

How we made the maps

By Chris Walker



Map 1 - 1856 US Coast Survey



Map 2 - 1856 US Coast Survey registered to Open Street Map, with landmark and historical resource boundaries.

We started with a map that was presented by Morrison and Foerster, the lawyers for Blake Griggs Properties, the developers who are proposing to build 260 apartments and 28,000 square feet of retail on the West Berkeley Shellmound Landmark site at 1900 4th Street in Berkeley.

In the lawyer’s letter defending the Draft Environmental Impact Report, the following map appears as Exhibit C.



Map 3 - Exhibit C - Comment letter from Morrison and Foerster, 1900 Fourth Street Project Draft Environmental Impact Report.

This map shows two mounds indicated as hatched circles on either side of the Spenger’s parking lot. What is unique about this map is that it has historical line work superimposed on a modern street grid. This map was created by the U.S. Geological Survey (USGS) in 1957, with the exception of the orange rectangle that was added by the developer to indicate the 1900 4th street project site.

1957 U.S. Geological Survey Map



Closeup



Approximate boundaries of former shores, ponds, tidal flats, and streams now filled or concealed
After unpublished U. S. Coast and Geodetic Survey planetable sheets nos. XXIV and XXV, U. S. Coast Survey, San Francisco Bay, Calif., 1856.

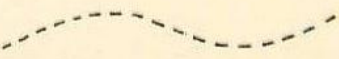
Area of old tidal flats
After U. S. Coast and Geodetic Survey planetable sheets listed above, 1856.

Site of former Indian shellmounds
Approximate outlines after U. S. Coast and Geodetic Survey planetable sheets listed above, 1856.

Legend from the 1957 USGS Map

Blue lines show the 1856 historical overlay that is printed on the 1957 USGS map.

In the legend of the 1957 U.S. Geological Survey map, the boundaries of the former shorelines, the streams, the tidal flats, and the Indian shellmounds, are indicated as being referenced from an entirely different map, specifically the “**U. S. Coast and Geodetic Survey planetable sheets nos. XXIV and XXV, U. S. Coast Survey, San Francisco Bay, Calif., 1856.**”

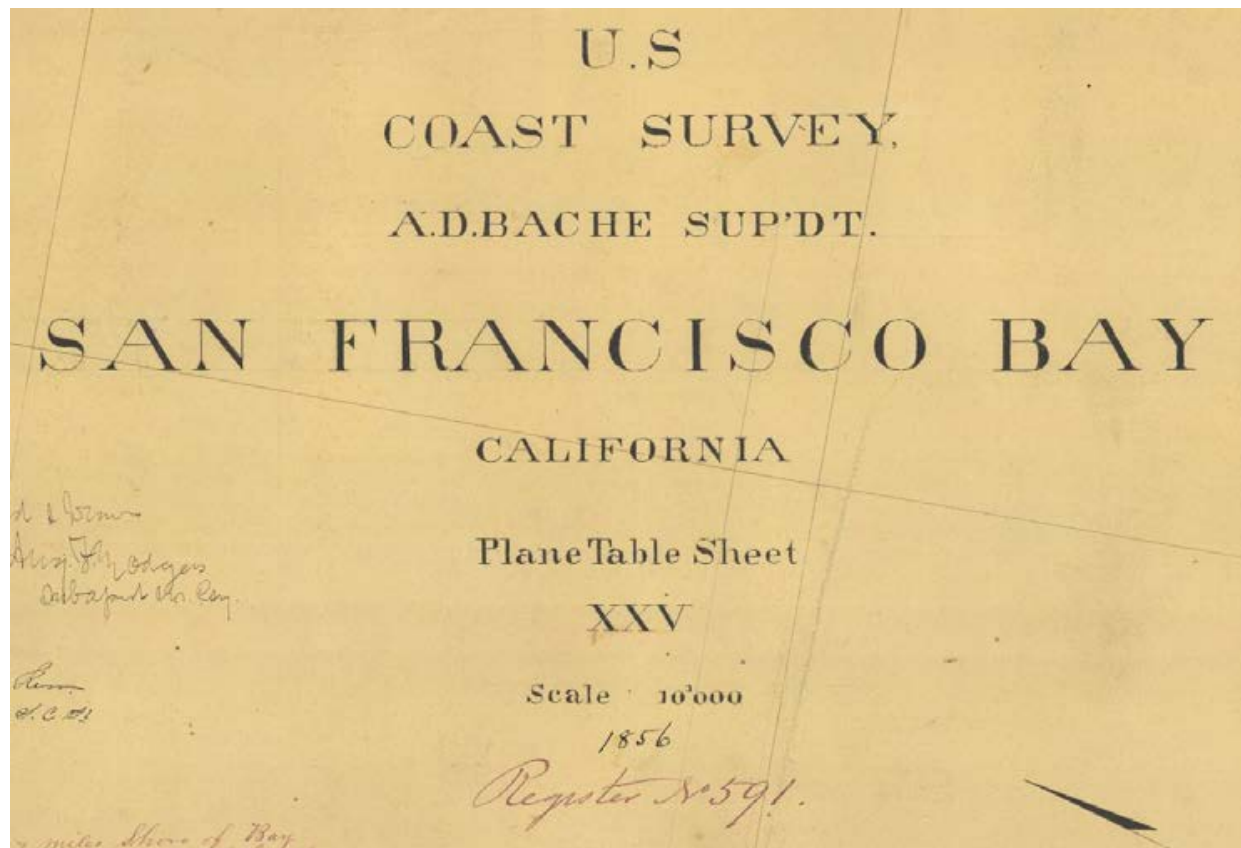


Approximate boundaries of former shores, ponds,
tidal flats, and streams now filled or concealed
*After unpublished U. S. Coast and Geodetic Survey planetable
sheets nos. XXIV and XXV, U. S. Coast Survey, San
Francisco Bay, Calif., 1856.*

From the Legend on the 1957 USGS Map.

