THE PRE-CONTACT "HAUL ROAD" SITE, WEST POINT FOUNDRY, COLD SPRING, NEW YORK: 4400 YEARS OF MICROSTRATIGRAPHIC DEPOSITION

JOEL W. GROSSMAN

JOSEPH E. DIAMOND
SUNY NEW PALTZ

ERI WEINSTEIN
TEXAS HEALING ARTS INSTITUTE

ABSTRACT

The rescue excavation of an endangered prehistoric site in the Hudson Highlands led to the discovery of a 4400-year-old sequence of prehistoric cultures spanning from the late Archaic to the Late Woodland periods. The site, designated the Haul Road site, was discovered, buried, and protected from later impacts by a layer of Civil War-era deposits. These deposits were, in turn, overlain by a ca 2.5-foot thick dirt roadway, known as the Haul Road, in Cold Spring, Putnam County, New York. Stylistic analysis documented the presence of 19 diagnostic points, extending from Vosburg and Brewerton Corner-Notched types dating to between 2500 - 3000 BC, to Late Woodland Levanna points from c. 1100 - 1630 AD. In addition to the use of arbitrary 0.10 ft micro-stratigraphic levels and particle analysis, quantified artifact analysis revealed significant shifts in ceramic decoration, and the distribution of worked versus unworked flakes.

INTRODUCTION

Initial Phase 1B testing (gridded shovel tests and controlled test units) in 1990 within the "Haul Road" right-of-way documented the presence of a buried pre-Contact occupation component on the 80 foot (24.4 m) high terrace overlooking the West Point Foundry (Figures 1, 2) in Cold Spring, New York. This was part of the multi-phase data recovery program of the West Point Foundry complex conducted by Grossman and Associates, Inc., under contract with Malcolm Pirnie, Inc. as part of a Federal Section 106 data recovery program under the jurisdiction of the USEPA, USACE and the New York State Department of Environmental Conservation (DEC). The four thousand year old Late Archaic, Transitional and Woodland period multi-component site has been designated as the Haul Road Site with the New York State Historic Preservation Office (NYSHPO), site number of USN 07942.000364. During the excavation the site and its contents were designated Area 8 of the overall Foundry investigation.

Based on the preliminary investigation, it appeared highly probable that this pre-Contact site may have survived as a direct result of the later Foundry-associated construction of post-1830 workers' housing and early office facilities on the same terrace (Grossman *et al.* 1993). The Phase IB shovel tests and test excavation units suggested that the near surface pre-Contact deposits were initially buried and protected by spoils from the foundation builder's trenches that were cut down into the bluff, with the spoil being piled outside of each of the foundations to form a protective mantle over the pre-Contact levels (Figure 3). Later road construction and slope wash deposited another cap of ca. 1 - 2 ft (30.48 – 60.96 cm) of post-Civil War road fill over the buried historic horizon, which in turn capped the pre-Contact deposits.

Figure 1. Aerial photo of general project area fronting on the Hudson River opposite West Point, above Foundry Cove in Cold Spring, New York. Note: Rectangle shows location of detailed topographic map (Figure 2).

Figure 2. Detail of West Point Quadrangle topographic map showing site location as a black octagon at the ca. 80 ft (24 m) contour line.

Figure 3. View of Haul Road looking west under heated winter shelters showing prehistoric site matrix between Civil War-era foundations of worker's housing, West Point Foundry, Cold Spring, New York.

It is highly possible that the pre-Contact deposits located during the Haul Road excavation constitute a site noted earlier by both Arthur C. Parker (1922) and William Beauchamp (1900). In 1900, William M. Beauchamp published his survey of known archaeological sites in New York entitled *Aboriginal Occupation of New York*. His descriptions for Putnam County were vague and sparse, but suggestive. He wrote that "the sites here are small and scattered, and though frequent on streams attracted little attention" (Beauchamp 1900:137). He also noted that all known sites in this county were near Cold Spring and "had been previously been reported by Dr. James S. Nelson." From this source, Beauchamp listed three sites to the north and south of Cold Spring. His site No. 1 was two miles south of Cold Spring, but his site No. 2 was listed as a camp a mile north of Cold Spring "where a copper knife was found." In other words, these sites were known to be present near Cold Spring, but none had been formally investigated by the New York State Museum or reported in any publications. Beauchamp's site No. 2 is important because although not formally referenced, Arthur C. Parker subsequently listed the same site (with the copper knife), in his later publication of 1922, *The Archaeological History of New York*. Parker noted the location and provided brief descriptions of seven pre-Contact sites in Putnam County (Parker 1922:671, Plate 207). His map and site locations were at a small scale (Figure 4), but his descriptions were more specific than those of Beauchamp. Notably, one of his sites (Site 4) was listed as "A campsite near Indian Brook. "A copper knife was found there" (Parker 1922:671). The reference to a copper knife shows that Parker's site No. 4 may have been the same as Beauchamp's site No. 2. Parker's mention of Indian Brook was important, because it is the clue that suggests that his site No. 4 may be one and the same as the multi-component site designated as our Area 8 excavation.

Parker showed his site No. 4 as being to the east of, and up-slope from, an inlet or indentation in the shoreline of the Hudson River, which looks to be in the approximate location of East Foundry Cove, and into which "Indian Brook flows." During the Civil War-era of foundry operations, this stream was also called "Foundry Brook" (Beers 1867). Indian Brook has a waterfall that passes to the east of the terrace 80 ft (24.4 m) above the floodplain. During the Civil War, the brook powered a large waterwheel, which served the cannon making machinery of West Point Foundry. This small terrace was also the setting of the historic, pre- and post-Civil War-era workers housing (Grossman *et al.* 1993; Grossman 1994a,

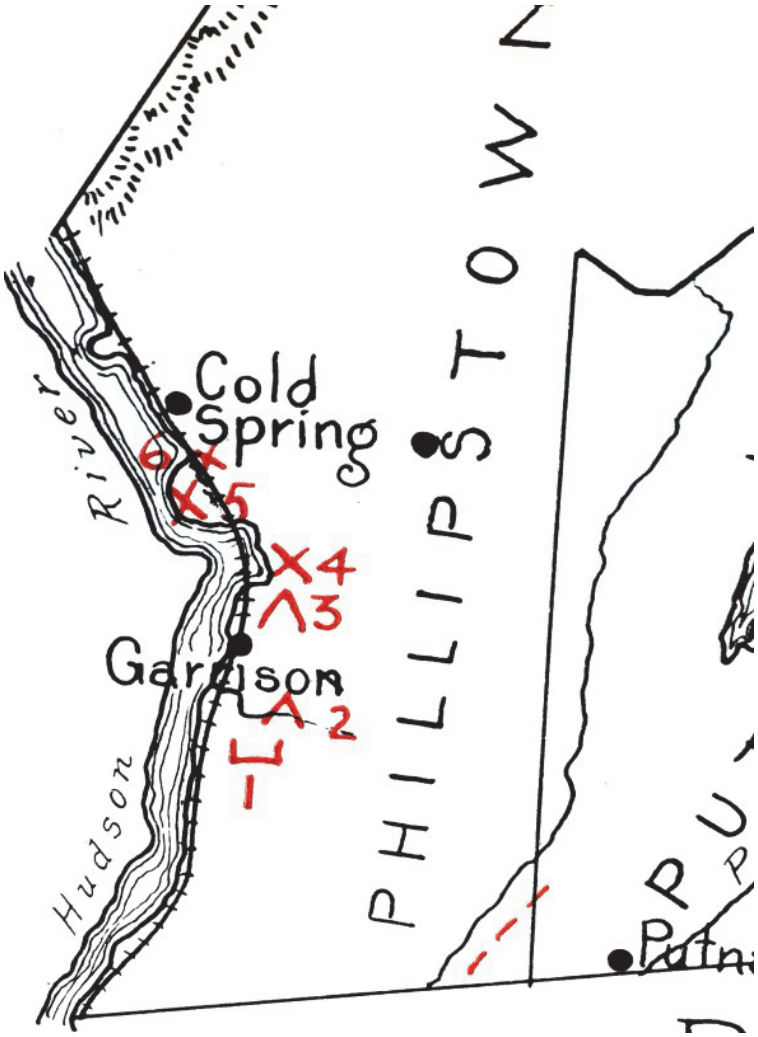

Figure 4. Detail of Parker's 1922 map of Cold Spring showing the location of his Site No. 4 overlooking Foundry Cove and the Hudson River, Putnam County, New York (Parker 1922: Plate 207).

1994b, 2008; Holzer 1995) and today, is the route of a dirt road (the "Haul Road") snaking down from the bluff above the foundry complex. It is this dirt road and its 1 – 2 ft of fill and overburden that appears to have helped preserve the buried pre-Contact site (Figure 5). This process would have post-dated the Civil War period of occupation, and thus might have been exposed at the turn of the century when Beauchamp, and presumably local collectors, knew of the site.

It is the premise of this paper that the discovery of a buried, multi-component pre-Contact site on the 80 ft (24.4 m) high terrace overlooking the floodplain and historic foundry ruins is one and the same as Parker's site No. 4, and possibly Beauchamp's Site No. 2. Neither the initial Phase IB testing phase nor the subsequent wide-area micro-stratigraphic excavation of the site suggested any agricultural activity such as plow scars and/or homogenous undifferentiated soils.

