

Bronco Utah Operations LLC

PO Box 527
Emery Utah, 84522
801-286-2447

May 21, 2019

Mr. Steve Christensen
Utah Division of Oil, Gas and Mining
Coal Program
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, UT 84114-5801

C/015/0015
Received 5/24/19
Task #5936

**RE: Bronco Utah Operations LLC
Emery Mine
DOGM Permit No. C/015/0015
Emery 2 Full Extraction Deficiency Response Task ID 5769**

Mr. Christensen:

Please consider these deficiency responses to the above mentioned permit task which includes an executed C1 form, C2 form, revised pages, and Plates. As you are aware, several of the deficiencies have been submitted and approved under previous permit actions. The previous submittal Task ID's have been identified throughout the deficiency response document.

This submittal updates a previous pre-subsidence survey on the surface south of Quitchupah Creek and requests approval to conduct full extraction mining and planned subsidence of the surface. Surface owner agreements will be obtained prior to any full extraction within a given tract not controlled by Bronco.

If you have any questions concerning this request, please contact Kit Pappas at 435-286-2027.

Sincerely,



Kit Pappas
Environmental Manager

Attachments Application for Coal Permit Processing

Deficiency List
Task id #5769
Full Extraction Revision

The members of the review team who have identified deficiencies include the following individuals:

Priscilla Burton (Pburton)
Steve Christensen (Schristensen)
Joe Helfrich (Jhelfrich)
Justin Eatchel (Jeatchel)

GENERAL CONTENTS

Right of Entry

R645-301-114.100: Please provide right of entry information for SITLA lease ML 51745 and revise text in Appendix I-2 (p. 9-10) and maps accordingly. (Pburton)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised CH I, Plate I-1(Surface and Coal Ownership), and CH I Appendix I-2. The SITLA lease has been revised to depict current status.

Refer to Emery 2, 2nd left panel full extraction Task #5847 for CH V, Appendix V-8 Figure 1(Pre Subsidence Survey)

R645-301-121.100: Surface ownership shown on Plate I-1 and Figure 1 of App. V-8 do not match. Please make the appropriate corrections so that pre-subsidence notifications are sent to the correct surface owners. (Pburton)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised CH I, Plate I-1(Surface and Coal Ownership), and CH I Appendix I-2.

Refer to Emery 2, 2nd left panel full extraction Task #5847 for CH V, Appendix V-8 Figure 1(Pre Subsidence Survey)

Surface and coal ownership was taken from county records.

R645-301-114.100: The Permittee must provide a description of the documents upon which they base their legal right to enter and begin coal operations within Federal Coal Lease U-5287. The description will identify the documents by type and date of execution and identify the specific lands to which the document pertains and explain the legal rights claimed by the Permittee. The text in Chapter 1 and Appendix I-2 must be revised accordingly. (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised CH I Appendix I-2.

Federal Lease U-5287 is leased as described in CH I Appendix I-2, pages 7-12

ENVIRONMENTAL RESOURCE INFORMATION

Historic and Archeological Resource Information

R645-301-411: Historic and Archeological information in Chapter X of the Emery Deep Mining and Reclamation Plan (MRP) needs to be updated to include the proposed full extraction areas. (Jhelfrich)

*Refer to Chapter X, Appendix V-15 Emery full extraction expansion (MOAC Report 19-007) and Plate X-A-1 (Permit Area Cultural Resources) CONFIDENTIAL
This report covers the full extraction area outlined on Plate V-5 (Subsidence Monitoring Points & Buffer Zones) as well as additional area to the south.*

Vegetation Resource Information

R645-301-320: Vegetation information in Chapter VIII of the Emery Deep Mining and Reclamation Plan (MRP) needs to be updated to include the proposed full extraction areas. (Jhelfrich)

Refer to CH VIII, Plate VIII-1 (Vegetation and Landuse Map) updated under Emery Right of Way additional adjacent area minor revision, Task #5859.

R645-301-320: Revisions to all of the maps (non water resources) need to include the correct permit and adjacent area boundaries. Some of these maps do not include the current permit area boundaries (vegetation and fish and wildlife), some show full extraction extending beyond the adjacent area on the west boundary. Areas of mining activities and full extraction need to be clearly identified on all of the maps in the MRP. (Jhelfrich)

Correct permit and adjacent area boundaries are depicted on all pertinent Plates.

CH VIII, Plate VIII-1 (Vegetation and Landuse Map) and CH IX, Plate 10-1 (Selected Wildlife Information) depict the current approved permit boundary updated under Emery Right of Way additional adjacent area minor revision, Task #5859.

Refer to Plate V-5 (Subsidence Monitoring and Buffer Zones) for the full extraction area approved and proposed under this revision.

Any mining projections shown beyond the adjacent area are for planning purposes only and are not permitted to mine.

Fish and Wildlife Resource Information

R645-301-322: Fish and Wildlife information in Chapter IX of the Emery Deep Mining and Reclamation Plan (MRP) needs to be updated to include the proposed full extraction areas. (Jhelfrich)

Refer to CH IX, Plate 10-1 Vegetation and Landuse Map updated under Emery Right of Way additional adjacent area minor revision, Task #5859.

R645-301-322: Revisions to all of the maps (non water resources) need to include the correct permit and adjacent area boundaries. Some of these maps do not include the current permit area boundaries (vegetation and fish and wildlife), some show full extraction extending beyond the adjacent area on the west boundary. Areas of mining activities and full extraction need to be clearly identified on all of the maps in the MRP. (Jhelfrich)

Correct permit and adjacent area boundaries are depicted on all pertinent Plates.

CH VIII, Plate VIII-1 (Vegetation and Landuse Map) and CH IX, Plate 10-1 (Selected Wildlife Information) depict the current approved permit boundary.

Refer to Plate V-5 (Subsidence Monitoring and Buffer Zones) for the full extraction area approved and proposed under this revision.

Any mining projections shown beyond the adjacent area are for planning purposes only and are not permitted to mine.

Hydrologic Baseline Information

R645-301-724.100 and -724.200: The Permittee must provide and/or demonstrate that adequate baseline data has been collected to characterize the quality and quantity of both ground and surface water within the areas proposed for full extraction mining. Sections VI.2.4.1, Groundwater Information and VI.2.4.2, Surface Water Information of the approved Mining and Reclamation Plan (MRP) must be revised accordingly per R645-301-724.1 00 and -724.200. (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859.

Probable Hydrologic Consequences Determination

R645-301-728: The Permittee must revise Section VI.2.8, Probable Hydrologic Consequences to address potential impacts to ground and surface water resources in the proposed area of full extraction mining (T22S, R6E, Sections 30, 31 and 32). (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859

Maps Subsurface Water Resources

R645-301-722.100: The Permittee must revise/update Plate VI-6, Anticipated Initial Depth of Groundwater Over Bottom of I Seam, Plate VI-7, Upper Ferron Sandstone Potentiometric Surface (2006) and Plate VI-8, Lower Ferron Sandstone Potentiometric Surface (2006). (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859

OPERATION PLAN

Subsidence Control Plan, Renewable Resource

R645-301-525.420: Figure 1 (App. V-8) should show panels in Section 31 and 32. (Pburton)

Refer to Emery 2, 2nd left panel full extraction Task #5847 for CH V, Appendix V-8 Figure 1(Pre Subsidence Survey)

Subsidence Control Plan, Subsidence

R645-301-525.300, -525.700: Permittee must secure a more recent and up to date County Road Repair Agreement with Emery County since the previous agreement expired on July 3, 2017. Additionally, a subsidence notification should be sent and written approval secured from the Utah Department of Transportation prior to undermining SR-10. (Jeatchel)

The County road agreement does not pertain to this submittal. It covered an area northeast of the 4th East Portal and does not need to be updated. Subsidence agreements are not required from UDOT due to the fact that Bronco does not intend to subside SR-10 (as depicted on Plate V-5).

Subsidence Control Plan, Performance STD

R645-301-525.311: Permittee must present sufficient evidence to demonstrate that structures and zones that are protected from subsidence will remain unaffected. Perhaps altering the pillar dimensions or adopting a higher factor of safety could contribute to ensuring subsidence does not occur in sensitive areas. Regardless of what Permittee intends to adopt, the Division is not comfortable with the present subsidence control plan in light of recent events. (Jeatchel)

Bronco will follow the Mine Safety & Health Administration (MSHA) roof Control Base Plan dated April 17, 2018 and subsequent site-specific amendments regarding pillar design and safety factors.

Subsidence Control Plan, Notification

R645-301-525.700: Please confirm notification of the Emery County Water Conservancy District, the Muddy Creek Irrigation Company, Utah Department of Transportation and all surface owners. The notice must provide the information stated in R645-301-525.700, including a location where the subsidence control plan may be examined. Notification to the landowner(s) will include the pre-subsidence survey as required by R645-301-525.130 and stated in the MRP Section V-B.2 item 1.1.2. (Pburton)

Public Notice of the Proposed Mining will be conducted per the cited regulation and sent to the water conservancy district, and to all owners and occupants of surface property and structures above the underground workings.

Pre-subsidence surveys will be provided to landowners per CH V-B.2 (Subsidence Survey and Monitoring Plan).

Hydrologic Ground Water Monitoring

R645-301-731.210: The Permittee must provide a ground water monitoring plan capable of determining whether proposed full extraction mining has or has not produced impacts to the hydrologic balance. (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised Plate VI-4 (Ground Water Monitoring Well and Surface Water Monitoring Site Location Map) for additional well status.

Hydrologic Surface Water Monitoring

R645-301-731.220: The Permittee must provide a surface water monitoring plan capable of determining whether proposed full extraction mining has or has not produced impacts to the hydrologic balance. (Schristensen)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859

Maps, Mine Workings

R645-301-521.142, -525.420: Currently Plates V-5 and IV-2 are proposing two different mining scenarios. Permittee must change these plates to restore consistency and ensure that no contradictions exist. Additionally, please delete the word "Previously" from the "Areas to be Fully Extracted" legend item on V-5 to dispel the notion that Sections 31 and 32 have previously been approved for full extraction mining. (Jeatchel)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised Plates V-5 and IV-2.

SPECIAL CATEGORIES

Operations, Alluvial Protection of Agricultural

R645-301-525.440. Monitoring points on Plate V-5 should be shown above mining panels beneath irrigated lands in Sections 30, 31 and 32. (Pburton)

Refer to Emery Right of Way additional adjacent area minor revision, Task #5859 for revised Plate V-5.

Subsidence monitoring points are depicted on Plate V-5 over panels where planned subsidence (full extraction) is either approved or proposed.

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: Bronco Utah Operations LLC (BUOLLC)

Mine: Emery Mine

Permit Number: 015/015

Title: Emery 2 Full Extraction

Description, Include reason for application and timing required to implement:

Emery 2 Full Extraction

Deficiency Responses Task ID 5769

05/19

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ increase decrease.
- Yes No 2. Is the application submitted as a result of a Division Order? DO# _____
- Yes No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes No 6. Does the application require or include public notice publication?
- Yes No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes No 9. Is the application submitted as a result of a Violation? NOV # _____
- Yes No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
- Yes No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes No 13. Does the application require or include collection and reporting of any baseline information?
- Yes No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes No 15. Does the application require or include soil removal, storage or placement?
- Yes No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes No 19. Does the application require or include certified designs, maps or calculation?
- Yes No 20. Does the application require or include subsidence control or monitoring?
- Yes No 21. Have reclamation costs for bonding been provided?
- Yes No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

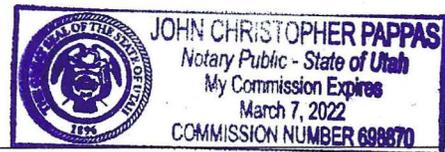
I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations herein.

