed that once the temporary construction disturbances are ended and construction is complete, nesting birds that may have left could return to the area. Depending on where the vent shaft was located up to 10 acres of northern goshawk habitat could be disturbed.

During the survey efforts for the 2004 Muddy Creek Wildlife Technical Report (Cirrus 2004), three goshawk responses were recorded within the current Greens Hollow projected subsidence area. Goshawk occupancy on the Sanpete and Ferron/Price Ranger Districts declined between 2000 and 2008 and has rebounded to nearly 2000 rates in 2012. In 2008, these districts experienced a low of 19.5 percent occupancy in suitable habitat. This is in contrast to the high of 45.5 percent occupancy in 2000 and 42.4 percent in 2012 (Forest Service 2013b).
Flammulated owl territories have been recorded within the analysis area itself and in nearby ponderosa pine habitat. Flammulated owl territories within the analysis area could have habitat altered due to the drilling of the vent shaft. Depending on where the vent shaft was located up to 10 acres of flammulated owl habitat could be disturbed.

4.4.5.1.2.1.3 Sage-grouse

Construction of the vent shaft site and the associated removal of 10 acres of vegetation would likely not impact sage-grouse if constructed within current guidelines. It is unknown where this disturbance would occur and what types of vegetation would be impacted. However, any surface use activities would comply with current FS and BLM direction for management of sage-grouse habitat (Stipulation #14, Appendix B). Thus there is no potential for cumulative effects of habitat loss through construction of a vent shaft.

However, noise impacts due to construction of the vent shaft could potentially disrupt sage-grouse life cycles, at least in short term. Noise impacts associated with vent shaft construction would likely be similar to those discussed above (Section 4.4.5.1.2.1.2). If vent shaft construction occurred during sage-grouse lekking season, noise from the construction measured at the edge of the lek would not be allowed to exceed 10 dB above ambient sound level at sunrise.

For the duration of the vent shaft construction phase, multiple vehicles would be accessing the site daily. Once construction begins on the vent shaft site, vehicles would likely need to travel on an existing road through a small section of the Wildcat Knolls lek complex to access the area. For the majority of the year this would not cause an impact to grouse in the area. However, during lekking, nesting, and brood rearing seasons, these operations would be consistent with Stipulation #14 and current direction regarding sage-grouse habitat (Appendix B).

4.4.5.1.2.1.4 Peregrine Falcon

Cumulative actions are not expected to remove any nesting habitat for the peregrine falcon. However, as 10 acres of perennial grasslands and mountain brush could be removed, it is possible that some potential foraging habitat for the species may be lost. The species has been recorded in the general area (Cirrus 2004), and it is not uncommon for peregrine falcons to travel 10 miles or more from the nest while foraging (White et al. 2002). It is unlikely that the loss of this habitat could substantially impact peregrine falcons. Noise impacts associated with construction of the vent shaft could impact the species as described above (Section 4.4.5.1.2.1.2).

4.4.5.1.2.1.5 Three-toed Woodpecker

Depending on where the vent shaft was located up to 10 acres of three-toed woodpecker habitat could be disturbed. Noise impacts associated with construction of the vent shaft would impact the species as described above (Section 4.4.5.1.2.1.2).

4.4.5.1.2.2 TES Mammals

4.4.5.1.2.2.1 Pygmy Rabbit

Pygmy rabbits are not located in the analysis area and it is expected that the construction activities around a potential vent shaft site would have no impacts on them.

4.4.5.1.2.2.2 Bighorn Sheep

Bighorn sheep are not located in the analysis area and it is expected that the construction activities around a potential vent shaft site would have no impacts on them.
4.4.5.1.2.2.3 Spotted Bat and Townsend’s Big-eared Bat
With the construction of the reasonably foreseeable vent shaft there could be a minor reduction in habitat for moths, the primary prey species for spotted bats (Luce and Keinath 2007) and Townsend's big-eared bats (Gruver and Keinath 2006). It is expected that this impact would be negligible as a very minor amount of habitat within the subsidence zone (10 acres) would be taken. In the adjacent, connected landscape much more foraging habitat is available.

4.4.5.1.2.3 MIS
4.4.5.1.2.3.1 Golden Eagle
The reasonably foreseeable vent shaft could be drilled within a couple miles of the nearest eagle nest which has been observed outside of the analysis area in Greens Canyon. The associated eagles could potentially be disturbed from the noise and human presence near the site, especially if the vent shaft drill pad were visible from the nest site. However, this is likely not to be the case due to topography as the nests are built on the side of cliff faces in Quitchupah Canyon well below the canyon rim. Thus, there is no line-of-sight disturbance to eagles on the nest as they could not see construction activities in most areas. As such, impacts due to equipment movement and human activity would be expected to be negligible to golden eagles. Habitat modification or loss is unlikely to impact this MIS species. Ten acres are expected to be lost when the vent shaft is constructed. This acreage could support some eagle prey base species (various lagomorphs, etc.), but is such a minor amount of habitat loss in relation to the connected landscape that the impact would be negligible.

Construction noise has the potential to impact nesting golden eagles. Although explosives and other violent, acoustical disturbances can elicit a startle/flush response, it has been shown that that golden eagles become less responsive (habituated) to noise with successive exposures (Grubb et al. 2007). Further, Grubb et al. discovered that helicopter and other types of noises and visual disturbances had no impact to golden eagle nesting success or productivity rates. Even so, despite this apparently high tolerance, Grubb et al. (2007) still pointed out that any activity, initially tolerated or not, in excess or extreme (such as loud, blasting events), may cause negative impacts to the species. It should also be kept in mind that the golden eagles studied by Grubb et al. were already habituated to human presence which may not necessarily be the case in this analysis area.

4.4.5.1.2.3.2 Mule Deer and Rocky Mountain Elk
Much of the area that has potential for vent shaft drilling is associated with summer crucial and winter crucial range for mule deer and summer crucial and winter substantial ranges for elk (UDWR 2013) and are very important for deer and elk locally. Deer and elk using these areas during the period of drilling activity would likely be disturbed around the clock for the full length of the construction period (12 to 14 months per shaft site). It is probable that they would initially avoid this area during the construction of the vent shaft. However, deer and elk generally easily and quickly adapt or habituate to new sounds and learn to ignore them if they are not associated with real danger (Bashore and Bellis 1982). It has been shown that deer readily accept and habituate to noise and movements (Transport Canada 2008). However, there is little doubt that there will be a habituation period where the species are learning to tolerate the new disturbances and are driven from the foraging habitat. If this takes place during the important winter months, these species could be severely impacted by the loss of habitat and forage as well as the added physical stress resulting from disturbance.

Increased use of roads associated with vent shaft drilling would also potentially result in vehicle-related mortality or habitat avoidance. Elk are less likely to cross linear boundaries than deer. This is especially true on roads with traffic (Wisdom et al. 2004). Although the area already receives vehicular traffic and deer and elk are likely somewhat habituated to it, additional vehicles do equate to an increased risk of deer and elk mortality from collisions.
Impacts of habitat removal and to available forage would be negligible since only approximately 10 acres of total habitat would be removed. This area would eventually be reclaimed but in the short-term would be lost habitat. Essentially, this is one small 10-acre block of lost habitat in a much larger sea of available forage. Removal of habitat suitable for deer fawning and elk calving would not likely occur.

4.4.5.1.2.3.3 Sage Nesters (MIS for Fishlake National Forest only)
Construction of the reasonably foreseeable vent shaft site and the associated removal of 10 acres of habitat could impact sage nesting MIS. Little to no potential exists for a vent shaft located on the FLNF. If all 10 acres fell in sagebrush habitat, this would constitute a minor reduction in suitable habitat available not only within the expected subsidence zone, but within connected habitats beyond the analysis area. It is not expected that this habitat loss or the disturbance experienced during the removal of this habitat, would create a notable impact to these species. However, noise impacts due to construction of the vent shaft would likely disrupt life cycles of sage nesters, at least in short term. Noise impacts associated with vent shaft construction would likely be similar to those discussed in Section 4.4.5.1.2.1.2).

4.4.5.1.2.3.4 Cavity Nesters (MIS for Fishlake National Forest only)
Depending on where the vent shaft facility was located up to 10 acres of cavity nesting habitat could be disturbed. These species could also be impacted by construction noise, occupancy, and other disturbances associated with vent shaft construction.

4.4.5.1.2.3.5 Riparian Nesters (MIS for Fishlake National Forest only)
Depending on where the vent shaft facility was located up to 10 acres of flammulated owl habitat could be disturbed. These species could also be impacted by construction noise, occupancy, and other disturbances associated with vent shaft construction.

4.4.5.1.2.4 Species of High Federal Interest
As stated above, 10 acres of habitat would be lost due to the construction of the vent shaft pad site. This would undoubtedly include habitat used by numerous species of migratory birds. Given the relatively small area to be disturbed impacts from habitat loss are expected to be minimal. These species could also be impacted by construction noise, occupancy, and other disturbances associated with vent shaft construction.

4.4.5.1.2.5 Other Species
The location of the vent shaft drill pad could be in the general vicinity of a small number of ponds and springs in the analysis area. If drilling occurred in the ponds or springs, or associated hydric vegetation, amphibian habitat would be impacted. No drilling is conceptualized in the vicinity of the known boreal toad populations as they are found outside the analysis area (Cirrus 2004).

Potential impacts to reptiles, small mammals, or non-game birds would be anticipated from construction of the vent shaft. Ten acres of habitat would be removed for the construction of the vent shaft drill pad. To a small mammal or reptile with limited mobility, this could represent a substantial impact. Further, noise impacts from construction of the vent shaft could impact these types of species. It is unknown how small mammals and reptiles would respond to such impacts, but it would be likely that burrowing species in the area could be impacted by the noise from drilling and initial blasting of the vent shaft.

4.4.5.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract
4.4.5.2.1 Changes in Water Flow
- Changes in water flow due to reasonably foreseeable construction of a vent shaft facility, including but not limited to flow at points of diversion or use could affect wildlife and aquatic
species and/or their habitat, including Bonytail, Colorado Pikeminnow, Humpback Chub, Razorback Sucker and Colorado River Cutthroat Trout, if present.

4.4.5.2.1 TES Fishes
Water would need to be diverted from the North Fork of the Quitchupah Creek for construction of the above-ground vent shaft. The mine company would likely divert approximately 600 gallons of water per day for construction of the vent shaft. This would constitute approximately 255,500 gallons used in 14 months for the shaft (or 0.784 acre feet) for construction. Water depletions of less than one hundred acre-feet constitute small depletions. It is expected that this diversion would occur year-round until construction is complete. All water would be consumed in this use and none would return to the system. The water used for the construction would come from an existing agricultural water right that would be reassigned for this use.

Annual flow of the North Fork of the Quitchupah has been monitored by SUFCO just above the road crossing (NFSR 50007) west of the conceptual vent shaft site. Monitoring from 1982 through 2009 reveals an average of 1.239 acre-feet of annual flow (3.4 acre-feet of daily flow; DOGM 2010). These average flows over 14 to 28 months of construction time would account for approximately 1,443 acre-feet of water past the diversion point. As stated above, a total of approximately 0.784 acre-feet of water would be diverted and depleted from the system over this time frame.

4.4.5.2.2 Access Road Use and Maintenance
- Access road use and maintenance and reasonably foreseeable activities such as construction of mine ventilation shaft facility could temporarily disrupt existing seasonal closures; use of summer habitat by terrestrial species such as sage-grouse; and deer and elk use of winter range.

Potential impacts to wildlife associated with drilling and construction of a mine vent shaft facility is discussed below. Increased traffic on the access roads are estimated at roughly 25 extra trips per day (10 per day for light vehicles and 10 to 15 per day for heavy vehicles), during the duration of the construction of the vent shaft facility (Forest Service 2008c).

4.4.5.2.2.1 TES Birds
4.4.5.2.2.1.1 Bald Eagle
There are no known bald eagle nests in or around the analysis area. Although incidental observations in the general area were recorded during the 2001 to 2003 survey effort, eagle occurrences are rare in the area. No potential eagle nesting habitat would be removed or altered through access road use and maintenance.

4.4.5.2.2.1.2 Northern Goshawk and Flammulated Owls
The vent shaft drill pad could be in the vicinity of historic northern goshawk response sites and numerous flammulated owl territories (Cirrus 2004). Noise associated with construction of pads and with drilling could disrupt nesting, roosting and foraging behavior. The magnitude of behavior modification would vary depending on the distance of the disturbance from the birds and nest sites, and the intensity and duration of the disturbance. Responses could vary from temporary startle responses/flushing (as explosives would be used in construction of the vent shaft and would be evident at the initial stages of shaft construction) and short avoidance flights, to longer-term avoidance of territories, and potential abandonment for a given year or permanent abandonment of the area. As the drilling activities would occur year-round, breeding birds would either become habituated to the noise and disturbance or move to another location for that breeding period or permanently. It is assumed that once the temporary construction disturbances are ended and construction is complete, nesting birds that may have left could return to the area.
During the survey efforts for the 2004 Muddy Creek Wildlife Technical Report (Cirrus 2004), three goshawk responses were recorded within the current Greens Hollow tract projected subsidence area. Goshawk occupancy on the Sanpete and Ferron/Price Ranger Districts declined between 2000 and 2008 and has rebounded to nearly 2000 rates in 2012. In 2008, these districts experienced a low of 19.5 percent occupancy in suitable habitat. This is in contrast to the high of 45.5 percent occupancy in 2000 and 42.4 percent in 2012 (Forest Service 2013b). Depending on where the vent shaft facility was located, up to 10 acres of northern goshawk habitat could be disturbed.

Flammulated owl territories have been recorded within the analysis area itself and in the adjacent ponderosa pine habitat. Flammulated owl territories within the analysis area could have habitat altered due to drilling of a vent shaft. Construction of a vent shaft facility and the noise and dust associated with it may have an impact on the species. The impacts expected would be similar to what has been discussed above. Additionally, it is unknown how flammulated owls would react to a constant background noise source such as a vent shaft fan system that is reasonably foreseeable within the analysis area. With this in mind, as with the northern goshawk, the best data available on noise impacts to avian species is presented in Section 4.4.5.2.4.

4.4.5.2.2.1.3 Sage-grouse
Of all the avian sensitive species, the Proposed Action has the potential to impact sage-grouse the most. One or more vent shafts would likely need to be constructed in order to facilitate operation of the mine. It is unknown where this disturbance would occur and what types of habitat would be impacted. However, any surface use activities would comply with current FS and BLM direction for management of sage-grouse habitat (Stipulation #14, Appendix B). Thus there is no potential for cumulative effects of habitat loss through construction of a vent shaft.

However, noise impacts due to construction of the vent shaft and the constant droning of the anticipated vent fan could potentially disrupt sage-grouse life cycles, at least in short term. Noise impacts associated with vent shaft construction would likely be similar to those discussed above (Section 4.4.5.1.2.1.3). Noise impacts to sage-grouse associated with the vent fan itself has been a major concern during the course of this analysis and has spawned a noise impacts analysis (Tetra Tech 2008) by a qualified contractor as well as a separate review by a biologist at the Rocky Mountain Research Station (Grubb and Delaney 2008). This full analysis can be found in Section 4.4.5.2.4.

4.4.5.2.2.1.4 Peregrine Falcon
The access road use and maintenance are not expected to remove any habitat for the peregrine falcon or alter their behavior. However, as 10 acres of vegetation would be removed, it is likely that some potential foraging habitat for the species may be lost. The species has been recorded in the general area (Cirrus 2004) and it is not uncommon for peregrine falcons to travel 10 miles or more from the nest while foraging (White et al. 2002). While there is an abundance of foraging habitat in and around the analysis area, it is still likely that some of this habitat would be removed by implementation of the reasonably foreseeable surface facilities. Noise impacts associated with construction of the vent shaft and subsequent constant running of the vent fan would impact the species as described above in Section 4.4.5.1.2.1.4.

4.4.5.2.2.1.5 Three-toed Woodpecker
The access road use and maintenance are not expected to remove any habitat for the three-toed woodpecker or alter their behavior. Noise impacts associated with construction of the vent shaft and subsequent constant running of the vent fan would impact three-toed woodpeckers as described above (Section 4.4.5.1.2.1.5).
4.4.5.2.2.2 TES Mammals

4.4.5.2.2.2.1 Pygmy Rabbit
Pygmy rabbits are not located in the analysis area and it is expected that the construction activities around the vent shaft site and use of the access road would have no impacts on them. Although ten acres of sagebrush habitat could be removed, the sage habitats in the analysis area are generally not high-quality sites for pygmy rabbits. They generally require loose, deep soils for digging their burrows and tall, decadent, mature sage brush stands (NatureServe 2005, Ulmschneider 2004). Furthermore, as they are not located in the analysis area, it is expected there would be no effect on pygmy rabbits.

4.4.5.2.2.2 Bighorn Sheep
Bighorn sheep are not located in the analysis area and it is expected that the construction activities around a potential vent shaft site and use of the access road would have no impacts on them.

4.4.5.2.2.2.3 Spotted Bat and Townsend’s Big-eared Bat
With the construction of reasonably foreseeable surface facilities there would be a minor reduction in habitat for moths, the primary prey species for spotted bats (Luce and Keinath 2007) and Townsend's big-eared bats (Gruver and Keinath 2006). It is expected that this impact would be negligible as a very minor amount of habitat within the subsidence zone would be taken. In the adjacent, connected landscape much more foraging habitat is available. The access road use and maintenance are not expected to remove any habitat for bats or alter their behavior. There is, however, potential for interruption of bat foraging activities due to increased steady background noise from vent shaft construction and future fan noise.

4.4.5.2.2.3 MIS

4.4.5.2.2.3.1 Golden Eagle
The vent shaft location could be in the vicinity of two golden eagle nests outside of the analysis area, on the canyon wall, above Quitchupah Creek, in Quitchupah Canyon. The associated eagles could potentially be disturbed from the noise and human presence near these sites, especially if the vent shaft drill pad were visible from the nest site. However, this is not likely to be the case due to topography as the nests are built on the side of cliff faces in Quitchupah Canyon well below the canyon rim. Thus, there would be no line-of-sight disturbance to eagles on the nest as they cannot see the construction activities. As such, impacts due to equipment movement and human activity would be expected to be negligible to golden eagles. Habitat modification or loss is unlikely to impact this MIS species. Ten acres are expected to be lost when the vent shaft facility is constructed. This acreage likely supports some eagle prey base species (various lagomorphs, etc.), but as discussed above, is such a minor amount of habitat loss in relation to the connected landscape, that the impact is negligible.

Construction noise has the potential to impact nesting golden eagles. Although explosives and other violent, acoustical disturbances can elicit a startle/flush response, it has been shown that that golden eagles become less responsive (habituated) to noise with successive exposures (Grubb et al. 2007). Further, Grubb et al. discovered that helicopter and other types of noises and visual disturbances had no impact to golden eagle nesting success or productivity rates. Even so, despite this apparently high tolerance, Grubb et al. (2007) still pointed out that any activity, initially tolerated or not, in excess or extreme (such as loud, blasting events), may cause negative impacts to the species. It should also be kept in mind that the golden eagles studied by Grubb et al. were already habituated to human presence which may not necessarily be the case in this analysis area.

4.4.5.2.2.3.2 Mule Deer and Rocky Mountain Elk
Much of the analysis area that could be used for vent shaft drilling is associated with summer crucial and winter crucial range for mule deer and summer crucial and winter substantial ranges for elk (UDWR 2013) and are very important for deer and elk locally. Deer and elk using these areas during the period of drilling activity would likely be disturbed around the clock for the full length of the construction period.
It is probable that they would initially avoid these areas during the construction of the vent shaft. However, deer and elk generally easily and quickly adapt or habituate to new sounds and learn to ignore them if they are not associated with real danger (Bashore and Bellis 1982). It has been shown that deer readily accept and habituate to noise and movements (Transport Canada 2008). However, there is little doubt that there will be a habituation period where the species are learning to tolerate the new disturbances and are driven from the foraging habitat. If this takes place during the important winter months, these species could be severely impacted by the loss of habitat and forage as well as the added physical stress resulting from disturbance.

Increased use of roads associated with vent shaft drilling could also potentially result in vehicle-related mortality or habitat avoidance. Elk are less likely to cross linear boundaries than deer. This is especially true on roads with traffic (Wisdom et al. 2004). Although the area already receives vehicular traffic and deer and elk are likely somewhat habituated to it, additional vehicles do equate to an increased risk of deer and elk mortality from collisions.

Impacts of habitat removal and reduction of available forage would be negligible since approximately 10 acres of total habitat would be removed which is a very small portion of available habitat and forage in the surrounding area. These areas would eventually be reclaimed but in the short-term would be lost habitat. Essentially, this is one small 10-acre block of lost habitat in a much larger sea of available forage.

4.4.5.2.2.3.3 Sage Nesters (MIS for Fishlake National Forest only)
Construction of the vent shaft facility and the associated removal of 10 acres of habitat could impact sage nesting MIS directly. Little to no potential exists for a vent shaft located on the FLNF.

However, noise impacts due to construction of the vent shaft would likely disrupt life cycles of sage nesters, at least in short term. Noise impacts associated with vent shaft construction would likely be similar to those discussed in Section 4.4.5.1.2.1.2. Noise impacts to sage-grouse associated with the vent fan itself has been a major concern during the course of this analysis and spawned a noise impacts analysis (Tetra Tech 2008) by a qualified contractor as well as a separate review by a biologist at the Rocky Mountain Research Station (Grubb and Delaney 2008). Although this analysis was aimed at sage-grouse in particular, there is no doubt some applicability of the results to these MIS. This full analysis can be found in Section 4.4.5.2.4.

4.4.5.2.2.3.4 Cavity Nesters (MIS for Fishlake National Forest only)
Depending on where the vent shaft facility was located, up to 10 acres of cavity nesting MIS habitat could be disturbed. These species could also be impacted by construction noise, occupancy, and other disturbances associated with the construction of these facilities.

4.4.5.2.2.3.5 Riparian Nesters (MIS for Fishlake National Forest only)
Depending on where the vent shaft facility was located, up to 10 acres of riparian nesting MIS habitat could be disturbed. These species could also be impacted by construction noise, occupancy, and other disturbances associated with the construction of these facilities.

4.4.5.2.2.4 Species of High Federal Interest
As stated above, 10 acres of habitat would be lost due to the construction of the vent shaft pad site. This could include habitat used by numerous species of migratory birds. This 10-acre impact represents a total of 0.03 percent of the total expected subsidence zone. Potential noise impacts associated with construction of the vent shaft would likely impact migratory bird species in a similar manner to the other species discussed above in Section 4.4.5.1.2.1.2. It is not expected that this habitat loss or the disturbance experienced during the removal this habitat would create a notable impact to these species.
4.4.5.2.5 Other Species
The location of the vent shaft drill pad could be in the general vicinity of a small number of ponds and springs in the analysis area. If drilling occurred in the ponds or springs, or associated hydric vegetation, amphibian habitat would be impacted. No drilling is reasonably foreseeable in the vicinity of the known boreal toad populations as these populations occur outside the study area (Cirrus 2004).

Potential impacts to reptiles, small mammals, or non-game birds would be anticipated from construction of the vent shaft facility. Ten acres of habitat would be removed for the construction of the vent shaft drill pad. To a small mammal or reptile with limited mobility, this could represent a substantial impact. Further, noise impacts from construction of the vent shaft could impact these types of species. It is unknown how small mammals and reptiles would respond to such impacts, but it would be likely that burrowing species in the area could be impacted also by the noise from drilling and initial blasting of the vent shaft.

4.4.5.2.3 Construction and Operation of Power Line
- Reasonably foreseeable construction and operation of a power line and poles could cause electrocution of raptors, increase predation of sage-grouse by raptors, and cause sage-grouse mortality through direct collision with power lines.

4.4.5.2.3.1 Raptors
Power line poles would be designed to exclude raptors from perching on them. This design would not only prevent raptors from using the poles as artificial perches from which to hunt, but would also separate wires so large birds could not ground one wire to the next and electrocute themselves. A schematic of the power line poles with wire attachments is included in Appendix B of the Wildlife Technical Report (Cirrus 2013d).

4.4.5.2.3.2 Sage-grouse
Sage-grouse collisions with power lines can be avoided through marking of lines, similar to marking of fences, to make them more visible to sage-grouse (Stevens et al. 2012).

4.4.5.2.4 Constant Background Sound
- Reasonably foreseeable need for a ventilation shaft and fan system could create constant background sound which may negatively impact lekking sage-grouse.

The Wildcat Knolls lek complex could be impacted by continuous noise from the potential fan. Thus, potential impacts of fan noise are addressed in this analysis.

To gather baseline noise levels from the operating SUFCO mine fan as well as background noise, Ark contracted with a third-party consultant to investigate potential noise impacts in late July 2008 (Tetra Tech 2008). Additionally, a biologist researcher from the Rocky Mountain Research Station in Flagstaff, Arizona, visited the site on September 8, 2008. As a result of that visit, a site visit summary and assessment was submitted (Grubb and Delaney 2008) to help with the preparation of this document. The assessment offers professional opinion on the project and a review of the Tetra Tech (2008) document, but submitted no findings, data, or analysis as no data was collected on the visit.

Noise sampling was completed at a time of year (mid-summer) that varies atmospherically and conditionally to when sage-grouse are actually using the strutting grounds in the Wildcat Knolls area (Grubb and Delaney 2008). During the winter while grouse are strutting, circumstances exist that could create conditions for sound to travel differently than during the season when the study occurred. Both documents referenced above recommended further studies be completed while grouse are actually on the
lek. This will help give a clearer picture as to what is happening on site at the seasonally-appropriate time.

On July 29 and 30, 2008, 49 sound monitoring sites were located on and around the currently operating SUFCO coal mine and the proposed Greens Hollow tract as well as the Wildcat Knolls lek complex (Tetra Tech 2008). As there is no standard protocol for collecting this data, the methodology used was identical to previous studies which successfully obtained the required data for projects that have been accepted by the BLM on oil and gas well projects (James 2008). All readings were recorded as dBA, for two minutes with maximum, minimum, and equivalent continuous noise level readings taken. Environmental, vegetative cover, and other conditions were also recorded. Although A-weighted decibels are appropriate for human hearing, they do not necessarily reflect the true way different families and individual species of wildlife hear noise. As such, it is generally inappropriate to measure noise impacts in A-weighted decibels for wildlife. However, sage-grouse and gallinaceous birds in general do not have a studied and recorded weighting function to their hearing range and sensitivity. Therefore, with a lack of a species-specific metric, and the FS and the BLM having no standard protocol, noise data were recorded as A-weighted. This weighting however is the standard method of collection for OSHA. (James 2008, Tetra Tech 2008).

Sampling in the study area determined that background sound levels for the analysis area averaged 34.0 dBA. This level was recorded within the vicinity of the analysis area where the currently-operating SUFCO fan was not audible to human researchers sampling noise levels. These readings were taken at various locations throughout the analysis area to get an average baseline across the area without noise interference from passing vehicles, overhead airplanes, during calm wind conditions, quiet researchers, and as stated above, where the SUFCO mine was inaudible to researchers. This is considered to be the background noise level for the analysis area in mid-summer (Tetra Tech 2008).

Current guidelines for limiting noise impacts on sage-grouse suggest a maximum of 10 dB above ambient measured at the edge of the lek (Morales et al 2011). Noise levels above this threshold have been shown to reduce peak male attendance at affected leks. This same study also showed intermittent noise to be more detrimental than constant noise of the same decibel level (Blickley et al 2012).

Although Grubb and Delaney (2008) state that noise coming from an additional potential fan would be additive, it is not as simple as adding the two decibel levels together. Sound is measured in decibels on a logarithmic scale so sounds cannot be added with standard addition. Two sounds of equal level (±1 dB) combine to raise the noise level by 3 dB. However, if the sounds differ by more than 10 dB, there is no combined increase in the sound level—the higher output masks any other noise (WSDOT 2013). The implication is then, that if multiple fans are running below background levels (even if one is 10dB louder than the other), additive fan noise would not rise above background levels. If the fans were of equal levels (±1 dB) and the overall noise did rise by 3 dB, dissipation rates calculate that ±2.9 dBA are dissipated in 330 feet (100 meters) of unobstructed travel at the same elevation.

4.4.5.2.5 Fan Maintenance Traffic

- Intermittent traffic associated with maintaining a reasonably foreseeable fan system at a ventilation shaft may result in disturbance impacts to terrestrial species.

Under normal circumstances routine maintenance trips to the 10-acre vent fan site would be scheduled on a weekly basis year-round for the life of the mine. This generally would involve one light vehicle to make the trip to the vent shaft facility where mechanical maintenance checks and services would occur. Under normal circumstances, visits would consist of maintenance personnel traveling directly to the fan site and not exiting the vehicle until arriving on site for a brief visit of a few hours each week. During winter months, the road would be plowed to allow vehicular access. Under emergency situations where
repairs are required, the number of vehicles accessing the site would be situation-dependent. This scenario would be expected to be infrequent and periodic in nature while routine, weekly maintenance visits would be the standard through the life of the mine. During normal maintenance visits, trips would be planned during daylight hours. However, during emergency periods the site could be visited at any time of day or night to correct problems. Potential impacts associated with increased traffic for fan maintenance to wildlife are discussed below.

4.4.5.2.5.1 TES Birds

4.4.5.2.5.1.1 Bald Eagle

There are no known bald eagle nests in or around the analysis area. Bald eagle occurrences are rare in the area. No potential eagle nesting habitat would be removed or altered during fan maintenance activities. Eagle/vehicular collisions are rare and in this area with very little eagle use and relatively small amounts of traffic, it is expected that minor increases in traffic would have no impact to bald eagles.

4.4.5.2.5.1.2 Northern Goshawk and Flammulated Owl

The vent site access road could be in the vicinity of historic goshawk response sites and flammulated owl territories. Noise associated with increased road use and maintenance equipment could disrupt roosting and foraging behavior of these birds. The magnitude of behavior modification would vary depending on the distance of the disturbance from the birds, and the intensity and duration of the disturbance. Some of the possible disturbances could include short startle responses, longer avoidance flights, and abandonment of current nesting activity. Although surface disturbance is restricted near known northern goshawk nests from March 1 to September 30 (see Section 4.4.6) this restriction does not apply to vehicle travel in these areas.

There is also the potential that with increased traffic on the roads, there is an increase in the chances for vehicular collisions. This is a minor concern as neither species is known for foraging on road kill on the side of the road and the collision would have to be on the wing during daylight hours when maintenance trips are being made.

4.4.5.2.5.1.3 Sage-grouse

Projected noise impacts due to increased traffic to the vent shaft site for fan maintenance could disrupt sage-grouse life cycles year-round; however, if gates to access roads are locked to eliminate public access from December 1 to May 15 and if fan maintenance traffic is limited to a maximum speed of 15 mph March 1 to May 15, then these restrictions would drastically reduce the potential impacts of traffic on sage-grouse.

4.4.5.2.5.1.4 Peregrine Falcon

Fan maintenance activities are not expected to impact any nesting habitat for the peregrine falcon. The species has been recorded in the general area (Cirrus 2004), and it is not uncommon for peregrine falcons to travel 10 miles or more from the nest while foraging (White et al. 2002). While there is an abundance of foraging habitat in and around the analysis area, it is still possible that some disruption of foraging activities could occur due to increased traffic in the area. Increased traffic also increases the chance for vehicular collisions and premature death to peregrine falcons.

4.4.5.2.5.1.5 Three-toed Woodpecker

This species has been recorded in the general area (Cirrus 2004). While there is an abundance of foraging habitat in and around the analysis area, it is still possible that some disruption of foraging activities could occur due to increased traffic in the area. Increased traffic also increases the chance for vehicular collisions and premature death to woodpeckers. This is a minor concern as this species is not known for foraging on road kill on the side of the road and the collision would have to be on the wing during daylight hours when maintenance trips are being made.
4.4.5.2.5.2 TES Mammals

4.4.5.2.5.2.1 Pygmy Rabbit
Pygmy rabbits are not located in the analysis area and it is expected that the increased traffic use of access roads would have no impacts on them.

4.4.5.2.5.2.2 Bighorn Sheep
Bighorn sheep are not located in the analysis area and it is expected that the increased traffic use of access roads would have no impacts on them.

4.4.5.2.5.2.3 Spotted Bat and Townsend’s Big-eared Bat
It is unclear how increased traffic would impact bat species. It is likely that nearly all of the increased traffic would occur during daylight hours and have no interruption at all to foraging bat species. There may be times when a maintenance problem occurs and nighttime use is necessary; however, even nighttime maintenance is unlikely to impact bats in any detrimental way.

4.4.5.2.5.3 MIS

4.4.5.2.5.3.1 Golden Eagle
Two golden eagle nests occur in the vicinity of the potential vent shaft access road. If nesting, the associated eagle pairs could potentially be disturbed from the increased noise and human presence along this road. However, due to the topography of the area, the road would be well above the nest locations and should not pose a notable impact to the nesting eagles below. There is an existing Forest System Road in the area that was not created for this project and has been in use by the public for many years. This use has not deterred golden eagles from nesting in this area in the past and it is expected this would remain true throughout the life of this project.

Additionally, it has been shown that golden eagles become less responsive (habituated) to noise with successive exposures (Grubb et al. 2007). Further, Grubb et al. (2007) discovered that extreme noise and visual disturbances had no impact to golden eagle nesting success or productivity rates. Even so, despite this apparently high tolerance, Grubb et al. (2007) still pointed out that any activity, initially tolerated or not, in excess or extreme (such as loud, blasting events), may cause negative impacts to the species. It should also be kept in mind that the golden eagles studied by Grubb et al. (2007) were already habituated to human presence which may or may not necessarily be the case in this analysis area. Disturbance may occur but would likely be minor due to the topographic features discussed, infrequency of use (once-per-week maintenance visit), and brevity of duration (no more than a few hours) of maintenance visits to the site.

4.4.5.2.5.3.2 Mule Deer and Rocky Mountain Elk
The potential increased traffic could affect summer crucial and winter crucial range for mule deer and summer crucial and winter substantial range for elk (UDWR 2013). Deer and elk using these areas could temporarily be disturbed during increased traffic use of the access road. Increased use of roads potentially could result in vehicle-related mortality or habitat avoidance. Elk are less likely to cross linear boundaries than deer. This is especially true of roads with traffic (Wisdom et al. 2004). The once-weekly maintenance trip mandated by law would add additional trips along the area. Although the area already receives vehicular traffic and deer and elk are likely somewhat habituated to it, additional vehicles do equate to an increased risk of deer and elk being hit.

Projected noise associated with the increased traffic and fan maintenance activities could potentially disturb deer and elk in the analysis area. However, disturbance would be temporary as this increase would usually just be a single visit each week and does not constitute a large increase in traffic by itself.
During winter months, the road would be plowed to allow vehicular access. During winter months when minimizing disturbance to big game is most important, plowing roads could impact species more than during non-winter seasons. This is because additional trips are expected to be necessary to plow and keep the roads clear for maintenance access to the sites. These additional trips would further disturb or disrupt wintering big game during a critical season of increased stress. The additional stress caused by increased vehicle presence during winters that historically have not had roads plowed and vehicular access could impact big game. They could experience impacts from startle responses to being driven out of the area to find other (and possibly not as valuable) wintering grounds. Stipulation #14 imposes travel restrictions within big game winter range from December 1 to April 15 as well as travel restrictions within big game calving/fawning habitat from May 15 to July 5 (see Section 4.4.6).

4.4.5.2.5.3.3 Sage Nesters
Projected noise impacts due to increased traffic to a vent shaft site would likely disrupt sage-nesting MIS life cycles, at least in the short-term. Existing roads in the area travel through historic sagebrush habitat that has recently been undergoing restoration. If restoration of these areas is successful, the transition from crested wheatgrass dominated habitat to native sagebrush, grasses, and forbs is expected to increase the value of the habitat for sage-grouse, but also for sage nesting MIS.

As construction trips would occur daily during the construction phase, once complete, maintenance checks would occur year-round on a weekly basis. Vehicles would be driving through this habitat during all seasons. Noise impacts to sage-grouse have been a major concern for this analysis. Section 4.4.5.2.4 deals with additional sage-grouse noise issues. Although specifically addressing grouse, there is no doubt some applicability to sage nesting MIS in the conclusions drawn in that section as well as additional discussion above in Section 4.4.5.1.2.1.2 that is not related to fan noise. Increased traffic in the area also increases the chance for vehicular collisions and premature death to sage-nesting MIS songbirds.

4.4.5.2.5.3.4 Cavity Nesters
While there is an abundance of foraging habitat in and around the analysis area, it is still possible that some disruption of foraging activities could occur due to increased traffic in the area. Existing roads run near or through potential habitat for cavity-nesting MIS species. Increased traffic also increases the chance for vehicular collisions and premature death to cavity-nesting MIS.

4.4.5.2.5.3.5 Riparian Nesters
There is not an abundance of foraging and nesting habitat in and around the analysis area for riparian nesting MIS. Existing roads avoid riparian areas, but it is still possible that some disruption of foraging and nesting activities could occur due to increased traffic in the area. Increased traffic also increases the chance for vehicular collisions and premature death to riparian nesting MIS.

4.4.5.2.5.4 Species of High Federal Interest
An increase in traffic for maintenance of the vent shaft site would occur. This would include a single trip each week to the vent shaft site. This is a requirement mandated by law for mine safety and would take a couple of hours on site per visit.

This additional trip increases the potential for mortality in neo-tropical migratory birds due to vehicular collisions. This would be true during all seasons as the maintenance is required every week, year-round for the life of the mine.

4.4.5.2.5.5 Other Species
The existing roads are in the general vicinity of a small number of ponds and springs in the analysis area. If increased traffic created copious amounts of dust and erosion, there is the possibility that ponds and
springs could be impacted by additional sediment. This in turn could impact potential amphibian habitat in the area.

Impacts to reptiles, small mammals, or non-game birds are anticipated from increased maintenance trips to the vent shaft site along access roads. Small mammals and especially reptiles who sun themselves on roadways are particularly susceptible to this potential for increased mortality.

### 4.4.5.2.6 Other Cumulative Effects

The effects of this project would be cumulative with other impacts occurring in the area. Several land management activities have recently occurred, are currently occurring, or could occur in the near future in or near the Greens Hollow analysis area. The activities that have the greatest potential to add cumulatively to the impacts of proposed mining on wildlife include cattle grazing, mining in various tracts, habitat modification projects, water use development projects (stock ponds and guzzlers), wildfire and prescribed burns, and recreation.

In general, livestock grazing poses a potential threat to both terrestrial and aquatic habitat. Improper grazing practices can degrade terrestrial habitat, streams, riparian habitats, and fish populations. It can also reduce the quality of habitat for terrestrial species associated with riparian systems. Degradation occurs when soils are compacted and the vegetation composition is changed. This can lead to increased runoff and erosion, reduced stream bank vegetation and stability, changes to aquatic habitat, and adverse impacts to fish and other aquatic species (Platts 1991). Impacts from cattle grazing could add cumulatively to the impacts to aquatic habitat from mining-induced subsidence and escarpment failure. Further, if proper grazing practices are not followed, terrestrial habitats could be impacted and forage available for wildlife could be reduced and habitat value diminished. Further, if vegetation is stressed due to lack of surface water, livestock and big game grazing and browsing compounded with subsidence impacts due to surface cracks could cumulatively affect vegetation and habitat for wildlife.

Past, present, and future mining activities in the nearby mines could affect fish and aquatic macroinvertebrate habitat in the area, as small flow reductions and additional sediment inputs into Muddy Creek are anticipated (Forest Service 1999). The cumulative effect of these changes could incrementally decrease fish and aquatic macroinvertebrate diversity, habitat, and individuals across not just the analysis area, but potentially at the watershed level. Potential escarpment failure and cliff-face spalling, and mining-induced tension cracks associated with this mining lease if approved could also add cumulatively to the impacts to other aquatic and terrestrial wildlife as discussed in Section 4.4.2.2 above, but at a larger scale than at the project level.

Further, subsidence-induced cracking has the potential to cumulatively impact surface water as well as divert sub-surface water to new discharge points or retention underground. This potentially could decrease available water in the area for wildlife and riparian zones and increase the stress on available resources and the wildlife themselves. Additional stress on more limited resources could compound the limitations to the point where wildlife are driven from the areas of stress or in the case of low-mobility species, displace them from the area which in turn reduces species diversity.

Increased mining on 2,316 acres due to the West Coal Lease Modifications (directly south of the Greens Hollow tract on the FLNF), would not increase ground-disturbing impacts to wildlife habitat, additional noise, occupancy, or displacement of individuals. This is because no additional surface facilities will be constructed and maintained as all access to the site will be through existing underground access points. It is anticipated that some subsidence, surface cracking, and failure of escarpments as well as some temporary loss or diverted riparian habitat due to subsidence may occur. These impacts may affect R4 sensitive mammal species such as spotted and Townsend’s big-eared bats, as well as riparian MIS and
some neo-tropical migratory bird species. No federally-listed species are expected to be impacted by this action.

Old crested wheatgrass and smooth brome seedings not optimal for sage-grouse were disked, harrowed, and re-seeded with sagebrush, native grasses, and a variety of forbs to restore sage-grouse habitat and increase species diversity in and around the Wildcat Knolls lek complex and expected subsidence zone. Although a cumulative temporary disturbance, if restoration of these areas is successful, the transition from crested wheatgrass dominated habitat to native sagebrush, grasses, and forbs is expected to increase the value of the habitat for sage-grouse. It is expected this project will continue over multiple seasons (Jewkes 2008b).

Other habitat improvement projects in the general area have been taking place since the late 1980s. These include multiple prescribed burns on the Pines Tract to improve elk winter ranges. More recently (in 2005, 2007, and 2008), prescribed, understory burns have been used to improve value in ponderosa pine habitats. Since 2005, some 2,180 acres have been treated. Along with this, in 2004 the Link Wildfire burned an additional 102 acres on the Pines Tract to the north of the Wildcat Knolls sage-grouse lek complex. None of the habitat affected by these fires was treated with reseeding projects. However, the areas have shown good response to re-growth of grasses, and very good response to aspens returning to the sites.

Several water storage and distribution projects have been completed and are planned for the area. Several stock ponds have been developed, three wildlife guzzlers were installed in 2005, and other wildlife and livestock water distribution projects are planned. Greater water distribution to the area is expecting improved livestock distribution and wildlife habitat improvement. These projects are expected to benefit livestock and wildlife in the area through greater distribution and lowering of congregating animals around limited watering sites. This should help decrease overuse of habitat and increase the overall health and viability of forage and habitat in the area. Additionally, three mesic areas were restored in 2007. These included a total of 0.5 acres of sage-grouse brood-rearing habitat that was improved.

Recreation in the analysis area is associated primarily with hunting. Increased visitation and vehicle use due to road maintenance during the hunting season could add cumulatively to disturbances associated with coal exploration activities. Additional habitat degradation and modification as well as fragmentation could also occur due to increased visitation through illegal off-road, OHV use in the area. Road maintenance could increase this type of recreation opportunity which in turn could decrease wildlife habitat and forage value as well as foster additional human-wildlife interactions which could create harassment of wildlife.

4.5 VEGETATION RESOURCES

4.5.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under Alternative 1, the coal reserves on the Greens Hollow tract would not be leased and thus mining would not occur. As a result, the potential impacts discussed below under Alternatives 2 or 3 would not occur. There would be no changes to surface water or ground water due to subsidence or other mining-related impacts that could affect vegetation, including riparian vegetation.

