HOBOKEN CITY-OWNED / CITY-LEASED WATERFRONT STRUCTURES INSPECTION

Our File No. BUE-1009

BOSWELL UNDERWATER ENGINEERING
330 Phillips Avenue
South Hackensack, New Jersey 07606
(201) 641-0770

March 2011

BOSWELL UNDERWATER ENGINEERING

UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS • MARINE CONSTRUCTION

330 Phillips Avenue • PO Box 3152 • South Hackensack, NJ 07606-1722 (201) 641-0770 • Fax (201) 641-1831

VIA ELECTRONIC & REGULAR MAIL

March 31, 2011

Jennifer W. Maier
Director of Environmental Services
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Re: Hoboken City-Owned/City Leased
Waterfront Structures Inspection
Our File No. BUE-1009

Dear Director Maier:

In accordance with the terms of the referenced Agreement, we are pleased to submit the Final Condition Survey Report of the above referenced facility.

This report summarizes our field survey efforts, evaluation of the structural conditions of the various elements of the facilities and recommendations for repair to preserve and/or prolong the serviceability of these facilities. Repair recommendations have been prioritized and have been individually enumerated, as practicable.

The thoroughness and accuracy of all work on this project has been ensured through independent quality control by our technical and senior management staff.

Please do not hesitate to contact this office if you should have any questions or comments.

Very truly yours,

BOSWELL UNDERWATER ENGINEERING

Michael J. Ganas, P.E.
BUE Managing Director

MJG/kc
Enclosures

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Boswell Underwater Engineering (BUE), a division of Boswell Engineering, performed a condition survey of the City of Hoboken, city-owned and city-leased waterfront structures from November, 2010 to February 2011. The condition survey included an inspection of the following waterfront structures:

- Roughly 976 linear feet of concrete seawall, and a steel pipe pile supported platform and pier at Castle Point (Noted as Location A on the attached Inspection Location Key Sheet).
- Approximately 1,370 linear feet of seawall north of Pier A, comprised of 290 ft long high-level steel pipe platform, and a masonry gravity wall, roughly 1,080 ft in length (Noted as Location B1 and B2, respectively, on the attached Inspection Location Key Sheet).
- Pier A (Noted as Location C on the attached Inspection Location Key Sheet).
- High-level platform south of Pier A (Noted as Location D on the attached Inspection Location Key Sheet).

There are no emergency action or immediate repair recommendations as a result of this survey at any of the inspected structures.

CASTLE POINT

The overall condition of the Castle Point waterfront structures is satisfactory with the exception of the area adjacent to the existing gazebo at the southern end of the inspection area which is currently in the rehabilitation design and permitting phase. As referenced above, this area is denoted as Location A on the Key Sheet located at the end of this Executive Summary. The concrete seawall is generally in fair condition with seven isolated areas of voids at the base of the seawall and minor to heavy scaling. The steel pipe piles are in fair to satisfactory condition with minor to moderate corrosion noted within and above the tidal zone. The concrete pile caps and deck planks are in good condition with no significant deterioration.

It is recommended that the voids at the base of the concrete seawall be repaired on a routine basis. The steel pipe piles that have coating loss and/or corrosion within and above the tidal zone should be protected to prevent corrosion on a routine basis.

STEEL PIPE PILE PLATFORM AND MASONRY GRAVITY WALL

The general condition of the steel pipe pile supported platform north of Pier A is satisfactory. The steel pipe pile platform begins at the north face of Pier A and extends approximately 290 linear feet in a northerly direction. As referenced above, this area is denoted as Location B1 on the Inspection Location Key Sheet located at the end of this Executive Summary. The steel pipe piles are typically in satisfactory condition with minor coating loss and corrosion observed in the

top 2 to 3 feet of the piles. The condition of the concrete pile caps and pre-cast concrete deck planks is good.

It is recommended that where coating loss and/or corrosion is present that steel pipe piles be cleaned and re-coated on a routine basis to prevent future corrosion.

The overall condition of the masonry gravity wall is fair. The masonry gravity wall section begins at the end of the steel pipe pile section referenced above and extends approximately 1,080 feet in a northerly direction and terminates at the southern end of Sinatra Field. Sinatra Field has not been inspected as part of this report as this project is currently in the rehabilitation design and permitting phase. As referenced above, this area is denoted as Location B2 on the Inspection Location Key Sheet located at the end of this Executive Summary. The timber cribbing beneath the masonry wall is exposed in three areas for a total of approximately 580 linear feet. The timber displays moderate to severe marine borer infestation. The northern 174 linear feet of the gravity wall has widespread grout loss, displaced masonry blocks and several voids as a result of missing blocks.

It is recommended that an engineering evaluation be performed on areas with timber cribbing exposed below the masonry seawall and the northern section of deteriorated masonry seawall. The engineering evaluations should consider the structural capacity of the structure and determine the appropriate repair method. The engineering evaluation and subsequent repairs should be implemented on a priority basis.

PIER A

The overall condition of Pier A is fair due to 893 of 1,362 concrete-encased piles supporting the pier having steel exposed below the encasement. Pier A is located just south of the pipe pile platform inspection area along Sinatra Drive, at the easterly end of First Street. As referenced above, this area is denoted as Location C on the Inspection Location Key Sheet located at the end of this Executive Summary. The concrete encasements, when originally installed, extended into the mudline to protect the H-piles from corrosion. The mudline has scoured since the installation of the concrete encasements, exposing the steel H-piles to a maximum length of exposure of 8.5 feet and an average length of exposure of 1.6 feet. Measurements of a representative number of piles indicate section loss of the exposed steel between 27 and 48 percent, with an average of 37 percent loss of section. Additionally, 91 concrete encasements have voids at the top of the pile or gaps between the encasement and pile cap, thus exposing the steel H-pile or reinforcing steel. The concrete deck planks and pile caps are generally in satisfactory condition with 20 areas of spalling or delaminations noted. A cantilevered steel girder which supports the south fascia beam at Bent 31 apparently has been damaged by impact and is no longer functioning.

The platform south of Pier A, denoted as Location D on the Inspection Location Key Sheet located at the end of this Executive Summary, is generally in fair condition. Of the 11 accessible

piles inspected, one was not encased, and one had a large void exposing the top 6 inches of the steel H-pile.

It is recommended that the exposed steel H-piles be protected below the encasements in order to prevent further corrosion, voids and gaps in concrete encasements be patched, and the cantilevered girder at Bent 31 be repaired on a priority basis. The spalls and delaminations on the underdeck and pile caps should be repaired on a routine basis.

This report contains conclusions concerning the causes of the noted conditions and recommendations for the rehabilitation of the structures. The repair procedures contained in the recommendation section of the report outline the general extent of the required rehabilitation work. Repair recommendations do not preclude the necessity of performing further investigation and preliminary design work for the purpose of establishing the complete scope of work and the final rehabilitation.

BOSWELL UNDERWATER ENGINEERING

UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

INSPECTION LOCATION KEY SHEET

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009- 1	SHEET v

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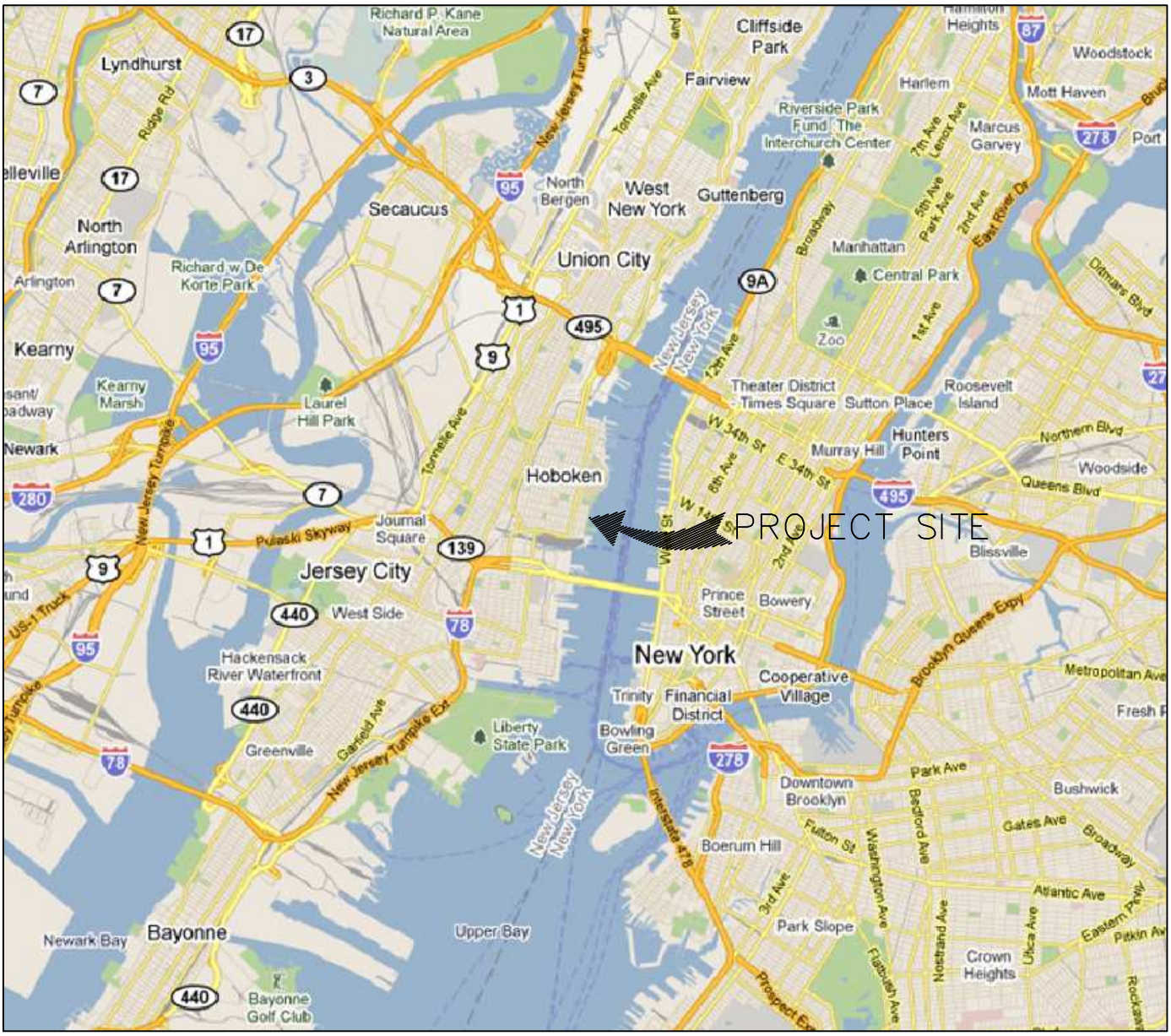

BOSWELL UNDERWATER ENGINEERING

UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

VICINITY PLAN

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-2	SHEET viii

BOSWELL UNDERWATER ENGINEERING

UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

SITE PLAN

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
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SCOPE OF WORK AND INSPECTION PROCEDURE

1. SCOPE OF WORK AND INSPECTION PROCEDURE

1.1 SCOPE OF WORK

From November, 2010 to January, 2011 Boswell Underwater Engineering (BUE) performed a condition survey of city-owned and city-leased waterfront structures in Hoboken, New Jersey. The condition survey entailed an inspection of approximately 1,000 linear feet of existing concrete seawall, a high-level steel pipe pile supported platform, and pier at Castle Point. An inspection of the masonry gravity wall, and high-level steel pipe pile supported platform north of Pier A to the south end of the Sinatra Soccer Field was performed. Pier A and the high-level steel H-pile supported platform (south of Pier A) extending to the New Jersey Transit property line were also inspected.

1.2 FACILITY DESCRIPTION

1.2.1 Castle Point

The Castle Point structure is a concrete gravity wall that is approximately 976 long located on the east shore of the Hudson River. The structure is bordered on the south by a newly constructed walkway pier and bordered on the north by a timber relieving platform at a dry dock facility. The shoreline adjacent to the concrete gravity wall is comprised of placed stone. For purposes of this inspection, the structure was stationed from south to north, with Station 0+00 at the south end and Station 9+76 at the north end where it terminates.

At the south corner of the structure the timber pile supported seawall has collapsed. The repair of the collapsed corner is currently in the design phase. From Sta. 1+13 to Sta. 7+80, a high-level platform was constructed consisting of reinforced concrete-filled steel pipe piles, pre-cast concrete pile caps and deck planks. The steel pipe piles are 14 in. diameter with a nominal wall thickness of 0.5 in., as indicated on design drawings, dated 1997. The platform supports a walkway adjacent to Frank Sinatra Drive. At approximately Sta. 6+80 a T-shaped pier of similar construction to the platform extends roughly 125 ft east of the outboard edge of the platform. A plan view and typical sections of this area are shown on Drawings Nos. 4 through 6.

1.2.2 Gravity Seawall and Relieving Platform

From the north face of Pier A to the kayak launch south of the soccer field at Sinatra Park, the shoreline is comprised of a high-level steel pipe pile supported platform and a masonry gravity seawall founded on timber cribbing. For the purpose of this inspection, the entire section of seawall was stationed from south to north, beginning with Sta. 0+00 at the north end of the outfall at the northern limits of the New Jersey Transit property to Sta. 18+24 at the termination of the seawall just south of the soccer field. The outboard portion of the soccer field is built on a timber relieving platform. The southeast corner of the soccer field seawall and platform has collapsed. This area

was previously inspected by BUE in October of 2009 and the repairs for this area are currently in the design phase. The inspection of Sinatra Park was not included in this scope of work.

From Sta. 4+55 (north face of Pier A) to Sta. 7+44, the structure is comprised of a high-level steel pipe pile platform. The steel pipe piles are 14 in. diameter with a 1/2 in. wall thickness; it is not known if the piles are concrete filled. The pipe piles support cast-in-place concrete pile caps; pre-cast concrete deck planks rest on the pile caps. The deck planks support a concrete seawall at the outboard edge, and a fill and paver walkway inboard of the seawall. The pipe piles are configured in rows oriented east to west, typically spaced at approximately 26.5 ft on center with a fascia beam at the outboard edge of the structure. Due to the presence of rip-rap and fill sloped upward to the bottom of the pre-cast deck planks, the western limits of the platform substructure were inaccessible. Plans for this area were not available at the time of inspection and the presence and type or configuration of an inboard closure wall is unknown.

From Sta. 7+44 to 16+50, the structure is a stacked masonry gravity wall founded on timber cribbing. The timber cribbing is exposed intermittently along the length of the gravity wall, with several areas where the interface between the masonry and timber cribbing is buried beneath the mudline. The masonry consists of 6 or 7 (depending upon location) courses of stacked blocks, each approximately 2 ft high. A concrete seawall is cast on top of the masonry. The masonry and concrete wall retain fill which supports a paver walkway.

From Sta. 16+50 to 18+24, the seawall consists of loosely stacked stone of varying sizes. A concrete wall is cast on top of the stone seawall. At the north end of the structure the wall slopes down and terminates at a sloped ramp, possibly used for launching small watercraft. North of this area is a rocky shore leading to the soccer field.

At Sta. 11+80 and 16+07, there are pier walkways or ramps extending from the seawall to the recently constructed Pier C. As the construction of Pier C was ongoing at the time of the inspection, Pier C was not included in the scope of work.

Plans and typical sections of the relieving platform and masonry gravity wall are depicted on Drawing Nos. 7 through 10.

1.2.3 Pier A

Pier A is a concrete structure founded on 1,362 concrete-encased steel H-piles. Rehabilitation plans indicate that the H-piles are HP14x89. The pier is approximately 789 ft long and 328 ft wide with 38 bent rows typically spaced at 21.5 ft, center to center. Each row typically has between 32 and 40 piles.

Near the center of the pier, in Rows 7 through 34, there is an abandoned rail well, roughly 28.5 ft wide and 4 ft deep. The rail well was designed to support rail cars when the pier was utilized to transfer cargo. Based on rehabilitation plans, the rail well has been filled with light weight

concrete. Pier A has been converted to a park; the deck currently supports concrete walls along the fascias to retain fill, paver walkways, trees and lawn areas.

Drawing Nos. 11 through 13 depict a plan view and typical cross sections of the pier. The plan view was developed based on the plans available at the time of the inspection titled as, "The Port Authority of NY & NJ, Hoboken South Waterfront Development, Pier A Rehabilitation, Contract No. HUD 544.007", dated May 1996.

South of Pier A is a high-level platform, roughly 127 ft long and 55 ft wide. The platform is supported by concrete-encased steel H-piles and is of similar construction to Pier A. The platform was built over a steel sheet pile cofferdam. The cofferdam was left in place but is no longer structurally significant. Due to the presence of the cofferdam, only 11 of the 27 piles that support the platform were accessible for inspection. A plan view depicting the platform is shown on Drawing No. 14.

1.3 INSPECTION PROCEDURE

The facility was inspected under the direction of a registered Professional Engineer licensed in New Jersey. The underwater inspection was performed by a three-person team, consisting of a professional engineer-diver, an engineer-diver, and an inspector-diver. All underwater inspection work was conducted utilizing surface-supplied air and a hardwire communications tether. Operations were staged from an inspection van located on the pier deck as well as a 25 ft dive boat. The inspection was performed and report prepared in accordance with the American Society of Civil Engineers' "Underwater Investigations Standard Practice Manual". The following Inspection Levels were employed for this inspection.

Level I A close visual examination or a tactile examination using large sweeping motions of the hands where visibility is limited. Although this effort is often referred to as a "swim-by" inspection, it must be detailed enough to detect obvious major damage or deterioration caused by overstress or other severe deterioration. It should confirm the continuity of the full length of all members and detect undermining or exposure of normally buried elements. This inspection also may include limited probing of the substructure and adjacent channel bottom.

Level II A detailed inspection that requires marine growth to be removed from portions of the structure. Cleaning is time-consuming, hence the need to base the inspection on a representative sampling of components. For piles, a 12-in.-high band should be cleaned at designated locations, generally near the low waterline, at the mudline, and midway between the low waterline and the mudline. On a rectangular pile, the marine growth removal should include at least three sides; on an octagonal pile, at least six sides; on a round pile, at least three-fourths of the perimeter. On large-diameter piles (3 ft or greater), 1-ft x 1-ft areas should be cleaned at four locations approximately equally spaced around the perimeter at each elevation. On large,

solid-faced elements such as retaining structures, 1-ft x 1-ft areas should be cleaned at these three elevations. This inspection also should focus on typical areas of weakness such as attachment points and welds. It is intended to detect and identify damaged and deteriorated areas that may be hidden by surface biofouling. The thoroughness of cleaning should be governed by the tasks necessary to discern the condition of the underlying material. Removal of all biofouling staining is generally not required.

Level III A detailed inspection typically involving nondestructive or partially destructive testing, conducted to detect hidden or interior damage or to evaluate material homogeneity. Typical inspection and testing techniques include the use of ultrasonics, coring or boring, physical material sampling, and in situ hardness testing. This inspection is generally limited to key structural areas, areas that are suspect and areas that may be representative of the underwater structure.

The following types of inspection/survey activities were performed on the components of the structures:

Concrete-Encased Steel H-Pile

For this survey, a 100% Level I – visual/tactile inspection of the concrete-encased steel H-piles was conducted from the pile cap to the mudline. Where steel was exposed below the concrete encasement, 10% of the piles were given Level II inspections. Due to the relatively short lengths of exposure, typically only one band was cleaned. Additionally, 5% of the piles with steel H-pile exposed below the encasement were selected for Level III inspection, which included two micrometer readings of each flange, for a total of four micrometer readings per location.

Concrete Pile Cap and Underdeck

For this survey, a 100% Level I visual inspection was conducted of the concrete pile caps and underdeck at Pier A, the platform south of Pier A, the platform north of Pier A, and at Castle Point.

Steel Pipe Piles

For this survey, a 100% Level I visual/tactile inspection of the steel pipe piles at the platform north of Pier A and at Castle Point was performed.

Masonry Gravity Wall and Timber Cribbing

For this survey, a 100% visual/tactile inspection was performed at the masonry gravity wall and timber cribbing. The masonry wall was probed with a probe rod at joints to determine extent of grout loss, if any. For the timber cribbing, the elements were probed with an ice pick at

representative locations to ascertain the presence and severity of marine borer intrusion and the softness of the wood.

Concrete Seawall

For this survey, a 100% Level I visual inspection was conducted at the concrete seawall at Castle Point.

Due to extremely poor underwater visibility, underwater photographs were not feasible. Photographs of typical and atypical above water conditions, and conditions that were visible at low tide were taken and included in this report beginning on page 34.

1.4 DEFINITIONS OF RECOMMENDATION CATEGORIES

1.4.1 RATING CRITERIA

The following ratings criteria, as defined by Table 2-4, of the ASCE Underwater Investigations Standard Practice Manual, were utilized for this inspection:

Table 2-4. Routine Underwater Condition Assessment Ratings

Rating		Description
6	Good	No visible damage, or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed. No repairs are required.
5	Satisfactory	Limited minor to moderate defects or deterioration are observed, but no overstressing is observed. No repairs are required.
4	Fair	All primary structural elements are sound, but minor to moderate defects or deterioration is observed. No repairs are required.
3	Poor	Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high priority basis with strong urgency.

1.4.2 DESCRIPTION OF RECOMMENDED ACTIONS

Based on the findings of the routine condition assessment, the following recommendation categories as defined by Table 2.6 of the ASCE Underwater Investigations Standard Practice Manual, may be assigned:

Table 2-6. Description of Recommended Actions Options

Recommended Action	Description
Emergency Action	Recommended whenever an unsafe condition is observed. If the situation is life threatening or if significant property damage or environmental damage may occur, appropriate owner representatives should be contacted immediately.
	May consist of barricading or closing all or portions of the structure, placing load restrictions, or unloading portions of a structure.
Engineering Evaluation	Recommended whenever significant damage or defects are encountered that require a structural investigation or evaluations to quantify the structural capacity, determine whether repairs are required, or determine which method of repair is appropriate.
	Although the scope of the routine inspections should include the structural assessment of the damage or defects on the capacity of typical structural components relative to their new condition, the engineering evaluation should consider the actual or anticipated loads that are or will be imposed on the structure.
Repair Design Inspection	Recommended whenever repairs are required, typically as a result of a routine inspection, but also may result from a special inspection or post-event inspection.
Special Inspection	Typically recommended to determine the cause or significance of atypical deterioration, usually before designing repairs.
	Special testing, analysis, monitoring, or investigation using nonstandard equipment or techniques is typically required.
Develop Repair Plans	Recommended when the repair design inspection has been completed and any special inspections recommended have been completed.
	Indicates that the field data may have been collected and that the structure is ready to have repair documents prepared.
No Action	Recommended when no further action is necessary on the structure until the next scheduled routine inspection.

Four categories of recommendations for repair are identified and defined as follows:

Immediate Requires immediate action, including possible closing of the structure or areas affected for safety reasons until interim remedial measures, such as shoring or removal of potentially unsafe structures (or elements), can be implemented. These closings or interim remedial actions, if any, always require immediate action upon discovery.

Priority Conditions for which no immediate action may be required or for which immediate action has been completed, but further investigations, design and implementation of interim or long-term repairs should be undertaken on a priority basis, i.e., taking precedence over all other scheduled work.

Safety Conditions that present a potential hazard and which should be repaired as soon as possible.

Routine Conditions requiring further investigation of remedial work, which can be undertaken as part of a scheduled maintenance program, other scheduled project, or routine facility maintenance, depending on the action required.

1.4.3 INSPECTION TERMINOLOGY

The following terms may be used during inspection to describe the condition of structural members:

a. Steel Members

1. Corrosion

Minor (or Light) – A light surface rust.

Moderate – Rust that is loose and flaking with some pitting. This scaling or exfoliation can be removed with some effort by use of a scraper or chipping hammer. Element exhibits measured but no significant loss of section.

Severe – Heavy, stratified rust or rust scales with extensive pitting. Removal requires exerted effort and may require mechanical means. Significant loss of section.

2. Pack Rust – Rust collected between two interfacing surfaces, usually two steel plates. Pack rust can be minor, moderate, or severe as described above. Pack rust can severely deform the steel members due to the expansive nature of rust.

3. Pitting – Formation of cavities due to corrosion. Minor, moderate, and severe pitting categories are used based upon depth and density of cavities.

   Minor – Typically less than 1/4 inch in diameter and 1/32 inch deep.

   Moderate – 1/4 inch to 1/2 inch diameter and up to 1/8 inch deep.

   Severe – Greater than 1/2 inch diameter and over 1/8 inch deep.

b. Concrete Members

1. Cracking – A separation into two or more parts with a space between the fractured concrete surfaces.

   Hairline – Crack width less than 1/32 inch.

   Fine – Crack width between 1/32 inch and 1/16 inch.

   Medium – Crack width between 1/16 inch and 1/8 inch.

   Wide – Crack width greater than 1/8 inch.

   The above definitions for cracks can be modified, depending on the type of structural element. Other terminology, such as map cracking, pattern cracking, etc., may be used as appropriate.

2. Efflorescence – A white deposit caused by crystallization of soluble salts brought to the surface by moisture leaching through concrete.

