INTRODUCTION AND PROJECT DESCRIPTION

Armstrong Energy Corporation, proposes to construct the Liza Jane Federal #1 well pad and access road in Township 5 South (T5S) Range 34 East (R34E) Section 19 S1/2, Roosevelt County, New Mexico. A previous proposed project area was surveyed and reported recently by Galassini and Broxson (2017, NMCRIS 137529). The proposed project area was moved for reasons unrelated to cultural resources, and a new cultural resource survey was required for the revised location.

The proposed pad measures 270 ft north-south by 300 ft east-west. According to the Bureau of Land Management (BLM), Roswell Field Office (RFO), the Area of Potential Effect (APE) for the pad is 400 ft by 400 ft, or 3.67 ac. The proposed road measures 3,546 ft long. The proposed easement is 30 ft wide, comprising 2.44 ac. The combined APE is 8.95 ac.

After consultation with BLM archaeologist C. Carlson on 16 March, 2017, a cultural resource survey was conducted. The surveyed space includes three components: (1) a 600-ft by 600-ft (8.26 ac) block area around the well pad, (2) a 200-ft by 400-ft (1.84 ac) block area around the point where the proposed road intersects the existing road, and (3) a linear survey along 3,176 ft of the proposed road that falls outside the survey blocks. This staked line was surveyed in three 15-m (50-ft) transects, comprising 10.94 ac. The total surveyed space was therefore 21.06 ac.

The APE and surveyed space are located entirely on land with private surface ownership.

One archaeological site (LA 187372) was newly discovered within the project area. No isolated occurrences were found. There are no previously recorded sites within a mile of the project area. LA 187372 is an aboriginal artifact scatter. It is recommended that National Register of Historic Places (NRP) eligibility for this site remain undetermined at this time. Avoidance is recommended. The site was located about 12 m (40 ft) north of the proposed pad. The pad has been moved 18 m (60 ft) to the south to provide a 30-m (100-ft) buffer between the pad and the site. This will result in no impact to the resource. Additional survey transects were conducted to the south of the original block survey to ensure a 30-m (100-ft.) buffer to the south of the pad as well. The adjusted surveyed space totals 21.89

If additional cultural material more than 50 years old is observed during construction, work in the vicinity should cease and archaeologists with the BLM/RFO should be consulted for guidance.

The project was conducted under BLM Permit #190-2920-16-V and New Mexico Permit #NM 17-157-S issued to Boone Archaeological Resource Consultants (BooneARC).

ENVIRONMENTAL SETTING

The project area is located in the Great Plains Physiographic Province on the Llano Estacado, an area described by Hogan (2006) as a "high, isolated pediment surface" characterized by relatively flat terrain with a very slight southeastern gradient. Caliche is at or near the surface, and numerous shallow depressions are present, "many containing playas with lunate dunes on their leeward margins." The terrain is a gently rolling non-dunal plain, with a gentle slope toward a playa west of the proposed pad. Elevation is approximately 4,330 ft above mean sea level.

Soils are classified as Ratliff Sandy Clay Loam, 0 to 3 percent slope, and Kimbrough Loam, 0 to 3 percent slope. Ratlilff soils dominate the pad area and are found on plains and playa steps. They form in calcareous loamy eolian deposits. Kimbrough soils are found primarily along the east-west portion of the proposed road and the road intersection buffer. These soils are found on plains and form in loamy eolian deposits derived from sedimentary rock (USDA/NRCS 2012). The dominant vegetation, regardless of terrain, is creosote, mesquite, and sage, with other scattered shrubs and succulents. Grass is sparse.

There is minimal construction activity in the project area. There is a buried pipeline near the west end of the proposed road, and the road passes near the south side of an existing pad. It crosses several fences and two-track roads before intersecting the proposed pad. A two-track road crosses the pad survey area. Cattle grazing is a major impact, due to the proximity of a playa west of the proposed pad, and a ranch complex to the northwest. Cattle trails are evident throughout the project area. Erosion is generally minor along the road, but portions of the pad survey block exhibit sheetwash, especially where the level plain begins to slope down toward the playa.

CULTURE CONTEXT

by Chris Mickwee

The following cultural setting is an abbreviated description of culture traits and associated chronological sequences articulated from archaeological and historical research. Emphasis is placed on southeastern New Mexico in the area of the Mescalero Plain, the Pecos River Valley, and the southern portion of the Llano Estacado. The earliest investigations in the state began in the 1920s with research of the Pueblo Indians; however, it was not until the 1970s that a refined cultural chronology was developed that included the southeastern region of New Mexico (Leslie 1978, 1979). This cultural setting is intended to provide a general contextual framework from which newly discovered cultural resources in the area can be considered. By addressing morphological site and assemblage characteristics of known components, it is further intended that sites may be associated with a particular cultural period, pertinent research questions can be formulated, and cultural resource management concerns can be more effectively addressed.

The Paleoindian Period (10,000 to 5,500 BC)

Evidence for the earliest human activity in the area dates to the Paleoindian Period (10,000 to 6,000 BC) Paleoindian peoples are characterized as highly residentially mobile groups of hunter-gatherers. The Paleoindian period was cold and moist with limited seasonal variation. Paleo-climatological reconstructions suggest that southeast New Mexico consisted of open, heavily-vegetated savannas and montane coniferous forests exhibiting pine, fir, and spruce interspersed with shallow lakes during the late Pleistocene (Dick-Peddie 1993:16). Subsistence practices included hunting megafauna including bison (*Bison antiquus*) and mammoth (*Mammuthus primigenius*). Fine-grained details of Paleoindian lifeways have not been articulated as a result of limited botanical and feature data. It is typically accepted that, despite the heavy weighting of faunal subsistence data in the archaeological record, both floral and faunal resources were of equal importance during the Paleoindian period. A climatological shift towards more variable, drier, and warmer weather resulted in the extinction of multiple species and subsequent adaptive strategies in human subsistence, marking the onset of the Archaic Period (Katz and Katz 1994, McCormack et al. 2010).

Paleoindian sites have been recorded in a variety of topographic zones, including high mountains, grasslands, mesas, river valleys, and dry lakebeds. Regardless of topography, all Paleoindian sites are located within sight of either an extant or former water source (Katz and Katz 1994). Paleoindian assemblages include artifacts associated with hunting camps such as fire-cracked rock and lithic tools. Bone fragments, megafauna bone beds, ground stone, and hearths may also be present (Katz and Katz 1994:38-40).

Paleoindian peoples are distinguished archaeologically by their distinctive tool kits and lithic technologies, including parallel-flaked and fluted projectile points. The Paleoindian Period is commonly divided into three subphases, or complexes, distinguished through variability in projectile point forms and other tool kit elements: Clovis, Folsom, and Late Paleoindian. Limited data has suggested that there may have been populations active in southeastern New Mexico prior to 10,000 BC as evidenced by sites such as Hermit's Cave (10,900 BC) and Pendejo Cave (11,000 BC). This evidence is questionable, however, and it is generally accepted that initial human occupation of the area occurred with the earliest dates of the Clovis subphase (McCormack 2010:9).

Clovis Complex (10,000 to 9,000 BC)

The Clovis Complex represents the earliest definitive evidence for occupation of the Americas and southeastern New Mexico. Clovis manifestations are characterized by the presence of large, fluted, lanceolate projectile points as well as prismatic blades produced from core-and-blade reduction technologies (Collins 1999; Green 1963; Hester 1972; Stanford 1991). Clovis assemblages also include transverse end scrapers, gravers, bifacial knives, perforators, and hammerstones, and display a variety of high-quality raw materials (cryptocrystalline silicates) transported from nonlocal sources. Clovis sites in New Mexico reflect a preference for chert and chalcedonies from west and central Texas, as well as obsidian and basalt (Hester 1972). The use of nonlocal source materials suggests a high

degree of residential mobility; however, evidence for the use of local materials such as quartzite, shale, and silicified wood has been observed at Clovis sites in the area as well (Condon 2006; Hester 1972). Clovis sites in southwestern New Mexico include Hermit's Cave, where charred wood samples associated with dire wolf and mammoth remains were dated to the late Quaternary (Sebastian and Larralde 1989:29); Blackwater Draw, where Clovis artifacts were found in stratigraphic association with megafaunal remains; and Burnet Cave, where a Clovis point was found in association with bison remains (Sebastian and Larralde 1989:31). Little more is known about the lifeways of local Clovis populations.

Folsom Complex (9,000 to 8,000 BC)

The Folsom Complex follows and, it is generally accepted, overlaps the preceding Clovis Complex. This complex is characterized by a heavy reliance on bison hunting as a result of megafaunal extinction, as well as other environmental changes that occurred during the late Pleistocence-early Holocene transition. A multitude of mass-kill sites have been recorded in the Southern High Plains that reflect these shifting subsistence preferences (Holliday 1997). Subsistence differences aside, similarities in lithic technologies exist between Clovis and Folsom populations and likely represent a technological continuation. In general, Folsom lithic traditions exhibit a larger variety of tool forms and reduction strategies. The fluted lanceolate points that mark the Folsom subphase are distinguished from those of the Clovis subphase by length and morphology; they are generally smaller, exhibit parallel flaking along the lateral margins, and possess more extensive grinding along the lower lateral margins. Further, Folsom projectile points are typically produced from flakes rather than prefabricated cores. The Folsom toolkit also includes perforators, end scrapers, spokeshaves, bifacial knives, denticulates, awls, drills, choppers, and abrading stones.