4.5.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Under Alternative 2, the entire Greens Hollow tract would potentially be mined and subjected to subsidence. Maleki (2008) reports that surface subsidence would occur over the longwall panels, with
surface fractures along the panel margins. In general, subsidence would be expected to result in slight changes in the surface topography. The change in slope would be expected to be between 1 and 2 percent (Maleki 2008) and may be noticeable as minor rock falls from escarpments and ponding. This would affect approximately 6,175 acres as shown in Table 4.7. Surface fractures may occur, particularly over longwall gate roads and near shallow block boundaries. Many of the fractures should close over time, but some would remain open.

### Table 4.7. Acres of vegetation types within potential subsidence areas under Alternative 2 in the Greens Hollow Tract Boundary and Analysis Area.

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<th>Vegetation Community</th>
<th>Greens Hollow Tract</th>
<th>Analysis Area</th>
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<tr>
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<td>Acres</td>
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<td>Aspen</td>
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<tr>
<td>Aspen Mixed Conifer</td>
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<td>Curlleaf Mountain Mahogany</td>
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<td>Douglas Fir Forest</td>
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<td>High Mountain Brush</td>
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<tr>
<td>Juniper/Curl-leaf Mohogany</td>
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<td>-</td>
</tr>
<tr>
<td>Limber &amp; or Bristlecone Pine Forest</td>
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<td>Mixed Conifer</td>
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<td>Willow Dominated Riparian Area</td>
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<td><strong>Grand Total</strong></td>
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**Issue 1:** Subsidence and other mining-caused changes to surface and ground water could affect riparian, wetland, and upland vegetation.

**Evaluation Criteria:** Changes in wetland hydrology due to subsidence mining impacts and corresponding changes in species composition in riparian areas and wetlands; changes in ground or surface water due to mining impacts affecting the composition of upland plant communities.
4.5.2.1 Upland Vegetation
Under Alternative 2, the Greens Hollow tract would be leased and mined. Surface subsidence would occur along longwall panels (Maleki 2008) and surface tensile fractures would develop near the edges of longwall panels. In general, subsidence would be expected to result in slight changes in the surface topography. The change in slope would be expected to be between 1 and 2 percent (Maleki 2008). Vertical subsidence would not be visually discernible because of gradual but more significant natural changes in surface slopes.

In terms of aerial extent, subsidence resulting from the Proposed Action could potentially affect up to 6,175 acres within the Greens Hollow tract boundary, as detailed in Table 4.7. Inside the Greens Hollow analysis area, the Proposed Action could affect up to 8,887 acres (Area of Subsidence Mining). Subsidence effects would extend beyond this boundary, but would diminish with distance away from the mine area and would be wholly contained within the buffer shown on Figure 4.6, while up to 11,025 acres could be affected within the analysis area and 900-foot extended subsidence zone (Mining Analysis Area Boundary).

In general, effects of subsidence on vegetation would be very minor to nonexistent and would not lead to the loss of vegetation or other changes in upland plant communities because of the slight changes that would occur to the surface topography. Where mining does occur under escarpments, subsidence could result in escarpment failures and rock falls. These events could result in small areas of impacts to the vegetation communities that occur under or above the escarpments but would be very minor based on the extent of the area affected.

4.5.2.2 Wetlands
Springs and wetlands occur within the Alternative 2 analysis area, as described in Section 3.5.3. The Surface and Ground Water Technical Report for the Greens Hollow tract (Cirrus 2013c) assessed the risk of permanent water loss at springs due to subsidence from mining the longwall panels. It notes that springs that occur in the Price River Formation and the North Horn Formation could be at risk of being impacted due to surface tensile cracks caused by subsidence. The overburden where the springs in these formations occur is greater than 1,300 feet, so the overall risk for permanent water loss would be relatively low. At these overburden depths, subsidence would not result in increased vertical flow between the shallow ground water and the coal seam (i.e., water from the springs would not seep into the mine). Springs tend to occur where there are clays and shales present and cracks in these substrates should heal. However, as surface tensile cracks form and reseal with the shales and clays, the seals may form below the surface and allow the water table to drop below the level where it is available, thus dewatering and drying the wetland system. The Surface and Ground Water Technical Report (Cirrus 2013c) does predict that if flows at a spring in the Price River Formation or North Horn Formation are permanently affected, the ground water would be expected to discharge to the surface further down slope. Although new wetlands may form at these locations over time, the existing wetlands could be impacted.
Figure 4.6. Vegetation types in analysis area.
Based on the hydrologic impact analysis completed for this project, the risk that subsidence would permanently impact spring discharge rates and volumes is relatively low (Section 4.3.2.2). Therefore, the risk that Alternative 2 would result in impacts to wetland vegetation supported by the water discharged from these springs is also relatively low. Although surface tensile cracks could occur in the Price River and the North Horn formations, any changes in flow discharge from springs would generally be expected to be temporary as clays and shales in these formations would tend to reseal the cracks relatively quickly. However, some surface cracks may not re-seal, and there is a chance that a spring-wetland system could be permanently affected, likely resulting in the water being discharged further down slope. Springs that are located on panel boundaries and in sandstone formations are more likely to be affected by surface cracks that remain open and alter the long-term surface and subsurface flows associated with wetlands. Since the location of panel boundaries is not known, it is not possible at this point in the analysis to predict which spring-wetland systems have a higher risk of being impacted. However, if a wetland’s hydrology is altered, it would result in a loss of the wetland-dependent plant species and conversion of the site to an upland plant community. Many of the wetland functions would also be reduced or eliminated. Because the water would probably be discharged down slope, the wetland may redevelop at the new discharge point, depending on the degree of suitability of the topography, soils, distance, and other factors. The development of a functional wetland at new discharge points would be a long-term process.

Under the Proposed Action, 80 wetlands that occur within the Greens Hollow tract boundary (Figure 4.7), totaling approximately 11.7 acres, could be subsided as a result of mining, as detailed in Table 4.8. In the larger Proposed Action analysis area, there are an additional 15 wetlands, totaling approximately 3.2 acres that could be subsided due to mining. The 900-foot extended subsidence zone adds an additional 43 wetlands within the area potentially affected by subsidence, totaling approximately 7.2 acres.

### 4.5.2.3 Riparian

Riparian communities also occur along the perennial streams in the Alternative 2 analysis area, including the Muddy Creek, Cowboy Creek, Greens Hollow, and the North Fork of Quitchupah Creek, as described in Section 3.5.3. The Surface and Ground Water Technical Report for the Greens Hollow tract (Cirrus 2013c) assesses the risk of permanent water loss from these streams due to subsidence from mining the longwall panels. Any water loss could affect the riparian community.

Under Alternative 2, approximately 3 miles of the Muddy Creek occur within the Greens Hollow tract boundary and could potentially be undermined and subsided. The overburden cover is less than 900 feet in this area and there is potential for mine induced subsidence from longwall mining beneath Muddy Creek to result in loss of water from Muddy Creek to the underground mine workings. The magnitude of flow loss is not known with certainty, but with the overburden cover in the 700 to 900 foot range along Muddy Creek, it is quite possible that there could be water loss but that the stream may not dry up during low flows (Cirrus 2013c). The fracture occurrence is likely to diminish with the overburden cover greater than 600 feet and the montmorillonite clays in the upper portions of the Blackhawk Formation may heal fractures because of the expanding nature of these clays. Where subsidence-reduced stream flows and enhanced rates of subsurface flow in the fractured bedrock and alluvium occur, there may be a contraction of the riparian zone, depending on the severity, season, and duration of the water loss. Shallow-rooted herbaceous species would be more susceptible to this impact. Changes in surface slopes resulting from differential subsidence could result in an increase in the length of cascades and an increase in pool volumes of the stream. These changes in channel gradient could also affect riparian vegetation, potentially expanding it in areas where pools form and contracting it where the gradient increases.
Figure 4.7. Wetlands in the analysis area.
<table>
<thead>
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<th>Wetland ID Number</th>
<th>Area (Acres)</th>
<th>Geologic Unit Description</th>
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Table 4.8. (cont’d) Breakdown of wetlands under Alternative 2.

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Additional Wetlands occurring in the Analysis Area.

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### Table 4.8. (cont’d) Breakdown of wetlands under Alternative 2.

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</tr>
<tr>
<td>Additional Wetlands Occurring in the Analysis Area 900-foot Extended Subsidence Zone.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>0.42</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>92</td>
<td>0.10</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>93</td>
<td>0.08</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>94</td>
<td>0.06</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>95</td>
<td>0.02</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>96</td>
<td>0.07</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>97</td>
<td>0.18</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>98</td>
<td>0.05</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>99</td>
<td>0.06</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>100</td>
<td>0.02</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>101</td>
<td>0.25</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>103</td>
<td>0.07</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>104</td>
<td>0.32</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>105</td>
<td>0.04</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>106</td>
<td>0.01</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>107</td>
<td>0.03</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>108</td>
<td>0.22</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>109</td>
<td>0.17</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>110</td>
<td>0.20</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>111</td>
<td>0.03</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>113</td>
<td>0.02</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>114</td>
<td>0.38</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>115</td>
<td>0.04</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>116</td>
<td>0.07</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>117</td>
<td>0.30</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>118</td>
<td>0.13</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>119</td>
<td>0.06</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>120</td>
<td>0.56</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>121</td>
<td>0.18</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>122</td>
<td>0.30</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>123</td>
<td>0.22</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>124</td>
<td>0.70</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>125</td>
<td>0.07</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>126</td>
<td>0.06</td>
<td>North Horn Formation</td>
</tr>
</tbody>
</table>
### Table 4.8. (cont’d) Breakdown of wetlands under Alternative 2.

<table>
<thead>
<tr>
<th>Wetland ID Number</th>
<th>Area (Acres)</th>
<th>Geologic Unit Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>127</td>
<td>0.04</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>128</td>
<td>0.07</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>136</td>
<td>0.12</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>130</td>
<td>0.49</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>133</td>
<td>0.49</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>131</td>
<td>0.20</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>134</td>
<td>0.20</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>132</td>
<td>0.04</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td>135</td>
<td>0.04</td>
<td>North Horn Formation</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>7.18</strong></td>
<td></td>
</tr>
</tbody>
</table>

The North Fork Quitchupah Creek could be undermined by longwall panels under Alternative 2. The Surface and Ground Water Technical Report (Cirrus 2013c) assessed the potential impacts of subsidence on this stream. Because of the depth of overburden, the extension and expansion of existing fracture systems and upward propagation of new fractures resulting from mine subsidence would not affect the tributaries of Quitchupah Creek and water would not be lost to the mine. Subsidence would result in gradual changes (1 to 2 percent) in the gradient of the stream profile and may be noticeable as localized ponding. Tensile cracks may occur at the surface near the edges of the longwall panels. These cracks are usually shallow and most would be healed by clays and shales that are present in the soil profile. Possible effects of enhanced surface tensile fracturing in the Castlegate Sandstone and lower portion of the Price River Formation would be to reduce stream flows and enhance the rate of subsurface flow in the fractured bedrock and alluvium along downstream channel segments. Where this impact occurred, there would be reduced water in the stream, which could result in a contraction of the riparian zone. Shallow-rooted herbaceous species would be more susceptible to this impact.

Both Cowboy Creek and Greens Hollow could also be undermined by longwall panels. The Surface and Ground Water Technical Report (Cirrus 2013c) also assessed the potential impacts of subsidence on these streams. Subsidence caused by the mining would be unlikely to result in the loss of surface water to the mine because of the geotechnical properties of the overlying rocks, but could result in localized ponding due to changes in stream gradient and topography. Surface tensile cracks would develop at the longwall panel boundaries. These cracks would be shallow and would result in a temporary loss of stream water where the stream channels cross the cracks. In most cases, clays and shales would heal these cracks and water loss would be minor and of short duration and most likely would not notably affect riparian vegetation. However, cracks in the Castlegate Sandstone would be slow to heal, and some might never heal. The perennial reach of Cowboy Creek and Greens Hollow ends in the general vicinity of where the streams cross the Castlegate Sandstone on the east side of the analysis area. The additional surface tensile cracks in the Castlegate Sandstone may result in reduced stream flows and a shortening of the perennial reach of the streams. Water would be unlikely to be lost to the underground mine workings. More likely the loss of surface flows from the stream would enhance the rate of subsurface flow in the fractured bedrock and alluvium along reaches of the streams downstream of the Castlegate Sandstone outcrop. In terms of riparian vegetation along the stream corridor, this loss of surface water could result in a contraction of the riparian zone. Shallow-rooted herbaceous species would be more susceptible to this impact.
4.5.2.4 Federally Listed Plant Species
There would be no known impacts to federally listed plant species. As shown in Table 3.8, the analysis area is not in the known geographic or habitat range of Winkler cactus, San Rafael cactus, Wright’s fishhook cactus, and Last Chance townsendia, and is outside of the elevational range and habitat constraints for Heliotrope milkvetch.

4.5.2.5 Forest Service R4 Sensitive Species
One sensitive plant species occurs in the general analysis area. Link Canyon Columbine occurs in Link Canyon, Greens Hollow, and Cowboy Canyon. Populations in Greens Hollow and Cowboy Canyon would not be affected by these elements, and Link Canyon is outside of the analysis area. No other impacts to sensitive species or their habitat would be anticipated.

4.5.2.6 BLM and State Sensitive Species
BLM and State sensitive plant species were considered for Sanpete and Sevier counties (Appendix E), were not known to exist in the analysis area, and were not analyzed further.

4.5.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS
Under Alternative 3, sensitive areas and escarpments would be protected from subsidence, as shown on Figure 4.8.

Issue 1: Subsidence and other mining-caused changes to surface and ground water could affect riparian, wetland, and upland vegetation.

Evaluation Criteria: Changes in wetland hydrology due to subsidence mining impacts and corresponding changes in species composition in riparian areas and wetlands; changes in ground or surface water due to mining impacts affecting the composition of upland plant communities.

The general impacts to vegetation would be similar to Alternative 2. Gradual subsidence with little effect to surface vegetation would be expected to occur over most of the tract where subsidence mining occurs. Areas identified that would not allow subsidence mining would result in no impacts to riparian, wetland, or upland vegetation.

4.5.3.1 Upland Vegetation
The protection of sensitive areas and escarpment areas from subsidence would reduce the acres of vegetation potentially affected by subsidence by approximately 698 acres in the Greens Hollow tract and by approximately 860 acres in the larger analysis area, as detailed in Table 4.9. Any impacts to upland vegetation due to subsidence are expected to be minor to non-existent, as noted in Section 4.5.2.

4.5.3.2 Wetlands
Under Alternative 3, sensitive areas and escarpments would be protected from subsidence as shown on Figure 4.9. Three wetlands (9, 16, and 17) fall in the area that would not be mined. Otherwise, the impacts to wetlands would be the same as under Alternative 2.
Figure 4.8. Vegetation cover types under Alternative 3.
Figure 4.9. Wetland types under Alternative 3.
Table 4.9. Analysis of vegetation types potentially affected by subsidence under Alternative 3 in the Greens Hollow tract boundary and the analysis area.

<table>
<thead>
<tr>
<th>Vegetation Community</th>
<th>Reduction in Potentially Subsided Acres in the Lease Tract Relative to Alternative 2</th>
<th>Reduction in the Potentially Subsided Acres in Analysis Area Relative to Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>0.67</td>
<td>0.67</td>
</tr>
<tr>
<td>Aspen Mixed Conifer</td>
<td>17.59</td>
<td>22.84</td>
</tr>
<tr>
<td>Barren Rock Outcrop or Ledge</td>
<td>32.39</td>
<td>33.40</td>
</tr>
<tr>
<td>Basin Big Sagebrush</td>
<td>38.53</td>
<td>39.45</td>
</tr>
<tr>
<td>Big Mountain Sagebrush</td>
<td>56.58</td>
<td>142.87</td>
</tr>
<tr>
<td>Black Sagebrush</td>
<td>24.95</td>
<td>40.06</td>
</tr>
<tr>
<td>Curlleaf Mountain Mahogany</td>
<td>123.84</td>
<td>123.84</td>
</tr>
<tr>
<td>Douglas Fir Forest</td>
<td>229.24</td>
<td>231.49</td>
</tr>
<tr>
<td>High Mountain Brush</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Juniper/Curl-leaf Mahogany</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Limber &amp; or Bristlecone Pine Forest</td>
<td>11.35</td>
<td>11.35</td>
</tr>
<tr>
<td>Mixed Conifer</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Mountain Brush</td>
<td>59.64</td>
<td>83.41</td>
</tr>
<tr>
<td>Oakbrush</td>
<td>10.92</td>
<td>11.08</td>
</tr>
<tr>
<td>Perennial Forb Land (high &amp; mid elevation)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Perennial Forb Land (mid to low elevation)</td>
<td>38.24</td>
<td>38.24</td>
</tr>
<tr>
<td>Perennial Grassland (low elevation)</td>
<td>16.82</td>
<td>29.44</td>
</tr>
<tr>
<td>Perennial Wetland or Meadow</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pinyon Juniper Woodland</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ponderosa Pine Forest</td>
<td>2.09</td>
<td>2.25</td>
</tr>
<tr>
<td>Rocky Mountain Juniper Woodland</td>
<td>33.62</td>
<td>33.62</td>
</tr>
<tr>
<td>Spruce/Fir Forest</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>True Mountain Mahogany</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Willow Dominated Riparian Area</td>
<td>1.67</td>
<td>16.05</td>
</tr>
<tr>
<td>Total</td>
<td><strong>698.31</strong></td>
<td><strong>859.94</strong></td>
</tr>
</tbody>
</table>

4.5.3.3 Riparian

Under Alternative 3, protecting sensitive areas and escarpments from subsidence (within the Area of Subsidence Mining) as shown on Figure 4.9 would protect the narrow riparian corridors along Muddy Creek, Horse Creek, Greens Hollow, Cowboy Creek, and the North Fork of Quitchupah Creek from subsidence in the area where they are most vulnerable to subsidence impact, i.e., where the Castlegate Sandstone outcrops. The lengths of riparian corridors that would be protected for each stream are shown in Table 4.10.

4.5.3.4 Federally Listed Plant Species

There would be no known impacts to federally listed plant species. As shown in Table 3.8, the analysis area is not in the known geographic or habitat range of Winkler cactus, San Rafael cactus, Wright’s fishhook cactus, and Last Chance townsendia and is outside of the elevational range and habitat constraints for Heliotrope milkvetch.
**Table 4.10. Length of stream riparian corridors excluded from potential subsidence impact under Alternative 3.**

<table>
<thead>
<tr>
<th>Stream Name</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Fork Muddy Creek</td>
<td>0.39</td>
</tr>
<tr>
<td>North Fork Muddy Creek</td>
<td>0.28</td>
</tr>
<tr>
<td>Horse Creek</td>
<td>0.43</td>
</tr>
<tr>
<td>Greens Hollow Creek</td>
<td>0.63</td>
</tr>
<tr>
<td>Cowboy Creek</td>
<td>0.72</td>
</tr>
<tr>
<td>North Fork Quitchupah Creek</td>
<td>0.87</td>
</tr>
<tr>
<td>Muddy Creek</td>
<td>3.22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6.54</strong></td>
</tr>
</tbody>
</table>

### 4.5.3.5 Forest Service R4 Sensitive Species

One sensitive plant species occurs in the general analysis area. Link Canyon Columbine occurs in Link Canyon, Greens Hollow, and Cowboy Canyon. Populations in Greens Hollow and Cowboy Canyon would not be affected by these elements, and Link Canyon is outside of the analysis area. No other impacts to sensitive species or their habitat would be anticipated.

### 4.5.2.6 BLM and State Sensitive Species

BLM and State sensitive plant species were considered for Sanpete and Sevier counties (Appendix E), were not known to exist in the analysis area, and were not analyzed further.

### 4.5.4 Cumulative Effects

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have, or are likely to affect the vegetation resources, including wetlands and riparian areas, in the cumulative effects analysis area. The cumulative effects analysis area as defined for the vegetation analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

#### 4.5.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

Reasonably foreseeable surface mine facilities on the Greens Hollow tract under all action alternatives could include the construction of a vent shaft and associated infrastructure and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under a separate issue statement raised during scoping.

- **Reasonably foreseeable access road use and maintenance and construction of a vent shaft facility could impact native vegetation and introduce and/or spread noxious weeds.**

Accord Lakes Construction Access. Existing forest roads from Accord Lakes to a reasonably foreseeable vent shaft facility would be maintained as necessary to provide access for the construction of a vent shaft. Road maintenance that could occur would not be expected to increase susceptibility to weed establishment.
Vent Shaft Facility. One reasonably foreseeable vent shaft facility could be required within the Greens Hollow tract under an action alternative. It is reasonably foreseeable that a vent shaft would be located on the tract and could impact up to 10 acres of vegetation. Plant communities at the vent shaft facility would be converted to a disturbed condition for the life span of the project. Some portion of the site where spoil from the shaft is stored may be stabilized with a reclamation seed mix. After the coal mining is finished, the site would be reclaimed and revegetated. Disturbed areas associated with the vent shaft would have increased susceptibility to weed establishment, particularly during construction before the area is stabilized.

The area disturbed by the construction of the vent shaft would be susceptible to the establishment of noxious weeds. Construction vehicles, equipment, and workers represent potential vectors that could bring weed seeds on site from other areas.

**4.5.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract**

Reasonably foreseeable surface mine facilities outside the Greens Hollow tract under all action alternatives could include the construction of a vent shaft and associated infrastructure, a power line, and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under two separate issue statements raised during scoping.

- *Reasonably foreseeable access road use and maintenance and construction of a vent shaft facility could impact native vegetation and introduce and/or spread noxious weeds.*

Accord Lakes Construction Access. Existing forest roads from Accord Lakes to the reasonably foreseeable vent shaft facility would be maintained as necessary to provide access for the construction of the vent shaft. Road maintenance that could occur would not be expected to increase susceptibility to weed establishment.

Vent Shaft Facility. One reasonably foreseeable vent shaft facility would be required outside the Greens Hollow tract under an action alternative. It would impact up to approximately 10 acres of vegetation. Plant communities at the vent shaft facility would be converted to a disturbed condition for the life span of the project. Some portion of the site where spoil from the shaft is stored may be stabilized with a reclamation seed mix. After the coal mining is finished, the site would be reclaimed and revegetated. Disturbed areas associated with the vent shaft facility would have increased susceptibility to weed establishment, particularly during construction before the area is stabilized.

The area disturbed by the construction of the vent shaft facility would be susceptible to the establishment of noxious weeds. Construction vehicles, equipment, and workers represent potential vectors that could bring weed seeds on site from other areas.

- *Reasonably foreseeable construction of the power line could result in removal of ponderosa pine and associated habitat.*

Power Line. The ponderosa pine vegetation type is extremely limited in the North Zone of the MLNF. Within the general Greens Hollow area, there are approximately 1,754 acres of ponderosa pine, representing 5 percent of the area, as noted in Table 3.7. As such, and because it is an important habitat type for wildlife, impacts to this community were identified as an issue.

Power line impacts that would alter the vegetation community structure and type would be limited to the forested types. Trees greater than 10-feet tall within a 100-foot wide corridor along the power line would
be cleared. The conceptual power line could be routed to minimize the need for tree removal, but some could be removed. Limited ground disturbance would likely occur with the construction of a power line.

Construction of the power line could be done from existing roads (or using a helicopter in rugged canyon terrain). Impacts to forbs, grass, and shrubs would result from power line construction equipment moving between the existing roads and the power line corridor to set poles and string the wires. These impacts would result in trampling of the vegetation. Some species, such as sagebrush may be broken or killed, but other species, including snowberry, grasses, and forbs, would generally not be killed by the off-road travel during construction. During the life of the power line, maintenance and repair requirements may result in additional localized episodes of travel between the power line and the roads by service vehicles.

The effects of this project would be cumulative with other impacts occurring in the area. Historic mining impacts include those associated with the Ricci Mine in Muddy Creek Canyon and the Link Canyon Mine in Link Canyon. More recent mining includes the Pines Tract coal mine (see also Section 4.1.1) to the east of the Greens Hollow tract and the SUFCO mines to the south. Mining near the Greens Hollow tract includes the West Lease Modification parcels adjoining to the west of the existing mine leases. Impacts of these mines include disturbance for mine portals and infrastructure. Under similar geologic conditions at the surface, subsidence associated with ongoing and future mining actions is likely to result in similar impacts due to subsidence as would accompany this project under either alternative 2 or 3. Other than that described above, the Greens Hollow project would not contribute cumulatively to surface disturbance due to mine portals and associated infrastructure since access would be from underground. However, surface disturbance associated with the vent shaft facility would be cumulative with other surface disturbance with existing mine portals and break-outs.

Also related to coal mining is exploratory drilling. This drilling has been conducted in the cumulative effects analysis area to describe the geology and coal reserves. Additional exploratory drilling is anticipated to occur, including during the development of the Greens Hollow tract. Generally the impacts resulting from exploratory drilling are temporary and include the construction of temporary drill pads and access roads to the drill pads from the existing road network. Much of the contemporary and future exploration drilling is being done with heliportable drill rigs, which minimizes the scale of the impact. Temporary disturbance sites and roads are reclaimed once the drilling is completed. Depending on the vegetation community types affected, the temporary impacts would diminish over time as the natural community regrows. Cumulative impacts from drilling are minor in extent and effect.

Livestock grazing, both historic and ongoing, is another effect on vegetation in the cumulative effects analysis area. Grazing has contributed to changes in the plant community and the spread of non-native plants. Stock water developments and range improvement projects have also been implemented to increase grazing and have altered plant communities. Stock water developments in particular have affected wetlands as springs are developed. Wildlife habitat improvements, including water developments, controlled burns, and sagebrush treatments are similar in terms of effects on vegetation. Effects from livestock grazing and range and habitat improvement projects are more extensive and affect larger blocks of land across the landscape. The cumulative effect from the Greens Hollow project with vegetation impacts due to livestock grazing and wildlife improvements would be minimal, being primarily limited to disturbance at the vent shaft facilities.

Also affecting vegetation in the conifer cover types are disease and insect outbreaks, most notably the spruce beetle. This has led to die-off of large areas of conifer forest and may set the stage for either fire or salvage logging with accompanying impacts. In addition, there have been several past timber sales, including the East Box Creek and the Link Canyon timber sales. The Greens Hollow project would most likely have very minor impacts on ponderosa pine stands so the cumulative impact to this vegetation type would be minimal.

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Recreation use has resulted in primarily localized impacts, usually associated with campsites and ATV/off-road vehicle use. Impacts from the Rough Brothers of the Hills cabin are also very localized. The incremental impact of developing and mining the Greens Hollow tract would be cumulatively minor with recreation impacts.

### 4.6 HERITAGE RESOURCES

Potential impacts to the heritage resources are addressed below for each of the three alternatives analyzed in this EIS. The following issue and evaluation criteria were developed through the scoping process and guide this analysis of impacts.

**Issue 1: Mining and subsequent subsidence could cause surface disruption and adversely impact both known and unidentified heritage resources.**

**Evaluation Criteria:** Expected heritage sites and effects to them. Number of significant sites impacted. Number of known heritage sites eligible for NRHP.

#### 4.6.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

If Alternative 1- No Action were pursued, the lease would not be offered and no mining would take place within the Greens Hollow tract. Subsequently, no heritage resources would be affected by related coal mining activities. Alternative 1- No Action serves as the baseline for estimating effects of the action alternatives on heritage resources in the analysis area.

#### 4.6.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

There are 18 previously identified sites within the Proposed Action boundary that might be affected by subsidence resulting from underground mining. Seven of these sites (42SV1566, 42SV2584, 42SV2586, 42SV2589, 42SV2949, 42SV3224, and 42SV3226) are recommended as eligible for inclusion in the NRHP. Five of the eligible sites (42SV1566, 42SV2586, 42SV2949, 42SV3224, and 42SV3226) are primarily prehistoric lithic scatters. Sites 42SV2584 and 42SV2589 each contain two rock shelters with spatially associated lithic scatters.

All seven eligible sites are within the area of subsidence mining as shown in Figure 1.3 and could be subject to ground subsidence. It is predicted the most pronounced effects to the ground surface would be in the form of bedrock collapse or movement near the edge and along the walls of canyons and escarpments. This bedrock failure could cause the destruction of rock shelters by collapsing the roofs of the shelters or by shifting the bottoms of the shelters on which undisturbed cultural deposits rest. Either one of these would damage or destroy the attributes of those sites that make them eligible for inclusion on the National Register of Historic Places. This would additionally destroy the cultural value that these shelters hold for Tribal groups.

Surface cracks could occur anywhere within the Proposed Action boundary, but are more likely to occur near the edges of canyons and escarpments. These could create cracks that range from less than an inch to over a foot in width (based on subsidence under the existing SUFCO mine). This kind of cracking is less likely to occur in areas with thick overburden (away from canyon edges), and these areas constitute the majority of the area of subsidence mining (Figure 1.3; see also Section 4.2.2.3). Surface cracking could result in the disruption of a given heritage site’s intact cultural deposits and features that are within and near the cracks. This could destroy the stratigraphic relationships of artifacts and damage or destroy features such as fire hearths. Cracking could also promote erosion of both surface and subsurface deposits by channeling water.
The exact location and degree of effect from subsidence is very difficult to predict. All of the seven previously recorded National Register Eligible sites are located near escarpments. In particular, the four rock shelters associated with sites 42SV2584 and 42SV2589 could all be partially or completely destroyed under the Proposed Action. Surface and subsurface deposits in lithic scatters outside of rock shelters at all seven sites could be adversely affected by surface cracking. This includes at least one hearth or roasting pit at site 42SV3224. As a result, it is likely that subsidence mining could adversely affect all seven sites.

Enough of the general analysis area has been inventoried to make predictions about the potential effect of subsidence on unidentified heritage resources that may exist within the maximum area of subsidence mining under this alternative. All of the canyon edges have been inventoried, so the potential effects to sites in those locations are relatively well understood and are described above. These are also the areas that are likely to contain the greatest number of sites and the areas that might receive the most ground movement or cracking from subsidence. The possibility remains that unidentified sites exist in the area of subsidence mining that are in steeper settings away from canyon edges. However, these are also the areas that would likely be the least affected by surface cracking. As a result, it is likely that unidentified cultural resources within the analysis area would not be adversely affected by subsidence.

The remaining 11 sites within the Proposed Action boundary that might be affected by subsidence mining are recommended not eligible for inclusion in the NRHP. These are sites 42SP179, 42SP492, 42SP497, 42SP498, 42SV2585, 42SV2774, 42SV3217, 42SV3219, 42SV3220, 42SV3222, and 42SV3223. As a result, these sites are not considered to be affected by the project under the NHPA. However, Tribes expressed concerns over the effect of subsidence on these sites, as well. As a result, a summary of the potential effect of subsidence on these sites is offered here. None of these sites contain rock shelters but nine of the eleven sites are near escarpments or canyon edges. These nine sites in particular could experience the kind of effects from bedrock collapse or surface cracking noted above.

**4.6.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS**

There are 5 previously identified sites within the Alternative 3 boundary that might be affected by subsidence from underground mining since this alternative precludes mining near canyon rims (Figure 1.4). Of these sites, only one (42SV3224) is recommended as eligible for inclusion in the NRHP. It is located in an area with relatively little overburden and could therefore be more likely to be affected by subsidence cracking. The site does not contain rock shelters, but is a lithic and ceramic scatter with at least one feature that could be adversely affected by cracking of the ground surface as described under Section 4.6.2 above. This alternative decreases from seven to one the number of potentially adversely affected sites eligible for inclusion in the NRHP relative to Alternative 2.

Once again, the remaining 4 sites (42SP179, 42SP492, 42SV2774, and 42SV3217) are recommended not eligible for inclusion in the NRHP, and would therefore not be affected by the Alternative 3 under NHPA. However, tribal concerns about the potential effect of subsidence on these sites remain. All of the sites are lithic scatters. Two of them (42SV2774 and 42SV3217) are located away from escarpments and in areas with enough overburden to suggest that subsidence cracking would probably have little or no effect on them. The other two sites (42SP197 and 42SP492) are near escarpments and would more likely be affected by surface cracking. Overall, this alternative could potentially affect seven fewer of these sites than Alternative 2.

**4.6.4 SPECIAL STIPULATIONS AND DESIGN CRITERIA**

If Alternative 1- No Action were pursued, no protection of heritage sites would be required.
Under the Proposed Action, subsidence could adversely affect the seven sites (42SV1560, 42SV2584, 42SV2586, 42SV2589, 42SV2949, 42SV3224, and 42SV3226) that are eligible for inclusion in the NRHP. All of these sites include lithic scatters and two of them (42SV2584 and 42SV2589) contain two rock shelters each. Special Stipulation #1 would protect these resources.

Under Alternative 3, subsidence could adversely affect one site, 42SV3224, which is eligible for inclusion in the NRHP.

4.6.5 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have, or are likely to affect heritage resources in the cumulative effects analysis area. The cumulative effects analysis area, as defined for the heritage resources analysis, includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present, and future activities impacting the cumulative effects analysis area that were considered in this analysis.

4.6.5.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

- Reasonably foreseeable ground-disturbance associated with construction of surface facilities could adversely affect cultural resources and sacred sites in the areas of potential affect for those facilities.

It is reasonably foreseeable that each action alternative could require the construction of a vent shaft on the Greens Hollow tract. Clearance surveys would be required once the vent shaft location was determined.

4.6.5.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

- Reasonably foreseeable ground-disturbance associated with construction of surface facilities could adversely affect cultural resources and sacred sites in the areas of potential affect for those facilities.

It is reasonably foreseeable that each action alternative could require the construction of a vent shaft facility (including a fan) and a power line for the ventilation fan system and the mine itself outside the Greens Hollow tract. Clearance surveys would be required once the vent shaft and power line locations were determined.

Effects associated with the construction and use of the vent shaft include: drilling of the vent shaft hole, stockpiling rock out of the shafts, and the construction of transformer and generator facilities, all within the area of potential effect. Construction and use of the vent shaft could damage or destroy sites within that construction footprint.

In order to construct a vent shaft facility, the road would need to be maintained. Road maintenance would not be expected to affect cultural resources along existing routes.

The effects of this project would be cumulative with other impacts occurring in the area. The cumulative effect of subsurface coal mining on heritage resources in and near the Greens Hollow tract is considered within the context of impacts from past mining activities, timber sales, range improvements, wildlife habitat improvements, recreation, and surface activities such as increased traffic from monitoring and exploration. Effects to sites from past mining activities consist of two general categories. The first is the
potential effects of the development of surface facilities such as roads. Few of these have occurred in the general analysis area, but when they have occurred the specific potential effects have been analyzed and avoided because they are predictable and can be specifically identified. This predictability is not present in the case of ground subsidence associated with underground mining. Past efforts to monitor and predict the potential effect of subsidence on particular rock shelters have proven difficult and several rock shelters have been destroyed due to subsidence. As was the case with four eligible rock shelter sites within the nearby Pines Tract, subsidence from this subsurface mine caused three of these shelters’ roofs to collapse, resulting in the destruction of these shelters. The fourth rock shelter was completely destroyed due to the collapse of a canyon wall.

Effects to sites in the area from timber sales, wildlife habitat improvements, etc. have been analyzed prior to project implementation since the 1980’s. As a result, adverse effects to sites from these activities have generally been avoided and will continue to be avoided or minimized through compliance with the NHPA and Stipulation #1.

One activity that has and will likely continue to adversely affect sites in this area is illegal artifact collecting and looting in rock shelters. Efforts to reduce these activities through public education have had some success, but law enforcement is insufficient to end this activity as a source of site damage or destruction. Any past, present, and future road improvements or activities that bring increased numbers of visitors into this area are likely to increase the potential for this illegal activity and, in turn, damage to sites.

The cumulative effect of increased coal mining activities in the Greens Hollow area is a net increase in the potential for significant (NRHP eligible) sites to be damaged or destroyed both directly and indirectly. However, these impacts can be eliminated through avoidance or minimized through authorizing scientific research at these sites. The potential for subsidence to affect sites in the form of surface cracking can also be repaired through excavation. However, these excavations may not mitigate the cultural and spiritual value of these sites to modern American Indian Tribes.

4.7 PALEONTOLOGICAL RESOURCES

Issue 1: Mining and subsequent subsidence could impact unidentified paleontological resources.

Evaluation Criteria: Expected prehistoric sites and effects to them. Number of significant sites impacted. Potential impact on paleontological resources.

Impacts to paleontological resources are generally the result of activities that disturb bedrock whether as part of a planned project or some random human action. Impacts include damage or destruction of the fossil itself, removal of the fossil from its source with a corresponding loss of contextual data, or the total obliteration of the fossil material or its mold or cast.

Natural erosive forces are not considered destructive unless associated with extreme events like floods and landslides. Slow erosive action is important in removing rock material surrounding fossils so they can be found and studied.

Paleontological resources are not considered resources when associated with economic ore bodies. In the sub-surface even vertebrates, if encountered in a coal seam or uranium vein, are not valued for their scientific information. Therefore, encountering fossil foot prints, bones, petrified wood, and other preserved specimens in the coal seam is not considered an impact.
The ability to interpret and understand paleontological resources is based not only on recovering the specimens but also on the relationship between those specimens and their depositional environment. The nonscientific disturbance or removal of paleontological resources from their original location results in the loss of information; it limits a researcher’s ability to collect all available data. For example, if an untrained collector removes material from the site without collecting data associated with its orientation or if a bulldozer scrapes across a vertebrate assemblage and changes the bone’s relative positions, then important information about the deposit will be compromised and lost. Subsidence of sedimentary units however, does not prevent the scientific extraction of data though the orientation may be altered.

4.7.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under this alternative, the tract would not be leased and no mining would take place on the Greens Hollow tract at this time; thus no impacts would occur to paleontological resources associated with mining on the tract. Paleontological resources would continue to be affected by the ongoing forces of nature. Discovery and recovery of fossils resources by scientists could continue through existing permitting processes. Activities off-lease would continue and be conducted as laws and permits allow.

4.7.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

The Proposed Action allows the BLM to lease and the FS to consent to leasing within the Greens Hollow tract. The leasing would be consistent with the standard lease terms, conditions, and special coal lease stipulations (with the exception of Stipulation #9). Details regarding the Proposed Action are provided in Chapter 2, Section 2.4. Special Coal Lease Stipulation #1 specifically addresses paleontological resources (Appendix B).

The Greens Hollow tract would be made available for competitive leasing and underground coal mining within the entire tract. The project elements within the analysis area are shown in Figure 1.3. Figure 1.3 also identifies the area that would be designated for subsidence mining (Area of Subsidence Mining) and the subsidence analysis area boundary (Mining Analysis Area Boundary). Subsidence mining could be allowed anywhere within the Area of Subsidence Mining, including areas underlying escarpments.

Under Alternative 2, paleontological resources in and above the Blackhawk Formation could be directly affected via escarpment failure. The northern boundary of the Greens Hollow tract consists of approximately 6,000 linear feet of steep slopes and cliffs in Muddy Creek Canyon. The eastern boundary of the tract intersects Greens Hollow Canyon and adds approximately 500 feet to areas that have mass movement potential.

Subsidence along these escarpments could initiate rock falls, small rock slides, soil creep, and other mass-wasting processes. The exact location and lateral extent of any event is not possible to predict, but would occur directly above the subsiding area at the time of mining and continue for several months as the rock mass subsides. The magnitude of these mass movements would be small and localized.

Other mines on the Wasatch Plateau are geologically similar; they mine coal in the same formation; they have the same cliff-forming units in canyon walls; they have similar paleontological resources; they mine using full subsidence technologies, and they have rock fall, rock slides, slump, creep, and other forms of mass movement; and yet no paleontological resources have been identified as the result of these processes (Bigelow 2012; Fleck 2011).

Assuming subsidence affects the entire escarpment, there could be paleontological impacts only if vertebrate fossils are present; and as pointed out in chapter 3, though the Blackhawk is an important
vertebrate fossil bearing formation, most of the fossils are in the coal bearing seams and noteworthy finds are rare.

Stipulation #1 (Appendix B) and HR 146 (Public Land Management Act of 2009) protects paleontological resources. Providing that paleontological surveys are conducted if escarpments fail, and if paleontological resources are discovered and the FS is notified of the discovery, there would be no negative impacts to paleontological resources due to subsidence on the Greens Hollow tract. Discovery and recovery of fossil resources by scientists could continue through existing permitting processes.

4.7.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Alternative 3 evaluates the use of no subsidence mining or no leasing in specific locations to further protect surface resources (Figure 1.4). Areas of substantial surface impact were based on perennial streams where water could be lost to surface cracking of Castlegate Sandstone or where escarpments could fail.

Longwall mining would occur within the tract in an unspecified manner while avoiding the subsidence of areas of substantial surface impact. Impacts to paleontological resources would be less than those considered under Alternative 2. Eliminating subsidence mining under escarpments would reduce or eliminate any mass wasting along escarpments, and therefore proportionally eliminate any disruption to paleontological resources that may exist.

4.7.4 CUMULATIVE EFFECTS

Mines in the surrounding area have not identified any paleontological resources associated with subsidence or the mass wasting of cliff walls. The lack of effects from the surrounding area added to the potential Greens Hollow tract impacts would not be significant.

4.7.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

Reasonably foreseeable surface mine facilities on the Greens Hollow tract under all action alternatives could include the construction of a vent shaft and associated infrastructure and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under a separate issue statement raised during scoping.

- Reasonably foreseeable ground disturbing activities associated with a vent shaft and possible access roads could impact paleontological resources.

Ninety-five percent of the surficial bedrock associated with the Greens Hollow tract are the North Horn and Price River formations; both have produced important vertebrate discoveries. Paleontological resources could be indirectly impacted by mining if construction of the additional infrastructure takes place and excavation of the North Horn or Price River occurs.

The surface facility associated with a vent shaft would require the excavation of potentially fossiliferous bedrock material and if an access road is required to get to the shaft location, then blading and excavating of potentially fossiliferous bedrock material would occur.

Stipulation #1 (Appendix B) and HR 146 protects paleontological resources. If Stipulation #1 is adhered to then there would be no negative affects to paleontological resources. Discovery and recovery of fossil resources by scientists could continue through existing permitting processes.
No paleontological discoveries have been identified or excavated by local mines due to surface disturbing activities. No other surface disturbing projects are proposed in the area. Therefore, if the project adheres to the specified stipulations, there would be no significant impacts to paleontological resources.

4.7.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

Reasonably foreseeable surface mine facilities outside the Greens Hollow tract under all action alternatives could include the construction of a vent shaft facility and associated infrastructure, a power line, and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under two separate issue statements raised during scoping.

- **Reasonably foreseeable ground disturbing activities associated with a vent shaft facility, fan system, and possible access roads for fan(s) and power supplies could impact paleontological resources.**

Ninety-five percent of the surficial bedrock associated with the Greens Hollow tract are the North Horn and Price River formations; both have produced important vertebrate discoveries. Paleontological resources could be indirectly impacted by mining if construction of the additional infrastructure takes place and excavation of the North Horn or Price River occurs.

The surface facility associated with the vent shaft and fan(s) would require the excavation of potentially fossiliferous bedrock material; the placing of a power line would require the drilling of potentially fossiliferous bedrock material; and if access roads were required to get to each shaft location or the power line location, then blading and excavating of potentially fossiliferous bedrock material would occur.

