CULTURAL RESOURCE MANAGEMENT PLAN FOR ALTON COAL DEVELOPMENT'S PROPOSED DEVELOPMENT OF THE ALTON AMPHITHEATER AND SINK VALLEY, KANE COUNTY, UTAH

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May 23, 2008

MOAC REPORT NO. 07-136

United States Department of Interior (FLPMA)
Utah Permit No. 07-UT-60122

State of Utah Public Lands Policy
Archaeological Survey Permit No. 117

File in:
☒ Confidential
☐ Shelf
☐ Expandable
Refer to Record No 0023 Date 7/10/2008
In C0250005, 2008, Outgoing
For additional information

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INTRODUCTION

The Alton Coal Cultural Resource Management Plan (CRMP) is a new, collaborative approach to state and federal undertakings with potential affects to cultural resources in the Alton Amphitheater and Sink Valley regions. The Alton Coal project is being developed in phases on both public and private lands located in the Alton Amphitheater and Sink Valley, south of the town of Alton, Utah and includes a reasonably foreseeable transportation route that travels north from Alton along US Highway 89, west along State Route 20, and south along Interstate 15. The Alton Coal project area is divided into two separate project areas and phases of development, proceeding by separate permitting and leasing actions. The first action, the Coal Hollow Mine project area, is located in Sink Valley on private lands subject to state mine permit application no. C/025/005, overseen by the Utah Division of Oil, Gas and Mining (UDOGM). This private phase of development includes 433 acres of land located in Sections 19, 20, and 30 of Township 89 South, Range 5 West (Figure 1). The second phase includes leased federal coal within the Alton Coal Tract, which is located on public lands administered by the Bureau of Land Management (BLM), Kanab Field Office, and private lands. SWCA Environmental Consultants, under the direction of the BLM, is currently preparing an Environmental Impact Statement (EIS) for a federal coal lease application under the Lease by Application (LBA) process set forth at 43 CFR 3425. The Alton Coal Tract, includes 3,544 acres of federal coal reserves beneath public and private surface areas, of which 2,284 acres occur on public land administered by the BLM and 1,260 acres occur on private land. The Alton Coal Tract is located in Sections 12, 13, 24, and 25 of Township 89 South, Range 6 West; and Sections 7, 18, 19, 20, 30, and 31 of Township 89 South, Range 5 West (Figure 1).

The private and federal actions associated in the Alton Coal CRMP involve a number of state and federal agencies and must be compliant with a number of state and federal mandates. The Coal Hollow Mine permit on private lands is overseen by UDOGM and must be in compliance with Utah Code 9-8-404. The proposed federal leasing action for the Alton Coal Tract, is under the jurisdiction of the BLM. Although not currently under consideration, prior to mining the federally leased coal, a mine permit must be obtained through UDOGM. The proposed leasing action must be in compliance with the National Environmental Policy Act (NEPA) of 1969, Section 106 of the National Historic Preservation Act of 1966 (as amended), the Archaeological and Historic Conservation Act of 1972, the Archaeological Resources Protection Act of 1979, the American Indian Religious Freedom Act of 1978, and the Utah State Antiquities Act of 1973 (amended 1990). All of the involved agencies (those mentioned above, as well as the Utah State Historic Preservation Office and the State of Utah Public Lands Policy Coordination Office) are aware that while the mine permit on public land and the proposed federal lease are not directly connected, these actions are related and therefore this document is a reference for UDOGM, the Utah State Historic Preservation Office (SHPO), and the Utah Public Lands Policy Coordination Office (PLPCO) for application to Utah Code 9-8-404, as well as for the BLM and UDOGM for application to Section 106 of the NRHP and NEPA.

The management plan will be implemented in a phased process that begins with immediate impacts to the cultural resources on private lands, and the subsequent phases of data recovery that will be conducted should a federal action proceed. Each phase of research, the research or testing design and data recovery will amend this document. This plan includes a systematic approach to the management of sites located in the project area and consists of three proposed phases of research and mitigation. Phase I consists of the mitigation of seven archaeological sites that

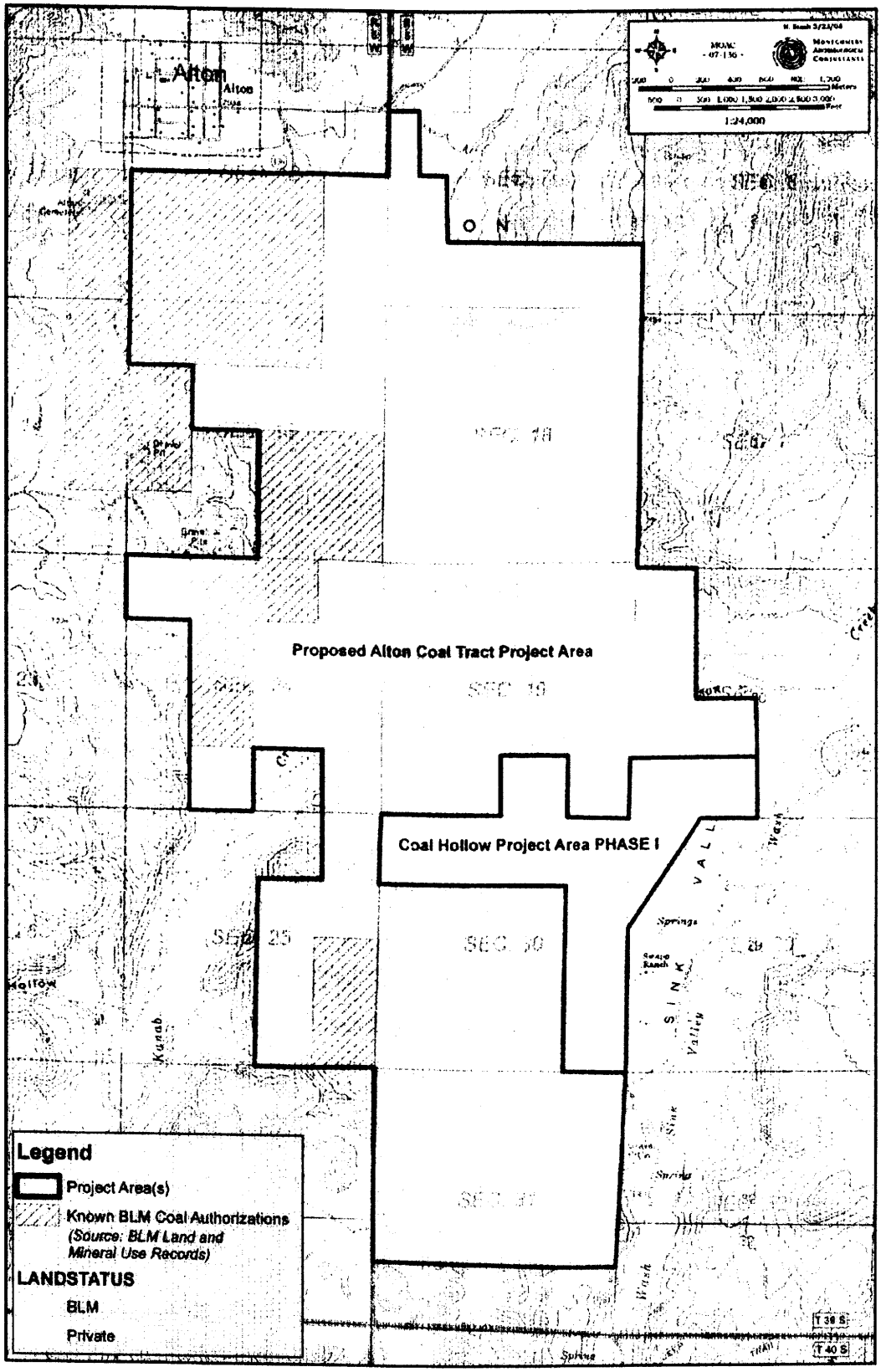

Figure 1. Alton Coal Project Area, Kane County, Utah; Showing the Current Boundaries for the Coal Hollow Project Area and the Alton Coal Tract Lease Project Area.

will be impacted by Alton Coal Development's proposed Coal Hollow surface mining plan. This phase of the project is located entirely on private lands, is in consultation with UDOGM, SHPO, and PLPCO and in compliance with Utah Code 9-8-404. Phase I data recovery and research will serve to inform possible subsequent phases of research through the collection of data regarding geomorphology, site depositional processes, depositional preservation, and erosional processes that have been operative in the project area, as well as chronology, artifact distribution, site function, subsistence, technology, and settlement patterns. Research would proceed to Phase II if all of the following events occur: 1) the BLM completes an EIS for the Alton Coal Tract federal coal lease application; 2) the BLM decides to offer the Alton Coal Tract for lease; 3) the lease is offered for competitive bid; 4) Alton Coal Development, LLC successfully acquires the lease. Phase II consists of an assessment of Phase I data and methods, the determination of comprehensive research questions, the development of a testing design, and the testing of eligible sites. Phase II accompanies a proposed federal action, which triggers compliance with Section 106 of the NRHP Act and NEPA and is in consultation with the BLM, UDOGM, and SHPO. Phase III consists of the refinement of overarching research questions and methods based on the results of Phases I and II, the selection of sites for mitigation, and the mitigation of the selected sites. Phase III also accompanies the proposed federal action consistent with Section 106 of the NRHP Act and NEPA and in consultation with the BLM, UDOGM, and SHPO. During the mining of private and federal coal it may be necessary to identify and mitigate the effects of associated actions (pipelines, power lines, roads, etc.) as such actions are proposed during the course of mine development.

This document will first discuss the affected environment including the physiography, climate, plant and animal resources, current land uses and impacts, and the cultural resources. The next section will discuss the consequences of each project phase, a description of each research phase, and stipulations for the production and review of mitigation plans. The document will then conclude with a brief summary of the project.

AFFECTED ENVIRONMENT

This section discusses the relevant aspects of geography, geology, climate, and biological resources. These topics set the stage for a discussion of cultural history, archaeological inventories and investigations, and the cultural resources documented in the project area. The affected environment includes the Coal Hollow project area, the Alton Coal Tract project area, and the reasonably foreseeable transportation route. The Coal Hollow and Alton Coal Tract project areas are located in the Alton Amphitheater and Sink Valley localities, south of the town of Alton, Kane County, Utah. The legal description of the project area, sans the transportation route, is Sections 12, 13, 24, and 25 of Township 89 South, Range 6 West; and Sections 7, 18, 19, 20, 30, and 31 of Township 89 South, Range 5 West (Figure 2). The reasonably foreseeable transportation route (Figure 3) extends west from Alton on CR-10/Cistern Road, north along US-89 through the NRHP Historic District in Panuitch to SR-20; west along SR-20 to Insterstate 15 and then south along Interstate 15 to Cedar City; and finally along Iron Springs Road to Iron Springs.

Physiography

The project area lies within the Grand Staircase Section physiographic subdivision of the Colorado Plateau (Stokes 1986). This area is characterized by a series of cliffs and terraces that rise from the Grand Canyon in Arizona to the summit of the High Plateaus in Utah. This section is bounded on the east by the East Kaibab Monocline, on the west by the Hurricane Fault, on the north by the edges of the various high plateaus, and on the south by the Grand Canyon of Arizona.

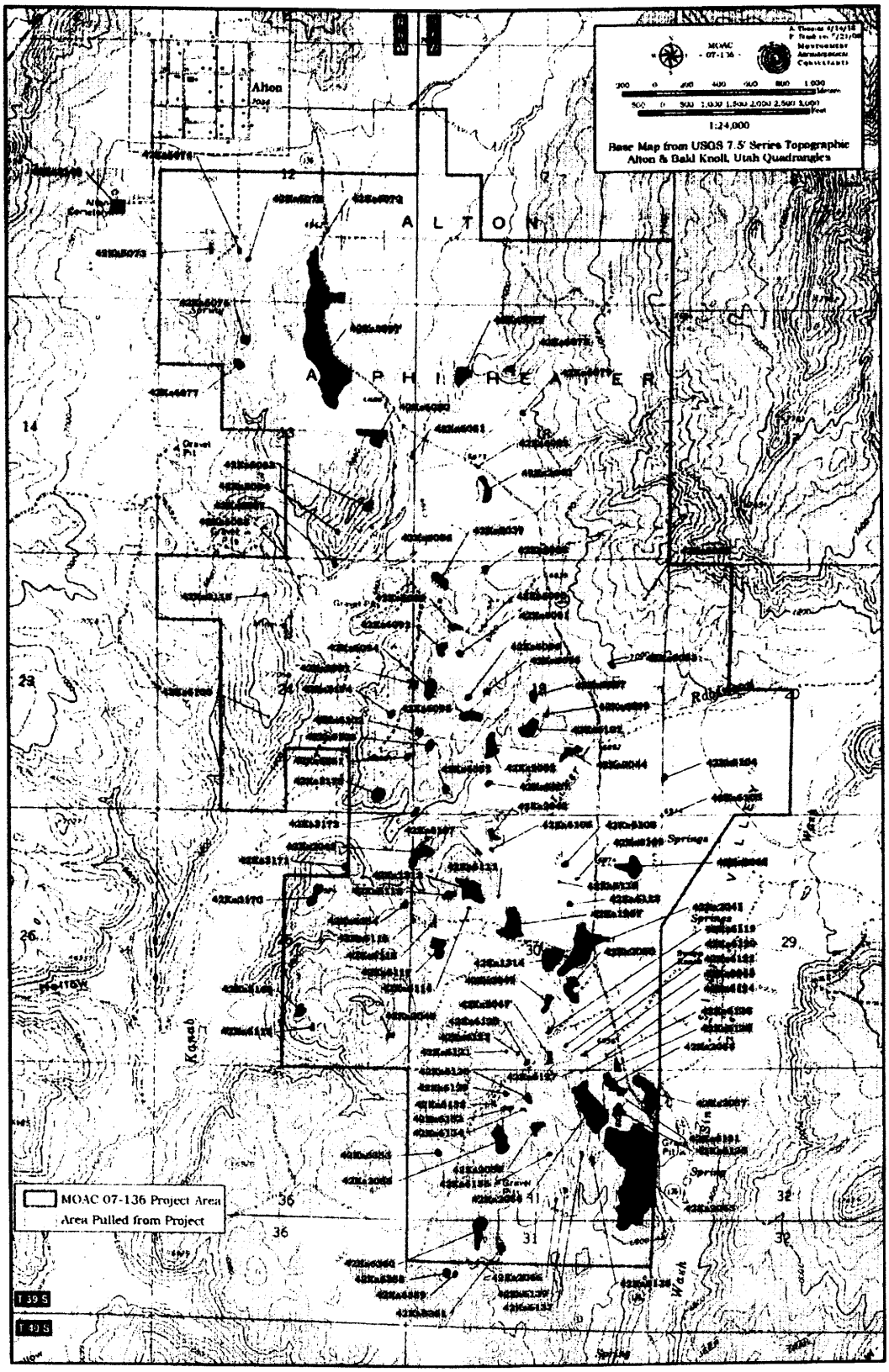

Figure 2. Alton Coal Project Area, Kane County, Utah; Showing Cultural Resources.

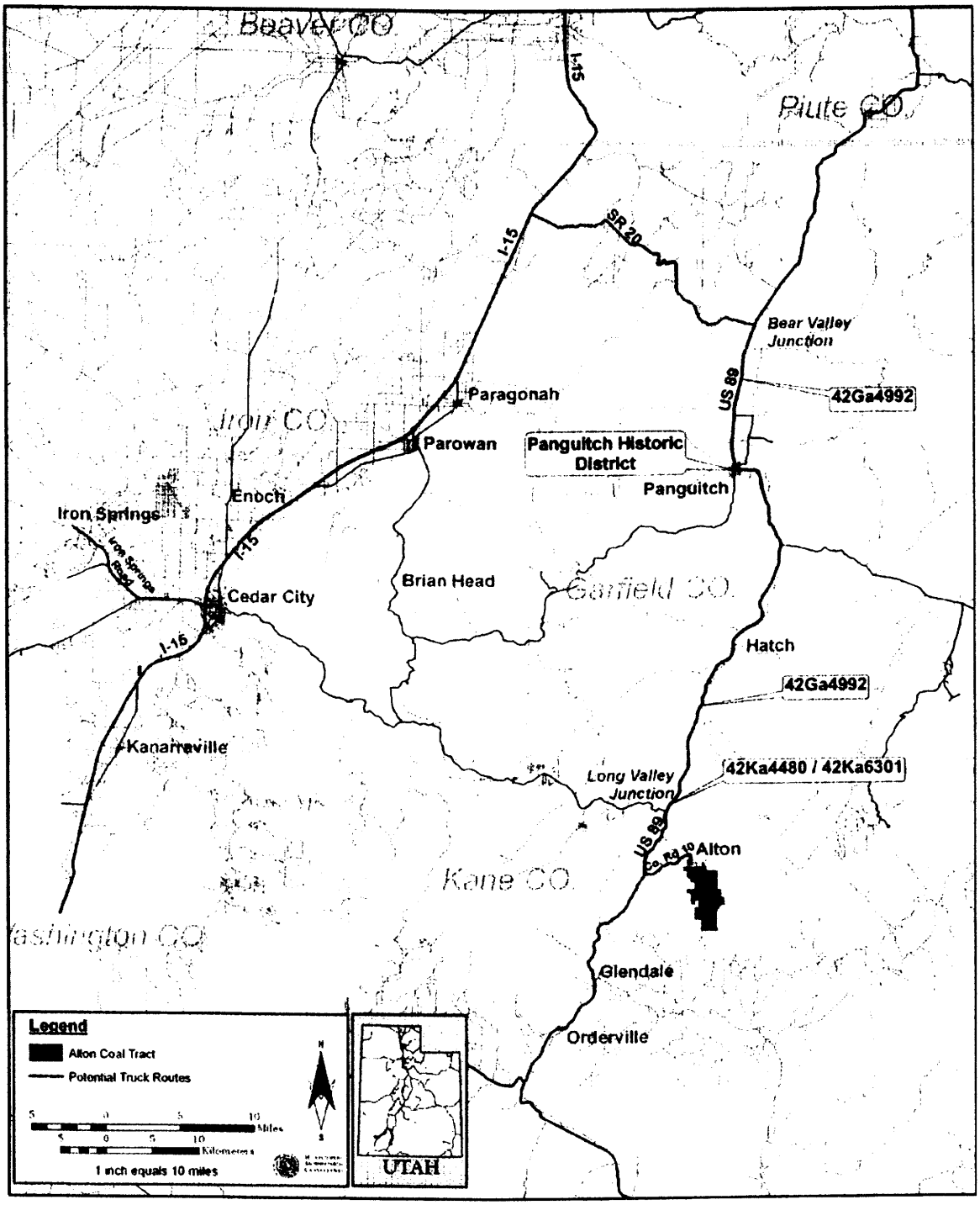

Figure 3. Reasonably Foreseeable Transportation Route, Kane, Garfield, and Iron Counties, Utah.

Harder rock layers create cliffs and accompanying benches and tablelands, whereas the softer rock units have eroded into slopes and badlands. Specifically, the project area is located along the western edge of the Paunsaugunt Plateau. The Alton Coal Field is comprised of relatively horizontal bedrock units of Mesozoic age (see Stavish 2006, Appendix C). Within portions of the project area, bedrock units are exposed as low hills and along the incised drainage of Kanab Creek. The exposed bedrock units include, from the oldest to youngest, the Winsor member of the Carmel formation (Jurassic), the Dakota formation (Cretaceous), and the Tropic shale (Cretaceous). The two most prominent geologic units are alluvium and Tropic Shale. The horizontal deposition of the geologic formations coupled with time and erosion has reduced much of the area to flat ridges and benches which are dissected by long alluvial drainages and their tributaries. Drainages often widen to form meadows, such as Sink Valley and the Alton Amphitheater. Alluvium, derived from weathered bedrock, is extensive throughout the project area along the broad, open areas of cultivation and valley floor. Characteristics of the alluvium include the location of low, relatively level areas of the project area, including cultivated fields, incised arroyos, and drainages. According to Lamm (Stavish 2006, Appendix C), total depth of the alluvium is not known and likely varies across the project area. Soils in the drainages have some agricultural potential as a result of their sand, gravel and silt composition and the presence of limestone and arkosic minerals (Gregory 1951:12).

The possible natural impacts to cultural resources distributed on the alluvium include localized slope failure/collapse of arroyo walls, piping of finer grained sediments, entrenching of drainages, and the potential for buried archaeological sites (see Stavish 2006, Appendix C). Cultural resources distributed across the Tropic shale formation are potentially impacted by localized slope failure, surficial creep on steeper slopes, slope wash on steeper slopes, and erosion of weathered bedrock slopes on steep to gentle slopes. Furthermore, the vertical erosion of sediments formed in situ on exposures of the Tropic shale may also distort the integrity of buried cultural resources (Ibid.).

Climate

Elevation in the project area ranges from 6800 ft (2079 m) to 7200 ft (2202 m). Climatic patterns are based on a 59 year record (1915 to 1974) from the Alton, Utah, weather station (Halbirt and Gualtieri 1981:8). The current weather pattern for the area exhibits a two season maxima of precipitation, winter and mid-late summer. The dominant seasonal precipitation occurs during the winter months, from December through March, when a low pressure system over the Pacific-California coast brings heavy snowfall. Precipitation during the summer occurs as short, heavy rains triggered by conversional mixing of warm moist air from the Gulf of Mexico and cool dry air from the mountainous regions of the Southwest.

The average monthly temperatures are generally mild and follow a modal distribution with a low of 26°F during January and a high of 65°F during July. The number of consecutive frost-free days average between 84 to 104 days (Gregory and Moore 1931). This period is shorter than the necessary 100 to 120 frost-free days required to mature modern hybrid corn, and more time is needed under dry conditions (Crosswhite 1981). Because the arable land is located within drainages, the growing season is further shortened due to the effects of cold air drainage.

Plant and Animal Resources

The project area consists primarily of three vegetation zones: a pinyon-juniper community, a sagebrush community, and an agricultural community. Generally, the pinyon and juniper associated vegetation occurs on the tops and the slopes of the ridges. However, the pinyon and juniper associations have encroached in the sagebrush community. The sagebrush community exists within the alluvial floodplains, draws, and meadows. Also located within the alluvial floodplains and meadows are several fields of agriculture. It is generally held that the pinyon and juniper encroachment into sagebrush communities is a current phenomenon caused by overgrazing of the land (Halbirt and Gualtieri 1981). After the settlement of the west, the great influx of domestic livestock depleted many ranges and the combination of overgrazing, lack of fire, and the dissemination of seeds by animals lead to the encroachment of pinyon and juniper communities in to grassland and sagebrush communities (Ibid.). Halbirt and Gualtieri (1981:10) infer that the vegetation composition prior to European settlement was a more open pinyon-juniper community located on ridge and mesa slopes and tops and that the floodplains, draws, and mesa interiors were populated with a grassland-browse community.

A number of edible plant species are available in the Alton Amphitheater and Sink Valley regions. Table 1 lists these edible plants, their ethnographic use, and seasonal occurrence.

Table 1. Edible Plants Available in the Alton Amphitheater and Sink Valley (after Halbirt and Gualtieri 1981:11, Table 2).

Common Name	Latin Name	Parts Used	Ethnographic Use	Seasonality
Barberry	*Berberis sp.*	berries, leaf	medicine, food	early fall
Canyon grape	*Vitis sp.*	berries	food	late summer - early fall
Cattail	*Typha sp.*	seeds, roots	food	fall
Currant	*Ribes sp.*	berries	food	fall
Goosefoot	*Chenopodium sp.*	seeds, plant	food	summer - fall
Juniper	*Juniperus sp.*	seeds, leaves	medicine, food	fall
Oak	*Quercus sp.*	acorns	food	fall
Onion	*Allium sp.*	root	food	spring - summer
Pinyon	*Pinus edulis*	nuts	food	fall
Prickly pear	*Opuntia sp.*	root, fruit, pads, blossom	medicine, food	spring - winter
Sagebrush	*Artemisia sp.*	seeds, leaves	medicine, food	fall
Sedge	*Carex sp.*	stem, roots	food	spring -summer
Serviceberry	*Amelanchier sp.*	berries	food	late summer - early fall
Squawbush	*Rhus sp.*	berries	food	late summer - early fall

Common Name	Latin Name	Parts Used	Ethnographic Use	Seasonality
Stickleaf	*Mentzelia sp.*	seeds	medicine, food	fall
Sunflower	*Helianthus sp.*	seeds, tubers	medicine, food	late summer - early fall
Various Grasses	*Gramineae*	seed	food	spring - fall
Yucca	*Yucca sp.*	fruit, root	food	summer

The region is inhabited by a wide range of animals that include at least 30 species of mammal, 85 species of bird, and 6 species of reptile. Historic settlement of the area and subsequent overgrazing have severely effected local animal populations. Grizzly bear, elk, antelope, beaver, lynx, and wolf have completely disappeared from the area and the deer population has been heavily reduced (Halibirt and Gualtieri 1981:10). Potential mammal resources found in the Alton Amphitheater and Sink Valley areas, prehistorically, include mule deer, elk, antelope, red and gray fox, lynx, badger, grizzly bear, wolf, coyote, mountain lion, porcupine, deer mice, wood rat, marmot, ground squirrel, pine squirrel, prairie dog, gopher, jackrabbit, cottontail rabbit, and beaver. Potential bird and reptile resources include wren, mourning dove, hawk, woodpecker, owl, bald eagle, raven, thrush, sparrow, rattlesnake, gopher snake, garter snake, horned toad, and whiptail and swift lizards. For the Southern Paiute who occupied the Alton area, deer was the chief large-game animal with rabbits and an assortment of rodents taken throughout the year (Kelly 1964:36).

Current Land Uses/Impacts

Current land use in the Alton Amphitheater and Sink Valley areas include farming, ranching, and mining. Agricultural lands cover over 20 percent of the land in the project area. Crops that currently and historically have been planted in the region include wheat, oats, barley, and alfalfa (Bradley 1999). Cattle and other ranching livestock graze on unimproved farmlands and on public lands managed by the BLM, Kanab Field Office. Livestock raised in the area include cattle, horses, mules, sheep, pigs, and poultry. Historic coal mining has been conducted in the area and three archaeological historic sites were documented in 1993 and 1994 by Nielson Consulting Group and Timpanogos Research Associates (Hughes et al. 1994). The Smirl Mine (42Ka4017), and the Jacob A. Sorenson Mine (42Ka4019), and the Alton Mine (42Ka4091) were located south of the town of Alton, along Kanab Creek. The Smirl Mine was opened in January 1944 to produce coal for local consumption. The mine was operated as a truck or wagon mine until 1961 when the mine closed due to a fire. Jacob A. Sorenson's mine, also known as Prospect 2A, was leased for coal production in 1936 and there are no records of the closure of the mine. The Alton Mine dates to the 1960s and no additional information could be ascertained. The remnants of these mining activities were reclaimed shortly after the sites were documented and no surface artifacts or features could be relocated during a 2005 cultural resource inventory (Stavish 2006, 2007).

Cultural Resources

Cultural-Historical Overview

Paleoindian

Human occupation in the region represents the Paleoindian, Archaic, Formative, Protohistoric, and Historic cultural stages. The first Native American occupation of the general study area probably occurred during the Paleoindian stage at the late glacial Pleistocene-Holocene boundary (ca. 11,500 B.P. - 9000 B.P.). Early Paleoindian artifact assemblages are typified by large, lanceolate projectile points, spurred end scrapers, gravers and borers, and crescents (Frison 1978:78), indicating the exploitation of megafaunal and floral resources. On the basis of projectile point typologies and subsistence strategies, the early portion of the Paleoindian stage is commonly divided into two cultural complexes referred to as the Clovis (ca. 11,500 - 11,000 B.P.), and the Folsom (ca. 11,000 - 10,000 B.P.). Aikens and Madsen (1986) postulate that Paleoindian people migrated into the eastern portion of the Great Basin following the recession of Lake Bonneville (10,500 B.P.). Several surface fluted projectile points have been reported from Garfield County (Copeland and Fike 1988) and northeastern Arizona (Geib 1995). Late Paleoindian or Plano projectile points have been found on the Kaiparowits Plateau and classified as large stemmed or concave base points (Geib et al. 2001:191-192).

Archaic Stage

The Archaic stage (7800 - 500 B.C.) is generally viewed as a hunting-gathering lifeway that is represented by subsistence practices more labor-intensive than those of Paleoindians with a greater number of smaller animal and plant species being intensively exploited. Several cultural sequences for the Archaic stage are proposed on the basis of regional differences. Jennings (1978) provides a concept of the western Archaic, or Desert Culture, based on diverse resource exploitation, diagnostic artifacts including cordage and basketry, and artifactual variability in various regions such as the California-Nevada axis and Utah-Oregon axis. Matson (1991) presents a four-period sequence model incorporating data from the Greater Southwest: Early (7800 - 4000 B.C.), Middle (4000 - 2000 B.C.), Late (2000 - 1000 B.C.), and Terminal (1000 B.C. to roughly A.D. 700). Immediately east of the project area, Geib et at (2001) outlines the following four period sequence for the Western Kaiparowits Plateau: Early Archaic (9000 B.P. to 6000 B.P), Middle Archaic (6000 B.P. to 4000 B.P.), Late Archaic (4000 B.P. to c. 2000 B.P. or the adaptation to agriculture), and the Terminal Archaic (2000 B.P. to A.D. 500).

South of the study area, the Early Archaic period is labeled the Desha Complex known for its crudely made, shallow, side-notched lanceolate points. In the Glen Canyon region excavations from Sand Dune and Dust Devil Cave provide a radiocarbon date of 5050 to 6050 B.C. (Lindsay et al. 1968). About a dozen projectile points were recovered from the lower layer in Sand Dune Cave including Pinto Series, Jay, and varieties of side-notched points (later classified as Sand Dune Side-notched) (Matson 1991:147). Faunal remains recovered from the Desha Complex include those of mountain sheep, cottontail, pack rat, and lesser numbers of jackrabbit, gopher, squirrels, skunk, and bison (one bone). At Dust Devil Cave, the earliest Archaic component (Stratum IV) provided a date from a yucca-lined pit of ca. 8793 B.C. along with an abundance of prickly pear cactus (*Opuntia*) extracted from human feces (Ambler 1996:42). Significant materials recovered from this cave included 25 Archaic sandals, classified into three basic types; open-twined, fine warp-faced, and coarse warp-faced (Ibid 44). On the northern Colorado Plateau the

earliest Archaic component is dated at Cowboy Cave (42Wn420) between 7430 and 7100 B.C. although no artifacts were found in this stratum (Schroedl and Coulam 1994:11). The upper Early Archaic component (Stratum III 5250 - 4350 B.C.), however, contained 11 projectile points (Pinto, Northern Side-notched, and Elko Corner-notched), faunal remains (cottontails, jackrabbits, porcupine, and *Canis* sp.), and floral remains (sunflower, sand dropseed, chenopods, cactus, juniper and bugseed) (Jennings 1980). The most significant features from Stratum III were a number of depressions referred to as "scooped out troughs" by Jennings (1975:9), more recently redefined by Schroedl and Coulam (1994:6-7) as pitstructures which were repeatedly cleaned out and reoccupied during the Early Archaic. In the Alton West Coal leasehold previous investigations have documented several Early Archaic projectile points types (Pinto Series, Humboldt, and Northern Side-notched) from sites which include later Formative and Late Prehistoric temporal components (e.g. 42Ka2045 and 42Ka2056) (Halbirt and Gualtieri 1981).

