# ECOSYSTEM MANAGEMENT, INC.

## *Data Recovery Plan*

**For LA 82534 and LA 82635 at Rio Algom Mine, Near Ambrosia Lake, McKinley County, New Mexico**

**Prepared By**

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**Prepared For**

Rio Algom Mining LLC

**DECEMBER 2005**

*Data Recovery Plan*

**For LA 82634 and LA 82635 at Rio Algom Mine, Near Ambrosia Lake, McKinley County, New Mexico**

Prepared by
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Under

**BLM Permit Number 157-2920-04-L**
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**NMCRIS NO. 95014**

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For

**Rio Algom Mining, LLC.**

**EMI Report Number 675**

**December 2005**

## ABSTRACT

The data recovery treatment plan presented herein has been developed in response to a request by Rio Algom Mining, LLC, to address proposed adverse effects to archaeological sites LA 82634 and LA 82635. The sites are located at the Rio Algom Mine, near Ambrosia Lake, in McKinley County, New Mexico. LA 82634 and LA 82635 are situated within Township 14N Range 9W of Section 32 on the USGS 7.5 minute Ambrosia Lake quadrangle.

Rio Algom Mining, LLC intends to initiate a remediation plan to deal with contaminated soils related to previous mining activities. Implementation of the remediation plan will have an adverse effect on archaeological sites LA 82634 and LA 82635 resulting from ground disturbing activities that will in effect destroy both sites. As a result, all data potential present at both sites will be diminished.

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## PROJECT DESCRIPTION and PURPOSE OF THE STUDY

The data recovery treatment plan presented herein has been developed in response to a request by Rio Algom Mining, LLC to address proposed adverse effects to archaeological sites LA 82634 and LA 82635. The sites are located at the Rio Algom Mine, near Ambrosia Lake, in McKinley County, New Mexico. LA 82634 and LA 82635 are situated within Township 14N Range 9W of Section 32 on the USGS 7.5 minute Ambrosia Lake quadrangle. The sites were originally recorded by Southwest Archaeological Consultants in October 1990 (Viklund 1990). Survey assessment of the sites identified them both as Anasazi lithic and ceramic scatters with no clearly identified features.

Rio Algom Mining, LLC, intends to initiate a remediation plan to deal with contaminated soils related to previous mining activities. Implementation of the remediation plan will have an adverse effect on archaeological sites LA 82634 and LA 82635 resulting from ground disturbing activities that will in effect destroy both sites. As a result, all data potential present at both sites will be diminished.

The purpose of the Plan is to remediate the windblown tailings, effluent contaminated soils, and soils contaminated by licensed activities that originated from the milling operation and disposal area, and to demonstrate that the clean up plan was successful in remediating the contaminated soils to comply with the proposed release criteria and achieve appropriate closure to allow for the transfer of these areas to the U.S. Department of Energy. A comprehensive description of proposed remediation activities is provided below.

### *Remediation Strategy*

Remediation of affected areas involves excavation of the surface soils followed by verification of remediation through instrument surveys and laboratory analysis. Following successful remediation, the area will be revegetated.

<u>Excavation</u>

The technique that will be considered for remediation of surface soils is excavation. Excavation will consist of picking up contaminated soil and transporting it to the disposal cell. Excavation of contaminated material is expected to be limited to the top six inches of surface soil. Excavation techniques for larger areas will include grading and/or scraping. The contaminated area may be graded to form wind rows of surface soil that are subsequently picked up by scraper. Otherwise, the surface soil may be picked up directly by scraper. The excavated area will be contoured by grading as necessary after excavation to facilitate survey activities. Excavation techniques for small areas will include grading and/or scraping. The surface soil of the contaminated area may be pushed into a pile that is subsequently picked up by bucket loader. Otherwise, the surface soil may be picked up directly by bucket loader. The excavated area will be contoured by grading or backfill with clean soil as necessary after excavation and successful surveys.

<u>Verification - Surveys</u>

The objective of the verification phase is to demonstrate that the final condition of the site satisfies the requirements of 10 CFR 40 Appendix A Criterion 6(6). Scanning surveys will be completed using a NaI(Tl) radiation detector coupled to a handheld scaler/ratemeter. Measurements will be collected by keeping the detector approximately eighteen (18) inches above the ground surface while walking or driving over the area at a rate comparable to a casual walk. The measurements will be made along straight line paths between opposite borders of the area being surveyed. The distance between the paths will be approximately six (6) feet. The scaler/ratemeter will be coupled to global positioning system (GPS) equipment and a data logger. A gamma measurement from the scaler/ratemeter and a location from the GPS will be recorded approximately every two seconds. The gamma measurement will be recorded as counts per minute. The location will be recorded with respect to the reference coordinate system described in Section 8.3. The scanning measurements will be averaged for each 100 $m^2$ grid. The scanning average value will be compared directly to the gamma guideline value. If the scanning average value is less than or equal to the gamma guideline value, no further scanning survey will be made of the grid. If the scanning average value is greater than the gamma guideline value, the failed grid and each surrounding grid will be remediated and another gamma scan performed. Additionally, the number of individual survey readings in each grid will be determined. Grids not meeting the scanning density of 10 readings per grid will be subjected to additional scanning survey. A tabular and graphic record will be compiled describing the scanning survey results relative to the gamma guideline value, remediation, and subsequent scanning survey results.

Verification – Soil Sampling

Soil samples will be collected in a known and consistent fashion, and with respect to the location reference system used for the scanning survey. Soil plugs will be collected from five evenly spaced locations across a 100$m^2$ grid. The soil plugs will be collected from the top six inches of soil. The five plugs from a six inch layer will be combined to create one composite soil sample. Sample collection activities will also include documentation of sampling activities on a field log. Equipment will be decontaminated between sample locations, and collection of replicate samples will be at a rate of one per 10. Chain-of-custody procedures will be applied beginning at the time of sample collection. The composite soil samples will be prepared in a known and consistent manner for laboratory analysis. The preparation will include removing rocks and vegetation, drying (if needed), crushing, and mixing/blending. The preparation concludes with placement of the prepared soil in a container and labeling the container. The soil sample result will be compared to clean up levels such that the sum of the ratios for the concentration of each radionuclide of concern to the respective concentration limit will not exceed "1" (unity). If the sum of ratios is less than or equal to one, no further measurement or evaluation will be made of the 100 $m^2$ grid. If the sum of the ratios exceeds unity, the grid and every adjacent grid will be remediated and re-sampled. A tabular and graphic record will be compiled describing the initial soil sample results, remediation, and subsequent soil sample results. Results of characterization sampling and remediation control sampling of soils may be incorporated into to the final status survey data set. If the number of failed 100 $m^2$ grids is greater than five per 100 the gamma guideline value will be re-evaluated and adjusted downward.

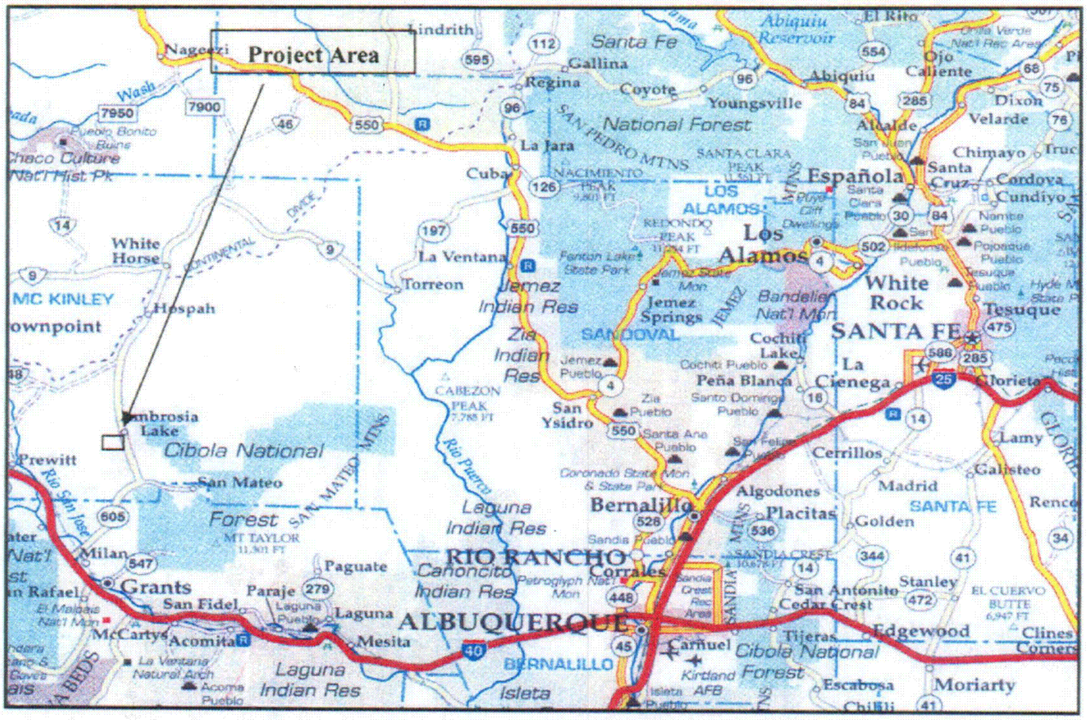


**Figure 1.** Project Location.
Source: Recreational Map of New Mexico, GTR Mapping (2000 Edition).


Figure 2. Site Locations
Legend
Site Locations
82635
82634
Ambrosia Lake
(Mobile Home Park)
Carter Well
Kermac Mine No 30
Trailer Park
Ann Lee Mine No 1
Phillips Petroleum Ambrosia Mill
Tailings Pond
Storage Pond
Homestake New Mexico Partners Mine
Kermac Nuclear Fuels Processing Plant
Pump
DITCH
Sec 33 Mine
Well
Wells
31
32
33
28
6
5
4
NAVAJO
INDIAN
LAND
AMBROSIA LAKE ROAD
BM 6915
0 0.2 0.4 0.8 Miles
Ambrosia Lake, NM USGS 7.5 minute quadrangle

## TREATMENT PLAN ORGANIZATION AND CONTENT

The treatment plan consists of ten basic elements: (1) research context; (2) resource description/current knowledge of the sites; (3) specific research questions; (4) specific procedures to excavate the sites; (5) procedures to operationalize the plan; (6) backfill; (7) analytical procedures; (8) schedule; (9) personnel; and (10) curation. The intent of the research orientation section is to identify basic research themes that apply to the project area as a whole, and to the kinds of sites that are known to occur.