3. Delamination – A layered separation of the concrete. When a delaminated area of concrete is struck (sounded) with a hammer, a hollow sound will be emitted.

4. Leaching – The dissolution and washing away of the calcium hydroxide in concrete. The moisture enters the concrete through exposed cracks in the surface.

5. Spall – A roughly circular, oval, or elongated depression in the surface of a concrete element caused by separation of a portion of the surface concrete.

   Small (Pop-out) – Less than 6 inches in diameter and 1 inch deep.

Medium – Between 6 inches and 12 inches in diameter and up to 2 inches deep.

Large – Over 12 inches in diameter and any depth.

6. Scaling – The gradual loss of surface mortar and aggregates.

Light Scaling – Loss of surface mortar up to 1/4 inch deep.

Medium Scaling – Loss of surface mortar between ¼ inch and ½ inch deep, including loss between large aggregate.

Heavy Scaling – Loss of mortar greater than ½ inch in depth significantly exposing large aggregate.

7. Hollow area – An area of concrete which emits a hollow sound when struck with a hammer, indicating the existence of a fracture plane beneath the surface.

8. Honeycomb – Typically small pocket voids formed by the entrapment of air during the placement of the concrete.

c. Timber Members

1. Marine Borer Attack

Limnoria – Commonly referred to as wood gribbles, these crustaceans are tiny wood eaters that attack the timber from the outside, continually reducing the diameter of a timber pile. Severe attack will result in an hourglass shape to the pile.

Teredo – Commonly referred to as shipworms, these mollusks burrow minute holes into the timber and attack from within. Severe attack will result in a hollowing of the pile, leaving just the outer shell, and may go undetected. Teredo leave a white calcified trail that may be exposed by exterior timber deterioration.

2. Fungus Decay

Generally appears as a moist area with stain or discoloration. Fungi produce conks, which are fruiting bodies, usually fan-like in shape, and which grow horizontally from the wood. They shed spores which propagate the fungus. Conks are a sure sign of advanced decay and they vary from a fraction of an

inch to several inches in length. Sapstain fungi have small black, globular fruiting bodies which smear like soft carbon when brushed with the hand.

a. Molds – Cottony powdery circular growths varying from white or light colors to black. Molds themselves do not cause decay but their presence is an indication that conditions favorable to growth of fungi exist.

b. Stains – specks, spots, streaks, or patches, varying in color, which penetrate the sap wood. Sapstain is harmless to wood. It is usually a surface phenomenon and like molds, implies conditions where harmful fungi can flourish.

c. Soft rot – attacks the wood, making it soft and spongy. Only the surface wood is affected, and thus it does not significantly weaken the member.

d. Brown rot – feeds upon the cellulose and makes the wood dark brown and crumbly.

e. White rot – feeds upon both the cellulose and the lignin and makes the wood white and stringy.

Brown and white rots are responsible for structural damage to wood, while the other fungi types simply provide a sign that favorable conditions exist for growth.

3. Checks – Separation of the wood fibers, normally occurring across the annual growth rings.

4. Splits – similar to checks except the separations of the wood fibers extend completely through the piece of wood.

5. Shakes – Separations along the grain, which usually occur between the annual growth rings.

6. Damage by parasites

Damage is generally inside the surface of the wood and is therefore not visible, but sagging, crushing, small holes or the accumulation of sawdust may be observed.

Parasites tunnel in and hollow out the insides of timber members for food and shelter. Some common types of parasites include:

a. Termites – Termites are pale-colored, soft-bodied insects that feed on wood. All damage is inside the surface of the wood, hence it is not visible. The only visible signs of infestation are white mud shelter tubes or runways extending up from the earth to the wood and on the side of masonry substructures.

b. Carpenter ants – Carpenter ants are large, black ants that gnaw galleries in soft or decayed wood. The ants may be seen in the vicinity of the infested wood, but the accumulation of sawdust on the ground at the base of the timber is also an indicator of their presence.

c. Powder-post beetles – Powder-post beetles also hollow out the insides of timber members and leave the outer surface pierced with small holes about 1/16" in diameter filled with dry pulverized wood. Often a powdery wood dust is dislodged from the holes. The inside may be completely excavated.

7. Overloading – Overstressing of the timber element by continuous or impact loads in excess of their ultimate capacity. Typically evident by severe vertical cracks in the timber that cross the grain, breakage of the timber, or bulging of the timber with splitting of the wood fibers.

8. Abrasion – Reduction of the timber surface due to continual rubbing by debris, ice, or suspended particulates in the water. When combined with Limnoria attack, abrasion may rapidly reduce the cross-sectional area of piles.

9. Connecting Hardware Corrosion – Pins and bolts connecting timber members are subject to corrosion and may provide the weak link in a structure if they fail. Additionally, holes left in the timber due to missing hardware provide openings for marine borers to access the untreated interior of the timber.

d. Masonry Members

1. Spalling – Masonry spalling occurs where small pieces of stone break away from the surface, leaving a depression in the stone.

2. Splitting – Opening of cracks in the rock, breaking the rock into pieces.

3. Abrasion – Abrasion and weathering of the hard surface of the rock to degenerate into small granules.

4. Erosion – General degradation of the surface of the masonry units.

5. Degradation of Mortar – Gradual loss of mortar.

INSPECTION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

2. DETAILED INSPECTION FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

2.1 CASTLE POINT

The overall condition of the Castle Point structure is satisfactory. The steel pipe piles supporting the pier exhibit minor to moderate degrees of protective coating loss and minor corrosion in the tidal and splash zones. The concrete seawall has minor to moderate scaling and isolated areas of voids beneath the seawall. The southern end of the seawall has collapsed (Photo No. 8); and at the time of this inspection, the repairs of that area were in the design phase. Therefore, the southern collapsed portion of seawall was not included in this scope of work and is not reflected in the overall condition rating or recommendations.

2.1.1 Steel Pipe Piles

The general condition of the steel pipe piles is fair to satisfactory. The pipe piles supporting the high-level platform parallel to Frank Sinatra Drive typically have coating loss of up to 25% of the overall area within the top 3 ft of the pile, with only minor corrosion (Photo No. 5). The piles that support the fishing pier exhibit coating loss generally between 50% and 80% of the area for the top 4 ft of the pile, with random surface corrosion and blistering also evident (Photo No. 7). Below mean low water, the protective coating is predominately intact. At a few isolated locations, where the piles were welded, minor corrosion was observed at the welds which show some minor loss of coating. A band of corrosion was observed near mean low water that is 2 ft to 3 ft high, where the coating loss is up to 80% of the area, and where there are rust blisters covering 10% of the area, with pitting to 3/16” deep. UT measurements of representative piles indicate section loss of 20% or less. One exception was found at the pile at the southwest corner of the pier, at a weld location showing moderate corrosion where a UT measurement of 0.305 was taken, corresponding to a loss of section of 39% (Photo No. 6).

2.1.2 Concrete Pile Caps and Deck Planks

The condition of the concrete pile caps and deck planks is good, with no notable deterioration.

2.1.3 Concrete Gravity Wall

The general condition of the gravity seawall is fair. There are seven locations where the bottom of the seawall has voids due to erosion of the concrete or scouring of the mudline beneath the seawall. The largest void was found at Sta. 6+60 and measured 10 ft long, 2 ft high and 4 ft deep (Photo No. 9). Two cracks up to 1 in. wide, were found in the seawall, one at Sta. 9+76 at the north end of the structure where the seawall abuts timber cribbing (Photo No. 10) to the north and one at Sta. 0+30. Moderate to heavy scaling of the concrete face of the seawall was noted at three isolated locations (Photo No. 11), with the most severe scaling found at Sta. 9+70 where it was up to 6 in. deep. The remainder of the seawall typically has minor scaling.

The southern 30 ft of the seawall is supported by a timber relieving platform. Portions of the platform have been repaired by driving steel piles and placing a new concrete deck. No repairs were made to the timber piles supporting the seawall, and the seawall collapsed at the southeast corner and along the south face. At the time of this inspection, the repair of this corner of the structure was in the design phase. The proposed repair will replace the entire south face and roughly 115 ft of the seawall from the southeast corner with a concrete-capped steel sheet pile bulkhead. The new bulkhead will be filled with lightweight flowable cementitious fill.

Presently, the west end of the timber-supported concrete gravity wall abuts a newly constructed pedestrian walkway pier (Photo Nos. 12 and 13). The condition of the timbers supporting the seawall at this location is poor due to severe marine borer infestation. The proposed new design will replace this portion of the seawall. At the time of the inspection, access to this area was restricted by a chain link fence. Until such time that the proposed repair is completed, the area should remain cordoned off.

2.1.4 Recommendations

Based on the findings of the condition survey, the following repairs and/or actions are recommended:

- Clean and apply protective coating to the steel pipe piles from the pile cap to 2 ft ± below mean low water on a routine basis to protect from corrosion.
- Fill seven void areas beneath concrete seawall on a routine basis.

The recommended inspection frequency of the Castle Point structure is five years.

2.2 STEEL PIPE PILE RELIEVING PLATFORM AND MASONRY GRAVITY SEAWALL

2.2.1 Steel Pipe Pile Relieving Platform

The overall condition of the relieving platform north of Pier A is satisfactory. The steel pipe piles are generally in satisfactory condition with minor coating loss, rust staining and blistering observed in the top 2 to 3 ft of the piles (Photo No. 16). This zone of corrosion generally occurs in the vicinity of mean high water or above, which is referred to as the splash zone. Corrosion rates are typically highest within the splash zone because the steel is almost continually wet and biofouling organisms do not attach in this zone. There is no indication of significant section loss of the steel; however, the blistering, rust staining, and isolated loss of coating are signs that corrosion in this zone has begun.

BUE performed an inspection of all 36 accessible piles. Design plans were not available for this area at the time of inspection and it could not be determined how far west the structure extends, or the total number of piles that support the structure. The rip-rap mudline slopes sharply towards the west and meets the concrete deck planks just west of the second pile from the east. The western limits of the platform were not accessible; however, there is evidence that west of the second row of piles from the outboard fascia of the platform, that the fill beneath the platform has settled. It is not known if there is a closure wall or bulkhead at the western limits of the platform, and if the observed settlement is of concern. Design plans and as-built documents should be reviewed to determine if a bulkhead or closure wall is present to retain the upland fill.

At approximately Sta. 6+30 there is an outfall pipe beneath the platform (Photo No. 17). The typical bent spacing was altered to allow for the outfall. Steel sheets that were used as part of the construction for the outfall have been left in place but are not structurally significant. The exposed portions of the outfall structure are in good condition.

The concrete pile caps and precast concrete deck planks are in good condition with no significant deterioration identified.

2.2.2 Masonry Gravity Seawall

The overall condition of the masonry gravity wall is fair, primarily due to intermittent exposure of the timber cribbing below the masonry with marine borer infestation, and widespread mortar loss and displaced and missing stones from Sta. 16+50 to Sta. 18+24.

The overall condition of the masonry blocks is satisfactory from Sta. 7+44 to 16+50. There were several isolated areas where grout was noted to be missing within the tidal zone, generally in the vertical joints of the bottom two courses of stone (Photo No. 18). There were two locations where blocks appeared to be displaced, one at Sta. 11+85 and one at Sta. 12+00. There were no signs of settlement or displacement in the concrete wall or walkway above.

As evidenced by the inspection findings, the masonry gravity wall is founded on a timber crib structure. At three locations along the masonry seawall, the timber cribbing, on which the masonry wall is founded, is exposed. The locations are from Sta. 8+10 to Sta. 8+30, from Sta. 10+05 to Sta. 13+35, and from Sta. 13+80 to Sta. 16+10, for a total of 580 linear feet. The height of timber cribbing exposure is up to 1.7 ft, with the maximum exposure occurring at Sta. 10+35. The general condition of the exposed timber is fair due to marine borer attack caused by Teredo infestation. The level of marine borer infestation is typically moderate to heavy, with localized areas of severe infestation as evidenced by visual signs of Teredo tunnels and ice pick penetration up to 1.5 in. deep.

Teredo, also known as shipworms, are mollusks that begin their life cycle as free-swimming larvae that settle on the exterior surface of wood, enter the wood through a pin-sized hole and begins boring. The larvae then undergo a metamorphosis, acquiring a wormlike body in the adult form.

The Teredo feed on the interior of the wood creating burrows, typically parallel to the grain of the wood. The loss of wood volume due to Teredo infestation can be extensive and can be difficult to detect during a visual inspection as the only outward sign may be the original pinhole entry point.

The masonry wall section from Sta. 16+50 to Sta. 18+24 is generally in poor condition. There is widespread mortar loss within the tidal zone for the length of the wall. At several locations, blocks are displaced or missing. The largest void in the wall was located at an outfall pipe near Sta. 17+00 and is approximately 10 ft wide by 4 ft high (Photo No. 21). At the time of the inspection there were no obvious signs of settlement in the concrete above the masonry or in the walkway. However, with widespread voids in the seawall, there is a potential for loss of fill from behind the seawall which could result in settlement in the walkway.

2.2.3 Recommendations

Based on the findings of the condition survey, the following repairs and/or actions are recommended:

- Relieving Platform (Sta. 4+55 to Sta. 7+44) – Clean and apply protective coating to the top 4 ft of all accessible piles to protect from corrosion on a routine basis.
- Masonry Gravity Wall (Sta. 7+44 to Sta. 16+50) – Perform Repair Design Inspection and Engineering Evaluation of the areas where timber cribbing is exposed below masonry gravity wall. Repair timber cribbing to prevent further deterioration due to marine borer intrusion, and undermining of the masonry seawall on a priority basis.
- Masonry Gravity Wall (Sta. 16+50 to Sta. 18+24) – Perform Engineering Evaluation for this area to determine appropriate method of repair for missing and displaced masonry on a priority basis.

The recommended frequency of inspection for the relieving platform (Sta. 4+55 to Sta. 7+44) is 5 years. The recommended inspection frequency for the masonry gravity wall is 3 years.

2.3 PIER A

The overall condition of Pier A is fair primarily due to the exposure below the encasement of 66% of the steel H-piles, and moderate to severe section loss of the H-piles where exposed.

2.3.1 Concrete-Encased Steel H-Piles

The overall condition of the concrete-encased steel H-piles is fair. A total of 893 of 1,362 steel H-piles that support Pier A are exposed below the concrete encasements (Photos Nos. 24 through 26), 396 are encased into the mudline, and 73 were not inspected as they were inaccessible or structurally obsolete (Photo No. 29). Table 2.3.1 contains a summary of inspected piles.

Table 2.3.1. Summary of Inspected H-Piles

	No. of Piles	Percentage
Total Piles	1,362	100%
Encased into Mudline	396	29%
Exposed below Encasement	893	66%
Not Inspected	73	5%

Typical cross-sections depicting the bottom of the concrete encasement at Elevation 292.15 and a mudline survey are included in the 1996 Pier A Rehabilitation Plans, Sheets S-4 and HSW-14, respectively (see Appendix A). The 1996 soundings indicate the bottom of the encasements on average were buried approximately 1 ft below the mudline. A comparison of soundings taken during this survey to the 1996 study indicate scour of the mudline to an average depth of 3.4 feet, with a maximum scour of 5.3 ft. Currently, the average length of H-pile exposure below the encasement is 1.6 ft, with a maximum length of exposure of 8.5 ft found at the northeast corner of the pier.

The 1996 rehabilitation plans included the encasement of roughly 114 piles, primarily batter and plumb piles located at the north and south sides of the rail well and piles situated in the easternmost bent row (Bent 44). Ten of the piles were never encased and left abandoned in place; 91 still extend into the mudline.

The condition of the exposed H-piles below the encasement is fair with moderate to severe corrosion noted. Typically, the exposed steel has uniform corrosion, a general thinning of the steel, and pitting over the exposed surface. Knife-edging of the flanges of the H-piles, a condition where thinning of the edge of the flange occurs due to the corrosion was noted at 136 locations. A total of 398 piles were observed to have minor hour-glassing, a reduction in the width of the flanges due to loss of overall section from corrosion. Due to the uneven surface of the steel, UT measurements could not be taken. Instead, the flange thickness was measured with a micrometer at 5 percent of the exposed piles to determine loss of section. The 1996 repair plans indicate that the H-piles are HP14x89, which have an original flange thickness of 0.615 in. The average flange thickness based on the micrometer readings is 0.385 in, which corresponds to an average section loss of 37 percent. The minimum measured section loss is 25 percent; the maximum measured section loss is 48 percent. Results from micrometer readings are presented in Table 2.3.2.

Table 2.3.2. Results from Micrometer Readings

BENT	N/S	PILE	FLANGE				PERCENT SECTION LOSS
			NE	SE	NW	SW	
19	S	1	0.437	0.423	0.462	0.462	27%
19	S	8	0.403	0.411	0.372	0.403	35%
20	S	6	0.381	0.410	0.375	0.382	37%
20	S	13	0.387	0.386	0.372	0.360	39%
21	S	7	0.410	0.420	0.440	0.390	33%
22	S	6	0.440	0.410	0.430	0.400	32%
23	S	8	0.400	0.420	0.420	0.290	38%
24	S	12	0.420	0.430	0.420	0.440	30%
25	S	9	0.450	0.460	0.450	0.460	26%
26	S	6	0.410	0.440	0.450	0.440	29%
27	N	2	0.407	0.421	0.479	0.435	29%
27	S	12	0.350	0.291	0.367	0.368	44%
28	N	2	0.413	0.453	0.421	0.405	31%
28	S	11	0.421	0.335	0.379	0.371	39%
29	N	6	0.429	0.421	0.432	0.419	31%
29	S	13	0.395	0.390	0.348	0.409	37%
30	S	10	0.378	0.368	0.340	0.362	41%
31	N	4	0.321	0.306	0.392	0.403	42%
31	S	13	0.388	0.382	0.362	0.398	38%
32	N	1	0.358	0.391	0.379	0.359	40%
32	S	8	0.350	0.354	0.363	0.354	42%
33	N	3	0.340	0.341	0.395	0.326	43%
33	S	12	0.364	0.355	0.387	0.374	40%
34	N	1	0.387	0.383	0.341	0.392	39%
34	S	7	0.353	0.339	0.374	0.389	41%
35	N	4	0.385	0.336	0.315	0.288	46%
36	N	3	0.402	0.401	0.397	0.421	34%
36	S	12	0.582	0.425	0.419	0.431	25%
37	N	5	0.407	0.382	0.385	0.327	39%
37	S	15	0.354	0.351	0.367	0.353	42%
38	N	3	0.410	0.303	0.421	0.385	38%
38	S	3	0.413	0.421	0.450	0.418	31%
38	S	8	0.421	0.397	0.410	0.385	34%
39	S	12	0.385	0.442	0.456	0.366	33%
40	N	1	0.368	0.362	0.402	0.381	38%
40	S	6	0.486	0.475	0.457	0.434	25%
41	N	1	0.371	0.340	0.396	0.311	42%
41	N	15	0.370	0.240	0.370	0.310	48%
41	S	13	0.380	0.346	0.387	0.347	41%
42	N	7	0.330	0.320	0.300	0.360	47%
42	S	7	0.361	0.348	0.362	0.299	44%
43	N	3	0.290	0.340	0.300	0.340	48%
43	N	21	0.380	0.300	0.490	0.300	40%
43	S	4	0.421	0.370	0.400	0.389	36%
44	S	1	0.302	0.346	0.333	0.294	48%
AVERAGE SECTION LOSS							**37%**

A structural analysis was performed based on the existing deteriorated condition of steel H-piles and the loads imposed by the current usage of the pier (see Appendix B). Based on the analysis, the steel H-piles adequately support the current loads.

The overall condition of the existing concrete encasements is fair. At 91 locations, voids or spalls in the top of the encasements, exposing reinforcing steel or the encased H-pile, or gaps between the top of the encasement and the bottom of the pile cap exposing a portion of the encased steel H-pile, were found (Photos Nos. 27 and 28).

Directly south of Pier A is a relieving platform, similar to Pier A; the platform consists of concrete-encased H-piles supporting concrete pile caps and concrete deck planks (Photo No. 35). Only 11 of 27 piles were accessible for inspection, with the remainder of the piles driven within or behind a sheet pile cofferdam. The cofferdam is severely corroded with large holes in the sheets within the tidal zone (Photo No. 36); however, the structure was abandoned in place and does not support the platform above it. Of the 11 piles accessible for inspection, 10 were encased to the mudline, and one pile (the southwestern pile) was not encased and has approximately 2 ft exposed above the mudline. Additionally, the top of the encasement at the center pile in the southern row is deteriorated, with the top 6 in. of the H-pile exposed. There was no notable deterioration of the pile caps and underdeck of the relieving platform.

A plan view of Pier A with locations of observed conditions is included on Drawing Nos. 13 and 14.

2.3.2 Concrete Pile Caps and Deck Planks

The overall condition of the concrete deck planks is satisfactory. There are 17 isolated locations in the underdeck noted to have spalls or areas of delamination, totaling approximately 108 square ft of affected area. The most severe condition was noted between Bents 11 and 12 in the vicinity of Pile 10N where 2 adjacent planks are spalled for nearly their full length with exposed corroded reinforcing (Photo No. 29). Additionally, there are several smaller spalls, roughly 2 square ft each, just north of this area. The remainder of the underdeck deterioration is less than 3 square ft per location and spread throughout the pier at isolated random locations.

From Bents 39 to 43, near the center of the pier, there is a significant amount of efflorescence leaking from the joints between the deck planks (Photo No. 32). The efflorescence is a sign that water is leaking from the top of the pier through the joints in the planks. Efflorescence was also noted along the north fascia of the pier at the joints between the top of the deck and concrete seawall (Photo No. 33).

The general condition of the concrete pile caps and fascia beams is satisfactory. There are only three observed locations with spalls or areas of delaminations. These areas range in size from 3 to 18 square ft (Photo No. 30). At the south side of the pier, between Bents 30 and 32, a repair was made consisting of replacing the southernmost pile in the row with two piles, one each, east and

west of the original pile. The replacement piles support a steel girder system, which in turn supports the concrete pile cap. The girder system has a cantilevered steel beam with bearing plates extending from the main girder to support the fascia beam at Bent 31. The cantilevered section of the beam is bent towards the west and is no longer functioning (Photo No. 34). The angle connection plates are bent and broken. The damage is likely the result of impact.

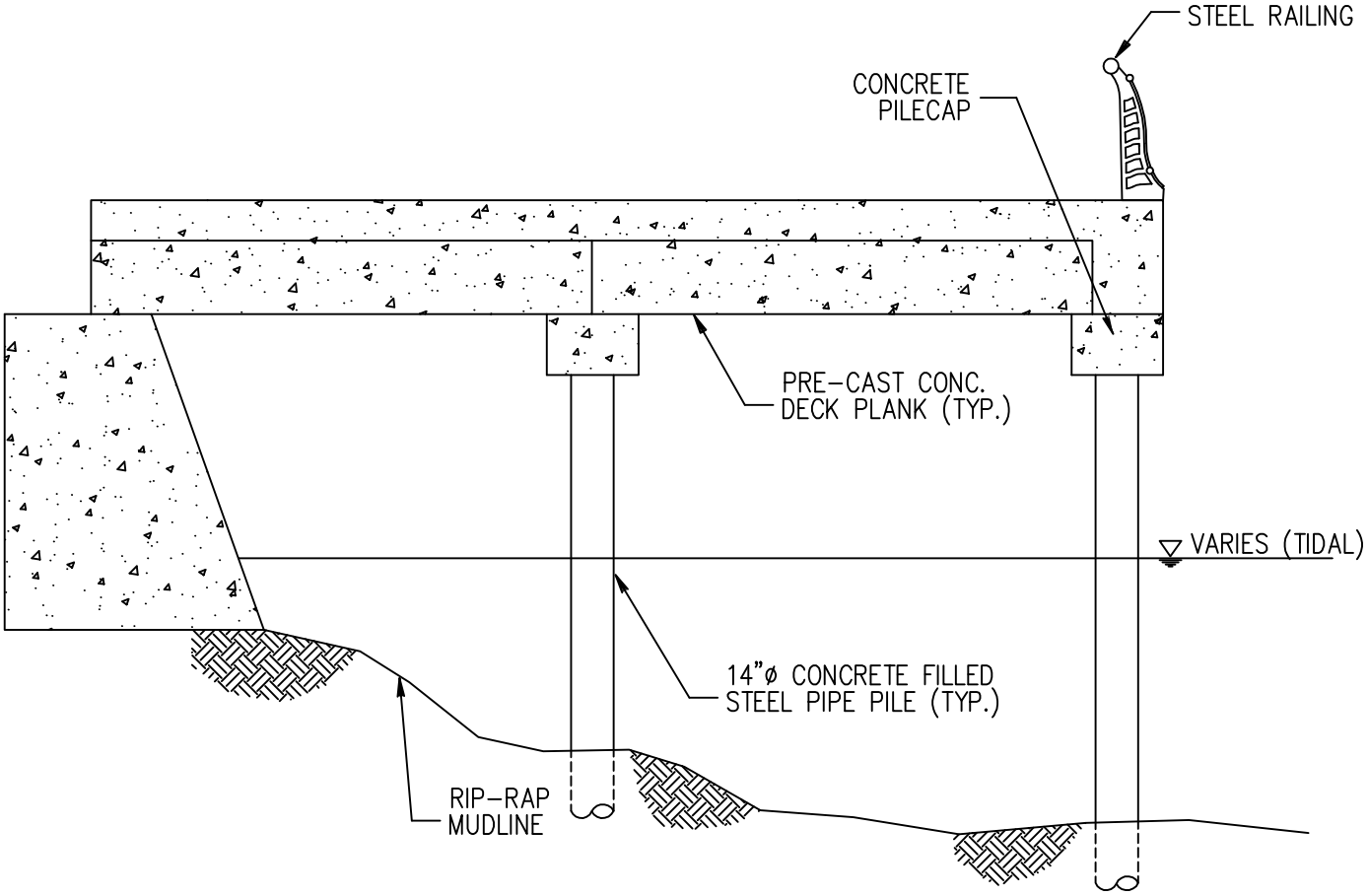
2.3.3 Recommendations

Based on the findings of the condition survey, the following repairs and/or actions are recommended:

- Protect exposed steel H-piles from further corrosion on a priority basis.
- Patch voids or gaps at the top of encasements to protect encased H-piles from corrosion on a priority basis.
- Repair or replace cantilever girder section at the south end of Bent 31 on a priority basis.
- Repair underdeck and pile cap spalls on a routine basis.