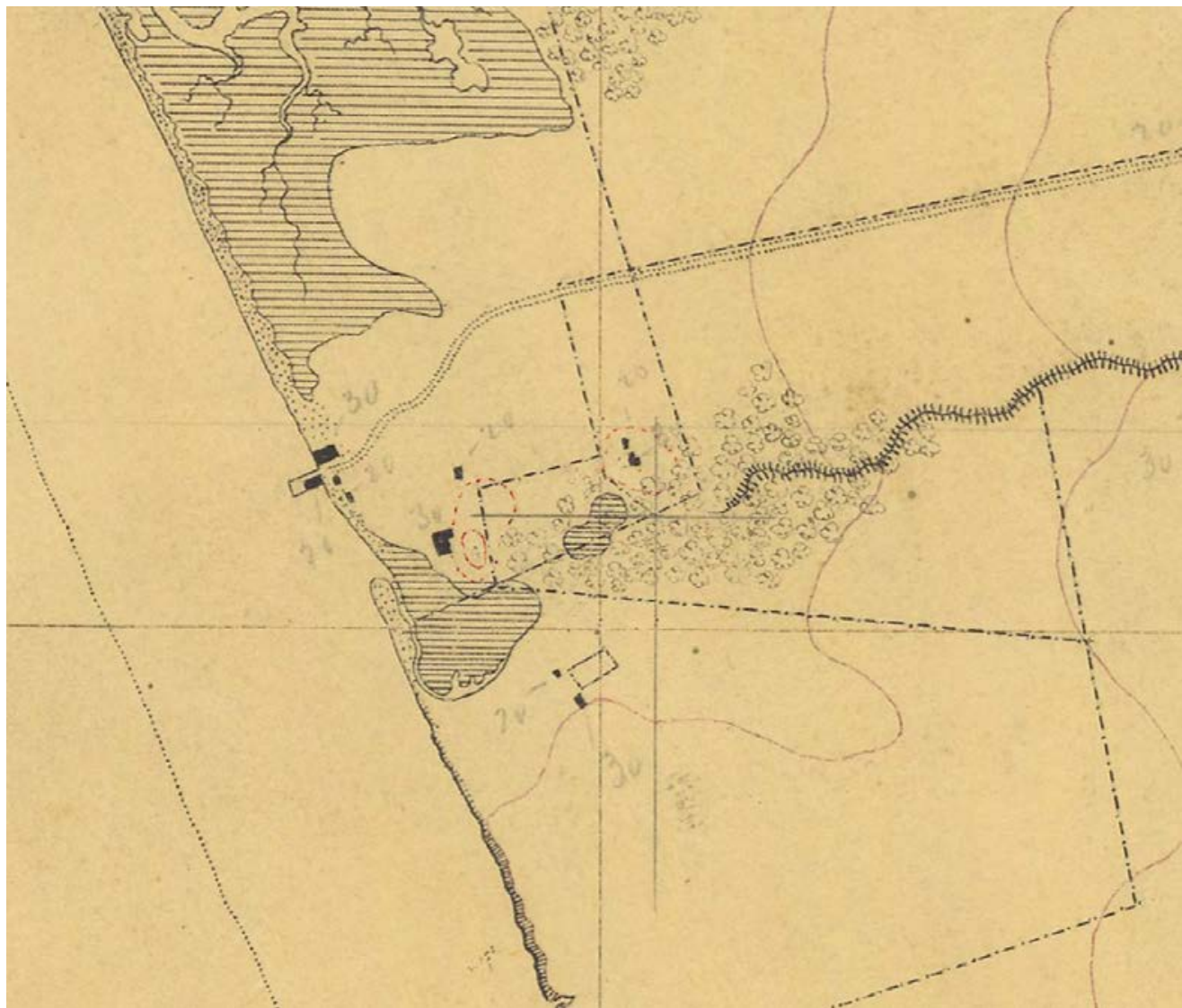
Everything that we were interested in — The Shellmounds, the Original Shores, Ponds and Tidal flats — had been superimposed onto this new 1957 map from another, older, unpublished US Coast Survey Map from 1856.

I found a clean digital copy of the 1856 U. S. Coast Survey at the National Oceanic and Atmospheric Administration (NOAA) historic maps library. The technical name for this map is T-sheet 591 (“T” for Topographic).



Title section of the 1856 US Coast Survey map.

The 1856 Coast Survey source map includes significant details that do not appear in the 1957 USGS Map shown on page 2 and 3 above. The shellmounds actually have topographic lines on them, and they are surrounded by a riparian landscape along Strawberry Creek. The detailing of the peninsula at the mouth of Strawberry creek is more clearly defined. And spot elevation data is written in pencil for the early structures.



Map 4 - Detail of the 1856 US Coast Survey Map.

I inserted this recently recovered “unpublished” source map back into the 1957 USGS map, creating the map that appears on the next page.



Map 5 - When the shellmounds (in yellow) from the 1856 map are superimposed onto the 1957 USGS map, you can see that the westerly mound significantly overlaps the Spenger's parking lot in the northwest corner.

Here is the process I followed to create the 15-map sequence of the history of this site:

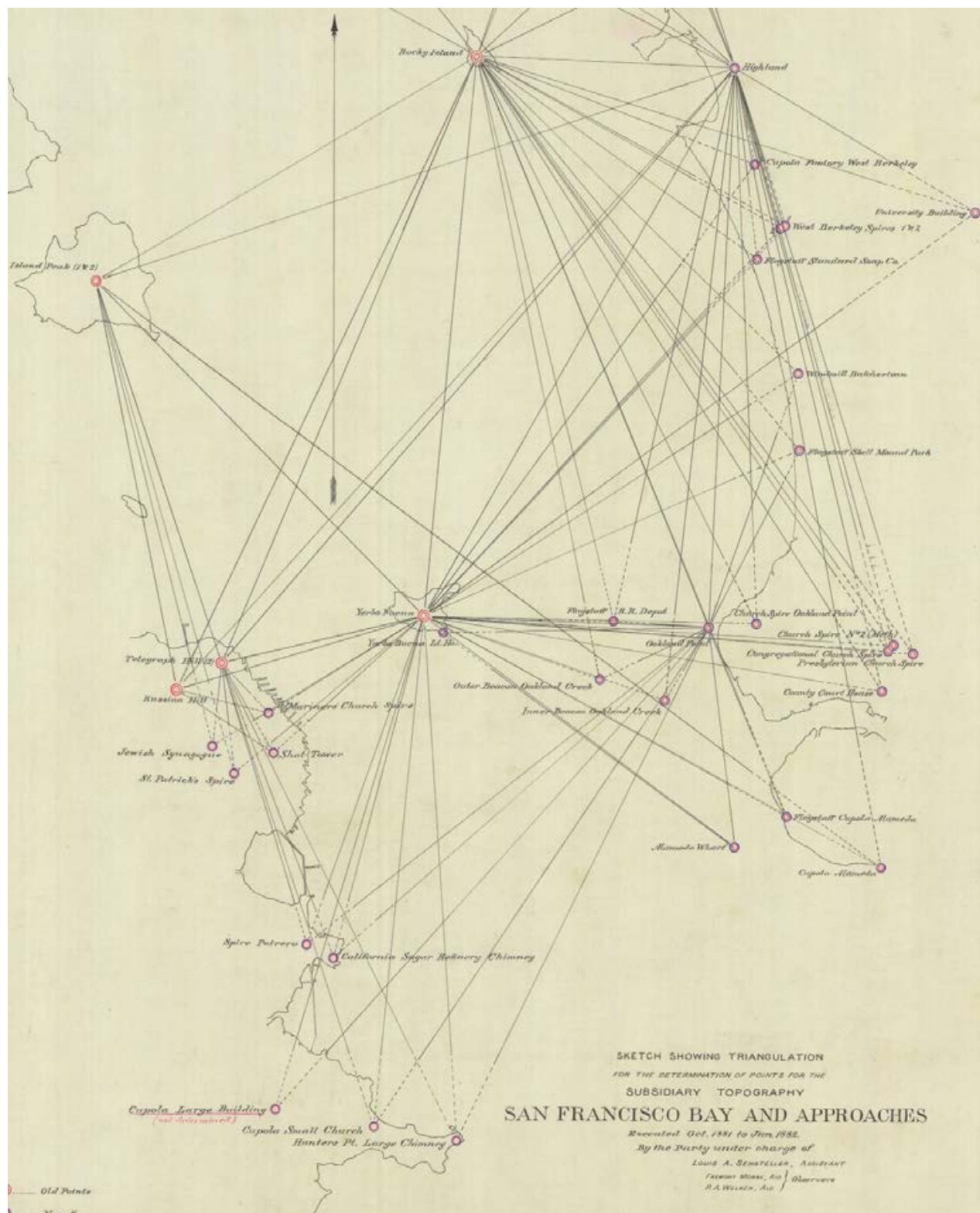
To achieve the highest accuracy possible for registering these maps to one another, a wide set of landmarks were identified in common to each map. The further these landmarks are away from each other, the more accurate the rotational and spatial registration will be. In this case, I identified landmarks from Fleming Point in the north, to the Emeryville Shellmound in the south, and several landmarks in-between. (See Map 7 below.)