## RESEARCH CONTEXT

Sites LA 82634 and LA 82635 are Anasazi lithic and ceramic scatters with possible subsurface features dating to the Pueblo II to Early Pueblo III period (A.D. 900-1150) based on diagnostic ceramics identified at each site. As such, the research context shall emphasize these time periods in terms of a comprehensive culture history based on current research.

The following discussion of the prehistory and history of the area is taken from the Farmington Proposed Resource Management Plan and Final Environmental Impact Statement (2003). This information provides a thorough backdrop for the types of resources expected and highlighting developmental sequences identified within the project area. The discussion is at a regional level, however, it is tempered with information regarding local phases and settlement/subsistence patterns likely seen within the project area.

*Pueblo II (ca. A.D. 900 to 1050)*

The Pueblo II (PII) period is characterized by an increase in the number of sites, an increase in average site size, a shift toward above-ground coursed masonry architecture, the appearance of larger numbers and larger sizes of storage facilities, and the appearance of formal kivas. Sites typically contain between 6 and 9 rooms per site, most arranged in a linear fashion. Larger sites containing more numerous rooms are often laid out in a quadrilateral pattern around central plazas. It is during PII times that the Chaco phenomenon truly flourishes, accompanied by the establishment of very large towns, the appearance of multistoried room blocks, increasingly complex architectural elaboration of kivas, the advent of field systems in an effort to boost agricultural production, and the development of road systems to facilitate trade and exchange. These changes seem to signal a return to accelerating population growth in response to dramatically improved climatic conditions. Unlike the PI period, climatic reconstructions for A.D. 900 to 1050 indicate a return to higher rainfall levels, although this was accompanied by episodic droughts whose intensity varied from place to place. In areas less affected by droughts, settlements were pushed into areas that would have been marginal in PI times. It is suspected that differential spatial distributions of critical resources probably became more pronounced in PII times over much of the San Juan Basin. In short, current theories suggest that much of the PII period is typified by imbalances between people and resources, both temporally and geographically. Such imbalances necessitated the introduction of various buffering mechanisms in an effort to offset these imbalances. Among the buffering mechanisms inferred from the archaeological record were improved storage facilities, expansion of regional exchange networks, and more frequent abandonment and reestablishment of large villages in areas better suited for agriculture. One consequence is that PII sites often were occupied for relatively short periods of time. Subsistence practices indicate greater reliance on cultivated plants, although evidence of use of wild resources persists at most PII sites. Maize, beans, and squash are quite common at both large and small sites. Evidence of agricultural intensification derives from the identification and dating of the first water control structures in the San Juan Basin. These structures were designed to augment rainfall, thereby increasing overall productivity of given plots of land. Many of these water control devices seem to provide water to outwash fans, areas that are often marginal for direct rainfall agriculture. Earlier dissimilarities between sites in the southern San Juan Basin and those in the northern basin largely disappear during PII times. The emergence of region-wide (relative) homogeneity in ceramics, architecture, subsistence practices, and settlement patterns has been interpreted as evidence supporting the inference that region-wide trade and exchange systems emerge in full force during PII times. One notable exception to this homogeneity is found in the Chaco Canyon region, where settlement in the Chaco heartland is typified by numerous small habitation sites distributed around fewer, but very much larger and more complex towns (central places) containing kivas, great kivas, reservoirs, dams, and roads. Sourcing studies suggest that non-local materials were being imported from far-flung parts of the Southwest. These facts, combined with the panregional distribution of ceramics that are virtually identical, suggests that Chaco Canyon may have been the primary focal point for trade and exchange networks whose limits extended into northeastern Arizona, southern Colorado, and west-central New Mexico. Analyses of ceramics and chipped stone indicate that source areas for such critical resources gradually shifted over time from the southeastern part of the area (Zuni) to the western (Chuska) region and, finally, to the northern portion of the San Juan Basin. It is likely that these regions approximate the outer limits of this exchange and trading network. There is some evidence suggesting that turkeys and perhaps corn were among the crucial subsistence resources being imported into the Chaco region. If such inferences are accurate, reliance on imported foodstuffs underscores the tenuous agricultural conditions that prevailed across the central San Juan Basin during PII times. Chaco Canyon, and the outlying sites related to it, is unique in Southwestern prehistory. The Chaco phenomenon is defined on the basis of multiple attributes. There are two alternating site types, great houses and villages viewed by many as indicative of economic and political differences inherent in the Chaco system. Multistoried great houses, usually consisting of upwards of 200 rooms, typically were constructed as a series of temporally discrete units (Kantner and Mahoney 2000, Saitta 1997). In contrast, surrounding villages usually consist of single story structures ranging from 20-40 rooms in extent. Obvious differences in site construction characteristics are underscored by the recovery of exotic goods in great house sites and the virtual absence of such goods in villages. Among these goods are copper bells, turquoise, shell jewelry, and macaws from Central America (Mathien and McGuire 1986, Toll 2001). Finally, great houses appear to be nodes for upwards of 70 constructed roads or road segments, often interpreted as remnants of transportation/communication routes (Renfrew 2001; Vivian 1997a, b). Because the "Chaco phenomenon" is one of the most well-documented archaeological manifestations in the Southwest, it is no surprise that it provides a basis for widespread discussion of the factors that contributed to its appearance, operation, and eventual collapse. The phenomenon of "Chaco" has been viewed by different scholars as either (1) largely a local geographic phenomena that appears in response to generally favorable climatic conditions and is typified by redistributive activities or (2) as one component of a much larger Mexican-Southwestern interaction network founded largely on ideational factors. The characteristics of inferences necessarily vary considerably between these perspectives.

*Chaco as a Regional System*

Those who view Chaco as a somewhat localized Southwestern phenomenon underlain by redistributive activities assume that Chaco exhibits attenuated links to other regions (e.g., Mexico). Researchers of this perspective generally focus on the occurrence of two alternating site types, great houses and villages, as well as the presence of exotic goods and constructed roads as consistent with strategies to control access to and redistribution of goods—both subsistence resources and trade items—across the San Juan Basin (Renfrew 2001). Those advocating the presence of religicopolitical elites cite the presence of large proportions of non-residential rooms at great house sites as evidence for storage of surplus foodstuffs, which were then redistributed by elites residing in great house communities. There are differences of opinion on this theme primarily with respect to inferred degrees of political centralization, ranging from egalitarian (Vivian 1990) or ranked (Grebinger 1973) to chiefdoms (Earle 2001, Lekson 1999, Saitta 1997). Others, however, find insufficient evidence to conclude that hierarchical elites were present (Feinman et al. 2000, Saitta 1997, Sebastian 1992, Vivian 1997b, Windes and Ford 1996). The presence of upwards of 70 constructed road segments, possibly built through some form of non-coerced or coerced communal labor (Saitta 1997), is viewed by some as reinforcing the notion of politico-religious authorities coordinating road construction to facilitate transport and communication across the San Juan Basin (Cameron and Toll 2001, Nelson 1995, Vivian 1997b). Among the activities inferred for Chacoan roads are transport of beams into great house communities for use in roof construction (Snygg and Windes 1998), as access routes for pilgrims to ceremonies and periodic markets centered in great house communities (Judge 1989, Malville and Malville 2001, Renfrew 2001, Roney 1992, Vivian 1997b), as routes for the movement of turquoise, much of which seems to have been used within Chacoan communities (Mathien 2001), or as routes for military activities undertaken to forcibly integrate outlying communities into the Chaco system (Wilcox 1994). Others, however, have concluded that these roads were too wide to have been designed simply as transportation routes, regardless of what might or might not have been transported (Roney 1992, Kantner 1997, Vivian 1997b). Similarly, while exotic items of Mexican origin (e.g., copper bells, macaws) are known from Chacoan sites, those subscribing to the notion that Chaco was a regional network note that the overall quantity of such remains is too small to reflect widespread trade or exchange with Mexico (Renfrew 2001). At the same time, some have suggested that the value, not quantity, of exotic items from Mexico may be a far more important factor in evaluating the presence of such items at Chaco (Reyman 1995). Finally, some see Chaco's settlement system as based largely on cosmology (Stein and Lekson 1992). Specifically, the Chaco phenomenon is argued to have been predicated on shared ritual ideology linked to cosmological events (e.g., solstices, equinoxes) which, in turn, were manifested in the structured spatial arrangement of archaeological sites (e.g., kivas, shrines, rock art, water control features, and roads) across Chacoan landscapes (see also Sofaer 1997).

*Chaco as a Pan-Regional System*

Most recently, Lekson has proposed that Chaco may be part of a much larger Mexican-Southwest settlement system. Lekson (1999) focuses on the supposed alignment of structures found at the New Mexico sites of Aztec Ruins and Chaco Canyon, along with the site of Paquimé in northern Mexico, on a north-south axis running from nearly Colorado into northern Chihuahua. These complexes are suggested to be time-sequent residences of religico-political elites that moved in response to a succession of deteriorated environmental intervals. Specifically, he proposes that a politico-religious elite, originally resident in Chaco Canyon, moved successively to Aztec (ca. A.D. 1125) and then Paquimé (A.D. 1275). What is perhaps most controversial about Lekson's argument is the notion that the arrangement of these three sites along a given meridian represents a deliberate effort to construct sites according to some preconceived plan by a multi-generational elite that spanned more than 200 years and 630 kilometers. Not surprisingly, there are objections to Lekson's view of Chaco. For example, Phillips (2000) demurs about this model, observing that the alignment of these three sites along a given meridian may be more apparent than real and, moreover, that the presumptive similarity of architecture across these three sites is without foundation. Further, Phillips notes that, in particular, ceramic assemblages from Paquimé are quite dissimilar from Chacoan ceramics in general, suggesting that a time- and spacetransgressive elite is not responsible for constructing these three sites.