The recommended inspection frequency for Pier A and the relieving platform south of the pier is three (3) years.

DRAWINGS



SECTION A-A

BOSWELL UNDERWATER ENGINEERING

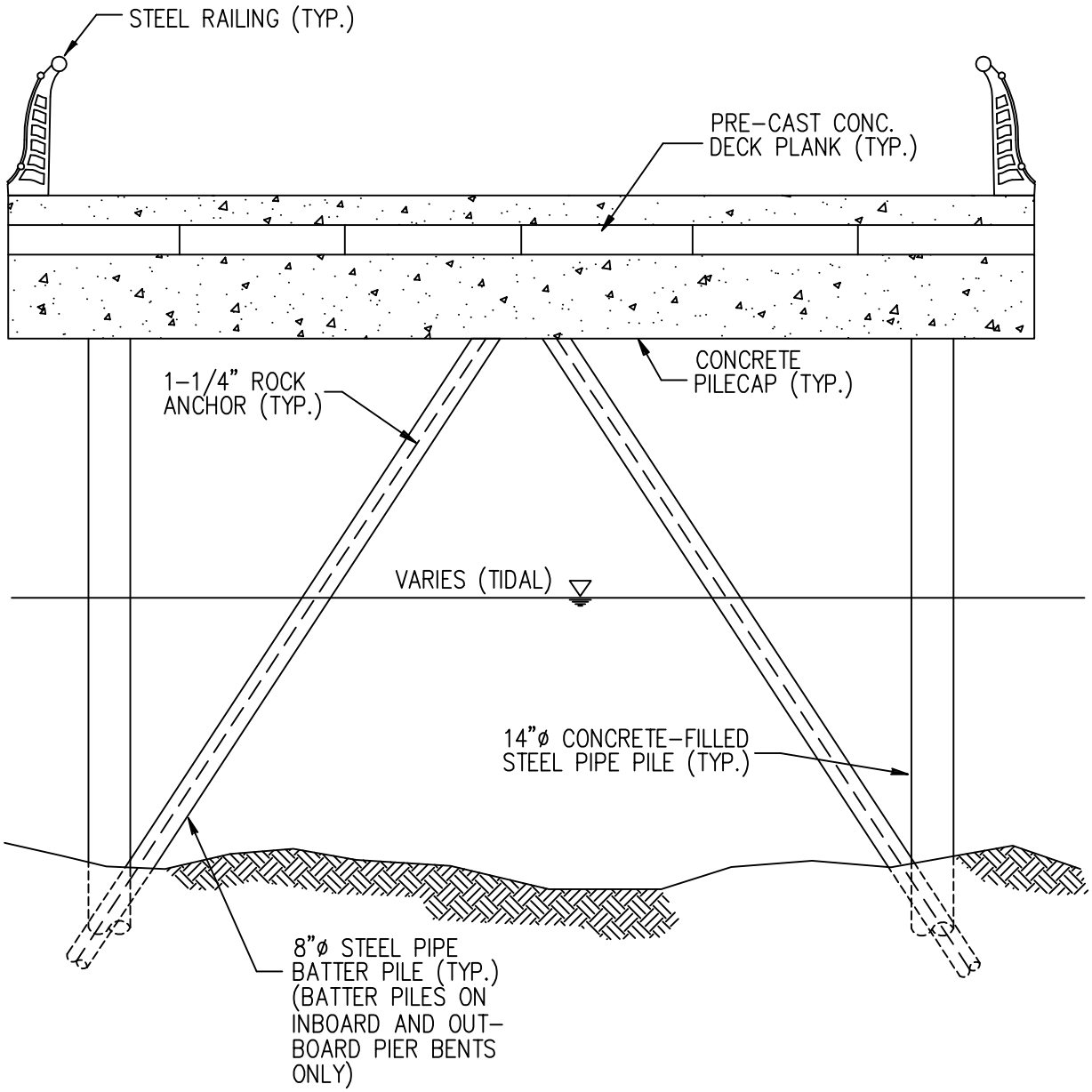
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

CASTLE POINT TYPICAL PLATFORM AND CONCRETE SEAWALL SECTION

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-4	SHEET 22



SECTION B-B

BOSWELL UNDERWATER ENGINEERING

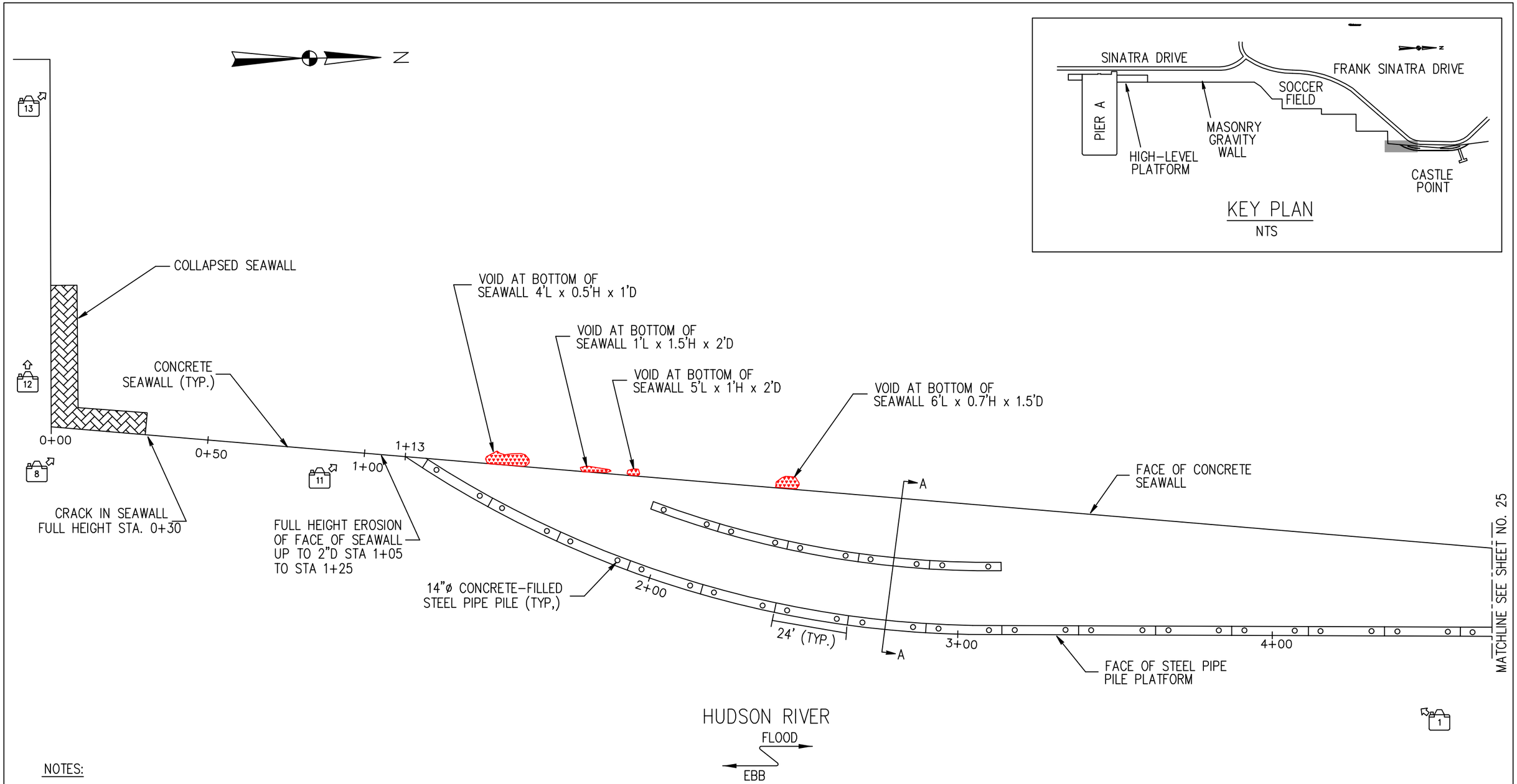
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

CASTLE POINT TYPICAL PIER SECTION

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-5	SHEET 23



NOTES:

1. STEEL PIPE PILES TYPICALLY HAVE COATING LOSS OF UP TO 25% OF SURFACE AREA OF THE TOP 3' OF PILE WITH MINOR TO MODERATE CORROSION AND RUST STAINING.

LEGEND:

VOID AT BOTTOM OF SEAWALL

PHOTO I.D. AND DIRECTION

BOSWELL UNDERWATER ENGINEERING

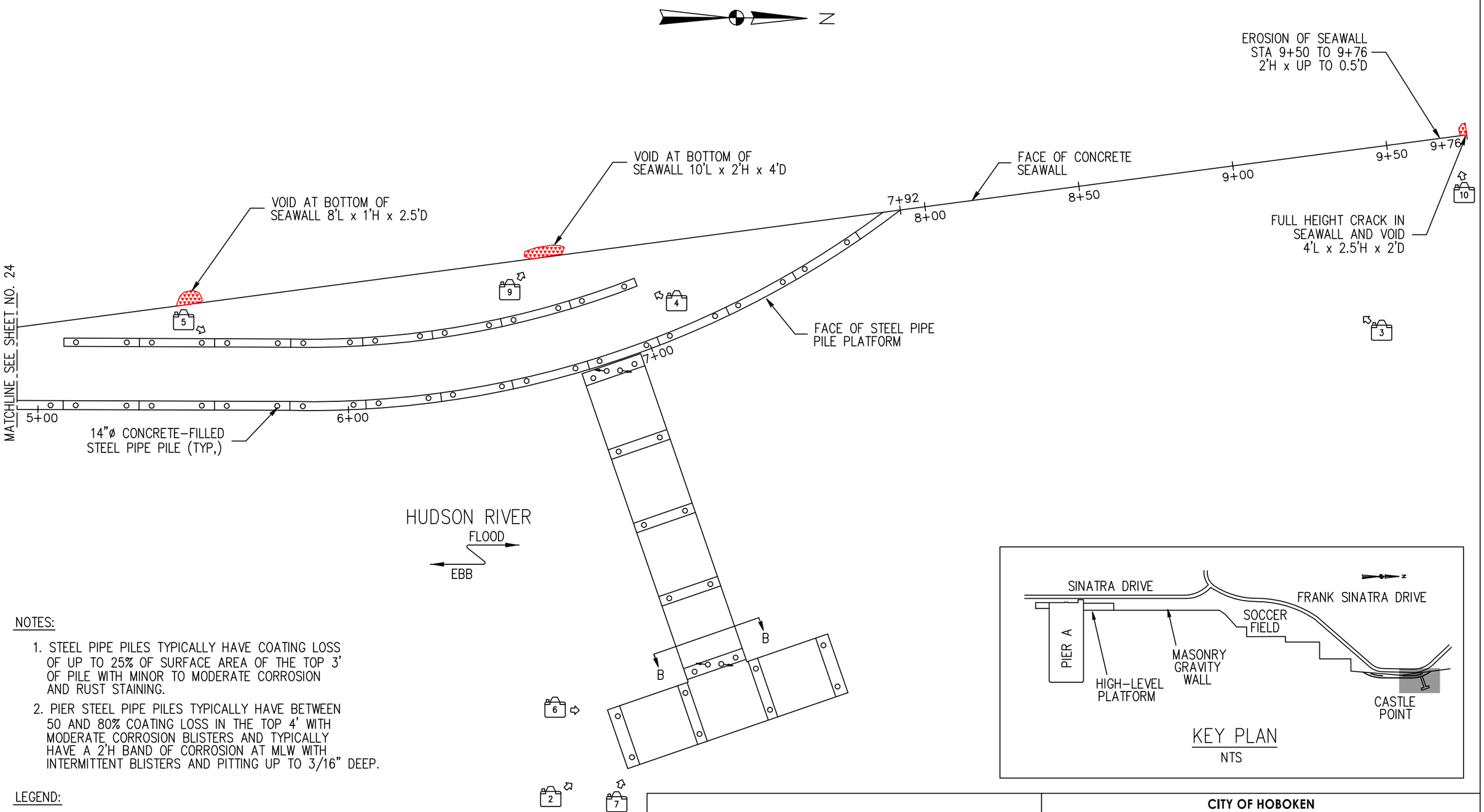
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

CASTLE POINT PLAN VIEW (1 OF 2)

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 30'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-6	SHEET 24



NOTES:

1. STEEL PIPE PILES TYPICALLY HAVE COATING LOSS OF UP TO 25% OF SURFACE AREA OF THE TOP 3' OF PILE WITH MINOR TO MODERATE CORROSION AND RUST STAINING.
2. PIER STEEL PIPE PILES TYPICALLY HAVE BETWEEN 50 AND 80% COATING LOSS IN THE TOP 4' WITH MODERATE CORROSION BLISTERS AND TYPICALLY HAVE A 2'H BAND OF CORROSION AT MLW WITH INTERMITTENT BLISTERS AND PITTING UP TO 3/16" DEEP.

LEGEND:

VOID AT BOTTOM OF SEAWALL

PHOTO I.D. AND DIRECTION

BOSWELL UNDERWATER ENGINEERING

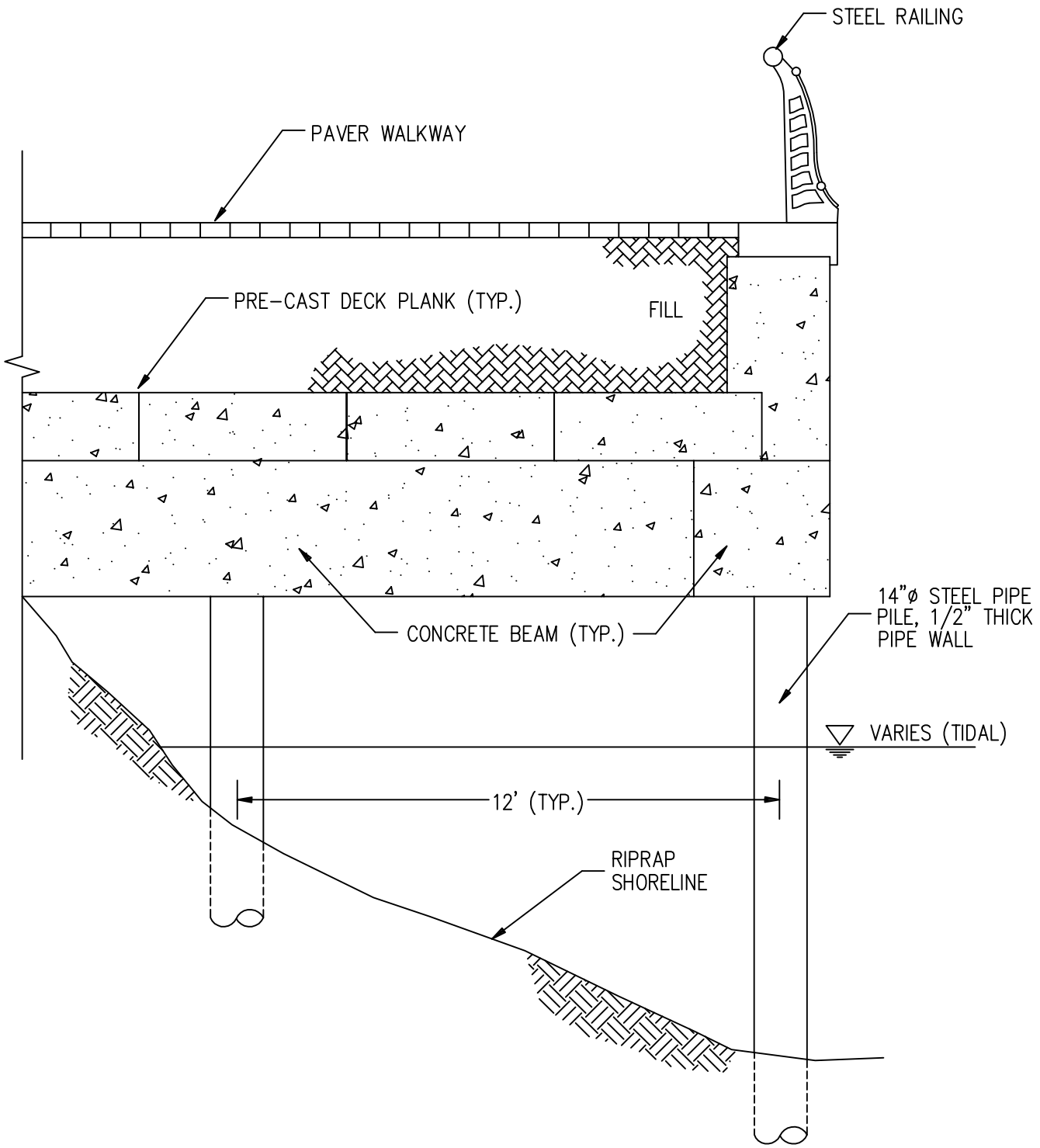
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

CASTLE POINT PLAN VIEW (2 OF 2)

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 30'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-7	SHEET 25



SECTION C–C

BOSWELL UNDERWATER ENGINEERING

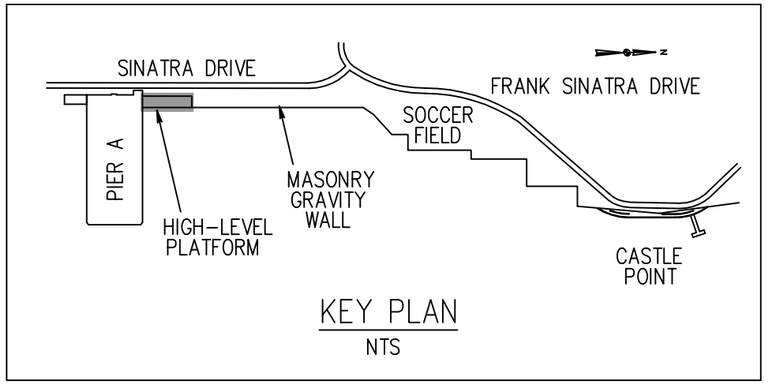
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

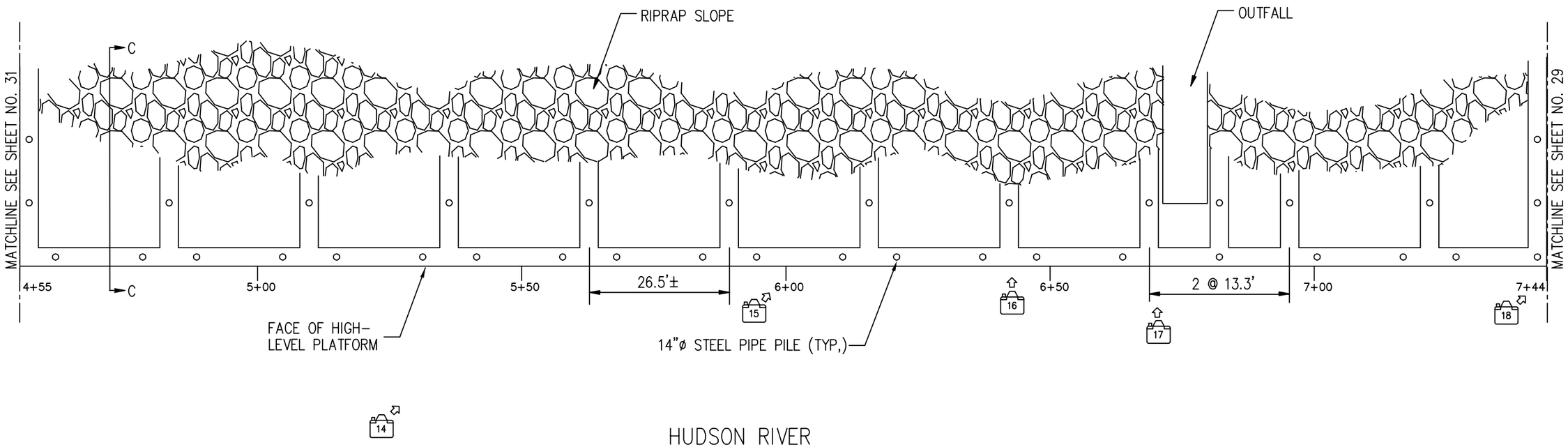
CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

HIGH-LEVEL PLATFORM
STA. 4+55 TO 7+44 TYPICAL SECTION

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-8	SHEET 26





NOTES:

1. ALL ACCESSIBLE PILES HAVE MINOR TO MODERATE COATING LOSS WITH MINOR CORROSION, BLISTERING, AND RUST STAINING IN THE TOP 2' TO 3'.

