PIEDRAS MARCADAS (LA 290) CERAMICS:

THE POTTERY OF A CLASSIC PERIOD RIO GRANDE PUEBLO

By

Hayward H. Franklin

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Preface

Matthew Schmader

Piedras Marcadas Pueblo, LA 290, is the largest known village in the southern Tiwa portion of the Rio Grande Valley. In the many years since the site was first recorded in the late 1920s by Reginald Fisher, it has only been the subject of minor surface collections and limited testing. Following formal tribal consultations in the early 1980s, the focus of investigations shifted to geophysical techniques. Non-invasive research in the past 10 years has yielded abundant evidence of the 1540–1542 expedition into the U.S. Southwest led by Francisco Vàzquez de Coronado.

This emphasis on geophysics and the Coronado expedition has, in a sense, overshadowed the fact that Piedras Marcadas was likely the home to hundreds of pueblo people for hundreds of years. As a consequence, other kinds of analysis of site materials have great potential. The site contains excellent evidence of the entire Rio Grande glazeware sequence from A.D. 1300 into the mid-1600s. Most of the representative Rio Grande glazeware types are found there, and Mera named LA 290 as the type site for Tiguex Glaze Polychrome, a Glaze D ceramic type. With this essay, Hayward Franklin brings to the forefront a current analysis of the Rio Grande glazeware sequence. Ceramic studies of this sort can only be conducted at the most intact remaining southern Tiwa villages, such as Santiago (LA 326/54147), Alameda (LA 421), and Chamisal (LA 22765). Using technological precision combined with newly obtained radiocarbon dates, Franklin's ceramic analysis moves our current knowledge of Rio Grande Glaze Ware forward considerably.

Acknowledgments

I wish to express my appreciation to the many individuals who helped with this project, especially Matthew Schmader and David Snow. I am also indebted to Kit and Arnold Sargeant, Carol Condie, and others whose petitions and persuasions helped preserve this marvelous archaeological site. I'm indebted to Dave Phillips, of the Maxwell Museum, for his dedication to editing the Maxwell Museum Technical Series.

Chapter 1

INTRODUCTION

The extensive ruins of Piedras Marcadas (LA 290) lie on the west bank of the Rio Grande river near Albuquerque, New Mexico. Together with neighboring prehistoric villages (Chamisal, Alameda, Puaray, Santiago, and Kuaua), this large village was a major center within the Tiguex Province, as the cultural district was known to Spanish colonists. Accounts of the Spanish *entradas* listed 12 to 14 large occupied villages within the thriving Tiguex (Tiwa speaking) Province, along the river banks from Isleta north to modern Bernalillo (Barrett 2002; Morales 1997). Figure 1 shows some of the major Classic (Pueblo IV) period Tiguex Pueblos north of Isleta. By some estimates, there may have been up to 20 pueblos in this area at the time of contact.

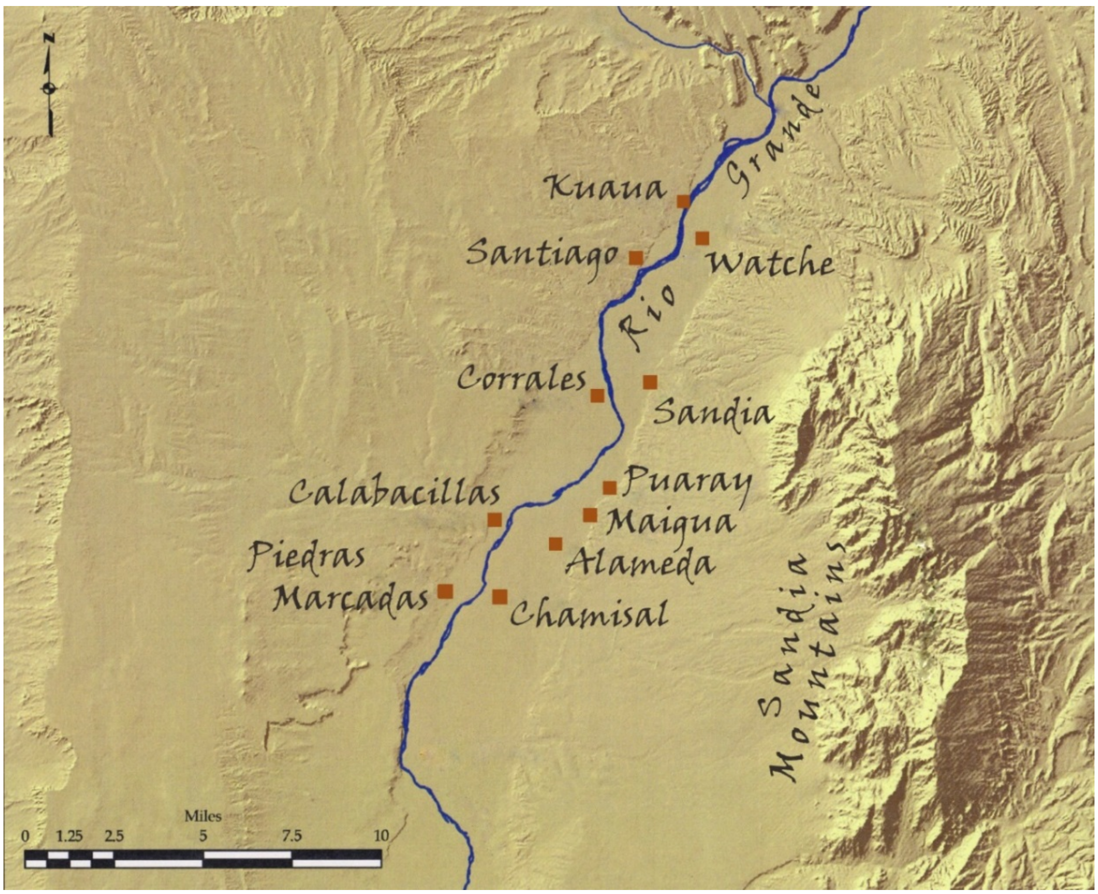

Figure 1. Major Classic period pueblos north of Isleta.
(Map courtesy of Matthew Schmader).

Because the original architecture was adobe and has eroded, Piedras Marcadas is not eye-catching. Today, the site consists of a series of low earthen mounds. Within the area preserved by the City of Albuquerque, the site covers at least 2.8 hectares (7 acres). Originally the site was much larger, extending into what is now a parking lot, a large irrigation ditch, and nearby privately owned fields. The surviving artifact scatters are testimony to a large and thriving population during the Classic period. At its peak, Piedras Marcadas up to 1,000 rooms (Marshall 1988). The inhabitants interacted with neighboring towns and villages. Trade and other exchange brought ceramics, ceramic raw materials, stone tools and raw materials, and shell ornaments from distant places. Undoubtedly, other items were exchanged but have not survived; these may have included the hides and meat of bison, deer, elk, and antelope, other foods, cotton, and finished cloth.

Set just above the floodplain of the Rio Grande, the ancient pueblo lies between rich farmlands to the east, along the river, and the West Mesa escarpment capped by basalt several kilometers to the west. East of the Rio Grande, the Sandia and Manzano mountains offer high-elevation resources within 16 to 32 km (10 to 20 miles) of the site. Those mountain resources included hunting and plant collection areas and sources of lithic and ceramic raw materials. In general, the middle Rio Grande Valley was, and is, a desirable place to live, offering its occupants arable land, a permanent water supply, and access to multiple environmental zones.

Culture History

In late prehistoric times, the middle Rio Grande Valley was home to a substantial population residing in multiple large villages. Archaeologists have studied many of these villages, including Piedras Marcadas (LA 290), Chamisal (LA 22765), Alameda (LA 421), Montaño Bridge (LA 33223), Puaray (LA 717), Santiago (LA 326), Kuaua (LA 187), and Nuestra Señora (LA 677) in Bernalillo. Less well known are Calabacillas Pueblo (LA 289) and Analco Pueblo in Corrales (LA 288). Some smaller villages, occupied for shorter periods, also existed in the area. A campsite from the Coronado expedition (LA 54147) was found near Santiago. The only Tiwa-speaking pueblos still occupied are Sandia (LA 294) and Isleta (LA 724).

Although archaeologists have been interested in the local villages since the 1920s, only a few have been investigated using modern archaeological methods, and independent dates are rare. Piedras Marcadas was occupied from about 1250–1300 to 1625–1650, about 350 years (all dates in this report are A.D.). At least parts of the village were thus in use from late Coalition to late Classic (Pueblo IV) times. Other villages nearby have similar age estimates, and thus a large population existed along the middle Rio Grande (Barrett 2002).

Initial construction at these locations, during the Coalition period, was generally in the form of pit houses or *jacal* (wattle and daub) structures. In the ensuing early Classic period (1300–1450), construction consisted of loose arrangements of contiguous above-ground rooms with adobe walls, perhaps with associated kivas.

Between 1450 and 1500 or shortly after, Piedras Marcadas was transformed into a compact pueblo, probably multistoried, enclosing a plaza and at least one kiva and presumably including the entire population. The clearly defensive aspect of the new pueblo included not just its more compact design but surrounding walls and limited access to the interior.

At the time of European contact in the 1500s, Piedras Marcadas was a thriving community. It was undoubtedly one of the 12 Tiguex Province pueblos recorded by Castañeda of the Coronado expedition (Hammond and Rey 1940). Piedras Marcadas was attacked by Coronado's forces in the winter of 1540–1541, as is described by Schmader (2011, 2012, 2016) and by Mathers et al. (2013). The chronicles of the expedition (Hammond and Rey 1940) record a battle and siege at two pueblos, one of which was definitely Piedras Marcadas; the other may have been Santiago.

Based on the presence of Glazes D, E, and F pottery, the final residents left between 1625 and 1650. The documentary record is poor for the final period of occupation—between 1540 and the early 1600s, but the brief encounters during later Spanish *entradas* (Hammond and Rey 1966) evidently did not have a great impact on Piedras Marcadas' residents. Once the Spanish established a permanent presence in New Mexico (initially at San Gabriel del Yunque in the Española Valley, in 1598), the impacts became unavoidable. Although located away from the principal early Colonial settlements in northern New Mexico, the native villages of the middle Rio Grande Valley were affected by the creation of land grants and by the establishment of haciendas[1] and missions. Decimated by European diseases, forced labor, consolidation (*reducción*), and religious oppression, the Pueblo population declined drastically. From a peak of ca. 14 to 18 large villages and numerous smaller ones at time of contact, the Tiguex population between Isleta and Bernalillo shrank to four struggling settlements (Isleta, Sandia, Alameda, and Puaray) by the Pueblo Revolt of 1680 (Barrett 2002). All other settlements, including Piedras Marcadas, had been abandoned.

Archaeological Investigations

LA 290, Piedras Marcadas, was designated "Site 7" in Fisher's (1931) survey and as "Tiguex Pueblo" by Mera (1933, 1940). Since then it has been mistakenly known as "Alameda Pueblo," which is LA 421 (on the east side of the river near Fourth Street and Alameda Boulevard). LA 290 was also referred to as the "Mann" site, after owners of a residence at the north end of the property.

Piedras Marcadas has been the subject of archaeological interest for years, and Hendron (1935) placed a stratigraphic test in the site. Other limited testing and salvage operations took place sporadically through the years (Marshall 1993), but no major excavations have been undertaken. Consequently, large collections of artifacts do not exist for laboratory analysis. Instead, surface studies and salvage operations have yielded a few small collections from across the site. As part of these efforts, Schmader tallied a sample of the surface ceramics, so the range of types and varieties is known (Schmader 2011).

This report describes my analysis of the types, tempering materials, and paste clays from a sample of more than 6,000 sherds. These were recovered between 2010 and 2014, during trenching for a new gas line in the southwestern part of the site (Phase 1; Franklin 2014), and from multiple test pits: Nos. 1–3 (Phase 2; Franklin 2015) and 4–7 (Phase 3; Franklin 2016).

[1]Remains of haciendas have been recorded near Santiago and Kuaua (David Snow, personal communication 2016; Vierra 1987).

This sample does not include Schmader's (2011) earlier counts, or a sample collected from Piedras Marcadas during excavations at Chamisal site across the river (see Appendix A). While the sherd sample described in this report is a large one, only part of the site was tested, so the sample does not necessarily represent the site as a whole. Study of samples from other test excavations would be needed to complete the ceramic picture.

Recently, five AMS radiocarbon dates were obtained for LA 290. The dates are discussed later in this report, and represent a valuable addition to the ceramic seriation, stratigraphic, and cross-dating information previously used to estimate the age of the site.

Site Layout and Tested Locations

Figure 2, an aerial view of the site, includes the late pueblo but not the full original extent of the village.

Figure 2. Aerial view of LA 290. North is at the top. Left: unretouched. Note the lined drainage ditch at the left edge of the image. Right: the solid line indicates the present extent of the pueblo; the dashed line indicates the late pueblo (a room block surrounding a plaza).

Earlier Coalition period (Pueblo III) and Classic (Pueblo IV) structures apparently exist south, east, and north of the late (post-1450) structure. Before being disturbed the site may have contained 1,000 rooms, although not all occupied simultaneously (Marshall 1988). The early Classic period (Pueblo IV, ca. AD 1300–1450) construction apparently consisted of several small room blocks spread over much of the site, perhaps over 1.2 hectares (3 acres) or more. Today, the earlier room blocks are indicated by low mounds of melted adobe accompanied by artifact scatters. When the gas line trench was excavated through the south end of the site, outside the area shown in Figure 2, collection of more than 1,000 sherds indicated that the site was more extensive than the portion now fenced and protected. Matthew Schmader (personal communication, 2016) divides the site into north, middle (the late pueblo), and south portions.

Figure 3 shows the "late" pueblo, which evidently was built in the western-central portion of the zone of earlier room blocks. The room outlines in Figure 3 were determined by electrical resistivity, not excavation (Schmader 2016:204). This massive enclosure probably was built between 1450 and 1500, and consists of room suites in a compact formation around a rectangular plaza. A possible square kiva sits in the plaza..

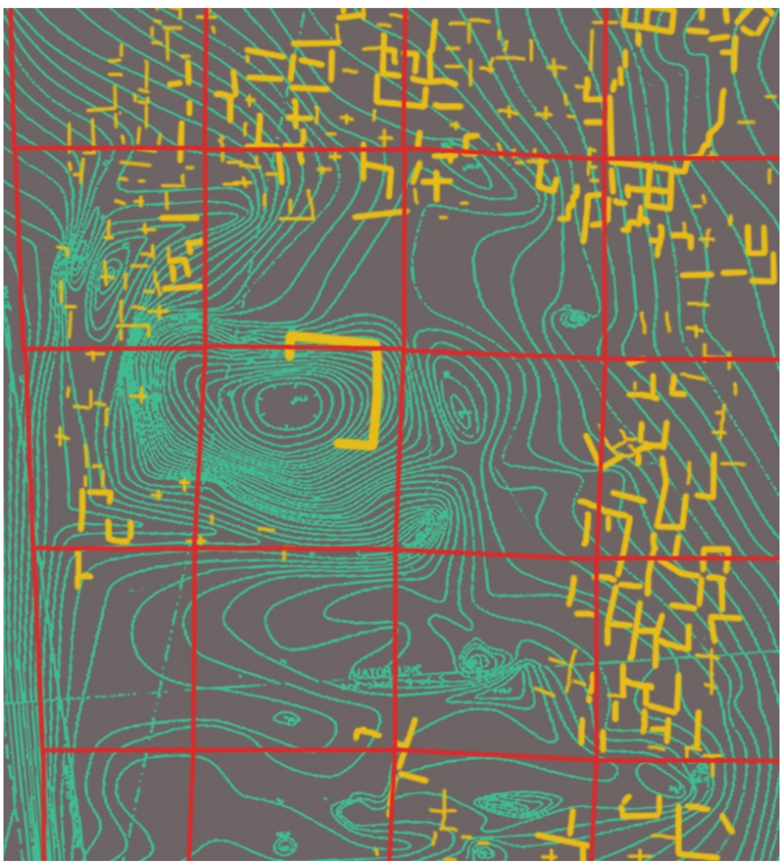

Figure 3. Map of part of LA 290, showing known walls of the late pueblo (yellow) and surface contours (turquoise). North is up. The grid interval is 20 m. (Courtesy Matthew Schmader).

The late pueblo was evidently built with social centralization and defense in mind; only two entrances to the plaza were provided. It was this late pueblo that was attacked by Coronado in 1540–1541, as described in the expedition's chronicles. Many metal artifacts of Spanish manufacture have been found in and around this structure, and Schmader has reconstructed details of the violent encounter with the local villagers; his most recent summary can be found in the 2016 annual volume of the Archaeological Society of New Mexico (Schmader 2016).

Figure 4 shows the locations of the seven test pits, which were 1 m square. These small tests, designed to determine the depth and history of the deposits, were placed in the plaza of the late main part pueblo. All were in a large depression or on the adjacent berm, both of which are evident from the contour map.

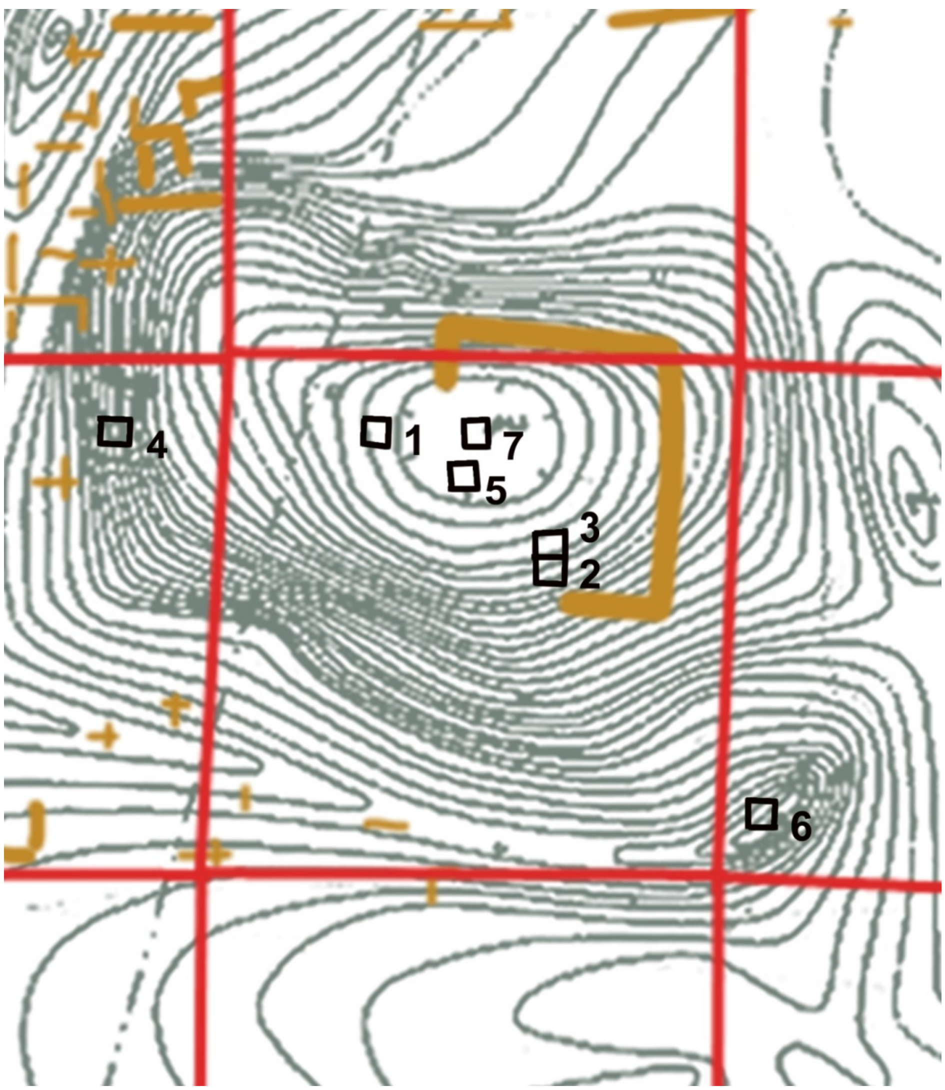

Figure 4. Central plaza area of the late pueblo, showing the locations of the seven test pits. North is up. Grid interval is 20 m. Courtesy Matthew Schmader.

The test units were excavated in 10 cm levels, as measured from surface datums. Level fill was screened using 1/8 inch (3 mm) mesh. The features in the tested area evidently relate to Puebloan usage of the plaza, and the unit fills included both natural accumulation and trash deposits. The occupants may have dug a well in the area while under siege by the Spanish in 1540–1541, and an unknown rectangular structure, possibly a kiva, is located nearby. Fortunately, the tested deposits apparently lay undisturbed since the occupation of the late pueblo. They are therefore well suited to archaeological evaluation of artifact assemblages and of potential changes through time in those assemblages.

