

**ARCHAEOLOGICAL
FIELD MONITORING**

**IKEA RETAIL SITE
RED HOOK, BROOKLYN,
NEW YORK**

GRAVING DOCK No. 2

NYS OPRHP No. 03PR00155



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MANAGEMENT SUMMARY

The following report summarizes the results of monitoring and photograph documentation of Graving Dock No. 2, that was conducted as part of the planned construction of a new IKEA retail store in Red Hook, Brooklyn, Kings County, New York (Block 612, Lot 130) (Figures 1.1-1.5,3.1). A Phase 1A Archaeological Assessment identified the location of the former Graving Dock No. 2 as archaeologically sensitive (HPI 2003). The subsequent archaeological monitoring was sporadic based upon planned construction activities conducted within the bounds of the identified area of sensitivity.

Historic documentary research indicated that Graving Dock No. 2, currently buried under landfill, was a wooden structure dating from 1867, and may be one of the few large wooden graving docks left in the New York City Harbor (Historical Perspectives, Inc. 2003). Although not officially determined eligible for listing on the National Register of Historic Places (NRHP), Graving Dock No. 2 was deemed likely eligible for NRHP recognition, depending on its integrity.

During January-May 2007, Historical Perspectives, Inc. monitored soil remediation and utility installation activities at the project site. A total of six trenches were monitored during the aforesaid site activities. Remnants of the graving dock or associated elements were found in each of the trenches. Generally, the remaining upper portions of the graving dock were located immediately below grade. However, monitoring revealed that much of the graving dock had been either altered or destroyed during early to mid 20th century activities.

Monitoring revealed that a poured concrete dock (cap) had been installed atop the wooden elements of the graving dock. The concrete dock (cap) was likely a very late 19th century or early 20th century undocumented addition. In summary, monitoring activities found that the graving dock was likely altered numerous times throughout its usage. The integrity of the 1867 Graving Dock was not as intact as had been assumed. However, the footprint and stepped altars of the Graving Dock, as well as associated hardware, were identified and recorded.

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1. INTRODUCTION

The proposed construction of a new 346,000 gross square foot (sf) IKEA furniture and home furnishings store in the Red Hook neighborhood of Brooklyn, Kings County, New York, by One Beard Street, LLC, has provided the opportunity to investigate the history and land use of this portion of Brooklyn. The project site is located on Block 612, Lot 130, and comprises 22 acres bounded by Beard and Halleck Streets on the north, Columbia Street on the east, Erie Basin on the south, and a deep-water slip on the west. The project site constitutes the majority of the property formerly owned and operated by the New York Shipyards (also known as the Todd Shipyards).

Due to environmental review requirements for the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP), the proposed action at the IKEA project site required an archaeological sensitivity study. Historical Perspectives, Inc. (HPI) completed a Phase IA Archaeological Assessment for the project site in August 2003 (HPI). This research found that the 1867 Graving Dock No. 2, unlike Graving Dock No. 1,

was not substantially altered after its original construction in 1867, although it was lengthened in 1928-29, and some wooden elements presumably were replaced over the years as they wore out. This graving dock was buried under landfill in the late 1970s; despite possible demolition of some elements prior to backfilling, it is believed that at least some of its original components survive under the fill (HPI 2003: 19).

The OPRHP also determined that several historic resources on the project site—including Graving Dock No. 1, several buildings, and one crane—met the eligibility requirements for listing on the National Register of Historic Places (NRHP). Because Graving Dock No. 2, had been buried under landfill, it was unknown if this feature retained any or all of its original wooden construction. If still present and intact, this feature would be one of the few large wooden graving docks remaining in the New York City Harbor. Therefore, depending on its integrity, Graving Dock No. 2 might be considered eligible for NRHP recognition.

The Remedial Work Plan that was approved by the New York State Department of Environmental Conservation (NYSDEC) in March 2006 for the IKEA site's Brownfields Cleanup Agreement requires the removal of soil down to groundwater in a number of site areas, including areas along the bulkhead that would become landscaped portions of the proposed waterfront esplanade, as well as upland areas that would be landscaped. In addition, a limited amount of excavation within the area of the buried Graving Dock No. 2 would be required for the installation of utility and water lines for the project. Therefore, the possible remains of Graving Dock No. 2 could not be avoided. As per the signed Letter of Resolution (LOR) between the NYSDEC and the OPRHP (12/05), archaeological monitoring of the soil remediation excavations was required. In compliance with the LOR, HPI established a Monitoring Protocol and Unanticipated Discovery Plan (November 2006) for the IKEA project site. The Protocol was approved by OPRHP on December 12, 2006. The Protocol was amended in April 2007 to include additional planned construction-related activities.

The following report summarizes the results of the archaeological monitoring of the resulting construction activities in and around the buried Graving Dock No. 2, Block 612, Lot 130 (Figures 1.1-1.5, 3.1). During January-May 2007, HPI monitored soil remediation and utility installation activities associated with the construction of the retail store and associated parking lot. As mentioned above, monitoring was conducted during soil remediation and utility installation activities within the archaeological sensitivity area that was identified during the archaeological assessment (Figure 1.2-1.6; HPI 2003). The archaeological sensitivity area of Graving Dock No. 2 was based on historic cartographic evidence. The sensitivity area also included a 15-foot buffer area, or apron ringing the presumed boundaries of the entire graving dock.

During the project, significant efforts were made by the archaeologists and contractors to coordinate monitoring with construction activities. Archaeological monitoring was prioritized by the needs of the various contractors working within the graving dock archaeological sensitivity area, consisting of either soil remediation for landscaping (Figure 1.4) or utility installation (Figure 1.5). Earlier, during the design phase of the project, efforts were made to minimize the number of utilities running through the Graving Dock No. 2 archaeological sensitivity area. The required utility trenches that could not avoid the Graving Dock No. 2 archaeological sensitivity area were carefully monitored during construction. In contrast, the creation of smaller parking lot islands, identified on Figure 1.4, did not necessitate soil removal and therefore did not entail archaeological monitoring. A total of six trenches were monitored by the archaeologists. Two of the trenches were in planned landscaping locations and were identified as the Bulkhead Trench and Trench 1. Four utility trenches were also monitored: Utility Trench 1, associated with a

temporary electrical line; Utility Trenches 2 and 3, both permanent electric lines; and Utility Trench 4, a 12-inch water main. The locations of the six monitored trenches are shown on Figure 3.1.

As a documentation package, the following report includes a full archival context on Graving Dock No. 2, as well as photographs of identified elements of Graving Dock No. 2 identified during the monitoring process. Only a portion of the total number of photographs is printed and reproduced in the report; however, the complete assemblage of photographs, both color and black/white, is included on the enclosed electronic file (CD). In order to assist the reader, a glossary of graving dock terminology is appended.

2. HISTORICAL REVIEW

In order to understand the historical context of the IKEA project site, a summary of the development of the project site follows. This Historical Review partially includes and expands on the data presented in the Phase 1A report prepared by HPI in 2003. Additional archival research was completed in 2007-2008 (HPI 2003:8-17). Supplemental research was conducted (either online or in-person) at the Brooklyn Historical Society, the Hagley Museum and Library, the New York Public Library (Humanities and Social Sciences Library and Science, Industry and Business Library) and the Alexander Library at Rutgers University. A chronology of shipyard ownership and activities is presented in this report as Appendix A.

Cartographic research indicates that use of the project site was limited during the early historical period, as most of the area was not firm, or fast, land (Figures 2.1-2.2). The area remained essentially unused and undeveloped up through the early nineteenth century, as the property was still under water or marshland. However, the future of the project area changed dramatically after 1834, the year Brooklyn became a city. Developers pushed for expansion of the street grid from the downtown area across to Red Hook, in anticipation of new housing, as well as the creation of a city bulkhead line to attract waterfront commerce. Prior to actual development, the marshes and ponds in the Red Hook area were filled, often by leveling adjacent hills, so as to create a more level building surface (Raber Associates 1984:26). The pace of grading and filling of the borough is shown on a series of historic maps from this period. The 1849 Colton map (Figure 2.3) depicts the original topography of Red Hook with the projected street grid superimposed; the Perris 1855 map (Figure 2.4) not only shows the area with the proposed Erie Basin outline superimposed, but also the location of the original shoreline (Coast Survey Office 1844; Colton 1849; Perris 1855; Ratzer 1767).

Erie Basin Construction

Beginning in the mid-1840s, a number of successful merchants and developers – most notably William Beard and brothers Jeremiah and George Robinson – began to acquire offshore rights in the project area stretching from Van Brunt Street to Hamilton Avenue at the Gowanus Canal. Their plan was to create two contiguous ship basins, the Erie Basin and the Brooklyn Basin. At the time, the property consisted of marshland with the offshore areas having up to 8 feet of water at mean tide and “sand spits and islands with irregular connections to the mainland” (Raber Associates 1984:63). Although some undocumented improvements apparently occurred in the area between 1845 and 1855, work on the basins began in earnest in 1856, and continued through about 1880.

William Beard began the ambitious project by erecting a narrow breakwater beginning at about Conover Street (north of the later Erie Basin perimeter) and stretching around the projected ends of the two basins, about 8,000 feet to the foot of Court Street (south of the projected end of the Brooklyn Basin). Once the area was enclosed, the basin areas were dredged, and the recovered material utilized to create bulkhead lines that would become the inner Erie Basin walls. By ca. 1864, Beard had completed the bulkhead outlines – along Elizabeth Street (later renamed Beard Street) to Otsego Street – and the outer breakwaters, and had enclosed about 60 acres of water. The eastern end of Erie Basin was at this time an irregular line of dredged fill, and would remain so for a number of years. Between 1865 and 1880, Beard constructed piers and additional bulkheads extending into Erie Basin from the shores. The outer edge of the breakwater remained an irregular mass of loose, dredged fill until the early twentieth century, with an open pile bridge connecting this breakwater to the finished bulkheads on Elizabeth Street (Beard Street). This breakwater was the division between Erie Basin and Brooklyn Basin, but as Brooklyn Basin was not fully constructed during the nineteenth century, completion of its outer edge became a lower priority for Beard (Raber Associates 1984:64).

Early Years of the Shipyard

In 1864, while construction of Erie Basin was still underway, Beard and the Robinson brothers sold a portion of Erie Basin, running southeast from a point between Richards and Dwight Streets at Elizabeth (Beard) Street, to another entity, called the Erie Basin Dock Company, whose president was Jeremiah Robinson. Here, the Erie Basin Dock Company established a shipyard, which would survive, under various owners, for over 100 years. The current IKEA project site falls within the former Erie Basin Dock Company's property.

The Erie Basin Dock Company's primary order of business was to hire Bostonian James Simpson to construct the shipyard's first graving docks,¹ where ships would be repaired. Raber Associates (1985:5) describes these permanent graving docks as:

“basin drydocks,” of a type generally excavated into a shoreline, made watertight with timber or masonry lining, and provided with a gate or caisson to seal one end. With the basin flooded, a ship could enter through the gate and rest over a set of timber keel and bilge blocks. With the gates closed and the water pumped out, the ship settled on the blocks for repairs to the lower hull, rudder, or propellers. Such drydocks in the United States dated to naval yard facilities of the 1830s in Boston and Norfolk, and included the extant 1851 Brooklyn Navy Yard dock with a masonry lining (Anderson 1907:156).

Known as Graving Dock No. 1, the first facility was completed in 1866, along with an engine or pump house (housing a compound steam pump set in a pit to dewater the dry docks) and several storehouses (Mitchell 1981:5). This initial cluster of structures was located on the south side of Elizabeth (Beard) Street, near the intersection of Dwight Street. Figure 2.5, a photograph taken in 1866, shows Graving Dock No. 1 – already containing a ship – along with the machine shop on the left and the storehouses on the right. In the foreground of the image, which depicts the northeast corner of the Elizabeth (Beard) Street and Dwight Street intersection, the edge of the Colonial-era millpond can still be seen. The area later occupied by Graving Dock No. 2 appears to be underwater at the time of the photograph (Mitchell 1981:1).

An 1870 article in the *Brooklyn Eagle* described the initial configuration of the shipyard. Graving Dock No. 1 was 500 feet long, 120 feet wide at the top, 60 feet wide at the floor, 90 feet wide at the top of the gate (or caisson), and 60 feet wide at the bottom of the gate. It was constructed of heavy timbers, and could receive vessels measuring 12 feet draft at low water and 18 feet draft at high water. Graving Dock No. 2, completed by Simpson in 1867 and located immediately east of Graving Dock No. 1, was 447 feet long, 100 wide at the top, and 47 feet wide at the floor. It could receive vessels measuring 17 feet draft at low water and 22 feet draft at high water. As an added feature, a second gate was installed near the middle of Graving Dock No. 2 that allowed the structure to house two ships at one time. The two-sectioned parts of the dock measured 222 feet and 218 feet long. The newspaper article also noted that the engine gates used centrifugal pumps that could handle 1,500 gallons of water per minute. The stylish brick engine house at the head of the docks (with a mansard roof and brownstone trimmings) housed a 100-horse-power horizontal engine and two oscillators using 50 and 30 horse-power. By the late 1860s, the shipyard also had built four large warehouses (located west of Graving Dock No. 1 on top of a newly filled area behind an extended bulkhead) to hold the cargoes of the vessels being repaired. These buildings were four stories high, 132 feet deep, and 29 feet wide. They had granite and concrete foundations resting on pilings sunk 25 feet in depth (*Brooklyn Eagle* 1870).

Late Nineteenth Century

From the 1870s through the 1890s, the shipyards were sold and leased several times (See Chronology, below). Meanwhile, the community of Red Hook began to expand, reaching a population of 20,000 by 1876. By the last quarter of the 19th century the Erie Basin became an important shipping point for the city. Following the Civil War, the inadequate docks and piers in Manhattan were overlooked for the facilities in Brooklyn. Burrows and Wallace wrote of Erie Basin:

¹ The term “graving dock” derives from the structure’s excavation below ground, like a “grave.” See Glossary.

The vast Erie Basin complex at Red Hook sped barged-in grain to Liverpool steamers using steam-driven elevators. Public works complemented private metamorphoses ...From Main Street to Red Hook Point, three thousand vessels (not counting canal boats) tied up each year, disgorging molasses, sugar coffee, hides, and wool into the burgeoning warehouse districts and grain into elevators capable of storing fifteen million bushels (Burrows and Wallace 1999: 949).

With this development in shipping, the repair facilities hosted at Erie Basin were well situated to work on vessels needing repairs after delivering their cargo.

One of the first maps that shows the actual layout and shoreline of the shipyards during the first decade of operation, as opposed to some maps that depicted the projected lines of the yet to be completed basin, was made by the U.S. Coast Survey in 1874 (Figure 2.6). Here, both the shoreline and the bulkhead line are clearly visible. This map is the first to depict the presence of Graving Dock No. 2, although there is little detail of the dock and facilities. The map further indicates that Graving Docks No. 1 and No. 2 were the same length and width. However, the map indicates that Graving Dock No. 2 had straight walls, while Graving Dock No. 1 had tapered walls near the headwall and gate, forming a linear shaped hexagon (U.S. Survey 1874).

The Bromley map from 1880 (Figure 2.7) illustrates the shipyards (and the former shoreline), and identifies the two graving docks as “dry docks.” The unlabeled structures to the north and west are the engine house and the warehouses. Graving Docks No. 1 and 2 were afforded greater detail on the 1880 map. Graving Dock No. 2 (“Dry Dock”) is shown as a linear hexagon approximately the same length and width as Graving Dock No. 1 (“Graving Dock”). Graving Dock No. 1 is depicted as a linear shaped pentagonal with a slightly narrowed opening. The map did not depict the gate for either graving dock (Bromley 1880).

The 1886 Sanborn map shows the project site area and the shoreline in additional detail (Figure 2.8). In particular, it illustrates that the eastern breakwater for Erie Basin, along the line of Columbia Street, was still only accessible via a wooden causeway, and that a large portion of the project site east of the graving docks was still under water. According to the map Graving Dock No. 2 (“Dry Dock No. 2”) was longer and wider than Graving Dock No. 1 (“Dry Dock No. 1”) and both were linear hexagons with gates. At that date, the facilities, including Graving Dock No. 2, were owned by “Anglo American Dry Dock & Ware House Company” (Sanborn 1886).

A photograph from the early 1890s (Figure 2.9) shows both graving docks in use, with buildings along Beard Street in the foreground bearing the name of Handren & Robins Dry Docks (Mitchell 1981:8). Records indicate that under the ownership of John N. Robins, the shipyard repair facilities expanded considerably in the decades around the turn of the twentieth century. In 1896 Graving Dock No. 1 was rebuilt, and plans were underway to construct a third graving dock to the west of it measuring 800 feet in length; although it appears this mammoth project was never actually undertaken (*Brooklyn Eagle* 1896). Instead, the company purchased three floating dry docks, one in 1892 and two in 1901 (Mitchell 1981:9, 11). The 1904 Sanborn map shows the locations of the new repair facilities (Figure 2.10). The first dry dock – a Balance Dry Dock – was located between Piers 1 and 2, west of Graving Dock No. 1 (Sanborn 1904).

The Robins shipyard expansion around the turn of the century was well documented. A *Brooklyn Eagle* article from 1899 described the activity as follows:

The old freight shed of the Anglo-American Stores has been torn down and a much larger one built close up to the warehouses. Half of the old wharf upon which the shed stood has been removed and the remainder is being strengthened and rebuilt. Parallel to this a narrow wharf had been built out some 500 feet into the basin and a new bulkhead is being built between these pieces. In the slip between, one of the sectional docks will be located. The pierhead adjoining and just north of the entrance to the smaller chamber dock is being rebuilt.

Farther over, beyond the ship house, two dredges are at work deepening the basin for a chamber for a second sectional dock. Two long piers will also be built there. The third dock will be located on the south side of the yard, from between the lines of the boiler shop and Long Dock (*Brooklyn Eagle* 1899a).

The changes to the shipyard that the article details include modifications to Piers 1 and 2, the bulkhead in between the piers, as well as the construction of Piers 3 and 4.

Twentieth Century

A lithograph from circa 1903 (Figure 2.11) also shows the Robins shipyard facilities with the results of the late 1890s changes (Mitchell 1981: frontispiece). In the image, ships are visible in the two graving docks, as well as in the three floating dry docks acquired in 1892 and 1902, the Balance Dry Dock between Piers 1 and 2, and the sectional dry docks adjacent to Piers 3 and 4. The lithograph also depicts the various support buildings associated with the shipyard, including structures along Beard Street, the warehouses and “freight shed” west of Graving Dock No. 1, and a number of enclosed and semi-enclosed structures east of Graving Dock No. 2. The Hamilton Ferry trolley is also shown running along Beard Street.

The 1904 Sanborn map (see Figure 2.10), made soon after the lithograph, details additional improvements at the shipyard, including the support buildings on top of newly filled areas stretching east to the line of Otsego Street. Pier 5 was the location of the Mannings Yacht Agency and several ancillary structures. During this period, piers along the eastern breakwater of Erie Basin provided berths and repair facilities for yachts, as well as places for canal barges and their occupants to tie up over the winter months, when ice prevented their passage up to the Erie Canal. The defining shape of Graving Dock No. 2 remained unchanged during the last years of the 19th and early 20th century. However, two new buildings were erected between Graving Docks No. 1 and No. 2 (“Dry Dock No. 1” and “Dry Dock No. 2”). A small “Shop” was located west of Graving Dock No. 2, on the edge of the 15-foot monitoring buffer (*Brooklyn Eagle* 1894, 1899b; Raber Associates 1984; Sanborn 1904).

The John N. Robins Company became the Robins Dry Dock and Repair Company in 1911. A British firm presented then-President William H. Todd with a lucrative offer to buy the shipyards a few years later. Todd, a tough businessman, had advanced rapidly in the company from boilermaker foreman in 1895, to superintendent in 1903, to general manager and vice president in 1905, and finally to president in 1909. Drawing on the loyalty and funds of about 100 of his coworkers, Todd made a counteroffer to the company owners that was equal to his British rivals, and succeeded in purchasing the shipyards in 1915. The company then officially changed its name to the William H. Todd Corporation. In 1915 the Todd Corporation shipyards was known as the largest repair facility in New York, containing 29 acres of real estate, two graving docks, and three floating docks capable of handling ships up to 18,000 tons (Mitchell 1981: 14-17). The 1915 Sanborn map (Figure 2.12) provides additional details of the shipyard around the time it was acquired by Todd. All three of the floating dry docks are depicted, and the pier formerly located just east of Graving Dock No. 2 had been removed. Graving Dock No. 2 remained unchanged according to the map (Sanborn 1915).

The new Todd Shipyards employed about 2,500 men. Its graving docks could handle ships of up to 10,000 and 11,000 tons capacity, and its floating dry docks between 6,000 and 18,000 tons capacity. It quickly became clear that the shipyard would be well-suited for upcoming war-related work, a notion that was echoed by Todd’s claims that the yards were “designed especially for the repairing of ocean-going vessels,” and the “dry docks can accommodate ships of large size” (Mitchell 1981:27-28). During World War I, Todd Shipyards and its new subsidiaries (several other facilities located elsewhere in New York Harbor) received contracts to repair and refit approximately 70% of all damaged German and Austrian vessels interned at the Port of New York, and close to 80% of the work done outside the Brooklyn Navy Yard (Mitchell 1981:35).

The Company also expanded its holdings during World War I. Research conducted by Raber Associates found that the two sectional dry docks, originally installed in 1901-1902, were replaced during World War I with new wooden sectional docks made by the Cossey Shipyard in Tottenville, Staten Island (1985:7). These new dry docks had five sections, each 90 feet long and 114 feet wide, and could accommodate vessels measuring 460 feet long and with a 25-foot draft. The piers adjacent to the sectional dry docks were rebuilt at this time to accommodate these new structures.

The Todd Shipyards experienced an abundance of work during the first part of the 1920s, due in part to the post-war backlog of commercial vessel repairs. In 1921-22, the shipyards engaged in an extensive program to add third-class accommodations to American passenger vessels now making the Atlantic crossing to England and the Continent, and worked on a series of medium-sized ocean liners (Mitchell 1981:79). The increased work precipitated the installation of a fourth floating dry dock, consisting of five wooden sections and capable of handling 10,000 tons (Mitchell 1981:85).

In the late 1920s, Graving Dock No. 1 was drastically reconditioned and enlarged. The original timber walls were rebuilt in concrete and the entire facility was lengthened. Begun in 1928 and completed in 1929, just after the stock market crash, the new and improved graving dock was touted as the most capacious dry dock in New York Harbor, now measuring 790 feet in length, 90 feet in width, and able to dock a ship 731 feet in length and 28 feet draft (Mitchell 1981:91; Raber Associates 1985:7). The facility became known as an engineering marvel, because this was likely the first time the “Tremie Method” of pouring concrete underwater was used to build a graving dock in the United States.² This new advance in construction enabled the completion of new concrete graving docks in only two years instead of almost ten. As a result, the rebuilt Graving Dock No. 1 was held up as a pioneering example of how to construct “Tremie-placed concrete dry docks” in record time; the procedure later was employed to build concrete dry docks all over the country (Harris 1942). Although Graving Dock No. 2 was also lengthened in 1928-29, reports indicate that it was not rebuilt in concrete at that time (Raber Associates 1985:7).

The original 1866-67 era centrifugal pumps were also replaced at the same time with 48-inch electric spiral screw pumps, which had the ability to pump 16 million gallons a day. These new pumps were installed in a pit nearer the docks, and the old pump house was converted into an electric generator and switchboard room. The original centrifugal pumps from the pump house were too cumbersome to remove, and so were said to have been simply buried and floored over under the structure, where presumably they remain today (Raber Associates 1985:7).

Although the country was experiencing a severe economic depression, when Graving Dock No. 1 reopened, the company attracted considerable contracts, including work on the *George Washington*, America’s second largest flagship at the time (Mitchell 1981:92). The 1939 Sanborn map (Figure 2.13) shows the Todd Shipyards after the building episodes of the 1920s. Raber Associates (1985:7) identified additional changes to the shipyard in the period from ca. 1925-1934. These included rebuilding Piers 1 and 2, erecting a reinforced concrete barrier between the two graving docks and installing a 20-ton crane, and creating a rail track network for cranes on most of the piers. The map indicates that the shape of “Graving Dock No. 2” was slightly altered when the western wall closest to the headwall was changed and staggered by the rebuilding of “Graving Dock No. 1” and the area between the two docks (Sanborn 1939). A new “Pump Ho[use]” was located along the eastern side of Graving Dock No. 1, north of a new “Gantry Crane.” The Sanborn indicated that new utilities were installed along the southern portion of Graving Dock No. 2 along the tapered walls closest to the graving dock gate. According to the map, the gates on Graving Docks No. 1 and No. 2 were quite different. The gate on Graving Dock No. 1 was hexagonal and Graving Dock No. 2 was oval.

During the late 1930s, work slowed considerably for Todd Shipyards, although the facility never closed. During World War II, however, the facilities were again working at full capacity. The yards serviced over 3,000 ships, and for the first time included women workers – about 5,000 of them – among its crews, as the men shipped off to battle (Mitchell 1981:143). Todd Shipyards also participated in a wartime program to build two dozen LCI (Landing Craft Infantry) boats for the U.S. Navy, assisting Todd’s Hoboken, New Jersey yards. For construction of these vessels, workers transformed Graving Dock No. 2 and its adjacent yard space into a modified assembly line (Mitchell 1981:158). In the midst of the war, the shipyards also went through two name changes. In 1942, the company became Todd Erie Basin Dry Docks, Inc., and in 1943, the yards became known as the Todd Shipyards, Brooklyn Division, to distinguish it from the numerous other shipyards that the company had acquired as part of its nationwide expansion during the preceding decades (Mitchell 1981:160-161).

A report issued by the Todd Shipyards Corporation in 1943 cited the rapid re-growth of the company and discussed “the tremendous volume of shipping it has repaired, converted or built for the U.S. Army, U.S. Navy, U.S. Maritime Commission and Allied Nations” (Todd Shipyards Corporation 1943, np). According to the report, most of Todd’s work during 1942-1943 was for the government (Figure 2.14). The report also contained a photograph (Figure 2.15) with a dock of similar construction to Graving Dock No. 2 filled with a “new ship developed by the Navy for secret work; built in quantity by Todd” (Todd Shipyards Corporation 1939: np). The dock was shown as filled with water and vessels. The sides of the graving dock were depicted as having stepped concrete levels. Containers and/or small temporary structures were shown atop the steps. The two rows of boats are separated by what may be a floating walkway. The report does not indicate that this was an image of Graving Dock No. 2, but it appears to be similar morphologically.

² The procedure used a specialized pipe, called a Tremie pipe, to conduct the concrete from dry land to its underwater destination.

As a result of the wartime work performed at “Todd Erie Basin Dry Docks Inc.”, the company received the “Maritime Commission ‘M’ Pennant Victory Fleet Flag” (Todd Shipyards Corporation 1939: np). Admiral Emory S. Land, Chairman of the United States Maritime Commission, stated upon making the “M” award to the Todd Erie Basin Dry Docks, Inc.:

It is apparent from your record that both workers and management are fully cognizant of the job they have to do. Your average work week per man has been sixty-nine hours - far above the national average. It takes that kind of work to meet and overcome the Axis submarine threat. You have done a fine job. You fully merit the honor bestowed upon you today. This Merit Award is not only a recognition of your past performance but is also an expression of confidence by your nation that you will continue and redouble your efforts in the future (Todd Shipyards Corporation 1939: np).

The physical changes to the shipyard during World War II are described below:

Todd rebuilt and/or razed virtually the entire yard upland in 1941-42 except the old shops and offices along Beard Street... All the older structures behind Piers 1 and 2, including the historic storehouses which had been a join shop for some years, disappeared. South of the graving docks and behind Piers 3 and 4, new structures included a large manufacturing/storage building, a personnel building, a new blacksmith shop, a compressor building, and a rivet shop, together with a new set of crane tracks through this part of the yard serving piers from No. 3 southwards (Raber Associates 1985:8).

The 1950 Sanborn map (Figure 2.16) indicates that new construction at the Erie Basin facility was finished by that time. A detailed review of the map shows only limited alterations (other than demolition or removal of ancillary structures) from the later 20th century maps. Expansion of the shipyards by this time included reclamation of the remainder of the basin waters behind bulkheads to the east of Otsego Street, an area that previously had only been accessible via a causeway, and erection of a number of service buildings along the property’s eastern boundary. The floor and slanted walls of Graving Dock No. 2 were depicted in detail on the 1950 map. The map indicates that by this time, the dock gate had been replaced with a new gate, similar to that found on Graving Dock No. 1. A “Gantry Craneway” was shown between the two graving docks, and the small shop located to the west of Graving Dock No. 2 had been removed. New utilities were depicted atop the east and west walls of Graving Dock No. 2. Apparently, “6 1½” Salt Water Hose Conn’s” were located on the east wall and “9 1½” Fresh Water Hose Conn’s” were located on the west wall. A “Wooden Deck” was located on the headwall of the dock with “Open Spkls Under”. At that date, the entire facility was under the ownership of “Todd Shipyards Corp. Brooklyn Division” (Sanborn 1950).