Richard Parkins
Print Name

[Signature], PRESIDENT, 5-16-19
Sign Name, Position, Date

Subscribed and sworn to before me this 16 day of MAY, 2019

[Signature]
Notary Public
My commission Expires: _____
Attest: State of UTAH } ss:
County of CARBON } MARCH 7, 2022



For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
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The method used historically in most of the mine was room and pillar mining with some partial pillar ~~extraction/removal~~. Partial pillar ~~extraction/removal~~ is designed not to result in subsidence. Full extraction mining (planned subsidence) did occur ~~above the atsealed~~ Emery ~~Mine old works~~ and will occur ~~above at the~~ Emery 2 ~~mine plan~~ in areas previously approved and designated full extraction as noted on Plate V-5. If the ~~new~~ Emery 2 mine plan contemplates full extraction in areas other than those depicted ~~as full extraction~~ on Plate V-5, Bronco will submit a revision with the required pre-subsidence survey data. As a result, any subsidence outside these areas would fall into the unplanned subsidence category. ~~CH V, Figure 1 shows the partial pillar splitting diagram employed underground. This layout is the result of past experience as well as Federal and State regulations pertaining to roof control and ventilation. All pillar design, or pillar splitting (whether partial pillar extraction or full extraction) will be approved by MSHA. A pillar split diagram specific to full extraction is provided in CH V, Figure 2. Full extraction pillar splitting will result in subsidence.~~

Maximum subsidence at the Emery Mine will be approximately 50% of the extraction height. Given the current mining horizon, this would relate to 3 feet of subsidence in areas of 6-foot extraction to 5 feet of subsidence in areas of 10-foot extraction. The predicted angle of draw will range from approximately 5 degrees at 150 feet of cover, 12 degrees at 350 feet of cover, and 15 degrees at 750 feet of cover or greater. ~~Please refer to Plate V-5 (Subsidence Monitoring Points and Buffer Zones) for estimated subsidence depth isopachs.~~

~~Bronco~~ ~~Consol~~ intends to prevent subsidence from affecting Quitchupah Creek, Christiansen Wash, and the alluvial valley floor area on the west side of the adjacent area (Refer to Plate V-5). There will be no full extraction within the designated buffer zones. An intermittently occupied dwelling in Section 30 will also be protected from subsidence. As of the date of this writing, a subsidence waiver has not been obtained on this dwelling. At such time as a waiver is obtained, the Division shall be notified and the buffer around this dwelling will be removed. Other than these features, the presubsidence survey and our knowledge of the permit area confirms there are no structures overlying present or future underground workings for which mitigation of subsidence effects would be overly difficult.

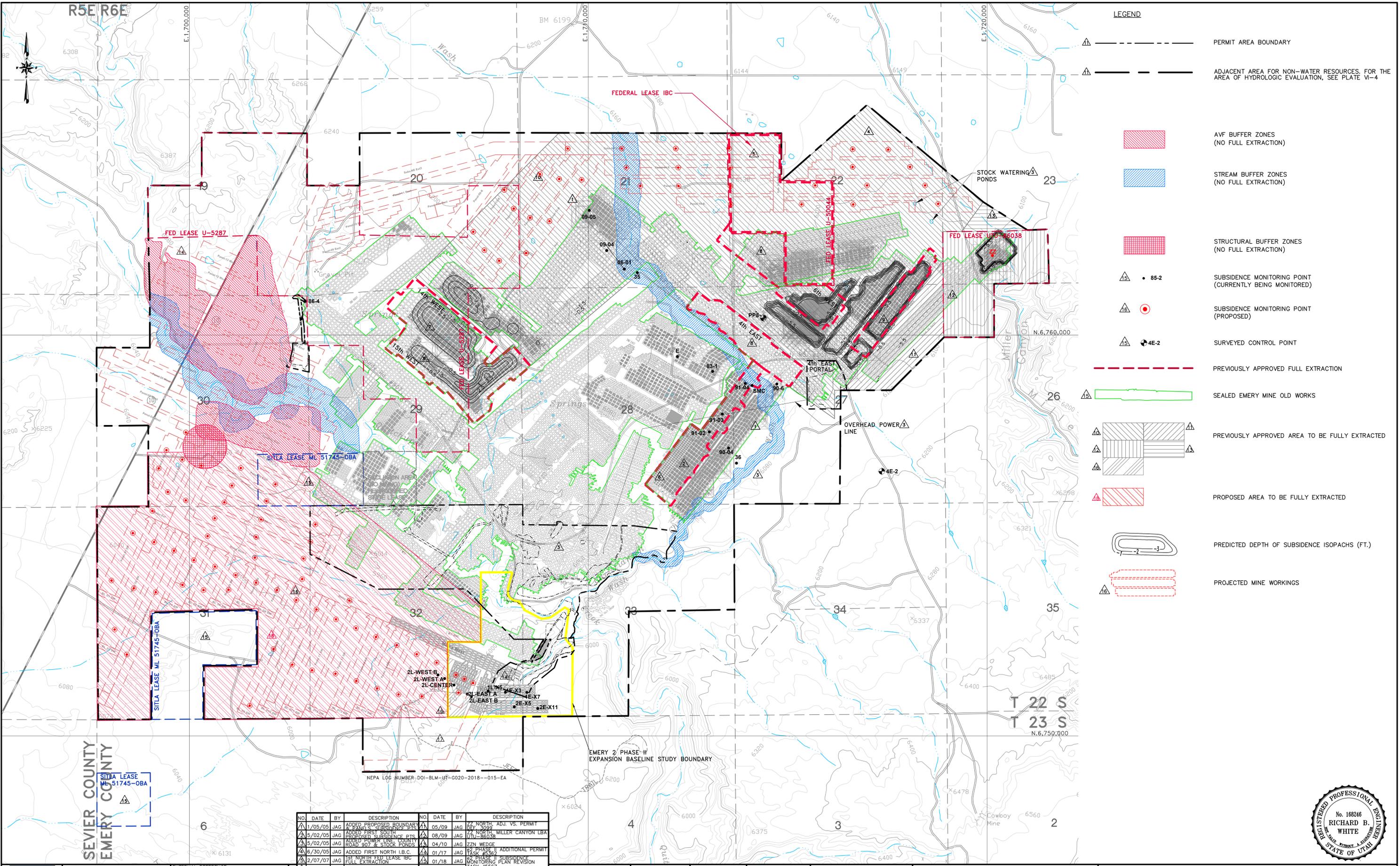
The three above noted features will be protected by establishing buffer zones which in turn are created by leaving coal pillars of adequate size beneath these areas. The dimensions of the buffer zone will be determined by the overburden depth and the angle of draw. With respect to Quitchupah Creek and Christiansen Wash, the buffer zone will include an additional standoff distance of 100 feet on either side, as required by UMC 817.57. ~~The pillar dimensions are based on established geotechnical information and a factor of safety for long-term pillar stability. The partial pillar splitting design data can be found at CH V Pages 28a, 28b, and 28c. A pillar split plan sketch can be found at CH V Page 28 and Figure V-1 on CH V Page 28d. As can be seen from the following design data, this partial pillar splitting plan will not result in subsidence and is considered unplanned subsidence per the MRP.~~

~~Chapter V pages V-28 through V-35 have been removed. These pages included pillar stability design pertaining to the sealed Emery old works and are not pertinent to the Emery 2 mine plan.~~

Reserved

Chapter V pages 28 through 35 have been removed as they do not pertain to any future mining area.

Inserted 5/2019



LEGEND	
	PERMIT AREA BOUNDARY
	ADJACENT AREA FOR NON-WATER RESOURCES. FOR THE AREA OF HYDROLOGIC EVALUATION, SEE PLATE VI-4
	AVF BUFFER ZONES (NO FULL EXTRACTION)
	STREAM BUFFER ZONES (NO FULL EXTRACTION)
	STRUCTURAL BUFFER ZONES (NO FULL EXTRACTION)
	SUBSIDENCE MONITORING POINT (CURRENTLY BEING MONITORED)
	SUBSIDENCE MONITORING POINT (PROPOSED)
	SURVEYED CONTROL POINT
	PREVIOUSLY APPROVED FULL EXTRACTION
	SEALED EMERY MINE OLD WORKS
	PREVIOUSLY APPROVED AREA TO BE FULLY EXTRACTED
	PROPOSED AREA TO BE FULLY EXTRACTED
	PREDICTED DEPTH OF SUBSIDENCE ISOPACHS (FT.)
	PROJECTED MINE WORKINGS

SEVER COUNTY
EMERY COUNTY

SITLA LEASE ML 51745-OBA

NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION
1	05/05	JAG	ADDED PROPOSED BOUNDARY	11	05/09	JAG	77 NORTH ADJ. VS. PERMIT REF. 0095
2	02/05	JAG	ADDED FIRST SOUTH CLOSED SUBSIDENCE PTS.	12	08/09	JAG	011 NORTH MILLER CANYON LBA
3	02/05	JAG	ADDED POWER LINE COUNTY ROAD 907 & STOCK PONDS	13	04/10	JAG	ZZN WEDGE
4	03/05	JAG	ADDED FIRST NORTH I.B.C.	14	01/17	JAG	PHASE II ADDITIONAL PERMIT TASK #557
5	07/07	JAG	1ST NORTH FED LEASE IBC FULL EXTRACTION	15	01/18	JAG	PHASE II SUBSIDENCE MONITORING PLAN REVISION TASK #557
6	09/05	JAG	1ST SOUTH FULL EXTRACTION PLAN	16	01/19	JAG	2ND WEST FULL EXTRACTION
7	07/07	JAG	15TH WEST 6TH WEST AND 15TH WEST FULL EXTRACTION	17	03/19	JAG	RIGHT OF WAY EXPANSION
8	03/08	JAG	ADDITIONAL FULL EXTRACTION	18	05/19	JAG	FULL EXTRACTION TASK #5769
9	09/08	JAG	LIFE OF MINE FULL EXTRACTION				

BASE MAP:
U.S.G.S. 7.5 MINUTE QUADRANGLE'S EMERY WEST 1968,
EMERY EAST 1968, PHOTO REVISED 1976,
MESA BUTTE 1968, PHOTO REVISED 1976,
WALKER FLATE 1968, PHOTO REVISED 1976.

COORDINATE SYSTEM:
STATE PLANE COORDINATES,
ZONE 4302-UTAH, CENTRAL - US FEET
VERTICAL DATUM - NAVD 83-US FEET

EXTERNAL REFERENCE:
 U:\0382\REF-CURRENT\REF-USGMAP.DWG
 U:\0382\REF-CURRENT\REF-WORKS-SMC.DWG
 U:\0382\REF-CURRENT\REF-SECTION.DWG
 U:\0382\REF-CURRENT\REF-HATCH-ZZN.DWG
 U:\0382\REF-CURRENT\REF-LOW.DWG
 U:\0382\REF-CURRENT\REF-14THWEST.DWG
 U:\0382\REF-CURRENT\REF-HATCH-ZZN.DWG
 U:\0382\REF-CURRENT\REF-EMERY_FINAL_PERMIT-502-03-17
 U:\0382\REF-CURRENT\REF-MINE_WORKINGS\REF-ACREMENTS-11-16

0' 1000'
SCALE: 1" = 1000'
CONTOUR INTERVAL = 40'

DRAWN BY: DJL
CHECKED BY: JAG
APPROVED BY: JAG

ORIGINAL DATE: 1/03
RE-DRAWN DATE: 03/19

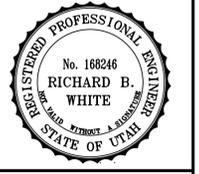
EMERY MINE
EMERY COUNTY, UTAH

PERMIT NO.
ACT015/015

BRONCO UTAH OPERATIONS, LLC

P.O. BOX 1
PRICE, UT 84501

PLATE V-5
SUBSIDENCE MONITORING
POINTS AND BUFFER ZONES



CHAPTER X

PART A: CULTURAL RESOURCES

	PAGE
NARRATIVE FOR UMC 783.12(b), 783.24(i),(j)&(k), AND 784.17	1-3
APPENDICES	
5.0 ARCHEOLOGICAL EVALUATION – AERC, 1980. SEE CONFIDENTIAL BINDER	
5-1 ARCHEOLOGICAL EVALUATION – AERC, 1981. SEE CONFIDENTIAL BINDER	
5-2 ARCHEOLOGICAL EVALUATION – M.S. BERRY, 1975. SEE CONFIDENTIAL BINDER	
5-3 ARCHEOLOGICAL EVALUATION – AERC, 1988. SEE CONFIDENTIAL BINDER	
5-4 ARCHEOLOGICAL SITE FORMS, SEE CONFIDENTIAL BINDER	
5-5 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGICAL CONSULTANTS, 4 th EAST PORTAL SITE, MAY 2002. SEE CONFIDENTIAL BINDER	
5-6 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGICAL CONSULTANTS, 4 th EAST POWERLINE, AUGUST 2002. SEE CONFIDENTIAL BINDER	
5-7 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGICAL CONSULTANTS, 4 th EAST EXTENSION AREA, MARCH 2003. SEE CONFIDENTIAL BINDER	
See Chapter XII, Appendix XII-3, Cultural Resource Report (MOAC Report No. 05-177, May 23, 2005), for 1 st North IBC Archeology. SEE CONFIDENTIAL BINDER	
See Chapter XIII, Appendix XIII-3, Class 3 Cultural Resource Report (MOAC Report 07-33, February 13, 2007) for First Federal Lease IBC Archeology. SEE CONFIDENTIAL BINDER	
5-8 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Zero North and Zero Zero North (MOAC 07-323). SEE CONFIDENTIAL BINDER	
5-9 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Life of Mine Panels (MOAC 08-135) spring 2008, Site Treatment Plan. The treatment plan for eligible site 42Em3924 will be completed at least 6 months prior to subsidence, with a follow-up visit only to the site within 12 months after subsidence. SEE CONFIDENTIAL BINDER	
5-10 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Zero Zero North 120 acre parcel LBA UTU-86038 (MOAC 08-096) Per Management Recommendations on page 19, a qualified archaeologist will periodically monitor the sites (post subsidence) for subsidence impacts. The results will be reported in the Annual report. If mitigation is necessary, a mitigation plan will be submitted to BLM. SEE CONFIDENTIAL BINDER	