*Pueblo III (ca. A.D. 1050 to 1300)*

The Pueblo III (PIII) period is typified by the aggregation of populations into progressively larger centers, accompanied by the gradual collapse of the Chaco phenomenon that so defines early and middle PII times. Some researchers suggest that populations began to move northward into the northern San Juan Basin near Aztec, as well as southward out of the Mesa Verde region. Concurrent with Chaco's gradual decline in importance is a seeming realignment of social interaction spheres northward toward Mesa Verde. For example, sites along the Chuska Mountains seem to evidence a period of increased building events, accompanied by the replacement of Chacoan ceramics with those more typical of Mesa Verde. As well, the appearance of bi- and tri-wall buildings, nominally characteristic of the Mesa Verde region at sites in the San Juan Basin, suggests the gradual outward expansion of Mesa Verde peoples into areas formerly containing Chaco components. Over much of this period, sites contain between 13 and 30 rooms, with larger sites exhibiting upwards of 200 rooms. These changes are attributed to the onset of a period of dramatically decreased rainfall after ca. A.D. 1220, accompanied by increased spatial variability in rainfall across the basin as a whole. Areas adversely affected by reduced rainfall, the central and southern San Juan Basin, seem to act as donor areas for population out-migration, while areas less subject to reduced rainfall, like the Mesa Verde and McElmo regions, become recipient areas for immigrants. Many parts of the Basin appear to have been abandoned toward the terminal portion of the PIII period. Further, as noted in the PII discussion, dual PII-PIII components are quite common across the region.

## RESOURCE DESCRIPTION/CURRENT KNOWLEDGE OF THE SITES

**LA 82634/SW 260-2**

**Site Type: Artifact Scatter**
**No. of Components: 1**
**UTM Coordinates: 244380 E; 3920460 N, Z 13**
**Cultural Affiliation: Anasazi**
**Elevation: 6930 feet above mean sea level**
**Topographic Location: Alluvial flat**
**Vegetation Community: Desert Scrub**

Site LA 82634 is a lithic and ceramic scatter that is located on an alluvial flat, just to the west of New Mexico State Highway 509 (NM 509). The site was originally recorded in September of 1990 by Lonyta Vicklund of Southwest Archaeological Consultants (Vicklund 1990). The site measures approximately 28 m x 48 m, has a site area of 1,344 square meters, and is at an elevation of 6930 feet above mean sea level. It is situated within a desert scrub/grassland vegetation community comprised of chamisa, four-wing saltbush, sage, Russian thistle, and various grasses. A total of 15 flakes were identified during the original recording and are dispersed across the site boundary. They are defined as primary and secondary flakes manufactured from chert and quartzites. Three small pieces of unmodified vesicular basalt were also noted. Ceramics on the site include more than 100 sherds. Types represented within the assemblage include Red Mesa Black-on-white, Gallup Black-on-white, and Escavada Black-on-white sherds representing bowls and jars. There are numerous sherds of indeterminate grayware, Clapboard corrugated, and corrugated indented jar sherds (with some Chuska varieties). Sandstone spalls and unmodified blocks were noted in limited concentrations on the site, however no formal feature designation was given. The site condition was determined to be intact. The site was determined to have possible subsurface deposits present. The site was interpreted to represent a field location and possible habitation dating from the Late Pueblo I to Pueblo III period (A.D. 800-1150) based on the presence of several different types of ceramic vessels and possible remnants of a subsurface structure or eroded jacal structure. The ceramic types present more accurately date to the Pueblo II to Pueblo III period (A.D. 900-1150). The site was recommended as eligible for inclusion to the National Register of Historic Places under criterion D, information potential.

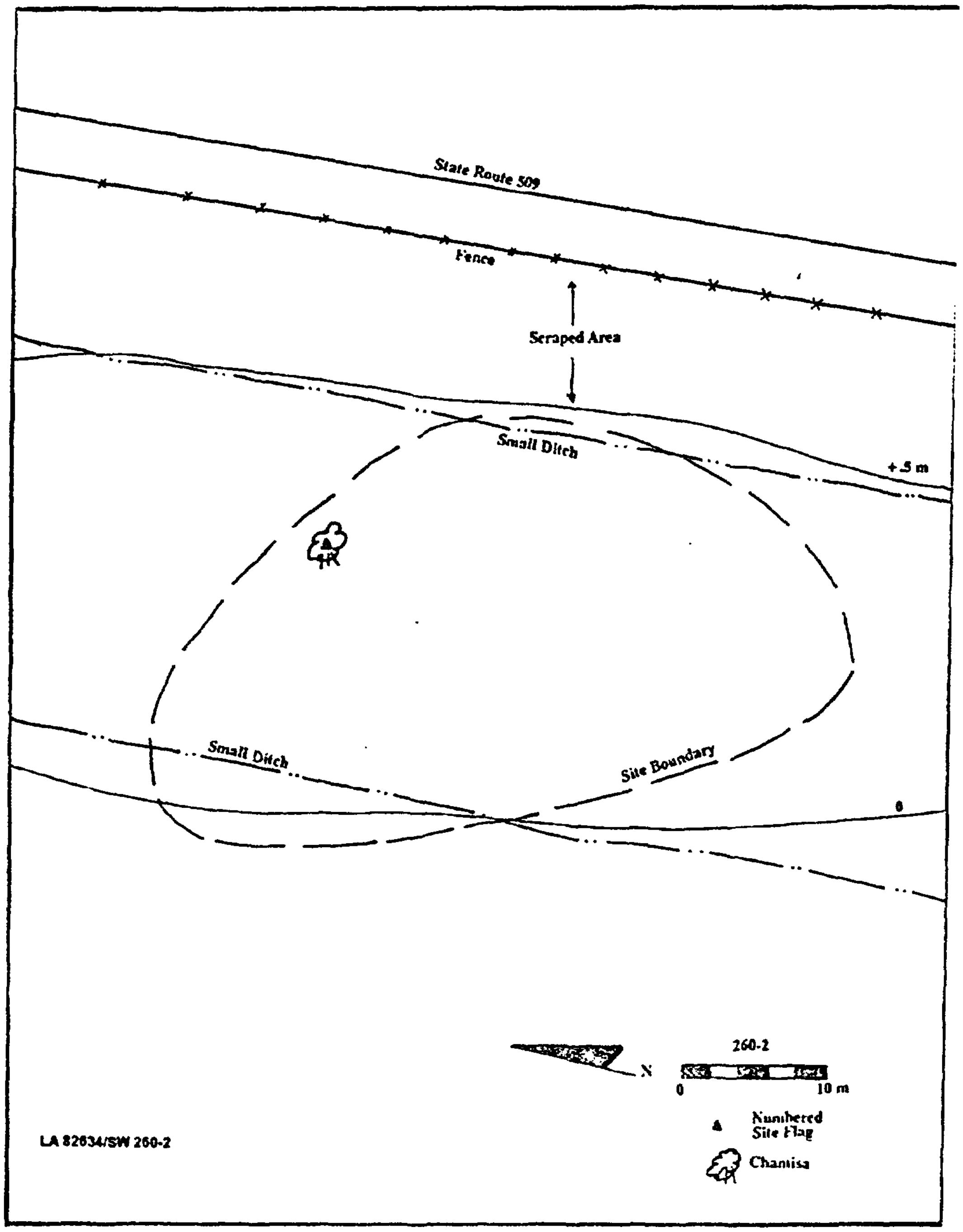


Figure 3. Site map for LA 82634/SW 260-2.

**LA 82635/SW 260-3**
**Site Type: Artifact Scatter**
**No. of Components: 1**
**UTM Coordinates: 244200 E; 3920840 N, Z 13**
**Cultural Affiliation: Anasazi**
**Elevation: 6930 feet above mean sea level**
**Topographic Location: Alluvial flat**
**Vegetation Community: Desert scrub**

Site LA 82635 is a lithic and ceramic scatter that is located on an alluvial flat, just to the west of New Mexico State Highway 509 (NM 509). The site was originally recorded in September of 1990 by Lonyta Vicklund of Southwest Archaeological Consultants (Vicklund 1990). The site measures approximately 39 m x 35 m, has a site area of 1,365 square meters, and is at an elevation of 6930 feet above mean sea level. It is situated within a desert scrub vegetation community comprised of chamisa, four-wing saltbush, sage, Russian thistle, and various grasses. A total of 4 flakes were identified during the original recording and are dispersed across the site. They are defined as primary and secondary flakes manufactured from chert and quartzite. A trough metate and three small pieces of unmodified vesicular basalt were also noted. Ceramics on the site include 55 sherds. Types represented within the assemblage include Red Mesa Black-on-white, an indeterminate pinchpot fragment, indeterminate grayware, and corrugated indented sherds representing both bowl and jar remnants. Sandstone spalls and unmodified blocks were noted in limited quantities on the site, however no formal feature designation was given. The site condition was determined to be intact. The site was determined to have possible subsurface deposits present. The site was interpreted to represent a field gathering/processing location and possible habitation dating from the Late Pueblo I to Pueblo III period (A.D. 800-1000) based on the presence of several different types of ceramic vessels and possible remnants of a subsurface structure or eroded jacal structure. The ceramic types present more accurately date to the Pueblo II to Pueblo III period (A.D. 900-1050). The site was recommended as eligible for inclusion to the National Register of Historic Places under criterion D, information potential.