Chapter 2

ANALYSIS METHODS

In keeping with procedures used in earlier analyses of the sherds, the contents of each bag were separated into various categories and each sherd cross-section was viewed under a microscope at 10 to 30 power. Each combination of type, vessel form, vessel part, and tempering material was tallied recorded using a series of codes on a tally sheet. The tally sheet data were then entered into an Excel spreadsheet and checked for accuracy. Data analysis included sums by pottery type and other attributes, as well as cross-tabulations of pottery type by stratigraphic depth, pottery type versus temper type, pottery type versus vessel form, etc. Finally, kiln refiring was employed to test paste clays for oxidized color and firing temperature. The results of these tests are summarized in tables. Photos of the most representative sherds have been added to a file of digital pottery photos from the entire site; examples are shown in Appendix B.

Sherds were assigned to commonly recognized pottery types. In most cases, an exact pottery type was determined. However, within the Rio Grande Glaze Ware group, *specific types were assigned only when a bowl rim is present.* Bowl rims are the defining characteristic of the evolution of this series. That limitation drastically reduces the sample of diagnostic sherds, so the analysis also encompassed the less diagnostic but still informative bowl body sherds and jar sherds. Considerable information can be derived from such glazeware pieces, for instance, information on technical attributes (slips, paints, temper, and clays).

Pottery Classification

This study employed standard Southwestern pottery types, based on the regional archaeological literature and my prior experience. I will not repeat the type definitions, as they are well described in print. The original definitions of Rio Grande Glaze Ware were provided by Kidder and Shepard (1936) and H. P. Mera (1933, 1940) and revised by the Eighth Southwestern Ceramic Seminar (Honea 1966). Good modern definitions and illustrations of these pottery types (including bowl rim profiles) may be found in Dyer (2008), in Wilson et. al. (2007), and on the web pages of the OAS Ceramic Typology Project, headed by Dean Wilson, (2014). Summaries of definitions and customary dates are also available in Snow (1982), and Oppelt (2002).

The standard Rio Grande Glaze Ware sequence established by Mera (1933, 1940) and Kidder and Shepard (1936), then codified by the Eighth Southwestern Ceramic Seminar (Honea 1966) has been surprisingly durable in its applicability. However, there is a growing recognition of regional and even local variability in the glaze wares, in some cases possibly due to individual potters' "variations on a theme." For example, a sharply incurved bowl rim with angled lip marks a local Glaze C variant found at Piedras Marcadas, Kuaua Glaze Polychrome. Similarly, Tiguex Glaze Polychrome is a local variant of San Lazaro Glaze Polychrome during Glaze D times (as an interesting historical fact, H. P. Mera (1933) used Piedras Marcadas as his type site for the description of Tiguex Glaze Polychrome). Later on, an unnamed but very common Glaze E–F hybrid combines the very thick rim of E times with the inferior, increasingly runny glaze paint of the Glaze F times. (No name has yet been applied to this common transitional type.) If one keeps such variability in mind, the basic glazeware sequence applies well to Albuquerque area Classic period sites.

Table 1 provides the basic ceramic chronology. Abbreviations used in the tables include B/W for black-on-white, GP for glaze polychrome, G/R for glaze-on-red, and G/Y for glaze-on-yellow. "Glaze ware" (compound noun) and "glazeware" (adjective) refer to the Rio Grande Glaze Ware series.

Table 1. Pottery Types of the Coalition and Later Periods.
(Adapted from Mera 1933 and Honea 1966. Dates adapted from Oppelt 2002.
Some types are not well dated, and regional variation exists.)

Glaze Ware Rim Type	**Named Type**	**Time Span**
	Historic Period	
N/A	(Matte paint wares)	1700–present
	Classic Period	
Glaze F	Kotyiti Glaze Polychrome Kotyiti Glaze-on-yellow Kotyiti Glaze-on-red Trenaquel Glaze Polychrome	1650–1700 1650–1700 1650–1700 1650–1700?
Glaze E	Puaray Glaze Polychrome Tiguex Glaze Polychrome	1525–1650 1525–1600?
Glaze D	San Lazaro Glaze Polychrome	1475–1525+
Glaze C	Kuaua Glaze Polychrome Espinoso Glaze Polychrome	1450–1500? 1450–1500
Glaze B	Largo Glaze Polychrome Largo Glaze-on-red Largo Glaze-on-yellow	1425–1450 1425–1450 1425–1450
Glaze A	Pottery Mound Glaze Polychrome San Clemente Glaze Polychrome Cieneguilla Glaze-on-yellow Agua Fria Glaze-on-red Arenal Glaze Polychrome Los Padillas Glaze Polychrome	1400–1490? 1315–1425 1325–1425 1315–1425 (to 1500?) 1315–1350? 1300–1315?
	Coalition Period	
N/A	Galisteo Black-on-white Wiyo Black-on-white Santa Fe Black-on-white Socorro Black-on-white	1300–1400 1300–1400 1200–1350 1050–1300

Morales (1997) provides a broad overview of Classic period ceramics of the vicinity. Locally, excellent descriptions and illustrations for the Alameda site can be found in Kurota (2008, 2013). For Chamisal (LA 22765), extensive analyses of typology and chronology have been completed (Franklin (2012a; Kurota n.d.), and publication of that work is planned. Salvage excavations at Montaño Bridge (Raymond 2010) included ceramic analysis by Franklin (2010c) and Schleher

(2010b). To the south but still within the middle Rio Grande district, glaze ware studies are available for Valencia Pueblo (Franklin 1997) and more recently for Los Abeytas near Belen (Eckert and Snow 2015). Farther afield, outside the Rio Grande Valley proper, extensive pottery analyses have been carried out by various investigators for Pottery Mound (LA 416) and Tijeras Pueblo (LA 581). Marshall's recent salvage work at Isleta (2015) is noteworthy in providing a glimpse of very late glazeware ceramics. Work by Vierra (1987a, 1987b) at Kuaua, and by Vierra (1989) and Marshall (1989) at the Coronado Campsite (LA 54147), provides useful data for the immediate vicinity of Piedras Marcadas. Studies underway at Chamisal and Kuaua will provide additional data comparable to the Piedras Marcadas results.

Chapter 3

THE CERAMIC ASSEMBLAGE

The pottery type frequencies derived from this study reveal a continuous series of glazed and non-glazed Pueblo ceramics from the Coalition through Classic period. Table 2 summarizes the entire assemblage of 6,304 sherds by pottery type. About half of the total consists of utility pottery used for cooking and storage, as is typical for the period.

Table 2. Assemblage Used in the Analysis.

Pottery Type	Code	Count	Pct. of Total	Pct. of Ware
White Ware				
Plain white	6	17	0.3%	0.7%
Socorro B/W	12	1	0.0%	0.0%
Santa Fe B/W	15	7	0.1%	0.3%
Santa Fe/Wiyo B/W	17	3	0.0%	0.1%
Rio Grande Glaze Ware, not by Type				
Red slip	91	1003	15.9%	38.8%
Yellow slip	92	194	3.1%	7.5%
Red-on-white, no glaze	94	7	0.1%	0.3%
Glaze-on-red	95	566	9.0%	21.9%
Glaze-on-yellow	96	367	5.8%	14.2%
Glaze Polychrome	98	141	2.2%	5.4%
Very late	99	84	1.3%	3.2%
Rio Grande Glaze Ware, by Type				
Los Padillas GP	101	7	0.1%	0.3%
Glaze A, Arenal GP	105	1	0.0%	0.0%
Glaze A, Agua Fria G/R	110	28	0.4%	1.1%
Glaze A, San Clemente GP	113, 115	16	0.6%	0.5%
Glaze A, Cieneguilla G/Y	120	1	0.0%	0.0%
Glaze B, Largo GY	201	3	0.0%	0.1%
Glaze C, Espinoso GP	301	3	0.0%	0.1%
Glaze C, Kuaua G/P	305	5	0.1%	0.2%
Glaze D, San Lazaro GP, red slip	401	12	0.2%	0.5%
Glaze D, San Lazaro GP, yellow slip	402	4	0.1%	0.2%
Glaze E, Puaray GP	501	43	0.7%	1.7%
Glaze E, Tiguex GP	502	26	0.4%	1.0%
Glaze F, Kotyiti GP	601	12	0.2%	0.5%
Glaze F, Kotyiti GY	610	23	0.4%	0.9%
Glaze F, Kotyiti GR	615	6	0.1%	0.2%

Table 2. Assemblage Used in the Analysis.

Pottery Type	Code	Count	Pct. of Total	Pct. of Ware
Non-local Types				
St. Johns Polychrome	50	1	0.0%	0.0%
Pinnawa Glaze-on-white	820	1	0.0%	0.0%
Kwakina Polychrome	830	2	0.0%	0.1%
Sikyatki Polychrome	860	1	0.0%	0.0%
Biscuit A B/W	25	2	0.0%	0.1%
Biscuit B B/W	30	1	0.0%	0.0%
Subtotal, decorated		2588		100.0%
Utility Wares				
Clapboard corrugated	701	7	0.1%	0.2%
Indented corrugated	705	18	0.3%	0.5%
Obliterated corrugated	706	1	0.0%	0.0%
Rio Grande plain gray utility	710	3690	58.5%	99.3%
Subtotal, utility		3716		100.0%
Total		6304	100.0%	

The decorated group is dominated by the Rio Grande Glaze Ware series; every temporal group from Glaze A through Glaze F is represented, implying a continuous occupation of the immediate area from about 1300 to about 1650. The presence of Coalition period Socorro and Santa Fe Black-on-white suggests that people from earlier pit house villages at or near Piedras Marcadas formed the initial population base of the pueblo. In fact, all of the other major glazeware villages in the vicinity had a similar beginning, perhaps as small villages of the Coalition period merged into larger communities.

Within the continuous glazeware sequence, there are distinct peaks of popularity of given types and times, as seen in Table 2. Glaze A pottery is common at all such sites, and the several Glaze A types (Los Padillas, Agua Fria, and San Clemente) times are well represented at Piedras Marcadas. Glaze B (Largo) and C (Espinoso and Kuaua) types are considerably less common, raising two possibilities that are not mutually exclusive. First, while village occupation continued, there may have been a significant reduction in activity. Second, Glaze A pottery was still being made alongside Glaze B and C types, at Piedras Marcadas and in the vicinity. The second possibility does not imply that Glaze A pottery was continuously produced through the entire glazeware time span, however. The massive quantities of Glaze E and F from the tests in late deposits are nearly devoid of Glaze A through C sherds.

I suspect a probable population downturn in the late 1400s, with an abundance of Glaze D (San Lazaro) marking a resurgence after 1500. Tiguex Glaze Polychrome represents a local Glaze D into E continuation of the broader San Lazaro tradition. After about 1550 the burgeoning population produced large amounts of Glaze E (Puaray) pottery. As Glaze E morphed into Glaze F about 1600, an unnamed E–F transitional type had paint whose quality deteriorated rapidly, while bowl rim forms retained the thickened lozenge-shaped profile of Glaze E. Finally, Glaze F

(Kotyiti) paints became runny to the point of becoming unmanageable, for reasons that have intrigued archaeologists for decades. Rims returned to an almost parallel profile with F; while glaze polychrome production continued, a resurgence of bichrome (glaze-on-red and glaze-on-yellow) vessels harkened back to the simpler decorative themes of Glaze A.

Change through Time

The stratigraphic tests and gas line excavation covered two major parts of Piedras Marcadas; the gas line sampled the south (and earlier) end of the site, while Schmader's test pits were concentrated in the northwest area dominated by post-1500 construction. Together, these collecting efforts may have documented most of the depositional history of the site.

Table 3 provides a summary of pottery frequencies for the seven test pits and the gas line trench. A previous report (Franklin 2016) examined the vertical distribution of pottery types in each of the eight tested loci at the site. Those data are summarized here.

Gas Line Trench

Excavation of a gas line trench at the south edge of the site resulted in the collection of 1,025 sherds (Table 3). Due to the method of excavation, stratigraphic control was lacking, so the artifacts are considered as one lot.

Coalition types—Socorro, Santa Fe, and Wiyo Black-on-white—are prominent. Diagnostic glazeware bowl rims (n = 48) are mostly early Classic period Glaze A–C (78 percent of all bowl rims). Glaze D (San Lazaro; n = 8) and Glaze E (Puaray; n = 3) are scarce, and no Glaze F bowl rims were recovered from the gas line trench. The less diagnostic glazeware body sherds also suggest production during the early glaze period; glaze-on-red and glaze-on-white layouts greatly outnumber polychrome designs on the non-rim sherds.

Three sherds from the Acoma-Zuni glaze tradition are also early. They suggest some trade with the Western Pueblo region.

The utility ware assemblage similarly suggests deposition early in the Classic period; it includes 21 pieces of clapboard and indented corrugated utility ware. Corrugated styles were replaced by wiped, semi-obliterated coils during the early 1300s, and after about 1400 virtually all utility pottery along the middle Rio Grande had plain surfaces.

Collectively, the gas line assemblage indicates a midden deposit from Coalition through early Classic times (about 1200–1450). The architecture related to this deposit is not documented but may have been late pit houses or early above-ground contiguous adobe rooms.

Table 3. Piedras Marcadas Pottery Types by Unit.

Code	Pottery Type	Gas Line	TP 1	TP 2	TP 3	TP 4	TP 5	TP 6	TP 7	Totals
White Ware										
6	Plain white	16						1		17
12	Socorro B/W	1								1
15	Santa Fe B/W	7								7
17	Santa Fe/Wiyo B/W	2			1					3
	Subtotal	26			1			1		28
Rio Grande Glaze Ware, not by Type										
91	Red slip	192	121	107	68	30	47	414	24	1003
92	Yellow slip	27	20	31	16	10	6	82	2	194
94	Red-on-white, no glaze	5		1				1		7
95	Glaze-on-red	101	69	75	60	17	15	211	18	566
96	Glaze-on-yellow	78	22	27	40	7	19	166	8	367
98	Glaze Polychrome	23	19	19	16	4	3	57		141
99	Very late		6	1	2	1	2	72		84
Rio Grande Glaze Ware, by Type										
101	Glaze A, Los Padillas GP	3			2		1	1		7
105	Glaze A, Arenal GP	1								1
110	Glaze A, Agua Fria G/R	20		4	2	2				28
113, 115	Glaze A, San Clemente GP W/R	10	1	3	1	1				16
120	Glaze A, Cieneguilla G/Y				1					1
201	Glaze B, Largo G/Y		1			1			1	3
301	Glaze C, Espinoso GP		1		1	1				3
305	Glaze C, Kuaua GP	3	1					1		5
401	Glaze D, San Lazaro GP, red slip	4	1	2	1	2		2		12
402	Glaze D, San Lazaro GP, yellow slip	4								4
501	Glaze E, Puaray GP	3	5	7	4			23	1	43
502	Glaze E, Tiguex GP					1	1	22	2	26

Table 3. Piedras Marcadas Pottery Types by Unit.

Code	Pottery Type	Gas Line	TP 1	TP 2	TP 3	TP 4	TP 5	TP 6	TP 7	Totals
601	Glaze F, Kotyiti GP							11	1	12
610	Glaze F, Kotyiti G/Y		1				1	20	1	23
615	Glaze F, Kotyiti G/R							6		6
	Subtotal	474	268	277	214	77	95	1089	58	2552
	Non-local Types									
50	St. Johns Polychrome			1						1
820	Pinnawa Glaze-on-white	1								1
830	Kwakina Polychrome	2								2
860	Sikyatki Polychrome							1		1
25	Biscuit A B/W			1		1				2
30	Biscuit B B/W					1				1
	Subtotal	3		2		2		1		8
	Utility Wares									
701	Clapboard corrugated	6				1				7
705	Indented corrugated	15			1			2		18
706	Obliterated corrugated							1		1
710	Rio Grande plain gray utility	501	360	389	284	110	146	1819	81	3690
	Subtotal, utility	522	360	389	285	111	146	1822	81	3716
	Total	1025	628	668	500	190	241	2913	139	6304

Test Pits

The stratigraphic tests by Schmader were in the heart of the pueblo encountered by Coronado. The general time span indicated by the sherds is about 1500 to 1650. This time span is indicated in part by the rarity of Glaze A, B, and C pottery, suggesting that initial construction of the late pueblo postdated these types. While it is not clear when the pueblo was started, a guess date of 1500 makes sense given the ubiquity of Glaze D or later pottery within its walls. Moreover, this was the pueblo attacked by Coronado in 1540, so initial construction must predate that event.

Table 3 shows the summary counts for the seven tests (for more detailed counts, see Franklin 2016). A total of 5,279 sherds came from the seven tests, and collectively the assemblages are heavily weighted towards post-1500 ceramic types. The tests yielded 137 diagnostic Rio Grande Glaze Ware bowl rims; only 21 are Glaze A through C, while 116 are Glaze D through F.

Compared to the sample from the gas line trench, the samples from the test pits are later. In the gas line trench sample, Glaze A–C sherds are much more numerous. Furthermore, the trench yielded 26 Coalition period black-on-white sherds, while the much larger sample from the tests in the late plaza yielded only one Santa Fe Black-on-white sherd. The late character of the test pits assemblage is also suggested by the distribution of plain-surfaced utility pottery, which suggests deposition after 1500 pottery. The earlier gas line trench yielded 21 clapboard and indented corrugated sherds and 501 plain gray utility sherds, while the seven tests in the plaza yielded five corrugated utility sherds and 3189 plain gray sherds. In sum, the ceramic assemblages are consistent with the post-1500 date attributable to the "late" pueblo due to the presence of Spanish artifacts.

The test pit assemblages are not identical, however. Test Pits 1–4 all yielded small percentages of pre-1500 (Glaze A–C) bowl rims along with the more common post-1500 glaze types. It is unclear why, but some of the plaza trash deposits sampled by the test pits may have included admixtures of earlier deposits. This possibility is suggested by the fact that of the four test pits, only Test Pit 2 (which yielded a large sample) shows a clear proportional shift from early to late glaze bowl rim forms in the higher levels of the unit.

Test Pits 5–7 had almost no examples of early glazes; instead the tests yielded Glazes D–F sherds from top to bottom. Test Pit 6—more than 3 m deep—yielded the most pottery (n = 2,913) of the three; of 86 diagnostic Rio Grande Glaze Ware bowl rims from Test Pit 6, only two were from earlier (Glaze A–C) types. While Test Pits 5 and 7 were shallower and yielded smaller samples, the same can be said for them.

All in all, the samples from seven test pits are dominated by late glazeware pottery. While three of the tests yielded some black-on-white and early glazeware sherds, those are not dominant numerically. If the early sherds are not due to admixtures of earlier and later trash, they could indicate the retention and eventual discard of heirloom pieces.

Discussion

Collectively, the seven tests in the plaza of the “late” pueblo and the gas line trench at the south end of the site are likely to have encompassed the entire ceramic history of the site, although not necessarily in proportion to the site’s ceramic assemblage as a whole. Quantitatively, Glazes B and C are minor components in these samples compared to Glaze A or Glazes D –F. Whether this pattern is representative of the entire site area or due to the available samples is not known. The gas line trench at the south end of the site cut through deposits dating to about 1250 to 1500, while the tests in the “late” plaza are dominated by post-1500 glazeware and culinary types. Additional tests in the eastern and northern parts of the site might add more data pertaining to the “early” (Glaze A–C) pueblo.

All major pottery types of the Middle Rio Grande district are present, from the Coalition period past the end of the Classic Period. No significant gaps in the series were detected. Judging by the sherds, occupation of the village was continuous for as much as 400 years, although the spatial distribution of its residents seems to have shifted over time.

Chapter 4

CHRONOLOGY

Chronological assessment at sites in this area and general time frame typically relies on their abundant pottery. This approach involves both relative frameworks and, where possible, cross-dating to other, independently dated sites. Specifically, application of a well known ceramic typology, for Rio Grande Glaze Ware, together with absolute dates from other localities, provides a basis for assessing the age of the site as a whole and of its various components. One potential pitfall is the assumption that pottery types that are securely dated in one place have the same date ranges in another (the central assumption in cross-dating). At Piedras Marcadas and nearby villages this is not a major drawback, however, as the overall sequence is quite well known.

Given the samples available from Piedras Marcadas, a potentially more serious limitation of this approach is the relatively small number of diagnostic sherds. For Rio Grande Glaze Ware, the most diagnostic pottery consists of bowl rim sherds, which are always in a minority. This limits sample sizes for dating, and hampers statistical treatment of assemblages.

As I described earlier, the seven tests in the center of the site and the gas line trench at the south end of the site appear to have encompassed the entire ceramic history of the site, although not necessarily in in proportion to actual levels of ceramic production and discard. The gas line trench at the south end represents the early part of the occupation, 1250–1500, while the tests in the late plaza are dominated by post-1500 glaze and culinary wares. While tests in the eastern and northern parts of the site might add to our samples of early (Glaze A–C) pottery, all of the major local pottery types from the Coalition period through the end of the Classic period are represented. To put it differently, the collections from Piedras Marcadas indicate no significant gaps in production and consumption of pottery. This indicates, in turn, that there was a continuous occupation at the site for the entire span of the Rio Grande Glaze Ware series, or some 400 years, although the focus of habitation seems to have shifted within the site over that period.