LEGEND:

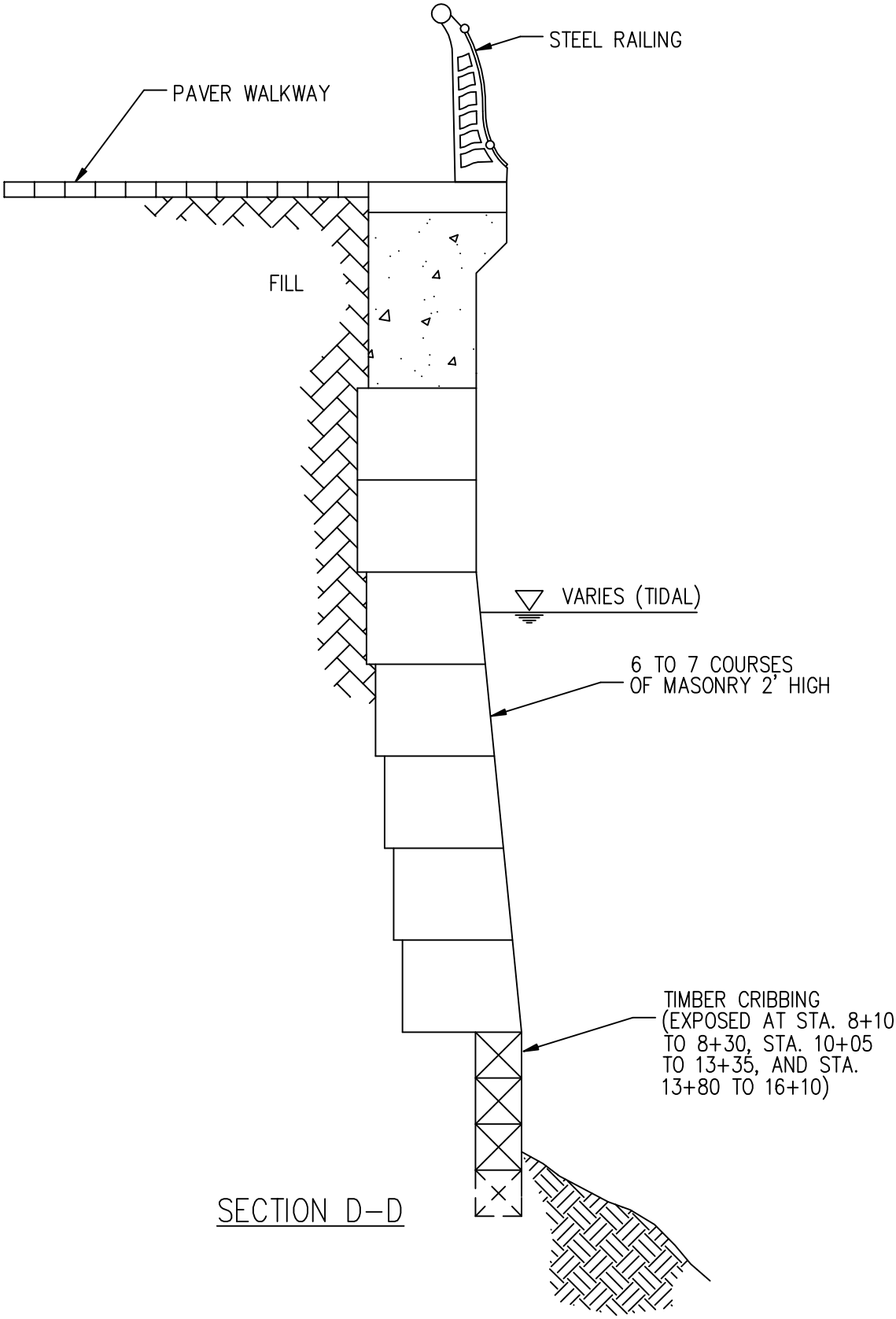
PHOTO I.D. AND DIRECTION

BOSWELL UNDERWATER ENGINEERING
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN
CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

HIGH-LEVEL PLATFORM STA. 4+55 TO 7+44 PLAN VIEW

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 20'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO.- 1009-9	SHEET 27



BOSWELL UNDERWATER ENGINEERING

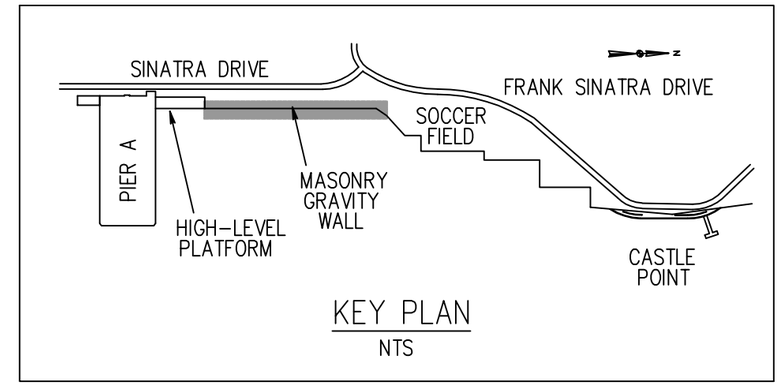
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

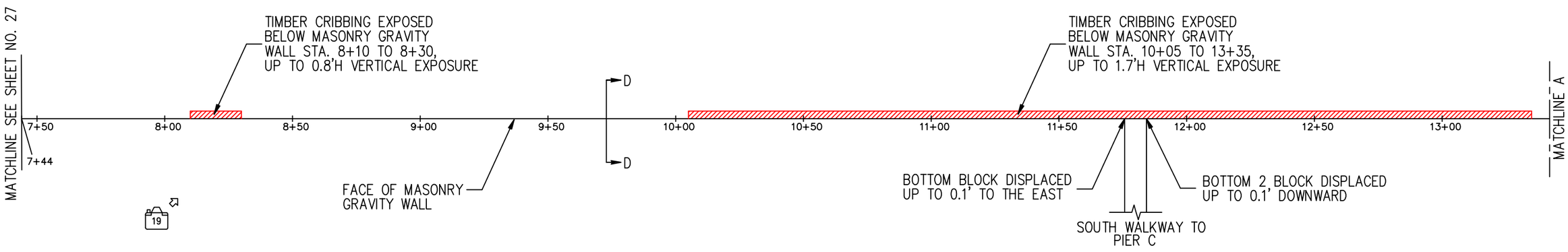
CITY OF HOBOKEN

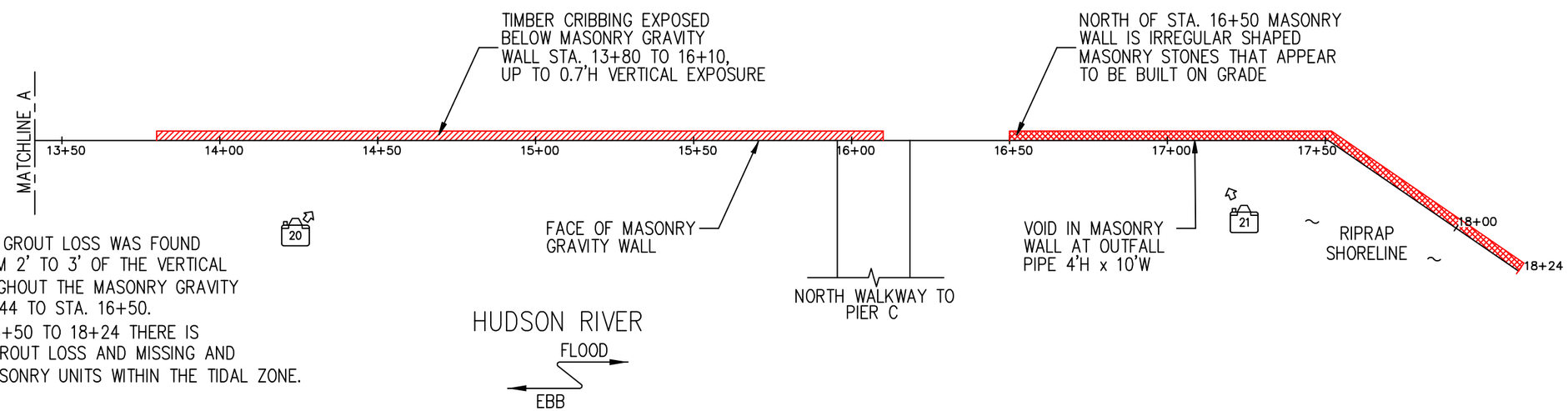
CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

MASONRY GRAVITY WALL STA. 7+44 TO 16+50 TYPICAL SECTION

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: NTS	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-10	SHEET 28







NOTES:

1. INTERMITTANT GROUT LOSS WAS FOUND IN THE BOTTOM 2' TO 3' OF THE VERTICAL JOINTS THROUGHOUT THE MASONRY GRAVITY WALL STA. 7+44 TO STA. 16+50.
2. FROM STA. 16+50 TO 18+24 THERE IS WIDESPREAD GROUT LOSS AND MISSING AND DISPLACED MASONRY UNITS WITHIN THE TIDAL ZONE.

LEGEND:

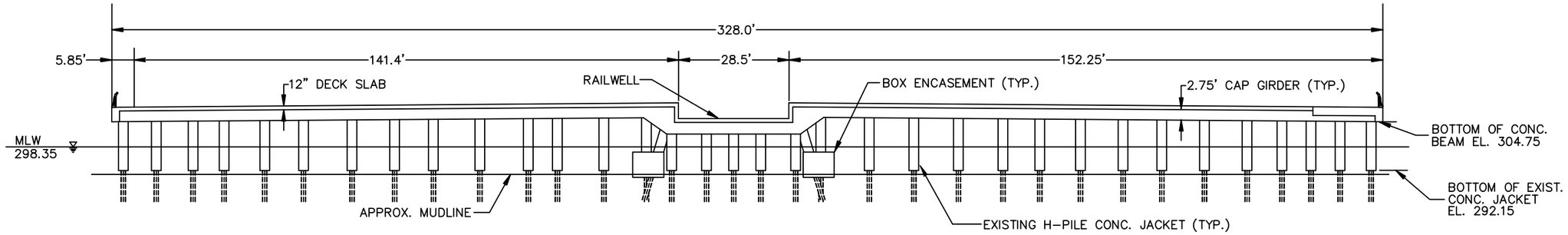
- TIMBER CRIBBING EXPOSED BELOW MASONRY GRAVITY WALL
- MASONRY GRAVITY WALL WITH WIDESPREAD GROUT LOSS, LOOSE AND MISSING MASONRY UNITS
- PHOTO I.D. AND DIRECTION

BOSWELL UNDERWATER ENGINEERING
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

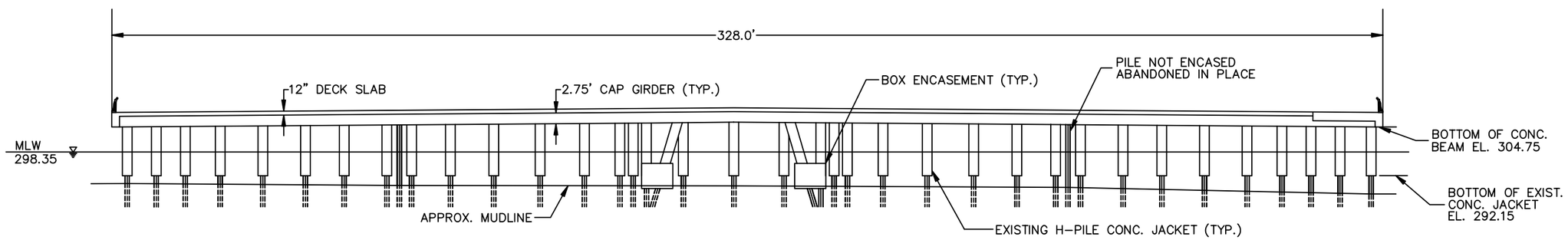
CITY OF HOBOKEN
CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

MASONRY GRAVITY WALL PLAN VIEW

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 40'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-11	SHEET 29



TYPICAL SECTION – BENTS 12 TO 34
LOOKING WEST



TYPICAL SECTION – BENTS 35 TO 43
LOOKING WEST

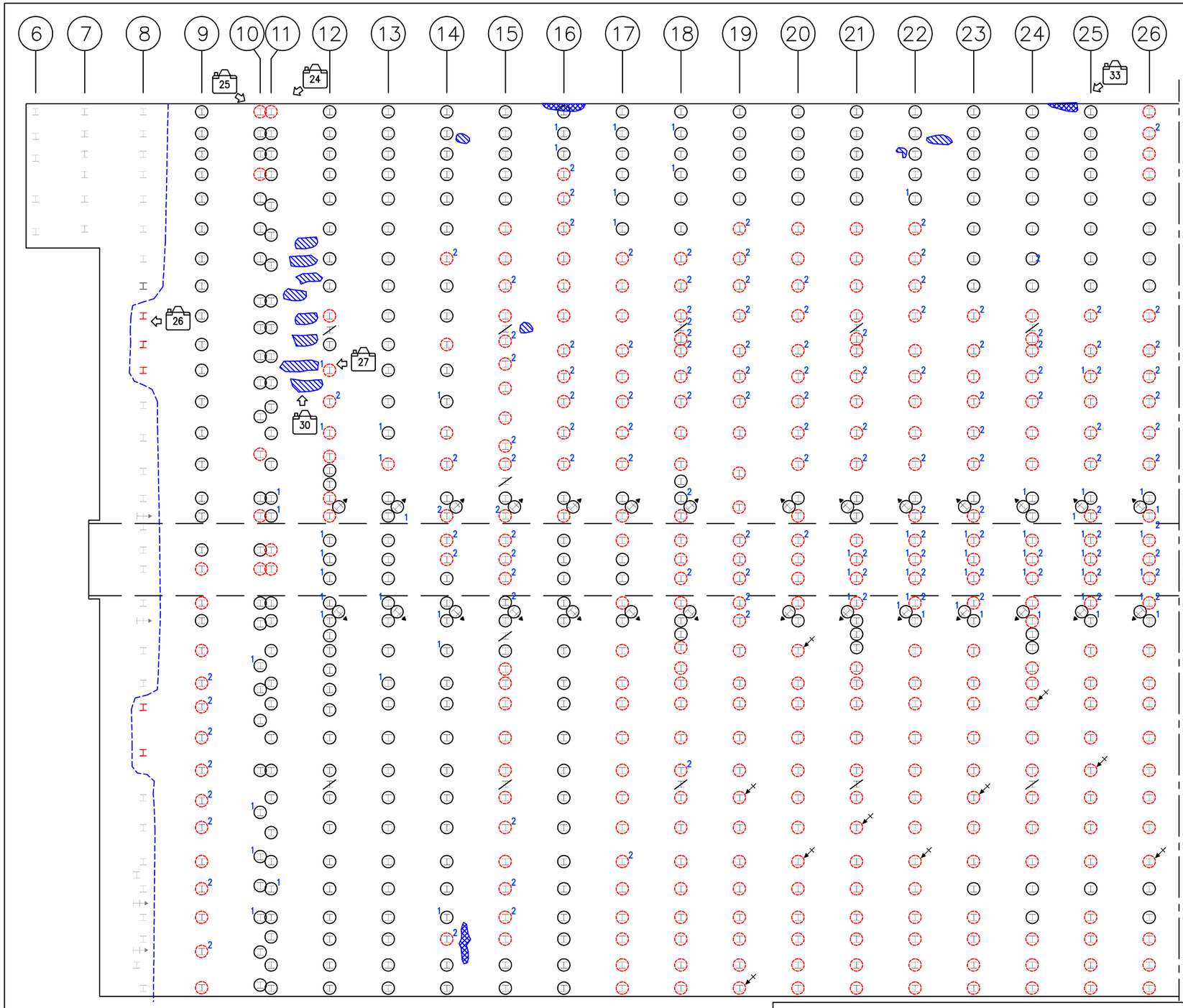
BOSWELL UNDERWATER ENGINEERING
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

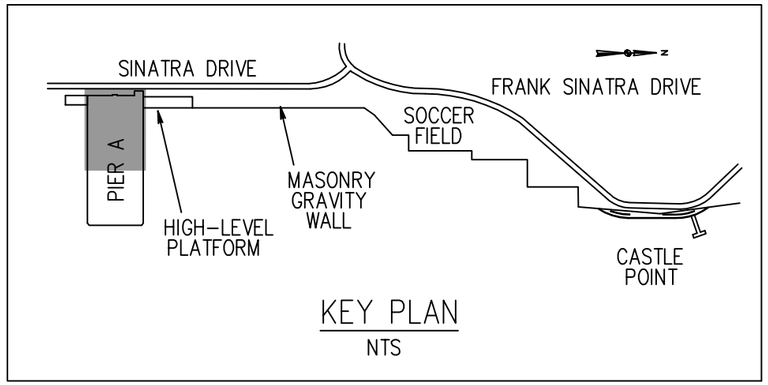
CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

PIER A TYPICAL SECTIONS

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 30'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-12	SHEET 30





N

LEGEND

- STEEL H-PILE
- STEEL BATTER H-PILE
- INACCESSIBLE OR BURIED STEEL H-PILE
- STEEL H-PILE CONCRETE ENCASED INTO MUDLINE
- ABANDONED STEEL H-PILE
- CONCRETE ENCASED STEEL H-PILE, BOTTOM OF ENCASEMENT IS ABOVE MUDLINE, STEEL H-PILE EXPOSED BELOW ENCASEMENT
- EXPOSED STEEL H-PILE, NOT ENCASED
- LEVEL III INSPECTION
- VOID IN CONCRETE ENCASEMENT LOCATED AT THE TOP OF PILE
- KNIFE EDGING/HOURGLASSING OBSERVED IN STEEL H-PILE
- LIMIT OF INSPECTION
- SPALL/DELAMINATION IN PRECAST DECK PLANK
- SPALL/DELAMINATION IN CONCRETE PILE CAP OR FASCIA BEAM
- PHOTO I.D. AND DIRECTION

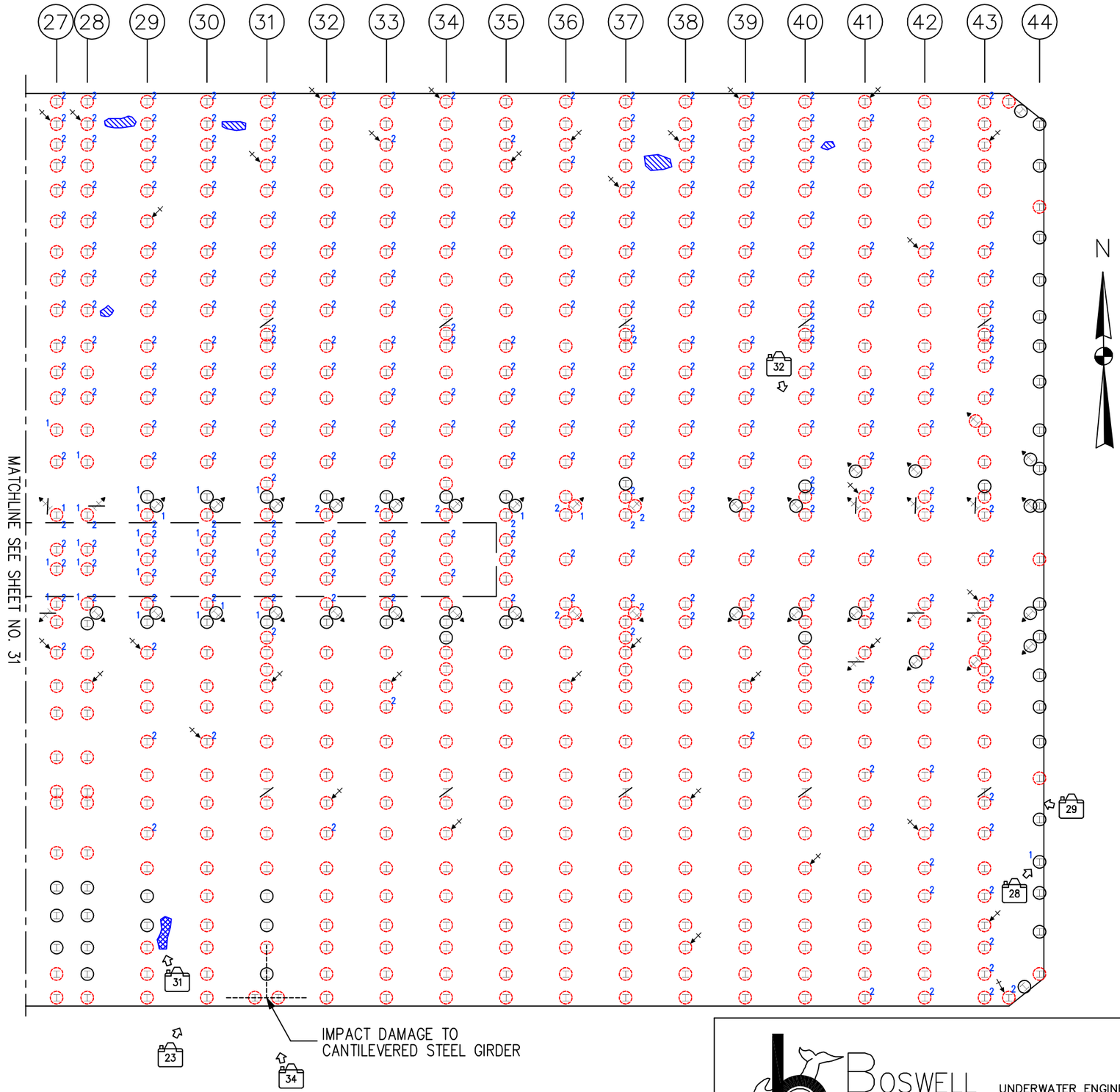
BOSWELL UNDERWATER ENGINEERING

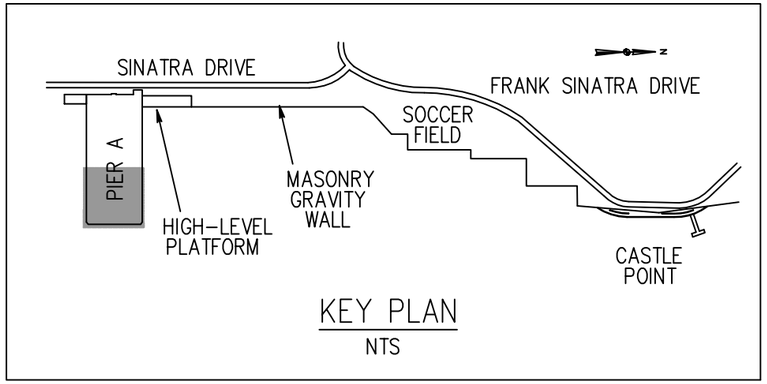
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN
CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

PIER A PLAN VIEW (1 OF 2)

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 40'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-13	SHEET 31





N

FLOOD
EBB
HUDSON RIVER

LEGEND

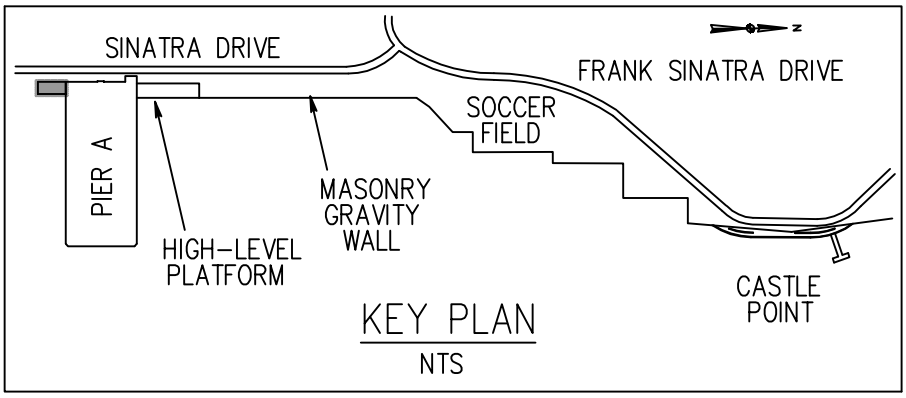
- STEEL H-PILE
- STEEL BATTER H-PILE
- INACCESSIBLE OR BURIED STEEL H-PILE
- STEEL H-PILE CONCRETE ENCASED INTO MUDLINE
- ABANDONED STEEL H-PILE
- CONCRETE ENCASED STEEL H-PILE, BOTTOM OF ENCASEMENT IS ABOVE MUDLINE, STEEL H-PILE EXPOSED BELOW ENCASEMENT
- EXPOSED STEEL H-PILE, NOT ENCASED
- LEVEL III INSPECTION
- VOID IN CONCRETE ENCASEMENT LOCATED AT THE TOP OF PILE
- KNIFE EDGING/HOURGLASSING OBSERVED IN STEEL H-PILE
- LIMIT OF INSPECTION
- SPALL/DELAMINATION IN PRECAST DECK PLANK
- SPALL/DELAMINATION IN CONCRETE PILE CAP OR FASCIA BEAM
- PHOTO I.D. AND DIRECTION

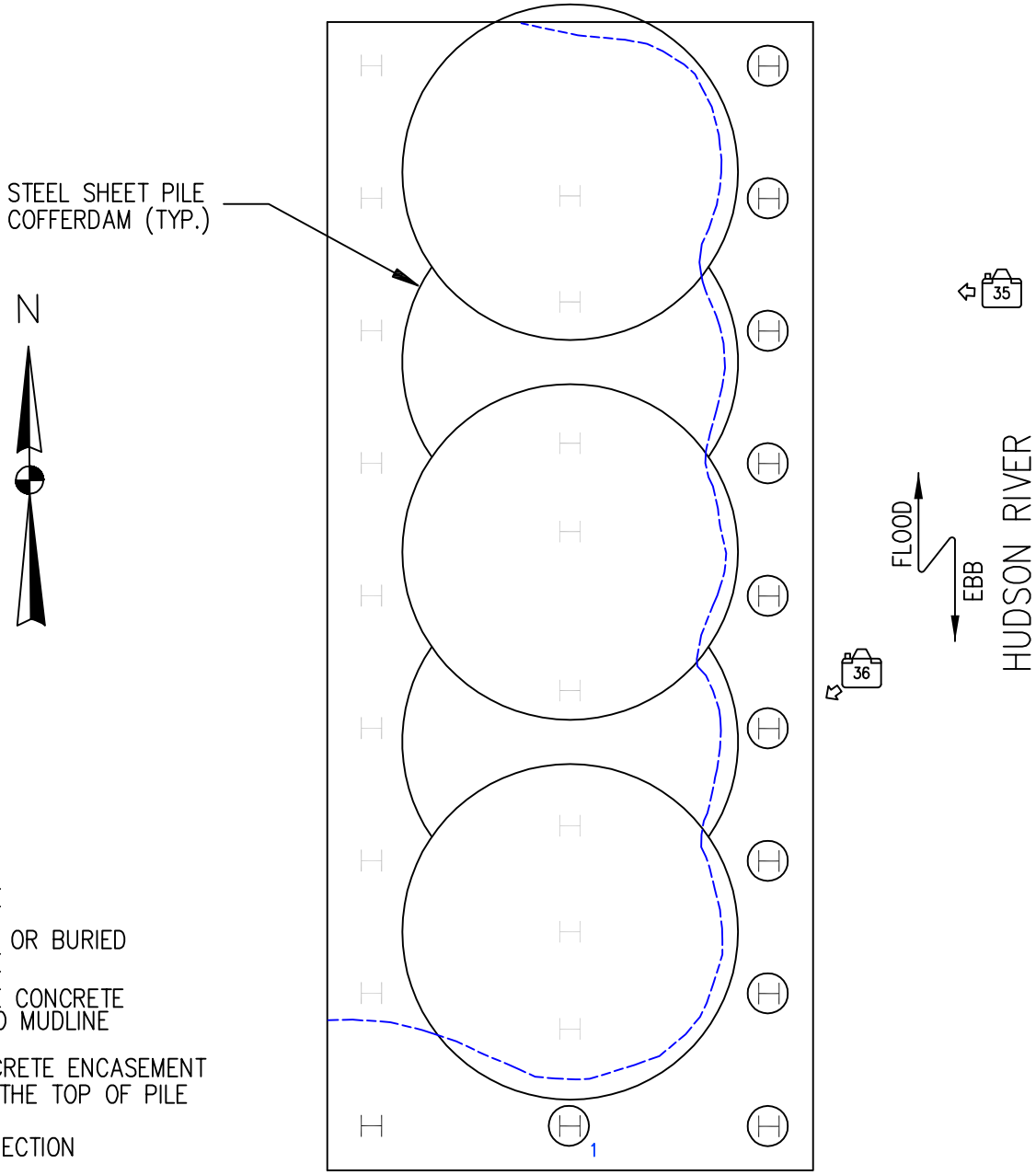
BOSWELL UNDERWATER ENGINEERING
UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN
CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

PIER A PLAN VIEW (2 OF 2)

INSPECTED BY: JP, DC, JF DRAWN BY: JG	SCALE: 1" = 40'	DATE OF INSPECTION: FEBRUARY 2011
JOB NO. BUE 1009	DRAWING NO.- 1009-14	SHEET 32





LEGEND

- STEEL H-PILE
- INACCESSIBLE OR BURIED STEEL H-PILE
- STEEL H-PILE CONCRETE ENCASED INTO MUDLINE
- 1 VOID IN CONCRETE ENCASEMENT LOCATED AT THE TOP OF PILE
- LIMIT OF INSPECTION
- # PHOTO I.D. AND DIRECTION

BOSWELL UNDERWATER ENGINEERING

UNDERWATER INSPECTION & DIVING SERVICES
HYDROGRAPHIC SURVEYS – MARINE CONSTRUCTION

CITY OF HOBOKEN

CONDITION SURVEY OF CITY-OWNED WATERFRONT STRUCTURES

COFFERDAM PLAN VIEW

INSPECTED BY: JP, DC, JF, PD, TM, JG DRAWN BY: JFG	SCALE: 1" = 20'	DATE OF INSPECTION: JANUARY 2011
JOB NO. BUE 1009	DRAWING NO. - 1009-15	SHEET 33

PHOTOGRAPHIC DOCUMENTATION

Photo No. 1

Location:

Castle Point
Sta. 0+00 to 5+00

Description:

General view.