FIELD METHODOLOGY

Between the 1990 and 1991 winter season of fieldwork, numerous pre-Contact artifacts were recovered from both shovel tests and from controlled test squares, which indicated that the lithic scatter extended for several hundred feet along the terrace. Clusters of pre-Contact lithic flakes clearly indicated

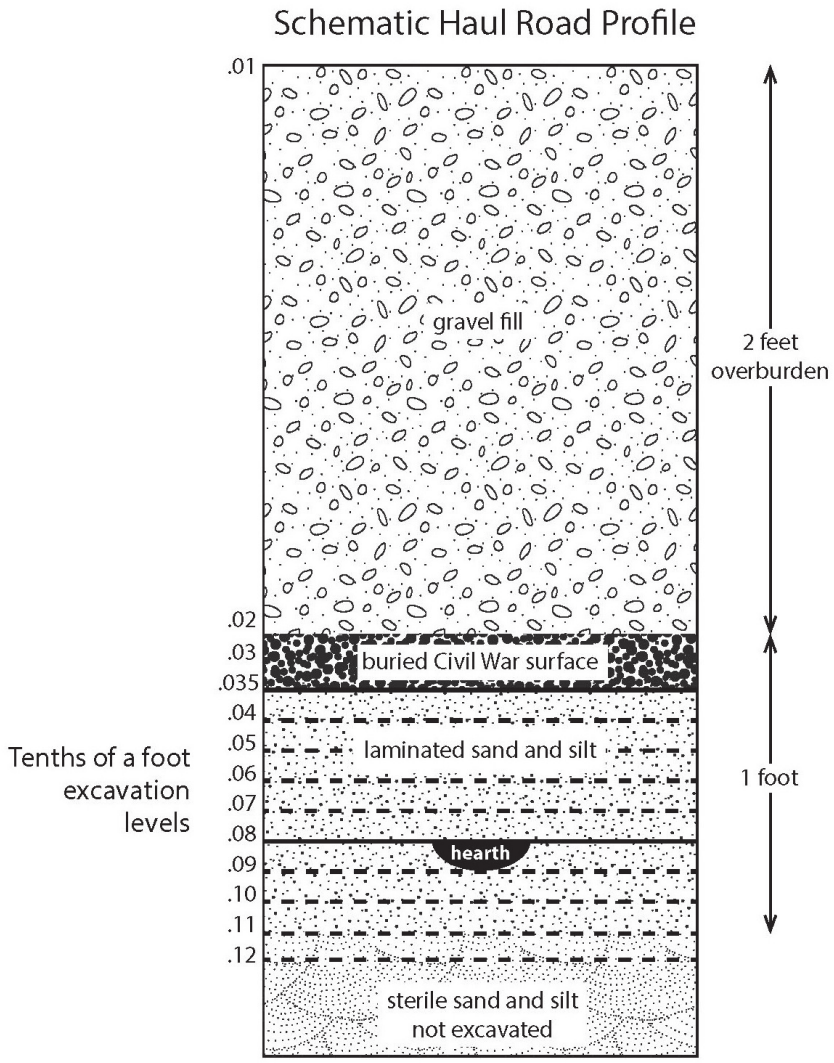

Figure 5. Schematic profile of Haul Road stratigraphy.

the presence of pre-Contact occupations below the historic 19th-century "surface" deposits located beneath the road fill. While their vertical provenience could not be established by the mixed soils provided by the shovel tests, this recovery clearly documented that the pre-Contact component extended to the south and east of the four Civil War-era worker houses (Grossman *et al.* 1993).

The first step in preparing the study area for the wide area 1992 excavation was to strip away all recent post-Civil War overburden with the assistance of a flat-bladed backhoe down to the top of the underlying historic level (.03), at a depth of 1 - 2 ft (60.96 cm) below the 20th-century grade (Figure 5). The overburden was taken down with a Gradall to within .1 ft (3.048 cm) of the ca. .2 ft (6.96 cm) thick, buried near surface historic Civil War-era occupation “surface” deposit. The controlled excavation began with the manual removal of the historic surface deposit as .2 ft (3.048 cm) arbitrary micro-levels, designated context subdivisions .02 and .03 in each of the 5 x 5 ft (1.542 x 1.542 m) units. To assure the clean separation of the mixed historic .03 deposit from the underlying pre-Contact strata, an arbitrary interface was designated context subdivision, or micro-level, .035 (without volume or depth) indicating that it could contain materials from either the upper historic (.02 and 0.3) levels or lower pre-Contact deposits of levels .04 -.12.

Following the removal and isolation of the mixed historic and pre-Contact materials in the .02 and .03 levels, the controlled manual excavation of the pre-Contact deposits (designated Area 8) began

with context subdivision .04, and continued down in .1 ft (3.048 cm) intervals to a uniform depth to subdivision .9 (27.43 cm). Several test units extended in depth from 1.1 (33.53 cm) to 1.2 ft (30.48 cm). Given the sampling focus on levels 03. - .09, the core matrixes of prehistoric occupations were concentrated within a 0.6 ft thick band of cultural deposits.

The extent of the wide area excavation of the buried pre-Contact deposits was partially determined the initial testing phase and by the overall level of effort agreed upon with the supervising agencies (USEPA, USACE and NYDEC). The emergency excavation was constrained by the fact that the field investigation took place in January of 1992, in severe winter conditions. As a consequence, the entire excavation was undertaken within the confines of a ca. 25 by 30 ft long (7.72 by 9.1 m) heated "greenhouse" shelter which delimited the dimensions of the excavation. The total extent of the Area 8 pre-Contact excavation (Haul Road) amounted to ten 5 x 5 ft grid units, or the equivalent of 250 ft^2 (23.2 m^2). This size left enough interior room for screening within the sheltered area, for wooden plank walkways, and sufficient passage for the placement of photographic, total station, and video recording systems around and over the excavation area.

The grid control system was laid out in 5 ft squares (1.542 x 1.542 m) with each unit assigned a discrete context number. Excavation levels within each numbered context grid square were distinguished as a decimal subdivision of each primary context number. Each excavation level was a .1 decimal subdivision of the context number. The lateral extent of the prehistoric site was initially indicated by the recovery of prehistoric artifacts while excavating the Civil War foundations and features of foundry workers on the Haul Road terrace. Despite what was determined to be several feet of 20th-century fill for an access road, the extent of the prehistoric site was also partially indicated by the surface distribution of prehistoric artifacts along the 80 ft. contour ridge or terrace. A total of 81 artifacts (5.2 % of total of 1930), were recovered as surface finds and in shovel tests during the initial survey of the area (Table 1). The prehistoric site would have been known, or at least visible, by both the mid-19th century workers who lived there and turn of the century archaeologists and collectors looking for prehistoric sites in the region.

The site testing, shovel tests and exploratory test units, indicated that the site held the potential for good preservation, and that intact pre-Contact features might still exist within the buried deposits. Similarities to projectile point forms which had been radiocarbon dated elsewhere, indicated that the initially recovered Haul Road sample contained a temporally broad range of point styles, including Woodland period pottery (Figure 7), and suggested the potential presence of prehistoric occupations extending back in time from the Woodland period to between ca. 3000 BC and ca. 1900 BC. Together, the diversity of diagnostic point types and recovered indigenous ceramics document that the prehistoric deposits were left by Archaic and Woodland period peoples, dated between ca. 3000 BC and 1400 AD, or approximately 4400 years.

CHRONOLOGICAL INDICES

The rescue excavation yielded 1980 artifacts (Figure 10; Table 2), twelve cores, two gravers or spokeshaves, twelve hammerstones, four milling stones, and eight specimens of either scrapers or knives (Table 1, 3; Figure 11). The absolute totals for artifacts varied among different data tables. One data base listing (Table 1) shows a total of 1930 artifacts. The second data table, Table 2, showed a total 1980 artifacts. Finally, the excavation sample yielded a total of 308 pieces of Native American pottery, including five examples of cord-impressed sherds and five sherds with dentate stamped surface treatments (Figure 12; Table 4). The Woodland period ceramics were concentrated in Level .05, which yielded 209 out of a total of 308 sherds, or 70% of the total sample from this level alone. The sample dropped to fourteen sherds in level .06 (4.5%) and twenty-eight (9.1%) in level .07. Seven sherds were found in level .08 and one sherd in the next to the lowest level of .09 - .10. No Native American ceramic sherds were recovered from the lowest .11 - .12 Archaic levels. However, the vertical series of ceramic finds throughout the sequence suggests strongly that the lower levels or contexts (.06 - .10) were partially disturbed, and chronologically mixed, by either human or natural impacts.

TABLE I: HAUL ROAD. CROSS TABULATION OF ARTIFACTS FROM THE SITE SHOWING THE QUANTIFIED DISTRIBUTION OF FUNCTIONAL ARTIFACT GROUPS OF DECORATED AND UNDECORATED POTTERY, DIAGNOSTIC PROJECTILE POINTS AND DEBITAGE, BY EXCAVATION CONTEXT LEVELS.