No matter how successful ceramic cross-dating has been, it is always desirable to obtain additional independent dates, both for verification and to expand the basis for future cross-dating. Fortunately, several radiocarbon dates are now available for Piedras Marcadas.

Radiocarbon Dates from Piedras Marcadas

Five radiocarbon samples, of charcoal and wood from the tests at Piedras Marcadas, were analyzed by Beta Analytic (Appendix C). The samples were submitted by Matthew Schmader and included five samples from four test pits. The samples were from various depths. Two samples came from Test Pit 6, from two different levels. All of the samples came from within the late pueblo (probably built between 1450 and 1500). This is the pueblo attacked by the Coronado expedition in 1540–1541. All of the samples derive from plaza area trash deposits; none is from a room.

The resulting calibrated radiocarbon dates were expected to fall somewhere between 1500 and 1650. This expectation was based on the construction sequence (this being was the later pueblo), a known historical date (a Spanish attack in 1540–1541), and the dominance of ceramics in the Glaze E and F range. (The pueblo must have been abandoned by the revolt of 1680, but by how much is not known.) Although this general expectation was largely corroborated by the radiocarbon dates, it appears that the vagaries of deposition, possibly including the mixing of deposits, have affected the absolute dates. The situation is further complicated by the fact that the radiocarbon curve can cross absolute time in more than one location, so that a single radiocarbon sample can yield multiple calibrated date ranges. In such cases, one option is to choose among the various date ranges and present the reconstruction that most closely reconciles radiocarbon and other information.

This following discussion incorporates Matthew Schmader's interpretations of the results as well as my own. All cited calibrated date ranges are at the 68 percent (one sigma) probability range.

Test Pit 1, 212–215 cm

Four date ranges are listed for this sample; three are too late (they fall in the 1700s and 1800s). The earliest range, 1669 to 1682, is intriguing. If the sample was indeed derived from the occupation of the site, it indicates activity at the site late in 1600s, perhaps nearly just before the Pueblo Revolt of 1680. The pottery from Test Pit 1 included 11 diagnostic glazeware rims, with Glaze E and F in the majority. The sherd count from this specific level (210–220 cm) includes three late glaze rims (E or F) and no early ones. The associated sherds are therefore consistent with a date in the late 1600s—but the suggestion that the town was occupied that late is surprising.

Test Pit 2, 120–130 cm

This sample yielded two calibrated date ranges: 1450–1510 and 1600–1615. The pottery from the test is a mixture of Glaze A, D, E, and F, with no clear pattern. Since the sample was collected high in the stratigraphic profile, it is our opinion that the later date range (1600–1615) is correct.

Test Pit 6, 105–110 cm.

Two samples were taken from this test; this one is from higher in the profile. The sample yielded two calibrated date ranges: AD 1450–1510 and 1600–1615. Glaze E and F types predominated in the entire test pit, top to bottom. A bit of Glaze D was found, but with no appreciable trend across 3 vertical meters. In the level where this sample was taken, two Glaze E bowl rims were found. Thus, the latter of the two date ranges (1600–1615) fits best.

Test Pit 6, 325–331 cm

The second sample from Test Pit 6 was obtained from a lower and thus earlier level. The two resulting date ranges are 1520–1575 and 1630–1645. The diagnostic sherds from the pit are almost all Glaze E and F (82 of 86 diagnostic glazeware rims), and there is no indication of changes in the pottery assemblage by depth. Thus, although this is the lower of the two samples run from Test Pit 6, it is not necessarily much earlier. Instead, the entire test may consist of late trash. In the end, either date range could be accepted. Together, they span the period in which the late pueblo was built and used, about 1500 to 1650.

Test Pit 7, 100–110cm

In this test a possible iron helmet fragment was discovered, along with a piece of wood that was dated. The two resulting date ranges are 1305–1365 and 1385–1400. This is inconsistent with the diagnostic pottery, which is dominated by Glaze D and E rims (admittedly, in a small sample). Schmader interprets these ranges as indicating that an old piece of wood was reused in Glaze D–E times, or that the wood was redeposited in the level. Even if the wood is out of context, the dates are consistent with the overall life date range for the site, about 1300 to 1650.

Evidence From Other Projects at Piedras Marcadas

Ceramic Tallies by Schmader

Matthew Schmader (2011:330) completed an in-field intensive surface analysis within a 400 square meter area near the center of the site; his results are reproduced here as Table 4. Schmader's type assignments were sometimes made on body sherds as well as the more diagnostic bowl rims, but are typologically compatible with mine. As Schmader noted, every glazeware phase is represented, from A through F. However, late glazeware types (E, E–F, and F) predominate, and are relatively more common in the central plaza of the late pueblo versus on the mounds closer to the site periphery. Schmader also found fragments of contact-period terra cotta olive jars, and noted earthenware sherds with green lead glaze on the central plaza surface (Schmader 2011:330). It is clear that central pueblo and its plaza were the latest part of the site.

Salvage Excavation by Marshall

When Piedras Marcadas was acquired by the City of Albuquerque, Michael Marshall (1988) prepared a summary estimate of the site's resources. Somewhat later, he led excavations for a power line and pole at the south end of the site, near the present parking lot (Marshall 1993). He exposed an early glazeware period deposit including a midden and possibly part of a kiva. Marshall (1993) interpreted the time of deposition as during the Glaze B–C horizon, about 1450 to 1525. The present work confirms the existence of a Coalition to early Classic period occupation (between 1200 and 1525) at the site; Marshall's evidence suggests that part of that early occupation took place at the south end of the site.

Table 4. Surface Sherds in the Central Plaza of the Late Pueblo.
(Source: Schmader 2011:330)

Categories and Dates	Type Names	Total	Percent
Early Wares			
Coalition period, 1200–1400	Santa Fe B/W, Galisteo B/W	12	0.6%
Glaze A, 1300–1425	Agua Fria G/R, San Clemente GP	1138	60.3%
Glaze B, 1425–1450	Largo GP	1	0.1%
Glaze C, 1450–1500	Espinoso GP	50	2.7%
Subtotal, Early Wares		1201	63.7
Late Wares			
Glaze D, 1475–1525+	San Lazaro GP	316	16.8%
Glaze E, E–F, F, 1525–1700	Tiguex GP, cf. Kotyiti GP	365	19.4%
Pueblo IV, 1300–1375	Jeddito Black/yellow	4	0.2%
Subtotal, Late Wares		685	36.4%
Grand Total		1886	100.%

Stratigraphic Test by Hendron

In the early 1930s, J. W. Hendron selected a large trash mound at Piedras Marcadas for testing (Hendron 1935). Unfortunately, the location of the test trench was not reported (most likely it was near the north end of the site). Hendron's trench was 3 feet (0.9 m) wide, 6 feet (1.8 m) long, and almost 8 feet (2.4 m) deep. The trench was excavated in 6 inch (15 cm) levels, "accurately measured and marked" (Hendron 1935:32). Lenses of ash, sand and ash were filled with refuse throughout. The strata were more or less horizontal.

The resulting assemblage of 896 sherds was dominated by Rio Grande glazeware. Allowing for minor variations, "all rims from this site fit in the Mera classification" (Hendron 1935:29). Very little non-glazeware pottery was noted: three Biscuit Ware sherds and one Sikyatki polychrome sherd from Hopi.

The sequence of glazeware rims is listed in detail, and yields an excellent picture of the occupational sequence. To paraphrase Hendron (1935:38), the glaze bowl rims appeared in the following order:

Lowest levels (8 down to the bottom): only Glaze A rims
Levels 6 and 7: Glaze A, with small amounts of Glazes B and C, which appear simultaneously
Level 5: highest level in which Glaze A appears
Levels 1–4: Glazes E and F dominate the assemblage (but no Glaze D found?)
Levels 1 and 2: Glazes E and F only

Hendron (1935:39) concluded, "It appears that there is a succession from bottom to top, although Groups A, B, and C are present up to level 4, where Groups E and F are present in the majority and totally in the remaining upper levels." It is not clear why Hendron did not mention Glaze D; either Hendron did not correctly identify this rim type or there was n hiatus in the depositional sequence at the mound. Glaze D is common elsewhere in the site.
Hendron's sequence, as given in diagram form and summarized in his text, was an early confirmation of the Rio Grande Glaze Ware sequence proposed by Mera. With the curious exception of Glaze D, Mera's groups are present in the proper order: Glaze A alone, followed by Glaze A with a few examples of Glazes B and C, followed by Glazes E and F, which occur exclusively in the top levels.

A related issue is the persistence of Glaze A pottery, dominated by Agua Fria Glaze-on-red. Following Mera's original approach, which was developed in the northern part of the glaze ware production area, Glaze A died out after 1425, but it has since become clear that Glaze A continued to be made much later in the southern part of the production area. Glaze A was not found throughout the entire stratigraphic sequence at either Puaray (McCreery 1935) or Kuaua. At Piedras Marcadas, Glaze A was found alone, or accompanied by small amounts of Glaze B and C, in bottom levels, but not with Glaze E and F in uppermost levels—a pattern documented both by Hendron and by this analysis. Wherever the line between the northern pattern (Glaze A dies out) and the southern one (Glaze A persists) actually falls, it must fall south of Piedras Marcadas.

As Baldwin (1984) notes, Hendron's test remains important. It was done with rigorous controls and the resulting assemblage was evaluated with the Mera's proposed ceramic sequence in mind. In effect, it showed that Mera's sequence could be duplicated in the Middle Rio Grande District.

Reconstruction of Site History

During the overall occupation span, of about 1400 to 1650, settlement shifted within the site, with the population eventually consolidating in a compact pueblo built around a plaza. During this occupation, the temporally diagnostic pottery consisted almost entirely of Rio Grande Glaze Ware. While Mera's sequence of Glaze A through F has stood the test of time, more absolute dates are needed to refine his sequence. Along the Rio Abajo, tree-ring dates are rarely obtained, so radiocarbon are needed. In this respect the Piedras Marcadas data may be especially important.

Bringing together all the various lines of evidence, it is possible to discuss the establishment, growth, and demise of the pueblo. Like so many other pueblos of the Classic period, Piedras Marcadas was established in the early 1300s. The founding population probably consisted of former residents of nearby Developmental period pit house villages, possibly augmented by newcomers from other parts of the Southwest. The early village seems to consisted of a series of widely scattered above-ground adobe structures. Part of this settlement is now under parking lots, fields, and other properties. The early settlement is associated with Glaze A through C pottery, which is dominant in the southern part of the site (as shown by the assemblage recovered from the gas line trench near the current visitor center). Ceramic evidence of this early settlement also appeared in Hendron's (1935) stratigraphic test. Furthermore, the radiocarbon dates from the site includes date ranges of 1450–1510 (Test Pits 2 and 6) 1305–1365 (Test Pit 7). We do not know the architectural details of the early settlement, as no structures of this phase have been excavated (the possible exception being Marshall's [1993] salvage work). And much of the early settlement seems to have been disturbed by modern construction.

Between 1450 and 1500, the site pattern changed. A pueblo with a central plaza was built at the center of the older, dispersed village. Multi-storied and compact, and easily fortified, this new pueblo was possibly designed with defense in mind. The new pueblo was encountered by Coronado's party in 1540–1541, and Schmader has found European artifacts in the pueblo. The dominant diagnostic pottery in this part of the site is Glaze D, E and F, especially the last two. Radiocarbon date ranges from the tests in the plaza fall strongly after 1500 and extend into the 1600s. Four late dates (from Test Pits 2 and 6) extend from 1600 to 1682 and cluster about 1600–1645. The combined information indicates that the late pueblo was occupied between 1500 and about 1650 in this part of the site. It is therefore obvious that the attack by Coronado's forces did not cause the village to be abandoned; it continued to flourish for another 100 years.

The advent of European colonialism after 1600 had a devastating effect on the local Pueblo population of the Rio Grande valley, as has been well documented. Despite disease, forced removals, and intense acculturation, residents of Piedras Marcadas pueblo persisted well into the 1600s. The abundant Glaze E and E–F sherds attest to the widespread late production and consumption of pottery at the site, which implies that a substantial population was present to make and use the vessels. However, the decline in the frequency of diagnostic sherds in Glaze F times suggests a decline in site population after about AD 1625. The absolute dates from Test Pits 1, 2, and 6 hint at human activity as late as 1650 but despite a date range of 1669–1682 (Test Pit 1), it seems that the villagers left by the middle of that century (well before the Pueblo Revolt of 1680) and never returned. Two types of ceramic evidence that might indicate a post-1700 occupation—glazeware vessels in European forms, and Pueblo matte painted wares—do not occur at Piedras Marcadas.

Radiocarbon Dates from Nearby Classic Period Sites

Two nearby sites, Montaño Bridge and the Alameda School Site, have yielded AMS radiocarbon dates relating to the Classic period. These will now be summarized, as they relate to the ceramic sequence and dates at Piedras Marcadas.

Montaño Bridge

Excavation exposed a variety of prehistoric components at the west side of the Montaño Road bridge, prior to its construction (Raymond (2010). The report included my typological analysis of 14,785 sherds (Franklin 2010c) and a petrographic analysis of selected samples by Kari Schleher (2010b). Roney and Raymond (2010) reviewed the dating of the site's various components.

The ceramics relevant to the Classic period derived from a small early Classic period room block and an associated kiva, which yielded 6,286 sherds. The kiva remains included two floors, one superimposed on the other, and a collapsed kiva roof, with later ceramic trash from the rooms above and next to it. Three AMS radiocarbon dates associated with these levels were reported by Roney and Raymond (2010, Table 7-1) and were interpreted by Franklin (2011), and Roney (2012:126). The following summary of the sequence is based on calibrated dates:

1. Lower kiva floor: mean date of A.D. 1430 (1 sigma range of 1420–1440). Ceramics: Arenal Glaze Polychrome (early Glaze A) below the lowest floor, and Glaze A Glaze-on-red sherds (not diagnostic to the type level) on the floor surface.

2. Upper kiva floor and floor fill: mean date of A.D. 1435 (1 sigma range of 1425–1445). Ceramics: Agua Fria Glaze-on-red, San Clemente Glaze Polychrome, and Cieneguilla Glaze-on-yellow (all typical Glaze A types). Also found: Santa Fe Black-on-white and corrugated utility ware.

3. Trash on collapsed kiva roof: mean date of A.D. 1462 (1 sigma range of 1445–1480). This is an inferred date; the radiocarbon sample was taken from an adobe room next to the kiva, and trash from that and other rooms was discarded onto the collapsed kiva roof. I further infer that the trash on the collapsed kiva roof represents vessel that were utilized together. This pottery includes more than 2,000 sherds of Agua Fria Glaze-on-red, Largo Glaze Polychrome, and Espinoso Glaze Polychrome. The utility wares are mostly plain, not corrugated. Such types are typical of the Glaze A through Glaze C period.

This interesting stratigraphic series documents the shifts after the Coalition period emphasis on black-on-white pottery. The use of the kiva is associated with a “pure” Glaze A assemblage dominated by Agua Fria Glaze-on-red. After the kiva was abandoned, a mix of Glaze A–C types was deposited on the collapsed kiva roof; apparently, all of the types were used concurrently, and discarded in or close to the 1460s. This sequence mirrors the one found in the earliest levels at Piedras Marcadas, as documented by Hendron (1935) and this analysis.

Alameda

The second location with recent dates is the Alameda Schoolhouse site (LA 421), also known simply as Alameda, where three AMS radiocarbon dates were obtained by the Office of Contract Archeology based on its investigations in 2008 (Estes 2008:96). The two-sigma calibrated dates—A.D. 1400–1460, A.D. 1290–1430, and A.D. 1290–1420—corroborate the ceramic evidence of a substantial occupation of the village during Glaze A, B, and C times. Like the Montaño Bridge dates, they also add to the evidence for a Glazes A through C regional population. The new dates from Piedras Marcadas (see above) are mainly for the later glazeware period, so the Alameda and Montaño Bridge site results shed light on Piedras Marcadas during the Glaze A though C period.

Coronado Campsite

Until the new dates on the Glaze E and F occupation at Piedras Marcadas were obtained, independent dating for the local late glazeware sequence was lacking. One exception was the Coronado campsite (LA 54147) (Vierra 1989), where a documented event provides a 1540 date for the associated pottery. That pottery is mostly Glaze E but includes some Glaze D.

Local Chronological Trends

When combined, the information from LA 290, together with that from Montaño Bridge (Franklin 2010c; Raymond 2010; Roney and Raymond 2010; Schleher 2010b), Chamisal (Franklin 2012a; Kurota n.d.), the Alameda School site (Estes 2008; Kurota 2008, 2013), the Coronado Campsite (Vierra 1989), and the Price site (Turnbow 2011) suggest a fairly consistent cultural history for the Classic period in the Albuquerque area. (In the near future, this picture should be supplemented by data from new analyses of Kuaua artifacts.)

Collectively, the large local villages of the Classic period were founded about AD 1300. At the time there were major changes occurred in all aspects of local culture, including settlement patterns, architecture, and of course, ceramics. Specifically, villages consisted of above-ground adobe rooms built in scattered blocks and pottery was painted with lead-based paint that vitrified on firing. Later, perhaps between 1450 and 1500, rooms were increasingly consolidated; the resulting large, multistoried pueblos condensed activities into smaller spaces. Whether this trend reflects the need for additional security is an open question. If so, the new defensive posture predates Spanish contact and may be due to threats from either within the Puebloan domain or from without.

From 1300 to the mid-1600s, the trajectories of ceramic change at these Middle Rio Grande sites tend to be similar. Although we view the potters' activities only through different "windows" of time, my overall impression is that the potters in these various communities were part of a common sphere of ceramic practice. If we assume anything else, it is difficult to explain why the sequences of types and varieties area quite consistent within the area.

The data from the sites also provide further support of the ceramic sequences proposed by Kidder and Mera, at least in terms at of the order in which of diagnostic pottery types and rim profiles appeared. More generally, the local sequence of Coalition period black-on-white types, followed by Socorro and Santa Fe Black-on-white, followed by glazeware vessels, is verified.

Taken together, the area's Classic period sites suggest a continuity of Pueblo occupation through the entire Rio Grande Glaze Ware span, from Glaze A through Glaze F. However, within the overall Classic period span of about 350 years, certain periods seem to have been prominent (ceramically at least) at some sites but not others. Despite some incompatibility among collected samples at these PIV sites, it appears that certain glazeware types are more common at some locations than others. All share a common base in Glaze A red (Agua Fria) pottery, and the diversity of named pottery types was far higher during that period than at any other. If ceramic data are taken as a proxy for population, the latter peaked during the Glaze A production period.

After that, the sites begin to differ. Piedras Marcadas peaks numerically in Glaze E and E-F times. Very little Glaze B and C has been recovered at this site. By contrast, Glazes C and D occur in quantity at Chamisal (based on data being compiled by Alex Kurota). The same Glaze C–D period ceramics are also dominant at the Price Site (LA 728), based on the analysis by Lori Reed (in Turnbow 2011:196). My current research at Kuaua now suggests that the entire glazeware sequence is probably evident there, but that pottery type frequencies probably vary by room blocks. Thus, based on ceramic counts, it appears that peaks of production, and probably also population, may vary from town to town within the Middle Rio Grande production zone.

At Piedras Marcadas specifically, the Classic period occupation can be characterized as probably continuous but not constant. Glaze A types are common at the south end of the site area, but not in the compact central pueblo. Following the "pure" Glaze A period, a period of coeval Glaze A, B, and C pottery obtained for some time (as an estimate, from 1400 to 1500). There is no evidence that Glaze A, as Agua Fria Glaze-on-red, persisted after 1500, although it is commonly associated with Glaze B and C types until about that time. Following a short period of consolidation and rebuilding, Glazes D, E, E-F are seen in abundance. Especially prominent are Glaze E and E–F bowl rims, which are now better dated thanks to radiocarbon dates. Based on type quantities, the Piedras Marcadas population increased from Glaze D through Glaze E and E–F times. After about 1600, smaller amounts of Glaze F signal a dwindling ceramic output. A declining village population persisted until perhaps 1650. By that time the "sister cities" of Chamisal and Alameda were also in decline, and all of them appear to have lost their last inhabitants about the same time, between 1625 and 1650. Locally, the early 1600s were undoubtedly a time of stress, population decline, and abandonment of long-established villages.

