WHY HERE? SETTLEMENT, GEOARCHAEOLOGY, AND PALEOENVIRONMENT AT THE WEST BERKELEY SITE (CA-ALA-307)

CHRISTOPHER D. DORE, STEPHEN BRYNE, MICHAEL MCFAUL, AND GARRY L. RUNNING IV

During 2001, in an attempt to define the spatial boundaries and condition of the archaeological deposits that constitute the West Berkeley Site (CA-Ala-307), a systematic sample of sediment cores was taken throughout the streets of Berkeley. While these cores allowed the three-dimensional boundaries of disturbed and undisturbed deposits to be delineated, they also provided new data on the natural setting of this prehistoric settlement. This paper presents the geoarchaeological and paloenvironmental data, presents an environmental reconstruction of the mouth of Strawberry Creek, and infers the reasons that this location was the location-of-choice for the early settlers of San Francisco Bay.

Until recently, many of the large, once mounded archaeological sites that ring San Francisco Bay were thought to have been destroyed. Over the last five years, archaeological detective work and subsurface probing have revealed that these sites have not been destroyed and in some cases, retain substantial integrity. This has caused cities and other agencies responsible for environmental compliance, as well as archaeologists, to rethink an archaeological record that hasn't been seen since the World War II urban expansion of the Bay Area. This paper presents the story of the West Berkeley Site (CA-Ala-307).

The West Berkeley Site is thought to have been a multi-function habitation site occupied relatively continuously from 3030 B.C. to A.D. 780. It is the type-site for the Early Horizon, Berkeley Facies (as defined by Elsasser 1978:37-41 and suggested by Wallace and Lathrap 1975:57) and has been recommended as eligible for listing in the National Register of Historic Places under each of the four eligibility criteria (Dore *et al.* 2002). It currently is thought to be the earliest major settlement on the edge of San Francisco Bay following the Bay's Holocene filling.

The West Berkeley Site once was a well-known landmark, first to mariners navigating San Francisco Bay (Figure 1), and then to East Bay residents as the cities of Ocean View and Berkeley grew up around it. Many newspaper references indicate that the site was a part of the everyday life of citizens. Unfortunately, most of these citizen activities contributed to the degradation of the site as it was used for a recreational setting, location of "treasure hunting," commercial fill source, and obstacle for industrial growth. The site was the subject of archaeological excavations in 1902, 1904, 1950, and 1954…the time when the cultural deposits above the contemporary grade were finally removed.

While the exact location of the impressive 6.1-meter high mound once was well known by archaeologists and the public alike, the knowledge of this location gradually faded as the neighborhood landmarks were modified and replaced. The archaeological projects of the 1950s did draft detailed maps of the mound, topography, and placement of archaeological excavation units. The reference data that were used, however, were corners of buildings that were destroyed during the early 1950s and these maps, while well known, could no longer be placed in the correct city block. An earlier site sketch map made by Nels Nelson in 1910 did reference city streets and gave precise measurements for site dimensions. The existence of this map, however, was not known and was only recently discovered in old archival files. It was only in the late 1990s with the development of geospatial technologies that the old maps could be referenced to the present using historic aerial photographs as linking documents. This process reestablished the exact location of the West Berkeley Site (Pastron 2000:Appendix 2), or at least the mounded portion of the site.

While the spatial location of the mound was once again known, questions still remained about the extent and boundaries of the site. Since the archaeological

Christopher D. Dore, Statistical Research, Inc. & University of California, Berkeley, cdore@sricrm.com
Stephen Bryne, Garcia and Associates, sbryne@garciaandassociates.com
Michael McFaul, LaRamie Soils Service, Inc., geomorph@laramiesoils.com
Garry L. Running IV, University of Wisconsin & LaRamie Soils Service, Inc., running1@uwec.edu