Midland points, identified as unfluted lanceolate forms similar to Folsom types, are found within Folsom sites in southeastern New Mexico and may suggest a chronological and technological overlap between two separate components (Amick 1995; Holliday; 1997; Sebastian and Larralde 1989). Lithic material selection represents a continuation of Clovis practices, in that a variety of high-quality, non-local materials are observed along with a smaller percentage of locally available stone (Condon 2006; Hester 1972:120). Like Clovis groups, Folsom populations are identified as being highly residentially mobile; however, they appear to have been geographically limited to the Great Plains and peripheral regions. Folsom sites have been recorded throughout southeastern New Mexico and include LA 22122 on the east side of Laguna Plata, LA 165710 southwest of Laguna Plata, Burnett Cave south of Carlsbad, and the Boot Hill site northwest of Maljamar.

Late Paleoindian Complexes (8,000 to 5,500 BC)

The complexes of the Late Paleoindian are less understood and more varied than the earlier complexes of the culture period. Multiple artifact complexes have been identified within the Late Paleoindian including Cody, Eden, Agate Basin, Plainview, Firstview, Plano, Frederick, Alberta, and Hell Gap (Hogan 2006; McCormack et al. 2010; Sebastian and Larralde 1989; Turner and Hester 1993). In general, Late Paleoindian lithic

technology is typified by non-fluted, collaterally flaked lanceolate-shaped projectile points. Subsistence practices during the Late Paleoindian reflect a continued reliance on bison hunting with a shift toward more generalized strategies. The subsistence transition that demarcates the change from the Paleoindian to the Archaic Period is not well defined chronologically as there is a lack of reliable dates from buried archaeological sites. In southeast New Mexico, a Plainview Late Paleoindian component was recorded at the Maroon Cliffs site west of Laguna Plata (Hurst 1976:49).

The Archaic Period (5,500 BC to AD 500)

The Archaic Period is typically viewed as a period of technological transition and cultural adaptation coinciding with the broad-scale environmental changes of the Pleistocene to Holocene interface. Thus, the Archaic Period is characterized by an increased diversity in subsistence strategies and a marked shift toward a broad-spectrum, hunter-gatherer settlement pattern. These patterns reflect a change from constant nomadism to seasonal mobility to better exploit the annual availability of critical plant resources. Lithic technologies become more stylistically varied during the Archaic, likely to accommodate more generalized subsistence strategies. An increase in the number of ground-stone tools suggests a heavier reliance on botanical resources.

Archaic sites have been recorded across different topographic settings in southeastern New Mexico. Radiocarbon dates recorded from these sites have been used to articulate three periods of increased occupation during the latter half of the Archaic Period: 1) 2,600 to 2,300 BC, 2) 1,900 to 1,600 BC, and 3) 1,400 to 300 BC (Railey et al. 2009:50). This and other work (Katz and Katz 1985) demonstrate a near absence of Archaic radiocarbon samples predating 3,000 BC; however, an Early Archaic period is documented through the presence of diagnostic projectile points (Katz and Katz 1985:35). Notable Archaic Period sites in the region include Hooper Canyon Cave in Dark Canyon (Roney 1985), Dark Canyon Cave and Honest Injun Cave (Applegarth 1976), the South Seven Rivers site, and the Sheep Draw Canyon site (Condon 2002; Wiseman et al. 1999).

The Archaic Period covers a large time-depth and is generally divided into Early, Middle, and Late subperiods based on changes in paleoenvironmental conditions and lithic technology. Katz and Katz (1993) proposed a region-specific cultural sequence for the Archaic Period that was divided into four phases based on changes in point typology and population dynamics. The sequence posited by Katz and Katz (1993) is referenced below within the larger, three-subperiod structure.

Early Archaic Period (5,500 to 3,000 BC)

The Early Archaic Period is characterized by a single diagnostic projectile point type referred to as a Jay complex style point, defined by a lanceolate shape with weak shoulders and a long, tapering stem (Irwin-Williams 1973). Although data from this complex have not been associated with a dated context, morphologically similar projectile points have been recorded and defined for the Early Archaic Period (Katz and Katz 1993, 2001). Another

projectile point type, the bipointed Lerma, may also be associated with Early Archaic manifestations in southeastern New Mexico.

This archaeological period likely corresponds with movements of native groups into adjacent regions. These movements were likely in response to the transition from the warm early Holocene into the hot, drier conditions of the mid-Holocene. Projectile points of the Bajada phase (4,800 to 3,200 BC) of the Early Archaic are differentiated from those of the Jay complex by decreasing length, basal thinning and indentation, and more well-defined shoulders. This phase increased in prevalence during the terminal Early Archaic and persisted somewhat into the early Middle Archaic Period (Irwin-Williams 1973). The Bajada phase has been associated with a variety of subsistence practices surrounding seasonal mobility and an intensification of resource exploitation. The presence of both Bajada phase and Jay complex point types in the region may reflect logistical resource procurement from the uplands in the north into the desert areas of southeast New Mexico (Vierra et al. 2012).

The Early Archaic Period corresponds with the initial portion of Katz and Katz's (1993) Archaic I Phase (5,500 to 1,700 BC), which overlaps both the Early and the Middle Archaic in so broad a time span that it is too ambiguous for detailed interpretations and lacks supporting chronological data.

Middle Archaic Period (3,000 to 1,800 BC)

The Middle Archaic Period is associated with a general improvement from the dry conditions of the mid-Holocene. An increase in the number of sites along the southern borderland deserts suggests an intensification of settlement in these areas by Middle Archaic peoples (Amick and Lukowski 2006; Anderson 1993; Carmichael 1986; O'Laughlin 1980). A variety of diagnostic projectile points characterize this period, including San Jose-style points, classified by basal grinding, serrated edges, and shorter stem-to-blade ratios than Bajada phase types (Irwin-Williams 1973). Other Middle Archaic point types include contracting stem varieties (such as Langtry), and large side-notched types. These projectile point styles are thought to represent the movement of groups between the desert regions to the east and west and the southern borderlands, as well as between the northern uplands and the southern desert lowlands (Carpenter et al. 2005; Miller and Shackley 1998).

Shallow basin metates and milling stones also appear in Middle Archaic assemblages, suggesting a further increase on the reliance of plant-processing from previous periods. Studies of settlement, subsistence, and technological adaptations during this period denote an emphasis on the exploitation of small game and wild foraging (Vierra 2007). Evidence for expedient, Middle Archaic brush structures has been recorded. Also, large fire-cracked-rock earthen oven features such as mescal pits, as well as synchronic groupings of multiple hearths, suggest larger specialized activity groups than has been observed with previous periods (Irwin-Williams 1973).

The Middle Archaic Period corresponds with the latter portion of Katz and Katz's (1993) Archaic I Phase (5,500 to 1,700 BC) and the initial portion of their Archaic II phase (1,700 to 1,000 BC). However, the Archaic II phase is questionable as it is defined by the chronological context of isolated fire-cracked rock features lacking a definitive diagnostic artifact assemblage (Hogan 2006). Further, this phase is defined primarily from data recorded at a single site (LA 44544) (Katz and Katz 1985:398; 1993:119).

Late Archaic Period (1,800 BC to AD 500)

The Late Archaic Period is characterized by patterns of decreasing residential mobility, increasing complexity in the use of ecotonal environments and specific environmental settings, and the first evidence for maize cultivation (Anderson 1993). Diagnostic projectile points for this period include types such as Palmillas, Ensor, Marcos, Maljamar, and San Pedro varieties. These types exhibit a high degree of stylistic variation but are generally characterized by stemmed and corner-notched "dart" points with large, triangular blades and an absence of basal grinding (Shelley 1994; Turner and Hester 1993).

Evidence for the use of domesticated-plant resources (such as maize) in addition to a more formal milling technology, characterize the Late Archaic Period. Although these activities occurred during the period, it has been suggested that reliance on domesticated food resources in the Late Archaic southeast New Mexico was very limited (Hard et al. 1996). The earliest evidence for maize use (1,200 BC) was recorded at Fresnal Cave, Tornillo Rockshelter, and Cerro Jaunaquena in Dona Ana County (Hard and Roney 2005; Tagg 1996; Upham et al. 1987). Settlement and mobility models indicate that lower-basin settings were occupied from the late spring to early fall and facilitated access to rabbits, mesquite, and grasses, and allowed the use of upland alluvial deposits for agricultural purposes (Anderson 1993). Rockshelters in upland areas were occupied during the summer and fall, allowing access to deer, oak, pinyon, and the cultivation of maize (Bohrer 2007; MacNeish 1993).

The terminal Archaic is not demarcated by environmental changes as was the case with previous cultural periods. There is currently disagreement as to the end of the Late Archaic Period and the beginning of the Formative Period in southeastern New Mexico. However, the initial appearance of ceramic artifacts in the archaeological record is widely held as being indicative of the transition to Formative Period sites.

The Late Archaic Period corresponds with the latter portion of Katz and Katz's (1993) Archaic II phase (1,700 to 1,000 BC), and their Archaic III (1,000 BC to AD 1) and Archaic IV (AD 1 to 500) phases.

The Ceramic/Formative Period (The Jornada Mogollon Culture)

The Formative Period (pre AD 500 to AD 1500) is defined by the introduction of ceramic technology, the presumed introduction of bow and arrow technology, a relative increase in sedentism, and an increase in maize agriculture. Each avenue exhibits inter- and intraregional variability in terms of occurrence and chronology (Katz and Katz 1993:1-126;

Roney 1985:47; Sebastian and Larralde 1989:73). It is commonly accepted that the domestication of plants and a trend toward a more sedentary settlement system occurred in peripheral areas during this period, though evidence for agricultural intensification is limited in southeast New Mexico. It is traditionally accepted that Formative Period peoples in the region, collectively referred to as the (Eastern) Jornada Mogollon, maintained hunter-gatherer subsistence economies indicative of previous periods.