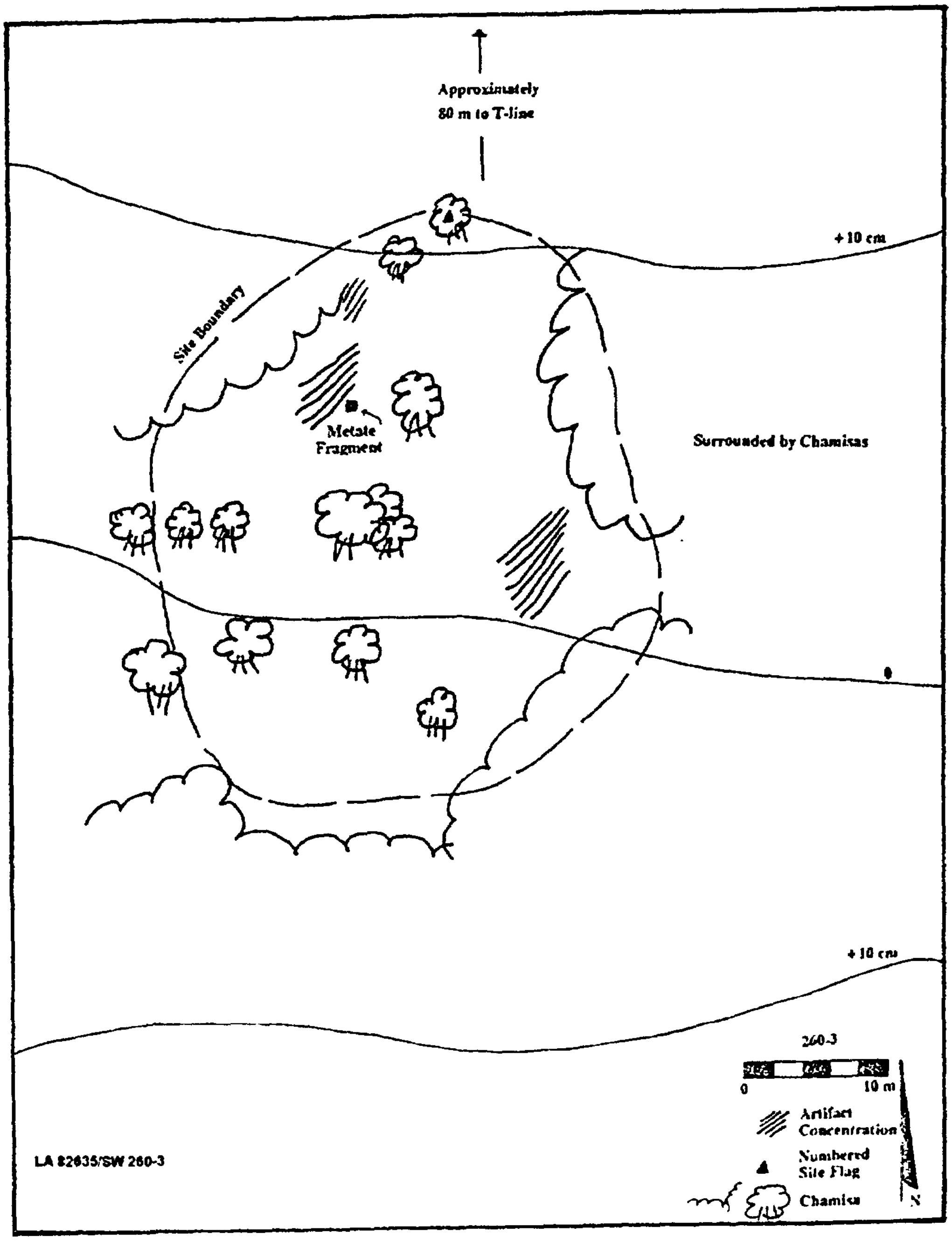


Figure 4. Site map for LA 82635/SW 260-3.

## PROPOSED TREATMENT

To adequately address the concerns of the site owner (Rio Algom Mining, LLC) and the New Mexico State Historic Preservation Office (SHPO), a data collection and synthesis proposal/plan is required. The plan must address technical and logistical guidelines for the physical collection, as well as research orientation for the synthesis of information gathered.

## SPECIFIC RESEARCH QUESTIONS

General research issues that may be applicable to the investigation of LA 82634 and 82635 are related mainly to settlement and subsistence strategy patterns and how they relate to regional data bases. Research questions that may be answered by the excavation of small, presumably seasonal loci include cultural, economic, technological and possibly seasonal and longevity of site use. Sampling of feature deposits may recover evidence of dietary and perishable economic products, as well as other technological items. Interpretation of attributes derived from macrobotanical or artifactual evidence may lead to a better understanding of prehistoric strategies of resource production/procurement for subsistence products, as well as raw materials for tool production, related processing methods, and the determination of regional cultural affiliation as defined through lithic tool forms, raw materials, groundstone, and ceramic analysis. Considerable emphasis has been placed on the value of ceramic typology when interpreting temporal and cultural affiliations of various Southwestern cultures. Additional artifact classes and the information potential that they provide are often overlooked. Every attempt to derive interpretive data from the analysis of ceramics and other artifact classes i.e. flaked lithic, groundstone, bone, mineral etc. may insure an enhanced understanding of prehistoric economies at the sites.

The importance of determining site function can help to clarify the directing environmental factors of settlement patterns. Identifying small site function is necessary for determining exactly how people were utilizing their environment and how these sites fit into the overall cultural landscape. This is especially true of Anasazi settlement patterns and site function whether residential, agricultural, resource procurement or ceremonial. Regardless of site function, economic activities occur both on and off specific site types. Sites are typically a conglomeration of features and artifacts indicative of occupation or economic activity. It seems logical to state that many transient activities relevant to prehistoric subsistence occur away from the permanent or longer-term residential sites. Numerous reasons may be presented, however the most logical one is the scattered distribution of natural resources across the landscape. Modern analogy may be used to infer past human behavior. Most people have a primary residence at which many activities take place, resulting in material remains that are indicators of those domestic activities. On the contrary, many other activities take place away from that primary residence that also leave material remains behind. These material remains, however, are evidence that is more difficult to relate back to a specific primary residence. As such, a regional approach must be employed, analyzing both on and off site data, to understand landscape utilization during a typical year or throughout a specific prehistoric period. In order to accomplish such a task, an analysis of all sites within a given region, as well as areas interstitial to those sites must be conducted before an adequate assessment of landscape utilization can be developed. An undertaking of that magnitude is clearly beyond the scope of this data recovery project. However an analysis of artifacts and specialized features and their role in Anasazi site function can contribute to regional data from survey and excavation contexts. Excavated contexts retaining chronological, economic or other cultural data are investigated at a far lesser frequency than those provided by survey data. With the accentuated quality of preservation found in buried contexts and their ability to provide data, interpretation of discrete feature or activity areas found at small sites is preferable to surface indications used to interpret buried or disrupted features/assemblages during survey interpretation.

LITHIC ARTIFACTS

Determination of flaked lithic artifact type and function is critical for understanding specific elements of resource processing and identifying similar or differential activity loci within a site. Research issues related to lithic tool type and function as they relate to the inference of site function include, but are not limited to: (1) can artifact type, raw material and function be reliably ascertained? (2) can stages of, or type of manufacture (i.e. hard hammer vs. soft hammer) represented in the assemblage be reliably ascertained from the assemblage data? (3) can differential activity loci be determined by the identification of artifact type or attribute analysis data?; and (4) are lithic artifact type, lithic artifact functions (as determined through use wear analysis and tool form), stages of manufacture, and relation to activity loci primary indicators of site function? and (5) does the presence of certain raw material types or stages of manufacture relate to local or imported sources and therefore cultural interaction through trade; or additional transience in resource acquisition strategies.

Lithic artifact analysis should occur on a variety of levels. First, determination of artifact type and raw material is critical for understanding what types of activities associated with lithics were taking place at the site. This determination of an artifact's introduction to the site and the identification of it's disposition, whether being a functional entity or the by-product of producing a functional entity, is the initial typing of the individual artifact. Specific artifacts are often temporally diagnostic in form (arrowpoints vs dart points) or morphologically indicative of distinct types of activities (e.g. scraping, cutting, planning etc.). The attributes of physical morphology, both natural and human imparted, can provide information about the procession or trajectory of lithic acquisition and reduction, possibly providing inferences to cultural or economic strategies.

The determination of the process of manufacture is crucial in identifying the role of the artifact and possible cultural relation to the assemblage data. Whole artifacts, particularly flakes, are crucial for the discussion of reduction trajectories or stages. Attributes such as the type and percentage of cortex on debitage may be a primary indicator of reduction stage or stages performed at the site. For example, assemblages that exhibit flakes with a high percentage of cortex may be categorized as the product of primary core preparation or tool production from a cortical piece of raw material. Conversely, exterior flakes that exhibit large percentages of cortex may have been selected for the specific properties that cortical surfaces impart to use edges, or for backing purposes. Therefore, the identification of an artifact as specifically debitage, the by-product of tool manufacture, or an item produced specifically for use as a tool is critical to the identification of the act that produced the artifact and therefore one of the site functions inferred by the assemblage. Therefore the presence or absence of certain types of debitage is crucial to activities being employed or sources of raw materials.

Identification of platform types on individual flakes may further enable determination of flake type or origination. An essential attribute for inferring whether a flake was produced from a core for a specific use, produced during the manufacture of a biface, or in other tool manufacture or maintenance activities such as retouching, may be inferred by platform or other dimensional flake attributes. Individual artifacts identified by single or multiple attributes may then be compared or contrasted with groups of artifacts recovered from the site, further enabling confidence of function at the assemblage level. By viewing an assemblage as a whole, it may be possible to identify procurement and transportation strategies of raw material, stages or trajectories of lithic reduction or tool production, and inferred function of stone tools and therefore, activities being performed at the site. This last distinction is important to note. Any mention of site function can only be discussed in terms of lithics and the role they played in prehistoric procurement and subsistence strategies. Other artifact types, such as those used for manufacture and maintaining stone tools, may or may not be present and must also be considered. At a minimum the artifact assemblage may provide an overview of some of the activities that bring the artifact to, as well as those being performed at the site. At a higher level, site data can then be incorporated into a regional perspective of Anasazi behavior.