During the Middle Archaic period (4000 - 2000 B.C.) there was a decrease in the occupation of the Colorado Plateau, presumably caused by the Altithermal climate, which may have been a two drought event (Matson 1991:165-166). Many of the previously mentioned sites (Dust Devil Cave and Cowboy Cave) exhibit a reduced intensity of occupation during the Middle Archaic period. Recent radiocarbon data from the Glen Canyon region are filling the Middle Archaic gap (e.g. 1,000 years) as proposed by Berry and Berry (1986) for the Colorado Plateau indicating that the hunter-gatherers of the area may have not completely abandoned the area 6,000 years ago (Geib 1996:32). Middle Archaic settlement patterns most likely reflect the response to a probable protracted drought by populations shifting residential camps to water-rich lowlands and especially higher elevation settings (above 8,000 ft). Common projectile points at Middle Archaic sites are Sudden Side-notched, San Rafael Side-notched, Hawken Side-notched and Elko Series. Previous investigations in the Alton West Coal leasehold have identified such point types as Sudden Side-notched from sites which include other Archaic periods and later temporal components which appear to represent residential camps and processing camps (Halbirt and Gualtieri 1981).

The Late Archaic period began around 4,000 years ago and corresponds to a noticeable increase in radiocarbon dates in the region and is temporally correlated with an increase of effective moisture what is termed as the sub-boreal interval (Berry and Berry 1986). This period is marked by a heavy reoccupation of Cowboy Cave starting at about 1750 B.C. and is characterized by the inhabitants engaging in broad-scale hunting and gathering with an increased emphasis on mountain sheep and chenopods/amaranths (Matson 1991:171). Gypsum projectile points comprised approximately 30 percent of the total identifiable collection from Cowboy and adjacent Walters Cave (Jennings 1980:36). These stemmed points are among the most common type of point found in southeastern Utah and appeared on the northern Colorado Plateau sometime after 2550 B.C. (Holmer 1986:105). Split-twig figurines are another important diagnostic of the Late Archaic period, best known from Cowboy Cave, but occur over a broad territory centered on the Colorado River and it tributaries. Farther south in the Glen Canyon region, Late Archaic occupations are less represented, although a few Gypsum points were recovered from Dust Devil Cave (Geib and Ambler 1991). On the Kaiparowits Plateau, Late Archaic sites are represented primarily by residential camps situated in the higher elevations with access to ample water, fuel wood, large and small game, and plant resource diversity whereas the limited activity camps and reduction loci are prevalent in the lower elevations that contained a greater abundance of economic grasses (Geib et al. 2001:367). Investigations at the Arroyo Site (42Ka3976) situated in the Grand Staircase-Escalante National Monument revealed a potential pitstructure exposed in a trench below a Formative horizon, dated to circa 1850 B.C., may attest to a semi-permanent occupation of the floodplain environment (McFadden 2000:15). In the Alton West Coal leasehold several Late Archaic Gypsum projectile were recorded at open sites with other older and more recent prehistoric temporal components (42Ka2047 and 42Ka2059) (Halbirt and Gualtieri 1981).

The Terminal Archaic period (1000 B.C. to roughly A.D. 700) is marked on the northern Colorado Plateau by the presence of arrow points and shafts along with the introduction of corn. The Archaic-Formative transition at Cowboy Cave is found in two separate episodes of occupation beginning about A.D. 100 during a period of high effective moisture (Schroedl and Coulam 1994:23). This relatively intense occupation (Stratum Vb) appeared to have represented a late summer/early fall seed processing locale based on the coprolite evidence (Hogan 1980). A corn cache as well as corn kernels were found in this horizon revealing that the pre-Formative occupants were growing this domesticate, although the extent of agricultural dependency is unknown. It is well established that corn dates to at least 1200 B.C. across much of the southern portion of the Colorado Plateau with later dates derived from sites farther north (Geib 1996:54). Even if the populations in the study area were not actively involved with farming, they were likely in contact with farmers or were a least experiencing changes resulting from the presence of nearby farmers. At Hog Canyon Dune (42Ka2574), located at the junction of Hog and Kanab creeks about two miles north of Kanab, charred corn kernels were recovered from a pitstructure in association with a hearth and a burial yielding two dates: 910 - 390 B.C. and A.D. 60-640 (Janetski 1993:229). The dating of bow and arrow introduction to the eastern Great Basin and Utah has been an issue of continuing debate. Past evidence from the lithic technologies between the terminal Archaic and Basketmaker II populations indicates that by ca. A.D. 100 the bow and arrow was employed by the ancestral Fremont, while the ancestral Anasazi continued to employ the atlatl. In the northern portion of the region, at Cowboy Cave, arrow points come from preceramic Stratum V deposited about A.D. 100-600 (Schroedl and Coulam 1994). To the south, the Sunny Beaches site (42Ka2751) in the Glen Canyon Recreational Area is somewhat of an anomaly. A number of Rose Spring Corner-notched points, which are accepted markers of bow and arrow technology dated earlier (e.g. around A.D. 100) than the established chronology for Basketmaker II aceramic occupations. In the Alton Coal Leasehold previous inventories have documented Rose Spring Corner-notched arrow points from several sites. At site 42Ka2056 both Early Archaic Pinto Series points and Rose Spring Corner-notched points were found, but in two separate lithic assemblage loci (Halbirt and Gualtieri 1981:85).

Formative Stage

The Formative stage began about A.D. 500, when ceramics were generally used on the Colorado Plateau, and continued until A.D. 1300, with the Anasazi abandonment of Four Corners region. Within the region, this stage encompasses two different cultures: the Anasazi (Puebloan) and the Fremont. The project area is within the occupation zone of the Anasazi, which is divided into two recognizable branches the Virgin Anasazi and the Kayenta Anasazi. The Virgin Anasazi primarily occupied the Arizona Strip, southwestern Utah, and southernmost Nevada. Whereas, the Kayenta Anasazi occupied a large portion of northern Arizona and far southeastern Utah. The Fremont are considered a separate entity, found primarily at sites in Utah north of the Anasazi region. Artifactual evidence in the study area indicates primarily a Virgin Anasazi cultural tradition, although both Kayenta Anasazi and Fremont ceramic types have been identified.

The Virgin Anasazi occupied the area from Basketmaker II through early Pueblo III times, and apparently adapted horticultural practices to a variety of environmental conditions (Thompson and Thompson 1978; Walling and Thompson 1988). Investigations in the Grand Staircase area east of Kanab Creek indicates it was occupied continuously from at least Basketmaker II times (ca. A.D. 300) through late Pueblo II (ca. A.D. 1200). Virgin Anasazi residential units are characterized by an architectural sequence from pithouse residences with separate cist storage facilities, through

intermediate stages of room block development, and eventually to substantial surface masonry pueblos incorporating both storage and habitation functions (Talbot 1990). According to McFadden (1996:24) the quantity of storage space per residential unit did not vary significantly over time indicative of a continuity of subsistence practices. In the Grand Staircase region Virgin Anasazi sites located immediately adjacent to cultivable fields were fully residential with large storage capacities (Ibid 7). Furthermore residential mobility may have been part of an adaptive strategy that allowed the Virgin Anasazi to engage in agriculture in an environment in which a variety of short-term environmental fluctuations needed to be accommodated. In contrast the Kolob/Skutumpah Terrace area where the present study area resides (above 6,400 ft) is characterized by a short growing season (less than 120 days at Alton), hence prehistoric agricultural potential was risky. Several studies in this area (Christensen et al. 1983; Halbirt and Gualtieri 1981; Keller 1987:87) indicated that the vast majority of the prehistoric sites are limited activity sites or camps related to hunting and gathering behavior. For the entire Alton Coal leasehold, Keller (Ibid.:87) estimates that 23 percent of the total sites date from Basketmaker III to Pueblo II. However, surveys in the Alton Amphitheater conducted by MOAC (Stavish 2006, 2007) suggest a smaller percentage, only seven percent, of Basketmaker III to Pueblo II temporal components. Data compiled by McFadden (1996:17) from this area, as well as the Grand Staircase and Upper Virgin River, suggests that Virgin Anasazi residential sites are predominantly associated with agricultural potential, while hunting/gathering sites are more common in the elevated zone where agriculture is not feasible. Ceramic types identified in the Alton Coal leasehold are dominated by mainly Virgin Anasazi North Creek Gray, North Creek Corrugated, Shinarump Brown, and St George Black-on-Gray. To a lesser extent Kayenta Anasazi (Tusayan Black-on-Gray) and Fremont Great Salt Lake Gray have been reported in the area adjacent to Kanab Creek (Halbirt and Gualtieri 1981:35).

In the Grand Staircase physiographic section the adaptive strategy of the Virgin Anasazi is summarized by McFadden (1996:30) as an occupation of multiple "homesteads" located in a variety of different agricultural niches, each with different characteristics but all suitable for agriculture. Furthermore, shifts in residence would occur periodically in response to short term climatic fluctuations, but also as a result of local environmental deterioration. A comparison of site types from the lower elevation study areas and the Kolob and Skutumpah Terrace area suggests that given frequent residential moves, the farmsteads themselves could have served as base camp/processing stations with this upland functioning as a hunting-gathering component.

In Washington and Kane Counties, archaeological investigations have revealed habitation sites, storage sites, possible field houses, and nonstructural Virgin Anasazi sites. In the Kanab area, structural sites are situated along Kanab Creek, and its perennial tributary Johnson Creek, to access water for agricultural land. In some places and times, deep soils made possible true dry-farming; in other cases, sites are situated in areas where natural drainage concentrates runoff. East of Kanab, where the population peaks in Late PII times, sites are increasing, situated where they can take advantage of runoff concentrated by washes and streams (Lyneis 1995:225). Other site types found in the Upper Virgin Anasazi area consist of storage features but no dwellings, which may represent part of the flexible nature of Virgin Anasazi settlement patterns (Lyneis 1995:218). In addition, nonstructural sites with Anasazi ceramics are found throughout the area in nonagricultural locations. These may include rockshelters, sometimes associated with large roasting pits, as well as featureless sherd and lithic scatters.

Protohistoric and Southern Paiute

Protohistoric occupation of the project area is attributed to the Southern Paiute, members of the Numic population. Several models address the migration of Numic populations to the Great Basin. Some theorize that Numic expansion from the southwestern Great Basin eastward occurred approximately 1,000 years ago (Lamb 1958). Other models view the expansion taking place several thousand years ago (Taylor 1961, Swanson 1962). On the basis of the co-occurrence of Southern Paiute and Virgin Anasazi ceramics in stratigraphic context it is theorized that entry into the southwestern Utah area by Numic speakers occurred during the late occupational period of the Virgin Anasazi (Westfall et al. 1987). Fowler (1994) compares the material culture of the Southern Paiute to that of the Virgin Anasazi, noting similarities such as clay figurine styles, certain features of coiled basketry, and one type of sandal, and concludes that these similarities suggest interaction between the groups. Besides pottery or perishable materials, the other common diagnostic is the Desert Side-notched projectile point. Although Desert Side-notched points should be considered horizon marker rather than ethnic markers, Southern Paiute use of the study area is well documented (Kelley 1964), and appeared to have constituted the primary post-A.D. 1300 indigenous occupation. Cottonwood Triangular points may not be useful diagnostics of Numic occupations if they are unfinished items broken in production; such tools might have been intended as Desert Side-notched points or Bull Creek points or some other arrow point type (Geib et al. 2001:392). Southern Paiute Brown Ware found in southwest Utah is characterized as conical-bottomed vessels exhibiting undulating surfaces on their thick walls. Decoration is limited to some surface incising, corrugation or fingernail impressions, and/or clapboarding of coils; the former often over the entire surface of the vessel (Baldwin 1950). Temper tends to be visible and coarse and fall into two types for the area: 1) abundant very fine rounded to subangular particles that are generally clear and appear to be frosted suggesting that they originate from eolian and alluvial deposits; 2) large angular to subangular particles most of which are white and very fine grained as if derived from a crushed quartzite or other aphanitic particles (Westfall et al. 1987:70).

The Southern Paiute were hunter-gatherers and part-time horticulturists, with domesticates playing a minor role in their subsistence strategy (Fowler and Fowler 1971, 1981; Steward 1938). This cultural tradition is characterized by the use of rockshelters, and open camp sites containing wickiup dwellings, rock-filled roasting pits, fire hearths, conical-bottomed brownware ceramics, some decorated with fingernail incisions, rabbit fur blankets, basketry hats and containers, digging sticks, milling stones, and stone tools (Euler 1966; Westfall et al. 1987). Social organization revolved around bands of multiple family units, cooperating and joining forces when necessary to ensure the survival of the community (Steward 1938). At least 16 major bands, or 35 smaller groups, have been identified in Utah.

The area adjacent to the present town of Alton was the summer home of one of the seven socio-economic groups that comprised the Kaibab Band of the Southern Paiute (Kelley 1964). The organization of these groups was largely economic in character, however, some attention was allotted to social residence. It appears that the group inhabiting the Alton area was a small patrilocal aggregate. While evidence exists that other groups visited the area occasionally to gather seeds and berries, there seems to have been minimal economic cooperation between groups (Ibid.). The Alton group was controlled by a chief who directed the seasonal movements of camps, and who was in most instances in charge of deer hunting (Ibid 27). According to Kelley (Ibid 6), campsite location was determined by the presence of springs which fell under the jurisdiction of the local economic group. Subsistence activities varied according to seasonality, with the occupants of a spring "....tending to share the same seasonal cycle" (Ibid 8). During the winter, the group

resided in Kanab Canyon were semi-permanent camps in the sense that the occupants returned to them following hunting and foraging trips. Resources utilized during this period included seeds and rabbits, the latter hunted in large scale drives consisting of perhaps 25 individuals from different households (Ibid 24). Periodically, deer and pinyon nut forays were also conducted along the top of the Vermillion cliffs. When snows receded in the spring, the group moved north to the Alton area and subsisted until summer on stores of food previously cached in caves (Ibid 16). The group remained in Alton for most of the summer collecting a wide variety of seeds and berries as well as hunting deer, marmot, and rabbit (Halbirt and Gualtieri 1981:15). At some point during this period the group returned briefly to the Kanab area to gather seeds and cached them for the succeeding winter occupation (Kelly 1964:16). Deer hunting and the gathering of "plateau" seeds was emphasized during the late summer to fall months. It is during this period that deer begin to congregate in small migratory groups.

Navajos occupied areas of the Skutumpah Terrace during the post World War II period (about 1945 to 1970) while cutting and installing cedar fences for local ranchers (Halbirt and Gualtieri 1981:56). Physical remains from the Navajo occupation primarily east of the project area fall into one of the four following categories: 1) forked-stick hogans composed of interlocking poles and a corbelled roof entrance; 2) palisade hogan composed of a corbelled roof supported by four corner posts and a series of stringers which lean against the roof; 3) brush hogan roughly square in plan view and partially supported by two living pinyon trees which provided the superstructure firm support; 4) sweat lodge consisting of three interlocking poles with stringers leaning against the frame and packed with mud daub (Bradley 1999:56).

Historic - European

The first documented entry of European Americans into Kane County was the expedition of Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante in the autumn of 1776 to establish an overland route between settlements in Santa Fe and Los Angeles. Because of a snowstorm near Milford, the expedition halted the attempt to reach California, and instead followed a route to the southeast to return to Santa Fe. Along this route they named Sulphur Creek (later renamed the Virgin River), Rio de Pilar (later known as Ash Creek), and Hot Sulphur Springs (Alder and Brooks 1996; Bradley 1999). Another early explorer, Jedediah Smith, followed parts of the Dominguez and Escalante Old Spanish Trail, of which various portions were later referred to as the California Trail, through Washington County in 1826 and 1827. His route created a new pathway for pioneers traveling from the East to California, and was widened to an actual wagon road in 1849. Other explorers to follow in these footsteps include John C. Fremont in 1844 and Mormon pioneer leaders from Salt Lake City in 1847 (Alder and Brooks 1996).

Important to the Mormon colonization effort was the organization of an Indian mission in Harmony in early 1854. Jacob Hamblin, a Mormon explorer and settler of Kane County, led the effort to establish harmonious relationships with key Native American leaders. His knowledge of the area also facilitated government exploration and mapping projects, including a Colorado River voyage with John Wesley Powell in 1871 that documented the landscape of Glen Canyon and the present-day city of Kanab. While Kanab is the principal settlement in Kane County, small towns in Long Valley are important centers of agriculture and stock-raising. In 1862, John and William Berry first led a team of ranchers into the Long Valley area in search of rangeland for their cattle. The area was called Long Valley due literally to its length (a long narrow valley situated between high mountain walls), fertile land, and proximity to water. The first settlement in the valley was probably that of Berryville (later renamed Glendale), established by the Berry brothers in 1864.

Berryville was abandoned in June 1866 due to conflicts between the Mormon settlers and Pauite and Navajo tribes in the area. This pattern of settlement was common to many of the small towns in Long Valley throughout the late 1800s. On January 16, 1864, the Utah Territorial Legislature approved an act that officially created Kane County. Its boundaries were defined on the west to include the upper Virgin River area, including Virgin City, the principal town in the new county at the time (Bradley 1999:56-59). Kane County remained isolated because of its challenging landscape, its relatively small population, and its lack of connection to railroad lines.

The town of Alton is a small ranching community located near the head of Long Valley. It originally developed from Upper Kanab, an earlier settlement in the valley of upper Kanab Creek that was abandoned during the Black Hawk War. Upper Kanab was first settled by Lorenzo Wesley Roundy when he brought his family to Upper Kanab Creek in 1865. Historically, this area had tall grass, good fodder for their animals, streams of clear water, abundant wildlife in the nearby mountains, berries and other wild fruit, and timber for homes and fences (Bradley 1999:65). The settlement was first called Roundy's Station and the immigrants built two log cabins that first summer. In 1865, the Mormon Church ordered inhabitants of Upper Kanab and other small settlements to go to Kanab, Dixie, and larger towns in the area to help fortify them against Pauite raids (Ibid 65-66). Settlers did not return to Upper Kanab until 1870, when Lorenzo Roundy's nephew, Byron Donalvin Roundy, and his wife settled there. Byron and his brother, William Roundy, organized a cattle company called the Canaan Cooperative Stock Company, headquartered in St. George. In 1882, Edwin D. Woolley and Daniel Seegmiller also brought their families to settle in Upper Kanab. Two buildings, a schoolhouse and a recreation hall, were erected in 1885 at the head of the Virgin River. During the late 1880s, when the federal government began to crack down on the polygamists of Utah territory, many Mormon men fled to the area to escape marshals (Ibid 143-149). In 1887, the communities of Ranch, Upper Kanab, and Sink Valley joined together to form a LDS ward. In 1908, the town acquired its present-day name of Alton during a May Day celebration drawing. Charles R. Pugh, who had been reading a book about the Alton Fjord in Norway, suggested the name. The population of the town peaked at 350 in the 1930s (Ibid 210). In the post World War II years, coal reserves were discovered near Alton, and the Smirl-Alton coal mines extracted an average of 40 tons daily in 1949. Today, Alton is home to fewer than 100 people, and its main sources of livelihood stem from ranching, the timber industry, and its potential for coal mining.

Today, most traffic through the area is generated by tourists headed to attractions such as Bryce Canyon National Park, Zion National Park, and Grand Staircase-Escalante National Monument. Bryce Canyon, the southern part of which lies in Kane County, was designated a national monument by President Warren G. Harding in 1923, and elevated to National Park status in 1928. Originally, the boundary of Zion National Park ended at the Washington-Kane County State line. In 1930, it was expanded to include part of Kane County, which was made accessible by the Zion-Mt. Carmel tunnel and road (Bradley 1999:218). Grand Staircase-Escalante National Monument was established by President Bill Clinton on September 17, 1996. The monument comprises approximately 1.7 million acres in Kane and Garfield Counties. These major tourist destinations are all accessible via US Highway 89, which bisects Long Valley and proceeds through every town in Kane County except Alton (Ibid 8).

Previous Archaeological Work In or Adjacent to the Project Area

A record search for previous projects and cultural resources was conducted at the Utah State Historic Preservation Office, Salt Lake City on March 25, 2005 by Ms. Marty Thomas. Intensive cultural resource investigations have taken place in the area since the 1980s; however, numerous archaeological sites have been recorded since the 1970s. The majority of the eleven identified inventories were conducted by the Museum of Northern Arizona or Bureau of Land Management and are mostly related to proposed mining activities.

In 1974, the Museum of Northern Arizona (MNA) performed clearance of 48 drilling locations and access routes on the Skutumpah Terrace in Kane County; 19 drilling locations and access routes in the Alton Amphitheater in Kane County; and four meteorological tower sites in Kane County (Davidson et al. 1974). Thirty-six archaeological sites were documented during the investigations. Three of these sites are located in the current project area, 42Ka1267, 42Ka1314, and 42Ka1834. Site 42Ka1267 is a lithic campsite with lithic tools, lithic debitage and ground stone that was determined to be significant. 42Ka1314 is an artifact scatter determined to be significant. These sites were re-documented; however, site 42Ka1834, a small lithic scatter with a single projectile point, could not be relocated in the field.

In 1979-1980, MNA conducted inventories for Utah International, Inc.'s coal mining lease area situated on the Skutumpah Terrace and Alton Amphitheater (Halbirt and Gualtieri 1981). The four surveyed parcels were designated Alton East and Alton West, the coal preparation plant site, and major road routes. A total of 107 archaeological sites, most of which were of prehistoric affiliation, were documented dating from the Archaic to Late Prehistoric. A total of 107 archaeological sites, most of which were of prehistoric affiliation were documented dating from the Archaic to Late Prehistoric. A portion of the Alton West parcel is located within the current project area and includes previously documented sites 42Ka2037, 42Ka2038, 42Ka2039, 42Ka2040, 42Ka2045, 42Ka2047, 42Ka2048, 42Ka2049, 42Ka2050, 42Ka2051, 42Ka2052, 42Ka2055, 42Ka2056, 42Ka2057, 42Ka2058, 42Ka2059, 42Ka2065, and 42Ka2066. These sites are prehistoric temporary camps, artifact scatters and lithic scatters. All of these sites, except 42Ka2037, were re-documented for the current undertaking. Site 42Ka2037 is a lithic scatter with a single projectile point that was not relocated during the 2005 MOAC inventories.

In 1980, the Bureau of Land Management (BLM) Kanab Field Office performed a Class III inventory of Engineers International, Inc. seismic testing areas (McFadden 1980). No cultural resources were located in the project area. The BLM performed a cultural resource inventory in 1981 of a tract allotment for Heaton Brothers (McFadden 1981). No archaeological sites were documented during the project. The Cone allotment chaining area was surveyed by the BLM in 1982, resulting in a finding of no cultural resources (McFadden 1982).

In 1984, the BLM surveyed the Syler Knoll chaining area for cultural resources (McFadden 1984). Previously recorded site 42Ka2045, a large lithic scatter containing diagnostic artifacts, was located within the project area. Because 42Ka2045 was previously evaluated as not significant (for eligibility to the NRHP), clearance was recommended for the chaining activities.

In 1986, MNA performed cultural resource inventories of 43 drill locations and access roads within the Alton Coal Field for Utah International, Inc. (Weaver 1986). Two new archaeological sites, located outside of the current project area, were documented. Also in 1986, MNA performed survey and monitoring of nine test pit locations and access routes for Utah International, Inc. (Weaver and Hurley 1986). No new cultural resources were documented.

In 1986, the Museum of Northern Arizona (MNA) returned to the Alton Coal Leasehold to survey another 12,500 acres, resulting in the documentation of 103 additional sites of which six occur in the present project area (42Ka3077, 42Ka3080, 42Ka3097, 42Ka3115, 42Ka3140, and 42Ka3168) (Keller 1987). Site 42Ka3077 is a lithic and hearth scatter of Archaic affiliation that was recommended as eligible to the NRHP. 42Ka3097 is a multi-component Archaic, Anasazi, Paiute, and historic artifact scatter that was recommended as eligible to the NRHP. Site 42Ka3115 is a lithic scatter of Paiute affiliation that was recommended as eligible to the NRHP and site 42Ka3140 is the Alton Cemetery. Site 42Ka3168 is a lithic and hearth scatter of Virgin Anasazi affiliation that is recommended as eligible to the NRHP. Site 42Ka3080 was described as a historical agricultural trash dump consisting of various agricultural implements and an automobile. This site was not re-located during the current inventory and was likely moved or reclaimed from the in-use agricultural field.

In 1987, the Museum of Northern Arizona (MNA) surveyed 22 auger borings and 27 backhoe test pits for Utah International, Inc. (Weaver and Hurley 1987).

In 1993 and 1994, Nielson Consulting Group and Timpanogos Research Associates performed cultural resource inventories and site evaluations of several abandoned mines in central and southern Utah (Hughes et al. 1994). Three of the mines (42Ka4017, the Smirl Mine; 42Ka4019, Prospect 2A; and 42Ka4091, the Alton Mine) are located in the current project area. None of these mines are evaluated as eligible to the NRHP. These sites could not be re-located during the 2005 MOAC inventories, likely as a result of reclamation.

A stratified probability sample inventory of the Kaiparowits Plateau was conducted in 1998 and was designed to provide information on the density, distribution, and diversity of cultural resources in the region (Geib et al. 2001). This survey identified prehistoric remains dating from the early Archaic through the Protohistoric; including Archaic, Fremont, Anasazi, and Late Prehistoric (likely Southern Paiute). While Archaic sites were numerous across the survey area with abundant cultural remains, small Late Prehistoric sites containing few cultural remains were identified to have the greatest density. Sites attributed to the Archaic period are dominated by hunting camps. Importantly, the authors note that many Archaic sites on the Kaiparowits Plateau appear to be mainly surface phenomena and appear to have little potential for buried cultural remains (Ibid.:7-5). Residential and hunting camps were identified with equally high frequency for the Fomative period, and together represent more than half of the identified Formative period sites. Of the identified Late Prehistoric site types on the Kaiparowits Plateau, hunting camps were identified with the greatest frequency (Geib et al. 2001).

In June and July 2005, MOAC conducted a cultural and fossil resource inventory of Alton Coal Development's project area in the Alton Amphitheater, south of the town of Alton, Utah (Stavish 2007). The inventory resulted in the documentation of 31 previously recorded archaeological sites and 60 new archaeological sites. The previously recorded archaeological sites include one historic site (Alton Cemetery); three multi-component prehistoric/historic sites; and 27 prehistoric sites that consist of temporary camps, artifact scatters, and lithic scatters. The new archaeological sites include two historic sites (a corral and a bridge); two multi-component prehistoric/historic sites; and 56 prehistoric sites that consist of temporary camps, artifact scatters, and lithic scatters. The inventory also resulted in the documentation of 30 new paleontological localities and three previously documented paleontological localities (Stavish 2007). In August 2005, MOAC completed a survey of six coal seam drill sites for Alton Coal Development; no cultural resources were found (Thornton and Montgomery 2005).

In 2007, the Bureau of Land Management, Kanab Field Office, conducted a cultural resource inventory of additional lands associated with the Alton Coal Area of Potential Effect (APE) (Zweifel 2007). The inventory resulted in the documentation of 14 archaeological sites (42Ka3170-42Ka3172, 42Ka3174, 42Ka3175, 42Ka6351-42Ka6354, and 42Ka6357-42Ka6361). Two of theses sites (42Ka6358 and 42Ka6259) are located outside of the current APE and are not included in the project area.

Previous Archaeological Investigations - Regional

Regional archaeological investigations conducted in the vicinity of the project area include investigations at the Red Cliffs Site (Dalley and McFadden 1985), the Little Man Archaeological site on the Virgin River (Dalley and McFadden 1988), along SR-9 (Horn 1991), the Washington City-Green Spring Project (Westfall et al. 1987), the Interstate 15 within the Middleton to Snowfield Interchange project (Westfall 1991), and at Quail Creek (Walling et al. 1986). These sites consist mainly of Pueblo I and Pueblo II Virgin Anasazi, Archaic, and Southern Paiute affiliation. Large excavation projects have been completed for the Kern River 2003 Expansion Project (Reed et al. 2005), at Sand Hollow (Talbot and Richens 2002) and Corral Canyon (Roberts and Eskenazi 2006). Numerous small sites have also recently been excavated in the St. George Basin including 42Ws1809 (Eskenazi 2006) and 42Ws2556 (Eskenazi 2005).

Fourteen sites were investigated along Interstate 15 within the Middleton to Snowfield Interchange project area (Westfall 1991). These sites include four prehistoric and 10 historic resources. Test excavations at the prehistoric sites indicated that site 42Ws1220 is a multi-component Archaic, Virgin Anasazi and Southern Paiute camp, site 42Ws2364 is a lithic scatter of unknown cultural affiliation, site 42Ws2394 is a resource processing camp of unknown cultural affiliation, and site 42Ws2395 is a Virgin Anasazi (Pueblo I) habitation.

The Quail Creek project included a wide range of site types that reflect Native American use from the late Archaic/Basketmaker period to the Paiute period (Walling et al. 1986). Quail Creek is the only Virgin Anasazi settlement system covering an entire canyon that has been investigated using radiocarbon dating methods, as well as macrobotanical and pollen analysis of botanical samples. The radiocarbon dates, in association with the temporally diagnostic ceramics from the sites, suggest that the area was used continuously during the Virgin Anasazi period from about A.D. 80 to 1290 and possibly as late as A.D. 1380.

The Red Cliffs site is a Pueblo I-II Virgin Anasazi habitation that was excavated and stabilized by the Bureau of Land Management (Dalley and McFadden 1985). The Red Cliffs site contained 27 storage features and two habitations, with other minor features including firepits, midden areas, and use surfaces. The complexity of building sequences and storage blocks is suggested as evidence of a periodic settlement strategy (ibid.). The BLM also excavated several Virgin Anasazi sites located on the Virgin River between Quail Creek and Hurricane, Utah that are known as the Little Man sites (Dalley and McFadden 1988). The habitations and storage features excavated at the Little Man sites suggest episodes of reuse, rebuilding, and reoccupation. The authors also suggest that a full range of tool production activities were occurring at each site, which included hunting and related processing activities (ibid.:256).