Stipulation #1 (Appendix B) and HR 146 protects paleontological resources. If Stipulation #1 is adhered to, and if a qualified paleontologist is present during any ground disturbing surface activity, then there would be no negative affects to paleontological resources. Discovery and recovery of fossil resources by scientists could continue through existing permitting processes.

No paleontological discoveries have been identified or excavated by local mines due to surface disturbing activities. No other surface disturbing projects are proposed in the area. Therefore, if the project adheres to the specified stipulations, there will be no significant impacts to paleontological resources.

4.8 SOCIOECONOMICS

Potential impacts to the socioeconomic study area are addressed below for each of the three alternatives analyzed in this EIS. The following issue and evaluation criteria were developed through the scoping process and guide this analysis of impacts.

**Issue 1:** Leasing of the tract could provide an important energy resource for the public and result in social and economic benefits.

*Evaluation Criteria:* Recoverable Coal (tons), SUFCO Mine Life (years), Employment (person/years), Royalties/Bonus Bids.

The socioeconomic environment could include direct, indirect, or induced effects. These effects are defined as follows:
Direct effects: Direct effects are the on-site or immediate economic impacts created by expenditures. In the mining of coal, direct effects refer to the jobs associated with mining employees and contractors, as well as jobs at equipment and machinery factories.

Indirect effects: Indirect effects are the increases in economic activity that occur when a directly affected business involved in the coal mine (e.g., a contractor or manufacturer) receives payment for goods and services and buys goods and services that support their business. This could include a banker who finances the contractor or an accountant who maintains a manufacturer’s books. Other indirect effects may include steel manufacturers that supply equipment, legal firms that write contracts for the project developer, or hardware stores that provide building supplies for construction crews.

Induced effects: Induced effects are the change in wealth and income that are induced by the spending of those businesses and persons directly and indirectly employed by the coal mine. Induced effects would include spending by those directly or indirectly employed by the mine on food, clothing, retail services, public transportation, gasoline, vehicles, property and income taxes, medical services, etc.

4.8.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under the No Action alternative, the Greens Hollow tract would not be offered for leasing and there would be no subsurface mining activities within the tract at this time. The coal resource within the tract would remain in place and continue to have future value as long as the tract was accessible. Adjoining coal tracts would continue to be mined as currently permitted and as future permits and authorizations are obtained.

The future of mining within the local mine would be limited. Current coal mining leases and approvals for the local mine have an expected mine life of some 7 years, allowing the mine to keep operating until the year 2015 (Davis 2008). The estimated additional 8.8 years of coal production under the Proposed Action (assuming the current mining scenario and production rates) would not occur, thereby having the potential of closing the mine 8.8 years sooner (i.e., in 2015). Under the No Action alternative, the mine would exhaust all sources of coal available through current approvals and leases, and then be forced to cease mine operations 8.8 years sooner than they would if they had access to the coal in the Greens Hollow tract.

Impacts to the population within the study area would occur due to the loss of employment 8.8 years sooner than under the Proposed Action. Closure of the mining operation would result in the potential direct loss of 383 jobs employed within the mine, an additional 279 trucking jobs over 8.8 years, as well as approximately 1,034 indirect mine support jobs. The direct loss of jobs would force employees to seek employment opportunities elsewhere which would result in the lost opportunity for about 1,199 mine employee household persons and 873 trucking employee household persons. Therefore, total direct displacement would be just over 2,000 persons. The total indirect number of persons associated with mine support jobs that would be displaced would be approximately 3,237. This would potentially impact approximately 5.4 percent of the projected persons living in the study area in 2012. In the mining community, these job-loss impacts would deprive families of income and be potentially difficult to overcome in the short-term. In the long-term, jobs would be sought after in the local community and, if unsuccessful, in other communities. It is also recognized that indirect impacts of employment and its effect on the local economy would be increased due to the relatively high wages and percentage of total employment in the local economy and public when compared to a metropolitan area. This percentage in Salt Lake County would represent over 25,900 non-farm jobs in 2011 (U.S. Department of Commerce 2013).
Not leasing would result in the early loss of employment providing some 383 direct mining jobs. Assuming most mine employees and supporting employment would be within Sanpete and Sevier counties, these direct mine jobs represent some 3.6 percent of the non-farm employment levels in the counties. A like percentage in Salt Lake County would represent over 17,800 non-farm jobs (U.S. Department of Commerce 2013). Some 1,307 jobs in total would be provided in the United States through direct and induced economic activity (Ernst & Young 2013).

In 2011, jobs related to coal mining in the State of Utah have been shown to support more jobs in the service industry (2,107) than in the mining industry (1,778), which includes coal mining (1,748). Also, wages supported in the mining sector are almost three times as large as those in the service sector. This is because average mining wages in general, and average coal mining wages ($77,520/year) in particular, are almost double the average wages in the state ($40,898/year), whereas average service sector wages are lower than overall average wages. (Hogue 2012)

The No Action alternative would also ultimately reduce the potential amount of coal mined by more than 56.6 million tons, or a little over 6.43 million tons per year for 8.8 years. This reduction would result in a negative economic impact to the local economy as well as to the State of Utah and the Federal government. The 20-year (1993 to 2012) average market value of coal in real terms is $27.23 per short ton (USDL 2012). Therefore, the total market value of coal that would not be realized in response to market needs under the No Action alternative would be approximately $1.54 billion. The five-year average (2008-2012) in real dollars was $32.96 per short ton and the value in real dollars in 2012 was $35.78 per short ton (USDL 2012). At the 2006 and 2007 market values (Table 3.15), the No Action would forfeit approximately $22,000,000 annually in royalties and tax revenues due to no production of coal. Therefore, over the 8.8 year period, the No Action alternative would forfeit a total of approximately $194,000,000 in royalties and tax revenues from no coal production.

In terms of energy resources, under the No Action alternative the equivalent electrical needs of approximately 1.34 million U.S. households or 3.48 million U.S. citizens would not be realized annually. This assumes that all of the coal is converted into electrical energy. In reality, some of the coal produced would provide energy for other uses.

With the closing and abandonment of the existing mine, future access to the coal would likely require new portals in Muddy Creek canyon or some other area, potentially substantially increasing the environmental impacts and costs in order to extract the coal resource at a later date.

4.8.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Under the Proposed Action, the Greens Hollow tract would be delineated, leased, and mined with BLM standard lease terms and conditions and the special coal lease stipulations (with the exception of Stipulation #9) needed to protect non-coal resources as directed by the Memorandum of Understanding (MOU) between the BLM and the FS and the Forest Plan. Longwall or full-extraction mining would be allowed throughout the area which could result in subsidence of the entire area. This alternative is based on a conceptual mine plan that would attempt to maximize coal production within the Greens Hollow tract and adjoining leases.

Compared to the No Action alternative, issuance of the lease could result in 8.8 years of mining beyond the estimated remaining life of the local mine. Continuing opportunity for 383 mining jobs, 279 truck driving jobs, and the 1,034 indirect mine support jobs. The approximately 56.6 million tons of coal could be recovered and provide revenue generated from property, income, sales taxes, and mine royalties through the extended period. The State of Utah would receive a 50 percent share of the royalties and the counties would receive a proportionate share.

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Leasing would continue employment providing some 383 direct mining jobs. Assuming most mine employees and supporting employment would be within Sanpete and Sevier counties, these direct mine jobs represent some 3.6 percent of the non-farm employment levels in the counties. A like percentage in Salt Lake County would represent over 17,800 non-farm jobs (U.S. Department of Commerce 2013). Some 1,307 jobs in total would be provided in the United States through direct and induced economic activity (Ernst & Young 2013).

If the local mine obtains the Greens Hollow tract, the annual employment in the SUFCO Mine is expected to remain unchanged. Therefore, there would be no additional effects associated with an influx of new employees and their families. However, if another entity obtains the lease tract and does not use the existing portal facilities, a new socioeconomic analysis would be required for the new mine plan. A mining plan that would not utilize the existing portal facilities would have different construction and mining needs, different employee needs, and a different schedule of construction and operations than the current mine operator. Details from that mine plan would be required to fully address the potential impact to population, housing, employment, income, and fiscal resources within the study area. If a bidder other than SUFCO were to acquire the lease, the disclosure of those impacts would occur under a separate NEPA process with the preparation of a supplemental or new EIS.

Alternative 2 would ultimately allow more than 56.6 million tons of coal to be mined at, or a little over, 6.43 million tons per year for 8.8 years. These amounts are projected based on the proposal submitted by Ark Land Company and could be different if another entity were the successful bidder. This would result in a continued positive economic impact to the local economy as well as to the State of Utah and the Federal government. The 20-year (1993 to 2012) average market value of coal in real terms is $27.23 per short ton (USDL 2012). Therefore, at that price the total market value of coal that would be realized under Alternative 2 would be approximately $1.54 billion. The value in real dollars in 2012 was $35.78 per short ton (USDL 2012). At 2006 and 2007 market values, the Alternative 2 would contribute approximately $22,000,000 annually in royalties and tax revenues due to coal production. Therefore, over the 8.8 year period, Alternative 2 would generate a total of approximately $194,000,000 in royalties and tax revenues from coal production.

In terms of energy resources, under Alternative 2 the annual equivalent electrical needs of approximately 1.34 million (11.81 million total) U.S. households or 3.48 million (30.59 million total) U.S. citizens would be realized. This assumes that all of the coal is converted into electrical energy. In reality, some of the coal produced would provide energy for other uses.

**4.8.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS**

Under Alternative 3, the Greens Hollow tract would be delineated, leased, and mined with BLM standard lease terms and conditions and the special coal lease stipulations needed to protect non-coal resources as directed by the MOU between the BLM and the FS and the Forest Plan.

Under Alternative 3, approximately 900,000 tons of recoverable coal would be left in place to protect perennial streams and escarpments. Issuance of the lease under Alternative 3 would extend the mining operations for about 8.7 years, or about 2 months less than Alternative 2. In addition, moving the longwall panel around the no-subsidence area would increase costs to the mine by $6 million for each move. Leasing of the Greens Hollow tract would extend mine life to the projected year of 2024. The 383 jobs at the SUFCO mine would continue as would the 279 truck driving jobs and the 1,034 indirect mine support jobs. The approximately 55.7 million tons of coal could be recovered and provide revenue generated from property, income, sales taxes, and mine royalties through 2024. The State of Utah would receive a 50 percent share of the royalties and the counties would receive a proportionate share.
Leasing would continue employment providing some 383 direct mining jobs. Assuming most mine employees and supporting employment would be within Sanpete and Sevier counties, these direct mine jobs represent some 3.6 percent of the non-farm employment levels in the counties. A like percentage in Salt Lake County would represent over 17,800 non-farm jobs (U.S. Department of Commerce 2013). Some 1,307 jobs in total would be provided in the United States through direct and induced economic activity (Ernst & Young 2013).

If the local mine obtains the Greens Hollow tract, the annual employment in the SUFCO Mine is expected to be unchanged. Therefore, there would be no additional effects associated with an influx of new employees and their families. The additional coal reserves in the Greens Hollow tract would extend the life of mining operations and provide continued revenue generated from property, income, and sales taxes, and mine royalties for the duration of the mining operation.

Under alternative 3, more than 55.7 million tons would ultimately be mined, or a little over 6.43 million tons per year for 8.7 years. These amounts are projected based on the conceptual mining plan submitted by Ark Land Company and could be different if another entity were the successful bidder. This would result in a continued positive economic impact to the local economy as well as to the State of Utah and the Federal government. The 20-year (1993 to 2012) average market value of coal in real terms is $27.23 per short ton (USDL 2012). While the present spot price for coal in Utah is much greater than $27.23, this price is felt to be the best estimate to use in this analysis due to the long-term projection that is necessary for future coal values. Therefore, the total market value of coal that would be realized under Alternative 3 would be approximately $1.52 billion (a reduction of about $24.5 million when compared to Alternative 2). At 2006 and 2007 market values, Alternative 3 would contribute approximately $22,000,000 annually in royalties and tax revenues due to coal production. Therefore, over the 8.7 year period, Alternative 3 would generate a total of approximately $191,000,000 in royalties and tax revenues from coal production.

In terms of energy resources, under Alternative 3 the annual equivalent electrical needs of approximately 1.34 million (11.62 million total) U.S. households or 3.48 million (30.10 million total) U.S. citizens would be realized for the life of the project, 2 months less than would be provided under Alternative 2. This assumes that all of the coal is converted into electrical energy. In reality, some of the coal produced would provide energy for other uses.

### 4.8.4 Cumulative Effects

This section considers the cumulative effects of the Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have affected social and economic resources in the cumulative effects analysis area. The cumulative effects analysis area as defined for the socioeconomic analysis includes portions of Sanpete, Sevier, and Emery counties. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

The effects of this project would be cumulative with other impacts occurring in the area. Coal mining operations currently occur, or have occurred, in the existing SUFCO mines, the Quitchupah Lease Tract, the Pines Coal Lease Tract, and the SITLA Coal Lease Tract. These mines occur south and west of Muddy Creek and have been actively mined for many years. With the possible exception of the North Water Springs area on the Pines Tract, mining in these areas have resulted in similar impacts due to subsidence and mine development as would accompany this project under either Alternative 2 or 3. However, the loss of flow at springs in the North Water area on the Pines Tract may have a negative long-term economic effect. If SUFCO is not able to restore flow at the springs and other long-term intervention measures are not employed or are not successful, approximately 3,000 acres of primary rangeland could become secondary rangeland. This could reduce the number of AUMs available for...
grazing on the allotment and the amount of forage available for wildlife which could have an economic effect on the affected permittees, hunters, and recreationists. This reduction of forage could result in a negative impact to the community. However, due to the hydro-geologic nature of the Greens Hollow tract, similar impacts to livestock permittees, hunters, and recreationists would not likely occur.

The closed Ricci mine in Muddy Canyon just south of the Sanpete-Sevier County line near the mouth of Last Water Canyon has two mineable seams, the Muddy No. 1 and No. 2. The lower is at least 12 feet thick and the upper 4 feet thick with 12 to 18 feet between them. The thicker seam has a parting up to 6 inches thick about one-third from the top of the bed. At least 35,000 tons have been mined. The mine was active from 1941 to 1953.

All reasonably foreseeable future exploration activity would be subject to site-specific analysis and approvals. The process of exploratory drilling throughout the Greens Hollow tract and adjoining tracts creates additional jobs within the study area. Without exploratory drilling efforts, impacts to the socioeconomic environment could be large considering the lease tracts involved requiring exploration. Monitoring of the effects of mining, including installation of water monitoring wells would not noticeably change employment numbers, if at all.

This project would not add to the cumulative effects of wildlife habitat improvement projects, livestock grazing, recreational use, and re-issuance of the special use permit for Rough Brothers of the Hills cabin on the socioeconomic environment. Also, the FS will not re-issue a special use permit for the cabin. It must be removed from NFS lands by December 31, 2016.

4.8.5 UNAVOIDABLE ADVERSE EFFECTS, IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF RESOURCES

Coal is a nonrenewable resource. Energy and materials expended during the mining process and the coal reserves mined and consumed denote irretrievable and irreversible commitments of resources. Some economic recovery or reversal of the economic benefits of mining could occur by opening/reopening the mine or portions of the mine at a future date. Coal reserves left un-mined for gate roads and roof support and their economic value as discussed under alternatives 2 and 3 would be considered irretrievable and irreversible considering current mining technology and economics.

4.9 RECREATION RESOURCES

4.9.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under Alternative 1, leasing would not occur and no underground coal mining would be authorized. The recreation environment would remain unchanged. Natural processes would continue to occur. However, recreational use and activities could decrease from current levels due to the displacement of a portion of the public following mine closure (see Section 4.8.1).

4.9.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

The Proposed Action is for the BLM to offer for lease and the FS to consent to leasing within the Greens Hollow tract based on a conceptual mine plan. The leasing would be consistent with the standard lease terms, conditions, and special coal lease stipulations (with the exception of Stipulation #9). The conceptual mine plan consists of longwall mining using current technology. The conceptual mine plan assumes that mining would be done through the existing mine workings.
**Issue 1: Subsidence could cause damage to roads and trails through surface disruption, resulting in safety risks and disruption of the recreation experience.**

Subsidence would be expected to occur directly above longwall panels and extend out beyond panel boundaries depending on the angle of draw. The degree of subsidence would be anticipated to vary with coal thickness and depth from surface. The depth of subsidence would range from 4.3 feet on the southern end of the tract to 8 feet on the northern end. Changes in surface slope would be anticipated to be less than 2 percent. (Maleki 2008) Most of the long-term impacts would be expected to be in the zones of permanent tension along the panel margins.

Instances of subsidence-related impacts in Utah have been limited. Susan White, Mining Program Coordinator for the Utah Division of Gas, Oil and Mines indicated that she was aware of two instances in which subsidence produced surface fractures on road beds and in both cases repairs were easily made without further incident (White 2004). Stipulation #13 requires the replacement of FS owned or permitted facilities (Appendix B).

Over the life of the project, subsidence would have limited impacts to the road network within the mining analysis area boundary. Subsidence and displacement of surface features would be distributed over a fairly extensive area, but would be more evident over mine panels and gate roads, as well as in the areas with shallow overburden in the northeast part of the tract. The road network would not be substantially impacted, except where road alignments traverse and parallel the edges of mining mains and mining districts, where the potential for subsidence-related damage would be possible (Anderson 2004b).

In the case of the Greens Hollow analysis area, several roads fall within areas that may be subject to subsidence. NFSR 50132 crosses the northeast part of the tract for 1.6 miles, and NFSR 52029 branches off of this road for 0.9 miles. NFSR 52006 and NFSR 52008, which branch off of NFSR 50044, also traverse the tract for about 2.3 and 1.6 miles, respectively. NFSR 52010 cuts in and out of the east-central tract buffer zone for about 0.9 miles. All of these roads are dead-end roads, and are likely to receive limited recreational traffic. Big Ridge Trail (#025) travels through the south central part of the tract for about 2.3 miles. This trail is likely to receive a moderate amount of traffic.

NFSR 50044 provides a key access out of the tract and to the Skyline Drive. NFSR 50044 travels across the northern part of the tract for approximately 4.5 miles. This road is part of the Arapeen OHV Trail System, and potential closure of this road due to damage, albeit temporarily, would reduce this form of recreation and subsequently reduce recreation vehicle days (RVDs) on the tract.

Hunting, which often makes heavy use of ATV’s, could be affected by subsidence damage to the road system. However, the ability of ATV’s and four-wheel drives to traverse rugged terrain would tend to minimize the impacts to travel that could be caused if tensile cracks appear in the road. Repairs to roads damaged by subsidence would likely be easily made shortly after damage occurred (White 2004). In the event that forest visitors are at the outer reaches of any of the roads on the tract, and a subsidence event were to occur, it would be possible that portions of roads could become impassable, potentially trapping people (or their vehicles), although the potential for this to occur would be remote. Alternatively, damage to the existing road network could increase the incidence of user-developed roads as motorized visitors seek other ways to reach destinations. This would have the effect of increasing erosion, landscape scarring, and other forms of damage to otherwise undeveloped lands within the tract.

Subsidence would also create surface fractures that pose very limited hazards to visitors traveling on foot or in motorized vehicles. Most are anticipated to be narrow in width and shallow, however they could be as deep as 50 feet and vary in length from a few feet to 500 feet (Maleki 2008). In either case, an individual or vehicle would likely be able to easily cross over most of these surface fractures (Anderson
Fractures that cross forest roads and are especially deep and/or wide would increase the difficulty of road repairs. Cracks would be expected to range in width from 1/8 inch to 6 inches (DeGraff 1978).

Another disruption of the recreational experience could be seismic events associated with longwall mining. Seismic events would be expected to occur during periods of subsidence and could range from moderate to high. Maleki (2008) estimated the maximum probable event to be a 3.4 Richter scale seismic event. A seismic event could alarm some forest visitors and potentially create short-term concern. Approximately 80 percent of subsidence-induced seismic activity would take place within three weeks of the passing of a longwall miner through a given underground area (Anderson 2004c).

4.9.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Issue 1: Subsidence could cause damage to roads and trails through surface disruption, resulting in safety risks and disruption of the recreation experience.

Impacts under Alternative 3 would be similar to those under Alternative 2.

4.9.4 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have affected recreation resources in the cumulative effects analysis area. The cumulative effects analysis area as defined for the recreation resources analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the proposed project. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis. Actions that are relevant to the cumulative effects analysis are discussed below.

4.9.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

Reasonably foreseeable surface mine facilities on the Greens Hollow tract under all action alternatives could include the construction of a vent shaft facility and associated infrastructure and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under separate issue statements raised during scoping.

- Reasonably foreseeable construction of a ventilation shaft may result in traffic and heavy equipment operation that could temporarily disrupt dispersed recreation.

If leased, foreseeable surface uses could include construction traffic, mainly small trucks, that would make daily use of NFSR 50007 and NFSR 50044 during the construction period. During the relocation of the heavy equipment to the vent shaft site, construction traffic may impede recreational users of these routes, which are major roads through the area. Daily construction traffic would be primarily limited to pickups or busses which would be noticeable to recreationists but should not impede traffic flows.

- Reasonably foreseeable need for a ventilation shaft may result in noise from the vent fan that could impact recreation.

The conceptual vent shaft, a lined vent shaft up to approximately 30 feet in diameter, could be near NFSR 50044, which is the major road on the tract. A shaft located on the Greens Hollow tract would not likely require a ventilation fan, so it would not cause noise impacts, but it would be visible to passing motorists. The ventilation shaft site is described in greater detail in Section 2.6.2.
Ambient noise levels would be elevated during vent shaft drilling operations and installation of ventilation shaft structures. Noise levels would be sufficiently high to displace Forest visitors away from the area around vent shaft drill sites to other parts of the Forest. Noise from drilling activity can be heard from distances of up to one mile (Anderson 2004b). As a result, RVDs in the immediate area surrounding the vent shaft could see a reduction in numbers as forest users seek more primitive recreation experiences, consistent with the tract’s SPM and RN ROS classes, elsewhere on the Forest.

- *Reasonably foreseeable access road use and maintenance may lead to increased recreational traffic.*

Because roads on the tract, including NFSR 50007 and NFSR 50044, are composed of clay in some areas, road surfaces become difficult to travel on when wet. Maintenance activities would likely need to occur to such areas to support mine traffic. These activities could have the potential to draw additional hunter traffic to the area for pre-season trips, if they improve access to the area during a period when the roads can be difficult to drive on. There could also be an increase in the number of hunting trailers brought to the tract because of the improved road conditions. In addition, there may be an increase in visits to the tract by other recreational users due to the improved road conditions. However, no new recreation destinations would be created, so a large number of new recreational visitors would be unlikely. In addition, the road is already in good condition in most areas most of the year. Therefore, the increase in visits to the tract would not be likely to exceed 10 percent (Broadbear 2008).

### 4.9.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

Reasonably foreseeable surface mine facilities outside the Greens Hollow tract under all action alternatives could include the construction of a vent shaft facility and associated infrastructure, a power line, and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under three separate issue statements raised during scoping.

- *Reasonably foreseeable construction of a ventilation shaft facility may result in traffic and heavy equipment operation that could temporarily disrupt dispersed recreation.*

If leased, foreseeable surface uses could include construction traffic, mainly small trucks, that would make daily use of NFSR 50007 and possibly NFSR 50044 during the construction period. Weekly maintenance visits to the vent shaft site would also be necessary during the operation of the fan. During the relocation of the heavy equipment to the vent shaft site, construction traffic may impede recreational users of this route, which is a major road through the tract. Daily construction traffic would be primarily limited to pickups or busses which would be noticeable to recreationists but should not impede traffic flows. Weekly maintenance traffic would not likely affect recreation users.

- *Reasonably foreseeable need for a ventilation shaft facility may result in noise from the vent fan that could impact recreation.*

The reasonably foreseeable ventilation shaft facility would include a vent shaft and fan(s), utility borehole structures, diesel generators, electrical transformers, fuel storage tanks, shaft collars, ventilation fan equipment, and fencing/barriers. The ventilation shaft would be a lined vent approximately 15-30 feet in diameter. Sound impacts, associated with the operation of the fan, would be expected on NFSRs in the study area. It is likely that sound from the fan would be discernible on NFSRs within 3 miles of the conceptual fan location. The NFSRs would be expected to experience sound level impacts up to 74 dBA, the highest decibel recording within 330 feet of the operational fan (Tetra Tech 2008).
Noise levels that would be experienced at the shaft would be inconsistent with expectations of Forest visitors and would tend to redistribute visitors to alternative locations on the Forest. Sound reducing BMPs, such as installing an earthen berm, vegetative buffer, or other methods, could reduce potential sound impacts.

Depending on the location of the vent shaft facility and the existing road network, varying levels of impact to the recreational experience could occur. NFSR 50007 and 50044 are the primary roads outside the tract that could conceptually be affected.

Ambient noise levels would also be elevated during vent shaft construction operations and installation of ventilation shaft structures. Noise levels would be sufficiently high to displace Forest visitors away from the area around vent shaft drill sites to other parts of the Forest. Noise from vent shaft construction activity can be heard from distances of up to one mile (Anderson 2004b). As a result, RVDs in the immediate area surrounding the vent shaft site could see a reduction in numbers as forest users seek more primitive recreation experiences, consistent with the tract’s SPM and RN ROS classes, elsewhere on the Forest.

Odors exhausted from ventilation shaft facilities would be expected to be nominal and would dissipate into the atmosphere relatively quickly. Most equipment operates electrically, except for the stand-by equipment, and there would be little exhaust from underground combustion engines. Similarly, visible emissions would be limited to occasional occurrences. During those times of the year with cold atmospheric temperatures, water vapor could form outside of ventilation shafts resulting from condensation of warm, moisture-laden air from the mine. Rock dust applied to the walls of the mine to reduce the potential for fire and explosion, would occasionally be exhausted out into the atmosphere near the exhaust vents. This would be anticipated to occur only a few days per year (Anderson 2004c). The proximity of these shafts to FS roads may increase the impacts of these effects.

- Reasonably foreseeable access road use and maintenance may lead to increased recreational traffic.

Because NSFR roads, including NFSR 50007, are composed of clay in some areas, road surfaces become difficult to travel on when wet. Maintenance activities may be needed to support mine traffic. These activities could have the potential to draw additional hunter traffic to the area for pre-season trips, if they improve access to the area during a period when the roads can be difficult to drive on. There could also be an increase in the number of hunting trailers brought to the tract because of the improved road conditions. In addition, there may be an increase in visits to the tract by other recreational users due to the improved road conditions. However, no new recreation destinations would be created, so a large number of new recreational visitors would be unlikely. In addition, the road is already in good condition in most areas most of the year. Therefore, the increase in visits to the tract would not be likely to exceed 10 percent (Broadbear 2008).

The effects of this project would be cumulative with other impacts occurring in the area. Coal mining has occurred throughout the cumulative effects analysis area. However, the effects of coal mining have been limited. Surface disturbance is primarily restricted to the portal site. Historic mining in Link Canyon at the Link Canyon Mine and Muddy Creek at the Ricci Mine has minimal if any impact on the recreational opportunities and experiences of the area. Although these sites still appear as disturbed areas, they are reclaiming through natural processes. Subsidence from ongoing and future mining in the SUFCO and Pines Tract has little effect on recreation opportunities and most visitors are unaware of the process. This would continue to be the case as mining continues in these tracts, and for mining in the West Lease parcels. Impacts to road and trail infrastructure have not been a problem and the mine would be required to repair any road damage that might result from subsidence. The chance for visitors to be affected would
be small and of short duration. Noise from the operation of the vent shaft fan in the North Fork of Quitchupah Canyon impacts the recreational experience for users in that part of the analysis area. The Proposed Action and Alternative 3 would cumulatively add to the noise impact and the recreational experience in that area through the construction and operation of a second vent shaft fan.

Exploratory drilling has occurred throughout the analysis area, and is expected to continue to better define the coal reserves. Future exploration activity would be subject to site-specific analysis and approvals. Impacts to recreation from drilling would be relatively minor because they would be short term and primarily localized to the area around the drill site. Never-the-less, the drilling process, the construction of new temporary access roads and potential improvements to existing roads, and the development of staging areas could affect the recreational experience. The visual presence and noise from drilling activity would create temporary impacts to recreation. The sight of large heavy vehicles, drilling rigs, workers, vehicular traffic, and overall activity level would be inconsistent with a forest visitor's expectations for recreation quality in this relatively remote section of the Forest. Truck traffic could temporarily create dusty and noisy conditions and impair the recreation experience. Because exploratory drilling impacts are temporary and impacts from future drilling are not likely to coincide in time or space with construction associated with the Proposed Action or Alternative 3, no cumulative impacts would be anticipated.

Wildlife habitat improvement projects may have resulted in adverse impacts on the recreational experience for some users before site recovery due to the level of disturbance to the vegetation. Past habitat improvement projects include 400 acres of ponderosa pine understory burned in the Pines Tract, 530 acres of crested wheatgrass and smooth brome monoculture areas double disked, and 270 acres of crested wheatgrass and smooth brome monoculture areas harrowed. These treated areas were re-seeded with sagebrush, native grasses, and forbs to increase species diversity. Future projects include a 700-acre prescribed ponderosa understory burn. The effect would be greatest at the time of the project for users who have less understanding of the need for the restoration. However, several years post project, the level of disturbance would diminish. Adverse effects would largely disappear for most visitors and would not result in cumulative impacts with the Proposed Action or Alternative 3.

Livestock grazing may have an adverse impact on the experience of some recreational users. This would primarily include encountering campsites where cows have been, dusty road and trail conditions, and actual interaction with livestock. Hauling water to the North Water Area may result in occasional encounters with Forest visitors and some increased road dust from the water truck, but the impact on recreation would be minor. The effects of the Proposed Action and Alternative 3 would be cumulative with these impacts.

The East Fork Box Creek Timber Sale and the Link Canyon Timber Sale occurred 25 years ago and no longer affect recreation.

Construction of forest roads for grazing, mining, recreation, timber operations, and private land access does affect recreation in the cumulative effects analysis area. Roads have both positive and negative effects. For many Forest visitors, the roads contribute to the recreational experience by providing opportunities for 4-wheel drive and OHV use. However, the roads limit the opportunity for those who seek non-motorized recreation. The Proposed Action would not result in the construction of new roads, but unauthorized use could occur along sections of the power line that do not currently have roads.

The implementation of the Proposed Action or Alternative 3 could conflict with recreational land uses. Such impacts are anticipated to be relatively minor and temporary or short term but would be cumulative with the other impacts to recreation from the past, present, and reasonably foreseeable actions considered in this section. All reasonably foreseeable future development on NFS lands would be required to be consistent with management requirements of the Forest Plan.
4.10 VISUAL QUALITY

4.10.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under the No Action Alternative, the Greens Hollow tract would not be offered for leasing and there would be no subsurface mining activities within the tract at this time. Natural processes would continue. The visual quality would remain similar to current conditions.

4.10.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Issue 1: Subsidence may affect visual quality.

Surface fractures due to subsidence could impact up to 80 individual wetlands (approximately 11.7 acres) and the riparian along reaches of North Fork of Quitchupah Creek, Greens Hollow, and Cowboy Creek on the east side of the analysis area due to changes in hydrology, as noted in Section 4.5.2.2. Although water is unlikely to be permanently lost from the area, it could shift to a new location. The likelihood of these impacts occurring would be greater where there is shallow cover over Castlegate Sandstone, and at the edge of a panel boundary where surface cracks can remain open. In terms of effects of visual resources, if there is a loss of water in a wetland or riparian due to subsidence crackings, there would be a change from wetland and riparian vegetation to more xeric communities dominated by upland plants, corresponding to the degree of loss of water. This change in vegetation would affect visual resources. However, shifts from mesic to more xeric communities would not result in an area failing to meet the VQO objectives of Modification or Partial Retention because the affected area would not visually dominate the area and the new vegetation community would borrow from naturally established form, line, color, and texture so as to blend in with the surrounding landscape.

4.10.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Issue 1: Subsidence may affect visual quality.

Impacts due to subsidence would be the same under Alternative 3 as discussed under the Proposed Action with the exception of those areas where full-support mining would occur.

4.10.4 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have or could affect visual quality in the cumulative effects analysis area. The cumulative effects analysis area as defined for the visual quality analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

4.10.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

Reasonably foreseeable surface mine facilities on the Greens Hollow tract under all action alternatives could include the construction of a vent shaft and associated infrastructure and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under a separate issue statement raised during scoping.

- Reasonably foreseeable need for surface facilities and ground disturbance could result in a temporary (construction phase) decrease in visual quality.
Reasonably foreseeable construction of a vent shaft site on the Greens Hollow tract would include both temporary and permanent impacts. Temporary visual impacts are assessed on the basis of the duration of the impact. Because the predicted timeframe for vent shaft drilling is approximately 1 year, visual impacts associated with the construction phase of the vent shaft best falls under the temporary impact category. However, to ensure adequate disclosure, these impacts are disclosed in the context of the Visual Management System (VMS).

Temporary visual impacts to visual resources would occur as a result of the drilling equipment, trucks, and support equipment employed in drilling and construction at the ventilation shaft site. The drilling operations are projected to occur 24-hours per day, requiring that the site be illuminated during the night.

The reasonably foreseeable vent shaft site would likely be in an area designated in the Manti-La Sal Forest Plan (Forest Service 1986a) with a VQO of Partial Retention or Modification. It would be located in a Range Management Unit whose prescription does not have specific direction for meeting VQO but defaults to the Forest Wide direction that uses should meet the adopted VQO. It is unlikely a vent shaft would be constructed on the Fishlake National Forest. NFSR 50044 would possibly provide foreground views of the site during the construction phase while the shaft equipment and other rigs are present. During the construction phase, this site would not meet the VQO of Partial Retention in foreground views because the drill rig would not be visually subordinate to the characteristic landscape. The night-time illumination of the site and drill rig would be obvious for great distances due to the contrast with the otherwise dark environment. During the day, the drill equipment, spoil pile, and other equipment would be visible, particularly in foreground views. Dust on forest roads from increased truck traffic could impair visual quality over the short term. Stipulation #8 would require the implementation of dust control measures and Stipulation #6 would consider other potential adverse visual impacts.

- **Reasonably foreseeable ventilation shaft facility (excavated rock, fences, etc.), access road use and maintenance, and any visible emissions (water vapor) could decrease visual quality during and after the life of the facilities.**

As noted above, the vent shaft site on the Greens Hollow tract would be located in an area with a VQO designation of Partial Retention or Modification (Forest Service 1986a). The completed site would consist of one large vent shaft up to approximately 30 feet in diameter with a low collar above the ground and the spoil piles removed from the shaft during excavation. Once the construction is completed, the spoil would be stabilized and revegetated. Because of the size of the spoil piles, the low collar around the shaft, and the chain-link fence, the vent shaft site would not be visually subordinate to the characteristic landscape. Therefore, this site (estimated to be approximately 10 acres) would not meet the VQO of Partial Retention for foreground distances. The visual impacts associated with the site would remain for the life of the project before being reclaimed. During the life of the project, this site would be inconsistent with Forest Plan VQO of Partial Retention. However, after the project is completed and the site is reclaimed, the company would be required to complete the reclamation to a level that the site would again meet the VQO of Partial Retention.

Access road use and maintenance to the vent shaft site would occur during construction and as necessary throughout the life of the project. These roads are currently maintained and graded which would likely continue. Maintenance of the roads would not change the VQO ratings.

**4.10.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract**

Reasonably foreseeable surface mine facilities outside the Greens Hollow tract under all action alternatives could include the construction of a vent shaft facility and associated infrastructure, a power line, and maintenance of existing forest roads to accommodate traffic that would be required for the year-
round construction of the vent shaft. This section evaluates the potential impacts of these elements under three separate issue statements raised during scoping.

- **Reasonably foreseeable need for surface facilities and ground disturbance could result in a temporary (construction phase) decrease in visual quality.**

Reasonably foreseeable construction of a vent shaft facility outside the Greens Hollow tract would include both temporary and permanent impacts. The temporary impacts are addressed under this issue statement; the permanent impacts are addressed under the next issue statement. Temporary visual impacts are assessed on the basis of the duration of the impact. Because the predicted timeframe for drilling is approximately 1 year, visual impacts associated with the construction phase of the vent shaft best fall under the temporary impact category. However, to ensure adequate disclosure, these impacts are disclosed in the context of the Visual Management System (VMS).

Temporary visual impacts to visual resources would occur as a result of the drilling equipment, trucks, and support equipment employed in drilling and construction at the ventilation shaft site. The drilling operations are projected to occur 24-hours per day, requiring that the site be illuminated during the night.

The reasonably foreseeable vent shaft site would likely be in an area designated in the Manti-La Sal Forest Plan (Forest Service 1986a) with a VQO of Modification for foreground views. It would likely be located within a Range Management Unit whose prescription does not have specific direction for meeting VQO but defaults to the Forest Wide direction that uses should meet the adopted VQO. NFSR 50007 would possibly provide foreground views of the vent shaft site. During the construction phase, the site would not meet the VQO of Modification in foreground views because the project would strongly contrast with the naturally established form, line, color, and texture of the landscape, and it would not blend in with the surrounding landscape character. The night-time illumination of the site and drill rig would be obvious for great distances due to the contrast with the otherwise dark night time conditions. During the day, the drill equipment, spoil pile, and other equipment would be visible, particularly in foreground views. Dust on forest roads from increased truck traffic could also impair visual quality over the short term. Stipulation #8 would require the implementation of dust control measures and Stipulation #6 would consider other potential adverse visual impacts.

- **Reasonably foreseeable ventilation shaft facility (excavated rock, fences, fan, generators, fuel storage tank, etc.), access road use and maintenance, the power line, and any visible emissions (water vapor) could decrease visual quality during and after the life of the facilities.**

The reasonably foreseeable vent shaft facility outside the Greens Hollow tract would likely be located in an area of Modification (Forest Service 1986a). This site could be visible to forest visitors traveling on NFSR 50007 in the foreground and middleground viewing distances. Because of the designated foreground viewing distance and because the elements of this site would not borrow from naturally established form, line, color, and texture so as to blend in with the surrounding landscape character, the ventilation shaft site would not be consistent with the VQO of Modification. The degree of variance from the VQO of Modification would be less after the construction phase is complete, the construction equipment is removed, and the excavated material is stabilized. However, the facilities at the site and the excavated material would strongly contrast with the naturally established form, line, color, and texture of the landscape and would not blend with the surrounding landscape character when viewed from the foreground viewing distances. The visual impacts associated with the site would remain for the life of the project before being reclaimed. During the life of the project, the site would be inconsistent with Forest Plan VQO of Modification. However, after the project is completed and the site is reclaimed, the company would be required to complete the reclamation to a level that the site would again meet the VQO of Modification.
During mine operations, water vapor emissions from the ventilation shaft could be visible. These would mainly occur during cold weather, and result from condensation of warm, moisture-laden air from the mine. The potential frequency or size of these emissions is not known, but they would not occur during the summer when recreational use is higher. Emissions may occur during the fall hunting season, but they would not be likely to have a large negative impact on the hunting experience beyond those associated with the facility.

Access road use and maintenance to the vent shaft site would occur during construction and as necessary throughout the life of the project. These roads are currently maintained and graded which would likely continue. Maintenance of the roads would not change the VQO ratings.

- **Reasonably foreseeable power line construction could affect visual quality objectives.**

To provide power to operate the mine, as well as the ventilation fan, it would be reasonably foreseeable that an overhead power line would need to be built. A 100-foot-wide right-of-way would be required for the line, in which trees over 10 feet tall would be removed. Power poles would be about 61 feet tall.

The alignment for the power line could cross NFS lands with a VQO classification of Modification. Most of the designated distance zones in the area would be middleground. The power line would be visible to Forest visitors to varying degrees along an alignment, but particularly if it is close to a road.

For the analysis of this element meeting the VQO, both foreground and middleground distance zones are evaluated. In foreground distance zones, the power line would visually dominate the characteristic landscape and would not borrow from naturally established form, line, color, and texture so as to blend in with the surrounding landscape character. Because the power line would not blend with the landscape character, it would not meet the VQO of Modification for foreground views. However, for areas with middleground designations, the power line would not dominate the characteristic of the landscape and would meet the VQO of Modification. The visual impacts associated with the site would remain for the life of the project before being reclaimed. After the project is completed and the site is reclaimed, the company would be required to complete the reclamation to a level that the site would again meet the VQO.

The effects of this project would be cumulative with other impacts occurring in the area. Visual quality has been minimally affected by underground coal mining. Historic mining has had some effect on visual resources. Although the Ricci Mine in Muddy Creek Canyon is largely hidden from most view points, the Link Canyon Mine is visible from the Link Canyon Road. Visual evidence of the mine is still present, but much of the disturbance has disappeared with time. Ongoing development of adjacent areas, such as the Quitchupah Tract, Pines Tract, and SITLA Tract, have not affected the visual quality to a noticeable degree and are not anticipated to do so in the future. Mine portals and other mine-related development are located in canyons and screened from most views by the topography and would not be visible from either conceptual ventilation shaft site, which could be the primary source of visual impacts of the Proposed Action. Therefore, the impacts of past mining development would not be cumulative with this project.

Subsidence associated with the mining has had a limited, localized effect on visual resources. Specifically, subsidence associated with the Pines Tract has dewatered wetlands in Box and North Water Canyon (see Section 4.1.1). Loss of water is expected to result in the loss of the wetland and riparian vegetation at these locations. The shift to an upland vegetation community will be an effect on the visual resources in the area. Subsidence due to the Proposed Action could also result in similar impacts to wetland and riparian vegetation in the analysis area. The likelihood of impact would be greatest where Castlegate Sandstone is near the surface along Muddy Creek and along reaches of North Fork of Greens Hollow Federal Coal Lease Tract
Quitchupah Creek, Greens Hollow, and Cowboy Creek on the east side of the analysis area. Impacts would likely be isolated and result in a shift to upland vegetation. These impacts would be cumulative with those that occurred on the Pines Tract. However, these changes would not visually dominate the area. The new vegetation community would borrow from naturally established form, line, color, and texture so as to blend in with the surrounding landscape. VQO of Modification or Partial Retention would still be met. Alternative 3 would preclude the possibility of these impacts occurring. Underground development of the SUFCO Mine through additional leases, including the West Lease Modifications, is expected to have minimal effect on visual resources, but could result in similar losses of wetland and riparian vegetation in localized areas.

Exploratory drilling has been completed across the analysis area in order to define the coal reserves. Visual impacts associated with exploratory drilling are typically short-term. Once the exploration is complete, the drill sites and access roads are reclaimed and the visual impact diminishes. In the past, exploratory drilling has been completed with conventional land-based drills. However, advances in technology and the availability of heliportable drills have decreased the level of short-term disturbance associated with the drilling. As a result, the effect of the exploratory drilling on visual resources has been negligible in terms of long-term impacts. Temporary impacts may result from the exploratory drilling due to the presence of the drills, other equipment, access routes, and staging areas, depending in part if the location is in an area where it is visible to Forest users. The FS VMS focuses on forest uses in the context of long-term impacts. VMS standards or guidelines for short-term impacts require the use of BMPs during all phases of this activity and in some prescriptions sets time frames for when an area must be returned to the planned VQO.