Chapter 5

VESSEL FORM AND FUNCTION

Puebloan ceramic vessels were made in a variety of forms, many of which were multifunctional. Compared to earlier times, however, the range of forms in Classic period ceramics was limited. This is true for the entire glazeware series. Bowls and ollas (storage jars) dominate glazeware assemblages, but those assemblages tend to include very few mugs, pitchers, ladles, canteens, or human or animal effigies (all of which were made in earlier times). The Piedras Marcadas assemblage also lacks vessels with European-inspired shapes. No soup plates have been seen there, for example. At sites having more sustained contact with Spanish settlements, such vessel forms are common; these include Isleta (Marshall 2015), San Gabriel del Yunque well to the north (Dyer 2010), and possibly Kuaua (Ethan Ortega, personal communication, 2016).

The changes in bowl rims that underlie the Rio Grande glaze Ware classification system, can be seen as an example of artistic creativity and of the growing and waning popularity of specific artistic approaches. The same can be said of the carinated (angled shouldered) and shouldered bowl forms that emerged during the middle of the sequence, resulting in form-based types such as Tiguex Glaze Polychrome, and of Kuaua Glaze Polychrome with its incurving bowl rims and sharply beveled or angled lips. In contrast, after Glaze C the painted decoration on glazeware vessels was repetitious and uninspired.

Table 5 tallies the vessel forms for the study assemblage. These were always determinable from rim sherds, and almost always from body pieces as well. As might be expected, almost all (n = 3,716; 97.3 percent) of the utility ware sherds came from jars. Nonetheless, 93 utility ware sherds (2.5 percent) came from bowls. Single sherds represent a possible figurine, a possible ladle, and a possible soup plate.

The black-on-white vessels of the Coalition period included both jars and bowls in comparable frequencies, as is shown in the small sample of Socorro and Santa Fe Black-on-white sherds. Similarly, the few sherds from the Western Pueblo region are in typical jar or bowl shapes.

The Rio Grande Glaze Ware sherds (n = 2,552) are dominated by bowls (58.4 percent) and jars (41.5 percent). Two fragments of a seed jar and one possible pitcher or mug sherd complete the list. Because most glazeware type identifications are based on bowl rims, Table 5 shows almost complete dominance of bowls among glazeware sherds assigned to types. The notable exception is Tiguex Glaze Polychrome, which can be identified from jar or shouldered bowl sherds.

The ratio of bowls to jars does not accord with the sherd counts, of course. Decorated closed forms (jars) had at least twice as much surface area as open bowls of the same diameter, so the original vessel count should be more weighted in favor of bowls. Thus, 41.5 percent jar sherds versus 58.4 percent bowl sherds probably corresponds to about 20 percent whole jars and 80 percent whole bowls.

Table 5. Pottery Types by Vessel Form.

Code	Pottery Type	Jar	Bowl	Effigy	Ladle	Seed Jar	Un-known	Pitcher/ Mug	Total
White Ware									
6	Plain white	4	13						17
12	Socorro B/W	1							1
15	Santa Fe B/W	2	5						7
17	Santa Fe/Wiyo B/W	1	2						3
	Subtotal	8	20						28
Rio Grande Glaze Ware, not by Type									
91	Red slip	493	509			1			1003
92	Yellow slip	108	86						194
94	Red-on-white, no glaze	4	3						7
95	Glaze-on-red	194	372						566
96	Glaze-on-yellow	112	253					1	366
98	Glaze polychrome	83	58			1			142
99	Late runny glaze	33	51						84
Rio Grande Glaze Ware, by Type									
101	Glaze A, Los Padillas GP	2	5						7
105	Glaze A, Arenal GP		1						1
110	Glaze A, Agua Fria G/R	3	25						28
113, 115	Glaze A, San Clemente GP		16						16
120	Glaze A, Cieneguilla G/Y		1						1
201	Glaze B, Largo G/Y		3						3
301	Glaze C, Espinoso GP		3						3
305	Glaze C, Kuaua GP		5						5
401	Glaze D, San Lazaro GP, red slip	1	11						12
402	Glaze D, San Lazaro GP, yellow slip		4						4
501	Glaze E, Puaray GP		43						43

Table 5. Pottery Types by Vessel Form.

Code	Pottery Type	Jar	Bowl	Effigy	Ladle	Seed Jar	Un-known	Pitcher/ Mug	Total
502	Glaze E, Tiguex GP	25	1						26
601	Glaze F, Kotyiti GP		12						12
610	Glaze F, Kotyiti G/Y		23						23
615	Glaze F, Kotyiti G/R		6						6
	Subotal	1058	1491			2		1	2552
	Non-local Types								
50	St. Johns Polychrome		1						1
820	Pinnawa Glaze-on-white	1							1
830	Kwakina Polychrome		2						2
860	Sikyatki Polychrome	1							1
25	Biscuit A Black-on-white		2						2
30	Biscuit B Black-on-white		1						1
	Subtotal	2	6						8
	Utility Wares								
701	Clapboard Corrugated	6	1						7
705	Indented Corrugated	18							18
706	Obliterated Corrugated	1							1
710	Rio Grande Plain Gray Utility	3591	92	2	1		4		3690
	Subtotal	3616	93	2	1		4		3716
	Total	4684	1610	2	1	2	4	1	6304

Utility vessels were almost exclusively jars, designed for cooking and storage. Corrugation on the exterior, so common in earlier times, slowly gave way to wiped (also called "striated" or "obliterated") surfaces, then to plain gray surfaces. Meanwhile, smudged and polished interior surfaces became more common on utility vessels, especially near the rims, probably to make the vessels less permeable and more durable. I have the impression that cooking jars became wider at the rim than before.

The assemblage also includes a few sherds from utility ware bowls. Such bowls were not typical of northern Southwest ceramic inventories in Pueblo II (locally, late Developmental) and Pueblo III (Coalition) times, but were revived in the late Pueblo IV (Classic) period. Unpublished sherd counts for Chamisal Pueblo also reveal the occasional presence of utility bowl rims, with smudging and polishing on the interior. A few smudged, polished bowl sherds are also known from the Coronado Campsite (Marshall 1989:79) and Alameda (Kurota 2013). Perhaps the concept arrived from the Mogollon area, where people had created smudged and polished utility bowl interiors for generations.

Given the reduced array of vessel forms in the Classic period, bowls and jars must have assumed new functions. Bowls were employed as serving dishes, of course, but probably also for food preparation, gathering crops, etc. Painted jars could have served to store and dispense liquids, and possibly for transporting liquids, grains, etc. This restricted range of glazeware forms seems to have been widespread, judging by those illustrated for Alameda (Kurota 2013). In studying the assemblage from the Coronado Campsite, Marshall (1989:102) commented, "Forms other than standard utility jars and glazeware bowls are extremely rare in the LA 54147 collection."

Utility pots, obviously used for cooking, must have been called on for numerous other tasks, including storage and even long distance transport. Although we think of decorated vessels as being the focus of long-distance pottery exchange, it is now evident that utility pottery was carried over long distances—if not for their own sake, then to hold whatever was being exchanged. Considerable amounts of utility pottery from the Acoma–Zuni and Hopi areas were imported to Pottery Mound (Franklin 2007). At Piedras Marcadas, a few utility sherds with hornblende latite imply utility imports from the Galisteo pueblos. With more detailed analysis, the known incidence of transported utility jars would undoubtedly increase.

Chapter 6

TEMPER AND PASTE

Identifying constituent materials and tracing them to matching environmental sources provides information on methods of production, sources of raw materials, and exchange of raw materials, finished ceramics, or both. Caution is required, as it is possible for materials from two or more source locations to have similar characteristics, or a resource may be so widespread as to limit the usefulness of resource identification. Nonetheless, such studies often yield useful results. To evaluate material sources, all of the more than 6,000 sherds in the study were clipped, and the temper was examined with a binocular microscope at 10 to 30 power. In order to characterize paste, two refiring (oxidation) experiments examined 281 sherds.

Types of Tempering Materials

Potters added non-plastic materials to clay to prevent shrinkage during drying and cracking during firing. Judging by the study assemblage and similar glazeware samples from nearby Classic period sites, pottery temper consisted almost entirely of crushed igneous and metamorphic rocks. Moreover, potters appear to have chosen specific types of rock. Thus, a given sherd typically contains only one tempering material, although a tiny amount of other non-plastic material may have been added to the mix inadvertently. Thus stream sand, though ubiquitous and abundant in the environment, hardly ever appears as the major intentional temper.

Potsherd temper, so prevalent in Coalition period black-on-white pottery, was employed only briefly in the earliest glazeware pottery (Los Padillas Glaze Polychrome), giving way to crushed rock for the rest of the series. Indeed, a complete change in temper preference was one of many aspects of the shift from Coalition period black-on-white pottery to Classic period glazeware pottery. Once that shift occurred, local potters sought basalt from the lava flows west of the river, intermediate igneous rocks (IIR) including granite and related rock (andesite-diorite), and metamorphic schist, phyllite, and micaceous granite. They then laboriously processed the rock into temper. The result was angular temper that bound well to clay and that, being igneous, did not alter during firing. Modern Pueblo potters follow the same custom.

Basalt from geologically fairly recent lava flows covers much of the present surface of Albuquerque's West Mesa. The flows produced vesicular basalt and scoria as well as darker, harder olivine diabase rock. Both general kinds of basalt were used as pottery temper, as well as for making manos and metates. Almost all analyses of local Classic period ceramics have listed basalts as the dominant temper in glazeware and utility ware sherds.

The intermediate igneous rock or IIR potentially includes several kinds of rock, including granite, granodiorite, and andesite; the category does not imply uniform mineralogical composition. Shepard (1942) identified most of the source rocks in the Middle Rio Grande basin as "andesites" but most of the Piedras Marcadas IIR temper probably derived from decayed granite derived from the Sandia Mountains. The IIR category was used by Helene Warren for

Chamisal Pueblo pottery (personal communication, 1980). It was also used by Garrett (1993) for studies of the same site, and her petrographic analysis suggested that the IIR group included granite. My own analysis of Chamisal pottery (Franklin 2012a) suggests Sandia granite as the likely source of the IIR in the glazeware sherds. Again, however, IIR is not an inherently uniform category.

Micaceous and schistose rocks were employed as temper only in utility ware, apparently in recognition of the strength imparted by those materials to the walls of cooking vessels. Micaceous plain ware is common in local utility ware assemblages (Franklin 2012a; Garrett 1993; Kurota 2013; Warren 1981). Small outcrops of schistose rock occur in Tijeras Canyon, at the north end of the Sandia Mountains, and on the west face of the Manzano Mountains.

Temper analysis of sherds from Alameda Pueblo (LA 421) revealed the same general pattern as at Piedras Marcadas: an emphasis on basalts and IIR, with micaceous temper in some utility ware sherds. At Alameda, the percentage of micaceous temper in utility ware sherds was higher (Kurota 2008, 2013).

One rock temper in some of the Rio Grande Glaze Ware found in the Albuquerque area is non-local and thus indicative of imported finished pottery. Appearing consistently in minor quantities, "hornblende latite" temper is distinctive. Warren (1969) identified this material in the pottery of Tonque Pueblo on the lower San Pedro drainage, about 50 km (30 miles) from Piedras Marcadas. Recent visits have confirmed the presence of this rock type on the surface of Tonque, and in the vicinity of the site. Similar rocks were used as temper in large villages throughout the Galisteo Basin, but a complete analyses of tempering materials from all those sites has not been carried out. (Thanks to Schleher [2010a], we do have a thorough examination of the tempers used at San Marcos Pueblo, about 70 km [45 miles] north of Piedras Marcadas.) The glazeware assemblages in the middle Rio Grande Valley tend to contain minor percentages of the latites and monzonites characteristic of villages to the north and east. While at present it is impossible to identify the exact origins of those pieces, recognition of the latite-monzonite rock type, and of the associated lighter-colored pastes, is important for identifying the imports. Otherwise, they are easily mistaken for locally made Rio Grande Glaze Ware.

Frequencies of Tempering Materials

Tempering agents in Rio Grande Glaze Ware series are almost entirely crushed igneous rocks or IIR, employed in both decorated and utility wares (Table 6). However, the early black-on-white vessels at the site, dating to the Coalition period, were often tempered with crushed potsherds, as were trade wares from the Little Colorado region (St. Johns Polychrome) and the Acoma-Zuni district (Pinnawa Glaze-on-white, Kwakina Polychrome). As expected, the few sherds of these trade wares found at Piedras Marcadas contain sherd temper. Sand and sandstone, although locally abundant, were rarely used as temper. On occasion, black-on-white types made use of one of the two along with crushed sherds. In glazeware sherds, crushed sandstone appears only rarely and stream sand was included only accidentally.

Table 6. Pottery Types by Tempering Material.

Code	Pottery Type	Sherd	Sand or sand-stone	IIR	Mica	Horn-blende Latite	Basalt	Tuff/ Tuff Sand	Total
	White Ware								
6	Plain white	7	1	4			5		17
12	Socorro B/W	1							1
15	Santa Fe B/W	4	1	1			1		7
17	Santa Fe/Wiyo B/W	1					2		3
	Subtotal	13	2	5	0	0	8	0	28
	Rio Grande Glaze Ware, Not by Type								
91	Red slip	10		565	1	66	361		1003
92	Yellow slip	6		108		31	49		194
94	Red-on-white, no glaze			4			3		7
95	Glaze-on-red	10	1	363		25	167		566
96	Glaze-on-yellow	2		221		47	96		366
98	Glaze polychrome	2		77		20	43		142
99	Late runny glaze	1		50		3	30		84
	Rio Grande Glaze Ware, by Type								
101	Glaze A, Los Padillas GP	6					1		7
105	Glaze A, Arenal GP			1					1
110	Glaze A, Agua Fria G/R			13		1	14		28
113, 115	Glaze A, San Clemente GP	1		10		2	3		16
120	Glaze A, Cieneguilla G/Y					1			1
201	Glaze B, Largo G/Y			1		1	1		3
301	Glaze C, Espinoso GP			2		1			3
305	Glaze C, Kuaua GP			2			3		5
401	Glaze D, San Lazaro GP, red slip			7			5		12
402	Glaze D, San Lazaro GP, yellow slip			4					4
501	Glaze E, Puaray GP			27		3	13		43

Table 6. Pottery Types by Tempering Material.

Code	Pottery Type	Sherd	Sand or sand-stone	IIR	Mica	Horn-blende Latite	Basalt	Tuff/ Tuff Sand	Total
502	Glaze E, Tiguex GP			11		1	14		26
601	Glaze F, Kotyiti GP			5			7		12
610	Glaze F, Kotyiti G/Y			13		1	9		23
615	Glaze F, Kotyiti G/R			4			2		6
	Subtotal	38	1	1488	1	203	821	0	2552
	Non-local Types								
50	St. Johns Polychrome	1							1
820	Pinnawa Glaze-on-white	1							1
830	Kwakina Polychrome	2							2
860	Sikyatki Polychrome		1						1
25	Biscuit A B/W							2	2
30	Biscuit B B/W							1	1
	Subtotal	4	1	0	0	0	0	3	8
	Utility Wares								
701	Clapboard Corrugated			4			3		7
705	Indented Corrugated			3	3		12		18
706	Obliterated Corrugated			1					1
710	Rio Grande Plain Gray Utility	12	1	842	159	5	2671		3690
	Subtotal	12	1	850	162	5	2686	0	3716
	Total	67	5	2343	163	208	3515	3	6304
	Percent	1.1%	0.1%	37.2%	2.6%	3.3%	55.8%	0.0%	100.0%

Although local glazeware and utility ware tempers are often the same, some tempers were employed only in certain wares or types. Moreover, any given vessel was tempered with one or another of these rock materials; mixtures are very rare. It is clear that the potters deliberately chose a single type of crushed rock as they added temper to a batch of clay.

Utility Ware

Table 6 lists tempers for utility pottery (n = 3,716). The clear preference for igneous or metamorphic crushed rock in utility pottery construction, and the lack of use of the ubiquitous stream sand during this period, is a clear trend in collections from multiple Classic period sites in the valley. Not surprisingly, basalt is heavily favored (72.3 percent of sherds) in the dominant plain gray utility jars as well as in jars made in the earlier corrugated style. IIR was found in 23 percent of the utility pottery sherds, while micaceous rock (having abundant muscovite, biotite, or foliated schist flakes as the main mineral) comprised 4.4 percent of the total.

Hornblende latite occurs in only five utility ware sherds, perhaps showing that small amounts of utility ware were imported from the Galisteo Basin along with glazeware vessels. Based on uniformity in paste, almost all utility pottery was probably made on-site—but some potting groups within the village preferred one crushed rock temper over another.

Some utility ware vessels were made with micaceous temper, perhaps because of the improved strength and thermal resistance provided by such temper. Conscious selection of micaceous temper for utility ware production increased during the Classic period in the middle Rio Grande Valley (Warren 1981) and throughout northern New Mexico. The tradition persists today in the micaceous "bean pots" of Taos and Picuris Pueblos, whose durable wares continue to be valued for New Mexican cuisine. (On the other hand, decorated serving vessels never incorporated mica temper.) At Piedras Marcadas, the frequency of micaceous sherds (due either to micaceous pastes or micaceous temper or both) is admittedly low; only 4.4 percent of all utility sherds (Table 6). Such sherds are relatively more common at contemporary sites on the east side of the river. At Chamisal (Franklin 2012a, Table 10) 882 (41.6 percent) of 2,122 utility ware sherds were micaceous (see also Garrett's [1993] petrographic study). At Alameda Pueblo (Kurota 2008:100), 383 (58 percent) out of 661 utility ware sherds were micaceous (including mica clay and schist/phyllite temper). In OCA's subsequent work at Alameda (Kurota 2013:95), 1,287 (55 percent) out of 2,328 utility ware sherds were micaceous.

Clearly, mica temper was often favored by local Classic period potters. However, the relative emphasis on this temper type varied from one village to the next. East of the river, at Chamisal and Alameda, roughly half (42 and 58 percent) of the utility ware assemblage was tempered with some form of micaceous rock. West of the river, at Piedras Marcadas, only about one utility ware sherd in 20 (4.4 percent) was tempered this way. Instead, IIR and especially basalt, were more popular as tempers (Table 6). This variation probably reflects the fact that Chamisal and Alameda were closer to the schist and micaceous clays of the Sandia mountains.

Rio Grande Glaze Ware

In the Rio Grande glazeware types as a whole, popular tempers include basalt or granitic rock, again with essentially no mixing of the materials within a single batch of clay. No micaceous temper is seen in glazeware sherds. In the total glazeware sample, (n = 2,552), most (1,488 or 58.3 percent) are tempered with IIR, while 821 (32.2 percent) have local basalt temper (Table 6). Smaller numbers of glazeware sherds are tempered with hornblende latite (203, 8.0 percent) or potsherds (38, 1.5 percent).

Hornblende latite temper was a favorite of contemporary potters at Classic period villages to the north and east, specifically at Tonque Pueblo (Warren 1969). Similar rock tempers (monzonites and latites) were employed at the villages of the Galisteo Basin (Wilson 2007, Wilson et. al. 2015) and San Marcos (Schleher 2010a). When found in middle Rio Grande Valley ceramic collections, such temper indicates pottery traded in from the Galisteo district. It is instructive that only glazeware sherds have such temper.

Discussion

Production of both utility ware and glazed decorated ware appears to have involved selection of specific crushed rocks. As batches of clay were prepared, the rock types usually were not mixed. Both basalt and granitic rock were used in both utility and glazed pottery, but micaceous rock was confined to the preparation of utility pieces. Potsherd and hornblende tempers were employed almost exclusively to create glazeware vessels, and the latter further indicate the importing of glazeware vessels from the Galisteo Basin. We seem to have evidence of discrete "communities of practice" (as defined by Cordell and Habicht-Mauche [2012]) both within and between Classic Period villages.

Small numbers of sherds are from imported pottery from more distant sources. Biscuit Ware from the Pajarito Plateau area to the north has volcanic tuff and sand temper. Sikyatki polychrome from the Hopi area has very fine sand or sandstone inclusions and possibly was "self-tempered." The St. Johns Polychrome, Pinnawa Glaze-on-white, and Kwakina Polychrome from the Little Colorado River valley to the west all revealed their typical white pastes and potsherd tempers.

Paste Clay

Refiring Procedure

Rice (1987) provided a review of the theory and method of paste clay oxidation studies. Briefly, oxidation or "refiring" of sherds in an electric kiln burns out miscellaneous impurities, while bringing all samples to a uniform temperature and atmosphere. Typically, samples are fired to 900 degrees C. for 10 minutes. Upon cooling, the oxidized pottery can be compared using a standard Munsell Soil Color Chart (1973). Differences in Hue, Value and Chroma reflect differences in original clay minerals, and probably indicate differences in collection sources. Subsequent refiring studies may compare raw clays from the local area to pottery clays to determine whether a match exists. Although the method is not technically sophisticated, it can reveal broad parameters of clay collection and usage. Furthermore, it can be carried out on large numbers of samples at low cost. As a result of refiring, associations of pottery types, tempers, and paste clays can be defined.