The Green Spring excavations were conducted in 1985 by Abajo Archaeology and consisted of six small rock shelters with seven associated outdoor hearths (Westfall et al. 1987). The analysis of artifacts, macrobotanical and pollen samples, and faunal remains was interpreted to suggest that the sites represented short-term encampments and residential camps whose occupants were

engaged in resource procurement and processing (ibid.). The sites were occupied during the Pueblo I and II periods and later by Paiute groups (after A.D. 1800). The site function is suggested to have shifted from a seasonal base camp during the Pueblo I occupation to a specialized resource procurement locale during the Pueblo II period. Radiocarbon dates from heathers in the front of the shelters yielded historic dates; however the historic Euro-American artifacts associated with the Southern Paiute occupation of the shelters were not found in association with these features. The historic Euro-American artifacts associated with the Southern Paiute occupation include pieces of fabric, a bullet, and eighteen cartridge casings (ibid.).

Excavations at sites 42Ws54 and 42Ws1226 along State Road 9 between St. George and Hurricane, Utah were conducted by Alpine Archaeological Consultants (Horn 1991). Site 42Ws54, an open scatter of artifacts with an nearby Anasazi roomblock, contained 2,795 artifacts and dates to the Pueblo II Virgin Anasazi and Southern Paiute periods (ibid.:52). Site 42Ws1226 was a small rockshelter with deep alluvial and cultural deposits that contained 1,333 artifacts and occupation is attributed entirely to the Southern Paiute period. Deposits in the floodplain below site 42Ws1226 appear to date from the Archaic to the Protohistoric (ibid.:87).

A large-scale data recovery effort was undertaken by Brigham Young University prior to the construction of the Sand Hollow Reservoir near Hurricane, Utah (Talbot and Richens 2002). The Sand Hollow project investigated over 30 components that represented occupations spanning the Early Archaic through the Southern Paiute periods. Talbot and Richens (2002:401) documented substantial evidence of the use of the plant and animal resources during the Middle and Late Archaic periods during both short and longer-term stays. The excavations resulted in the interpretation of 14 structures or possible structures and numerous pit features described as postholes, subfloor pits, and thermal pits (ibid.:399). Temporary habitation features are noted for both the Late Archaic and Southern Paiute periods.

The Kern River 2003 Expansion Project concentrated archaeological date recovery efforts to a limited number of sites with good potential for addressing pertinent research questions (Reed et al. 2005). The 22 sites selected for archaeological excavation range from Paleoindian lithic scatters to Euroamerican town sites. Sites located in southwestern Utah are primarily lithic and ceramic scatters that range from Early Archaic to Protohisotric temporal affiliations, and include both Virgin Anasazi and Fremont cultural groups.

HRA conducted excavations at site 42Ws2556, which is located on a terrace adjacent to the Virgin River, near the town of Bloomington, Utah (Eskenazi 2005). The excavations centered on a charcoal stain that dated to the Southern Paiute period and pollen from a quartzite mano suggests that the occupants of the site processed locally available resources such as Cheno-am seeds. Eskenazi (2005:54) suggests that the site functioned a temporary plant and animal processing camp that was used for as short a period as only a single night to a few days. Artifacts from earlier and later periods suggest that the site may also have been briefly occupied by Archaic and Anasazi groups.

The Coral Canyon excavations conducted by HRA consisted of test excavations and data recovery at 23 sites located north of Washington City, Utah (Roberts and Eskenazi 2005). The documented sites were occupied during the Early Archaic through the Late Archaic period and the Southern Paiute Period (ibid.). The site types, similar to those documented in the Sand Hollow report, included short-term processing camps, seasonal residences, and residential camps. The associated paleo-environmental study suggested that the Coral Canyon sites were occupied during cooler, wetter periods, such as the Late Archaic and Little Ice Age (A.D. 1500-1700) (ibid.:208).

Data recovery at the Plain View site, 42Ws1809, conducted by HRA resulted in the documentation of six storage features, four hearths, and a shallow, ephemeral living structure (Eskenazi 2006). Two and possibly three occupations are proposed to have occurred between A.D. 800 and 900. Floatation and pollen samples that fuel woods were obtained locally, and that two features may have been involved in plant processing activities (ibid.:76). The presence of slab-lined storage cists indicated that the occupants invested time and energy into creating for reliable food storage and the site was likely used for short-term stays while the food was being processed or for longer periods of time during milder seasons (ibid.:90).

To summarize, cultural resource projects conducted in the vicinity of the current project area have yielded evidence of prehistoric and historic sites. Prehistoric site types include lithic scatters, lithic quarry/workshops, residential camps, specialized resource procurement and processing camps, transitory camps, and habitations. Cultural affiliation of these sites is attributed to Archaic, Virgin Anasazi, and Southern Paiute peoples.

Overview of Cultural Resources in the Project Area

In 2005, MOAC completed two cultural resource inventories located in the Alton Amphitheater and Sink Valley, south of the town of Alton, Utah (Stavish 2006, 2007). In 2007, the BLM Kanab Field Office completed a cultural resource inventory of 510 acres of BLM lands (Zweifel 2007). The inventories examined a total of 3,977 acres; these incldue 2,284 acres of public lands administered by the Bureau of Land Management, Cedar City District, Kanab Field Office, and 1,693 acres of private lands. Additionally, the foreseeable transportation route utilizes US-89, which has been designated as 42Ka4480 (old US-89) and 42Ka6301 (current alignment) in Kane County and 42Ga4992 in Garfield County, and have been recommended as not eligible to the NRHP. The NRHP Historic District in Panguitch is also located along the foreseeable transportation route and is recommended as eligible to the NRHP under Criteria A and C. The Environmental Impact Statement (EIS) that the BLM and SWCA Environmental Consultants are preparing for the federal coal lease application describes the foreseeable transportation route through the Historic District of Panguitch as a cumulative effect. Combined, these inventories resulted in the documentation of 113 cultural resources (Table 2). These sites consist of five historic sites, six multi-component prehistoric/historic sites, and 102 prehistoric sites (see Table 2). The historic sites include trash scatters/dumps (42Ka1267, 42Ka2058, 42Ka6113, and 42Ka6135), the US-89 heritage road (42Ka4480, 42Ka6301, and 42Ga4992), the Panguitch Historic District, a corral (42Ka6082), and a collapsed bridge (42Ka6086). The multi-component prehistoric/historic sites include prehistoric artifact scatters with historic trash dumps (42Ka1267, 42Ka2058, and 42Ka6113), a prehistoric artifact scatter with a historic herding camp (42Ka2050), a prehistoric temporary camp with a historic trash scatter (42Ka6135), and a prehistoric lithic scatter with a historic homestead (42Ka2068). The prehistoric sites include 22 temporary camps, 16 artifact scatters, and 64 lithic scatters. The temporal and/or cultural periods represented by the sites include the Archaic (Early Archaic and Late Archaic), Anasazi, Fremont, Numic, and Southern Paiute. Three sites (42Ka3140, 42Ka6358, and 42Ka6359) were documented during cultural resource inventories associated with both of the proposed projects, but are located outside the project area, though this is dependent on the final lease area.

Table 2. Site Type and NRHP Eligibility of Sites.

State Site Number	Site Type	Temporal or Cultural Affiliation	Land Status	NRHP Eligibility
42Ka1267	Prehistoric Artifact Scatter Historic Trash Dump	Numic, Historic	Private	Eligible; D
42Ka1313	Prehistoric Temporary Camp	Archaic, Anasazi PII, Numic	BLM, Private	Eligible; D
42Ka1314	Prehistoric Temporary Camp	Southern Paiute	Private	Eligible; D
42Ka2038	Prehistoric Artifact Scatter	Southern Paiute	BLM	Eligible; D
42Ka2039	Prehistoric Temporary Camp	Archaic, Numic	BLM	Eligible; D
42Ka2040	Prehistoric Artifact Scatter	Southern Paiute	Private	Eligible; D
42Ka2041	Prehistoric Lithic Scatter	Anasazi, Southern Paiute	BLM, Private	Eligible; D
42Ka2042	Prehistoric Temporary Camp	Unknown	Private	Eligible; D
42Ka2043	Prehistoric Lithic Scatter	Numic	Private	Eligible; D
42Ka2044	Prehistoric Lithic Scatter	Archaic	BLM, Private	Eligible; D
42Ka2045	Prehistoric Artifact Scatter	Archaic	BLM	Eligible; D
42Ka2047	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka2048	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka2049	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka2050	Prehistoric Artifact Scatter Historic Herding Camp	Archaic, Historic	Private	Eligible; D
42Ka2051	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka2052	Prehistoric Artifact Scatter	Archaic	BLM	Eligible; D
42Ka2055	Prehistoric Temporary Camp	Archaic, Fremont, Southern Paiute	BLM	Eligible; D
42Ka2056	Prehistoric Artifact Scatter	Fremont, Numic	BLM	Eligible; D
42Ka2057	Prehistoric Temporary Camp	Anasazi, Southern Paiute	BLM	Eligible; D
42Ka2058	Prehistoric Artifact Scatter Historic Trash Dump	Late Archaic, Historic	BLM	Eligible; D
42Ka2059	Prehistoric Artifact Scatter	Unknown	BLM	Eligible; D
42Ka2065	Prehistoric Temporary Camp	Archaic, Anasazi, Fremont, Southern Paiute	BLM	Eligible; D

State Site Number	Site Type	Temporal or Cultural Affiliation	Land Status	NRHP Eligibility
42Ka2066	Prehistoric Artifact Scatter	Unknown	BLM	Eligible; D
42Ka2068	Historic Homestead and Prehistoric Lithic Scatter	Unknown, Historic	Private	Eligible; D
42Ka3077	Prehistoric Artifact Scatter	Unknown	Private	Eligible; D
42Ka3097	Prehistoric Artifact Scatter	Archaic, Anasazi, Southern Paiute	Private	Eligible; D
42Ka3115	Prehistoric Temporary Camp	Unknown	Private	Eligible; D
42Ka3140	Historic Cemetery	Historic	Private	Eligible; A, B
42Ka3168	Prehistoric Artifact Scatter	Anasazi	BLM	Eligible; D
42Ka3170	Prehistoric Artifact Scatter	Archaic, Late Prehistoric	BLM	Eligible; D
42Ka3171	Prehistoric Open Camp	Late Prehistoric	BLM	Eligible; D
42Ka3172	Prehistoric Artifact Scatter	Pueblo II, Ute/Paiute	BLM	Eligible; D
42Ka3174	Prehistoric Open Camp	Archaic	BLM	Eligible; D
42Ka3175	Prehistoric Open Camp	Archaic, Late Prehistoric	BLM	Eligible; D
42Ka6072	Prehistoric Lithic Scatter	Unknown	Private	Not Eligible
42Ka6073	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6074	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6075	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6076	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6077	Prehistoric Lithic Scatter	Unknown	Private	Not Eligible
42Ka6078	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6079	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6080	Prehistoric Temporary Camp	Archaic, Numic	BLM	Eligible; D
42Ka6081	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6082	Historic Corral	Historic	Private	Not Eligible
42Ka6083	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6084	Prehistoric Artifact Scatter	Southern Paiute	BLM	Eligible; D

State Site Number	Site Type	Temporal or Cultural Affiliation	Land Status	NRHP Eligibility
42Ka6085	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6086	Historic Bridge	Historic	Private	Not Eligible
42Ka6087	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6088	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6089	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6090	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6091	Prehistoric Temporary Camp	Early Archaic	BLM	Eligible; D
42Ka6092	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6093	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6094	Prehistoric Lithic Scatter	Early Archaic	BLM	Eligible; D
42Ka6095	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6096	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6097	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6098	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6099	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6100	Prehistoric Lithic Scatter	Archaic	BLM	Not Eligible
42Ka6101	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6102	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6103	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6104	Prehistoric Lithic Scatter	Archaic	Private	Eligible; D
42Ka6105	Prehistoric Lithic Scatter	Numic	Private	Eligible; D
42Ka6106	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6107	Prehistoric Lithic Scatter	Unknown	Private	Eligible; D
42Ka6108	Prehistoric Lithic Scatter	Early Archaic	Private	Elgible; D
42Ka6109	Prehistoric Lithic Scatter	Unknown	BLM, Private	Eligible; D
42Ka6110	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6111	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6112	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D

State Site Number	Site Type	Temporal or Cultural Affiliation	Land Status	NRHP Eligibility
42Ka6113	Prehistoric Artifact Scatter Historic Trash Scatter	Unknown, Historic	BLM	Eligible; D
42Ka6114	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6115	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6116	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6117	Prehistoric Lithic Scatter	Fremont	BLM	Eligible; D
42Ka6118	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6119	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6120	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6121	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6122	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6123	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6124	Prehistoric Lithic Scatter	Unknown	Private	Not Eligible
42Ka6125	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6126	Prehistoric Temporary Camp	Anasazi, Southern Pauite	Private, BLM	Eligible; D
42Ka6127	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6128	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6129	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6130	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6131	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6132	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6133	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6134	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6135	Prehistoric Temporary Camp Historic Trash Scatter	Southern Paiute, Historic	BLM	Eligible; D
42Ka6136	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6137	Prehistoric Lithic Scatter	Unknown	BLM	Eligible; D
42Ka6138	Prehistoric Artifact Scatter	Late Archaic, Southern Paiute	BLM	Eligible; D

State Site Number	Site Type	Temporal or Cultural Affiliation	Land Status	NRHP Eligibility
42Ka6139	Prehistoric Temporary Camp	Unknown	BLM	Eligible; D
42Ka6307	Prehistoric Artifact Scatter	Unknown	Private	Eligible; D
42Ka6351	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka6352	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6353	Prehistoric Seasonal Camp	Unknown	BLM	Eligible; D
42Ka6354	Prehistoric Lithic Scatter	Unknown	BLM	Not Eligible
42Ka6357	Prehistoric Artifact Scatter	Archaic, Late Prehistoric	BLM	Eligible; D
42Ka6358	Prehistoric Lithic Scatter	Archaic	BLM	Not Eligible
42Ka6359	Historic Artifact Scatter	Historic	BLM	Not Eligible
42Ka6360	Prehistoric Lithic Scatter	Middle Archaic, Late Prehistoric	BLM	Eligible; D
42Ka6361	Prehistoric Lithic Scatter	Archaic	BLM	Eligible; D
42Ka4480 42Ka6301 42Ga4992	Historic US-89 Road Alignments in Kane and Garfield Counties	Historic	UDOT	Not Eligible
N/A	Panguitch Historic District	Historic	N/A	Eligible; A, C

Three sites (42Ka3140, 42Ka6358, and 42Ka6359), which are include in Table 2, are not discussed in the description of sites below. These sites are not located within the current boundary of the project area, but were documented during cultural resource inventories of the Alton Amphitheater and Sink Valley localities (Stavish 2006, Zweifel 2007). Site 42Ka3140 is the Alton Cemetery and is defined by 154 graves that date from 1889 to 1997. The cemetery is recommended as eligible to the NRHP under Criteria A and B. Site 42Ka6358 is a disperse, diffuse lithic scatter consisting almost entirely of white tertiary flakes and a probable dart point fragment suggest an Archaic temporal affiliation. Site 42Ka6359 is a historic artifact scatter that consists of four small metal toy wagon beds and associated parts with a small amount of associated historic debris.

Eighteen prehistoric sites have multiple prehistoric temporal/cultural components, while the majority of prehistoric sites are single component. However, as many of the single component sites are described as unknown cultural or temporal affiliation, it is possible that some of these sites are multi-component sites of multiple unknown cultural periods. Because of the numerous multi-component sites, 129 individual site components are identified among the 111 sites. This total includes 121 prehistoric components and ten historic components. The prehistoric components can be further sorted temporally, such that there are 30 Archaic components, eight Anasazi components, four Fremont components, 25 Southern Paiute and Numic components, and 62

components of unknown prehistoric affiliation. Diagnostic artifacts indicative of two or more distinct prehistoric cultural periods are identified at 16 multi-component sites. These temporally diverse components represent either the reoccupation of the same locale by subsequent culture groups or the practice of later Native Americans curating and reusing the tools of their predecessors. Collection, curation, and reuse of manos from "archaeological sites" has been noted ethnographically for the Kaibab band of the Southern Paiute (Kelly 1964:37).

Most of the prehistoric sites (n=87) in the project area are comprised of artifact scatters with no associated features. Twenty-one prehistoric sites are comprised of one or more features with or without associated artifacts. The prehistoric sites with features are primarily single component sites of Archaic or unknown temporal affiliation. The features present at both single component and multi-component prehistoric sites are all fire-cracked rock concentrations that most often exhibit little morphology and little to no soil staining.

The historic components (n=10) identified in the project area reflect historic activities since 1889 and represent a variety of homesteading, ranching, and community based activities. Six different historic component types are identified and are primarily defined by the presence of features. Historic component types include trash scatter, herding camp, homestead, historic heritage route, the historic district of Panguitch, corral and bridge. Historic trash scatters are the most common historic component type (n=4) and they appear to represent short term or single episode trash dumps or scatters with no associated historic features. A single historic herding camp component (42Ka2050) is comprised of three discreet trash dump features, two temporary or expedient corral features, a possible wire clothesline, a poorly constructed lumber privy, and an unknown collapsed small lumber structure. A historic homestead component (42Ka2068) is comprised of a standing log structure described as a granary, a stone cellar, a log corral, three log fence sections, and agricultural field, and an associated stand of oak trees with rose bushes. The historic corral and bridge components (42Ka6082 and 42Ka6086) are each solely defined by their features and structural elements. The Panguitch Historic District and the state heritage route US-89 (42Ka4480, 42Ka6301, and 42Ga4992) are historic components associated with the reasonablely foreseeable transportation route of the coal trucks. The Panguitch Historic District was listed on the NRHP in 2006 and consists of a number of architecturally significant institutional, commercial, and residential buildings. An old alignment of state heritage route US-89 has been documented in Kane County, north of Kanab, and is designated as site 42Ka4480. The current alignment and associated features of state heritage route US-89 has been designated as site 42Ka6301 in Kane County and as site 42Ga4992 in Garfield County.

Site size is highly variable depending on site type, location, and duration of use. Site areas range from 43 m^2 (42Ka6122) to 140,123 m^2 (42Ka2065). The smallest sites consist of artifact scatters with no features, where as the larger sites (greater than 10,000 m^2) are typically multi-component and consist of dispersed but continuous artifact scatters and fire-cracked rock features. Examples of the most expansive sites include: site 42Ka2065, a prehistoric multi-component temporary camp with two fire-cracked rock features; site 42Ka3097 a prehistoric artifact scatter with diagnostic artifacts representing the Archaic, Anasazi, and Southern Paiute; and site 42Ka2057 a prehistoric multi-component temporary camp that is affiliated with the Anasazi and Southern Paiute and includes a single fire-cracked rock feature. Most of the sites (n=77) cover less than the average site size (6,531 m^2) and just over a third (n=36) of the total sites cover less than 1000 m^2.

Eligible sites (n=92) are primarily nominated to the National Register of Historic Places (NRHP) under Criterion D, although one site (42Ka3140) is nominated under Criteria A and B. Site 42Ka3140 is the Alton Cemetery, at which many of the buried individuals are early settlers of the Upper Kanab area and early founders of the town of Alton. Additionally, the cemetery dates to an early period of settlement in southwestern Utah and dates to the formation of the community of Alton (Upper Kanab). The remaining eligible sites were recommended to the NRHP under Criterion D and the sites consist of a multi-component historic/prehistoric site, prehistoric temporary camps, and prehistoric artifact scatters. Site 42Ka2068 is a multi-component site that consists of a prehistoric artifact scatter of unknown aboriginal affiliation and a historic homestead. Both components of the site are recommended as eligible to the NRHP, as they are likely to provide further information in various aspects of prehistoric and historic research. All of the prehistoric temporary camp sites or site components were recommended as eligible to the NRHP as they exhibit a diversity of cultural materials, spatial patterning, fire-cracked rock features, and in several cases temporally diagnostic tools or ceramics. Sixty-one prehistoric artifact scatters were recommended as eligible to the NRHP as they exhibit a variety of artifacts, spatial patterning, site integrity and the potential for subsurface material culture. Sites that were recommended as not eligible to the NRHP consist of the remnants of a collapsed historic bridge, a historic period corral, and 15 prehistoric lithic scatters. The prehistoric artifact scatters were recommended as not eligible to the NRHP as they consist of small artifact assemblages that are unlikely to retain intact subsurface deposits. Additionally, the majority of the non-eligible sites are located on the Tropic shale formation, as identified in by Lamm (in Stavish 2006: Appendix C). Cultural resources distributed across the Tropic shale formation are potentially impacted by localized slope failure, surficial creep on steeper slopes, slope wash on steeper slopes, and erosion of weathered bedrock slopes on steep to gentle slopes. Furthermore, the vertical erosion of sediments formed in situ on exposures of the Tropic shale may also distort the integrity of buried cultural resources (Ibid.).

CONSEQUENCES OF PROJECT PHASES

The cultural resource management plan is broken down into phases due to separate state and federal actions undertaken on private and federal lands. Phase I covers the proposed actions on private land and consists of the mitigation of adverse impacts in compliance with Utah Code 9-8-404 in consultation with UDOGM, SHPO, and PLPCO. Phase I consists of data recovery and mitigation of eligible sites, through randomly selected sample units, the targeting of surface features, and archaeological monitoring. As a result, Phase I will need to impart an adaptive field strategy and unanticipated discoveries that occur during this phase will need to be dealt with immediately. At the completion of Phase I data recovery, archaeological monitoring will occur to further collect any unanticipated data or discoveries. An internal review and consultation with participating agencies will be conducted at the end of this phase. Phase II and III cover the possible federal undertaking resulting from the lease of the Alton Coal Tract in compliance with Section 106 of the NRHP Act and NEPA, and is in consultation with the BLM, UDOGM, and SHPO. Phase II will consist of site testing and data recovery based on the development of overarching research questions and a site testing and data recovery plan utilizing statistical sampling methods. These comprehensive research questions will be influenced by the type and nature of the data collect during Phase I data recovery and the sampling design will be influenced by previous methods and techniques. Phase III is a continuance under the proposed federal undertaking, and consists of the refinement of research methods and questions based on Phase I and Phase II data recovery and testing. Phase III also consists of the selection of sites for mitigation and the mitigation of those sites.

Phase I: Data Recovery for Coal Hollow

The first phase of the project consists of the mitigation of seven archaeological sites that will be impacted by Alton Coal Development, LLC's proposed Coal Hollow surface mining plan in the Sink Valley locality, south of Alton, Utah. This phase of the project is located entirely on private lands involves a mine permit overseen by UDOGM and must be in compliance with Utah Code 9-8-404. A permit for archaeological excavation will be requested from PLPCO. Phase I data recovery and research will serve to inform possible subsequent phases of research through the collection of data regarding geomorphology, site depositional processes, depositional preservation, and erosional processes that have been operative in the research area, as well as the research domains. Though Phase I data recovery will occur at only a small subsection of sites located in the area, these Phase I sites are relatively representative of topography, geomorphology, and depositional processes that occur throughout the Alton Amphitheater and Sink Valley localities. The selection of sites for Phase I data recovery is based solely on land status, site eligibility, and potential impacts associated with the Coal Hollow undertaking. Furthermore, Phase I sites will not physically be available for subsequent phases of research, due to the nature of the proposed undertaking. Therefore, Phase I data recovery and field methods will need to be adaptive. If features, activity areas, or multiple levels of occupation are observed during the course of excavating the initial randomly sampled units, then additional units adjacent to such discoveries will be excavated in tandem so as to fully address the nature and extent of such discoveries. Though the Phase I sites can not be preserved for subsequent phases of research, the overarching research design for subsequent phases can and likely will inform the analysis of data recovered from Phase I sites.

The cultural resource inventory of Alton Coal Development's Coal Hollow (Sink Valley-Alton Amphitheater) project area resulted in the documentation of one previously recorded historic/prehistoric site (42Ka2068), five previously recorded prehistoric sites (42Ka1313, 42Ka2041, 42Ka2042, 42Ka2043, and 42Ka2044), and nine new prehistoric sites (42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, 42Ka6108, 42Ka6109, 42Ka6110, 42Ka6124, and 42Ka6126) (Stavish 2006). Of the 15 documented sites, one site is not eligible to the NRHP (42Ka2124) and seven of the sites will be avoided by the proposed undertaking (42Ka1313, 42Ka2041, 42Ka2043, 42Ka2044, 42Ka6109, 42Ka6110, and 42Ka6126). The remaining seven sites (42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108) cannot be avoided by the undertaking and are all eligible to the NRHP under Criterion D. Briefly, the sites included in the Phase I data recovery plan (Appendix A) include a prehistoric temporary camp of unknown cultural affiliation (42Ka2042), a historic homestead and prehistoric lithic scatter (42Ka2068), a lithic scatter of Archaic temporal affiliation (42Ka6104), a lithic scatter of protohistoric/contact period temporal affiliation (42Ka6105), two lithic scatters of unknown cultural or temporal affiliation (42Ka6106 and 42Ka6107), and a lithic scatter of Early Archaic temporal affiliation (42Ka6108). These sites are situated in the western portion of Sink Valley within the Alton Amphitheater and many of the sites exhibit integrity, spatial patterning, and good potential for intact subsurface cultural remains.

The data recovery plan and research design entitled "Data Recovery Plan and Research Design for Sites 42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108, Kane County, Utah," is included in Appendix A. The purpose of the data recovery plan is threefold. First, the data recovery plan serves as a research design to direct the archaeological investigations. This includes the identification and development of relevant research questions and the methods and techniques necessary to address these questions. Second, the plan outlines the methods and techniques that will be used during mitigation, in the laboratory, and during analysis

of the data collected. Third, the data recovery plan addresses reporting results, curation, and dissemination parameters for all portions of the Phase I data recovery. Public involvement in the Phase I data recovery will consist of an invitation to the local chapters of the Utah Statewide Archaeological Society to visit the excavations in an open house setting. Additionally, the local press will be contacted. Data recovery of the Phase I sites will allow for the refinement of archaeological research questions and methods for the potential subsequent phases of archaeological management of the Alton Amphitheater and Sink Valley regions.

The Phase I data recovery and research design places emphasis on a series of prehistoric period research domains, which include cultural affiliation and chronology, site function, use history, artifact distributions, subsistence, settlement patterns, and mobility (eg. Ahlstrom et al. 1999; Firor et al. 1998; Tipps 1995; Tipps et al. 1996; Westfall 1987; Westfall et al. 1987; among others). The historic period research domains include site level ethnography, consumer behavior patterns, and settlement patterns. The systematic approach, introduced to archaeology by Binford (1965), conceptualizes different components, or subsystems, of a society and analyzes them separately and then as part of the entire system. Redman (1973:62) outlines a systematic organizational strategy for field investigations that includes four fundamental principles: 1) the explicit use of both inductive and deductive reasoning in the drafting of research designs; 2) programmatic and analytical feedback; 3) explicit utilization of probability sampling; and 4) the formulation of analytical techniques that are appropriate to the hypotheses and the subject matter. The four principles are then applied to a multistage sampling design that includes general reconnaissance (Stage 1) of the region, intensive survey (Stage 2), a controlled surface collection (Stage 3), and excavations (Stage 4) (Redman 1973:64). Previous work in the Alton Amphitheater includes general reconnaissance and an intensive survey. This CRMP, the Phase I data recovery and research design, and subsequent phases of research rely heavily upon Redman's (1973) concepts of a systematic organizational strategy and multi-stage research design.

Phase II: Data Recovery for the Alton Coal Tract

The BLM is currently preparing an Environmental Impact Statement (EIS) for a federal coal lease application under the Lease by Application (LBA) process set forth at 43 CFR 3425. Should the Bureau of Land Management decide to offer the Alton Coal Lease Tract in Kane County for lease, it will be offered for competitive bid. If Alton Coal Development, LLC successfully acquires the Alton Coal Lease Tract, then research would proceed to Phase II. The second phase of the project will consist of archaeological testing of eligible sites located within the Alton Coal Tract. This proposed federal action is under the jurisdiction of the BLM and UDOGM must be in compliance with Section 106 of the National Historic Preservation Act, National Environmental Policy Act, the Archaeological and Historic Conservation Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act. Archaeological excavation for Phases II and III will require an Archaeological Resource Protection Act permit in consultation with the BLM. Phase II will consist of site testing based on the development of overarching research questions and testing plan utilizing statistical sampling methods. The overarching research questions will be influenced by the type and nature of the data collect during Phase I data recovery and the sampling design will be influenced by previous methods and techniques. At the inception of Phase II, MOAC and the BLM will seek public input regarding ideas for public involvement during Phase III mitigation and the dissemination of results to the public. Possible public involvement includes public education in the form of in-field open houses for tribal groups, local schools, community groups, and other interested parties. Possible options for the dissemination of the excavation results include, but are not limited to, a written publication in "laymen's terms" for the public and the publication of a website.

As in Phase I data recovery, Phase II testing will be designed towards the collection of data regarding geomorphology, site depositional processes, depositional preservation, and erosional processes that have been operative in the research area. The Phase II testing design will employ a statistical sampling method and testing at the eligible sites will be conducted to determine the nature, extent, and integrity of the site. This phase of the research is designed towards establishing which sites are most likely to provide information necessary for addressing the overarching research questions. Therefore, if features, activity areas, or multiple levels of occupational are discovered during the course of site testing, excavation of these discoveries will be stopped after the appropriate documentation and these sites will be recommended for further mitigation in Phase III or subsequent phases. Additionally, sites that yield data sufficient for addressing the overarching research questions will be recommended for further mitigation in Phase III or subsequent phases.

Phase III and Subsequent Phases: Mitigation of Selected Sites for the Alton Coal Tract

The third phase of the project will consist of the mitigation of the archaeological sites determined most likely to provide the necessary information for addressing the overarching research design and questions. As in Phase II, this research phase would only proceed in the event that the Alton Coal Lease Tract is made available for competitive lease and in the event that Alton Coal Development, LLC is the successful lessee. This portion of the research will be overseen by the BLM and UDOGM and will need to be in compliance with the federal regulations and mandates as described in Phase II. Prior to writing a Phase III research design, MOAC will conduct a self-review of the Phase I data recovery and Phase II testing to establish possible changes to the overarching research questions, research design, mitigation methods, sampling methods, and monitoring techniques. After a self-review is complete, a research design and data recovery plan will be produced and will include a sampling design for the selected sites. Phase III mitigation and data recovery will be conducted on sites are determined through Phase II testing as most likely to provide pertinent information needed to address the overarching research questions for the Alton Coal Tract area and which may provide further analytical and interpretive data regarding prehistoric behavior and land use within the region. Public involvement activities, as determined desirable by the public and as determined appropriate for the protection of cultural resources and in deference to public safety, will occur during this stage of research.

Production and Review of Mitigation Plans

The following stipulations are put forth regarding the production and review of mitigation plans associated with each of the project phases. Firstly, mitigation plans are site or phase specific. The selected sites will be tested and mitigated only after a determination of effects has been made. Secondly, changes made to the research design, excavation methods, sampling methods, and monitoring techniques will be specifically addressed in the subsequent research design and mitigation plan. Lastly, the review period for this cultural resource management plan, all research designs and mitigation plans, testing plans, and all other documents submitted in association with or appended to this document is 30 days from the day of receipt. This review period applies to all agencies and involved parties.