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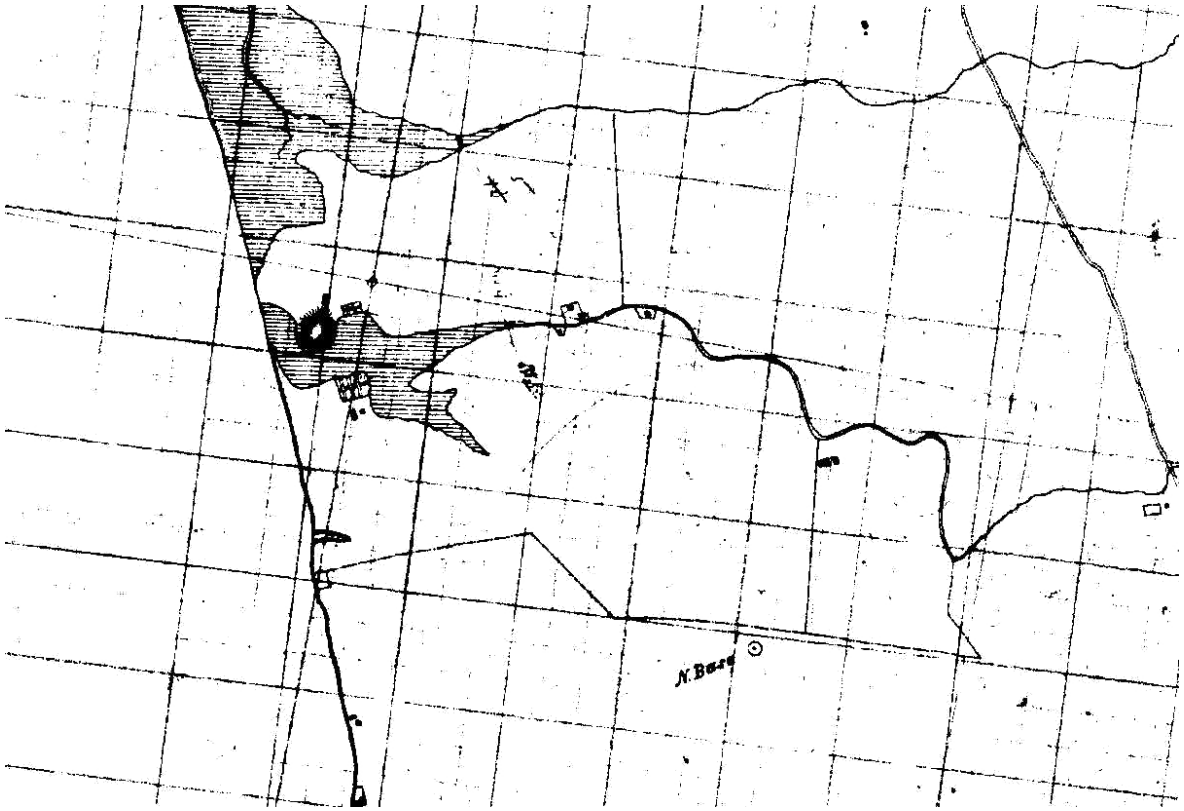

Figure 1: 1852 Coast Survey map showing the mound of the West Berkeley site and the mouth of Strawberry and School House creeks.

excavations at the site during the first half of the 20th century focused primarily on chronology, little attention was paid to areas away from the mound. Prior to the study discussed here today, the only source of site boundary information came from Nelson's 1910 sketch map (Nelson 1910). This map did show, and differentiate, between the boundary of the mound and the boundary of the site that was shown covering an area of approximately 2.5 square blocks. While Nelson's spatial data are important, they are problematic in that the criteria he used for boundary determination were not specified. It appears, too, that he was hindered in defining a western site boundary by the lack of property access (Sanborn Fire Insurance Company 1909).

Given planned infrastructure projects in the site vicinity by the City of Berkeley, determining the extent, depth, and integrity of the remaining cultural deposits was a critical fist step in meeting California and federal environmental laws. In 2001, the City of Berkeley contracted with Garcia and Associates to assist in the compliance process and, in turn, Garcia and Associates consulted with Archaeological Mapping Specialists (now Statistical Research) for geospatial support and LaRamie Soils Service for geoarchaeological expertise.

METHODS

Given the urban setting of this site and the lack of virtually any unpaved land surface, simple archaeological questions of extent and depositional integrity required distinctively urban methods. The project area consisted of a grid of 17 linear blocks and work was limited to public streets. A systematic sediment sampling program was designed to identify anthropogenic sediments in the project area and, if found, to determine their depositional context.

A total of 124 sediment cores were attempted in the project area during the summer of 2001. Cores were spaced at an approximate systematic interval of 25 meters. This distance was based upon inferences regarding the size of prehistoric and historic sites in the vicinity of the project area as determined by Nelson (1910), Busby and Bard (1978), Chavez (1989), Pastron (2000), and Tremaine (2000a, b). The amount of infrastructure under city streets necessitated

deviating slightly from the idealized 25-meter interval to avoid obstructions. Of the 124 cores attempted, a total of 96 cores produced data on the natural and cultural sediments below the road.