The environment during the Formative Period was virtually modern, with the same fauna and botanical resources, and frequent episodes of localized and intense drought (Holliday 1985b). A significant difference between the Formative and modern environment in southeastern New Mexico is the absence of extensive grassland communities. Rampant overgrazing and drought during the Historic period resulted in sudden environmental shifts that destroyed the grasslands throughout the region. As a corollary, animal and plant species associated with extensive grassland communities either reduced in population or disappeared entirely (Katz and Katz 1994).

Native groups during the Formative Period occupied locations throughout the landscape ubiquitously, with little regard to environmental or topographic setting (Katz and Katz 1994). Features containing subsistence data indicate similarities in behavior to those of the preceding Archaic Period excepting the presence of ceramic vessel fragments. Although caves and rockshelters continued to be utilized during the Formative Period, more substantial structures such as pithouses and above-ground room blocks were the principle form of dwelling in desert scrub and grassland areas. Despite the ubiquity of Formative Period settlement, desert and grassland settings were the most heavily utilized (Katz and Katz 1994).

Regional ceramic and point chronologies for Formative Period sites are poorly developed (Katz and Katz 1994). Nearly half of Formative Period sites have been eroded or disturbed by other forces. This loss of data may partially explain the inadequacies of the current culture perspective. Despite these limitations, ceramic and projectile point chronologies are the most useful method of identifying chronological associations for Formative sites (Hogan 2006). Heavy reliance on these established artifact classes, however, has not yet produced a consistent dataset or effective interpretative models (McCormack et al 2010). As a result, the onset of ceramic technology in southeastern New Mexico varies from AD 150 to 1,000, depending on the researcher and subregional area (McCormack et al 2010). Recent radiocarbon dates suggest that the earliest instance of ceramics (Jornada Brown wares) at Deadman's Shelter was around AD 200 (Hogan 2006). It is possible that two separate settlement and subsistence strategies were being used simultaneously by Formative Period groups, which may explain the perceived inconsistencies in the onset of ceramic technology (Sebastian and Larralde 1989).

One of these two systems was likely a nomadic adaptation in the Archaic Period tradition, wherein hunter-gatherers collected wild plant resources for use and storage in the initial portion of the period and became increasingly reliant on hunting bison in the latter portion of the period. The degree to which ceramic vessels were utilized by groups with this more nomadic adaptation is not known. The other system was likely an

agriculture-oriented approach wherein groups occupied more fertile areas suitable for growing crops. It is typically held that peoples of the more agricultural groups used ceramic vessels and were more sedentary than those that maintained a hunter-gatherer lifestyle (Sebastian and Larralde 1989). However, ceramic sites initially appear along major river valleys in southeastern New Mexico, yet they exhibit minimal to no reliance on agriculture (Sebastian and Larralde 1989). The adoption of ceramic technology without any associated evidence for agricultural subsistence strategies suggests that Archaic hunting and gathering were maintained until the Historic Period, regardless of the presence of ceramic vessels (McCormack et al 2010).

Five different phase sequences have been proposed for Formative Period sites in southeastern New Mexico. Four of these sequences were intended for specific subregional areas in southeastern New Mexico (Figure 1). Lehmer (1948) was the first researcher to develop a classification system for the Jornada branch of the Mogollon culture in south-central New Mexico. Leslie (1978, 1979) proposed a phase sequence for the eastern extension of the Jornada Mogollon based on the work of Lehmer (1948) and Corley (1965). Kelley (1984) developed a sequence for the south-central highlands based on research done in the Sierra Blanca Region and Jelinek (1967) developed a Pecos Valley sequence for the area between Fort Sumner and Roswell. All the phase sequences referenced here are expansions or renditions of the Lehmer (1948) Jornada Mogollon chronology. Katz and Katz (2001) proposed a fifth culture sequence that is divided into seven different phases based on the four previously developed sequences (Table 1 and Figure 2) with the intention of accommodating regional site comparisons. However, their approach does not include descriptions of associated changes in subsistence patterns, settlement systems, artifact types, or architectural forms specific to any particular area (Hogan 2006). Also, researchers typically have difficulties associating Formative Period sites to the individual phases identified by Katz and Katz (2001) based on the presence or proportions of diagnostic artifacts.

Leslie's (1979) sequence, which broadly follows cultural developments akin to the pithouse-to-pueblo sequences proposed for other culture areas, is presently the most applicable to cultural resources in southeast New Mexico. Leslie's (1979) sequence is adhered to in the following discussion and each sequence is related to the chronological equivalent for the pithouse-to-pueblo phases as well as the Katz and Katz (1993) schema.

Late Hueco Phase (pre AD 500 to AD 950)

The Late Hueco Phase overlaps a portion of the Late Archaic Period and the Early Formative Period, and is associated with the introduction of ceramic technology. This phase is often regarded as the nascent era of the characteristic Formative Period cultural adaptations (Leslie 1979). Late Hueco sites are typically defined by minor occurrences of plain brownware ceramics, an increase in groundstone tools, and the presence of bedrock mortars. The ceramic assemblage consists of types such as Jornada Brown, South Pecos Brown, Middle Pecos Micaceous Brown, and Alma Plain types, as well as the introduction of Cebolleta Black-on-white tradewares toward the later end of the phase.

Figure 1. Study Areas Discussed by Jelinek, Kelley, Lehmer, and Leslie.

(Sebastian and Larralde 1989)