SUMMARY

The management plan will be implemented in a phased process that begins with immediate impacts to the cultural resources on private lands, and the subsequent phases of data recovery that will be conducted should a federal action proceed. Each phase of research, the research or testing design and data recovery will amend this document. This plan includes a systematic approach to the management of sites located in the project area and consists of three proposed phases of research and mitigation. Phase I consists of the mitigation of seven archaeological sites that will be impacted by Alton Coal Development's proposed Coal Hollow surface mining plan. This phase of the project is located entirely on private lands, is in consultation with UDOGM, SHPO, and PLPCO and in compliance with Utah Code 9-8-404. Phase I data recovery and research will serve to inform possible subsequent phases of research through the collection of data regarding geomorphology, site depositional processes, depositional preservation, and erosional processes that have been operative in the project area, as well as chronology, artifact distribution, site function, subsistence, technology, and settlement patterns. Phase II consists of an assessment of Phase I data and methods, the determination of comprehensive research questions, the development of a testing design, and the testing of eligible sites. Phase II accompanies a proposed federal action, which triggers compliance with Section 106 of the NRHP Act and NEPA and is in consultation with the BLM, UDOGM, and SHPO. Phase III consists of the refinement of overarching research questions and methods based on the results of Phases I and II, the selection of sites for mitigation, and the mitigation of the selected sites. Phase III also accompanies the proposed federal action consistent with Section 106 of the NRHP Act and NEPA and in consultation with the BLM, UDOGM, and SHPO.

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APPENDIX A:
PHASE I

Data Recovery Plan and Research Design for Sites
42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106,
42Ka6107, and 42Ka6108, Kane County, Utah

DATA RECOVERY PLAN AND RESEARCH DESIGN FOR
SITES 42KA2042, 42KA2068, 42KA6104, 42KA6105,
42KA6106, 42KA6107, AND 42KA6108
KANE COUNTY, UTAH

Patricia Stavish

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In C/025005, 2008, Incoming
For additional information

DATA RECOVERY PLAN AND RESEARCH DESIGN FOR SITES 42KA2042, 42KA2068, 42KA6104, 42KA6105, 42KA6106, 42KA6107, AND 42KA6108 KANE COUNTY, UTAH

Prepared By:

Patricia Stavish

Prepared For:

State of Utah Public Lands Policy Coordination Office
Salt Lake City, Utah

and

Division of Oil, Gas, and Mining
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Prepared Under Contract With:

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May 23, 2008

MOAC REPORT NO. 07-136

United States Department of Interior (FLPMA)
Utah Permit No. 07-UT-60122

State of Utah Public Lands Policy
Archaeological Survey Permit No. 117

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INTRODUCTION

In 2005, Montgomery Archaeological Consultants, Inc. (MOAC) conducted cultural resource inventories for the proposed Alton Coal Development Coal Hollow (Sink Valley-Alton Amphitheater) and Alton Amphitheater project areas (Stavish 2006, 2007). Combined, these cultural resource inventories resulted in the documentation of three historic sites, six multi-component prehistoric/historic sites, and 90 prehistoric archaeological sites. The Alton Coal Cultural Resource Management Plan (CRMP) addresses all phases of the potential effects to cultural resources in the Alton Amphitheater. This data recovery plan and research design will address the mitigation of archaeological sites inventoried as part of the Coal Hollow project area, Phase I of the CRMP. The Coal Hollow project area is located on private lands.

The cultural resource inventory of Alton Coal Development's Coal Hollow (Sink Valley-Alton Amphitheater) project area resulted in the documentation of one previously recorded historic/prehistoric site (42Ka2068), five previously recorded prehistoric sites (42Ka1313, 42Ka2041, 42Ka2042, 42Ka2043, and 42Ka2044), and nine new prehistoric sites (42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, 42Ka6108, 42Ka6109, 42Ka6110, 42Ka6124, and 42Ka6126) (Stavish 2006). Of the 15 documented sites, one site is not eligible to the NRHP (42Ka2124) and seven of the sites will be avoided by the current proposed undertaking (42Ka1313, 42Ka2041, 42Ka2043, 42Ka2044, 42Ka6109, 42Ka6110, and 42Ka6126). The remaining sites (42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108) cannot be avoided by the undertaking and are all eligible to the NRHP under Criterion D.

Briefly, the sites included in the Phase I data recovery plan include a prehistoric temporary camp of unknown cultural affiliation (42Ka2042), a historic homestead and prehistoric lithic scatter (42Ka2068), a lithic scatter of Archaic temporal affiliation (42Ka6104), a lithic scatter of protohistoric/contact period temporal affiliation (42Ka6105), two lithic scatters of unknown cultural or temporal affiliation (42Ka6106 and 42Ka6107), and a lithic scatter of Early Archaic temporal affiliation (42Ka6108). These sites are situated in the western portion of Sink Valley within the Alton Amphitheater and many of the sites exhibit integrity, spatial patterning, and good potential for intact subsurface cultural remains (Figure 1).

The purpose of this data recovery plan is threefold. First, the data recovery plan serves as a research design to direct the archaeological investigations. This includes the identification and development of relevant research questions and the methods and techniques necessary to address these questions. Second, the plan outlines the methods and techniques that will be used during mitigation, in the laboratory, and during analysis of the data collected. Third, the data recovery plan addresses reporting results, curation, and dissemination parameters for all portions of the Phase I data recovery. Additionally, data recovery of the Phase I sites, as proposed in the Alton Coal CRMP, will allow for the refinement of archaeological research questions and methods for the potential subsequent phases of archaeological management of the Alton Amphitheater and Sink Valley regions.

ENVIRONMENTAL SETTING

The study area lies within the Grand Staircase Section physiographic subdivision of the Colorado Plateau (Stokes 1986). This area is characterized by a series of cliffs and terraces that rise from the Grand Canyon in Arizona to the summit of the High Plateaus in Utah. This section is bounded on the east by the East Kaibab Monocline, on the west by the Hurricane Fault, on the

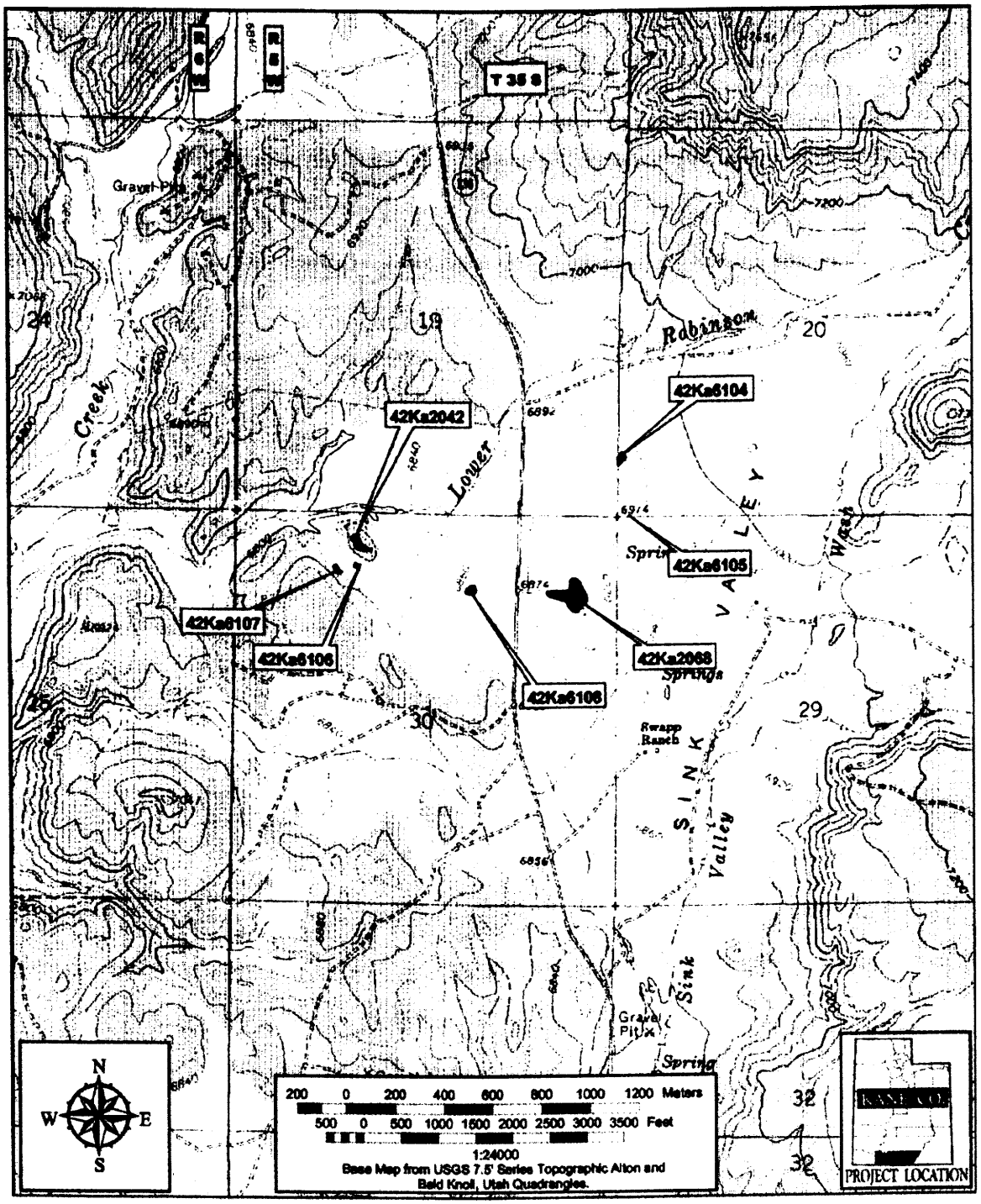

Figure 1. Location of Sites 42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108, Kane County, Utah.

north by the edges of the various high plateaus, and on the south by the Grand Canyon of Arizona. Harder rock layers create cliffs and accompanying benches and tablelands, whereas the softer rock units have eroded into slopes and badlands. Specifically, the project area is located along the western edge of the Paunsaugunt Plateau. The Alton Coal Field is comprised of relatively horizontal bedrock units of Mesozoic age (see Stavish 2006, Appendix C). Within portions of the project area, bedrock units are exposed as low hills and along the incised drainage of Kanab Creek. The exposed bedrock units include, from the oldest to youngest, the Winsor member of the Carmel formation (Jurassic), the Dakota formation (Cretaceous), and the Tropic shale (Cretaceous). Table 1, in Appendix C, summarizes the possible effects of surficial and bedrock units of the distribution of cultural resources in the area. The two most prominent geologic units are alluvium and Tropic Shale. The horizontal deposition of the geologic formations coupled with the impact of water and wind erosion has reduced much of the area to flat ridges and benches which are dissected by long alluvial drainages and tributaries. Drainages often widen to form meadows, such as Sink Valley and the Alton Amphitheater. Alluvium, derived from weathered bedrock, is extensive throughout the project area along the broad, open areas of cultivation and valley floor. Characteristics of the alluvium include the location of low, relatively level areas of the project area, including cultivated fields, incised arroyos, and drainages. According to Lamm (Stavish 2006, Appendix B), total depth of the alluvium is not known and likely varies across the project area. Soils in the drainages have some agricultural potential as a result of their sand, gravel and silt composition and the presence of limestone and arkosic minerals (Gregory 1951:12).

The possible natural impacts to cultural resources distributed on the alluvium include localized slope failure/collapse of arroyo walls, piping of finer grained sediments, entrenching of drainages, and the potential for buried cultural resources (see Stavish 2006, Appendix C). Cultural resources distributed across the Tropic shale formation are potentially impacted by localized slope failure, surficial creep on steeper slopes, slope wash on steeper slopes, and erosion of weathered bedrock slopes on steep to gentle slopes. Furthermore, the vertical erosion of sediments formed in situ on exposures of the Tropic shale may also distort the integrity of buried cultural resources (Ibid.).

Elevation in the project area ranges from 6800 ft (2079 m) to 7200 ft (2202 m). Climatic patterns are based on a 59 year record (1915 to 1974) from the Alton, Utah, weather station (Halbirt and Gualtieri 1981:8). The average monthly temperatures are generally mild and follow a modal distribution with a low of 26°F during January and a high of 65°F during July. The number of consecutive frost-free days average between 84 to 104 days (Gregory and Moore 1931). This period is shorter than the necessary 100 to 120 frost-free days required to mature modern hybrid corn, and more time is needed under dry conditions (Crosswhite 1981). The vegetation over most of the study area is a pinyon-juniper and sagebrush community. Pinyon-juniper with oakbrush associations occur on the tops and slopes of ridges, while a sagebrush community exists within alluvial flood plains, draws, and meadows. Other plant species which may have been utilized by ethnographic and prehistoric groups in the area include: barberry, canyon grape, cattail, currant, goosefoot, onion, prickly pear cactus, sedge, squawbush, sunflower, and yucca (Ibid:10). Today less than two percent of the area is under cultivation and products consist of primarily of alfalfa, potatoes, and cold weather vegetables. Major drainages in the project area are Kanab Creek , Sink Hole Valley Wash, and Lower Robinson Creek. Kanab Creek flows from north to south through the project area forming an incised canyon, and eventually empties into the Colorado River byway of the Virgin River. In addition, water resources are manifested as geologic aquifers or springs. Most of the springs are perennial and are derived from the Tropic Shale formation. Modern impacts of the landscape include ranching, agriculture, coal mining, and roads.

CULTURAL SETTING

Previous Archaeological Work

A record search for previous projects and cultural resources was conducted at the Utah State Historic Preservation Office, Salt Lake City on March 25, 2005 by Ms. Marty Thomas. Intensive cultural resource investigations have taken place in the area since the 1980s; however, numerous archaeological sites have been recorded since the 1970s. The majority of the eleven identified inventories were conducted by the Museum of Northern Arizona or Bureau of Land Management and are mostly related to proposed mining activities.

In 1974, the Museum of Northern Arizona (MNA) performed clearance of 48 drilling locations and access routes on the Skutumpah Terrace in Kane County; 19 drilling locations and access routes in the Alton Amphitheater in Kane County; and four meteorological tower sites in Kane County (Davidson et al. 1974). Thirty-six archaeological sites were documented during the investigations

In 1979-1980, MNA conducted inventories for Utah International, Inc.'s coal mining lease area situated on the Skutumpah Terrace and Alton Amphitheater (Halbirt and Gualtieri 1981). The four surveyed parcels were designated Alton East and Alton West, the coal preparation plant site, and major road routes. A total of 107 archaeological sites, most of which were of prehistoric affiliations, were documented dating from the Archaic to Late Prehistoric.

In 1980, the Bureau of Land Management (BLM) Kanab Field Office performed a Class III inventory of Engineers International, Inc. seismic testing areas (McFadden 1980). No cultural resources were located in the project area. The BLM performed a cultural resource inventory in 1981 of a tract allotment for Heaton Brothers (McFadden 1981). No archaeological sites were documented during the project. The Cone allotment chaining area was surveyed by the BLM in 1982, resulting in a finding of no cultural resources (McFadden 1982).

In 1984, the BLM surveyed the Syler Knoll chaining area for cultural resources (McFadden 1984). Previously recorded site 42Ka2045, a large lithic scatter containing diagnostic artifacts, was located within the project area. Because 42Ka2045 was previously evaluated as not significant (for eligibility to the NRHP), clearance was recommended for the chaining activities.

In 1986, MNA performed cultural resource inventories of 43 drill locations and access roads within the Alton Coal Field for Utah International, Inc. (Weaver 1986). Two new archaeological sites, located outside of the current project area, were documented. Also in 1986, MNA performed survey and monitoring of nine test pit locations and access routes for Utah International, Inc. (Weaver and Hurley 1986). No new cultural resources were documented.

In 1986, MNA returned to the Alton Coal Leasehold to survey another 12,500 acres, resulting in the documentation of 103 additional sites (Keller 1987). The prehistoric sites are described as typically surface lithic scatters emphasizing biface thinning technology and projectile point use and also to a lesser extent grinding slabs, manos, and large unifacial chopping tools. Keller (1987) speculates that there is a considerable degree of similarity between the exploitation patterns of cultural periods, with a concentration on deer hunting and pinyon seed gathering.

In 1987, the Museum of Northern Arizona (MNA) surveyed 22 auger borings and 27 backhoe test pits for Utah International, Inc. (Weaver and Hurley 1987). In 1993 and 1994, Nielson Consulting Group and Timpanogos Research Associates performed cultural resource inventories and site evaluations of several abandoned mines in central and southern Utah (Hughes et al. 1994). None of the mines are located in the current project area.

A stratified probability sample inventory of the Kaiparowits Plateau was conducted in 1998 and was designed to provide information on the density, distribution, and diversity of cultural resources in the region (Geib et al. 2001). This survey identified prehistoric remains dating from the early Archaic through the Protohistoric; including Archaic, Fremont, Anasazi, and Late Prehistoric (likely Southern Paiute). While Archaic sites were numerous across the survey area with abundant cultural remains, small Late Prehistoric sites containing few cultural remains were identified to have the greatest density. Sites attributed to the Archaic period are dominated by hunting camps. Importantly, the authors note that many Archaic sites on the Kaiparowits Plateau appear to be mainly surface phenomena and appear to have little potential for buried cultural remains (Ibid.:365). Residential and hunting camps were identified with equally high frequency for the Fomative period, and together represent more than half of the identified Formative period sites. Of the identified Late Prehistoric site types on the Kaiparowits Plateau, hunting camps were identified with the greatest frequency (Geib et al. 2001).

In June and July 2005, MOAC conducted a cultural and fossil resource inventory of Alton Coal Development's project area in the Alton Amphitheater, south of the town of Alton, Utah (Stavish 2007). The inventory resulted in the documentation of 31 previously recorded archaeological sites and 60 new archaeological sites. The previously recorded archaeological sites include one historic site (Alton Cemetery); three multi-component prehistoric/historic sites; and 27 prehistoric sites that consist of temporary camps, artifact scatters, and lithic scatters. The new archaeological sites include two historic sites (a corral and a bridge); two multi-component prehistoric/historic sites; and 56 prehistoric sites that consist of temporary camps, artifact scatters, and lithic scatters. The inventory also resulted in the documentation of 30 new paleontological localities and three previously documented paleontological localities (Stavish 2007). In August 2005, MOAC completed a survey of six coal seam drill sites for Alton Coal Development; no cultural resources were found (Thornton and Montgomery 2005).

Regional archaeological investigations conducted in the vicinity of the project area include investigations at the Red Cliffs Site (Dalley and McFadden 1985), the Little Man Archaeological site on the Virgin River (Dalley and McFadden 1988), along SR-9 (Horn 1991), the Washington City-Green Spring Project (Westfall et al. 1987), the Interstate 15 within the Middleton to Snowfield Interchange project (Westfall 1991), and at Quail Creek (Walling et al. 1986). These sites consist mainly of Pueblo I and Pueblo II Virgin Anasazi habitations. In addition, a single Archaic site and 17 Paiute sites were examined at the Quail Creek locality. During the Washington City-Green Spring Project conducted by Abajo Archaeology in 1986, six rock shelters and seven hearth features were excavated (Westfall et al. 1987). This investigation revealed a series of residential camps, specialized resource procurement and processing camps, and transitory camps, occupied by Virgin Anasazi groups (Pueblo I and Pueblo II periods), and by Southern Paiute groups. Fourteen sites were investigated along Interstate 15 within the Middleton to Snowfield Interchange project area. These sites include four prehistoric and 10 historic resources. Test excavations at the prehistoric sites indicated that site 42Ws1220 is a multicomponent Archaic, Virgin Anasazi and Southern Paiute camp, site 42Ws2364 is a lithic scatter of unknown cultural affiliation, site 42Ws2394 is a resource processing camp of unknown cultural affiliation, and site 42Ws2395 is a

Virgin Anasazi (Pueblo I) habitation. Large excavation projects have been completed for the Kern River 2003 Expansion Project (Reed et al. 2005), at Sand Hollow (Talbot and Richens 2002) and Corral Canyon (Roberts and Eskenazi 2006). Numerous small sites have also recently been excavated in the St. George Basin including 42Ws2871 and 42Ws2872 (Patterson 2006), 42Ws4283 (Kinnear-Ferris et al. 2005), 42Ws1809 (Eskenazi 2006), and 42Ws2556 (Eskenazi 2005).

To summarize, cultural resource projects conducted in the vicinity of the current project area have yielded evidence of prehistoric and historic sites. Prehistoric site types include lithic scatters, lithic quarry/workshops, residential camps, specialized resource procurement and processing camps, transitory camps, and habitations. Cultural affiliation of these sites is attributed to Archaic, Virgin Anasazi, and Southern Paiute peoples.

Cultural-Historical Overview

Paleoindian

Human occupation in the region represents the Paleoindian, Archaic, Formative, Protohistoric, and Historic cultural stages. The first Native American occupation of the general study area probably occurred during the Paleoindian stage at the late glacial Pleistocene-Holocene boundary (ca. 11,500 B.P. - 9000 B.P.). Early Paleoindian artifact assemblages are typified by large, lanceolate projectile points, spurred end scrapers, gravers and borers, and crescents (Frison 1978:78), indicating the exploitation of megafaunal and floral resources. On the basis of projectile point typologies and subsistence strategies, the early portion of the Paleoindian stage is commonly divided into two cultural complexes referred to as the Clovis (ca. 11,500 - 11,000 B.P.), and the Folsom (ca. 11,000 - 10,000 B.P.). Aikens and Madsen (1986) postulate that Paleoindian people migrated into the eastern portion of the Great Basin following the recession of Lake Bonneville (10,500 B.P.). Several surface fluted projectile points have been reported from Garfield County (Copeland and Fike 1988) and northeastern Arizona (Geib 1995). Late Paleoindian or Plano projectile points have been found on the Kaiparowits Plateau and classified as large stemmed or concave base points (Geib et al. 2001:191-192).

Archaic Stage

The Archaic stage (7800 - 500 B.C.) is generally viewed as a hunting-gathering lifeway that is represented by subsistence practices more labor-intensive than those of Paleoindians with a greater number of smaller animal and plant species being intensively exploited. Several cultural sequences for the Archaic stage are proposed on the basis of regional differences. Jennings (1978) provides a concept of the western Archaic, or Desert Culture, based on diverse resource exploitation, diagnostic artifacts including cordage and basketry, and artifactual variability in various regions such as the California-Nevada axis and Utah-Oregon axis. Matson (1991) presents a four-period sequence model incorporating data from the Greater Southwest: Early (7800 - 4000 B.C.), Middle (4000 - 2000 B.C.), Late (2000 - 1000 B.C.), and Terminal (1000 B.C. to roughly A.D. 700). Immediately east of the project area, Geib et at (2001) outlines the following four period sequence for the Western Kaiparowits Plateau: Early Archaic (9000 B.P. to 6000 B.P), Middle Archaic (6000 B.P. to 4000 B.P.), Late Archaic (4000 B.P. to c. 2000 B.P. or the adaptation to agriculture), and the Terminal Archaic (2000 B.P. to A.D. 500).

South of the study area, the Early Archaic period is labeled the Desha Complex known for its crudely made, shallow, side-notched lanceolate points. In the Glen Canyon region excavations from Sand Dune and Dust Devil Cave provide a radiocarbon date of 5050 to 6050 B.C. (Lindsay et al. 1968). About a dozen projectile points were recovered from the lower layer in Sand Dune Cave including Pinto Series, Jay, and varieties of side-notched points (later classified as Sand Dune Side-notched) (Matson 1991:147). Faunal remains recovered from the Desha Complex include those of mountain sheep, cottontail, pack rat, and lesser numbers of jackrabbit, gopher, squirrels, skunk, and bison (one bone). At Dust Devil Cave, the earliest Archaic component (Stratum IV) provided a date from a yucca-lined pit of ca. 8793 B.C. along with an abundance of prickly pear cactus (*Opuntia*) extracted from human feces (Ambler 1996:42). Significant materials recovered from this cave included 25 Archaic sandals, classified into three basic types; open-twined, fine warp-faced, and coarse warp-faced (Ibid 44). On the northern Colorado Plateau the earliest Archaic component is dated at Cowboy Cave (42Wn420) between 7430 and 7100 B.C. although no artifacts were found in this stratum (Schroedl and Coulam 1994:11). The upper Early Archaic component (Stratum III 5250 - 4350 B.C.), however, contained 11 projectile points (Pinto, Northern Side-notched, and Elko Corner-notched), faunal remains (cottontails, jackrabbits, porcupine, and *Canis* sp.), and floral remains (sunflower, sand dropseed, chenopods, cactus, juniper and bugseed) (Jennings 1980). The most significant features from Stratum III were a number of depressions referred to as "scooped out troughs" by Jennings (1975:9), more recently redefined by Schroedl and Coulam (1994:6-7) as pitstructures which were repeatedly cleaned out and reoccupied during the Early Archaic. In the Alton West Coal leasehold previous investigations have documented several Early Archaic projectile points types (Pinto Series, Humboldt, and Northern Side-notched) from sites which include later Formative and Late Prehistoric temporal components (e.g. 42Ka2045 and 42Ka2056) (Halbirt and Gualtieri 1981).

During the Middle Archaic period (4000 - 2000 B.C.) there was a decrease in the occupation of the Colorado Plateau, presumably caused by the Altithermal climate, which may have been a two drought event (Matson 1991:165-166). Many of the previously mentioned sites (Dust Devil Cave and Cowboy Cave) exhibit a reduced intensity of occupation during the Middle Archaic period. Recent radiocarbon data from the Glen Canyon region are filling the Middle Archaic gap (e.g. 1,000 years) as proposed by Berry and Berry (1986) for the Colorado Plateau indicating that the hunter-gatherers of the area may have not completely abandoned the area 6,000 years ago (Geib 1996:32). Middle Archaic settlement patterns most likely reflect the response to a probable protracted drought by populations shifting residential camps to water-rich lowlands and especially higher elevation settings (above 8,000 ft). Common projectile points at Middle Archaic sites are Sudden Side-notched, San Rafael Side-notched, Hawken Side-notched and Elko Series. Previous investigations in the Alton West Coal leasehold have identified such point types as Sudden Side-notched from sites which include other Archaic periods and later temporal components which appear to represent residential camps and processing camps (Halbirt and Gualtieri 1981).

The Late Archaic period began around 4,000 years ago and corresponds to a noticeable increase in radiocarbon dates in the region and is temporally correlated with an increase of effective moisture what is termed as the sub-boreal interval (Berry and Berry 1986). This period is marked by a heavy reoccupation of Cowboy Cave starting at about 1750 B.C. and is characterized by the inhabitants engaging in broad-scale hunting and gathering with an increased emphasis on mountain sheep and chenopods/amaranths (Matson 1991:171). Gypsum projectile points comprised approximately 30 percent of the total identifiable collection from Cowboy and adjacent Walters Cave (Jennings 1980:36). These stemmed points are among the most common type of point found in southeastern Utah and appeared on the northern Colorado Plateau sometime after 2550 B.C.

(Holmer 1986:105). Split-twig figurines are another important diagnostic of the Late Archaic period, best known from Cowboy Cave, but occur over a broad territory centered on the Colorado River and it tributaries. Farther south in the Glen Canyon region, Late Archaic occupations are less represented, although a few Gypsum points were recovered from Dust Devil Cave (Geib and Ambler 1991). On the Kaiparowits Plateau, Late Archaic sites are represented primarily by residential camps situated in the higher elevations with access to ample water, fuel wood, large and small game, and plant resource diversity whereas the limited activity camps and reduction loci are prevalent in the lower elevations that contained a greater abundance of economic grasses (Geib et al. 2001:367). Investigations at the Arroyo Site (42Ka3976) situated in the Grand Staircase-Escalante National Monument revealed a potential pitstructure exposed in a trench below a Formative horizon, dated to circa 1850 B.C., may attest to a semi-permanent occupation of the floodplain environment (McFadden 2000:15). In the Alton West Coal leasehold several Late Archaic Gypsum projectile were recorded at open sites with other older and more recent prehistoric temporal components (42Ka2047 and 42Ka2059) (Halbirt and Gualtieri 1981).

The Terminal Archaic period (1000 B.C. to roughly A.D. 700) is marked on the northern Colorado Plateau by the presence of arrow points and shafts along with the introduction of corn. The Archaic-Formative transition at Cowboy Cave is found in two separate episodes of occupation beginning about A.D. 100 during a period of high effective moisture (Schroedl and Coulam 1994:23). This relatively intense occupation (Stratum Vb) appeared to have represented a late summer/early fall seed processing locale based on the coprolite evidence (Hogan 1980). A corn cache as well as corn kernels were found in this horizon revealing that the pre-Formative occupants were growing this domesticate, although the extent of agricultural dependency is unknown. It is well established that corn dates to at least 1200 B.C. across much of the southern portion of the Colorado Plateau with later dates derived from sites farther north (Geib 1996:54). Even if the populations in the study area were not actively involved with farming, they were likely in contact with farmers or were a least experiencing changes resulting from the presence of nearby farmers. At Hog Canyon Dune (42Ka2574), located at the junction of Hog and Kanab creeks about two miles north of Kanab, charred corn kernels were recovered from a pitstructure in association with a hearth and a burial yielding two dates: 910 - 390 B.C. and A.D. 60-640 (Janetski 1993:229). The dating of bow and arrow introduction to the eastern Great Basin and Utah has been an issue of continuing debate. Past evidence from the lithic technologies between the terminal Archaic and Basketmaker II populations indicates that by ca. A.D. 100 the bow and arrow was employed by the ancestral Fremont, while the ancestral Anasazi continued to employ the atlatl. In the northern portion of the region, at Cowboy Cave, arrow points come from preceramic Stratum V deposited about A.D. 100-600 (Schroedl and Coulam 1994). To the south, the Sunny Beaches site (42Ka2751) in the Glen Canyon Recreational Area is somewhat of an anomaly. A number of Rose Spring Corner-notched points, which are accepted markers of bow and arrow technology dated earlier (e.g. around A.D. 100) than the established chronology for Basketmaker II aceramic occupations. In the Alton Coal Leasehold previous inventories have documented Rose Spring Corner-notched arrow points from several sites. At site 42Ka2056 both Early Archaic Pinto Series points and Rose Spring Corner-notched points were found, but in two separate lithic assemblage loci (Halbirt and Gualtieri 1981:85).

Formative Stage

The Formative stage began about A.D. 500, when ceramics were generally used on the Colorado Plateau, and continued until A.D. 1300, with the Anasazi abandonment of Four Corners region. Within the region, this stage encompasses two different cultures: the Anasazi (Puebloan)

and the Fremont. The project area is within the occupation zone of the Anasazi, which is divided into two recognizable branches the Virgin Anasazi and the Kayenta Anasazi. The Virgin Anasazi primarily occupied the Arizona Strip, southwestern Utah, and southernmost Nevada. Whereas, the Kayenta Anasazi occupied a large portion of northern Arizona and far southeastern Utah. The Fremont are considered a separate entity, found primarily at sites in Utah north of the Anasazi region. Artifactual evidence in the study area indicates primarily a Virgin Anasazi cultural tradition, although both Kayenta Anasazi and Fremont ceramic types have been identified.