Cores were extracted with a trailer-mounted, piston-driven, Giddings Soil Sampling device (Figure 2). To penetrate the concrete, asphalt, and road base materials overlaying sediments, a 4-inch auger was used. When the softer sediments were reached, the auger was exchanged with a 2-inch core capable of extracting intact sediment columns. The deepest core reached a depth of 7.5 meters below street level and served to provide a baseline vertical context for subsequent cores. Most cores were in the 1-3 meter range and were terminated when Pleistocene sediments were reached or when an obstruction prevented penetration.

When cores were extracted, basic stratigraphic relationships were observed and recorded. Then, sediments were removed from the core tube and recorded in detail. When soil scientists had finished recording the cores, archaeologists divided the sediments by strata and screened them through ¼-inch hardware cloth to identify artifacts and ecofacts within sediment strata. All artifacts and ecofacts were counted and described; they were photographed if they had special diagnostic traits. All artifacts, ecofacts, and natural sediments were replaced into the cores, compacted, and topped with clean sand. Following the extraction of the cores, the holes were surveyed to a horizontal accuracy of 30 centimeters using the global positioning system.

Figure 2: Field data collection.

RESULTS

Thirty-three cores contained prehistoric period cultural sediments attributable to the West Berkeley Site (Figure 3). Of these, 16 are interpreted as being in undisturbed contexts. An additional 17 cores have cultural deposits that are interpreted as being in a disturbed, or secondary deposit. These cores occurred in the same general area as did the cores containing undisturbed deposits.

Eleven of the cores with *in situ* cultural deposits are clustered into two groups of four and seven adjacent cores. This clustering indicates that, in some areas, primary cultural deposits are still present spanning distances of over 100 meters. Interestingly, the polygon that encloses all cores with primary deposits matches almost exactly the site boundary defined by Nelson in 1910. Cultural deposit thickness ranges from as thin as seven centimeters to as thick as 60 centimeters with the minimum depth below the modern road surface being no less than approximately 60 centimeters.

While our study was successful in defining primary and secondary cultural deposits in space, the most interesting finding came from the sedimentological data collected below the archaeological deposits. These data provided an opportunity to explore the spatial environment of the site's location prior to human settlement approximately 5,000 years ago. Why was this location chosen for one of the first villages at the edge of the newly formed San Francisco Bay?

GEOARCHAEOLOGICAL MODEL

The West Berkeley site is located at the modern edge of San Francisco Bay adjacent to, and perhaps spanning, the mouth of Strawberry Creek. Strawberry