For this study, two refiring tests were conducted. The first sample (n = 120) compared broad ceramic groups by temper and refired color. The second (n = 161) focused specifically on Glaze A–F bowl rims to determine variations in paste clays and potential temporal changes in clay utilization.

Paste Clay versus Tempering Material by Ceramic Class (Test 1)

Basically, this test asked whether there are specific associations among three variables: pottery type, tempering material, and choice of clay. After the type and temper of 120 sherds had been identified, “clips” of those sherds were tested by kiln oxidation (refiring). The sample included 20 clips from randomly selected sherds within the following six groups: utility ware with (1) basalt, (2) granitic rock, and (3) micaceous rock temper, and Rio Grande Glaze Ware (not broken down by type) with (4) basalt, (5) granitic, and (6) hornblende latite tempers.

After firing, the Munsell color of each clip was determined. In Figures 5 and 6 all Munsell Hue pages from 2.5 YR (brownish red) to 10YR (yellow-buff) are listed across the top, and the numbers of sherds are indicated by Value/Chroma combinations below. Because sample sizes are small, patterning is recognized easily from the Munsell frequencies themselves, and no further statistics were applied.

Utility ware was evaluated first, as it is likely to have been made from more uniform body clays, probably from local sources. The color distribution from refiring (Figure 5) shows that the modal frequency (n = 11) for utility sherds with basalt temper is 5YR 6/8 (reddish yellow). Smaller amounts fired to 7.5YR 6/8 (n = 5), and 5YR 5/8 (n = 3). These colors are actually very close in Value and Chroma, but on adjacent Hue pages. Thus, except for one somewhat redder (2.5YR 5/8) sherd, all 20 basalt-tempered sherds are tightly centered in the reddish yellow area, with a bright Chroma and fairly light Value. The tight clustering suggests a single, relatively homogeneous clay source. Utility sherds with IIR show an almost identical distribution to that for sherds with basalt temper. The mode remains at 5YR 6/8, with a second peak at 7.5YR 6/8, which are nearly identical colors. Rank order of frequency in the sample of 20 is likewise the same. Indeed, the same (based on refiring color) clay was utilized for basalt-tempered and IIR-tempered utility ware vessels.

Utility ware sherds tempered with micaceous rock follow much the same pattern (Figure 6). The same peak frequency at 5YR 6/8 is accompanied by smaller amounts in the same other colors seen for basalt and IIR temper. The exception is a lack at the more yellow (7.5YR 6/8 color) . But for this exception, which could be due to sample error, the refiring color pattern for micaceous rock tempered utility pottery is the same as for the other two utility ware tempers, suggesting the same or similar clay sources.

Pottery Type = Utility, Basalt temper, n=20

Hue: 2.5YR Red
Chroma (Saturation)

Value		0	2	4	6	8
light	6					
	5					1
	4					
	3					
dark	2.5					

Hue 5YR Red-tan
Chroma (Saturation)

Value		1	2	3	4	6	8
light	8						
	7						
	6						11
	5						3
	4						
	3						
dark	2.5						

Hue 7.5 YR Tan-yellow
Chroma (Saturation)

Value		0	2	4	6	8
light	8					
	7					
	6					5
	5					
	4					
	3					
dark	2					

Pottery Type = Utility, Granitic temper, n=20

Hue: 2.5YR Red
Chroma (Saturation)

Value		0	2	4	6	8
light	6					
	5					3
	4					
	3					
dark	2.5					

Hue 5YR Red-tan
Chroma (Saturation)

Value		1	2	3	4	6	8
light	8						
	7						
	6					1	12
	5						1
	4						
	3						
dark	2.5						

Hue 7.5 YR Tan-yellow
Chroma (Saturation)

Value		0	2	4	6	8
light	8					
	7					
	6					3
	5					
	4					
	3					
dark	2					

Pottery Type = Utility, Micaceous temper, n=20

Hue: 2.5YR Red
Chroma (Saturation)

Value		0	2	4	6	8
light	6					
	5					2
	4					1
	3					
dark	2.5					

Hue 5YR Red-tan
Chroma (Saturation)

Value		1	2	3	4	6	8
light	8						
	7						
	6						14
	5						3
	4						
	3						
dark	2.5						

Figure 5. Piedras Marcadas refiring matrix for utility ware. Sherd occurrences are highlighted in yellow.

Pottery Type = Rio Grande Glaze Ware, basalt temper, n=20

Hue: 2.5YR Red

Value	Chroma (Saturation): 0	2	4	6	8
light 6					
5					4
4					
3					
dark 2.5					

Hue 5YR Red-tan

Value	Chroma (Saturation): 1	2	3	4	6	8
light 8						
7						
6					1	12
5						3
4						
3						
dark 2.5						

Pottery Type = Rio Grande Glaze Ware, granitic temper, n=20

Hue: 2.5YR Red

Value	Chroma (Saturation): 0	2	4	6	8
light 6					1
5					2
4					
3					
dark 2.5					

Hue 5YR Red-tan

Value	Chroma (Saturation): 1	2	3	4	6	8
light 8						
7					1	
6					3	9
5						
4						
3						
dark 2.5						

Hue 7.5 YR Tan-yellow

Value	Chroma (Saturation): 0	2	4	6	8
light 8					
7			1	1	
6				2	
5					
4					
3					
dark 2					

Pottery Type = Rio Grande Glaze Ware, hornblende latite temper, n=20

Hue 7.5 YR Tan-yellow

Value	Chroma (Saturation): 0	2	4	6	8
light 8					
7				1	1
6				1	
5					
4					
3					
dark 2					

Hue 10YR Yellow

Value	Chroma (Saturation): 1	2	3	4	6	8
light 8				3	13	
7					1	
6						
5						
4						
3						
dark 2						

Figure 6. Piedras Marcadas refiring matrix for Rio Grande Glaze Ware. Sherd occurrences are highlighted in yellow.

Thus, the salient pattern for utility ware is that three distinct rock tempers are associated with the same clay colors (after refiring), centered on 5YR 5/8 (reddish tan). This indicates (but does not prove) that even though different tempers were used concurrently, makers of utility ware pottery were using the same clay source or highly similar clay sources.

The glazeware sherds were tested next. Figure 6 shows the refiring results for 20 sherds each with basalt, granitic, and hornblende latite temper, 60 sherds in all. (The few glazeware sherds with potsherd temper was not considered.) Basalt-tempered glazeware sherds refired to essentially the same colors (medium reddish-tan) as the basalt-tempered utility pottery; the mode is 5YR 6/8 in both cases, and the same range of color variation is apparent. Thus, most basalt-tempered glazeware vessels at Piedras Marcadas seem to have been made from the same clay employed for most of the utility ware.

Glazeware sherds tempered with IIR display greater variability in refiring colors. While the trend still centers in the 5YR Hue range, four pieces refired to lighter tan (7.5YR) and redder (2.5YR) Hues. This greater variability probably mirrors use of a greater range of clay sources for IIR-tempered glazeware pottery. Paste clay variations in the IIR-tempered glazeware pottery should be explored using more advanced analytical techniques, with the goal of identifying the various clay sources.

The third major temper type seen in local glazeware pottery is "hornblende latite." As I mentioned, the parent rock occurs in the lower San Pedro drainage, and potters at Tonque Pueblo used it extensively (Warren 1969). Moreover, clays used at Tonque and in the Galisteo area generally fire much lighter and yellower than those of the Rio Grande Valley. Shades in the Hue range of 10YR are common. Figure 6 shows this association between temper and paste color. The mode is 10YR 8/6 and the range is from 7.5YR 6/6 to 10YR 8/4 (light buff). None fired to the darker or redder hues of 5YR or 2.5YR. In this case, it is especially clear that the hornblende latite tempered sherds also contain quite different clay from the "local" middle Rio Grande utility and glazed pottery examined so far. Although the pottery "types" may be the same based on rim shapes and surface appearance (Glazes C, D, etc.), these examples clearly derive from a different production area. While much of the intrusive glaze ware may have originated at Tonque, there is enough ambiguity in current temper analyses to allow some sherds to be from other pottery producing villages in the Galisteo Basin.

In summary, most the utility and glazed pottery employed both basalt and IIR temper with a clay having a modal refiring color centering on 5YR 6/8. For both utility and glaze pottery, the variation in clay color extends to adjacent lighter Hues 7.5YR 6/6 and 6/8 (Figures 5 and 6), rarely into the redder 2.5YR. As these colors fall together in the spectrum, they might be accounted for by minor and continuous variations in a single clay source—most likely a readily available river clay. Assuming that the narrow range of colors reflects use of the same or similar clay sources, the different tempers reflect the habits of different potters who are using that source or set of sources.

While utility pottery often gives a clearer and simpler view of local clay and temper utilization, ingredients in decorated pottery typically involve greater heterogeneity. That is the case here. The variations in temper, especially in glazeware sherds, appear to be conscious choices and thus suggest multiple “sub-communities of practice” among the potters of Piedras Marcadas. Differing intra-village patterns of clay and temper usage are apparent among Pueblo potting families today, and the same variability undoubtedly extends into the past (see the essays in Cordell and Habicht-Mauche 2012).

Paste Clay versus Glazeware Pottery Type (Test 2)

I then studied the relationship between paste clay color and Rio Grande Glaze Ware type. My questions were:

1. Did paste clays change over the nearly 400 years of glaze ware production?

2. What are the central tendencies (and ranges of diversity) in refired clay color by period?

3. Is there evidence for changes in clay sources, or perhaps of regional trade?

Samples representing each of the pottery types (Glaze A–F) and each of the major temper groups were selected for evaluation of paste clay. The associations of clays and temper groups (see above) were then compared to the chronologically sensitive pottery types. The test involved taking clips from identified glazeware bowl rim sherds which were securely identified to a pottery type (Glaze A–F). A sample of 161 identified glazeware bowl rims was clipped and refired, following the procedure described earlier.

Table 7 plots glazeware type against Munsell color (with red-brown at the top and pale yellow at the bottom). Small sample sizes precluded statistical manipulation. The most popular clays for glaze ware production fired to 5YR (35.4 percent) and 7.5YR (48.4 percent). Specifically, colors 5YR 6/6 and 5YR 6/8 and the corresponding colors of adjacent Hue 7.5YR (7.5YR 6/6 and 7.5YR 6/8) account for the vast majority of the 161 sampled sherds. These four color chips are next to each other on two sequential pages of the Munsell soil color chart. Together the four color appear to represent a single clay color unit with minor variations in color. This result might represent multiple collection locales within a larger clay bed. Clays that are much redder than the ones just described do occur, but only rarely. Very pale yellow-white refired clays occur in 22 sampled glazeware bowl rims. On the whole, a considerable range of clay diversity is represented, from red to yellowish-red to pale yellow-buff, but the central tendency is clearly in Hues 5 to 7.5 and medium to bright shades of Value and Chroma. Presumably, this group of adjacent related shades represents the typical clay color used in most of the glazeware pottery made at Piedras Marcadas.

Viewing the color distribution by glazeware type (A–F; Table 7), the most obvious pattern over time is the consistent high frequency of the 5YR and 7.5YR Hues just mentioned. Persistent use of the same clay source over a long period is suggested. Variation through time is also apparent, however. The only samples with 2.5 red hues are late (Glaze F). At the other end of the color scale, the pastes that refire to light yellow-buff, strongly associated with hornblende latite temper (see above), probably represent vessels imported from Tonque and the Galisteo Basin. They are found in Glaze B–F sherds but not in Glaze A sherds. Perhaps vessels were not imported from those locations until after Glaze A times.

Table 7. Glazeware Bowl Rim Types by Refired Munsell Color.

Hue	Value/ Chroma	Glaze A	Glaze B, C	Glaze D	Glaze E	Glaze F	Total	Percent (n = 161)
2.5, red-brown	5/8					1	1	0.6%
	6/8					3	3	1.9%
Total						4	4	2.5%
5, light brown	5/8				1		1	0.6%
	6/6	3	2	9	16	1	31	19.3%
	6/8	1	3	3	12	5	24	14.9%
	8/6		1				1	0.6%
Total		4	6	12	29	6	57	35.4%
7.5, tan	5/6			1			1	0.6%
	6/4					2	2	1.2%
	6/6	7	1	6	10	13	37	23.0%
	6/8	3	1	2	3	2	11	6.8%
	7/6	5	2	2	6	11	26	16.1%
	7/8	1					1	0.6%
Total		16	4	11	19	28	78	48.4%
10, yellow-buff	7/4			1		3	4	2.5%
	7/6		1	3	5		9	5.6%
	8/4				2	3	5	3.1%
	8/6		2		2		4	2.5%
Total		0	3	4	9	6	22	13.7%
Grand Total		20	13	27	57	44	161	100.0%

The exact source of ceramic body clays used at Piedras Marcadas is unknown. However, refiring evidence suggests that the clay most often used by resident potters (which refires to a color range centered on 7.5 and 5YR 6/6) probably was a riverine clay from the banks of the Rio Grande. Whether it was the only clay used by local potters remains to be seen. The body clays that refire to a light yellow-buff were much more common to the northeast, and their co-occurrence with hornblende latite temper suggests consistent local use of vessels from the Galisteo pueblos and Tonque (Shepard 1942, Warren 1969, Wilson et. al. 2015). It is also possible that some of the variability in body clays, specifically the redder Hues, reflects inter-village trade with pueblos in the vicinity of modern Albuquerque. Comparative data from other, contemporary Classic period sites should be examined with this in mind.

Chapter 7

SOURCES OF CERAMIC RAW MATERIALS

Prudence Rice (1987) and Dean Arnold (1985) discuss how potters obtain both convenient local materials and rarer materials, providing ethnographic examples. In prehistoric times the local potters seem to have been highly selective about which materials they used, so locating suitable sources of paste and slip clay, temper, and paint ingredients certainly required much time and effort, Moreover, the only sources of the best quality raw materials were often some distance from home, requiring treks of many miles. Mining and processing clay, collecting and pulverizing the igneous rocks preferred for glazeware tempers, and locating or trading for high-quality slip clays for surface decoration must have been labor-intensive or even tedious. And as we now know, obtaining of the scarcest materials (such as ingredients for glaze paints) relied on long distance relationships with distant villages (Habicht-Mauche et. al. 2000, 2002).

It is worth attempting to determine (a) the locations and geological origins of the rock materials utilized in ceramics and (b) the distances involved, and the methods used to obtain these materials. To this end, I compiled data on the spatial distribution of materials from geological studies (Kelley 1977, 1982; Kelley and Northrop 1975) and maps. In particular, the detailed maps by Connell (2006) and the New Mexico Geological Society (1982) illustrating surface outcrops of different materials in central New Mexico. Also, over the past few years I have visited potential collection sites for rock tempers and clays, including in the Albuquerque basin.

Comparing the data on utilized pastes and tempers to known potential sources materials allows me to advance some preliminary conclusions about sources actually used. Still, much remains to be done. Although long distance trade in finished pottery has been demonstrated repeatedly in the prehistoric Southwest, we know relatively little about local procurement of raw materials by potters in given villages.

Sources for Tempers

The widespread Coalition period use of potsherd and sand or sandstone tempers persisted into the earliest Glaze A period, in Los Padillas and Arenal Polychrome. Perhaps this was also a holdover of practices in the White Mountain Red Ware tradition, which led to the birth of Rio Grande Glaze Ware (Franklin 1997; Honea 1966; Kurota 2013). However, potters throughout the middle Rio Grande production zone soon showed a universal preference for crushed igneous and metamorphic rocks. Those included granites, granodiorites, and micaceous schists and phyllites of the Sandia and Manzano ranges to the east and vesicular and denser diabasic rocks from the West Mesa lava flows bordering the valley to the west. About 80 to 110 km (50 to 70 miles) to the northeast, similar intermediate igneous rocks included hornblende-rich latites, monzonites, and other intermediate series igneous rocks of the Tonque-San Marcos-Galisteo Basin district. These tempers have been described by researchers including Shepard (1942) Warren (1969), and Schleher (2010a). Crushed sandstone temper may still have been employed occasionally, and has been documented analytically, but the preference for crushed igneous rocks is clear.

At Piedras Marcadas specifically, the utilization of various basaltic rocks, granites and granodiorites, and schistose rocks or micaceous clays or both, accounts for almost all of the temper frequencies (see above). Now that the basic identity of the lithic tempering materials has been determined, the next question is: Where did they come from?

Locally, the most available material is basalt from the West Mesa flows, about 3 to 5 km (2 to 3 miles) distant. Both the vesicular aphanitic basalt and the granular diabase basalt derive from flows from early Pleistocene volcanic vents. Not surprisingly, basalts account for most of the glaze ware and utility tempers at this site. Pieces of these dark or reddish rocks litter the site surface, and the same materials were employed to make manos and metates. Exhausted grinding implements may have been pulverized and used as pottery temper.

The broad sorting category of Intermediate Igneous Rock (IIR) is difficult to subdivide while examining sherds with a binocular microscope. Typical IIR minerals are quartz, feldspars, and mafic rocks consisting of hornblende, augite, biotite and muscovite mica. The percentages of each seem to vary in the ceramic samples, however, and more than one rock type and source may be implicated. Based on my analysis, the mineral suite seen in this pottery most closely matches that of a granitic rock, perhaps a granodiorite. Other possibilities include arkosic or multi-lithic sandstones, although observed tempers typically contain more variability than just the rounded quartz grains of regular sandstone. Thus, while the extent to which sandstones were utilized as temper is uncertain, it appears to have been a minor temper ingredient at best. Sandstones do occur in the West Mesa environment, under the basalt cap and in the Ceja formation gravels.

In sum, the IIR sorting category appears to derive mainly from minerals most typical of granite and granodiorite, which do not occur naturally west of the river. The most obvious source is the large plutonic body of the Sandia-Manzano uplift some 20 to 30 km (15 to 20 miles) to the east and southeast. The granites of this range vary somewhat in composition. Some locales have a pink granite high in orthoclase; to the south the mix is lighter colored, with abundant mafic inclusions such as hornblende and biotite (based on Kelley and Northrop [1975] and personal observation). The occurrence of manos matching the Sandia–Manzano granites at Piedras Marcadas gives weight to the idea that rock for temper was obtained from that source despite the substantial distance involved.

A similar conclusion applies to the micaceous schist used as temper in some utility ware at Piedras Marcadas. Late pueblos along the Rio Grande made substantial use of mica temper; at Tijeras Pueblo, the utility pottery is tempered almost exclusively tempered with that material (Warren1980). Outcrops of micaceous and phyllite schist occur in Tijeras Canyon, on the west face of the Sandias at the mouth of Juan Tabo Canyon, and farther north in the area of Piedra Lisa and Del Agua Canyons. These limited veins are documented on geological maps, and I have verified them personally (Franklin 2012b). No rocks of this type occur naturally on the West Mesa. Thus, like the granitic rocks, the micaceous rocks indicate that acquisition of pottery tempers involved a large “catchment area.” Moreover, potters apparently sought specific micaceous rocks, in large quantities, from specific locations. (Micaceous rock was also used to make axes and “kiva bells.”)

Hornblende latite (part of the IIR suite) was identified by Warren (1969) as a common temper at Tonque Pueblo, some 45 km (30 miles) to the northeast. Similar intermediate igneous rocks were employed by potters throughout the Galisteo Basin and at San Marcos (Schleher 2010a). Ceramics from that district were traded into the large villages of the Middle Rio Grande (Helene Warren, personal communication, 1981; see also Garrett 1993; Kurota 2008, 2013). At the Coronado Campsite, 14 percent of the glazeware sherds had hornblende latite temper, indicating a strong connection with the Galisteo district (Marshall 1989). Although the surface characteristics of glazeware vessels were much the same across the region, light colored pastes and hornblende latite temper identify pieces found in the Albuquerque area as imports. However, the mineralogical similarity to some Sandia granites (especially the presence of hornblende), complicates the situation, and one must not assume that any IIR temper with hornblende represents vessels from Tonque-Galisteo sources. Sourcing of all pottery within the generic "Intermediate Igneous Rock" temper category is a project worth pursuing in the future.

Rock Materials from the Piedras Marcadas Site Surface

Building a chain of evidence on temper procurement, preparation, and use can include more than examining sherds and locating the outcrops of raw materials. As I have touched on already, stone materials, both worked and unworked, litter the surfaces of archaeological sites. They also frequently turn up in bags of sherds. Based on my observations of the site surface and collection bags, rocks of the following types were present at Piedras Marcadas:

- Vesicular basalt: the most common material, sometimes black, sometimes red. Favored for manos and metates).
- Diabase (or gabbro), with olivine and light colored crystals (sanidine?). Used for grinding tools.
- Gray rhyolite-andesite (one chunk).
- Quartzite cobbles. Smashed; used for cutting tools.
- Sandstone: some uniform, some multi-lithic (i.e., composed of sand from multiple sources). Used for grinding tools.
- Mica schist: in raw form, and as axes.
- Granite: used for manos.