During the second half of the twentieth century, Todd Shipyards converted many vessels to container ship usage (Mitchell 1981:193). Government work waxed and waned during the Cold War and the Vietnam War eras, as the yards repaired many damaged freighters and other naval ships. In 1968, the yards even repaired a specialized Navy dry dock, which was used to repair large ballistic submarines. It was perhaps the only known instance at the yards of a dry dock nestled inside another dry dock (Mitchell 1981:235-236).

When the Todd Shipyards celebrated their fiftieth anniversary in 1966, John T. Gilbride spoke to the members of the Newcomen Society in North America. According to Gilbride, the Brooklyn Division upgrading had been completed at a cost of 3.5 million dollars, “making it the largest and most completely equipped shiprepair (sic) facility in the Port of New York” (Gilbride 1966: 20). A line rendering of the facilities issued with the report did not show Graving Dock No. 2 because of the angle of the drawing. However, a vessel is depicted in Graving Dock No. 1 along with the existing crane gantry (Gilbride 1966: 14).

Although Raber Associates (1985:8) found that repairs and overhauls to existing structures had taken place around 1965, the 1968 Sanborn map (Figure 2.17) depicted no changes within the yards since the 1950 edition, other than the removal of all but one floating dry dock, the one adjacent to Pier 5. The yard repairs included replacing or adding several gantry cranes, rebuilding Pier 4 in concrete and steel, overhauling the gate and pump at Graving Dock No. 1, and renovating part of Pier 2. According to the map, Graving Dock No. 2 remained unchanged.

During the 1970s, work at the Todd Shipyards was dramatically reduced. By 1975, the facility employed only 650 people, and had to apply for a federal loan guarantee of 225 million dollars to remain operating (Raber Associates

1985:8). The deteriorating Graving Dock No. 2, at the time a bit longer than the original 1867 configuration, had become obsolete and was no longer being used. In early January 1976, the company ordered this portion of the facility filled in. According to a late 20th century account:

Todd's oldest yard was ostensibly reducing its repair facilities. In reality, the facility in question, Erie Basin's Graving Dock No. 2, had long since been retired from active duty and had become an idle and somewhat untidy landmark from the era of [James] Simpson and the 'Boston Docks' (Mitchell 1981:271).

Although late 20th century Sanborn maps continued to show Graving Dock No. 2 as an active structure, it has been buried for decades. The Todd Shipyards closed permanently in 1983, and in 1986, the facility was sold. Over the next twenty years the property was owned and managed by the U.S. Dredging Corporation, which leased the former shipyards to a variety of maritime and non-maritime tenants. IKEA now owns the property and began redeveloping the site in 2006 (Photograph 2.1).

3. MONITORING

Between January and May 2007, HPI conducted archaeological monitoring in the Graving Dock No. 2 archaeological sensitivity area, including the approximate footprint of the buried physical remains of the graving dock as well as a 15-foot buffer, or apron surrounding the former facility that could potentially house associated dock features (e.g., fresh water hose connections, salt water hose connections, and culverts). Monitoring was conducted in accordance with the OPRHP-approved protocol.

Two on-site educational presentations were conducted by HPI with construction personnel and the soil remediation team. This provided the on-site construction employees and supervisors with a sense of stewardship for and participation in the potential recovery and understanding of cultural resources related to Red Hook's industrial waterfront heritage. HPI also worked with the project management team to create a sign informing the public about the history of the project site and the planned archaeological monitoring activities. The sign was placed on the exterior construction fence at the initiation of the archaeological monitoring.

Archaeological monitoring is the observation of construction excavation activities by an archaeologist in order to identify, recover, protect and/or document archaeological information or materials. The process is under the control of the construction contractor, with input from the archaeologist and reviewing agency. The archaeologist is given authority to temporarily halt construction work to complete their task. Excavation area, location, and depth, however, are determined by the contractor.

The protocol stipulated mitigative actions that include photography of any *in situ* graving dock structural members or associated features uncovered during the trench excavations in the sensitive area. If structural members or associated features were identified, they would be recorded and left in place. Once exposed and documented, the graving dock elements were covered with either tarps or geotextile fabric and then the excavation areas were filled.

Below is the summary discussion of the six trenches that were monitored for this project. A glossary of shipyard terms is included as Appendix B.

A. BULKHEAD TRENCH (Figures 3.1-3.6; Photographs 3.1-3.12)

Soil removal activities were divided into two sections that together formed an "L" shaped trench bounded by the caisson gate and eastern edge of the western gantry way. The L-shaped trench was identified as the Bulkhead Trench. The first section, located within the south and east 15-foot buffer area, was oriented approximately northeast-southwest and was approximately 73 feet by 15 feet. The second section, the leg of the "L," was located across the footprint of the former graving dock.

Consistent with utility maps made during the 20th century, utilities related to and located in the Graving Dock were identified within the first section of the trench (Figures 3.1-3.3; Photographs 3.1-3.3). A circa 1940 electrical vault and conduit were identified within the trench. The electrical vault connected to Graving Dock No. 2 via electrical cables threaded through metal pipes (Photograph 3.1). The concrete-encased electrical conduit ran roughly parallel with the east wall of Graving Dock No. 2 (Figure 3.3).

A six-inch pipe was also identified within the eastern 15-foot buffer/apron (Photograph 3.2). According to a 1969/71 utility map (Figure 3.3), this pipe was laid within the bounds of the east wall of Graving Dock No. 2. Monitoring confirmed this relationship. According to the map the pipe was a “Fire Boat Connection” running southwest along the east wall of the graving dock to the end of an adjacent wharf where it would interface with fireboats. During monitoring it appeared that the southernmost portion of the pipe might have been destroyed in the past, as it did not extend farther than the electrical vault. Alternatively, the southernmost portion of the pipe might have run deeper into the graving dock and through the caisson towards the end of the pier, and therefore would not have been visible within the open trench.

Initially, it appeared that the pipe lay on a concrete footer or floor. However, it was revealed that the concrete was actually the undocumented lip of the east wall of Graving Dock No. 2 (Photograph 3.3). This exposed uppermost portion of the east wall of Graving Dock No. 2 was comprised of poured concrete. The installation of the pipe likely represented the end of regular usage of the graving dock, as the pipe was located on the “stepped altar”³ or ledge leading from the lip of the dock to the body of the basin. During regular usage the presence of the pipe would have presented a safety hazard. The pipe was removed during monitoring to expose the underlying concrete cap. A void opened along the western face of the stepped east wall revealed wooden timbers oriented lengthwise southeast-northwest several feet below the concrete steps, or altars along the inner wall (Photograph 3.4).

Excavation found that the east wall of Graving Dock No. 2 had been disturbed by filling activities during the 1970s and consequently very little of the intact wall was exposed during archaeological monitoring. Soils overlying the east wall were stratified fill episodes with bricks and “cement wash,” cement or concrete deposited by cement mixers cleaning or washing out their drums. A typical stratigraphic sequence taken from the western profile overlying the east wall of Graving Dock No. 2 (Photograph 3.5) consisted of a dark yellowish brown silty sandy fill (10YR 4/4) overlying a layer of concrete fill. The concrete fill overlaid another dark yellowish brown silty sandy fill episode (10YR 4/4), which in turn overlaid a layer of brick and building demolition.

The second section of the Bulkhead Trench, approximately 98-feet long by 25-feet wide, was oriented 90 degrees-perpendicular to the first section, running approximately southeast to northwest. The west wall of Graving Dock No. 2 was identified approximately 10 feet east of the western terminus of the Bulkhead Trench (Figure 3.5-3.6; Photograph 3.6). An approximately 25 foot by 5 foot by 5 foot section of the west wall was exposed within the Bulkhead Trench. This portion of the graving dock was also a section of the poured concrete cap atop wooden piles with iron ties. The exterior or western face of the dock contained the remnants of wooden forms used to hold the shape of the dock when it was poured (Figure 3.6). A wooden timber was located within the southern profile of the trench running from the westernmost portion of the trench lengthwise into the concrete dock. The relationship between the concrete dock and the wooden timber is unclear, but the concrete dock covered the wood. The wooden timber was located at the bottom of the excavated trench, under several layers of fill. The west wall exterior, or eastern face contained the remnants of wooden forms from the casting of the concrete cap (Photograph 3.7). The west wall interior, or western face contained two sets of stepped altars descending towards the interior of the basin (Figure 3.5; Photograph 3.8). Two iron rings (approximately 6-8 inches in diameter) were located on the second tier of the steps. These rings were likely used to tie off boats once they entered into the dock. Vertical wooden sheets, attached via iron ties, were located below the concrete dock. Only two of these sheets were identified attached to the dock (Photograph 3.9). The remaining sheeting was possibly unexposed, had rotted away or been obliterated during the filling activities of the 1970s. Iron reinforced vertical structural supports ran from the concrete dock into the fill. These vertical supports were only briefly glimpsed during monitoring and were not available for further documentation (Photograph 3.10-3.12).

Aside from the west wall of Graving Dock No. 2, no significant cultural materials were identified within the second section of the Bulkhead Trench. Graving Dock No. 2 was filled in during the 1970s and the fill material is consistent with this period: automotive parts, tires, aluminum debris, slag, concrete spoil, plastic coffee lids, cinder blocks, and other late 20th century debris. The eastern portion of the trench contained a high amount of concrete attributed to “concrete washing” by concrete trucks in the late 20th century. As a result of this action, stratified concrete layers were identified within the eastern portion (evident in north and south faces) of the trench.

³ Regularly spaced steps, known as stepped altars, run from the top of the dock down towards the center of the dock basin and generally encircle the three stationary sides of the basin. Stepped altars are used as working surfaces to both support the vessel once it enters the graving dock and to store or stage materials.

The uppermost portion of the cap of the west wall of Graving Dock No. 2 was located approximately at existing grade level. The exposed portion of the east wall, the mirror or opposite image of the west wall, was approximately 2 feet below grade. The upper portions of the east wall were likely destroyed following the abandonment of the dock or during filling in the 1970s.

B. TRENCH 1 (Figures 3.7-3.9; Photographs 3.13-3.18)

Trench 1 was approximately 268 feet long and between 30 and 42 feet wide. The trench was oriented approximately north to south (Figures 3.7-3.9) and was laid out using a line of foundation piles (X Line) driven for the IKEA development.⁴ The trench elevation prior to soil removal was approximately six feet above mean high tide. Soil Mechanics, the company in charge of the remediation action, planned to remove soil to a depth of 0.7 feet above mean high tide, removing 5.3 feet of overburden from the trench.

The east wall of Graving Dock No. 2 was exposed during soil removal within Trench 1 (Figure 3.7-3.9; Photographs 3.13-3.14). The portion of the exposed wall, approximately 126 feet long by 4 feet high by 6.5 to 7 feet high, was composed of poured concrete overlying and supported by wooden piles. The poured concrete cap of the east wall contained five stepped altars, each approximately 0.9 feet by 0.75 feet. Due to the length and width of Trench 1, a larger section of the east wall was exposed during monitoring revealing more hardware located on the concrete dock. The circa 1940 electrical conduit located within the Bulkhead Trench running parallel with the east wall and located approximately two feet to the east was also revealed running the entire length of the exposed wall. A mottled, compact clay fill with asphalt (10YR 2/1 with 2/2) separated the east wall from the electrical conduit (Photographs 3.13-3.14).

Hardware located on the exposed portion of the east wall of Graving Dock No. 2 within Trench 1 included two 6"x8" iron rings with clasps and an iron wench with pulley (Photograph 3.15). According to Pino Desario, a former dock worker, ropes tied to vessels were threaded through the iron rings and tightened and stabilized with the pulley and wench (Personal Communication with James Cox, March 2007)

The poured concrete dock (cap) overlaid a horizontal wooden timber, approximately 1-foot wide. "Pulled" iron ties protruded from the wood and likely represent the former location of vertical wooden piles (Photograph 3.17). Vertical wooden piles were encountered in a portion of the trench. Each was approximately 1-foot wide and they were spaced approximately 1-2 feet apart (Photograph 3.17). The vertical piles were affixed to the horizontal wooden element and poured concrete dock by iron ties. The original wooden stepped wall which had been located below the concrete dock, had been removed or destroyed during filling in the 1970s. Loose wooden sheeting was identified during monitoring and initially thought to be evidence of the remaining wooden stepped altars. However, the sheeting was not attached to the aforesaid piles or horizontal elements and was instead likely associated with 20th century fill episodes or redepositions.

Two vertical 4-inch iron pipe valves were located on the top step altar facing into the interior of the graving dock (Photograph 3.16). The inverse ends, located on the exterior side of the dock, had been smashed or flattened. These valves appeared to be horizontal and level. The valves may have been part of the dewatering process associated with the graving dock, but their orientation (prior to monitoring) and function is unclear. Another horizontal 4-inch pipe was located atop the lowest step altar, similar to the pipe found in the Bulkhead Trench/15-foot buffer (Photograph 3.18).

C. UTILITY TRENCH 1 (TEMPORARY UTILITY TRENCH) (Figure 3.10; Photographs 3.19-3.21)

A temporary utility route was planned for electrical lines to provide power to the construction site. The trench was routed through the northern and eastern bounds of the Graving Dock No. 2 archaeological sensitivity area (Figure 3.10). The temporary utility trench, also known as Utility Trench 1, ran from the northern portion of the site (Beard Street) southwest through the western and central portions of the archaeological sensitivity area before turning slightly south, and crossed over the east wall of the graving dock before turning east toward the proposed southern stairwell of the IKEA store facility. Utility Trench 1 was approximately 422 feet long, four feet wide and between

⁴ The piles are numbered in ascending order from north to south. Piles 4 through 10 demarcate perpendicular lines (Y Lines) within the Trench. The centerline of Trench 1 is 75 feet west of the X Line. From the centerline the east and west bounds of the trench were placed at 20 feet, extending the trench width to 40 feet, rather than 30 feet.

three and six feet deep. The depth of this trench was determined by the planned installation of future utilities (Utility Trenches 2 and 3), crossing above the electric lines within Utility Trench 1.

During excavation, the east wall of Graving Dock No. 2 was exposed within Utility Trench 1. The east wall was again located approximately two feet below grade. The maximum exposure of the east wall when first identified was nine feet long by 2.5 feet wide. The newly exposed portion of the eastern wall was approximately six feet north of Trench 1 and consisted of a poured concrete cap, similar to the exposed portions within Trench 1 (Photograph 3.19).

Maximum exposure within profile, including the reinforced concrete cap, was 5.2 feet wide. The concrete cap was overlaid by a mixed, mottled fill of sandy soils (10YR 2/1 (black), 10YR 2/2 (very dark brown), 10YR 4/4 (dark yellowish brown) and 10YR 4/6 (dark yellowish brown)) and demolition debris (bricks, concrete, etc.). The fill overlaid concrete spoil (north of the cap) and asphalt (south of the cap), at the same grade as the concrete cap. The concrete spoil overlaid "interior fill," a coarse, dark yellowish brown mottled sand (10YR 4/4 and 10YR 4/6) with building debris (brick, building debris, concrete, modern fill, etc.). Beneath the asphalt was a layer of trap rock above "exterior fill," which was comprised of mixed fill and demolition deposits, a mottled black sand (10YR 2/1) with dark yellowish brown sand (10YR 4/6) and building debris consisting of concrete, gravel and modern trash (Photograph 3.20).

Installation of the temporary utilities within the trench breached the modern concrete cap/step altar, but did not impact any *in situ* wooden elements. In profile it was revealed that a four-inch pipe lay on the stepped altars. A reinforced concrete pad was located along the exterior or eastern side of the concrete cap/stepped altars. The reinforced concrete pad was not likely contemporaneous with the concrete cap of the graving dock. In profile the concrete cap/stepped altars within Utility Trench 1 are similar to those identified within Trench 1 (Figure 3.10; Photograph 3.21).

D. UTILITY TRENCH 2 (Figures 3.11; Photographs 3.22-3.24)

Utility Trench 2 was an approximately 336-foot long, ten-foot wide and 4.5 foot deep trench carrying electrical lines from Beard Street south through the northern side of the site. This trench was located parallel to the east wall of Graving Dock No. 2, and then turned east toward the future IKEA store site. The electrical lines were stacked (approximately three feet wide) throughout the northern 172 feet of the trench until reaching a manhole box (approximately eight feet by fifteen feet). South of the manhole box the lines were split (approximately seven feet), and laid next to each other. The lines ran approximately 92 feet until they split again into two routes. The second split turned east and proceeded 72 feet before terminating within the footprint of the future store site. The utilities and manhole box were supported by piles and laid on "gray bar," a reinforced concrete pad. Much of the area excavated for Utility Trench 2 was previously monitored during soil remediation within Trench 1.

The route of Utility Trench 2 is divided into three sections: Headwall, Manhole Box, and Southern Exposure. The Headwall section was the area north of the Manhole Box and parallel with the headwall of Graving Dock No. 2. The Manhole Box section was the area excavated during the construction of the manhole box. The Southern Exposure was the area south of the Manhole Box and parallel with the east wall of the dock. Within Utility Trench 3, discussed in detail below, the Southern Exposure section crossed over the eastern wall; however, no significant cultural materials were identified within the Headwall or Southern Exposure sections within Utility Trench 2. Cultural materials, perhaps associated with the graving dock, were identified within the Manhole Box section. The results of monitoring are summarized below.

1. Headwall

The electrical conduit running parallel with and east of the east wall of Graving Dock No. 2 was identified within the Headwall section of Utility Trench 2, but at the point at which this feature was identified it was pulling away from the dock and running northeast towards another building or Beard Street, outside of the 15-foot buffer. The Headwall section of the trench did not intersect with the headwall or any other component of the graving dock. No significant cultural materials were identified within the Headwall section of Utility Trench 2.

2. Manhole Box (Photographs 3.22-3.24)

The Manhole Box section of Utility Trench 2 was approximately eight feet (east-west) by fifteen feet (north-south). The total area excavated was approximately eighteen feet (east-west) by twenty-four feet (north-south) and

rectilinear. Six wooden piles - two rows of three, spaced seven feet apart - were installed to support the manhole box. Total depth excavated was eight feet below grade. Grade was unnaturally raised through soil remediation within Trench 1, which partially overlapped with the area excavated for the manhole box.

A horizontal wooden timber was identified approximately 6.5 feet below grade within the western portion of the Manhole Box section of Trench 2. The wooden element was located approximately twelve feet north of the southwestern corner of the manhole box excavation and was oriented east-west. The timber was approximately three feet long and between 0.5 and 1.5 feet wide. Much of the wood had rotted away, but it appeared that it likely overlaid additional wooden components. The wooden timber was outfitted with an iron tie with an iron plate protruding from the top of the wood. A vertical iron plate connected the wood to the decayed wood elements below. Projecting west, the wooden timber was at least three feet east of the east wall of the graving dock, based on cartographic extrapolation (Photographs 3.22-3.23).

The western profile of the Manhole Box section indicates that the wooden timber had not been cut into the surrounding matrix, which consisted of a dark yellowish brown sand (10YR 4/6) mixed with gravel. The electrical conduit, running parallel to and east of the east wall of the graving dock, was located above this horizon, separated by compact yellowish brown clay fill (10YR 5/6). Projecting west, the wooden timber might have been located below the east wall of the graving dock. At this time the relationship between the former dock and the timber is unclear based on the limited exposure within the trench (Photograph 3.24).

3. Southern Exposure

No significant cultural materials were identified within the Southern Exposure section of Utility Trench 2. Further, part of the Southern Exposure section lay outside of the monitoring zone, including the 15-foot buffer. The southern route of the trench did not intersect with the buried graving dock or reveal any significant infrastructural elements, ancillary elements, or features.

E. UTILITY TRENCH 3 (Figures 3.12-3.15; Photographs 3.25-3.32)

Utility Trench 3 ran parallel with Utility Trench 2 and was approximately 380 feet long, ten feet wide, and 4.5 feet deep. The trench was excavated for the route of electrical lines running from Beard Street south through the northern side of the site. The trench crossed over the headwall of Graving Dock No. 2, passed through the center of the dock, then turned towards the southeast where it crossed the east wall of the graving dock before it ended at the site of the future store.

Similar to Utility Trench 2, the electrical lines in this trench were stacked (approximately three feet wide) throughout the northern 172 feet of the trench until they reached a manhole box (approximately eight feet by fifteen feet in size). South of the manhole box the lines were split (approximately seven feet wide) and laid next to each other. The lines then ran adjacent to each other for approximately 92 feet until they split again into two routes. After the second split the route of the trench turned east and proceeded 96 feet where it crossed the east wall of Graving Dock No. 2 before terminating within the footprint of the future store site (see Figure 3.12).

The route of Utility Trench 3 is divided into three sections: Headwall, Manhole Box and Southern Exposure. The Headwall section was the area north of the Manhole Box and intersected with the headwall of Graving Dock No. 2. The Manhole Box was the area excavated for the installation of the manhole box. The Southern Exposure was the area south of the manhole box running parallel to and crossing over the east wall of the dock. The east wall of Graving Dock No. 2 was identified in each section of Utility Trench 3. The results of monitoring each section are summarized below.

1. Headwall (Figure 3.15; Photographs 3.25-3.26)

The headwall of Graving Dock No. 2 was identified within the Headwall section of Utility Trench 3. Piles driven to support the electrical line impacted part of the poured concrete headwall, and a nine-foot section was removed during monitoring. The remaining 32-foot long, seven-foot wide portion of the headwall was documented.

The exposed portion of the headwall of Graving Dock No. 2 within Utility Trench 3 was comprised of poured concrete with iron hardware (Photographs 3.25-3.26). The headwall was located approximately 2.5 feet below grade,

or 4.23 feet above mean sea level, and was overlaid by concrete wash and/or fill and other building debris. The concrete wash was left on the headwall when it was encountered as a complete, distinct horizon.

The headwall appeared to be solid cast concrete extending approximately 15 feet southwest from the northern pile-break before angling southwest, congruent with available historic cartographic sources (see Chapter 2). The exposed portion of the headwall did not appear to overlie wooden elements or stepped altars. The installation of utilities within this section of Utility Trench 3 did not entail further soil removal to determine what was below the uppermost concrete section of the headwall.

2. Manhole Box (Figure 3.14; Photographs 3.27-3.30)

The Manhole Box section of Utility Trench 3 was approximately eight feet (east-west) by 15 feet (north-south). The total area excavated was approximately 18 feet (east-west) by 23 feet (north-south) and rectilinear. Six wooden piles, two rows of three, were spaced seven feet apart to support the manhole box. The total depth excavated was six feet below grade. Grade was unnaturally raised through soil remediation within Trench 1, which overlapped with the entire area covered by the manhole box excavation within Utility Trench 3 (Figure 3.14; Photographs 3.27-3.30; see also Photograph 3.17.).

The concrete dock (cap) and wooden elements associated with the graving dock, previously identified within Trench 1, were again exposed during the excavation for the manhole box. (Photographs 3.27-3.30). An additional 0.5 foot of the wooden elements was also revealed.

The poured concrete dock (cap) overlaid a horizontal wooden timber, approximately one foot wide. In part of the trench “pulled” iron ties protruded from the wood, likely representing the former location of vertical wooden piles (Photograph 3.27). When encountered elsewhere in the trench, vertical wooden piles, approximately one foot wide, were spaced approximately one to two feet apart (Photograph 3.17, 3.29). The vertical piles were affixed to the horizontal wooden timber and poured concrete dock by iron ties. Wooden stepped altars had likely been located below the concrete dock but were removed or destroyed during filling in the 1970s. Loose wooden sheeting was identified during monitoring and initially thought to be evidence of the remaining wooden stepped altars. The loose wooden sheeting was removed to reveal that it overlaid modern fill. The examination of the sheeting, which was not attached to the aforesaid graving dock piles or horizontal timber, indicated that it was instead associated with the 20th century fill material. It is likely that much of the wooden superstructure of the graving dock was destroyed when the facility was filled.

3. Southern Exposure (Photographs 3.31-3.32)

The southern section of Utility Trench 3 intercepted and crossed the east wall of Graving Dock No. 2. The portion of the wall revealed in the Southern Exposure section of Utility Trench 3 was 25 feet long, 4.6 feet wide and 2.5 feet deep. The east wall was located approximately two feet below grade in this location.

The wall contained two stepped altars below the top of the dock (cap) on its interior or eastern face. Each of the stepped altars were approximately seven inches wide and seven inches deep (Photograph 3.31-3.32). The concrete-encased electrical conduit paralleled the east wall, running along its east side, separated by approximately two feet of fill that contained a five-inch iron pipe. The pipe appeared to be parallel with both the east wall and the electrical conduit. Unfortunately, the relationship between the pipe, graving dock and electrical conduit is unclear (Photograph 3.32) due to the limited exposure within the excavation cut for Utility Trench 3.

B. UTILITY TRENCH 4 (Figure 3.16-3; Photographs 3.33-3.35)

Utility Trench 4 was located perpendicular to the graving dock, crossing over both the east and west walls, south of Utility Trenches 2 and 3. At its maximum exposure Utility Trench 4 was approximately 147 feet long, four feet wide and five feet deep. The graving dock at its greatest expanse, from eastern exterior edge to western exterior edge, was 117 feet long. Aside from the concrete-encased conduit running parallel with the east wall of the graving dock, no historical utilities were identified within the 15-foot buffer. The 15-foot buffer on the west side of Graving Dock No. 2 overlapped with the crane gantry way.

1. Graving Dock: West Wall

The exposed section of the west wall of Graving Dock No. 2 within Utility Trench 4 measured approximately 6 feet wide and 2.7 feet deep. It appeared that the top stepped altar had been partially removed; with the three steps below it revealed during excavation. The west wall appeared to be heavily degraded and the steps in extremely poor condition (Photograph 3.33). Concrete patches were observed on the stepped altars of the western or interior face of the graving dock. A void within the southern side of the western or interior face indicated that the concrete dock (cap) within this section was perhaps hollow.

No utilities were located within the western 15-foot buffer/apron. This location did, however, encompass part of the crane gantry way. The presence of the gantry way likely precluded the installation of utilities or other subsurface features within the western 15-foot buffer.

2. Graving Dock: East Wall

The exposed section of the east wall of Graving Dock No. 2 within Utility Trench 4 was approximately 4.5 feet wide and 5 feet deep. Although the surface step had been partially removed, four intact stepped altars were exposed during monitoring. The lowest (deepest) stepped altar appeared to be weathered, perhaps through continued usage or neglect. Each of the stepped altars was approximately eight inches wide and five inches deep. The east wall was located approximately one foot below grade in this location (Photograph 3.34-3.35).

Aside from the electrical conduit, running parallel with and east of the east wall, no utilities were located within the eastern 15-foot buffer. Fill overlaid both the east wall and the electrical conduit. The interior fill contained building debris associated with the 1970s fill of the graving dock.

4. CONCLUSIONS

Documentary research indicated that Graving Dock No. 2 was originally a wooden facility (HPI 2003). Cartographic evidence indicates that Graving Dock No. 2 had been upgraded several times, but detailed information on the materials and changes was not available from documentary sources.⁵

The exposed remnants of Graving Dock No. 2 consisted of poured concrete overlying and supported by wooden piles and other wooden elements. The poured concrete dock (cap) was characterized by regularly spaced steps, known as stepped altars, running from the top of the dock down towards the center of the dock basin. The concrete dock (cap) overlaid wooden piles, perhaps remnants of the wooden stepped altars and superstructure from the original circa 1867 graving dock. It was noted that much of the wood supporting the graving dock had rotted away during the past 30 years or had been disturbed during filling.

There is no doubt that the wooden graving dock had been updated with the addition of a poured concrete dock (cap), perhaps as the wooden elements began to falter. The patches, or repairs noted on the wall (particularly in sections of the graving dock exposed in Utility Trench 4) indicate that the concrete was likely in place during much of the 20th century.

According to a modern source:

Some of the earliest basin dry docks were simple excavations lined with timber, having a brick or concrete floor and fitted with a gate bearing against a sill to exclude the tide. The vessels entered at high tide, and the entrance gate was closed. As the tide receded, the dock emptied itself through a tidal sluice, and the vessel settled on blocks that had been prepared for it. At locations with little or no tide, the water had to be pumped out of the basin. As

⁵ The dock appeared to be relatively unaltered between 1874-1880, before being changed during the first half of the 1880s. By 1886 it is depicted as dwarfing Graving Dock No. 1. The dock again appeared stable between 1886-1915 before being altered during the second quarter of the 20th century, according to a map produced in 1939. This map indicated that Graving Dock No. 1 had been rebuilt, altering the orientation of the west wall of Graving Dock No. 2. The 1950 map presented the dock in greater detail and indicated further development, notably with the change in type of gate and addition of new utilities along its southern walls. From 1950 the dock remained unchanged until it was filled in the 1970s.

ships became larger, dry docks became important civil works. Solid masonry was adopted for lining the walls, and large pumps were added for rapid dewatering of the dock (Gaythwaite 2004: 413-414).

