GEOARCHAEOLOGICAL X-RAY FLUORESCENCE SPECTROMETRY LABORATORY
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ALBUQUERQUE, NM  87113  USA

Bifaces from LA 290 (Piedras Marcadas) and Other Albuquerque City property

SOURCE PROVENANCE OF OBSIDIAN AND DACITE BIFACES FROM CITY OF ALBUQUERQUE OPEN SPACE PROPERTY, MIDDLE RIO GRANDE VALLEY, NEW MEXICO

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Report Prepared for

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Albuquerque Open Space
City of Albuquerque, New Mexico

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INTRODUCTION

The analysis here of 7 visually selected obsidian and dacite artifacts from the surface of Piedras Marcadas (LA 290) in the middle Rio Grande River valley and surrounding Open Space properties indicates sources similar to previous analyses of surface and subsurface contexts, (Shackley 2009, 2013a, 2014). All these sources are present in the Rio Grande alluvium as far south as Albuquerque, although the Valles Rhyolite (Cerro del Medio) nodules are very small, probably too small to produce the one projectile point made from this source (Sample 1911; Shackley 2013b). Mount Taylor is not available in Rio Grande Quaternary sediments this far north. The dacite artifact is from the northern New Mexico source of Cerros del Rio that has eroded into the Rio Grande Quaternary alluvium (Shackley 2011a). No detailed discussion is offered here. Refer to Shackley (2014) for a thorough discussion of the sources and secondary distribution.

With regard to the Concave base side-notched arrowpoints, they are common throughout North America in the late period including all of the North American Southwest (Justice 2002; Loendorf 2012; Shackley 2004; see cover image here). Obsidian side-notched points occur at Pottery Mound, Tijeras Pueblo, and contact period sites near Socorro.

ANALYSIS AND INSTRUMENTATION

All archaeological samples are analyzed whole. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate x-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Geoarchaeological XRF Laboratory, Albuquerque, New Mexico, using a Thermo Scientific Quant’X energy dispersive x-ray fluorescence spectrometer. The spectrometer is equipped with a ultra-high flux peltier air cooled
Rh x-ray target with a 125 micron beryllium (Be) window, an x-ray generator that operates from 4-50 kV/0.02-1.0 mA at 0.02 increments, using an IBM PC based microprocessor and WinTrace™ 4.1 reduction software. The spectrometer is equipped with a 2001 min⁻¹ Edwards vacuum pump for the analysis of elements below titanium (Ti). Data is acquired through a pulse processor and analog to digital converter. This is a significant improvement in analytical speed and efficiency beyond the former Spectrace 5000 and QuanX analog systems (see Davis et al. 2011; Shackley 2011a).

For Ti-Nb, Pb, Th elements the mid-Zb condition is used operating the x-ray tube at 30 kV, using a 0.05 mm (medium) Pd primary beam filter in an air path at 200 seconds livetime to generate x-ray intensity Kα₁-line data for elements titanium (Ti), manganese (Mn), iron (as Fe⁭), cobalt (Co), nickel (Ni), copper, (Cu), zinc, (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), lead (Pb), and thorium (Th). Not all these elements are reported since their values in many volcanic rocks is very low. Trace element intensities were converted to concentration estimates by employing a least-squares calibration line ratioed to the Compton scatter established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). Line fitting is linear (XML) for all elements but Fe where a derivative fitting is used to improve the fit for iron and thus for all the other elements. When barium (Ba) is acquired, the Rh tube is operated at 50 kV and 0.5 mA in an air path at 200 seconds livetime to generate x-ray intensity Kα₁-line data, through a 0.630 mm Cu (thick) filter ratioed to the bremsstrahlung region (see Davis et al. 2011). Further details concerning the petrological choice of these elements in North American obsidians is available in Shackley (1988, 1990, 1995, 2005; also Mahood and Stimac 1991; and Hughes and Smith 1993). A suite of 17 specific standards used for the best fit regression calibration for elements Ti- Nb, Pb, and Th, include G-2 (basalt), AGV-2 (andesite), GSP-2 (granodiorite), SY-
2 (syenite), BHVO-2 (hawaiite), STM-1 (syenite), QLO-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), BCR-2 (basalt), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, NBS-278 (obsidian) from the National Institute of Standards and Technology, BR-1 (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France, and JR-1 and JR-2 (obsidian) from the Geological Survey of Japan (Govindaraju 1994).

The data from the WinTrace software were translated directly into Excel for Windows (Table 1). In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run (Table 1). RGM-1 is analyzed during each sample run for obsidian artifacts to check machine calibration (Table 1). Source assignments made by reference to source data at the lab, and Shackley (1995, 2005, 2011a). Noel Justice considers these part of the Pueblo Side-notched Cluster common from northern Sonora and Chihuahua into the southern Great Basin (2004:289-319).

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Schamber, F.H.

Shackley, M. Steven


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Table 1. Elemental concentrations for the archaeological specimens and the USGS RGM-1 standard. All measurements in parts per million (ppm).

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