- 5-11 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Zero Zero North wedge (MOAC 10-054). SEE CONFIDENTIAL BINDER
- 5-12 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Emery 2 expansion (MOAC Report 09-152). SEE CONFIDENTIAL BINDER
- 5-13 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Emery 2 expansion site 42EM1314 Mitigation and Discovery Plan. SEE CONFIDENTIAL BINDER
- 5-14 DOI-BLM-UT-G020-2018-0051-EA – Interdisciplinary Team Analysis Checklist BLM ROW Archeo signoff
- 5-15 ARCHEOLOGICAL EVALUATION – MONTGOMERY ARCHAEOLOGY CONSULTANTS, Emery full extraction expansion (MOAC Report 19-007) SEE CONFIDENTIAL BINDER

FIGURES

- X-1 1st SOUTH FULL EXTRACTION ARCHEOLOGY SITES. SEE CONFIDENTIAL BINDER
- X-2 App 5-13 blasting limits-site 42EM1314 Mitigation and Discovery Plan. SEE CONFIDENTIAL BINDER

PLATES

- X.A-1 PERMIT AREA CULTURAL RESOURCES. SEE CONFIDENTIAL BINDER

Revised 10/2003
 Revised 9/2005
 Revised 5/2007
 Revised 12/2007
 Revised 1/2009
 Revised 6/2009
 Revised 9/2009
 Revised 5/2010
 Revised 5/2016
 Revised 10/2016
 Revised 2/2019
Revised 5/2019

CHAPTER X

**APPENDIX 5-15
Archeology Report**

**Emery Full Extraction Expansion
MOAC 19-007**

COVER PAGE

**Must Accompany All Project Reports
Submitted to the Utah SHPO**



Report Title: Cultural Resource Inventory of Bronco Utah Operation's Emery 2 Mine Subsidence Expansion, Emery and Sevier Counties, Utah.

UDSH Project Number: U19MQ0029

Org. Project Number: 19-007

Report Date: May 30, 2019

County(ies): Emery

Report Author(s): Jody J. Patterson

Principal Investigator: Jody J. Patterson

Record Search Date(s): January 27, 2019

Field Supervisor(s): Jody J. Patterson

Intensive Acres Surveyed (<15m intervals): 1983.5

Recon/Intuitive Acres Surveyed (<15m intervals): 0

USGS 7.5' Series Map Reference(s): Walker Flat, Utah 1978

Sites Reported	Count	Smithsonian Trinomials
Revisits (no updated site forms)	0	
Updates (updated site forms attached)	9	42EM194, 42EM196-42EM201, 42EM609, 42EM1387
New recordings (site forms attached)	18	42EM5248-42EM5265
Total Count of Archaeological Sites in APE	21	42EM196, 42EM199, 42EM1387, 42EM5248-42EM5265
Historic Structures (structures forms Attached)	0	
Total National Register Eligible Sites	9	42EM196, 42EM199, 42EM5249, 42EM5252, 42EM5254 42EM5259, 42EM5260, 42EM5263 and 42EM5254

*Please list all site numbers per category. Number strings are acceptable (e.g. "42TO1-13; 42TO15"). Cells should expand to accommodate extensive lists.

Checklist of Required Items for Submittal to SHPO

- "Born Digital" Report in a PDF/A format
 - SHPO Cover Sheet
 - File Name is the UDSH Project Number with no hyphens or landowner suffixes
- "Born Digital" Site forms in PDF/A format
 - UASF with embedded maps and photos
 - File name is Smithsonian Trinomial without leading zeros (e.g. 42TO13 not 42TO00013)
 - Photo requirements (including size and quality)
- Archaeological Site Tabular Data
 - Single spreadsheet for each project
 - Follows UTSHPO template (info here: <https://goo.gl/7SLMqj>)
- GIS data
 - Zipped polygon shapefile or geodatabase of survey (if different from APE) or other activity area with required field names and variable intensity denoted
 - Zipped polygon shapefile or geodatabase of site boundaries with a the required field name

CULTURAL RESOURCE INVENTORY OF
BRONCO UTAH OPERATION'S
EMERY 2 MINE SUBSIDENCE EXPANSION,
EMERY AND SEVIER COUNTIES, UTAH.

For Official Use Only: Disclosure of Site Locations Prohibited (43 C.F.R. § 7.18)

CULTURAL RESOURCE INVENTORY OF
BRONCO UTAH OPERATION'S
EMERY 2 MINE SUBSIDENCE EXPANSION,
EMERY AND SEVIER COUNTIES, UTAH

By:

Jody J. Patterson

Prepared For:

Bureau of Land Management
Price Field Office

State of Utah School and Institutional Trust Lands Administration
Salt Lake City, Utah

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Utah Division of Oil, Gas, and Mining
Salt Lake City, Utah

Prepared Under Contract With:

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ABSTRACT

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INTRODUCTION

In February and April of 2019, Montgomery Archaeological Consultants (MOAC) conducted a Class III cultural resource survey of Bronco Utah Operation’s Emery 2 Mine Subsidence Expansion in Emery and Sevier Counties, Utah. The inventory was conducted at the request of Mr. John Gefferth, Barr Engineering, Salt Lake City, Utah. The project consists of proposed expansion on mining operations at the Emery II mine, which will result in the subsidence within the area of potential effect (APE). The project area occurs on public land administered by the Bureau of Land Management (BLM) Price Field Office, State of Utah School and Institutional Trust Lands Administration (SITLA), and private property.

The inventory objective was to locate, document, and evaluate any cultural resources within the project area in order to comply with 36 CFR 800, the National Historic Preservation Act (NHPA) of 1966 (as amended). The inventory was also implemented to attain compliance with a number of federal and state mandates, including the National Environmental Policy Act of 1969, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, the American Indian Religious Freedom Act of 1978, Utah State Antiquities Act of 1973 (amended 1990), and Utah Code, Title 9, Chapter 8, Section 404 (9-8-404).

The fieldwork was conducted between January 29 – February 1 and April 04-09 by Jody J. Patterson (P.I., Field Supervisor), Patricia Stavish, Jessica Del Bozque, Adam Thomas, Tanner Gittins, and Michael Bianchini. The survey was accomplished under the auspices of US Department of the Interior (FLPMA) Permit No. 18-UT-60122, State of Utah Antiquities Permit (Survey) No. U-19-MQ-0029, and State of Utah Public Lands Policy Principal Investigator Permit No. 167 issued to Jody Patterson of MOAC, Moab, Utah.

A file search was performed by Adam Thomas using UDSH Preservation Pro on January 27, 2019. This consultation identified 16 projects and 56 sites that occur within a half-mile of the project area (Tables 1 and 2). Of these 56 sites, 23 are located in or within 150 ft of the project area. Additionally, Jessica Del Bozque and Jody J. Patterson completed a search of Cadastral Plats and aerial photography on January 27 and February 4, 2019, which identified two historic farmsteads (one of which is 42EM1387) within the project area.

Table 1. Previous Projects within a Half-Mile of the Proposed Undertaking.

State Project Number	Project Title	Consultant
U77BC0113	Emery Substation-Dog Valley Mine Distrib. Line	BYU - OPA
U79AF0502	Recon of Proposed Well Locations in the Walker Flat and Dog Valley Localities	AERC
U79UA0501	CRI of Three Seismic Lines in Emery County	University of Utah - Archaeological Center
U84BC1241	An Archaeological Survey Of Three Seismic Lines Near Emery City Emery And Sevier Counties Utah	BYU - OPA
U88AF0511	CCC-88-1	AERC
U89AS0664	UDOT SR-10 Fremont Junction to Rock Creek	Abajo Archaeology
U94AF0785	Quitcupah Creek Road	AERC
U96DH0050	Three Coal Mines	Dames and Moore
U02MQ0421	Consolidation Coal Haul Road	MOAC
U06ST1659	Quitcupah East Road Cultural Resources	SWCA

State Project Number	Project Title	Consultant
U08SJ0675	Quitcupah Climbing Lane	Sagebrush Archaeological Consultants
U09MQ0287	Consolidation Coal Co. - Hidden Valley Flat Water Exploration	MOAC
U09MQ0567	CRI Of Consolidated Energy's Emery 2 Mine Near Quitcupah Creek Emery County Utah	MOAC
U10MQ0107	Brown Brothers' Material Source	MOAC
U12MQ1133	CRI Of The SR-10 Drainage Re-Alignment Sevier County Utah	MOAC
U13SH0664	Cultural Resources Survey For A Diversion Structure Pond Water Pipeline And Central Pivot Along Quitcupah Creek Emery And Sevier Counties Utah.	NRCS

Table 2. Previously Documented Sites within a Half-Mile of the Proposed Undertaking.

Site Number	SHPO Number	Site Type	NRHP Eligibility	Within 150 ft of Current Project
42EM43	U88AF0511	Unknown	Unknown	No
42EM182	Unknown	Fremont Campsite	Undetermined	Yes
42EM183	Unknown	Fremont Campsite	Undetermined	Yes
42EM184	Unknown	Fremont Campsite	Undetermined	Yes
42EM185	Unknown	Fremont Campsite	Undetermined	Yes
42EM186	Unknown	Fremont Campsite	Undetermined	Yes
42EM187	Unknown	Fremont Campsite	Undetermined	Yes
42EM188	Unknown	Fremont Campsite	Undetermined	Yes
42EM189	Unknown	Fremont Campsite	Undetermined	Yes
42EM190	Unknown	Fremont Campsite	Undetermined	Yes
42EM191	Unknown	Fremont Campsite	Undetermined	Yes
42EM192	Unknown	Fremont Campsite	Undetermined	Yes
42EM193	Unknown	Fremont Campsite	Undetermined	No
42EM194	Unknown	Fremont Campsite	Undetermined	Yes
42EM195	Unknown	Fremont Campsite	Undetermined	Yes
42EM196	Unknown	Fremont Campsite	Undetermined	Yes
42EM197	Unknown	Fremont Campsite	Undetermined	Yes
42EM198	Unknown	Fremont Campsite	Undetermined	Yes
42EM199	Unknown	Fremont Campsite	Undetermined	Yes
42EM200	Unknown	Fremont Campsite	Undetermined	Yes
42EM201	Unknown	Fremont Campsite	Undetermined	Yes
42EM202	Unknown	Fremont Campsite	Undetermined	No
42EM204	Unknown	Fremont Campsite	Undetermined	Yes
42EM205	Unknown	Fremont Chipping Area	Undetermined	No
42EM206	Unknown	Fremont Chipping Area	Undetermined	No
42EM207	Unknown	Historic/Prehistoric Campsite	Undetermined	No
42EM208	Unknown	Fremont Campsite	Undetermined	No
42EM209	Unknown	Fremont Campsite	Undetermined	No
42EM210	Unknown	Fremont Campsite	Undetermined	No
42EM212	U84BC1241	Fremont Lithic Scatter	Not Eligible	No
42EM213	Unknown	Fremont Campsite	Undetermined	No
42EM214	Unknown	Fremont Campsite	Undetermined	No
42EM215	Unknown	Fremont Campsite	Undetermined	No
42EM216	Unknown	Fremont Campsite	Undetermined	No
42EM217	Unknown	Fremont Campsite	Undetermined	No
42EM218	Unknown	Fremont Campsite	Undetermined	No
42EM219	Unknown	Fremont Campsite	Undetermined	No
42EM220	Unknown	Fremont Lithic Chipping Area	Undetermined	No
42EM221	Unknown	Fremont Chipping Area	Undetermined	No
42EM222	Unknown	Fremont Campsite	Undetermined	No
42EM223	Unknown	Fremont Campsite	Undetermined	No
42EM609	Unknown	Unknown Prehistoric Aboriginal Temporary Encampment	Undetermined	Yes
42EM610	Unknown	Unknown Prehistoric Aboriginal Chipping Station	Eligible	No