I used three frames of reference for landmarks;

- 1) The landmarks that the surveyors used in 1856.
- 2) The Coastline, Creeks and Roads.
- 3) The local landmarks closest to the site, specifically, Jacob's Landing and Railroad Spur, and the small peninsula comprised of alluvial deposition that had built up at the mouth of Strawberry Creek.

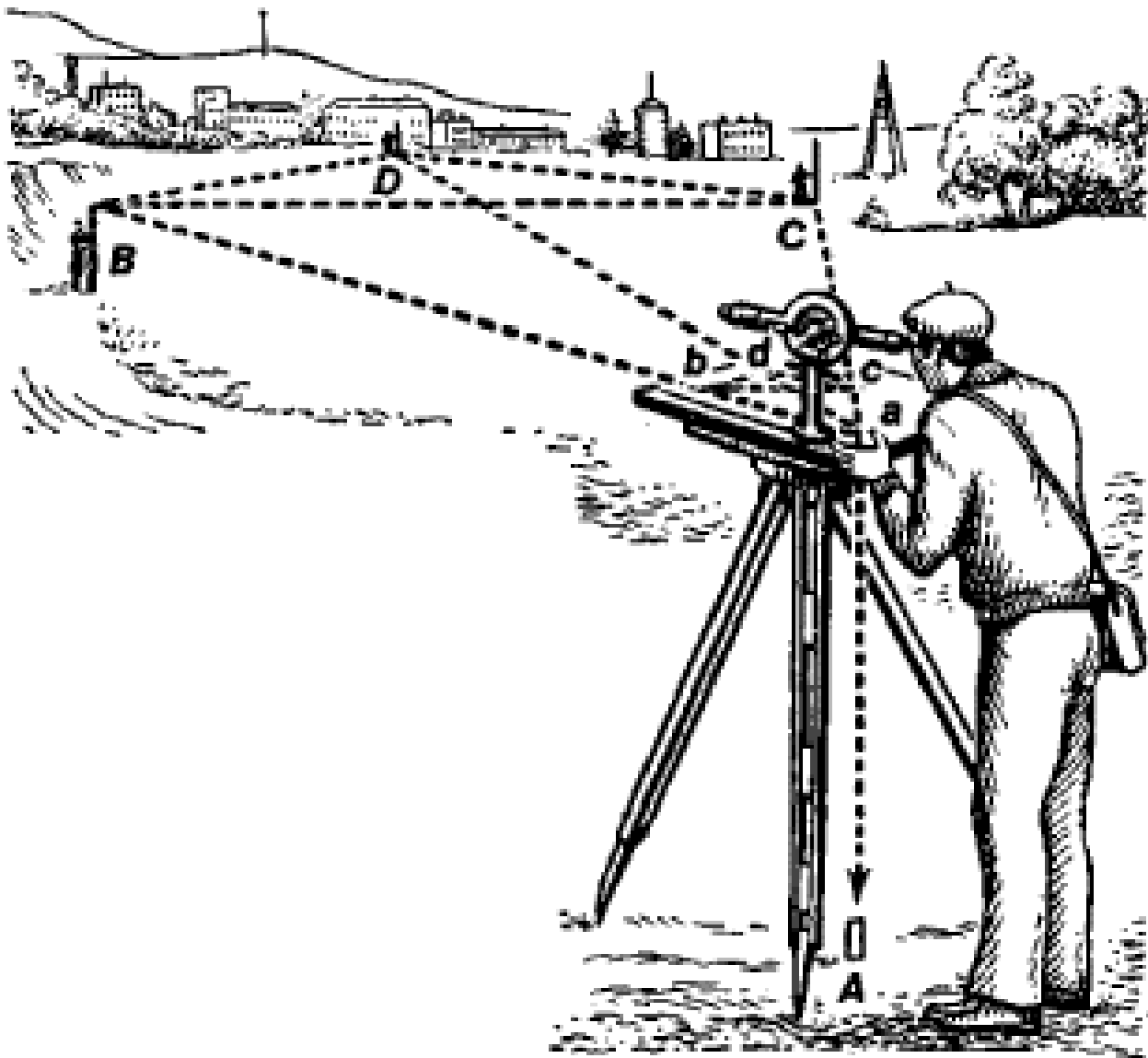
Surveyors' Landmarks

The U.S. Coast Survey map makers used recognizable high points and monuments in the landscape as surveying base stations for triangulating positions and distances. These base stations were measured against each other to create highest possible degree of accuracy.



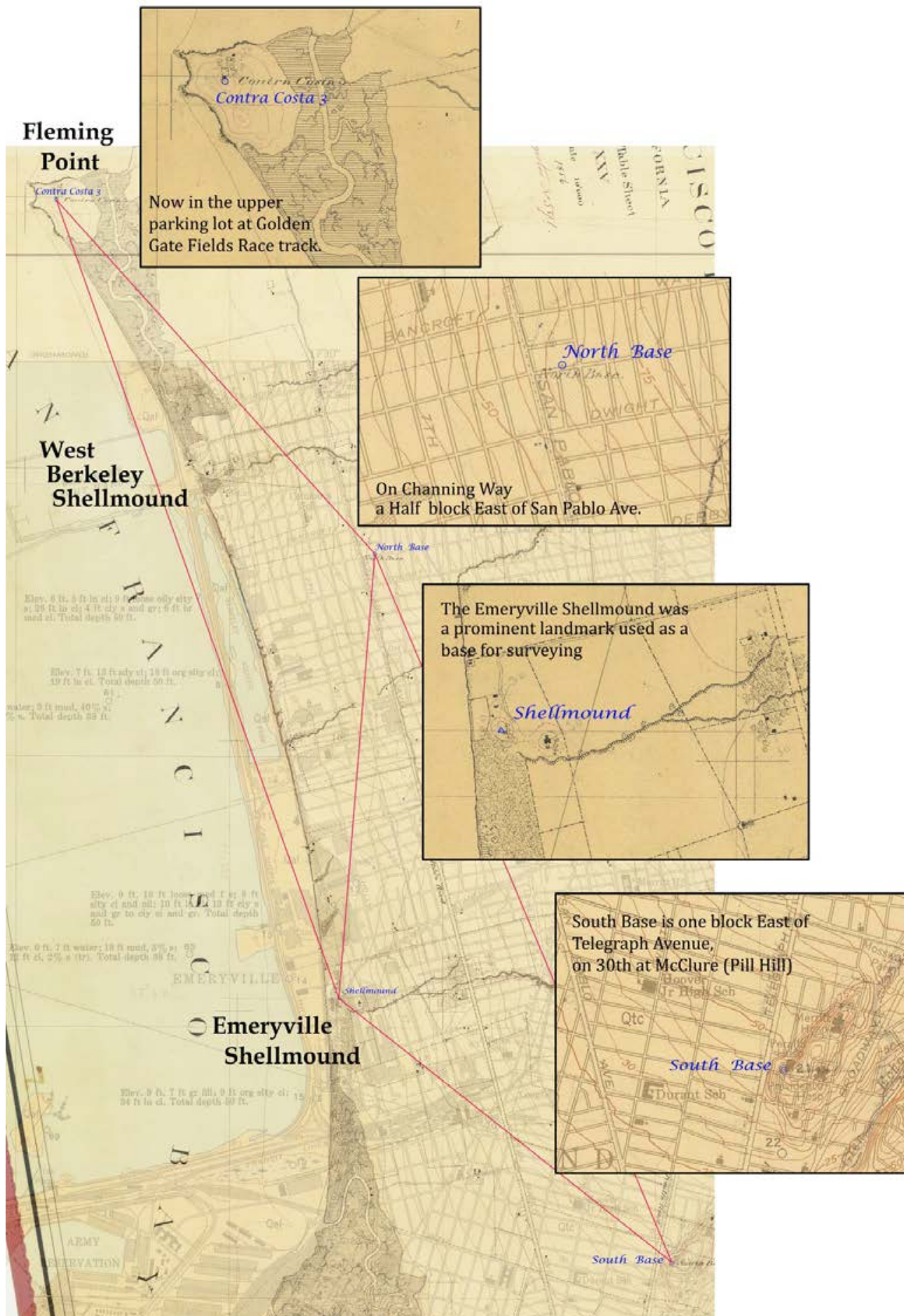
Map 6 - Triangulation map of the San Francisco Bay, 1882