A mid 20th century account of dry dock construction noted that:

The structural repairs of a concrete or masonry graving dock, with greenheart gates, are infinitesimal. Steel gates will necessitate some expense of upkeep, as against a reduction in their cost of construction compared with wooden gates. No doubt, the timber graving docks prevalent in the United States require extensive repairs from time to time, but in this case is also the capitalised (sic) amount is balanced by a corresponding economy in initial expenditure, and they represent, moreover, a very limited class (Cornick 1958: 178).

As noted earlier, Graving Dock No. 1 was rebuilt in 1896 and was expanded and rebuilt again in 1928-1929, while Graving Dock No. 2 remained functional. Although its defining size and shape was not altered, Graving Dock No. 2 was likely updated between 1896-1928 during the interim of work on Graving Dock No. 1. It is possible that the concrete cap uncovered during archaeological monitoring is contemporaneous with the reconstruction of Graving Dock No. 1 in the twentieth century. However, no significant diagnostic materials, contexts, or documents have been identified to confirm the date of this alteration. Graving Dock No. 2 was evidently a less important component of the shipyards and was not updated to the same substantial extent as Graving Dock No. 1. However, Graving Dock No. 2 was likely integral to the continued use of the facilities while Graving Dock No. 1 was undergoing repairs.

Based on the historic dry dock construction practices quoted above it would seem that Graving Dock No. 2 was updated to prolong its effective life, but not in a manner that would take it into the 21st century. The exposed wooden elements of the dry dock were probably replaced several times during the dock's usage, and the concrete cap likely acted as a stopgap measure until the entire dock could be rebuilt, similar to Graving Dock No. 1. However, it is likely that with the advent of the World Wars, the addition of floating dry docks and other modern advances the usefulness or profitability of maintaining or updating Graving Dock No. 2 became questionable.

Although not officially determined eligible for listing on the National Register of Historic Places (NRHP), the SHPO environmental review of 2003 determined that Graving Dock No. 2 was likely eligible for NRHP recognition, depending on its integrity. Monitoring, as detailed in this technical report, has indicated that the uppermost sections of the graving dock had been either altered or destroyed during early to mid 20th century activities. Monitoring also revealed that an undocumented poured concrete dock (cap) had been installed atop the wooden elements of the graving dock. In summary, monitoring activities found that the graving dock was likely altered numerous times throughout its usage. Therefore integrity of the 1867 Graving Dock was not as intact as had been indicated in the documentary record. However, the exposed portions of the graving dock, including the stepped altars of the Graving Dock and associated hardware, were identified and recorded.

5. REFERENCES

Anderson, Sven, editor

1907 *Floating Drydocks*. Maryland Steel Company, Sparrows Point, MD.

Brooklyn Eagle (selected years available online at <http://eagle.brooklynpubliclibrary.org>)

1870 Erie Basin and Dry Docks. *Brooklyn Eagle*, May 17, 1870. Page 2.

1894 Going Into Winter Quarters. Canal Boats Filling Up the Atlantic and Erie Basins. *Brooklyn Eagle*, December 5, 1894. Page 12.

1896 A Fine New Dry Dock. *Brooklyn Eagle*, August 3, 1896. Page 2.

1899a Preparations Are Now Being Made for the Establishment of Additional Dry Docks. *Brooklyn Eagle*, July 2, 1899. Page 35.

1899b The Erie Basin Is Now a Winter Venice. *Brooklyn Eagle*, December 17, 1899. Page 38.

Burrows, Edwin G. and Mike Wallace

1999 *Gotham, A History of New York City to 1898*. Oxford University Press, New York.

Coast Survey Office

1844 *Map of New-York Bay and Harbor and the Environs*. Survey of the Coast of the U.S. Office. On file, New York Public Library, Map Division.

Colton, J.H.

1849 *Map of the City of Brooklyn*. J.H. Colton, New York. On file, New York Public Library, Map Division.

Cornick, Henry F.

1958 *Dock and Harbour Engineering, Volume 1, The Design of Docks*. Charles Griffin & Company Limited, London.

Gaythwaite, John W.

2004 *Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels*. American Society of Civil Engineers, Reston, Virginia.

Gilbride, John T.

1966 *Todd Shipyards In Peace and War*. The Newcomen Society in North America, New York.

Historical Perspectives, Inc. (HPI)

2003 Phase 1A Archaeological Assessment, Proposed Ikea Site, Block 612, Lot 130, Red Hook, Erie Basin, Brooklyn, Kings County, New York, August.

J. Livingston & Co.

1942 *High and Low Tension Underground Duct Distribution System of Entire Yard*. Drawing No. 110. Todd Shipyards Corp., Todd Erie Basin Drydock Corp, Brooklyn, New York. December 11, 1942.

Mitchell, C. Bradford

1981 *Every Kind of Shipwork: A History of Todd Shipyards Corporation, 1916-1981*. The Corporation, New York.

Perris, William

1855 *Maps of the City of Brooklyn*. William Perris, New York. On file, New York Public Library, Map Division.

Raber Associates

1984 Cultural Resources Investigations in Brooklyn Reach 1: New York Harbor Collection and Removal of Drift Project. Prepared for New York District, Army Corps of Engineers.

1985 Todd Shipyards, Erie Basin. Addendum To: Cultural Resources Investigations in Brooklyn Reach 1: New York Harbor Collection and Removal of Drift Project. Prepared for New York District, Army Corps of Engineers.

Ratzer, B.

1766-7 *Plan of the Town of Brooklyn and Part of Long Island, Surveyed in the Years 1766 and 1767*. On file, New York Public Library, Map Division.

Sanborn Map Company

1886 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. Electronic copy available at the Columbia University Library, New York.

1904 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. Electronic copy available, Columbia University Library, New York.

1915 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. Electronic copy available, Columbia University Library, New York.

1939 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. Electronic copy available, Columbia University Library, New York.

1950 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. Electronic copy available, Columbia University Library, New York.

1968 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. On file, New York Public Library, Map Division.

2003 *Insurance Maps of the Borough of Brooklyn*, Volume 1. Sanborn Map Company, New York. On file, New York Public Library, Map Division.

Todd Shipyards Corporation

1939 *Todd Shipyards Corporation at War*. New York.

Todd Shipyards Corporation, Brooklyn Division

1969 (1971) *Salt Water System*. October 1969, altered June 1971.

United States Geological Survey (USGS)

1874 *Bay and Harbor of New York*. On file, New York Public Library, Map Division.

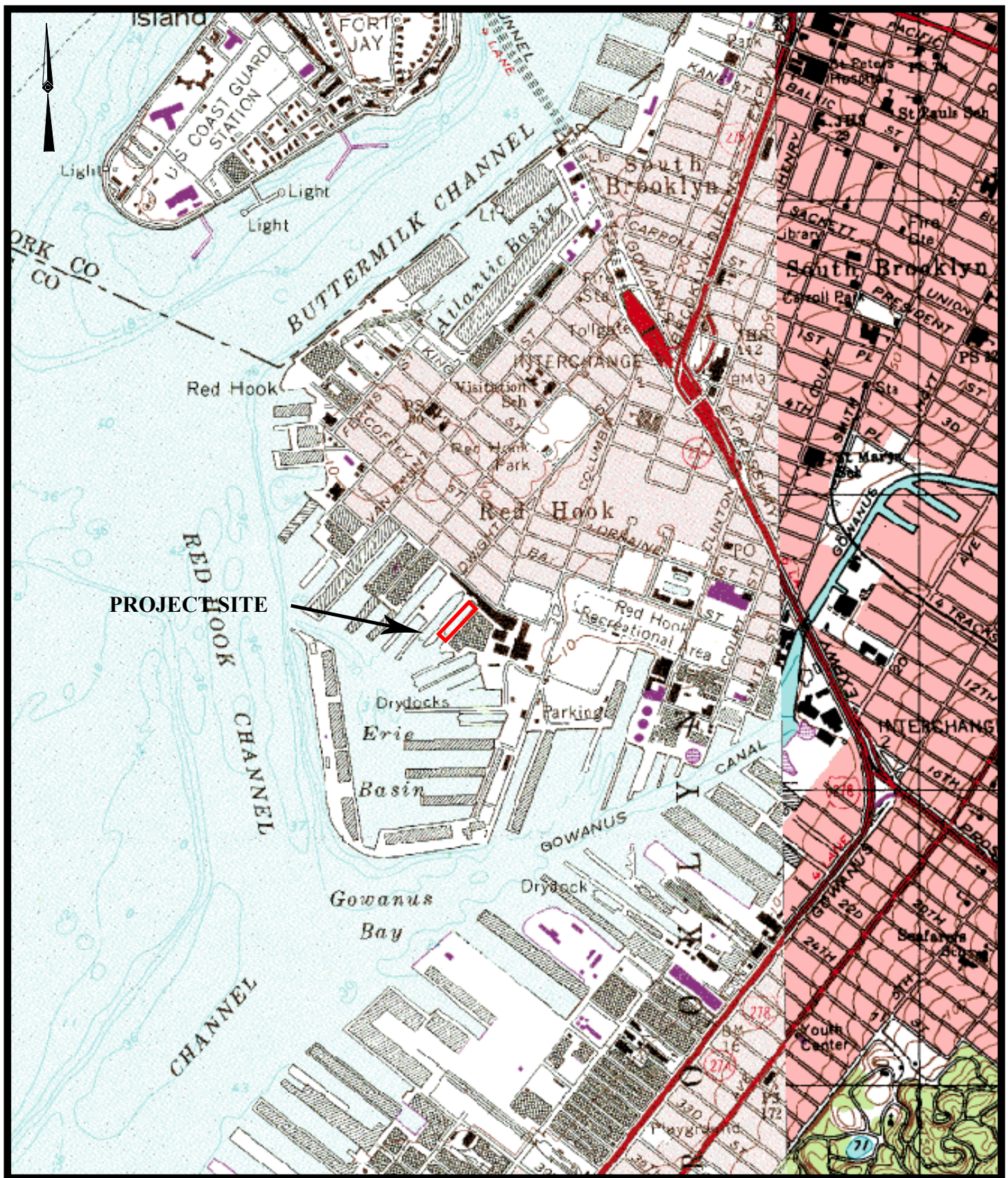
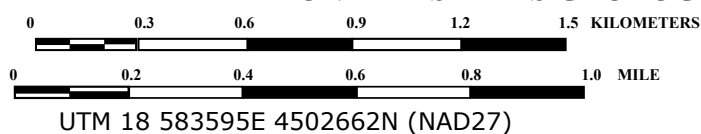


FIGURE 1.1 LOCATION OF GRAVING DOCK NO. 2 ON JERSEY CITY QUADRANGLE, NEW JERSEY AND NEW YORK; BROOKLYN QUADRANGLE, NEW YORK. UNITED STATES GEOLOGICAL SURVEY, 1976 AND 1995, RESPECTIVELY.



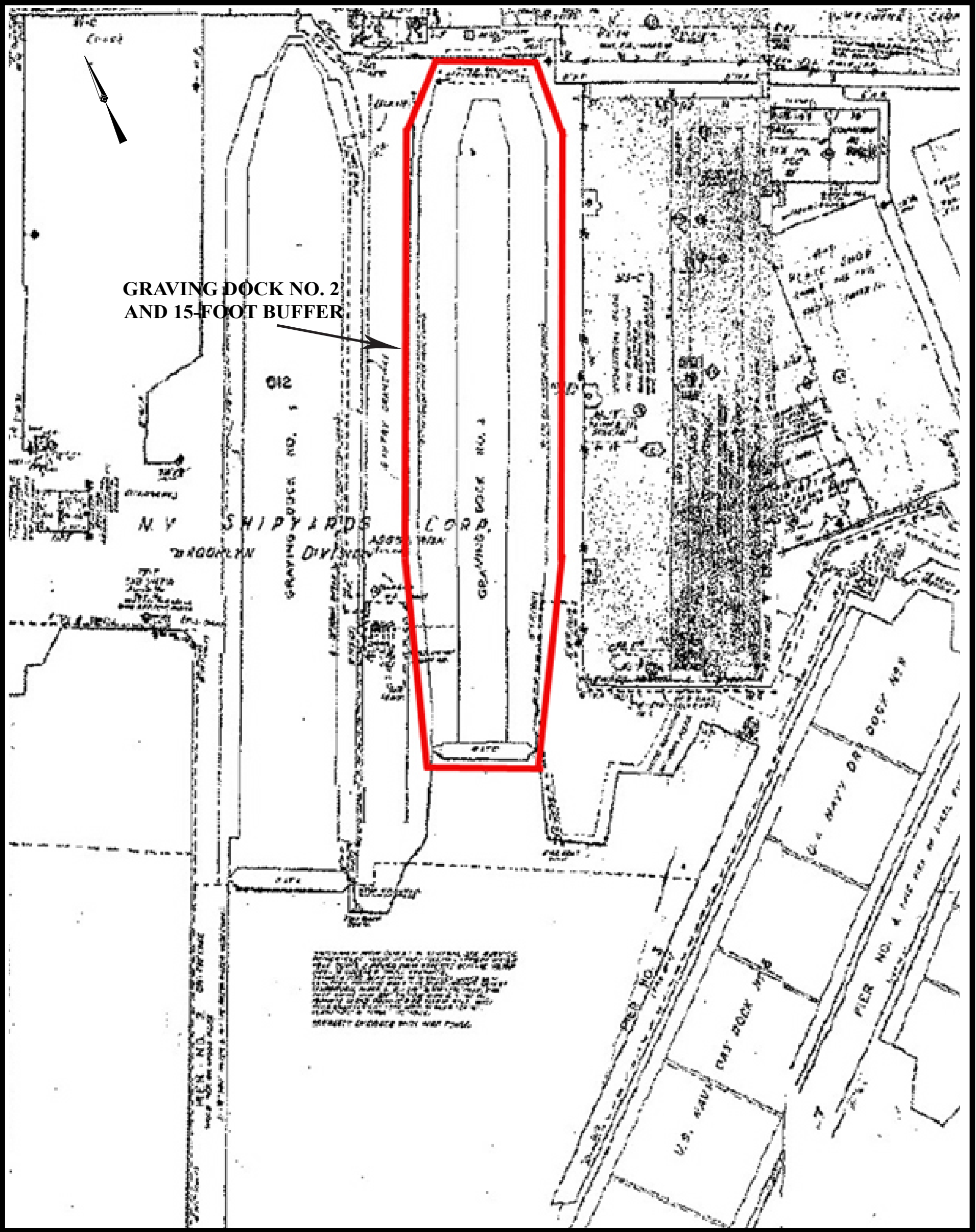
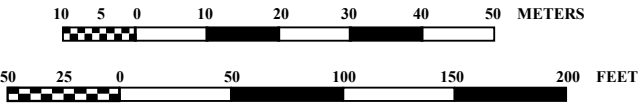


FIGURE 1.2 GRAVING DOCK NO. 2, BROOKLYN, NY. SANBORN 2003.





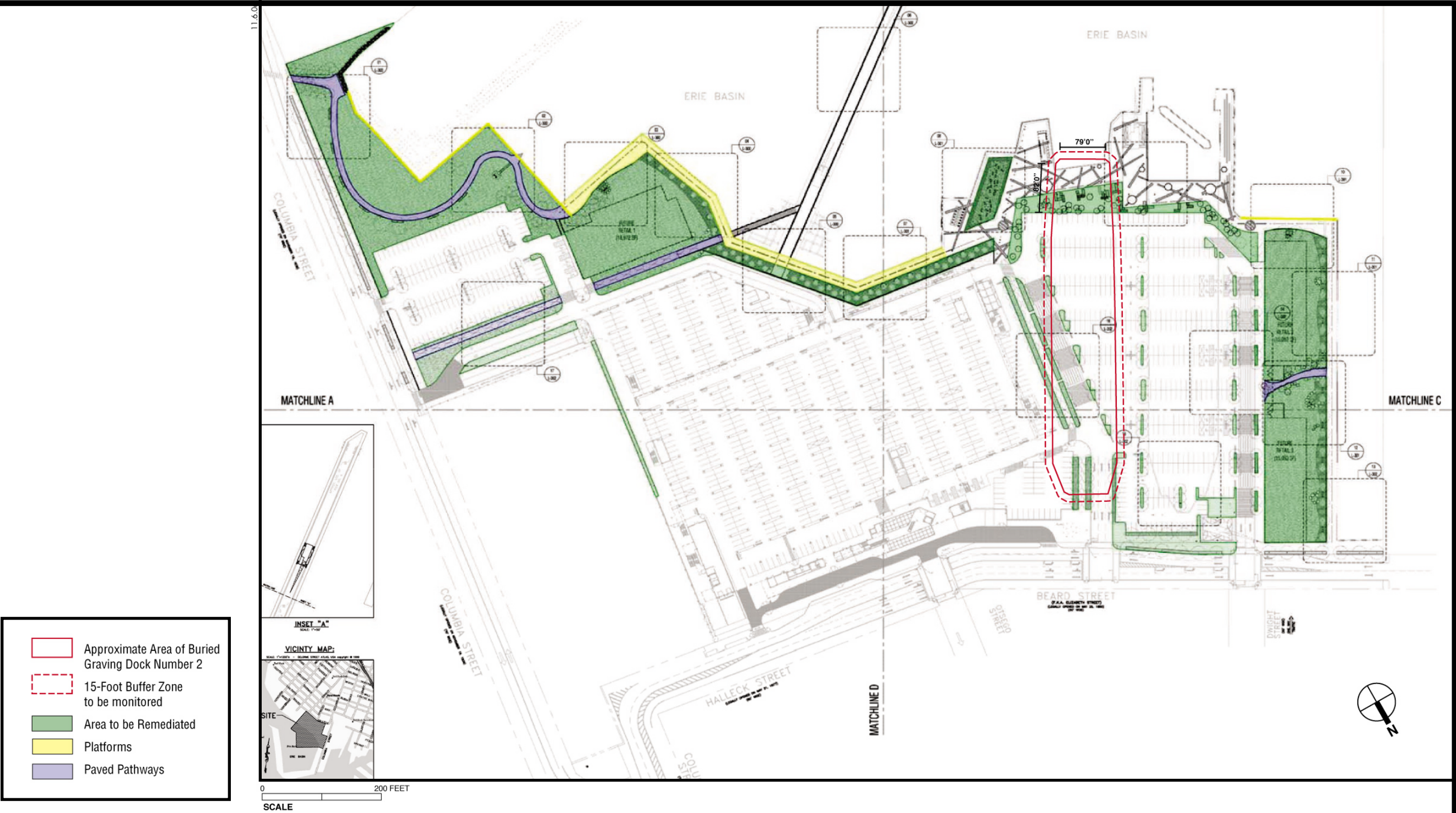


FIGURE 1.4 PROJECT SITE PLAN SHOWING THE LOCATION OF FORMER GRAVING DOCK NO. 2 AND PLANNED SOIL REMEDIATION ACTIVITY AREAS.

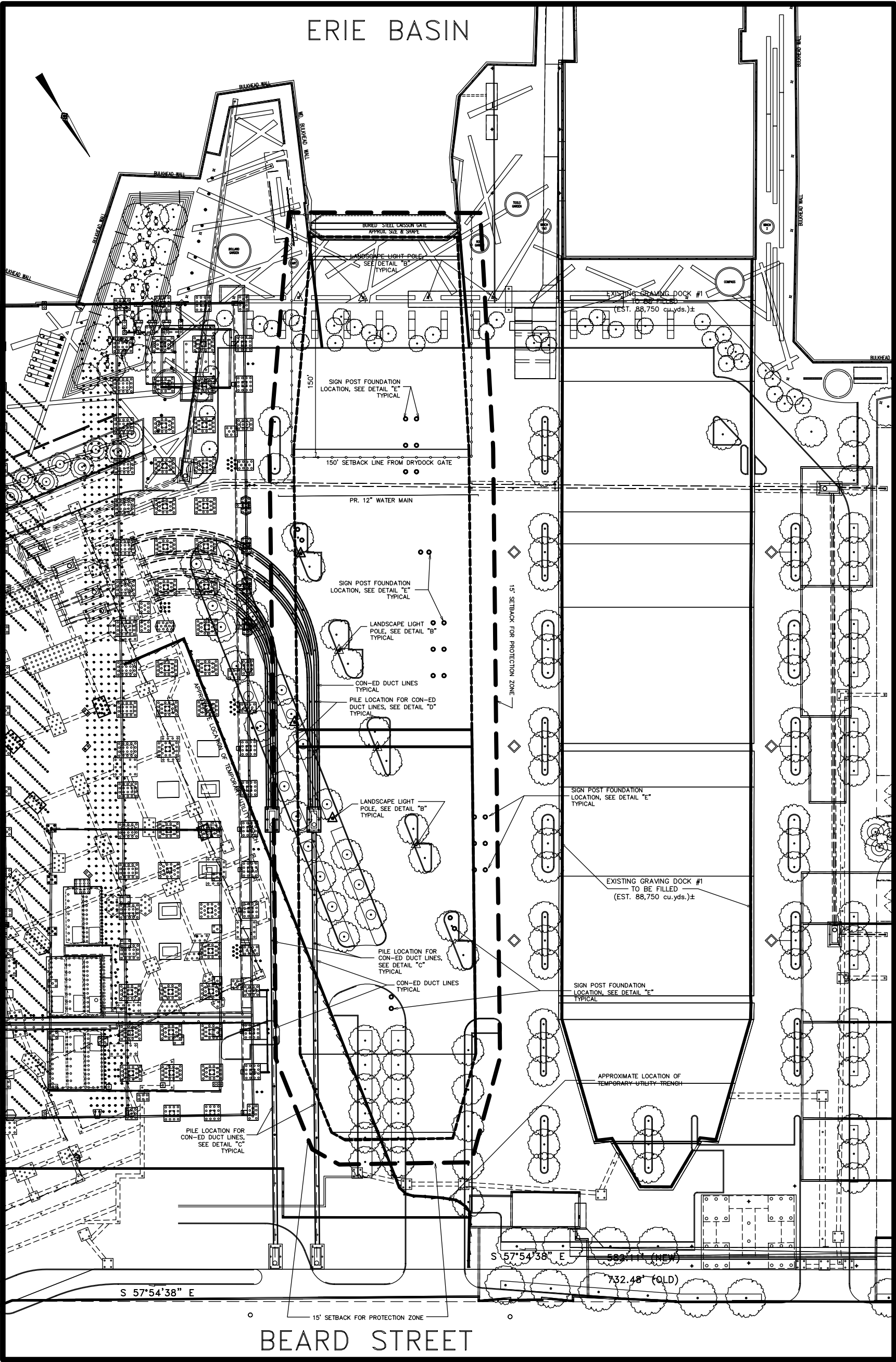
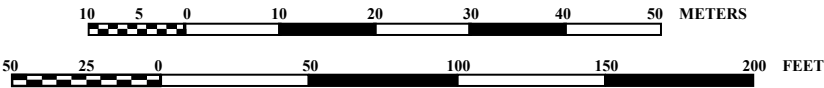


FIGURE 1.5 SITE PLAN SHOWING THE APPROXIMATE LOCATION OF GRAVING DOCK NO. 2 and 15-FOOT BUFFER ZONE WITH PROPOSED UTILITIES AND LANDSCAPED AREAS.

— — GRAVING DOCK NO. 2 AND 15-FOOT BUFFER ZONE



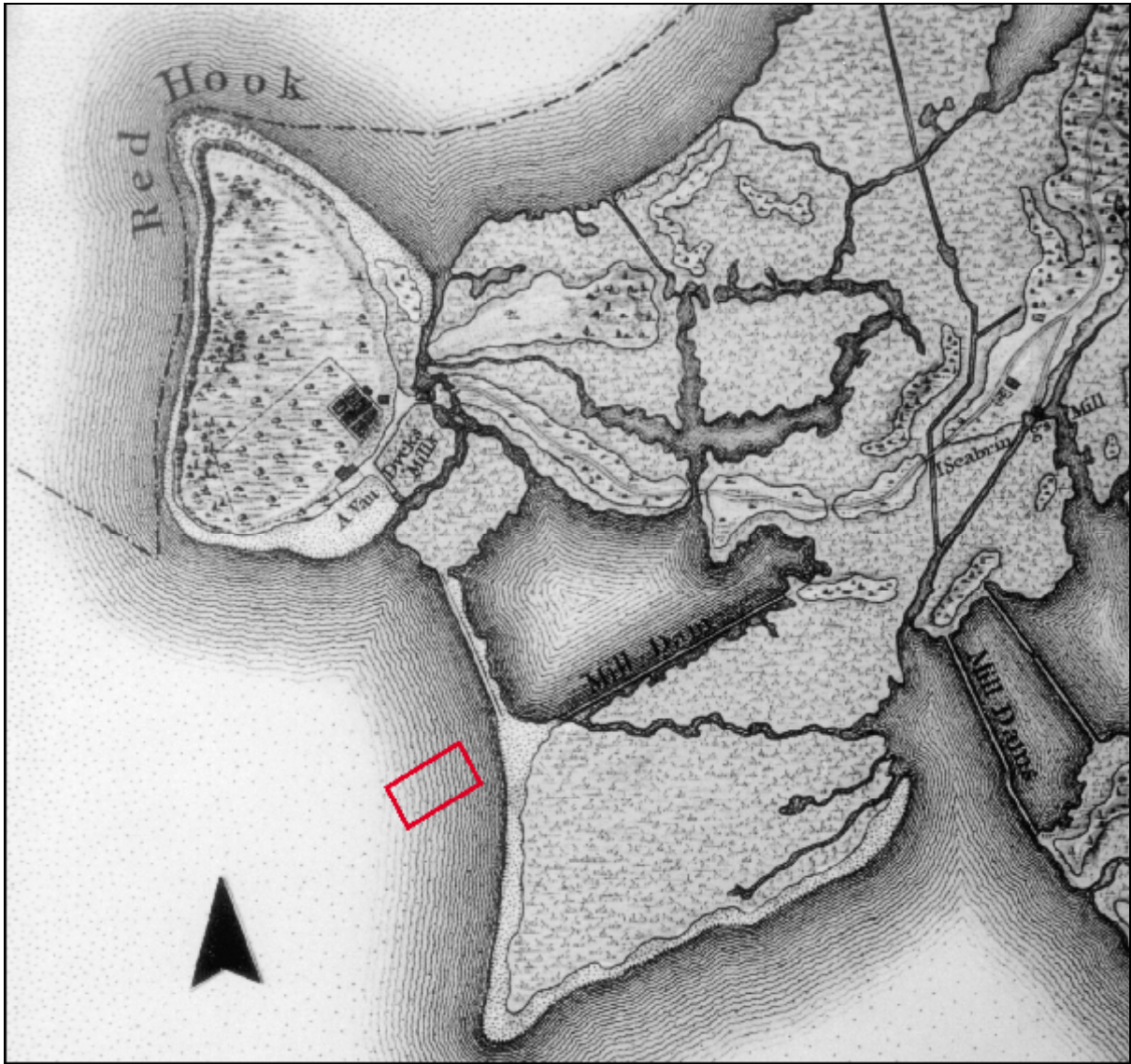


FIGURE 2.1. *Plan of the Town of Brooklyn and Part of Long Island.* Ratzer 1767. Project area/APE indicated with red box. Scale one inch: 1000 feet (approximately).





FIGURE 2.2. *Map of New-York Bay and Harbor and the Environs.* Coast Survey Office 1844. Project area/APE indicated with red box. Scale one inch: 1000 feet (approximately).