Site Number	SHPO Number	Site Type	NRHP Eligibility	Within 150 ft of Current Project
42EM1173	U84BC1241	Unknown Prehistoric Aboriginal Lithic Scatter	Not Eligible	No
42EM1311	U09MQ0567	Fremont Rock Shelter and Lithic Scatter	Eligible	No
42EM1312	U09MQ0567	Fremont/Late Prehistoric Lithic Scatter	Not Eligible	No
42EM1313	U09MQ0567	Middle Archaic Lithic Scatter	Not Eligible	No
42EM1314	U09MQ0567	Unknown Aboriginal Rockshelter and Lithic Scatter	Eligible	No
42EM1315	U09MQ0567	Fremont Rockshelter and Temporary Camp	Eligible	No
42EM1321	U09MQ0567	Fremont artifact scatter	Not Eligible	No
42EM1374	Unknown	Unknown	Unknown	No
42EM1387	Unknown	Euroamerican Homestead	Not Eligible	Yes
42EM1853	U96DH0050	Quitcupah Coal Mine	Not Eligible	No
42EM2277	U02MQ0447	Historic State Route 10	Not Eligible	No historic segments present
42EM4179	U09MQ0567	Unknown Aboriginal Rockshelter and Lithic Scatter	Eligible	No
42EM4180	U09MQ0567	Unknown Aboriginal Lithic Scatter	Not Eligible	Yes

DESCRIPTION OF PROJECT AREA

The project area is between the town of Emery and I-70 in Emery County, Utah. The survey area is in Township 22 South, Rang 5 East, Section 25; Township 22 South Range 6 East, Sections 19, 30, 31, 32; and Township 23 South Range 6 East, Sections 4, 5, 6. The project area encompasses 1983.3 acres, of which 526.4 acres occur on public lands administered by the BLM Price Field Office, 40.8 acres occur on SITLA administered lands, and 1416.1 acres occur on private property.

Environmental Setting

The project area is located in Castle Valley, near the town of Emery, Utah. In general, the project area lies within the Mancos Shale Lowlands physiographic subdivision of the Colorado Plateau (Stokes 1986). The highly varied topography of the Castle Valley region has its origins in tectonic disturbances that occurred during the Sevier Orogeny, beginning about 105 million years ago in the early Cretaceous. This was followed by the Laramide Orogeny, which also began during the Cretaceous about 80 million years ago and lasted into the Tertiary Period, about 40 million years ago (Stokes 1986). Sandstone and shale ranging in age from the Carboniferous through the Quaternary occur throughout the area. The dominant geological formation in the area is the Blue Gate Member of the Mancos Shale Formation, which consists of a series of thick shale and thin sandstones. Many of the areas of higher relief are capped with Quaternary gravel, while the lower drainage basins have filled in with more recent Quaternary alluvium. The gravel terraces are a source of lithic materials, including a variety of chalcedonies, which have eroded from upper geologic deposits and have been redeposited along the ancient terraces and valley bottoms. Soils are predominately aridsols, characterized as thin, light colored soils that are moderately to strongly alkaline. These soils cover terraces, slopes, and broad desert valleys (Hutchings and Murphy 1981).

Castle Valley is considered an arid steppe, where potential evapo-transpiration exceeds precipitation: this creates a semi-arid grassland. Most of the study area experiences between 120 and 140 frost-free days per year and averages less than 10 inches of precipitation per year (Geary 1996:8). Historically, dry-land agriculture was reportedly possible in some areas of Castle Valley up until 1924. However, due to moist springs and regular thunderstorms, the area has a climate where agriculture is possible only through irrigation (Emery County Historical Society 1981). The Wasatch Plateau forms the watershed of Castle Valley. The nearest permanent water sources to the project area are Quitcupah Creek and several unnamed springs. Irrigation water in the Emery Canal is derived from Muddy Creek. Situated within the Upper Sonoran life zone, the primary vegetation community in the project area is the Desert Shrub

Association, which includes greasewood, shadscale, rabbitbrush, and mat saltbush. Several agricultural fields and farms occur within and along the project area. A riparian habitat is established along the Emery Canal and includes cottonwood, willow, cattail, and Russian olive (an introduced species). The elevation of the project area ranges between 6,180 to 6,400 ft asl. The project area is generally in a large valley, varying between long flat stretches and areas cut by ridges and drainages. Modern impacts to the landscape include roads, fence lines, utility lines, agriculture, and residences.

Cultural History

Paleoindian Period

In the project area, the Paleoindian period began around ca. 11,500 B.P. and extends to 7500 B.P. The Paleoindian period is commonly divided into three cultural traditions: the Llano or Clovis (ca. 11,500-11,000 B.P.), the Folsom (ca. 11,000-10,000 B.P.), and the Plano (ca. 10,000-7500 B.P.).

The Llano or Clovis tradition is characterized by very large, fluted, lanceolate projectile points that are sometimes found in association with mammoth or other Pleistocene megafauna remains. Within the study area, no Clovis tradition artifacts have been found in association with Pleistocene megafauna. Though evidence of Clovis tradition hunters appear rather ephemeral, consisting primarily of isolated finds of diagnostic artifacts, evidence of megafauna populations near the project area have been discovered. In 1988, a nearly intact skeleton of a Columbian mammoth was uncovered at Huntington Reservoir in upper Huntington Canyon and was dated to around 9440 B.P.; a date more than 500 years after Columbian mammoths were thought to have become extinct (Gillette 1989). Remains of a short-faced bear and the presence of a late Paleoindian projectile point are also attributed to this find. Direct and indirect evidence, represented by cut marks on a rib and the potentially associated projectile point, suggests the possibility of human interactions with the Huntington Mammoth on at least a post-mortem basis (Madsen 2000). Pleistocene megafauna that have been discovered in the Canyonlands region include mammoth, mylodont sloth, horse, bison, and present day fauna such as bighorn sheep, deer, and bear (Schroedl 1991:9). To date, no chronometrically dated Clovis or Folsom tradition components have been excavated in the study area.

The Folsom tradition (ca. 11,000-10,000 B.P.) is characterized by slightly smaller, fluted, finely crafted, lanceolate projectile points and an emphasis on the hunting of now-extinct varieties of bison. Folsom projectile points are among the more common Paleoindian projectile points found throughout the Colorado Plateau, generally as isolated occurrences, and have been found in Emery County, sometimes associated with lithic debitage (Copeland and Fike 1988; Schroedl 1991).

The Plano tradition (ca. 10,000-7500 B.P.) is characterized by large, unfluted, lanceolate points that tend to have restricted stems and indented bases, and reliance on large game animals as well as plant resources. Projectile points found within or near the study area that date to this period include Lake Mohave points, Lovell Constricted points, and a Medicine Lodge point style (Black and Metcalf 1986; Hauck 1979).

Archaic Period

At the end of the Pleistocene, climatic conditions warmed and it became drier throughout central Utah, causing an expansion of xeric vegetation while plants requiring cooler conditions retreated to higher elevations (Horn et. al. 1994). The Archaic era is represented by more broad-scale subsistence patterns than those practiced by Paleoindians, and is a prominent component of the archaeological record. Archaic hunter-gatherers relied on large herd animals less intensively, replacing these dwindling

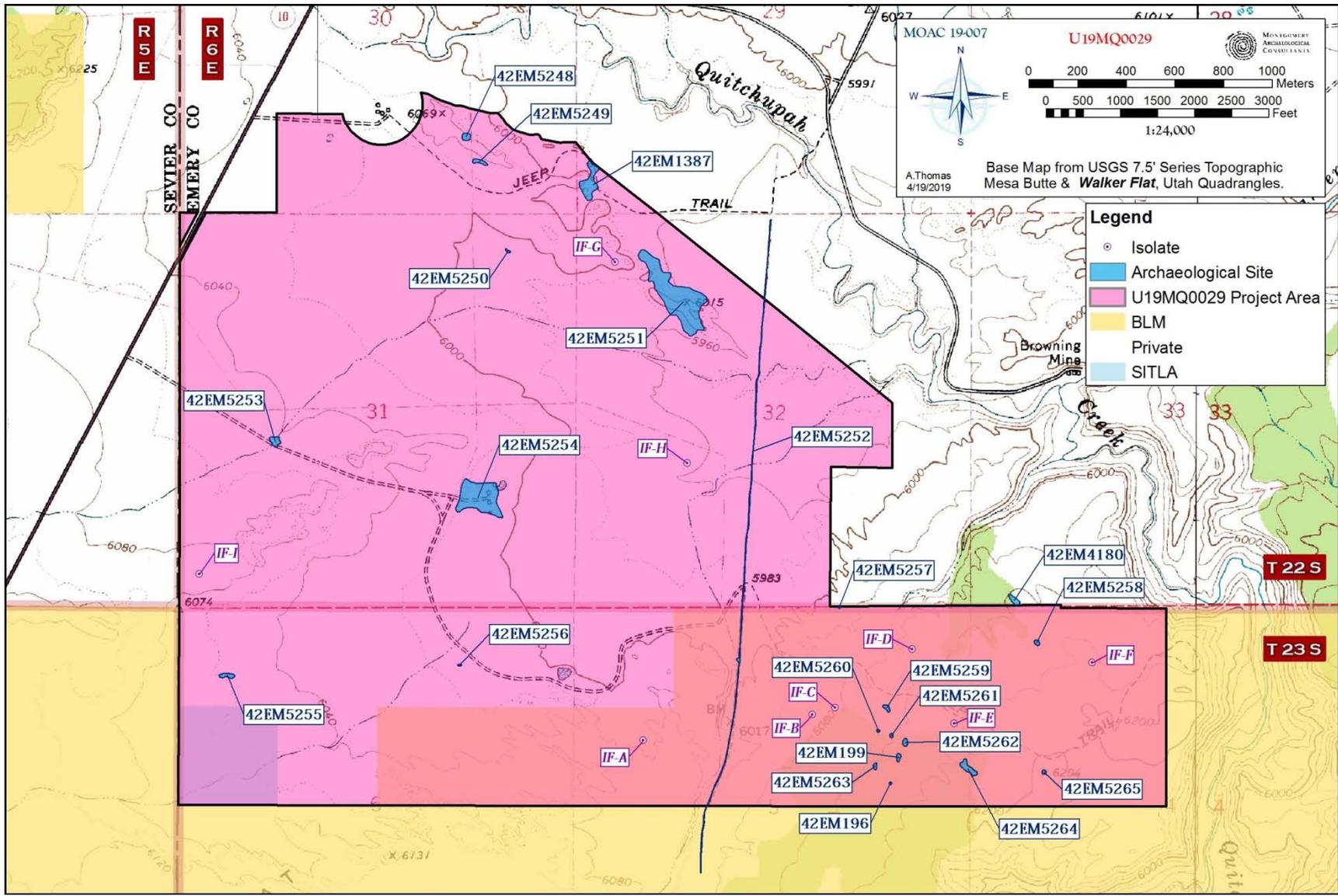


Figure 1. Class III survey area showing locations of Archaeological Sites and Isolate Finds. **For Official Use Only: Disclosure of Site Locations Prohibited (43 C.F.R. § 7.18)**

resources with smaller, more dispersed fauna and plant resource processing. Archaic sites tend to cluster in areas that offer good viewsheds, proximity to lithic procurement areas, and major topographic features (Black and Metcalf 1986; Howell 1992). A number of important Archaic sites have been excavated in central Utah, some very near the current study area (e.g. Joe's Valley Alcove, Sudden Shelter, and the Confluence site).

Schroedl (1976) suggests the Archaic period may have begun as early as 7800 B.C. and has defined four phases for the Archaic based on technology, subsistence, and environmental change. These phases include the Black Knoll, Castle Valley, Green River, and the Dirty Devil phase. Matson (1991) has divided the Archaic period into four temporal periods, termed the Early, Middle, Late, and Terminal. Schroedl and Coulam (1994) subsequently revised Schroedl's (1976) chronology for the Northern Colorado Plateau, arranging the Archaic phases within Early, Middle, and Late periods and included a fourth period, the Terminal Archaic, as well as a new Escalante phase, based on reinterpretation of the stratigraphy at Cowboy Cave.