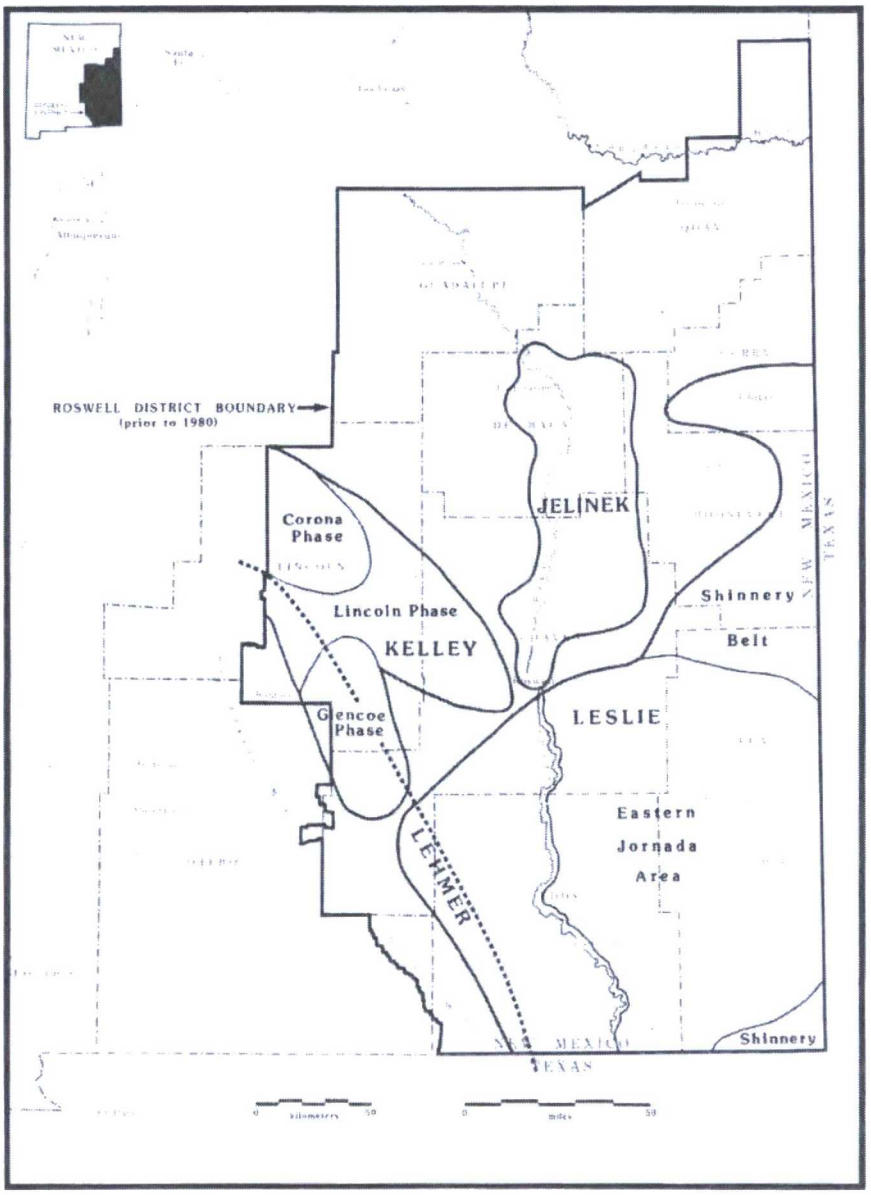


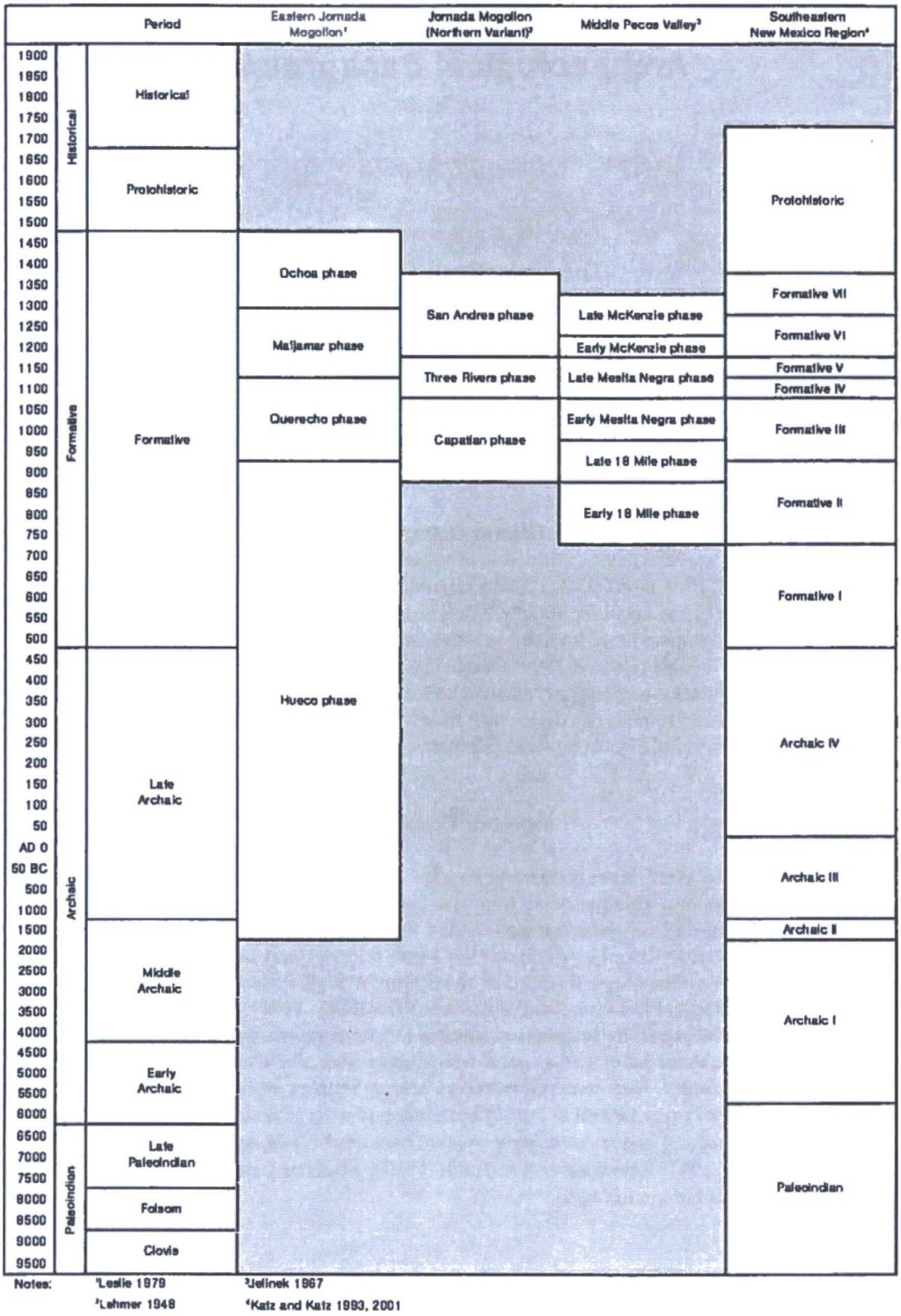
Table 1. Chronological Sequences or Schemes Developed for Southeastern New Mexico (McCormack and Boggess, 2010; Sebastion and Larralde, 1989; Katz and Katz, 2001)

Ceramic Period (A.D. 200/900 to 1540)			
Author	**Phase**	**Site Characteristics**	**Ceramics**
Lehmer (1948)	Hueco (Archaic)		
South-central New Mexico	Mesilla	Pithouse sites, containing both rectangular and round structures with extramural hearths and storage pits	El Paso Brown mainly, some imported ceramics from the Mimbres area
	Dona Ana	Multi-room, above ground adobe structures occupied along with pithouses like those of the mesilla phase	El Paso Polychrome (a painted ware), El Paso Brown, and an increase in number and variety of tradeware ceramics (Mimbres, Zuni, and northern Tularosa Basin areas)
	El Paso	Adobe room blocks arranged around a plaza or oriented in in long east-west tears	El Paso Polychrome is the dominant ceramic. Tradewares include Chupadero Black-on-white, Lincoln Black-on-red, and Three Rivers Red-on-terracotta
Leslie (1965)	Querecho	Non-structural (early portion of phase), small rectangular pit structures occur on some sites	Locally manufactured variants of Jornada Brownware and imported Mimbres and Cebolleta Black-on-white.
Extreme Southeastern New Mexico	Maljamar	Non-structural camps and pithouse villages with small rectangular structures	Variants of Jornada Brown, some corrugated utility wares late in the phase, and imported ceramics including Chupadero Black-on-white, El Paso Polychrome, and Three Rivers Red-on-terracotta
	Transitional		Glaze A Red and Yellow types; Gila, Ramos, and El Paso Polychromes; and Lincoln Black-on-red
	Ochoa AD 1150-1400	Surface rooms, occurring both in room blocks and as single units	Ceramics are less varied than in preceding phase and include a locally produced Ochoa Indented and imported Chupadero Black-on-white.
Kelly (1984)	Corona (northern portion of Sierra Blanca)	Small open villages of contiguous Jacal rooms with upright slab foundations.	Jornada Brownware and Chupadero Black-on-white
South-central Highlands	Lincoln (Occur in northern portion of Sierra Blanca)	Villages consisting of multi-room pueblos composed of stone masonry and coursed adobe. Subterranean ceremonial structures are present at these sites	Corrugated utility wares, Chupadero Black-on-white, and Lincoln Black-on-red, with El Paso Polychrome and Three Rivers Red-on-terracotta as tradewares
	Glencoe (contemporaneous with Corona and Lincoln but occurs in southern portion of the MOA Area)	Open, scattered arrangements of pithouses	Major ceramic type is Jornada Brown. Early tradewares include Chupadero Black-on-white, El Paso Polychrome, , and Mimbres Boldface Black-on-white, while later sites contain Chupadero Black-on-white, El Paso Polychrome, Lincoln Black-on-red, and Three Rivers Red-on-terracota
Jelinek (1967)	18 Mile (subdivided into early and late)	Both early and late contain pithouses with surface rooms appearing late in the phase.	Early: Jornada Brownware and Lino Gray Late: Middle Pecos and Micaceous and Red Mesa Black-on-white
From Roswell to Fort Summer	Mesita Negra (subdivided into early and late)	Both early and late have pithouses.	Both early and late contain Chupadero Black-on-white, Santa Fe Black-on-white, and Socorro Black-on-white
	McKenzie	Surface Structures that are rectangular and slab-based.	McKenzie Brown, and Chupadero and Middle Pecos Black-on-white
	Post-McKenzie		Evidence of continued use of the Middle Pecos Region by ceramic-period groups after AD 1300

Table 1 Continued:

Author	Phase	Site Characteristics	Ceramics
Katz and Katz (1994)	Formative 1	Sites continue to be located near the Pecos River or close watering holes.	Mainly non-local types such as Alma Plain. Early brown wares, such as Jornada South Pecos, and Middle Pecos, Micaceous Brown, are also present.
	Formative 2	Small pithouses. In the southeast, clay floor pads, in the Middle Pecos locality, the first sedentary villages appear.	Brownware predominates the ceramic assemblage, but in this phase, the brown wares are local. They include Middle Pecos Micaceous Brown and South Pecos Brown in both the northern and the southern portions of the region. The earliest known black-on-whites appear - Cebolleta Black-on-white in the south.
	Formative 3	Sites become larger. In the southeast, identified sites consist of large concentrations of small rectangular pitroom villages at permanent lakes.	Local browns continue to dominate the ceramic assemblage, local and exotic gray wares make their first appearance. Crosby Black0on-gray represents the new gray ware. Mimbres Black-on-white replaces Cebolleta Black-on-white.
	Formative 4	Sites become smaller and surface architecture has been replaced by subsurface structures, but some pithouses still remain.	Gray wares remain an important component of the ceramic assemblage , and there is significant increase in locally made wares. Decrease in locally made brown wares with a the exception of McKenzie Brown (a new type). Chupadero Black-on white is present.
	Formative 5	Sites become larger. Rectangular slab-based surface room.	Some local brown wares are proportionally reduced while others are favored. South Pecos Brown is replaced by McKenzie Brown in the Middle Pecos locality.
	Formative 6	Most of the sites are small with a variety of architectural forms and patterns, including pithouses, surface rooms, artifact scatters.	Locally produced plain brown ware has disappeared from the ceramic inventory and replaced by local textured and corrugated brown ware. In the Middle Pecos, Black-on-white dominates the ceramic assemblage followed by McKenzie Brown.
	Formative 7 This phase is characterized by rapid change. The end of the Formative corresponds to the beginning of the "Little Ice Age."	Early: Large and deep pithouses. Middle: Shallower pithouses. Late: Single surface rooms. Short-term campsites and small stone circles have been identified. Abundant presence of obsidian.	The ceramic assemblage is characterized by fewer types and fewer overall sherds compared to previous phases. Painted intrusive types predominate and plain brown ware is overwhelmed by textured brown ware.

Figure 2. Regional Cultural Phase Sequences for Southeastern New Mexico (Unruh et al. 2015).



Bow and arrow technology appears to have been introduced sometime between the Late Hueco Phase and following Querecho Phase. The lithic assemblage therefore includes smaller-sized projectile points such as Leslie's (1978) Type 3A, 3B, 5, and 6, in addition to regional types, such as Scallorn-style projectile (arrow) points and variants. These tools are characterized as triangular bladed, side- and corner-notched points with expanding bases.