FIGURE 2.3. *Map of the City of Brooklyn. Colton 1849. Project area/APE indicated with red box. Scale one inch: 1000 feet (approximately).*



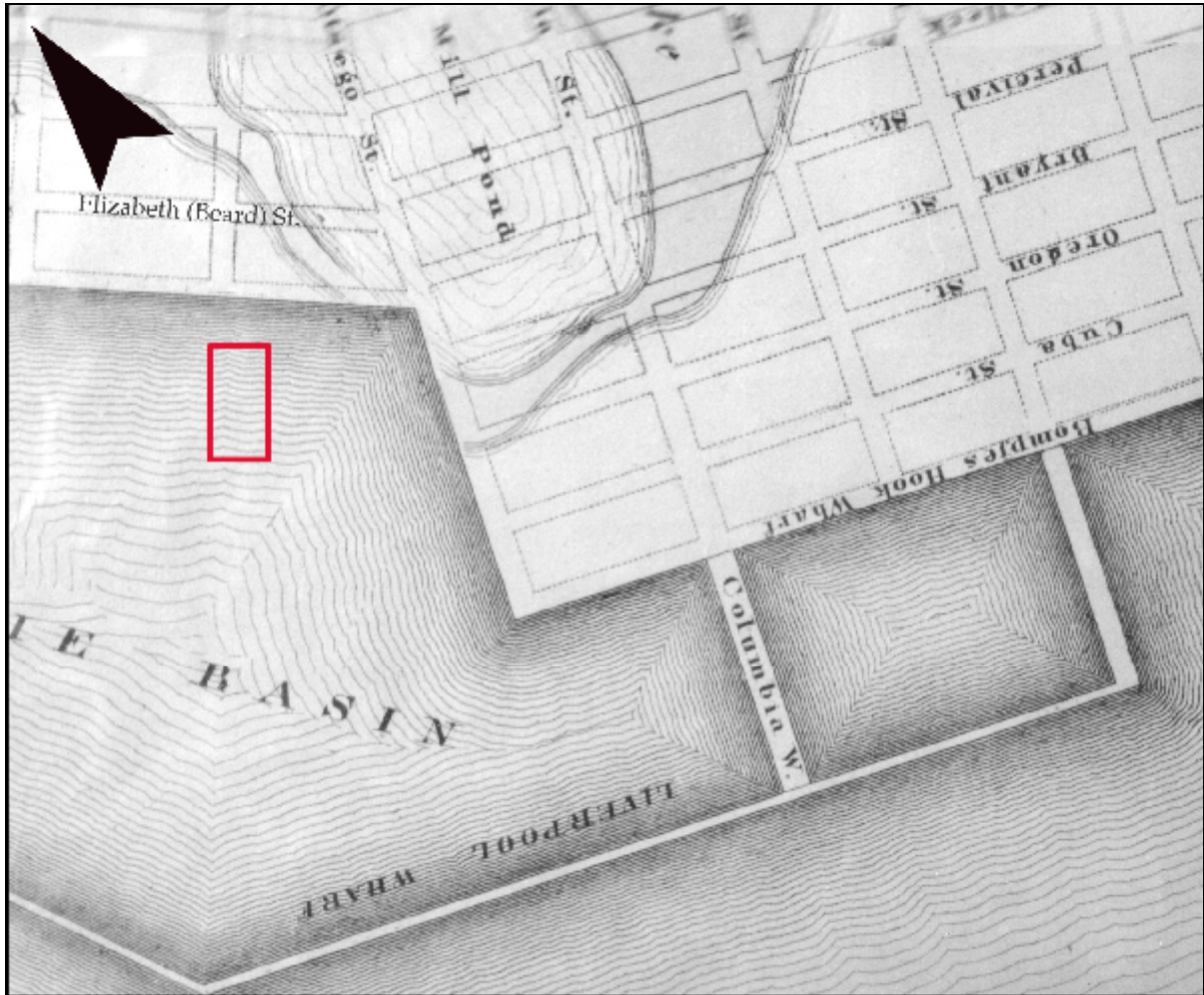


FIGURE 2.4. *Maps of the City of Brooklyn.* Perris 1855. Project area/APE indicated with red box. Scale one inch: 1200 feet (approximately).



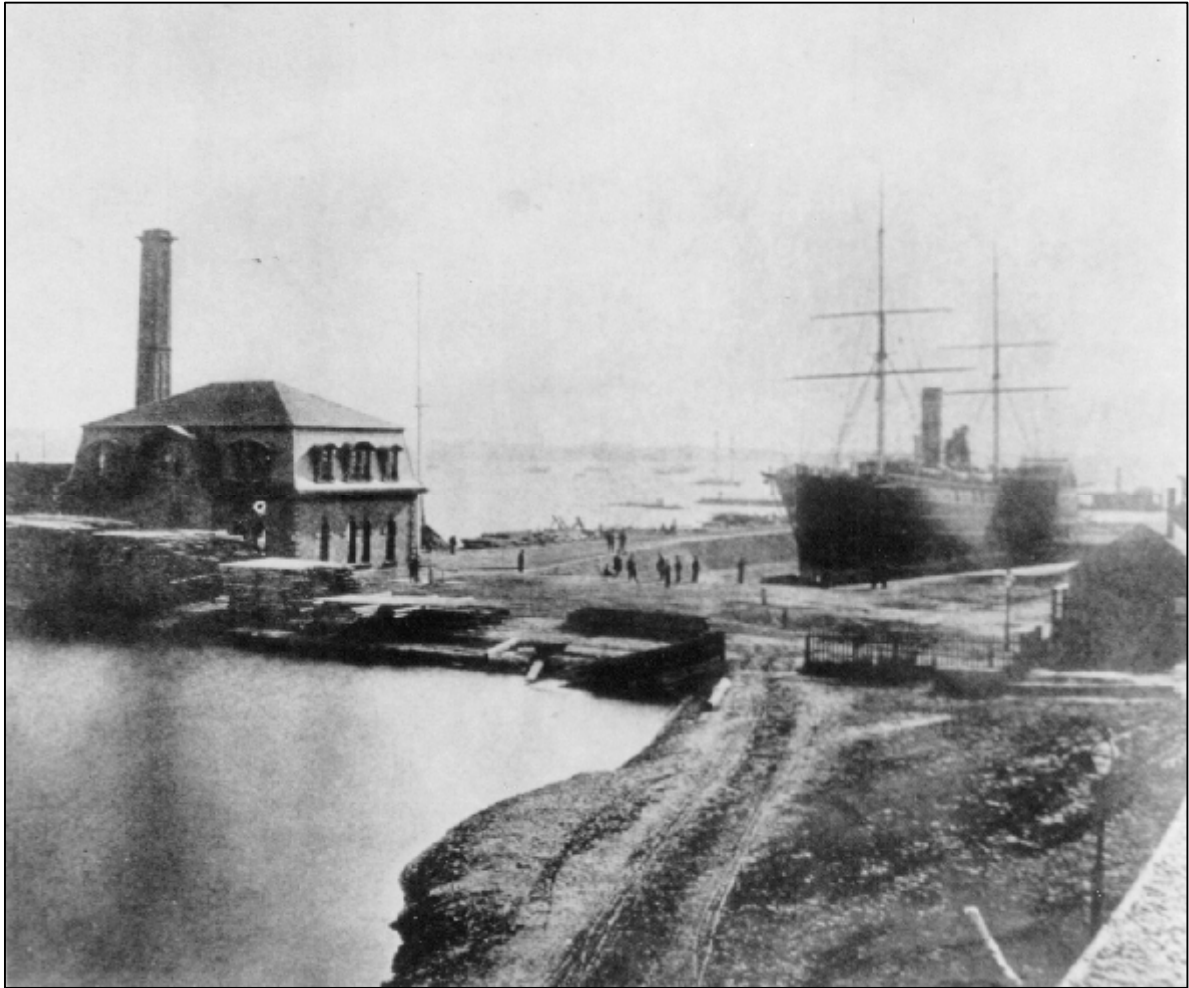


FIGURE 2.5. *“Erie Basin’s first graving dock, photographed in 1866, the year it opened. The sidewheeler under repair is believed to be the 2,000-ton New York-New Orleans liner Morning Star of the New York Mail Steamship Co.”* (Source: Mitchell 1981, p. 1.).



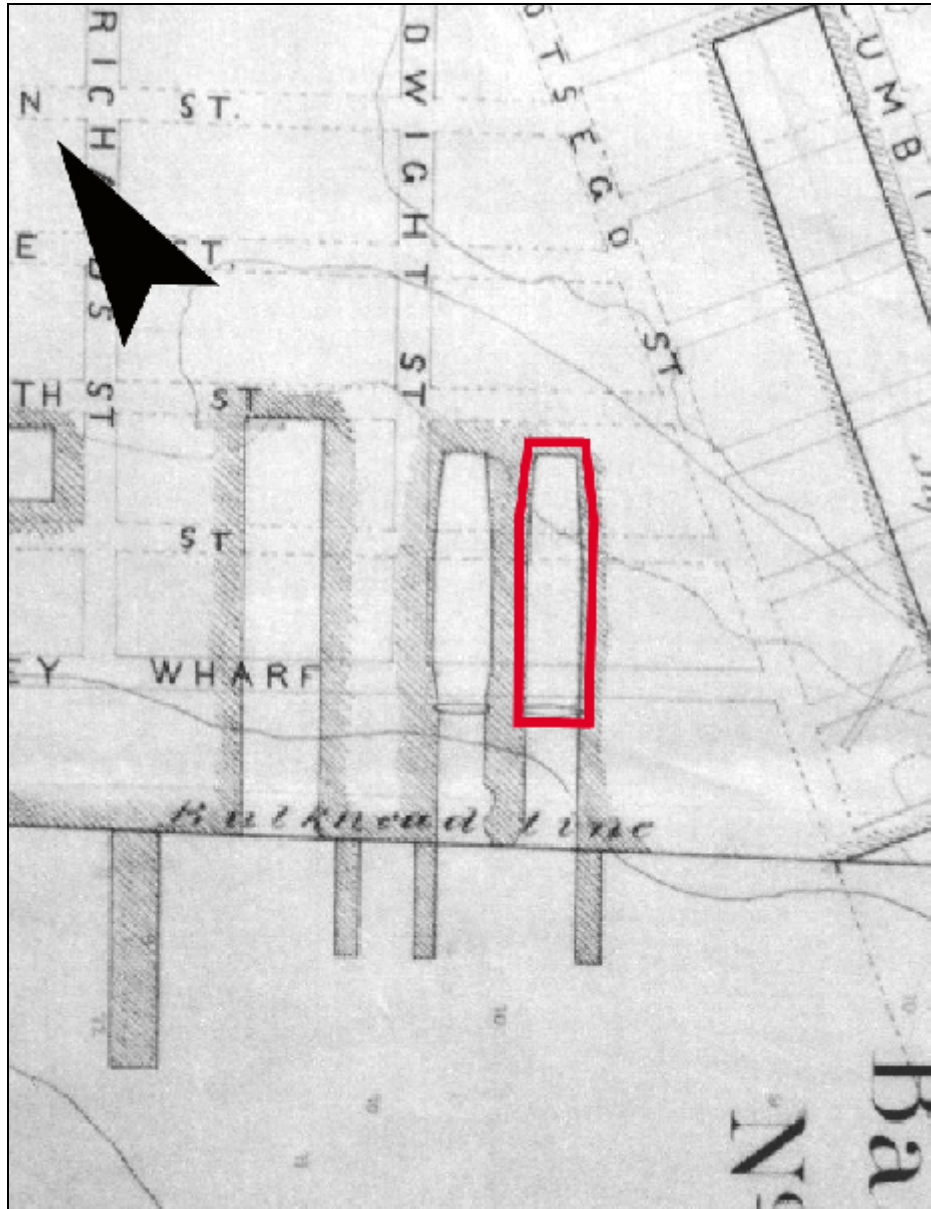


FIGURE 2.6. *Bay and Harbor of New York.* United States Geological Survey 1874. Project area/APE indicated with red box. Scale one inch: 964 feet (approximately).



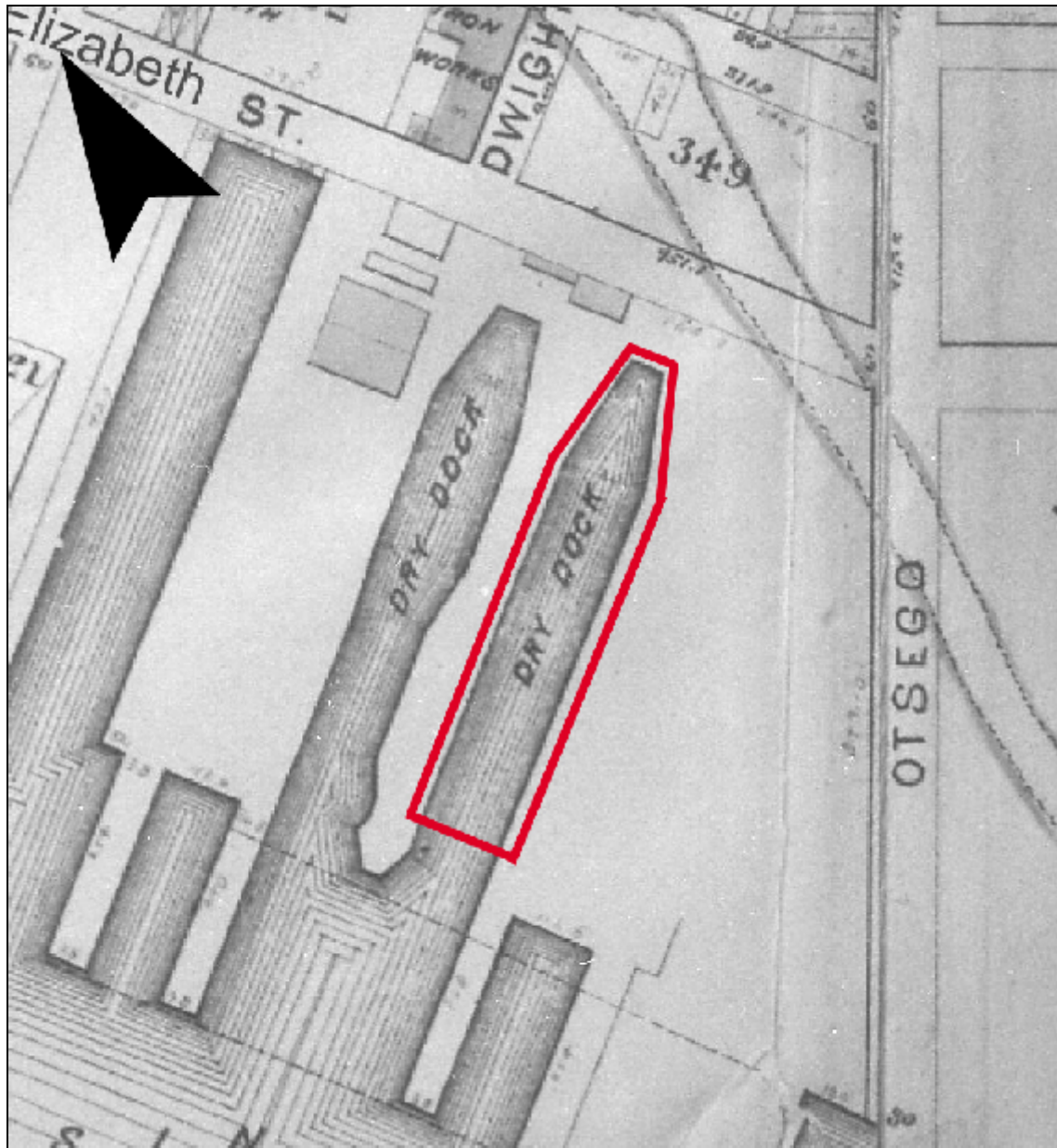


FIGURE 2.7. *Atlas of the Entire City of Brooklyn.* Bromley 1880. Project area/APE indicated with red box. Scale one inch: 347 feet (approximately).



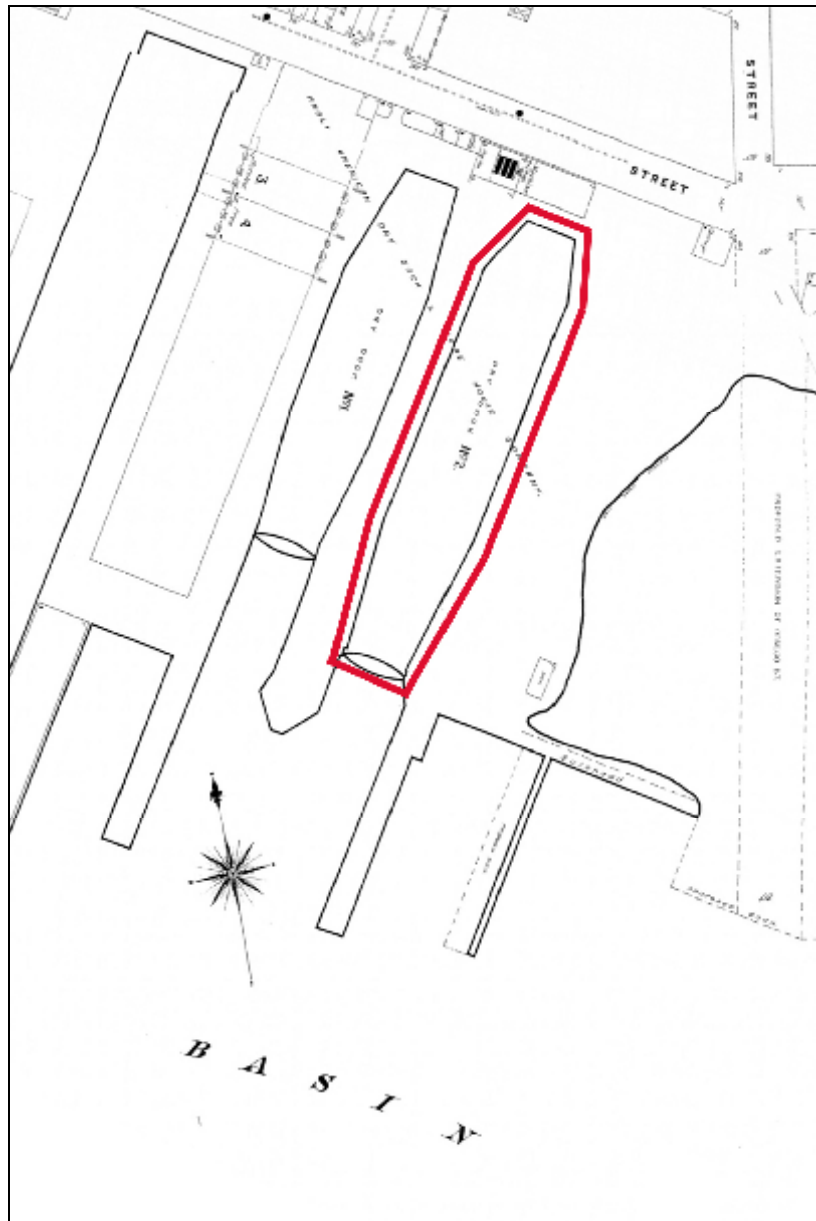


FIGURE 2.8. *Insurance Maps of Brooklyn.* Sanborn 1886. Scale one inch: 200 feet (approximately).



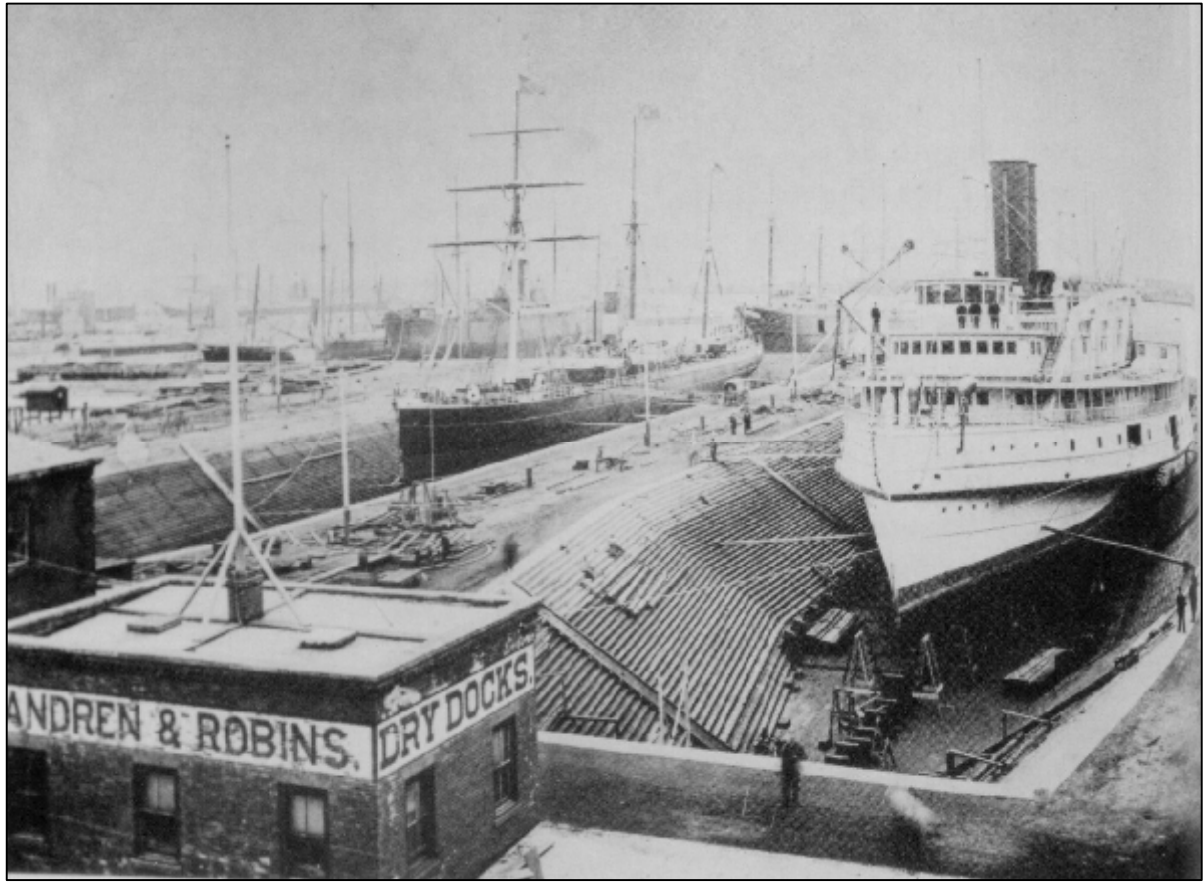


FIGURE 2.9. *“Coastwise and ocean tonnage under repair at Erie Basin in the Nineties: Graving Dock No. 1 holds the 3,400-ton Long Island Sound passenger steamboat Connecticut; No. 2 (at left), the 2,300-ton Hamburg Liner Procida.”* (Source: Mitchell 1981, p. 8.).



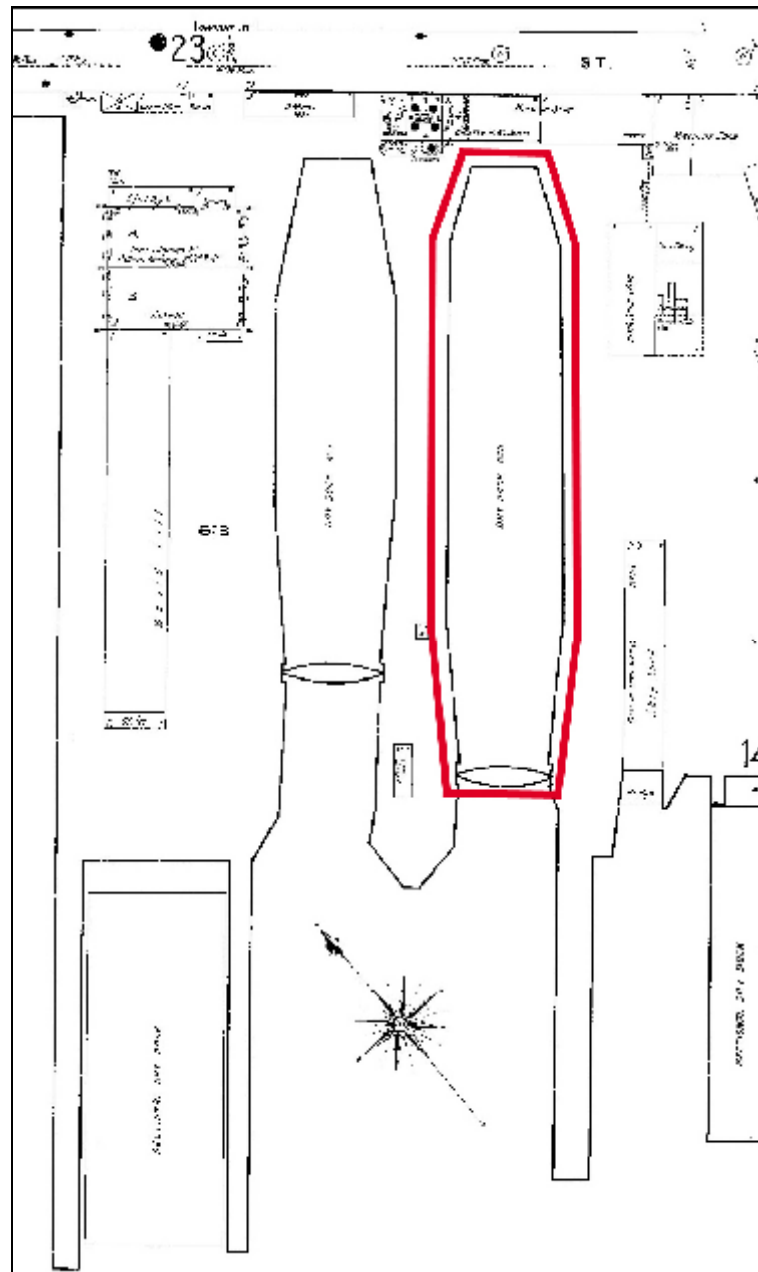


FIGURE 2.10. *Insurance Maps of Brooklyn.* Sanborn 1904. Project area/APE indicated with red box. Scale one inch: 254 feet (approximately).



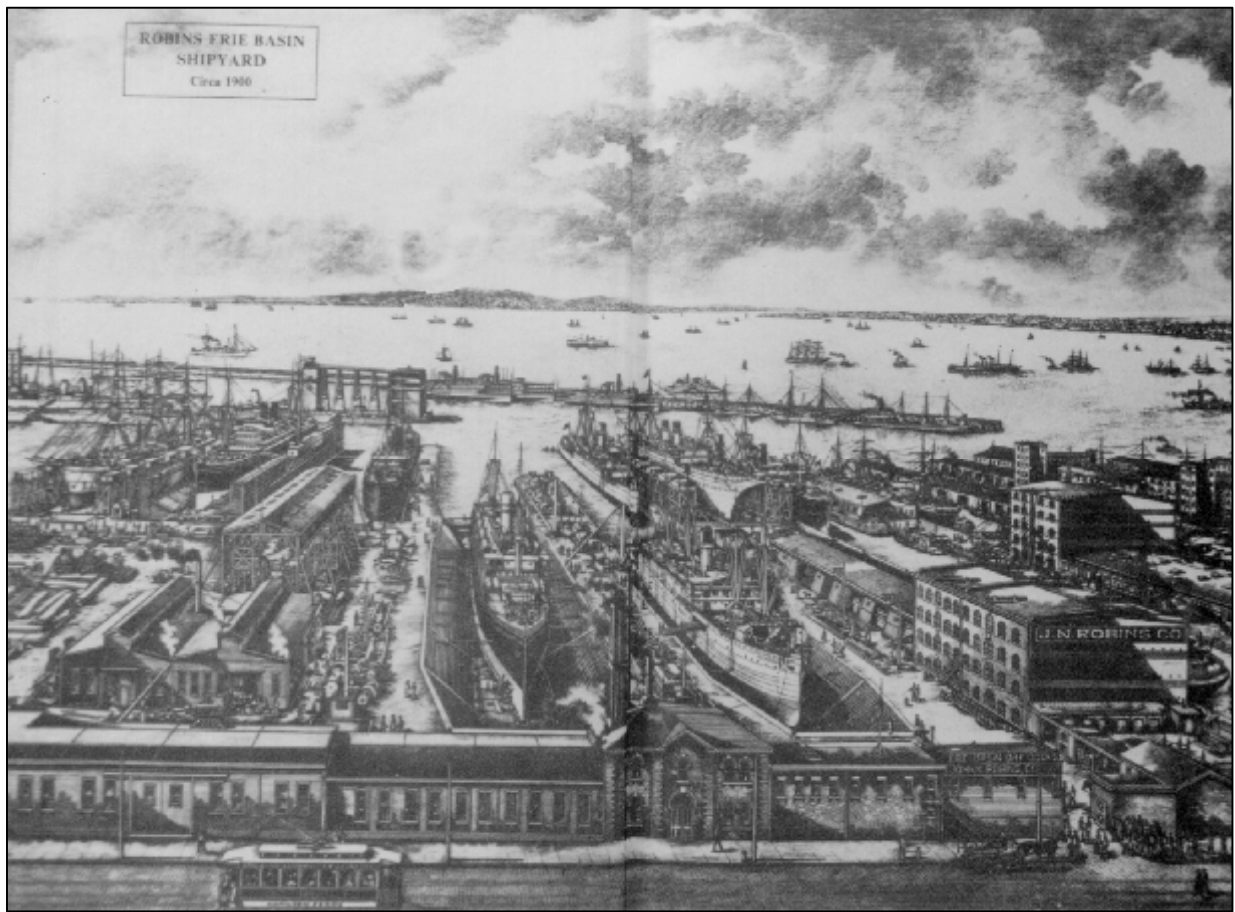


FIGURE 2.11. Robins (Todd) Shipyard c. 1900 (Source: Mitchell 1981, frontispiece).