Artifact Types	Context .0-.01	Context .01-.02	Context .02-.03	Context .03-.04	Context .04-.05	Context .05-.06	Context .06-.07	Context .07-.08	Context .08-.09	Context .09-.10	Context .10-.11	Context .011-.012	Totals
Pottery													
Plain	1		2	37	209	14	28	7		1			299
Corded				1	1	1	2						5
Dentate Stamped			1	3									4
Points													
Untyped					1	3	1			1			6
Levanna			2										2
Orient Fishtail				1		1	1						3
Snook Kill						1							1
Poplar Island				1									1
Bare Island				1	1								2
Lamoka							3		2				5
Brewerton							1		1				2
Vosburg						2			1				3
Other Tools													
Bifaces				1		1	1						3
Choppers			1			4	1					1	7
Core/Scrapers				1	1			3					5
Graver/Spokeshaves				1						2			3
Hammerstones				1	1	6	1					3	12
Millingstones			1	1		1		1					4
Scraper/Knife					2			6					8
Flake/Scraper (UF?)						2	1	2		2		4	11
Subtotals (All Artifacts - Debitage)			7	49	216	36	40	19	4	6		8	386
Debitage	81	4	117	153	224	243	251	256		147		68	154
All Artifacts	**81**	**4**	**124**	**202**	**440**	**279**	**291**	**275**	**4**	**153**	**0**	**76**	**1930**

Beginning with the deepest levels, of the 19 out of 25 diagnostic and datable projectile point forms, four Late Archaic point types, a Vosburg, a Brewerton, and two Lamoka points, were found isolated in context .09 (Figure 13; Table 5). All four examples were separated from overlying deposits by the .08 level. Both the Vosburg and Brewerton points have been dated to the Late Archaic and both have been assigned an age range from ca. 2500 - 3000 BC (Funk 1993, Figure 25:157). Examples of these two early forms (Vosburg and Brewerton) occurred in levels .09, .07, and .06. Although two examples of the Lamoka type were found in the 0.09 level in association with the Vosburg and Brewerton points, the type

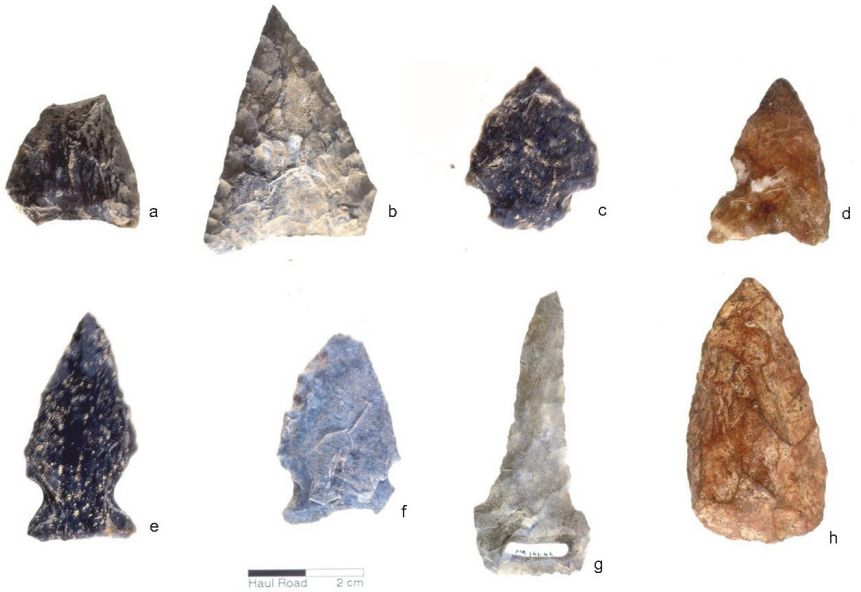

Figure 6. Haul Road site pre-Contact artifacts. a and b, Levanna points from .03 level. c-f and h, untyped points from .04 level. g is a drill from the .02 level.

Figure 7. Haul Road site pre-Contact Middle Woodland ceramics. Top row, left to right: three cord-marked sherds. Bottom row, left to right: two cord marked sherds, two dentate stamped sherds.

was also represented by two examples in level 0.07. These associations suggest that the .06 - .09 levels represented blend of predominantly Late Archaic deposits, mixed with a small amount of Woodland period pottery (38 sherds) from overlying levels.

Following these earliest Late Archaic variants (Vosburg, Brewerton), the third oldest projectile point was the Lamoka type, which has been attributed to later in time by some 500 years to the Late Archaic and has been assigned to an age range of between ca. 2500 - 1900 BC (Funk 1993, Figure 25:157). Five Lamoka points were excavated from the lowest levels. Three Lamoka points came from the .07 - .08 level, and two were recovered from the deepest level (.09 - .10). None were recovered from levels higher in the excavation sequence (Figure 13; Table 5).

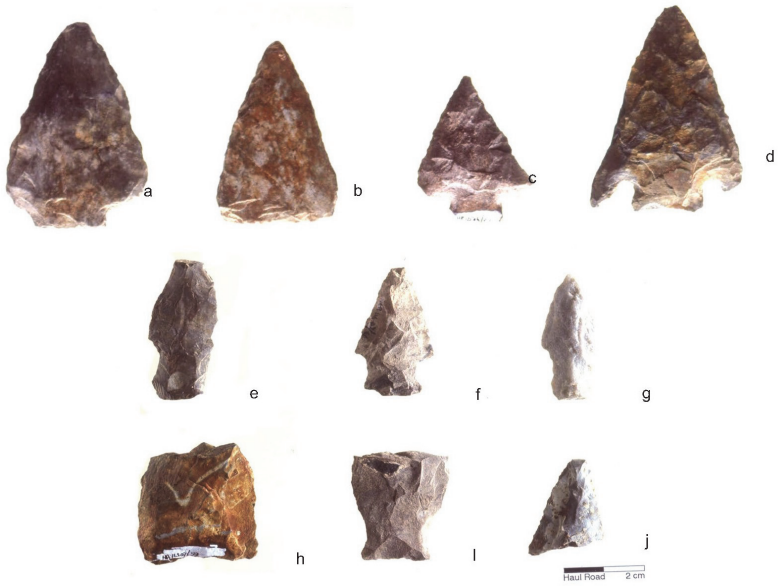

Figure 8. Haul Road site pre-Contact artifacts. a, b, untyped Archaic points from cx 165.06, c, d, Brewerton corner-notched points from cx 165.06. e, f, g, h, Lamoka / Bare Island points from cx 165.07. I, Orient Fishtail base from cx 165.07. j, Levanna (?) point cx 165.07.

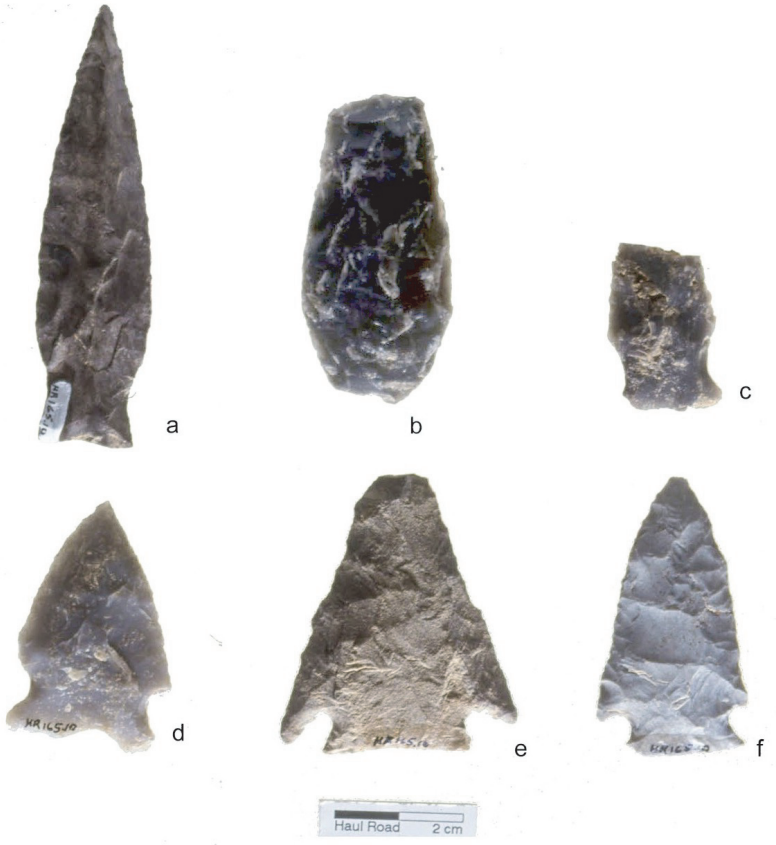

Figure 9. Haul Road Pre-Contact artifacts. a, Orient Fishtail point from cx. 165.10. b, untyped point from cx 165.10, c, untyped point base from cx 165.10, d, Brewerton side-notched point from cx 165.10; e, Vosburg point from cx 165.10; f, untyped corner-notched point (possibly Vosburg) from cx 165.10.