As mentioned, at least some were also employed as pottery temper: the two basalts, mica schist, and granite. It is instructive to see how those rocks almost always have ground surfaces, indicating that they are fragments of stone tools. Pulverization of stone from old manos and metates, for use as temper, was also indicated at Pottery Mound (Franklin 2010b). There may have been a reduced need to make special trips for temper from distant sources, if pieces of damaged or exhausted grinding tools could be found throughout the village.

Discussion

The notion that Pueblo potters always had suitable raw materials close at hand, and always used those materials, is certainly not true. Pioneering studies of glaze paint compositions and their distributions by Habicht-Mauche and others (2000, 2002) proved that specific raw materials were mined and widely distributed in order to avail local glaze ware potters of needed pigments.

Now is appears that at times, other ceramic raw materials were also obtained over substantial distances, either by direct collection or indirectly through trade. We should now ask where the raw materials for paints, slips, body clays, and tempers were obtained, instead of assuming that the sources were nearby.

Expanding on my earlier discussion of travel distances from Piedras Marcadas to temper sources, Table 8 summarizes travel distances from four recently studied Classic period sites in the area to major outcrops of raw materials resembling those used for temper. Of course, these raw materials may also have been collected originally for making stone tools, and later reduced to temper for inclusion in pottery pastes.

Table 8. Distances from Selected Classic Period Pueblos to Hard Rock Temper Sources.
(Rounded to whole km and nearest half mile)

	Linear Distance (Map Estimate)		**Times 1.2 to Adjust for Terrain**	
Site Name	**Km**	**Miles**	**Km**	**Miles**
To West Mesa Basalt				
Montaño Bridge	3	2	4	2.5
Piedras Marcadas	5	3	6	3.5
Chamisal	8	5	10	6
Alameda	10	6.5	13	8
To Juan Tabo Canyon Granite and Schist				
Montaño Bridge	19	12	23	14.5
Piedras Marcadas	18	11.5	22	14
Chamisal	18	11	21	13
Alameda	16	10	19	12
To Tijeras Canyon Granite, Schist, and Red Clay				
Chamisal*	34	21	40	25

*Similar distances for the other three sites

Large quantities of basalt were needed to provide grinding tools at all the local Classic period pueblos, and also for temper, but given the distances involved, the logistics were not challenging. In contrast, use of the Sandia and Manzano Mountains' extensive sources of granites, including micaceous granites, and more limited sources of schists, involved travel distances of 16 to 34 km (Table 8), so overnight trips or trade are indicated. Perhaps those visits or exchanges involved the many small "pueblitos" in the foothills of the Sandia range. If nothing else, those pueblitos indicate multiple uses of the mountain environment. At least six of the pueblitos are of the same age as Piedras Marcadas (late Coalition and Classic periods), and many smaller foraging localities are situated along the western side of the Sandia uplift.

The foothills pueblitos are poorly known, so I will review them briefly. The foothills habitation sites range from little-used rock shelters to 20 to 30 room pueblos, the latter complete with contiguous room blocks and fragments of glazeware pottery. This author has relocated and documented several of the sites in recent years, with the assistance of John Hayden, formerly of the Forest Service, and John Guth and Roger Cook, members of the Albuquerque Archaeological Society. Analysis of the pottery of the Jaral Canyon site (Franklin 2010a), at the large end of the pueblito range, showed that pottery from the entire glazeware sequence (A through E–F) was brought up to the foothills from the large villages in the valley. Likely uses of the foothills environment include hunting (the sites could also have served as departure points for hunting trips into the terrain) and gathering of wild plant resources. Even limited farming is suggested, given the rock-bordered terraces at several locations. They also served as refuges from persecution by the Spanish after 1540. And, as I have mentioned, the sites could have served as collection centers or waypoints for granitic and micaceous rock used in tools and temper.

Tijeras Pueblo (LA 581) is too large to be a pueblito, and is not in the foothills of the Sandia-Manzano uplift (instead it is in the canyon of the same name, east of Albuquerque). Still, it could have played a role similar to that of the foothills pueblitos. Tijeras was occupied in late Coalition and early Classic times, between ca. 1200 and 1425; post-Glaze A pottery does not occur there (Cordell 1980). The ceramics have been studied by Warren (1980) and, more recently and intensively, by Judith Habicht-Mauche and her students (e.g., Habicht-Mauche and Burgess 2016). The local utility pottery was universally tempered with mica schist, while local decorated pottery is mostly sherd-tempered. A small study by Franklin (2012b) verified the utility temper as mica schist, and documented the use of local clays in glazeware manufacture. The red (and perhaps white) clays can be found in the Abo formation, outcrops of which occur from Tijeras northward to Cedar Crest and beyond. For the riverine pueblos, Tijeras Pueblo may have been a source of ceramic raw materials as well as of finished vessels. If so, the distances involve again indicate overnight travel or exchange (Table 8).

The occurrence of the last temper type, hornblende latite and similar IIR, is due to imports of finished vessels from the Galisteo Basin. Such pieces came from 80 to 95 km (50 to 60 miles) away and clearly relate to exchange rather than trips to procure raw materials.

Up to now, I have not discussed whether erosion led to the natural transport of rocks used in tools and temper, reducing the distances listed in Table 8. In theory, downslope erosional forces could move basalt from the West Mesa eastward toward the Rio Grande, and one can find tumbled fragment of basalt in arroyos emanating from the West Mesa flows. Likewise, rocks from the Sandias could be transported down the piedmont and bajada westward toward the river. Today, however, the material reaching the floodplain tends to be sand-sized or smaller. My inspections indicate that at the mouth of Juan Tabo Canyon, large pieces of phyllite schist are carried downstream only a short way before they are reduced and mixed with other gravels on the pediment. In general, rocks derived from the west face of the Sandias disintegrate within 1.6 km (1 mile) or so of their points of origin. To the south, the Tijeras Canyon micaceous granites, metamorphic greenstones, and schists utilized by local potters are rare by the time that stream course reaches Carnuel, and occur there only in pebble size. Downstream from Carnuel, the schists are absent in any usable form.

There are, admittedly, cobble deposits along the Rio Grande, but those consist of quartzite and similar material derived from the Rockies and other upstream sources. Kurota (2013:166) states that unmodified pieces of basalt were found during excavations at Alameda Pueblo, and that the raw material is present in the local gravels, thus deposits of river-transported rock may be exposed in the Alameda area. For the most part, residents in villages next to the Rio Grande had to travel or trade for the sizes and quantities of specific rock types that they needed in a pure form. Rather large pieces would be required for stone tool production (manos, metates, axes, etc.), while pottery temper needs could have been satisfied by copious amounts of smaller pieces.

Sources for Body Clays

Identifying clay sources is more difficult than identifying temper sources. Clay origins are less obvious from their visible characteristics, and there are no easily consulted geological maps of clay sources as there are for rock outcrops. Locating and documenting all possible sedimentary and residual clays in a region would be daunting task. However, initial comparisons of pottery to samples of potters' clays found in sites, and then to obvious sources nearby, can provide useful information.

We do not know exactly where the Piedras Marcadas potters obtained body and slip clays. The range of paste colors of refired sherds suggests that more than one clay source was utilized, while the peak frequencies of coloration suggest a heavy preference for one major source. Specifically, a clay refiring to 7.5 and 5 in Hue and to 6/6 to 6/8 in Value/Chroma was heavily employed as body clay, for both glazed pieces and utility wares (Figures 5 and 6).

Thus far, no raw potter's clay has been recovered from Piedras Marcadas. However, raw clay refiring to the same color range as the Piedras Marcadas paste clay was found at Chamisal, in cakes of raw clay and as balls of worked but unfired clay (Franklin 2012a). Raw clays from the Rio Grande floodplain, not far away, match the Chamisal clay samples closely in color; when fired, those floodplain clays show a close color match with refired pottery from the site (Franklin 2012a). The similarity with the Piedras Marcadas refiring colors suggests that for that site as well, local riverine clay was the potters' favorite material.

Interestingly, a piece of oxidized building adobe from a test pit at Piedras Marcadas had a Munsell color of 7.5YR 6/6, matching the most common paste clay color for refired pottery. Because the adobe was undoubtedly mixed locally, the color match with the pottery reinforces the idea that potter's clay was derived from the local floodplain.

However, refiring tests here and at Chamisal have revealed that other clays were also used. A body clay with a redder tinge, in the 2.5YR Hue, when refired, was present at both sites in minor amounts; its source has not been located but variation within floodplain deposits may account for the clay. At least some of this redder clay corresponds to micaceous utility ware (Figure 5). While finished micaceous utility may have been imported from sites such as Tijeras Pueblo, where it is known to have been produced, local manufacture of micaceous utility ware cannot be ruled out (Franklin and Schleher 2012). After all, and as noted above, raw pieces of schist and micaceous schist axes were found at Piedras Marcadas.

At the other end of the Munsell spectrum, the buff-yellow clay found in some glazeware (but not utility ware) sherds (Figures 5 and 6) is associated with hornblende latite temper. As mentioned, this clay-temper combination is found in vessels made at Tonque or at the villages of the Galisteo Basin, and procurement of the clay falls outside any discussion centered on the villages along the Rio Grande.

Finally, we need to consider local sources of micaceous clay. One small source exists next to Jaral Pueblo in the foothills, and Kurota (2013) suspects that there may be residual micaceous clays near mica veins exposed near Tijeras. Decay and disintegration of micaceous rocks would produce localized micaceous clay deposits, which should be revealed by additional searches.

Sources for Slip Clays and Paint Ingredients

Slip clays were needed to produce the white, red, orange, yellow, and buff backgrounds seen on local glazeware vessels. These high quality clays are much rarer than paste clays and were worth transporting over longer distances. Unfortunately, we know almost nothing about potential sources of the slip clays used at Piedras Marcadas. There are no known sources of fine red, yellow, or white clay nearby. Based on limited reconnaissance, it does not appear that fine quality slip clays were available in the nearby vicinity of the site. Consequently, I suspect that the Piedras Marcadas potters relied mainly on distant sources, possibly sharing those sources with potters from other communities.

Fine red clay is available at an outcrop of “Tertiary sedimentary mudstones” (shown on the map by Connell [2006]) near the Juan Tabo picnic ground, 19 km (12 miles) from Piedras Marcadas (Figure 7). I have collected that clay and it appears suitable for conversion into slip clay. The La Cueva site, a 6 to 8 room pueblo, is nearby (Marshall and Walt 1985) . Perhaps the site was there to control or facilitate clay mining. There are no other known sources of fine clays along the whole west face of the Sandias, nor are any known on the West Mesa near the site.

Fine red clays can be obtained from the Abo formation, which is exposed near Tijeras Pueblo and northward from there to near Cedar Crest. White slips could have been obtained through trade with the Acoma or Laguna pueblos, some 50 to 65 km (30 to 40 miles) distant, but closer sources might exist. Yellow and reddish clays are obtainable at La Bajada Hill near the present I-25 road cut, about 50 km (30 miles) away.

For now, the most parsimonious narrative for slip clay procurement is that the Piedras Marcadas potters were not able to obtain their decorative slip clays locally; instead they either traveled to distant sources or traded for the clays.

Pigments for pottery paints (and other decorative uses) were also necessary. I found a piece of limonite in a bag of sherds from Piedras Marcadas. Known mines for limonite and hematite were located in the Manzano Mountains, about 1.6 km (1 mile) from Tijeras Pueblo.

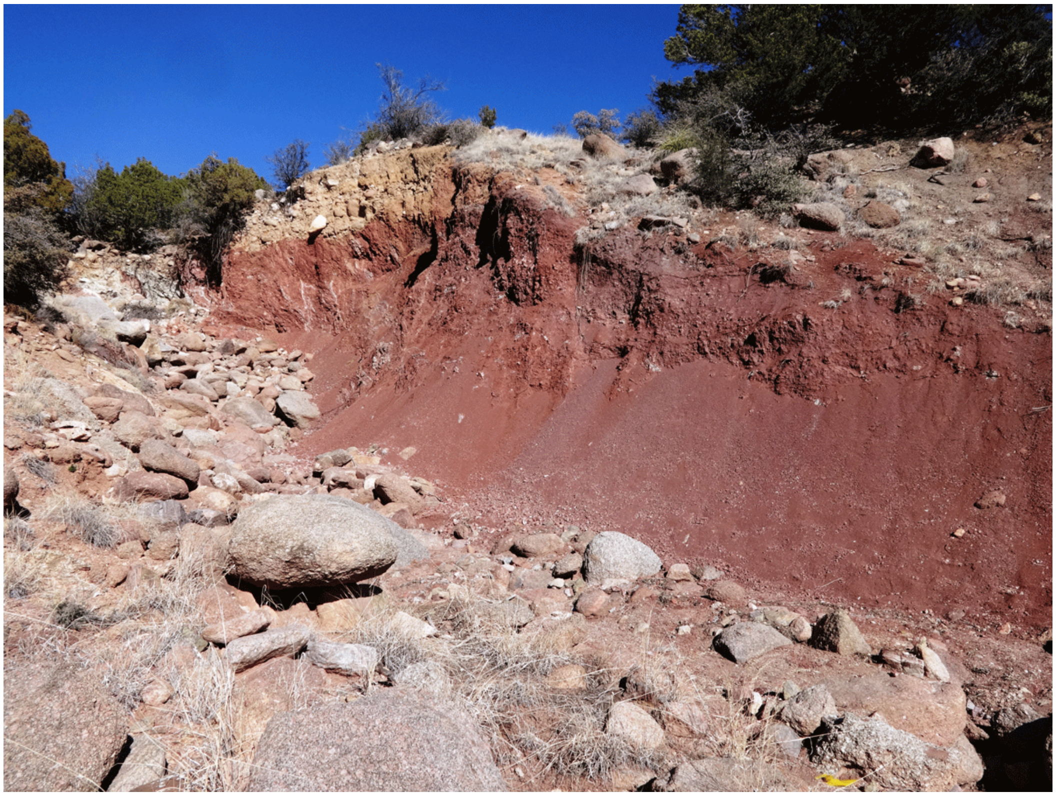

Figure 7. Outcrop of potential red slip clay near the Juan Tabo picnic ground.

Deciphering glaze paint chemical signatures and manufacturing techniques has been a daunting task (e.g., Blinman et. al. 2012). We now know that the principal source of the lead ore used in glaze paints was the Cerrillos Hills near Santa Fe (Habicht-Mauche et al. 2000, 2002; see also Bice et al. 2003). Additional, smaller exposures of lead ore occur in the Manzano and Magdalena ranges. Clearly, obtaining resources of such limited distribution required long-distance transport and probably trade. The long-distance trade in paint pigments existed as part of exchange networks that carried many other goods over vast distances in the Southwest.

Raw Materials Sources and Production Zones: Summary and Conclusions

In an interview by Harold Colton (1953:9), a Hopi potter discussed sources of raw materials, including body clay, iron-based paints (hematite and limonite), and white paint and slip. The last source was more than 16 km (10 miles) from the potter's home. It appears that the prehistoric potters of Piedras Marcadas were also willing to travel in order to obtain their preferred raw materials, or at least were willing to trade for those materials. When the paste clays, tempers, slip clays, and paints documented by this study are considered together, the raw materials for pottery were derived from a very large "catchment" area.

Potters can be quite particular about tempering agents, and the Piedras Marcadas potters went to some length to obtain specific rock materials in more or less pure form. Rock formations both west and east of the Rio Grande valley bottom were utilized heavily as temper sources. Specifically, basalts were obtained from the West Mesa lava flows, granites from the Sandia and Manzano mountains, and micaceous rocks and phyllite schist from limited exposures in the same mountains. Furthermore, employment of micaceous pastes or added mica (or both) was confined to utility wares, again implying specificity in the temper recipes for certain vessel types and forms.

Potters may have been less particular about body clay. Refiring of samples of glazeware and utility ware sherds indicates relative uniformity in clay body composition; most samples refired to a medium reddish tan (Munsell 7.5 and 5 6/8). I found alluvial clay that refired to this color in ditch banks and other exposures in the Rio Grande floodplain in the vicinity of Piedras Marcadas. This color range was also the most common range obtained when refiring pottery from Chamisal, across the river. Lumps of unfired clay found in archaeological contexts in the site also refired to that color range (Franklin 2012a). In the vicinity of Chamisal as well, I found alluvial clay that refired to the range seen in the pottery. Together, these data suggest reliance on local clays from the Rio Grande floodplain. The pairing of local relatively homogeneous paste clay with multiple temper types—some of them decidedly not local—reveals the thoughtful choices being made by local potters (possibly due to family traditions or interacting "communities of practice").

Occasionally, a few other clays were used in locally made pottery. These led to pastes that were redder than most, or to light yellow to buff pastes, used together with unidentified igneous rocks. At this time, local sources for such clays are not well known. Light buff pastes are typically, but not always, paired with hornblende latite temper, indicating vessels imported from Tonque or sites in the Galisteo Basin.

High quality slip clays are not readily available near Piedras Marcadas. In the middle Rio Grande Valley proper, out of the floodplain, red clay occurs only as a limited outcrops near the north end of the Sandias. Red slip clay from the Abo formation, obtained near Tijeras Pueblo, may have been a valued trade good. Farther afield, red and yellow clays occur at the foot of La Bajada, about 50 km (30 miles) distant. The more rarely used white slip clay may have traveled even farther, possibly originating in the Acoma area.

Recent studies indicate that most of the lead used in paints came from the Cerrillos Hills. Hematite and limonite, required for multiple purposes including pottery paint, were also exotic goods.

More work will be needed to fully assess the procurement strategies of Classic period potters. Even so, the picture to date indicates that raw materials for pottery came from multiple areas, at various distances from the home village. Trips to the West Mesa and Sandia foothills may have served multiple purposes including hunting, gathering of wild plants, and collection of ceramic raw materials. The sites of the Sandia foothills—field houses, hunting blinds, and "pueblitos" such as at Jaral Pueblo (Franklin 2010a)—indicate that utilization of that zone may have included semi-permanent or even limited permanent habitation. West of the Rio Grande, Kurota and Hogan (2009) have documented similar outlying features (see also Schmader 1986; Schmader and Hays 1985). The extensive Classic period petroglyphs of the West Mesa and the more limited occurrences of rock art in the Sandias also point to a familiarity with these areas. Chapman (2013) postulates that such extensive environmental use is a common Pueblo pattern.

The combination of (a) travel to obtain ceramic raw materials for home use and (b) exchange of both raw materials and finished vessels glazeware pottery between nearby production centers seems assured. Distinguishing between these synchronous and overlapping cultural processes poses analytical problems. What is certain is that by one means or another, potters in the big towns along the Rio Grande availed themselves of needed raw materials from a very wide area. Within and between the large Rio Grande villages, "communities of practice" consisting of interacting groups of potters, must have added to the variability and availability of materials being used.

Chapter 8

TRADE AND EXCHANGE

Fortunately for archaeologists, ceramics (fragile as whole vessels, but durable as potsherds) were widely used in the prehistoric and historic Southwest. The extensive trade of various goods, including pottery, allows routes and directions of movement to be determined. Trade in ceramics included both local exchange with contemporary pueblos in the Rio Grande Valley and long-distance trade with settlements elsewhere. Trade from outside the local glazeware production area is more easily identified, and will be considered first.

Pottery Made Outside the Middle Rio Grande Glaze Ware Area

Few of the 6,304 sherds in the Piedras Marcadas sample are from Classic period vessels made outside the Middle Rio Grande Glaze Ware production area (where that period may be instead be referred to as Pueblo IV). Two sherds are from Biscuit Ware vessels made in northern Rio Grande centers, as is one sherd of Sankawi Black-on-cream observed on the site surface. Three sherds are from Acoma-Zuni area glazeware vessels (Kwakina and Pinnawa Polychrome). Two sherds came from the Little Colorado area even farther west: one St. Johns Polychrome and one Sikyatki Polychrome (the latter from the Hopi region).

Hendron (1935) reported “several” Biscuit A and B sherds and one Sikyatki Polychrome sherd out of 896 sherds in his stratigraphic test. More recently, Schmader (2011; see also Table 4) listed four Jeddito Black-on-yellow sherds, out of a total of 1,886.

Kurota (2008:100) reports that in a sample of 1,343 sherds from Alameda Pueblo, one is Galisteo Black-on-white and eight are Biscuit Ware. His later work at the same site (Kurota 2013:168), on a sample of 4,193 sherds, identified 27 pieces of White Mountain Red Ware, eight sherds from the Acoma-Zuni area, two pieces of possible Pottery Mound Glaze Polychrome, one Jeddito Yellow Ware sherd from the Hopi area, two sherds of Chupadero Black-on-white, 23 sherds of Galisteo Black-on-white, three pieces of Jemez Black-on-white, five pieces of Biscuit Ware, and four pieces of Sankawi Black-on-cream.

Sherd counts are not available from Chamisal Pueblo at this time, as Kurota’s analysis is not complete. In examining the Chamisal type collection, assembled by Kit Sargeant and Helene Warren, I noted a range of ceramic imports similar to that reported from Alameda (Franklin 2012a).