The triangulation map above was created in 1882, at a time when surveyors were using prominent industrial features such as spires and smokestacks as well as geographic features, such as the top of Yerba Buena Island, as reference points for their trigonometric calculations.



The accuracy of these early coast surveys is comparable to modern mapping techniques. As quoted in *Triangulating Archeological Landscapes* by Scott Byram (page 17): “The triangulation from the Pulgas Base (35 miles south of San Francisco) to the Yolo base exceeded its true length by .35 meters, a difference which is equivalent to about 1/50,000 of the actual length.”

In other words, a measurement between the two bases was so accurate that the error was one foot across 10 miles.

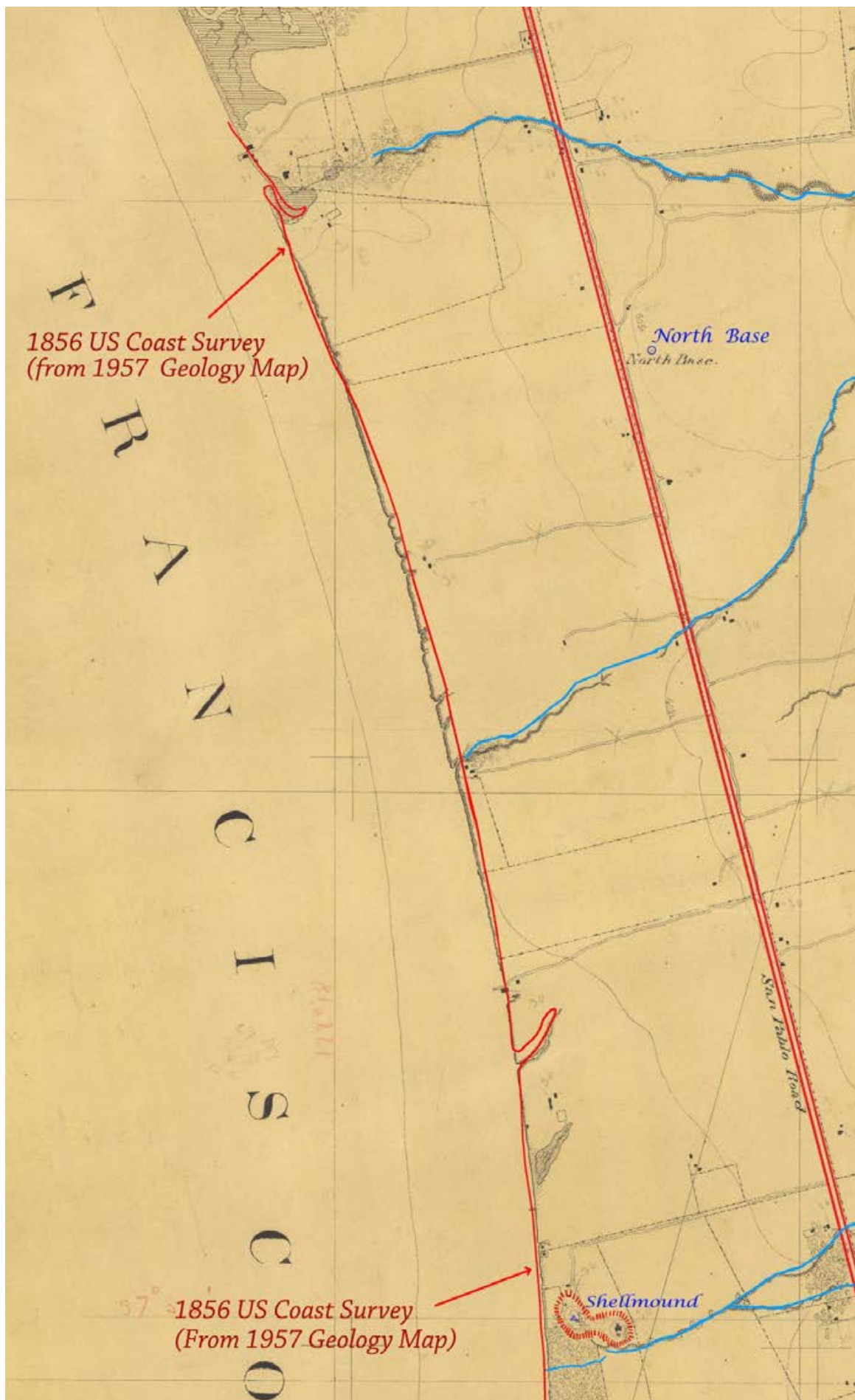


Map 7 - The map above shows the 1957 US Geological Survey (the Developer's exhibit) with the 1856 T-sheet registered, at 50% transparency, with close-up insets of each of the four base stations used as landmarks.