Most Late Hueco Phase sites appear to be ephemeral campsites with an absence of structural remains representing significant architectural investment (Leslie 1979). These patterns strongly suggest that Late Hueco peoples practiced a high degree of residential/seasonal mobility. Further, radiocarbon data from multiple sites suggests a significant increase in occupational intensity that began in the Late Archaic portion of the Late Hueco, reaching its peak during the Early Formative portion of the phase (Railey et al. 2009).

The Late Hueco Phase roughly corresponds with Leslie's (1979) Early Pithouse Phase (AD 200 to 750) and the earliest portions of the Late Pithouse Phase (AD 750 to 1100), as well as Katz and Katz's (1993) Formative I Phase (AD 500 to 750) and Formative II Phase (AD 750 to 950).

Querecho Phase (AD 950 to 1100)

The Querecho Phase is often considered the first fully ceramic phase related to the Eastern Jornada Mogollon Culture. Querecho sites are defined by a dominance of Jornada Brown and other local brownwares in the ceramic assemblage, sometimes accompanied by tradewares such as Mimbres and Cebolleta Black-on-white. Graywares are also introduced during this phase. Bow and Arrow technology had been widely adopted by the Querecho Phase and small, corner-notched "arrow" points including Leslie's (1978) Types 3A through 3F are recognized as part of the Querecho tool kit, representing an increase in stylized biface variation. Ground-stone implements are a common element of the lithic assemblage and include varieties such as basin metates and convex-faced manos (Katz and Katz 1993:129). An increase in the prevalence and variety of ground-stone artifacts during this phase suggests an associated increase in the reliance on botanical resources.

The majority of early Querecho sites continue to exhibit ephemeral or nonstructural architectural investment. Some late Querecho sites, however, reflect a trend toward small, rectangular pit rooms and surface-room floors by the end of the period. These more permanent structures are configured into loosely aggregated village settings (Leslie 1979). A significant increase in logistical procurement activities, particularly within the parabolic dune fields, has also been noted by an increase in the number of smaller Querecho sites in that setting.

The Quechero Phase corresponds fairly well with Leslie's (1979) Late Pithouse Phase (AD 750 to 1,100) and Katz and Katz's (1993) Formative III Phase (AD 950 to 1,075).

Maljamar Phase (AD 1100 to 1300)

The Maljamar Phase is thought to represent a local increase in sedentism and associated lifeways. This is evidenced by the widespread appearance of village sites with up to 20 or 30 rectangular pithouse structures (Leslie 1979). The small logistic sites that occurred in large numbers during the previous phase are still present during the Maljamar Phase but are recorded in lower numbers. This pattern reflects a decrease in the reliance of logistical procurement within the dune fields, and likely, and increase in reliance on resources near occupation sites. However, it is suggested that a large portion of the Eastern Jornada culture area was abandoned toward the end of this phase (Leslie 1979). Thus, a decrease in logistic sites may represent a reduction in the local population. Katz and Katz (1993:130) attribute the shifting population to a transition from reliance on riverine settlement to upland settings (by AD 1200). It is possible that some factor or a series of factors motivated a temporary change in both settlement and subsistence strategies. Recording bias may also be responsible for these observations; groups could have continued to inhabit riverine areas despite the limited evidence recorded. Thus, the increase in upland occupation may have been the result of a general population increase. Regardless, it has been noted that sites increased in population density and began to exhibit an increase in agricultural intensity by AD 1300 (Katz and Katz 1993:131). Maize pollen and bison remains have been identified at terminal Maljamar sites (Brown 2010).

Jornada Brown and other local brownwares continue to dominate the ceramic assemblage; graywares increase in prominence and corrugated wares appear during the later end of the phase. Tradewares including Chupadero Black-on-white, as well as Three Rivers Red-on-terracotta and El Paso Polychrome, first appear during the Maljamar Phase. By the terminal period of the phase, other nonlocal wares appear including Ramos Polychrome, Gila Polychrome, Glaze A, and Lincoln Black-on-red. The appearance of these additional tradewares occurs with the sudden increase in population density and sedentism noted by Katz and Katz (1993:131), suggesting a subsequent increase in trade activities. The lithic assemblage exhibits a preferential transition around AD 1200 from corner-notched projectile points to side-notched tools, represented by Leslie's (1979) Types 2A and 2B, though some corner-notched styles persist. It is interesting to note that this shift in lithic technology appears in tandem with the previously mentioned shifts in settlement and subsistence practices.

The Maljamar Phase corresponds fairly well with Leslie's (1979) Early Pueblo Phase (AD 1100 to 1200) and the early portion of the Late Pueblo Phase (AD 1200 to 1400), as well as Katz and Katz's (1993) Formative IV (AD 1075 to 1125), Formative V (AD 1125 to 1200), and Formative VI (AD 1200 to 1300) Phases.

Ochoa Phase (AD 1300 to 1500.)

The final phase of the Formative Period, as well as the prehistoric era in southeast New Mexico, is the Ochoa Phase. The beginning of this phase corresponds with the shifting environmental conditions associated with the "Little Ice Age." Evidence for retaining the semi-sedentary lifeways established during previous

phases persists for this phase. Village sites contain an average of 15 to 30 floor surface rooms in large, shallow pit structures. Occupational structures are typically configured in small blocks or are found as individual units.

An increase in artifact assemblage variation is noted for the Ochoa Phase. The ceramic assemblage reflects a continuing increase in trade activities as nonlocal pottery increases in frequency. Chupadero Black-on-white becomes the dominant decorated ware and Ochoa Corrugated brownwares constitute a minority type (Leslie 1979). The lithic assemblage expands to include a variety of scrapers and shaft straighteners (spokeshaves), as well as higher proportions of obsidian artifacts. Projectile points during this phase are typically small, corner- and basal-notched "arrow" points identified as Leslie's (1978) Types 2C-2F.

The Ochoa Phase roughly corresponds with Leslie's (1979) Late Pueblo Phase (AD 1200 to 1400) and Katz and Katz's (1993) Formative VII Phase (AD 1300 to 1375).

Current Prehistoric Research in Southeastern New Mexico

The body of archaeological research on the cultural resources of southeast New Mexico has grown over the past few decades. These endeavors have produced additional, more recent datasets by which researchers can refine the current understanding of prehistoric occupation and lifeways in the region. These studies include Statistical Research, Inc.'s (SRI) "The Geologic and Archaeological Contexts for Lithic Resource Acquisition in Southeastern New Mexico" (Kremakau et al. 2013) and "A Cultural Resource Inventory Survey of The Alpha Crude Connect Pipeline Project" (Unruh et al. 2015), the archaeological geology workshops for the Mescalero Sands and the Permian Basin (Hall and Boggess 2013), TRC Environmental's "The Laguna Plata Site Revisited: Current Testing and Analysis of New and Existing Assemblages at LA 5148, Lea County, New Mexico" (Brown 2010), and Geo-Marine, Inc.'s (GMI) "Archaeological Investigations at LA 33085 and LA 165710 in the Maroon Cliffs Special Management Area, Eddy County, New Mexico" (Stowe and Condon 2012). These projects represent some of the most recent research into the prehistoric components of the region.

Lithic Resource Acquisition in Southeastern New Mexico

(Kremakau et al. 2013)

From December 2012 to January 2013, archaeologists from SRI performed archaeological and geological studies at 14 previously recorded archaeological sites, three locations chosen for geological study, and two archaeological survey parcels. This work was conducted in Eddy, Lea, and Chaves Counties. Survey and site recording were undertaken using grid-cell methodology to allow for fine-grained recording and the development of NRHP eligibility recommendations for any sites recorded. The principle goal of the project was the development of a systematic approach for recording and evaluating the research potential of lithic-procurement

sites in the region (Kremakau et al. 2013). The work was conducted in response to the BLM development of the Southeastern New Mexico Regional Research Design (SENMRRD) (Hogan 2006), which articulated multiple avenues for future research in the region. The SENMRRD includes identifying lithic raw material sources and understanding cultural behaviors associated with raw-material acquisition as important steps to understanding prehistoric lifeways in the southeastern New Mexico.

SRI reviewed the geological zones in the region and presented the geologic processes that led to the distribution of lithic resources within the study area. They also compared artifact collections from their study locations to those from several other sites in the region, including quarries and procurement sites, as well as habitation sites. Some of the patterns identified include contrasting assemblages between site types which can be utilized for data comparison. In addition, SRI examined the spatial distribution of features and artifacts to determine how locations were utilized and structured by prehistoric peoples. SRI also recommended avenues for future research, including a focus on groups of contemporaneous sites (quarries and procurement sites, habitation sites, and sites of other types) in varying locations within the region (Kremakau et al. 2013). By comparing contemporaneous sites with different functions, SRI was better able to understand changes in technology, regional settlement patterns, and lithic procurement strategies. Future analyses along these lines would allow investigators to study diachronic changes in settlement patterns and technology.

The Alpha Crude Connect Pipeline Project

(Unruh, et al. 2015)

SRI also conducted a survey through Eddy and Lea counties for the 382.4-mile Alpha Crude Connect Pipeline from July 1, 2014 to January 17, 2015 (Unruh et al. 2015). Pedestrian survey was conducted along all potential pipeline alignments. The cumulative survey corridor comprised approximately 4,667.57 linear miles across the southeastern portion of the state. Forty-eight previously recorded sites were updated and 42 newly discovered sites were recorded. From this dataset, studies of lithic procurement strategies, settlement systems, and a variety of other studies were conducted and combined with a suite of data from radiocarbon assays and XRF sourcing analyses. The Alpha Crude dataset is therefore a rich source of information on local prehistoric populations. Southeastern New Mexico has typically been perceived as a region with poor lithic resources. SRI used the Alpha Crude Pipeline dataset as well as other work conducted in the area to address whether this is an accurate representation of the lithic landscape, and to determine how differences in raw material availability influenced prehistoric procurement strategies.