Forest roads and other user-created roads developed for grazing, mining, recreation, timber operations, and private land access have had an effect on visual resources. Where roads exist they represent the most visually dominant change in the landscape, creating linear corridors through the natural vegetation. Because portions of the road system could be visible from reasonably foreseeable ventilation shaft sites, these impacts would be cumulative. The cumulative consideration of the visual effect of the roads with the visual effect of the ventilation shaft sites would not alter the assessment Forest Plan consistency previously noted: both sites would be inconsistent with Forest Plan VQO for the life of the project. However, at the end of the project, the sites would be reclaimed and they would meet Forest Plan VQO in consideration with the roads.

In terms of visual quality, livestock grazing has had minimal effect in the analysis area. Habitat improvement projects, including controlled burns, have affected the visual quality in portions of the analysis area. These impacts are typically short term and diminish as time passes and vegetation in the area regrows. Over time, controlled burns may enhance visual quality by the rejuvenation of decadent stands of sagebrush.

The proposed 2-inch pipeline from the North Fork of Quitchupah Creek would be anticipated to have minimal effect on visual quality, depending on where it is located and how it is built.

Other projects and activities listed in Table 2.1 have had no meaningful impact on the visual quality of the landscape.

The visual impacts associated with the implementation of the Proposed Action or Alternative 3 discussed previously would be cumulative with the visual resource impacts of the past, present, and reasonably foreseeable future actions discussed in this section. Specifically, reasonably foreseeable surface infrastructure that could be associated with the Greens Hollow tract lease, including the vent shafts and power lines, could incrementally affect the visual resources in localized areas where these elements would be located, in the context of the relatively minimal impacts that have already occurred in the analysis area.

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The cumulative aspect of the impacts discussed here would not alter the consistency determinations of the project with regards to Forest Plan direction. Future development of the SUFCO Mine through additional leases should have no cumulative effect. Development of adjacent areas such as the current Quitchupah Tract, Pines Tract, and SITLA Tract have not affected the visual quality to a noticeable degree and are not anticipated to in the future. Other areas of possible development such as lease modifications in association with the SUFCO Mine are separated by substantial distances of intervening terrain and have no apparent connection in terms of hydrology or other relevant resources. Further, the future development area considered in this analysis has its own independent utility and would be pursued independently, regardless of the ultimate disposition of other potential developments.

4.11 RANGELAND RESOURCES

4.11.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under the No Action Alternative, the tract would not be leased and no mining would take place on the Greens Hollow tract. Thus, subsidence-related damage to range improvements would not occur. Water resources would not be affected, and grazing would likely continue as under current management, involving the same permitted numbers and season of use, the same permittees, and the same inventory of range improvements.

4.11.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Issue 1: Subsidence could damage range improvements and facilities, including spring developments.

As discussed in section 3.11, stock water is the most limiting resource on the allotments. The most reliable water sources in the analysis area are the 13 spring-fed water troughs on the Emery allotment. Potential mining impacts to spring flows are discussed in detail in the Surface and Ground Water section of this analysis. Overall, the Surface and Ground Water analysis concludes that the risk of loss of ground water at an individual spring is very low, but it does note potential impacts due to surface tensile cracking for four springs with water troughs: M_SP02, which feeds Greens Hollow Trough (202018), as well as Greens Pasture #1 Pond; M_SP08, which feeds Aspen Spring Trough (202007); M_SP18, which feeds Greens Seeding Trough (202014), as well as Greens Seeding Trough (202014A) via the Greens Seeding pipeline; and the White Mountain Spring which has a springbox and feeds a trough. Since subsidence mining would be allowed under perennial streams and perennial stream flow could be altered, (Cirrus 2013c), the importance of developed stock water sources would potentially increase under the Proposed Action.

Springs within the zone of subsidence could potentially be affected by subsidence, causing shallow ground water feeding the spring to be redirected and surface further downslope. Water is not anticipated to be lost into the mine due to the depth of overburden above the coal seams. The Surface and Ground Water Report (Cirrus 2013c) concludes that the likelihood of loss of water due to tensile fractures or compression stress is very low due to the thickness of the overburden (greater than 1,300 feet) and the depth of fine sediments overlying the Castlegate Sandstone. However, it is difficult to specifically assess the risk of affecting a particular spring because the impact depends in part on the location of gate roads and panel boundaries where any tensile cracks that form may not heal as well.

Similar to springs, the stock ponds in the analysis areas overlying mine panels could also be impacted due to subsidence-induced tensile fractures and cracking and experience water loss. Most of the ponds in the analysis area are filled by surface water runoff, although Greens Pasture #1 Pond is fed by spring M_SP02 and if subsidence reduced flows from the spring, the water level in that pond would be affected.
The same factors discussed above that would minimize the risk of water loss to springs would also reduce the likelihood of long-term impacts to the ponds, namely the depth of overburden and the embedded silts and clays that would help heal any cracks that form. Because of the depth of overburden and fine sediments overlying the Castlegate Sandstone, the actual risk of cracking would be low, so damage would be unlikely. If cracking did occur, the impacts would likely be of short duration, as cracks are projected to heal relatively quickly due to the silts and clays. Because mining in the lease tract would occur over a 8.8-year time period, potential impacts would tend to be localized at any given time, i.e., if a pond were affected by tensile cracks, it would probably have time to heal before another pond was affected.

Although the likelihood of a water source being affected by subsidence is considered to be low, the following discusses the implications if such an impact were to occur. The costs of repair or replacement would be one measure of the cost of subsidence impacts. However, any temporary or permanent loss of stock water resources could have a larger indirect effect by limiting livestock distribution, thereby reducing the forage base. This in turn would reduce either the number of cattle the allotment could support or the length of the grazing season.

Addressing this issue requires assessment of the type of stock water developments (i.e., relatively reliable spring-fed troughs v. less reliable stock ponds) and their distribution. For planning purposes, cattle are assumed to travel up to a mile for water without being stressed in mountainous terrain. In reality, cattle on less mountainous terrain in arid western ranges typically travel substantially greater distances.

As noted, spring-fed troughs are the most reliable water source and are concentrated in the central portion of the analysis area. Of the troughs or trough systems potentially affected by subsidence, Cowboy Trail #2 spring-trough system (202012) is currently the most productive in terms of water volume. In the case of the Aspen Spring Trough (202007), the other water sources within a mile radius are the trough at Big Ridge Spring (202006) nearly a mile east and the Dugout Trough 0.3 miles to the southwest. To the north, alternative sources are from one to two miles away. Similarly, the Greens Hollow trough (202018) has alternate sources within a mile to the north (Greens Seeding Trough (202014)) and west (Greens Pasture #1 pond (202033)) and the pond on the Greens Hollow tributary. The nearest water to the west, Clay Springs Pond, is 1.6 miles away. However, since Greens Pasture #1 stock pond (202033) is less than 500 feet east of the trough, it would serve as a backup water source for the mile radius around the trough. For purposes of this analysis, it is assumed that in the unlikely event that the flow to Aspen Spring or Greens Hollow troughs ceased, other water sources would be available.

Cowboy Trail #2 trough has 2 water sources, including a spring box at spring M_SP14. If subsidence affected the springs in this area, both springs would likely be affected. The nearest alternate water sources are White Mountain Springs at 1.5 miles and Aspen Springs and trough at 1.7 miles. Approximately 45 percent of the area within this radius is in the Greens Hollow tract. In total, the loss of this trough would make about 2,024 acres on the tract within a 1 mile radius of the trough unavailable for grazing due to lack of water. At 4.9 acres per AUM, this would equate to 413 AUMs, or 6.3 percent of the forage within the Emery Allotment.

White Mountain Spring is bordered to the south by a boundary fence, so the water it provides is only available to cattle grazing on Emery allotment. There are no water sources within 1 mile of this spring. Therefore, the loss of this water source would make unusable about 781 acres of forage. At 6.9 acres per AUM in this allotment, this would result in a loss of 113 AUMs, or approximately 2 percent of the forage within the Emery Allotment.

The ponds that may be subject to damage from mining activities are all located on the northern end of the tract. Two ponds, Greens Pasture #1 (202033) and Green Pasture (202038), are located next to water troughs; Greens Hollow Trough (202018) and Greens Reseeds Trough (202015) for the former and Greens Hollow Federal Coal Lease Tract
Issue 2: Subsidence impacts to water resources could affect livestock permit operations. Direct, indirect, and cumulative impacts to water resources, including but not limited to points of diversion or use and vegetation may change all or a portion of the area from primary range to secondary range, and impact grazing capacity.

If continued, widespread impacts to water resources were to occur in the analysis area due to mining in the Greens Hollow tract and other adjacent leases; livestock permit operations may be affected. Mining activity, including subsidence, may cause changes in points of diversion or use of surface water. Such changes, if they were to occur, would be expected to have minimal effect on the forage production on the allotments. However, impacts to grazing could result due to the loss of water from developed and undeveloped water sources, making that forage unavailable and negatively impacting grazing capacity. If effects were severe enough, grazing on project-area allotments could be reduced or eliminated.

Based on the conclusion reached by the water resource specialists (Cirrus 2013c), the likelihood of losing water sources for the allotments due to mine subsid ence impacts would be very low due to the depth of overburden and the clays and shales present in the area. It is more likely that if springs were affected, these effects would occur to individual springs as the mining and subsid ence progressed across the landscape, and these impacts would be short term because cracks would tend to heal due to the clays and shales present in the analysis area. The discharge points for some springs may move down slope as the cracks heal, compromising the function of the existing water developments, but there is not expected to be a net loss of water. Stipulation #13 requires existing FS owned or permitted surface improvements need to be protected, restored, or replaced to provide for the continuance of current land uses. Springs that coincide with gate roads may be more at risk of a long-term impact because subsidence cracks above gate roads may not heal quickly. Therefore, based on the assessment in the Surface and Ground Water technical report (Cirrus 2013c), livestock permit operations are not expected to be affected by Alternative 2.

4.11.2.1 Other Range Improvements

In terms of other range improvements, including fences, gates/cattle guards, and grazing enclosures, surface cracking would be the source of potential damage. The conclusions from the Assessment of the Effects of Surface Impacts Resulting from Longwall Mining in the Greens Hollow Tract (Maleki 2008) regarding surface cracking summarized above for stock ponds are also relevant to these other range improvements. No other range improvements lie in the zone of moderate to high cracking risk. Low and negligible cracking hazard is not considered a threat to range improvements other than water developments as discussed above, so potential impacts to improvements in those zones due to cracking are not discussed further.

Livestock trailing onto and off of the Emery allotment via Link Canyon and the Ferron allotment via Hole Trail, Dry Wash, and Ferron Canyon Road would not be affected by the Proposed Action. The Greens Hollow tract would be accessed via underground mine workings from the adjacent SUFCO Mine and would not affect livestock trailing.

4.11.2.2 Probability, Duration, and Cost of Potential Impacts

In general, this analysis addresses only moderate to high probability impacts site specifically. However, because of the importance of reliable, spring-fed stock water sources, the potential impact to the spring Greens Hollow Federal Coal Lease Tract...
feeding the Cowboy Trail #2 trough is considered here even though it would be a very low probability occurrence. As noted above, an estimated 413 AUMs per season could be made unavailable, reducing the forage base in the allotment by 6.3 percent. This loss would be reflected each season until an alternative source of stock water in the area was developed. This analysis assumes that permittees would have to lease private range to offset this forage loss. A potential short-term solution would be for water to be delivered to affected areas by truck during the grazing season, as currently takes place at some troughs outside the Greens Hollow tract. Long-term solutions would include redeveloping the spring if its discharge point changes due to subsidence, as noted in Section 4.11.4.

As mentioned above, the ponds within the mining tract are close enough to backup water developments that the loss of any of these ponds would not make any AUMs unavailable. In the event of damage, the mine would be responsible for the cost to replace or repair any improvements damaged by subsidence, including loss of surface water inflow into the ponds due to changes in the drainage patterns.

In terms of replacement costs, the Ferron Ranger District has recent experience with damaged spring-fed troughs (Forest Service 2004b). Troughs can be repaired for as little as $1,500 while new troughs cost about $3,000. The cost of replacing lost AUMs by leasing private range is estimated to range from $12 to $15 per AUM (Forest Service 2004c).

Based on this assessment of potential damage and these repair/replacement costs, the replacement of AUMs that would be lost if Cowboy Trail #2 trough became unavailable due to subsidence impacts would be about $6,195 per grazing season, and replacing AUMS lost due to unavailability of White Mountain Spring would cost about $1,695. This is a conservative estimate of potential costs based on the impacts projected through this analysis. As discussed, there is an element of uncertainty in projecting the impacts associated with subsidence on range improvements. The cited impacts might not occur, eliminating these repair/replacement costs. On the other hand, if additional water developments or other range improvements were damaged, costs would increase proportionally. Additional costs could be projected based on the figures presented above. If damage to water development did result in reduced forage availability, the cost of leased rangeland to offset the reduction could be calculated using the figures included in this analysis.

4.11.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Impacts to range resources associated with Alternative 3 would essentially be the same as those described for Alternative 2.

4.11.4 SPECIAL STIPULATIONS AND DESIGN CRITERIA

- Stipulation #7 would require that flow at springs, including M_SP08 be monitored to detect changes during and after mining.

- Compliance with Stipulations #13 and #17 would guide protection, restoring or replacing surface range improvements if damaged and redeveloping the spring or water source at a new location.

4.11.5 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have affected rangeland resources in the cumulative effects analysis area. The cumulative effects analysis area as defined for the rangeland resources analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present,
and future activities affecting the cumulative effects analysis area that were considered in this analysis. Actions that are relevant to cumulative effects analysis are discussed below.

4.11.5.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

- Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

Reasonably foreseeable construction and operation of a ventilation shaft would require a total of approximately 10 acres within the Emery or Quitchupah Allotment. This land would be unavailable for grazing for the life of the mine, until these sites are reclaimed. At 4.9 acres/AUM, the average forage level of the suitable grazing areas of the allotment, this would result in the loss of approximately 2 AUMs. Even factoring in a buffer area around the ventilation shaft site that cattle may be likely to avoid, this represents a trivial percentage of the estimated 6,441 AUMs on the Emery Allotment or 4,052 AUMs on the Quitchupah Allotment. Replacement of the lost AUMs could be required. Replacement could possibly be accomplished by a rangeland improvement to increase the overall AUMs on the allotment.

4.11.5.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

- Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

Reasonably foreseeable construction and operation of a ventilation shaft facility would require a total of approximately 10 acres within the Emery or Quitchupah Allotment. This land would be unavailable for grazing for the life of the mine, until these sites are reclaimed. At 4.9 acres/AUM, the average forage level of the suitable grazing areas of the allotment, this would result in the loss of approximately 2 AUMs. Even factoring in a buffer area around the ventilation shaft site that cattle may be likely to avoid, this represents a trivial percentage of the estimated 6,441 AUMs on the Emery Allotment or 4,052 AUMs on the Quitchupah Allotment. Replacement of the lost AUMs could be required. Replacement could possibly be accomplished by a rangeland improvement to increase the overall AUMs on the allotment.

The effects of this project would be cumulative with other impacts occurring in the area. Coal mining has occurred throughout the cumulative effects analysis area. Historic mining includes the Link Canyon Mine in Link Canyon and the Ricci Mine in Muddy Creek. Ongoing mining includes the SUFCO, Pines Tract, and West Lease mining. In general, the effects of coal mining have been limited. Surface disturbance is primarily restricted to the portal site. However, coal mining on adjacent coal lease tracts could impact rangeland resources, including forage and water availability. Subsidence due to mining in the Pines tract adjacent to the Greens Hollow tract has impacted springs in the North Water area that were used to support livestock grazing in the North Water springs area. Flow from several spring locations and their associated riparian/wetland habitat was lost due to subsidence. Loss of this livestock water has been offset temporarily by hauling water, but long-term water replacement options are still pending. Forage lost due to mine infrastructure would also be cumulative with losses associated with the Greens Hollow tract. If water is lost due to subsidence and efforts to replace it are unsuccessful, this could cause primary range to be reclassified as secondary range. This could result in a decrease in total AUMs for the allotment, and a subsequent loss to the livestock permittees, but this loss would represent a very small portion of the range resource available in the analysis area. As discussed above in Section 4.1.1, fundamental differences exist between the Pines Tract and the Greens Hollow tract. Trying to predict the amount of rangeland that could change from primary to secondary range would be speculative due to the specific location of the water source and distance to forage. It is not expected that this type of impact would occur, particularly under Alternative 3.

Impacts of any future exploratory drilling would be assessed separately from this EIS. Exploration drilling across the cumulative effect area has occurred in the past and is likely to continue as coal reserves are developed. Depending on location and how the holes are drilled (conventional vs. heliportable drill),
the amount of disturbance for access and the drill site varies. Drill hole sites would temporarily decrease available forage; however, only a negligible amount of forage would be affected, and effects would be dispersed across a large area. Cumulative impacts from exploratory drilling to rangeland resources would be minimal, if any.

Wildlife improvement projects have impacted rangeland resources in the past and additional improvement projects are likely in the future. Past habitat improvement projects include 400 acres of sagebrush burned in the Pines Tract to improve elk winter range. Current habitat improvement projects include diskng and Dixie harrowing 800 acres to restore sage-grouse habitat for nesting and brood rearing. Future projects include a 700-acre controlled burn. The effects would be greatest at the time of the project, and would have a short-term adverse impact on forage resource availability. As the areas recover, increased forage resources would become available. Livestock may be excluded for multiple years to facilitate recovery. Wildlife foraging does result in some direct competition for forage resources, but such interactions have a limited effect on the rangeland forage resource available in the analysis area. Implementation of the Proposed Action or Alternative 3 would have minimal cumulative effect with wildlife habitat improvement projects or forage use for rangeland resources.

Recreation use does occur across the analysis area. Impacts from recreation can include loss of forage associated with off-road ATV/vehicle use and dispersed camping. Although these impacts result in the loss of forage resources, the impacts are usually localized and affect a very small percentage of the forage resource on the allotments and would result in a negligible cumulative effect. The Rough Brothers of the Hills permit will not be renewed and the cabin must be removed by December 31, 2016, therefore, there would not be any meaningful cumulative impacts.

The East Fork Box Creek Timber Sale and the Link Canyon Timber Sale occurred 25 years ago. Removal of trees during the timber sales likely would have increased forage production in the understory, but such effects would tend to diminish over time and would not result in meaningful cumulative impacts with the current project.

Construction of forest roads for grazing, mining, recreation, timber operations, and private land access affects rangeland resources in the cumulative effects analysis area. Roads have both positive and negative effects. Roads facilitate access for range improvement projects and management actions, but would also result in the loss of a very small amount of forage base. The Proposed Action would not result in the construction of new roads, but unauthorized use could occur along sections of the power line that do not currently have roads.

The implementation of the Proposed Action or Alternative 3 could conflict with rangeland resources, as noted in Section 2.4 and 2.5. Such impacts are generally anticipated to be relatively minor and temporary or short term but would be cumulative with the other impacts to rangeland resources from the past, present, and reasonably foreseeable actions considered in this section. Potential loss of water sources would potentially represent the most notable impact and would be cumulative with the water loss at the North Water area. All reasonably foreseeable future development on NFS lands would be required to be consistent with management requirements of the Forest Plan.

4.12 ROADLESS RESOURCES

This analysis assesses compliance of the Proposed Action and alternatives with the 2001 Roadless Rule and assesses impacts to IRAs’ and draft unroaded-undeveloped area’s characteristics listed previously in Chapter 3.
Portions of the Greens Hollow tract are in the Muddy Creek-Nelson Mountain and White Mountain inventoried roadless areas (IRAs) and are thus subject to the provisions of the 2001 Roadless Rule. Locations of any proposed surface use will be verified for relationship to IRA boundaries using site-specific maps if/when surface operations are proposed.

4.12.1 ALTERNATIVE 1 – NO ACTION DIRECT AND INDIRECT EFFECTS

Under the No Action alternative, the Greens Hollow tract would not be offered for lease. There would be no activities within the analysis area as a result of this proposal. Therefore, there would be no effects to the wilderness attributes and the roadless characteristics of the IRAs and draft unroaded-undeveloped areas that occur in or near the analysis area. However, other uses and activities that have occurred in the past would continue, and new activities may evolve. These include recreation uses and livestock grazing. Particularly, recreational uses have the potential to affect the roadless characteristics given the prevalence of OHV vehicle use and the tendency for user-created roads to be developed over time.

4.12.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Issue 1: Surface related impacts from underground mining may change characteristics of inventoried roadless areas and other unroaded areas.

Under the Proposed Action, the Greens Hollow tract would be offered for lease and mined. Approximately 48 percent of the Greens Hollow tract area would occur within the White Mountain and Muddy Creek-Nelson Mountain IRAs. No road construction or reconstruction would be required to create a mine entry because the mine would be accessed from existing underground workings. The area above the longwall panels would be subsided. Thus portions of the IRAs would be subsided. The lease tract is outside of the boundaries of the Wildcat Knolls IRA; thus this IRA would not be affected by subsidence mining.

Table 4.11 analyzes the effects of subsidence on the wilderness attributes and roadless area characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs. This analysis is tiered to RAREII inventories and describes the specific effects of project activities on the wilderness attributes and roadless characteristics previously described for these areas. As noted in Table 4.11, implementation of the Proposed Action could have adverse effects on some roadless characteristics and wilderness attributes and their potential for wilderness consideration in the future.

The Proposed Action would also affect the White Mountain and Muddy Creek draft unroaded-undeveloped areas. Approximately 5,457 acres in the White Mountain and approximately 802 acres in the Muddy Creek draft unroaded-undeveloped areas occur within the Greens Hollow tract boundary, as depicted on Figure 3.9, and would potentially be subsided. Effects to the six wilderness attributes are disclosed in Table 4.12.

Stipulation #21 addresses activities in roadless areas.

4.12.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Issue 1: Surface related impacts from underground mining may change characteristics of inventoried roadless areas and other unroaded areas.

The effects to IRAs and draft unroaded-undeveloped areas would be essentially the same as described under Alternative 2. Any differences are explained in Tables 4.11 and 4.12.
4.12.4 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, on-going, and reasonably foreseeable projects that have affected the roadless character of the cumulative effects analysis area. The cumulative effects analysis area as defined for the roadless analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

4.12.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

Reasonably foreseeable surface mine facilities (Section 2.6.2) on the Greens Hollow tract under all action alternatives could include the construction of a vent shaft and associated infrastructure and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction of the vent shaft. This section evaluates the potential impacts of these elements under a separate issue statement raised during scoping.

- Surface related impacts incident to mining such as the reasonably foreseeable need for a ventilation shaft may affect roadless characteristics and wilderness attributes of inventoried roadless areas and other draft unroaded/undeveloped areas.

Reasonably foreseeable vent shaft construction could occur on the Greens Hollow tract. The vent shaft site could be located outside of the Muddy Creek-Nelson Mountain and White Mountain IRAs. It would also likely be located outside the White Mountain and Muddy Creek draft unroaded-undeveloped areas.
Table 4.11. Effects of subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes and Roadless Characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs.

<table>
<thead>
<tr>
<th>Wilderness Quality or Attribute</th>
<th>Is there an effect?</th>
<th>Which direction is the effect? Improving, Stable or Degrading?</th>
<th>Description of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untrammeled</td>
<td>Yes</td>
<td>Stable to degrading, depending on the magnitude of hydrologic effects</td>
<td>Long-term ecological processes of the Muddy Creek – Nelson Mountain and White Mountain IRAs would be minimally affected by subsidence. Hydrology in subsidence zones may experience some short-term effects but would be expected to regain long-term equilibrium and continue to function as surface tensile cracks associated with subsidence heal. Although the overall risk of long-term subsidence impacts to hydrology has been determined to be low to very low, tensile cracks on panel boundaries may not heal. If a spring were to fall on one of these boundaries, it could be affected (see the Hydrology section of this analysis). Any associated wetlands could also be affected. Perennial streams with shallow overburden or contact with the Castlegate Sandstone formation could experience impacts due to subsidence that could result in altered hydrology. These streams include the Muddy Creek and segments of Greens Hollow stream and Cowboy Creek. Alternative 3 would avoid the main areas of concern. Short-term impacts would diminish over time and would not result in substantial long-term impacts to this attribute.</td>
</tr>
<tr>
<td>Natural</td>
<td>Yes</td>
<td>Stable to degrading, depending on the magnitude of hydrologic effects</td>
<td>Short-term minor impacts due to subsidence would occur in the Muddy Creek – Nelson Mountain and White Mountain IRAs. Areas of severe subsidence (panel boundaries) would experience some surface effects – a 1 to 2 percent change in topography, surface cracks, bank sloughing, etc. However, unlike impacts that occurred at the adjacent Pines Tract, these impacts would not be noticeable to most visitors unfamiliar with subsidence due to the differences in the geologic features of much of the Greens Hollow tract. Perennial streams with shallow overburden or contact with the Castlegate Sandstone formation could experience impacts due to subsidence. These impacts could result in altered hydrology, which could in turn affect the naturalness of the IRAs. These streams include the Muddy Creek and segments of Greens Hollow stream and Cowboy Creek. Alternative 3 would avoid these areas of concern. Short-term impacts would diminish over time and would not result in substantial long-term impacts to this attribute.</td>
</tr>
<tr>
<td>Table 4.11. (cont’d)  Effects of subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes and Roadless Characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Undeveloped**  
This quality monitors the presence of structures, habitations, and other evidence of modern human presence of occupation. | No | Stable | Subsidence would have minimal effect on undeveloped character of the IRAs. |
| **Outstanding opportunities for solitude or a primitive and unconfined type of recreation**  
This quality monitors conditions that affect the opportunity for people to experience solitude, or primitive, unconfined recreation in a wilderness setting. | Solitude | No | Stable | Subsidence would have minimal effect on opportunities for solitude within the IRAs. |
| | Opportunities for Primitive Recreation | No | Stable | Subsidence would minimal effect on opportunities for primitive recreation within the IRAs. |
| **Special Features (Ecological, Geologic, Scenic or Historical)**  
An attribute that recognizes that wilderness may contain other values of ecological, geologic, scenic, or historic or cultural significance. | No | Stable | No special features occur within the area that would be affected by subsidence. |
| **Manageability (as Wilderness)**  
A measure of the ability to manage an area to meet the size criterion (5,000 + acres), the resulting configuration of the potential wilderness, and the interaction of the other elements above. | Yes | Stable | Subsidence would have minimal effect on the manageability of the IRAs. In the Muddy Creek IRA, 2,056 acres would fall within the tract, while 847 acres in the White Mountain IRA would fall in the tract. |
### Table 4.11. (cont’d) Effects of subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes and Roadless Characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs.

<table>
<thead>
<tr>
<th>Effect to Roadless Characteristics</th>
<th>Is there an effect? Yes or No</th>
<th>Which direction is the effect? Improving, Stable or Degrading?</th>
<th>Describe the actual effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil, Water and Air resources</td>
<td>Yes</td>
<td>Degrading to stable</td>
<td>Soil- Short-term impacts: areas of severe subsidence (panel boundaries) would experience surface effects – surface cracks, bank sloughing, etc. – but would heal as layers settle. Long-term impacts: short-term impacts would diminish and soil would provide the same high-quality functions, but particularly at panel boundaries, some surface cracks may not heal. Under Alternative 2, greater impacts would potentially occur along escarpments and in areas of shallow cover above the Castlegate Sandstone layer. Escarpments and areas above the Castlegate Sandstone layer with less than 50 feet of cover would be protected under Alternative 3 due to the exclusion of subsidence mining in those areas. Water- Subsidence under the Muddy Creek and tributaries under Alternative 2 could result in the reduction and possibly the loss of surface flows. Under both Alternative 2 and 3, subsidence could result in hydrologic impacts (shifts in spring locations changes in stream flow regime). These impacts are most likely to occur where the overburden thickness is less or at panel boundaries. The effects of these changes may be to diminish the flow of a particular spring or to increase the flow of a spring. However, the water would not be lost or gained from the larger watershed but may be displaced locally. Over the long term, a new equilibrium would develop and the area would continue to provide hydrologic functions. Air- No long-term detrimental effects on this characteristic.</td>
</tr>
<tr>
<td>Sources of public drinking water</td>
<td>Yes</td>
<td>Stable to Degrading</td>
<td>The Muddy Creek-Nelson Mountain and White Mountain IRAs are sources of public drinking water for the town of Emery, Utah. Alternative 2 could affect flows and water quality in Muddy Creek and its tributaries if they are undermined and subsided. Alternative 3 would prevent subsidence of perennial streams.</td>
</tr>
<tr>
<td>Diversity of plant and animal communities</td>
<td>No</td>
<td>Stable</td>
<td>The IRAs support a range of plant and animal communities associated with the sagebrush, pinyon-juniper, and other forested habitats present. Subsidence would have minimal effect.</td>
</tr>
<tr>
<td>Table 4.11. (cont’d) Effects of subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes and Roadless Characteristics in the Muddy Creek-Nelson Mountain and White Mountain IRAs.</td>
<td></td>
<td></td>
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<tr>
<td>-------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Habitat for TES and species dependent on large undisturbed areas of land</strong></td>
<td>No</td>
<td>Stable to degrading</td>
<td></td>
</tr>
<tr>
<td>No TES plants are known to occur in areas that could be affected by subsidence, as noted in Section 4.5.2.4. Potential effect to TES wildlife species are addressed in Section 4.4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primitive and semi-primitive classes of recreation</strong></td>
<td>No</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Subsidence would have minimal effect on opportunities for primitive recreation within the IRAs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reference landscapes for research study or interpretation</strong></td>
<td>No</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>The Nelson Mountain Research Natural Area (RNA) is located in the Muddy Creek-Nelson Mountain IRA. This RNA does not occur in the analysis area and therefore would not be affected by the proposed leasing and subsequent mining. The White Mountain IRA contains a prospective RNA and habitat for a federally listed plant. These resources occur outside the analysis area and neither would be affected by subsidence.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Landscape character and integrity</strong></td>
<td>Yes</td>
<td>Stable to degrading, depending on the actual magnitude of subsidence</td>
<td></td>
</tr>
<tr>
<td>Short-term impacts resulting from subsidence would be minor and not noticeable to most users, particularly under Alternative 3. Areas of severe subsidence (panel boundaries) could experience some surface effects – surface cracks, bank sloughing, etc. Long-term impacts would be minor as the short-term impacts diminish. Under Alternative 2, subsidence of areas with limited cover above the Castlegate Sandstone could degrade the landscape character and integrity in these locations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Traditional cultural properties and sacred sites</strong></td>
<td>Yes</td>
<td>Degrading</td>
<td></td>
</tr>
<tr>
<td>Surface cracking associated with the subsurface longwall mining could adversely affect the traditional cultural properties that occur within the area of subsidence, as noted in Heritage Resources, Section 4.6.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other locally unique characteristics</strong></td>
<td>No</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>No other unique characteristics associated with these IRAs have been identified.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 4.12. Effects of the subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes for the White Mountain and Muddy Creek draft unroaded-undeveloped areas.

<table>
<thead>
<tr>
<th>Wilderness Quality or Attribute</th>
<th>Is there an effect?</th>
<th>Which direction is the effect?</th>
<th>Description of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Untrammeled</strong>&lt;br&gt; This quality monitors modern human activities that directly control or manipulate the components or processes of ecological systems inside wilderness.</td>
<td>Yes</td>
<td>Stable to degrading, depending on the actual magnitude of hydrologic effects</td>
<td>Long-term ecological processes would be minimally affected by subsidence. Hydrology in subsidence zones may experience some short-term effects but would be expected to regain long-term equilibrium and continue to function as surface tensile cracks associated with subsidence heal. Although the overall risk of long-term subsidence impacts to hydrology has been determined to be low to very low, tensile cracks on panel boundary may not heal. If a spring were to fall on one of these boundaries, it could be affected (see the Hydrology section of this analysis). Any associated wetlands could also be affected. Surface water and shallow ground water would not be lost into the mine. Perennial streams with shallow overburden or contact with the Castlegate Sandstone formation could experience impacts due to subsidence that could result in altered hydrology. These streams include the Muddy Creek and segments of Greens Hollow stream and Cowboy Creek. Alternative 3 would avoid these areas of concern. Short-term impacts would diminish over time and would not result in substantial long-term impacts to this attribute.</td>
</tr>
<tr>
<td><strong>Natural</strong>&lt;br&gt; This quality monitors both intended and unintended effects of modern people on ecological systems inside wilderness since the time the area was designated.</td>
<td>Yes</td>
<td>Stable to degrading, depending on the actual magnitude of hydrologic effects</td>
<td>Short-term minor impacts due to subsidence. Areas of severe subsidence (panel boundaries) would experience some surface effects – a 1 to 2 percent change in topography, surface cracks, bank sloughing, etc. However, unlike what has occurred at the adjacent Pines Tract, these impacts would not be noticeable to most visitors unfamiliar with subsidence due to the differences in the geologic features of much of the Greens Hollow tract. Alternative 3 would avoid these areas of concern. Short-term impacts would diminish over time and would not result in substantial long-term impacts to this attribute. Perennial streams with shallow overburden or contact with the Castlegate Sandstone formation could experience impacts due to subsidence. These impacts could result in altered hydrology, which could in turn affect the naturalness of the IRAs. These streams include the Muddy Creek and segments of Greens Hollow stream and Cowboy Creek. Alternative 3 would avoid these areas of concern. Short-term impacts would diminish over time and would not result in substantial long-term impacts to this attribute.</td>
</tr>
</tbody>
</table>
Table 4.12. (cont’d) Effects of the subsidence mining under the Proposed Action and Alternative 3 on Wilderness Qualities or Attributes for the White Mountain and Muddy Creek draft unroaded-undeveloped areas.

<table>
<thead>
<tr>
<th>Undeveloped</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This quality monitors the presence of structures, habitations, and other evidence of modern human presence of occupation.</td>
<td>No</td>
<td>Stable</td>
<td>Subsidence would have minimal effect on undeveloped character.</td>
</tr>
</tbody>
</table>

| Outstanding opportunities for solitude or a primitive and unconfined type of recreation | Solitude | No | Stable | Subsidence would have minimal effect on opportunities for solitude. |
| Opportunities for Primitive Recreation | No | Stable | Subsidence would have minimal effect on opportunities for primitive recreation. |

| Special Features (Ecological, Geologic, Scenic or Historical) |  |  |  |
| An attribute that recognizes that wilderness may contain other values of ecological, geologic, scenic, or historic or cultural significance. | No | Stable | No effect. Special features are not known to occur in the area that could be affected by subsidence. |

| Manageability (as Wilderness) |  |  |  |
| A measure of the ability to manage an area to meet the size criterion (5,000 + acres), the resulting configuration of the potential wilderness, and the interaction of the other elements above. | Yes | Stable | Subsidence would have minimal effect on manageability of these units as wilderness. The Greens Hollow tract would constitute an active mineral lease, but subsidence would not likely result in the area within the lease tract being unavailable for wilderness considerations. Because of the shape of the White Mountain draft unroaded-undeveloped area relative to the lease tract, the lease tract could be perceived as separating the draft unroaded-undeveloped area into two isolated parcels, but would not necessarily prevent the area from wilderness consideration. The parcel on the west side of the tract would be approximately 7,711 acres and the tract on the east side would be 4,484 acres. In the case of the Muddy Creek draft unroaded-undeveloped area, the lease tract would infringe on the south and west edge of the unit, approximately 802 acres. |

Greens Hollow Federal Coal Lease Tract

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Assuming the vent shaft would be located outside of the IRAs and the draft unroaded-undeveloped areas, there would be minimal long-term effects on the wilderness attributes and roadless area characteristics of these areas. Short term effects during construction associated with increased noise, dust, use of existing roads, and human activity could affect some attributes around the edges of the Muddy Creek-Nelson Mountain IRA and the White Mountain and Muddy Creek draft unroaded-undeveloped area. However, after construction is complete, values would return to essentially pre-project levels.

### 4.12.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

Reasonably foreseeable surface mine facilities outside the Greens Hollow tract under all action alternatives could include the construction of a vent shaft facility and associated infrastructure outside the Greens Hollow tract, a power line, and maintenance of existing forest roads to accommodate traffic that would be required for the year-round construction and maintenance of the vent shaft. This section evaluates the potential impacts of these elements under a separate issue statement raised during scoping.

- Surface related impacts incident to mining such as the reasonably foreseeable need for a power line and a ventilation shaft facility may affect roadless characteristics and wilderness attributes of inventoried roadless areas and other draft unroaded/undeveloped areas.

Reasonably foreseeable construction of a vent shaft facility and associated infrastructure, including a fan, could occur outside the Greens Hollow tract. The vent shaft site would likely be located outside of the Muddy Creek- Nelson Mountain, White Mountain, Wildcat Knolls IRAs. However, it would likely be located within the White Mountain draft unroaded-undeveloped area.

The construction of an electrical power line for a ventilation fan system and other potentially needed facilities to support underground mining operations at the vent shaft site would be reasonably foreseeable. Some construction equipment cross-country travel could be anticipated during construction to access pole locations and stringing wires, and potentially during the life of the power line for maintenance. No new road construction would be required to construct the power line.

Table 4.13 analyzes the effects of the off lease tract elements on the wilderness attributes and roadless area characteristics of the IRAs. Table 4.14 analyzes the effect of the off lease tract elements on the White Mountain drafted unroaded-undeveloped area. This analysis is tiered to previous inventories/Forest Planning processes and describes the specific effects of potential off lease tract elements on the Wilderness attributes and roadless characteristics previously described for these areas. As noted in Table 4.13 and 4.14, off-lease tract surface facilities would have adverse effects on some roadless characteristics and wilderness attributes and their potential for wilderness consideration in the future. The power line and ventilation shaft facility represent long-term impacts to the wilderness attributes and roadless area characteristics that would be present for the life of the project. After the project is finalized, the company would be required to remove the elements and restore the disturbed areas.

### 4.12.4.3 Other Cumulative Effects

The effects of this project would be cumulative with other impacts occurring in the area. The roadless character of the IRAs and draft unroaded-undeveloped areas have been affected by coal mining. Although underground coal mining itself has minimal effects on the roadless character, mining results in development of mine portals, associated infrastructure, and support activities that require or are facilitated by roads. Historic mining includes the Ricci Mine in Muddy Creek Canyon and the Link Canyon Mine in Link Canyon. Road access was provided to both mines. Past and current mining includes the Pines Tract coal mine to the east of the Greens Hollow tract and the SUFCO mines to the south. These mines are accessed from the portal in Convulsion Canyon, which has road access. This ongoing mining near the Greens Hollow Federal Coal Lease Tract would be reasonably foreseeable.
Greens Hollow tract includes the modifications of three existing leases. The modifications did not require new road construction but were accessed from existing infrastructure. The Greens Hollow tract conceptual mine plan would not add cumulatively to road impacts because it would also be accessed from existing underground workings. However, surface disturbance associated with the vent shafts would be cumulative with other surface disturbance with existing mine portals and break-outs.

Subsidence associated with the ongoing mining at the SUFCO or Pines Tract is likely to result in similar impacts (depending on associated geologic features; see Section 4.1.1) as would accompany this project under either alternative 2 or 3. Limited areas exist under Alternative 2 that could result in similar impacts to what has occurred on the Pines Tract. These areas have been eliminated from subsidence mining under Alternative 3. Subsidence from mining would not affect the roadless character in the cumulative effects analysis area unless mining were to occur where cover is limited above the Castlegate Sandstone layer.

Coal mining has affected several roadless characteristics via noise from vent shaft fans at the SUFCO Mine. This noise is present in portions of the Wildcat Knolls and White Mountain IRAs and the White Mountain draft unroaded-undeveloped area. It is reasonably foreseeable that the current proposal could add an additional ventilation fan system which would increase the extent of the area where fan noise could be heard. Existing and reasonably foreseeable new noise from the fans were assessed in a noise study prepared for this project (Tetra Tech 2008).

Exploratory drilling has been completed across the analysis area in order to define the coal reserves. In the past, exploratory drilling has been completed with conventional land-based drills. These drills required road access and preparation of the drill site to bring in drill rigs. Existing roads were used if they provided access to the site, but otherwise temporary roads were built. Advances in technology and the availability of heliportable drills have decreased the level of short-term disturbance associated with the exploratory drilling. Impacts associated with exploratory drilling are typically short-term. Once the exploration is complete and the drill sites are reclaimed, the impacts would diminish over time. Additional temporary impacts due to exploratory drilling could likely continue, but these impacts would not have a long-term effect on roadless values in the analysis area.

In terms of roadless characteristics, livestock grazing has had an effect on the analysis area. Roads and trails have been built to facilitate access for livestock management. These roads include both official Forest roads and user-created roads. Road impacts are typically long-term because they often remain in service indefinitely. Livestock water developments and impoundments are also now part of the landscape. Habitat improvement projects for both livestock and wildlife, including controlled burns and mechanical treatments, have affected the character of the area, but such effects are short term and disappear as the vegetation regrows.

The Link Canyon and East Box Creek timber sales affected the Muddy Creek-Nelson Mountain IRA in the early 1980’s. These sales used existing roads and created new roads for logging access and timber removal. Logging has affected the roadless character of a portion of the IRA where the logging occurred but these impacts have diminished over time. The Greens Hollow tract project would not cumulatively affect the roadless character of the Muddy Creek-Nelson Mountain IRA or the Muddy Creek unroaded-undeveloped area.

Unauthorized recreational use has resulted in new roads in the analysis area, including the roadless areas, and this pattern is likely to continue as recreational ATV and 4-wheel drive use persists in the area.
<table>
<thead>
<tr>
<th>Wilderness Quality or Attribute</th>
<th>Is there an effect?</th>
<th>Which direction is the effect? Improving, Stable or Degrading?</th>
<th>Description of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Untrammeled</strong></td>
<td>Yes</td>
<td>Stable in Muddy Creek – Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA</td>
<td>Construction of a power line outside the Greens Hollow tract could have an effect on the sage-grouse population associated with the Wildcat Knolls lek. A power line could provide hunting perches for raptors, increasing sage grouse depredation. Noise impacts, discussed below, would also affect this attribute in the White Mountain and Wildcat Knolls IRAs and White Mountain unroaded-undeveloped area.</td>
</tr>
<tr>
<td>This quality monitors modern human activities that directly control or manipulate the components or processes of ecological systems inside wilderness.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Natural</strong></td>
<td>Yes</td>
<td>Stable in Muddy Creek – Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA</td>
<td>As noted above, a power line could affect wildlife in the White Mountain and Wildcat Knolls IRAs, depending on its location. Visitors to the IRAs could experience scenic impacts due to a power line. A power line would appear as an unnatural element, particularly when viewed from foreground views. In addition, short-term impacts would include tire tracks due to off-road travel during power line construction and occasional maintenance. The vent shaft that would be constructed outside of the lease area would have a fan system. Fan noise would likely carry for some distance depending on wind speed, direction, temperature, and other variables. Although the actual structure could be located outside of the IRAs, the fan noise would be present within portions of the Wildcat Knolls and White Mountain IRAs. Fan noise from an existing fan in the North Fork Quitchupah Creek can be heard in the general area.</td>
</tr>
<tr>
<td>This quality monitors both intended and unintended effects of modern people on ecological systems inside wilderness since the time the area was designated.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Undeveloped</strong></td>
<td>Yes</td>
<td>Stable in Muddy Creek - Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA</td>
<td>A power line crossing IRAs in the analysis area would decrease this value in the respective IRA. Short-term impacts would occur during construction as construction crews work along the corridor. Long-term impacts would remain as a result of the permanence of the power line. Power line structures would decrease the undeveloped quality of affected IRAs for visitors. Intrusion into the IRA for power line construction and maintenance would represent periodic impacts to undeveloped quality.</td>
</tr>
<tr>
<td>This quality monitors the presence of structures, habitations, and other evidence of modern human presence of occupation.</td>
<td></td>
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</tr>
</tbody>
</table>
The noise from a ventilation installation outside of the lease tract would affect the undeveloped nature of the nearby IRAs. Noise from the fan would be audible in portions of the Wildcat Knolls and White Mountain IRAs. Fan noise from an existing fan in the North Fork Quitchupah Creek currently exists in the general area.