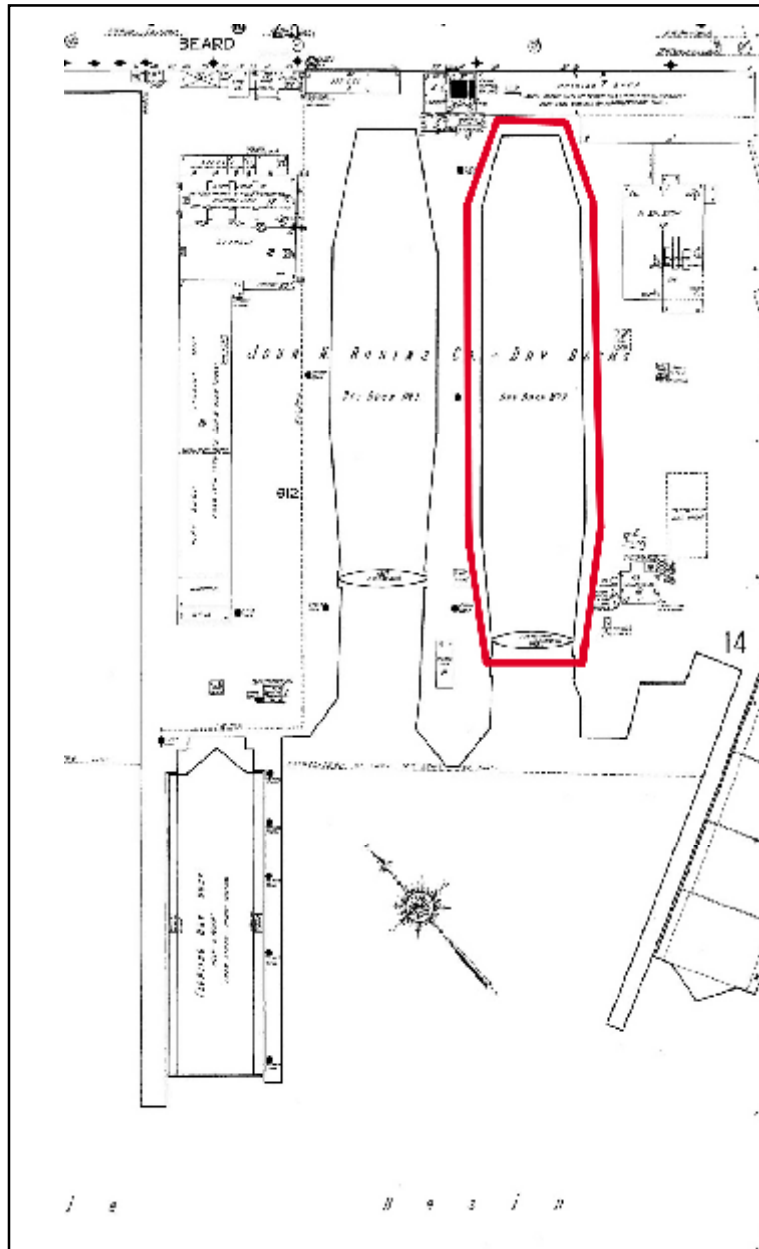


FIGURE 2.12. *Insurance Maps of Brooklyn.* Sanborn 1915. Project area/APE indicated with red box. Scale one inch: 365 feet (approximately).



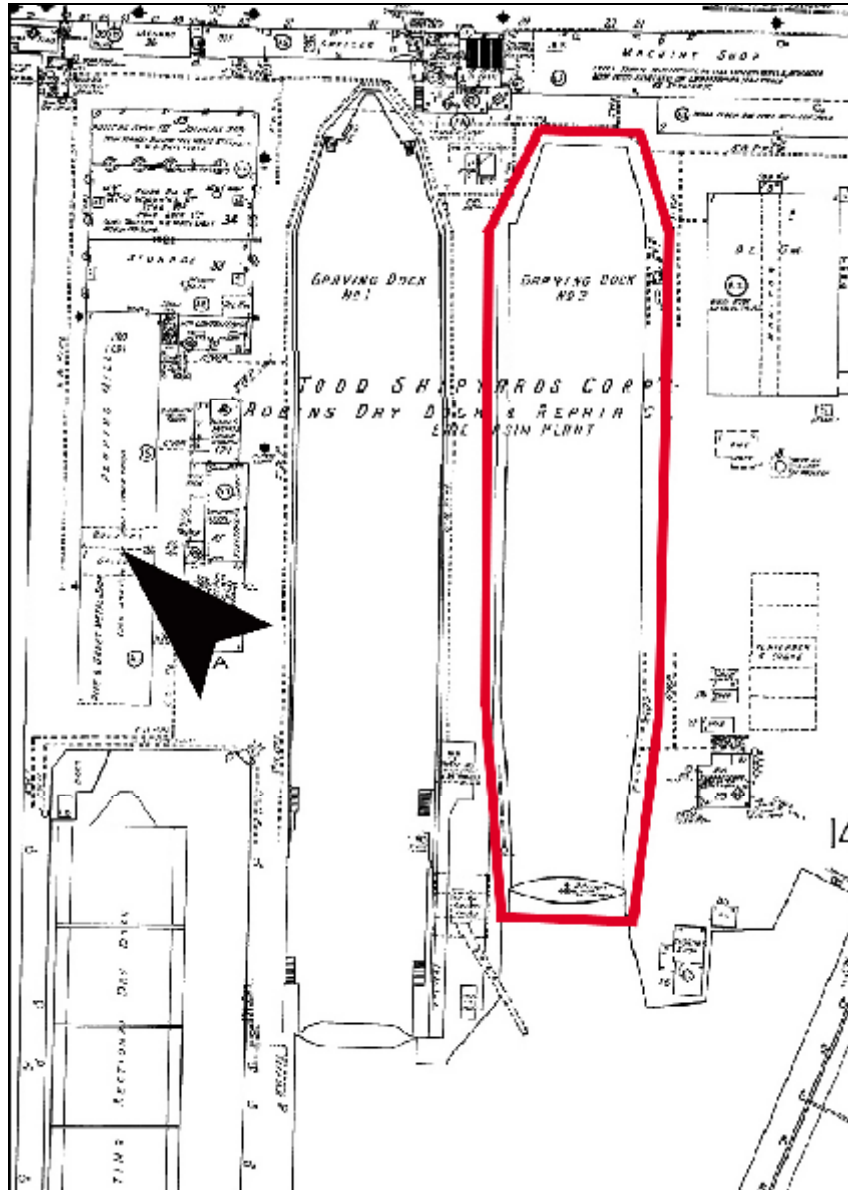


FIGURE 2.13. *Insurance Maps of Brooklyn.* Sanborn 1939. Project area/APE indicated with red box. Scale one inch: 243 feet (approximately).





Figure 2.14. “Thousands of women are taking the places of Todd men now a the fighting fronts.” (Source: Todd Shipyard Corporation 1939, np).



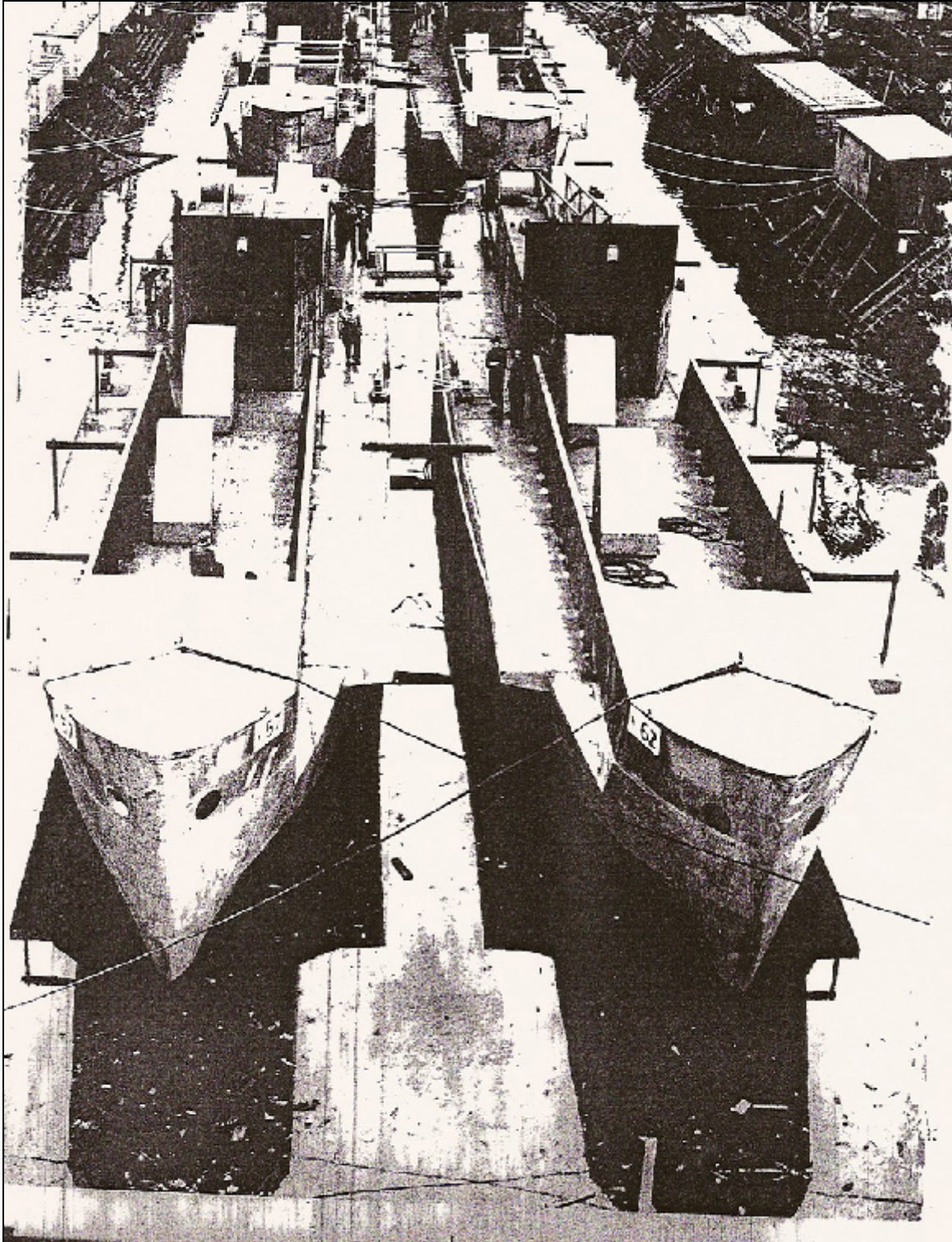


Figure 2.15. “A new ship developed by the Navy for secret work; built in quantity by Todd” (Todd Shipyards Corporation 1939, np).



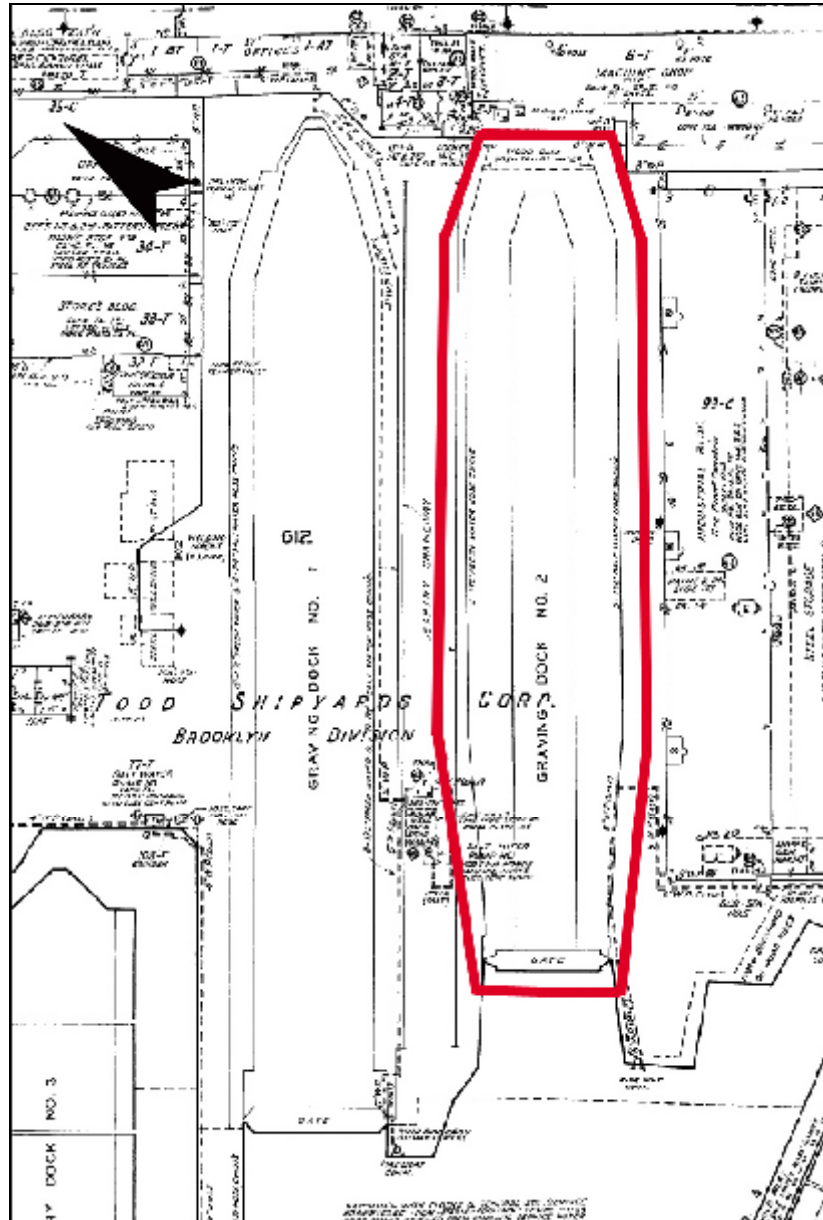


FIGURE 2.16. *Insurance Maps of Brooklyn.* Sanborn 1950. Project area/APE indicated with red box. Scale one inch: 226 feet (approximately).



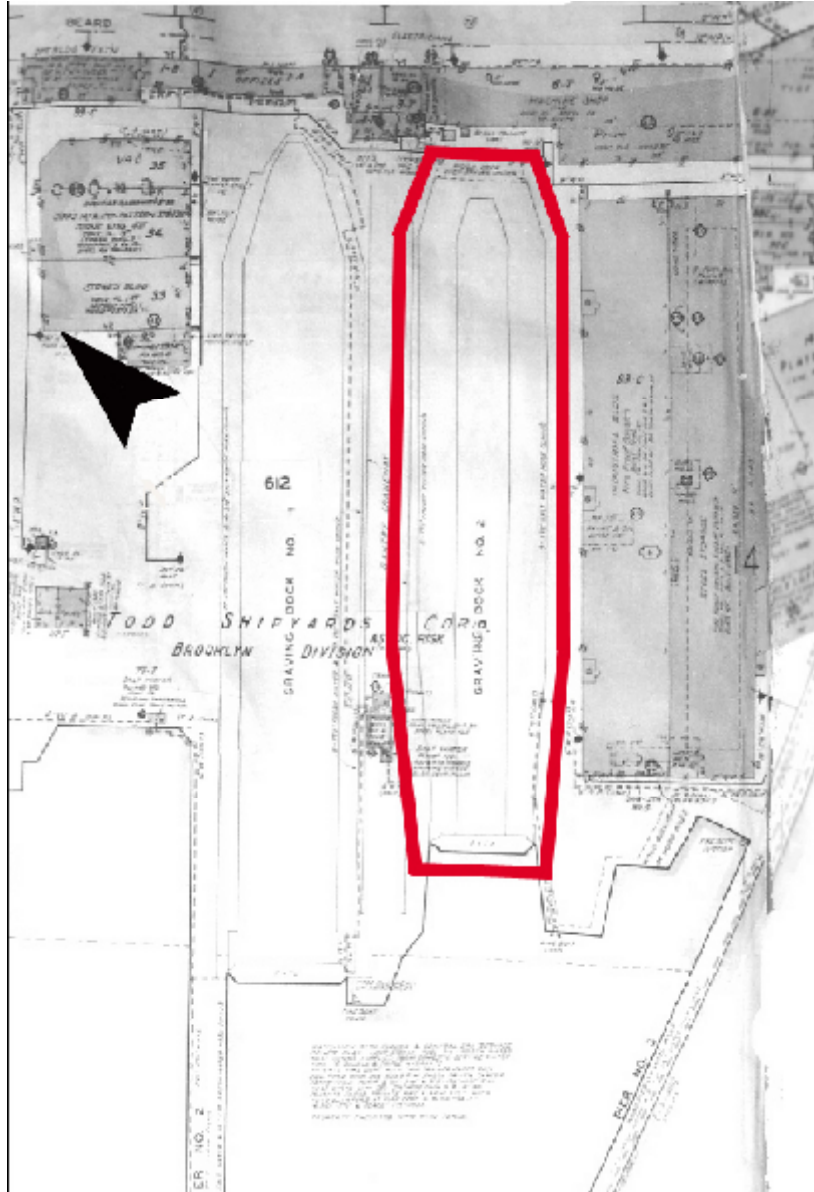


FIGURE 2.17. *Insurance Maps of Brooklyn.* Sanborn 1968. Project area/APE indicated with red box. Scale one inch: 264 feet (approximately).



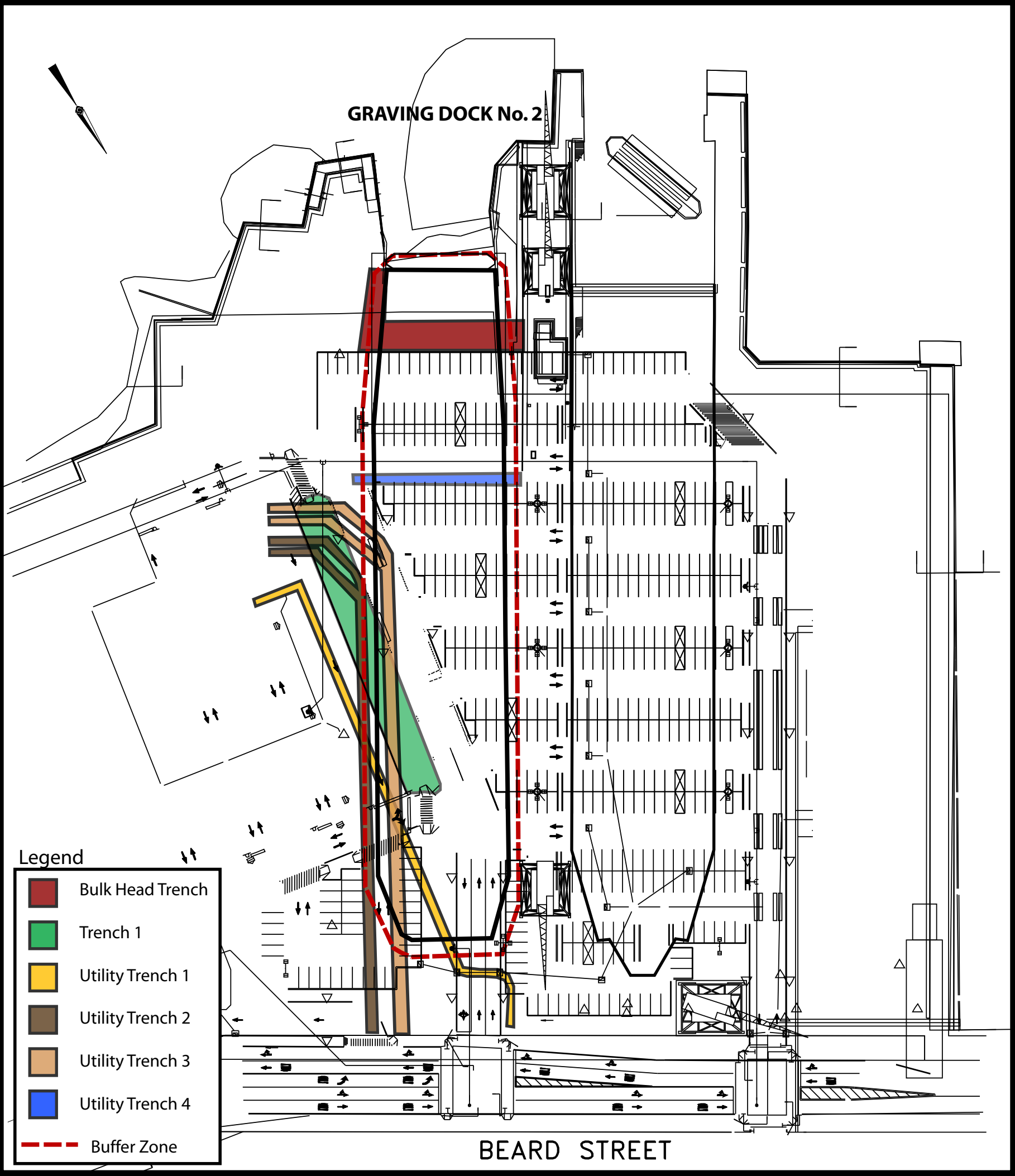
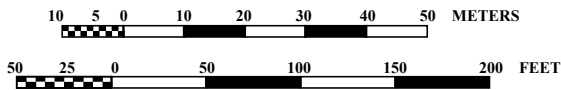


FIGURE 3.1. SITE PLAN SHOWING THE APPROXIMATE LOCATION OF GRAVING DOCK NO. 2, 15-FOOT BUFFER ZONE AND MONITORED TRENCHES.



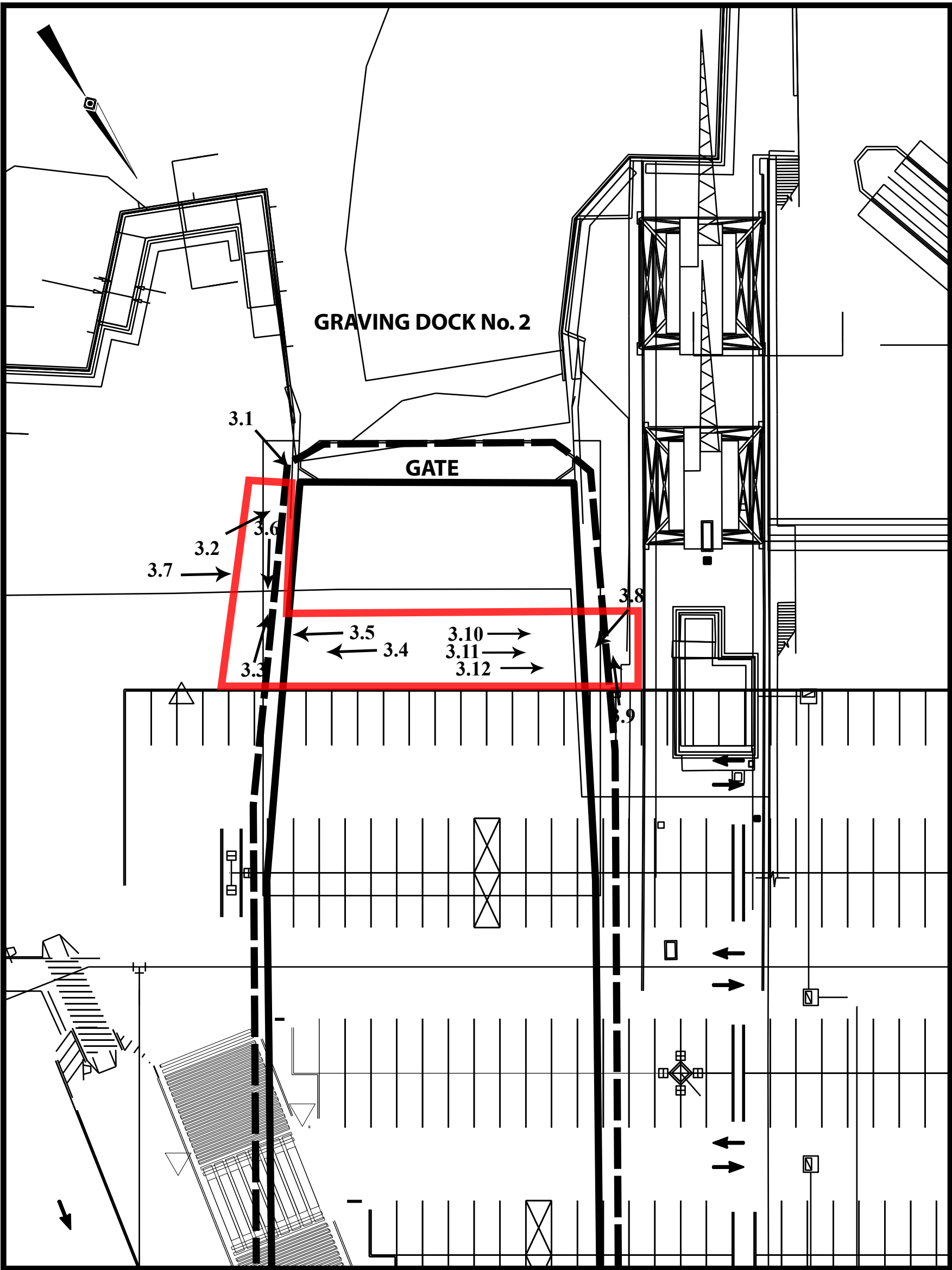


FIGURE 3.2. PHOTOGRAPH KEY AND PLAN VIEW OF BULK HEAD TRENCH WITH *IN SITU* GRAVING DOCK ELEMENTS.

2 1 0 2 4 6 8 10 METERS

10 5 0 10 15 20 25 FEET

← = Photograph Direction/View

--- = Location of Graving Dock No. 2 and Surrounding 15-foot buffer Zone



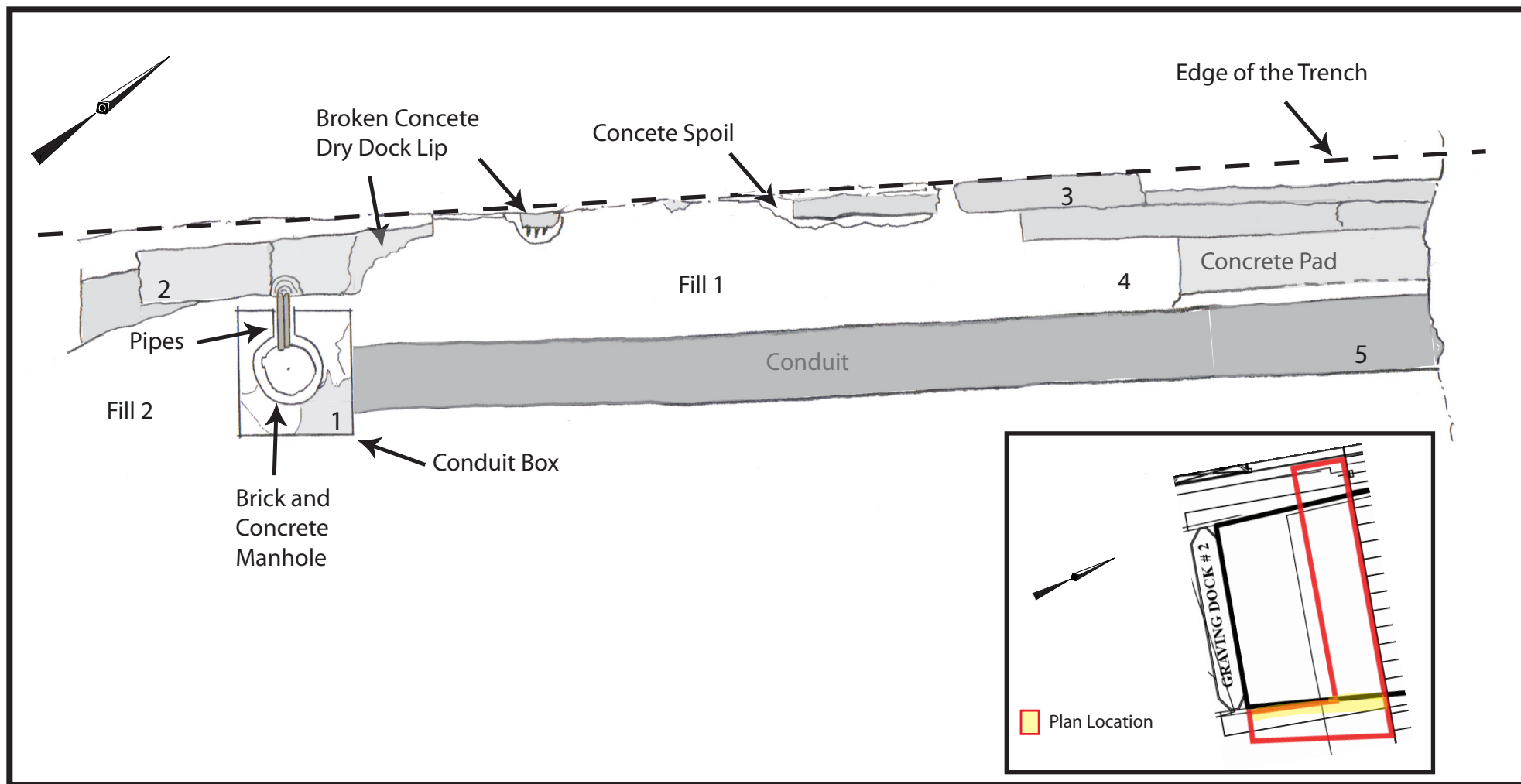


FIGURE 3.3. PLAN VIEW, BULKHEAD TRENCH, 15-FOOT BUFFER ZONE.