The locally available materials of the Seven Rivers formation include a distinctive fossiliferous chert, and the Ogallala Formation contains purple quartzite and opalized (silicified) caliche or sandstone (Backhouse et al. 2009; Banks 1990;

Church et al. 1996; Kremakau et al. 2013; Holliday 1997:247-250; Holliday and Welty 1981; Hurst et al. 2010). The most apparent differences that SRI observed were that materials recorded along the eastern side of the Llano Estacado were dominated by quartzite, whereas western samples were characterized by a mixture of quartzite and chert. Purple quartzite was recorded ubiquitously across both areas (Unruh et al. 2015). Several chert types have been recorded in southeastern New Mexico, including San Andres chert and fossiliferous cherts, as well as other materials such as purple quartzite, mustard quartzite, and opalized caliche. Sites containing San Andreas chert are concentrated around the Pecos and Delaware Rivers. Also, SRI determined that Alibates chert cores were brought into the area from long distances to be reduced on site (Kremkau et al. 2013). The San Andres source is closer to the general area than the Alibates source. However, prepared San Andres cores were likely brought to local sites from sources in the Sacramento Foothills, reduced, and discarded (Kremkau et al. 2013:56). Purple quartzite was the most common lithic-material type used in the region and is locally available within Ogallala Formations.

Using XRF analysis, SRI was able to source obsidian artifacts recovered across southeastern New Mexico. Three obsidian sources were identified in the area: Valles rhyolite obsidian from Cerro del Medio in the Jemez Mountains; Sierra Fresnal obsidian from Chihuahua, Mexico; and Gwynn Canyon obsidian from western New Mexico (Shackley 2005, 2013). Obsidian from these nonlocal sources could have been obtained through either exchange networks or directly through subsistence-related movement. Valles rhyolite obsidian was presumably obtained through exchange networks with pueblos who were in contact with other groups occupying the northern Rio Grande Valley. An attempt was made to determine if this obsidian type was obtained from the Sierra Blanca region alongside ceramics such as Chupadero Black-on-white and maize prior to and/or after AD 1300. SRI addressed this question by looking at the distribution of sourced obsidian artifacts relative to sourced ceramic vessel fragments. The contrast in source data between ceramics and obsidian from sites in the northern portion of the region and those from sites along the Pecos River suggested that ceramics and obsidian were likely not obtained through the same exchange networks. For instance, it seems that the occupants of LA 132358 procured obsidian from pueblos to the north, but were involved in ceramic exchanges with groups to the west and south. At LA 15189, LA 121545, and other sites west of Gatuna Canyon, the occupants appear to have traded for both obsidian and ceramics from northern pueblos.

In addition to identifying possible trade networks, SRI also used their radiocarbon and survey data to refine our understanding of local settlement patterns (Unruh et al. 2015). Radiocarbon dates indicate that the occupation of the region was more episodic during the Paleoindian and Archaic Periods than during the Formative Period (Cummings and Kovacik 2013; Railey et al. 2009). The majority of Archaic period components were located around the Pecos and Delaware Rivers in the physiographic region referred to as the Southwest Pecos Slope (Hogan 2006), located between the Guadalupe Ridge/Reef Escarpment and the Pecos River. It is likely that the lowland occupations were part of a larger settlement system that included the

Guadalupe Mountains. Data indicate that Archaic Period groups favored these parts of the region over the Mescalero Plain, perhaps because of the particular nature of their subsistence mobility. From the Southwest Pecos Slope, Archaic peoples could easily access resources associated with the Pecos Floodplain and terrace region along the river, the Mescalero Plain to the east, and the foothills to the west, all within a one- or two-day walk.

A high number of Formative Period sites were recorded in the Mescalero Plain, clustered south of Loco Hills and Nimenim Ridge. This clustering of sites can be explained by the presence of prominent playas which may have been favored for Formative Period settlement. Formative Period sites are more numerous to the east and north of Clayton Basin, though several sites are present encircling the basin (Unruh et al. 2015). Given the type and density of artifacts at some Late Formative sites, the edges of the playa in this area may have been the locations of year-round habitations where horticultural practices were being undertaken. Several Late Formative sites was also recorded along the eastern edge of Nimenim Ridge, usually on high points overlooking the terrain in view of other contemporaneous sites. It is possible that Late Formative sites in this area were positioned partly to facilitate intersite communication through line of sight.

Additional, potentially earlier Formative Period sites exhibiting a more scattered distribution are present farther to the east on the Mescalero Plain. These smaller sites contain undifferentiated brownwares and do not exhibit the Late Formative Period tradewares found at larger Formative sites to the west. Further, Formative Period sites recorded on the eastern side of the Mescalero Plain were not oriented along ridges or especially large playas like those to the west. The potentially Early to Middle Formative Period sites to the east may reflect shorter-term occupations and more intensive seasonal rounds than the Late Formative Period sites to the west. It is also possible that these sites are contemporaneous and represent different subsistence strategies being utilized simultaneously by different groups.

Both SRI's study of lithic resource acquisition (Kremakau et al. 2013) and their survey of the Alpha Crude Pipeline (Unruh et al. 2015) not only resulted in the articulation of multiple, significant archaeological patterns for southeastern New Mexico, but also provide a large and varied dataset for future research questions to be addressed.

The Archaeological Geology Workshops

(Hall and Boggess 2013)

Stephen Hall and Douglas H. M. Boggess conducted a series of workshops on the geoarchaeological characteristics of the Mescalero Sands region (Hall 2002; Hall and Boggess 2013). The resulting workshop guidebooks provide a description of the geomorphology and archaeological geology of different locations in the Mescalero Sands, particularly the Loco Hills (Hall 2002) and Carlsbad (Hall and Boggess 2013) areas. A principle component of these efforts was the use of optically stimulated

luminescence (OSL) dating, which produced valuable data on the ages of the local aeolian sand deposits (Hall and Rittenour 2010). These new studies have resulted in a better understanding of the geological history of the southeastern New Mexico sands and their relationship to the archaeological record. The guidebooks provide dates for common sand deposits throughout the area, enabling researchers to identify which strata in different areas are likely associated with 20th-century deposits, buried A-Horizons from prehistoric time periods, and earlier paleosols. This baseline data accounts for the different depositional characteristics of each area and allows for any archaeological deposits to be considered relative to the depositional chronology of the locality. Thus, should 20th-century sands in parabolic dunes dominate the surface of a particular area, such as the southern portion of the Permian Basin in Lea County, that information can be taken into account in terms of survey efforts. Where this occurs, for instance, archaeological deposits associated with the Upper Aeolian Sand Unit will be exposed and concentrated on the floor of a blowout depression (Hall and Boggess 2013).

The depositional histories of multiple areas within southeastern New Mexico are articulated and verified with dating, allowing for the unique aspects of each area to be considered in terms of archaeological probability (Hall and Boggess 2013). For instance, the Upper Aeolian Sand Unit near LA 129216 along Highway 128 (80 cm thick) is the same age as the Upper Aeolian Sand Unit north of Loco Hills in the Mescalero Sands (4.5 to 5.0 meters thick). This sand body represents a widely occurring period of aeolian sand deposition within the Mescalero Plain and is of particular archaeological interest as, in contrast to the southern portion of the Permian Base in Lea County, sites may occur within the sands as well as on the stable surface of the sand unit. Another example of area-specific depositional issues relative to archaeological deposits is provided for the Quahada Ridge area in Eddy County. Based on the OSL age of the uppermost aeolian sand deposit, the sand on the surface has accumulated since AD 1918. Archaeological sites predating this period are therefore buried and are exposed only where the 20th-century sand has been disturbed or removed by recent erosion. This information is significant because the area does not often exhibit the same parabolic dunes with blowout depressions as other areas with recent sands (Hall and Boggess 2013).

Hall and Boggess' (2013) workshop also addressed taphonomic processes directly related to archaeological sites. The authors discuss how mesquite coppice dune development and subsequent erosion influence the archaeological record in the Loco Hills area. Artifacts and features occur on the eroded surface of the Lower Sand Unit where the base of large stone features that intrude into the Lower Sand may still be intact. Twentieth-century erosion has removed the upper portion of the Lower sand unit and some coppice dunes that began forming in the early 20th Century are now being eroded away, resulting in artifacts becoming scattered over the eroded surface in the form of lag gravel. In some cases, archaeological sites were already eroded before the coppice dunes formed. Thus, the dunes, when present, bury the eroded site surface. With dunal erosion, artifacts are further scattered by sheet erosion and lowered topographically (Hall and Boggess 2013).

In areas where mesquite coppice dunes are being removed by erosion, the underlying aeolian sand unit can become exposed. However, a portion of this unit is protected from erosion by the dune pedestal. When this occurs, the horizon where archaeological materials are located is the area where the Lower Sand Unit contacts the dune pedestal. Hall and Boggess (2013) also explain the process of dune erosion relative to archaeological deposits. For instance, in the Loco Hills area, dunes shift from a depositional to erosional sequence over time, resulting in the loss of sand along the sides of the dune. This produces an isolated dune core on an erosional pedestal of the Lower Sand Unit. If artifacts or features are present in the sands, they will falsely appear to be located within the dune itself. The entire dune sequence takes 200 to 300 years. Therefore, in the Loco Hills area, it is unlikely that any deposits older than approximately AD 1700 will be present within a mesquite dune pedestal, though older deposits may have eroded out into surrounding areas from previous dune formations.