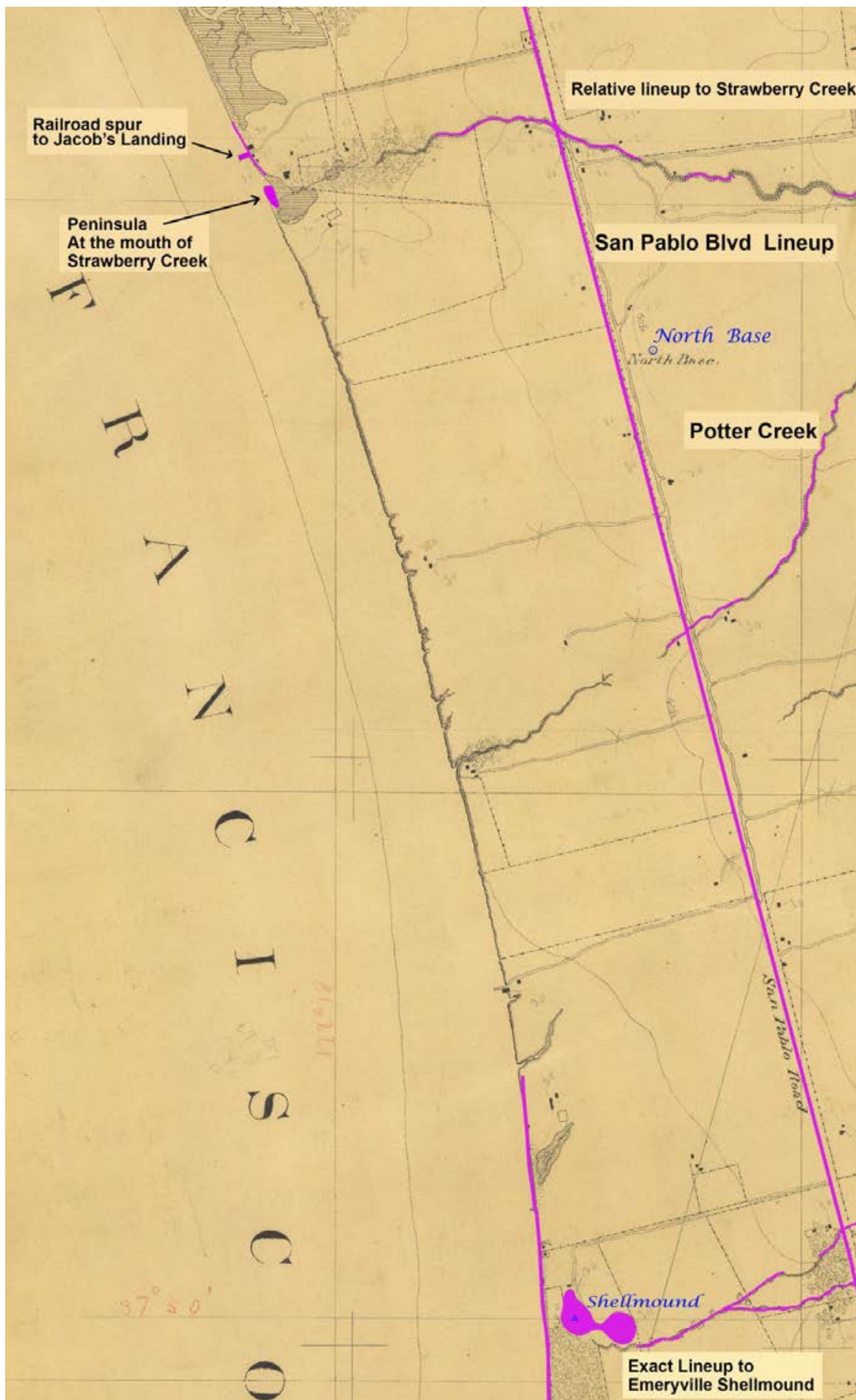
The Coastline, Creeks and Roads



Map 8 - The 1957 US Geology Survey with, The Coast line, The Creeks, and San Pablo Blvd. highlighted.



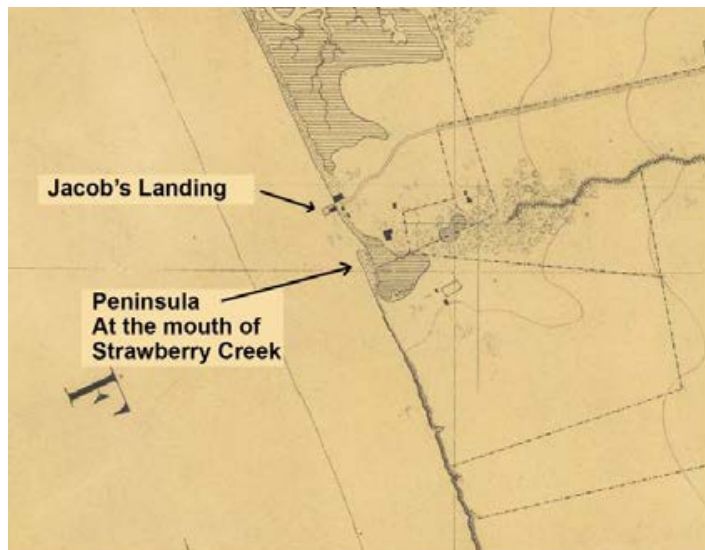
Map 9 - The same landmarks from the 1957 USGS map above, superimposed onto the 1856 US Coast Survey.



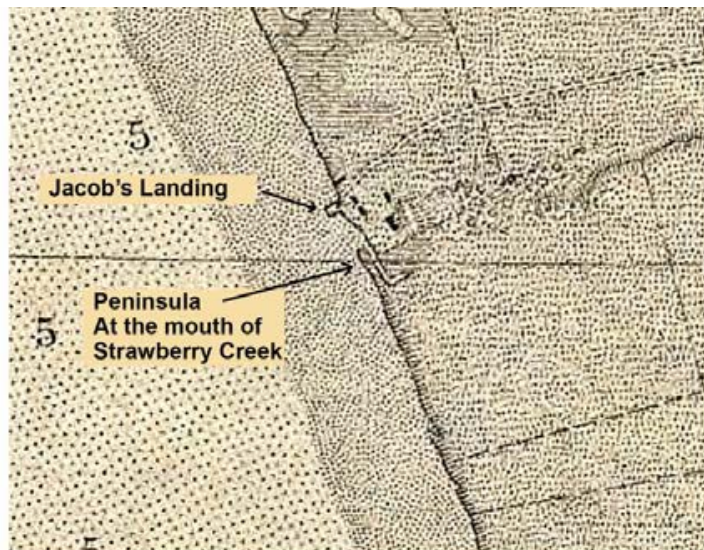
Map 10 - The coincidence of landmarks highlighted in pink, between the 1957 US Geological Survey map and the 1856 Coast Survey map.

Local Landmarks

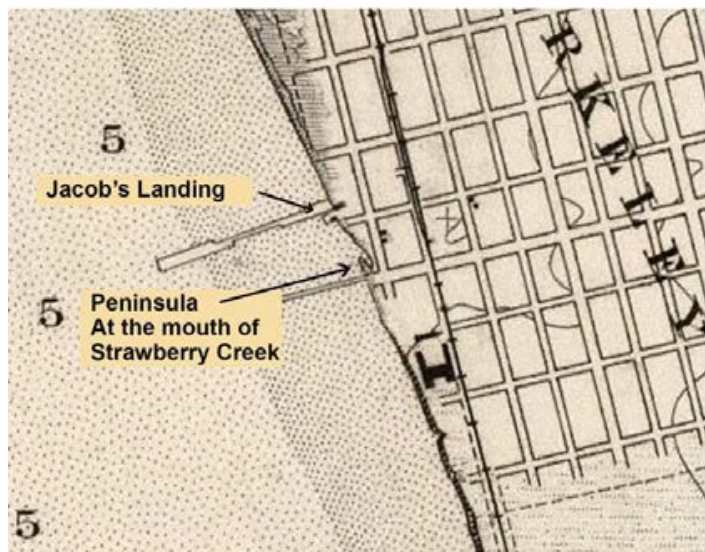
Two local landmarks, the peninsula at the mouth of Strawberry Creek, and Jacob's Landing, are lined up and corroborated on multiple maps.