Photo No. 2

Location:

Castle Point Pier

Description:

General view.

Photo No. 3

Location:

Castle Point
Sta. 7+00 to 9+76

Description:

General view.

Photo No. 4

Location:

Castle Point

Description:

General view of steel pipe pile bent.

Photo No. 5

Location:

Castle Point
Steel Pipe Pile
Platform

Description:

Typical coating loss and minor corrosion of steel pipe piles

Photo No. 6

Location:

Castle Point Pier
Southwest Pile

Description:

Band of moderate corrosion near weld at mean low water

Photo No. 7

Location:

Castle Point Pier

Description:

Typical coating loss of steel pipe piles with corrosion

Photo No. 8

Location:

Castle Point
Sta. 0+00

Description:

Collapse at south end

Photo No. 9

Location:

Castle Point
Concrete Seawall
Sta. 6+60

Description:

Void at base of the seawall 10'L x 2'H x 4'D

Photo No. 10

Location:

Castle Point
Concrete Seawall
Sta. 9+76

Description:

Void at base of seawall 4'L x 2.5'H x 2'D with wide crack above void

Photo No. 11

Location:

Castle Point
Sta. 1+13

Description:

Erosion of concrete seawall

Photo No. 12

Location:

Castle Point
South Face of Seawall

Description:

Interface with new Stevens Institute of Technology pier

Photo No. 13

Location:

Castle Point
South Face of Seawall

Description:

Deteriorated timber piles and pile caps supporting concrete seawall

Photo No. 14

Location:

Steel Pipe Pile Platform
Sta. 4+55 & 7+44

Description:

General view.

Photo No. 15

Location:

Steel Pipe Pile Platform
Sta. 4+55 & 7+44

Description:

General view of pipe piles and concrete seawall

Photo No. 16

Location:

Steel Pipe Pile Platform
Sta. 4+55 to 7+44

Description:

Typical coating loss and corrosion of top of pipe pile

Photo No. 17

Location:

Steel Pipe Pile Platform
Sta. 6+30

Description:

General view of outfall

Photo No. 18

Location:

Steel Pipe Pile Platform
Sta. 7+44

Description:

Transition from pipe pile platform to masonry gravity wall

Photo No. 19

Location:

Masonry Gravity Wall
Sta. 7+44 to 11+80

Description:

General view

Photo No. 20

Location:

Masonry Gravity Wall
Sta. 13+00 to 16+00

Description:

General view

Photo No. 21

Location:

Masonry Gravity Wall
Sta. 16+50 to 17+50

Description:

Widespread grout loss, displacement of masonry units, and void due to missing masonry units

Photo No. 22

Location:

Pier A
East Face

Description:

General view.

Photo No. 23

Location:

Pier A

Description:

General view, row of concrete encased steel H-piles

Photo No. 24

Location:

Pier A
Pile 11N - 1

Description:

Steel H-pile not encased – moderate corrosion

Photo No. 25

Location:

Pier A
Pile 10N - 1

Description:

Steel H-pile not encased – severe corrosion

Photo No. 26

Location:

Pier A
Pile 8N - 9

Description:

Steel H-pile not encased – moderate corrosion

Photo No. 27

Location:

Pier A
Pile 12N - 12

Description:

Void in concrete encasement, steel reinforcing mesh exposed

Photo No. 28

Location:

Pier A
Pile 44S - 4

Description:

Void in concrete encasement, steel H-pile exposed

Photo No. 29

Location:

Pier A
Pile 43N – 21B

Description:

Abandoned pile, not encased, severe corrosion and section loss

Photo No. 30

Location:

Pier A
Bent 11 to 12

Description:

Spall of precast deck plank with corroded pre-stressing strands

Photo No. 31

Location:

Pier A
Bent 29S to 30S

Description:

Spall at bottom of bent 14 S.F. x 4”D

Photo No. 32

Location:

Pier A
Bent 39 to 40

Description:

Heavy efflorescence through joints in deck planks

Photo No. 33

Location:

Pier A
North Fascia

Description:

Efflorescence at north fascia

Photo No. 34

Location:

Pier A
South Fascia
Bent 31

Description:

Damaged cantilevered girder

Photo No. 35

Location:

Platform South of Pier A

Description:

General view.

Photo No. 36

Location:

Platform South of Pier A

Description:

Holes in steel sheeting cofferdam

APPENDIX A

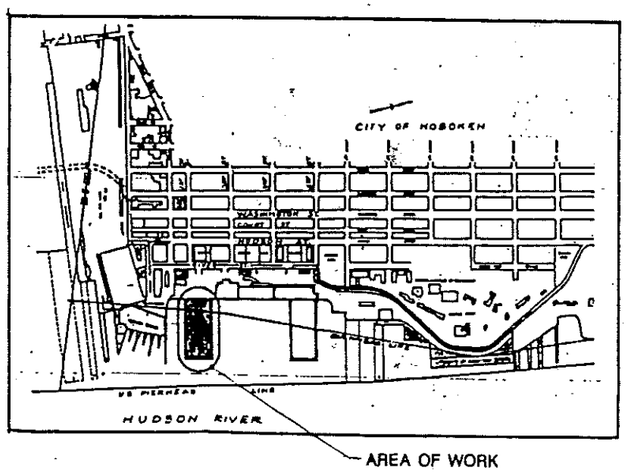
1996 PIER A REHABILITATION PLANS

THE PORT AUTHORITY OF NY & NJ

HOBOKEN SOUTH WATERFRONT DEVELOPMENT

PIER A REHABILITATION

CONTRACT NO. HWD 544.007



LOCATION PLAN
N.T.S.

INDEX OF DRAWINGS	
DWG.NO.	TITLE
G-1	LOCATION PLAN AND INDEX OF DRAWINGS
G-2	SITE PLAN AND GENERAL NOTES
S-1	STRUCTURAL AND GEOTECHNICAL NOTES
S-2	REMOVAL PLAN
S-3	PILE PLAN
S-4	TYPICAL SECTIONS AND DETAILS
S-5	CONCRETE JACKET DETAILS
S-6	CONCRETE REPAIRS DETAILS
S-7	PILE REPLACEMENT DETAILS

Sheet of

THE PORT AUTHORITY OF NY & NJ

CHIEF ENGINEER

ASSISTANT CHIEF ENGINEER DESIGN

ENGINEERING PROGRAM MANAGER
PORT COMMERCE DEPARTMENT

No. Date Revision Approved

Engineering Department
Design Division

Hoboken South Waterfront Development

Title

PIER A REHABILITATION

GENERAL

LOCATION PLAN AND INDEX OF DRAWINGS

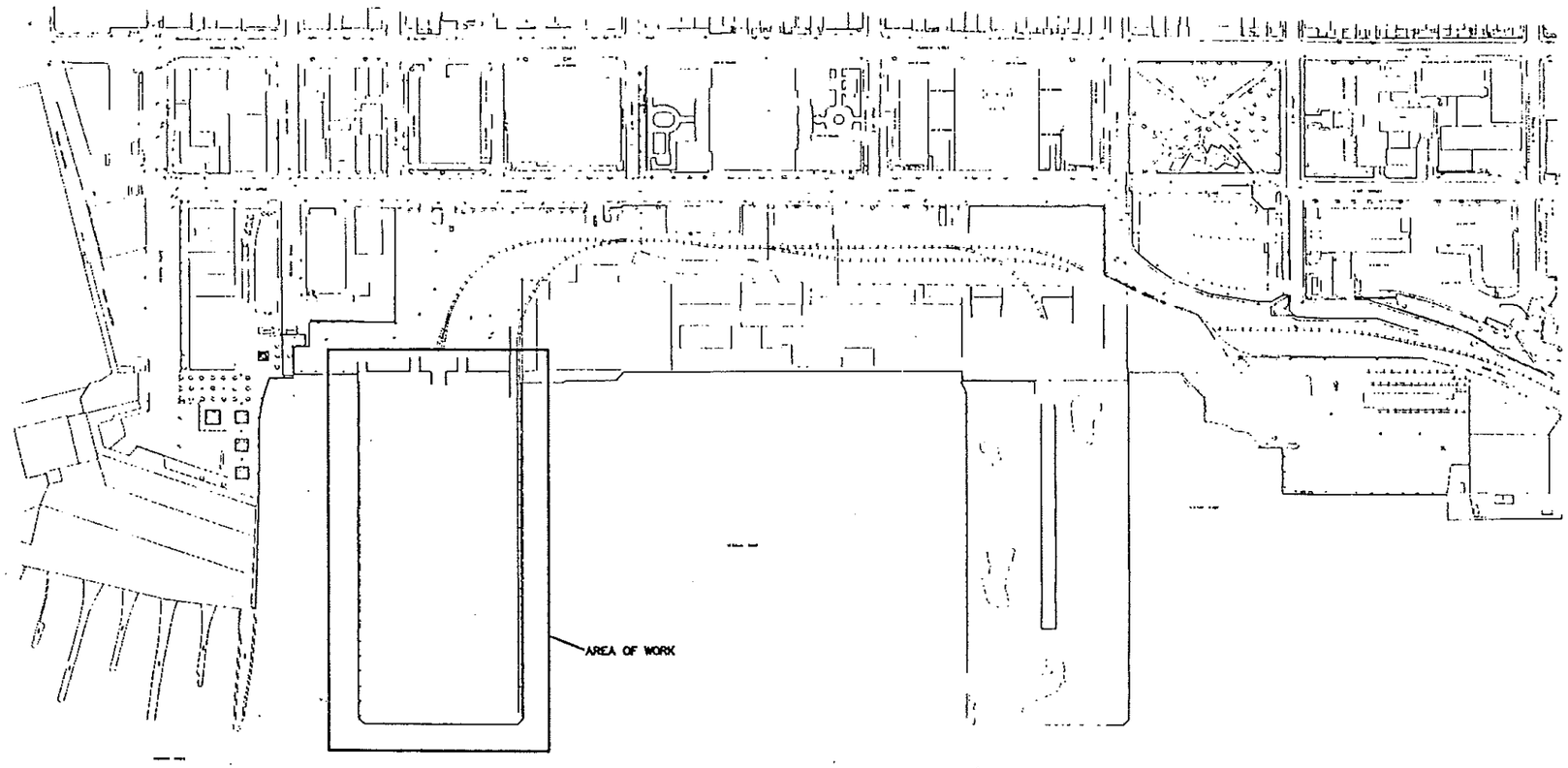
This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent

Z ZULINSKI

Designed by Drawn by Checked by

Date Scale AS NOTED

Contract Number HWD 544.007 Drawing Number G-1



Sheet 4 of

THE PORT AUTHORITY OF NY & NJ

ENGINEERING PROGRAM MANAGER PORT COMMERCE

CHIEF STRUCTURAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Division

Hoboken South Waterfront Development

Title

PIER A REHABILITATION

GENERAL

SITE PLAN

The drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent

XXX	K.WETZEL	XXX
Designed by	Drawn by	Checked by

Date XXX Scale NTS

Contract Number HWD 544.007

Drawing Number G-2

STRUCTURAL NOTES

GENERAL

1. DATUM: ELEVATION 300.0 IS MEAN SEA LEVEL AT SANDY HOOK, N.J. (NGVD 1929)

2. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS, INCLUDING LOCATION OF EXISTING REPAIRS IN THE FIELD BEFORE ORDERING MATERIALS, COMMENCING ANY FABRICATION OR PERFORMING ANY WORK. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING OF ANY CONDITIONS OR DIMENSIONS WHICH VARY FROM THOSE SHOWN ON THE DRAWINGS AND INCORPORATE SUCH VARIATIONS IN THE CONSTRUCTION AS APPROVED BY THE ENGINEER

3. ANY PORTION OF THE EXISTING STRUCTURE NOT TO BE REMOVED UNDER THIS CONTRACT SHALL BE PROTECTED TO PREVENT DAMAGE DURING THE PERFORMANCE OF THIS CONTRACT AND ANY DAMAGE OR ALTERATION RESULTING FROM CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR TO ITS ORIGINAL CONDITION AND TO THE SATISFACTION OF THE ENGINEER, AT NO COST TO THE AUTHORITY

4. THE CONTRACTOR SHALL SUBMIT EQUIPMENT AND METHODS OF REMOVALS AND CONSTRUCTION TO THE ENGINEER FOR APPROVAL. AT LEAST 3 JACKETS SHALL BE POURED AS SAMPLE INSTALLATIONS AND SHALL HAVE FORMS REMOVED IMMEDIATELY FOLLOWING CURING TO PERMIT INSPECTION OF THE JACKETS. THE ENGINEER WILL INSPECT THESE JACKETS TO VERIFY THAT THE CONTRACTOR'S METHODS ARE PRODUCING SATISFACTORY JACKETS. SHOULD UNSATISFACTORY JACKETS BE FOUND, SAID JACKETS SHALL BE REPAIRED OR REPLACED AS ORDERED BY THE ENGINEER AND THE CONTRACTOR SHALL SUBMIT REVISED METHODOLOGY FOR APPROVAL AND AN ADDITIONAL 3 JACKETS SHALL BE POURED. ONCE THE TEST JACKETS HAVE BEEN FOUND ACCEPTABLE, PRODUCTION JACKETING MAY COMMENCE.

5. PRIOR TO PUMPING CONCRETE, THE CONTRACTOR SHALL MEET WITH THE CONCRETE SUPPLIER, CONCRETE PUMP OPERATOR, AND A QUALITY ASSURANCE REPRESENTATIVE OF THE MATERIALS ENGINEERING DIVISION TO COORDINATE CONCRETE PUMPING ISSUES.

STRUCTURAL STEEL

1. STRUCTURAL STEEL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF SPECIFICATION SECTION 05120.

2. STRUCTURAL STEEL SHAPES SHALL CONFORM TO ASTM A36.

3. FIELD CONNECTIONS SHALL BE BOLTED WITH TYPE "A" SLIP CRITICAL ASTM HIGH STRENGTH BOLTS USING STANDARD OVERSIZE HOLES. BOLTS SHALL BE FULLY PRE-TENSIONED WITH OVERSIZE WASHERS UNDER THE NUTS. HOLES IN EXISTING PILES SHALL BE DRILLED. THE EQUIPMENT FOR TIGHTENING THE BOLTS SHALL BE SUITABLE FOR UNDERWATER OPERATION AND OF ADEQUATE CAPACITY TO PERFORM THE REQUIRED TIGHTENING OF EACH BOLT.

4. E60XX LOW HYDROGEN ELECTRODES SHALL BE USED FOR ALL UNDERWATER WELDS. MINIMUM FILLET WELD SIZE SHALL BE 5/16 INCH.

5. UNDERWATER WELDING SHALL CONFORM TO AWS D3.6.

6. PRIOR TO WELDING, SURFACES OF PILES SHALL BE CLEANED TO BARE METAL IN ORDER TO PRESENT A PROPER WELD SURFACE. ALL OTHER SURFACE CONTAMINATES SHALL BE REMOVED WITH BRUSH, SCRAPER OR GRINDER.

7. SURFACES OF PILES WHICH WILL BE IN CONTACT WITH SPLICE ANGLES, SHALL BE CLEANED OF ALL RUST, SCALE, BURRS, PAINT, CHALK, OIL, DIRT, AND OTHER FOREIGN MATERIAL. CLEANED AREA ON PILES SHALL EXTEND TO A MINIMUM OF SIX INCHES BEYOND LIMITS OF THE REPAIR.

8. STUDS SHALL CONFORM TO ASTM A-108 (FY = 50,000 PSI MINIMUM) AND SHALL BE CONNECTED WITH 5/16 INCH MINIMUM FILLET WELDS ALL AROUND.

9. STUDS INSTALLED ABOVE WATER ELEVATION MAY BE BY STUD WELDING METHOD IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

CONCRETE JACKETING NOTES

1. CONCRETE AND BAR REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF SPECIFICATION SECTIONS 03364 AND 03200, RESPECTIVELY.

2. ALL REINFORCING BARS SHALL BE ASTM A615, GRADE 60. REINFORCING BARS SHALL BE EPOXY COATED.

3. CONCRETE FOR JACKETING PILES, BOTH ABOVE AND BELOW THE WATER LINE, SHALL CONFORM TO SECTION 03364 EXCEPT AS FOLLOWS:
   - a. COARSE AGGREGATE: 3/4" MAXIMUM GRAVEL OR STONE, GRADED ACCORDING TO ASTM C33.
   - b. COARSE TO FINE AGGREGATE RATIO IN THE MIX SHALL NOT BE LESS THAN 1 BY VOLUME.
   - c. DCI AS MANUFACTURED BY W.R. GRACE SHALL BE ADDED AT A RATE OF 4 GAL./CY
   - d. AIR CONTENT SHALL BE 6 TO 9%.
   - e. SUBSTITUTE EITHER FLYASH OR SLAG AS INDICATED IN PART 2.02.B.1.(2)
   - f. MAX WATER CEMENT RATIO: 0.40
   - g. CONCRETE DELIVERY TRUCKS SHALL CONTAIN ONLY THAT QUANTITY OF CONCRETE THAT CAN BE DISCHARGED WITHIN 1 HOUR OF BATCHING

4. REINFORCING BARS SHALL HAVE LAP SPLICE LENGTHS IN ACCORDANCE WITH ACI 318-89 CLASS B

5. SURFACES OF PILES TO BE ENCASED IN CONCRETE SHALL BE CLEANED AS DESCRIBED IN STRUCTURAL STEEL NOTE 7. CLEANING SHALL BE DONE IMMEDIATELY BEFORE FORMS ARE INSTALLED TO PREVENT REFOULING

6. SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL SHOWING ALL FASTENING DETAILS, STANDOFFS, FORMS, AND ANY OTHER DEVICES NECESSARY TO SECURE THE FORMS SO THAT CONCRETE MAY BE PLACED IN A CONTINUOUS OPERATION COMPLETELY ENCAPSULATING THE PILES AND SUCH THAT SHIFTING OF THE FORMS DUE TO UNEQUAL HEAD OF FLUID CONCRETE IS PREVENTED

7. FORMS FOR JACKETS SHALL BE FABRIC SLEEVES, CORRUGATED STEEL PIPE, FIBERGLASS OR OTHER SUITABLE MATERIAL OF SUFFICIENT STRENGTH TO SUPPORT THE FLUID PRESSURE OF WET CONCRETE AND OF SUFFICIENT IMPERMIABILITY TO PREVENT SEAWATER FROM CONTAMINATING THE WET CONCRETE

8. FORMS FOR JACKETS SHALL BE INSTALLED IN ACCORDANCE WITH APPROVED SHOP DRAWINGS. BOTTOM SEAL SHALL BE MORTAR TIGHT IN PARTICULAR. THE BOTTOM FORM SHALL BE GASKETED AND THE JACKET DRAWN TIGHT AGAINST THE FORM. NOTE THE NEED TO SEAL THE SPACE BETWEEN THE FORM AND THE PILE. CAULKING WITH QUICK SETTING MORTAR OR CAULKING COMPOUND WILL BE PERMITTED. FORMS SHALL BE CONCRETED WITHIN TWO DAYS TO PREVENT REFOULING OF PILES.

9. FORMS MAY REMAIN IN PLACE IF CONSTRUCTED OF GALVANIZED STEEL OR OTHER NON-DEGRADABLE MATERIAL AND THE MATERIAL SUBSTANTIALLY ADHERES TO THE CONCRETE. HOWEVER, NOT LESS THAN 10% OF THE FORMS, AS SELECTED BY THE ENGINEER, SHALL BE REMOVED TO PERMIT INSPECTION. IF THE JACKET (S) ARE NOT SATISFACTORY TO THE ENGINEER, THE JACKET (S) SHALL BE REPAIRED AS ORDERED BY THE ENGINEER. UNSATISFACTORY JACKET (S) SHALL NOT BE COUNTED TOWARDS THE 10% OF FORMS TO BE REMOVED FOR INSPECTION.

10. JACKETS WILL BE DEEMED NOT SATISFACTORY, IF AFTER REMOVAL OF THE FORMS:
    - a. POCKETS OF HONEYCOMB (UNCEMENTED COARSE AGGREGATE) MORE THAN ONE INCH DEEP AND 100 SQ. IN. AREA ARE FOUND.
    - b. SAND STREAKS (POCKETS OR STREAKS OF UNCEMENTED FINE AGGREGATE MORE THAN ONE INCH DEEP AND 100 SQ. IN. AREA) ARE FOUND
    - c. CORNERS OF FORMS ARE NOT FILLED.
    - d. BOTTOM OF JACKETS SHOW MORE THAN TWO INCHES OF UNCEMENTED MATERIAL.
    - e. JACKETS ARE UNDERSIZE.
    - f. CONCRETE FAILS TO "SET-UP" (INDENTS UNDER A HAMMER BLOW AFTER 7 DAYS).

11. PLACING AND CONVEYING CONCRETE SHALL BE IN ACCORDANCE WITH ACI 304 AND ACI 305R AND 306R AS APPLICABLE AND AS FOLLOWS:
    CONCRETE SHALL BE PLACED UNDER AN AIR PRESSURE SUFFICIENT TO ASSURE A SMOOTH AND CONTINUOS FLOW. THE DISCHARGE END OF THE HOSE SHALL BE INSERTED INTO THE FORM BEFORE ANY CONCRETE IS PUMPED INTO PLACE AS THE LEVEL OF THE CONCRETE RISES IN THE FORM, THE HOSE SHALL BE SLOWLY WITHDRAWN, CARE BEING TAKEN THAT THE END OF THE PIPE OR HOSE BE CONTINUOUSLY IMMERSED IN THE NEWLY PLACED CONCRETE. KINKING THE HOSE OR OTHER SOURCE OF FLOW INTERRUPTION SHALL BE AVOIDED INSOFAR AS POSSIBLE. IN GENERAL, CONCRETE SHALL BE PLACED IN A SMOOTH, CONTINUOUS OPERATION, AT A RATE WHICH WILL AVOID DAMAGE TO THE FORM AND PERMIT THE CONCRETE TO FLOW AROUND THE PILES, AND IN SUCH A MANNER AS TO AVOID SEGREGATION OF THE SAND AND CEMENT PARTICLES. NOT LESS THAN 2 PUMP HOSES, ONE ON EACH SIDE OF THE PILE, SHALL BE PROVIDED AND PUMPED SIMULTANEOUSLY. IF HOSES WILL NOT FIT IN THE SPACE PROVIDED BETWEEN THE BAR REINFORCEMENT AND THE FORM OR THE BAR REINFORCEMENT AND THE PILE, PUMP CONCRETE THROUGH NIPPLES (2 EACH) AT THE BOTTOM OF THE FORM.

12. EXCESS CONCRETE AT THE TOP OF THE FORM SHALL BE REMOVED SEVEN DAYS AFTER POURING CONCRETE. THE GAP BETWEEN CONCRETE ENCASEMENT AND PILECAP SHALL BE FILLED WITH NON-SHRINK GROUT IN ORDER TO PROVIDE FULL BEARING

GEOTECHNICAL NOTES

PILE NOTES

1. PILES SHALL BE DRIVEN WITH A SINGLE ACTING AIR STEAM HAMMER WITH A MINIMUM RATED ENERGY OF 26,000 FT-LBS AND A MINIMUM ENERGY TRANSFER OF 13,000 FT-LBS TO THE TOP OF THE PILE. THE PILES SHALL BE DRIVEN TO REFUSAL ON BEDROCK DEFINED AS 20 BLOWS PER INCH WITH A MINIMUM TIP PENETRATION ELEVATION OF EL. 210

2. THE ENGINEER SHALL PERFORM DYNAMIC PILE TESTING FOR EACH H-PILE ACCORDING TO SPECIFICATION SECTION 02356 ENTITELED, "DYNAMIC PILE TESTING."