Elevations

- 1 = .83 feet below surface
- 2 = .25 feet below surface
- 3 = 3.5 feet below surface
- 4 = 3 feet below surface
- 5 = 2.5 feet below surface

Concrete Graving Dock

Conduit

Fill 1 - Dark Yellowish Brown Silty Sand 10YR 4/4
mottled with black sand 10YR 2/1

Fill 2 - Yellowish Brown Silty Sand 10YR 4/6
mottled with brown sand 10YR 4/2

0 3 6 ft



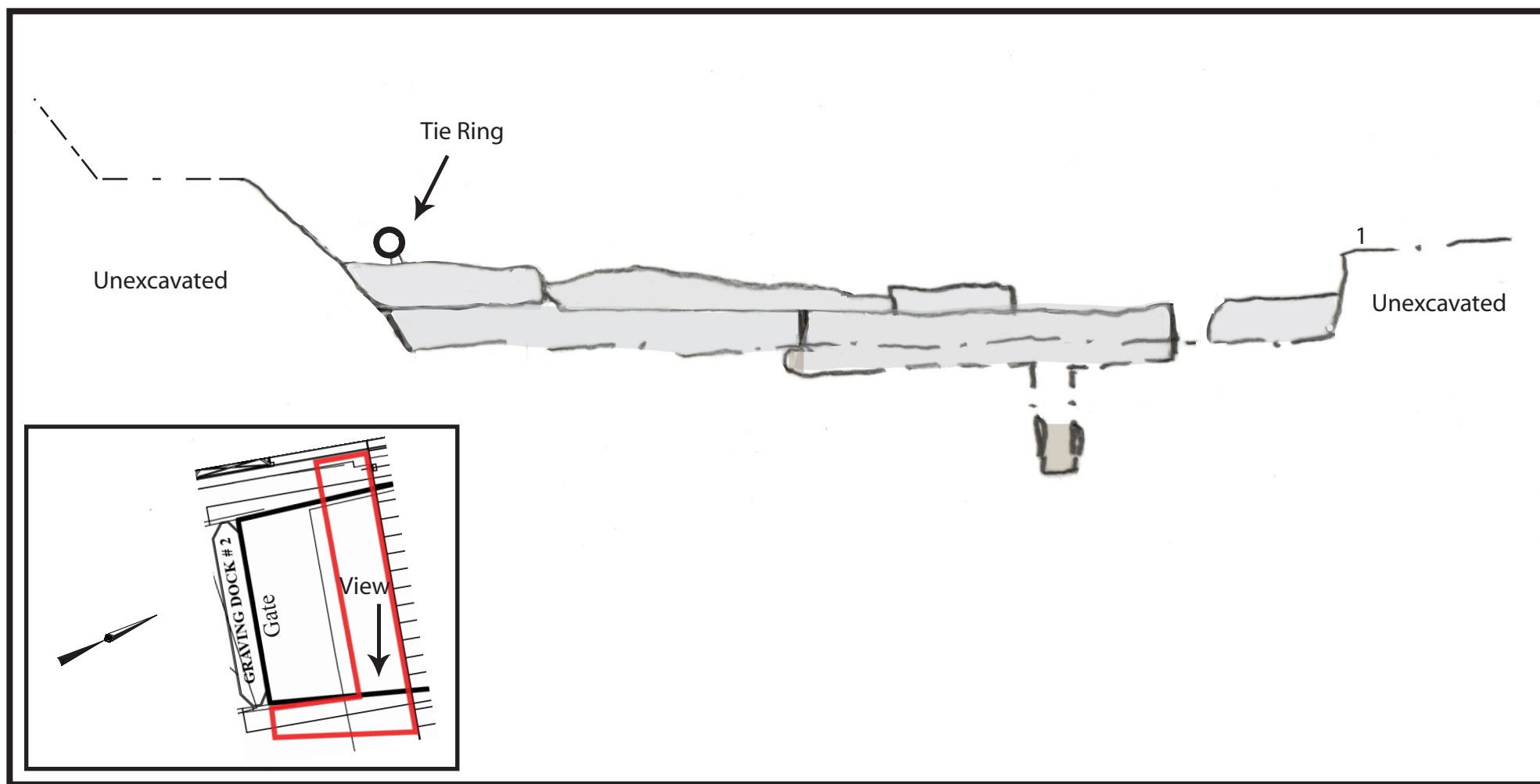


FIGURE 3.4. INTERIOR EAST WALL PROFILE, GRAVING DOCK NO. 2, BULKHEAD TRENCH.

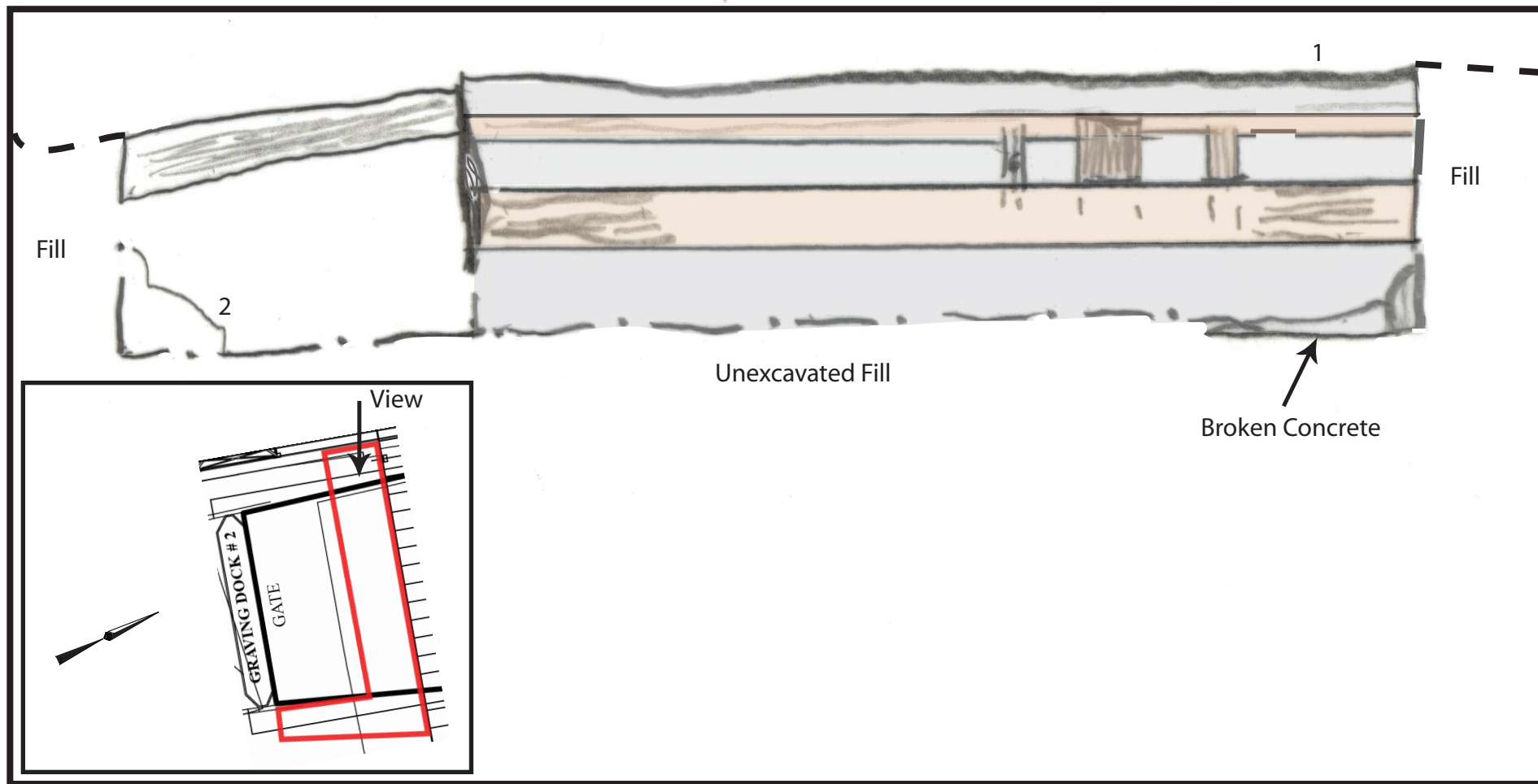


FIGURE 3.5. PROFILE OF EXTERIOR WEST WALL SECTION, GRAVING DOCK NO. 2, BULKHEAD TRENCH.



Elevation
 1 = .4 feet below the surface
 2 = 4.2 feet below the surface

Concrete Graving Dock
 Wood Timbers



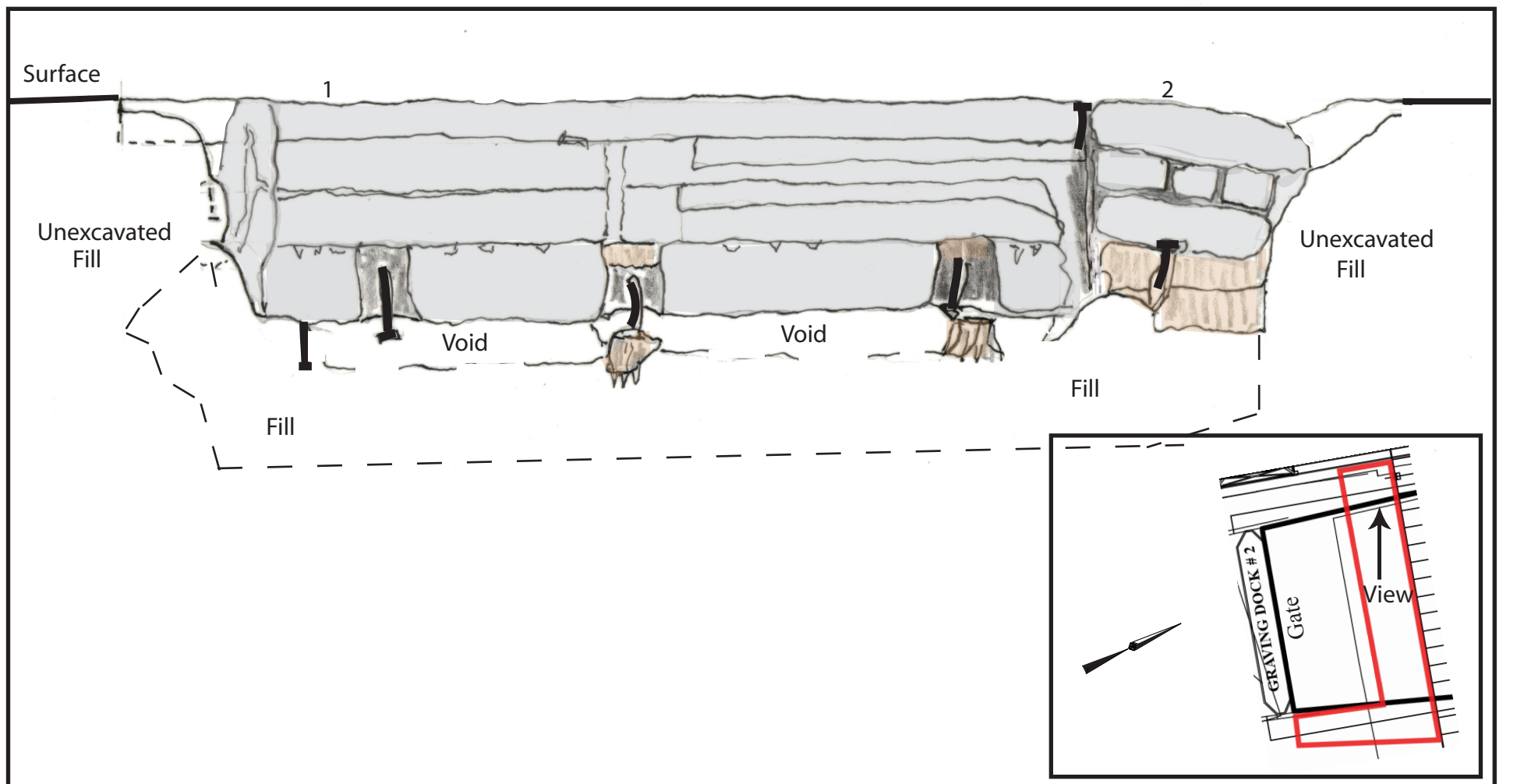






FIGURE 3.6. PROFILE OF INTERIOR WEST WALL SECTION, GRAVING DOCK NO. 2, BULKHEAD TRENCH.

0 5 10 ft

Elevation
1 = .4 feet below the surface
2 = .66 feet below the surface

-  Concrete Graving Dock - Stepped Altars
-  Wood Pile Fragments and Vertical Timber
-  Broken or Missing Concrete
-  Iron Ties
- Fill - Dark Yellowish Brown Silty Sand 10YR 4/4



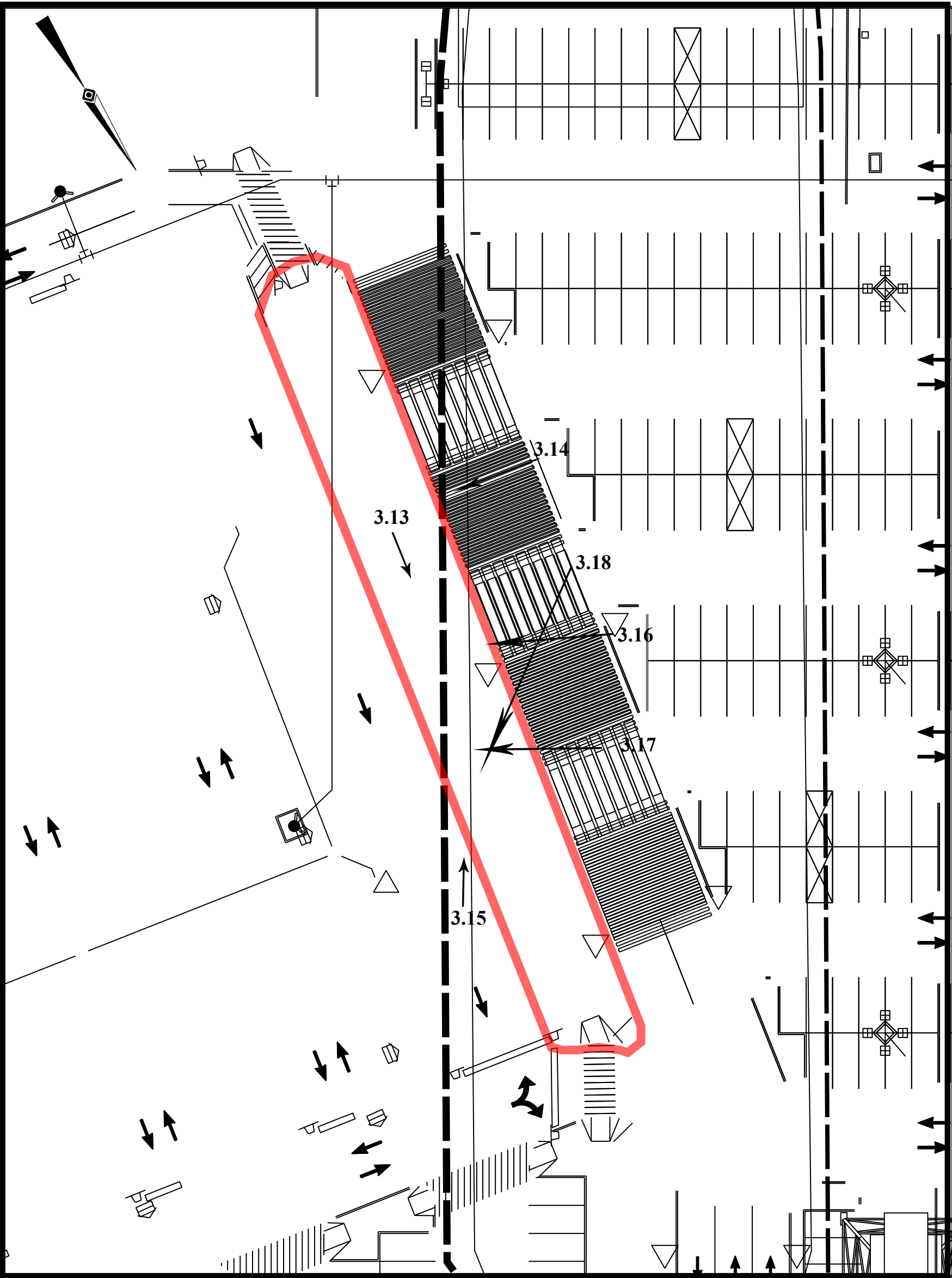


FIGURE 3.7 PHOTOGRAPH KEY AND PLAN VIEW OF TRENCH 1 WITH *IN SITU* GRAVING DOCK ELEMENTS.

2 1 0 2 4 6 8 10 METERS

10 5 0 10 15 20 25 FEET

← = Photograph Direction/View

--- = Location of Graving Dock No.2 and Surrounding 15-foot buffer Zone



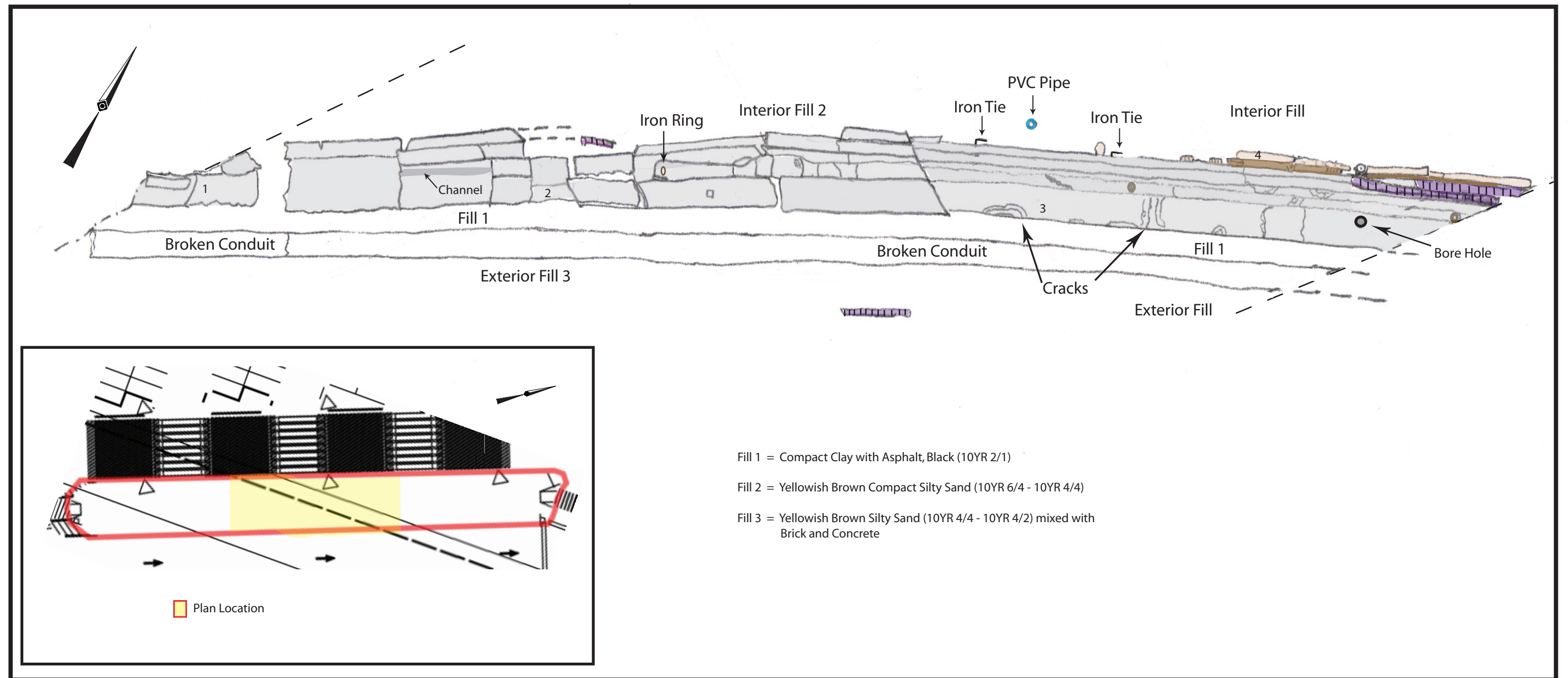


FIGURE 3.8. PLAN VIEW OF EAST WALL, GRAVING DOCK NO. 2, TRENCH 1.

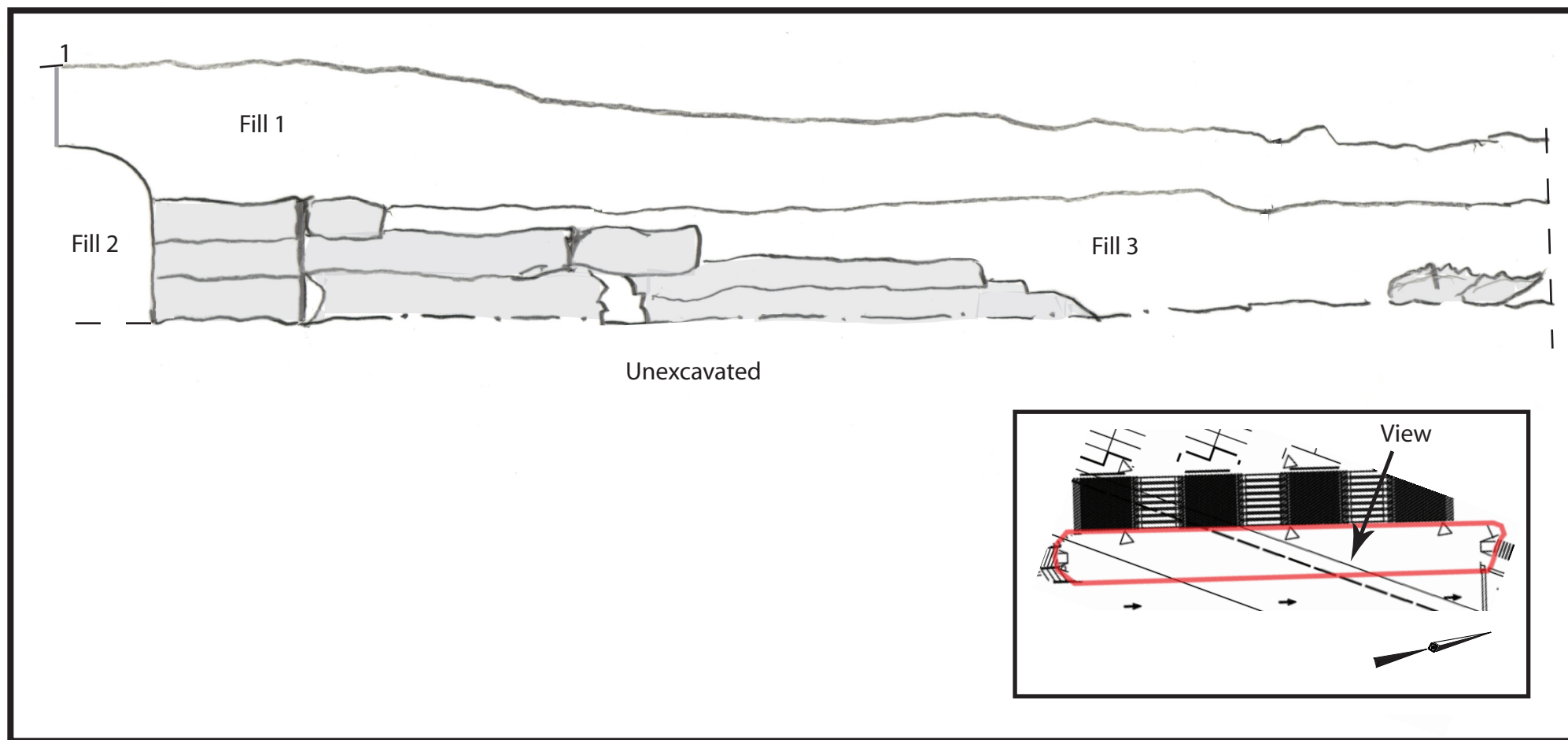


FIGURE 3.9. INTERIOR EAST WALL PROFILE, GRAVING DOCK NO. 2, TRENCH 1.

Elevation
1 = 1.4 feet Below the Surface

Concrete Graving Dock Stepped Altars

Fill 1 - Black Sand 10YR 2/1 mottled with Dark Yellowish Brown Silty Sand 10YR 4/4

Fill 2 - Miscellaneous Fill, Dark Yellowish Brown Silty Sand 10YR 4/6

Fill 3 - Interior Fill of Graving Dock No. 2, Dark Yellowish Brown Silty Sand 10YR 4/4



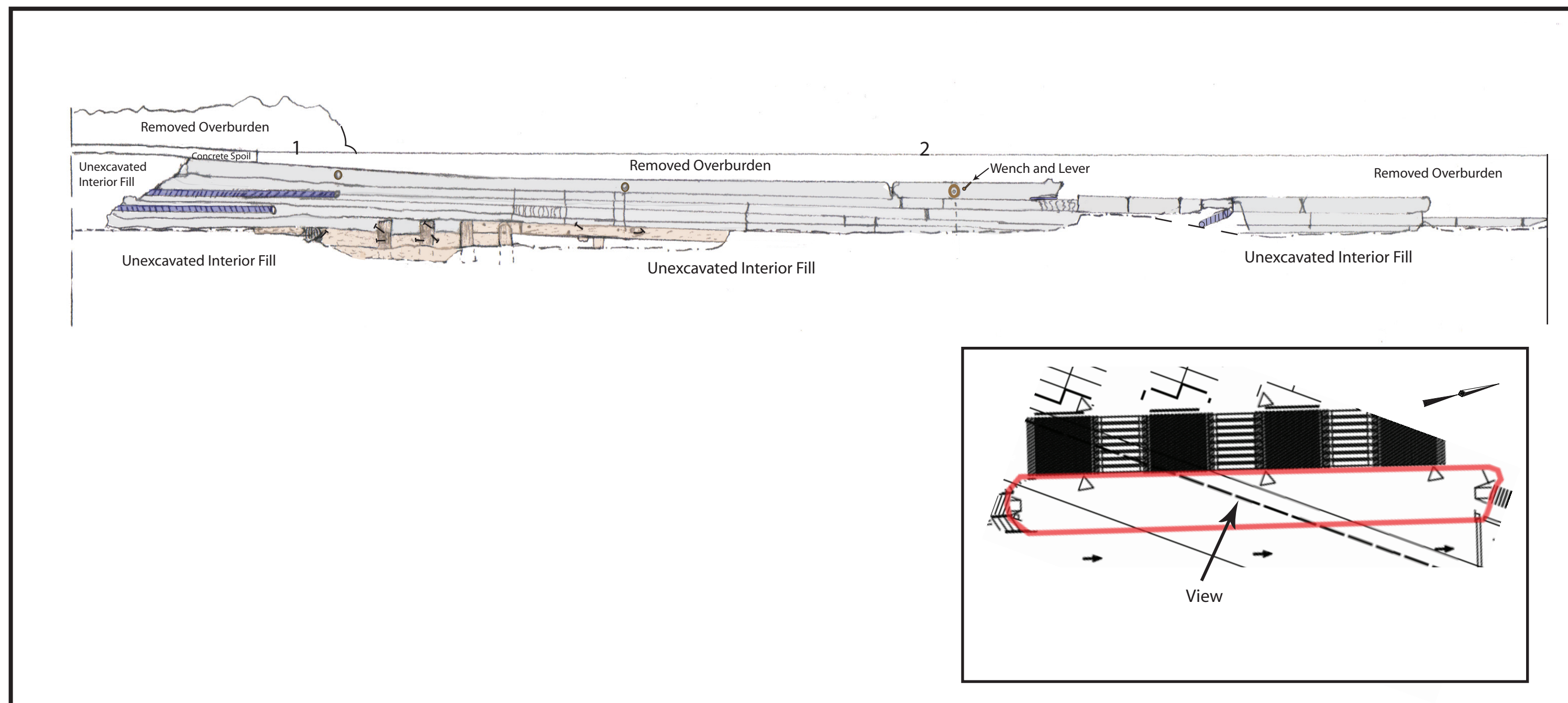


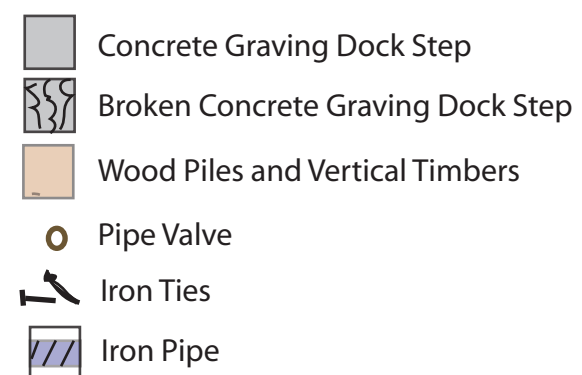
FIGURE 3.10. EXTERIOR EAST WALL PROFILE, GRAVING DOCK NO. 2., TRENCH 1.