Stephen Hall's and Douglas Boggess' geoarchaeological workshops (Hall 2002; Hall and Boggess 2013) provide researchers with a valuable source of stratigraphic, chronological, and taphonomic information with which archaeological data can be more accurately interpreted.

The Laguna Plata Site Revisited

(Brown 2010)

In early 2010, TRC Environmental performed testing at the Laguna Plata site (LA 5148), as well as a review and analysis of previous data compiled from previous excavations. (Brown 2010). TRC conducted limited excavations, previous collections analyses, and specialty studies including macrobotanical, pollen, diatom, stable isotope, starch grain, FTIR residue, XRF obsidian, INAA ceramic, and radiocarbon analyses. One of the principle goals of their research was to provide a more comprehensive interpretive assessment of the prehistoric utilization of the site and a general understanding of how contemporaneous populations were utilizing similar locations (Brown 2010). TRC followed strategies similar to those of earlier researchers by emphasizing the collection of spatial, technological, and geomorphological data to address diachronic changes in site structure and function.

Based on previous excavation data, it is believed that LA 5148 exhibits early Archaic through Late Archaic components, with an episode of more intensive site occupation during the Formative Period between AD 600 and 1350 (Brown 2010). Based on the ceramic assemblage, TRC identified three periods of site use during the Formative Period. Ceramic data suggest an occupation predating AD 1100, a second period of occupation between AD 1100 and 1300 that shows evidence for increased site use and regional interaction, and a period of use that continued into the 14th Century and terminated around AD 1400/1450. These periods of use may reflect activities oriented around seasonal site utilization. Haskell (1977) interpreted the abandonment of LA 5148 as having occurred by AD 1350; however, TRC's research

suggests that the site was occupied for a longer period than previously believed (Brown 2010).

Macrobotanical analyses conducted by TRC at LA 5148 not only produced significant data regarding Formative Period subsistence at larger sites, but also evidence of trade activities. Starch grain analysis indicated what may be local production as well as trade at LA 5148 (Brown 2010). Maize was not identified on any of the grinding implements, but was identified in cooking vessels. The absence of maize on ground-stone implements but presence on ceramic sherds suggests that it was obtained through trade activities. FTIR analysis of ground-stone tools and organic residue analysis of a Jornada Brown ceramic sherd suggests that agave, saltbush fruit, cholla buds, acorn nutmeat, gourd/pumpkin/squash, and rabbit meat were being utilized. The chemical signatures associated with the cucurbita flesh likely reflect the use of cultivars rather than wild varieties, as an overlay of the signatures for the cultivated and wild species revealed significant differences. Although horticulture was practiced it may not have played a major role in the Laguna Plata subsistence strategy. TRC did not identify any discernable changes in subsistence from the late Archaic to the Formative periods, corroborating the commonly held idea that the area is typified by a continuation of Archaic period practices (Brown 2010).

Given the nature of the features and site assemblage, the Laguna Plata site likely served as an aggregation locus during the Archaic Period and a seasonal residential site during the Formative Period (Brown 2010). This reflects a shift in priorities for areas such as Laguna Plata between the two culture periods. Interaction with other regions is evinced by the recovery of tradewares and tool stone across the site. Pottery types sourced via INAA analysis to the west of the site area suggests interaction with populations within and peripheral to the Jornada Mogollon region. The prevalence of pottery associated with the Sierra Blanca highlands denotes an established relationship with populations to the northwest. TRC also identified evidence of direct or indirect interactions with the Henderson and Bloom Mound sites in the Roswell area, and possibly the pithouse settlements of The Fox Place site in Sierra Blanca, all of which were contemporaneous components (between AD 1250 and 1400) (Brown 2010). No evidence for interaction with groups living in the plains was recorded. It is commonly believed that, in southeastern New Mexico, the development of cultural interaction was facilitated by the seasonal aggregation of groups into large sites where trade was undertaken. The Laguna Plata site may have served as one such location.

TRC's research at LA 5148 provides valuable data regarding a particular aspect of the prehistoric settlement systems of the area. Detailed information regarding subsistence, interaction, and site structure was produced that not only refine current perspectives of prehistoric lifeways but also provide a comparative dataset (Brown 2010).

Archaeological Investigations in the Maroon Cliffs Special Management Area

(Stowe and Condon 2012)

In January of 2011, Geo-Marine, Inc. conducted testing at sites LA 33085 and LA 165710 in Eddy County, New Mexico (Stowe and Condon 2012). Testing was focused on two prehistoric sites located in similar topographic settings within the Maroon Cliffs Special Management Area. Geo-Marine addressed questions on the nature of site formation processes, occupation, and function. From their research, a more refined understanding of site context and new aspects of land and resource selection were developed. Although LA 165710 was found to be unsubstantial, the testing at LA 33085 produced valuable data.

LA 33085 is a dense artifact scatter with a well-developed anthrosol in a comparable setting to the Laguna Plata site (LA 5418). The ceramic assemblage at LA 33085 suggests the site was occupied over a broad period, with diagnostic pottery types dating from AD 200/400 to 1375 (Hogan 2006; Katz and Katz 1993; Wiseman 2003). The purpose of Geo-Marine's investigations was to determine the integrity of the site, provide more conclusive data regarding the possible residential nature of LA 33085, and provide radiocarbon data for any features recorded at the site (Stowe and Condon 2012).

Geo-Marine carried out radiocarbon analysis on five samples from the anthrosol at LA 33085. These analyses provided a range of occupational episodes from 1040 BC to AD 1210 (Stowe and Condon 2012). The radiocarbon data represent human activity within the core area of the site and suggest the presence of multiple occupations. An analysis of the ceramic assemblage indicated a significant occupation after AD 500. Based on these combined data, the site was likely intermittently occupied from the Late Archaic through the Late Formative Periods, with occupational fluctuations during the Archaic/Formative transition and again after AD 1000 (Stowe and Condon 2012). The chronological and chronometric data suggest a high point in occupation after AD 1000 and a low point after AD 1375. Generally established data for population dynamics in the region posit an intensification between AD 900 and 1000/1100, with decreases in occupation by approximately AD 1375 (Grissino-Mayer et al. 1997; Railey et al. 2009). These dates correlate with what was articulated at LA 33085, and both are roughly parallel to what has been presented for Laguna Plata (Brown 2010).

Geo-Marine also examined macrobotanical data from LA 33085 to address subsistence behaviors (Stowe and Condon 2012). Six ground-stone artifacts were examined in an attempt to recover starchy remains of plant resources that may have been processed at the site. The data indicate that multiple types of plant resources were exploited. In addition, a starch grain from what was almost certainly maize was extracted from a mano fragment (Brown 2010). This is in contrast to the absence of Maize on ground-stone tools at Laguna Plata and suggests differences in subsistence behavior and/or trade interactions between similar, contemporaneous sites. As with

the Laguna Plata site, starch grain data from LA 33085 pointed towards the exploitation of both non-domesticated plants and cultigens within the subsistence regime (Stowe and Condon 2012). The utilization of non-domesticated plants and fauna, possibly supplemented by cultigens, appears to be a widespread pattern for large sites during the Formative Period in southeast New Mexico. These patterns suggest a continuity in selection and procurement throughout the Late Archaic and Formative Periods in the region. Local logistical collection strategies typify the immediate return economy associated with repetitive short-term sedentism rather than those of long, continuous habitations (Stowe and Condon 2012).

Prehistoric trade networks have not been clearly defined for the New Mexico area and are typically limited to indirect evidence such as nonlocal tool stone, nonlocal ceramics, and exotic marine shell (Brown et al. 2011; Condon et al. 2008; Wiseman 2003). However, recent investigations utilizing modern research methods, such as those performed by SRI (Unruh et al. 2015) and at LA 33085 (Stowe and Condon 2012) provide more direct evidence of trade activities. At LA 33085 seven specimens were subjected to XRF analysis. Samples from the site were sourced to two obsidian flows from the Valles Caldera in the Jemez Mountains: Cerro Toledo Rhyolite and Valles Rhyolite (Shackley 2005). The source data for the obsidian artifacts reveal the movement of goods from the northwest to the Maroon Cliffs area.

Indirect evidence of trade includes the recovery of nonlocal pottery from LA 33085. Tradeware ceramics suggest interaction with areas along the western edge of the Pecos River Valley, the Rio Grande Valley, and the Little Colorado River. Ceramics from the north and west of the Pecos River (Brown et al. 2011, Wiseman 2003), the west Texas Rio Grande region (Miller and Kenmotsu 2004), the Sierra Blanca region (Wiseman 2003), and the Little Colorado River valley northwest of El Paso (Brown et al. 2010). As with other local sites for which more meticulous analyses have been undertaken, there is a notable absence of materials originating from the Southern High Plains to the east of the Llano Estacado. It appears that, given the collective body of recent data, the transition to the high plains area served as an environmental and/or social boundary for the transmission of prehistoric culture traits. Regardless, sourcing analysis and the recovery of nonlocal materials from the west and north offer further evidence of interaction between populations within the Maroon Cliffs region and those of inhabiting peripheral areas (Stowe and Condon 2012).

Geo-Marine concluded that LA 33085 represents a site where seasonal aggregation and economic activity were practiced for relatively long durations (Stowe and Condon 2012). Thus, sites such as LA 33085, the Laguna Plata site, and others, may have anchored mobile groups to productive environments by serving as residential focal points in trade and exchange. The body of data for the southeast New Mexico region suggest these interactions were with populations to the north, west, and to a lesser extent, the south (Brown 2010; Stowe and Condon 2012; Unruh, Vierra, and Leckman 2015). With the implementation of more modern sourcing techniques such as XRF and INAA analyses, direct evidence of these interactions can

be articulated using more empirical data and continue to supplement existing datasets.