### Outstanding opportunities for solitude or a primitive and unconfined type of recreation
This quality monitors conditions that affect the opportunity for people to experience solitude, or primitive, unconfined recreation in a wilderness setting.

<table>
<thead>
<tr>
<th>Solitude</th>
<th>Yes</th>
<th>Stable in Muddy Creek-Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities for Primitive Recreation</td>
<td>Yes</td>
<td>Stable in Muddy Creek-Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA</td>
</tr>
<tr>
<td>Special Features (Ecological, Geologic, Scenic or Historical)</td>
<td>No</td>
<td>Special features identified in the IRAs would not be affected.</td>
</tr>
<tr>
<td>Manageability (as Wilderness)</td>
<td>Yes</td>
<td>Stable in Muddy Creek-Nelson Mountain and White Mountain IRA; Degrading in the Wildcat Knolls IRA</td>
</tr>
</tbody>
</table>

Construction of a power line and noise from a vent shaft fan would decrease the size of the areas available for primitive recreation where visitors could be isolated from the evidence of man. Noise from a ventilation fan would likely affect both the Wildcat Knolls and White Mountain IRAs.

If a power line crossed the Wildcat Knolls IRA it could effectively decrease the size of the two remaining blocks of this IRA below 5,000 acres. The manageability of the Muddy Creek-Nelson Mountain and White Mountain IRAs would not be affected.
<table>
<thead>
<tr>
<th>Roadless Characteristics</th>
<th>Is there an effect?</th>
<th>Which direction is the effect?</th>
<th>Describe the actual effect</th>
</tr>
</thead>
</table>
| Soil, Water and Air resources                                                            | Yes                 | Degrading                     | Soil- Construction of a power line would result in minimal long-term soil disturbance along its length. Disturbance would be limited to pole holes and compaction from cross-country travel. Construction of a ventilation shaft site would affect soil resources within the site, estimated to be 10 acres.  
Water- None.  
Air- No long-term detrimental effects on this characteristic. Short-term impacts to air quality would be possible from the construction of a power line in an IRA and construction of a vent shaft facility outside of the IRAs. |
<p>| Sources of public drinking water                                                         | No                  | Stable                        | None.                                                                                                                                                                                                                 |
| Diversity of plant and animal communities                                                | No                  | Stable                        | The IRAs support a range of plant and animal communities associated with the sagebrush, pinyon-juniper, and other forested habitats present. Impacts due to the project would be limited to a ventilation shaft facility and a power line. |
| Habitat for TES and species dependent on large undisturbed areas of land                  | Yes                 | Degrading (potential effect to sage-grouse) | No long-term or short-term effects are anticipated to this characteristic for plants in these categories. No T&amp;E plants are known to occur in the analysis area. A power line alignment would be chosen to minimize potential impacts to sage-grouse by placing the power line where it would not provide raptor perch sites for hunting in sage-grouse habitat. Noise from a fan could affect sage-grouse use of the Wildcat Knolls lek, and disturbance associated with construction could affect sage-grouse and other wildlife species. |
| Primitive and semi-primitive classes of recreation                                       | Yes                 | Stable in Muddy Creek-Nelson Mountain IRA; Degrading in White Mountain and Wildcat Knolls IRA | A power line crossing through an IRA would adversely affect primitive and semi-primitive recreation opportunities. A power line would represent a modern intrusion into the IRA and would be subject to human presence during construction and periodic maintenance. Noise from a ventilation fan system located off of the lease tract would adversely affect this attribute in the Wildcat Knolls and White Mountain IRAs. |</p>
<table>
<thead>
<tr>
<th>Table 4.13. (cont’d) Reasonably Foreseeable Post-lease Surface Use Effects to Wilderness Quality or Attributes and Roadless Characteristics due to Conceptual Elements Located Outside the Greens Hollow Tract.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference landscapes for research study or interpretation</td>
</tr>
<tr>
<td>Landscape character and integrity</td>
</tr>
<tr>
<td>Traditional cultural properties and sacred sites</td>
</tr>
<tr>
<td>Other locally unique characteristics</td>
</tr>
<tr>
<td>Wilderness Quality or Attribute</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td><strong>Untrammeled</strong>&lt;br&gt;This quality monitors modern human activities that directly control or manipulate the components or processes of ecological systems inside wilderness.</td>
</tr>
<tr>
<td><strong>Natural</strong>&lt;br&gt;This quality monitors both intended and unintended effects of modern people on ecological systems inside wilderness since the time the area was designated.</td>
</tr>
<tr>
<td><strong>Undeveloped</strong>&lt;br&gt;This quality monitors the presence of structures, habitations, and other evidence of modern human presence of occupation.</td>
</tr>
</tbody>
</table>
| Outstanding opportunities for solitude or a primitive and unconfined type of recreation | Solitude | Yes | Degrading | Opportunities for solitude would decrease due to the construction of the ventilation shaft facility outside of the Greens Hollow tract. One possible location for this facility would be in the White Mountain draft unroaded-undeveloped area on the southern edge of the unit. Effects to this attribute would be due the presence of the facility (localized) and the propagation of fan noise (more wide spread) within the unit. Construction of a power line could occur in a portion of the White Mountain draft unroaded-undeveloped area. Locating the power line near the boundary and near an existing Forest Road would result in the impact on this attribute being localized.

Outstanding opportunities for Primitive Recreation
This quality monitors conditions that affect the opportunity for people to experience solitude, or primitive, unconfined recreation in a wilderness setting. |
| Opportunities for Primitive Recreation | Yes | Degrading | Opportunities for primitive recreation would decrease due to the construction of the ventilation shaft facility outside of the Greens Hollow tract. This facility would likely be located in the White Mountain draft unroaded-undeveloped area on the southern edge of the unit. Effects to this attribute would be due the presence of the facility (localized) and the propagation of fan noise (more wide spread) within the unit. Construction of a power line could occur in a portion of the White Mountain draft unroaded-undeveloped area. Locating the power line near the boundary and near an existing Forest Road would result in the impact on this attribute being localized.

Special Features (Ecological, Geologic, Scenic or Historical)
An attribute that recognizes that wilderness may contain other values of ecological, geologic, scenic, or historic or cultural significance. | No | Stable | No effect. Heliotrope milkvetch is not known to occur in the area that would be affected by the ventilation shaft facilities that would be located outside of the Greens Hollow tract. |
<table>
<thead>
<tr>
<th>Manageability (as Wilderness)</th>
<th>Yes</th>
<th>Degrading</th>
</tr>
</thead>
<tbody>
<tr>
<td>A measure of the ability to manage an area to meet the size criterion (5,000 + acres), the resulting configuration of the potential wilderness, and the interaction of the other elements above.</td>
<td>Construction of a ventilation shaft facility and a power line outside of the Greens Hollow tract could decrease the manageability of the White Mountain draft unroaded-undeveloped area as wilderness. The vent shaft facility would likely be located on the southern edge of the White Mountain draft unroaded-undeveloped area. Their physical presences and the noise effects from the fan that would propagate out would decrease the effective size of this unit. However, a manageable wilderness boundary could be created by excluding the affected area in any proposed wilderness.</td>
<td></td>
</tr>
</tbody>
</table>
The impacts to roadless characteristics associated with the implementation of the Proposed Action or Alternative 3 discussed previously would be cumulative with the impacts to roadless characteristics of past, present, and reasonably foreseeable future actions discussed in this section. The development of the Greens Hollow tract, in conjunction with past, present, and reasonably foreseeable future actions would not incrementally add roads to the roadless areas. It is possible that some reasonably foreseeable surface facilities could be sited outside of roadless areas and adjacent to existing roads, and access would be underground from existing mines. However, infrastructure that would be associated with the Greens Hollow tract, including the power line and noise from the vent shaft fans, would incrementally affect roadless characteristics and wilderness attributes in the Wildcat Knolls and White Mountain IRAs and the White Mountain draft unroaded-undeveloped area. The duration of these impacts would be for the life of the mine. As noted, after mining is completed, the company would be required to remove the infrastructure, and reclaim any disturbance.

4.13 AIR QUALITY

A technical review was performed to assess potential impacts on ambient air quality from future development of the Greens Hollow tract adjacent to the existing SUFCO Convulsion Canyon Mine in Sevier and Sanpete counties. Issues raised during public scoping include the following:

**Issue 1:** Extended life of coal handling and hauling, mine ventilation, coal stockpiles, etc. could impact air quality.

- **Evaluation Criteria:** Describe existing air quality and analyze potential changes in air quality. Compare current conditions and projected future conditions with State air quality standards. Identify Class I and II areas and impacts to them.

**Issue 2:** Coal mine methane released through vent shafts could be converted into electrical power.

- **Evaluation Criteria:** Methane concentration exhausted from vent shaft; feasibility.

Therefore, the following issues are addressed quantitatively or qualitatively in this analysis:

1. Project construction-related impacts.
2. Project operational impacts.
3. Impacts to attainment of the NAAQS for the analysis area.
4. Prevention of Significant Deterioration (PSD) review.
5. Air Quality Related Values: Visibility impacts to the Class I areas, acid deposition, flora, and fauna.
6. General Conformity.
7. Cumulative Impacts.

Impacts to air quality generated by mining activities are largely due to the dispersion of small diameter dust particles from the action of prevailing winds and/or the turbulence caused by moving machinery and trucks. These dust emissions are typically termed "fugitive dust." Other impacts include emissions of nitrogen oxides ($NO_x$), carbon monoxide (CO), sulfur dioxide and hydrocarbons from the diesel engines (such as loaders and haul trucks) used in mining operations and to load and transport coal. Coal mine ventilation air is a potential source of methane emissions.

The proposed Greens Hollow tract leasing action is projected to extend the mine life of the existing SUFCO Mine operations. The Proposed Action would add mining activities through underground workings in the existing SUFCO permit area. Existing portal facilities in the SUFCO mine complex would be used. The existing facility is currently permitted to operate under a state of Utah Approval.
Order (Utah DEQ 2006). This permit identifies the potential to emit the following pollutants: \( \text{PM}_{10}, \text{SO}_2, \text{NO}_x, \text{CO}, \text{VOC}, \) and aldehydes. The state considers ozone precursors (NOx and VOC) rather than ozone directly in the permitting process. The previous Muddy Creek analysis area which included much of the Greens Hollow tract was evaluated in 2004 (Cirrus 2004) and has been incorporated into the above referenced Approval Order. The following discussion addresses additional air quality impacts resulting from the Proposed Action that have not been previously evaluated.

### 4.13.1 PROJECT EMISSIONS INVENTORY

Emissions are quantified to determine the relationship between emissions released into the atmosphere from various sources and the ambient concentrations that result. An emissions inventory is a listing, by source, of the amount of air pollutants discharged into the atmosphere per unit time. Ambient concentration refers to the mass of a pollutant per unit volume in the atmosphere and is commonly expressed in units of micrograms per cubic meter (\( \mu\text{g/m}^3 \)). The air quality impacts of future development can be predicted using the emissions calculated in an emissions inventory.

#### 4.13.1.1 Emissions Inventory – Operations

The Greens Hollow tract would utilize existing surface facilities and coal movement operations at the SUFCO mine. The emission rates for the existing mining operation were calculated for the Muddy Creek EIS (Cirrus 2004). Operational emission sources evaluated were:

1. Conveyor and Transfer Points including Crushing, Screening and Truck Loading,
2. Wind Erosion from Open Storage Piles,
3. Vehicular Traffic/Haul Roads Paved and Unpaved,
4. Front End Loader Operations and Travel on Unpaved Roads,
5. Underground Diesel Equipment and Heaters Vented through Mine Portals and vents.

The total annual emission rates in tons per year estimated for the Muddy Creek mining operations were as follows.

<table>
<thead>
<tr>
<th></th>
<th>( \text{PM}_{10} )</th>
<th>( \text{NO}_x )</th>
<th>( \text{CO} )</th>
<th>( \text{SO}_x )</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24.1</td>
<td>62.0</td>
<td>17.7</td>
<td>4.7</td>
<td>4.7</td>
</tr>
</tbody>
</table>

#### 4.13.1.1.1 Ventilation-Air Methane

Methane emissions would likely continue at current rates described in Section 3.13.6.1 for the additional life of the mine that depends on the final agency decision.

#### 4.13.1.1.2 Ventilation – \( \text{CO}_2 \)

\( \text{CO}_2 \) emissions would likely continue at current rates described in Section 3.13.6.2 for the additional life of the mine that depends on the final agency decision.

#### 4.13.1.1.3 Nonmethane Organic Compounds

NMOC emissions would likely continue at current rates described in Section 3.13.6.3 for the additional life of the mine that depends on the final agency decision.

#### 4.13.1.1.4 Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are anticipated from operation of the mine from combustion sources such as the emergency diesel generators, and vehicle exhaust. The HAP emissions were not identified as
pollutants of concern for this project because they are not expected to be at significant levels. The impacts are anticipated to be small in relation to other regional combustion sources.

### 4.13.2 AIR QUALITY IMPACTS

The 2004 Muddy Creek analysis (Cirrus 2004) addressed air quality impacts to the Capitol Reef National Park Class I area, nearby non-attainment areas, and the local Class II area due to particulate emissions. Air quality impacts due to operations were discussed above.

EPA set a new 1-hour NO\textsubscript{2} standard effective January 22, 2010, after much of the Greens Hollow tract analysis was completed. To determine compliance with the new standard, EPA established new ambient air monitoring requirements for NO\textsubscript{2}. In urban areas, monitors are required near major roads as well as in other locations where maximum concentrations are expected. Additional monitors are required in large urban areas to measure the highest concentrations of NO\textsubscript{2} that occur across communities. Utah DEQ and the EPA will be evaluating the existing monitoring network for compliance with the new standard and will have two years to make necessary monitoring station location adjustments (UDAQ 2011). Because the Greens Hollow tract is in a remote location, it is likely that the area will be designated to be in attainment of the new 1-hour NO\textsubscript{2} standard even with a potential expanded monitoring network. The combustion sources at the Greens Hollow tract would be subject to state permitting requirements and associated compliance demonstrations. Due to the limited increases in combustion emissions, impacts were not quantified.

The 2004 Muddy Creek analysis (Cirrus 2004) also addressed visibility impacts to the Capitol Reef National Park Class I area. Because of the conservative assumptions built into the previous analysis, it is believed that the visibility impacts and the conclusions drawn in that analysis remain valid. The Muddy Creek analysis used Level-1 screening worst-case assumptions and it was assumed that the observer was located at the boundary of the Capitol Reef National Park. The visual range was set at 170 kilometers which is the maximum visual range in the continental United States. The results showed that screening criteria at the Capitol Reef National Park are not exceeded, that is, the project would not impact visibility in the nearest Class I area.

### 4.13.3 SUMMARY OF RESULTS

#### 4.13.3.1 Compliance with the NAAQS

**4.13.3.1.1 Alternative 1-No Action Direct and Indirect Effects**

Under Alternative 1, the No Action Alternative, the Greens Hollow tract would not be leased and there would be no mining in the Greens Hollow tract. There would be no mining-related impacts to air quality resulting from the Greens Hollow tract, but the existing SUFCO mine operation and other mines in the area would continue to operate as would other regional point sources. The Hunter Power Plant would continue to operate, burning coal from other sources. Air emissions from transportation of coal to various power plants would continue; however, travel routes and distances may vary depending on the proximity of the coal source to the ultimate end users. The No Action Alternative may result in haul routes that are much further from the end user destination resulting in greater environmental impacts.

Other air quality impacts from traffic on highways, wood burning stoves, fireplaces, forest fires, prescribed burning, and wind-blown dust would continue and may increase slightly from general regional growth.
4.13.3.2 Alternative 2-Proposed Action Direct and Indirect Effects
Alternative 2, as described in Section 2.4, is for the BLM to lease and the FS to consent to leasing within the Greens Hollow tract. The emissions inventory discussed above indicates that air quality would be minimally impacted by the addition of particulate matter, CO, SO₂, NOₓ and VOC from mining operations associated with this alternative.

4.13.3.3 Alternative 3 Direct and Indirect Effects
Because this alternative does not change the surface operation of the mine, the conclusions drawn for Alternative 2 would apply to this alternative.

4.13.3.2 Impacts to Class I Areas
Based on results from the 2004 Muddy Creek analysis (Cirrus 2004), Alternatives 2 and 3 would not substantially impact the Capitol Reef National Park Class I Area.

4.13.3.3 Prevention of Significant Deterioration
Emissions from alternatives 2 and 3 are less than the PSD threshold of 250 tons per year, so PSD requirements do not apply.

4.13.3.4 Air Quality Related Values
Air Quality Related Values (AQRVs) would not be substantially impacted by Alternatives 2 and 3:

- Visibility - Level 1 screening analysis performed for the 2004 Muddy Creek analysis (Cirrus 2004) indicates that visibility in the Capitol Reef National Park Class I area would not be impacted from operations of the Greens Hollow tract.
- Acid rain - Acid rain comes from sulfur oxides and nitrogen oxides, products of burning coal and other fuels and from certain industrial processes. The proposed project alternatives do not produce emissions that would be considered significant sources of acid rain.
- Flora and Fauna - Air quality standards are designed to protect both health and environment. Modeling results show compliance with air quality standards, therefore, air quality impacts to flora and fauna at Class I areas would not be expected.

4.13.3.5 General Conformity
The analysis area is located in counties that are in attainment of the NAAQS for all criteria pollutants as defined under the USEPA National Ambient Air Quality Standards.

4.13.3.6 Global Climate Change
Climate change analyses are comprised of several factors, including greenhouse gases (which include methane and CO₂), land use management practices, and the albedo effect (reflectivity of the surface – vegetation or water). The tools necessary to quantify incremental climatic impacts of specific activities associated with those factors are presently unavailable (i.e., existing climate prediction models are not at a scale sufficient to estimate potential impacts of climate change within the analysis area). Research on how emissions of Green House Gases (GHG) influence global climate change and associated effects has focused on the overall impact of emissions from aggregate regional or global sources. This is primarily because GHG emissions from single sources are small relative to aggregate emissions, and GHGs, once emitted from a given source, become well mixed in the global atmosphere and have a long atmospheric lifetime. The climate change research community has not yet developed tools specifically intended for evaluating or quantifying end-point impacts attributable to the emissions of GHGs from a single source, and there is a lack of any scientific literature to draw from regarding the climate effects of individual,
facility-level GHG emissions. The current tools for simulating climate change generally focus on global and regional-scale modeling. Global and regional-scale models lack the capability to represent explicitly many important small-scale processes. As a result, confidence in regional- and sub-regional-scale projections is lower than at the global scale. There is thus limited scientific capability in assessing, detecting, or measuring the relationship between emissions of GHGs from a specific single source and any localized impacts. As a consequence, impact assessment of effects of specific anthropogenic activities cannot be performed. Additionally, specific levels of significance have not yet been established. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing of factors that contribute to climate change. Qualitative and/or quantitative evaluation of potential contributing factors within the planning area is included where appropriate and practicable.

It is not currently known what the end use of the coal produced from the Greens Hollow tract would be although it is likely that most of the coal would be used for electrical energy production. If existing contracts are extended, it is likely that the majority of the coal would continue to be delivered to the Hunter Power Plant with the remainder transported to multiple end users.

There is no reliable methodology to assess the relationship between plan decisions and the consumption of the resources produced as a result of plan decisions. An attempt to analyze the impacts of greenhouse gas emissions and other climate change factors from the consumption of the resources produced from the planning area would be a highly speculative exercise unnecessary for the land management decisions for which the agencies are responsible. The agencies do not determine the destination of the resources produced from Federal lands. The effects from consumption are not only speculative, but beyond the scope of agency authority or control. Therefore, this document does not include quantitative analysis of the consumption of resources produced as a result of planning decisions. Chapter 3 described existing regional sources of GHG and black carbon. Those regional GHG and black carbon emissions described in Chapter 3 would not change appreciably as a result of the Proposed Action because the annual coal production rate is not expected to increase.

4.13.3.7 Transportation of Coal

Agencies acknowledge that the current truck traffic to haul coal to either an end user or a central loading point for rail loading would be extended under the action alternative. The majority of the coal currently is trucked to the Hunter Power Plant. While this activity would be extended under the action alternative, it is likely that truck traffic would continue under the no action alternative as well from alternative sources for the life of the power plant. Therefore, emissions would likely continue at current levels with the exception of a probable reduction in sulfur emissions due to new sulfur standards for diesel fuel. Construction of the Quitchupah Creek Road will also greatly reduce truck hauling distance between the mine entry and State Highway 10, thereby reducing emissions.

4.13.3.8 Combustion of Coal

BLM acknowledges that the burning of the coal is an indirect impact that is a reasonable progression of the mining activity. BLM does not authorize the burning of coal by issuing a lease for federal coal. The releases of sulfur, nitrogen, mercury, arsenic, particulates, etc. from the burning of coal are authorized through state and federal permitting processes, and are issued to the operators of such facilities. BLM does not have access to the various control technologies that may be utilized by the operators of the facilities ultimately burning the coal and could not develop reasonable emissions estimates for specific pollutants. Scrubber and bag-house technologies vary as do operating parameters such as boiler temperatures and pressures. There are many facility-dependent parameters that affect emissions of specific pollutants which are largely dictated by existing facility authorizations. Analytical techniques are not available to address specific design criteria of potential end users and their permit limitations.
associated with the above referenced pollutants and resulting potential emissions have therefore not been quantified.

The composition of coal from the Proposed Action is not available and would be different than the existing mine; however, the dry basis composition of the coal from the existing mine is as follows:

**Ultimate Analysis (%)**

<table>
<thead>
<tr>
<th></th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>12.33</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.40</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>1.19</td>
</tr>
<tr>
<td>Carbon</td>
<td>71.94</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>4.58</td>
</tr>
<tr>
<td>Oxygen</td>
<td>9.56</td>
</tr>
</tbody>
</table>

The Hunter Power Plant or other users of the coal (refer to Chapter 3 for emissions and authorizations) would likely continue as one end user of coal either from the proposed Greens Hollow tract or from another source. This plant is anticipated to continue operations as authorized by the state for the life of the facility. Therefore, regional impacts to ambient air quality from the combustion of coal within the region would be generally the same for each Alternative.

### 4.13.4 CUMULATIVE IMPACTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, ongoing, and reasonably foreseeable projects that have affected the air quality of the cumulative effects analysis area. The cumulative effects analysis area as defined for the air quality analysis includes the regional airshed that encompasses the landscape setting for the Greens Hollow tract project.

Table 2.1 lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis.

#### 4.13.4.1 Reasonably Foreseeable Post-lease Surface Use on the Greens Hollow Tract

- *Reasonably foreseeable surface construction activities and mine ventilation could impact air quality.*

**Emissions Inventory – Reasonably Foreseeable Construction**

Heavy construction is a source of dust emissions that may temporarily impact local air resources. Reasonably foreseeable minimal construction would be required and it is estimated that a total of 10 acres would be disturbed for construction activities over a potential two year period for construction of a vent shaft. This is less than previously evaluated in the 2004 Muddy Creek analysis (Cirrus 2004) which assumed five acres disturbed at a time during any given month. Using AP-42 equations (USEPA 2008), the proposed project would produce about 0.55 tons of PM10 (0.055 tons is PM$_{2.5}$) over a one year period at the vent shaft location plus an additional 11 tons per year (TPY) of fugitive PM10 emissions (1.1 TPY PM$_{2.5}$), from heavy construction and light construction vehicle traffic to and from the site, which would occur over the approximate two-year construction period.

Construction access to the vent shaft site would be through existing roads currently consisting of naturally occurring parent material. These roads would be maintained as necessary.
Emissions Inventory – Reasonably Foreseeable Operations

While the mine would primarily utilize existing mining facilities, it is reasonably foreseeable that wind erosion from a new stockpile area would provide a new source for the operation of the facility. Stockpile emissions were evaluated in the 2004 Muddy Creek analysis (Cirrus 2004) and would add less than 0.5 TPY of PM$_{10}$ (0.05 TPY PM$_{2.5}$). Only a fraction of the stockpile particulates would be fine particle.

The new vent shaft would relocate ventilation for the underground mining operations to accommodate the Greens Hollow tract but would not add additional emissions since the vent would function as an intake.

Reasonably Foreseeable Air Quality Impacts

Reasonably foreseeable surface facility operation would add 1.5 TPY of particulate emissions. On site temporary construction emissions at the vent shaft site would add less than 1 ton of PM$_{10}$ total over an approximate one year period.

4.13.4.2 Reasonably Foreseeable Post-lease Surface Use Outside the Greens Hollow Tract

- Reasonably foreseeable surface construction activities and mine ventilation could impact air quality.

Emissions Inventory – Reasonably Foreseeable Construction

Heavy construction is a source of dust emissions that may temporarily impact local air resources. Reasonably foreseeable minimal construction would be required and it is estimated that a total of 10 acres would be disturbed for construction activities over a two year period for construction of the vent shaft. This is less than previously evaluated in the 2004 Muddy Creek analysis (Cirrus 2004) which assumed five acres disturbed at a time during any given month. Using AP-42 equations (USEPA 2008), the proposed project would produce about 0.55 tons of PM$_{10}$ (0.055 tons is PM$_{2.5}$) over a one year period at the vent shaft location plus an additional 19 tons per year (TPY) of fugitive PM$_{10}$ emissions (1.9 TPY PM$_{2.5}$), from heavy construction and light construction vehicle traffic to and from the site, which would occur over the approximate two-year construction period.

Construction access to the vent shaft site would be through existing roads currently consisting of naturally occurring parent material. These roads would be maintained as necessary.

Emissions Inventory – Reasonably Foreseeable Operations

While the mine would primarily utilize existing mining facilities, it is reasonably foreseeable that there would be three new sources for the operation of the facility. These include:

1. Two emergency diesel generators would provide backup power for the new fan shaft. The new fan shaft would be equipped with two 2000 kilowatt Caterpillar 3516B diesel engine generators, or similar, in parallel to start a 2500 horsepower fan. Once the fan starts, one of the generators would be shut down and the other would remain operational until either facility operations were shut down or until line power was restored.
2. Wind Erosion from a new stockpile area.
3. Access to the vent shaft site for weekly examination of ventilation equipment and maintenance activities.

Assuming 500 hours of emergency generator operation per year, the total annual emission rates in TPY are as follows.
The main source of increased fugitive dust would be associated with wind erosion from the reasonably foreseeable material stockpile at the ventilation shaft site. The reasonably foreseeable vent shaft would relocate ventilation for the underground mining operations to accommodate the Greens Hollow tract but would not add additional emissions since the underground sources were accounted for in the 2004 Muddy Creek Analysis (Cirrus 2004). Stockpile emissions were evaluated in the 2004 Muddy Creek analysis (Cirrus 2004) and would add less than 0.5 TPY of PM$_{10}$ (0.05 TPY PM$_{2.5}$). Only a fraction of the stockpile particulates would be fine particle.

Using AP-42 equations (USEPA 2008), vehicular traffic to the vent shaft site for routine inspections and maintenance would add an additional 1.4 TPY of PM$_{10}$ (0.14 TPY PM$_{2.5}$) assuming light duty vehicles, unpaved roads, and 37 average vehicle miles traveled per round trip. This estimate does not take any control credit for wet days and therefore is considered to be very conservative.

Combustion sources include the operation of two emergency diesel generators. Because the diesel generators are to be used for upset conditions only, pollutant emission rates from the combustion sources would be very similar to current operations and would result in minor adverse impact to air quality resources. It is expected that all of the particulates from the diesel generators are fine particle (PM$_{2.5}$). In addition, NO$_x$ and SO$_2$ are considered precursor pollutants to the formation of PM$_{2.5}$. However, the NO$_x$ and SO$_2$ emissions from the operation of the diesel generators are less than the significant emission rates established under the final rule of the New Source Review provisions for PM$_{2.5}$ (USEPA 2008).

Construction impacts were deemed to be of a temporary nature. The conservative screening modeling performed in the 2004 Muddy Creek analysis (Cirrus 2004) showed near field concentrations of PM$_{10}$ are acceptable and when added to background concentrations would not violate the 24-hr NAAQS. Construction activities would have a minor adverse impact to air quality resources.

**Reasonably Foreseeable Air Quality Impacts**

Reasonably foreseeable surface facility operation would add 1.5 TPY of particulate emissions. On site temporary construction emissions at the vent shaft site would add less than 1 ton of PM$_{10}$ total over an approximate one year period. The majority of the temporary construction emissions would occur along 14 miles of roads to the vent shaft site due to traffic to and from the site. The maximum increase in PM$_{10}$ emissions would be 15 TPY spread over the 14 mile stretch. While this could be considered a substantial increase compared to the Muddy Creek analysis, there are several relevant limiting factors:

- The emissions are spread over a 14 mile road with varied terrain and therefore should be well distributed along the route. Distribution of the emissions over the entire area of the road results in an emission rate of $2.4 \times 10^6$ g/sec-m$^2$ PM$_{10}$. The emission rate in the SCREEN3 analysis performed for the construction of the Muddy Creek tract was $7.68 \times 10^6$ g/sec-m$^2$ PM$_{10}$. While it is not practical to run a SCREEN3 analysis on the 14 mile road because the aspect ratio is too large, it is believed that additional modeling would result in concentrations less than predicted for the Muddy Creek Tract construction because the area source emission rate is less than previously analyzed.

- Re-entrained road dust emissions are not high loft emissions and are therefore, typically very localized. Previous screening of fugitive dust sources from the Muddy Creek analysis showed peak impacts within 100 meters of the source with less than half the concentrations at 400 meters.

- The road will be sprayed to control fugitive dust emissions.

<table>
<thead>
<tr>
<th>PM$<em>{10}$/PM$</em>{2.5}$</th>
<th>NO$_x$</th>
<th>CO</th>
<th>SO$_2$</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.44</td>
<td>15.00</td>
<td>3.44</td>
<td>2.53</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Greens Hollow Federal Coal Lease Tract
• Construction activities are short term and are expected to be performed over an approximate one year period.

• The construction activities would not be concurrent with the operation of the Greens Hollow tract.

Because of the conservative assumptions built into the analysis, it is believed that the environmental impacts and the conclusions drawn in the previous analysis remain valid. The recent upgrade of the nearby areas previously designated as non-attainment highlights improvements in overall regional air quality (refer to Chapter 3). The modeled PM_{10} concentrations results of the 2004 Muddy Creek analysis are summarized in Table 4.15.

The 2004 Muddy Creek analysis (Cirrus 2004) did not evaluate PM_{2.5} impacts because the regulation was not in effect at that time. The PM_{2.5} NAAQS have since been promulgated, and non-attainment areas in Utah have been established (refer to Section 3.13.5). The analysis area is currently classified as in attainment of the PM_{2.5} NAAQS. The small increase in particulates due to construction and operation of the Proposed Action is not expected to notably affect attainment because the increase is insignificant in relation to regional sources.

<table>
<thead>
<tr>
<th>Model Year</th>
<th>Averaging Time</th>
<th>Background Conc.</th>
<th>Class I Cap Reef Conc.</th>
<th>Class II Conc.</th>
<th>Total Class II Conc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Annual</td>
<td>10</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td>24-Hr</td>
<td>28</td>
<td>0.2</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>1998</td>
<td>Annual</td>
<td>10</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td>24-Hr</td>
<td>28</td>
<td>0.3</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>1999</td>
<td>Annual</td>
<td>10</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0006</td>
</tr>
<tr>
<td></td>
<td>24-Hr</td>
<td>28</td>
<td>0.2</td>
<td>0.06</td>
<td>0.04</td>
</tr>
</tbody>
</table>

* Source: Cirrus 2004.
* Re-designations are pending for all three locations (refer to Section 1.6).
* Includes background.

The effects of this project would be cumulative with other impacts occurring in the area. Based on the general excellent air quality in the region, cumulative impacts of the proposed project on ambient air quality would be minimal and would be generally the same for each Alternative. Wildfires and prescribed burning may affect air quality in the project vicinity, both of which are capable of exceeding the federal standards for PM_{2.5} and PM_{10}. Other potential new projects in the region and general growth may also impact air quality. The proposed Greens Hollow tract by itself would have minor impacts to air quality as was demonstrated by this analysis. Minor impacts to air quality could in turn add minimally to the surrounding ecosystem. Consequently, it would add only a minor increment to the air quality impacts of any other projects in the vicinity of the project.
4.14 UNAVOIDABLE ADVERSE IMPACTS

This disclosure is required under NEPA and CEQ regulations regarding its implementation. This analysis identified several unavoidable, adverse, environmental impacts, the most notable of which include:

1. Loss of water from deep inactive groundwater systems. This water is considered to be isolated from active groundwater discharge that supports baseflow in Muddy Creek or other perennial stream segments in the analysis area.
2. The potential exists for relocation of spring discharge locations and permanent loss of dependent vegetation at spring discharge sites.
3. The potential exists for short-term water loss from stream segments and ponds prior to mitigation.
4. Impacts of subsidence and reasonably foreseeable surface resources following facility construction include short-term disruptions and disturbance to the normal life-cycles of wildlife and vegetation communities.
5. Subsidence associated with subsurface long wall mining and reasonably foreseeable construction of vent shafts, power line, and access road maintenance would affect prehistoric or prehistoric/historic sites.

4.15 SHORT-TERM USES V. LONG-TERM PRODUCTIVITY

This disclosure, required under NEPA, identifies the costs, in terms of natural productivity in the long-term (i.e. over decades or centuries), that are projected to result from the short-term use, comprised by a proposed action. Short-term impacts to resources in the analysis area have been reviewed and assessed in previous sections of this chapter. To a large degree, these impacts would attenuate through natural processes or human action in the short-term. Under Alternative 2, diversion of water from Muddy Creek to the mine in the north east corner of the analysis area could occur in the short term. The elimination of this impact over the long-term would require successfully removing downward migration and loss of water to the mine. Long-term impacts to springs may occur at a site-specific level (e.g. relocation of spring discharge to downslope areas). Permanent loss of riparian vegetation or wetlands supported by spring discharge at these locations would occur. This short-term loss would be offset by growth of new vegetation and establishment of wetland area at the downslope location.

4.16 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

This required disclosure identifies commitments of resources that, in practical terms, cannot be regained. Irreversible commitment of a resource means that, once committed, the resource is lost to other uses. This type of commitment generally applies to non-renewable resources (e.g. minerals, geologic feature, or cultural resources) or to resources that are only renewable over a very long period of time (e.g. soil productivity or perhaps old-growth forest). Mining of the Lower Hiawatha coal seam would result in the irreversible commitment of the Upper Hiawatha coal seam due to the impact of subsidence on the geologic material above the Lower Hiawatha coal seam (see Section 4.2.2.1). Only a thin layer of material separates the two coal seams (see Section 3.2.4). However, portions of the Upper Hiawatha coal seam are currently unmineable due to coal seam thickness which would lessen the potential impact mining the Lower Hiawatha coal seam could have on the mineability of the Upper Hiawatha coal seam (see Section 4.2.2.1). Interception and removal of water from deeper, inactive groundwater systems, which would occur under all action alternatives, is considered an irretrievable commitment of groundwater resources because these volumes cannot be restored through natural recharge processes without an extensive amount of time (i.e., recharging could take tens of thousands of years).
5.0 CHAPTER 5 – CONSULTATION AND COORDINATION

5.1 INTRODUCTION
The scope of the environmental concerns addressed in this SEIS, the Proposed Action, and the alternatives analyzed were developed in coordination with numerous government agencies and individuals. The process included consultation with the public, scoping with specific agencies, and public comment on the scoping issues. A discussion of the scoping process is included in Chapter 1 (Section 1.8).

Meetings to understand the conceptual mining plan and explore options were held during the EIS process. Issues were identified through comments solicited from the public, and other federal, state, and local agencies that were identified as interested and/or affected by the Proposed Action. Additionally, management concerns were identified by reviewing the Forest Plans and through discussions with the BLM, FS, and other agency resource specialists.

5.2 PUBLIC AND AGENCY INVOLVEMENT
NEPA requires that the public and agency personnel be involved from an early stage in decision making on federal lands. Public involvement is an important part of the environmental and socioeconomic analysis process. A public involvement plan (communications plan) was developed to describe the methods and techniques that would be used to involve the public in the environmental and socioeconomic analysis. The plan allows the public to actively participate in the NEPA process and to communicate issues of support, benefits, and any concerns regarding the proposed action. In addition, involvement of local, State, and other Federal agencies help to anticipate the potential effects and benefits that could result from the project. The plan is part of the project record located in the BLM Price Field Office.

5.2.1 THE SCOPING PROCESS
An important part of the public involvement process is scoping, which the Council on Environmental Quality (CEQ) regulations describe as the process for determining the “scope of the issues to be addressed and for identifying the significant issues related to a proposed action” (40 CFR § 1501.7). In addition to disclosing potentially significant issues of support, benefits, and concern, this process can also identify possible alternatives related to the Proposed Action for consideration in analyzing the impacts of the proposal.

The Notice of Intent (NOI) for the Greens Hollow Coal Lease Tract EIS was printed in the Federal Register (Vol. 73, No. 29, pp. 8060-8062) on Tuesday, February 12, 2008 (Appendix C). The NOI designated a 45-day comment period ending March 28, 2008. A public scoping notice was also prepared and distributed on February 22, 2008 to interested individuals on the BLM, Price Field Office and Manti-La Sal and Fishlake National Forests mailing list. A legal notice was also sent to local newspapers (Richfield Reaper, Sun Advocate, Emery County Progress, and Salina Sun) to notify the general public through newspaper releases and media coverage. Comments were to be directed to the agency project manager in the BLM, Price Field Office. A content analysis of the comments received was prepared.

In addition, in 2004 the FS initiated the preparation of an EIS for the Muddy Creek Tract. Public scoping was conducted from March 5, 2004, through April 12, 2004, and a total of 10 responses were received. Based on the scoping comments and internal agency review, four resources were identified for detailed
analysis in the Muddy Creek EIS: water resources, wildlife and wildlife habitat, vegetation, and cultural/paleontological resources.

5.2.2 RELEASE OF THE DEIS

The DEIS for the Greens Hollow Coal Lease Tract was released and distributed on March 26, 2009. The Environmental Protection Agency (EPA) Notice of Availability (NOA) appeared in the Federal Register on April 3, 2009, initiating the formal comment period on the DEIS (Appendix C). The BLM NOA appeared in the Federal Register on April 6, 2009. The FS Legal Notice of Proposed Action appeared in the Emery County Progress and Sun Advocate newspapers on April 14, 2009 and in the Richfield Reaper and Salina Sun newspapers on April 15, 2009. The 45-day comment period established in the EPA NOA in the Federal Register ended on May 18, 2009. The NOA was also posted on the BLM’s Environmental Notification Bulletin Board (ENBB) on April 3, 2009. An electronic copy of the DEIS was made available on the BLM’s website. Approximately 60 hard copies of the DEIS were mailed to the project mailing list and additional copies were made available at the BLM and FS offices. The project mailing list was compiled from required agencies, interested individuals, scoping activities, and subsequent requests for the EIS. The distribution list for the EIS is provided below.

5.2.3 PUBLIC AND AGENCY MEETINGS

Following the release of the DEIS, a public comment meeting was held in conjunction with the Fair Market Value Hearing in the North Sevier High School auditorium at Salina, Utah on May 6, 2009.

5.2.4 COMMENTS ON THE DEIS

Those receiving a copy of the DEIS were given instructions and the address of where to send comments. At the public meeting, details on how to provide comments and where to send them were also given. Only written comments are included in Appendix C. Oral comments and remarks made during the meeting were used to clarify and index written comments, but persons wanting to submit oral comments were advised that in order for the comment to be included in the document, it would have to be submitted in writing and signed. During the public meeting, attendees were advised that comments which raised concerns with specific areas of the DEIS would be most useful to the process, rather than simply voicing opposition or support. Comment letters were sent to the agency project manager at the BLM Price Field Office in Price, Utah. All comment letters were given an identification number and were placed in the Project Record of the EIS in the order in which they were received. Comments in each letter were subsequently identified and given a code comprised of the comment letter identification number and an additional numerical identifier.

The analysis of the comments focused on substantive comments on the DEIS as directed in 40 CFR 1503.4(b). Substantive comments included those which challenge the information in the DEIS as being accurate or inadequate or which offer specific information that may have bearing on the decision. Comments which merely express an opinion for or against the project were not identified as a comment requiring a response. In cases where the comment was not substantive but appeared to indicate that information in the EIS was either misunderstood or unclear, a response was prepared to clarify the information. Resource specialists prepared draft responses to each substantive comment. Those responses on the DEIS are located in the project record.

5.2.5 COMMENTS RECEIVED DURING THE APPEAL OF THE RECORD OF DECISION

A FEIS and Record of Decision (ROD) for the Greens Hollow Federal Coal Lease Tract were released by the FS and BLM in December 2011. Interested parties on the mailing list were sent a notification dated December 14, 2011 of the release of the FEIS and ROD. The notification informed the interested parties...
where the FEIS and ROD could be located electronically and included the documents or CD, if requested. An EPA NOA was published in the Federal Register on Friday, December 23, 2011 (Appendix C).

An appeal of the ROD was filed with the Regional Forester on February 13, 2012 by the Utah Environmental Congress, Grand Canyon Trust, and Center for Biological Diversity.

The FS withdrew the ROD for the Greens Hollow Coal Lease Tract on March 20, 2012. Concerns raised in the appeal were further addressed in this SEIS.

5.2.6 NOTICE OF INTENT TO PREPARE A SUPPLEMENTAL EIS
An EPA NOI was published in the Federal Register on Thursday, October 18, 2012 announcing the intent to prepare a supplemental EIS on the Greens Hollow Federal Coal Lease Tract (Appendix C). Additional scoping was not conducted in accordance with 40 CF 1502.9(c) (4). There will be a 45-day comment period after the draft SEIS is issued.

5.2.7 COMMENTS LEADING TO ALTERNATIVES
All of the above mentioned comments were taken into consideration when developing alternatives to the proposed action and are discussed in Chapter 2 under Alternatives Development.

5.3 DISTRIBUTION OF EIS
Agencies, organizations, and individuals with an interest in the issues surrounding the leasing of the Greens Hollow Coal Lease Tract were given a copy of the EIS, given an electronic copy of the EIS, or were notified of the availability of the EIS on the agency websites.