The Virgin Anasazi occupied the area from Basketmaker II through early Pueblo III times, and apparently adapted horticultural practices to a variety of environmental conditions (Thompson and Thompson 1978; Walling and Thompson 1988). Investigations in the Grand Staircase area east of Kanab Creek indicates it was occupied continuously from at least Basketmaker II times (ca. A.D. 300) through late Pueblo II (ca. A.D. 1200). Virgin Anasazi residential units are characterized by an architectural sequence from pithouse residences with separate cist storage facilities, through intermediate stages of room block development, and eventually to substantial surface masonry pueblos incorporating both storage and habitation functions (Talbot 1990). According to McFadden (1996:24) the quantity of storage space per residential unit did not vary significantly over time indicative of a continuity of subsistence practices. In the Grand Staircase region Virgin Anasazi sites located immediately adjacent to cultivable fields were fully residential with large storage capacities (Ibid 7). Furthermore residential mobility may have been part of an adaptive strategy that allowed the Virgin Anasazi to engage in agriculture in an environment in which a variety of short-term environmental fluctuations needed to be accommodated. In contrast the Kolob/Skutumpah Terrace area where the present study area resides (above 6,400 ft) is characterized by a short growing season (less than 120 days at Alton), hence prehistoric agricultural potential was risky. Several studies in this area (Christensen et al. 1983; Halbirt and Gualtieri 1981; Keller 1987:87) indicated that the vast majority of the prehistoric sites are limited activity sites or camps related to hunting and gathering behavior. For the entire Alton Coal leasehold, Keller (Ibid.:87) estimates that 23 percent of the total sites date from Basketmaker III to Pueblo II. However, surveys in the Alton Amphitheater conducted by MOAC (Stavish 2006, 2007) suggest a smaller percentage, only seven percent, of Basketmaker III to Pueblo II temporal components. Data compiled by McFadden (1996:17) from this area, as well as the Grand Staircase and Upper Virgin River, suggests that Virgin Anasazi residential sites are predominantly associated with agricultural potential, while hunting/gathering sites are more common in the elevated zone where agriculture is not feasible. Ceramic types identified in the Alton Coal leasehold are dominated by mainly Virgin Anasazi North Creek Gray, North Creek Corrugated, Shinarump Brown, and St George Black-on-Gray. To a lesser extent Kayenta Anasazi (Tusayan Black-on-Gray) and Fremont Great Salt Lake Gray have been reported in the area adjacent to Kanab Creek (Halbirt and Gualtieri 1981:35).

In the Grand Staircase physiographic section the adaptive strategy of the Virgin Anasazi is summarized by McFadden (1996:30) as an occupation of multiple "homesteads" located in a variety of different agricultural niches, each with different characteristics but all suitable for agriculture. Furthermore, shifts in residence would occur periodically in response to short term climatic fluctuations, but also as a result of local environmental deterioration. A comparison of site types from the lower elevation study areas and the Kolob and Skutumpah Terrace area suggests that given frequent residential moves, the farmsteads themselves could have served as base camp/processing stations with this upland functioning as a hunting-gathering component.

In Washington and Kane Counties, archaeological investigations have revealed habitation sites, storage sites, possible field houses, and nonstructural Virgin Anasazi sites. In the Kanab

area, structural sites are situated along Kanab Creek, and its perennial tributary Johnson Creek, to access water for agricultural land. In some places and times, deep soils made possible true dry-farming; in other cases, sites are situated in areas where natural drainage concentrates runoff. East of Kanab, where the population peaks in Late PII times, sites are increasing, situated where they can take advantage of runoff concentrated by washes and streams (Lyneis 1995:225). Other site types found in the Upper Virgin Anasazi area consist of storage features but no dwellings, which may represent part of the flexible nature of Virgin Anasazi settlement patterns (Lyneis 1995:218). In addition, nonstructural sites with Anasazi ceramics are found throughout the area in nonagricultural locations. These may include rockshelters, sometimes associated with large roasting pits, as well as featureless sherd and lithic scatters.

Protohistoric and Southern Paiute

Protohistoric occupation of the project area is attributed to the Southern Paiute, members of the Numic population. Several models address the migration of Numic populations to the Great Basin. Some theorize that Numic expansion from the southwestern Great Basin eastward occurred approximately 1,000 years ago (Lamb 1958). Other models view the expansion taking place several thousand years ago (Taylor 1961, Swanson 1962). On the basis of the co-occurrence of Southern Paiute and Virgin Anasazi ceramics in stratigraphic context it is theorized that entry into the southwestern Utah area by Numic speakers occurred during the late occupational period of the Virgin Anasazi (Westfall et al. 1987). Fowler (1994) compares the material culture of the Southern Paiute to that of the Virgin Anasazi, noting similarities such as clay figurine styles, certain features of coiled basketry, and one type of sandal, and concludes that these similarities suggest interaction between the groups. Besides pottery or perishable materials, the other common diagnostic is the Desert Side-notched projectile point. Although Desert Side-notched points should be considered horizon marker rather than ethnic markers, Southern Paiute use of the study area is well documented (Kelley 1964), and appeared to have constituted the primary post-A.D. 1300 indigenous occupation. Cottonwood Triangular points may not be useful diagnostics of Numic occupations if they are unfinished items broken in production; such tools might have been intended as Desert Side-notched points or Bull Creek points or some other arrow point type (Geib et al. 2001:392). Southern Paiute Brown Ware found in southwest Utah is characterized as conical-bottomed vessels exhibiting undulating surfaces on their thick walls. Decoration is limited to some surface incising, corrugation or fingernail impressions, and/or clapboarding of coils; the former often over the entire surface of the vessel (Baldwin 1950). Temper tends to be visible and coarse and fall into two types for the area: 1) abundant very fine rounded to subangular particles that are generally clear and appear to be frosted suggesting that they originate from eolian and alluvial deposits; 2) large angular to subangular particles most of which are white and very fine grained as if derived from a crushed quartzite or other aphanitic particles (Westfall et al. 1987:70).

The Southern Paiute were hunter-gatherers and part-time horticulturists, with domesticates playing a minor role in their subsistence strategy (Fowler and Fowler 1971, 1981; Steward 1938). This cultural tradition is characterized by the use of rockshelters, and open camp sites containing wickiup dwellings, rock-filled roasting pits, fire hearths, conical-bottomed brownware ceramics, some decorated with fingernail incisions, rabbit fur blankets, basketry hats and containers, digging sticks, milling stones, and stone tools (Euler 1966; Westfall et al. 1987). Social organization revolved around bands of multiple family units, cooperating and joining forces when necessary to ensure the survival of the community (Steward 1938). At least 16 major bands, or 35 smaller groups, have been identified in Utah.

The area adjacent to the present town of Alton was the summer home of one of the seven socio-economic groups that comprised the Kaibab Band of the Southern Paiute (Kelley 1964). The organization of these groups was largely economic in character, however, some attention was allotted to social residence. It appears that the group inhabiting the Alton area was a small patrilocal aggregate. While evidence exists that other groups visited the area occasionally to gather seeds and berries, there seems to have been minimal economic cooperation between groups (Ibid.). The Alton group was controlled by a chief who directed the seasonal movements of camps, and who was in most instances in charge of deer hunting (Ibid 27). According to Kelley (Ibid 6), campsite location was determined by the presence of springs which fell under the jurisdiction of the local economic group. Subsistence activities varied according to seasonality, with the occupants of a spring "....tending to share the same seasonal cycle" (Ibid 8). During the winter, the group resided in Kanab Canyon were semi-permanent camps in the sense that the occupants returned to them following hunting and foraging trips. Resources utilized during this period included seeds and rabbits, the latter hunted in large scale drives consisting of perhaps 25 individuals from different households (Ibid 24). Periodically, deer and pinyon nut forays were also conducted along the top of the Vermillion cliffs. When snows receded in the spring, the group moved north to the Alton area and subsisted until summer on stores of food previously cached in caves (Ibid 16). The group remained in Alton for most of the summer collecting a wide variety of seeds and berries as well as hunting deer, marmot, and rabbit (Halbirt and Gualtieri 1981:15). At some point during this period the group returned briefly to the Kanab area to gather seeds and cached them for the succeeding winter occupation (Kelly 1964:16). Deer hunting and the gathering of "plateau" seeds was emphasized during the late summer to fall months. It is during this period that deer begin to congregate in small migratory groups.

Navajos occupied areas of the Skutumpah Terrace during the post World War II period (about 1945 to 1970) while cutting and installing cedar fences for local ranchers (Halbirt and Gualtieri 1981:56). Physical remains from the Navajo occupation primarily east of the project area fall into one of the four following categories: 1) forked-stick hogans composed of interlocking poles and a corbelled roof entrance; 2) palisade hogan composed of a corbelled roof supported by four corner posts and a seriers of stringers which lean against the roof; 3) brush hogan roughly square in plan view and partially supported by two living pinyon trees which provided the superstructure firm support; 4) sweat lodge consisting of three interlocking poles with stringers leaning against the frame and packed with mud daub (Bradley 1999:56).

Historic - European

The first documented entry of European Americans into Kane County was the expedition of Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante in the autumn of 1776 to establish an overland route between settlements in Santa Fe and Los Angeles. Because of a snowstorm near Milford, the expedition halted the attempt to reach California, and instead followed a route to the southeast to return to Santa Fe. Along this route they named Sulphur Creek (later renamed the Virgin River), Rio de Pilar (later known as Ash Creek), and Hot Sulphur Springs (Alder and Brooks 1996; Bradley 1999). Another early explorer, Jedediah Smith, followed parts of the Dominguez and Escalante Old Spanish Trail, of which various portions were later referred to as the California Trail, through Washington County in 1826 and 1827. His route created a new pathway for pioneers traveling from the East to California, and was widened to an actual wagon road in 1849. Other explorers to follow in these footsteps include John C. Fremont in 1844 and Mormon pioneer leaders from Salt Lake City in 1847 (Alder and Brooks 1996).

Important to the Mormon colonization effort was the organization of an Indian mission in Harmony in early 1854. Jacob Hamblin, a Mormon explorer and settler of Kane County, led the effort to establish harmonious relationships with key Native American leaders. His knowledge of the area also facilitated government exploration and mapping projects, including a Colorado River voyage with John Wesley Powell in 1871 that documented the landscape of Glen Canyon and the present-day city of Kanab. While Kanab is the principal settlement in Kane County, small towns in Long Valley are important centers of agriculture and stock-raising. In 1862, John and William Berry first led a team of ranchers into the Long Valley area in search of rangeland for their cattle. The area was called Long Valley due literally to its length (a long narrow valley situated between high mountain walls), fertile land, and proximity to water. The first settlement in the valley was probably that of Berryville (later renamed Glendale), established by the Berry brothers in 1864. Berryville was abandoned in June 1866 due to conflicts between the Mormon settlers and Pauite and Navajo tribes in the area. This pattern of settlement was common to many of the small towns in Long Valley throughout the late 1800s. On January 16, 1864, the Utah Territorial Legislature approved an act that officially created Kane County. Its boundaries were defined on the west to include the upper Virgin River area, including Virgin City, the principal town in the new county at the time (Bradley 1999:56-59). Kane County remained isolated because of its challenging landscape, its relatively small population, and its lack of connection to railroad lines.

The town of Alton is a small ranching community located near the head of Long Valley. It originally developed from Upper Kanab, an earlier settlement in the valley of upper Kanab Creek that was abandoned during the Black Hawk War. Upper Kanab was first settled by Lorenzo Wesley Roundy when he brought his family to Upper Kanab Creek in 1865. Historically, this area had tall grass, good fodder for their animals, streams of clear water, abundant wildlife in the nearby mountains, berries and other wild fruit, and timber for homes and fences (Bradley 1999:65). The settlement was first called Roundy's Station and the immigrants built two log cabins that first summer. In 1865, the Mormon Church ordered inhabitants of Upper Kanab and other small settlements to go to Kanab, Dixie, and larger towns in the area to help fortify them against Pauite raids (Ibid 65-66). Settlers did not return to Upper Kanab until 1870, when Lorenzo Roundy's nephew, Byron Donalvin Roundy, and his wife settled there. Byron and his brother, William Roundy, organized a cattle company called the Canaan Cooperative Stock Company, headquartered in St. George. In 1882, Edwin D. Woolley and Daniel Seegmiller also brought their families to settle in Upper Kanab. Two buildings, a schoolhouse and a recreation hall, were erected in 1885 at the head of the Virgin River. During the late 1880s, when the federal government began to crack down on the polygamists of Utah territory, many Mormon men fled to the area to escape marshals (Ibid 143-149). In 1887, the communities of Ranch, Upper Kanab, and Sink Valley joined together to form a LDS ward. In 1908, the town acquired its present-day name of Alton during a May Day celebration drawing. Charles R. Pugh, who had been reading a book about the Alton Fjord in Norway, suggested the name. The population of the town peaked at 350 in the 1930s (Ibid 210). In the post World War II years, coal reserves were discovered near Alton, and the Smirl-Alton coal mines extracted an average of 40 tons daily in 1949. Today, Alton is home to fewer than 100 people, and its main sources of livelihood stem from the timber industry and its potential for coal mining.

Today, most traffic through the area is generated by tourists headed to attractions such as Bryce Canyon National Park, Zion National Park, and Grand Staircase-Escalante National Monument. Bryce Canyon, the southern part of which lies in Kane County, was designated a national monument by President Warren G. Harding in 1923, and elevated to National Park status in 1928. Originally, the boundary of Zion National Park ended at the Washington-Kane County

State line. In 1930, it was expanded to include part of Kane County, which was made accessible by the Zion-Mt. Carmel tunnel and road (Bradley 1999:218). Grand Staircase-Escalante National Monument was established by President Bill Clinton on September 17, 1996. The monument comprises approximately 1.7 million acres in Kane and Garfield Counties. These major tourist destinations are all accessible via US Highway 89, which bisects Long Valley and proceeds through every town in Kane County except Alton (Ibid 8).

SITE DESCRIPTIONS

42Ka2042

The site is a prehistoric temporary camp located on the top and slope of a knoll (Figure 2). The site contains 171 flakes and eight tools. The lithic tools include one utilized flake, three bifaces, two cores, one ground stone fragment and one hammerstone. Tool 1 is a chert ground fragment. Tool 2 is a quartzite core. Tool 3 is a Stage 1 chert biface. Tool 4 is a utilized chert flake. Tool 5 is a sandstone hammerstone. Tool 6 is a Stage 3-4 chert biface fragment. Tool 7 is a Stage 3 chert biface. Tool 8 is a chert core fragment. Secondary and tertiary flakes are common in the debitage, while primary flakes and shatter are rare. The lithic debitage material types include chert, obsidian and quartzite. Feature A is a concentration of fire cracked rock and lithic debitage located within an area of darkened soil. The concentration measures 7 m in diameter. Feature A is located on a sloped area near a small drainage system. This is an extensive temporary camp with several types of lithic tools, a fire-cracked rock feature, and additional potential for subsurface cultural remains. The site is evaluated as eligible under Criterion D because it could contribute to such research topics as site function, chronology, subsistence, spatial organization and material culture.

42Ka2068

Originally recorded in 1983, this site contains both a prehistoric and historic component. The historic component partially overlaps the prehistoric component, however, portions of the aboriginal occupation still retains integrity (Figure 3). Prehistoric diagnostic artifacts include one projectile point midsection and one biface fragment. Tool 1 is the point midsection and measures 1.3 x 1.8 x 0.4 cm. This tool was manufactured from a white chert and has snap fractures at both the proximal and distal ends. Tool 2 is a red mottled Stage 2 or 3 biface. Debitage is dominated by shatter (flake fragments, broken flakes, and angular debris) along with lesser amounts of tertiary, secondary and primary flakes. Lithic materials include a wide range of colored cherts (white common) and one piece of obsidian. No cultural features were observed on the surface; however, the site retains good depth potential.

The historic component represents an abandoned farming/ranching habitation and contains several structures, both architectural and landscape, as well as artifacts. The property was patented by James Swappe on August 9, 1889 under the Homestead Act of 1862. Mr. C. Butron Pugh, a local informant, stated that his grandfather purchased the ranch in 1908 from the Robinson family (personal communication, 2006). This site was previously recorded in 1983 and was described as containing a barn, a shed, a bunkhouse and a corral. Mr. Pugh stated that in addition to the currently visible structures (granary, corral, and cellar) other structures located on the ranch included: a small three room house, a large barn with a stone/rock foundation, a blacksmith shop, a bunk house, a washhouse, a springhouse, two outhouses (used consecutively), and "rip-gut" or pitchpole fencing to the north.

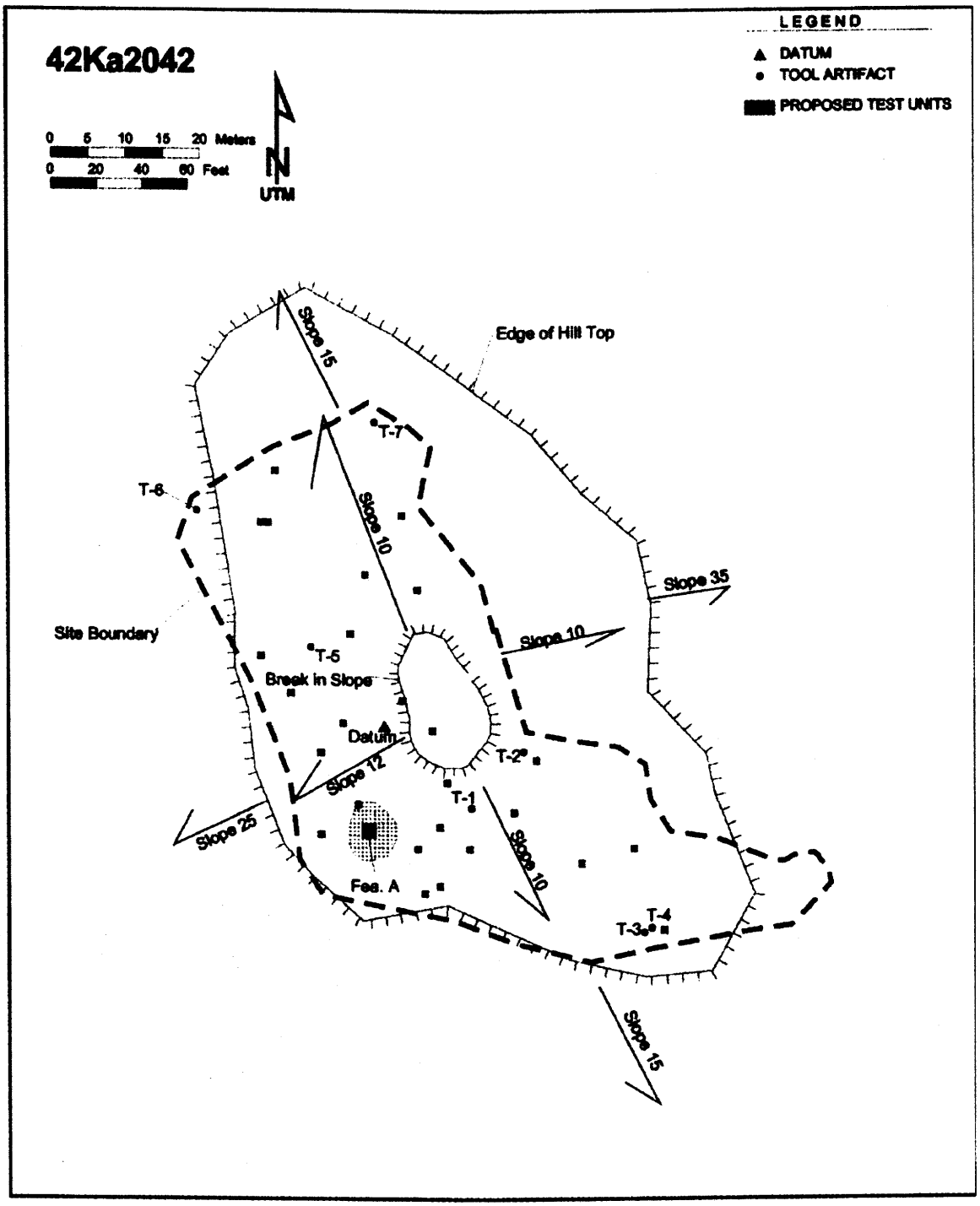

Figure 2. Site Map of 42Ka2042.

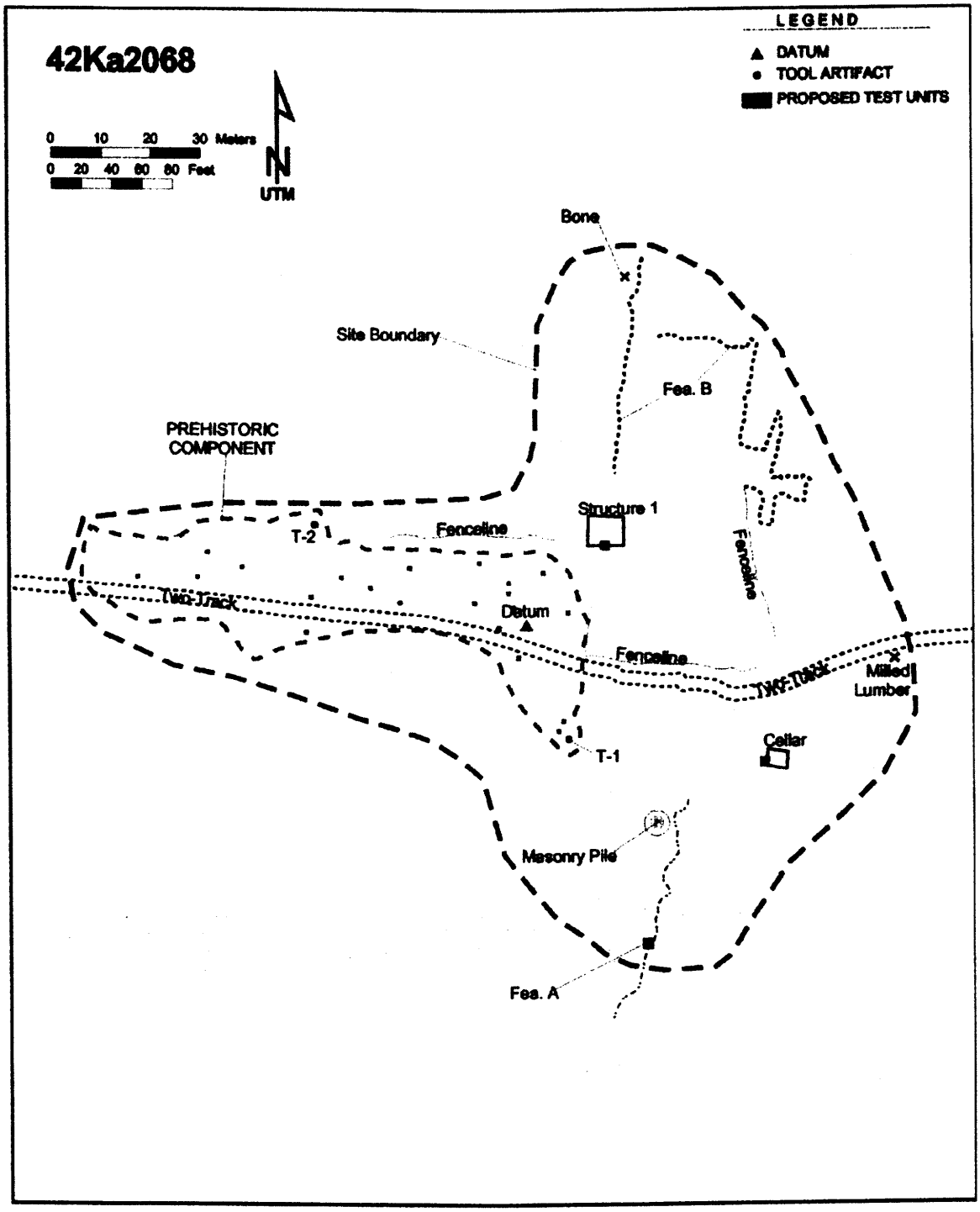

Figure 3. 42Ka2068 Site Map.

The documented historic features include a granary, a corral, a cellar, several fences, as well as historic artifacts. The granary is constructed of lumber, log, and stone and divided into two rooms with storage above. The granary is slightly elevated from the ground surface by log stilts and a stone foundation with possible ditching around the foundation; perhaps as a measure to avoid flooding and/or rodent infestations. This structure is constructed with large log cross beams, and V-shaped log construction, with lumber paneling and floorboards. The roof has collapsed into the building and the door frames are partially collapsed and the two doors are blocked. Mr. Pugh stated that the door hinges for the granary were made at the on-site blacksmith shop. One room contained several hooks and some leather strapping, while the other room is completely open and a half swing door connects the two rooms. The storage area above has remnants of hay.

The corral is constructed with log fences and log upright beams and the chute is made of milled lumber with a couple log beams at main support locations. The corral has been reinforced with wire and some metal fencing and was used into the 1980s according to the original investigator (Halbirt and Gualtieri 1981) and the local informant, Mr. Pugh. The corral also contains an old dodge chute that was used to separate the sheep herds. The masonry cellar is approximately 120 cm deep with the uppermost level of stone collapsing. The walls are otherwise still in good shape. The log beams that would have supported the ceiling for the cellar are partially burnt and caved in. The cellar depression is partially filled with various debris including glass jars and bottles, metal cans, and some plastic bottles with materials dating between 1920 and the 1980s. Mr. Pugh stated that the cellar was used to store and age cheese made by his grandmother. Three fences surround the site area: one lines the two-track drive; one fence marks a field boundary on the north side of the two-track; and one fence marks a field boundary on the south side of the two-track. Landscape features include the agricultural field around the granary and corral and the oak trees. To the east of the granary is a stand of live oaks and rip-gut fencing with a large quantity of wild rose bushes that appear to be planted in rows and maintained. Mr. Pugh stated that much of the rip-gut fencing is in good condition, however several of the uprights were replaced in the 1950s due to rotting.

Historic artifacts include glass, ceramic, and other domestic items. The glass artifacts consist of several hundred brown and clear fragments and lesser amounts of amethyst and aqua-colored glass. Most likely a significant amount of the container fragments are from canning jars, and few metal canning rings were found. None of the glass artifacts had manufacture's trademarks which would have aided in temporality. Most of the ceramics occurred at the location where the large house was said to have existed. The most prevalent type of ceramic was the hard paste porcelain "Boyd's Genuine Porcelain Lined Cap" canning lid. In addition sherds from a Flow Blue vessel (est.1820-1870), decal decorated sherds, and plain whiteware fragments were observed. Most of the tin cans were disposed of in the open cellar. These include four "Punch Here" milk cans, a Spam meat can, an internal friction cocoa can, and four oil cans.

Although the prehistoric component has been disturbed by the later historic occupation, it still retains integrity of location and setting, a diversity of lithic artifacts and material types, as well as potential for subsurface cultural remains (Criterion D). The historic component is also considered significant because of its potential to provide additional information concerning spatial patterning, trash disposal patterns, consumer behavior, and socioeconomic status. The structural features (granary, cellar, corral) fail to embody the distinctive characteristics of a type, period, or method of construction (Criterion C) nor is the property associated with any person(s) or event(s) that have made a significant contribution to national, state, or local history (Criteria A and B). Hence, 42Ka2068 is recommended eligible to the NRHP under Criterion D because it is likely to yield important information about the history and prehistory of the area.

42Ka6104

This is a sparse lithic scatter situated on the slope of a low north-south trending ridge in Sink Valley (Figure 4). The site contains 29 flakes and seven tools. The tools includes two projectile points, three bifaces, a utilized flake, and a core. Tool 1 is a Stage 2-3 chert biface. Tool 2 is a chert projectile point tip. Tool 3 is a utilized chert flake. Tool 4 is a Stage 3-4 biface fragment that may have been heat treated. Tool 5 is an Elko projectile point that is broken at the notches, only the base with one notch remains. It is possible that it has been heat treated. Tool 6 is a Stage 5 obsidian biface. Tool 7 is a quartzite core that may have been utilized. The debitage is dominated by shatter, while tertiary and secondary flakes are common, primary flakes and cores are rare. The material types include chert, quartzite, and obsidian. This is a low density lithic scatter affiliated with the Archaic Stage which contains several classes of lithic artifacts. The site retains integrity of location and setting, spatial patterning, and good potential for subsurface cultural remains. The site is evaluated as eligible under Criterion D, as it is likely to contribute to such research topics as site function, chronology, subsistence, material culture, spatial organization and lithic procurement.

42Ka6105

This is a low density lithic scatter of Protohistoric/Contact affiliation located at the bottom of a southwest facing slope in Sink Valley (Figure 5). Cultural materials include 18 flakes and three tools, which includes a projectile point and two bifaces. Tools 1 and 2 are Stage 1-2 chert bifaces. Tool 3 is a chert Desert Side-notched projectile point. The debitage is dominated by shatter, while tertiary flakes are common, secondary flakes and primary flakes are rare. The material types include chert, quartzite, and obsidian. The site retains integrity of location and setting, spatial patterning, and good potential for subsurface cultural remains. The site is evaluated as eligible under Criterion D, as it is likely to contribute to such research topics as site function, chronology, subsistence, material culture, spatial organization and lithic acquisition.

42Ka6106

The site consists of a sparse lithic scatter located at the bottom of a southwest-facing slope in Sink Valley (Figure 6). The site contains 18 flakes and two tools, which includes a chert projectile point mid-section, and a chert awl/drill. The debitage is dominated by shatter, and contains very few secondary or tertiary flakes, and no primary flakes. The material types include chert and obsidian. Although the site exhibits a limited assemblage size, it lies in an area of alluvial deposition with good potential for subsurface cultural remains. Therefore, it is recommended eligible to the NRHP under Criterion D because it is likely to yield additional information relevant to the history of the area.