Raw material sourcing also has implications concerning Anasazi populations and possible interaction with other entities. Questions that may be answered through raw material analysis include, but are not limited to: (1) is the selection of a specific raw material type such as Chinle chert for multiple uses typical of local Anasazi sites?; (2) is the selection of multiple raw material types for single or multiple uses typified on Anasazi sites?; (3) are specific raw material types preferred for specific processing activities, or the product of expedient acquisition or tool production?; and (4) can mobility and/or trade patterns of seasonally inhabited areas be determined through raw material analysis?

Most non-local materials identified on seasonally inhabited Anasazi sites are assumed to be a product of trade. Trade of raw material across great distances is commonplace in the southwest during the Pueblo periods. The presence of usable pieces of debitage or formal tools without the presence of waste or shatter from reduction processes is the most obvious or provable relationship that may be qualified through analysis.

GROUNDSTONE ARTIFACTS

The use of groundstone to identify economic activities is more obvious in nature given the inferred function of an implement i.e. mano, metate, lapstone etc. Specialized artifacts such as a tsamajilla, or corn maiden may be culturally significant.

Mano form and size are generally accepted to relate to the product being processed and therefore possibly useful in determining the presence or absence of certain dietary produce. One-hand manos and basin or slab metates are generally associated with the processing of wild foods such as seeds. Two-hand manos and trough metates are generally seen to relate to corn processing. The former types are generally smaller and portable and typical of a more mobile economic strategy. The latter are generally much larger and heavier due to the processing needs of dried maize. The presence or absence of these types of artifacts may be helpful in determining subsistence products and longevity of site use.

Specialized activities or possessions may be identified by the presence of artifacts such as grooved abraders, pecked and ground implements, ground mineral pigments or jewelry such as pendants.

CERAMIC ARTIFACTS

Ceramic artifacts are probably the most obvious component of Anasazi artifact assemblages. The project area is located at the confluence of several Anasazi provinces within the Mount Taylor region. It is on the eastern periphery of the Red Mesa areas, south of Chaco Canyon and west of the Puerco Salado area. The San Mateo and Cebolleta regions are most proximate to the Ambrosia Lake area. All of these provinces exhibit similar ceramic wares relating to the widespread use of Cibola whitewares during the Pueblo II and Pueblo III periods. There are however differential frequencies of whitewares and several intrusive wares that relate to one district or the other.

Relatively high frequencies of ceramic artifacts or the presence of a predominant ware are usually necessary to assign discrete differences to an assemblage. If a sufficient number of sherds is recovered, these discrete regional assignations may be deduced. Differences in occupation may also be determined within the Pueblo II period and the later portion of that period and the early portion of the Pueblo III.

The influence of the Chaco system on local Anasazi populations in the Mount Taylor region during the A.D. 950 to A.D 1150 period accounts for the rapid increases in local populations, and therefore site densities. Stuart and Gauthier (1981) also relate a widespread trade network in the region. Therefore, ceramic evidence should relate to this phenomenon. Any deviation from this pattern would be evident in the ceramic assemblage.

Mineral painted Black-on-white wares such as Red Mesa, Gallup, Puerco, Escavada and Chaco, are the predominant types found throughout the Pueblo II period and early Pueblo III period. The presence of Red Mesa Black-on-white is reduced from the middle to the end of the period. Carbon painted Black-on-white such as Chaco McElmo and redwares such as Puerco Black-on-red and Wingate Black-on-red are indicative of the latter portion of the period and the early portion of the Pueblo III period.

All of these wares are found across the region at Anasazi sites of this period. If less prevalent or intrusive wares such as Socorro or Casa Salazar Black-on-white occur, a relation to the Cebolleta group may be inferred. The presence of brownware ceramics within the Mount Taylor region is generally accepted as evidence of Anasazi and Mogollon contact. Cibola whitewares are expected to comprise the bulk of the assemblage. The overall ceramic assemblage will be documented as to type of ware, concentrating on the identification of wares divergent to the Cibola whiteware types mentioned.

SITE STRUCTURE AND ARTIFACT/FEATURE RELATIONSHIPS

How may the site type be determined by site structure and artifact distribution? The presence or absence of certain features and densities of artifact assemblages are the most obvious characteristics observed during survey documentation. Specialized Anasazi locations relating to agricultural activities will exhibit artifacts and features similar to those at extended occupations (ramadas, single masonry rooms) but at lower frequencies and reduced sizes. Substantial or multi-roomed masonry structures or large pitrooms are generally absent. Because of the seasonal or short-term occupation at specialized sites, temporary, and therefore expedient feature types are used. The ephemeral nature of these locations subjects them to more substantial degradation through erosion. Discrete features such as postholes or hearth pits are often obliterated in surface contexts, therefore the artifact scatters/concentrations are the only remaining evidence.

Small or specialized Anasazi sites such as field houses or ramadas will exhibit a more expedient assemblage of both lithic and groundstone artifacts and lack the densities and varieties observed at residential centers. Exotic lithic raw materials may be present, but the tools are generally representative of more limited activities than at longer-term residential loci. Ceramic artifacts may be represented by higher frequencies of utilitarian wares at specialized locations and decorated wares may be represented by multiple types, but in lower frequencies than residential locales.

The formerly discussed differences at both site types are considered obvious. What is not usually obvious at the ephemeral locales is the presence of discrete features. If artifacts are the only cultural evidence observed during survey documentation the site is considered non-structural. A variety of open sites exhibiting artifact scatters have been found to produce features when excavated (Phippen, personal observation). To compare similar site structure and use patterns, albeit bimodal from residential to specialized site, the use of artifact scatters may be used as a guide for excavation. Both site types exhibit similar patterning in site structure. Midden areas and residential areas are set at generally west to east or northwest to east/southeast with the residences on the west to north sides. Therefore the excavation strategies employed during the project will use this relationship to investigate the possibility for features, and therefore deposits containing intact carbon or macrobotanical materials valuable for interpretation of time frames and economic attributes of the occupation.

The presumed assemblage of artifacts, and association to site areas or features that may be encountered, is the predominant tool that a researcher possesses to propose and initiate excavation strategies. The presence of an open site that has been variously affected by a variety of climactic and depositional/erosional sequences directs to some degree the progression of excavation. Minimally this includes identification of areas retaining cultural horizons and therefore artifacts and/or features, and the expansion of these areas through excavation to recover as much artifactual or other data present as possible. These goals may be reached by first attaining a cross section of the subsurface characteristics of the site to gain insight into the areas retaining the highest potential. Following the identification of positive subsurface areas, excavations following the levels of cultural materials observed are expanded to attain the highest degree of artifact and feature deposits as possible. The expanded excavation of positive areas and the artifacts that they may yield will provide a chance for the assemblage to provide similar or differential artifact functions, and therefore uses of the site. Specifically, artifacts from both screened and excavated contexts, as well as features, should provide information concerning artifact and site function, raw material procurement and preferences, settlement patterns, and how this site relates to others previously identified in the area.

In summary, the analyses of individual artifacts resulting from the proposed data recovery will serve as the bridging mechanism between the research orientation and the field methods. In this specific situation, the damaged area of the site dictates to a large degree the methods of fieldwork to be employed during the data recovery. Other areas on the site may produce more suitable data for understanding site function, settlement, and the site's relationship to others in the region; however, these undisturbed areas of the site are not subject to the proposed data recovery. The proposed data recovery will allow the researcher to exhaust the data potential in the damaged areas by incorporating a systematic process of excavation and analysis. The fieldwork is primarily guided by the damaged area requiring treatment, while the analysis of any materials that result from the fieldwork operates to directly address the research orientation of the project. Hence, the research orientation, fieldwork, and analysis should be viewed as tightly integrated entities.

## SPECIFIC PROCEDURES TO TEST/EXCAVATE THE SITES

The duties of Principal Investigator and Project Director will be performed by Richard Burleson of Ecosystem Management, Inc. (EMI). The basic organizational unit for excavation will be a five person crew consisting of the Field Supervisor (Robert Phippen) and four archaeological technicians.

The limits of each site have previously been determined during the initial documentation of the sites. These site boundaries will be reassessed in the field to determine whether or not any significant changes have occurred. No features were delineated during the initial recordation, however sandstone slab spalls were noted that may be remnants of features. These areas will be assessed in the field thoroughly prior to initiating excavation/shovel testing. Previously defined artifact distributions and densities will be re-assessed in an attempt to define any intrasite activity areas.

Different strategies will be employed at each site. The current level of site documentation suggests that there are likely significant subsurface cultural deposits that may yield important subsistence, settlement, and chronological data at LA 82634 as evidenced by the presence of a relatively high frequency, spatial distribution, and type of ceramics on the present ground surface. It is believed that a probable subsurface feature may be present. On the contrary, LA 82635 likely contains a lesser degree of potential to yield such information. The current assemblage is a low density, dispersed scatter of lithics and corrugated indented utility ceramics with no defined concentrations that suggest possible subsurface feature areas.

LA 82634:

Prior to the initiation of excavation, the site area will be included within a metric grid system. The datum will be assigned the designation 100 N x 100 E. This will provide each excavation unit a unique number and avoid the possibility of error when having repeated numbers in adjacent grids (e.g., 1N x 1E, 1N x 1W etc.). All excavation will be tied horizontally and vertically to a main site datum and sub-datums as necessary. The main horizontal control unit is the 1 m x 1 m grid square. Initial excavations will consist of single units, with blocks of contiguous 1 m x 1 m units being the anticipated result of ongoing and completed excavation. The basic vertical control unit will be the 10 centimeter (cm) depth level. Excavations within individual grid units will proceed in flat, arbitrary, 10 cm levels until cultural strata are encountered. Cultural strata will be excavated in 10 cm levels unless they do not reach that thickness and are removed as a unit.