The Early Archaic period, dating between ca. 9800 and 6200 B.P. includes the Black Knoll phase, defined by Schroedl (1976) as the earliest of the Archaic periods. It is characterized by Pinto projectile points (Homer 1978) and a contrast in subsistence between high and low elevations in which large artiodactyl are hunted in the uplands, while wild plant gathering is emphasized at lower elevations (Schroedl 1976:61-62). Milling stones and coiled basketry are also hallmarks of the Early Archaic, reflecting an increase in seed exploitation (Simms 2008). Sites near the current study area with components dating to this phase include Joes Valley Alcove and Sudden Shelter. At Joes Valley Alcove, short-term field camps were seasonally and sporadically occupied from the Early Archaic to the end of the Middle Archaic, 8,940±180 B.P. to 3,920±80 B.P. (DeBloois 1983). The earliest component at Sudden Shelter dates 8400-6300 B.P. and included Pinto, Northern Side-notched, and Humboldt projectile points and faunal remains suggesting that hunting was the primary subsistence activity with a greater reliance on mule deer and porcupine (Jennings et al. 1980).

The Middle Archaic (ca. 6200-4500 B.P.), which includes the Castle Valley phase, is characterized by a lower aboriginal population on the northern Colorado Plateau, possibly attributed to a two-stage Altithermal drought (Black and Metcalf 1986:10). Few sites date to this phase; Sudden Shelter (Jennings et al. 1980) being one of the few with radiocarbon dates between 6200 and 5000 B.P. (Schroedl 1976). Hunting and gathering practices remain similar to those of the Early Archaic, though faunal evidence from Sudden Shelter indicates increased hunting of cottontail and mountain sheep. Notably, grasses and forbs may have become more important as foodstuffs (Jennings et al. 1980; Matson 1991; Schroedl 1976), and the use of slab-lined pits becomes common. It was during this time that a variety of projectile point styles were employed, including Rocker, Hawken, Sudden Side-notched points, Humboldt points, and McKean points (Homer 1978).

The Late Archaic (4500-3300 B.P.), or the Green River phase, is characterized by Gypsum and San Rafael Side-notched projectile point types and split-twig figurines (Schroedl 1976). Populations evidently increased and hunting of cottontail, mule deer, and especially mountain sheep was emphasized (Black and Metcalf 1986). Plant resources were also emphasized and included chenopods, grasses, and amaranth (Matson 1991). Sudden Shelter, Joe's Valley Alcove, and Cedar Siding Shelter include components dated to this period. Artifacts recovered from the later component of Sudden Shelter, that date to this time period, indicate a balance between plant and animal utilization, with faunal and botanical assemblages dominated by bighorn sheep and pigweed (Jennings et al. 1980).

The Terminal Archaic (3300-1250 B.P.), which includes the Dirty Devil phase (ca.3300-2200 B.P.) and the Escalante phase (ca. 2200-1250 B.P.), marks the transition into the Formative stage lifeway and is

characterized by increased sedentism and the introduction of corn horticulture (Schroedl 1976). Gypsum projectile points are common at the beginning of the Terminal Archaic and the bow and arrow comes into use during the latter part of this period (Schroedl 1976). This phase has also been termed by Black and Metcalf (1986) the “Proto-Formative” phase (A.D.150 to 700), a transitional stage from an Archaic to a Formative lifeway. More recently, investigations along Muddy Creek have better defined the earliest manifestations of the Fremont culture, called the Confluence Phase (Greubel 1996, 1998), and is further discussed below.

Formative Period

The chronology for the Fremont or Formative period has traditionally begins around A.D. 500 and ends between A.D. 1300-1400. The beginning date has been based on the arrival of ceramics into the Fremont area and the end dates are based on the disappearance of core Fremont traits. Within the last 20 years a number of sites excavated in Utah, have pushed back the origins of Fremont tradition to roughly 2000 B.P. The general trend throughout the Fremont period was one of increasing sedentism and dependence on agriculture. In a review of data from central Utah, Janetski (1993) describes a pattern of gradual trait accumulation by the indigenous population, identifying increasing permanence and formality in residential architecture and storage features as well as the arrival of corn (200 B.C.), bows and arrows (A.D. 200), and ceramics (A.D. 500). Other artifacts include Rose Spring, Eastgate, and Elko series projectile points, hock moccasins, and one-rod-and bundle basketry.

In light of recent excavations and synthesis of the Fremont in Utah, a three period scheme (Talbot et al. 1998) is presented for the study area opposed to Black and Metcalf’s (1986) earlier phase sequence for Castle Valley. During the Early Fremont (A.D. 1-500), groups within the Great Basin and northern Colorado Plateau began to appear to share many of the traits that would differentiate them from previous hunter-gatherers. These include high investment residential architecture (pithouses) occurring in small groups, storage facilities, maize horticulture, the bow and arrow, and towards the terminus of the period, ceramics.

Investigations along Muddy Creek have demonstrated a well-dated Early Fremont period habitation at the Confluence Site (A.D. 400-550). Assigned the Confluence Phase by the researchers, the occupation is described as an aceramic, semi-sedentary, horticultural adaptive culture beginning around A.D. 200 (Greubel 1996:516). Important aspects include the presence of a well-developed pattern of semi-sedentism, pithouse architecture, maize horticulture, large bell-shaped storage pits, use of the bow and arrow, and community or special function structures. Evidence from Clyde’s Cavern (42Em177), located within the study area, indicates the earliest date for maize agriculture is A.D. 460 (Winter 1973). Winter (1973) further suggests that corn from Clyde’s Cavern supports the theory that Fremont Dent corn developed locally in Utah from non-dent maize and that early maize cultivation in the Archaic was not likely productive enough to allow near or partial dependence on farming.

The Middle Fremont period (A.D. 500-900) continued the trends of the earlier period with increases in agriculture and sedentism and uniformity in residential architecture (Talbot et al. 1998). Sites in the study area are characterized as small isolated hamlets or single dwelling units, usually found on small ridges overlooking perennial water sources and arable land (Schroedl and Hogan 1975). Off-site granaries in cliffs and rock shelters appear during this period, which may indicate an increase in dependence on storage and agricultural intensification. Data from Clyde’s Cavern (e.g. coprolites, faunal and botanical remains) suggest an economy centered on seasonal farming of maize and squash and the gathering of wild grasses and animals (Winter and Wylie 1974). Although hunting and gathering and some degree of residential mobility most likely continued to play an important role in most groups subsistence and settlement patterns (Talbot 2000). In the study area, the cultural material remains are dominated by

Emery Gray Ware, some decorated by applique and incisions, and Rose Spring Series and Uinta Side-notched arrow points.

Sites dating to this period include 42Em53, located one mile north of the town of Emery, which yielded two ranges: A.D. 526 to A.D. 637 and A.D. 858 to A.D. 988 (Stavish 2012). Interpreted as a seasonal occupation, it contained a small boulder-lined pit structure, and several outdoor activity areas with formal and informal hearths. The artifact assemblage contained Emery Gray, Sevier Gray, and a few Snake Valley Gray sherds as well as Rose Spring Series arrow points and some groundstone implements. Botanical remains were dominated by *Zea mays* and lesser amounts of *Cucurbita*, in addition to a moderately diverse range of wild plants. Other sites containing more formal domestic architecture in the area include Windy Ridge-Structure I (A.D. 690 +/- 100, Crescent Ridge (A.D. 780 +/- 100), Huntington Canyon 42Em2095 Structure 2 (A.D. 680 +/- 50) and 42Em2109-Structure 1 (A.D. 890 +/- 60) (Madsen 1975; Montgomery and Montgomery 1993). All of these Middle Fremont period habitations in Castle Valley lacked corrugated wares or painted ceramics of Fremont or Anasazi origins. An overview of Fremont architectural variance by Talbot (2000) indicates that prior to A.D. 900 individuals were residing in individual or small clusters of circular pithouses in the Great Basin/Colorado Plateau Transition zone. Also prevalent in many of the circular structures on the Colorado Plateau are wall constructions of wet/dry-laid masonry and the use of slab, cobble and boulder lining.

The Late Fremont Period (A.D. 900 to 1350) represents the culmination of Fremont development (Talbot et al. 1998:35). Populations seem to have increased significantly, and evidence of aggregation appeared in the archaeological record as relatively large villages developed along the Great Basin-Colorado Plateau Transition area (Talbot 2000). Madsen and Simms (1998), Janetski and Newman (2000), and Janetski et al. (2000) all agree that the use of domesticates increased through time and became particularly important to some sedentary groups during this period. Specifically, the analysis of Fremont storage facilities have indicated that subterranean storage pits (pits, bell-shaped pits, and slab lined cists) decreased through the Fremont time period as surface storage (adobe, composite, masonry, and slab surface structures) increased (Yoder 2005). Diagnostic artifacts of this phase include Bull Creek, Nawthis Side-notched, Bear River Side-notched arrow points, corrugated and painted ceramics (including Ivie Creek B/W, Snake Valley B/W, and Snake Valley Corrugated), and both Mesa Verde and Kayenta Anasazi trade wares. In addition to Anasazi trade wares, evidence for regional and extramural exchange within the study area is evidenced by non-local chert and obsidian artifacts and *Olivella* shells originating from the Pacific coast (Berge 1974; Black and Metcalf 1986).

Habitation sites dating to this period situated along the Wasatch eastern slope and Castle Valley include Windy Ridge-Structure 2 (A.D. 970 +/- 110), Huntington Canyon-42Em2095 Structure 1 (A.D. 1150), Innocents Ridge (ca. post A.D. 1000), Snake Rock Village (ca. 1050-1100), and Blue Trail House (A.D. 1026-1223) (Aikens 1967; Greubel 1996; Madsen 1975; Montgomery 1993; Schroedl and Hogan 1975). After A.D. 900 surface and below-ground structures changed in most areas from shallow circular structures to quadrilateral forms. According to Talbot (2000:167), acceptance of the quadrilateral style spread northeastward towards the Uinta Basin, perhaps by A.D. 1000-1050. This is exemplified at Snake Rock Village (Aikens 1967), in which dating for this site is dependent on intrusive Anasazi ceramics, suggesting that quadrilateral pithouses may not have come into use until after A.D. 1050. Exceptions to this architectural shift are exhibited at Huntington Canyon (42Em2095) and a few other habitations on the Colorado Plateau, where circular pithouses are present after A.D. 1100. Talbot (2000:168) suggests that the continued use of circular pithouses into the Late Fremont period could be attributed to seasonal occupation of sites in certain peripheral areas where the larger-scale residential settlements are a great distance from the smaller sites. However, the “oversized” (post A.D. 1100) circular structures in Huntington Canyon (42Em2095) containing a wealth of ritually placed items (including figurines) may denote a continuity through time of this architecture for integrative and/or ideological purposes

(Montgomery and Montgomery 1993). Early Fremont period examples of large, probable communal pit structures includes Feature 10 at the Confluence Site, which exhibited a bead manufacturing locus and other ornaments, as well as internal patterning of features and gender-related activity areas (Gruebel 1996, 1998). Sometime following A.D. 1200, the Fremont appear to have abandoned east-central Utah, a change attributed to both environmental and subsistence-related reasons (Lindsay 1986).

Late Prehistoric/Ethnohistoric Period

Following the Fremont abandonment of the area, a largely nomadic hunting and gathering subsistence-based economy resumed when new inhabitants arrived from the west. This occupation is attributed to the Numic-speaking peoples, a diverse population of interrelated peoples that were present throughout much of Utah when the Europeans arrived. Archaeological evidence suggests that the Numic-speaking Ute appeared in east-central Utah at approximately A.D. 1100 or shortly thereafter, migrating from the southwestern Great Basin (Madsen 1975).

Projectile points of this era consist primarily of Cottonwood Triangular and Desert Side-notched types. Desert Side-notched points in western Colorado are frequently attributed to Ute occupations and Holmer (1986) notes that Desert Side-notched points from the Colorado Plateau date between A.D. 1200 and 1700, though they have appeared in earlier contexts. Cottonwood Triangular points appear on the Colorado Plateau between A.D. 950 and 1150 at some Fremont sites but are most common at Numic sites postdating A.D. 1300 (Holmer 1986). Ceramics consist of a fairly crude micaceous tempered brownware pottery and distinctive rock art and occasional wickiups are also characteristic of Ute occupation (Jennings 1978).

The Utes were primarily hunters and gatherers who practiced very limited horticulture (Smith 1974). With the adoption of horses as beasts of burden by some groups in the mid-seventeenth century, skin covered tipis were used. Accounts of early travelers indicate that there were Utes in Castle Valley. The San Pitch band, centered in the Sanpete and Sevier Valleys, probably also made extensive use of western Emery County, as they continued to do on a seasonal basis well into the historic era (Geary 1996:22). Utes were forced out of east-central Utah by Euro-Americans in the 1870s (Hauck 1979).