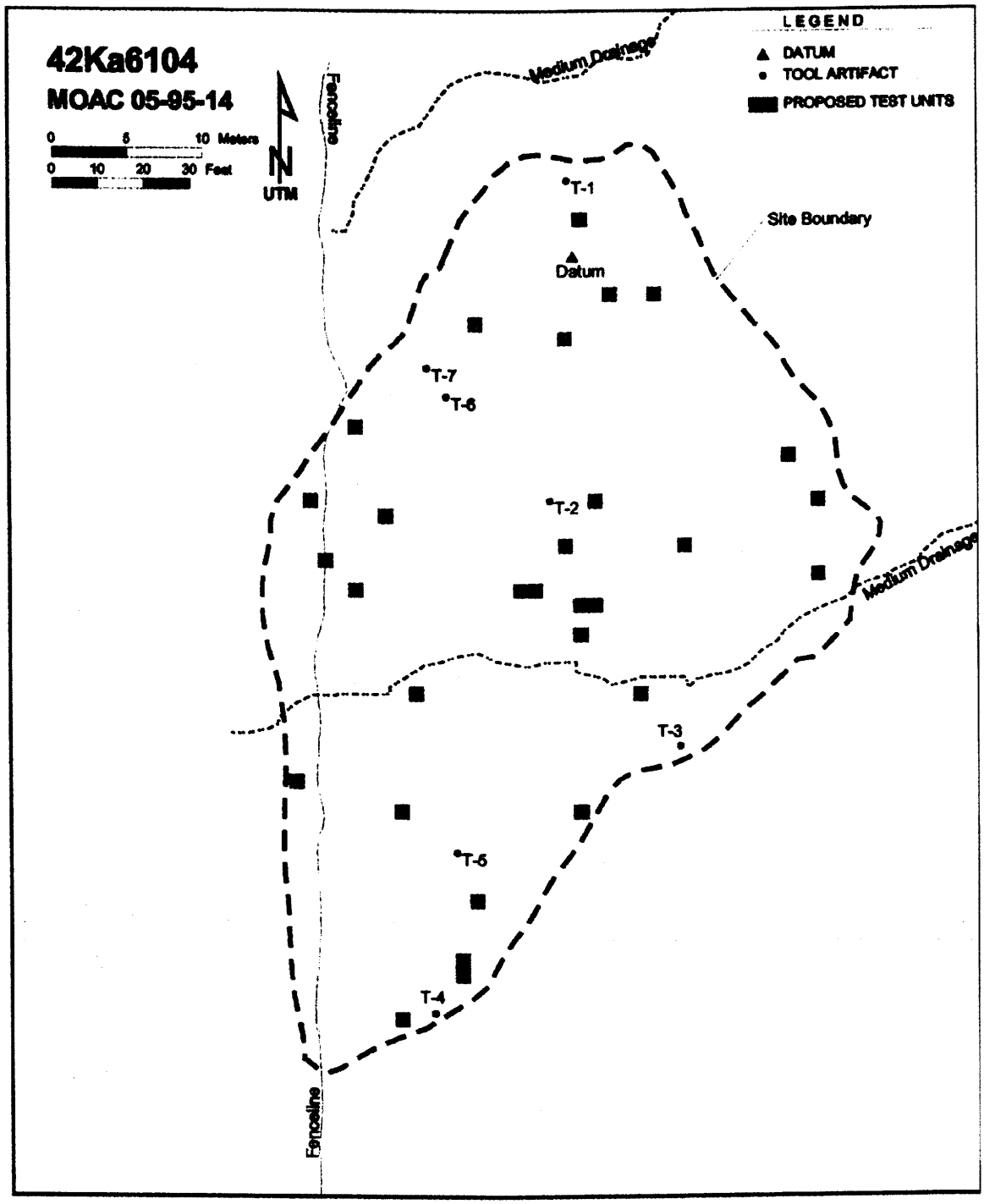

Figure 4. 42Ka6104 Site Map.

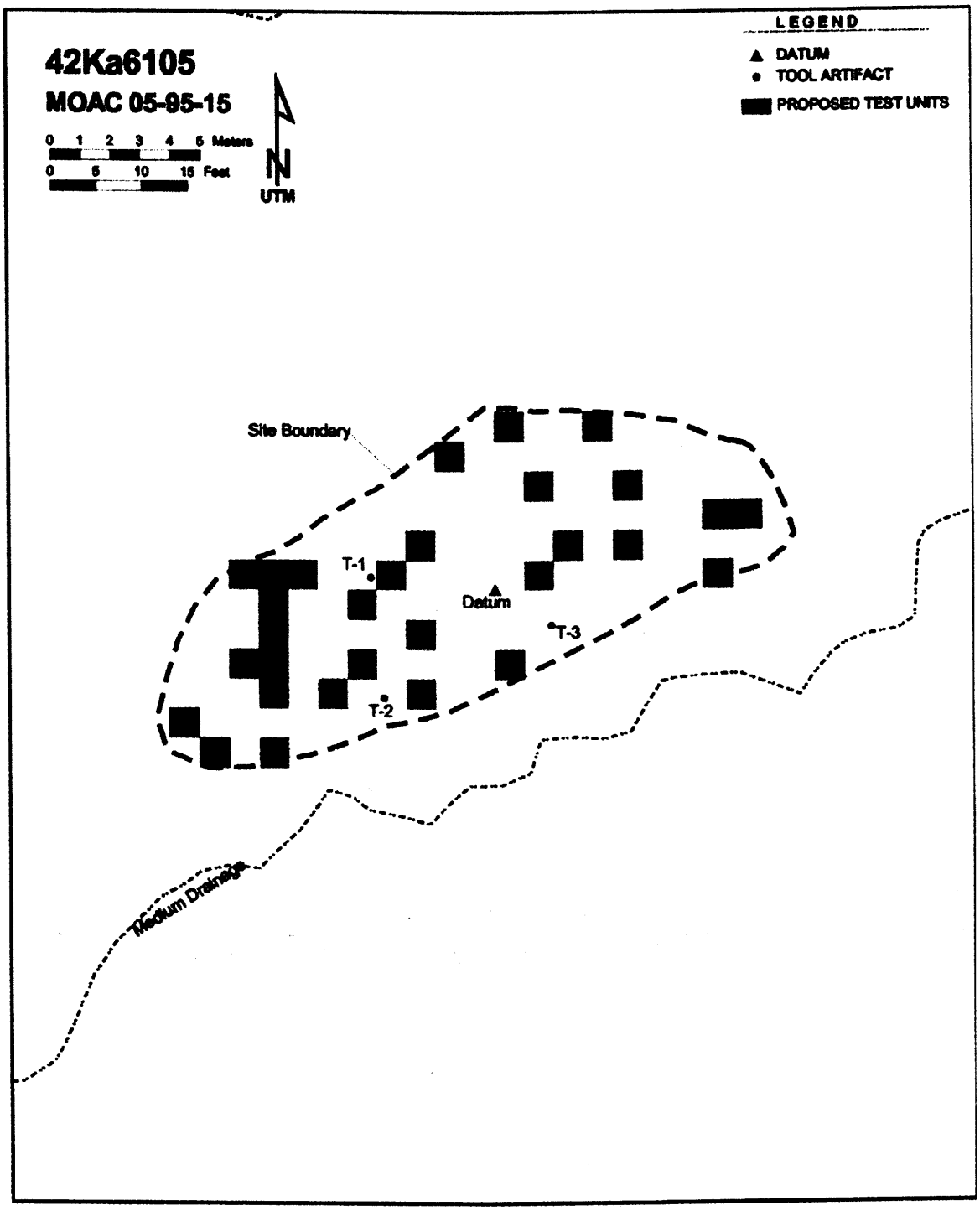

Figure 5. 42Ka6105 Site Map.

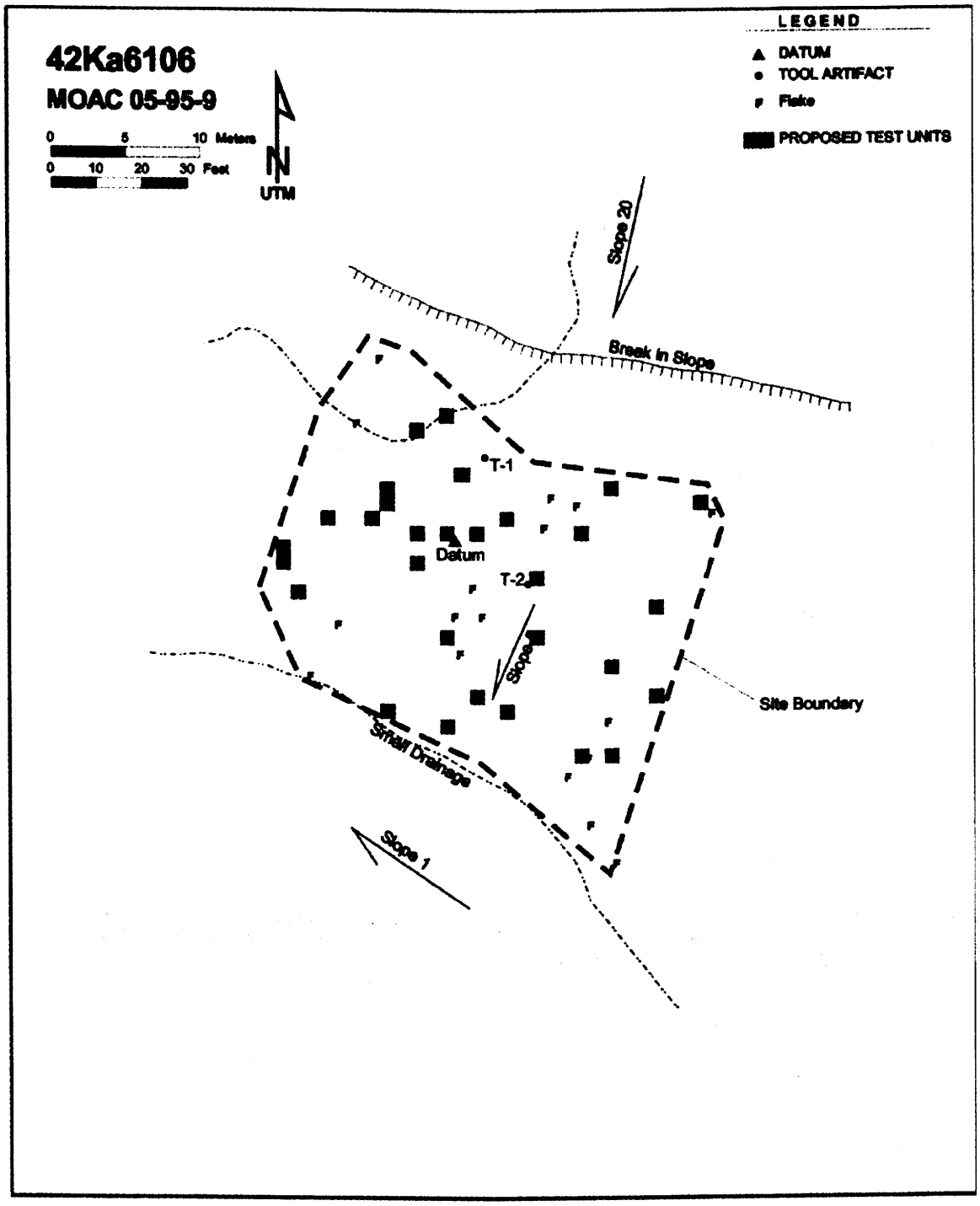

Figure 6. 42Ka6106 Site Map.

42Ka6107

The site is a lithic scatter that is located in and around three drainages at the bottom of a northeast facing slope (Figure 7). Cultural materials consist of 34 flakes and two tools, which are both utilized flakes. The debitage is dominated by shatter, tertiary flakes are common, secondary flakes are rare, and primary flakes are nonexistent. The material types include chert, quartzite, and obsidian. Although the site exhibits a limited assemblage size, it possess integrity of location and setting and lies in alluvial deposits with good potential for subsurface cultural remains. Therefore, it was recommended eligible to the NRHP under Criterion D because it is likely to yield additional information relevant to the history of the area.

42Ka6108

The site is a dense lithic scatter that is located on a small rise and slope along the west side of Sink Valley (Figure 8). The site contains more than 200 flakes and 19 tools. Two lithic concentrations were noted indicating spatial patterning. The chipped stone tools documented at the site consist of ten utilized flakes (Tools 2, 4, 8, 10, 11, 13, 14, 15, 18, and 19), seven bifaces (Tools 3, 5, 6, 7, 9, 16, and 17), a Hawken Side-notched projectile point (Tool 1), and a projectile point tip of unknown type (Tool 12). The debitage is dominated by shatter, tertiary flakes are common, secondary flakes are rare, and primary flakes are nonexistent. The material types include chert and obsidian. In addition, two historic artifacts were observed, a hole-in-top milk can and an earthenware vessel sherd. This Early Archaic site exhibits an assemblage size and diversity that could contribute to such research topics as site function, chronology, subsistence, material culture, lithic acquisition and spatial organization. Hence, the site is recommended as eligible to the NRHP under Criterion D.

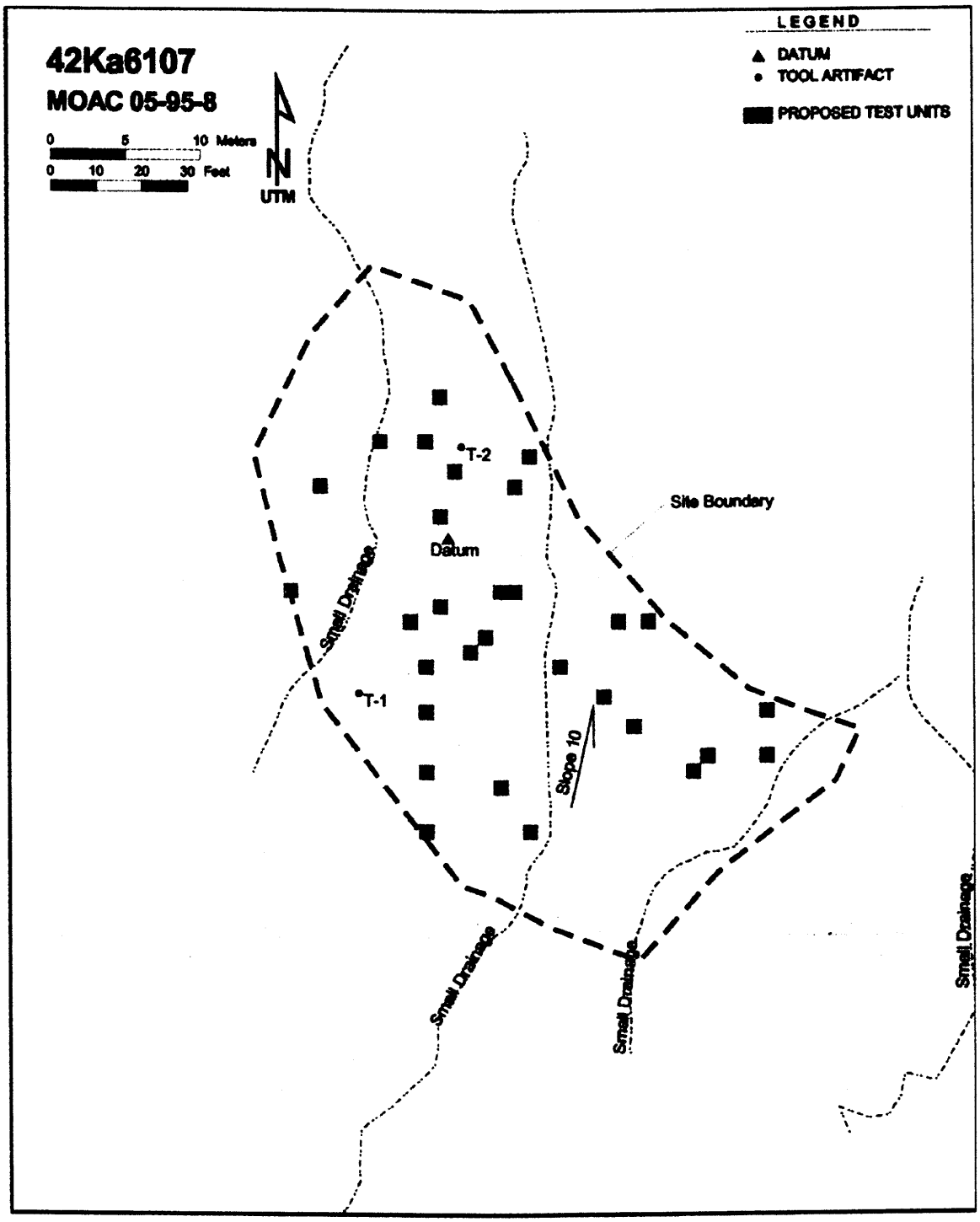

Figure 7. 42Ka6107 Site Map.

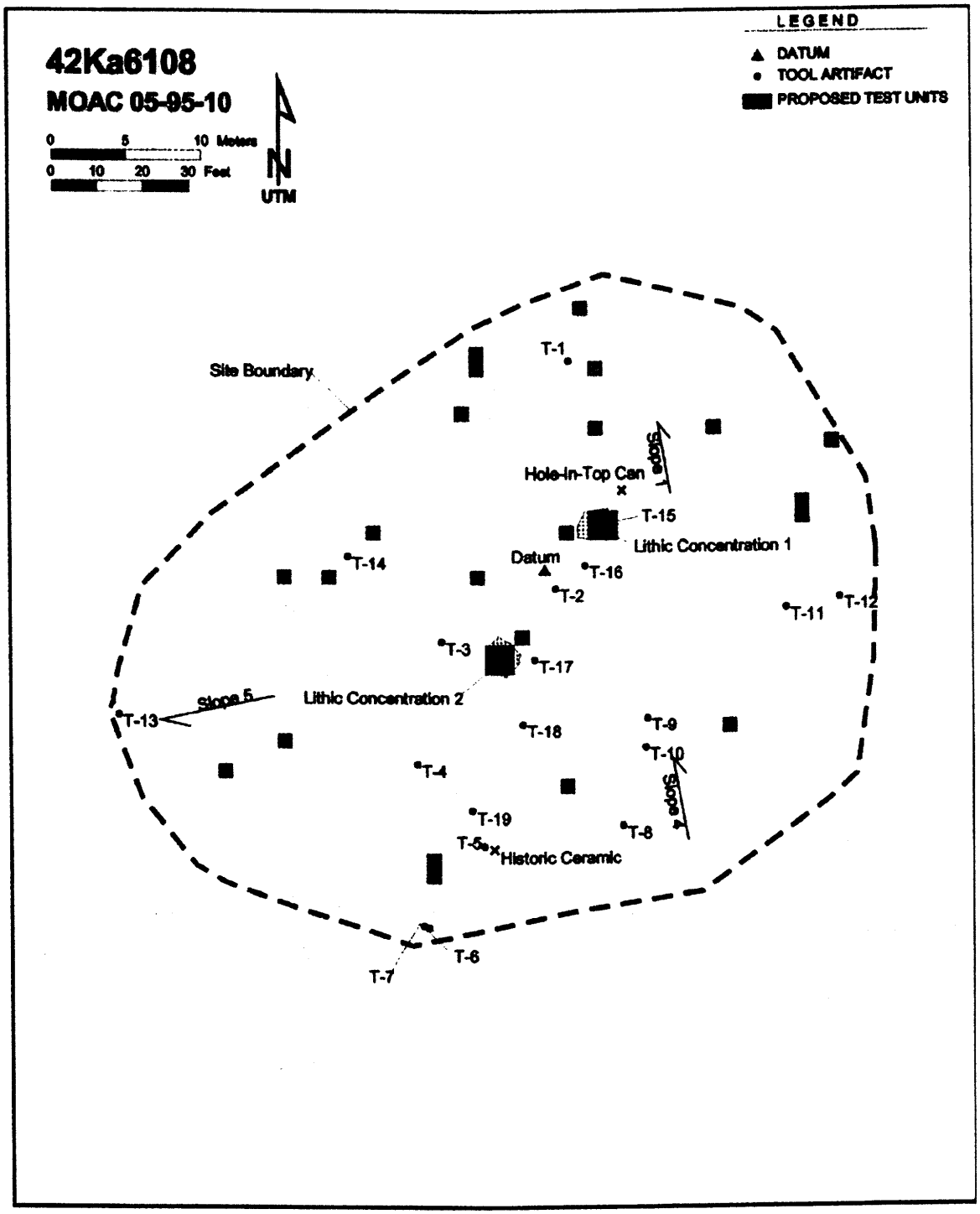

Figure 8. 42Ka6108 Site Map.

RESEARCH DOMAINS AND QUESTIONS

Inevitably research programs, whether academic or mitigation, are guided by some general or specific theoretical framework. In the case of many mitigation efforts in Utah, an emphasis is placed on a series of research domains which include cultural affiliation and chronology, site function, site structure, technology, subsistence, interaction, settlement, site formation processes, and ideology (eg. Ahlstrom et al. 1999; Firor et al. 1998; Tipps 1995; Tipps et al. 1996; Westfall 1987; Westfall et al. 1987; among others). The systematic approach, introduced to archaeology by Binford (1965), conceptualizes different components, or subsystems, of a society and analyzes them separately and then as part of the entire system. Redman (1973:62) outlines a systematic organizational strategy for field investigations that includes four fundamental principles: 1) the explicit use of both inductive and deductive reasoning in the drafting of research designs; 2) programmatic and analytical feedback; 3) explicit utilization of probability sampling; and 4) the formulation of analytical techniques that are appropriate to the hypotheses and the subject matter. The four principles are then applied to a multistage sampling design that includes general reconnaissance (Stage 1) of the region, intensive survey (Stage 2), a controlled surface collection (Stage 3), and excavations (Stage 4) (Redman 1973:64). Previous work in the Alton Amphitheater includes general reconnaissance and an intensive survey (see Previous Archaeological Work, pages 3 and 4). The Alton Amphitheater Cultural Resource Management Plan and this Phase I data recovery and research design rely heavily upon Redman's (1973) concepts of a systematic organizational strategy and multi-stage research design. In order for the Phase I data recovery to inform subsequent archaeology, we will need to collect specific data regarding geomorphology, site depositional processes, and erosional processes that have been operative at the site. These depend on both natural processes (wind and water) and human agencies (prehistoric, historic, and modern occupations).

Several working hypotheses concerning the relationship between sites in the Coal Hollow Phase I and the surrounding Alton Coal Tract have been developed. These working hypotheses include:

1. Given the similar environmental setting in the greater Alton Amphitheater - Sink Valley area, land use and subsistence strategies at temporally associated sites are similar. For example, we would expect the Early Archaic site (42Ka6108) to have similar technological, functional, and organizational characteristics to other sites with the same temporal affiliation in the Alton Amphitheater - Sink Valley area.

2. We would expect that the natural processes active at temporally associated sites in similar depositional environments are consistent across the project area. For example, the natural processes affecting a Late Prehistoric or Protohistoric in the Sink Valley locality would be similar to a Late Prehistoric or Protohistoric site in the vicinity of Kanab Creek in the Alton Amphitheater locality.

3. We would expect that temporally associated sites would have similar depositional preservation throughout the Alton Amphitheater - Sink Valley area.

Prehistoric Sites

Most of the archaeological information we have pertaining to the sites in and around Alton Amphitheater comes through CRM related surveys with the main objectives of locating cultural

resources and determining the eligibility of the sites for inclusion to the National Register of Historic Places. These surveys identified numerous prehistoric sites consisting chiefly of lithic artifacts, no discernible structures, and very few features. The lack of features may be due to the nature of the site recording, as indications of features may not be visible on the surface. Another possibility is that features do not exist or traces of them have vanished as a result of time and geomorphic processes. What survey projects have revealed, however, is a relatively long and continuous use of the Alton Amphitheater by various indigenous populations including Archaic, Fremont, Anasazi, Southern Paiute, and Ute peoples.

Research Domain 1: Artifact Distributions - Surface and Subsurface Assemblages

Artifact distribution will be examined with regard to vertical differences, thus particular attention will be paid to differences or similarities between surface and subsurface artifact assemblages. To determine if surface and subsurface assemblages are different or similar, we will use independent sample t-tests, or their nonparametric equivalent (in the event that data other than ratio level data is used). Samples to be used in testing the hypothesis include artifact frequencies, material type frequencies, and tool type frequencies. If necessary, because of multiple comparison problems resulting from the addition of more samples, an analysis of variance test (ANOVA), supplemented with Bonferonni post hoc tests will be used where multiple data sets can be tested together. Additional samples may result from more than one subsurface artifact assemblage or the addition of unexpected frequency data; however, both these instances are unlikely.

1.1. Do surface diagnostics represent overall site chronology?

1.2. In terms of artifact frequency, diversity, and richness how do the surface and subsurface assemblages differ? Are the differences significant? Are the differences related to cultural or natural processes?

1.3. Are there any characteristics of the surface assemblages that can adequately predict subsurface assemblages?

1.4. Are the functional interpretations derived from the surface artifact assemblage supported by the subsurface artifact assemblage?

1.5. What is the depositional environment? Is it alluvial? Residual? Colluvial?

1.6 What post-depositional processes are active or were previously active that may have affected artifact distributions (slope wash, bioturbation, alluviation, devegetation/grazing)? Are the artifacts located in a primary context or a secondary context?

Research Domain 2: Chronology

We anticipate that the sites will provide chronological data on the Archaic and Southern Paiute periods, and perhaps the Formative period. The chronological placement of sites in the Virgin Anasazi region is complicated by several factors that include poor temporal resolution of ceramic chronologies and the scarcity of tree-ring dates. Sites 42Ka2042, 42Ka2068 (prehistoric component), 42Ka6106, and 42Ka6107 have no culturally or chronologically diagnostic artifacts on the surface, but there is potential for buried cultural remains and excavation might reveal datable features and artifacts. Site 42Ka6104 contained a single Elko projectile point attributed to the

Archaic period, during initial surface documentation. Surface documentation at site 42Ka6105 located a single Desert Side-notched projectile point attributed to the protohistoric/contact period. At site 42Ka6108, a single Hawken Side-notched projectile point was located during surface documentation and was attributed to the Early Archaic period. These three sites (42Ka6104, 42Ka6105, and 42Ka6108) also exhibit good potential for buried cultural remains, which during excavation may reveal further datable features and artifacts.

Efforts will be made to place site components within previously defined cultural units as appropriate. If possible, component data will be compared to temporal periods defined for the area. Data recovery at the seven sites will focus on obtaining chronological data from cultural horizons and features that may provide further insight into cultural or temporal affiliation. Relative and absolute dating techniques, including stratigraphy, luminescence dating, obsidian hydration, and ^{14}C dating, may be employed to examine the relationship of features and diagnostic artifacts (projectile points and ceramics), and compare them to the known chronologies and cultural traditions of the region. Recovered projectile points will be identified according to the morphological classifications of Holmer (1986) and Holmer and Weder (1980). Recovered ceramics will be identified according to such classifications as Colton (1955) and Pippin (1986).

Research Questions

2.1. During what period(s) were the sites inhabited or used? Are other datable materials present at the site? How well do temporally diagnostic artifacts correlate with other relative and absolute dating methods (obsidian hydration, ^{14}C dating, etc.)? Can relative and absolute dating techniques be used to place the temporally unaffiliated sites into the regional chronological framework (e.g. the Kern River 2003 Expansion Project obsidian hydration sequence)?

2.2. Can multiple periods of use or temporal components be distinguished at the sites? Do the sites with unknown temporal affiliations (42Ka2042, 42Ka2068, 42Ka6106, and 42Ka6107) represent single or multi- component sites? Do other lines of data support the single temporal classification at sites 42Ka6104, 42Ka6105, and 42Ka6108?

Research Domain 3: Site Function and Use History

To understand prehistoric land-use patterns, it is necessary to determine the primary function of a cultural component/site. Although prehistoric people may have used individual sites for different activities at different times, insight into site function can be gained through analysis of represented artifact classes, artifact diversity, and cultural features. Many of the sites in the area contain artifact classes (projectile points, scrapers, bifacial knives) typically related to hunting and animal processing activities. To a limited extent the presence of ground stone at other sites in the Alton Amphitheater may suggest the processing of plant materials.

3.1. What activities can be identified as having taken place at the sites? How were those activities distributed across the sites? Do artifact assemblages reflect single or limited activities or multiple activities? Are activities related to resource procurement or processing? Are there distinct activity areas?

3.2. Can evidence of a distinct episode of use be identified at site 42Ka2042, a temporary camp? Can a group of contemporaneous features, activity areas, or trash disposal areas be identified within the site? At the assemblage level, are there quantifiable differences between 42Ka2042 and the lithic scatters (42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108)?

Research Domain 4: Subsistence and Environment

Given that broad temporal occupation of the area and the diversity of subsistence practices, the types of subsistence resources utilized by the inhabitants of the sites can potentially be very large. Evidence for subsistence resources will be gathered primarily from pollen, botanical, and faunal assemblages. It is unlikely that, given differential preservation of organic materials, that the entire range of resources will be identified or that the relative proportions of the remains reflect the degree of dependence. However, the data will serve as an approximation of subsistence resources.

On- and off-site sediment samples will be taken for pollen and macrobotanical analysis and sent to Paleo Research Institute in Golden, Colorado. Pollen washes will be performed on appropriate ground stone artifacts. If features are located at the sites additional bulk sediment samples will be taken from the features for floatation. In addition to subsistence data, the analysis of these samples will be used for comparison with generalized paleoclimate reconstructions for the Greater Colorado Plateau. If appropriate, protein and starch residues on firecracked rock will be analyzed using Fourier Transform Infrared Spectrometry (FTIR). Additionally, at this phase of the project an attempt will be made to identify an appropriate location for the possible placement of a pollen core sample and a sub-contractor to collect the core and conduct the analysis. Pollen core samples are generally obtained from lacustrine sediments where pollen grains are deposited and are under anaerobic conditions. Although samples from soil sediments may be analyzed, degradation of the pollen exine and bioturbation significantly reduce the quality of pollen grains and the stratigraphy necessary for an environmental reconstruction. In the event that an appropriate location for the pollen core cannot be located, other methods of environmental reconstruction will be pursued.

Research Questions

4.1. What plants and animals, wild or domesticated, can be identified as having been exploited by the sites' inhabitants? What types of data do we have to assess this (protein residue, pollen wash, FTIR)?

4.2. Can we distinguish between a processing or extraction locality and whether a single or multiple resources are being procured or processed? Is the site primarily related to gathering vegetal resources or animal resources?

4.3 What portions of the artifact assemblages may provide proxy data of the food items that were processed (ground stone, lithic use-wear, tool types)? What portions of the artifact assemblage may provide proxy data of the animals that were processed (tool morphology, use-wear, protein residue)?

4.4. Do the Archaic sites (42Ka6104 and 42Ka6108) more closely reflect a forager or collector

strategy? Are there any similarities between the Archaic assemblages and the Protohistoric assemblage (42Ka6105) that may be attributable to similarities in subsistence strategies? Are there any similarities between the temporary camp assemblage (42Ka2042) and the lithic scatters, both of known and unknown temporal affiliation, that may be attributed to subsistence strategies?

Research Domain 5: Technology

Technological organization will be assessed in regards to resource utilization and activities (e.g. scraping, cutting, grinding, cooking), and tool diversity. Artifact assemblages will be investigated and analyzed to determine the manufacturing technique, the raw materials used, and distinctions between the assemblage at these sites and surrounding sites. General debitage and tool analysis can aid in the determination of site function and the delineation of activity areas. Spatial patterns in the distribution of lithic debitage (and ceramics), the identification of reduction sequences, and the refitting fragmentary tools within the spatial lattice provides the data necessary to identify activity areas possibly reflecting specialized behaviors. Various site function classifications exist for hunter-gatherers (e.g. Binford 1980), semi-nomadic peoples, and agriculturists. These models may aid in the interpretation of archaeological remains, but they will be used here only as aids and not as *a priori* categories. Functional inferences concerning lithic assemblages will be drawn from direct measures of lithic diversity and richness at both the debitage and tool level, the presence/absence of certain artifact types, and tool attrition and use history.