5.3.1 FEDERAL AGENCIES
Bureau of Indian Affairs
Bureau of Reclamation
Environmental Protection Agency
Federal Aviation Administration
Federal Highway Administration
Mineral Management Service
National Park Service
Office of Surface Mining
OEPC
Planning and Review Advisory Council on Historic Preservation
US Army Engineers
US Coast Guard
US Department of Agriculture – APHIS PPD/EAD
US Department of Agriculture – Natural Resources Conservation Service
US Department of Agriculture – National Agricultural Library
US Department of Energy
US Department of the Interior, Office of Environmental Policy and Compliance
US Environmental Protection Agency Region 8, EPR-N
US Fish & Wildlife Service
U.S. Geological Survey
5.3.2 STATE AGENCIES
Office of the Governor

5.3.3 OTHER GOVERNMENT AGENCIES
Emery County Commissioners
Emery County Public Lands Administrator
Emery Water Conservation District
Emery Town Mayor
Salina Mayor
Sevier County Commissioners

5.3.4 NATIVE AMERICAN TRIBES
Hopi Tribal Council
The Navajo Nation
Paiute Indian Tribe of Utah
Ute Indian Tribe

5.3.5 CONSERVATION, ENVIRONMENTAL, AND OTHER INTEREST GROUPS
Grand Canyon Trust
Muddy Creek Irrigation Company
Red Rock Forests
Utah Environmental Congress

5.3.6 OTHER INTERESTED PARTIES
Other interested parties including individuals and businesses who have requested a copy of the EIS and/or are on the mailing list to receive a copy of the EIS were given a copy of the EIS, given an electronic copy of the EIS, or were notified of the availability of the EIS on the agency websites.
6.0 CHAPTER 6 – LIST OF PREPARERS AND REVIEWERS

Tables 6.1 through 6.3 identify the BLM, FS, and contractor preparers of this EIS, respectively.

**Table 6.1. BLM preparers.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Responsibility with this Document</th>
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<tbody>
<tr>
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<td>Project Manager</td>
<td>Project management, coordination, and quality control.</td>
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<tr>
<td>Steve Falk</td>
<td>BLM Project Contact</td>
<td>Technical oversight and coordination.</td>
</tr>
<tr>
<td>Chris Conrad</td>
<td>Geologist</td>
<td>Technical review.</td>
</tr>
<tr>
<td>Mike Glasson</td>
<td>Geologist</td>
<td>Technical oversight and geology review.</td>
</tr>
<tr>
<td>Jeff McKenzie</td>
<td>Coal, Mining Engineer / Economist</td>
<td>Technical oversight and state office coordination.</td>
</tr>
<tr>
<td>Ahmed Mohsen</td>
<td>Environmental Coordinator</td>
<td>NEPA oversight and review.</td>
</tr>
<tr>
<td>Brad Higdon</td>
<td>Environmental Coordinator</td>
<td>NEPA oversight and review.</td>
</tr>
<tr>
<td>Floyd Johnson</td>
<td>Environmental Coordinator (Acting)</td>
<td>NEPA oversight and review.</td>
</tr>
<tr>
<td>Jim Kohler</td>
<td>Branch Chief, Solid Minerals (Retired)</td>
<td>Technical oversight and coordination.</td>
</tr>
<tr>
<td>Craig Harmon</td>
<td>Tribal Liaison</td>
<td>Review of tribal consultation.</td>
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</tbody>
</table>

**Table 6.2. Forest Service preparers.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Responsibility with this Document</th>
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<tbody>
<tr>
<td>Tom Lloyd</td>
<td>MLNF Project Contact, Geologist</td>
<td>Coordination with MLNF specialists and technical oversight.</td>
</tr>
<tr>
<td>Mesia Nyman</td>
<td>District Ranger</td>
<td>Technical oversight and review.</td>
</tr>
<tr>
<td>Marlene Depietro</td>
<td>Acting District Ranger</td>
<td>Review of document.</td>
</tr>
<tr>
<td>Jeff Alexander</td>
<td>Minerals Engineer</td>
<td>Line office review and concurrence.</td>
</tr>
<tr>
<td>Dale Harber</td>
<td>Forest Geologist</td>
<td>Technical oversight and review.</td>
</tr>
<tr>
<td>Michael Davis</td>
<td>Environmental Coordinator</td>
<td>NEPA oversight and review.</td>
</tr>
<tr>
<td>Kevin Albrecht</td>
<td>Wildlife Biologist</td>
<td>Review of wildlife analysis.</td>
</tr>
<tr>
<td>Pamela Jewkes</td>
<td>Forest Fisheries Biologist</td>
<td>Review of aquatics analysis.</td>
</tr>
<tr>
<td>Bill Broadbear</td>
<td>Forester (Recreation)</td>
<td>Review of recreation analysis.</td>
</tr>
<tr>
<td>Katherine Foster</td>
<td>Forest Hydrologist</td>
<td>Review of surface and ground water analysis.</td>
</tr>
<tr>
<td>Pete Kilbourne</td>
<td>Forest IRM</td>
<td>Review of visual quality analysis.</td>
</tr>
<tr>
<td>Mat Meccariello</td>
<td>Range Management Specialist</td>
<td>Review of vegetation analysis.</td>
</tr>
<tr>
<td>John Healy</td>
<td>Rangeland Management Specialist</td>
<td>Review of range analysis.</td>
</tr>
<tr>
<td>Charmaine Thompson</td>
<td>Forest Archaeologist</td>
<td>Review of heritage resources analysis.</td>
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<tr>
<td>Don Wilcox</td>
<td>Civil Engineer</td>
<td>Road analysis.</td>
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**Fishlake National Forest**

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<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
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<td>Marianne Orton</td>
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<td>Coordination with FLNF specialists and technical oversight.</td>
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<tr>
<td>Chris Wehrli</td>
<td>FLNF Project Contact, Environmental Coordinator</td>
<td>Coordination with FLNF specialists and technical oversight.</td>
</tr>
<tr>
<td>Fred Houston</td>
<td>District Ranger</td>
<td>Line officer review and concurrence.</td>
</tr>
<tr>
<td>Chris Colt</td>
<td>Wildlife Biologist</td>
<td>Review of wildlife analysis.</td>
</tr>
<tr>
<td>Adam Sult</td>
<td>Hydrologist</td>
<td>Review of surface and ground water analysis.</td>
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</tbody>
</table>
### Table 6.3. Contractor preparers.

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td><strong>Cirrus Ecological Solutions, LC</strong></td>
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<tr>
<td>Scott Evans</td>
<td>Contractor</td>
<td>Project management, coordination, quality control, and socioeconomic specialist.</td>
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<tr>
<td></td>
<td>Project Manager</td>
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<td>Tom Ashton</td>
<td>Wildlife Biologist</td>
<td>Technical analysis of fisheries and wildlife resources.</td>
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<tr>
<td>Matt Westover</td>
<td>Wildlife Biologist</td>
<td>Technical updates and revisions of fisheries and wildlife resources.</td>
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<tr>
<td>Eric Duffin</td>
<td>Watershed Hydrologist</td>
<td>Technical analysis of surface and ground water resources.</td>
</tr>
<tr>
<td>Craig Limesand</td>
<td>Rangeland Ecologist</td>
<td>Technical analysis of range and recreation resources.</td>
</tr>
<tr>
<td>John Stewart</td>
<td>Biologist</td>
<td>Technical analysis of vegetation, wetland, visual quality, and roadless resources. Technical updates and revisions of range and recreation resources.</td>
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<td>Judy Seamons</td>
<td>Document Specialist</td>
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<td><strong>Paul B. Anderson</strong></td>
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<tr>
<td>Paul Anderson</td>
<td>Consulting Geologist</td>
<td>Technical analysis of geologic resources.</td>
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<td><strong>Erathem-Vanir Geological</strong></td>
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<td>Gustav Winterfeld</td>
<td>Paleontologist</td>
<td>Technical analysis of paleontological resources.</td>
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<td><strong>Maleki Technologies, Inc.</strong></td>
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<tr>
<td>Hamid Maleki</td>
<td>Consulting Mining and Geotechnical Engineer</td>
<td>Technical analysis of mining subsidence and seismicity.</td>
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<td><strong>Marquez Environmental Services</strong></td>
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<td>Lori Marquez</td>
<td>Air Quality Specialist</td>
<td>Technical analysis of air quality.</td>
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<tr>
<td><strong>NORWEST Applied Hydrology</strong></td>
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<tr>
<td>Art O’Hayre</td>
<td>Senior Hydrologist/Manager</td>
<td>Technical analysis of surface and ground water resources.</td>
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<tr>
<td><strong>Western Land Services</strong></td>
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<td>Jim Welch</td>
<td>Archaeology Department Manager</td>
<td>Technical oversight of heritage resource analysis.</td>
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<tr>
<td>Colin Ferriman</td>
<td>Project Archaeologist</td>
<td>Technical analysis of heritage resources.</td>
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</tbody>
</table>
7.0 CHAPTER 7 – REFERENCES


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Berg, L. 2002c. Email addressed to Rebecca Thompson, Cirrus Ecological Solutions, LC from Lois Berg, Aquatic Program Manager, Southeastern Region UDWR, regarding fish suverys in the Muddy, Quitchupah, Straight Canyon, and Cottonwood drainages. November 12.


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Greens Hollow Federal Coal Lease Tract  290            Draft Supplemental Environmental Impact Statement


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8.0 CHAPTER 8 – GLOSSARY

Affected Environment: Surface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by proposed activities. The environment of the area to be affected by the alternatives under consideration.

Air Quality Classes: Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act that limits the amount of air pollution considered significant within an area. Class I applies to areas where almost any change in air quality would be significant, Class II applies to areas where the deterioration normally accompanying moderate, well-controlled growth would be permitted, and Class III applies to areas where industrial deterioration would generally be allowed.

Alluvial Material: Material transported and deposited by running water in riverbeds, lakes, alluvial fans and valleys. Includes clay, silt, sand, gravel, and mud.

Alternative: A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. One alternative need not substitute for another in all respects.

Analysis Area: A delineated area of land subject to analysis. See also Project Area.

Angle of draw: The angle of inclination from the vertical of the line connecting the edge of the workings and the edge of the subsidence area.

Animal Unit Month (AUM): The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

Aquatic Ecosystem: All organisms in a water-based community plus the associated environmental factors.

Aquatic Wildlife or Species: Animal species that inhabit and/or depend on the aquatic ecosystems for this life processes.

Aquifer: A layer of geologic material that contains water.

Attenuation: The ability of rocks and soils to transmit ground vibrations over distance. The energy or amount of vibration transmitted through rock decreases with increasing distance from the source. The amount of energy or vibration at a specific distance from the source is dependent on the magnitude of the source event, ability of specific materials to transmit the vibrations, and the distance from the source.

Authorized Officer: Any employee of the Bureau of Land Management or Forest Service delegated the authority to perform the duty described in the section in which the term is used.

Barrier: A large pillar of coal left unmined designed to isolate production areas (and therefore, the above-ground effects), including longwall or room-and-pillar panels.

Big Game Winter Range: The area available to and used by big game (large mammals normally managed for sport hunting) through the winter season.

Big Game: Larger species of wildlife that are hunted such as elk, deer, moose, and mountain lion.
**Biological Assessment (BA):** A document describing activities in sufficient detail to determine how an action or proposed action may affect any proposed, threatened, or endangered species.

**Biological Diversity:** The diversity or numbers of species that collectively represent the living plants and animals within a local, regional, or continental landscape.

**Biological Evaluation (BE):** A document describing activities on National Forest System lands in sufficient detail to determine how an action or proposed action may affect any sensitive species.

**Buffer:** An area set aside for the protection of resources.


**Candidate Species:** Any species not yet officially listed but that are undergoing a status review or are proposed for listing according to the Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce.

**Caving:** The collapse of roof strata into mined workings.

**CEQ:** See Council on Environmental Quality.

**Compression:** Stress resulting in the contraction or “Squeezing” of ground strata: opposite of tension.

**Contrast:** The effect of a striking difference in the form, line, color, or texture of an area being viewed.

**Council on Environmental Quality:** An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies and advises the President on environmental matters.

**Critical Habitat:** Specific areas within the geographical area occupied by the species on which are found those physical and biological features (1) essential to the conservation of the species; and (2) which may require special management considerations or protection. Critical habitat shall not include the entire geographic area which can be occupied by the threatened and endangered species.

**Critical Subsidence:** At some extraction width, the maximum depth of a critical subsidence basin no longer increases. The critical subsidence basin will have a pointed bottom similar to that of a subcritical subsidence basin.

**Cumulative Impact:** The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

**Depth of cover:** The thickness of ground from a coal seam to surface.

**Development:** The mining of initial entries for access, ventilations, etc. prior to full-scale production mining.

**Differential subsidence:** The difference in vertical subsidence between two locations.

**Director:** Director of the Bureau of Land Management.
**Dispersed Recreation:** That portion of outdoor recreation use that occurs outside of developed sites in the unroaded and roaded Forest environment (i.e., hunting, backpacking, and camping).

**Displacement:** As applied to wildlife, forced shifts in the patterns of wildlife use either in location or timing of use.

**Distance Zone:** The divisions of a landscape being viewed. Three zones are used to describe a landscape: foreground, middleground, and background.

**Diversity:** (1) The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area; or (2) The distribution and abundance of different plant and animal communities and species within the area covered by the Land Resource Management Plan. (36 CFR Part 219.3)

**Duration:** The length of time the management activity and its impacts would be taking place.

**Ecosystem:** All organisms in a community plus the associated environmental factors.

**Effects (also see Impacts):**

- **Direct Effects** – Caused by the action and occur at the same time and place.
- **Indirect Effects** – Caused by the action later in time or farther removed in distance but still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

**Endangered Species:** Any species in danger of extinction throughout all or a significant portion of its range.

**Entry:** An underground passage used for haulage or ventilation.

**Environmental Analysis:** An analysis of alternative actions and their predictable short- and long-term environmental effects that include physical, biological, economic, social, and environmental design factors and their interactions.

**Environmental Impact Statement (EIS):** A formal public document prepared to analyze the impacts on the environment of the proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action.

**Erosion:** (1) The wearing away of the land surface by running water, wind, ice, or other geological agents including such processes as gravitational creep; or (2) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

**Exploration:** Drilling, excavating, and geological, geophysical or geochemical surveying operations designed to obtain detailed data on the physical and chemical characteristics of Federal coal and its environment including the strata below the Federal coal, overburden, and strata above the Federal coal, and the hydrologic conditions associated with the Federal coal.

**Extraction ratio:** The ratio of mined to unmined area within a defined area.

**Face:** The location of the longwall mining machine and active production mining within a longwall panel.
**Fair Market Value:** An amount in cash, or in terms reasonably equivalent to cash, for which in all probability the coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

**Federal Lands:** Lands owned by the United States, without reference to how the lands were acquired or what Federal agency administers the land, including surface estate, mineral estate and coal estate, but excluding lands held by the United States in trust for Indians, Aleuts or Eskimos.

**First-pass mining:** First stage room-and-pillar production mining at a lower extraction ratio than subsequent second-pass mining; larger pillars are left than after second-pass mining.

**Floodplain:** The lowland and relatively flat area adjoining inland waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

**Forage:** All browse and herbaceous foods that are available to grazing/browsing animals.

**Forest Service:** The agency of the United States Department of Agriculture responsible for managing National Forests and Grasslands under the Multiple Use and Sustained Yield Act of 1960.

**Full-extraction mining:** Complete extraction of the coal seam in the horizontal extent over a particular area; no pillars are left after mining.

**Full-support mining:** Mining that takes place leaving unmined pillars that adequately support the overburden and prevent subsidence from occurring.

**Game Species:** Any species of wildlife or fish for which seasons and bag limits have been prescribed and that are normally harvested by hunters, trappers, and fishermen under State or Federal laws, codes, and regulations.

**Government Entity:** A Federal or State agency or a political subdivision of a State, including a county or a municipality, or any corporation acting primarily as an agency or instrumentality of a State.

**Gradient:** The slope (rise/run) of a surface or stream profile.

**Habitat Type Group:** A logical grouping of habitat types to facilitate resource planning and public presentation.

**Habitat Type:** An aggregation of all land areas potentially capable of producing similar plant communities at climax.

**Habitat:** A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

**Heritage Resources:** Those fragile and nonrenewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were or importance in human events.

**Human Environment:** The factors that include, but are not limited to, biological, physical, social, economic, cultural, and aesthetic factors that interrelate to form the environment.

**Impact (See Effects):** The effect, influence, alteration, or imprint caused by an action.
**Indicator Species:** A species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

**Indirect Effects:** Secondary effects that occur in locations other than the initial action or significantly later in time.

**Intake:** The passage through which fresh air is drawn or forced into a mine or to a section of a mine.

**Interest in a lease, application or bid:** Any record title interest, overriding royalty interest, working interest, operating rights or options, or any agreement covering such an interest; any claim or any prospective or future claim to an advantage or benefit from a lease; and any participation or any defined or undefined share in any increments, issues, or profits that may be derived from or that may accrue in any manner from the lease based on or pursuant to any agreement or understanding existing when the application was filed or entered into while the lease application or bid is pending. Stock ownership or stock control does not constitute an interest in a lease within the meaning of this definition. Attribution of acreage to stock within the meaning of this definition.

**Invertebrate:** An animal lacking a spinal column.

**Irretrievable:** Not retrievable, irrecoverable, incapable of being recovered or regained; not capable of being restored, remedied, or made good.

**Irreversible:** Not reversible: incapable of being reversed or altered. Not having the ability to change and then revert to the original state.

**Key Wildlife Area:** Any area that is critical to wildlife during at least a portion of the year. This importance may be due to vegetative characteristics such as residual nesting cover or behavioral aspects of the animals such as fawning/calving areas. Key areas include: winter ranges, lambing/fawning/calving areas, dancing/strutting grounds, nesting areas, breeding grounds, elk wallows, riparian and woody draws, and roosting areas.

**Kilovolt (kV):** 1,000 volts.

**Leasable Minerals:** Minerals acquired only by lease and generally include oil, gas, coal, oil shale, sodium, potassium, phosphate, native asphalt, solid and semi-solid bitumen, and deposits of sulfur.

**Lease Stipulations:** Additional specific terms and conditions that change the manner in which an operation may be conducted on a lease or modify the lease rights granted.

**Lease:** A Federal lease, issued under the coal leasing provisions of the mineral leasing laws, which grants the exclusive right to explore for and extract coal. In provisions of this group that also refer to Federal leases for minerals other than coal, the term Federal coal lease may apply.

**License to mine:** A license issued under the provisions of 43 CFR Part 3440 to mine coal for domestic use.

**Licensee:** The holder of an exploration license.

**Long-Term:** Describes impacts that would occur over a 20-year period or more.

**Longwall mining:** A mining method in which large blocks of coal (panels), outlined by gateroad entries, are completely extracted in a single, continuous operation using a longwall mining machine.
**Longwall move:** The disassembly, transportation, and reassembly of a longwall mining machine at the end of a mined panel to the beginning of a new unmined panel.

**Longwall panel:** A rectangular block of coal bounded by development entries and fully mined (no pillars left) by a longwall mining machine.

**Macroinvertebrates:** Aquatic insects.

**Main Entry:** A main haulage road.

**Mains:** A series of parallel interconnected development entries providing primary access to production areas, ventilation, and transportation of mined coal.

**Management Indicator Species (MIS):** Management Indicator Species (MIS) are a select group of wildlife species that can indicate change in habitat resulting from activities on the Forest.

**Maximum Economic Recovery (MER):** Based on standard industry operating practices, all profitable portions of a leased Federal coal deposit must be mined. At the times of MER determinations, consideration will be given to: existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations. The requirement of MER does not restrict the authority of the authorized officer to ensure the conservation of the recoverable coal reserves and other resources and to prevent the wasting of coal.

**Mineable or Minable Coal:** That portion of a coal seam that can be mined considering the physical and economic limitations of the mining method used. Estimates of minable reserves consider all of the in-place coal that can be mined, but not necessarily produced from the mine. It is contrasted by the term “recoverable coal” which is the amount of coal that can be physically mined and removed from the mineable coal seam or area.


**Mining height:** The extracted height of a coal seam.

**Mining-Induced Seismicity:** Earthquakes or ground vibrations caused by underground coal mining and the resulting subsidence.

**Mining Plan:** A resource recovery and protection plan.

**Mining Supervisor:** The Authorized Officer.

**Mining Unit:** An area containing technically recoverable coal that will feasibly support a commercial mining operation. The coal may either be Federal coal or be both Federal and non-Federal coal.

**Mitigation:** Includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

(c) Rectifying the impact of repairing, rehabilitating, or restoring the affected environment.
(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

Multiple-use: Management of the surface and subsurface resources so that they are jointly used in the manner that will best meet the present and future needs of the public without permanent impairment of the productivity of the land or the quality of the environment.


National Forest System (NFS): All National Forest Systems lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land use projects administered under Title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 et seq.); and other lands, waters, or interest therein which are administered by the U.S.D.A. Forest Service or are designated for administration through the U.S.D.A. Forest Service as a part of the system (16 U.S.C. 1609).

National Register of Historic Places (NRHP): A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance established by the Historic Preservation Act of 1966.


No Action Alternative: No action or activity would take place. Another definition is where ongoing programs described within the existing Land Management Plan continue. No decision would be made and no leases would be offered.

Nongame Species: Species of animals that are not managed as a sport hunting/fishing resource.

Nonpoint Source Pollution: Sources from which the pollutants discharged are:

(1) induced by natural processes, including precipitation, seepage, percolation, and runoff;

(2) not traceable to any discrete or identifiable facility; and

(3) better controlled through the use of Best Management Practices, including process and planning techniques. This includes natural pollution sources not directly or indirectly caused by man.

Noxious Weeds: Rapidly spreading plants that cause a variety of major ecological impacts to both agriculture and wild lands.

Numerical (subsidence) model: A mathematical description of subsidence phenomena solved by computer, used for the prediction of ground surface deformation from mining.

Off-Road Vehicle: Any motorized vehicle designed for or capable of cross-country travel on or immediately over land water, snow, ice, marsh, swampland or other natural terrain. It includes, but is not limited to, four-wheel drive or low-pressure-tire vehicles, motorcycles and related two-wheel vehicles, amphibious machines, ground-effect or air-cushion vehicles.
**Operator:** A lessee, exploration licensee or one conducting operations on a lease or exploration license under the authority of the lessee or exploration licensee.

**Overburden:** The geologic strata overlying a coal seam.

**Overstory:** The portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

**Panel centerline:** The horizontal line running central and parallel to the long axis of a longwall panel.

**Panel:** A coal mining block that generally comprises one operating unit.

**Partial-extraction mining:** Incomplete extraction of the coal seam where pillars are left after mining.

**Particulates:** Small particles suspended in the air and generally considered pollutants.

**Permanent strain:** Ground strain that remains after the completion of mining.

**Portal:** The structure surrounding the immediate entrance to a mine.

**Prehistoric Site:** Archaeological sites associated with American Indians and usually occurring before contact with Europeans.

**Prevention of Significant Deterioration (PSD):** A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 U.S.C. 1875, et seq.).

**Production mining:** Full-scale mining following the initial mining of access (development) entries; in contrast to development mining.

**Project Area:** The area of analysis. See also Analysis Area.

**Reasonably Foreseeable Development Scenario (RFDS):** The prediction of the most likely future coal mining actions in the project area that would likely result from the proposed action.

**Reclamation:** Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

**Record of Decision (ROD):** A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official’s decision on the proposed action.

**Recoverable Coal:** The amount of coal that can actually be mined and transported from a coal seam or area after leaving pillars for support of operations.

**Recreation Opportunity Spectrum (ROS):** Land delineations that identify a variety of recreation experience opportunities in six classes along a continuum from primitive to urban. Each class is defined in terms of natural resource settings, activities and experience opportunities. The six classes are: Urban, Rural, Roaded, Natural, Semiprimitive Motorized; Semiprimitive Nonmotorized, and Primitive.

**Reserves:** Recoverable Coal Reserves.
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**Restore:** To bring back landscape to a former or original condition or appearance.

**Retreat:** Production mining following initial development of access entries in a coal seam.

**Retreating Mining:** Exploitation in the direction opposite from development.

**Return:** The air of ventilation that has passed through all the working faces of a split.

**Revegetation:** The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance such as seed bed preparation, reseeding, and mulching.

**Richter Scale:** A scale by which the magnitude of earthquakes or ground vibrations are measured, generally ranging from 0 to 10 with 10 being the highest magnitude.

**Rigid (abutment) pillar:** A coal pillar designed to remain intact and provide complete load-bearing capacity throughout the course of mining.

**Riparian Ecosystem:** A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

**Riparian:** Riparian areas consist of terrestrial and aquatic ecosystems, those lands in a position to directly influence water quality and water resources, whether or not free water is available. This would include all lands in the active flood channel and lands immediately upslope of stream banks. These areas may be associated with lakes, reservoirs, estuaries, potholes, marshes, streams, bogs, wet meadows, and intermittent or permanent streams where free and unbound water is available.

**Roadless:** Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

**Room-and-pillar mining:** A mining method by which coal is extracted over large areas from a network of entries separated by pillars.

**Scoping Process:** An early and open public participation process for determining particular issues to be addressed in an environmental document and for identifying the significant issues related to a proposed action.

**Second-pass mining:** Final state room-and-pillar production mining following first-pass mining; higher extraction ratios than first-pass mining are achieved by partial to full mining of remnant first-pass coal pillars.

**Secretary:** Secretary of the Interior.

**Seismicity:** The degree to which a region of the earth is subject to earthquakes.

**Sensitive Species:** Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alternations and have been identified for monitoring and measures to prevent them from being listed as Threatened or Endangered.

**Significant:** An effect that is analyzed in the context of the proposed action to determine the importance of the effect; either beneficial or adverse. The degree of significance is related to other actions with individually insignificant but cumulatively significant impact on the environment and when the effects on the quality of the human environment are likely to be highly controversial.
Small Game: Birds and small mammals normally hunted or trapped.

Special Coal Lease Stipulations: Statements included in Section 15 of the BLM’s standard coal lease form (Form 3400-12) that require specific actions or measures to be met by the lessee regarding actions for lease administration or development.

Sterilization: Rendering coal resources unmineable.

Stipulation: A provision that modifies standard lease right and is attached to and made a part of the lease.

Strain: Change in length per unit of length; a measure of ground deformation.

Stress: The force per unit area (also pressure), or intensity of forces distributed over a given area, responsible for deforming and fracturing ground strata.

Subsidence: The deformation of the ground mass above an underground mine and the resulting lowering of the ground surface. This occurs as the rock immediately above the void left by the mining caves and the overlying rock layers adjust to the loss of support.

Surface Management Agency: The Federal agency with jurisdiction over the surface of federally owned lands containing coal deposits, and, in the case of private surface over Federal coal, the Bureau of Land Management, except in areas designated as National Grasslands, where it means the Forest Service.

Tension crack: A crack (typically open) in the ground formed in an area of tensional stress.

Tension: Stress resulting in the elongation or “stretching” of ground strata; opposite of compression.

Threatened and Endangered Species: Definitions: Federal codes are defined as follows:

   Endangered (E): Any species that is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the ESA would present an overwhelming and overriding risk to man.

   Threatened (T): Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

   Candidate Species (C): Status review taxa for which the USFWS currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list the taxa as an endangered or threatened species.

   Forest Service Sensitive: Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

   Total Dissolved Solids (TDS): Salt or an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form cells that are dissolved or present in water.

   Transient strain: Ground strain of a temporary or ephemeral duration, as opposed to permanent strain.

   Vertebrate: An animal having a spinal column.
**Visual Quality Objectives (VQO):** Based upon variety class, sensitivity level, and distance zone determinations. Each objective describes a different level of acceptable alteration based on aesthetic importance. The degree of alteration is based on contract with the surrounding landscape.

- **Preservation:** In general, human activities are not detectable to the visitor.
- **Retention:** Human activities are not evident to the casual Forest visitor.
- **Partial Retention:** Human activities may be evident, but must remain subordinate to the characteristic landscape.
- **Modification:** Human activity may dominate the characteristic landscape, but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.
- **Maximum Modification:** Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.
- **Enhancement:** A short-term management alternative that is completed with the express purpose of increasing positive visual variety where little variety now exists.

**Visual Resource:** The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal of the unit.

**Wetlands:** Lands where saturation with water is the primary factor determining the nature of soil development and the kinds of animal and plant communities living under or on its surface.

**Yield pillar:** A coal pillar designed to crush controllably under loading.
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Appendix A:
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Greens Hollow Unsuitability Assessment

for Federal Coal Lease-By-Application UTU-84102

Unsuitability criteria as described in 43 CFR, Subpart 3461, and Table C-1 of the Manti-La Sal Land and Resource Management Plan (LRMP) are used to determine the suitability of National Forest lands for coal leasing. The criteria are applied when Federal lands are being considered for coal leasing. This Unsuitability Criteria Assessment addresses the Greens Hollow Lease tract, comprising approximately 6,096 acres on the Manti-La Sal National Forest (MLNF) while a small part along the southern edge of the tract is on the Fishlake National Forest (FLNF) (approximately 79 acres). The tract consists of National Forest System lands administered by the U.S.D.A., Forest Service, Manti-La Sal National Forest and Fishlake National Forest, with Federal coal administered by the Bureau of Land Management (BLM).

This unsuitability assessment will determine if any of the lands within the tract are unsuitable for coal leasing and mining for each of the 20 “Unsuitability Criteria” in 43 CFR 3461.5 (Criteria for assessing lands unsuitable for all or certain stipulated methods of coal mining).

The 20 criteria for assessing lands unsuitable for all or certain stipulated methods of coal mining (CFR 43, Subpart 3461.5) have been applied to the proposed Green’s Hollow Lease by Application (LBA) UTU-84102 tract.

Criteria 2, 3, 4, 5, 6, 7, 8, 12, 15, 16, 17, 19 and 20 were addressed in the LRMP (FS, 1986-Table C-1) as not applicable because the specific resources discussed do not exist within the MLNF. Criteria 1, 9, 10, 11, 13, 14, and 18 are either exempted or excepted because conditions do not exist or there will be no mining impact. Based on this Unsuitability Assessment, it has been determined the Greens Hollow LBA is suitable for leasing.

CRITERIA AND ASSESSMENT

Criterion Number 1:

All Federal lands included in the following land systems or categories shall be considered unsuitable: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers Systems, National Recreation Areas, lands acquired with money derived from Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns, and villages.

Assessment

Exceptions- (i) A lease may be issued within the boundaries of any National Forest if the Secretary finds no significant recreational, timber, economic or other values which may be incompatible with the lease; and (A) surface operations and impacts are incident to an underground coal mine, or (B) where the Secretary of Agriculture determines, with respect to lands which do not have significant forest cover within those National Forests west of the 100th Meridian, that surface mining may be in compliance with the Multiple-Use Sustained-Yield Act of 1960, the Federal Coal Leasing Amendments Act of 1976, and the Surface Mining Control and Reclamation Act of 1977.

Assessment

The LRMP allows for multiple use management on the lands in the proposed lease area which are principally managed for wildlife habitat; however management includes livestock grazing, motorized
recreation and vegetation treatment. The Greens Hollow tract overlaps with two inventoried roadless areas: the Muddy Creek-Nelson Mountain IRA on the north end of the tract and the White Mountain IRA on the south end. Intrusions from historical use of the land have reduced the natural integrity of the area and the landscape has lost some of its natural appearance. No significant recreational, timber, or economic or other values which may be incompatible with the lease are present on the tracts. There are five National Forest System roads (NFSR52007, NFSR52006, NFSR50132, NFSR52029 and, NFSR52259) within the Muddy Creek-Nelson Mountain IRA and Federal coal lease UTU-84102. Surface related impacts from mining such as the power lines and ventilation shafts may change characteristics of inventoried roadless areas and other unroaded - undeveloped areas. Recreation use in this area is mostly hunting and will not be adversely affected by leasing these lands. No suitable timber is identified within the LRMP for the lease area and no current timber sales authorized. Historically, this area has not had focused timber management. No outfitter guides are operating within the proposed lease area. Other than livestock grazing, no natural, processed or manufactured products that enter commerce are produced from the lease area.

With respect to roadless issues, approximately 847 acres of the Federal coal lease UTU-84102 are in the White Mountain IRA and 2,055 acres are in the Muddy Creek – Nelson Mountain IRA. These areas are subject to restrictions on road construction and timber harvest pursuant to rules and regulations of the Secretary of Agriculture pertaining to inventoried roadless area management.

No current management activities or reasonably foreseeable activities on the lease area are incompatible for leasing these lands. In addition, foreseeable surface operations and impacts will be incident to an underground coal mine. Therefore, for reasons stated above, the exception can apply to this criterion.

Criterion Number 2:
Federal lands that are within rights-of-way or easements or within surface leases for the residential, commercial, industrial, or other public purposes, on federally owned surface shall be considered unsuitable.

Assessment
The criterion is not applicable because lands proposed for leasing do not contain designated rights-of-way for easements of public residential, commercial, or industrial purposes.

Criterion Number 3:
Federal lands affected by section 522(e) (4) and (5) of the Surface Mining Control and Reclamation Act of 1977 shall be considered unsuitable. This includes lands within 100 feet of the outside line of the right-of-way of a public road or within 100 feet of a cemetery, or within 300 feet of any public building, school, church, community, or institutional building or public park or within 300 feet of an occupied dwelling.

Assessment
Conditions of Criterion Number 3 are not present in the lease area. There are no areas in the lease tract within 100 feet of the outside line of the right-of-way of a public road or within 100 feet of a cemetery, or within 300 feet of any public building, school, church, community, or institutional building or public park or within 300 feet of an occupied dwelling.
Criterion Number 4:
Federal lands designated as wilderness study areas shall be considered unsuitable while under review by the Administration and the Congress for possible wilderness designation. For any Federal land which is to be leased or mined prior to completion of the wilderness inventory by the surface management agency, the environmental assessment or the impact statement on the lease sale or mine plan shall consider whether the land possess the characteristics of a wilderness study area.

Assessment
This criterion is not applicable as there are no existing or proposed wilderness study areas that contain coal deposits in the lease tract.

Criterion Number 5:
Scenic Federal lands designated by visual resource management analysis as Class I (an area of outstanding scenic quality or high visual sensitivity) but not currently on the national register of natural landmarks shall be considered unsuitable. A lease may be issued if the surface management agency determined that surface coal mining operations will not significantly diminish or adversely affect the scenic quality of the designated area.

Assessment
This criterion is not applicable because there are no lands within the proposed lease tract that contains designated areas of outstanding scenic quality (Class 1). Lands within the tract have a visual quality objective of “partial retention”. Partial retention provides for management activities that are visually subordinate to the characteristic landscape. No surface mining will be conducted within the proposed lease tract.

Criterion Number 6:
Federal lands under permit by the surface management agency, and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments shall be considered unsuitable for the duration of the study, demonstration or experiment, except where mining could be conducted in such a way as to enhance or not jeopardize the purposes of this study, as determined by the surface management agency, or where the principal scientific user or agency gives a written concurrence to all or certain methods of mining.

Assessment
This criterion is not applicable to this proposed lease tract as there are no scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments being considered or implemented.

Criterion Number 7:
All districts, sites, buildings, structures, and objects of historical, architectural, archaeological, or cultural significance on Federal lands which are included in or eligible for inclusion in the National Register of Historical Places, and an appropriate buffer zone around the outside boundary of the designated property (to protect the inherent values of the property that make it eligible for listing in the National Register) as determined by the surface management agency, in consultation with the advisory Council on Historic Preservation and the State Historical Preservation Office shall be considered unsuitable.
**Assessment**

Exceptions - All or certain stipulated methods of coal mining may be allowed if the surface management agency determines, after consultation with the Advisory Council on Historical Preservation and State Historic Preservation Office that the direct and indirect effects of mining, as stipulated on a property in or eligible for the National Register of Historic Places will not result in significant adverse impacts to the property.

After consultation with the State Historical Preservation Office (SHPO), the Ute Tribe of Utah, the Piute Tribe and the Manti-La Sal NF underground mining may cause adverse effects to some surface sites (7) and Native American rock shelters (2). Through these discussions certain areas within the lease tract have been designated as No Subsidence Zones and proposed mitigations in the form of 13 additional stipulations have been agreed upon by the State and the Manti-La Sal NF in a Memorandum of Agreement (MOA), signed November 11, 2011, to anticipate and pre-empt major adverse effects.

**Criterion Number 8:**

Federal lands designated as natural areas or as National Natural Landmarks shall be considered unsuitable.

**Assessment**

This criterion is not applicable to the proposed lease tract because there are no natural areas nor National Natural Landmarks designated in the proposed tract.

**Criterion Number 9:**

Federally designated critical habitat for threatened or endangered plant and animal species, and habitat for federal threatened or endangered species which is determined by the Fish and Wildlife Service and the surface management agency to be of a central value and where the presence of threatened or endangered species has been scientifically documented, shall be considered unsuitable.

**Assessment**

This criterion is not applicable because there are no populations of listed threatened or endangered plants and animals as determined by the US Fish and Wildlife Service and the MLNF and FLNF nor is there habitat. The cutthroat trout, thought to belong to the native Colorado River subspecies, is the only fish species of concern within the analysis area. Minimal impacts on aquatic invertebrates within the tributaries of Cowboy Creek (perennial sections of Greens Hollow and Greens Canyon), and Muddy Creek would be expected, as the effects from subsidence on stream flow would be expected to be minimal (Maleki 2004).

**Criterion Number 10:**

Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a State pursuant to state law as endangered or threatened shall be considered unsuitable.
Exceptions: A lease may be issued and mining operations approved if, after consultation with the state, the surface management agency determines that the species will not be adversely affected by all or certain stipulated methods of coal mining. This criterion is not applicable because there are no populations or designated critical habitat of federally listed threatened or endangered plants and animals as determined by the U.S. Fish and Wildlife Service and the MLNF. The greater sage grouse, which is designated as a Candidate Species by the USFWS does have priority habitat within the Greens Hollow Lease.

Criterion Number 11:

A bald or golden eagle nest or site on Federal lands that is determined to be active and an appropriate buffer zone of the land around the nest site shall be considered unsuitable. Consideration of availability of habitat for prey species and of terrain shall be included in the determination of buffer zones. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Assessment

This criterion is not applicable, even though known golden eagle nests occur near the lease tract, but outside the project area, Special Coal Lease Stipulations were developed by the Forest Service to insure the use and protection of all lands including potential golden eagle nesting habitat. There are no known bald eagle nests in or around the proposed lease tract. No potential eagle nesting habitat would be removed or altered.

Criterion Number 12:

Bald and Golden Eagle roosts and concentration areas on Federal lands used during migration and wintering shall be considered unsuitable.

Assessment

This criterion is not applicable as currently, there are no known bald eagle nests in or around the project area. Golden eagle nests occur near the lease tract, but outside the project area. The MLNF has included stipulations within the lease language to minimize any adverse effects.

Criterion Number 13:

Federal lands containing a falcon (excluding kestrel) cliff nesting site with an active nest and a buffer zone of federal land around the nest site shall be considered unsuitable. Consideration of availability of habitat for prey species and of terrain shall be included in the determination of buffer zones. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

Assessment

This criterion is not applicable as currently, there are no known falcon eyries (nests) within the coal lease tract boundary.

Criterion Number 14:

Federal lands which are high priority habitat for migratory bird species of high federal interest on a regional or national basis, as determined jointly by the surface management agency in the Fish and Wildlife Service is, shall be considered unsuitable.
Assessment

This criterion is excepted as a lease may be issued where the surface management agency, after consultation with the Fish and Wildlife Service, determine that all or certain stipulated methods of coal mining will not adversely affect the migratory bird habitat during the periods when such habitat is used by a species.

Criterion Number 15:

Federal lands which the surface management agency and the state jointly agree are fish and wildlife habitat for residents species of high interest to the state and which are essential for maintaining these priority wildlife species should be considered unsuitable. Examples of such lands which serve a critical function for the species involved include: (i) active dancing and strutting grounds for sage grouse, sharp tailed grouse, and prairie chicken; (ii) winter ranges most critical for deer, antelope, and elk; and (iii) migration corridors for elk.

Assessment

Exception: A lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant long term impact on the species being protected.

Criterion Number 16:

Federal lands in riverine, coastal and special floodplains (100 year recurrence interval) on which the surface management agency determines that mining could not be undertaken without substantial threat of loss of life or property shall be considered unsuitable for all or certain stipulated methods of coal mining.

Assessment

Not applicable to this criterion as these conditions are not found within the proposed tract lease.

Criterion Number 17:

Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.

Assessment

Not applicable to this criterion as Muddy Creek and Quitchupah Creek are not designated as municipal watersheds.

Criterion Number 18:

Federal lands with national resource waters, as identified by states in their water quality management plans, and the buffer zone of Federal lands 1/4 mile from the other edge of the four banks of the water, shall be unsuitable.

Assessment

Not applicable to this criterion as these conditions are not found within the proposed lease tract.
Criterion Number 19:

Federal lands identified by the surface management agency in consultation with the state in which they are located, as alluvial valley floors according to the definition in 3400.0 (5) (a) of this title, the standards in 30 CFR part 822, the final alluvial valley floor guidelines of the Office of Surface Mining Reclamation and Enforcement when published, and approved state programs under the Surface Mining Control and Reclamation act of 1977, where mining would interrupt, discontinue, or preclude farming, shall be considered unsuitable. Additionally, when mining federal land outside and alluvial valley floor would materially damage the quantity or quality of water in surface or underground water systems that would supply alluvial valley floors, the land shall be considered unsuitable.

Assessment

Not applicable to this criterion as this condition is not found within the proposed tract lease.

Criterion Number 20:

Federal lands in the state to which is applicable a criterion (i) proposed by that state, and (ii) adopted by rulemaking by the Secretary, shall be considered unsuitable.

Assessment

The criterion is not applicable to the proposed lease tract as conditions related to the criterion are not present.
Appendix B:
Special Coal Lease Stipulations
PART 1. LEASE RIGHTS GRANTED

This lease, entered into by and between the UNITED STATES OF AMERICA, hereinafter called lessor, through the Bureau of Land Management (BLM), and (Name and Address) hereinafter called lessee, is effective (date) __/__/__, for a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the:

☐ The Mineral Leasing Act of 1920, as amended, 30 U.S.C. 181 - 287; or

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any bonuses, rents, and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

containing ___ acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE - Lessee must pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $___ for each lease year.

(b) RENTAL CREDITS - Rental will not be credited against either production or advance royalties for any year.

Sec. 2. (a) PRODUCTION ROYALTIES - The royalty will be ___ percent of the value of the coal as set forth in the regulations. Royalties are due to lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the BLM may accept, for a total of not more than 20 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty will be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee must maintain in the proper office a lease bond in the amount of $___ . The BLM may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years will terminate the lease. Lessee must submit an operation and reclamation plan for the BLM's approval pursuant to 30 U.S.C. 207(c) prior to conducting any development or mining operations or taking any other action on a leasehold which might cause a significant disturbance of the environment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease will become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease will then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.
Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessee may prescribe, lessee must furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee must keep open at all reasonable times for the inspection by BLM the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee must allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section will be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee must comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee must not conduct exploration operations, other than usual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area must be submitted to the BLM.

Lessee must carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee must take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor must condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee must: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years should be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither lessee nor lessee's subcontractors should maintain segregated facilities.

Sec. 9. (a) TRANSFERS - This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

This lease may be transferred in whole or in part to another public body or to a person who will mine coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee will be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee must deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee must remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the BLM. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, will become the property of the lessor, but lessee may either remove any or all such property or continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor will waive the requirement for removal, provided the third parties do not object to such waiver. Lessee must, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease will be subject to cancellation by the lessor only by judicial proceedings. This provision will not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver will not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS-IN-INTEREST - Each obligation of this lease will extend to and be binding upon, and every benefit hereof will inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereeto.