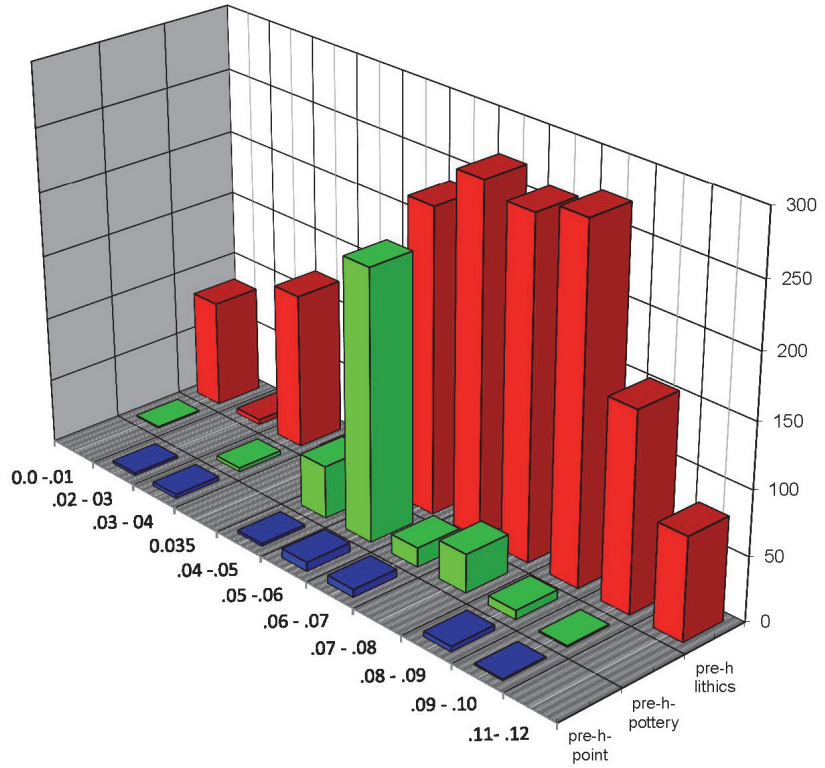

Figure 10. Haul Road site plot of cross-tabulation of prehistoric artifacts by general class totals for pottery, lithics, and diagnostic points by .10 foot excavation (cx) level (Table 2).

TABLE 2: HAUL ROAD. CROSS-TABULATION OF PREHISTORIC (PRE-H) ARTIFACTS BY GENERAL CLASS TOTALS FOR POTTERY, LITHICS, AND DIAGNOSTIC POINTS BY .10 FOOT EXCAVATION (CX) LEVEL (FIGURE 10).

Strata Sub.	Pre-h lithics	Pre-h-pottery	Pre-h-point	Total
0.0 -.01	84	1		85
.02 - 03	4		2	6
.03 - 04	122	3	3	128
0.035	9			9
.04 -.05	151	41	2	194
.05 -.06	237	210	7	454
.06 - .07	271	15	6	292
.07 - .08	262	30		292
.08 - .09	273	7	4	284
.09 - .10	154	1	1	156
.11- .12	80			80
Total	1647	308	25	1980

Strata Sub. = Strata Subdivision

A single example of a slightly more recent Late Archaic projectile type was recovered from level .06 - .07. The Snook Kill type has been placed in the region chronologically through radiocarbon dating at other sites at ca. 1700 - 1500 BC (Funk 1993, Figure 25:157). It was recovered from level .06 - .07 in stratigraphic association with an Orient Fishtail point (Figure 13; Table 5). A second Orient Fishtail point

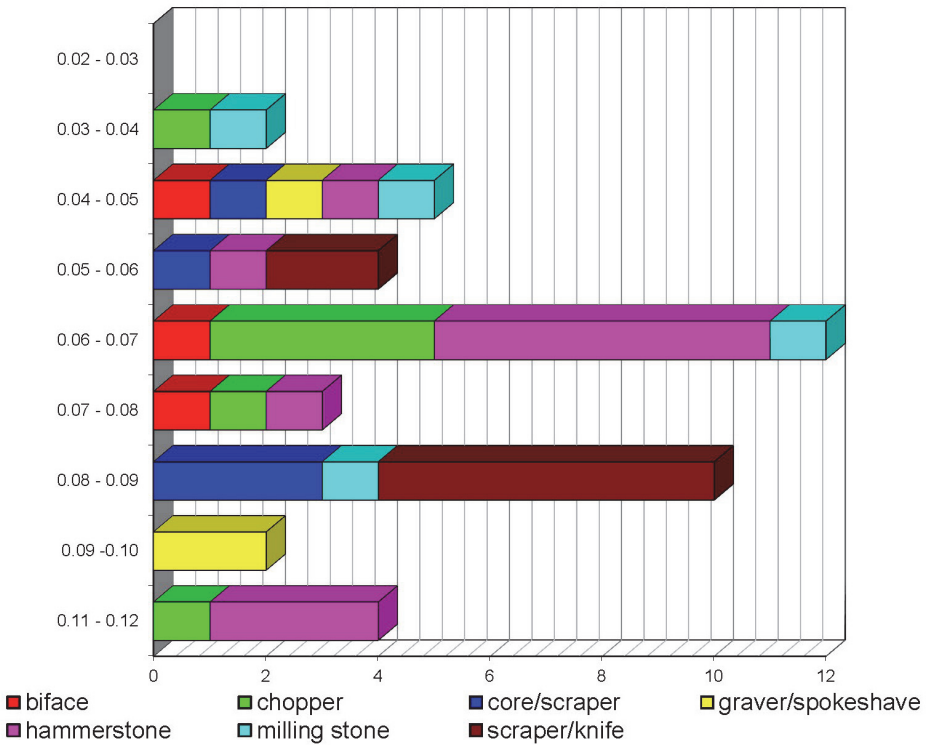

Figure 11. Haul Road site horizontal plot of cross-tabulation of artifacts showing the relative count of non-projectile point diagnostic lithic artifact types per .10 ft. excavation level (Table 3).

TABLE 3: HAUL ROAD. CROSS TABULATION OF ARTIFACTS SHOWING THE RELATIVE COUNT OF NON-PROJECTILE POINT DIAGNOSTIC LITHICS BY CX LEVEL (FIGURE 11).

Strata Sub.	Biface	Chopper	Core/ scraper	Graver/ spokeshave	Hammer- stone	Milling stone	Scraper/ knife	Total
0.02 - 0.03								
0.03 - 0.04		1				1		2
0.04 - 0.05	1		1	1	1	1		5
0.05 - 0.06			1		1		2	4
0.06 - 0.07	1	4			6	1		12
0.07 - 0.08	1	1			1			3
0.08 - 0.09			3			1	6	10
0.09 -0.10				2				2
0.11 - 0.12		1			3			4
Total	3	7	5	3	12	4	8	42

Strata Sub. = Strata Subdivision

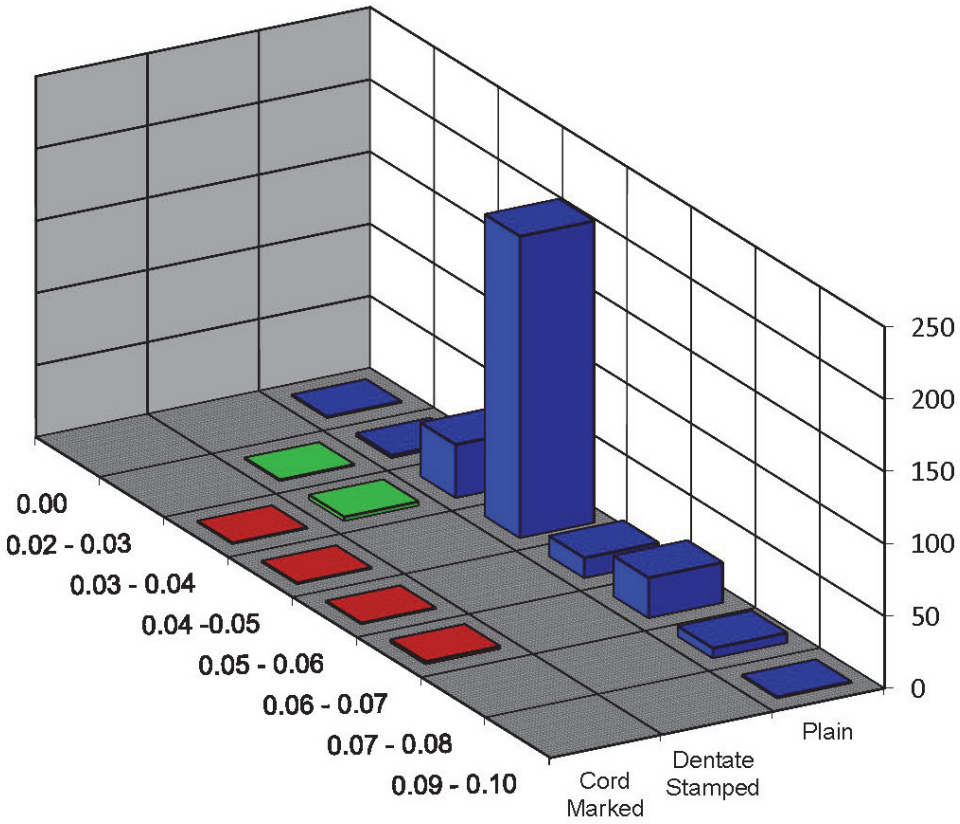

Figure 12. Haul Road site 3D plot of cross-tabulation of prehistoric pottery showing distribution by context and ceramic decoration (Table 4).