The collective results of these more recent research efforts have added to our current understanding of local prehistoric populations. Issues such as settlement systems and subsistence strategies, as well as intra- and interregional interaction, have been effectively addressed through current research. Future research that directly addresses regional data gaps using modern methods will continue to refine existing archaeological perspectives for prehistoric southeastern New Mexico.

Pre-field Research

Pre-field examination of the project area was conducted using Bureau of Land Management, Roswell Field Office GIS data on March 14, 2017, and the online database of the Archaeological Records Management Section (ARMS) of the Historic Preservation Division in Santa Fe on March 21, 2017. These file searches revealed no previously recorded archaeological sites within a mile of the project area. The only previous archaeological survey within a mile is the recent survey of the previous location of the currently proposed project, reported by Galassini and Broxson (2017; NMCRIS 137529.)

FIELD METHODS

The project area was surveyed in three 15-m (50-ft) transects. When cultural material was observed, the surrounding area was examined in 7-m intervals for additional cultural material. Cultural materials within 20 m of one another were grouped together as either archaeological sites or isolated manifestations based on BLM manual H-8100-1, as amended by the BLM January 2012. The site datum and a diagnostic artifact were mapped utilizing an Ashtech MobileMapper 100 GPS unit with submeter accuracy. All artifacts were analyzed in the field. No artifacts were collected. No subsurface testing was conducted. Photographs were taken of site overviews and the diagnostic artifact.

RESULTS

One newly recorded archaeological site was observed within the project area (Table 2). Site location data are provided in confidential Appendix A.

Table 2. Site Data Summary.

LA	Ownership	Quadrangle	Cultural/Temporal Affiliation	NRHP Rec.
187372	Private	Dora SW, 1984 (33103-G4)	Jornada Mogollon Early to Late Pueblo (AD 1150 to 1400), Protohistoric (AD 1400 to 1550)	Undetermined

Newly Recorded Site

LA No.: **187372**
Quadrangle: **Dora SW, 1984 (33103-G4)**
Ownership: **Private**
Eligibility Rec.: **Undetermined**

Description

LA 187372 (Figures 3, 4) is a small lithic and ceramic artifact scatter. It is located on the west side of a low rise overlooking a playa about 288 m to the west. The dimensions are 84 m north-south by 30 m east-west (1,802 square meters). Elevation is approximately 4,335 ft AMSL.

Vegetation in the area consists primarily of grasses, with some snakeweed and scattered yucca. Visibility is approximately 60 percent. The primary disturbance is sheetwash erosion exacerbated by heavy cattle traffic. The sheetwash generally begins where the slope begins to steepen toward the playa to the west, and the cultural material is exposed in eroded areas (where visibility is also the highest). Cattle traffic is heavy due to the playa and a ranch located about 170 m to the northwest.

The higher ground to the east exhibits a dark intact A-horizon. No cultural material was found here. The cultural material appears immediately where the sheetwash begins, raising the possibility that additional cultural material continues to the east beneath the intact A horizon. Assuming that this is not the case, the site is estimated to be 60 percent intact.

Subsurface Testing

No subsurface testing was conducted.

Features

No features were observed. Burned caliche is moderately dense within the site, and scattered pieces extend down slope beyond the site boundaries. This suggests that thermal activities did take place at the site. Feature remnants may be present in areas of dense vegetation or in subsurface context.

Artifacts

Thirty-three artifacts and hundreds of pieces of burned caliche were observed.

Figure 3: LA 187372, View North-northeast from Proposed Well Center Hole.

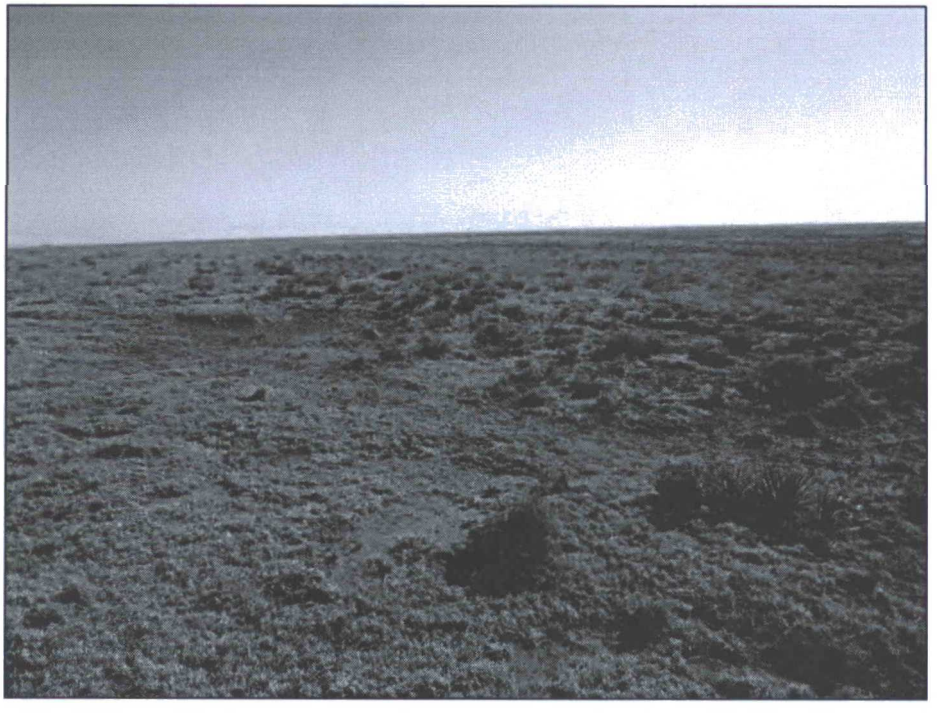


Figure 4: LA 187372, View South from Datum at Worst Erosion in Site.

The lithic assemblage (Table 3) includes 31 artifacts. There are 25 core-reduction flakes, four pieces of angular debris, and two cores. Eighteen artifacts are composed of quartzite, 11 of chert, and one of petrified wood. The raw materials were likely sourced locally in the abundant alluvial pebbles present in the eroded areas. The petrified wood flake is bifacially retouched. One of the quartzite cores is unifacially retouched and may have been used as a scraper. One cortical quartzite flake greater than 4 cm in size has been unifacially retouched on all margins.

Table 3. LA 187372 Lithic Artifact Assemblage.

Material	Size Category	Core-reduction Flakes	Angular Debris	Cores
Chert (black, gray, pink, red, tan)	<2 cm	Cortical: 3 Noncortical: 5	Noncortical: 1	
	2-4 cm	Cortical: 1 Noncortical: 1		
	>4 cm	Cortical: 1		
Petrified Wood (brown and white)	>4 cm	Cortical: 1		
Quartzite (black, brown, gray)	<2 cm	Cortical: 2 Noncortical: 3	Cortical: 1 Noncortical: 1	
	2-4 cm	Cortical: 7		
	>4 cm	Cortical: 1	Cortical: 1	2
Total		**25**	**4**	**2**

Two ceramic artifacts were observed. The first is an extremely small (<1 cm) body sherd, gray on one side and reddish-tan on the other. Both sides are smooth. The second is a Chupadero Black-on-white body sherd (Figure 5). This sherd is typically assigned a date range of AD 1150 to 1550 (Oppelt 2008:8).

Finally, hundreds of pieces of burned caliche are present within the site, from light to moderate in density (up to a dozen or so pieces per square meter). Sparser burned caliche continues down slope outside the site boundary.

Evaluation and Recommendations

LA 187372 is a lithic and ceramic artifact scatter. A Chupadero Black-on-white sherd was found, suggesting a cultural/temporal affiliation extending from the Jornada Mogollon Early to Late Pueblo periods (AD 1150 to 1400) into the Protohistoric (AD 1400 to 1550).

Figure 5: LA 187372, Chupadero Black-on-white sherd.

The surface assemblage of the site has been completely recorded, and there are no known features. However, additional cultural material, including possible features, may be present in buried contexts beneath the intact A-horizon soils atop the rise to the east. Without additional information regarding the presence or absence of buried cultural material, it is recommended that NRHP eligibility for LA 187372 remain Undetermined at this time.

Avoidance is recommended. The proposed pad was located 12 m (40 ft) south of LA 187372. It has been moved an additional 18 m (60 ft) to the south in order to provide a minimum 30 m (100 ft) buffer between the site and the pad.

SUMMARY AND RECOMMENDATIONS

Armstrong Energy Corporation, proposes to construct the Liza Jane Federal #1 well pad and access road. After consultation with BLM archaeologist on 16 March, 2017, a cultural resource survey was conducted. The total surveyed space was therefore 21.89 ac. The APE and surveyed space are located entirely on land with private surface ownership.

One archaeological site (LA 187372) was newly discovered within the project area. No isolated occurrences were found. There are no previously recorded sites

within a mile of the project area. LA 187372 is an aboriginal artifact scatter. It is recommended that National Register of Historic Places (NRP) eligibility for this site remain undetermined at this time. Avoidance is recommended. The site was located about 12 m (40 ft) north of the proposed pad. The pad was moved 18 m (60 ft) to the south to provide a 30-m (100-ft) buffer between the pad and the site. This will result in no impact to the resource.

If additional cultural material more than 50 years old is observed during construction, work in the vicinity should cease and archaeologists with the BLM/RFO should be consulted for guidance.

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