Sec. 13. INDEMNIFICATION - Lessee must indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Clean Water Act (33 U.S.C. 1252 et seq.), the Clean Air Act (42 U.S.C. 4701 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.).
Sec. 15. SPECIAL STIPULATIONS (Cont’d.) -

THE UNITED STATES OF AMERICA

______________________________________________

(Company or Lessee Name)

______________________________________________

(Signature of Lessee)

(BLM)

________________________

(Title)

(Title)

________________________

(Date)

(Date)

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

(Continued on page 4)
NOTICES

The Privacy Act and 43 CFR 2.48(d) require that you be furnished with the following information in connection with the information requested by this form.


PRINCIPAL PURPOSE: The BLM will use the information you provide to process your application and determine if you are eligible to hold a coal lease on public lands.

ROUTINE USES: The BLM will only disclose this information in accordance with the provisions at 43 CFR 2.56(b) and (c).

EFFECT OF NOT PROVIDING INFORMATION: Submission of the requested information is necessary to obtain or retain a benefit. Failure to submit all of the requested information or to complete this form may result in delay or preclude the BLM’s acceptance of your application for a coal lease.

The Paperwork Reduction Act requires us to inform you that:

The BLM collects this information to evaluate and authorize proposed exploration and mining operations on public lands. Submission of the requested information is necessary to obtain or retain a benefit.

You do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: The public reporting burden for this form is estimated to average 25 hours per response when the form is used under the authority of 43 subpart 3422 (Lease Sales), or 800 hours per response when the form is used under the authority of 43 subpart 3430 (Preference Right Leases). The estimated burdens include the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. You may submit comments regarding the burden estimate or any other aspect of this form to: U.S. Department of the Interior, Bureau of Land Management (1004-0073), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, Mail Stop 401 LS, Washington, DC 20240.
SPECIAL COAL LEASE STIPULATIONS

Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or parts of this lease contain lands the surfaces of which are managed by the United States Department of Agriculture, Forest Service, Manti-La Sal National Forest and Fishlake National Forest.

The following stipulations pertain to the Lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

Stipulation #1
Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the Lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the Lessee, prior to disturbance, shall immediately bring them to the attention of the appropriate authority. Paleontological remains of significant scientific interest do not include leaves, ferns or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

Stipulation #2
If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

Stipulation #3
The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.
Stipulation #4
Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

Stipulation #5
The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of access roads, are factors which will determine the ultimate size of the surface area utilized for the mine. A site-specific environmental analysis will be prepared for each new mine site development and for major improvements to existing developments to examine alternatives and mitigate conflicts.

Stipulation #6
Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed to reduce visual impacts and, where possible, achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural landforms and vegetative landscape features will be avoided.

Stipulation #7
The Lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground, and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

Stipulation #8
The Lessee shall provide for the suppression and control of fugitive dust on haul roads, permitted roads, and at coal handling and storage facilities. On National Forest System Roads (NFSR), Lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

Stipulation #9
Except at locations specifically approved by the Authorized Officer, with the concurrence of the Forest Service, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. Where the Forest Service specifically approves exceptions to the above restrictions on subsidence, the Lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

Stipulation #10
In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specific approved locations.

Stipulation #11
If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.
Stipulation #12
The coal contained within, and authorized for mining under this lease shall be extracted only by underground mining methods.

Stipulation #13
Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

Stipulation #14
In order to protect big-game wintering areas, elk calving and deer fawning areas, sage-grouse strutting areas, and other key wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specified periods of the year.

Any post lease surface disturbing activities shall be consistent with the most current regulations and direction regarding the management of greater sage-grouse habitat. For the USDA Forest Service, current direction include the Interim Conservation Recommendations for Greater Sage-Grouse and Greater Sage-Grouse Habitat, USFS Regions 1, 2, and 4; and a letter from Regional Forester, dated October 4, 2012. For the USDI Bureau of Land Management, current direction includes Instructional Memorandum No. 2012-043.

Stipulation #15
Support facilities, structures, equipment, and similar developments will be removed from the lease area within two years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages re-established, and the areas returned to a pre-mining land use.

Stipulation #16
The Lessee, at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed or displaced corner monuments (section corners, 1/4 corners, etc.), their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by Bureau of Land Management (BLM) land surveyors to the standards and guidelines found in the Manual of Surveying Instructions, United States Department of the Interior.

Stipulation #17
The Lessees, at their expense, will be responsible to replace any surface water and/or developed groundwater sources identified in the Record of Decision for protection that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

Stipulation #18
STIPULATION FOR LANDS OF THE NATIONAL FOREST SYSTEM UNDER JURISDICTION OF THE DEPARTMENT OF AGRICULTURE

The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the
Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operating plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-La Sal National Forest
599 West Price River Drive
Price, Utah 84501
Telephone Number: 435-637-2817

who is the authorized representative of the Secretary of Agriculture.

**Stipulation #19**
**ABANDONMENT OF EQUIPMENT:**

The lessee/operator is responsible for compliance and reporting regarding toxic and hazardous materials and substances under Federal Law and all associated amendments and regulations for the handling of such materials on the land surface and in underground mine workings.

The lessee/operator must remove mine equipment and materials not needed for continued operations, roof support and mine safety from underground workings prior to abandonment of mine sections. Exceptions can be approved by the Authorized Officer (The BLM) in consultation with the surface management agency. Any on-site disposal of non-coal waste must comply with 30 CFR 817.89 and must be approved by the regulatory authority responsible for the enforcement of the Surface Mining Control and Reclamation Act (30 U.S.C. 1201, et seq.). Creation of a situation that would prevent removal of such material and equipment by retreat or abandonment of mine sections, without prior authorization, could be considered noncompliance with lease terms and conditions and subject to appropriate penalties under the lease.

All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to sealing of any areas in the mine and state the reason for closure. Prior to seals being put in place, the lessee shall inspect the area and certify through documentation any equipment/machinery, hazardous substances, and used oil that is intended to be left underground. The Authorized Officer may participate in this inspection. The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120 (h) and State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries, etc.) that is proposed to be left underground. In addition, these items will be photographed at the lessee's expense and shall be submitted to the Authorized Officer as part of the certification.

**WASTE CERTIFICATION:**

The lessee shall provide on a yearly basis and prior to lease relinquishment, certification to the lessor that, based upon a complete search of all the operator's records for the mine and upon their knowledge of past operations, there has been no hazardous substances defined as per (40 CFR 302.4) or used oil as per Utah Greens Hollow Federal Coal Lease Tract B-9 Draft Supplemental Environmental Impact Statement
State Management Rule R-315-15, deposited within the lease, either on the surface or underground, or that all remedial action necessary has been taken to protect human health and the environment with respect to any such substances remaining on the property. The back-up documentation to be provided shall be described by the lessor prior to the first certification and shall include all documentation applicable to the Emergency Planning and Community Right-to-know Act (EPCRA, Public Law 99-499), Title III of the Superfund Amendments and Reauthorization Act of 1986 or equivalent.

Stipulation #20
Notwithstanding the approval of a resource recovery and protection plan (R2P2) by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) [as defined at 43 CFR 3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the Authorized Officer to leave such reserves unmined. Upon approval by the Authorized Officer, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the Authorized Officer determines that the R2P2 as approved will not attain MER as the result of changed conditions, the Authorized Officer will give proper notice to the operator/lessee as required under applicable regulations. The Authorized Officer will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the Authorized Officer that the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Minerals Management Service (MMS) demand for such royalties, or by issuing a notice of noncompliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

Stipulation #21

In addition, on lands within inventoried roadless areas any surface disturbance from authorized temporary cross-country motorized access will be restricted to the minimum necessary to safely and efficiently complete surface activities.
Appendix C:
Federal Register Notices
construction of a new 120-kV power line. Construction and operation of the project is projected to begin in 2008. Active mining for the Phoenix Copper project will last about 15 years and will not increase the current life-of-mine for the Phoenix Mine.

An interdisciplinary approach will be used to develop the SEIS, in order to consider the variety of resource issues and concerns identified. Potential significant direct, indirect, residual, and cumulative impacts from the proposed action will be analyzed in the SEIS. Federal, state, and local agencies, as well as individuals or organizations that may be interested in or affected by the BLM's decision on this plan are invited to participate in the scoping process.

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis and SEIS alternatives. BLM personnel will be present at the scoping meeting to explain the environmental review process, the mining regulations, and other requirements for processing the proposed plan amendment and the associated SEIS. Representatives of Newmont will be available to describe the proposal.

You may submit comments on issues in writing to the BLM at the public scoping meeting or you may submit them to the BLM using one of the methods listed in the ADDRESSES section above. Comments received and a list of attendees at the scoping meeting will be available for public inspection.

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impacts will be prepared assuming mining would be done through the SUFCO mine. Because the lease offering would be competitive bid, if a company other than Ark Land were the successful bidder, the adequacy of the EIS would be re-evaluated to determine if it could be used as the basis for mining plan approval.

The proposed lease tract is in a management area that is available for further consideration for coal leasing. The Forest Service and BLM have determined that data are available to meet the Data Adequacy Standards for Federal Coal Leasing, Uinta-Southwestern Utah Coal Region. The Greens Hollow coal tract falls within the Muddy Creek coal tract and a 2-mile buffer, for which three years of field data were collected and a technical analysis of potential effects to resources present in the tract were completed in anticipation of a mining proposal. In 2004 the Forest Service initiated the preparation of an EIS for the Muddy Creek tract. Public scoping was conducted from March 5, 2004 through April 12, 2004 and a total of 10 responses were received. Based on the scoping comments and internal agency review, four resources were identified for detailed analysis in the Muddy Creek EIS: water resources, wildlife and wildlife habitat, vegetation, and cultural/paleontological resources. Previously collected data will be reviewed and updated to ensure the data remain valid for the Greens Hollow analysis.

Purpose and Need for Action

The purpose of the Proposed Action is to provide appropriate opportunities for leasing and development of Federal coal resources (USDA-FS 1986) under the Manti-La Sal and Fishlake National Forests, and to make cleared tracts available for leasing, subject to the mitigation requirements determined through multiple-use management and environmental review.

Ark Land Company, as the lease applicant, has expressed the need to obtain rights to additional minable coal in order to extend the life of the SUFCO Mine by approximately 10 years, maintain production, remain competitive in the current coal market, and to maintain current coal contracts.

Proposed Action

The proposed action would offer the Greens Hollow Coal Lease Tract for competitive leasing. Technical data and analysis would be reviewed to determine if lease stipulations would be needed to protect non-mineral resources consistent with BLM and Forest Service policies and Forest Plan Standards/ Guidelines and Objectives.

Possible Alternatives

All of the alternatives and options may not be known until after data collection and completion of the analysis. However, the EIS would likely consider the following alternatives.

Alternative 1 (No Action)—The no action alternative will provide a baseline for evaluating the effects of the action alternatives. Under this alternative the lease tract would not be offered for leasing at this time and there would be no mining within the tract.

Alternative 2—Under this alternative, the tract would be offered for competitive leasing, as delineated by the Tract Delineation Team, with BLM standard lease terms and conditions only. No special coal lease stipulations would be included in the lease to be offered.

Alternative 3—Under this alternative, the tract would be offered for competitive leasing, as delineated, with BLM standard lease terms and conditions and special stipulations to protect non-mineral resources and uses.

Other Action Alternatives—Other alternatives may be developed, as needed, to address social and environmental issues or opportunities.

Lead and Cooperating Agencies

The Bureau of Land Management, Price Field Office, and the Forest Service, Manti-La Sal and Fishlake National Forests, will be joint lead agencies for this project. The Office of Surface Mining (OSM) will participate as a cooperating agency.

Responsible Official

The responsible official for the Bureau of Land Management is Selma Sierra, Utah State Director, Bureau of Land Management, 440 West 200 South, Suite 500, Salt Lake City, Utah 84145–0155. The responsible officials for the Forest Service are Howard Sargent, Forest Supervisor, Manti-La Sal National Forest, 599 W. Price River Drive, Price, Utah 84501, and Mary Erickson, Forest Supervisor, Fishlake National Forest, 115 East 900 North, Richfield, Utah 84701.

Nature of Decision To Be Made

In accordance with the Mineral Leasing Act of 1920, as amended, the Utah State Director of the BLM will decide whether or not to offer the tract for competitive leasing and under what terms, conditions, and stipulations.

In accordance with the Coal Leasing Amendments Act of 1975, which amended the Mineral Leasing Act of 1920, the Forest Supervisors, Manti-La Sal and Fishlake National Forests, will decide whether or not to consent to leasing by the Bureau of Land Management. If they consent to leasing, they will identify special coal lease stipulations needed to protect non-mineral resources.

Scoping Process

This notice of intent in the Federal Register initiates the scoping process for the Greens Hollow Coal Lease Tract Environmental Impact Statement. Agency and public scoping comments guide the development of the EIS. It is important that those interested in this proposed action participate at this time. Scoping notification is also given in the Sun Advocate and Richfield Reaper, the newspapers of record. In addition, a public notice will be published in the Emery County Progress and the Salina Sun and mailed to potentially interested parties. Interested parties are invited to submit comments as outlined above. To be most helpful, your comments should be as specific as possible.

The lead agencies are seeking information and comments from Federal, State, and local agencies as well as individuals and organizations that may be interested in, or affected by, the proposed action. The BLM and Forest Service invite written comments and suggestions on issues related to the proposal and the area being analyzed. Information received will be used in preparation of the draft EIS and final EIS. No public meetings are currently planned.

Comments, including names and addresses of respondents, will be available for public review at the BLM Price Field Office, and will be subject to disclosure under the Freedom of Information Act (FOIA). Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to
resources, employment in the local area, and economic viability of the local and regional areas.

Permits or Licenses Required

The operator must obtain a permit from the Secretary of the Interior prior to commencing mining, contingent upon review and acceptance of the mining and reclamation plan in accordance with Surface Mining Control and Reclamation Act of 1977 (SMCRA) and the requirements of 30 CFR 700 to end.

Salma Sierra,
Utah State Director, BLM.
Howard Sargent,
Forest Supervisor, Manti-La Sal National Forest.
[FR Doc. E8–2557 Filed 2–11–08; 8:45 am]
BILLING CODE 4310–11–P

DEPARTMENT OF THE INTERIOR
National Park Service
Boston Harbor Islands National Recreation Area Advisory Council; Notice of Public Meeting

AGENCY: Department of the Interior, National Park Service, Boston Harbor Islands National Recreation Area.

ACTION: Notice of meeting.

SUMMARY: Notice is hereby given that a meeting of the Boston Harbor Islands National Recreation Area Advisory Council will be held on Wednesday, March 5, 2008, at 6 p.m. to 8 p.m. at University of Massachusetts—Boston, 100 Morrissey Boulevard, Campus Center, 3rd floor Bayview Room, Boston, MA.

This will be the annual meeting of the Council. The agenda will include a presentation on the development of a new guide book: Discovering the Boston Harbor Islands, membership review and election of officers, “park report card” update and public comment.

The meeting will be open to the public. Any person may file with the Superintendent a written statement concerning the matters to be discussed. Persons who wish to file a written statement at the meeting or who want further information concerning the meeting may contact Superintendent Bruce Jacobson at (617) 223–8667.

DATE: March 5, 2007 at 6 p.m.
ADRESSEES: University of Massachusetts—Boston, 100 Morrissey Boulevard, Campus Center, 3rd floor Bayview Room, Boston, MA.

FOR FURTHER INFORMATION CONTACT: Superintendent Bruce Jacobson, (617) 223–8667.

SUPPLEMENTAL INFORMATION: The Advisory Council was appointed by the Director of National Park Service pursuant to Public Law 104–333. The 28 members represent business, educational/cultural, community and environmental entities; municipalities surrounding Boston Harbor; Boston Harbor advocates; and Native American interests. The purpose of the Council is to advise and make recommendations to the Boston Harbor Islands Partnership with respect to the development and implementation of a management plan and the operation of the Boston Harbor Islands NRA.

Dated: January 14, 2008.
Bruce Jacobson,
Superintendent, Boston Harbor Islands NRA.
[FR Doc. E8–2561 Filed 2–11–08; 8:45 am]
BILLING CODE 4310–86–P

DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
Long-Term Experimental Plan for the Operation of Glen Canyon Dam and Other Associated Management Activities

AGENCY: Office of the Secretary, Interior.

ACTION: Notice.

SUMMARY: In a Federal Register notice published on November 6, 2006 (71 FR 64982–64983), and pursuant to section 102(2)(C) of the National Environmental Policy Act of 1969, as amended, and 40 CFR 1508.22, the Department of the Interior, acting through the Bureau of Reclamation (Reclamation), provided notice of its intent to prepare an environmental impact statement (EIS) and conduct public scoping meetings for the adoption of a Long-Term Experimental Plan for the operation of Glen Canyon Dam and other associated management activities. This Federal Register notice provides updated information and additional background on the status and development of the Long-Term Experimental Plan, as well as information regarding shorter term proposed flow experiments related to the operation of Glen Canyon Dam.

FOR FURTHER INFORMATION: Dennis Kubly, Bureau of Reclamation, telephone (801) 524–3715; faxogram (801) 524–3658; e-mail at GCDExpPlan@usbr.gov.

SUPPLEMENTAL INFORMATION: In a Federal Register notice published on November 6, 2006 (71 FR 64982–64983),
include monitoring and mitigation measures to avoid water quality impacts and an air quality analysis including values for NAAQS and PSD. Rating EC2.

EIS No. 20080543, ERP No. D–NRC–C03017–NY, Generic—License Renewal of Nuclear Plants, Supplement 38 to NUREG–1437, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Westchester County, NY.

Summary: EPA expressed environmental concerns about the proposed project’s impacts to aquatic resources and storage of low level waste. We recommended that the final SEIS include new geologic and seismic data concerning recent seismic activity in the area. Rating EC2.

EIS No. 20090004, ERP No. D–NPS–H65028–MO, Jefferson National Expansion Memorial, General Management Plan, Implementation, St. Louis, MO.

Summary: EPA expressed environmental concerns that the competition for the design of the preferred alternative had not begun, and that the implemented design could cause “moderate to major long term to beneficial impacts on transportation”. EPA recommended working with metropolitan and State transportation planners to include design specifications to reduce potential adverse effects. Rating EC2.

Final EISs


Application for an Amendment License to Increase the Installed Capacity, Susquehanna River, Lancaster and York Counties, PA.

Summary: EPA expressed environmental concerns because the impacts associated with sediment and bedrock excavation activities, and requested additional information, including excavation plans, a comparison of alternatives, and sediment sampling plans.


Summary: EPA found the Final EIS to be largely responsive to EPA’s comments on the Draft EIS and Supplemental Information Report, and believes the project is much improved and will result in fewer environmental impacts than what was originally proposed. EPA does not object to the proposed project.


Summary: While EPA had no objections to the proposed action, EPA did request clarification on monitoring and catch limits.


Summary: The preferred alternative addresses EPA concerns and we support the development of a consistent and integrated aquatic strategy to provide for protection for riparian areas, aquatic species, and good water quality.

EIS No. 20090037, ERP No. FS–AFS–F65062–MN, Echo Trail Area Forest Management Project, Updated Information to Amended to Further Address Water Quality and Watershed Health, Superior National Forest, Lacroix Ranger District and Kawishiwi Ranger District, St. Louis and Lake Counties, MN.

Summary: No formal comments were sent to the preparing agency.

Dated: March 31, 2009.

Dawn Roberts,
Management Analyst, Office of Federal Activities.
[FR Doc. E9–7515 Filed 4–2–09; 8:45 am]
BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–8591–9]

Environmental Impacts Statements; Notice of Availability


EIS No. 20090091, Draft EIS, FRC, VA, Smith Mountain Pumped Storage Project (FERC No. 2210–169).

Application for Hydropower License To Continue Operating the 636-megawatt Pumped Storage Project, Roanoke River, Bedford, Campbell, Franklin and Pittsylvania Counties, VA, Comment Period Ends: 05/18/2009, Contact: Patricia Schaumb, 1–866–208–1372.

EIS No. 20090092, Draft EIS, FHW, MO, East Columbia Transportation Project, To Improvements the Transportation Network in Eastern Columbia/Bounty County by: (1) Extending Route 740 from its Terminus at US–63, along a new Alignment, to I–70 at the existing St. Charles road interchange, (2) Improving existing Broadway (Route WW) to Oliver Road and (3) Extending Ballenger Lane, from Route 740 to Clark Lane, City of Columbia, Bounty County, MO, Comment Period Ends: 05/18/2009, Contact: Peggy Casey, 573–636–7104.

EIS No. 20090093, Final EIS, FHW, IA, I–29 Improvements in Sioux City, Construction from Burlington Northern Santa Fe Rail Road (BNSF) Bridge over the Missouri River to Existing Hamilton Boulevard Interchange, Woodbury County, IA, Wait Period Ends: 05/04/2009, Contact: Lubin Quinones, 515–233–7300.

Amended Notices


Robert W. Hargrove, Director, NEPA Compliance Division, Office of Federal Activities. [FR Doc. E9–7516 Filed 4–2–09; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[FRL–8789–3]

Science Advisory Board Staff Office; Notification of a Public Meeting of the Clean Air Scientific Advisory Committee (CASAC) Carbon Monoxide Review Panel

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.


DATES: The public meeting will be held on Tuesday, May 12, 2009 from 9 a.m. to 5 p.m. (Eastern Time) and Wednesday, May 13, 2009 from 8 a.m. to 2 p.m. (Eastern Time).

ADDRESSES: The meeting will be held at the Carolina Inn, 211 Pittsboro Street, Chapel Hill, North Carolina 27516.

FOR FURTHER INFORMATION CONTACT: Any member of the public who wants further information concerning the CASAC public meeting may contact Dr. Ellen Rubin, Designated Federal Officer (DFO), EPA Science Advisory Board (1400F), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460; via telephone/voice mail (202) 343–9975; fax (202) 233–0643; or e-mail at rubin.ellen@epa.gov. General information concerning the CASAC can be found on the EPA Web site at http://www.epa.gov/casac.

SUPPLEMENTARY INFORMATION: Background: The Clean Air Scientific Advisory Committee (CASAC) was established under section 109(d)(2) of the Clean Air Act (CAA or Act) (42 U.S.C. 7409) as an independent scientific advisory committee. CASAC provides advice, information and recommendations on the scientific and technical aspects of air quality criteria and National Ambient Air Quality Standards (NAAQS) for the six “criteria” air pollutants, including carbon monoxide (CO). EPA is conducting scientific assessments to review the primary (health-based) NAAQS of CO. As part of this review, EPA’s Office of Research and Development (ORD) has completed a draft document, Integrated Science Assessment for Carbon Monoxide (First External Review Draft, March 2009) and requested that CASAC peer review the document. EPA’s Office of Air and Radiation (OAR) will also release a planning document entitled Carbon Monoxide National Ambient Air Quality Standards: Scope and Methods Plan for Risk and Exposure Assessment (April 2009). OAR has requested that the CASAC provide consultative advice on this plan.

The purpose of the May 12–13, 2009 meeting is to review these two documents. Background information about the formation of the CASAC Carbon Monoxide Review Panel was published in the Federal Register on October 12, 2007 (72 FR 58078–58080). The CASAC Panel previously held a public teleconference on April 8, 2008 (announced in 73 FR 12998) to provide consultative advice on EPA’s Plan for Review of the National Ambient Air Quality Standards for Carbon Monoxide, the first document in this review of the CO NAAQS. The CASAC panel report was made available at http://yosemite.epa.gov/sab/sabproduct/nsf/AB08ED61CF9F37DF8525746A00512EC$File/EPA-CASAC-08-013-unsigned.pdf. Technical Contacts: Any questions concerning EPA’s Integrated Science Assessment for Carbon Monoxide should be directed to Dr. Tom Long at long.tom@epa.gov at (919) 541–1880. Any questions concerning EPA’s Carbon Monoxide National Ambient Air Quality Standard: Scope and Methods Plan for Risk and Exposure Assessment should be directed to Dr. Dave McKee at mckeetave@epa.gov at (919) 541–5288. Availability of Meeting Materials: A meeting agenda, charge questions and other materials for the meeting will be placed on the CASAC Web site at http://www.epa.gov/casac. Select the calendar link on the left and click on May 12–13. The Integrated Science Assessment for Carbon Monoxide: First External Review Draft (March 2009) is available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=203935.
routine land management activities, and to return to pre-SHA conditions (baseline). Under the SHA, the Applicant would undertake management activities to benefit the PVB by: planting 934 ocean locoweed (Astragalus trichopodus var. lonchus) and 1,400 deerweed (Lotus scoparius) plants (PVB hostplants) in a matrix of native CSS plants that will benefit a variety of dependent wildlife species including the PVB; completing restoration of 8 acres of park land into CSS habitat with a diverse native plant community and high structural diversity; controlling invasive weeds; and increasing the connectivity of CSS habitats on the Peninsula within the Enrolled Property.

In order to receive the above assurances regarding incidental take of the PVB, the Applicant must maintain baseline on the Enrolled Property. The Service and Applicant have determined that the measure of baseline for PVB will be the number of ocean locoweed plants that were present within Friendship Park prior to restoration actions. The Palos Verdes blue butterfly does not currently inhabit the Enrolled Property. Therefore, the baseline for the SHA is 194 ocean locoweed plants within 0.055 acres of habitat for the PVB. There were only a few scattered deerweed plants on the property prior to restoration actions, and these plants are not considered part of the baseline condition.

If you wish to comment on the permit application, including the SHA, or the Environmental Action Statement, you may submit your comments to the address listed in the ADDRESSES section of this document. Comments and materials received, including names and addresses of respondents, will be available for public review, by appointment, during normal business hours at the address in the ADDRESSES section above. If you provide personal identifying information, you may request at the beginning of your comment that we withhold this information from public review. However, we cannot guarantee that we will be able to do so.

We will evaluate this permit application, associated documents, and comments submitted thereon to determine whether the permit application meets the requirements of section 10(a) of the Act and NEPA regulations. If we determine that the requirements are met, we will sign the proposed Agreement and issue an enhancement of survival permit under section 10(a)(1)(A) of the Act to the Applicants for take of the PVB incidental to otherwise lawful activities in accordance with the terms of the SHA. We will not make our final decision until after the end of the 30-day comment period and will fully consider all comments received during the comment period.

The Service provides this notice pursuant to section 10(c) of the Act and pursuant to implementing regulations for NEPA (40 CFR 1506.6).

Dated: March 31, 2009.

Jim A. Bartel,
Field Supervisor, Carlsbad Fish and Wildlife Office, Carlsbad, California.

[FR Doc. E9–7608 Filed 4–3–09; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF INTERIOR
Bureau of Land Management

DEPARTMENT OF AGRICULTURE
Forest Service

DEPARTMENT OF AGRICULTURE
Forest Service

[LLUT070 L13200000 EL0000 24 1A00]
Notice of Availability of the Draft Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Coal Lease Tract, Sanpete and Sevier Counties, UT

AGENCY: Bureau of Land Management, Interior and Forest Service, Agriculture.

ACTION: Notice of availability.

SUMMARY: In accordance with the National Environmental Policy Act of 1969 (NEPA, 42 U.S.C. 4321 et seq.), the Bureau of Land Management (BLM) has prepared a Draft Environmental Impact Statement (DEIS) for the Leasing and Underground Mining of the Greens Hollow Coal Lease Tract, Sanpete and Sevier Counties, Utah and by this Notice is announcing the opening of the comment period.

DATES: To ensure comments will be considered, the BLM must receive written comments on the Leasing and Underground Mining of the Greens Hollow Coal Lease Tract, Sanpete and Sevier Counties, Utah DEIS within 45 days following the date the Environmental Protection Agency publishes the Notice of Availability in the Federal Register. The BLM will announce future meetings or hearings and any other public involvement activities at least 14 days in advance through public notices, media news releases, and/or mailings.

ADDRESSES: You may submit comments by any of the following methods:

E-mail: UT_PR_Comments2@BLM.gov.
Fax: (435) 636–3657.

Mail: Bureau of Land Management, Price Field Office, 125 South 600 West, Price, Utah 84501, Attn: Greens Hollow Coal Lease Tract DEIS.

Copies of the Leasing and Underground Mining of the Greens Hollow Coal Lease Tract, Sanpete and Sevier Counties, Utah are available at the Price Field Office at the above address; the Manti-La Sal National Forest—Supervisor’s Office, 599 West Price River Drive, Price, Utah 84501, and the Fishlake National Forest, 115 East 900 North, Richfield, Utah 84701.

FOR FURTHER INFORMATION CONTACT: Steve Rigby, Project Manager, Price BLM Field Office at (435) 636–3604.

SUPPLEMENTARY INFORMATION: The DEIS evaluates a proposal by Ark Land Company, a subsidiary of Arch Coal, Inc., to lease and conduct underground mining of Federal coal within the 6,334 acre project area. The development plan proposal also includes two ventilation shafts, one surface mine ventilation fan and associated operational infrastructure, a new surface 69 kV powerline, and access road upgrade.

To address potential effects on the multiple resources which make up the affected environment, the BLM and the U.S. Department of Agriculture Forest Service, in coordination with cooperating agencies, have developed three alternatives in the DEIS. The alternatives include a No Action Alternative, the Proposed Action, and a third Alternative, which modifies components of the Proposed Action. The alternatives incorporate best management practices for underground coal mining and other measures necessary to adequately address impacts to geology, water resources, cultural resources, recreational opportunities, wildlife, vegetation, Threatened and Endangered Species, socioeconomics, visual resources, air quality, and other relevant issues.

Selma Sierra,
Utah State Director, BLM.

William LeVere,
Acting Deputy Regional Forester.
[FR Doc. E9–7827 Filed 4–2–09; 4:15 pm]
you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses.

**FOR FURTHER INFORMATION CONTACT:**

**SUPPLEMENTARY INFORMATION:** EPA is seeking public comment regarding its preliminary Finding of No Significant Impact (FONSI) to document its determination that no significant environmental impacts are anticipated from the issuance of the 2012 Construction General Permit. EPA invites the public to submit comments through Regulations.gov or by mail to the address cited in the ADDRESSES section during the 30-day comment period following the publication of this notice in the Federal Register.

Since 1992, EPA has issued a series of NPDES Construction General Permits (CGP) that cover areas where EPA is the permitting authority. At present, EPA is the permitting authority in four states (Idaho, Massachusetts, New Hampshire, and New Mexico), the District of Columbia, Puerto Rico, all U.S. territories with the exception of the Virgin Islands, federal facilities in four states (Colorado, Delaware, Vermont, and Washington), most Indian lands and other specifically designated activities in specific states (e.g., oil and gas activities in Texas and Oklahoma). EPA’s current CGP became effective on June 30, 2008 (see 74 FR 40338) and will expire on February 15, 2012. The proposed action, would replace the 2008 CGP, as well as the 2003 CGP for construction sites still covered under that administratively continued permit. EPA proposes to issue the construction general permit for five (5) years, and to provide permit coverage to eligible existing and new construction projects in all areas of the country where EPA is the NPDES permitting authority. On April 25, 2011, EPA proposed for public comment the draft National Pollutant Discharge Elimination System general permit for stormwater discharges from large and small construction activities and initiated scoping for the development of the environmental issues and reasonable alternatives to be addressed in the EA. 76 FR 22882.

The environmental review process, which is documented by the Environmental Assessment (EA), indicates that no potential significant adverse environmental impacts are anticipated from the proposed action. The EA, which analyzed the potential environmental impacts of issuing the new CGP, considered the potential environmental impacts from the discharge of pollutants in stormwater discharges associated with construction activity where EPA is the permitting authority.

Based on the environmental impact analysis in the EA, EPA has determined that no significant environmental impacts are anticipated from the issuance of the 2012 Construction General Permit and the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment, making the preparation of an Environmental Impact Statement (EIS) unnecessary. Therefore, EPA is issuing a preliminary Finding of No Significant Impact (FONSI).

Dated: December 20, 2011.

Aimee S. Hersert,
Deputy Division Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 2011–32945 Filed 12–22–11; 8:45 am]

**BILLING CODE P**

**ENVIRONMENTAL PROTECTION AGENCY**

[ER–FRL–9000–6]

Environmental Impacts Statements; Notice of Availability

**Responsible Agency:** Office of Federal Activities, General Information (202) 564–1399 or http://www.epa.gov/compliance/nepa/.

**Weekly receipt of Environmental Impact Statements**

Filed 12/12/2011 Through 12/16/2011 Pursuant to 40 CFR 1506.9

Notice: Section 309(a) of the Clean Air Act requires that EPA make public its comments on EISs issued by other Federal agencies. EPA’s comment letters on EIS are available at: http://www.epa.gov/compliance/nepa/eisdata.html.

**EIS No. 20110423, Draft EIS, NRG, SC,**
William States Lee III Nuclear Station Units 1 and 2 Combined Licenses (COLs) Application, Constructing and Operating Two New Nuclear Units at the Lee Nuclear Station Site, NUREG–2111, Cherokee County, SC, Comment Period Ends: 02/06/2012, Contact: Sarah Lopas (301) 415–1147.

**EIS No. 20110424, Final EIS, NOAA, IL,**

**EIS No. 20110425, Final EIS, FHWA, CT,**
North Hillside Road Extension on the University of Connecticut Storrs Campus, Hunting Lodge Road, US Army COE Section 404 Permit, in the town Mansfield, CT, Review Period Ends: 01/23/2012, Contact: Amy Jackson-Grove (860) 659–6703 Ext. 3009.

**EIS No. 20110426, Draft EIS, USFS, FL,**
City of Tallahassee Southwestern Transmission Line Project, Proposes to Construct, Operate and Maintain a New Overhead 230- kilovolt (kV), Electric Transmission Line, Special-Use-Permit (SUP), Apalachicola National Forest (ANF), Leon County, FL, Comment Period Ends: 02/06/2012, Contact: David Harris (404) 347–5292.

**EIS No. 20110427, Final EIS, AFS/BLM, UT,**
Greens Hollow Coal Lease Tract Project, Proposed Federal Coal Leasing and Subsequent Underground Coal Mining, Funding and Lease Application, Fishtlake and Manti-La Sal National Forest, Sanpete and Sevier Counties, UT, Review Period Ends: 01/23/2012, Contact: Tom Lloyd (435) 636–3596 (AFS) and Steve Rigby (435) 636–3604 (BLM). This is a Joint Lead document between AFS and BLM.

**EIS No. 20110428, Draft EIS, USACE, CA,**

**EIS No. 20110429, Draft EIS, FTA, NJ,**
Northern Branch Corridor Project, Restoration of Passenger Rail Service in Northeastern Hudson and Southern Bergen Counties, NJ, Comment Period Ends: 02/06/2012, Contact: Anthony Lee (212) 668–2170.

**Amended Notices**

**EIS No. 20110371, Draft EIS, BLM, UT,**
Alton Coal Tract Lease by Application Project, the Exploration and Development of Mineral Resource, Kane County, UT, Comment Period Ends: 01/27/2012, Contact: Keith Rigsrup (435) 655–3063 Revision to FR Notice Published 11/04/2011: Extending Comment Period from 01/06/2012 to 01/27/2012.
ENVIROMENTAL PROTECTION AGENCY

Notification of a Public Meeting of the Science Advisory Board Libby Amphibole Asbestos Review Panel

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA or Agency) Science Advisory Board (SAB) Staff Office announces a public face-to-face meeting of an SAB Panel to review EPA’s draft Toxicological Review of Libby Amphibole Asbestos (August 2011).

DATES: The meeting will be held on February 6, 2012 from 9 a.m. to 5:30 p.m., February 7, 2012 from 8:30 a.m. to 5:30 p.m. and on February 8, 2012 from 8:30 a.m. to 2:30 p.m. (Eastern Time).

ADDRESSES: The meeting will be held at the Westin Alexandria Hotel at 400 Courthouse Square, Alexandria, VA 22314.

FOR FURTHER INFORMATION CONTACT: Any individual of the public wishing further information regarding this meeting may contact Dr. Diana Wong, Designated Federal Official (DFO), SAB Staff Office, by telephone/voice mail at (202) 564–2049 or via email at wong.diana-M@epa.gov. General information concerning the EPA Science Advisory Board can be found at the EPA SAB Web site at http://www.epa.gov/sab.

SUPPLEMENTARY INFORMATION:

Background: The SAB was established pursuant to the Environmental Research, Development, and Demonstration Authorization Act (ERDAA) codified at 42 U.S.C. 4365, to provide independent scientific and technical peer review, advice, consultation, and recommendations to the EPA Administrator on the technical basis for EPA actions. As a Federal Advisory Committee, the SAB conducts business in accordance with the Federal Advisory Committee Act (FACA) (5 U.S.C. App. 2) and related regulations. Pursuant to FACA and EPA policy, notice is hereby given that an SAB Panel will hold a public meeting to review EPA’s draft Toxicological Review of Libby Amphibole Asbestos (August 2011). The SAB panel will comply with the provisions of FACA and all appropriate SAB Staff Office procedural policies.


Availability of the review materials: The agenda and materials in support of this meeting will be available at the URL above. For technical questions and information concerning EPA’s review document, please contact Dr. Danielle Devoney, of EPA’s National Center for Environmental Assessment (NCEA), by phone (703) 347–8558, or via email at devoney.daniel@epa.gov; or Dr. Bob Benson, of EPA Region 8, by phone (303) 312–7070, or via email at benson.bob@epa.gov.

Procedures for Providing Public Input: Public comment for consideration by EPA’s federal advisory committees and panels has a different purpose from public comment provided to EPA program offices. Therefore, the process for submitting comments to a federal advisory committee is different from the process used to submit comments to an EPA program office. Federal advisory committees and panels, including scientific advisory committees, provide independent advice to EPA. Members of the public can submit relevant comments pertaining EPA’s charge or meeting materials. Input from the public to the SAB will have the most impact if it consists of comments that provide specific scientific or technical information or analysis for the SAB panel to consider or if it relates to the clarity or accuracy of the technical information.

Members of the public wishing to provide comment should contact the Designated Federal Official for the relevant advisory committee directly. Oral Statements: In general, individuals or groups requesting an oral presentation at this public meeting will be limited to five minutes per speaker. Interested parties should contact Dr. Diana Wong, DFO, in writing (preferably via email), at the contact information noted above, by January 27, 2012 to be placed on the list of public speakers for the meeting. Written Statements: Written statements should be received in the SAB Staff Office by January 27, 2012 so that the information may be made available to the SAB Panel for their consideration. Written statements should be supplied to the DFO in electronic format via email (acceptable file formats: Adobe Acrobat PDF, WordPerfect, MS Word, MS PowerPoint, or Rich Text files in IBM–PC/Windows 98/2000/XP format). It is the SAB Staff Office general policy to post written comments on the web page for the advisory meeting or teleconference. Submitters are requested to provide an unsigned version of each document because the SAB Staff Office does not publish documents with signatures on its Web sites. Members of the public should be aware that their personal contact information, if included in any written comments, may be posted to the SAB Web site. Copyrighted material will not be posted without explicit permission of the copyright holder.

Accessibility: For information on access or services for individuals with disabilities, please contact Dr. Diana Wong at the phone number or email address noted above, preferably at least ten days prior to the meeting, to give EPA as much time as possible to process your request.

Dated: December 16, 2011.

Vanessa T. Vu,
Director, EPA Science Advisory Board Staff Office.

ENVIRONMENTAL PROTECTION AGENCY

Notification of Teleconferences of the Science Advisory Board Biogenic Carbon Emissions Panel

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA or Agency) Science Advisory Board (SAB) Staff Office announces two teleconferences of the SAB Biogenic Carbon Emissions Panel to review EPA’s draft Accounting Framework for Biogenic CO2 Emissions from Stationary Sources (September 2011).

DATES: The teleconferences will be held on January 27, 2012 from 2 p.m. to 5
Integrated Resource Timber Contracts. Forest Service Sales Officers will mail bid forms to potential bidders, and bidders will return the completed forms, dated and signed, to the Forest Service Sales Officer. The data gathered in this information collection are not available from other sources.

Forms Associated With This Information Collection

FS–2400–42a—National Forest Timber and Forest Products for Sale (Advertisement and Short-Form Bid): This form will be used for soliciting and receiving bids on short-notice timber sales that are advertised for less than 30 days and less than $10,000 in advertised value. Respondents are bidders on National Forest System timber sales.

FS–2400–14—Bid for Advertised Timber (3 form versions: FS–2400–14UR– Unit Rate Bidding; FS–2400–14WA– Weighted Average Bidding; FS–2400–14TV– Total Value Bidding): These forms will be used for soliciting and receiving bids on Timber Sales that are advertised for 30 days or longer and generally greater than $10,000 in advertised value. These forms implement the same statutes, policies, and regulations and collect similar information from the same applicants. Respondents are the bidders on National Forest System timber and forest product sales.

FS–2400–14BV—Solicitation and Offer For Specific Resources Resource Contract (2 form versions: FS–2400–14BV– Best Value, Total Value Offer; and FS–2400–14BVU– Best Value, Unit Rate Offer): These forms will be used for soliciting and receiving offers on Integrated Resource Timber Contracts that are advertised for 30 days or longer and generally greater than $10,000 in advertised value.

Forms showing changes to the April 2010 versions currently in use can be viewed on the World Wide Web/Internet site at: http://www.fs.fed.us/forestmanagement/products/bidforms.shtml and at the Forest Management Service Center, 2150 Centre Ave., Bldg. A, Fort Collins, CO. Visitors are encouraged to call ahead at (970) 295–5020 and ask for Lathrop Smith to facilitate entry into the building.

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<tr>
<td>Estimate of Annual Burden</td>
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<td>34 hours</td>
<td>53 hours</td>
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<td>Type of Respondents</td>
<td>Individuals, large and small businesses, and corporations bidding on National Forest timber sales and Integrated Resource Timber Contracts.</td>
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<tr>
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<td>2.2</td>
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<td>72,930 hours</td>
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Comment Is Invited

Comment is invited on: (1) Whether the proposed collection of information is necessary for the stated purposes or the proper performance of the functions of the agency, including whether the information shall have practical or scientific utility; (2) the accuracy of the agency’s estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used; (3) ways to enhance the quality, utility, and clarity of the information to be collected; and (4) ways to minimize the burden of the collection of information on respondents, including the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

All comments received in response to this notice, including name and address when provided, will be summarized and included in the request for Office of Management and Budget approval. All comments also will become a matter of public record.

Dated: October 10, 2012.

James M. Peña,
Associate Deputy Chief, National Forest System.

DEPARTMENT OF AGRICULTURE

Forest Service

Supplemental Environmental Impact Statement to the 2011 Final EIS for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract (UTU–84102)

AGENCY: Forest Service, USDA.

ACTION: Notice of intent to prepare a supplemental environmental impact statement.

SUMMARY: The Manti-La Sal and Fishlake National Forests along with the Bureau of Land Management (BLM), Price Field Office as joint lead agencies announce their intent to prepare a supplemental Environmental Impact Statement (EIS) and Record of Decision to the 2011 Final EIS For the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract UTU–84102. Supplemental analyses are required to correct deficiencies in the Final EIS.

DATES: Additional scoping will not be conducted in accordance with 40 CFR 1502.9(c)(4). The draft supplemental EIS is expected in late December 2012 and the final supplemental EIS is expected in March 2013. There will be a 45-day comment period after the draft supplemental EIS is issued.