TABLE 4: HAUL ROAD SITE CROSS-TABULATION OF PREHISTORIC POTTERY SHOWING DISTRIBUTION BY ARCHAEOLOGICAL CONTEXT AND CERAMIC DECORATION. (FIGURE 12).

Strata Sub.	Cord Marked	Dentate Stamped	Plain	Total
0.00			1	1
0.02 - 0.03		1	2	3
0.03 - 0.04	1	3	37	41
0.04 -0.05	1		209	210
0.05 - 0.06	1		14	15
0.06 - 0.07	2		28	30
0.07 - 0.08			7	7
0.09 - 0.10			1	1
0.11 - 0.12				0
Total	5	4	299	308

Strata Sub. = Strata Subdivision

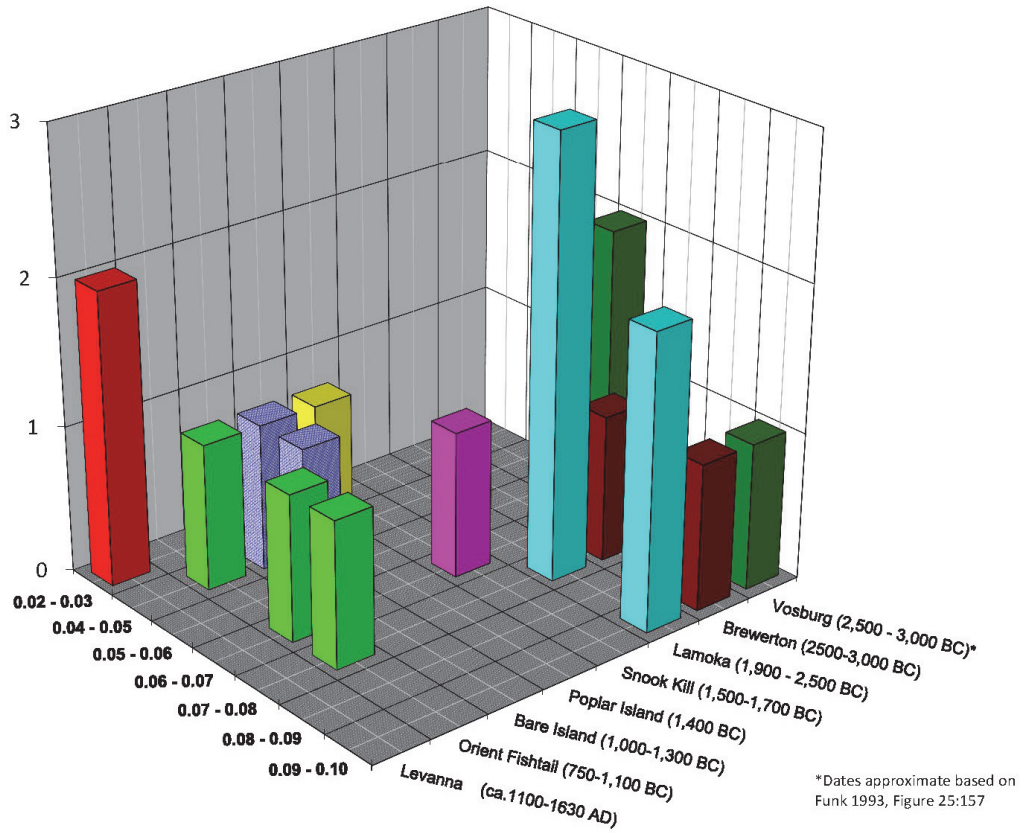

Figure 13. Haul Road site 3D plot of cross-tabulation of diagnostic projectile points by cultural periods (Woodland, Transitional and Late Archaic) per .10 ft excavation context.

TABLE 5: HAUL ROAD. CROSS-TABULATION OF DIAGNOSTIC PROJECTILE POINTS BY CULTURAL PERIODS (WOODLAND, TRANSITIONAL, AND LATE ARCHAIC) PER .10 FT. EXCAVATION CONTEXT (FIGURE 13).

	Woodland	**Transitional**			**Late Archaic**				**Other**	**Total**
Strata Sub.	Levanna (ca.1100-1630 AD)	Orient Fishtail (750-1100 BC)	Bare Island (1000-1300 BC)	Poplar Island (1400 BC)	Snook Kill (1500-1700 BC)	Lamoka (1900-2500 BC)	Brewerton (2500-3000 BC)	Vosburg (2500-3000 BC)		
0.02 - 0.03	2									2
0.04 - 0.05		1	1	1						3
0.05 - 0.06			1						1	2
0.06 - 0.07		1			1			2	3	7
0.07 - 0.08		1				3	1		1	6
0.08 - 0.09										
0.09 - 0.10						2	1	1	1	5
Total	2	3	2	1	1	5	2	3	6	25

Strata Sub. = Strata Subdivision

was recovered from level .07 - .08 in association with three Lamoka points. Although only one example of this Snook Kill type was recovered, its relative provenience in the sequence was chronologically consistent with the relative ages of the other point types recovered from above and below it in the sequence. In addition, although the subsequent .05 level was characterized by the predominance (70%) of ceramics in the vertical sequence, only one projectile point was recovered. The single diagnostic point type was classed as a Bare Island type which can be attributed to the end of the Late Archaic period, and is roughly coeval with the Lamoka point (Funk 1993:Figure 25:157). The ceramics alone suggest that this level belonged to the Woodland period in general (Ritchie 1961, 1980). However, the association of the Woodland period ceramics with the Bare Island point suggests that the .05 level represented a mixture of Woodland and Late Archaic period occupations. The recovery of a single diagnostic rim sherd from the Haul Road site was attributed to the Castle Creek phase. Recent high resolution AMS radiocarbon determinations from the upriver Little Wood Creek site have dated Castle Creek pottery to between 1247 - 1440 cal AD (Grossman *et al.* 2015).

The more recent .04 level was distinguished by the appearance of three relatively recent Transitional period point types: Poplar Island, Orient Fishtail, and what appears to represent a possible example of a Bare Island point. The Poplar Island and the possible Bare Island point base fragments were recovered from levels .04 and .05, and both types have been radiocarbon dated to between ca. 1500 and 1400 BC (Funk 1976, 1993:Table 25, 157).

Also recovered from levels .04 - .05, 06 - .07, and .07 - .08 were three Orient Fishtail points, which have been dated to ca. 1000 - 750 BC elsewhere in New York (Figure 9a; Funk 1993, Figure 24: 157). One example of a Transitional period Fishtail point has recently been AMS dated to between 1058 and 1501 cal BC at the Little Wood Creek site in Washington County (Grossman *et al.* 2015). This stratigraphic correlation is significant because the level .10 contained one of the three recovered Transitional period Orient Fishtail points. Two other Orient Fishtail points were recovered; one from the uppermost level of .04 immediately below the historic .03 deposit, and the second from the .07 level, immediately above the buried Late Archaic period deposits within the two tenths of a foot thick band of the .08 -.09 context subdivisions. The association of these "Transitional period" points from levels 0.6 and 0.7, below the predominantly ceramic-bearing .05 level, suggests that that the site may once have contained a distinct Transitional period occupation. The recovery of single Orient point from the .04 level, together with 41 ceramic sherds, above the ceramic-dominated .05 level, suggests that this level represents a mixture of both Transitional and Woodland period occupations (Figure 10; Table 2).

Finally, at the uppermost .03 context subdivision of mixed historic and pre-Contact deposits, the diagnostic artifact sample was limited exclusively to the presence of two small triangular examples of the Levanna projectile and possible Madison point types, which have been dated by Funk to between ca. 1100 and 1300 AD (Figure 6 a, b; Figure 13; Table 5; Funk 1993; Ritchie 1980). He dates the Madison type to a slightly more recent time frame of 1450 – 1600 AD, suggesting that the site may have continued to be occupied in the Contact period (Funk 1993, Figure 25:157). Recent AMS radiocarbon determinations from the Little Wood Creek site dated the Levanna and possible Madison point types to between 1247 and 1440 cal AD (Grossman *et al.* 2015). Work by Diamond (1996, 1999, 2004) on Contact period sites in the Mid-Hudson regions show these two point types extending into the second and possibly the third quarter of the 17th century.

Thus, based on the datable stone artifacts alone, the multi-component assemblage appears to encompass three long generalized periods, Late Archaic occupations dating to ca. 3000 - 1500 BC, and a later Transitional period component dating to around 1000 - 750 BC. Superseding these occupation the third major pre-Contact period was represented by the more recent Woodland period Levanna points, which were found exclusively in the uppermost mixed historic and pre-Contact level context subdivision .03 (Figure 10; Table 2). In all, this chronological evidence of diagnostic point types suggests that the terrace site was occupied repeatedly over a 4400 year period by at least three, and possibly by four culturally and temporally distinct Native American groups spanning from ca. 3000 BC to at least 1400 AD.