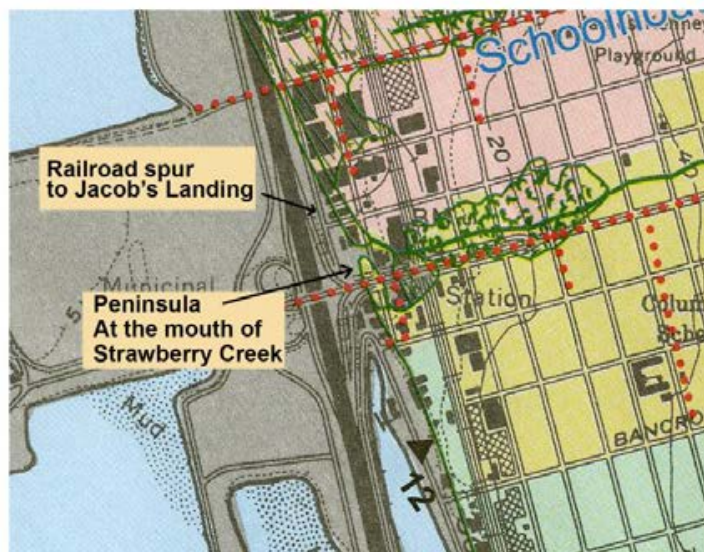
US Coast Survey 1856



US Coast Survey 1859



US Coast and Geodetic Survey 1884



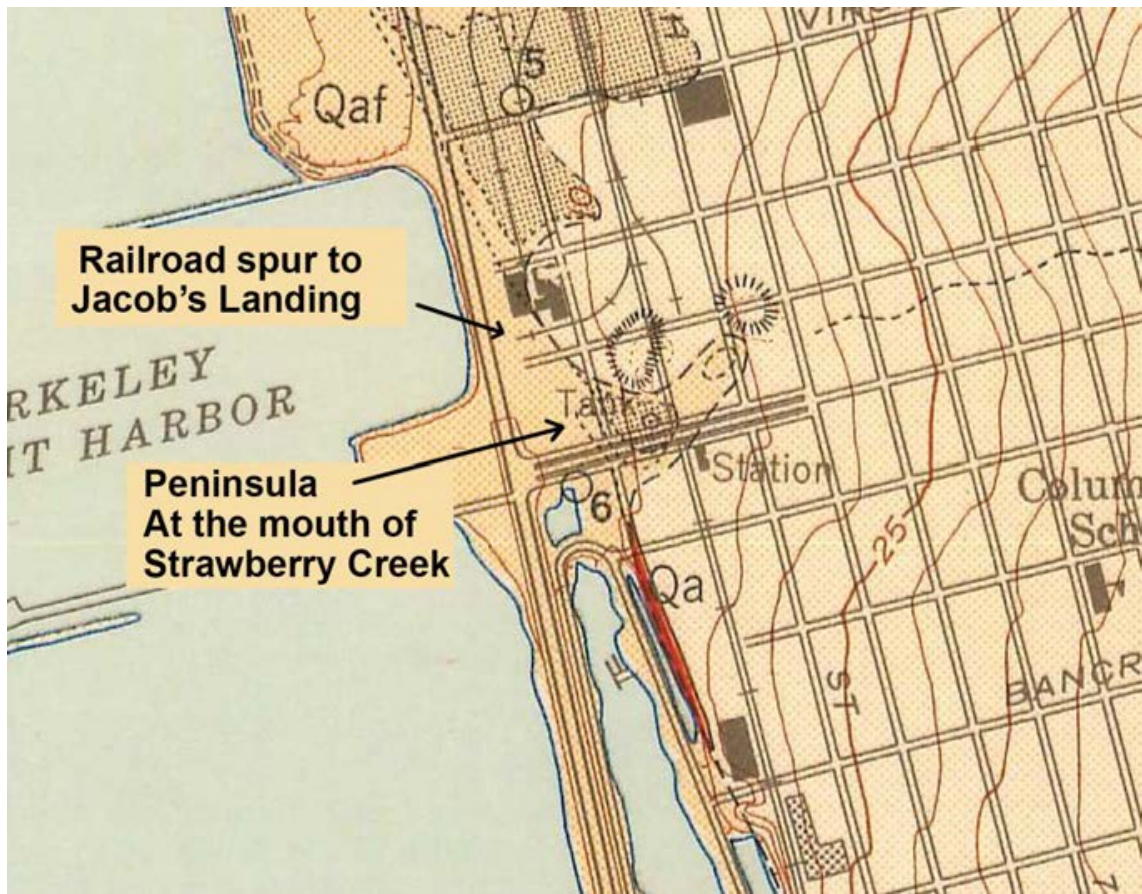
Creek and Watershed Map of Oakland & Berkeley 1993

Maps 11 - Knowing that these two landmarks are stable over time gives us confidence to use them as landmarks for registration between the 1957 USGS and 1856 US Coast Survey maps.

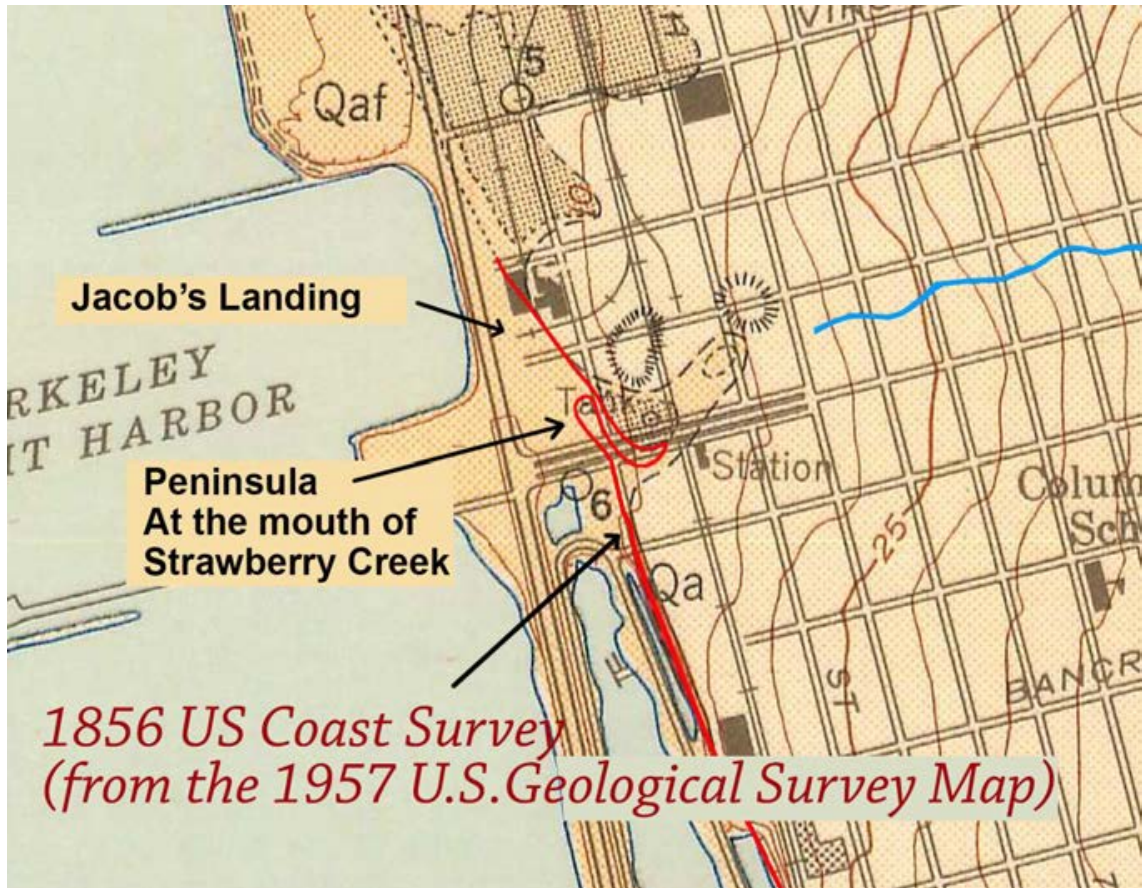
After registering the 1856 Coast Survey to the 1957 USGS map, using all of the methods above,