Historic Period

The earliest recorded visit by Europeans to Utah was the Dominguez-Escalante expedition, which moved through the areas north and west of Castle Valley in 1776-1777. Throughout the first half of the nineteenth century, explorers, surveyors, and trappers moved in small parties through the valley, up and down the Old Spanish Trail. In the 1870s, a government survey was conducted by Augustus Ferron in Castle Valley which conveyed the settlement potential of major drainages to future settlers then residing along the Wasatch Front. By the mid-1870s, stockmen from the Sanpete area started herding their cattle along Muddy Creek and their horses to the north along Huntington Creek (McElprang 1992). In 1877, a summons by Brigham Young was given for 75 men, under the leadership of Christian Larsen, former bishop of Spring City, to establish a colony in Castle Valley, although very few responded. Shortly thereafter, three parties of Mormon colonizers were organized by Orange Seeley (Bishop of Mount Pleasant North Ward) to homestead Huntington Creek, Cottonwood Creek, and Ferron Creek. The interest in settling this region in the 1870s was primarily motivated by a pressing need to provide land for the second generation of Utahns engaged in a farming and ranching lifestyle (Arrington 1981:110). The early settlers on Huntington Creek occupied dugouts near the present Highway 10 bridge (Geary 1996:98).

The first settlers along Muddy Creek also came from Spring City (Sanpete Stake). The first colonizer, Casper Christensen, established a farmstead on the right bank of the creek in 1879. The farmstead soon expanded into a Mormon settlement, locally known as Casper. This small community was occupied primarily by the Christensen family. Other settlers (Marinus Lund, Joseph Lund, and Charles Johnson), occupied land three miles upstream (Emery Historical Society 1981:241). The first homes were caves dug into the hillsides along Muddy Creek. Log homes were built later from cottonwood trees and timber brought down from the mountain. On May 15, 1881, the families who lived along the creek built an irrigation ditch to aid in raising their wheat crops (Geary 1996:103). Irrigation along the floodplain usually required the cooperative labor of several farms. The management of such construction projects and the supervision of water use was under the direction of Casper Christensen, who served as the Muddy Creek LDS Ward bishop. By 1882, more settlers arrived at Muddy, including Pleasant and Jacob Minchey, George Merrick, Orson Davis, Judiah Knight, and Ammon Foote. During this time a post office was established at Casper, with Casper Christensen acting as postmaster (Geary 1996). Sometime between 1883 and 1885 a log school and meetinghouse was erected where the present SR-10 bridge spans Muddy Creek. Mary Pettey, Hannah Christensen, and Nephi Williams were early school teachers at the settlement (Emery Historical Society 1981:243). A store was also opened on the Christensen farm, operated by Samuel M. Williams.

The Mormon colony on Ferron Creek started as individual homesteads strung along the eight miles of river bottom between the mouth of Ferron Canyon and The Box, where the creek cuts through Molen Reef. In 1882 most families in the area moved to the present townsite, constructing the first brick LDS meetinghouse in Emery County (Geary 1996:102). The present town of Emery was established around 1887, three miles south of the Muddy Creek settlement. The first house in town was reportedly constructed by Samuel M. Williams and by the 1890s several brick houses were being built in the new town site (Geary 1996:106). By this time, Emery was the county's wealthiest town on a per capita basis which is reflected in the larger homes built near the turn of the century (Geary 1996:106). Among others, popular architectural styles include the vernacular Classical and the Victorian Eclectic. Classical styles in architecture were popular in the Midwest in the 1830s and 1840s and the early Mormon settlers brought these traditions with them to Utah (Carter and Goss 1988:95). The Georgian, Federal and Greek Revival are the more formal divisions of the Classical style. Vernacular or folk examples were more common and are found in Utah from the early settlement log cabins through the 1880s (Carter and Goss 1988:95). Victorian styles were popular in Utah from circa 1885 to circa 1905 and Victorian Eclectic examples may have elements from a number of other styles including Neoclassical, Colonial Revival, and Italianate (Carter and Goss 1988:110). Large high-style examples are found in urban areas with simpler forms in smaller cottages throughout the state.

The town of Emery depended on water from the Emery Canal which first supplied the bench lands south and west of Muddy Creek, and reached the town of Emery in 1889. The greatest endeavor along this irrigation ditch was the completion of a four-mile-long highline section and tunnel. The settlers labored for two years to complete the tunnel, which was lined with timbers to protect it from the recurring rock falls and cave-ins (Emery Historical Society 1981:243). Emery was the wealthiest town in the county on a per capita basis during the 1890s, based on assessed valuation (Geary 1996:106). This was mainly a reflection of the residents' substantial livestock holdings. In 1894 the Independent Canal and Reservoir Company was organized for the purpose of building a canal to carry Muddy Creek water north to what is now the Moore area (Geary 1996:131). During its early history, water rights disputes were waged by Emery Canal Company. Emery Canal claimed the entire Muddy Creek flow from midsummer onwards, leaving the Independent Canal dry most of the time. The canal was enlarged in 1904 by the Gardena Land and Water Company, and the irrigation system was extended to Rochester (Geary 1996:178).

Around 1880, the Utah Territorial Legislature created three new counties — Emery, San Juan, and Uintah. The county boundaries, as described in the legislative act, constituted the area now included in Emery and Carbon counties, and designated Castle Dale as the county seat (Geary 1996:75-76). Prior to this time, the transportation routes in Emery County were wagon trails. However, after Emery County was formed, there was an emphasis on the development of better wagon roads. The earliest transportation route through southern Castle Valley was blazed by Orange Seely in the late 1880s. During the early 1920s freighters drove heavy wagons over impassible roads to haul the county's produce to market and bring back goods for local stores. The mail was delivered from Price to Castle Valley communities, at first by packhorse, and later by "white top stages" that also carried passengers (Geary 1996:140). In 1921 the Pikes Peak Ocean to Ocean Highway was routed through the county, following the Midland Trail route from Green River to Price then turning south through Castle Valley to Wasatch (Salina) Pass (Geary 1996:265). According to the locals, this route "ran around every little gully of the mountain south of Ferron" (Geary 1996:266). State Route 10, the main transportation artery for the western part of Emery County, had received a gravel surface from Price to Ferron by 1929 and the Sevier-Emery County line by 1932. In 1930 a new dugway was constructed on the blue hill south of Ferron, and an all-weather gravel road was completed through the settlement of Moore on to the town of Emery (Geary 1996:266). State Route 10 was re-designed between Muddy Creek and Emery in 1941 by the Utah State Road Commission. State Route 10 included a new "T"-beam bridge (Structure No. 8-462) over the creek (Utah State Road Commission 1941). In 1971, a more direct route was built between Ferron and the Muddy Creek bridge, and new culverts were installed across some of the drainages south of the creek (Utah State Road Commission 1971).

SURVEY METHODOLOGY

An intensive pedestrian survey was performed for this project which is considered 100 percent coverage. The project area was examined for cultural resources by the archaeologists walking parallel transects spaced no more than 15 m (49 ft) apart. Ground visibility was considered good. A total of 1983.3 acres was newly inventoried for cultural resources, including 526.4 acres the BLM lands, 40.8 acres occur on SITLA lands, and 1416.1 acres on private property.

Cultural resources were recorded as either an archaeological sites or isolated finds of artifacts. Archaeological sites were defined as spatially definable areas with features and/or ten or more artifacts. Sites were documented by the archaeologists walking transects across the site, spaced no more than 3 m apart, and marking the locations of cultural materials with pinflags. This procedure allowed clear definition of site boundaries and artifact concentrations. At the completion of the surface inspection, a Geo-Explorer Trimble was employed to map the sites, including diagnostic artifacts and other relevant features. Linear sites, such as historic roads, were documented by following the "Guidance for Identifying and Recording under Section 106 of the National Historic Preservation Act" (2008). Archaeological sites were plotted on a 7.5' USGS quadrangle, and photographed with site data entered on a Utah Archaeology Site Form (IHRWG 2017). Completed site forms associated with this project are included Appendix A.

INVENTORY RESULTS

The cultural resource survey resulted in the location of three previously documented archaeological sites (42EM196, 42EM199, and 42EM1387) and the documentation of 18 newly identified archaeological sites (42EM5248-42EM5265). The survey also resulted in the identification of six IFs (IF-A – IF-F). Additionally, six sites (42EM194, 42EM197, 42EM198, 42EM200, 42EM201, and 42EM609), most of

which were recorded and collected by BYU in the early 1970s, could not definitively relocated. The existing site documentation for these six sites was updated and included in Appendix A.

Smithsonian Site No.: 42EM196

Site Type: Unknown Prehistoric Temporary Camp

Land Owner: BLM

NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of unknown prehistoric affiliation located along a gentle slope on Walker Flat. The site consists of a thermal feature (Feature A) and a single lithic tool. Feature A is a thermal feature that consists of approximately 50 pieces of small FCR and a soil stain. The feature measures 140 x 160 cm. The stain is a dark gray and the FCR averages 7 x 7 x 2 cm. The flaked stone artifacts consist of a single biface (Tool 1). No debitage, ground stone implements, or ceramic artifacts were observed. The site was previously documented in 1972 by the BYU Department of Anthropology and Archaeology and was originally described as an open campsite with one firepit and a one blade. The site was revisited by MOAC in 2019 and re-recorded on a UASF form.

Smithsonian Site No.: 42EM199

Site Type: Unknown Prehistoric Temporary Camp

Land Owner: BLM

NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of unknown prehistoric affiliation located along a gentle slope on Walker Flat. The site was previously documented in 1972 by the BYU Department of Anthropology and Archaeology and was originally described as an open campsite with three firepits and artifacts including a thumbnail scraper, a knife fragment and one chert flake (some artifacts may have been collected). The site was revisited by MOAC in 2019 and re-recorded on a UASF form. The site consists of two FCR concentrations (Features A and B), two lithic tool, and eight pieces of debitage. Two features, both FCR concentrations, were observed at the site. They consist of numerous pieces of FCR and soil staining was observed in association with Feature A. The flaked stone artifacts include eight pieces of debitage and two lithic tools. The debitage are dominated by the tertiary flaking stage and material types include chalcedony and chert. The lithic tools include a biface fragment and a tested cobble. No ground stone implements or ceramic artifacts were observed.

Smithsonian Site No.: 42EM1387

Site Type: Farmstead

Land Owner: Private

NRHP Eligibility: Not Eligible

Description: Site 42EM1387 was first recorded by AERC in 1981. The site is a small farmstead consisting of a cabin, shed, and several other associated features (corrals, well, cellar, outhouse, etc). The farmstead first homesteaded in 1904 and the land was later patented in 1908. Since its initial documentation, the site has undergone substantial modification. An addition to cabin has been demolished and its associated cellar has been razed and leveled. The well outside the cabin has been "capped" with a WPA privy vault cover, which has been moved from the demolished outhouse at the site. The corrals in front of the cabin and tack shed have been removed. Much of the original integrity of the site has been lost in the last 38 years. The site revisit revealed no new information relevant to the site's previous eligibility determination.

Smithsonian Site No.: 42EM5248

Site Type: Euroamerican Domestic Artifact Scatter

Land Owner: Private

NRHP Eligibility: Not Eligible

Description: Site 42EM5248 is a small historic trash dump situated in a small saddle between to ridges overlooking the Quitcupah Creek flood plain. The small scatters, covering only about 900 m², consist primarily of broken glass bottles and ceramics, although a small amount of metal debris is also present. Most of the glass and ceramics are fairly well fragmented. The trash was likely dumped from a nearby two-track road on between one to three occasions. The site is equidistant from a small homestead (42EM1387) and another residence.

Smithsonian Site No.: 42EM5249

Site Type: Prehistoric Unknown Feature and Artifact Scatter

Land Owner: Private

NRHP Eligibility: Eligible, Criterion D

Description: The site is a small lithic scatter of unknown prehistoric affiliation located along the slope of a ridge. The site consists of a rock ring, 49 pieces of debitage, and a ground stone fragment. Feature A is a partial rock ring with a diameter of 2.6 m. No staining was observed with the feature, but the six rocks that make up the alignment are well embedded in the surface. The function of the feature is unknown. About half of the debitage identified at the site is in a small concentration that covers about 160 m². The debitage consists of core reduction waste from the testing and reduction of chert nodules eroding from a ridge immediately north of the site. Tools identified at the site include cores, retouched flakes, and utilized flakes.