Research Questions

5.1. Following Knell's (2004) General Nodule Analysis (GNA), do the chipped stone assemblages reflect the production or transport scenarios proposed by Knell? Are there differences or similarities between the GNA of the Archaic (42Ka6104 and 42Ka6108), the Protohistoric (42Ka6105), and the sites of unknown temporal affiliation (42Ka2042, 42Ka2068, 42Un6106, and 42Un6107)? What kinds of ground stone artifacts are present? Were the flaked stone tools and ground stone artifacts manufactured from locally available materials? Is there evidence of differential use, in terms of expediency, between local and non-local tools?

5.2. How was the thermal feature at 42Ka2042 made and used? What kinds of plants were used for fuel?

5.3. If ceramic artifacts are identified at the sites, what kinds and numbers of vessels might have been in use at any given time? Can local types and vessels be distinguished from non-local ones? What were the probable source areas for the non-local vessels?

Research Domain 6: Settlement Patterns and Mobility

Excavations at sites 42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108 will provide archaeologists with the opportunity to study at least two periods of use, the Archaic and Protohistoric periods. A key component in modeling settlement patterns is discerning the length of time that sites were occupied, and thus site variability often corresponds with the length of site occupation. Consequently, questions related to settlement patterning and mobility within an area that appears to have been continuously occupied from the Early Archaic to the Protohistoric periods depend heavily upon chronometric data and the chronological placement

of sites. Kent (1992) developed an approach for comparing relative group mobility based on a variety of site characteristics; such as site size, the presence/absence of formal middens, formal storage features, diversity of ceramic assemblages, and ratios of formal flaked tools to debitage. A version of Kent's model with modifications for non-structural sites was utilized for the Kern River 2003 Expansion Project (Reed et al. 2005:70-75), which address additional site characteristics such as the mean size of firecracked rock, ceramic labor, debitage density, lithic tool reduction strategies, percentage of expedient tools, tool diversity, and faunal and floral diversity.

Research Questions

6.1. What source information can be gleaned from the obsidian at the sites? Does the obsidian come from a single or multiple source(s)? Are there source differences among the Archaic, Protohistoric, and temporally unknown sites?

6.2. Can we learn anything about the mobility of groups represented at the sites? Are there discernable differences between the Archaic (42Ka6104 and 42Ka6108), the Protohistoric (42Ka6105), and the temporally unaffiliated (42Ka2042, 42Ka2068, 42Ka6106, and 42Ka6107) sites?

6.3. What can information gleaned from site characteristics such as those described above tell us about the mobility or settlement patterns of peoples who occupied the Alton Amphitheater? How do these settlement systems compare with those proposed for other sites within the region, particularly the sites associated with the Kaiparowits Plateau survey, the Coral Canyon sites, the Quail Creek area, the Kern River 2003 Expansion project sites, and the Sand Hollow sites?

Historic Site (42Ka2068)

Historical archaeologists often use the concept of a historical context as a method of structuring research and ordering data. Bowers (1998:1) defines a historical context as: "How a particular community theme is expressed at a particular time and place...based upon the major changes to the community, which have been influenced by such factors as: exploration, settlement, urbanization, commerce and economic development, transportation, disasters, and community permanence." Specific historical contexts are derived primarily from established histories of the town, county, or region under investigation, and serve as an interpretive framework with which to investigate archaeological data at various scales of analysis. For example, at a regional scale of analysis, Hardesty (1991) developed an approach that identifies several interpretive themes applicable to the entire Inter-mountain West. They are:

1. Evolution of hydraulic societies (control of water)
2. Uncertain enterprises and the boom-bust cycle
3. The evolution of conquest society
4. Frontier urbanism
5. Dependency on the Federal government

According to Hardesty, as a "geographical place with a distinctive regional culture" (Ibid.: 29), the Inter-mountain West is defined by these major themes or historical contexts. Therefore, these themes have direct relevance to an archaeological investigation, as all are expected to have

had a major impact on settlement patterns, economic and social organization, and ideology. For example, mining and ranching, two of the largest industries in the west, are particularly sensitive to economic cycles. As the western economy boomed with large-scale labor, technology, and capital the amount of variation in material culture reduced. Consequently, during bust cycles a localized subsistence pattern and folk cultures emerged (ibid.:31). This may include the wares of immigrant potters Hardesty (1991) argues that the archaeological record may be a particularly good source of information about all of these major themes and, as a result, "all of these topics can form the foundations for middle range theory building that can be tested with hypotheses using historical archaeological data" (Reed and Horn 1994: 233). Another important aspect of the research is to attempt to look at artifacts as more than indicators of time, place, and function. Artifacts with recursive qualities shape thought and behavior, in that making and using an object reinforces and reproduces the same social actions that went into the artifact initially (Leone 1992, Potter 1992). Artifacts are most likely to reflect an acceptance of social situations and thus social context can be investigated.

Domestic archaeological sites include the remains of residential occupations that include dwellings, wells, privies, gardens, middens, and sheet refuse deposits. Additionally, homesteads include barns, outbuildings, and agrarian landscape features. Common issues addressed by archaeological research on domestic sites include consumer behavior patterns and modernization (Hardesty and Little 2000:120). The Homestead Act of 1862 granted free land parcels to settlers in exchange for their agreement to live on the land, build a house, and make agricultural improvements. The archaeological remains of such homesteads date from the 1860s and well into the twentieth century. Stein (1990:30-34) has put forth several research themes and questions for developing a homestead context in Arizona. These include:

- To what extent were homesteads economically self-sufficient?
- To what extent was agriculture practiced?
- What was the role of women?
- What were the patterns of land use?
- How did the social mores of particular groups evolve in response to life on the frontier?
- What were the long-range goals, or motives, of homesteaders and how successfully were these goals met?
- What factors contributed to the success of a homestead, as measured by the conveyance of a title patent from the government to the claimant?

Such research themes have been successfully addressed in archaeological investigations at the Brown Homestead in Yavapai County, Arizona (Ayres and Seymour 1993). Here, archaeological excavations were designed to address research topics that relate to subsistence and food behavior that were applied to the understanding of the economic viability of the homestead, the sociocultural interaction of the homestead's occupants with neighboring homesteaders, and investigations into the vernacular architecture to explore issues of economic and social status.

In short, identifying historical contexts at a particular scale of analysis (national, regional, local) provides a conceptual and analytical background that serves to structure an archaeological investigation. The challenge for the archaeologist is to not only determine how, and the extent to which, these processes are reflected in the archaeological record of the particular site or sites under investigation, but to examine the inherent assumptions and generalizations underlying the identified historic contexts. In this way, an archaeological analysis contributes to a more complete understanding of the past by determining the relevance and/or validity of the established historical themes to a particular community or region.

Research Domain 1: Site Level Ethnography

Several general research questions are presented below that can be address through historical archaeology. These questions are considered important in structuring the research, so that the research can contribute to broader community level questions. Investigations at a single domestic site will not provide enough data to address fully a World Systems approach. However, an important result of this investigation is expected to be the development of a historical ethnography at the site level (see Schuyler 1988). Such a site level ethnography can then be used for comparative study on a regional or on a World System level.

Research Questions

1.1. What types of activities took place at the site? How does the archaeological record compare with regional historic accounts or the accounts of informants?

1.2. What activities are represented in the archaeological record that are underreported or absent from the historical record?

1.3. What is the social, economic, and ethnic situation of the occupants?

1.4. Are there changes in land use patterns and activities, evident in the archaeological record, that may be attributed to internal and external social, political, and economic situtations?

1.5. What is the social pattern of the homestead? Are families represented in all aspects of activities? Are gender roles evident in activities or within the household? How are children represented in the archaeological record?

Research Domain 2: Consumer Behavior Patterns

The second research domain addresses the consumer behavior patterns of the homestead; particularly the extent to which the homestead was self-sufficient and whether the data reflect a shift from self-sufficiency to consumer culture. Specific household data help to refine broader community data regarding consumer behavior patterns, as the household is the primary unit of analysis and serves as the unit of economic consumption and production (see LeeDecker 1994). To determine the level of self-sufficiency it will be necessary to look at the frequencies of canning jars or canning jar lid inserts versus sanitary tin cans and varying frequencies of artifact types (specifically tin can types and their associated contents), frequencies of ceramic vessels and vessel forms (based on rim sherd). A lack of sanitary food cans, meat tins, and evaporated milk cans may indicate a reliance on food products produced at the homestead. Conversely, a higher frequency of consumable goods versus durable goods is likely to indicate a more consumer driven culture. A shift from self-sufficiency to a consumer culture will only be evident, if present, if the site refuse exhibits either stratigraphically distinct deposit levels or if two (or more) disposal events can be identified based on temporally diagnostic artifacts.

Research Questions

2.1. Was the homestead self-sufficient? To what extent was the homestead self-sufficient?

2.2. Does the site reflect a change in consumer behavior, from self-sufficiency to consumer culture? At what period does such a change occur?

2.3. Do the artifacts at the site reflect a Mormon "ethic" of frugality ? Do the artifacts reflect the social context of a small, isolated Mormon community?

Research Domain 3: Settlement Patterns

The use of folk dwellings, old barns, granaries, etc. possess a diagnostic power to chart diffusion, reveal innovation, display adaptive systems, and explain regional cultures. Such structures provide insight in to the local settlement complex and the regional adaptive strategy of land use. Log dwellings of the montane West are informative about the regional culture and character and often represent the diffusion of Eastern or European housing traditions versus local innovations to western environments and cultures (Jordan et al. 1997:11). Conversely, log outbuildings are directly connected to livelihood and thus, they reveal adaptive strategies of land use better than dwellings (Jordan et al. 1997:33).

The remaining standing structure at site 42Ka2068 is described as a granary constructed with a masonry foundation, large log cross beams, and V-shaped log construction with lumber paneling and floorboards. The granary appears to be the oldest structure remaining on the site. Log outbuildings are relatively rare within the region and its log construction is particularly intriguing as milled lumber would have been available (nearest saw mill in Orderville) at the time of the Pugh family's purchase of the land and residence. Therefore, it is possible that the log structure was a residence for the initial homesteader, James Swapp (land patented on August 9, 1889 under the Homestead act of 1862), and later reused as an outbuilding. To test the above hypothesis it will be necessary to more closely examine the construction and construction methods of the log structure by dismantling the structure and documenting construction techniques and methods. Additionally, excavations in the floor and entrance ways of the structure may reveal artifactual evidence of activities associated with the structure.

Research Questions

3.1. What activities were conducted in or near the log structure?

3.2. How old is the structure? Can tree-ring dating of the timbers provide a constrution date for the structure?

3.3. Is there artifactual or structural evidence to suggest that the structure may have functioned as a dwelling?

3.4 What innovative or adaptive strategies may be represented by the structural remains?

3.5 Is there evidence for localized adaptation to the environmental conditions?

SAMPLING DESIGN

The location of excavation units were selected using a simple random sampling strategy. At each site, a grid system was overlaid onto the site sketch map and a random sample of units, without replacement, was generated using ArcView software. The purpose of this simple random or probabilistic sampling strategy is to maximize the chance of accuracy for making inferences about the population. In simple random sampling, each individual element (1-x-1-m grid unit) in the population (site) has an equal chance of selection, such that each unit is independent and does not effect the selection of other units. The assumptions necessary for simple random sampling are minimum (Redman 1975:150), and include the boundary of the population (site boundary as defined during the cultural resource inventory and documentation), the sampling frame (1-x-1-m grid units), and the sampling fraction. A sampling fraction is generally the percent of the sample relative to the sample universe; however, due to time and financial constraints a sample size of n=30 m^2 will be used. This sampling strategy allows us to collect a representative sample of the subsurface artifact assemblage and is necessary for addressing differences between surface and subsurface artifact assemblages. Importantly, simple random sampling also provides a basis for estimating how likely our inferences about the population are wrong, as well as how much confidence we can place in these inferences (Drennan 1996).

FIELD METHODS

In order to collect the necessary data to address the proposed hypotheses, field and laboratory methods must be compatible with one another, as well as with previous work conducted in the Grand Staircase, if larger research questions are to be answered. Additionally, data recovery at these seven sites, as proposed in this research design, will be used for possible future management of the surrounding cultural resources in the Alton Amphitheater and Sink Valley regions, as addressed in the Alton Coal CRMP. As such, the following field and laboratory methods will be used throughout this phase of the project.

The first task at each site will be to produce a detailed planimetric map consisting of site boundaries, surface artifacts, features, landscape features, etc. All prehistoric surface artifacts will be collected and point provenienced with a Trimble. To the extent possible the grid will be oriented to true North. The grid system will consist of a master grid datum located at or near the northwest corner of the site. Radiating from the datum will be an east-west and north-south baseline. Grid units (2-x-2-m), are designated by the number of meters east and south of the grid datum. As such the unit designations will resemble 16S/24E or 02S/32E. Individual grid datums are designated as the NW corner of each unit, unless it is obstructed in some fashion. Once the grid is established, surface "pinch samples" for controls in pollen analysis will be collected and the surface of the site will be surveyed and artifacts will be plotted on the planimetric map.

Excavation will consist of excavation units (random 1-x-1-m and 2-x-2-m), which may be expanded into larger block areas if necessary. The units will be excavated by natural layers using the control of arbitrary levels of 10 cm. However, if warranted by artifact density excavation will change to 5 cm arbitrary levels. This will allow for the archaeologist to demonstrate whether a single horizon has been turned or if multiple stratified horizons, or occupation levels, are present. All subsurface measurements will be made from the unit grid datum located in the NW corner and eventually plotted on the planview map. Excavations will cease once bedrock is encountered or one has excavated through 10-20 cm of sterile fill. At each site, at least one 1 by 1 m unit will be

excavated to one meter deep or a depth necessary to obtain a sediment profile. Excavation will be done by trowel or shovel with the material removed being screened through 1/4" mesh screen, unless a smaller size screen is warranted by artifact size or density.

At sites 42Ka6104, 42Ka6105, 42Ka6106, and 42Ka6107, we propose excavating a variety of 1-x-1-m units placed randomly across each site, as no artifact concentrations or features were observed during surface documentation. A minimum of 30 m^2 will be excavated at each of the sites.

At site 42Ka6108, we propose excavating a variety of 1-x-1-m and 2-x-2-m units. A minimum of 30 m^2 will be excavated. A 2-x-2-m unit will be placed in each of the lithic concentrations (Lithic Concentration 1 and 2) and the remaining units will be randomly placed across the site.

At site 42Ka2042, we propose excavating a variety of 1-x-1-m and 2-x-2-m units. A minimum of 30 m^2 will be excavated. At least one 2-x-2-m unit will be place in Feature A, a firecracked rock concentration with soil staining, and the remaining units will be randomly placed across the site.

At site 42Ka2068, we propose excavating a variety of 1-x-1-m and 2-x-2-m units. A minimum of 30 m^2 will be excavated. At least one 2-x-2-m unit will be place in or next to Structure 1, the log granary, and at least one 2-x-2-m unit will be placed in or next to the cellar. Additional units will be placed randomly across the site, in both the prehistoric component and historic component of the site.

At each of the above sites, expansion of the initial random units will occur if any of the following are observed at a specific site:

1. If a feature is discovered during excavation and it extends into an adjacent unit, the adjacent unit(s) will be excavated in tandem in the same method of excavation.
2. If an activity area is observed at a site, then additional units will be excavated to determine the nature and extent of the activity area. For the purposes of this research design, an activity area is defined as an increased density of artifacts that are spatially associated with a feature.
3. If multiple levels of occupation are observed at the site, and the placement of the random units does not adequately reflect multiple stratified horizons, then expansion will be conducted adjacent to the unit in which multiple horizons were observed.

Additionally, if during the course of excavation it becomes apparent that the nature and extent of a site can not be adequately addressed by the above proposed research design or excavation methods, then it may be necessary to temporarily avoid the site until adequate mitigation is complete.

Upon the completion of the excavations, all top soil removal conducted within the Coal Hollow project area will be monitored by a qualified archaeologist. In addition, monitoring will be conducted at "sensitive areas" including the site locations and areas expected to have artifacts and the heavy machinery employed for this process will remove the top soil in three inch levels in the "sensitive areas." If features are discovered, work within the vicinity of the discovery will cease until the features have been appropriately documented. Any features encountered during this procedure will be documented in a manner consistent with those identified through manual excavation.

Prehistoric artifacts recovered in situ will be three-point provenienced. If the artifact is not laying level a dip angle measurement will also be taken. If an artifact is large, such as a metate, additional provenience measurements will be taken. Tools, large sherds, vessels, articulated faunal remains, artifact concentrations, etc. will be photographed and drawn in situ. If lithic debitage or small sherd fragments are extremely numerous it may be necessary, because of time constraints, to provenience these materials by quadrant, layer, and level rather than with three point plotting. Artifacts recovered from the screens will be provenienced by grid, layer, and level. Artifacts will be given field specimen numbers at the end of each days work.

Historic artifacts documented during the cultural resource inventory at this site (pieces of glass, tin cans, and ceramic sherds) are common to historic sites in the area. Additionally, a collection of these artifacts is bulky, making long term curation problematic. Hence, a detailed, in-field recording program of all historic artifacts within the excavation area of the total site area will be utilized to collect information. No collection of historic artifacts is proposed, unless a rare, unique, or particularly diagnostic historic artifact is encountered.

Any features uncovered during excavations will be examined, described, drawn, and photographed following recording procedures established by MOAC. Samples of soils, charcoal, bulk matrix, etc. will be taken where appropriate. If it is necessary to trace out a feature that extends into an adjacent unit, excavation of the unit, or a portion thereof, will begin immediately, following the standard excavation techniques described above, to reveal the full extent of the feature. The newly opened unit will be excavated in tandem with the original unit until sterile fill or bedrock is encountered.

Photographs will be taken prior to, during, and after excavation at the sites and excavation units. Photographs will be taken using color print, black and white print, and color slide film. Excavation unit photographs will be taken prior to excavation and a final excavation photo will be taken of at least one unit wall. Photographs will be taken of features prior to and after excavation.

Upon the complete excavation of a given unit, at least one wall will be profiled. The wall to be profiled will be determined by a number of considerations including, but not limited to, unique characteristics of the profile, clearly discernable stratigraphy, evidence of post-depositional processes, and cross-sections of cultural strata. The soil profile will consist of soil descriptions, Munsell color designations, information concerning the depositional environment, and the structure of the matrix.

In the event that human remains are encountered during excavation, all digging activity in that grid and the immediate vicinity will cease immediately. The county sheriff will be notified, followed by the Utah State Archaeologist.

LABORATORY METHODS

It is anticipated that lithic artifacts will make up the bulk of the materials recovered during excavation at sites 42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108; however, it is probable that faunal remains will also be encountered. There is also a slight chance of recovering other organic artifacts such as basket fragments, wood (both natural and cultural), beads, etc. No historic artifacts will be collected during the mitigation process. Most of the laboratory work for the historic component of site 42Ka2068 will be conducted on site. This involves the measurement by weight and volume of artifacts and artifact classes, recording typological descriptions, and photography or illustrated of diagnostic historic artifacts.

Lithic Artifacts

In order to address the hypotheses, it is necessary to collect both qualitative and quantitative data on the lithic debitage and tools. General debitage analysis will consist of collecting the following variable characteristics for each artifact: material type and color, percent of dorsal cortex and type, platform type, artifact condition, the presence or absence of thermal alteration, the presence or absence of use wear, the technological artifact type, dorsal scar count, and size class.

The analysis design provides the means to collect the necessary information for determining principle reduction strategies represented at the site under investigation. Specifically, the lithic analysis will incorporate the following aspects:

1. Composition of the lithic assemblages with respect to raw materials;
2. Frequency of artifact categories including core reduction debitage, both pressure and percussion biface thinning debitage, other specialized debitage (i.e., projectile points, notching flakes, fluting or channel flakes, etc.), undiagnostic debitage and angular debris, cores and core tools, and expedient and formal tools, including tool-producing tools (i.e., hammerstones, anvils, etc.)
3. Morphological and metric attributes of formal and informal chipped-stone tools for classification, typology, and function determination.

Where applicable, individual concentrations, or spatially discrete units, will serve as the basic units of analysis (see Analysis Section). Analysis of artifacts from sites 42Ka2042, 42Ka2068, 42Ka6104, 42Ka6105, 42Ka6106, 42Ka6107, and 42Ka6108 will center on identifying specific flake types based on studies and debitage typologies devised by Ahler (1989) and Flenniken (1978, 1981). The modified typology includes the following classification scheme.

Debitage: Core reduction includes three distinct levels including primary, secondary, and tertiary reduction. Primary flakes are defined based on a percentage of 90% or higher dorsal surface cortex cover and either a cortical or single faceted platform. Secondary core reduction flakes are defined as those flakes exhibiting cortex covering between 5% and 90% of the dorsal surface and having at least one flake scar. Cortical and single faceted platforms are common and in some instances multifaceted platforms occur. Finally tertiary reduction flakes lack any cortex, have single and multifaceted platforms, but more obtuse platform angles, and a dorsal surface with several flake removal scars (two or more); generally running parallel with the long axis of the flake. The flake curvature becomes more pronounced at this stage. In all three stages of core reduction there is generally little evidence of platform preparation.

Biface thinning debitage breaks down into three categories: edge preparation, percussion biface thinning flakes, and pressure biface thinning flakes. Edge preparation flakes typically exhibit a triangular outline relative to the platform location, making them wider than they are long. Removal of these flakes generally occurs as a preliminary step in preparing the edge of a flake blank (i.e. tertiary core reduction flake) or biface blank for additional biface reduction. Characteristics of percussion biface thinning flakes include multifaceted platforms generally with some abrasion, acute platform angles, and a definite dorsal curvature. In some instances, platforms may show signs of crushing and collapsing. Pressure biface thinning flakes exhibit irregular dorsal topography, steep platform angles with lipping, pronounced dorsal curvature, and are thin and small

relative to percussion biface thinning flakes. All non-diagnostic flaking debris (flake fragments, angular debris, etc.) will be grouped into a single category.

Cores: Artifacts exhibiting one or more negative bulb scars and that do not appear to have come from another material are classified as cores. Cores include three subcategories: tested nodules or cobbles, unprepared cores, and prepared cores, which display a prepared platform from which flakes are removed.

Flaked Stone Tools: For the purposes of this analysis, a lithic tool is any artifact exhibiting use-wear. As such, it is necessary to group tools into two major groups: formal and informal, or expedient, tools. The formal category includes tools formed through biface reduction, or other reduction techniques, that dramatically alter the appearance of the original flake blank. Expedient tools include used flakes and retouched flakes where neither the use nor the retouch significantly alters the shape of the blank. As used here, use-wear includes microflaking, polish, striations, battering, edge rounding, abrasion, and edge frosting. Microflaking is generally the most evident form of use-wear and one of the only forms of attrition visible to the unaided eye. Identification of striations generally requires the aid of stereo microscopes (>200 x magnification), or even scanning electron microscopes.

The analysis of utilized and retouched tools will involve assessments of type and extent of use-wear, material preferences, and the relationship between use-wear and core or biface reduction stage. Following Frison and Bradley (1980), biface production stages will be determined. Briefly, the stage reduction sequence includes biface production starting from a blank (Stage I), moving through general stages of shaping and thinning (Stages II and III) to systematic thinning and shaping (Stage IV) to the final retouching and shaping into the desired form (Stages V and VI). Bifaces need not necessarily pass through all six stages before becoming a tool. In some cases it may be necessary to repeat particular stages if the blank or preform breaks during manufacture and some stages may be omitted altogether. Classified as either blanks (Stages I-IV) or preforms (Stages V and VI), these bifaces show no evidence of use. Only those bifaces exhibiting some form of attrition are classified as tools.

A sample of obsidian artifacts will be submitted to the Northwest Research Obsidian Studies Laboratory for obsidian sourcing and hydration dates.

Ground Stone Artifacts

Ground stone encountered will be collected and bagged. Once in the laboratory, the ground stone artifacts will be examined and their attributes recorded. Because of the possibilities of obtaining pollen and traces of various residues (proteins, stable isotopes, etc.) the artifacts, particularly the use surfaces, will not be cleaned. Attributes that will be recorded for each piece of ground stone will include material type, color, manufacturing technique (if any), condition, number of use surfaces, size of use surfaces (length, width, and where applicable, depth), attrition of use surfaces (polish, pecking, battering, striations), general cross-section, function, and size (length, width, and thickness).

Ceramics Artifacts

Information collected from ceramic artifacts includes a variety of data that, with additional statistical manipulation, should allow for the hypotheses proposed herein to be addressed. Data

collected from sherds will include pottery type, temper, vessel construction, finishing technique, surface manipulation, colors, vessel form, rim diameter (for rim sherds), hardness, firing atmosphere, and weight of all ceramics of a particular type per grid unit. Additionally, a sample of ceramic sherds will be submitted to the University of Washington Luminescence Dating Laboratory for luminescence dating.

Faunal Remains

Despite the lack of remains encountered during the cultural resource inventory at these sites, it is assumed that more rigorous field investigation may result in the identification of faunal remains. As such, the following laboratory analysis program is designed to collect the data necessary to address the hypotheses proposed in this research design.

First, the bone materials will be lightly cleaned by brush to remove detritus that may obscure potentially diagnostic characteristics that may aid in the determination of genus or species. After cleaning, all bone elements will be examined and recorded by laboratory personnel. More specifically, attributes that will be recorded for each element include the most specific taxon possible, the element present, the side of the element, the portion of the element present, its apparent age, evidence of cultural and natural impacts to the element, and any additional comments deemed necessary.

Ancillary Studies

Various samples of artifacts, soils, and organics, will be sent to outside labs for analysis. Samples of charred wood will be sent to Beta Analytical for ^{14}C dating. Soil samples will be sent to Paleo Research Institute for pollen identification and counts and macrofossils. A selection of stone tools will also be sent to Paleo Research Institute for protein residue analysis. If needed, pollen washes from groundstone will also be sent there. As mentioned above, at this phase of the project an attempt will be made to identify an appropriate location for the possible placement of a pollen core sample and a sub-contractor to collect the core and conduct the analysis.

ANALYSIS

Descriptive Analysis of Artifact Classes

Data collected from each artifact sub-assemblage (lithics, ceramics, faunal materials, etc.) will be subjected to a descriptive statistical analysis to define its basic parameters. The descriptive analysis will consist of determining counts and percentages of various artifact types, among type variability, and general descriptions. Of course, each class of artifacts has unique characteristics that require additional analysis. The results of the descriptive analysis will be examined in regards to the hypotheses proposed in this research design, as well as any other patterning evident.

Historic Artifact Analysis

In order to address the specific research questions, it is necessary to collect qualitative and quantitative data on the artifacts comprising the trash dumps and to organize this data by means of a method that allows a standardized procedure for both characterizing and establishing a context of association with a period, property and event.

There are three basic kinds of data that can be derived from an analysis of historic artifacts. They are:

1. Maker marks and trademarks
2. The technology of the artifact
3. Aspects of local and national history

Williams and Higgs (1998, Appendix 2) have conveniently summarized the information that historic artifacts provide:

> **Maker marks** inform us about an artifact's manufacturer, while **trademarks** usually describe the contents of a container or the technology of manufacture. Both types of marks provide information on function, and date and city of manufacture. While some companies registered formal trade marks, others served as internal identifications (production plant codes, dates of manufacture, or unique company marks) or as advertising. The **technology of the artifact** can also provide clues about date and place of manufacture. Artifacts often reflect **local and national history** and governmental regulations, including local place or store names, events affecting industry, or laws regulating use or labeling.

By classifying the artifacts that comprise a historic trash dump or scatter in a standardized manner, basic information about date and place of manufacture is obtained, facilitating further analysis. Furthermore, a means of establishing association with a parent structure is obtained based on any temporal, functional and also spatial affiliation. In this instance, the scatters are characterized by functional and temporal diversity, and a spatial proximity to the town site. Therefore, it is most likely that they represent community-level discard expected for a landfill or dump site.

According to Sprague (1980: 252), "function is the highest and most productive basis for site analysis." With this in mind, Sprague (1980) developed an artifact typology that has been widely employed in the artifact classification of western U.S. historic sites. Within this typology, artifacts are assigned to one of eight major classes of items: Personal Items; Domestic Items; Architectural Items; Transportation-related Items; Commerce and Industry-related Items; Group Services; Group Ritual Items; and Unknown/Unclassified.

Once the individual artifacts have been ascribed a functional and/or temporal affiliation, the data is then analyzed to determine how the assemblage of items relate to one another, that is, moving from an individual artifact typology to an assemblage characterization. As Gould (1998) states: "Since the Sprague scheme is originally centered upon a notion of a single artifact's functional attributes, it does make sense that when considered at the assemblage level, aggregated activities are identified."

The premise here is that similarities and differences in behavior, spatial configuration and/or temporal affinity results in corresponding similarities or difference in the frequencies of classified items. Therefore, one is essentially linking particular configurations of artifacts with particular aspects of behavior that are, in turn, determined by particular cultural or social influences.

REPORTING RESULTS AND DISSEMINATION

A draft report detailing the project, the analyses, and conclusions will be submitted to Utah Divison of Oil, Gas, and Mining (DOGM) for review. Upon receiving review and comments from DOGM, a final report will be prepared incorporating any changes. A final document will be produced and submitted to DOGM and the State Historic Preservation Office.

Prior to excavation, the local chapters of the Utah Statewide Archaeological Society will be invited to visit the excavations in an open house setting. Additionally, the local press will be contacted.

CURATION

All archival and prehistoric cultural materials collected or produced during the project's data recovery program will be submitted to the Utah Museum of Natural History, University of Utah, Salt Lake City, Utah. The Utah Museum of Natural History does not accept historic cultural materials for curation. Therefore, a detailed field analysis will be conducted for historic period artifacts. All data collected during in-field historic artifact analysis and associated field notes will be submitted for curation with all other archival materials associated with this project.

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1991 Testing and Evaluation of Selected Prehistoric and Historic Sites: UDOT Interstate 15 Middleton to Snowfield Interchange, Washington County, Utah. Abajo Archaeology, Bluff.

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1987 Green Spring: An Anasazi and Southern Paiute Encampment in the St. George Basin of Utah. *Bureau of Land Management-Utah Cultural Resource Series Number* 21.

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APPENDIX A:
Curriculum Vitae for Key Personnel

NAME: Keith R. Montgomery

ADDRESS: P.O. Box 219
Moab, Utah 84532
(435) 259-5764
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EDUCATION: 1974 A.A. Edmonds Community College
1976 B.A. Western Washington University (Anthropology)
1979 M.A. Western Washington University (Archaeology/Anthropology)

PROFESSIONAL ORGANIZATIONS: Utah Professional Archaeological Council
Society for American Archaeology

PROFESSIONAL EXPERIENCE:

1996 - Present Principal Investigator, Montgomery Archaeological Consultants, Moab, Utah.
In charge of writing technical proposals, and initiating and directing all cultural resource projects. Responsible for ensuring that all projects conducted by the company meet required standards for compliance with federal and state legislature pertaining to cultural resources. To date, he has directed over 500 projects to completion on state, federal, and private lands.