ELEVATIONS

1 = .2 Feet Below the Surface

2 = .2 Feet Below the Surface



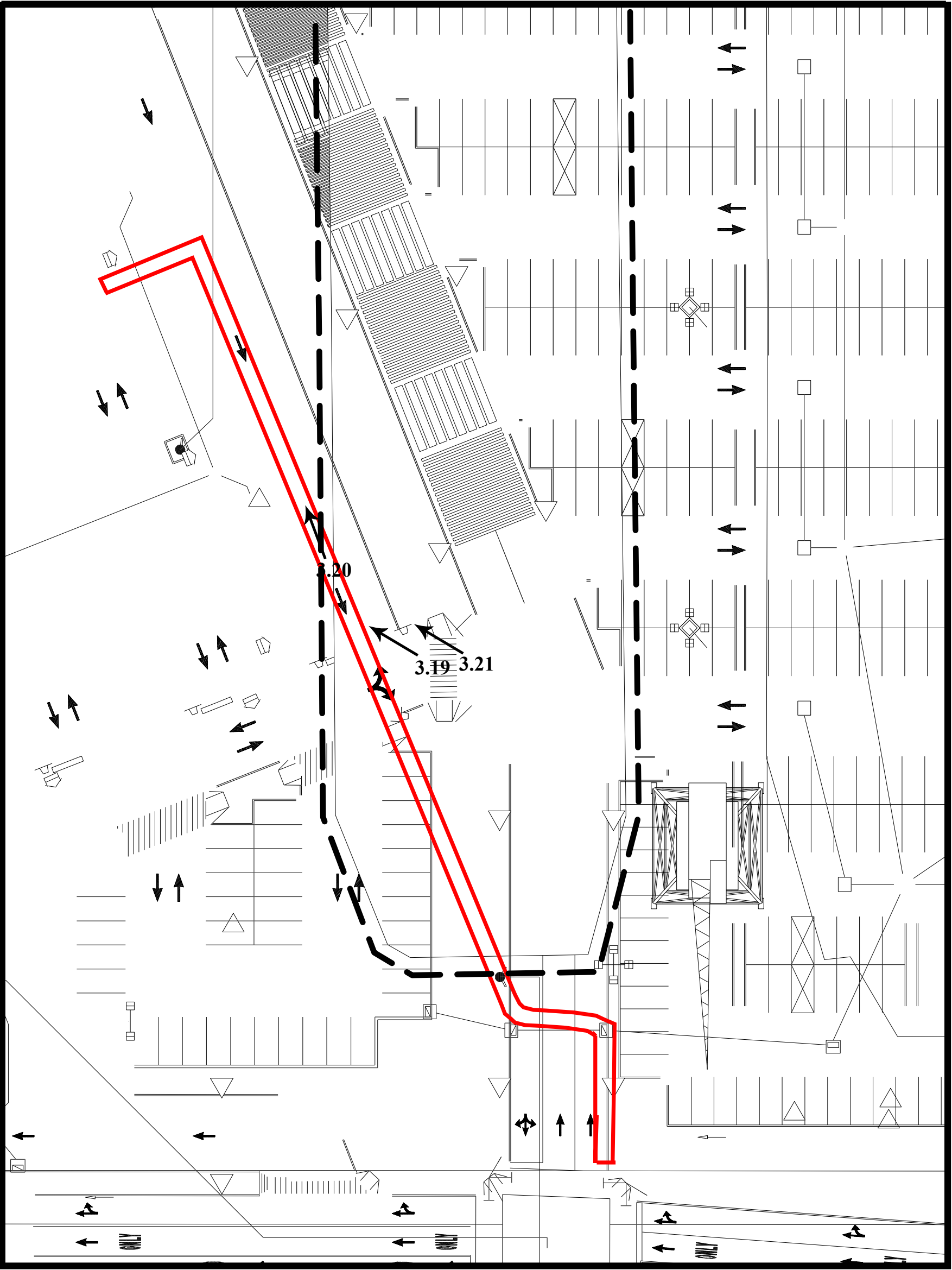
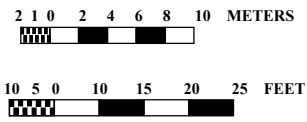


FIGURE 3.11. PHOTOGRAPH KEY AND PLAN VIEW OF UTILITY TRENCH 1 WITH *IN SITU* GRAVING DOCK ELEMENTS.



- ← = Photograph Direction/View
- - - = Location of Graving Dock No. 2 and Surrounding 15-foot buffer Zone



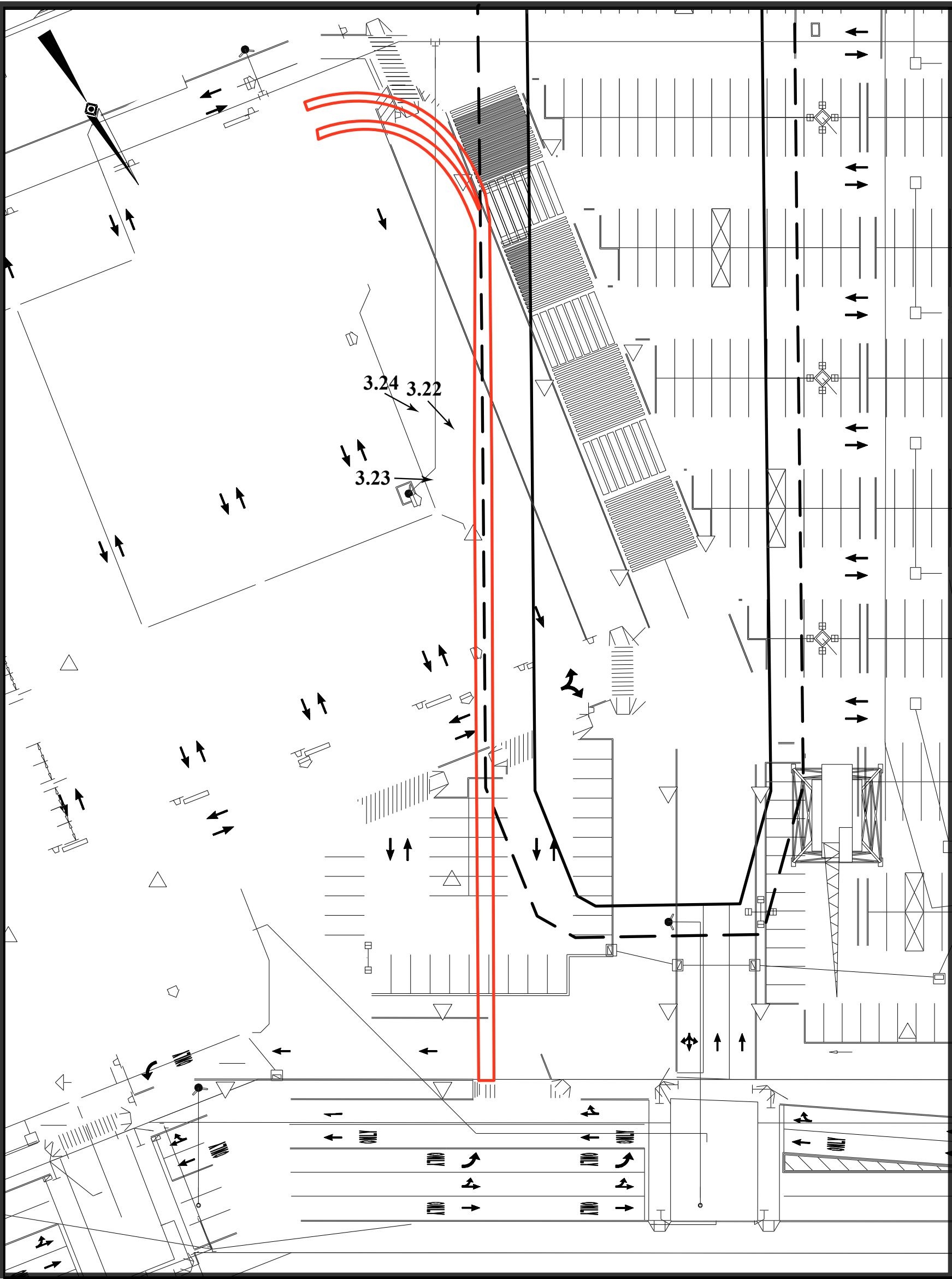


FIGURE 3.12. PHOTOGRAPH KEY AND PLAN VIEW OF UTILITY TRENCH 2 WITH *IN SITU* GRAVING DOCK ELEMENTS.

← = Photograph Direction/View

- - - = Location of Graving Dock No. 2



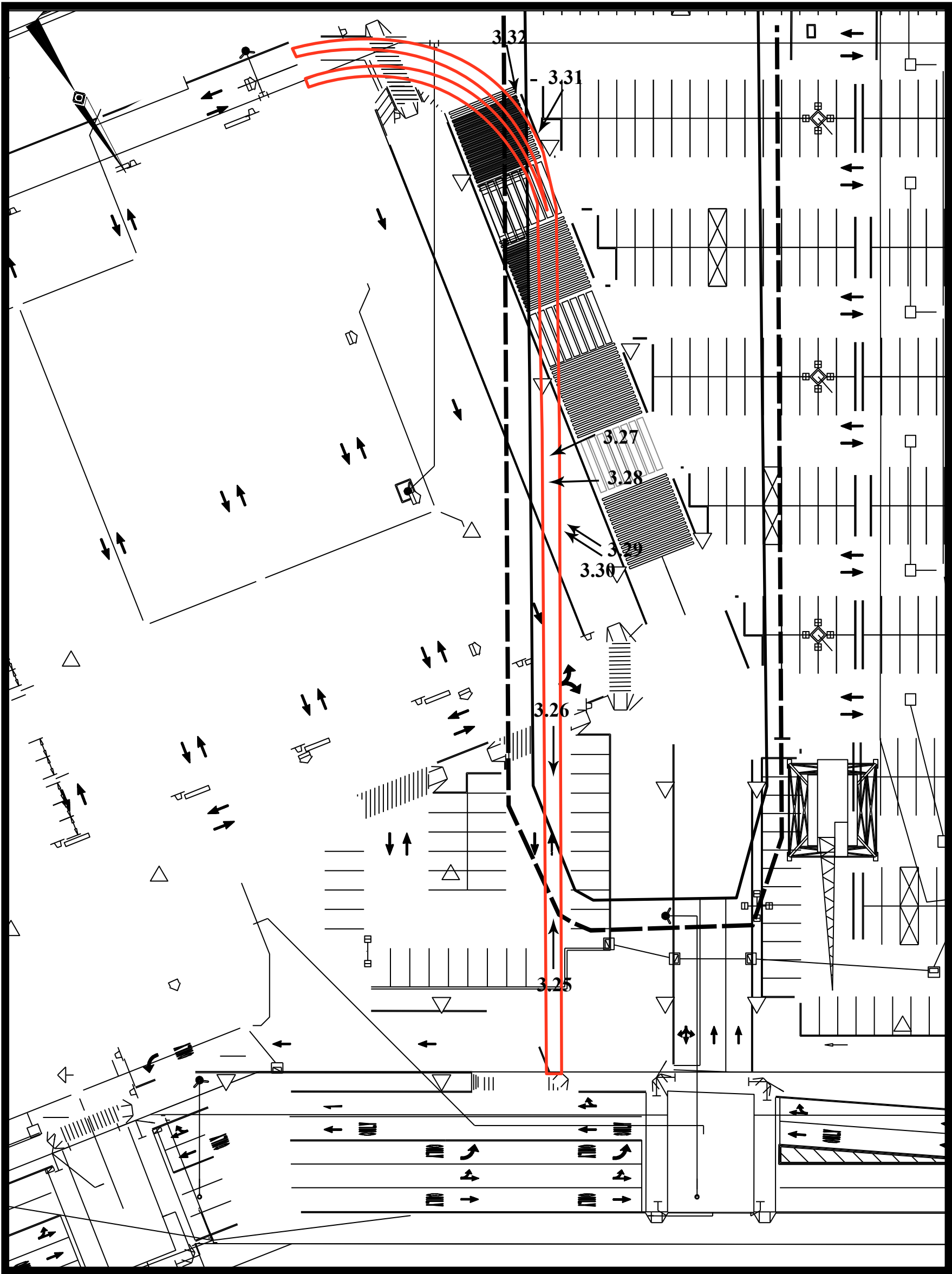


FIGURE 3.13. PHOTOGRAPH KEY AND PLAN VIEW OF UTILITY TRENCH 3 WITH *IN SITU* GRAVING DOCK ELEMENTS.

← = Photograph Direction/View

- - - = Location of Graving Dock No. 2

2 10 2 4 6 8 10 METERS

10 5 0 10 15 20 25 FEET



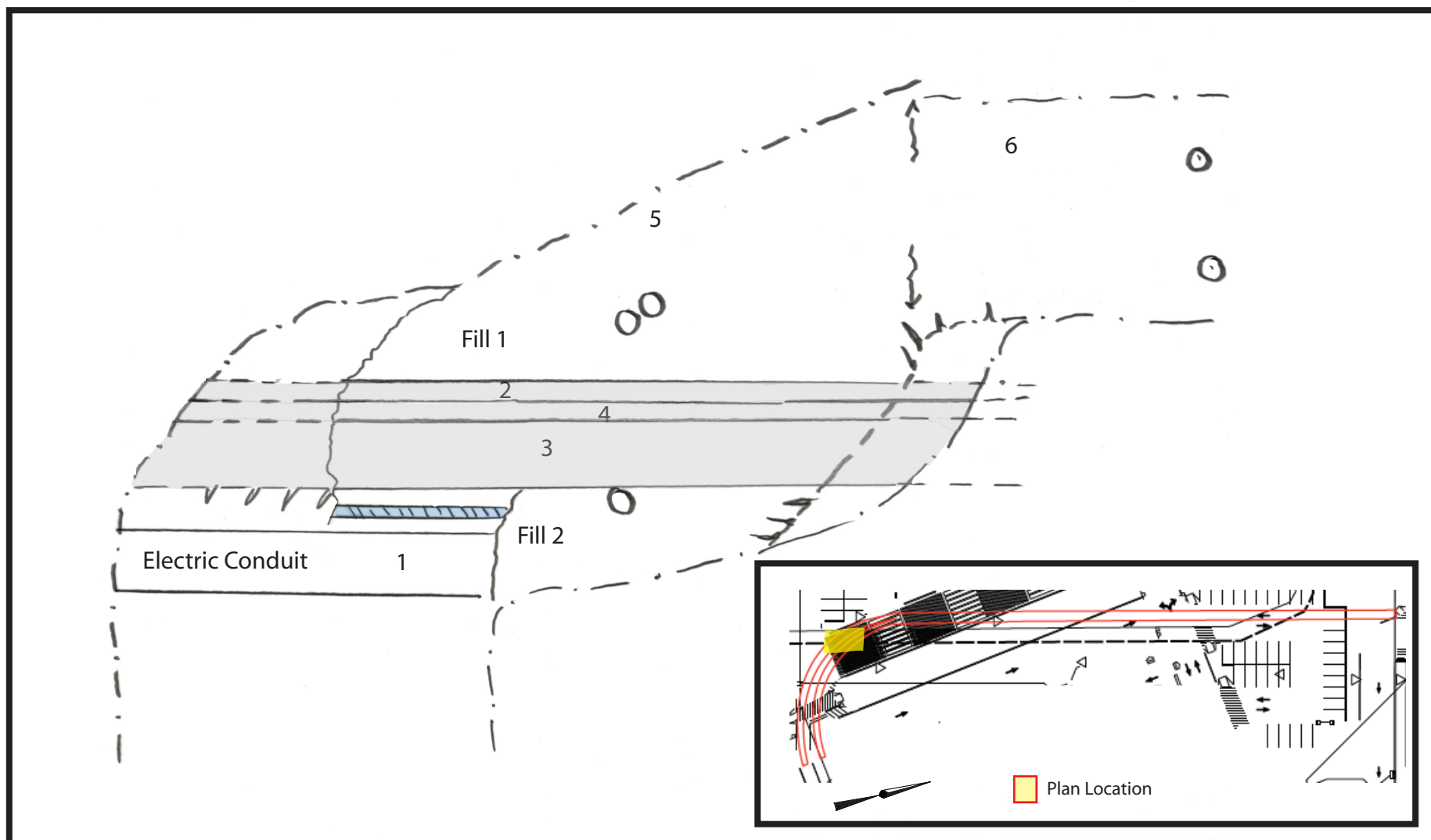


FIGURE 3.14. PLAN VIEW OF EAST WALL OF GRAVING DOCK NO. 2, UTILITY TRENCH 3, SOUTHERN EXPOSURE.



Elevations

- 1 = 3 feet below surface
- 2 = 3.4 feet below surface
- 3 = 2 feet below surface
- 4 = 2.7 feet below surface
- 5 = 3.4 feet below surface
- 6 = 3.6 feet below surface

Concrete Graving Dock Elements

Iron Pipe

Piles

Fill 1 Dark Yellowish Brown (10YR 4/4) Sand - Interior Fill

Fill 2 Dark Yellowish Brown (10YR 4/6) Sand - Exterior Fill



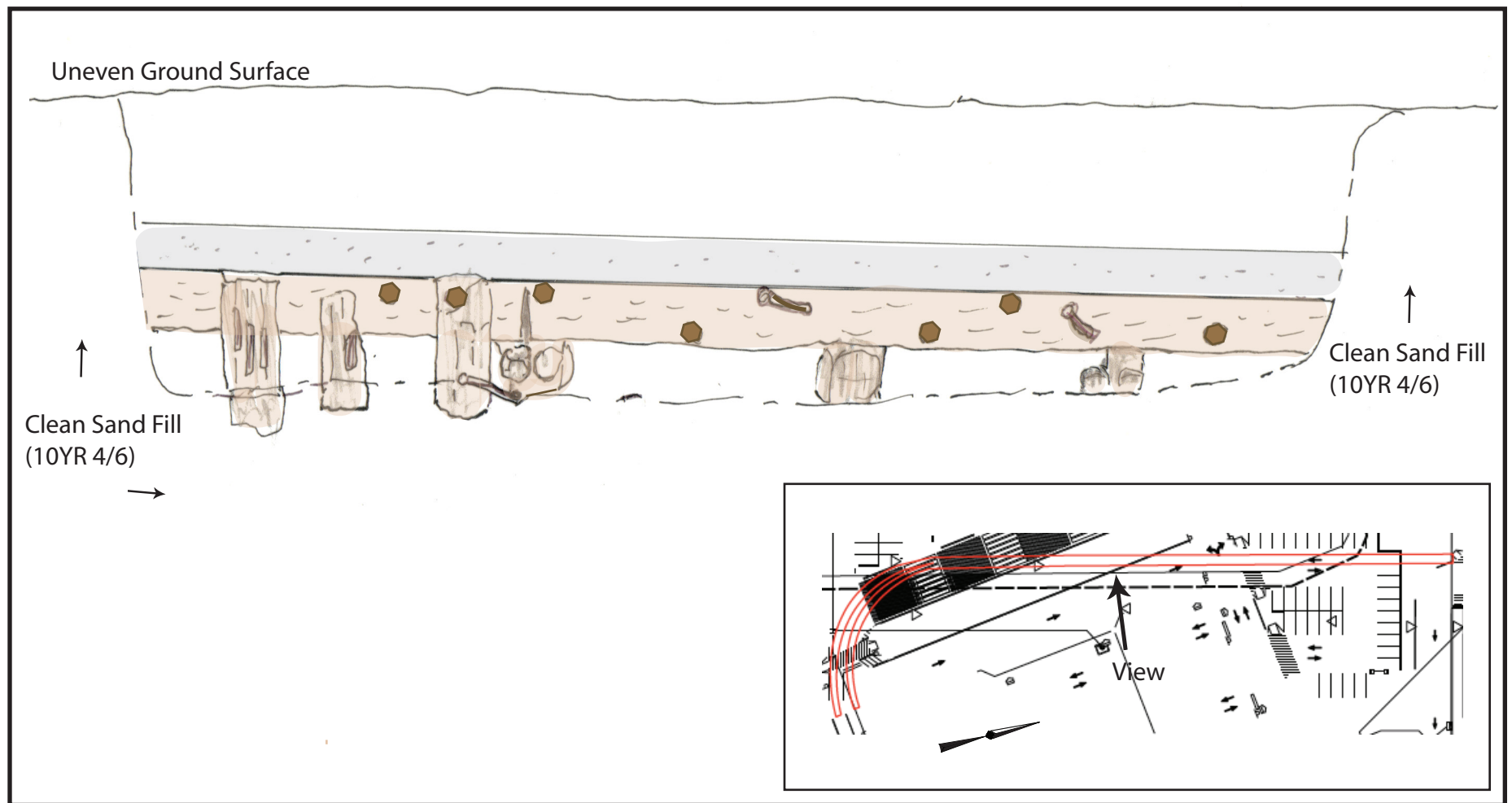






Figure 3.15. EXTERIOR EAST WALL PROFILE, GRAVING DOCK NO. 2
UTILITY TRENCH 3, MANHOLE BOX.

0 1 2 ft

-  Concrete Graving Dock Step
-  Wood Piles and Vertical Timber
-  Iron Bolt
-  Iron Ties



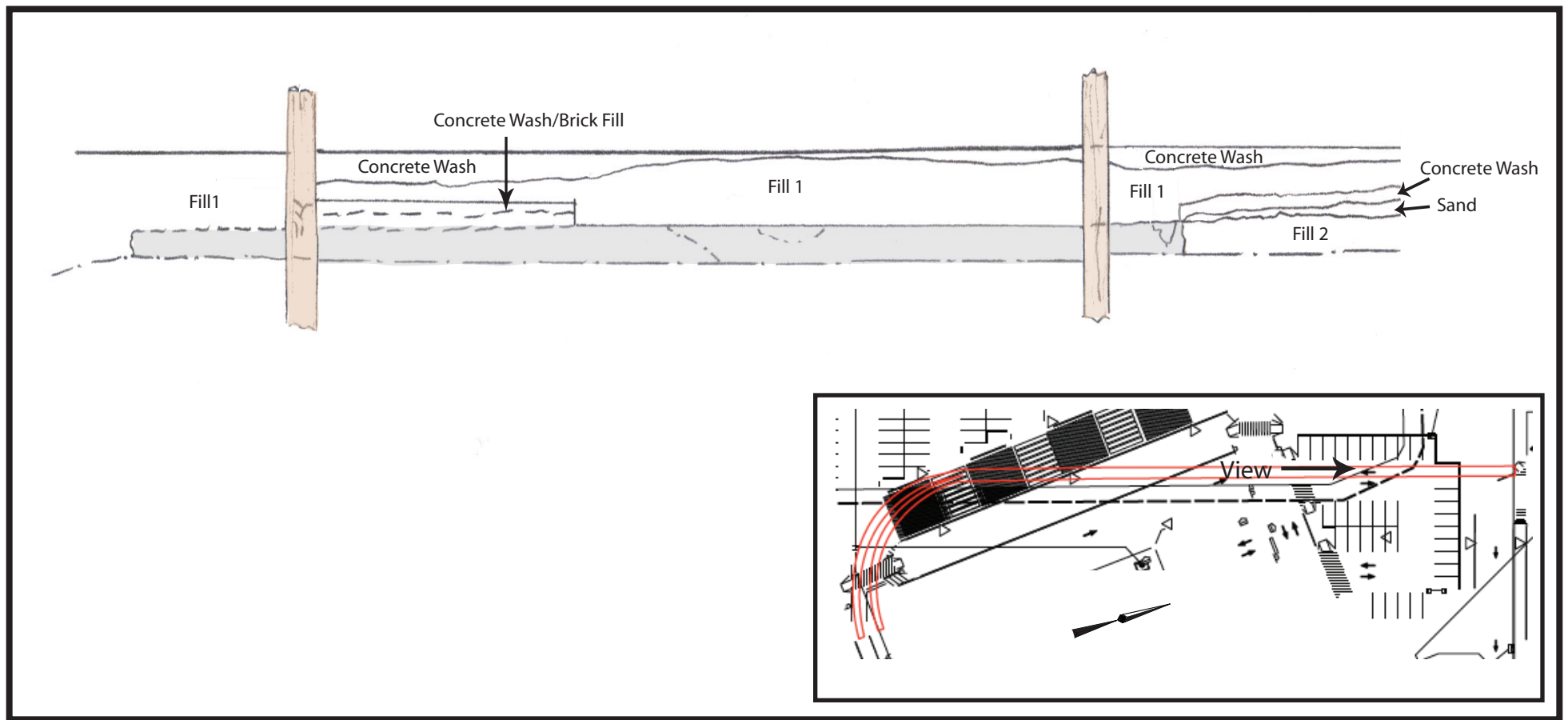


Figure 3.16. PROFILE OF HEADWALL SECTION, GRAVING DOCK NO. 2,
UTILITY TRENCH 3.

0 3 6 ft

Fill 1 Overburden Black (10YR 2/1) Mixed with
Dark Yellowish Brown (10YR 4/6) Sand

Fill 2 Dark Yellowish Brown (10YR 4/6 - 10YR5/6
with Traces of Black (10YR 2/1) Sand

 Concrete Graving Dock

 Wood Piles



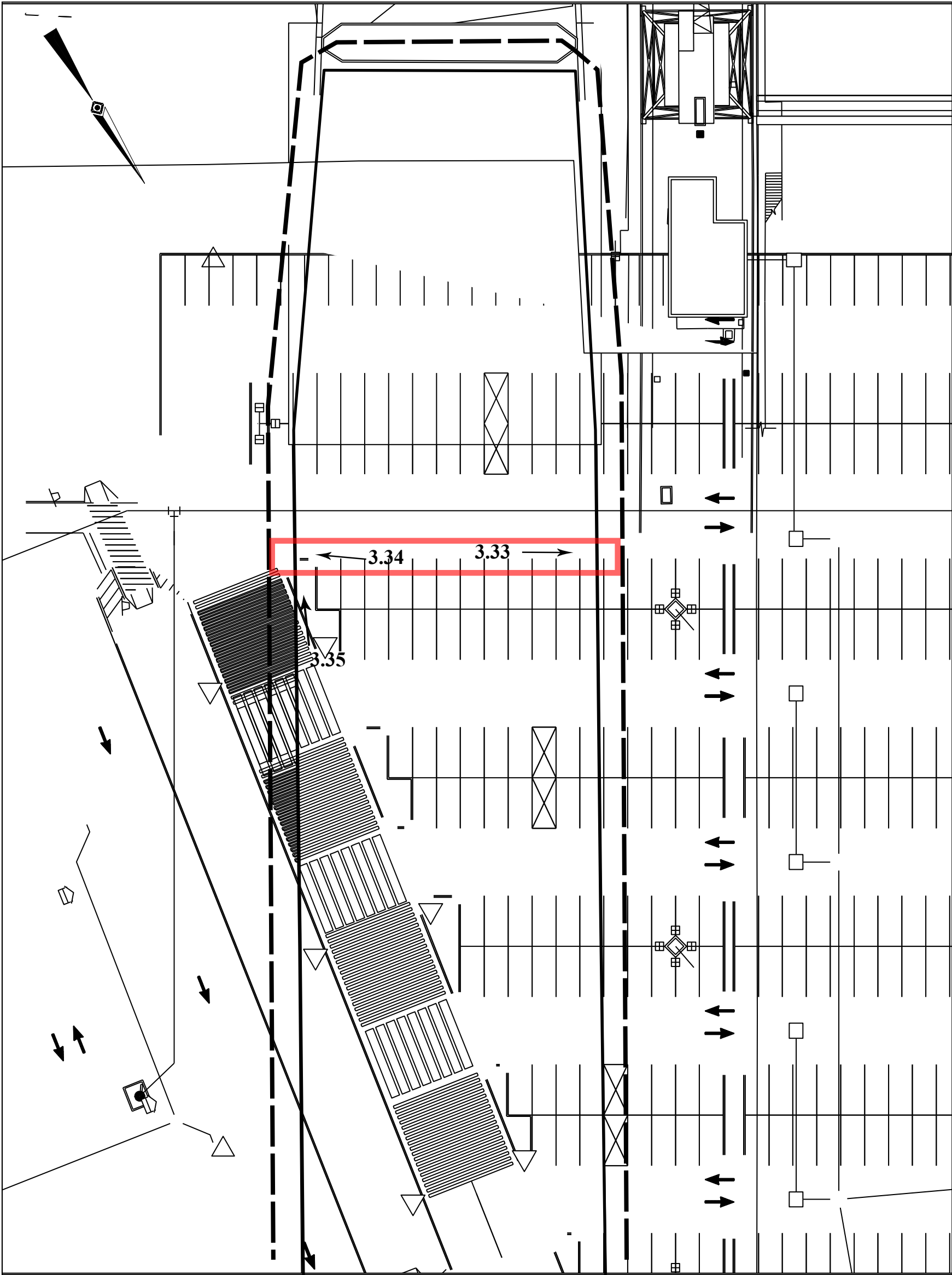


FIGURE 3.17. PHOTOGRAPH KEY AND PLAN VIEW OF UTILITY TRENCH 4 WITH *IN SITU* GRAVING DOCK ELEMENTS.