- The Surveyors landmarks,
- The Coastline, Creeks and Streets,
- Local landmarks,

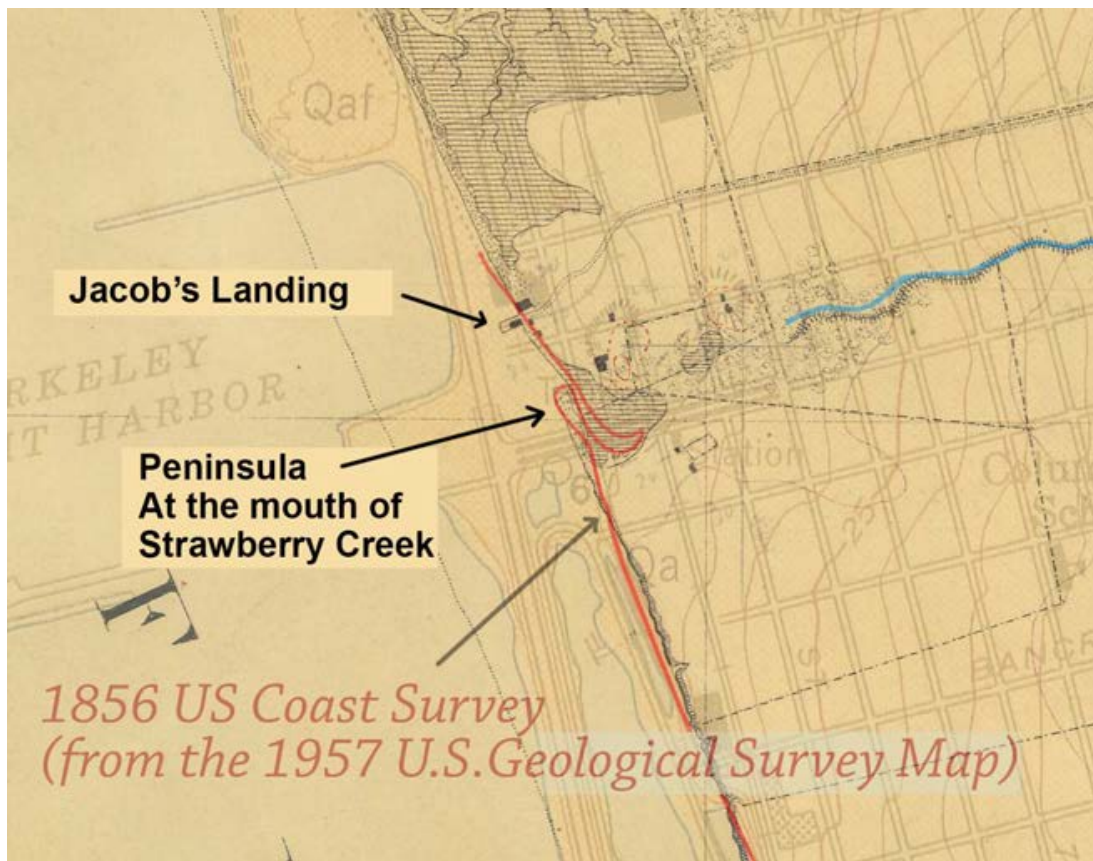
We can now systematically create a contemporary map with a more precise Shellmound footprint.



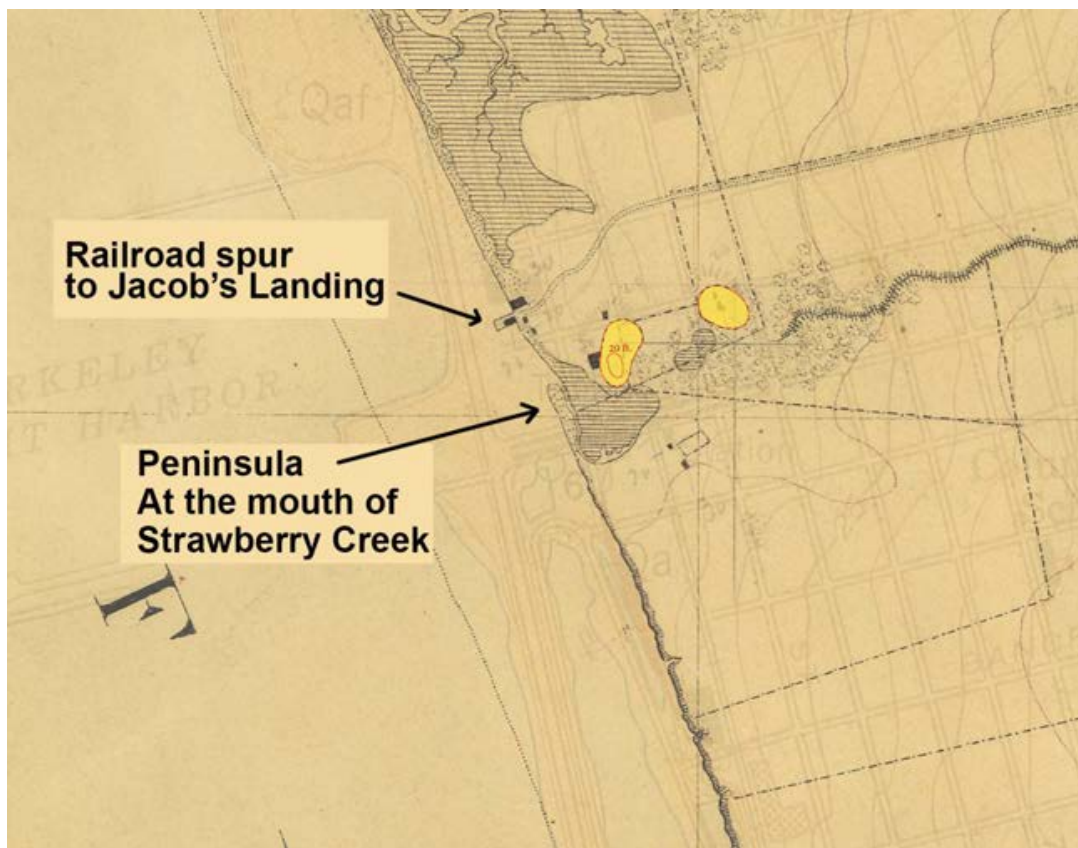
Map 12 - Starting with the 1957 USGS map, Local Landmarks annotated.