ADDRESSES: Send written comments to Allen Rowley, Forest Supervisor, 115 East 900 North, Richfield, Utah 84701. Comments may also be sent via email to comments-intermtn-fishlake@fs.fed.us, or via facsimile at 435–896–9347. Please reference Greens Hollow Supplemental EIS in the subject field.

FOR FURTHER INFORMATION CONTACT: Marianne Orton, Forest Environmental Coordinator, Fishlake National Forest, 115 East 900 North, Richfield, Utah 84701 or phone 435–896–1090. Individuals who use telecommunication devices for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339 between 8 a.m. and 8 p.m., Eastern Time, Monday through Friday.

SUPPLEMENTARY INFORMATION: The proposed Greens Hollow Federal Coal Lease Tract is located on the Manti-La Sal and Fishlake National Forests in Sanpete and Sevier counties, Utah. The surface and coal resources are both federally owned. The Forests administer the surface resources, while the BLM administers the subsurface coal resources. The tract is located on the Muddy Creek and North Fork Quitchupah Creek drainages approximately 10 air miles west of the town of Emery, Utah. The tract is estimated to contain about 56.6 million tons of recoverable coal reserves. The
tract is being considered for competitive coal leasing under BLM regulations at 43 CFR part 3400. Coal in the tract would be accessed and recovered using underground longwall mining methods, with foreseeable access from existing adjacent leases. The Forest Service and BLM have determined that data are available to meet the Data Adequacy Standards for Federal Coal Leasing, Uinta-Southwestern Utah Coal Region.

The final coal lease tract, as amended by BLM’s Tract Delineation Team, encompasses 6,175 acres of Federal coal estate. The proposed lease contains about 6,096 acres of National Forest System (NFS) lands administered by the Manti-La Sal National Forest and about 79 acres of NFS lands administered by the Fishlake National Forest.

A Final EIS for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract (UTU–84102) was released to the public along with the Record of Decision in December 2011. Subsequently, the decision was made to withdraw the Record of Decision and prepare a Supplemental EIS.

Purpose and Need for Action

The purpose for developing this Supplemental EIS is to clarify the decisions to be made and agency decision authority, analyze the environmental consequences of potential actions to be taken by each agency, make technical corrections, and address agency compliance actions and key resource concerns not previously analyzed in the original 2011 Final EIS. The Supplemental EIS will replace the Final EIS in its entirety. There is a need to comply with current direction regarding management of Inventoried Roadless Areas and unroaded/undeveloped areas, address key resource concerns, and update analysis for aquatic management indicator species and sage-grouse.

The Forest Service and the BLM have identified a need to respond to a federal coal lease-by-application, and assess whether or not to offer certain NFS lands for lease by competitive bid. The purpose of the federal agencies’ actions is to facilitate continued development and recovery of federally managed coal resources in an environmentally sound manner. The Proposed Action responds to the federal government’s overall policy to foster and encourage private enterprise in the development of economically sound and stable industries, and to promote orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs.

The BLM is considering the Proposed Action because it would be an integral part of the BLM’s coal leasing program under authority of the Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976 and supplemented in 1978, and by implementing regulations at 43 CFR 3425, Lease-On-Application. Coal development is recognized as an appropriate use of public lands within the Wasatch Plateau Coal Field. The BLM will consider the approval of the Proposed Action in a manner that minimizes impacts on or to other resource values (including water and cultural resources), avoids or reduces impact on resources and activities, and prevents unnecessary or undue degradation of public lands.

Proposed Action

The action proposed to meet the purpose and need is for the Forest Service to consent to the BLM offering the Greens Hollow Federal Coal Lease Tract (UTU–84102) for competitive bid. The Forest Service consent decision would include special coal lease stipulations for use and protection of non-mineral interests, and the BLM decision would include stipulations related to the mineral resource.

Lead and Cooperating Agencies

The Bureau of Land Management, Price Field Office, and the Forest Service, Manti-La Sal and Fishlake National Forests, are joint lead agencies for this project. The USDI Office of Surface Mining (OSM) will participate as a cooperating agency.

Responsible Official

The Responsible Official for the Forest Service is Allen Rowley, Manti-La Sal Acting Forest Supervisor and Fishlake Forest Supervisor, 115 East 900 North, Richfield, Utah 84701. The responsible official for the BLM is William Stringer, Green River District Manager, 170 South 500 East, Vernal Utah 84078.

Nature of Decision To Be Made

In accordance with the Federal Coal Leasing Amendments Act of 1975, which amended the Mineral Leasing Act of 1920, and enacting regulations at 43 CFR 3400, the Forest Supervisor for the Manti-La Sal and Fishlake National Forests, will decide whether or not to consent to BLM leasing the subject federal coal lease tract. As part of its consent decision, the Forest Service will identify special coal lease stipulations needed to protect non-mineral resources.

In accordance with the Mineral Leasing Act of 1920, as amended, and contingent on consent of the surface managing agency, the Green River District Manager of the BLM will decide whether or not to offer the tract for competitive leasing and under what terms, conditions, and special stipulations.

Preliminary Issues

This Supplemental EIS will analyze issues relating to the potential for underground mining and associated subsidence and foreseeable surface uses to affect: Geologic resources (including mining-induced subsidence and seismicity); existing and reasonably foreseeable surface structures and facilities; surface and ground water resources, including water quantity and water quality; terrestrial and aquatic wildlife resources (including Threatened, Endangered, and special status species); vegetation resources (including Threatened, Endangered, and special status species); heritage resources: paleontological resources; socioeconomics; recreation; visual quality; range; roadless characteristics; and air quality.

Permits or Licenses Required

Should a lease be issued and before any mining activity could commence, the lessee must obtain a coal mining and reclamation permit from the Utah Division of Oil, Gas and Mining consistent with the requirements of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) as codified in 30 CFR 700 to end, and the Utah Coal Rules. Other Federal and State permits would also be required.

Scoping Process

Scoping for this Supplemental EIS was completed in preparation of the previous EIS. The original Notice of Intent (NOI) for the Greens Hollow Coal Lease Tract was published in the Federal Register (Vol. 73, No. 29, pp. 8060–8062) on February 12, 2008. The NOI designated a 45-day comment period ending March 28, 2008, when comments would be most useful. A public notice was also distributed to interested individuals on the BLM, Price Field Office and Manti-La Sal and Fishlake National Forests mailing lists. A legal notice was also sent to local newspapers to notify the general public.

A content analysis of the comments received on the Draft EIS was prepared. A summary of the issues and concerns, grouped by discipline or resource, identified during the scoping process
were analyzed in the EIS, while a more detailed record of responses received were compiled into a scoping report for the project.

Other Public Involvement
The Draft EIS for the Greens Hollow Coal Lease Tract was released and distributed on March 26, 2009. The EPA Notice of Availability (NOA) was published in the Federal Register on April 3, 2009, initiating the formal 45-day comment period on the Draft EIS. The BLM NOA appeared in the Federal Register on April 6, 2009. The Forest Service Legal Notice of Proposed Action appeared in the local newspapers on April 14 and 15, 2009. The NOA was also posted on the BLM’s Environmental Notification Bulletin Board on April 3, 2009. An electronic copy of the Draft EIS was also made available on the BLM’s Web site and hard copies were mailed to the project mailing list. Responses to comments on the Draft EIS were included in the Final EIS, Appendix C.

The Final EIS was released to the public on December 14, 2011. The EPA NOA was published in the Federal Register on December 23, 2011. On February 13, 2012, an appeal was filed with the Region 4, Regional Forester. February 13, 2012, an appeal was filed with the Region 4, Regional Forester.

Summarized information has been mailed to the project mailing list. EIS were included in the Final EIS, Appendix C. The Final EIS was released to the public on December 14, 2011. The EPA NOA was published in the Federal Register on December 23, 2011. On February 13, 2012, an appeal was filed with the Region 4, Regional Forester. Following the appeal, the decision was made to withdraw the Record of Decision and conduct additional analyses.

Allen Rowley,
Forest Supervisor, Fishlake and Manti LaSal National Forests.

DEPARTMENT OF AGRICULTURE

Forest Service
Snohomish County Resource Advisory Committee (RAC)

AGENCY: Forest Service, USDA.

ACTION: Notice of meeting.

SUMMARY: The Snohomish County Resource Advisory Committee (RAC) will meet in Everett, Washington on October 25, 2012. The committee is meeting to review and prioritize 2012 and 2013 Snohomish County RAC Project Proposals for funding.

DATES: The meeting will be held on Thursday, October 25, 2012, from 9 a.m. to 5 p.m.

ADDRESSES: The meeting will be held in the Mt. Baker-Snoqualmie National Forest 4th floor Conference Room, located at the Wall Street Building, 2930 Wetmore Ave., Everett, Washington 98201.

FOR FURTHER INFORMATION CONTACT: Peter Forbes, District Ranger, Darrington Ranger District, phone (360) 436–2301, email pforbes@fs.fed.us. Individuals who use telecommunication devices for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339 between 8 a.m. and 8 p.m., Eastern Standard Time, Monday through Friday.


Comments may be sent via email to pforbes@fs.fed.us or via facsimile to (360) 436–1309. All comments, including names and addresses when provided, are placed in the record and are available for public inspection and copying. The public may inspect comments received at the Darrington Ranger District office at 1405 Emens Avenue, Darrington, Washington, during regular office hours (Monday through Friday 8 a.m.–4:30 p.m.).

Dated: October 12, 2012.
Jennifer Eberlien,
Forest Supervisor.

BILLING CODE 3410–11–P

DEPARTMENT OF AGRICULTURE

Rural Business-Cooperative Service

Notice of Request for Extension of a Currently Approved Information Collection

AGENCY: Rural Business-Cooperative Service, USDA.

ACTION: Proposed collection; comments requested.

SUMMARY: In accordance with the Paperwork Reduction Act of 1995, this notice announces the Rural Business-Cooperative Service’s (RBS) intention to request an extension of a currently approved information collection in support of the Intermediary Relending Program (IRP).

DATES: Comments on this notice must be received by December 17, 2012, to be assured of consideration.


SUPPLEMENTARY INFORMATION:

Type of Request: Extension of currently approved collection information.

Abstract: The regulations contain various requirements for information from the intermediaries, and some requirements may cause the intermediary to seek information from ultimate recipients. The information requested is necessary for RBS to be able to process applications in a responsible manner, make prudent credit and program decisions, and effectively monitor the intermediaries’ activities to protect the Government’s financial interest and ensure that funds obtained from the Government are used appropriately. It includes information to identify the intermediary; describe the intermediary’s experience and expertise; describe how the intermediary will operate its revolving loan fund; provide for debt instruments, loan agreements, and security; and other material necessary for prudent credit decisions and reasonable program monitoring.

Estimate of Burden: Public reporting burden for this collection of information is estimated to average 7.5 hours per response.

Respondents: Non-profit corporations, public agencies, Indian tribes and cooperatives.

Estimated Number of Respondents: 202.

Estimated Number of Responses per Respondent: 12.

Estimated Number of Responses: 2,383.

Estimated Total Annual Burden on Respondents: 17,959 hours.

Copies of this information collection can be obtained from Brigitte Sunter, Regulations and Paperwork Management Branch, Support Services Division at (202) 692–0042.

Comments

Comments are invited on (a) whether the proposed collection of information is necessary for the proper performance of the functions of RBS, including whether the information will have practical utility; (b) the accuracy of RBS’s estimate of the burden of the proposed collection of information including the validity of the methodology and assumptions used; (c) ways to enhance the quality, utility, and clarity of the information to be
Appendix D:

Coal Leases for Surrounding Tracts

including Special Stipulations
Coal Lease U-63214
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MODIFIED COAL LEASE

PART I.

THIS MODIFIED COAL LEASE is entered into on DEC 01 2009 by and between the UNITED STATES OF AMERICA, hereinafter called the Lessor, through the Bureau of Land Management, and Canyon Fuel Company LLC c/o Ark Land Company City Place One, Suite 300 St. Louis, MO 63141 hereinafter called Lessee.

This modified lease shall retain the effective date of July 1, 1989, of the original COAL LEASE UTU-63214, and is effective for a period of 10 years from the date of the last lease readjustment, dated July 1, 2009 and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the: (NOTE: Check the appropriate Act or Acts.)


and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessee as the holder of Coal Lease UTU-63214, issued effective July 1, 1989, was granted the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 1 and Tract 2.

The Lessor in consideration of fair market value, rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to Lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 3.

Tract 1:
T. 21 S., R. 4 E., SLM, Utah
Sec. 12, E½SE¼;
Sec. 13, E½NE¼, S½;
Sec. 14, E½SW¼, SE¼;
Sec. 23, E½, E½W¼;
Sec. 24, all;
T. 22 S., R. 5 E., SLM, Utah
Sec. 3, lots 1-4, S½N½, NE½SW¼, S½SW¼, N½SE¼, SW½SE¼;
Sec. 4, lots 1, 2, S½NE¼, SE½SE¼;
Sec. 9, NE½NE¼;

T. 21 S. R. 5 E., SLM, Utah
Sec. 15, W½;
Secs. 16-21, all;
Sec. 22, W½;
Sec. 26, W½NW½SW½SW½SW½;
Sec. 27, all;
Sec. 28, N½, N½SW½, SE½SW½, SE¼;
Sec. 29, E½NE¼, NE½SE¼;
Sec. 30, lot 1, N½NE¼;
Sec. 33, lots 2-4, NE¼, E½NW¼, NE½SW¼, N½SE¼;
Sec. 34, all;
containing 10,695.46 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

Part II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay Lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 per acre for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 8 percent of the value of the coal as set forth in the regulations. Royalties are due to Lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the Lessee, the authorized officer may accept, for a total of not more than 20* years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the Lessee requests approval to pay advance royalties in lieu of continued operation.

* 20 years (Public Law 109-58)

Sec. 3. BONDS - Lessee shall maintain in the proper office a bond in the amount of $1,600,000 if lands are added to the existing LMU. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease achieved diligent development February 1, 2003, and is subject to the conditions of continued operation. Continued operation may be excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the Lessee. The Lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension.

The Lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the Lessor of the Lessee’s application or at the direction of the Lessor, this lease shall become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval or modification will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

This lease was placed in the SUFCO LMU effective April 2, 1990.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as Lessor may prescribe, Lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of Lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow Lessor access to and copying of documents reasonably necessary to verify Lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to
inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by Lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specifications of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of Lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8 PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither Lessee nor Lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS (Check the appropriate space)

X This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

___ This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

___ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENTS - The Lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon Lessor's acceptance of the relinquishment, Lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such times as all portions of this lease are returned to Lessor, Lessee shall deliver up to Lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, Lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the Lessor, but Lessee shall either remove any or all such property or shall continue to
be liable for the cost of removal and disposal in the amount actually incurred by the Lessor. If the surface is owned by third parties, Lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by Lessee’s activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. **PROCEEDINGS IN CASE OF DEFAULT** - If Lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the Lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by Lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. **HEIRS AND SUCCESSORS - IN-INTEREST** - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall insure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. **INDEMNIFICATION** - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the Lessee's activities and operations under this lease.

Sec. 14. **SPECIAL STATUTES** - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. **SPECIAL STIPULATIONS** -

SEE ATTACHED STIPULATIONS
The United States of America

Company or Lessee Name

Company or Lessee Name

(Signature of Lessee)

(Signature of Lessee)

President

(Title)

President

(Title)

11/10/09

(Date)

(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.
SPECIAL STIPULATIONS FOR UTU-63214
MODIFIED COAL LEASE

1. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

2. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

3. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

4. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

5. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

6. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape
compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

7. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

8. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

9. Except at locations specifically approved by the Authorized Officer, with concurrence of the Forest Service, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

10. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

11. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

12. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

13. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

14. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

15. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to an acceptable post mining land use.
16. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by BLM, to the standards and guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

17. The Lessee, at his expense, will be responsible to replace any surface and/or developed ground water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

18. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Fishlake National Forest
115 East 900 North
Richfield, Utah 84701

Telephone No.: 435-896-9233

who is the authorized representative of the Secretary of Agriculture.

19. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (I) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the AO to leave such reserves unmined. Upon approval by the AO, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2 modification will not attain MER resulting from changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a new R2P2 modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.
The BLM may enforce this provision either by issuing a written decision requiring payment of the MMS demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

20. WASTE CERTIFICATION: The lessee shall provide upon abandonment and/or sealing off a mined area and prior to lease termination/relinquishment, certification to the lessor that, based upon a complete search of all the operator's records for the mine and upon their knowledge of past operations, there has been no hazardous substances per (40 CFR 302.4) or used oil as per Utah State Management Rule R-315-15, deposited within the lease, either on the surface or underground, or that all remedial action necessary has been taken to protect human health and the environment with respect to any such substances remaining on the property. The back-up documentation to be provided shall be described by the lessee prior to the first certification and shall include all documentation applicable to the Emergency Planning and Community Right-to-know Act (EPCRA, Public Law 99-499), Title III of the Superfund Amendments and Reauthorization Act of 1986 or equivalent.

21. ABANDONMENT OF EQUIPMENT: The lessee/operator is responsible for compliance with reporting regarding toxic and hazardous material and substances under Federal Law and all associated amendments and regulations for the handling such materials on the land surface and in underground mine workings.

The lessee/operator must remove mine equipment and materials not needed for continued operations, roof support and mine safety from underground workings prior to abandonment of mine sections. Exceptions can be approved by the Authorized Officer (BLM) in consultation with the surface management agency. Creation of a situation that would prevent removal of such material and by retreat or abandonment of mine sections without prior authorization would be considered noncompliance with lease terms and conditions and subject to appropriate penalties under the lease.

22. UNDERGROUND INSPECTION: All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to the sealing of any areas in the mine and state the reason for closure. Prior to seals being put into place, the lessee shall inspect the area and document any equipment/machinery, hazardous substances, and used oil that is to be left underground.

The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120(h) and State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries etc.) that is proposed to be left underground. In addition, these items will be photographed at the lessee's expense and shall be submitted to the Authorized Officer as part of the certification. The abandonment of any equipment/machinery shall be on a case by case basis and shall not be accomplished unless the Authorized Officer has granted a written approval.

23. GOB VENT BOREHOLES. The Lessee shall submit a gob vent borehole plan for approval by the AO as part of an R2P2 for all gob vent boreholes. The plugging portion of the plan must meet 43 CFR 3484.1(a)(3) as a minimum. If variations to the approved plugging procedures are necessary, they shall also be approved by the AO in writing prior to implementation of the procedures.

24. FAIR MARKET VALUE BONUS: Pursuant to 43 CFR 3432.2(c), “the lands applied for shall be added to the existing lease without competitive bidding, but the United States shall receive the fair market value of the lease of the added lands, either by cash payment or adjustment of the royalty applicable to the lands added to the lease by the modification.” Therefore, the lessee will pay the fair market value (FMV) bonus payment for the coal resources mined in the area of Federal coal lease modification (UTU-63214) Tract 2: Due to the uncertainty of the amount of recoverable coal tons in this modification and the uncertainty in mining conditions, the lessee will pay the fair market value (FMV) for the coal resources mined in the area of Federal Coal Lease Modification (UTU-63214 Tract 2) at the rate of $0.25 per ton for the actual tonnage mined. Payment of the FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Minerals Management Service (MMS). The lessee will clearly indicate which portion of the payment is for royalty and what is for lease bonus payment. Tract 3: in the amount of $155,666, prior to approval of the modification adding Tract 3 to lease UTU-63214. A payment of $159,333 will be due prior to one year anniversary of the approval of the modification and a final payment of $163,333 will be required to be paid prior to the second year anniversary of the approval of the modification. Finally, an additional bonus payment will be due for the coal resources mined on the areas comprised of Federal coal lease modification acreage added to coal leases SL- 062583 (Tract 2), UTU-47080 (Tract 2) and UTU-63214.
(Tract 3), which exceed 6,930,000 tons mined, at a rate of $.35 per ton for the actual tonnage mined, adjusted annually using the U. S. Bureau of Labor Statistics CPI West Urban Energy Index; or if that index is not available, an index that is mutually agreed to by the lessee and the authorized officer will be used. Payment of this part of the FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Minerals Management Service (MMS). The lessee will clearly indicate which portion of the payment is for royalty and what is for the lease bonus payment.
Coal Lease U-47080
IN REPLY REFER TO:
3451
UTU-47080
(UT-9223)

CERTIFIED MAIL—Return Receipt Requested

DEcision

Canyon Fuel Company LLC : Coal Lease
C/o Ark Land Company :
City Place One, Suite 300 :
St. Louis, MO 63141 :

Readjustment of Coal Lease UTU-47080
Effective October 1, 2011

The regulations under 43 CFR 3451.1(a)(1) and (2) state:

1. All leases issued prior to August 4, 1976, shall be subject to readjustment at the end of
   the current 20-year period and at the end of each 10-year period thereafter.

2. Any lease subject to readjustment, which contains a royalty rate less than the minimum
   royalty prescribed in 43 CFR 3473.3-2 shall be readjusted to conform to the minimum
   prescribed in that section.

Coal lease UTU-47080 was issued effective October 1, 1981. By notice dated October 7, 2009,
Canyon Fuel Company LLC was notified that the terms and conditions of the readjustment of
coal lease UTU-47080 would be provided in accordance with the regulations under 43 CFR 3451
no later than October 1, 2011.

As provided in Part I of the lease and in accordance with the regulations under 43 CFR 3451.2,
enclosed are the terms and conditions of coal lease UTU-47080 effective October 1, 2011.

This decision may be appealed to the Interior Board of Land Appeals, Office of the Secretary, in
accordance with the regulations contained in 43 CFR, Part 4, and the enclosed Form 1842.1. If
an appeal is taken, your notice of appeal must be filed in this office (at the above address) within
30 days from receipt of this decision. The appellant has the burden of showing that the decision
appealed from is in error.

If you wish to file a petition (pursuant to regulation 43 CFR 4.21)(58 FR 4939, January 19, 1993)
(request) for a stay (suspension) of the effectiveness of this decision during the time that your
appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed in this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards.

(1) The relative harm to the parties if the stay is granted or denied,

(2) The likelihood of the appellant's success on the merits,

(3) The likelihood of immediate and irreparable harm if the stay is not granted, and

(4) Whether the public interest favors granting the stay.

Shelley J. Smith

Juan Palma
State Director

Enclosures
1. Form 1842-1 (1 p)
2. Coal Lease Readjustment (10 pp)

cc: Ms. Jill Ptacek, Department of Justice, Antitrust Division, Transportation, Energy and Agriculture Section, 450 5th Street, NW, Suite 4100, Washington D.C. 20530 (w/encl.)
Resource Development Coordinating Committee, ATTN: Mineral Leasing Taskforce, 116 State Capital Building, Salt Lake City, Utah 84114 (w/encl.)
Mr. John Baza, Director, UDOGM, Box 145801, Salt Lake City, Utah 84114-5801 (w/encl.)
Price Coal Office (w/encl.)
ONRR, MRM, Solid Minerals Staff, Attn: Patrick Mulcahy, MS390B2, Box 25165, Denver, CO 80225-0165
Allen Rowley, Forest Supervisor, Fishlake National Forest, 115 East 900 North, Richfield, UT 84701(w/encl.)
Pamela Brown, Forest Supervisor, Manti-La Sal National Forest, 599 Price River Dr., Price, UT 84501(w/encl.)
Tina Garcia, USDA-Forest Service, Southwest Region, 333 Broadway Blvd., SE, Albuquerque, NM 87102
Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

Canyon Fuel Company, L.L.C.
c/o Ark Land Company
City Place One, Suite 300
St. Louis, MO 63141

hereinafter called lessee, is readjusted, effective October 1, 2011, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:


and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

Tract 1:
T. 21 S., R. 4 E., SLM, Utah
Sec. 25, all;
Sec. 36, N½;
T. 21 S., R. 4 E., SLM, Utah
Sec. 30, lots 2-4, W½SE¼;

Tract 2:
T. 21 S., R. 4 E., SLM, Utah
Sec. 35, E½, E½SW½;
T. 22 S., R. 4 E., SLM, Utah
Sec. 2, lots 1-4, S½NE¼, S½NW¼, N½SW¼;
Sec. 3, NE¼SE¼.

Sevier County, Utah

containing 1,953.73 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.
PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE. Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS. Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES. The royalty shall be 8.0 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES. Upon request by the lessee, the authorized officer may accept for a total of not more than *10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.
*20 years (Public Law 109-58)

Sec. 3. BONDS. Lessee shall maintain in the proper office a LMU bond in the amount of $3,253,000 which is on file. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE. This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU). Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.
Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS. Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term.

Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY. Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.
Sec. 9(a) TRANSFERS

/ X/ This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

/ / This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

/ / This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT. The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT. If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - INTEREST. Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.
Sec. 13. INDEMNIFICATION. Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES. This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151-1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS.

SEE ATTACHED STIPULATIONS
SPECIAL STIPULATIONS FOR COAL LEASE UTU-47080

1. In accordance with Sec. 523 (b) of the “Surface Mining Control and Reclamation Act of 1977,” surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with the Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). the United States Government does not warrant that the entire tract will be susceptible to mining.

2. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

3. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

4. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

5. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

6. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

7. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the
scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

8. The Lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

9. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

10. Except at locations specifically approved by the authorized officer, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

11. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

12. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

13. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

14. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

15. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

16. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

17. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the
rectangular surveying system. This work shall be conducted at the expense of the Lessee, by BLM to the standards and guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

18. The Lessee, at his expense, will be responsible to replace any surface water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

19. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Fishlake National Forest
115 East 900 North
Richfield, Utah 84701

Telephone No.: 435-896-9233

or

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who are the authorized representatives of the Secretary of Agriculture.

20. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the AO to leave such reserves unmined. Upon approval by the AO, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section
shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2 modification will not attain MER resulting from changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a new R2P2 modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Office of Natural Resources Revenue (ONRR) demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

21. WASTE CERTIFICATION: The Lessee shall provide upon abandonment, transfer of operation, assignment of rights, sealing off a mined area and prior to lease relinquishment, certification to the lessor that, based upon a complete search of all the records for the lease and its associated mine operation(s), and upon Lessee’s and the operator’s knowledge of past mining operations associated with the lease, there has been no reportable quantities of hazardous substances per (40 CFR 302.4) or used oil [as per Utah State Management Rule R-315-15], discharged, deposited or released within the lease, either on the surface or underground, and that all remedial actions necessary have been taken to protect human health and the environment with respect to any such substances. Lessee must additionally provide to the Lessor a complete list of all hazardous substances and hazardous materials and their Chemical Abstract Registry Numbers, and the oil and petroleum products used or stored on, or delivered to, the lease. Such disclosure will be in addition to any other disclosure required by law or agreement.

22. UNDERGROUND INSPECTION: All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to the sealing of any areas in the mine and state the reason for closure. Prior to seals being put into place, the lessee shall inspect the area and document any equipment/machinery, hazardous substances, and used oil that is to be left underground. The AO may participate in this inspection.

The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120(h) and Utah State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries etc.) that is proposed to be left underground. In addition, these items will be photographed at the Lessee's expense and shall be submitted to the Authorized Officer as part of the certification. The abandonment of any equipment/machinery shall be on a case by case basis and shall not be accomplished unless the Authorized Officer has granted a written approval. Any on-lease disposal of non-coal waste must comply with 30 CFR §817.89.

23. FAIR MARKET VALUE BONUS: Pursuant to 43 CFR 3432.2(c), "the lands applied for shall be added to the existing lease without competitive bidding, but the United States shall receive the fair market value of the lease of the added lands, either by cash payment or adjustment of the royalty applicable to the
lands added to the lease by the modification.” Therefore, the lessee will pay the fair market value (FMV) bonus payment for the coal resources of the Federal coal lease modification (UTU-47080) Tract 2, in the amount of $155,667, prior to approval of the modification which adds Tract 2 to lease UTU-47080. A payment of $159,334 will be due prior to one year anniversary of the approval of the modification and a final payment of $163,334 will be required to be paid prior to the second year anniversary of the approval of the modification.

Finally, an additional bonus payment will be due for the coal resources mined on the areas comprised of Federal coal lease modification acreage added to coal leases SL-062583 (Tract 2), UTU-47080 (Tract 2) and UTU-63214 (Tract 3), which exceed 6,930,000 tons mined, at a rate of $.35 per ton for the actual tonnage mined, adjusted annually using the U. S. Bureau of Labor Statistics CPI West Urban Energy Index; or if that index is not available an index that is mutually agreed to by the lessee and the authorized officer will be used. Payment of this part of the FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Minerals Management Service (MMS). The lessee will clearly indicate which portion of the payment is for royalty and what is for the lease bonus payment.
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Coal Lease SL-062583
IN REPLY REFER TO:
3451
SL-062583
(UT-9223)

CERTIFIED MAIL—Return Receipt Requested

DECISION

Canyon Fuel Company LLC : Coal Lease
c/o Ark Land Company : SL-062583
City Place One, Suite 300:
St. Louis, MO 63141:

Readjustment of Coal Lease SL-062583
Effective September 11, 2011

The regulations under 43 CFR 3451.1(a)(1) and (2) state:

1. All leases issued prior to August 4, 1976, shall be subject to readjustment at the end of
the current 20-year period and at the end of each 10-year period thereafter.

2. Any lease subject to readjustment, which contains a royalty rate less than the minimum
royalty prescribed in 43 CFR 3473.3-2 shall be readjusted to conform to the minimum
prescribed in that section.

Coal lease SL-062583 was issued effective September 11, 1941. By notice dated September 15,
2009, Canyon Fuel Company LLC was notified that the terms and conditions of the readjustment
of coal lease SL-062583 would be provided in accordance with the regulations under 43 CFR
3451 no later than September 11, 2011.

As provided in Part I of the lease and in accordance with the regulations under 43 CFR 3451.2,
enclosed are the terms and conditions of coal lease SL-062583 effective September 11, 2011.

This decision may be appealed to the Interior Board of Land Appeals, Office of the Secretary, in
accordance with the regulations contained in 43 CFR, Part 4, and the enclosed Form 1842.1. If
an appeal is taken, your notice of appeal must be filed in this office (at the above address) within
30 days from receipt of this decision. The appellant has the burden of showing that the decision
appealed from is in error.

If you wish to file a petition (pursuant to regulation 43 CFR 4.21)(58 FR 4939, January 19, 1993)
(request) for a stay (suspension) of the effectiveness of this decision during the time that your
appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed in this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

**Standards for Obtaining a Stay**

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards.

1. The relative harm to the parties if the stay is granted or denied,
2. The likelihood of the appellant’s success on the merits,
3. The likelihood of immediate and irreparable harm if the stay is not granted, and
4. Whether the public interest favors granting the stay.

/s/ Roger L. Banker
Kent Hoffman
Deputy State Director
Lands and Minerals

Enclosures
1. Form 1842-1 (1 p)
2. Coal Lease Readjustment (11 pp)

cc: Ms. Jill Ptacek, Department of Justice, Antitrust Division, Transportation, Energy and Agriculture Section, 450 5th Street, NW, Suite 4100, Washington D.C. 20530 (w/encl.)
Resource Development Coordinating Committee, ATTN: Mineral Leasing Taskforce, 116 State Capital Building, Salt Lake City, Utah 84114 (w/encl.)
Mr. John Baza, Director, UDOGM, Box 145801, Salt Lake City, Utah 84114-5801 (w/encl.)
Price Coal Office (w/encl.)
ONRR, MRM, Solid Minerals Staff, Attn: Patrick Mulcahy, MS390B2, Box 25165, Denver, CO 80225-0165
Allen Rowley, Forest Supervisor, Fishlake National Forest, 115 East 900 North, Richfield, UT 84701(w/encl.)
Tina Garcia, USDA-Forest Service, Southwest Region, 333 Broadway Blvd., SE, Albuquerque, NM 87102
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and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

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Tract 1:
T. 21 S., R. 4 E., SLM, Utah
Sec. 36, S½;
S½N½, S½;

T. 22 S., R. 5 E., SLM, Utah
Sec. 31, all;

Tract 2:
T. 22 S., R. 4 E., SLM, Utah
Sec. 2, SE¼, S½SW¼;
Sec. 3, SE¼SE¼;
Sec. 10, E½NE¼, NE¼SE¼;
Sec. 11, N½, N½S½.

T. 22 S. R. 4 E., SLM, Utah
Sec. 1, lots 1-4,
T. 22 S., R. 5 E., SLM, Utah
Sec. 6, all;
Sec. 7, N½NE¼, E½NW¼.
containing 3,079.83 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.
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(b) RENTAL CREDITS. Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES. The royalty shall be 8.00 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES. Upon request by the lessee, the authorized officer may accept for a total of not more than 20 (pursuant to Public Law 109-58) years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS. Lessee shall maintain in the proper office. An LMU bond in the amount of $1,600,000 is on file. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE. This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU). Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.
Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS. Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term.

Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY. Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.
Sec. 9(a) TRANSFERS

This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT. The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT. If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST. Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.
Sec. 13. INDEMNIFICATION. Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee=s activities and operations under this lease.

Sec. 14. SPECIAL STATUTES. This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151-1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS.

SEE ATTACHED STIPULATIONS
SPECIAL STIPULATIONS FOR COAL LEASE SL-062583

1. In accordance with Sec. 523 (b) of the “Surface Mining Control and Reclamation Act of 1977,” surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with the Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

2. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

3. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

4. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

5. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

6. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

7. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery
and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

8. The Lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

9. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

10. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

11. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

12. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

13. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

14. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

15. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

16. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

17. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by BLM to the standards and
guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

18. The Lessee, at his expense, will be responsible to replace any surface water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

19. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Fishlake National Forest
115 East 900 North
Richfield, Utah 84701

Telephone No.: 435-896-9233

who is the authorized representative of the Secretary of Agriculture.

20. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (I) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the AO to leave such reserves unmined. Upon approval by the AO, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2 modification will not attain MER resulting from changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a new R2P2 modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that
the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Office of Natural Resources Revenue (ONRR) demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

21. WASTE CERTIFICATION: The Lessee shall provide upon abandonment, transfer of operation, assignment of rights, sealing off a mined area and prior to lease relinquishment, certification to the lessor that, based upon a complete search of all the records for the lease and its associated mine operation(s), and upon Lessee’s and the operator’s knowledge of past mining operations associated with the lease, there has been no reportable quantities of hazardous substances per (40 CFR 302.4) or used oil [as per Utah State Management Rule R-315-15], discharged, deposited or released within the lease, either on the surface or underground, and that all remedial actions necessary have been taken to protect human health and the environment with respect to any such substances. Lessee must additionally provide to the Lessor a complete list of all hazardous substances and hazardous materials and their Chemical Abstract Registry Numbers, and the oil and petroleum products used or stored on, or delivered to, the lease. Such disclosure will be in addition to any other disclosure required by law or agreement.

22. UNDERGROUND INSPECTION: All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to the sealing of any areas in the mine and state the reason for closure. Prior to seals being put into place, the lessee shall inspect the area and document any equipment/machinery, hazardous substances, and used oil that is to be left underground. The AO may participate in this inspection.

The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120(h) and Utah State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries etc.) that is proposed to be left underground. In addition, these items will be photographed at the Lessee's expense and shall be submitted to the Authorized Officer as part of the certification. The abandonment of any equipment/machinery shall be on a case by case basis and shall not be accomplished unless the Authorized Officer has granted a written approval. Any on-lease disposal of non-coal waste must comply with 30 CFR §817.89.

23. FAIR MARKET VALUE BONUS: Pursuant to 43 CFR 3432.2(c), “the lands applied for shall be added to the existing lease without competitive bidding, but the United States shall receive the fair market value of the lease of the added lands, either by cash payment or adjustment of the royalty applicable to the lands added to the lease by the modification.” Therefore, the lessee will pay the fair market value (FMV) bonus payment for the coal resources mined in the area of Federal coal lease modification (SL-062583) Tract 2, in the amount of $155,667, prior to approval of the modification adding Tract 2 to lease SL-062583. A payment of $159,333 will be due prior to one year anniversary of the approval of the modification and a final payment of $163,333 will be required to be paid prior to the second year anniversary of the approval of the modification.

Finally, an additional bonus payment will be due for the coal resources mined on the areas comprised of Federal coal lease modification acreage added to coal leases SL-062583 (Tract 2), UTU-47080 (Tract 2) and UTU-63214 (Tract 3), which exceed 6,930,000 tons mined, at a rate of $.35 per ton for the actual tonnage mined, adjusted annually using the U. S. Bureau of Labor Statistics CPI West Urban Energy
Index; or if that index is not available an index that is mutually agreed to by the lessee and the authorized officer will be used. Payment of this part of the FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Office of Natural Resources Revenue (ONRR). The lessee will clearly indicate which portion of the payment is for royalty and what is for the lease bonus payment.
Appendix E:

BLM and State Sensitive Species
<table>
<thead>
<tr>
<th>Species</th>
<th>Analyzed in SEIS?</th>
<th>Habitat Present in the Project Area?</th>
<th>Known to Occur in the Project Area?</th>
<th>Analyzed Species with Shared Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wildlife Species</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American white pelican <em>Pelecanus erythrorhynchos</em></td>
<td>No</td>
<td>No - Breeds on islands in freshwater lakes. Winters at coastal sites.¹</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Bald eagle <em>Haliaeetus leucocephalus</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Big free-tailed bat <em>Nyctinomops macrotis</em></td>
<td>No</td>
<td>Yes - Rocky woodland habitat, roosts in caves, mines, old buildings, and rock crevices.</td>
<td>No</td>
<td>Spotted bat</td>
</tr>
<tr>
<td>Black swift <em>Cypseloides niger</em></td>
<td>No</td>
<td>No - Nests on rock ledges near or behind waterfalls in montane areas.²</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Burrowing owl <em>Athene cunicularia</em></td>
<td>No</td>
<td>No - Nests in open grasslands occupied by burrowing mammals such as prairie dogs.¹</td>
<td>No</td>
<td>Utah prairie dog</td>
</tr>
<tr>
<td>Carinate Glenwood pyrg <em>Pyrgulopsis inopinata</em></td>
<td>No</td>
<td>No - Three springs in Sevier County: two near Glenwood and one south of Sigurd.²</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Ferruginous hawk <em>Buteo regalis</em></td>
<td>No</td>
<td>No - Low elevation, flat, rolling grassland and shrubsteppe habitats. Avoids forests and narrow canyons.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Fringed myotis <em>Myotis thysanodes</em></td>
<td>No</td>
<td>Yes - Inhabits caves, mines and buildings in desert and woodland areas.²</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Grasshopper sparrow <em>Ammodramus savannarum</em></td>
<td>No</td>
<td>No - Nests in grasslands with sparse shrub cover.³</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Kit fox <em>Vulpes macrotis</em></td>
<td>No</td>
<td>No - Inhabits open desert plains.²</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Lewis’s woodpecker <em>Melanerpes lewis</em></td>
<td>No</td>
<td>Yes - Inhabits ponderosa pine forests, lowland riparian areas with cottonwoods, oak woodlands, and pinyon-juniper woodlands.¹</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Long-billed curlew <em>Numenius americanus</em></td>
<td>No</td>
<td>No - Nests in low vegetative density grasslands. Avoids areas with thick bunchgrasses or shrubs.¹</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Ninemile pyrg <em>Pyrgulopsis nonaria</em></td>
<td>No</td>
<td>No - Two springs near Ninemile Reservoir in Sanpete County.²</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Otter Creek pyrg <em>Pyrgulopsis fusca</em></td>
<td>No</td>
<td>No - Known from three sites in tributaries of Otter Creek in Piute and Sevier Counties.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Pygmy rabbit <em>Brachylagus idahoensis</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Short-eared owl <em>Asio flammeus</em></td>
<td>No</td>
<td>No - This species does not breed further south than the northernmost</td>
<td>No</td>
<td>None</td>
</tr>
</tbody>
</table>
### BLM and State sensitive species present in Sanpete and Sevier counties and their status in the Greens Hollow Federal Coal Lease Tract project area.

<table>
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<tr>
<th>Species</th>
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<th>Analyzed Species with Shared Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth Glenwood pyrg <em>Pyrgulopsis chamberlini</em></td>
<td>No</td>
<td>No - Two springs near Glenwood in Sevier County.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Southern Bonneville springsnail <em>Pyrgulopsis transversa</em></td>
<td>No</td>
<td>No - Six springs in north-central Utah: four in Tooele County, one in Utah County, and one in Sanpete County.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Southern leatherside chub <em>Lepidomeda aliciae</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Three-toed woodpecker <em>Picoides tridactylus</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Townsend’s big-eared bat <em>Corynorhinus townsendii</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Boreal (Western) toad <em>Bufo boreas</em></td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Vegetation Species

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><em>Alicielia tenuis</em> Emery, Sevier</td>
<td>No</td>
<td>No - Limestone or sandstone, in open grass, shrub, and woodland communities, between 5,200 and 7,100 feet elevation. Restricted to sandstone outcrops and sandy detrital slopes in association with a curious mixture of mountain brush, pinyon-juniper, and cushion plants. Largest concentrations are on sandstone (including mudstone and siltstone) with interbedded gypsum, on ledges, in cracks, and on talus slopes. Most populations are on steep terrain.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Astragalus loanus</em> Sevier</td>
<td>No</td>
<td>No - Known only from the middle Sevier Valley; sagebrush and PJ communities on igneous substrates, 6,300 to 6,800 ft.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Eriogonum brevicaule mitrophyllum</em> Sevier</td>
<td>No</td>
<td>No - Edemic to Sevier County; Arapien shale on clay flats and slopes, 5,250 to 5,575 feet.</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Ericameria lignumviridis</em> Sevier</td>
<td>No</td>
<td>No - 6150-6250ft elevation; crevices in igneous rock outcrops and cliffs</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Mentzelia argillosa</em> Sanpete, Sevier</td>
<td>No</td>
<td>No - Steeply sloping and constantly moving talus or scree</td>
<td>No</td>
<td>None</td>
</tr>
</tbody>
</table>
## BLM and State sensitive species present in Sanpete and Sevier counties and their status in the Greens Hollow Federal Coal Lease Tract project area.

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<tr>
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<tr>
<td><strong>Penstemon wardii</strong></td>
<td>No</td>
<td>No - Ephedra, rabbitbrush, shadescale, mountain mahogany, sagebrush, and pinyon-juniper communities on semiarid, white to gray, fine-textured (often calcareous or gysiferous) substrates (mostly Arapien shale), 5,500 to 6,800 ft.</td>
<td>None</td>
</tr>
<tr>
<td>Piute, Sanpete, Sevier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phacelia utahensis</strong></td>
<td>No</td>
<td>No - Salt desert shrub on clay hills and banks in the Arapien shale formation, 5,500 to 6,200 ft. Salt desert shrub on clay hills and banks in the Arapien shale formation, 5,500 to 6,200 ft.</td>
<td>None</td>
</tr>
<tr>
<td>Carbon, Sevier, Sanpete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Townsendia jonesii lutea</strong></td>
<td>No</td>
<td>No - Salt desert and mixed desert shubs and juniper-sagebrush communities on Arapien shale and clays in volcanic rubble, 5,500 to 6,300 ft.</td>
<td>None</td>
</tr>
<tr>
<td>Juab, Piute, Sevier</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Oliver and Bosworth 1999. [http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1530&context=govdocs](http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1530&context=govdocs)
6. [http://loco.biosci.arizona.edu/astragalus/images/Astragalus_images/Aloanus.htm](http://loco.biosci.arizona.edu/astragalus/images/Astragalus_images/Aloanus.htm)
7. Utah Rare Plants guide online.