Smithsonian Site No.: 42EM5250

Site Type: Euroamerican Artifact Scatter

Land Owner: Private

NRHP Eligibility: Not Eligible

Description: Site 42EM5250 represents a small historic trash scatter associated with a small rock ring. The rock ring has a maximum diameter of just over five feet and is composed of seven cobbles. The feature is associated with five fragments of aqua-colored glass. Additional artifacts observed at the site include several fragments of sun-colored amethyst (SCA) glass, fencing staples, two earthenware sherds, several shards of window glass, and two pieces of milled lumber. A single secondary chert flake was also observed. Sheetwash is displacing the smaller artifacts across the site. The presence of SCA glass at the site roughly dates the site to between 1880 and 1920.

Smithsonian Site No.: 42EM5251

Site Type: Unknown Prehistoric Lithic Quarry

Land Owner: Private

NRHP Eligibility: Not Eligible

Description: Site 42EM5251 represents a large lithic procurement locality covering over 34,000m². Despite its large areal extent, the site has a very low, but consistent, artifact density. Chert, mostly in nodule form, is eroding out of a ridge composed of the Blue Gate Member of the Mancos Shale. Most of the chert is grey with a distinct, orange-yellow cortex and rind; however, several other varieties of chert and chalcedony were also observed. The chert nodules were mostly tested and lightly worked along the lower edges of the ridge, though a few cores and flakes were found on the ridge slopes. Primary and secondary core reduction flakes make up the bulk of the artifacts identified. Naturally broken cobbles and associated debris are also present. In addition to nearly 200 flakes, the artifact assemblage also includes at least 12 cores, 10 tested nodules, and a limited variety of expedient tools (scrapers, choppers, and utilized flakes). No hammerstones were found, but pockets of quaternary alluvium are located on the ridge top. Cobbles from these deposits may have served as expedient hammerstones. One concentration, consisting of a core and 17 reduction flakes, likely represents a single reduction episode of a white chert core.

Smithsonian Site No.: 42EM5252
Site Type: Euroamerican Transportation Corridor (Loa Road)
Land Owner: BLM/Private
NRHP Eligibility: Eligible, Criterion A

Description: This site is the Loa Road, identified as such based on its designation on the 1925 Acord Lakes, Utah 15' Quad. The documented segment, south of Emery and north of Ivie Creek, is thought to have been constructed around 1905 based on an item in the *Emery County Progress* from February 4, 1905 titled "WAYNE COUNTY FOLKS WANT A ROAD TO EMERY". The article notes that the state legislature was urged to provide \$2,000 for the road, which would allow Wayne County residents to dispose of product and purchase goods in Emery and Carbon Counties. It also states that Emery County would profit from the travel of southern Utahans on this road for the opening of the Uintah Reservation. The article also notes that "between Fremont and the head of Rabbit Valley in Wayne County to Ivie Creek is a fine road for certain distances" (*Emery County Progress*, 4 February 1905). This indicates a portion of the road to the south of the project area already existed. Geary notes that Orange Seely, during his time as a probate judge (1882-1885), oversaw the laying out of a county road from the Price River to Ivie Creek, which in large part is still the route followed by SR-10 today (1996:117). This indicates that at least part of the alignment north of Ivie Creek was also constructed pre-1905. This pre-1905 road however was likely in poor condition. A Post Route map of Utah from 1900 shows no connection from Emery to Loa, suggesting there was not a feasible route for postal wagons to use. The Loa Road shows up on later maps such as the 1925 Acord Lakes, Utah Quad mentioned previously as well as the 1931 Clason's Road Map of Utah. The 1931 map also shows segments of SR-10. The lower segment of the road, below modern I-70, became designated SR-72 in 1933. On a 1950 Shell Highway Map of Utah, SR-10 is fully paved from Emery to Fremont Junction, bypassing the Loa Road in the current project area to the west. The Loa Road, now designated SR-72, is a combination of dirt road and graded road between Fremont Junction and Loa on the 1950 map. Therefore, the primary dates of use for the Loa Road in the current project area are roughly 1905 to 1950. The segment documented during the current inventory measures 8,883.5 ft long, and averages 10 to 12 ft wide. It is a dirt road in a depression/swale that has occasionally two-track impressions. The road surface appears to have had gravel at some point. One feature, a log, was observed to the west of the road on the side of an arroyo. Feature A is a 18 ½ ft long log, 35" in circumference, with a notch at its south end and possibly represents an erosion control feature. Feature B is a small retaining wall. Feature C is a possible bridge remnant consisting of a log and associated milled lumber embedded in an arroyo bank perpendicular to the road.

Smithsonian Site No.: 42EM5253
Site Type: Euroamerican Artifact Scatter
Land Owner: Private
NRHP Eligibility: Not Eligible

Description: The site is a small historic dump that measures 50.8 x 40.5 m and is likely associated with domestic use. The site is likely the result of only one or two dumping episodes. The cultural materials include a variety of domestic items including glass jars, tin cans, and a handful of ceramic shards. Other debris includes tires, plywood, cinder blocks, bed springs, a cement sewer pipe, various automobile parts, and fencing. Hole-in-top cans observed at the site likely date between 1950 and 1985. Trademarks on glass bottles and jars typically date to between 1920 and 1964, with a median date in the 1950s.

Smithsonian Site No.: 42Em5254
Site Type: Euroamerican Farmstead
Land Owner: Private
NRHP Eligibility: Eligible, Criterion C

Description: Site 42EM5254 represents a farmstead patented to Carl Albrechtsen, a Danish Mormon immigrant, in 1903. The farmstead consisted of two patents covering 320 acres in the E1/2 of Sec 31, T 22S, R 6E. The farmstead was built in the SE ¼ of the patented land. Today, the farmstead consists of an adobe house, a series of outbuildings used for storage, and a corral. The buildings and property have been modified considerably. The adobe house is probably the second residence built at the site. The first was likely a single room log cabin (Feature B1), which was later modified to function as a granary. Most of the farm equipment, appliances, and vehicles present at the site represent the most recent use of the farmstead and date mostly to the late 1940s and early 1950s. Features documented at the site include a three-room adobe house and associated cellar (Feature A), four connected storage rooms (Feature B), a generator shed (Feature C), a corral complex (Feature D), an isolate animal pen (Feature E), and a WPA era outhouse (Feature F). The site is scattered with farming and domestic equipment and appliances including three old farm trucks (2 Chevy, 1 GMC), wagon, trailers, butane tank (1946), harvester, Case Grand Detour plow (Post 1919), misc. farm equipment/parts, misc. metal, tires, wheel barrow, Lennox “Equator” Furnace (ca. 1930), Fuller Warren Stewart No. 8119 cast iron stove, misc. domestic items, books, refrigerators, and fencing materials. No distinct trash dumps or concentrations were observed, although there is a light scatter of tin cans and glass fragments throughout the site.

Smithsonian Site No.: 42EM5255
Site Type: Euroamerican Artifact Scatter
Land Owner: Private
NRHP Eligibility: Not Eligible

Description: The site is a small historic trash scatter that measures 63.7 x 18.0 m and is likely associated with domestic use. The site is likely the result of a single dumping episode. The cultural materials include church-key opened beverage cans, single-serving and crushed commodity food cans, a cone-top beer can, a juice can, five whole amber beer/beverage bottles, fragments from three amber beverage bottles, two complete clear liquor bottles, and fragments from one clear bottle. Based on the glass makers’ marks and beverage cans observed, the site likely dates from 1949 to 1958. No features were observed.

Smithsonian Site No.: 42EM5256
Site Type: Euroamerican Artifact Scatter
Land Owner: Private
NRHP Eligibility: Not Eligible

Description: The site is a small historic trash scatter that measures 16.8 x 6.6 m and is likely associated with domestic use. The site is likely the result of a single dumping episode. The cultural materials include a tobacco tin, a sanitary meat can, a friction top lid, several undetermined or crushed cans, a complete small amber medical vial, a complete clear cosmetic jar marked “ICE MINT” with metal screw cap, a complete clear medical bottle, fragments of clear glass representing three bottles, fragments of amber glass representing two vessels – one is a gallon sized jug with loop handle. Based on the glass makers’ marks, the site likely dates from 1933 to 1946. No features were observed.

Smithsonian Site No.: 42EM5257
Site Type: Euroamerican Artifact Scatter
Land Owner: BLM
NRHP Eligibility: Not Eligible

Description: The site is a small historic trash scatter, measuring 12.2 x 9.8 m, thought to be associated with domestic use and dumped at its current location. The site is located in a single cluster on the west upper edge of a large drainage. The cultural materials include two sanitary cans, an aqua bottle base, two fragments of a sun-colored amethyst paneled bottle, sherds of a single hotelware bowl or vase, fragments of a single milk glass jar lid insert, a zinc jar lid, possibly crockery pieces, stove parts, and miscellaneous

metal pieces. Based on the aqua, sun-colored amethyst, and milk glass observed the site is thought to date from 1890 to 1920. No features were observed.

Smithsonian Site No.: 42EM5258
Site Type: Unknown Prehistoric Temporary Camp
Land Owner: BLM
NRHP Eligibility: Not Eligible

Description: The site is a temporary camp of unknown prehistoric affiliation located along the slope of a ridge. The site consists of an FCR concentration, 52 pieces of debitage, and one lithic tool. Feature A is a deflated FCR concentration that consists of fire-reddened rock located along a drainage that bisects the site. The feature measures 3.0 x 3.0 m. No staining was noted. The flaked stone artifacts consist of 52 pieces of debitage and one chert core (Tool 1). The debitage is dominated by the tertiary flaking stage and lithic material types include chert, chalcedony, and quartzite. No ground stone or ceramics were observed.

Smithsonian Site No.: 42EM5259
Site Type: Unknown Prehistoric Temporary Camp
Land Owner: BLM
NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of unknown prehistoric affiliation measuring 38.1 x 17.5m. The site consists of three FCR concentrations, a biface fragment, a projectile fragment, and 31 pieces of lithic debitage. The FCR concentrations (Features A, B, and C) range from 0.8 to 1.0 m long and 1.0 to 1.4 m wide, consisting of roughly 20 to 30 pieces of FCR sandstone ranging 2 x 2 x 0.5 cm to 9 x 9 x 3 cm in size. One of the FCR concentrations, Feature C, has some possible associated soil staining. The chipped stone artifacts are manufactured from chert, chalcedony, and quartzite. The debitage represents all reduction stages but is dominated by tertiary flakes. No ground stone implements or ceramic artifacts were observed.

Smithsonian Site No.: 42EM5260
Site Type: Unknown Prehistoric Temporary Camp/Rock Shelter
Land Owner: BLM
NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of unknown prehistoric affiliation located along the exterior edge of a rock shelter and on the slope of a drainage. The site consists of a thermal feature (Feature A) and five pieces of lithic debitage. Feature A is a thermal feature with FCR, chunks of charcoal (approx. 1 x 1 cm), and charcoal flecking located just outside of a rock shelter along a drainage slope. The feature measures 2.10 x 2.15 m and includes approximately 100 pieces of sandstone FCR. The rock shelter has a maximum length of 7 m, a maximum depth of 1.5 m, and a maximum height of 1 m. Artifacts were not observed in the rock shelter, but were noted in a rill just outside of the shelter. The flaked stone artifacts include five pieces of debitage that represent the secondary and tertiary stages of reduction and material types include chalcedony and chert. No ground stone implements or ceramic artifacts were observed.

Smithsonian Site No.: 42EM5261
Site Type: Unknown Prehistoric Temporary Camp
Land Owner: BLM
NRHP Eligibility: Not Eligible

Description: The site is a temporary camp of unknown prehistoric affiliation located along the slope of a ridge. The site consists of a two FCR concentrations, Features A and B, one lithic tool and one piece of debitage. Feature A is an FCR concentration that measures 4.5 x 2.9 m and consists of approximately 350 pieces of fire-reddened rock and a smaller area (90 x 20 cm) of soil staining along the north edge. Feature

B is an FCR concentration that measures 1.8 x 1.1 m and consists of about 50 pieces of FCR that measure 14 x 10 cm or smaller. The flaked stone artifacts consist of a single brown chalcedony flake fragment and a hammerstone (Tool 1). No ground stone implements or ceramic artifacts were observed.