Vertical documentation will relate to the ground surface at the datum of 100 m elevation. This will avoid using any negative numbers across a site with differing topography. All elevations will either be less than 100.00 (99.99 down or 100.01 and up). Prior to excavation, ground surface elevations will be determined for X and Y baselines, as well as individual unit and block excavations. Subsequent elevation readings will be taken using the transit rather than line levels. This convention will be used because occupation levels may be thin, and the deviation in elevations taken with line levels is too large.

Documentation of the excavations will be recorded using standard excavation grid unit level forms, grouped grid unit forms, and feature forms. All features will be assigned an individual number. A plan and profile drawing of the completed excavation will be produced showing all relevant sediment or cultural characteristics. Instrument mapping of the entire site area will be performed following delineation of the area through excavation. Photographic documentation will be used to coincide with feature forms, plan and profile view drawings, and architectural characteristics.

All soil fill will be screened through ¼ inch (in) mesh. Fill in sensitive areas such as features may be screened using 1/8 in mesh if appropriate. Lithic, bone, and ceramic artifacts will be bagged by specimen type and provenience (grid, level, stratum, and feature association as appropriate), and assigned a unique field specimen (FS) number. Specialized non-artifactual samples will also be assigned an FS number. The field specimen numbers will be kept in numerological order by grid unit. Each unit will be assigned a unique number when cultural material is first collected. Each successive field specimen or sample collected will be listed as a decimal following the unique grid number. For example, for grid number 100N/100E, the field specimen is assigned the number 100.0. Each field specimen or sample recovered will be numbered in progression as encountered (e.g. 100.1, 100.2, 100.3 etc.).

Standard methods of collection and appropriate storage containers will be used for sample collection. Bulk soil macrobotanical samples will be collected, in total, from feature fill, and other special contexts as necessary, and placed in ziplock bags. Radiocarbon samples will be collected from burned contexts and stored in aluminum foil. An effort will be made to collect all burned wood or other carbonized material if it is the only datable material encountered. If possible an effort will be made to collect samples of single, (rather than bulk) large, intact pieces of charcoal from burned contexts. If large enough, the individual samples may provide a more reliable date range than bulk charcoal. As a general rule, pollen samples will not be collected from burned or open site contexts. If groundstone is encountered in well preserved contexts, it will be protected during collection in anticipation of pollen washing. Collection and storage of samples and artifacts will be achieved using the greatest care to protect against contamination of samples and damage to individual artifacts.

Excavation will proceed in a two phase approach. The present artifact assemblage will be collected from its surface context, noting locations of high frequency and distribution. This will be followed by surface stripping the site boundary using shovels. An estimated 5-7 centimeters of aeolian overburden will be removed in an attempt to identify potential subsurface feature elements. Initial excavations after surface stripping the site will center on establishing the character of the natural strata across the site. This will be performed by excavating control units across the site in an attempt to identify any undulation, inclusion, or consistency of the natural stratigraphic profile of the substrate. Determination of the profile is necessary for subsequent subsurface analogy in potentially cultural, as well as negative strata.

Following the definition of the stratigraphic profile across the site, excavations will concentrate on determining the extent of subsurface cultural horizons. This may be evident following the excavation of the control pits. If no cultural material is encountered in the control pits, additional single excavation units and blocks of units will be installed across the site in an effort to identify any buried artifact concentration, feature, or horizon. Block excavation units may be excavated by stripping similar amounts of sediment from groups of 1 m x 1 m units, or by vertical excavation of single units.

If and when subsurface cultural material is encountered, the excavation units surrounding the unit in which the material was encountered will be opened to expose the full extent of the buried artifact horizon. Any subsurface discovery or continuous artifact horizon will be excavated in total in an effort to retrieve as much artifactual and/or feature data available.

LA 82635:

Due to the dispersed nature of the artifact assemblage, it is recommended that the site undergo shovel testing at a predetermined interval along an established grid system in an attempt to identify any potential subsurface archaeological deposits. Prior to the initiation of shovel testing, the site area will be included within a metric grid system. The datum will be assigned the designation 100 N x 100 E. This will provide each excavation unit a unique number and avoid the possibility of error when having repeated numbers in adjacent grids (e.g., 1N x 1E, 1N x 1W etc.). All shovel testing will be tied horizontally and vertically to a main site datum. The main horizontal control unit will be a 50 cm x 50 cm shovel test unit. Initial testing will consist of shovel test units excavated at 2 m intervals across the site boundary. The basic vertical control unit will be the 10 centimeter (cm) depth level. Excavations within individual shovel test units will proceed in arbitrary, 10 cm levels.

Vertical documentation will relate to the ground surface at the datum of 100 m elevation. This will avoid using any negative numbers across a site with differing topography. All elevations will either be less than 100.00 (99.99 down or 100.01 and up). Prior to excavation, ground surface elevations will be determined for X and Y baselines, as well as individual unit and block excavations. Subsequent elevation readings will be taken using the transit rather than line levels. This convention will be used because occupation levels may be thin, and the deviation in elevations taken with line levels is too large.

Documentation of the shovel testing will be recorded using standard shovel test level forms. All features will be assigned an individual number if encountered. A plan and profile drawing of the completed units will be produced showing all relevant sediment or cultural characteristics should features be identified. Instrument mapping of the entire site area will be performed following delineation of the area through excavation. Photographic documentation will be used to coincide with forms, plan and profile view drawings, and architectural characteristics.

All soil fill will be screened through ¼ inch (in) mesh. Fill in sensitive areas such as features may be screened using 1/8 in mesh if appropriate. Lithic, bone, and ceramic artifacts will be bagged by specimen type and provenience (grid, level, stratum, and feature association as appropriate), and assigned a unique field specimen (FS) number. Specialized non-artifactual samples will also be assigned an FS number. The field specimen numbers will be kept in numerological order by grid unit. Each unit will be assigned a unique number when cultural material is first collected. Each successive field specimen or sample collected will be listed as a decimal following the unique grid number. For example, for grid number 100N/100E, the field specimen is assigned the number 100.0. Each field specimen or sample recovered will be numbered in progression as encountered (e.g. 100.1, 100.2, 100.3 etc.).

Standard methods of collection and appropriate storage containers will be used for sample collection. Bulk soil macrobotanical samples will be collected, in total, from feature fill, and other special contexts as necessary, and placed in ziplock bags. Radiocarbon samples will be collected from burned contexts and stored in aluminum foil. An effort will be made to collect all burned wood or other carbonized material if it is the only datable material encountered. If possible an effort will be made to collect samples of single, (rather than bulk) large, intact pieces of charcoal from burned contexts. If large enough, the individual samples may provide a more reliable date range than bulk charcoal. As a general rule, pollen samples will not be collected from burned or open site contexts. If groundstone is encountered in well preserved contexts, it will be protected during collection in anticipation of pollen washing. Collection and storage of samples and artifacts will be achieved using the greatest care to protect against contamination of samples and damage to individual artifacts.

*Photographic Documentation:*

All phases of excavation, as well as before and after documentation, will be photographed using 35 mm single lens reflex and digital cameras.

## PROCEDURES TO OPERATIONALIZE THE PLAN

*Mapping:*

Initially, an instrument map of each site area as it relates to the central datum will be generated. This map will function as an indicator of the extent of the sites' cultural surface indications. A mapping log will be generated to document all stages of site treatment. This will enable the production of final maps showing the extent of damage, as well as archaeologically investigated areas. An ongoing instrument map will be generated for the entire area included in the excavations. This map will document all areas excavated. Any subsurface manifestation will be documented on the excavation plan view.

Maps of individual grids and blocks of grids will be generated during excavation. Planviews and profiles will be drawn for any positive result. Profiles of individual pits will be produced to relate local stratigraphy as it relates to the site wide profile.

*Hand Excavation Units and Sampling:*

Whether or not there is potential for any intact feature deposit or cultural horizon to be present is, at this time, unknown. Excavation will concentrate on areas exhibiting surface manifestations, with sampling across other areas. Excavation will begin with the installation of control pits across the site along the N/S and E/W baselines, as well as areas that may represent differential sediment thickness or exhibit surface indications of cultural materials. Initially these pits will be placed at 2 meter and 5 meter intervals across the site. The number of control pits installed after initial testing is somewhat dependant on the results. In the event that none of the initial pits prove positive, a second round of single excavation units will be installed in areas previously untested along baseline and other areas. Control pits will be placed strategically and randomly in baseline and other site areas until a positive result is reached or the subsurface potential of the site is exhausted. Pits that prove positive will be used as the starting point for block excavations. Each positive pit area will be included within a block of grids that may be expanded or terminated depending on the results of excavation.

LA 82634:

As described above the total site area is 1344 square meters. The site will be excavated by surface stripping blocks within areas exhibiting surface manifestations. Stripped blocks will expand or be terminated depending on subsurface discovery. Subsurface discoveries will be excavated in total as described in the excavation methods discussion. One square meter control pits will be placed systematically along grid coordinates in areas exhibiting surface manifestation and at random across areas not exhibiting surface materials.

Initially five one-meter square control pits will be excavated in areas exhibiting surface materials. These will be associated with but not continuous with, three 25 square meter blocks of surface stripped area. The blocks will be placed over artifact concentrations and areas to the west and northwest in an attempt to identify any potential structure or feature areas. Standard one square meter test units will be excavated within each block. These may be continuous or dispersed depending on strata and cultural materials. Additionally, shovel width trenches will be excavated across one axis of the blocks at one-meter intervals along grid lines. An additional series of surface stripping trenches will be excavated across site areas exhibiting surface materials, as well as areas west and northwest of artifact concentrations. Site space not exhibiting surface materials will be stripped with 25 cm shovel width trenches at regular intervals. Minimum excavation totals may reach as much as 80 square meters with additional coverage as necessary. Shovel width stripped surfaces may add as much as another one meter square for every 4 meters of stripping.