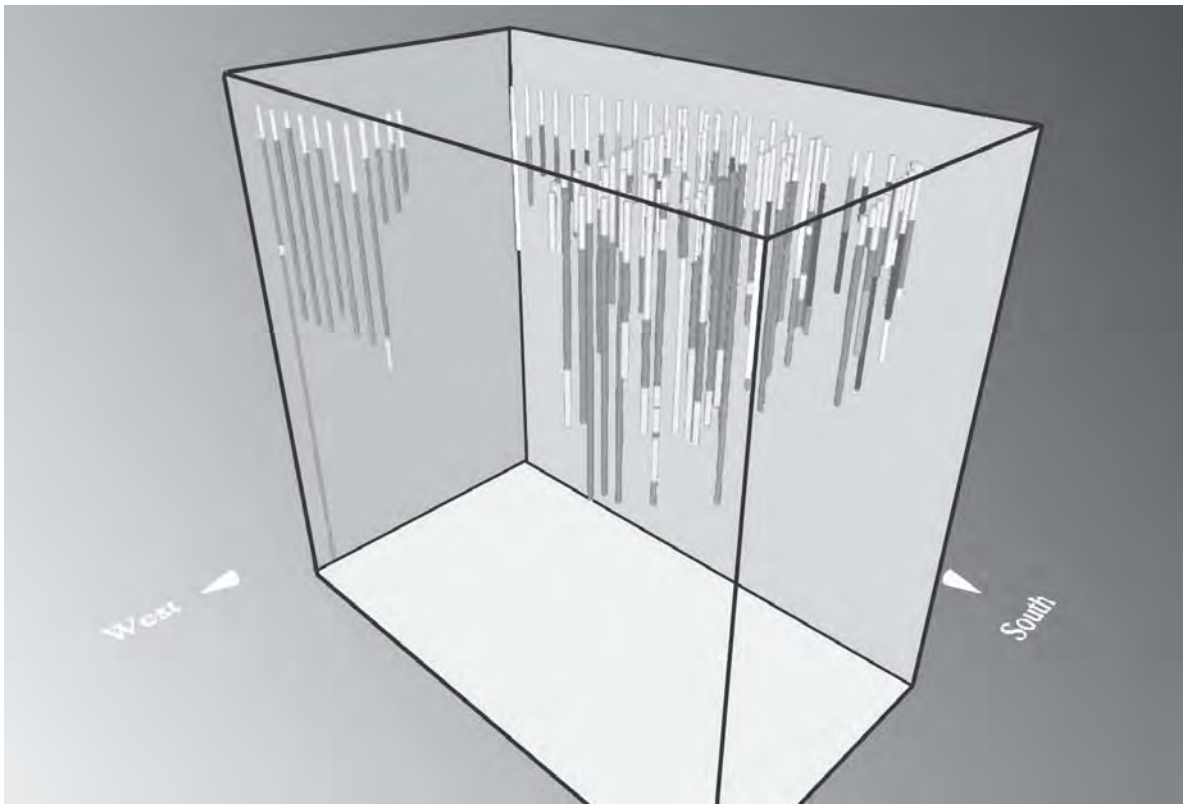

Figure 3: Core results.

Creek is a spring-fed perennial stream the flows from the Berkeley Hills to the Bay, and prior to the formation of the Bay was a tributary of the Sacramento River. The Berkeley Hills formed by Pleiocene uplifting approximately three million years ago. Erosion from the hills during the Pleiocene and into the Pleistocene formed large fan and bajada aprons at the foot of the hills.

The oldest deposit found during sediment coring is a terrestrial fan alluvium (San Antonio Formation, upper member). Transported from the Berkeley Hills down the School House and Strawberry Creek drainages, the alluvium coalesced to form a low relief bajada. Fan deposition was followed by the development of an argillic paleosol. The results of previous geologic investigations (Radbruch and Case 1967; Louderback 1951) and the strength of the argillic soil suggests that this paleosol and its host fan alluvium are Pleistocene in age.

Following the formation of the bajada, the drainage responded to the sea level lowering by cutting a channel into the bajada that may have been 10-20 meters deep in the site vicinity. Today, we tend to think of Bay Area streams as narrowly defined and channeled. However, the Pleistocene Strawberry Creek braided its way down the arroyo bottom cutting many different channels. The edges of Strawberry Arroyo can still be seen today in the streets of Berkeley as subtle, but distinct, topographic features.

Middle Holocene sea level increases subsequently flooded the arroyo creating a deep estuary overlooked by banks cut into the bajada. Cultural deposits from this period are found resting upon the terrestrial argillic paleosol that developed on the bajada. This alluvial surface probably corresponds with the submound surface described by Wallace and Lathrap (1975) for the excavations conducted during the 1950s (Table 1). This context also is consistent with the surface—a marine variant of the terrestrial alluvial surface—found underlying cultural deposits by Pastron during the auguring of the interior of one block in 1999 and 2000 (Pastron 2000). Since auguring destroyed the sediment and shell bedding of cultural deposits, Pastron was unable, in most samples, to conclusively address the primary/secondary distinction. We now believe, however, that the cultural deposits found by Pastron are in a primary setting.

Sea levels greatly stabilized during the middle Holocene but smaller fluctuations continued during the middle and late Holocene periods. Parts of the

<table>
<tr><th>This Study[3]</th><th colspan="2">Pastron (2000)</th><th colspan="2">Radbruch and Case (1967)</th><th>Wallace and Lathrop (1975)</th></tr>
<tr><td>U1</td><td colspan="2" rowspan="2">Stratum 1</td><td colspan="2">Qaf</td><td rowspan="8">Qu</td><td rowspan="2">Disturbed powdery zone</td></tr>
<tr><td>U2</td></tr>
<tr><td>YA_s</td><td colspan="2">Not observed[2]</td><td>Qtc</td><td rowspan="2">Qt</td><td>Not observed</td></tr>
<tr><td>YA_b</td><td colspan="2">Stratum 2</td><td>Qts</td><td>Darker zone with cultural materials</td></tr>
<tr><td>BM_s</td><td colspan="2" rowspan="3">Stratum 4</td><td colspan="2">Qm</td><td rowspan="2">Not observed</td></tr>
<tr><td>BM_n</td><td colspan="2" rowspan="2">Qbm</td></tr>
<tr><td>BM_o</td></tr>
<tr><td>OA_g</td><td rowspan="3">Stratum 2 if culture bearing</td><td rowspan="3">Stratum 3 if sterile</td><td colspan="2" rowspan="3">Qsu</td><td>Underlying clayey material</td></tr>
<tr><td>OA_{AB}</td><td rowspan="2">Yellow alluvium</td></tr>
<tr><td>OA</td></tr>
</table>