1983-1996 Consulting Project Archaeologist, Sagebrush Archaeological Consultants, Ogden, Utah. Permitted under Sagebrush to conduct cultural resource investigations (survey, testing, and excavation) on federal and state lands in the Great Basin (Utah and Nevada) and Colorado Plateau (Utah, Colorado, and Arizona). Responsible for project planning and coordination, supervision of field crews, site recordation, NRHP assessments, data analysis, and report preparation.

1984-1996 Consulting Project Archaeologist, Abajo Archaeology, Bluff, Utah.
Permitted under Abajo to perform cultural resource investigations (survey, testing, excavation) on federal and state lands in the Utah, western Colorado, and northern Arizona). Responsible for project planning and coordination, technical proposals, supervision of field crews, site recordation and NRHP assessments, data analysis, and report preparation.

1981-1983 Staff Archaeologist. Archeological Environmental Research.
Corporation (AERC) Bountiful, Utah. Permitted (federal and state) to supervise cultural resource investigations (survey and excavation) in the Great Basin and Colorado Plateau (Fremont and Anasazi) geographical/cultural areas.

Selected Projects with Technical Reports and Publications:

Montgomery, K.
2005 Cultural Resource Inventory of EOG Resources, Inc.'s Five Proposed Wells: CWU #662-6, CWU #663-6, and East Chapita #1-5, #2-5, and #5-5 in Uintah County, Utah

Montgomery, K.
2004 Cultural Resource Inventory of Bill Barrett Corporation's Proposed Tumbleweed Units #14-17-15-21, #16-17-15-21, #9-18-15-21 and #1-19-15-21 Well Locations, Uintah County, Utah.

Montgomery, K.R., and D.L. Shank
2004 Cultural Resource Inventory for Utah Department of Transportation's SR 56 Bridge (Structure OC -307) Rehabilitation Project, East of Modena, Iron County, Utah.

Montgomery, K., and S. Kinnear-Ferris
2004 Cultural Resource Survey of Bill Barrett Corporation's Cedar Camp3D Seismic Project, Uintah and Grand Counties, Utah.

Elkins, M., and K. Montgomery
2004 Cultural Resource Block Inventory of Ute Tribal Lands in Sections 19, 30, and 31 of T5S R5W for UTE FNR LLC, Duchesne County, Utah.

Mrstik, J., and K. Montgomery
2004 Cultural Resource Inventory of Division of Wildlife Resources Consumers Road Parcels, Carbon County, Utah.

Whitefield, A., and K. Montgomery
2004 Cultural and Fossil Resource Inventory Along US Highway 89 and State Route 14 Near Long Valley Junction, Kane County, Utah. STP-0089(86)104.

Elkins, M. and K.R. Montgomery
2003 Cultural Resource Inventory For the Utah Department of Transportation's US 6 Helper Interchange, Carbon County, Utah. Report No. U-03-MQ-0320s.

2003 Class 1 Existing Data Review of Encana Oil and Gas Corporation's Proposed Oil and Gas Development Area in the Kennedy Wash Region of Uintah County, Utah. Report No. U-03-MQ-752b,s,p.

Montgomery, J.A. and K.R. Montgomery
2003 Utah Department of Transportation's State Route 10 Muddy Creek Bridge Replacement Cultural Resource Inventory, Emery County, Utah.

Elkins, M. and K.R. Montgomery
2002 Cultural Resource Inventory of UP&L Pacificorp Camp Williams To Four Corners 345kv Power Line, San Juan County, Utah.

Elkins, M. and K.R. Montgomery
2002 Cultural Resource Inventory of Seven Seismic Lines for the Veritas Uintah Seismic Project, Uintah County, Utah.

2002 Cultural Resource Inventory of the Emery Telecom's Fiber Optic Line Between the Towns of Price and Helper, Carbon County, Utah.

Kinnear-Ferris, S. and K.R. Montgomery
2002 Cultural Resource and Fossil Inventory of Utah Department of Transportation's SR-95 Westwater

Canyon Realignment, San Juan County, Utah.

Montgomery, J. and K.R. Montgomery
2002 Utah Department of Transportation's State Route 10 Muddy Creek Bridge Replacement Cultural Resource Inventory, Emery County, Utah.

Montgomery, K.R. and S. Ball
2002 Cultural Resource Inventory of Inland Resources' 760-Acre Parcel in Township 8S, Range 16E, Section 24 and Township 8S, Range 17E, Section 19, Duchesne County, Utah.

Raney, A. and K.R. Montgomery
2002 Cultural Resource Inventory of the Dixie Escalante 138kV Power Line Project, Washington County, Utah.

Montgomery, K.R.
2001 Cultural Resource Inventories of 400 Acres in the Wells Draw and Pariette Bench Localities for Inland Production Company, Duchesne County, Utah. Montgomery Archaeological Consultants.

2001 Cultural Resource Inventories of 20 Well Locations, Access and Pipeline Routes in the Wonsits Valley Oil and Gas Field, Uintah County, Utah. For Shenandoah Energy, Inc. Montgomery Archaeological Consultants.

Montgomery, K.R. and S. Ball
2001 Cultural Resource Inventory of the Moore Road (County Road 1612) Emery County, Utah. Preapred for the Utah Department of Transporation under contract with JBR Environmental Consultants. Montgomery Archaeological Consultants.

2001 Cultural Resource Inventory of the Garkane Powerline Between Mount Carmel Junction and Zion National Park, Kane County, Utah. Montgomery Archaeological Consultants.

Montgomery, J.A. and K.R. Montgomery
2001 Cultural Resource Inventory of Bonnevilee Fuels Corporation's Willow Creek Pipeline, Uintah County, Utah. Montgomery Archaeological Consultants.

Elkins, M. and K.R. Montgomery
2001 Cultural Resource Inventory of Citizen Communications' Fiber Optic Line Along SR 174, Millard County, Utah. Montgomery Archaeological Consultants.

Elkins, M. and K.R. Montgomery
2001 Cultural Resource Inventory for the Utah Department of Transportation's US 89 Intersection Improvement Near Big Water, Kane County, Utah. Montgomery Archaeological Consultants.

Patterson, J.J. and K.R. Montgomery
2001 Cultural Resource Inventory of the Quitchupah Coal Haul Road, Emery and Sevier Counties, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R.
2000 Archaeological Data Recovery at a Prehistoric Quarry (Site 5RB790/42Un1669) In Hells Hole Canyon, Rio blanco County, Colorado. Montgomery Archaeological Consultants.

Montgomery, K.R. and S. Ball
2000 Cultural Resource Inventory of Marathon Oil Company's 2000 Drilling Program in Castle Valley, Carbon County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R. and J.A. Montgomery

2000 Utah Department of Transportation's Interstate 70 to Price State Route 10 Passing Lanes Cultural Resource Inventory, Emery and Carbon Counties, Utah. Montgomery Archaeological Consultants.

2000 Cultural Resource Inventory and Evaluative Testing of Utah Department of Transportation's U.S. 191 White Mesa Amended Right-of-Way Access Project, San Juan County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R.
1999 Cultural Resource Inventory of the Plateau's Willow Creek Mine Pipeline Gathering System, Carbon County, Utah. Montgomery Archaeological Consultants.

1999 Cultural Resource Inventory of Coastal Oil and Gas Corporation's Ten Well Locations in the Park Mountain Area, Rio Blanco County, Colorado. Montgomery Archaeological Consultants.

Montgomery, K.R. and J.A. Montgomery
1999 Cultural Resource Inventory Along Salina's Main and State Streets, Sevier County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R., J.A. Montgomery, and S.Kinnear-Ferris
1999 Cultural Resource Inventory of the Emery Telephone Fiber Optic Line Ferron to Emery, Emery County, Utah. Montgomery Archaeological Consultants.

Montgomery, J.A., and K.R. Montgomery
1999 Eligibility Testing at Site 42Cb1302, Carbon County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R.
1998 Cultural Resource Inventories of Coastal Oil and Gas Corporation's Douglas Creek Unit Wells #67, #69, and #70, Rio Blanco, Colorado. Montgomery Archaeological Consultants.

Montgomery, K.R.
1998 Data Recovery at Site 42Em2423.1 for the Proposed Cottonwood Creek Water Treatment Plant in Emery County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R., and J.A. Montgomery
1998 Cultural Resource Inventory of the Bryce Canyon Foster's Development Parcel, Garfield County, Utah. Montgomery Archaeological Consultants.

1998 Cultural Resource Investigations of the Joe Wilson Canyon Pipeline, San Juan County, Utah. Montgomery Archaeological Consultants.

1998 Cultural Resource Inventory of the Goblin Valley Materials Pit, Emery County, Utah. Montgomery Archaeological Consultants.

Montgomery, J.A.., and K.R. Montgomery
1998 Cultural Resource Inventory of the Jack Spring Water Line Project, San Juan County, Utah. Montgomery Archaeological Consultants.

1998 Cultural Resource Inventory of the Wellington Canal Irrigation and Water Conservation Project, Carbon County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R., and J.A. Montgomery
1997 Cultural Resource Inventory and Site Testing of the Cottonwood Creek Water Project, Emery County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R., and J.A. Montgomery

1997 Cultural Resource Inventory and Evaluative testing for the Wilson Arch Power Line Project, San Juan County, Utah. Montgomery Archaeological Consultants.

1997 Cultural Resource Inventory of the Emery Telephone Company's Green River to Crescent Junction Fiber Optic Line, Grand County, Utah. Montgomery Archaeological Consultants.

1997 Cultural Resource Inventory of the Moab Airport to Crescent Junction Fiber Optic Line, Grand County, Utah. Montgomery Archaeological Consultants.

Montgomery, K.R., and J.A. Montgomery
1996 Cultural and Paleontological Resource Inventory of Utah Department of Transportation's U.S. 191 Lane Addition and Drainage Easement for the Kane Springs Wash Bridge Replacement Project, San Juan County, Utah. Abajo Archaeology.

1996 Cultural Resource Inventory and Evaluation of Utah Department of Transportation's Mormon Tank Wash Bridge Replacement Project Along U.S. 191, San Juan County, Utah. Abajo Archaeology.

Montgomery, K.R.
1996 Evaluative Testing of Site 42Gr2556 along Tusher Canyon Road (CR126), Grand County, Utah. Abajo Archaeology.

W.E. Davis and K.R. Montgomery.
1996 Site 42Sa22396: A Prehistoric Hoe Procurement Site on Big Bench, Southern San Juan County, Utah. Utah Archaeology 1996.

Montgomery, K.R., and J.A. Montgomery
1995 Cultural Resource Inventory of Pacificorp/Utah Power's Proposed 345 kV Transmission Line Green River to Grand Junction Section, Grand County, Utah and Mesa County, Colorado. Volumes I and II. Abajo Archaeology.

Montgomery, K.R.
1995 Cultural Resource Inventory and Evaluative Testing for Utah Department of Transportation's State Route 18: St. George to Snow Canyon, Washington County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1994 Cultural Resource Inventory and Evaluation of Utah Department of Transportation's Mormon Tank Wash Bridge Replacement Project along U.S. 191, San Juan County, Utah. Abajo Archaeology.

1994 Cultural Resource Inventory and Historical Reconnaissance Survey for Utah Department of Transportation's SR-260, Sevier County, Utah. Abajo Archaeology.

Montgomery, K.R.
1994 Cultural Resource Inventory of Utah Departments of Transportation's La Sal Junction road improvement project along U.S. 191 and SR-46, San Juan Co., Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1993 Utah Department of Transportation's State Route 31 Huntington Canyon Project: Archaeological Excavations at Site 42Em2109 and 42Em2095, Emery County, Utah. Abajo Archaeology.

Montgomery, K.R.
1993 Cultural Resource Inventory and Site Testing for White Mesa Sanitary Landfill in San Juan County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1992 Cultural Resource Inventory and Evaluation of the Utah Department of Transportation's State Route

14 Corridor between Mileposts 0.6 and 8.5, Iron County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1992 Cultural Resource Inventory and Evaluation of Garfield County's Johns Valley Road Improvement Project, State Road 22 Survey Corridor between Mileposts 12.00 and 16.58, Garfield County, Utah. Abajo Archaeology.

Montgomery, K.R.
1992 Cultural Resource Inventories of Utah Department of Transportation's Circleville to Junction State Route 89 and State Route 62 Project Areas, Piute County, Utah. Abajo Archaeology.

Montgomery, K.R.
1990 Cultural Resource Survey of a Gold Mine Near Soup Rock, San Juan County, Utah. Sagebrush Archaeological Consultants.

1989 Cultural Resource Inventory of the Proposed Utah Department of Transportation`s Dubinkey Road Materials Pit, Grand County, Utah. Abajo Archaeology.

Montgomery, K.R.
1989 Cultural Resource Inventories and Evaluations of the Utah Department of Transportation`s Information/View Localities along State Route 313, Grand County, Utah. Abajo Archaeology.

1988 Cultural Resource Inventory of the Proposed Utah Department of Transportation's Sagebrush Bench Materials Pit, Emery County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1988 The Archaeology of the Recapture Dam Pipeline Project, Phase I, San Juan County, Utah. Abajo Archaeology.

1988 Archaeological Testing for Utah Department of Transportation at Site 42Em1876: Interstate Highway 70, Castle Valley to Beyond Muddy Creek Segment, Emery County, Utah. Abajo Archaeology.

1988 Archaeological Testing at Sites 42Sa10636, 42Sa18241 and 42Sa20040 Along U.S. Highway 191, Grand and San Juan Counties, Utah. Abajo Archaeology.

Montgomery, K.R.
1987 Cultural Resource Inventory of the Utah Department of Transportation's Ferron Creek Bridge and Highway Improvement Project in Emery County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1987 Cultural Resource Inventory of the State of Utah's Horse Pasture No. 2 Chaining Program, Grand County, Utah. Abajo Archaeology.

Montgomery, K.R.
1986 Intensive Cultural Resource Inventory of the Proposed Utah Department of Transportation Cat Canyon Materials Pit, Carbon County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1986 Cultural Resource Inventory and Avoidance Recommendations for the Alkali Road Improvement Project, San Juan County, Utah. Abajo Archaeology.

Montgomery, K.R., and J.A. Montgomery
1985 Cultural Resource Inventory and Avoidance on Seven Seismographic Transects for Champlin Petroleum, Alkali Prospect, San Juan County, Utah. Abajo Archaeology.

Montgomery, K.R.
1983 Cultural Resource Survey of Five Seismic Lines in San Juan County, Utah. Environment Consultants Inc., Dallas, Texas.

Montgomery, J.A., K.R. Montgomery, D.Weder, and F.R. Hauck
1982 Archaeological Investigations in the Ten Mile Potash Project Area in Grand County, Utah. AERC Paper No. 35, Archaeological Environmental Research Corporation, Salt Lake City.

Montgomery, K.R.
1981 Archaeological Reconnaissance of Seismic Corridors and Access Roads in the Cottonwood Canyon, Tank Mesa, Montezuma Canyon, Cedar Peak, and Little Ruin Canyon Localities of San Juan County, Utah. Archeological Environmental Research Corporation.

Montgomery, K.R.
1979 Prehistoric Settlements of Sumas Valley, Washington. Masters's Thesis, Department of Anthropology, Western Washington University.

Montgomery, K.R.
1978 "A Preliminary Report of Archaeological Research of the Sumas Area." Paper Presented to the 31st Annual Northwest Anthropological Conference.

Patricia M. Stavish
Curriculum Vitae 2007

EDUCATION:

2003-2005 Masters of Science in Anthropology with a focus in Archaeology, Dec. 2005
University of Wisconsin-Milwaukee, Milwaukee, WI. Thesis: Women and Children First: The Distribution of Grave Goods at the La Tene cemetery Munsingen-Rain.

1998-2002 Bachelor of Arts Degree with a major in Anthropology.
University of Minnesota-Twin Cities, Minneapolis, MN.

PROFESSIONAL ORGANIZATIONS:

Archaeological Institute of America (AIA)
Society for American Archaeology (SAA)

PROFESSIONAL EXPERIENCE:

April-Sept 2005
Feb 2006 to Present Staff Archaeologist, Montgomery Archaeological Consultants, Moab, Utah. Responsibilities include fieldwork (survey and mitigation); documentation of cultural resources; site eligibility assessments; laboratory analysis of artifacts technical and research design reports. Skilled in a number of software packages including Microsoft Word, Excel, GPS Pathfinder and ArcView; and is proficient with the use of GPS units and related software (e.g. Trimble GeoExplorer II and III).

2004 Archaeological Crew Member, Bad Duermberg, Hallein, Austria. Excavation of Iron Age settlement. Tasks included retrieval of artifacts and identification of settlement features; use of total station and theodolite to record artifacts and; laboratory analysis.

2002-2004 Archaeological Field Technician: Foth and Van Dyke, Eagan, MN. Phase I, II and III archaeological survey and excavation in Minnesota and Iowa. Operation of archaeological and survey equipment.

2000 Archaeological Assistant. Minnesota Historical Society, St. Paul, MN. Excavation of the Mill City ruins (historical urban site). Collection and documentation of archaeological data; creation of scaled drawings of historic structures; operation of survey and GPS equipment.

2000 University of Minnesota-Twin Cities Field School. Excavation of historical fur trading site in Mendota, Minnesota. Skills acquired: survey methods, site mapping, excavation of test units, mapping unit floors, profiles and features.

Utah Fieldwork (Montgomery Archaeological Consultants)

2005 Archaeological Technician. Cultural Resource Inventory of Alton Coal Development, Kane County, Utah (2 months). Cultural Area: Anasazi

2005 Archaeological Technician. HDR Engineers Central Railroad Project, Sevier County, Utah (2 weeks). Cultural Area: Great Basin

2005 Archaeological Technician. Utah Department of Transportation's Data Recovery at Sites 42Sa25619, 42Sa25664, and 42Sa25664, San Juan County, Utah (1 month). Cultural Area: Anasazi

2005 Archaeological Technician. Cultural Resource Inventory of Bill Barrett Corporation's Seismic Project Near Pine Ridge, San Juan County, Utah. (1.5 months). Cultural Area: Anasazi

2005 Archaeological Technician. Cultural Resource Inventory for the Santa Clara River Bridge on Shivwits Tribal Land, Washington County, Utah (2 weeks). Cultural Area: Anasazi

2005 Archaeological Technician. Cultural Resource Inventory of 13 EOG Resources well locations, Uintah County, Utah (1 week). Cultural Area: Great Basin

2005 Archaeological Technician. Cultural Resource Inventory of 5 EOG Resources well locations, Uintah County, Utah (3 days). Cultural Area: Great Basin

2005 Archaeological Technician. Cultural Resource Inventory of Veritas Geophysical Integrity's Seep Ridge 3D seismic prospect, Uintah County, Utah (3 weeks). Cultural Area: Great Basin.

2006 Archaeological Technician. Cultural Resource Inventory of Consol Coal's Hidden Valley development parcels, Emery County, Utah (1 week). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Delta Petroleum's three well locations, Grand County, Utah (1 week). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Tidewater's four well locations, Grand County, Utah (1 week). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of the Adam's mineral claims, Grand County, Utah (2 weeks). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee's Ouray compressor to Bridge station pipeline, Uintah County, Utah (5 days). Cultural Area: Great Basin.

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee's proposed State 921-33M well location, Uintah County, Utah (4 days). Cultural Area: Great Basin.

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee's proposed State 921-33M well location, Uintah County, Utah (4 days). Cultural Area: Great Basin.

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee's proposed State 1021-36L well location, Uintah County, Utah (4 days). Cultural Area: Great Basin.

Utah Fieldwork (Montgomery Archaeological Consultants)

2006 Archaeological Technician. Cultural Resource Inventory of EOG Resources well Locations North Duck Creek 320-27, 321-27, 322-27, 323-27, 324-27, 318-33, 319-33 on Ute Tribal Lands, Uintah County, Utah (1 week). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee NBU 1021-10P well location, Uintah County, Utah (5 days). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Kerr-McKee NBU 1021-7B well location, Uintah County, Utah (5 days). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Enduring Resources'10 Southam Canyon well locations, Uintah Co., Utah (1 week). Cultural Area: Great Basin

2006 Archaeological Technician. Cultural Resource Inventory of Questar E & P 13 well locations in the Wonsits Valley on Ute Tribal Lands, Uintah Co. Utah (1 week). Cultural Area: Great Basin.

2006 Archaeological Technician. Cultural and Fossil Inventory of Utah Department of Transportation's Hurricane State Route 9 / 600 North Project NH-0009(11)10E, Washington Co., Utah (2 weeks). Cultural Area: Anasazi

2006 Archaeological Technician. Additional Cultural Resource Inventory for the Southern Corridor Project, Phase I, Interstate 15 to River Road. Addendum to: Cultural and Fossil Inventory of Utah Department of Transportation's Southern Corridor Project, Washington Co., Utah (1 week). Cultural Area: Anasazi

2006 Archaeological Technician. Cultural and Fossil Resource Inventory for Utah Department of Transportation's US-89 Kanab to Kanab Creek Bridge Project, Kane Co., Utah (4 weeks). Cultural Area: Anasazi

2006 Archaeological Technician. Cultural and Fossil Resource Inventory for Utah Department of Transportation's SR-11 Ranchos Road to Landfill Road Project, Kane Co., Utah (2 days). Cultural Area: Anasazi

2007 Archaeological Technician. Data Recovery and Monitoring for Sites 42Sa20727, 42Sa21484, 42Sa21485, 42Sa24113, and 42Sa24114, San Juan Co, Utah. Utah Department of Transportation's US 191 Blanding to Moab Passing Lanes Improvement Project. (5 weeks). Cultural Area: Anasazi

LABORATORY WORK

2004 Lab Volunteer. Old World section in the Archaeology laboratory at the University of Wisconsin-Milwaukee. Digitizing field drawing from excavations in Germany.

2002-2003
Archaeological Lab Technician. Forth and Van Dyke, Eagan MN. Washed and cataloged artifacts, including both prehistoric and historical remains from surveys and excavations.

TEACHING EXPERIENCE

Fall 2005 Teaching Assistant. Introduction of Anthropological Statistics, University of Wisconsin-Milwaukee.

Spring 2005 Teaching Assistant. Introduction of Cultural Anthropology, University of Wisconsin-Milwaukee.

Fall 2004 Teaching Assistant. Introduction of Anthropological Statistics, University of Wisconsin-Milwaukee.

RESEARCH EXPERIENCE

2004 Part of a graduate student team involved in digitizing excavation drawings from the UWM "Landscape of Ancestors" project in Germany (http://www.uwm.ed/~barnold/arch/). Mortuary contexts, including burials, from two early Iron Age mounds digitized using Canvas software.

2002 Research assistant to Professor Greg Laden, Dept. Of Anthropology; University of Minnesota-Twin Cities, Minneapolis, MN. Library research on various topics of Biological Anthropology and Archaeology.

2001-2002
Research Assistant to Professor Robert Blanchette, Department of Plant Pathology; University of Minnesota-Twin Cities, Minneapolis, MN. Identification of archaeological wood samples using light microscope and digital imaging equipment.

PRESENTATIONS

December
2005 American Anthropological Association: 104th Annual Meeting, Washington, DC. Session: Materialization of Social Identity. Presentation of paper "Women and Children First: An Analysis of Grave Goods and Gender in the Iron Age Cemetery at Munsingen-Rain."

November
2004 Chacmool Gender Conference: Qu(e)erring Archaeology, Calgary, Alberta, Canada Session: Expressions of Gender Identity in Mortuary Context. Presentation of paper "Women and Children First: The Distribution of Grave Goods at the La Tene cemetery Munsingen-Rain."

TECHNICAL PUBLICATIONS (Montgomery Archaeological Consultants)

Stavish, P. and K. Montgomery

2005 Cultural Resource Inventory of EOG Resources' Proposed 3 CWU Wells: #684-1, #677-6, and #680-6 in Uintah County, Utah. Project No. U-05-MQ-0783b.

Cultural Resource Inventory of EOG Resources' Proposed 4 CWU Wells: #1039-18, #1034-19, #1035-19 and #692-20 in Uintah County, Utah. Project No. U-05-MQ-0780b.

Cultural Resource Inventory of EOG Resources' Proposed 5 Chapita Wells Units in Sections 29 and 30 of Township 9 South, Range 23 East in Uintah County, Utah. Project No. U-05-MQ-0781b.

Cultural Resource Inventory of EOG Resources' Proposed 4 CWU Wells: #1039-18, #1034-19, #1035-19 and #692-20 in Uintah County, Utah. Project No. U-05-MQ-0780b.

Cultural Resource Inventory of EOG Resources' Proposed 2 East Chapita Wells Units in Section 5 of Township 9 South, Range 23 East in Uintah County, Utah. Project No. U-05-MQ-0779b.

Cultural Resource Inventory of EOG Resources, Inc.'s Proposed Chapita Wells Unit #1065-3 (Previous #597-3), #1066-3 (Previous #543-3), and #1067-3 (Previous #542-3) in Uintah County, Utah. Project No. U-05-MQ-0778b.

Cultural Resource Inventory of EOG Resources, Inc.'s Proposed Chapita Wells Unit #1041-22 (Previous #237-22) and #1042-28 (Previous #401-28F) in Uintah County, Utah. Project No. U-05-MQ-0777b.

Cultural Resource Inventory of EOG Resources, Inc.'s Proposed Chapita Wells Unit #1036-13 (Previous #236-13), #1037-13 (Previous #338-13), and #1038-24 (Previous #328-24F) in Uintah County, Utah. Project No. U-05-MQ-0776b.

Cultural Resource Inventory of Westport Oil & Gas NBU #922-34 D, K, M and 0 Well Locations, Uintah County, Utah. Project No. U-05-MQ-0782b.

Cultural Resource Inventory of EOG Resources, Inc.'s 13 Proposed Well Locations: North Chapita #225-33, #284-6, #287-5, Stagecoach #97-8, #98-8, #99-8, #100-8, #106-8, #107-8, #108-8, CWU #982-9, #983-9, #985-9 in Uintah County, Utah. Project No. U-05-MQ-0795i.

Cultural Resource Monitoring of Westport Resources Pipeline Corridor, Carbon County, Utah. Montgomery Archaeological Consultants, Moab, Utah. BLM, Vernal Field Office. Permit No. U-05-MQ-041lb Part 2 of 2.

Cultural Resource Inventory of Portions of the Grey Wolf Parcel for the State of Utah, Division of Wildlife Resources, Duchesne County, Utah. Project No. U-05-MQ-0802s.

Cultural Resource Inventory of EOG Resources, Inc.'s Proposed Stagecoach Wells #109-7, #104-17, #80-20 and CWU #1016-16, Uintah County, Utah. Project No. U-05-MQ-0786i.

Stavish, P.
2006 Cultural Resource Inventory of Newfield Exploration's 40 Acre Parcel in Township 9S, Range 16E, Section 15, Duchesne, Utah. Project No. U-06-MQ-0349b,s.

Cultural Resource Inventory of Kerr-McGee Oil & Gas Onshore LP'S Proposed Ouray Compressor to Bridge Station Pipeline and Power Line in Uintah County, Utah. Project No. Project No. U-06-MQ-0348i.

Cultural Resource Inventory of Kerr-McGee Oil & Gas Onshore LP's Proposed State #921-33M Well Location, Uintah County, Utah. Project No. U-06-MQ-488s.

Cultural Resource Inventory of Kerr-McGee Oil & Gas Onshore LP's Proposed Well Locations State #1021-36L and #1021-36M Uintah County, Utah. Project No. Project No. U-06-MQ-0325b,s.

Cultural Resource Inventory of EOG Resources Inc.'s Proposed Well Locations North Duck Creek 320-27, 321-27, 322-27, 323-27, 324-27, 318-33, 319-33 on Ute Tribal Lands, Uintah County, Utah. Project No. U-06-MQ-0324i.

Cultural Resource Inventory of the Delta Petroleum Corporation Energy's Proposed Greentown Federal #33-12 and #35-12 Well Locations, Grand County, Utah. Project No. U-06-MQ-0288b.

Cultural Resource Inventory of Alton Coal Development's Sink Valley-Alton Amphitheater Project Area, Kane County, Utah. Project No. U-05-MQ-0346b,p.

Cultural and Fossil Inventory of Utah Department of Transportation's Hurricane State Route 9 / 600 North Project NH-0009(11)10E, Washington Co., Utah. Report No. U-06-MQ-1443b,p.

Additional Cultural Resource Inventory for the Southern Corridor Project, Phase I, Interstate 15 to River Road. Addendum to: Cultural and Fossil Inventory of Utah Department of Transportation's Southern Corridor Project, Washington Co., Utah. Report No. U-06-MQ-0946s.

Cultural and Fossil Resource Inventory for Utah Department of Transportation's US-89 Kanab to Kanab Creek Bridge Project, Kane Co., Utah. Report No. U-06-MQ-1700b,p,s.

Cultural and Fossil Resource Inventory for Utah Department of Transportation's SR-11 Ranchos Road to Landfill Road Project, Kane Co., Utah. Report No. U-06-MQ-1701p.

Stavish, P.
2007 Cultural Resource Inventory of Alton Coal Development's Project Area, Kane County, Utah. Report No. U-05-MQ-1568b,p.

APPENDIX B
Level and Artifact Recording Forms

MONTGOMERY ARCHAEOLOGICAL CONSULTANTS TESTING FORM

PROJECT:
EXCAVATORS:
TEST UNIT NUMBER:
Unit Size:

SITE:
DATE:
Screen mesh size:
Unit Orientation:
Datum Corner:

Unit Description: _____

General Surface Planview:

North

Is the depth below datum or MGS?
Level Number (Depth)/Description: _____

Level Number (Depth)/Description: _____

Lithic Analysis Form

Site:_____ AU#_____ Analyst:_____ Date: _____Page ___ of

Cat.	Grid	Sec	Layer	Level	Mat.	Color	% Cortex	Cortex Type	Platform	Cond.	HT	Use	mm of Use	# Dors. Scars	Tech. Type	tFunc. Type	Size Class

Ground Stone Analysis Form

Site:_____ AU#: _____ Analyst:_____ Date:_____

Page__ of__

Cat #	Prov.	Mat.	Color	Manufacture	# Use Surface	Size of surface	Attrition	X-section	Function	Size

Ceramic Analysis Form

Site:_____ AU#: _____ Analyst:_____ Date:_____

Page__ of __

Cat .#	Prov.	Type	Color	Finish	Hardness	Form	Rim Dia.	# of Sherds	Weight	Comments

Faunal Analysis Form

Site:_____ AU#: _____ Analyst:_____ Date:_____
Page__ of __

Cat #	Prov.	Taxon	Element	Side	Portion	Sex	Age	C-Forms	N-Forms	Comment

CULTURAL RESOURCE MANAGEMENT PLAN FOR ALTON COAL DEVELOPMENT'S PROPOSED DEVELOPMENT OF THE ALTON AMPHITHEATER AND SINK VALLEY, KANE COUNTY, UTAH

DRAFT 2

Patricia Stavish