LA 15147 (the Coronado campsite near Bernalillo) yielded a sherd of Hopi yellow ware. a sherd of Acoma-area glaze polychrome, six sherds of Biscuit Ware, and eight sherds of Potsuiw’i Gray and Potswi’i Incised (Marshall 1989:78). This is the same basic the same suite of Classic period trade wares, with the addition of Potsuwi’i from the Rio Chama area towns.

During the Coalition period, Socorro Black-on-white was locally made, and much of the Santa Fe Black-on-white found in the Middle Rio Grande region may also have been made locally as well (Franklin and Murrell 2010), even though it is often assumed to be imported. Unlike Santa Fe Black-on-white, Galisteo Black-on-white found locally always appears to be an import. Additional source studies are needed to clarify the origins of the black-on-white types that are so common in the Albuquerque area sites during the Coalition and early Classic periods.

As these results show, during the Classic period the local pueblos participated in a widespread exchange network. Imports of White Mountain Red Ware from the Little Colorado River drainage (including Wingate and St. Johns series polychromes) are of special interest, since initial Rio Grande Glaze Ware types (Los Padillas and Arenal Polychrome) were local copies of White Mountain Red Ware vessels (Honea 1966). it is likely that people as well as pots moved to the Rio Grande Valley from the Little Colorado River drainage.

During most of the Classic period, small amounts of imported decorated ceramics from the west (the Acoma-Zuni and Hopi areas) probably reached the Rio Grande Valley through Pottery Mound, a center of trade in ceramics and probably other items (Eckert 2003; Franklin 2010b; Schaafsma 2007). From there, the western wares may have been taken brought to nearby Rio Grande villages such as Valencia Pueblo (LA 953), where Pottery Mound Glaze Polychrome and Hopi yellow ware sherds were found (Franklin 1997), and thence to the large villages in the Albuquerque area and on to Tijeras Pueblo. By the time the western trade wares reached the Rio Grande, however, they were much rarer than at Pottery Mound. Indeed, the contrast in frequencies of Hopi and Acoma-Zuni regional imports at Pottery Mound versus the Rio Grande pueblos is quite dramatic, reinforcing the notion of Pottery Mound as a nexus of prehistoric trade. Moreover, the fact that imports from the West almost cease after 1500 may be due to the fall of Pottery Mound as a trading hub about that time.

Imports from the populous Biscuit Ware (presumed proto-Tewa) villages north of Santa Fe also occur with regularity in the Middle Rio Grande pottery assemblages. However, given how close those villages are, and how much Biscuit Ware was being made at them, the sherd counts of Biscuit A and B in Middle Rio Grande District sites are surprisingly low. As was the case at Pottery Mound (Franklin 2010b), the amount of trade pottery found in sites is due to many factors besides the distances involved. For example, cultural barriers (between Tiwa and Tewa speakers, for example) may have been more significant than geographical ones. My impression is that while glazeware vessels traveled northward from the Middle Rio Grande District in quantity, being found at almost every Biscuit Ware site north of Santa Fe, southward trade of Biscuit Ware vessels was much less common—a selectivity most easily explained in terms of cultural rather than geographical barriers.

Ceramic Trade Within the Middle Rio Grande Glazeware Area

Trade of vessels of Rio Grande Glaze Ware ceramics *within* in its production zone. *between* Pueblos participating in its manufacture, is difficult to assess. One might assume that glazeware pottery was very commonly traded up and down the Rio Grande, from the Galisteo Basin towns to the northeast to the Piro pueblos near Socorro vicinity to the south. Along this Rio Grande

Valley route, vessels may have move 160 km (100 miles) or more. However, the glazeware vessels were so similar in terms of painted decoration and rim form that we cannot identify local stylistic variants. It is likely, for instance, that yellow and buff slips are a hallmark of Galisteo-Tonque area glazeware production, but not exclusively so. Similarly, red slips seem to have persisted during the entire glaze sequence in the Piro area to the south, but such slips were also used elsewhere. The notable exception to this statement is Pottery Mound Polychrome, which most likely was made only at its namesake site.

Tijeras Pueblo (LA 518), San Antonio (LA 24), and Paa'ko (LA 162) all lie east of the Rio Grande Valley, and all three probably sent painted pottery to the villages along the river. This westward movement of vessels from the East Mountain area may also have included micaceous utility wares (Franklin and Schleher 2012). Ongoing research by Judith Habicht-Mauche on Tijeras Pueblo ceramics may throw new light on these interactions. But here again, there are no obvious external attributes that distinguish vessels made east of the Sandia–Manzano uplift from those made in the valley.

Fortunately, we can document the movement of glazeware pottery from the Galisteo Basin area (here taken to include Tonque and San Marcos) to Piedras Marcadas, over distances of 80 to 110 km (50 to 70 miles). The key is identifying the distinctive Galisteo Basin area yellow-buff paste and IIR temper such as hornblende latite (Warren 1969) and augite-monzonite (Schleher 2010a). Tonque (Barnett 1969;Warren 1969) seems especially implicated in the production of vessels for export to the Rio Grande Valley. Between 1325 and 1500, the glazeware vessels moving from the wider Galisteo Basin area to the Rio Grande Valley included Cieneguilla Glaze-on-red, Cieneguilla Glaze Polychrome, Largo Glaze-on-red, Largo Glaze-on-yellow, Largo Glaze Polychrome, and the abundant Espinoso Glaze Polychrome. Small amounts of these types appear in this analysis (Table 3). They also occur at Chamisal (based on unpublished data) and at Alameda (Kurota 2008:100, 2013:152–154). At LA 54147 (Coronado Campsite), imports from the Galisteo sites were very commonplace (Marshall 1989:99). Here again, however, designs evolved in parallel over a wide area, and distinguishing Galisteo Basin and Middle Rio Grande vessels requires paying close attention to technological rather than stylistic attributes.

Finally, ceramic interchange between villages along the Rio Grande must have occurred repeatedly, but so far we cannot distinguish one local village's pottery from another's. Not only were the vessels stylistically similar, but similar clays and tempers were being used. Future research, using more advanced techniques, may allow us to distinguish glazeware vessels made at Piedras Marcadas from those from neighboring villages. We are not there yet, however. A different approach, which promises more immediate returns, would be to examine patterns across the local landscape, in order to tease out attributes that are useful in identifying patterns of exchange. For example, a synthesis of published temper analyses from sites in the area could reveal variable patterns of rock temper usage across the Middle Rio Grande production zone. Such data are already available for Los Abeytas (Eckert and Snow 2015), Montaño Bridge (Schleher 2010b), Alameda (Kurota 2008, 2013), Piedras Marcadas (this report), LA 15147 (the Coronado Campsite) (Vierra 1989), and Nuestra Señora de los Dolores (Marshall 1982).

At each Rio Grande site studied thus far, several temper types appear in both the glazeware and utility wares. In fact, the glazeware tempers are never uniform at any locality; multiple kinds of rock temper appear in the glazeware samples at all of them. Were multiple tempers utilized by different potters in each village? Or is the variation due to constant exchange of vessels between villages, each of which (or each cluster of which) had its own unique temper recipe? Earlier in this paper, local riverine body clay combined with several rock tempers was interpreted as due to variable choices made by Piedras Marcadas potters. But similar choices of the same suite of rock tempers used with the same Rio Grande clay now appear in the data for other nearby sites (although in differing frequencies). More research is needed if we expect to pinpoint particular villages' "ceramic identities." Clearly, finding the exact points of origin for the Rio Grande Glaze Ware vessels in the Albuquerque Basin remains a challenging task.

Chapter 9

SUMMARY AND CONCLUSIONS

Piedras Marcadas, on the Rio Grande floodplain, is one of many large Pueblo villages that make up the Middle Rio Grande District. Although time and urban encroachment have devastated many of these large Classic period settlements, Piedras Marcadas is fairly well preserved; the central part of the site lies within a preserve maintained by the City of Albuquerque.

The site may have begun as a Coalition period pit house village, as early as A.D. 1250. A series of architectural modifications in the early 1300s led to a series of above-ground adobe room blocks spread over a wide area. Much remains unknown about this early Classic period settlement, including its full extent and the details of construction. Later—probably about A.D. 1500—a large pueblo was erected near the center of the settlement. This multistoried edifice surrounded a plaza and at least one kiva, and featured high and defensible walls as its exterior faces. Those, plus the limited access to the interior of the village, imply a defensive posture. Presumably the occupants of the previous rambling settlement were now concentrated in the central pueblo.

Piedras Marcadas was visited by Spanish *entradas* between 1540 and the establishment of New Mexico as a Spanish colony in 1598. The first *entrada,* led by Coronado, attacked Piedras Marcadas and probably two other nearby towns between 1540 and 1541 (Schmader 2011, 2012, 2016). After 1600, Spanish colonization had disastrous effects on the local native population, including epidemic disease, population loss, and the abandonment of many villages. This report focuses on the ceramic evidence, and detected no effects of the Coronado attack or other *entrada* episodes on native ceramic production. Rio Grande Glaze Ware was still being made in the mid-1600s when Piedras Marcadas was abandoned.

Dating

The Piedras Marcadas chronology rests on three things; an established pottery sequence, the ceramics from the site surface and limited testing, and five AMS radiocarbon dates. In particular, multiple well-dated pottery types can be combined with the vertical exposures obtained from a gas line excavation and Matthew Schmader's seven test pits. The eight vertical exposures provide data on ceramic changes through time, and consequently help date the occupational sequence. The seven tests were fairly closely spaced and relate mostly to the post-1500 occupation of the late pueblo encountered by Coronado's expedition in 1540–1541. The gas line trench at the south end of the site provided a look at the deposits in the remaining portion of the site.

Pottery from these eight loci ranges from the Coalition period to Glaze F times, or ca. 1250 to 1650. Every major diagnostic type in the Rio Grande Glaze Ware series is present, suggesting that the occupation was continuous, or nearly so, over a span of four centuries.

Taken together, five AMS radiocarbon dates confirm the proposed date span for the occupation, from the 1300s to the mid-1600s. While recent dates at several other local sites have recently substantiated a Glaze A-C time span 1300–1500, independent dates for the later (D–F) glazeware periods have been lacking. The several consistent radiocarbon dates from the late occupation of this site are an achievement.

Test pit 6, in particular, provided an excellent match between ceramics and absolute dates. This test yielded large amounts of Glaze E, E–F, and F bowl rims in 3 m of deposits. The probabilities for the associated AMS dates range from 1520 to 1645, the combined spans of these late glazeware types as documented elsewhere. Considering the previous lack of reliable independent dates for the late Classic period glaze wares of this district, this association between a solid sample of Glaze E and F sherds and several AMS dates is a definite advance. These results also tend to confirm and extend earlier conclusions by Hendron (1935), Marshall (1988, 1993), and Schmader (2011, 2012, 2016) about the occupation history of Piedras Marcadas.

Intensity of Occupation

Although it appears that the site was occupied continuously (or nearly so) over the four centuries of its existence, the ceramic data hint at a variable intensity of occupation. This conclusion is based, of course, on the assumption that "more pottery equals more people." The pattern at Piedras Marcadas involves (1) Coalition period black-on-white pottery occurring with early Glaze A types; (2) Glaze A pottery in abundance; (3) Glaze A, B, and C pottery occurring together; (4) Glaze D occurring by itself; and (5) Glaze E, E–F, and Glaze F occurring together. It is noteworthy that Glaze B and C never occur without Glaze A, which usually dominates such mixed assemblages. Of course, Glaze B is known to be a short-lived and minor variant in this area, and Glaze C is also not especially abundant. The Piedras Marcadas sample includes Glaze D but not in large amounts.

Taken on face value, these data suggest a downturn in intensity of occupation between 1475 and 1525. Whether the downturn actually occurred is debatable, since tests elsewhere in the site might yield a larger samples of Glaze B–D pottery. However, regional settlement pattern changes, including the abandonment of other PIV villages, suggest (impressionistically at least to me) some sort of disruption of the Eastern Pueblos about this time. Perhaps not coincidentally, this is also the time when the early Classic period room blocks scattered across Piedras Marcadas were abandoned and a new, more compact, more easily defended pueblo was built near the center of the settlement. This architectural predated the arrival of the Spanish in 1540–1541, and the resulting edifice was the one attacked by Coronado's soldiers. After the attack the occupants continued to occupy their village for almost another century. Indeed, Glaze E, hybrid E–F, and F vessels were made in large numbers after 1540–1541. The diminished quantity of Glaze F, together with AMS date ranges not extending past 1630–1645, points to a dwindling number of local occupants. Final abandonment seems to have taken place by 1650.

Ceramic Materials

On this project, both paste clays and tempering materials were studied.

Analysis of tempering materials, based on the entire sample of more than 6,000 sherds, revealed that glazeware pottery was almost tempered almost exclusively with crushed rocks. Rock temper preferences centered on igneous types, which are difficult to process and pulverize but make ideal tempering materials. Decorated wares were tempered with several kinds of basalts and intermediate igneous (predominantly granitic) rocks. Few sherds show included sand, which possibly was fortuitously introduced. Sherd temper is rare, and its use was confined to the very earliest glazeware types of Glaze A times. Similar-looking glazeware vessels tempered with hornblende latite or related monzonites point to trade from the Galisteo Basin pueblos to the northeast.

Utility ware was not always tempered with the same rocks as glazeware. While basalts and granitic rocks were popular, some utility ware vessels were tempered with micaceous schists or phyllites (mica was never mixed into the clay used for making decorated pots). Local use of micaceous clays is also theoretically possible. The durability of micaceous clay cooking vessels was probably well known, and micaceous utility pots increased in popularity throughout the Middle Rio Grande zone during the Classic period. There is evidence that sometimes, utility pottery was imported.

Paste clays probably were obtained locally from the abundant riverine sediments; refiring tests indicate a match between the most common paste clays with the secondary clays of the Rio Grande. Other paste clays indicate imports of glazeware vessels from other production centers; specifically, vessels with light buff-yellow paste clays and hornblende latite temper derive from the Galisteo Basin villages.

My personal reconnaissance work, combined with detailed published geological data, suggests possible source locations of the ceramic materials. While riverine clay may have been readily available, natural sources of specialty clays such as red and yellow slip clays were uncommon. Distances to these high quality clay sources vary, but many are remote from Piedras Marcadas.

Similarly, the specific basalts, granites, and mica schists desired for tempering were not readily available at or near the site. My inspections indicate that while occasional small pieces of such materials can be found in the local floodplain, they do not occur in usable amounts. Instead, large quantities of rock of the desired composition were only obtainable by manual transport from outcrops. Distances to suitable sources range from about 3 miles (5 km) for basalts to 10 miles (16 km) for granites, to 12–15 miles (19–24 km) for mica-rich veins and phyllite schists. However, many of these same rock materials were also used to make the manos, metates, axes, and similar tools found at the site, so potters may have saved themselves trips by sometimes recycling worn-out or damaged tools into temper.

The distant procurement of stone (especially obsidian) for knapping is well known, so it is not surprising that ceramic raw materials were likewise obtained over a wide area. The procurement of clays and tempers follows a pattern of environmental utilization of large catchment areas which probably included collection of many kinds of raw materials as well as hunting and foraging for wild plant foods. The pattern of multiple uses of increasingly broad ranges seems to be a feature of the Classic period, and involved temporary camps and small, permanent but seasonal localities along the periphery of the Rio Grande Valley. Some scarcer materials, such as high quality slips or pigments, were probably obtained from an even wider area, through exchange with contemporary Pueblo communities.

Trade

Local residents routinely used pottery made outside the Rio Grande Glaze Ware production zone. Piedras Marcadas is no exception; there sherds of White Mountain Red Ware (Wingate and St. Johns types) are common in early Classic period Glaze A contexts. Imports from Acoma-Zuni centers (Kwakina and Pinnawa types) arrived in small amounts, as did Hopi-area yellow wares of the Jeddito-Sikyatki series. Almost all of these imports arrived between 1300 and 1500, coinciding with production of Glaze A, B, and C along the Rio Grande.

Types of the White Mountain Red Ware series sparked the development of a local glazeware tradition, which at first imitated White Mountain pottery. I further suspect that an influx of people from that region contributed the Classic period population boom along the Rio Grande.

Imports from the west saw a sharp drop, or perhaps ended, about 1475–1500, as Pottery Mound declined. I see Pottery Mound as a middleman in the ceramic trade between the Rio Grande and points west, so the two events seem to be linked.

After 1500, ceramic imports came mainly from the large villages to the north, where the Biscuit Ware series (Abiquiu and Bandelier Black-on-gray) were made. Small amounts of Galisteo Black-on-white came from that direction. At this late time, very little non-glazed decorated pottery came from anywhere else. However, considering the proximity of the proto-Tewa villages to the north—the nearest one was probably about 40 miles (64 km) away—the quantity of ceramic imports from those large towns is small. The reason for such limited interaction needs to be explored.

At least some Santa Fe Black-on-white probably was made in the Middle Rio Grande, as was the preceding Socorro Black-on-white, so those types should not be taken as evidence for long-distance exchange.

Interaction Within the Middle Rio Grande District

Recent interest in the Rio Grande Glaze Ware has raised new awareness of its broad distribution and complicated internal variability (see for example, Eckert [2006] and other papers in *The Social Life of Pots* [Habicht-Mauche et. al. 2006] as well as *Potters and Communities of Practice* [Cordell and Habicht-Mauche 2012]). The ware was produced over area including the southern Piro district, the Tompiro pueblos of the Salinas district to the east, extending continuously up through the Middle Rio Grande valley to Bernalillo, and beyond. Even this minimum estimate defines a production zone measuring perhaps 200 miles (322 km) north-south by 70 miles (113 km) east-west.

As future studies lead to interlinking research results, local and sub-regional patterns of production and exchange within the Rio Grande Glaze Ware realm will undoubtedly become clearer. For now, the exchange of glazeware vessels within the Tiguex province and with adjacent glazeware-producing areas is not yet well understood. The key problem is that identifying of specific glazeware attributes assignable to particular sub-areas, districts, or "provinces" has been a slow process. Still, it is safe to assume that exchange of finished glazeware pottery occurred frequently between contemporary villages.

To date, the clearest example of exchange within the glaze ware production area is the movement of substantial numbers of glazeware vessels from the Tonque–Galisteo Basin production centers to the Middle Rio Grande Valley. As was first documented by Shepard (1942) and Warren (1969), the well-made glazeware of the Galisteo area pueblos made it a popular commodity. In the Middle Rio Grande towns, its light yellow paste and hornblende latite temper make it a distinctive variant and therefore a recognizable import.

Along the local Rio Grande corridor, recent studies indicate that clay and temper combinations vary considerably, even within the same site. As I describe above, Alex Kurota and I have documented this pattern at Piedras Marcadas, Chamisal, and Alameda, all pueblos in or near Albuquerque. Indeed, these three villages are close to each other and appear to share a common history. Farther south, the use of multiple temper types at one site is likewise documented (Eckert and Snow 2015), as it is in the Salinas province (Spielmann et. al. 2006). Whether this pattern drives from the existence of multiple potting families or "communities of practice" within the villages, or from the exchange of finished pottery among nearby villages with individual materials preferences, is unknown. Probably both processes were at work; I predict that in the future, it will be possible to define spheres of local exchange of finished vessels *and* communities of practice—interacting groups of potters who share a common set of production techniques (Snow and Franklin 2015).

Various authors, including David Snow (2012), have considered Pueblo social interaction with Spanish settlements after 1600 and its possible effect on the local glaze ware. But Spanish influence is not evident in the ceramics at most of the late Pueblo towns in the Piedras Marcadas area. Certainly not at Piedras Marcadas; no Spanish majolica or olive jars are found there, nor are Spanish forms represented in the glaze ware. However, at two other nearby large pueblos, Santiago and Kuaua, interaction with Europeans and their pottery preferences is evident. Vierra (1987b) points out that these two towns were near Spanish haciendas after 1600, leading to Pueblo production of European vessel forms and use of certain design elements. The same effect occurred to the south, at Isleta (Marshall 2015). Where this proximity to Europeans occurred, we see a wider range of ceramics, including European wares (such as majolica) as well as Puebloan wares from other areas. Also, local production was altered at these locations of cultural contact, so that forms such as soup plates were made by Pueblo potters (Ethan Ortega, personal communication 2016). For example, a pre-revolt (1600–1680) Spanish hacienda near Kuaua, Casa Quemada (now destroyed), yielded a large variety of European-made items as well as glaze-painted and matte-painted pottery from multiple sources (Vierra 1987a; Warren 1971).

Although the triad of Piedras Marcadas, Chamisal, and Alameda were spared the impact of a direct and continuous Spanish presence, they, like many other Pueblos, ultimately felt the disastrous effects of disease, relocation, and acculturation.