LA 82635:

As described above, it is proposed that a series of shovel tests be excavated across the entire site boundary of LA 82635. The site area is approximately 1,365 square meters. The placement of shovel tests at 2 meter intervals is recommended. Therefore, a total of 290 shovel test units are proposed. Each shovel test unit shall be approximately 50 cm x 50 cm and excavated to a depth of cultural sterility. The basic vertical control unit will be the 10 centimeter (cm) in depth level. If necessary excavations within individual shovel test units will proceed in arbitrary, 10 cm levels. This equates to a total of 72.5 square meters of shovel test excavation, which equates to approximately 19% of the total site area. A random series of shovel width trenches will be installed across site areas not investigated or exhibiting cultural materials. If subsurface discovery necessitates additional excavation it will proceed as previously described in methodology sections.

*Surface Collection:*

As a result of the implementation of Rio Algom Mine's remediation plan, all site areas will be destroyed. As such, a 100% surface collection of all artifacts will be conducted. Prior to collection, artifact concentrations will be delineated in order to facilitate provenience information from surface contexts. All artifacts within each defined concentration will be collected for curation accordingly and mapped on the instrument map discussed above. After provenienced concentrations have been collected, the site-wide scatter of artifacts will then be collected. Only specific artifacts (i.e. projectile points and/or unique artifacts) will be point provenienced on the instrument map. Initial in-field analysis previously conducted appears sufficient at this time. All artifacts surface collected will under go further detailed analysis upon their return to the laboratory.

*Samples:*

Should feature deposits be encountered, appropriate samples will be collected to assist in the determination of the site's age and products used there. Deposits will be collected in total from thermal or possibly storage features. Charcoal or charcoal within carbonaceous deposits may assayed for radiocarbon dating. Economic plant/wood data whether dietary, construction or fuels may be identified. Pollen samples will not be collected from burned deposits, but groundstone found in well sealed contexts may be processed for pollen washing.

Specialized analytical studies such as macrobotanical studies, faunal analysis, and pollen analysis are handled through subcontractors. A partial list includes: Beta Analytical (for radiocarbon assay), Laboratory of Tree-Ring Research at the University of Arizona, Colorado State University Archaeomagnetic Services, Lithic Analysis & Obsidian Hydration Laboratory Cotsen Institute of Archaeology at UCLA, University of Minnesota-Duluth College of Science and Engineering Archaeometry Laboratory, National Petrographic Service, Inc, and University of Washington Luminescence Laboratory.

*Human Burials:*

In accordance with the Native American Graves Protection and Repatriation Act, section 10, the discovery of human remains will be treated in the following manner. In case of discovery of human remains all excavation at that location will cease. Immediate telephone notification of the discovery, with written confirmation, will be provided to the appropriate local law enforcement agency officials. These officials will then contact the medical examiner and State Historic Preservation Officer. Notification by telephone and written confirmation will be provided by the appropriate agency official to the Indian tribes likely to be affiliated with the discovery. The discovery will result in an immediate ceasing of activities in the area of the discovery along with a reasonable effort to protect the human remains, funerary objects, sacred objects, or objects of cultural patrimony. If the human remains, funerary objects, sacred objects, or objects of cultural patrimony are to be excavated or removed, the requirements and procedures in the Native American Graves Protection and Repatriation Act Section 10.3(b) will be followed. The activities that resulted in the discovery may resume 30 days after certification by the SHPO of receipt of the written confirmation of notification of the discovery if the resumption of the activity is lawful. The activity may also resume at any time that a written, binding agreement is executed between the SHPO, Rio Algom Mining LLC, and the affiliated Indian tribes that adopt a recovery plan for the excavation or removal of the human remains, funerary objects, sacred objects, or objects of cultural patrimony following the Native American Graves Protection and Repatriation Act Section 10.3(b)(1).

Excavation of human burials will be consistent with current professional archaeological standards. The Archaeological Records Management System (ARMS) forms for each burial ground (if not previously recorded), plan maps of each burial and associated funerary objects, material objects or artifacts, photographs of each burial in situ with associated funerary objects, material objects or artifacts, description of field methodology, including observations about soils and the context of each burial within the burial ground will be prepared. Analysis of human remains will include sex, age, basic measurements, pathologies, and photodocumentation. Analysis of associated funerary objects, material objects, or artifacts will include a written inventory list of all items associated with the burial and removed from the burial ground, to be submitted to the SHPO before final disposition of the remains. The list will be specific in terms of material, typology, quantity and condition of the items recovered and scaled photographs of all recovered items, to be submitted with written inventory. The photographs will be labeled with the name of the permittee, provenience of the burial, date of excavation and disposition of items.

## BACKFILL

All shovel test units and excavated units will be backfilled upon completion of the project. As previously stated in the description of the project undertaking, the overburden being removed for remediation will not be re-deposited on the sites. After data recovery, clean soil will be deposited on the site from an adjacent location. This will be accomplished manually utilizing shovels and wheelbarrows.

## ANALYTICAL PROCEDURES

Where possible the results of analysis will be applied to or used to the extent that the numbers of artifacts or materials recovered from samples allow. Radiocarbon or tree-ring data will support or negate the assessment of the ceramic assemblage. Debitage analysis may relate use by Archaic groups if biface debitage is present. Tool types and wear pattern analysis may be used to describe or postulate the actions performed and on what type(s)of materials. Presence or absence of tool types will qualify processing activities (to the extent that is possible in the event that they were not removed at abandonment). Any macrobotanical remain will provide insight into subsistence activities.

Analyses of collected materials will be completed by qualified consultants in cases where the proper expertise is not available on the EMI staff. Mr. Burleson and Mr. Phippen have extensive experience in developing and performing lithic and ceramic analysis projects. As these sites are relatively small, it is proposed that 100% of all surface cultural materials and recovered materials from excavation contexts be analyzed in an attempt to extract as much data as possible from each site. All accumulated data will be processed using Microsoft Access (MCACCESS).

Lithic and groundstone artifacts will be analyzed by EMI personnel. Lithic analysis will be directed toward standard artifact attribute recording. Lithic artifacts (chipped, ground, and unmodified but utilized stone artifacts) will be entered into the MCACCESS database system by logging a variety of attributes. Collection of attributes will focus on the manufacturing techniques and artifact function. The following information will be recorded:

- Artifact type: angular debris/shatter, flake and flake sub-types (core or hard hammer, biface/soft hammer, retouch, Bifaces and (biface stage i.e. I,II,III,IV), uniface and scraper type (end, transverse, spurred, combination etc.), core, core tool (chopper, pecking stone, and, scraper planes in particular), hammerstone, projectile point (sub-categories to be developed), drill, etc. Flakes exhibiting use wear will be dropped from the debitage category and placed in a utilized flake type.
- Material type: specific materials found in the local area region as well as distinctive non-local materials. Materials typically identified on archaeological sites include andesite, basalt, chalcedony, chert, jasper, limestone, metasediment, obsidian, ryholite, silicified wood, and quartzites.
- Condition of artifact: whole, proximal, distal, lateral, medial, unknown fragment, and burned artifacts.
- Percentage of cortex: estimated.
- Platform type (refers to flakes or artifacts with visible platforms): not applicable, absent, collapsed, cortical, single facet, multi-facet, stepped, ground, crushed, bipolar.
- Dimensions (measured in millimeters): length, width, and thickness. Broken artifacts especially bifaces and projectiles will be measured in terms of thickness. If any maximum dimension can be inferred it will be monitored.

Retouch will be monitored for flakes exhibiting marginal refinishing through retouch. This will be documented as to location on the flake (proximal, distal, lateral), and directionality (unidirectional, bidirectional).

Use wear on debitage and tools will be monitored as present or absent at a minimum. If present, use retouch, rounding and polish, battering etc. will be recorded.

Analysis at the assemblage/site level will incorporate the specific data already mentioned, as well as information to assess functional, temporal, and potential spatial patterns across the site. These include:

- Component type: Paleoindian, Early Archaic, Middle Archaic, Late Archaic, etc.
- Reduction stage: primary reduction, secondary reduction, primary/secondary reduction, advanced stages of reduction, and all stages of reduction.
- Presence of tools: yes or no.
- Presence of cores: yes or no.
- Presence of groundstone: yes or no.
- Presence of fire-cracked rock: yes or no.
- Presence of non-local lithics: yes or no.
- Presence of structures or stains: yes or no.
- Topography: bench, hillslope, ridge, low rise, plain/flat, saddle, terrace, swale, and/or combinations of the above, etc.

Diagnostic projectile points, formal tools, and utilized flakes will undergo multi-attribute analysis to determine function and/or typological placement in regional seriations. Artifacts specifically mentioned in the report text will be drawn and photographed.

Ceramic analysis will be conducted by EMI archaeologists Robert Phippen and Richard Burleson. Mr. Phippen and Mr. Burleson have substantial experience with ceramic analysis in the southwest. Ceramic artifacts will be entered into MCACCESS database system by logging a variety of attributes. Collection of attributes will focus on the recordation of a series of attributes that describe the manufacturing techniques, function, ceramic type, form, temper, and interior/exterior surface treatment. Based on a visual inspection of the sites, typical Pueblo II period ceramics relating to the Cibola whiteware series are present.

Bone artifacts and faunal remains will be analyzed by EMI personnel when possible, and in the case of unknown species, a private consultant will be contracted on an hourly basis. Macrobotanical processing and analysis will be performed by Pamela McBride, a private consultant who also is employed with the Museum of New Mexico, Office of Archaeological Studies. Any pollen sample recovered will be sent to a palynological consultant. Radiocarbon samples will be processed by Beta Analytic of Miami, Florida. All dendrochronological samples will be sent to the Tree Ring Laboratory at the University of Arizona in Tucson.