PATTERNS THROUGH TIME

The recovery of a small number of surface-decorated sherds also suggested that several culturally and stylistically distinct epochs were indicated by two shifts in the vertical sequence. Examples of plain, and often small, pieces of pottery were recovered as far down as the .09 - .10 level of the excavation the first ceramic, the second lithic. In terms of raw counts by class, 251, or 82% of all pottery came from two of the uppermost context subdivisions (.04 and .05), while only 53, or 17% were recovered from the lower .06 through .08 levels combined (Figure 10; Table 2). This predominance of pottery within the upper strata levels was matched by an inverse distribution of pre-Contact scrapers that were recovered exclusively from the lower .06 through .12 levels (Figure 14; Table 6). These contrasting and inverse vertical nodes of distribution between the flake scrapers and ceramic samples, suggest that the transition from the preceramic Archaic levels to the later Woodland period occupations originally took place at the level .05 break in the vertical stratigraphic record. This pattern also suggests that levels .04 and .05 were in most likelihood deposited by early pottery making peoples during the Late Woodland period.

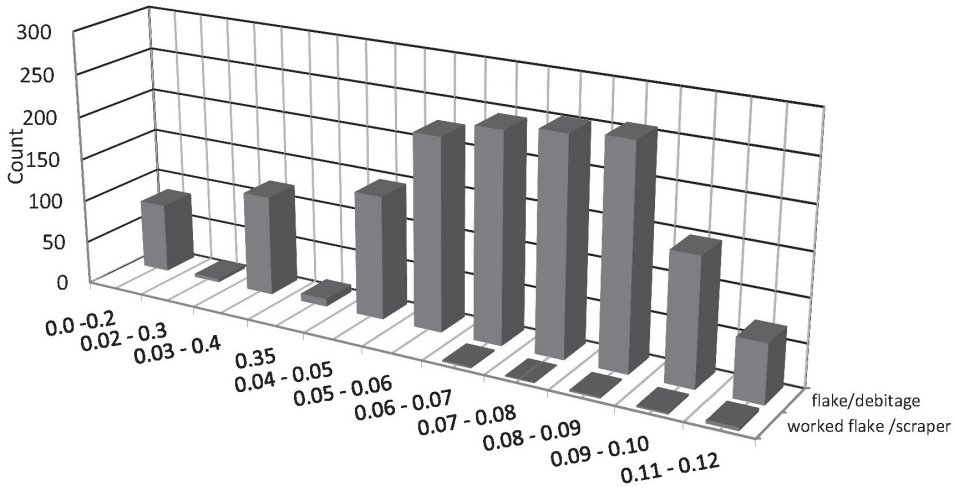

Figure 14. Haul Road site 3D plot of cross-tabulation breakdown of flake distribution of worked versus unworked per excavation level (Table 6).

TABLE 6: HAUL ROAD. CROSS-TAB BREAKDOWN OF FLAKE DISTRIBUTION BY EXCAVATION CONTEXT LEVELS (FIGURE 14).

Strata Subdivision	Flake/debitage	Worked flake/scraper	Total
0.0 -0.2	81		81
0.02 - 0.3	4		4
0.03 - 0.4	117		117
0.35	9		9
0.04 - 0.05	144		144
0.05 - 0.06	224		224
0.06 - 0.07	243	2	245
0.07 - 0.08	251	1	252
0.08 - 0.09	256	2	258
0.09 - 0.10	147	2	149
0.11 - 0.12	68	4	72
Total	1544	11	1555

The presence of 53 sherds in the lowest .06 - .08 levels, appear to have been mixed from either bioturbation or physical intrusions from above. Based on Cremeens' model of site formation processes, the Haul Road site may have some incipient, or residual, cultural stratification reflecting the downward migration of artifacts deposited over a span on nearly 5000 years (Cremeens 2003). Thus, it is possible, although not argued here, that the high concentration of ceramics in level .05 and the dominance of lithics in the .06 level could represent the byproducts of downward migration in the soil matrix, from bioturbation or other unidentified forces. Instead, we see the localized levels of artifact concentrations as suggesting possible residual traces of old living surfaces in the otherwise visually indistinguishable vertical stratigraphic sequence.

In addition to numerous pre-Contact flakes and pottery, a single diagnostic sherd was recovered during the exposure of a hearth feature in front of one of the Civil War foundations. This sherd was found while cutting through level .03 outside the structure (Building 2) (Grossman *et al.* 1993). The rim sherd was found associated with fire-cracked rock, one bi-facially flaked chopping or cutting tool, as well as several flakes. Although none of the originally (1990) recovered lithic specimens were culturally or chronologically diagnostic, the recovery of a single ceramic rim sherd, pointed to a Woodland period occupation. The presence of a rounded and slightly out flaring lip, with cord wrapped paddle decorations on the shoulder suggest either Jack's Reef Corded (Ritchie and MacNeish 1949:106-107) or East River Cordmarked (Smith 1950:Plate 10, #26 and 27; Plate 12, #1 and 11; Plate 13, #20), both of which are very similar (Grossman *et al.* 2015). In fact, Lavin *et al.* (1993) have combined the two types into "Jack's Reef Corded/East River Cordmarked" to indicate the similarity of the two types. Jack's Reef Corded is found on a number of sites in the Mid-Hudson region. These include the Black Rock site (Funk 1976:97), the Claverack Rockshelter (Funk 1976:116-123), the Ford site (Funk 1976:124-132), the Shagabak site (Funk 1976:142-145), and the Sylvan Lake Rockshelter (Funk 1976:148-172). Sites closer to the Haul Road site, particularly those in the Bear Mountain region also yielded Jack's Reef Corded. These include the Navy Rockshelter (Funk 1976:174), Riverbank Rockshelter (Funk 1976:175), Fisherman's Rockhouse (Funk 1976:175-176) and Nicoll Farm (Funk 1976:179-180). This distribution pattern extends into the Croton-Ossining region where this ceramic type has been found at the Wolcott site (Funk 1976:190). On the western side of the Hudson, and across from the Haul Road site, East River Cordmarked has been recovered at the Sheep Shelter Rockshelter (Funk 1976:179, Plate 76), and the Suffern Rockshelter (Funk 1976:181). It has also been found extensively in the Esopus Creek, Wallkill River, and Rondout Creek drainages (Diamond and Stewart 2011:77-82). Jacks Reef Corded has not been extensively C14 dated in the Hudson Valley. However, it has been dated using AMS in conjunction with attached food residues in central New York state to 1428±41 year B.P. (cal. 2 Σ range AD 543 [641] 668) (Hart *et al.* 2003) from the Kipp Island site, and 1430±40 B.P. (cal. 2 Σ range AD 559 [620] 662) from the Felix site (Hart and Brumbach 2005).

The excavation of this multi-component site revealed a well defined diversity of different artifact classes throughout the sequence. A total sample of 42 identified non-projectile point artifacts were excavated (Figure 11; Table 3). Seven types of non-projectile point artifacts were identified in this sample: biface tools; large chopping tools; worked cores and core scrapers; gravers for incising; chipped spokeshave tools for shaving wooden artifacts; hammerstones for pounding; ground and flattened milling stones for grinding or milling of seeds and vegetable products; and finally, tools which appear to have functioned as scrapers or cutting tools. This diversity of artifact types, in turn, suggests a variety of domestic activities, including food and materials processing.

This quantified sequence also revealed two chronologically significant nodes or trends in artifact diversity. The first node was indicated by a concentration of diverse lithics representing four classes of stone tools from within the .06 - .07 level, recovered in association with fourteen ceramic sherds. These lithic artifacts from this level consisted of one biface, four choppers, six hammerstones, and one milling stone. This first concentration of non-projectile point stone tools yielded 12 out of the 42 artifacts, or 29% of the sample. The second vertical node, or artifact concentration, of non-projectile point worked stone tools occurred at level .08 - .09. Level .08 yielded ten of the 42 (24%) non-point diagnostic artifacts above the deepest Late Archaic levels of the isolated .11 - .12 context. This second concentration of worked stone tools was characterized by a predominance of core scrapers and chipped scrapers and

knives. No diagnostic or dateable projectile points were recovered from Level .08, but its position relative to the deeper and isolated, Late Archaic .09 - .10 level suggests that the .08 concentration of biface and milling stones, plus the presence of features including a hearth, may represent an ancient "living surface." By living surface we assume an exposed interface in a sequence of deposits on which people lived for a period of time.

Two lines of evidence, the distribution of all sherds in general, and the vertical distribution of two chronologically distinct Woodland period ceramic decorative techniques, suggest that the pottery (like the projectile points) was formerly vertically stratified in pre-Contact levels. In addition to the patterns indicated by the quantified artifact distinctions, the Woodland period occupation sequence can be refined further based on differences in a small but stratigraphically consistent sample of surface-decorated sherds. Two chronologically significant modes of ceramic surface treatment were identified (Figure 7, 12; Table 4). One group consisted of cord-impressed sherds, and the other represented by apparently smoothed dentate stamped surface treatments. The distributions of the two decorative types varied by depth and appear to be almost mutually exclusive by level. The five specimens of cord-marked sherds were recovered from context subdivisions .04 through .07. Two of the five were excavated from the .07 level. In contrast, the four specimens of dentate stamped sherds were recovered exclusively from the uppermost .03 and .04 levels, both of which corresponded with the original mixed pre-Contact Late Woodland and historic surface level. This contrast in the distribution of ceramic decorative techniques suggests the existence of at least two-ill-defined phases of Woodland period pottery. Simply put, based on the stratigraphy and quantified tabulations, cord-marked sherds were the earliest in the Woodland sequence. The seriation of the two decorative techniques suggests that dentate stamped and surface smoothed varieties were more recent in date.