Future Research

At present, the available data from the half-dozen large, thriving Classic period pueblos in the Middle Rio Grande Valley are varied and inconsistent. Renewed interest in the local Classic period occupation will soon add to the data set, as old collections are organized, catalogued, and analyzed using modern techniques. The current effort includes studies at Santiago (by Marshall) and cataloguing of museum collections from Kuaua (by Ortega) and Chamisal (by Kurota and myself). For the moment, however, detailed comparisons, even of basic chronologies, are difficult to achieve. The need for additional independent dates, especially from after 1500, is especially great.

Once basic temporal frameworks are established for these sites, future research problems include:

A. Can we better document the exchange of finished pottery between potters and others in the same villages or other villages? Is there evidence of specialization in production of certain classes of glazeware ceramics, within or between local centers? Addressing this issue will require integrating the few existing studies of tempering materials with new data while examining spatial variability both within and among villages. The few existing temper studies include those for Alameda (Kurota 2008, 2013), the Coronado Campsite (Marshall 1989), Nuestra Señora (Marshall 1982), Chamisal (Franklin 2012a; Garrett 1993; Kurota n.d.), and Isleta (Marshall 2015), as well as this analysis at Piedras Marcadas.

B. How and by whom were ceramic raw materials obtained, and is there evidence of trade in such materials? These include not only glaze paint pigments but also paste clays, rock tempers, and rarer slip clays. As this research has shown, many of these essential ingredients for the local manufacture of massive amounts of glaze ware were not always close at hand. But what were the social interactions and inter-village relationships behind the procurement and distribution of these resources?

As always, additional research into the Classic period of the Tiguex province—a community of once-thriving villages—is needed. Non-destructive investigations at Piedras Marcadas itself would add to our present knowledge of the site as a whole. Larger samples will be needed to assess additional research questions, including the site's spatial extent and the intensity of its occupation during all phases its four century history. New kinds of ceramic samples, including thin section petrography, are also required, so we can assess frequencies of imported ceramics and interactions among the local Classic period pueblos. Such additional research into the Tiguex province will certainly provide new and unexpected insights.

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Appendix A

PIEDRAS MARCADAS SURFACE COLLECTION BY KIT SARGEANT

In 2016 I analyzed a surface collection from Piedras Marcadas, stored at the Sargeant residence at the Chamisal site and presumably made by the late Kathryn "Kit" Sargeant. The collections at the residence have since been moved to the Maxwell Museum of Anthropology.

Table A.1. Piedras Marcadas Sherds Stored at Chamisal.

Code	Pottery Type	Count
15	Santa Fe Black-on-white	5
91	Rio Grande Glaze Ware, red slip only	1
95	Rio Grande Glaze Ware, glaze-on-red	6
96	Rio Grande Glaze Ware, glaze-on-yellow	3
99	Rio Grande Glaze Ware, late runny glaze	1
110	Agua Fria Glaze-on-red	13
113	San Clemente Glaze Polychrome	4
201	Largo Glaze-on-yellow	2
301	Espinoso Glaze Polychrome	2
305	Kuaua Glaze Polychrome	2
401	San Lazaro Glaze Polychrome	17
501	Puaray Glaze Polychrome	32
601	Kotyiti Glaze Polychrome	3
610	Kotyiti Glaze-on-yellow	2
615	Kotyiti Glaze-on-red	1
706	Obliterated Corrugated	1
Total		95

Appendix B

PHOTOGRAPHS OF POTTERY

Figure B.1. Glaze A, Agua Fria Glaze-on-red bowl exterior. TP 6.

Figure B.2. Glaze C, Kuaua Glaze Polychrome bowl interior. TP 6.

Figure B.3. Glaze C–D, Kuaua Glaze Polychrome bowl interior. TP 6.

Figure B.4. Glaze D, San Lazaro Glaze Polychrome bowl exterior. TP 6.

Figure B.5. Glaze D, glaze-on-red bowl interior. TP 6.

Figure B.6. Glaze D, glaze-on-red bowl exterior. TP 6.

Figure B.7. Glaze D–E, two bowl rim interiors. TP 2.

Figure B.8. Glaze D–E, two bowl rim exteriors. TP 2.

Figure B.9. Glaze D, bowl rim exterior. TP 7.

Figure B.10. Glaze E, Tiguex Glaze Polychrome carinated shoulder. TP 6.

Figure B.11. Glaze D, carinated shoulder. TP 6.

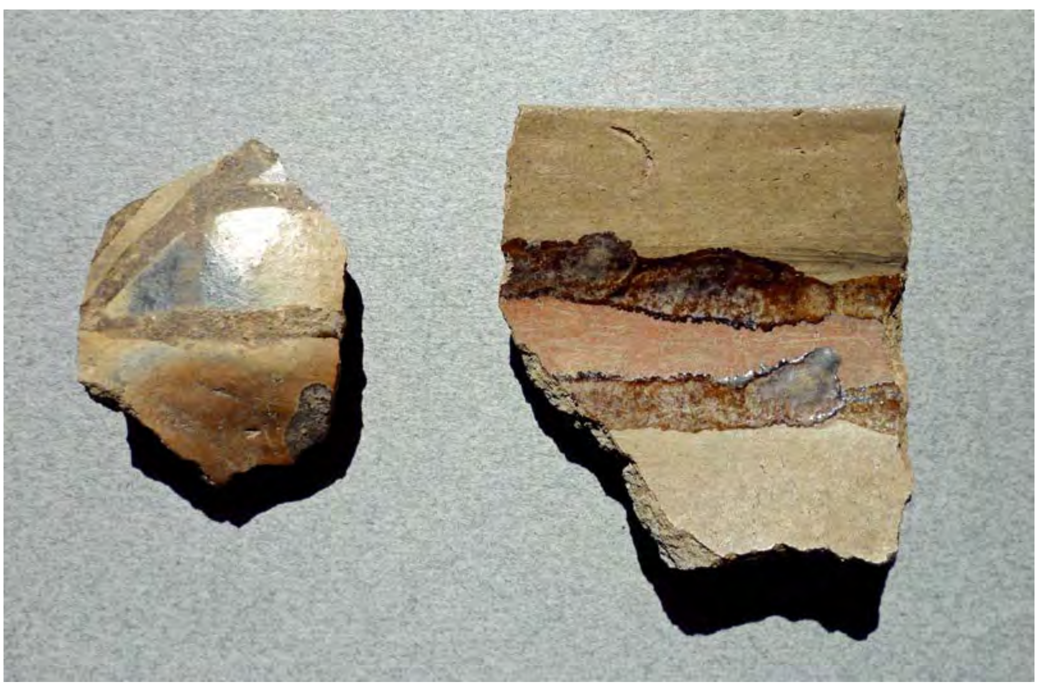


Figure B.12. Carinated body sherd and Glaze E rim sherd. TP 2.

Figure B.13. Glaze E, three bowl rim sherds, interior view. TP 3.

Figure B.14. Glaze E, three bowl rim sherds, exterior view. TP 3.

Figure B.15. Glaze E–F, bowl rim interior. TP 6.

Figure B.16. Glaze E–F, bowl rim exterior. TP 6.

Figure B.17. Glaze E–F, bowl rim interior. TP 6.

Figure B.18. Glaze E–F, bowl rim exterior. TP 6.

Figure B.19. Glaze F, glaze-on-red bowl interior. TP 6.

Figure B.20. Glaze F, glaze-on-red bowl exterior. TP 6.

Figure B.21. Glaze F, bowl rim interior. TP 6.

Figure B.22. Glaze F, bowl rim exterior. TP 6.

Figure B.23. Glaze F, bowl rim interior, showing runny glaze. TP 6.

Figure B.24. Glaze F, bowl rim exterior, showing runny glaze. TP 6.

Figure B.25. Two glaze polychrome jar rims. TP 2.

Figure B.26. Glaze polychrome jar rim. TP 1.

Figure B.27. Late glaze polychrome jar rim. TP 6.

Figure B.28. Late glaze-on-red jar rim. TP 1.

Figure B.29. Glaze E, two bowl rim profiles. TP 3.

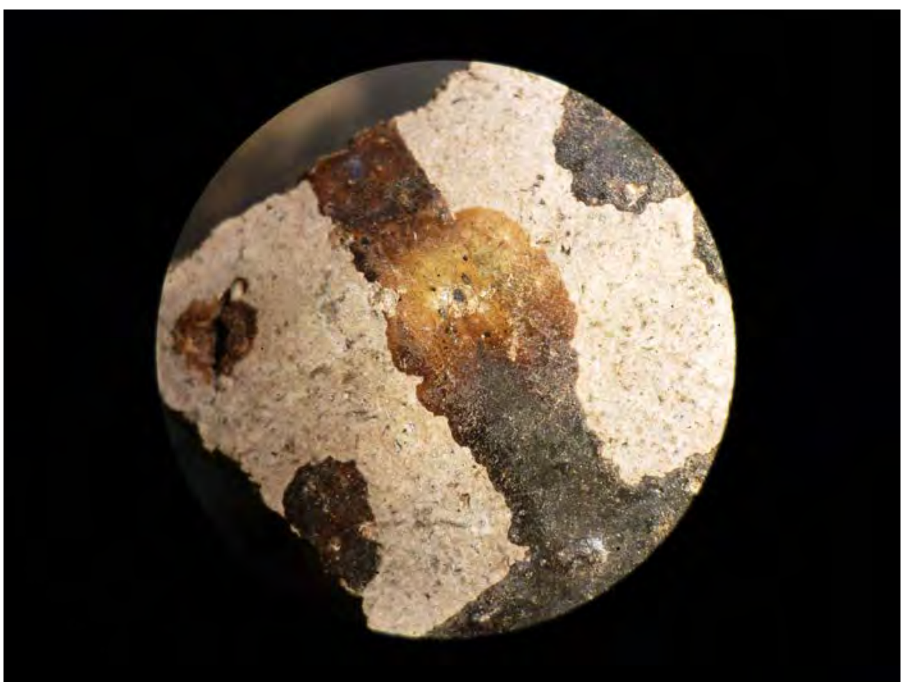


Figure B.30. An example of Glaze E–F paint. TP 1.

Figure B.31. Three plain utility ware jar rim sherds, exterior view. TP 6.

Figure B.32. Sikyatki Polychrome. TP 6.

Appendix C

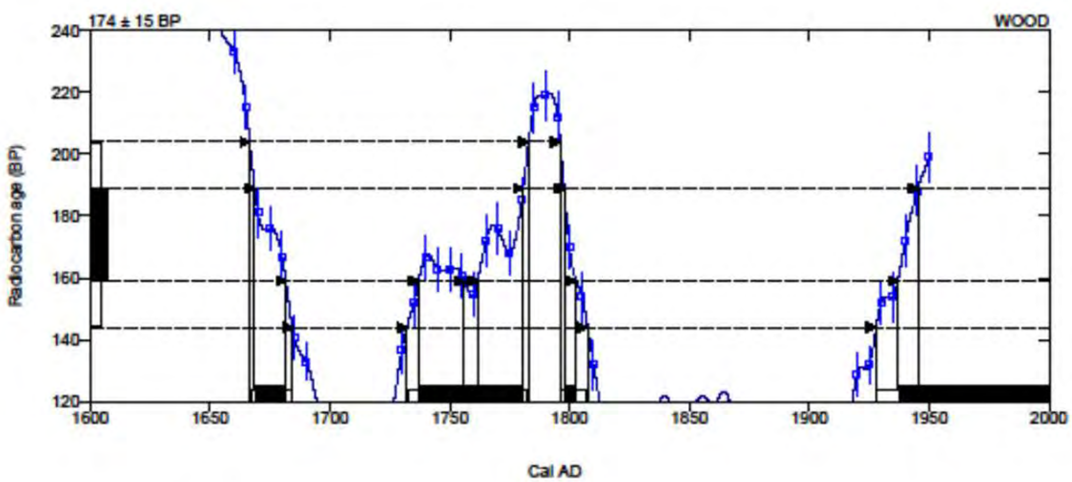
FIVE RADIOCARBON DATES FROM PIEDRAS MARCADAS

In 2016, Matthew Schmader submitted five radiocarbon samples from Piedras Marcadas. The results are included here, with his permission.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -22.85 o/oo : lab. mult = 1)

Laboratory number	**Beta-445382 : TP1 212-215**
Conventional radiocarbon age	**174 ± 15 BP**
Calibrated Result (95% Probability)	**Cal AD 1667 to 1684 (Cal BP 283 to 266)** **Cal AD 1732 to 1783 (Cal BP 218 to 167)** **Cal AD 1796 to 1808 (Cal BP 154 to 142)** **Cal AD 1928 to Post 1950 (Cal BP 22 to Post 0)**
Calibrated Result (68% Probability)	Cal AD 1669 to 1682 (Cal BP 281 to 268) Cal AD 1737 to 1781 (Cal BP 213 to 169) Cal AD 1798 to 1803 (Cal BP 152 to 147) Cal AD 1937 to Post 1950 (Cal BP 13 to Post 0)



Database used
INTCAL13

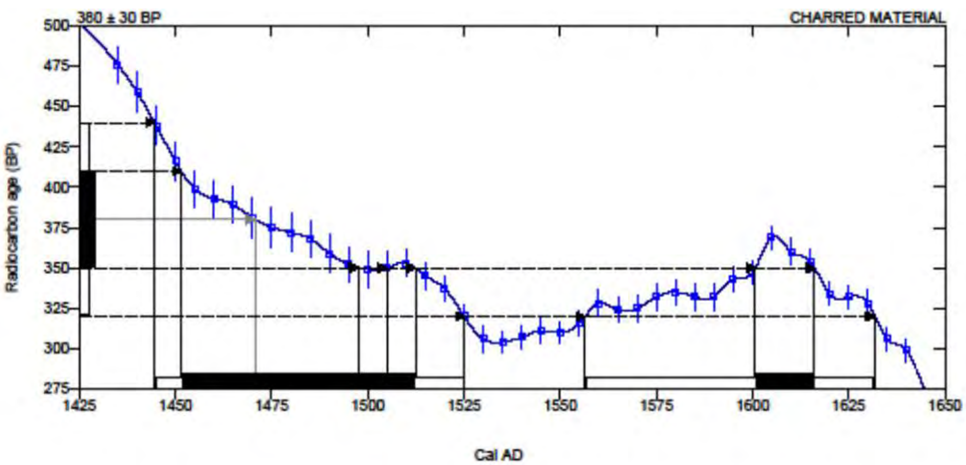
References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
References to INTCAL13 database
Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • Email: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -23.5 o/oo : lab. mult = 1)

Laboratory number	**Beta-445385 : TP2 120-130**
Conventional radiocarbon age	**380 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1445 to 1525 (Cal BP 505 to 425)** **Cal AD 1555 to 1630 (Cal BP 395 to 320)**
Intercept of radiocarbon age with calibration curve	Cal AD 1470 (Cal BP 480)
Calibrated Result (68% Probability)	Cal AD 1450 to 1510 (Cal BP 500 to 440) Cal AD 1600 to 1615 (Cal BP 350 to 335)



Database used
INTCAL13

References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
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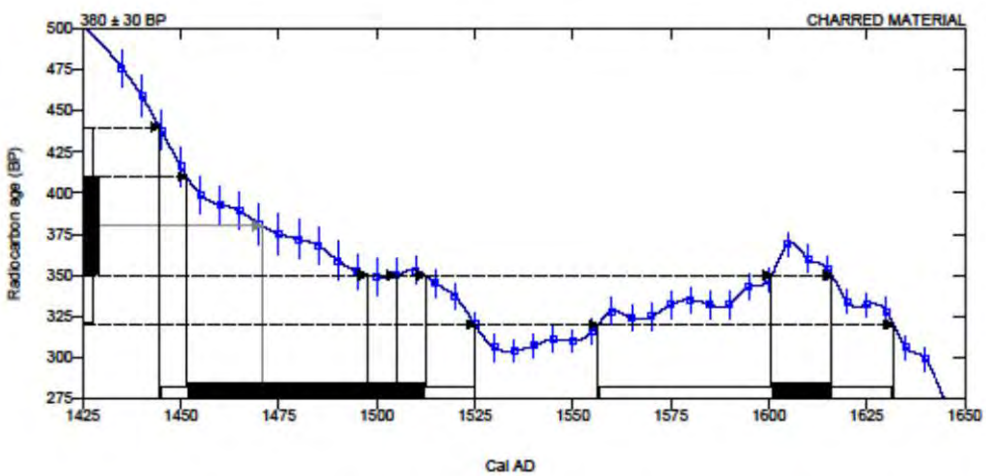
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -25.7 o/oo : lab. mult = 1)

Laboratory number	**Beta-445386 : TP6 105-110**
Conventional radiocarbon age	**380 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1445 to 1525 (Cal BP 505 to 425)** **Cal AD 1555 to 1630 (Cal BP 395 to 320)**
Intercept of radiocarbon age with calibration curve	Cal AD 1470 (Cal BP 480)
Calibrated Result (68% Probability)	Cal AD 1450 to 1510 (Cal BP 500 to 440) Cal AD 1600 to 1615 (Cal BP 350 to 335)



Database used
INTCAL13

References

Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
References to INTCAL13 database
Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

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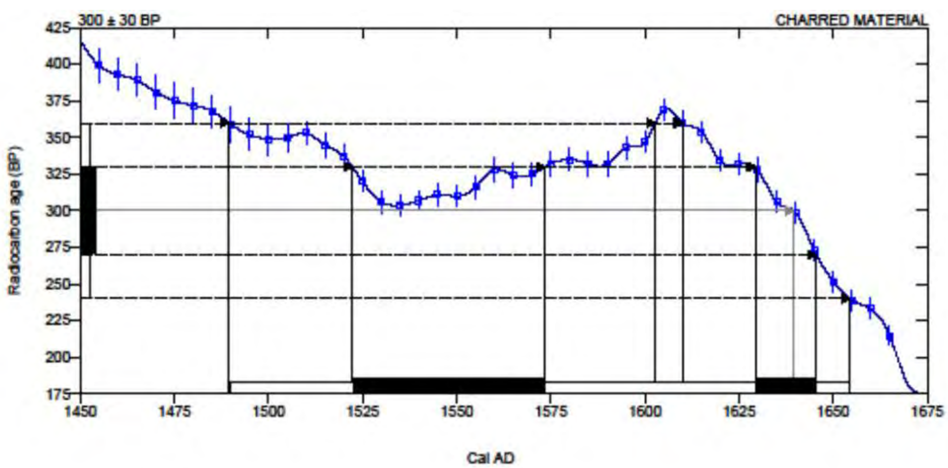
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -26.8 o/oo : lab. mult = 1)

Laboratory number	**Beta-445383 : TP6 325-331**
Conventional radiocarbon age	**300 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1490 to 1655 (Cal BP 460 to 295)**
Intercept of radiocarbon age with calibration curve	Cal AD 1640 (Cal BP 310)
Calibrated Result (68% Probability)	Cal AD 1520 to 1575 (Cal BP 430 to 375) Cal AD 1630 to 1645 (Cal BP 320 to 305)



Database used
INTCAL13

References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
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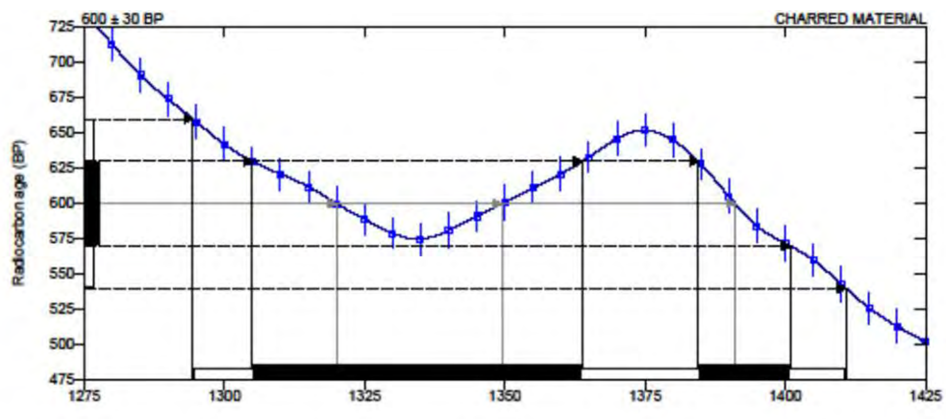
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -24.1 o/oo : lab. mult = 1)

Laboratory number	**Beta-445384 : TP7 100-110**
Conventional radiocarbon age	**600 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1295 to 1410 (Cal BP 655 to 540)**
Intercept of radiocarbon age with calibration curve	Cal AD 1320 (Cal BP 630) Cal AD 1350 (Cal BP 600) Cal AD 1390 (Cal BP 560)
Calibrated Result (68% Probability)	Cal AD 1305 to 1365 (Cal BP 645 to 585) Cal AD 1385 to 1400 (Cal BP 565 to 550)



Database used
INTCAL13

References

Mathematics used for calibration scenario
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