Smithsonian Site No.: 42EM5262

Site Type: Unknown Prehistoric Temporary Camp

Land Owner: BLM

NRHP Eligibility: Not Eligible

Description: The site is a temporary camp of unknown prehistoric affiliation located along the slope of a ridge. The site consists of an FCR concentration, five pieces of debitage, and six ground stone fragments. Feature A is an FCR concentration that measures 2.7 x 2.2 m and consists of about 200 pieces of FCR. The fire-reddened rock measures 16 x 13 cm and smaller. No staining was noted. The flaked stone artifacts consist of five pieces of debitage, which is dominated by broken flakes and lithic material types include chert and chalcedony. Six ground stone implements were observed and include five slab metate fragments, two of which refit, and one basin metate fragment.

Smithsonian Site No.: 42Em5263

Site Type: Unknown Prehistoric Temporary Camp

Land Owner: BLM

NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of unknown prehistoric affiliation located along a gentle slope on Walker Flat. The site consists of a thermal feature (Feature A), a lithic tool, and 16 pieces of debitage. Feature A is an FCR concentration located within a small rill that measures 1.9 x 4.4 m and consists of roughly 100 pieces of sandstone FCR. The FCR averages 11 x 16 x 2 cm. No soil staining was observed. The flaked stone artifacts consist of 16 pieces of debitage and a single biface (Tool 1). The debitage is dominated by the tertiary flaking stage and lithic material types include chert and chalcedony. No ground stone implements or ceramic artifacts were observed.

Smithsonian Site No.: 42Em5264

Site Type: Fremont Temporary Camp

Land Owner: BLM

NRHP Eligibility: Eligible, Criterion D

Description: The site is a temporary camp of Fremont affiliation located on west slope of a ridge, along benches and drainages. The site consists of four fire-cracked rock features (Features A-D), a lithic tool, lithic debitage, and ceramic sherds. The FCR concentrations range in size and include from 15 to 300 pieces of FCR. Soil staining was observed in two features (Features B and C). The flaked stone artifacts consist of 13 pieces of debitage and a single biface (Tool 1). The debitage is dominated by the tertiary flaking stage and lithic material types include chert and chalcedony. The ceramic assemblage consists of 47 sherds representing jars and bowls. The identified types include Emery Gray ware and a Kayenta series orange ware.

Smithsonian Site No.: 42Em5265

Site Type: Euroamerican Landscape Feature-Bench Mark

Land Owner: BLM

NRHP Eligibility: Not Eligible

Description: The site consists of a single feature of three rectangular rock alignments oriented north, southwest, and southeast to from a small central rock concentration. The site is located on a ridge exactly where an elevation (6,204 ft) is denoted on the 1968 Walker Flat, Utah 7.5' Quadrangle. Therefore, the feature is thought to represent an elevation benchmark and/or a triangulation point. The alignments and concentration are constructed from local sandstone rocks. The central cluster measures 2 ft by 1 ft 8

inches and the rectangular alignments measure 9 by 3 ft (north and southwest) and 10 by 3 ft (southeast). No artifacts were located in association with the feature. The earliest map this marker can be found on is the 1968 quad, but it likely dates earlier as other benchmarks in the area were installed in the 1920s and 1930s.

Table 3. Bronco's Emery 2 Subsidence Expansion Cultural Resources.

Smithsonian Site No.	UASF Site Type	UASF Site Characteristics	Affiliation	NRHP Eligibility	Land Status
42EM196	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Eligible, D	BLM
42EM199	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Eligible, D	BLM
42EM1387	Domestic, Agricultural/ Subsistence	Artifact Scatter, Architectural Features, Non-architectural Features	Euroamerican	Not Eligible	Private
42EM5248	Domestic	Artifact Scatter	Euroamerican	Not Eligible	Private
42EM5249	Unknown	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Eligible, D	Private
42EM5250	Agricultural/ Subsistence	Artifact Scatter, Non-architectural Feature	Euroamerican	Not Eligible	Private
42EM5251	Task Specific	Artifact Scatter, Non-architectural Feature, Lithic Source/Quarry	Unknown Prehistoric	Not Eligible	Private
42EM5252	Transportation/ Communication	Non-architectural Features, Linear (LOA ROAD)	Euroamerican	Eligible, A	BLM/Private
42EM5253	Domestic	Artifact Scatter	Euroamerican	Not Eligible	Private
42EM5254	Domestic, Agricultural/ Subsistence	Artifact Scatter, Architectural Features, Non-architectural Features	Euroamerican	Eligible, C	Private
42EM5255	Domestic	Artifact Scatter	Euroamerican	Not Eligible	Private
42EM5256	Domestic	Artifact Scatter	Euroamerican	Not Eligible	Private
42EM5257	Domestic	Artifact Scatter	Euroamerican	Not Eligible	BLM
42EM5258	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Not Eligible	BLM
42EM5259	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Eligible, D	BLM
42EM5260	Temporary Camp	Artifact Scatter, Non-architectural Feature, Rock Shelter	Unknown Prehistoric	Eligible, D	BLM
42EM5261	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Not Eligible	BLM
42EM5262	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Not Eligible	BLM
42EM5263	Temporary Camp	Artifact Scatter, Non-architectural Feature	Unknown Prehistoric	Eligible, D	BLM
42EM5264	Temporary Camp	Artifact Scatter, Non-architectural Feature	Fremont	Eligible, D	BLM
42EM5265	Other: Landscape	Non-architectural Feature	Euroamerican	Not Eligible	BLM

Table 4. Survey Results-Isolated Finds

Isolated Find	Legal Description	Affiliation	Artifact(s) Description
IF-A	T23S, R6E, S. 5 NE¼	Euroamerican	IF-A is an amber, machine made, crown cap bottle with “NO DEPOSIT, NO RETURN” on shoulder and “NOT TO BE REFILLED.” An Owens-Illinois Comp. mark is on the base with a date code for 1963.
IF-B	T23S, R6E, S. 5 NW¼	Unknown Prehistoric	IF-B is an oolitic white chert, early stage biface that measures 5.6 x 4.0 x 1.6 cm. It has an irregular flaking pattern and slightly sinuous margins.
IF-C	T23S, R6E, S. 5 SE¼	Unknown Prehistoric	IF-C is a fire-reddened slab metate fragment with pecking. The fragment measures 28 x 24 x 2 cm.
IF-D	T23S, R6E, S. 5 NE¼	Unknown Prehistoric	IF-D consists of one brown chert retouched flake, 20 pieces of Gilsonite, and a dark gray chert biface. The retouched flake has retouch along one ventral margin and bidirectional retouch along the other margin and the tool measures 3.7 x 2.2 x 0.3 cm. Some of the Gilsonite pieces have flake characteristics and some are angular shatter. The biface is Stage II-III with usewear along both margins and measures 3.2 x 3.0 x 0.5 cm.
IF-E	T23S, R6E, S. 5 NE¼	Unknown Prehistoric	IF-E consists of three chalcedony flakes and one biface fragment. The biface is a white chert, Stage V-VI, distal end fragment with no visible usewear and measures 2.1 x 2.6 x 0.4 cm.
IF-F	T23S, R6E, S. 4 NW¼	Euroamerican	IF-F is a stacked stone cairn that is circular/doughnut in shape, 1.15 m in diameter, 35 cm tall, and roughly eight courses of stone. A pack rat midden is located in the interior.
IF-G	T22S, R6E, S. 32 NW¼	Unknown Prehistoric	IF-G is an unprepared, multidirectional core with 12 flake scars and 30% remaining cortex. The orange-green chert ore is 16.3 cm long, 12.5 cm wide, and 11.3 cm thick. Six secondary flakes from the core were also present.
IF-H	T22S, R6E, S. 32 SW¼	Unknown Prehistoric	IF-H is a ground stone fragment that is 20.5 cm long, 20 cm wide, and 2.5 cm thick. The artifact, likely a slab metate fragment, is constructed from silicified sandstone and has a single use surface with light grinding and some polish.
IF-I	T22S, R6E, S. 31 SW¼	Unknown Prehistoric	IF I is a Stage II chalcedony biface fragment. The proximal fragment is 4.2 cm long, 2.5 cm wide, and 1.8 cm thick. There is approximately 40 mm of retouch and microflaking along its sinuous edge.

NATIONAL REGISTER OF HISTORIC PLACES EVALUATION

The National Register Criteria for Evaluation of Significance and procedures for nominating cultural resources to the National Register of Historic Places (NRHP) are outlined in 36 CFR 60.4 as follows:

The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, material, workmanship, feeling, and association, and that they:

- a)...are associated with events that have made a significant contribution to the broad patterns of our history; or
- b)...are associated with the lives of persons significant to our past; or
- c)...embody the distinctive characteristics of a type, period, or method of construction; or that represents the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- d)...have yielded or may be likely to yield information important in prehistory or history.

The cultural resource survey resulted in the location of three previously documented archaeological sites (42EM196, 42EM199, and 42EM1387) and the documentation of 18 newly identified archaeological sites (42EM5248-42EM5265). Nine of the 21 sites are recommended as eligible to the NRHP (42EM196, 42EM199, 42EM5249, 42EM5252, 42EM5254, 42EM5259, 42EM5260, 42EM5263, and 42EM5254). Six sites are prehistoric temporary camps that include a combination of factors suggesting they are eligible to the NRHP based on criterion D. These facets include diverse assemblages exhibiting potential spatial patterning, the presence of thermal features, and the potential to retain buried cultural horizons or significant feature fill. These sites include 42EM196, 42EM199, 42EM5259, 42EM5260, 42EM5263, and 42EM5264. Site 42EM5249, another prehistoric site includes a semi-circular rock ring, spatial patterning in the artifact distribution across the site, and depth potential as well. This site of unknown function is also eligible to the NRHP based on Criterion D. Site 42EM5252 represents early 20th century Loa Road, which was constructed to connect Castle Valley with the Loa area. The site is recommended as eligible under Criterion A for its importance in the social, economic, and commercial development of the region. Finally, site 42EM5254 is an early 20th century homestead. The homestead consists of several residential and agricultural structures, but fails to meet criterion A, B, or D. The primary structure on the site, however, consists of an adobe brick structure. Although in failing condition, the material and workmanship of the structure meets criterion C for inclusion on the NRHP. Only two other adobe brick structures have been formally documented in Emery County.

The remaining 12 sites are ineligible to the NRHP. Site 42EM1387, another homestead in the project area, was previously determined ineligible to the NRHP. The site has lost a considerable amount of its integrity since it was originally recorded. Prehistoric and historic artifact scatters lacking deposition potential, spatial patterning, diagnostic artifacts or features are recommended as ineligible for listing on the NRHP since they fail to fulfill any of the criterion. These sites include 42EM5248, 42EM5250, 42EM5251, 42EM5253, 42EM5255-5258, 42EM5261, 42EM5262, and 42EM5265.

CONCLUSIONS AND RECOMMENDATIONS

A Class III inventory encompassing a total of 1983.3 acres for the proposed Emery Mine II expansion resulted in the identification of 21 archaeological sites and nine IFs. Of the 21 archaeological sites, 9 are recommended as eligible to the NRHP. Six sites are prehistoric temporary camps that include a combination of factors (e.g., spatial patterning, deposition, features) suggesting they are eligible to the NRHP based on criterion D. These sites include 42EM196, 42EM199, 42EM5259, 42EM5260, 42EM5263, and 42EM5264. Three other sites, including a prehistoric site of unknown function (42EM5249), the historic Loa Road (42EM5252), and a homestead (42EM5254) are also recommended as eligible under Criteria D, A, and C, respectively. The proposed mining will result in the subsidence of portions of the APE. Subsidence will not adversely affect the qualities of site 42EM5252 that make it eligible to the NRHP for listing under Criterion C. Subsidence may adversely affect site 42EM5249. Site 42EM5249, a prehistoric artifact scatter and associated rock ring, may be affected by subsidence. The eligibility of the site is predicated on the potential for subsurface deposits associated with the rock ring feature. Limited eligibility testing, with land owner consent, is recommended for this site prior to subsidence to determine if such deposits are present. Site 42EM5254, including structures at the homestead contributing to its eligibility are mostly outside the proposed area of full extraction area and should not be impacted by subsidence. The owner of the property on which 42EM5254 occurs expressed that the homestead will likely be razed in the future to increase the farmable acreage of the property. No subsidence is proposed in the area underlying sites 42EM196, 42EM199, 42EM5259, 42EM5260, 42EM5263, and 42EM5264; this area will be used as the portal to coal deposits to the west. Hence, these sites will not be adversely affected by the proposed undertaking. Based on the results and recommendations, a determination of “no historic properties adversely affected” is proposed for the project pursuant to Section 106 of 36 CFR 800.

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APPENDIX A

Utah Archaeology Site Forms

On File At:

Utah Division of State History
Salt Lake City, Utah