PARTICLE ANALYSIS

The suggestion that the vertical stratigraphic sequence represented two possible former surfaces, the first (.03) based on artifact associations (and the *prima facie* evidence of an exposed surface with Woodland period and Civil War refuse on it) and the second (.08) by a hearth feature and artifact associations, presented an opportunity to examine particle size analysis as an aid to help distinguish culturally relevant anomalies in the physical sequence. Given the relatively thin makeup of the site matrix, but long term temporal history of the buried prehistoric occupations, a series of geomorphological studies were applied to identify any trends or sudden fluctuations in the particle size composition which could be of relevance to understanding the environmental context of the gradually forming cultural deposits. This particle size evaluation showed that the original ca. .9 ft (27.43 cm) thick yellow sandy matrix of the buried prehistoric deposits was also distinguished by an oscillating geomorphological history, which paralleled the 40 century long cultural changes within the thin layers of slowly accumulating clays, sands and silt on the 80 foot high ridge.

To investigate this formation history of the pre-Contact deposits, Dr. Eri Weinstein, the project's paleo-environmentalist and conservation specialist, sectioned a vertical column of the buried earth samples from each of thirteen, .1 ft (3.048 cm) arbitrary, micro excavation levels. Two questions were asked of the data:

1. How were the ancient deposits formed over the last four thousand years?; and
2. Was it possible to identify any environmentally or culturally relevant shifts in the relative proportions of sand, silt and clay which could be linked in time with any of the multiple periods of identified human occupation?

A total of thirteen samples were submitted to Dr. John S. Jacob of the Texas A&M Soil Characterization Laboratory for the measurement of the relative percentages of different size ranges of the sand, silt and clay in each sample. The test results were plotted in two formats as vertically shifting variations in the relative percentages of select fractions of each of the thirteen column samples. The first

format (Figure 15; Table 7) compared the indices or ratios of four sets of soil data: course versus very course sand; fine versus very fine sand; total silt versus total sand; and finally, fine silt versus course silt. The second format (Figure 16; Table 7) compared the percentages of course sand (C sand) to clay between the levels.

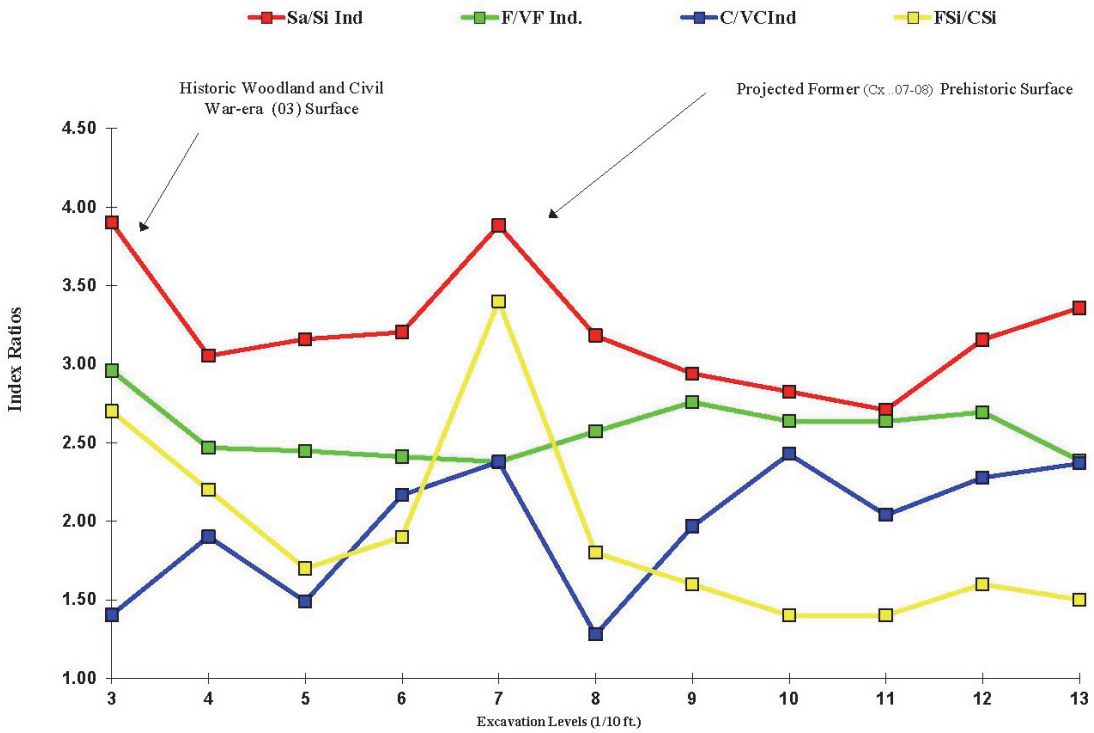

Figure 15. Line plot of changing particle size Index Ratios by depth and context subdivision levels (See Table 7).

TABLE 7: CROSS TABULATION OF CHANGING PARTICLE SIZE INDEX RATIOS BY DEPTH AND CONTEXT SUBDIVISION LEVELS (FIGURE 15).

Level	% Sand	% Clay (F)	% Silt (T)	Sa/Si Ind	(VC) Sand	(C) Sand	(F) Sand	(VF) Sand	FSi/CSi Ind	F/VF Ind.	C/VC Ind
3	74.50	6.40	19.10	3.90	9.40	13.20	28.70	9.70	2.70	2.96	1.40
4	69.00	8.40	22.60	3.05	4.10	7.80	30.10	12.20	2.20	2.47	1.90
5	69.20	8.90	21.90	3.16	4.70	7.00	30.10	12.30	1.70	2.45	1.49
6	70.80	7.10	22.10	3.20	3.60	7.80	31.10	12.90	1.90	2.41	2.17
7	73.40	7.70	18.90	3.88	2.90	6.90	32.10	13.50	3.40	2.38	2.38
8	70.00	7.70	22.00	3.18	4.30	5.50	32.40	12.60	1.80	2.57	1.28
9	68.50	8.20	23.30	2.94	3.00	5.90	32.00	11.60	1.60	2.76	1.97
10	67.80	8.20	24.00	2.83	1.40	3.40	33.50	12.70	1.40	2.64	2.43
11	66.90	8.40	24.70	2.71	2.50	5.10	31.90	12.10	1.40	2.64	2.04
12	68.80	9.40	21.80	3.16	1.80	4.10	33.40	12.40	1.60	2.69	2.28
13	71.20	8.20	21.20	3.36	1.90	4.50	33.90	14.20	1.50	2.39	2.37

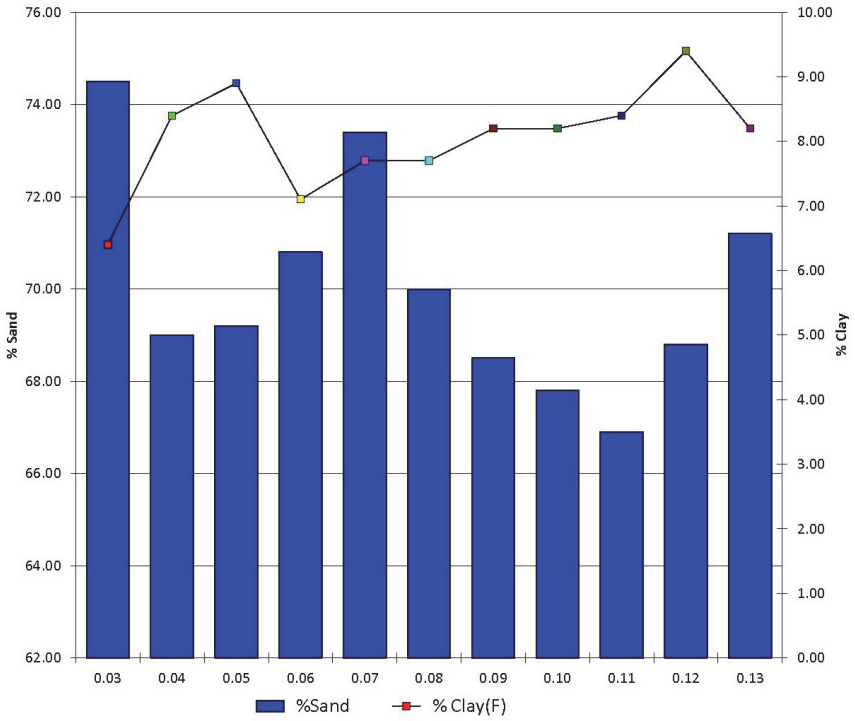

Figure 16. Haul Road site plot of changing % sand vs % clay ratios by depth (Table 7).