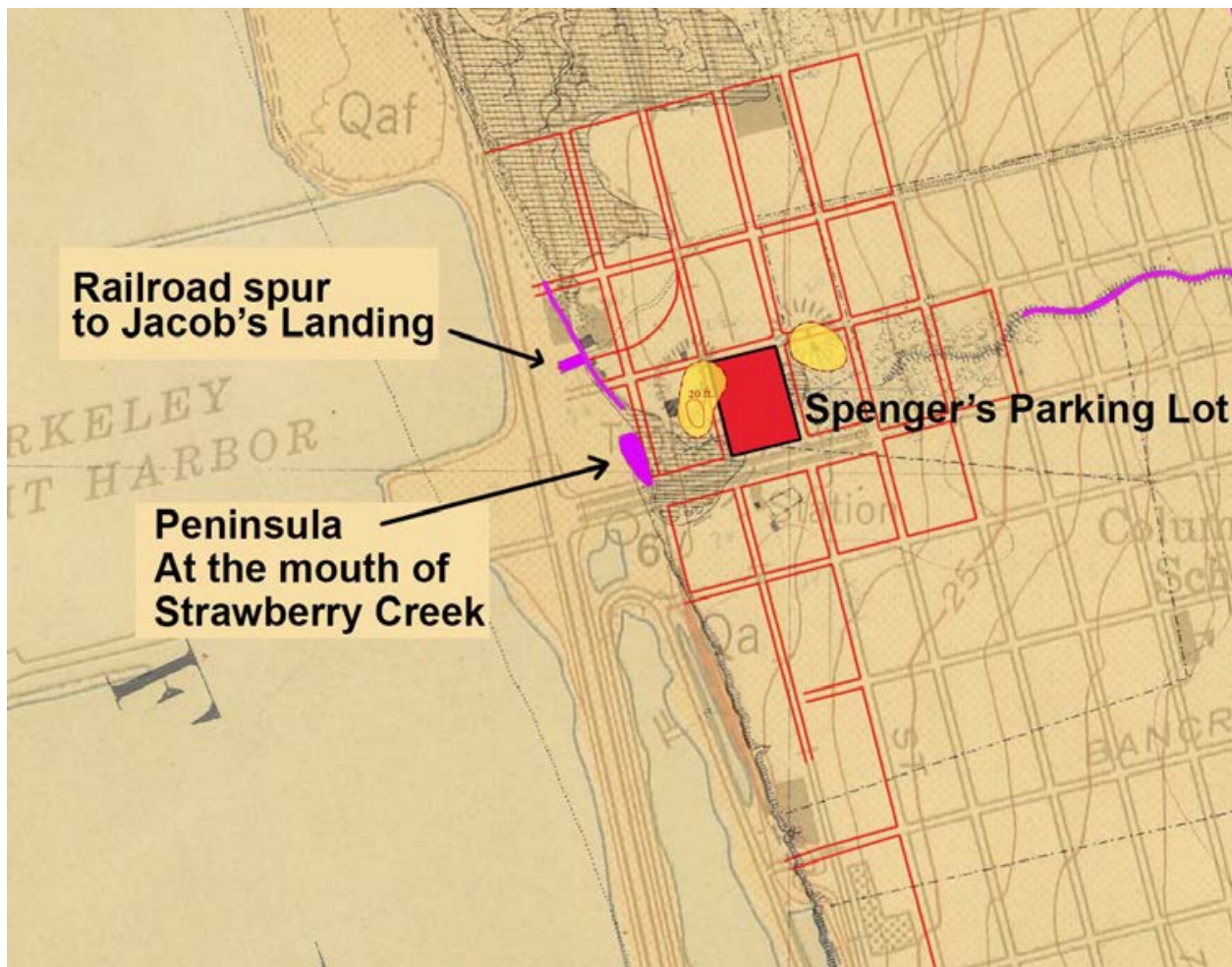
Map 13 - The map above is the same 1957 Geological Survey map, but with its historical data highlighted. Specifically, the historical coastline in red, and Strawberry Creek in blue.



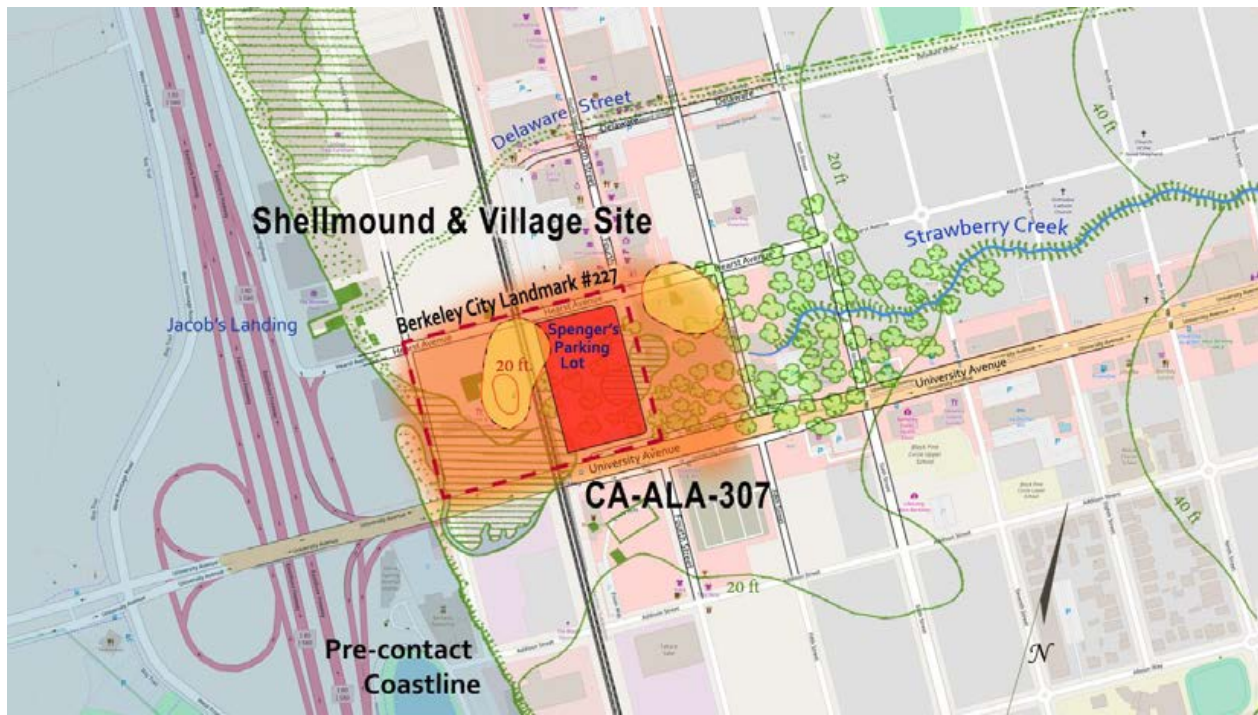
Map 14 - The map above is the 1856 US Coast Survey, registered and superimposed onto the 1957 U.S Geological Survey map. Note that Jacob's Landing, the Coastline, Strawberry Creek, and the peninsula at the mouth of the creek, are all lining up.



Map 16 - After registering the 1856 Coast Survey, the Shellmounds are highlighted in yellow.



Map 17 - The street grid from the 1957 Geological Survey along with Spenger's parking lot are highlighted in red. Local registration between the 1957 USGS and 1856 USCS maps is shown in pink.



Map 18 - Finally, 2018 OpenStreetMap is then registered to the 1957 USGS street grid.

The Shellmounds from the 1856 US Coast Survey are registered to a modern street grid using all three landmark registration methods outlined above.

With contemporary streets we can now see how the Berkeley City landmark and historical resource boundaries are embracing the shellmound footprints. The Spenger's parking lot is at the center of one of the most valuable historical resources in the state of California. And the 1856 Coast Survey re-inserted into the 1957 USGS map shows that the western shellmound is overlapping the Spenger's parking lot in the northwest corner.

Based on the research above, we know that the US Coast Survey team utilized the most accurate mapping techniques of its time. And that the accuracy they achieved is comparable to modern mapmaking. We also know that the local landmarks used for alignment were stable for at least 30 years.

Lastly, we owe a debt of gratitude to David Kerr, the surveyor who drew the 1856 T- sheet, who lovingly set out to document the West Berkeley Shellmound and ecosystem. The accuracy of the shape of the mounds and the 20-foot topo line speaks for itself.