← = Photograph Direction/View

- - - = Location of Graving Dock No. 2

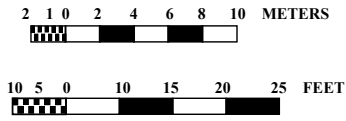




Photo 2.1. Site Conditions, Graving Dock No. 2 Caisson Gate, February 2, 2007



Photo 3.1. Bulkhead Trench/15-Foot Apron, Looking Northeast. Electrical vault and related conduit are located on the right hand side of the photo. The intact graving dock elements are manifest as poured concrete and appear on the left hand side, on or above grade. The electrical vault is connected to the graving dock by metal pipes.



Photo 3.2. View of intact graving dock elements/Erie Basin looking southwest from Electrical Vault. East Wall of Graving Dock No. 2 is manifest as poured concrete. The Caisson Gate is just beyond the concrete on the right, out of view.



Photo 3.3. Southeast view of Bulkhead Trench/15-Foot Apron. Two eight-inch pipes run along the eastern wall of the graving dock (right hand of photo) parallel with an electrical conduit (left hand of photo). The pipes were laid on the Stepped Altars of the dock.



Photo 3.4. Looking Northeast toward Eastern wall of Graving Dock No. 2 within Bulkhead Trench/15-Foot Apron. Intact elements of the East Wall of Graving Dock No. 2 were composed of poured concrete. The steps of the wall are known as Stepped Altars. A void opened along the face (lower right hand corner of photograph) and wooden supports were identified (see Photo 3.5).



Photo 3.5. Void along eastern face of Eastern Wall of Graving Dock No. 2. Horizontal wooden elements are visible below the poured concrete cap.



Photo 3.6. Looking northeast along the East Wall of Graving Dock No. 2 and electrical conduit within Bulkhead Trench/15-Foot Apron. The east wall was likely compromised during filling in the 1970s and further altered during monitoring/soil remediation. The electrical conduit is located on the right hand side of the photo and the East Wall on the left. Eight-inch pipe removed prior to photo.



Photo 3.7. West Wall of Graving Dock No. 2 within Bulkhead Trench/15-Foot Apron looking southwest. The West Wall is composed of poured concrete Stepped Altars overlying and supported by wooden piles. Wooden sheeting is visible on the right hand side of the photo, attached to the concrete cap by iron ties. The wooden elements of the dock had largely been destroyed or were in the process of rotting away.



Photo 3.8. Exterior View/East Profile of West Wall of Graving Dock No.2 looking northeast. Wooden forms are visible on the exterior of the wall from the construction of the concrete cap.



Photo 3.9. South profile of 15-Foot Apron along the western side of the West Wall of Graving Dock No. 2. Horizontal wooden element running from the graving dock (left of photo) northwest. A perpendicular wooden element was located above the visible horizontal wooden element within the void partially obscured by the photo board. The perpendicular wooden element was located within the fill episode overlying the visible wooden element.



Photo 3.10. Interior View/West Profile of West Wall of Graving Dock No. 2 within Bulkhead Trench. West Wall of Graving Dock No. 2 is composed of poured concrete overlying and supported by wooden piles. The piles are connected to the concrete cap by iron ties. Much of the wood is rotting away. The concrete cap is slumping towards the north. Iron rings are located along the second altar on the dock, visible on the right hand side of the photo and to the right of the photo board.



Photo 3.11. Interior View/West Profile of West Wall of Graving Dock No. 2 within Bulkhead Trench. Wooden sheeting connected to concrete cap by iron ties. The concrete cap is cracked and slumping towards the north. Iron ring located on second Stepped Altar on left side of photo.



Photo 3.12. Interior View/West Profile of West Wall of Graving Dock No. 2 within Bulkhead Trench. Note iron tie protruding from the cut on the lower Stepped Altar of the concrete cap. The tie once intersected the rotting wooden pile behind. Metal sheeting is running into the fill and supporting the concrete cap just to the right of the pile, and left of the vertical range pole.



Photo 3.13. Trench 1 Looking Northeast towards East Wall of Graving Dock No. 2. Interior/Eastern Face of East Wall of Graving Dock No. 2 was characterized by Stepped Altars. A circa 1940 electrical conduit runs parallel with the wall along the exterior side.



Photo 3.14. Trench 1, Looking North. Exterior/western face of East Wall of Graving Dock No. 2 exposed, though with little detail. A small pipe is visible in the middle ground running out of the wall. A Circa 1940 electrical conduit runs parallel with the wall along its exterior side, separated by a compact clay.



Photo 3.15. Trench 1 Looking North at the East Wall of Graving Dock No. 2. Interior/Eastern Face of East Wall of Graving Dock No. 2 was characterized by Stepped Altars. A circa 1940 electrical conduit runs parallel with the wall along the exterior side.



Photo 3.16. Trench 1 Looking Southeast towards East Wall of Graving Dock No. 2. East Wall of Graving Dock No. 2 was exposed during monitoring. Visible in the photo is a pulley and wench.



Photo 3.17. Trench 1 Looking Southeast towards East Wall of Graving Dock No. 2. Interior/Eastern Face of East Wall of Graving Dock No. 2 overlaid horizontal wooden elements with “pulled” iron ties. The horizontal wooden elements and concrete cap were attached to vertical wooden elements with additional “pulled” iron ties.



Photo 3.18. Trench 1 Looking Northeast towards East Wall of Graving Dock No. 2. Interior/Eastern Face of East Wall of Graving Dock No. 2 showing remnants of 4-inch pipe located atop Stepped Altar.



Photo 3.19. Temporary Utility Trench looking southeast. Note uncovered interior edge of Eastern Wall of Graving Dock No 2 (poured concrete). Top of dock was approximately 2.5 feet below grade.



Photo 3.20. Temporary Utility Trench looking south from Eastern Wall of Graving Dock No. 2. Trench depth in this section was approximately 4 feet below grade, later taken to 5 feet below grade.



Photo 3.21. Temporary Utility Trench, east profile, after removal of Eastern Wall of Graving Dock No. 2. Note cross section of Eastern Wall of Graving Dock No. 2. The pipe in the foreground is likely located on one of the steps of the dock, as depicted on the 1969 map. The pipe is also seen in the right of the photo, turned upright. Once the wall was removed the trench depth was approximately 5-6 feet deep in this section.



Photo 3.22. Utility Trench 2, Manhole Box western profile, looking northwest. Note wooden element protruding east out of wall. Concrete above the wooden element, appearing black in the photo, was the circa 1940 utility duct running parallel with the eastern wall of the graving dock.



Photo 3.23. Photo looking west towards wooden element protruding from western wall of Utility Trench 2, Manhole Box. Note: new 2x4s are part of a form built for the manhole box. Also, there does not appear to be a cut or fill episode for the wooden element.



Photo 3.24. Western Profile of Manhole Box cut within Utility Trench 2 looking northwest. Note: Circa 1940s electric duct is located above wooden element. No visible cuts or associated features were identified with the wooden element. Vertical piles in the foreground were driven to support the manhole box.



Photo 3.25. South profile of Headwall of Graving Dock No. 2 within Utility Trench 3.



Photo 3.26. Headwall of Graving Dock No. 2 within Utility Trench 3, looking northeast.



Photo 3.27. East Profile of Utility Trench 3, Manhole Box, showing exposed wooden elements of East Wall of Graving Dock No. 2.



Photo 3.28. Close up of southernmost portion of Manhole Box, East Profile of Utility Trench 3, showing exposed wooden elements of East Wall of Graving Dock No. 2.



Photo 3.29. Close up of portion of Manhole Box, East Profile of Utility Trench 3, showing exposed wooden elements of East Wall of Graving Dock No. 2.



Photo 3.30. Close up of northernmost portion of Manhole Box, East Profile of Utility Trench 3, showing exposed wooden elements of East Wall of Graving Dock No. 2.



Photo 3.31. East Profile of Graving Dock No. 2 within Utility Trench 3, Southern Exposure, looking northeast.



Photo 3.32. West Profile/Exterior of Graving Dock No. 2 within Utility Trench 3, Southern Exposure, looking north.

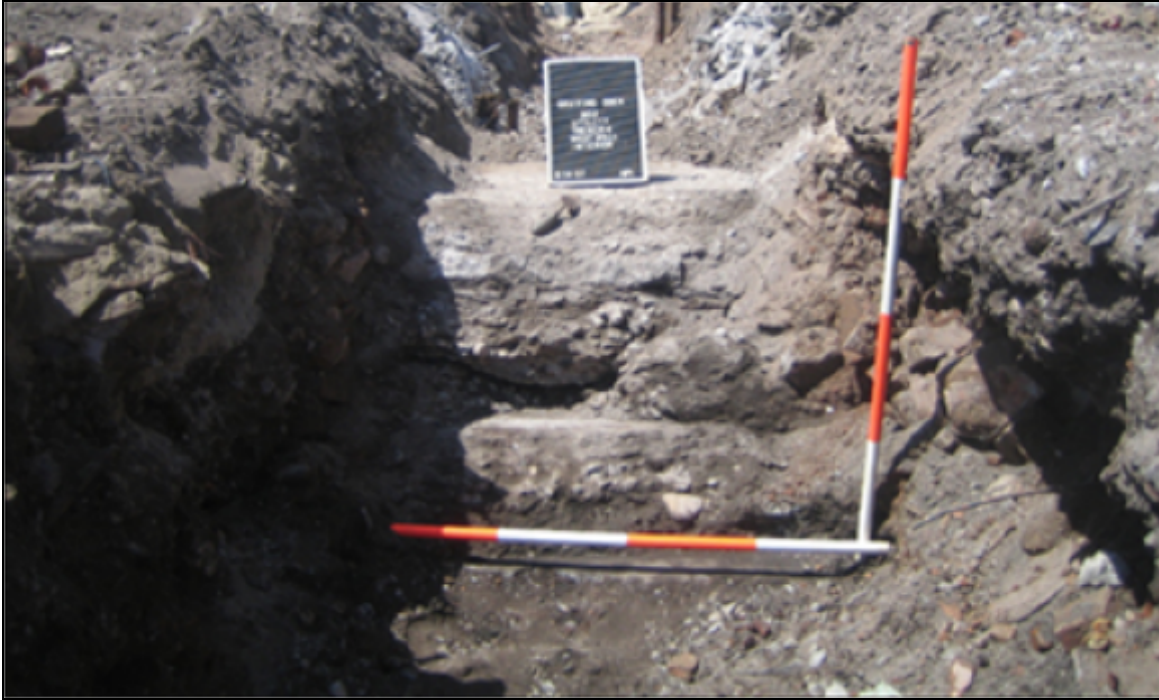


Photo 3.33. Looking Northwest toward West Wall of Graving Dock No. 2 West Profile/Interior. Note: void on left hand center of photo. The wall was hollow and patched with roughcast concrete.



Photo 3.34. Looking southeast toward East Wall of Graving Dock No. 2 Interior (East Profile). Note: Pipe in foreground is within fill. Four stepped altars exposed.



Photo 3.35. Looking Southwest toward East Wall of Graving Dock No. 2 - Plan View.

APPENDIX A: GRAVING DOCK NO. 2 CHRONOLOGY

- 1867 The area occupied by Graving Dock No. 2 was underwater during the first two-thirds of the 19th century (Figures 2.1-2.5) (Coast Survey Office 1844; Colton 1849; Mitchell 1981:1; Perris 1855; Ratzer 1767).
- 1867 Graving Dock No. 2 completed by Bostonian James Simpson, under contract to the Erie Basin Dock Company, and measured 447 feet long, 100 wide at the top, and 47 feet wide at the floor. It could receive vessels measuring 17 feet draft at low water and 22 feet draft at high water. A second gate was installed near the middle of Graving Dock No. 2 that allowed the structure to house two ships at one time. The two-sectioned parts of the dock measured 222 feet and 218 feet long (Brooklyn Eagle 1870; Mitchell 1981:5-6).
- 1874 Graving Dock No. 2 is depicted alongside Graving Dock No. 1 on a U.S. Coast Survey of the area published in this year (Figure 2.6) (United States Geological Survey 1874).
- 1876 The Erie Basin Dock Company sold their facilities, including Graving Dock No. 2, to a new company, the Erie Basin Dock and Warehouse Company, Ltd. (Mitchell 1981:6).
- 1880 Graving Dock No. 2 was depicted on the Bromley map published in this year, identified on the map as “Dry Dock” (Figure 2.7) (Bromley 1880).
- The Erie Basin Dock and Warehouse Company, Ltd. went bankrupt. Thomas Buckley, a local businessman purchased the company’s assets and liabilities at a public auction and then immediately conveyed the shipyards to the Anglo-American Dry Dock and Warehouse Company (Mitchell 1981:6).
- 1880s-1890s By this time the Erie Basin businesses had their own horse-car line. The Van Brunt Street and Erie Basin Railroad began running between the Hamilton Ferry and the Shipyards in 1880, and by the 1890s had converted to an overhead electric trolley (Mitchell 1981:6, 10).
- 1881 Anglo-American Dry Dock and Warehouse Company leased their newly acquired facilities to Cramps of Philadelphia for a term of 14 years (Mitchell 1981:6-7).
- 1883 Cramps subleased the yards to the fathers and son team of James Simpson Sr. and Jr. (the senior Simpson previously supervised the construction of the graving docks). During this period the shipyards were known locally as the “Boston Docks” (Mitchell 1981:7).
- 1886 Graving Dock No. 2 was depicted on a Sanborn map published in this year. The dock was identified as a “Dry Dock No. 2” under the ownership of the “Anglo-American Dry Dock & Warehouse Company” (Figure 2.8) (Sanborn 1886).
- The Simpsons surrendered their sublease and the Cramp lease transferred to the partnership of Handren and Robins of Manhattan (Mitchell 1981:7).
- 1895 The Cramps ownership of the property was officially sold to the Robins Company, formerly Handren and Robins, until Handren’s exit in 1892 (Mitchell 1981:7).
- 1900 A lithograph produced in this year confirms that Graving Dock No. 2 was composed of a set of steps extending from the top of the dock to the bottom of the basin. The lithograph depicts a ship within the dock (Figure 2.9) (Mitchell 1981:frontispiece).
- 1904 Graving Dock No. 2 was depicted on a Sanborn map published in this year. The graving dock was identified as “Dry Dock No. 2” on the Sanborn. A small building was located along the western side of the dock (Figure 2.10) (Sanborn 1904).

1911	The (John N.) Robins Company became the Robins Dry Dock and Repair Company (Mitchell 1981:16).
1915	William H. Todd Corporation purchased the facilities from the Robins Dry Dock and Repair Company (Mitchell 1981:17). A Sanborn published in the year depicts “Dry Dock No. 2” under the ownership of “John N. Robins Co. + Dry Docks” (Figure 2.12) (Sanborn 1915).
1924/25	Todd Shipyards Erie Basin facilities participated in repairing ships involved in collisions (Mitchell 1981:85).
1928/29	Graving Dock No. 2 was lengthened, but was purportedly not rebuilt in concrete, as was Graving Dock No. 1 (Raber Associates 1985:7).
1939	“Graving Dock No. 2” was depicted on the Sanborn published in this year under the ownership of “Todd Shipyards Corp’n Robins Dry Dock and Repair Co. Erie Basin Plant.” The crane gantry way was first introduced onto the site, between Graving Dock No. 1 and No. 2, between 1915 and 1939 (Figure 2.13) (Sanborn 1939).
1944	Todd Shipyards participated in a wartime program to build two-dozen Landing Craft Infantry boats for the U.S. Navy, assisting Todd’s Hoboken, New Jersey yards. For construction of these vessels, workers transformed Graving Dock No. 2 and its adjacent yard space into a modified assembly line (Mitchell 1981:158).
1950	Graving Dock No. 2 is depicted on the Sanborn published in this year as owned by “Todd Shipyards Corp. Brooklyn Division” (Figure 2.16) (Sanborn 1950).
1968	Graving Dock No. 2 is depicted on the Sanborn published in this year (Figure 2.17) (Sanborn 1968).
1976	Graving Dock No. 2 filled in. “Todd’s oldest yard was ostensibly reducing its repair facilities. In reality, the facility in question, Erie Basin’s Graving Dock No. 2, had long since been retired from active duty and had become an idle and somewhat untidy landmark from the era of [James] Simpson and the ‘Boston Docks.’ In January, 1976, it was ordered filled in” (Mitchell 1981:271).
2007	Monitoring conducted by HPI during construction and exposure of Graving Dock No. 2.

APPENDIX B: GLOSSARY

Anchored Dry Dock-In an anchored dry dock, the hydrostatic uplift is opposed by the permanent weight of the structure plus some type of anchorage. Soil conditions must be such that they can provide bearing capacity for the floor slab loads allowing for the development of tension in pilings or anchors embedded in the soil. Pilings play a dual role in this type of dock, acting in tension when the dock is empty and in compression when a vessel is in the dock. Unlike the *Mass Gravity Dry Dock*, the anchored dry dock relies on a relatively light floor slab. This is the least expensive of the dock types (Gaythwaite 2004:419).

Basin Dry Dock-An excavation or depression with one end open towards the sea. For dry-docking, a vessel enters the depression and the seaward end is sealed with a gate and the basin dewatered. The earliest graving dock was constructed in the late 15th century at Portsmouth, England. The basin dry dock came into prominence during the middle to late 17th century. The basic features of a basin dry dock include the *Floor*, *Sidewalls*, *Headwall* and *Dock Gate*. Generally, basin dry docks are best suited for large vessels. There are three types of basin dry docks: mass gravity, anchored, and underdrain (AKA pressure-relieved) (Gaythwaite 2004: 409, 413-414 and 418; Cornick 1958:1).

Bilge Blocks-See *Blocks*.

Blocks- Blocks (Bilge Blocks and Keel Blocks) used to balance and hold the ship once it has entered the dock and dewatered. Most blocks are made of composite construction with concrete and steel bases and a timber or rubber cap piece to provide the necessary cushioning against the ship's hull. Timber is sometimes added to the bass of the block to compensate for irregularities in the dock floor. Block placement is based on the ship's "docking plan" (Gaythwaite 2004: 411).

Clear Width-Space within the dry dock, normally greater than the *Entrance Width* to allow ample space for equipment working on the vessel.

Dewatering-The process by which water is removed from the *Basin Dry Dock*. This is accomplished through large capacity motors pumping water out of the *Basin Dry Dock* into the harbor. The energy utilized is inversely proportional to vessel size. The smaller the vessel docked the greater the quantity of water and the more energy necessary to remove it (Gaythwaite 2004: 415).

Dock-An artificial enclosure for the reception of shipping. There are three classes of docks: wet docks (1); dry or graving docks, and slip docks or slipways (2); and floating docks (3) (Cornick 1958:1).

Dock Gate-Gate that separates the *Basin Dry Dock* from the harbor. There are five different types of gates: floating, hinge, sliding, mitre, and flap gates (Gaythwaite 2004: 427).

Dry Dock-See *Basin Dry Dock*

Effective Length-Minimum horizontal distance measured along the centerline between the *Headwall* and *Dock Gate* (Gaythwaite 2004: 416).

Entrance Width- Distance between the permanent dock fenders or walls at the dock entrance (Gaythwaite 2004: 416).

Fender-A fender is a protective element between the graving dock and vessel, similar to a bumper on a car. Fender systems dissipate impact energy in a number of ways, from conversion of kinetic energy into potential energy to elastic deformation in compression. Generally a fender is a large rubber block (hollow core rubber unit) along the side of the dock or, often, a series of pneumatic-type floating fenders (Gaythwaite 2004: 151-176).

Flap Gate-A flap gate is hinged to the dock horizontally on two heavy trunnion bearings at the level of the dock floor. The gate opens into the harbor (Gaythwaite 2004:431-432).

Floating Gate-Most widely used gate type. The gate is independent of the dock and once it is free of the *Sill* is pulled or towed to a pier or quay for mooring (Gaythwaite 2004: 428).

Floor-The floor of the *Basin Dry Dock*, typically built of reinforced concrete in modern construction. Prior to this technological innovation, the floor was composed of brick arch and stone block. Dock floors may be built horizontal or with an inclination to enhance drainage during *Dewatering* (Gaythwaite 2004: 421).

Gantry Way-Route of a crane, carried by rails.

Graving Dock-See *Basin Dry Dock*

Head Wall-Wall opposite the dock gate without any opening to the harbor (Gaythwaite 2004: 414).

Hinge Gate-Modified version of a *Floating Gate*, though connected to the dock on one of its vertical edges via a vertical hinge. Similar to a door, it is opened along one end. The gate is opened by wire ropes, wenches or by a hydraulic ram (Gaythwaite 2004:428-429).

Keel Blocks-See *Blocks*.

Mass Gravity Dry Dock-The structure has sufficient mass to overcome upward pressure of the groundwater acting on the underside of the floor when the dock is empty. Gravity dry docks can be constructed as a monolithic frame or with a floor side separate from the sidewalls. Generally, this type of dock is preferred for docks of significant width. For docks of great depth, gravity-type docks become very labor intensive and uneconomical (Gaythwaite 2004: 418-419).

Mitre Gate-The mitre gate is split in the middle and connected vertically to the dock along its two outermost points. When open the mitre gate halves fit into the *Sidewalls* (Gaythwaite 2004:430-431).

Sidewalls- The walls of the *Basin Dry Dock*, perpendicular to the *Dock Gate* and *Headwall*.

Sill-Lip at the entrance to the *Dry Dock* on which the *Dock Gate* overlaps forming a seal (Gaythwaite 2004: 414).

Sliding Gate-A floating gate moved transversely into a special pocket or recess built in the sidewall of the dock (Gaythwaite 2004:429).

Stepped Altars- Regularly spaced steps running from the top of the dock down towards the center of the dock basin. Stepped altars are used as working surfaces to both support the vessel once it enters the *Graving Dock* and to store or stage materials (Gaythwaite 2004:417).

Tidal Basin-Another term for “dock,” though loosely applied. A tidal basin is an area of partially enclosed water in free communication with the sea. The tidal basin functions in a similar way to a dock (Cornick 1958:1).

Underdrain Dry Dock-(Also known as pressure-relieved) A dock where the groundwater around the dock is lowered sufficiently so that no uplift pressure develops. Pressure is relieved at the floor slab and walls. An external drainage system is installed, allowing the groundwater to be lowered. In docks where pressure is relieved under the floor slab, the water flow to the drainage system is controlled by a sheet-pile cutoff wall installed below the dock walls. A precise knowledge of the soil parameters is very important (Gaythwaite 2004: 420-421).

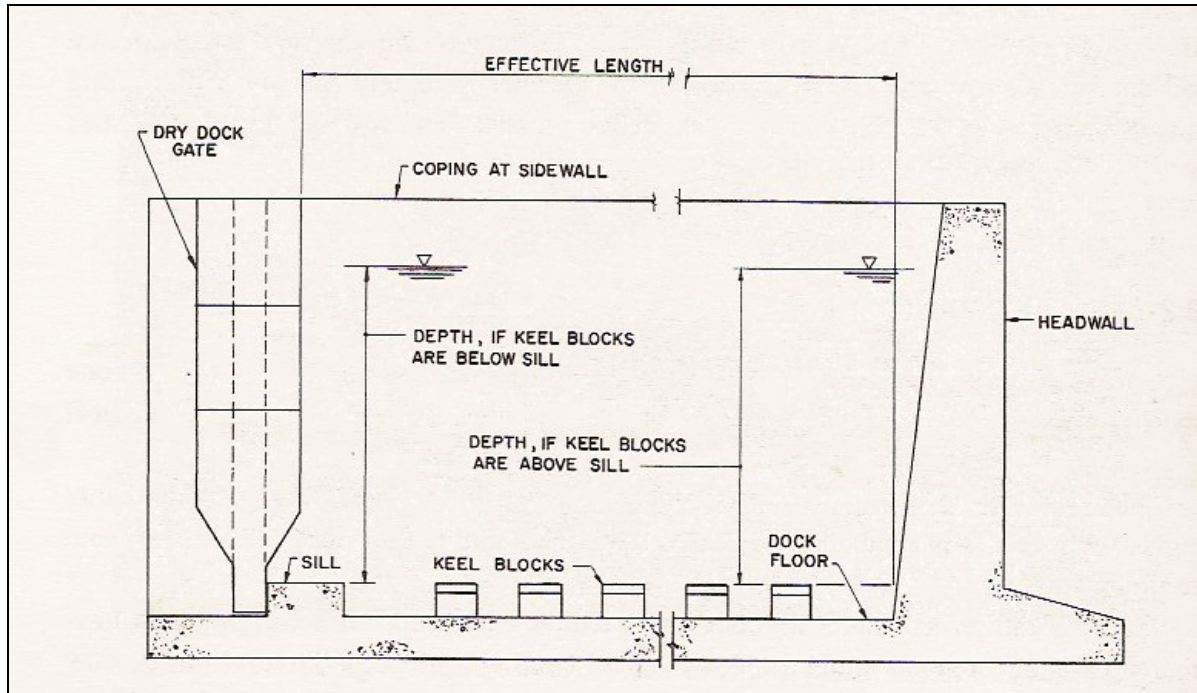


Figure B.1. Example of Graving Dock Cross Section/Profile-Lengthwise-Showing Architectural Elements (Gaythwaite 2004: 414).

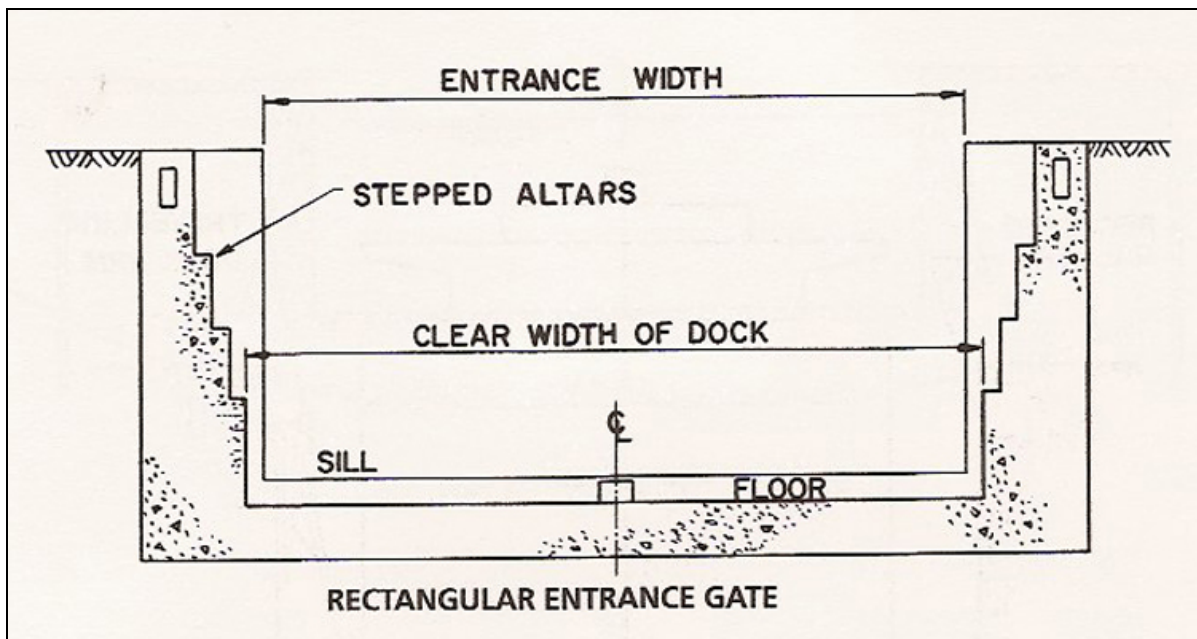


Figure B.2. Example of Graving Dock Cross Section/Profile-Width-Showing Architectural Elements (Gaythwaite 2004: 417).