3. PILES SHALL BE DRIVEN WITHIN ± 3 INCHES OF LOCATIONS SHOWN ON THE CONTRACT DRAWINGS. PULLING OF PILES INTO LOCATION WILL NOT BE PERMITTED

4. PILES SHALL HAVE HARDRITE H PILE DRIVING POINTS MODEL NO HP 27250 AS MANUFACTURED BY ASSOCIATED PILE AND FITTING CORPORATION OF CLIFTON, N.J. OR AN APPROVED EQUAL

5. IF REQUIRED, SPLICING OF PILES SHALL BE PERFORMED ACCORDING TO SECTION 3.02.C OF SPECIFICATION SECTION 02362 ENTITLED "STEEL H-PILES". EXCEPT THAT SPLICING SHALL NOT BE PERMITTED WITHIN 40 FT OF THE TOP OF PILE UNLESS FULL PENETRATION BUTT WELDS ARE EMPLOYED

6. PILES SHALL BE COATED TO A MINIMUM DRY COAT THICKNESS OF 18 MILS IN LIEU OF THE THICKNESS SPECIFIED IN ITEM 3.01.A.2 OF SPECIFICATION SECTION 02362 ENTITLED "STEEL H-PILES". AT A MINIMUM THE COATING SHALL EXTEND FROM THE UNDERSIDE OF CONCRETE JACKET TO EL. 240

7. AS REQUIRED BY ITEM 3.02.E.4. OF SPECIFICATION SECTION 02362 ENTITLED "STEEL H-PILES", THE AUTHORITY WILL PERFORM REQUIRED REDESIGN WITHIN 10 WORKING DAYS.

8. THE REDRIVING OF PILES WILL NOT BE REQUIRED AS SPECIFIED IN SECTION 3.02.F. OF SPECIFICATION SECTION 02362 ENTITLED "STEEL H-PILES".

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Engineering Department
Design Divisions

Hoboken South Waterfront Development

Title

PIER A REHABILITATION

STRUCTURAL

STRUCTURAL AND GEOTECHNICAL NOTES

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Z. ZULINOV

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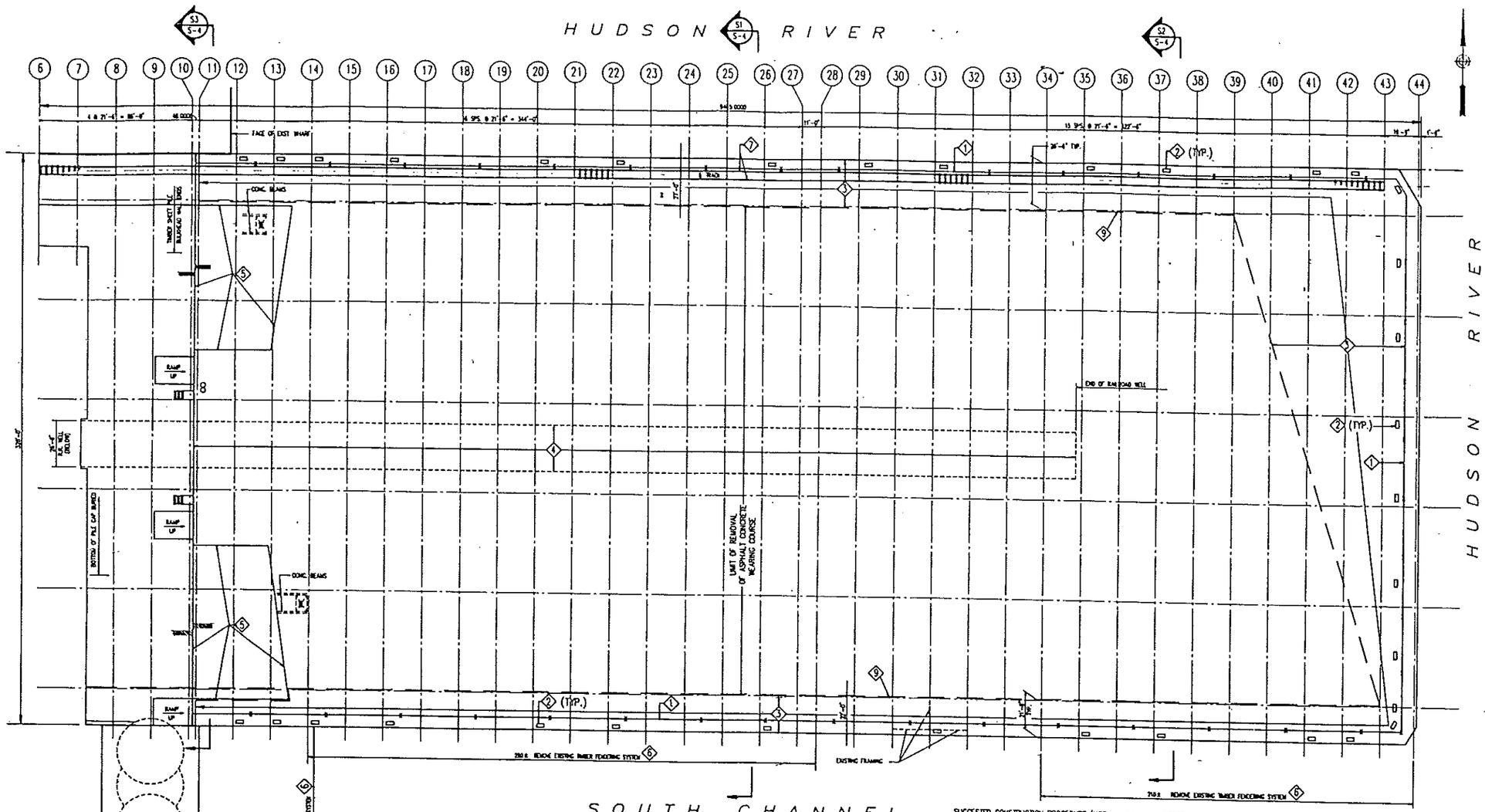
Date | Scale

Contract Number: HWD 544.007

Drawing Number: S-1



REMOVAL PLAN – PIER A

NOTES:

1. SEE DWG. S-1 FOR STRUCTURAL NOTES.
2. SEE DWG. G-2 FOR CIVIL NOTES.
3. SEE REFERENCE DWG. 2 OF CONTRACT HWD-210.008 FOR DETAILS OF FENCE
4. SEE REFERENCE DWG. 218 OF CONTRACT HWD-110.012 FOR DETAILS OF BOLLARDS,POSTS, & TIMBER FENDER SYSTEM.
5. SEE REFERENCE DWG. 215 FOR DETAILS OF RAILROAD TRACK.

LEGEND

- EXISTING RAILROAD TRACKS
- EXISTING CHAIN LINK FENCE
- EXISTING BOLLARD OR MOORING POST
- (9) INDICATES THE LOCATION AND/OR EXTENT OF AN ITEM OF WORK LISTED AT THE RIGHT IN THE SUGGESTED CONSTRUCTION PROCEDURE.
- EXISTING 8" DIA. STEEL PIPE SLEEVE THROUGH SLAB.
- (E) EXISTING ELECTRICAL SERVICE BOX TO REMAIN.

SUGGESTED CONSTRUCTION PROCEDURE (NOT IN SEQUENTIAL ORDER)

1. REMOVE AND DISPOSE OF EXISTING CHAIN LINK FENCE AND POSTS AND PATCH SLAB.
2. REMOVE EXISTING BOLLARDS AND MOORING POSTS TO A STORAGE LOCATION ON SITE, AS DIRECTED BY THE ENGINEER. PATCH BOLT HOLES.
3. REMOVE AND DISPOSE OF EXISTING ASPHALT WEARING COURSE AND ABRASIVE BLAST CONCRETE SLAB CLEAN INITIATE REMOVALS WITH 1" SAWCUT
4. REMOVE AND DISPOSE OF EXISTING ASPHALT WEARING COURSE AND SOIL FILL FROM RAILROAD WELL AREA AND BACKFILL WITH CELLULAR CONCRETE FILL. INITIATE REMOVALS WITH 1" SAWCUT.
5. REMOVE AND DISPOSE OF EXISTING ASPHALT WEARING COURSE AND VARIABLE DEPTH CONCRETE FILL AND ABRASIVE BLAST CONCRETE SLAB CLEAN INITIATE REMOVALS WITH 1" SAWCUT.
6. REMOVE EXISTING TIMBER FENDER SYSTEM INCLUDING PILES, CHOCKS, WALES AND BOLTS. PATCH BOLT HOLES.
7. REMOVE EXISTING RAILROAD TRACKS, CUT BOLTS AND PATCH SLAB LEVEL WITH ADJACENT SLAB.
8. PATCH CORE DRILLED HOLES IN SLAB. SEE DWG. S-3 FOR LOCATION OF SLAB REPAIRS.
9. EXPOSE AND CLEAN EXISTING 8 INCH DIAMETER PIPE SLEEVES THROUGH SLAB. COVER WITH TEMPORARY STEEL PLATES.

SCALE IN FEET

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Hoboken South Waterfront Development

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PIER A REHABILITATION

STRUCTURAL

REMOVAL PLAN

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Designed by	Drawn by	Checked by

Date XXX

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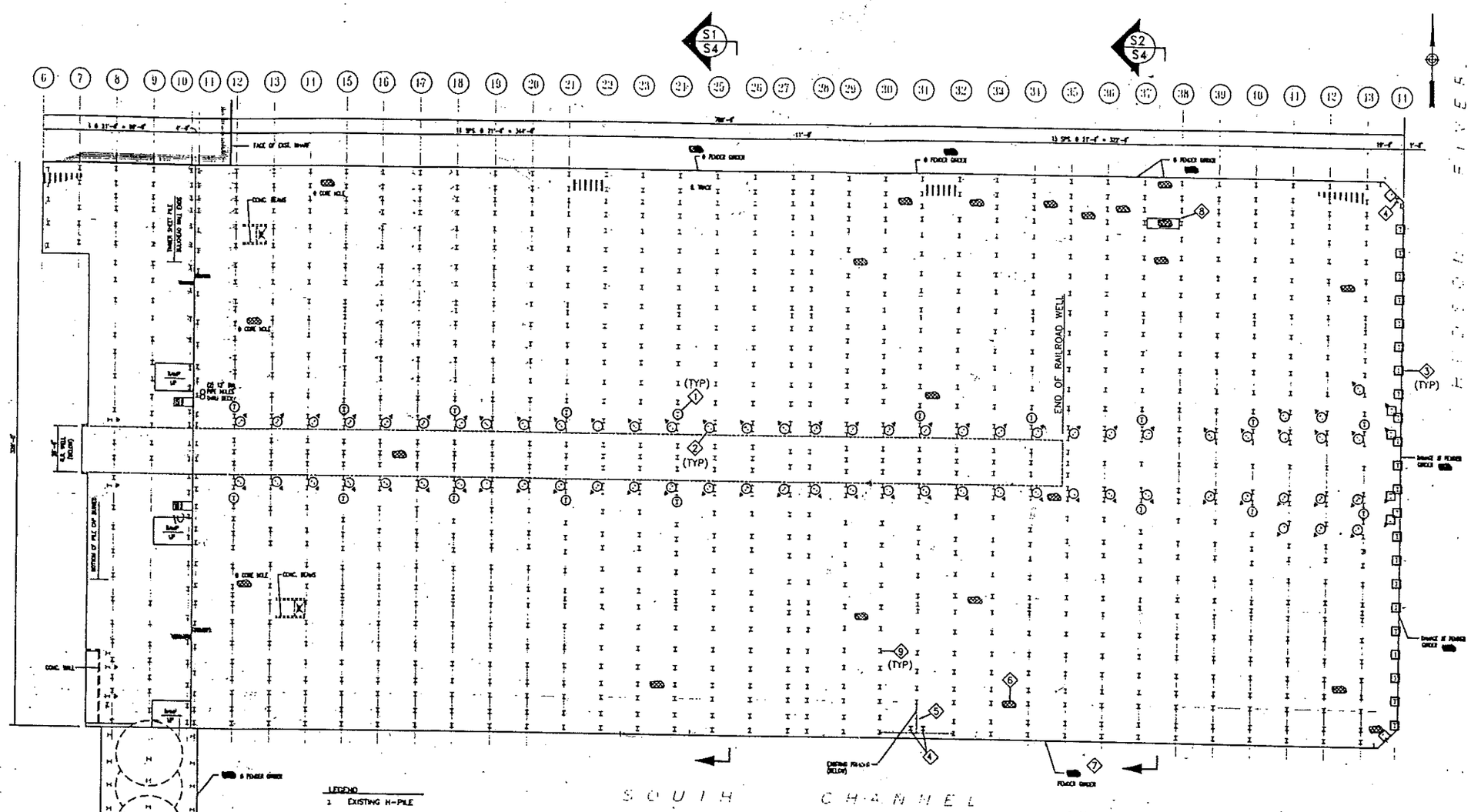
Drawing Number S-2



PILE PLAN

0' 10' 20' 30' 60' 90'

SCALE IN FEET

LEGEND

- EXISTING H-PILE
- EXISTING BATTERED H-PILE (ARROW DENOTES DIRECTION OF BATTER)
- STEEL H-PILE, HP14x89
- VERTICAL H-PILE TO RECEIVE TYPE I CONCRETE JACKET
- BATTERED H-PILE TO RECEIVE TYPE II CONCRETE JACKET (ARROW DENOTES DIRECTION OF BATTER)
- REPAIR AND EXTEND EXISTING CONCRETE PILE JACKETS
- CONCRETE SPALL REPAIR, TYPE A
- CONCRETE SPALL REPAIR, TYPE B
- CONCRETE REPAIR, TYPE C

NOTES:

1. SEE DRAWING NO. S-1 FOR STRUCTURAL AND GEOTECHNICAL NOTES.
2. SEE DRAWING NO. S-5 FOR DETAILS OF CONCRETE PILE JACKETS.
3. SEE DRAWING NO S-6 FOR CONCRETE REPAIR DETAILS.
4. SEE DRAWING NO. S-7 FOR PILE REPLACEMENT DETAILS.

SUGGESTED CONSTRUCTION PROCEDURE: (NOT IN SEQUENTIAL ORDER)

1. INSTALL TYPE I CONCRETE JACKETS ON EXISTING VERTICAL H-PILES.
2. INSTALL TYPE II CONCRETE JACKETS ON EXISTING BATTERED H-PILES.
3. REPAIR EXISTING CONCRETE JACKETS AND CONSTRUCT EXTENDED JACKETS TO THE MUD LINE. SEE DRAWING NO. S-5 FOR DETAILS.
4. INSTALL STEEL H-PILE AND CONCRETE PILE CAP AT MISSING PILE LOCATION. SEE DRAWING NO. S-7 FOR DETAILS OF PILE REPLACEMENT.
5. CONSTRUCT CONCRETE PILE EXTENSION AT CUT-OFF PILE LOCATION AND JACK LOAD INTO PILE. SEE DRAWING NO. S-7 FOR DETAILS.
6. PERFORM TYPE A CONCRETE REPAIRS AT SPALLED UNDERSIDE OF SLAB.
7. PEREFORM TYPE B CONCRETE REPAIRS AT SPALLED FENDER GIRDERS.
8. PERFORM TYPE C CONCRETE REPAIRS AT THE TOP OF THE SLAB.
9. BACKFILL AT EXISTING H-PILES WHICH HAVE CONCRETE JACKETS. SEE TABLE ON DRAWING NO S-1 FOR LOCATIONS AND DEPTH OF BACKFILL.

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Hoboken, New Jersey

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PIER A REHABILITATION

STRUCTURAL

PILE PLAN

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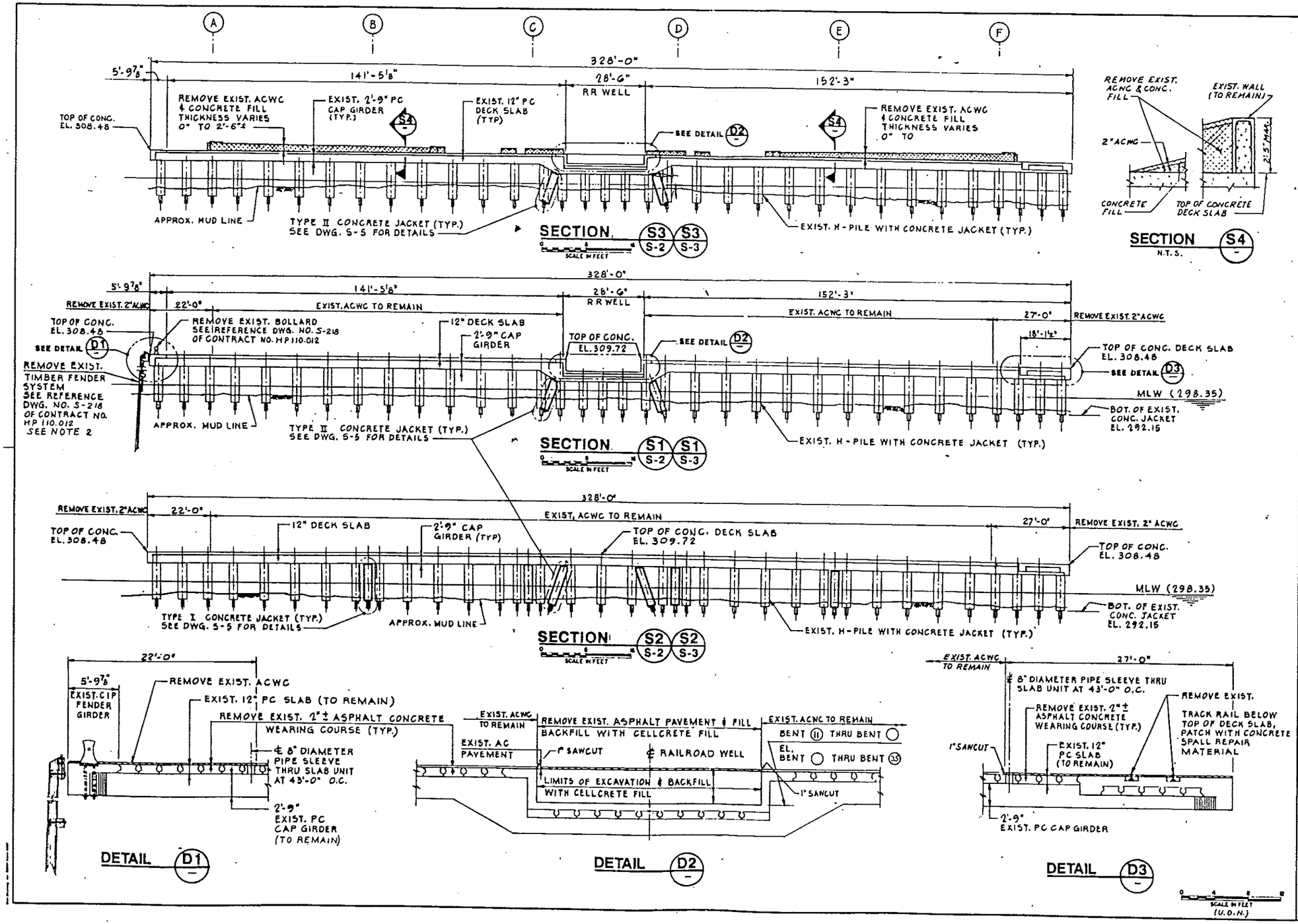
J. HEGARTY — Drawn by
Checked by

Date: MAY 1996
Scale: AS SHOWN
Contract Number: HWD 544.007
Drawing number: S-3



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TYPICAL SECTIONS AND DETAILS

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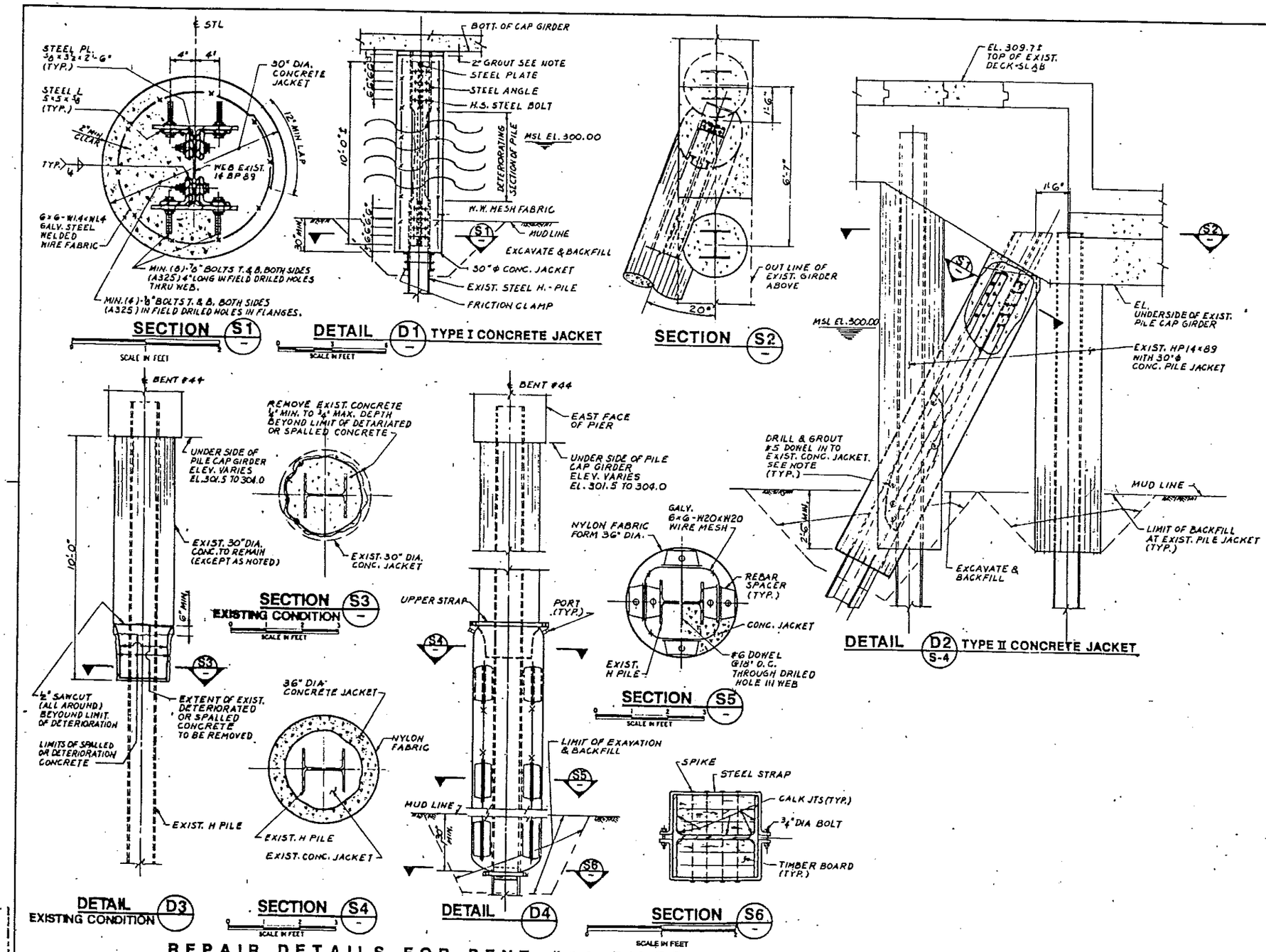

REPAIR DETAILS FOR BENT #44 PILES

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CONCRETE JACKET DETAILS

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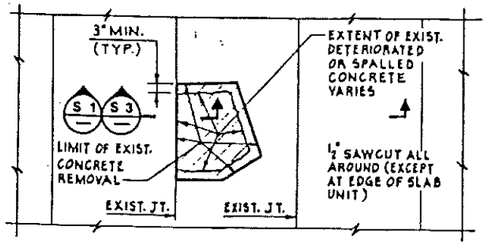
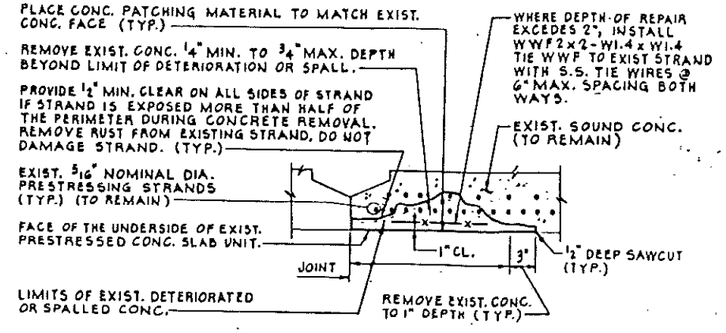


OVERHEAD PLAN VIEW
CONCRETE DECK PATCHING
TYPICAL LIMITS OF REMOVAL

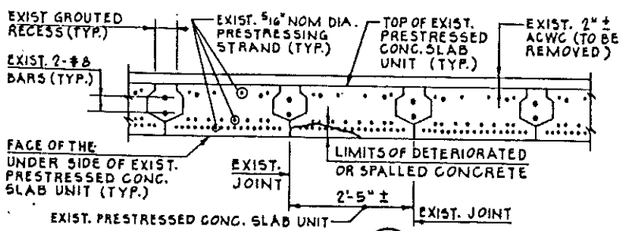
SCALE IN FEET



SECTION S 2

TYPE 'A' CONCRETE REPAIR

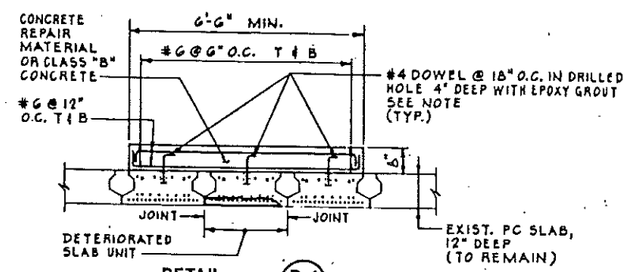
SCALE IN FEET



SECTION S 1

EXISTING CONDITIONS AT
OVERHEAD DETERIORATED OR SPALLED CONCRETE

SCALE IN FEET



DETAIL D 1

TYPE 'C' CONCRETE REPAIR

SCALE IN FEET

CONCRETE PATCHING NOTES:

SEE STANDARD SPECIFICATION SECTION 03734 FOR DETAILS OF CONCRETE SPALL REPAIRS.