When plotted by depth, each of the data sets shows measureable vertical oscillations in particle size composition. The four indices of computed ratios showed either increases or drops in the relative proportions of the different size ranges at the .07 - .09 levels coinciding with a concentration of artifacts that appear to represent the remnants of an approximate former surface (.08) (Figure 15; Table 7). A second pattern of shifts occurred at the level of the uppermost formerly buried historic .03 level, which contained both Native American and historic Civil War-era artifacts and represented deposition when the Foundry settlement was being built, and before the addition of 2 ft (60.96 cm) of surface fill and gravel bedding for the late 19th - 20th century Haul Road. These identified occupation levels correlated with quantified changes in the relative percentages of clay and sand, with a decrease in the percentage of clay, and an increase in sand beginning at the .07 level of the buried prehistoric living floor (Figure 16; Table 7). Here, a second set of shifts were demarcated by an increase in the percent of sand from 69% to 74.5%, accompanied with a sharp drop in clay from 8.9% at level .05, down to 6.4% in the .03 sample from the uppermost buried surface.

Specifically, when factored together, the ratios of course to very course sand indicated two vertical shifts in the particle size sequence, at the .08 level of the buried prehistoric deposits, and at the uppermost deposits represented by the upper .03 level Civil War-era/Woodland period occupation level. These fluctuations are mirrored in reverse by the changing sand to silt ratios by depth. This data showed a sharp jump in the index at the .07 level, and a second peak at the historic .03 level. Finally, the greatest degree of change in the particle size indices was apparent with the ratio of fine versus course silts in the vertical sample columns (Figure 15; Table 7). The ratios of fine versus course silts showed two peaks, but with much higher jumps than the other categories. The shift at the .07 level jumped from 1.8 - 3.4 on the index scale, an increase of 188%. The second sharp increase in this indicator occurred between the .03 and .05 levels, which vertically overlapped with the buried historic layer containing both historic pottery and two late prehistoric Levanna points and Woodland period pottery.

The two independent particle size comparisons suggest that the series of vertically stratified past human occupations played a key part in the soil developmental history of the site. It is important to caution that although visibly apparent through enhanced scales of computer generated graphics, these

shifts are relatively minor within the larger context of the site's geomorphological history. According to Dr. Jacob, the overall data set suggests the effect of slow natural processes, which based on the particle analysis, do not appear to be inconsistent with origins from windblown sand (personal communication Feb. 12, 1993). However, Dr. Jacob noted that while the breaks in the deposits are difficult to attribute to human factors based on the particle size data alone, and despite the superficial uniformity in color and lack of ease to detect vertical stratigraphic breaks, the repeated consistency of the soil particle size fluctuations with the identified depths of the prehistoric and historic artifact concentrations, strongly suggests that the particle data, arranged according to the archaeological sequence, did in fact reflect a real and detectable series of changes in the geomorphology of the site over the last ca. 5000 years, consistent with the level of resolution provided by the application of the microstratigraphic .1 ft excavation levels.

In other words, in addition to developing slowly from natural formation processes on the bluff, the data suggest that the changing composition of the formerly near surface, 80 foot high ridge deposits found below the Civil War-era Haul Road settlement, appear to have been formed through the combined influences of both natural and human factors. In addition, and in contrast to the ca. 2 ft thick overburden and road bedding that capped the buried historic surface deposit (Cx .03) and the underlying prehistoric levels, the prehistoric strata developed gradually at a slow pace which was periodically interrupted by episodes of pre-Contact human occupation.

CONCLUSIONS

In summary, the deep winter emergency rescue excavation of the Haul Road corridor yielded a 4400 year sequence of prehistoric cultures, spanning from ca. 3000 BC to ca. the 15th century AD (and potentially 17th century AD). The prehistoric site was found buried and preserved under a modern 20th-century access road into the foundry property and beneath and among the overlying cellars and foundation trench spoils from the homes of post-1830 Civil War-era foundry workers (Grossman *et al.* 1993; Grossman 1994a, 1994b). This roughly four-and-one-half millennia long sequence of occupations spanned the Late Archaic, Transitional, and Woodland periods in Northeast prehistory. In addition to possibly representing Parker's lost site No. 4 (Figure 4), the buried site matrix was found confined and preserved in a ca. one-foot thick series of nine (cx .03 - .12) .1 ft thick sandy layers. At least two of these levels (.03 and .08) appear to represent the mixed residual (based on both artifactual and particle size) indicators of former prehistoric surfaces. The most recent lithic artifact types (Levanna projectile points) were restricted to the uppermost .03 layer, dating to the very Late Prehistoric or Contact periods (ca. 1000 - ca. 1630 AD). Several of the earliest point types (Vosburg, Brewerton, Lamoka), dating to between 2500 and 3000 BC, were concentrated in two of the deepest, .09 -.10 contexts. However, like the ceramics, these early point types were also subject to artifact drift, or physical admixture from natural (Cremeens 2003) or man-made forces. Three of the Lamoka points and one out of two Brewerton points were recovered from the .06 - .07 level and two out of three Vosburg points were recovered from the .05. - .06 level (Figure 13; Table 5). In between were sandwiched various other culturally diagnostic artifact types from a range of intervening periods.

The use of micro-stratigraphic excavation procedures, quantified artifact analysis and the inclusion of detailed particle analysis of the vertically stratified soil sequence, defined three major categories of investigation, analysis, and findings. One category consisted of quantified cross-tabulations. In addition to the use of traditional style analysis to characterize and date the lithics and ceramics of the excavated collection, the entire sample was analyzed in terms of both attributes and quantified totals of different artifact categories recovered from each arbitrary stratigraphic break in the excavation. Three dimensional plots of cross tabulations provide comparisons showing the relative prevalence of different attributes or types of artifacts per excavation level (Figures 10 - 16; Tables 1 - 7). Sharp contrasts in artifact numbers throughout the sequence indicated a number of culturally relevant shifts in occupation patterns through time. For example, the analysis of the ceramics by count (Figure 12; Table 4), suggests strongly that the prehistoric pottery was concentrated in level .05 and that the small samples from the underlying, and earlier, contexts probably represent mixture from bioturbation or human activity.

Likewise, the quantified comparisons of ceramic surface decorative techniques changed through time by depth. Nearer to the surface, within two more recent contexts (.03 and .04), the pottery decoration was identified as dentate stamped. However, with depth (.04 - .07), the identified pottery decoration shifted to cord marked or cord impressed pottery decoration (Figure 12; Table 4). Finally, the quantified comparison of worked flakes versus un-worked flakes (without microscopic edge-ware), indicated strongly that this category of scraping tool was confined to the earlier and deeper Archaic period contexts (.06 - .12). No such tools were identified in association with any of the more recent overlying contexts of the Woodland period pottery making peoples (Figure 14; Table 6).

A second aspect of the overall investigation used soil particle analysis to identify culturally relevant shifts in the relative percentages of sand, silt and clay by excavation level (n=13). When these ratios were plotted against excavation levels, the data showed significant vertical oscillations in soil particle size fractions by depth (Figures 15, 16; Table 7). These shifts in particle size index ratios correlated with what are projected to have been at least two former living surfaces, excavated as contexts .03, and .08. Context .03 was a formerly exposed surface in the Woodland and Civil War-era historic period. Context .08 was flagged as a buried living surface because of the presence of a diversity of artifacts as well as a hearth and other features.

A third contribution derived from the use of micro-stratigraphy. The results of the analysis of the diagnostic and datable artifacts, in this thin .9 ft thick arbitrary levels, suggest that despite the deceptive visual uniformity in the color of the vertically superimposed and thinly laminated sands, silts and clays, and despite clear evidence of admixture between the various deposits, the multi-component site did indeed exhibit clear evidence for the presence of chronologically relevant breaks within the multiple deposits. This micro-stratigraphic evidence in turn indicates that some commonly applied techniques of excavation, specifically the use of relatively thick .5 ft or 10 cm. arbitrary levels, would have resulted in the loss of significant diachronic stratigraphic and cultural evidence. Such an excavation approach using thick levels would have obliterated the micro-stratigraphic distinctions, further mixing Archaic with Woodland period occupation deposits, and leaving the impression of no apparent cultural or soil stratigraphy at the site. As an end note we suggest that where previous disturbances cannot be documented, the use of small arbitrary excavation levels can be used to identify culturally relevant changes in the sequence.

As a final issue, it is pertinent to address any potential recommendations that can be made as a result of this investigation. While recommendations for future work at the site are impossible because it was destroyed as part of the project mitigation and remediation process, methodological recommendations can be made. Four aspects of the investigation warrant serious consideration when evaluating the approach for other sites with similar conditions and levels of preservation. Four techniques were used in the data recovery and analysis phases of the project: the use of micro-stratigraphic .10 ft. excavation levels; 3D quantification; particle size analysis; and, traditional stylistic analysis of artifacts. The results documented the critical import of using micro-stratigraphic excavation levels to distinguish chronologically significant breaks in the physical sequence, even where culturally and chronologically relevant changes in stratigraphy may not be visible. The 3D plots of excavated materials provided insights into the diversity and distribution of excavated artifacts. The implementation of particle analysis provided an independent line of data to aid in the definition of difficult to see stratigraphy, manifested by the shift in the relative percentiles of sand, silt and clay in each excavation context. Finally, the investigation used basic stylistic analysis to describe and compare the recovered artifacts with those from other regions. All are now standard procedures, but ones that illustrated their utility for providing a viable analytical framework, even in the context of a deep winter HAZMAT rescue excavation.

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