## SCHEDULE

Projected fieldwork is the total amount of hours estimated to fully excavate all proposed areas and exhaust the data potential for both sites. The total area involved at LA 82634 is 1,344 square meters and the total area involved at LA 82635 is 1,365 square meters. As it relates to LA 82634, the amount of earth moved by a crew of five will rarely exceed 2.5 cubic meters per day, especially if the incidence of cultural material is high. If the depth of fill reaches 50 cm per one meter excavation unit, a total of four units may be completed per day. This would total approximately 20 days. Therefore, the estimate of 20 days is used to account for the possibility that all pits will not have positive results, and most will not be excavated to a depth of 50 cm. Excessive discovery situations will slow progress. As it relates to LA 82635, an estimated eighty 50 cm x 50 cm shovel test pits excavated to a depth of 50 cm can be completed per day. This would total approximately 3.65 days. Therefore, the total amount of estimated time to complete all excavation and shovel testing would be approximately 24 days.

## PERSONNEL

**Richard Burleson M.A., Principal Investigator and Director of Laboratory Analysis**
*Education:* Ph.D. pending, Anthropology, University of New Mexico; M.A., Anthropology, New Mexico State University 1999; B.A., Anthropology, Appalachian State University, 1996
*Years of Experience:* 13
*Experience Summary:* Richard Burleson is EMI's Cultural Resource Program Manager and principal investigator and will be the principal point of contact for this contract. His duties include management and coordination of EMI's cultural resource projects. He prepares budgets and proposals, hires and manages crews, conducts artifact analyses, conducts record searches, conducts surveys, testing, and data recovery, Section 106 consultation, TCP and Native American consultation, report writing, and editing. His professional background includes over 13 years of experience in all phases of cultural resource management with work conducted in the Southwest (New Mexico, Colorado, Arizona, and Texas), the Great Plains (Oklahoma and Texas), the southeastern US (North Carolina), and Central America (Mexico and Belize on the Yucatan Peninsula). He has authored six paper presentations at national and regional conferences, and more than 85 reports and chapters concerning prehistoric and historic resources throughout the Southwest, Southeast, Great Plains, and Mexico. Mr. Burleson holds permits with the Navajo Nation HPD, BIA, Bureau of Land Management in New Mexico (NE, NW, SE, SW), Arizona, and Colorado, and State lands in New Mexico and Arizona. Mr. Burleson is currently managing large multi-year contracts with the New Mexico Bureau of Land Management, New Mexico Department of Transportation, White Sands Missile Range, and the Federal Highway Administration. Mr. Burleson also has extensive experience running laboratory facilities at a professional/curatorial level while serving as assistant to the curator for 2.5 years at the Maxwell Museum of Anthropology. As Program Director for the Pottery Mound Project, Mr. Burleson supervised and conducted the analysis of over 90,000 artifacts from Pottery Mound, a Classic period pueblo located along the Puerco River in north-central New Mexico. While serving in this capacity, Mr. Burleson also curated materials from the Cox Ranch Land Exchange and the Mimbres Foundation excavations. Mr. Burleson's expertise is in lithic analysis, specifically microwear analysis.

**Robert Phippen, B.A., Archaeologist, Field Director/Field Supervisor and Director of Laboratory Analysis**
*Education:* B.A. Anthropology, 1976, University of New Mexico
*Years of Experience:* 29
*Experience Summary:* Robert Phippen is EMI's cultural resource field director. His duties include coordination and direction of EMI's cultural resource projects in the field. He manages field crews, conducts records searches, conducts artifact analyses, and assists in report preparation. His professional background includes 29 years of experience in all phases of cultural resource management with work conducted in the Southwest (Arizona, Colorado, Utah, Texas, and New Mexico), the Plains (Oklahoma, Kansas, and Texas), and California. He has authored more than 75 reports and chapters concerning prehistoric and historic resources throughout the Southwest, Great Basin, Great Plains, and California. Mr. Phippen holds permits with the BIA, Bureau of Land Management in New Mexico (NE, NW, SE, SW, Dinetah, Great Plains, and Southwest Culture Area), Arizona, and Colorado, State lands in New Mexico and Arizona, and Navajo Nation. Mr. Phippen has extensive experience in directing and conducting data recovery projects on Archaic, Anasazi, and Navajo archaeological sites.

## CURATION

Excavated and screened cultural materials will be stored temporarily in the contractor's office/laboratory facilities in Albuquerque, New Mexico during the period of analysis and report preparation. With the exception of human remains (if applicable), all excavated and screened materials, field records, and photographic records will be reposited permanently at the Museum of New Mexico, Laboratory of Anthropology curatorial facilities utilizing approved curation procedures.

## REFERENCES CITED


Cameron, Catherine M., and H. Wolcott Toll.
2001. "Deciphering the Organization of Production in Chaco Canyon." *American Antiquity*. Volume 66, Number 1.

Earle, Timothy.
2001. "Economic Support of Chaco Canyon." *American Antiquity*. Volume 66, Number 1.

Farmington Proposed Resource Management Plan and Final Environmental Impact Statement
2003

Feinman, Gary M., Kent G. Lightfoot, and Steadman Upham.
2000. "Political Hierarchies and Organizational Strategies in the Puebloan Southwest." *American Antiquity*. Volume 65, Number 3.

Grebinger, Paul.
1973. "Prehistoric Social Organization in Chaco Canyon, New Mexico: An Alternative Reconstruction." *The Kiva*. Volume 39, Number 1.

Judge, W. James.
1989. "Chaco Canyon-San Juan Basin." *Dynamics of Southwest Prehistory*. Edited by Linda S. Cordell and George Gummerman. Smithsonian Press. Washington, D.C.

Kantner, John.
1997. "Ancient Roads, Modern Mapping: Evaluating Chaco Anasazi Roadways Using GIS Technology." *Expedition*. Volume 39, Number 3.

Kantner, John, and Nancy M. Mahoney
2000. *Great Communities Across the Chacoan Landscape*. Anthropological Papers, Number 64. University of Arizona Press. Tucson, Arizona.

Lekson, Stephen H.
1999. *The Chaco Meridian: Centers of Political Power in the Ancient Southwest*. Altamira Press. Walnut Creek, California.

Malville, J. McKim, and Nancy J. Malville.
2001. "Pilgrimage and Periodic Festivals as Processes of Social Integration in Chaco Canyon." *The Kiva*. Volume 66, Number 3.

Mathien 2001 Mathien, F.J.
2001. "The Organization of Turquoise Production and Consumption by Prehistoric Chacoans." *American Antiquity*. Volume 66, Number 1.

Mathien, F.J., and R.H. McGuire.
1986. "External Contact and the Chaco Anasazi." *Ripples in the Chichimec Sea*. Southern Illinois University Press. Carbondale, Illinois.

Nelson, Ben.
1995. "Complexity, Hierarchy, and Scale: A Controlled Comparison Between Chaco Canyon, New Mexico, and La Quemada, Zacatecas." *American Antiquity*. Volume 60, Number 4. Nicholopoulus

Phillips, David A.
2000. "The Chaco Meridian: A Skeptical Analysis." Poster session, 65th Annual Meeting, Society for American Archaeology, Philadelphia, Pennsylvania.

Renfrew, Colin.
2001. "Production and Consumption in a Sacred Economy: The Material Correlates of High Devotional Expression at Chaco Canyon." *American Antiquity*. Volume 66, Number 1.

Reyman, J.E.
1995. "Value in Mesoamerican-Southwestern Trade." *Gran Chichimeca: Essays on the Archaeology and Ethnohistory of Northern Mesoamerica*. Avebury Ashgate Publishing Company. Brookfield, Vermont.

Roney, John.
1992. "Prehistoric Roads and Regional Integration in the Chacoan System." *Anasazi Regional Organization and the Chaco System*. Edited by D. Doyel. Anthropological Papers, Number 5. Maxwell Museum of Anthropology. Albuquerque New Mexico.

Saitta, Dean J.
1997. "Power, Labor, and the Dynamics of Change in Chacoan Political Economy." *American Antiquity*. Volume 62, Number 1.

Sebastian, Lynne.
1992. *The Chaco Anasazi: Sociopolitical Evolution in the Prehistoric Southwest*. Cambridge University Press. Glasgow, England.

Sofaer, A.
1997. "The Primary Architecture of the Chaco Canyon." *Anasazi Architecture and the American Design*. Edited by B. Morrow and V.B. Price. University of New Mexico Press. Albuquerque, New Mexico.

Stein, John, and Steve Lekson.
1992. "Anasazi Ritual Landscapes." *Anasazi Regional Organization and the Chaco System*. Edited by D. Doyel. Maxwell Museum of Anthropology. Albuquerque, New Mexico.

Toll, H. Wolcott.
2001. "Making and Breaking Pots in the Chaco World." *American Antiquity*. Volume 66, Number 1.

Vivian, R. Gwinn.
1990. *The Chacoan Prehistory of the San Juan Basin* Academic Press. New York, New York.

Vivian, R. Gwinn.
1997. "Chacoan Roads: Morphology." *The Kiva*. Volume 63, Number 1.

Vivian, R. Gwinn.
1997. "Chacoan Roads: Function." *The Kiva*. Volume 63, Number 1.

Wilcox, David R.
1994. "The Scream of the Butterfly: Competition and Conflict in the Prehistoric Southwest." *Themes in Southwest Prehistory*. Edited by George J. Gummerman. School of American Research. Santa Fe, New Mexico.

Windes, Thomas C., and Dabney Ford.
1996. "The Chaco Wood Project: The Chronometric Reappraisal of Pueblo Bonito." *American Antiquity*. Volume 61.