THE CONTRACTOR SHALL UTILIZE FLOAT STAGES TO PREVENT CONCRETE MATERIAL OR DEBRIS FROM FALLING IN THE RIVER.

REMOVAL OF EXISTING CONCRETE AT REPAIR AREAS SHALL BE INITIATED WITH A NOMINAL 1/2 INCH DEEP SAW CUT AT THE LIMIT OF REMOVAL.

ALL LOOSE AND DETERIORATED CONCRETE SHALL BE REMOVED TO EXPOSE SOUND CONCRETE SURFACE. SOUND CONCRETE (BENEATH THE DETERIORATED CONCRETE) SHALL BE REMOVED FOR A DEPTH OF NOT LESS THAN 1/4 INCH BUT NOT MORE THAN 3/4 INCH. THE AREA SHALL BE CLEANED AND ROUGHENED USING METHODS APPROVED BY THE ENGINEER.

CONCRETE REMOVAL WORK SHALL BE PERFORMED IN A MANNER THAT WILL NOT DAMAGE CONCRETE, STRAND OR REBAR THAT ARE TO REMAIN. HAND TOOLS SHALL BE USED SO AS TO PROTECT THE STRUCTURAL MEMBERS THAT ARE TO REMAIN. CARE SHALL BE TAKEN SO AS NOT TO FRACTURE THE CONCRETE BEYOND THE AREA TO BE REPAIRED. AREAS DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER AT NO COST TO THE AUTHORITY.

ALL EXPOSED STRAND AND REBAR SHALL BE CLEANED OF ALL LOOSE RUST AND CONTAMINATION.

STEEL REINFORCEMENT, IF REQUIRED, SHALL BE ASTM A615 GRADE 60.

WELDED WIRE FABRIC SHALL BE ASTM A185 WITH MINIMUM YIELD STRENGTH OF 65,000 PSI AND SHALL BE EPOXY COATED. LAP AND SUPPORT DETAILS SHALL CONFORM TO CRSI STANDARDS.

THE CONCRETE PATCHING MATERIAL USED IN THIS CONTRACT FOR PATCHING DETERIORATED PIER DECK SLABS AND FENDER GIRDERS SHALL BE AS FOLLOWS:

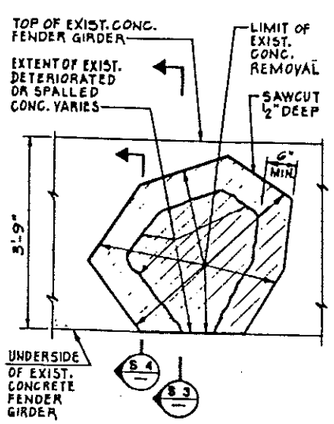
A. TOP OF SLAB
   I. PATCHROC 10-60 BY FOSROC CORP.
   II. SPEEDCRETE 2028 BY TAMMS
   III. FIVE STAR STRUCTURAL BY FIVE STAR PRODUCTS, INC.

B. UNDERSIDE OF DECK SLAB AND FENDER GIRDER
   I. EMACO S-88CA BY MASTERBUILDERS
   II. SIKA TOP 123 PLUS BY SIKA CORP.

MIXING AND PLACEMENT OF PATCHING MATERIAL SHALL BE DONE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN SPECIFICATIONS AND INSTRUCTIONS WHERE USE OF CONCRETE PATCHING MATERIAL IS SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL SELECT FROM THE PRODUCTS LISTED ABOVE, AS RECOMMENDED BY THE MANUFACTURER AND AN AUTHORIZED REPRESENTATIVE OF THE MANUFACTURER MUST BE PRESENT A MINIMUM OF TWO (2) WORK SHIFTS DURING CONCRETE PATCH PLACEMENT TO ENSURE COMPLIANCE WITH THEIR SPECIFICATIONS AND PROCEDURES.

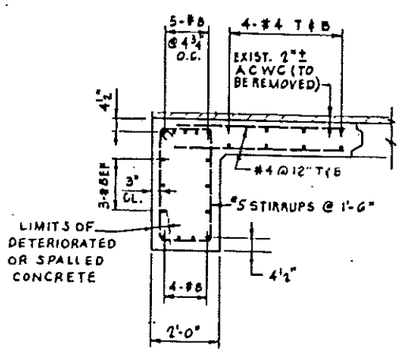
REPAIR AREAS SHALL BE CURED USING A WATER BASED CURING MEMBRANE OR AN APPROVED WET CURING PROCEDURE.

ALL ORIGINAL FEATURES OF THE AREAS REQUIRING CONCRETE REPAIRS, SUCH AS JOINTS, GROOVES AND CHAMFERS, SHALL BE RESTORED.



ELEVATION VIEW
CONCRETE FENDER GIRDER REPAIR
TYPICAL LIMITS OF CONCRETE REMOVAL

SCALE IN FEET



SECTION S 3

EXISTING CONDITIONS AT
CONCRETE FENDER GIRDER

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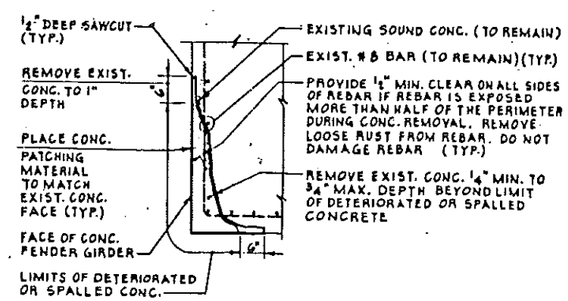

SECTION S 4

TYPE 'B' CONCRETE REPAIR

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STRUCTURAL

CONCRETE REPAIR DETAILS

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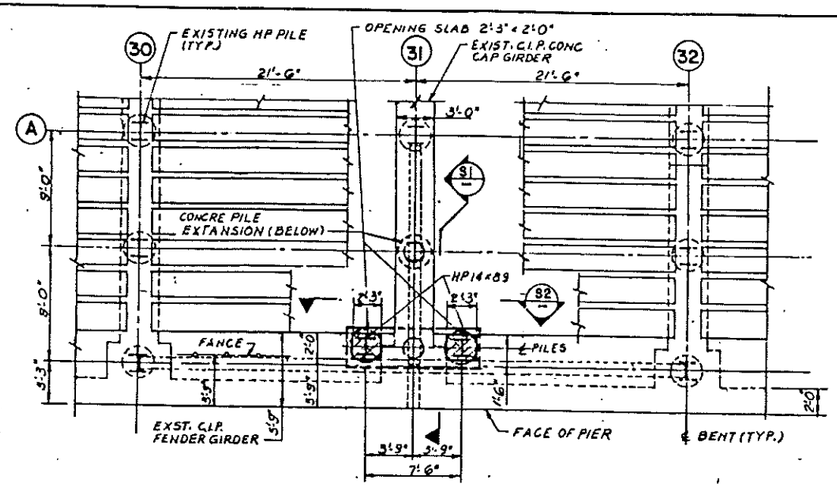
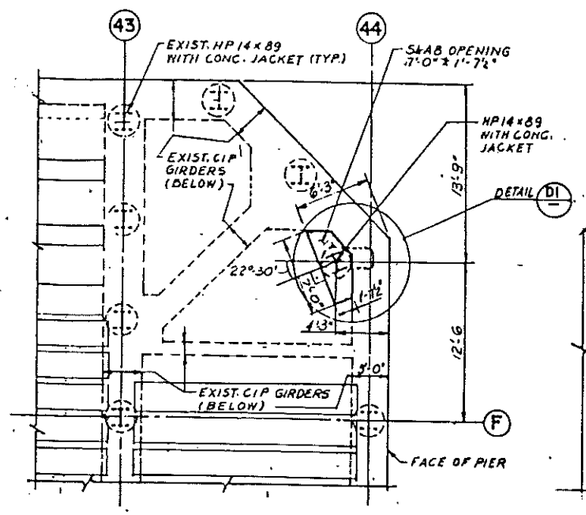
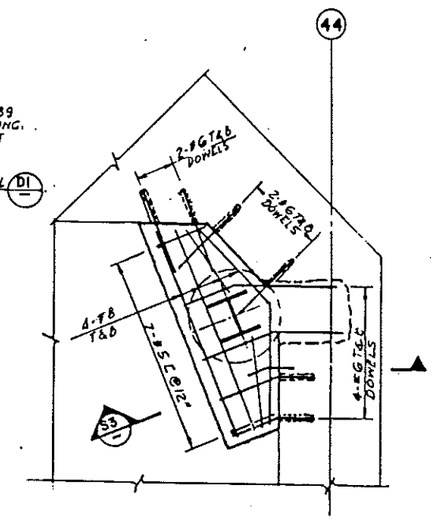


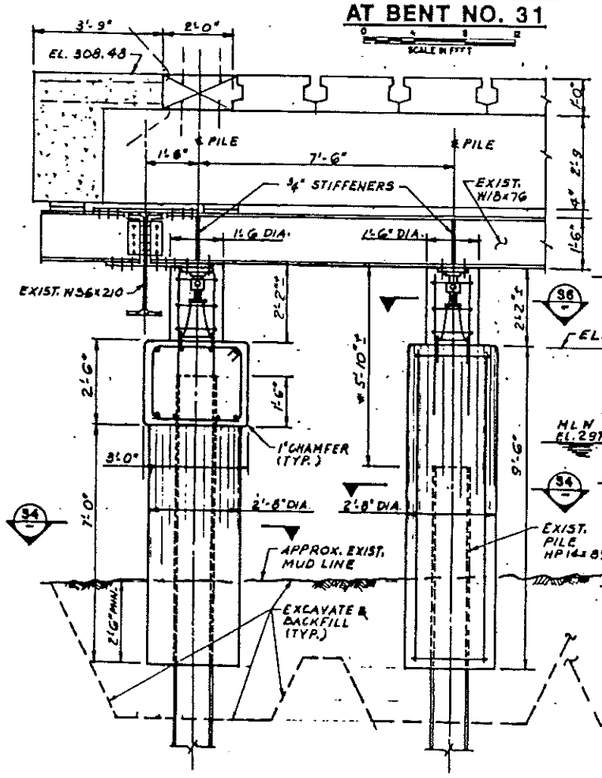
PART PLAN - PILE REPLACEMENT AT BENT NO. 31



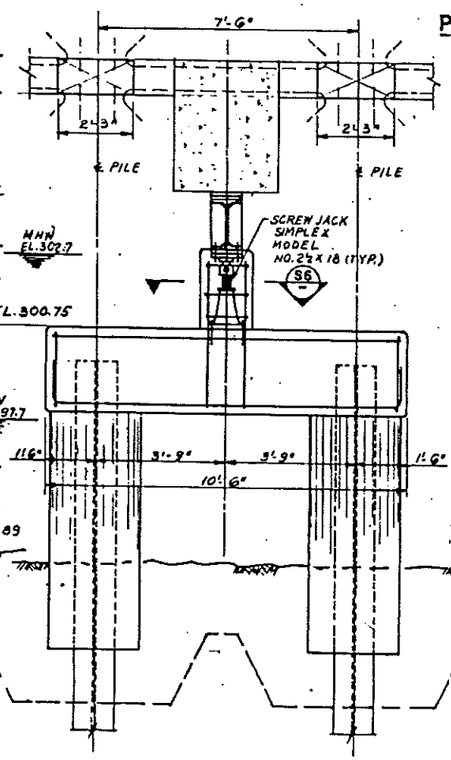
PART PLAN - PILE REPLACEMENT AT BENT NO. 44



DETAIL D1



SECTION S1



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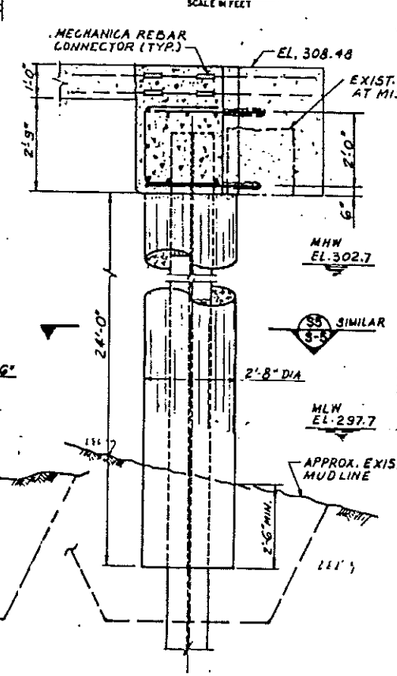

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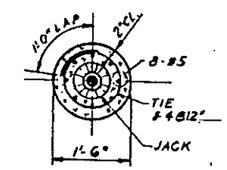

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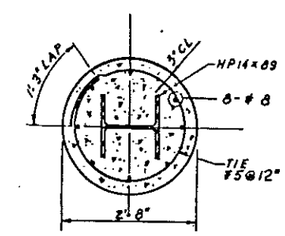

SECTION S4

NOTE:

FOR NOTES SEE DWG. S-1

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Engineering Department
Design Divisions

~~Hoboken South Waterfront Development~~

Title

PIER A REHABILITATION

STRUCTURAL

PILE REPLACEMENT DETAILS

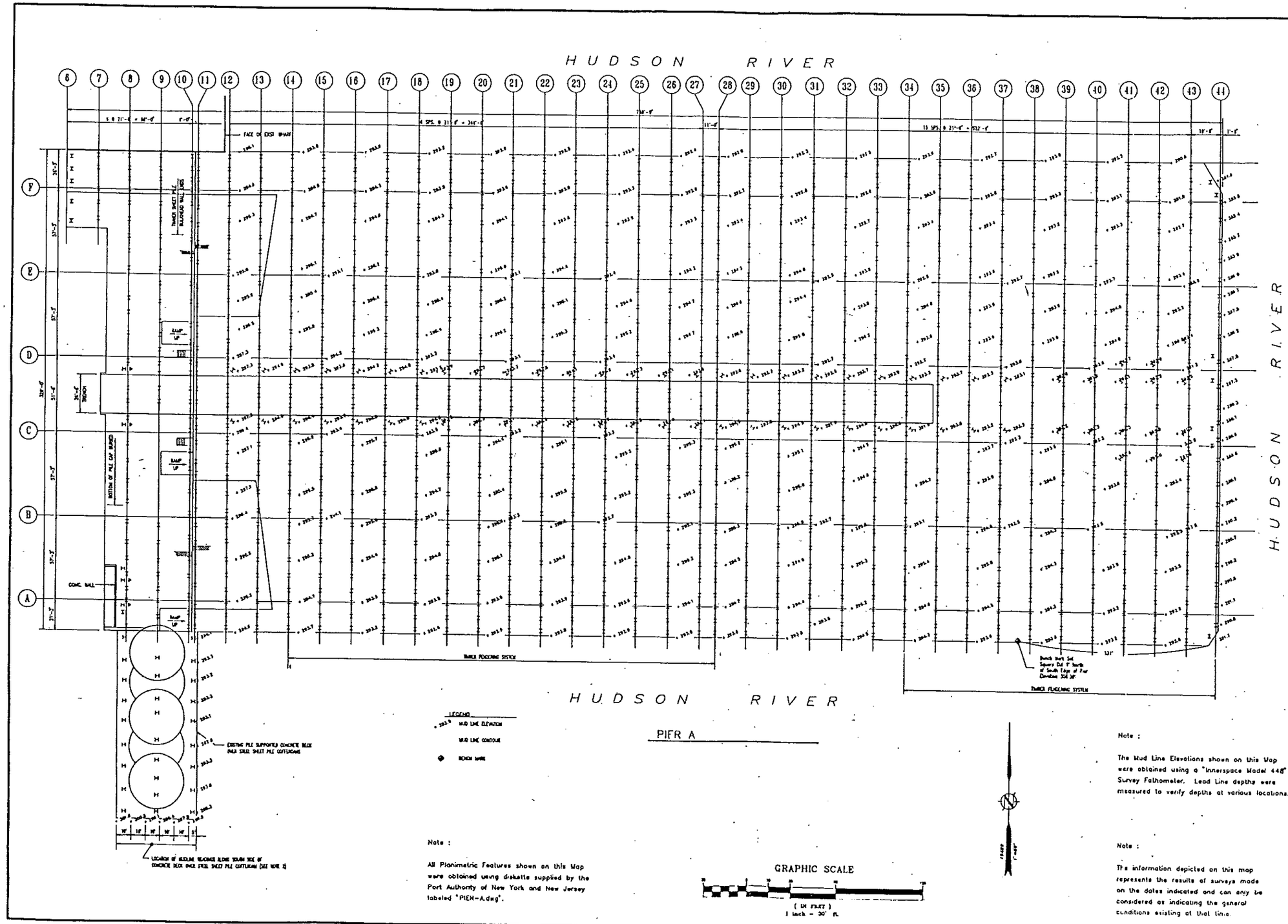
This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

Designed by Drawn by Checked by

Date Scale AS NOTED

Contract Number HWD 544.007

Drawing Number S-7



Note :

All Planimetric Features shown on this Map were obtained using diskette supplied by the Port Authority of New York and New Jersey labeled "PIER-A.dwg".

Note :

The Mud Line Elevations shown on this Map were obtained using a "Innerspace Model 448" Survey Fathometer. Lead Line depths were measured to verify depths at various locations.

Note :

The information depicted on this map represents the results of surveys made on the dates indicated and can only be considered as indicating the general conditions existing at that time.

Sheet 1 Of 1

THE PORT AUTHORITY OF NY & NJ

Construction Management Division

CENTRAL SURVEY GROUP

Title

HOBOKEN SOUTH WATERFRONT DEVELOPMENT PIER "A" MUDLINE SURVEY

No.	Date	Revision	Approved

VERTICAL CONTROL
ELEVATION 300.00' IS EQUAL TO 7.853' NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD '29) MUDLINE ELEVATIONS REFERENCED TO BENCH MARK "HSW-1", ELEVATION 313.21', SUPPLIED BY THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

HORIZONTAL CONTROL
SYSTEM AS SUPPLIED BY THE PORT AUTHORITY OF NY & NJ AS RECEIVED BY ROGERS SURVEYING ON DRAWING ENTITLED "PIER-A.DWG."

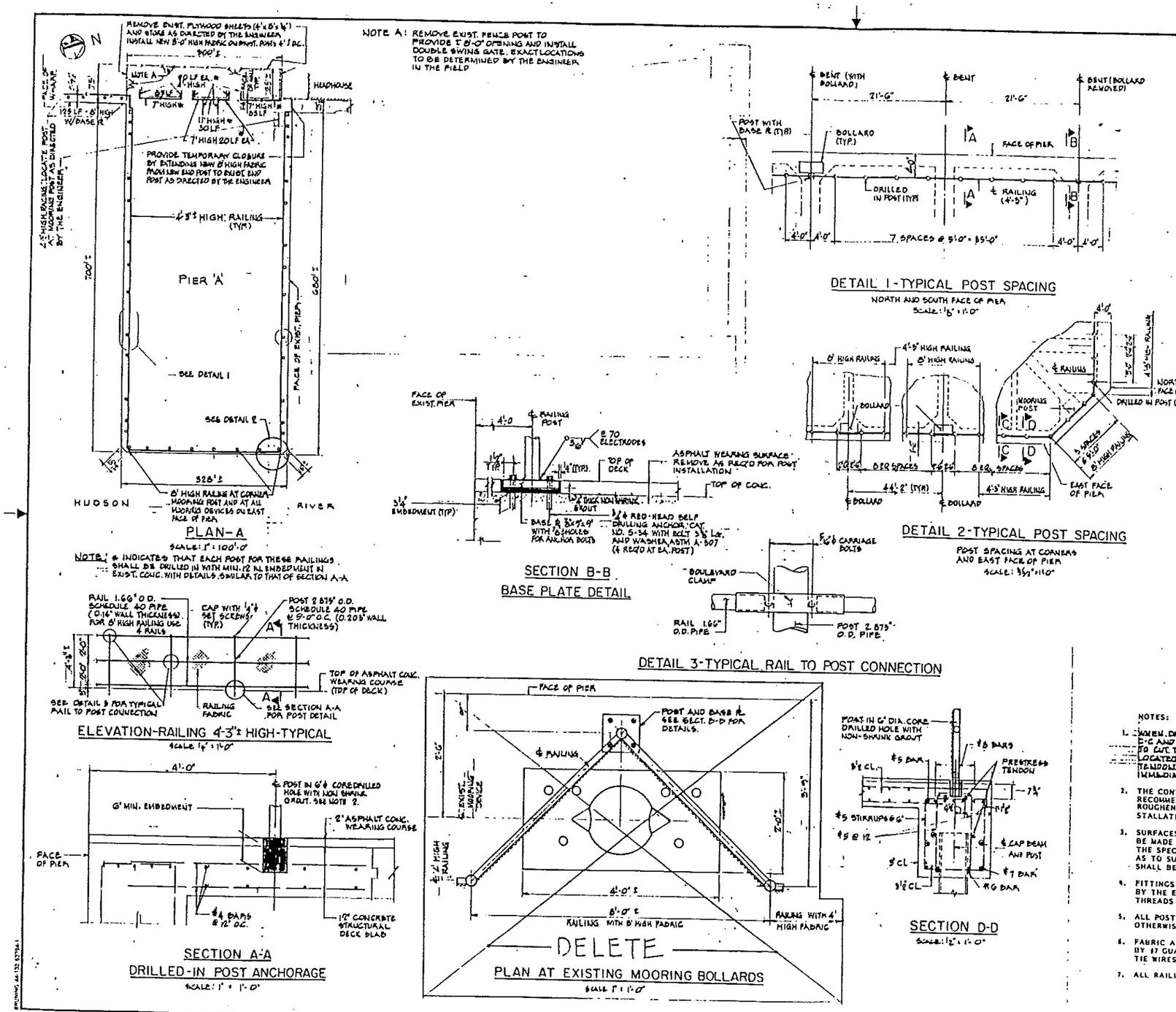
This drawing subject to conditions in contract All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without it's written consent

Rogers Surveying DWR BS
Surveyed by Drawn by Checked by

Date 5/22/96 Scale 1" = 30'

Contract Number S24-543.007

Drawing Number HSW-14



CERTIFIED "AS BUILT"
(BASED ON CORRECTED FIELD DRAWINGS)
DATE 10-25-85

NOTES:

1. WHEN DRILLING HOLES IN LOCATIONS COVERED BY SECTIONS C-C AND D-D THE CONTRACTOR SHALL USE ALL CAUTION NOT TO CUT THE POST TENSIONING TENDONS (THEORETICALLY LOCATED BELOW BOTTOM OF THE HOLE) IF HOWEVER A TENDON IS ENCOUNTERED BY THE CONTRACTOR HE SHALL IMMEDIATELY NOTIFY THE ENGINEER.
2. THE CONTRACTOR SHALL FOLLOW THE GROUT MANUFACTURER'S RECOMMENDATIONS AS TO PREPARATION OF HOLE INCLUDING ROUGHENING, WETTING AND CLEANING AND METHOD OF INSTALLATION OF GROUT.
3. SURFACES OF CONCRETE TO RECEIVE POST BASE PLATES SHALL BE MADE LEVEL BY MEANS OF A GROUT PAD AS SHOWN WITH THE SPECIFIED GROUT. THE MANUFACTURERS' RECOMMENDATIONS AS TO SURFACE PREPARATION AND METHOD OF INSTALLATION SHALL BE FOLLOWED.
4. FITTINGS SHALL BE MADE TAMPER-PROOF BY MEANS APPROVED BY THE ENGINEER SUCH AS THE USE OF CARRIAGE BOLTS WITH THREADS PEENED.
5. ALL POSTS SHALL BE SPACED FIVE FEET ON CENTERS UNLESS OTHERWISE NOTED.
6. FABRIC AT TOP OF 4'-3" ± RAILING SHALL ONLY BE SUPPORTED BY #7 GUAGE TENSION WIRE AND NOT TIED TO TOP RAIL WITH TIE WIRES.
7. ALL RAILINGS SEVEN FEET OR HIGHER SHALL HAVE FOUR RAILS.