Table 1. Soil/sediment unit correlations[1]

Notes:

[1] These correlations are based on our interpretations and do not necessarily reflect the intent of the original authors, nor can we be certain our correlations are correct.

[2] "Not observed" is not meant to imply incomplete observations on the part of other authors. Rather, we acknowledge that the scope, methods, and specific objectives of our research varied from that of previous authors and direct correlations across all of them may not be appropriate.

[3] Though all our soil/stratigraphic units were not observed in any single core, we present them in stratigraphic order, youngest to oldest, in the leftmost column.

bajada were inundated up to the +3 meter elevation mark that today is found between 3rd and 5th Streets in the project area—at a higher elevation than the West Berkeley Site.

During the late Holocene, a second alluvial unit began to accumulate on the argillic paleosol surface and in the estuary. In some places this alluvial material covers cultural layers; in one sediment core, cultural layers are found both below and above the alluvium. Wave erosion during the late Holocene shaped the Bay shore by forming cuts in the older alluvial fan that are still visible in places despite being covered with the late 20th century urban fabric.

Historic period changes to the area came quickly as evidenced by a variety of historic maps. Between 1852 and 1859 substantial portions of Strawberry Creek's estuary were filled. By 1874, the creek itself had been channelized. The once undulating landscape of alternating arroyos and ridges had been cut and filled into a much more level surface.

DISCUSSION

The long period of occupation at the West Berkeley Site makes settlement, occupation, and abandonment arguments difficult to correlate with factors of the natural environment[1]. During occupation, fluctuations in sea level above and below the elevation of the settlement took place. Occupation persisted through periods of heat, cold, wet, and dry. Rainfall, too, fluctuated dramatically as measured by salinity levels. Faunal assemblages suggest an environmental change from a rocky to a muddy near-shore setting in the site's vicinity. For example, the Pacific oyster (*Ostrea lurida*) constituted approximately 50 percent of the molluscan remains in the lower levels of the West Berkeley Site while the upper levels of the site are dominated by Bent-nosed clam (*Macoma nasuta*) (Greengo 1975:67). Since oysters favor gravel bottom conditions and clams favor mud flats, this has been interpreted as evidence of environmental change (Greengo 1975:67). This change may have resulted from the episode of late Holocene alluvial deposition visible in the sediment cores.

If explanations can't come from these environmental factors, where do we look for answers to why this was the Bay's first major settlement and why it was occupied for such an extensive amount of time? We believe that it is the uniqueness of this particular environmental setting that made the occupational history of the West Berkeley site so different from other village locations. While it is true that many of the sites that ring the Bay are found adjacent to perennial streams, Strawberry Creek doesn't appear to be like other streams. The presence

of the deep water estuary formed from Strawberry Arroyo, immediately adjacent high ground, and a location directly across from the Golden Gate[2] may be the factors that made this location the location of choice leading to the establishment of one of San Francisco Bay's first settlements, the development of an estuary adaptation, and allowing for nearly 4,000 years of continuous occupation.

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Endnotes

[1] *Note, however, that the abandonment of the site does correlate with the abandonment of at least four other Bay Area sites and a change to drier conditions (Ingram 1998). Other factors must have been operation in concert with this environmental change, though, since other sites continued to be used after this change and since periods of equal dryness occurred at other times during the occupation history of the West Berkeley Site.*

[2] *It has been speculated that this less sheltered area directly across from the Golden Gate may have had a greater than average occurrence of off-shore marine mammal traffic and on-shore wash-ups. Was this the reason that in 1772 Pedro Fages noted the peculiar lack of settlements and large numbers of grizzly bears in the Berkeley area of the East Bay (Brown 1994:14)?*

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