Sheet 2 of 2

THE PORT AUTHORITY OF NY & NJ

ENGINEER OF DESIGN FOR ECONOMIC DEVELOPMENT AND PORT FACILITIES

CHIEF STRUCTURAL ENGINEER

Engineering Department
Design Divisions

Hoboken Piers

Title

PIER "A" DECK RAILING

"PLANS" AND DETAILS

No	Date	Revision	Approved

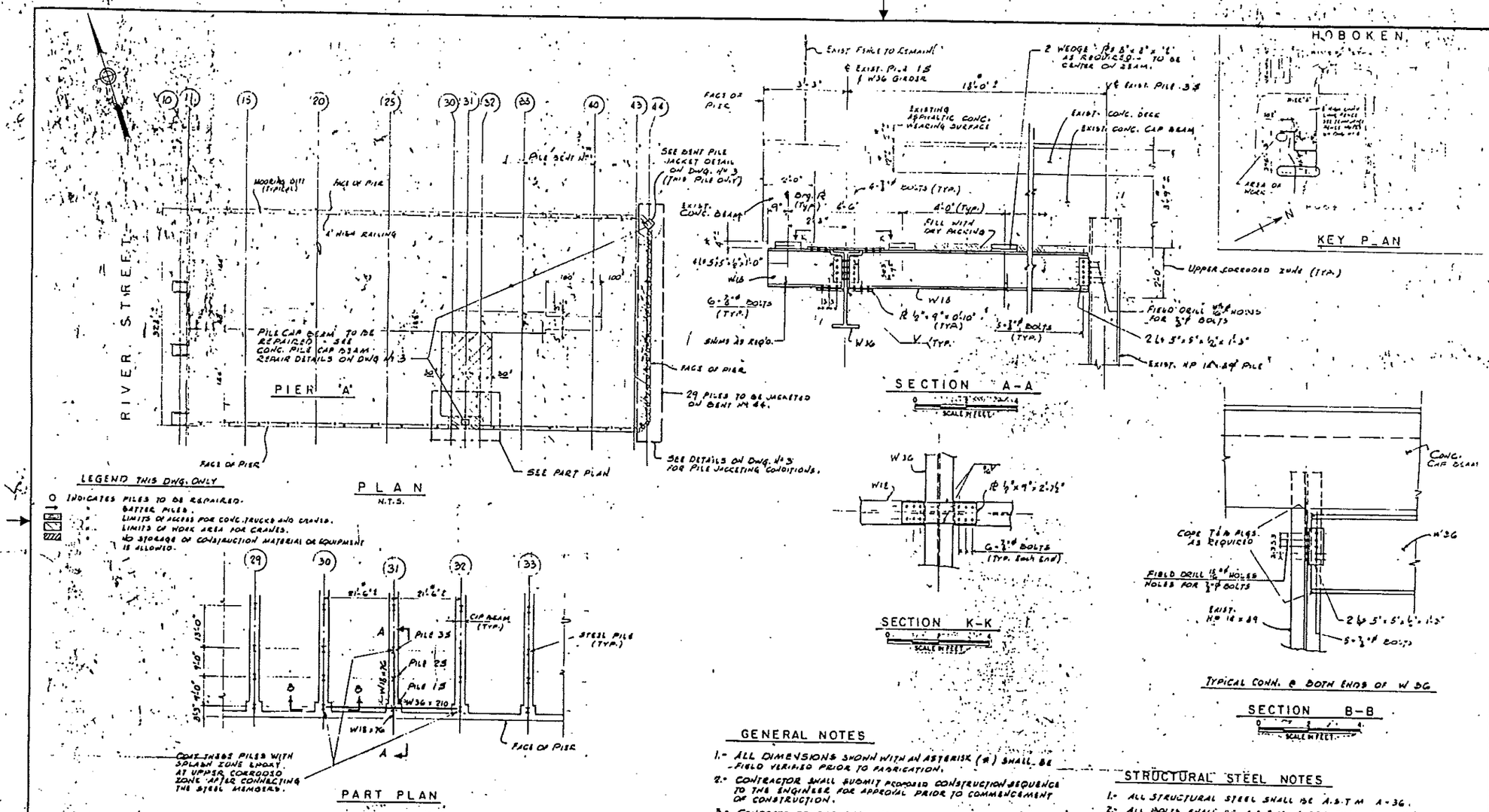
This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

Designed by — Drawn by — Task Leader

Date 6/21/85 — Chief Structural Engineer

Contract Number: HWD 210,008

Drawing Number: 2 of 2



GENERAL NOTES

1.- ALL DIMENSIONS SHOWN WITH AN ASTERISK (*) SHALL BE FIELD VERIFIED PRIOR TO FABRICATION.

2.- CONTRACTOR SHALL SUBMIT PROPOSED CONSTRUCTION SEQUENCE TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF CONSTRUCTION.

3.- CONCRETE TRUCKS SHALL NOT EXCEED 18 C.Y. CAPACITY AND SHALL BE SPACED A MINIMUM OF 30 FT. APART WHEN LOADED.

4.- CRANE USED SHALL NOT EXCEED 25 TON RATED CAPACITY. DURING LIFTING OPERATION, FULLY EXTENDED OUTRIGGERS SUPPORTED ON 6 FT. BY 6 FT. TIMBER MATTING (12" x 12" TIMBERS) SHALL BE USED.

5.- CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL THE CATALOG CUTS WITH DIMENSIONS AND LOADING DATA FOR THE CONCRETE TRUCK AND CRANE TO BE USED.

6.- FOR ALL AREAS OF PIER DECK OTHER THAN THOSE SPECIFICALLY DESIGNATED ON THE PLAN, THE CONSTRUCTION LIVE LOAD SHALL NOT EXCEED 150 P.S.F.

7.- DATUM: ELEVATION 300.0 IS 2.653 FT ABOVE MEAN SEA LEVEL AT SANDY HOOK AS ESTABLISHED BY THE NATIONAL OCEAN SURVEY.

8.- REMOVE AND RESTORE PORTION OF EXISTING RAILING AS REQUIRED FOR CONSTRUCTION AND AS APPROVED BY THE ENGINEER.

STRUCTURAL STEEL NOTES

1.- ALL STRUCTURAL STEEL SHALL BE A.S.T.M. A-36.

2.- ALL BOLTS SHALL BE A.S.T.M. A 325 TYPE F; UNLESS OTHERWISE NOTED.

3.- ALL PERMANENT STEEL SHALL BE COAL TAR EPOXY COATED

4.- FIELD COAT EXPOSED CONNECTIONS AS REQUIRED IN THE SPECIFICATIONS.

5.- INSTALL ALL STEEL GIRDERS WITH NATURAL CAMBER UP.

CONCRETE NOTES

1.- CONCRETE COMPRESSIVE STRENGTH @ 28 DAYS, f'c = 4000 P.S.I. (CLASS "B")

2.- W.W.F. EPOXY COATED Fy = 75,000 P.S.I.

Sheet 2 of 4

THE PORT AUTHORITY OF NY & NJ

ENGINEER OF DESIGN FOR ECONOMIC DEVELOPMENT AND PORT FACILITIES

CHIEF STRUCTURAL ENGINEER

Engineering Department
Design Divisions

Hoboken

Piers

Title

HOBOKEN
PIER A
PILE REPAIRS

PLAN AND SECTIONS.

No	Date	Revision	Approved

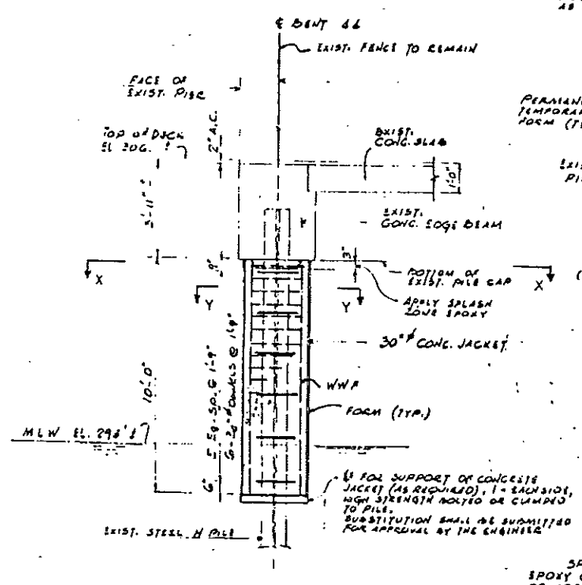
This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

Designed by M.K. Drawn by J.K. Task Leader

Date 3/1/86 Scale As Shown Section/Engineer

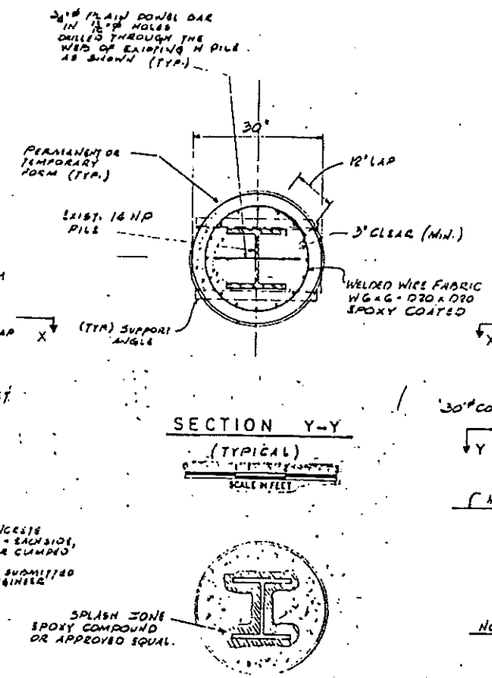
Contract Number Drawing Number

HWD - 210.012, 2



TYPICAL DETAIL FOR STRAIGHT PILE REPAIRS

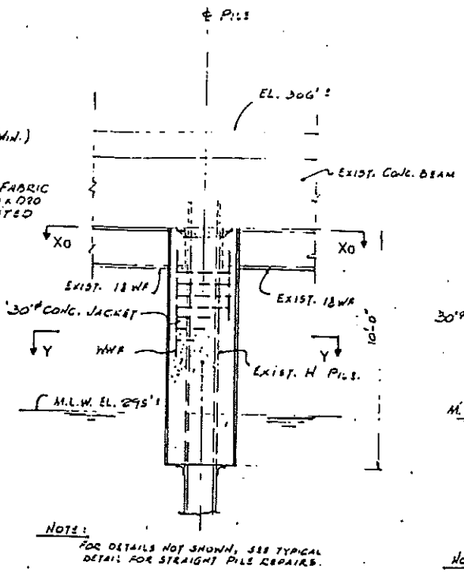
SCALE IN FEET



SECTION Y-Y (TYPICAL)

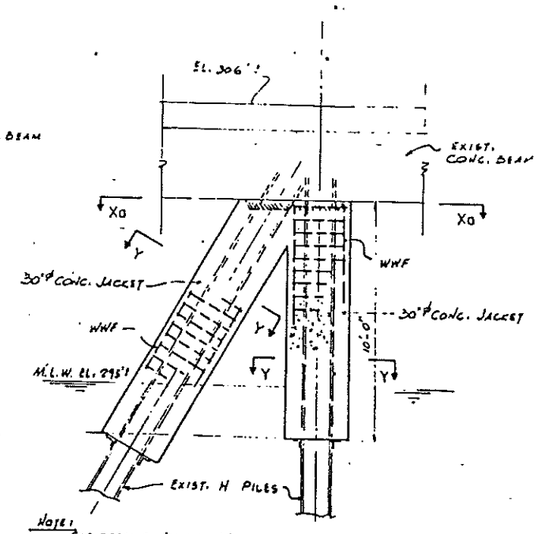
SCALE IN FEET

SECTION X-X AS SHOWN
SECTION Xa-Xa SIMILAR



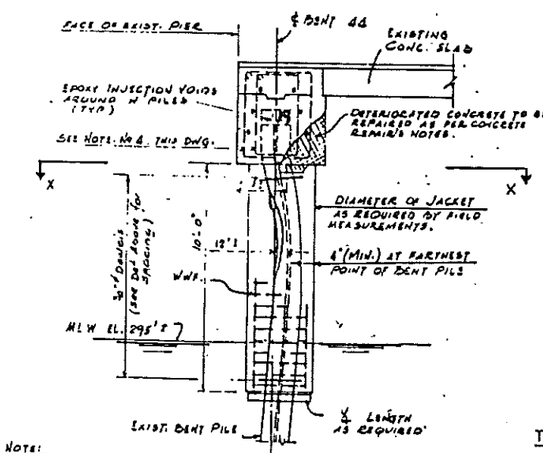
DETAIL FOR CONCRETE PILE JACKETS AT LOCATIONS WHERE WF BEAMS ARE CONNECTED TO THE HP PILES

SCALE IN FEET



DETAIL FOR CONCRETE PILE JACKETS AT LOCATIONS WHERE STRAIGHT & BATTERED PILES MEET

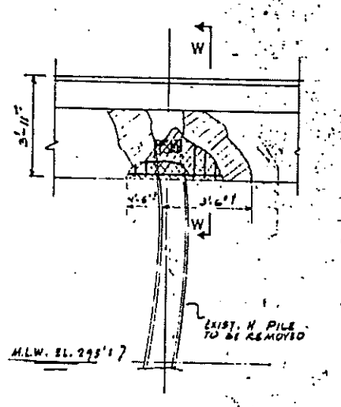
SCALE IN FEET



NOTE: FOR DETAILS NOT SHOWN, SEE TYPICAL DETAIL FOR STRAIGHT PILE REPAIRS.

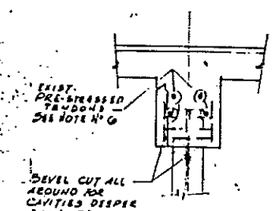
BENT PILE JACKET DETAIL

SCALE IN FEET

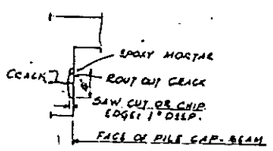


TYPICAL CONCRETE PILE CAP BEAM REPAIR

SCALE IN FEET



SECTION W-W



TYPICAL CRACK REPAIR

ESTIMATED QUANTITIES
LEGEND THIS DWG. ONLY

- CONCRETE SPALLING, TO BE REPAIRED. (APPROX 12 S.F.)
- CONCRETE DETERIORATION TO BE REPLACED (APPROX. 15 C.F.)
- CRACK TO BE REPAIRED. (APPROX. 15 L.F.)
- EPOXY INJECTION OF VOIDS (APPROX. 7 C.F.)

CONCRETE REPAIR NOTES

1.- ALL CRACKS SHALL BE REPAIRED BY ROUTING AND SEALING ACCORDING TO TYPICAL CRACK DETAIL AND SPECIFICATIONS.

2.- SPALLING & SCALING OF CONCRETE SHALL BE REPAIRED BY EPOXY MORTAR PATCHING ACCORDING TO TYPICAL DETAILS AND SPECIFICATIONS.

3.- DETERIORATED CONCRETE OR SPALLS DEEPER THAN 2" SHALL BE REMOVED AND REPLACED WITH SPECIFIED CONCRETE.
- REINFORCEMENT MUST NOT BE DAMAGED DURING REMOVAL.
- EXPOSED CONCRETE AND REINFORCEMENT SHALL BE ABRASIVE BLASTED AND REINFORCEMENT SHALL BE EPOXY COATED.

4.- ANY MISSING, DETERIORATED OR DAMAGED REINFORCEMENT SHALL BE REPLACED WITH EQUAL SIZED AND LAPPED AS PER SPEC. REPLACEMENT BARS SHALL BE DRILLED AND GROUTED INTO THE SOUND CONCRETE.

5.- FOR DETAILS NOT SHOWN, SEE TYP. DETAIL FOR STRAIGHT PILE REPAIRS.

6.- CARE SHALL BE TAKEN DURING CONCRETE REMOVAL, SO AS NOT TO DAMAGE PRESTRESSED TENDON.

Sheet 3 of 4

THE PORT AUTHORITY OF NY & NJ

ENGINEER OF DESIGN FOR ECONOMIC DEVELOPMENT AND PORT FACILITIES

CHIEF STRUCTURAL ENGINEER

Engineering Department
Design Divisions

Hoboken-Port Authority Piers

Title
HOBOKEN PIER A PILE REPAIRS

SECTIONS & DETAILS

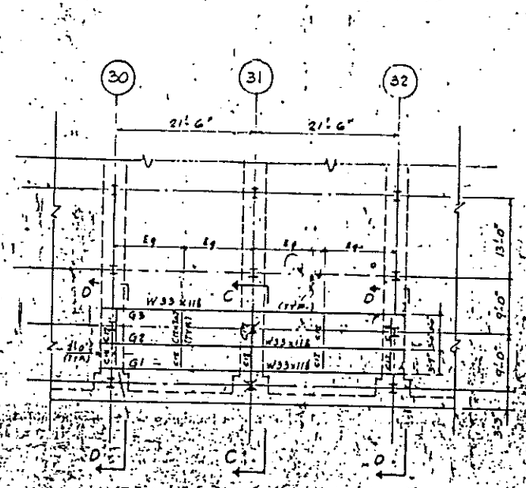
No	Date	Revision	Approved

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

Designed by M.Y. Drawn by J.R. Task Leader M.Y.

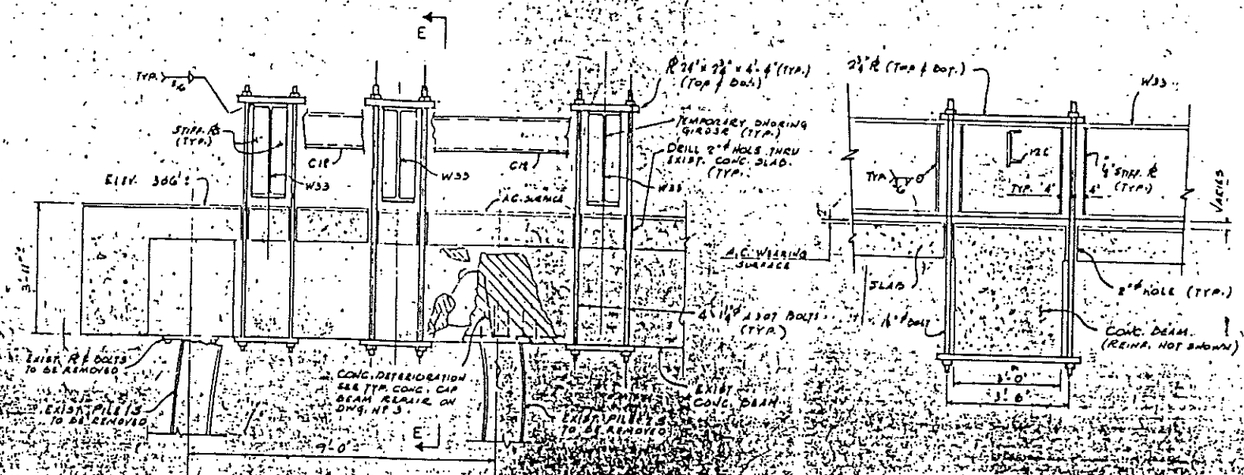
Date 3/11/86 Scale As Shown

Contract Number HWD.-210.012 Drawing Number 3

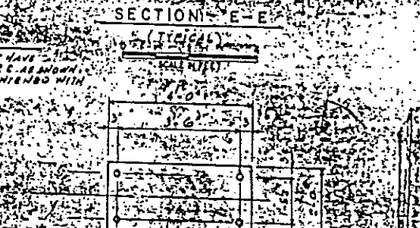


PART PLAN
TEMPORARY SHORING GIRDER

NOTE: X INDICATES PILES TO BE REMOVED.



SECTION C-C
(AT BENT Nº 31)
SCALE IN FEET



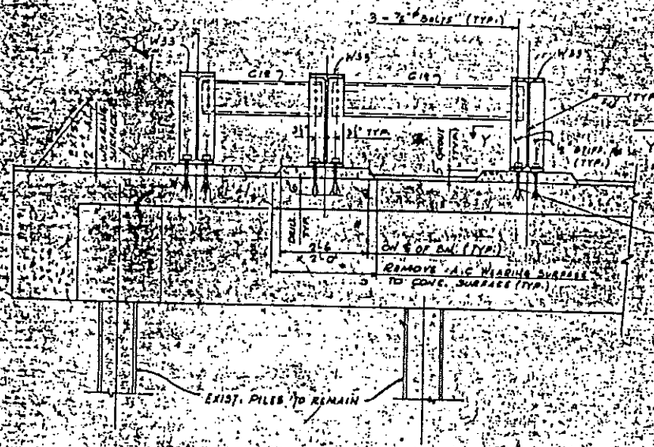
SECTION E-E
(TYPICAL)
SCALE IN FEET

CONNECTIONS FOR G2 ONLY SHALL HAVE 1½" x 2" VERT. SLOTTED HOLES ON 12 C. AS SHOWN. EACH BOLT SHALL BE HAND TIGHTENED WITH 2 WASHERS AND 2 NUTS.

SECTION Y-Y
(TYPICAL)
SCALE IN FEET

BRACING CONNECTION TO THE WEB OF THE TEMPORARY SHORING GIRDER
SCALE IN FEET

TOP AND BOTTOM STEEL PLATE DETAIL
SCALE IN FEET



SECTION D-D
(AT BENTS Nº 30 & 32)
SCALE IN FEET

CONSTRUCTION SEQUENCE

1. CORE HOLES IN THE CONCRETE DECK AS REQUIRED FOR THE INSTALLATION OF THE TEMPORARY SHORING STEEL GIRDERS.
2. PROVIDE CONCRETE GROUT BEDS FOR TEMPORARY SHORING GIRDERS.
3. SUPPORT THE TEMPORARY SHORING GIRDERS AT THEIR ENDS AS SHOWN ON SECTION D-D, THIS DWG.
4. SUPPORT THE EXISTING PILE CAP BEAM BY SIMULTANEOUSLY TIGHTENING THE NUTS AT THE MIDDLE OF THE SPAN OF TEMPORARY SHORING GIRDERS. EACH NUT SHALL BE TIGHTENED ONE TURN AT A TIME UNTIL THE FOLLOWING DEFLECTIONS ARE ACCOMPLISHED: G1 = 1"; G2 = 0"; G3 = ⅛".
5. REPAIR AND RESTORE DETERIORATED PILE CAP BEAM AS SPECIFIED ON CONCRETE REPAIR NOTES ON DWG. Nº 3. EPOXY INJECTION IS REQUIRED AFTER REMOVAL OF DETERIORATED CONCRETE TO SEAL RESULTING CRACKS AND VOIDS. CONCRETE REMOVAL SHALL BE LIMITED TO ONE HALF WIDTH OF EXIST. CONC. PILE CAP BEAM.
6. REMOVE PORTION OF PILE 1S BENT Nº 31 BY CUTTING IT AT THE UNDERSIDE OF THE PILE CAP BEAM AND AT MUD LINE (ELEV. 281.0±). REMOVE EXISTING CAP PLATE AND BOLTS AND PATCH THE UNDERSIDE OF THE PILE CAP BEAM TO ITS ORIGINAL CONDITIONS.
7. ERECT THE W36 x 210 PERMANENT UNDERPINNING GIRDER AS SHOWN ON DWG. Nº 2.
8. REMOVE PORTION OF PILE 2S AT BENT 31 BY CUTTING IT AT THE UNDERSIDE OF THE EXISTING PILE CAP BEAM AND AT THE MUD LINE (ELEV. 281.0±)
9. ERECT THE W18 x 76 PERMANENT UNDERPINNING BEAM AS SHOWN ON DRAWING Nº 2.
9. INSTALL BEARING PLATES WITH DRY PACKING AS SHOWN ON DWG. Nº 2.
10. LOOSEN THE NUTS AT MIDDLE OF THE SPAN OF THE TEMPORARY SHORING GIRDERS BY TURNING EACH NUT ONE TURN AT A TIME AND THEN REMOVE THE SHORING GIRDERS.
11. REMOVE GROUT BEDS, PATCH CORED HOLES IN THE DECK AND RESTORE WEARING SURFACE.

TEMPORARY FENCE NOTES

1. TEMPORARY CONSTRUCTION FENCING SHALL BE INSTALLED WHERE SHOWN ON PLAN PRIOR TO THE BEGINNING OF ANY PIER REHABILITATION WORK.
2. FENCE SHALL BE 8 FT. HIGH CHAIN LINK TYPE, CONSISTING OF 2" MESH #9 GAGE, GALV. (1500 L.F. OF 4 FT. HIGH FABRIC AVAILABLE AT THE SITE FOR CONTRACTOR'S USE). POST SHALL BE 2.875 IN. O.D., SCHEDULE 40, SPACED AT 10' O.C.
3. POST SHALL BE WELDED TO 9" x 9" x ½" BASE PLATE WITH ¼" CONT. FILLET WELD AND ANCHORED TO CONCRETE DECK WITH 4 - ¾" ϕ BOLTS, A.S.T.M. A-307 AND PHILLIPS RED SELF DRILLING ANCHORS WITH STANDARD WASHERS. BASE PL SHALL BEAR FULLY ON CONCRETE DECK. REMOVE A.C. WEARING SURFACE AS REQ'D.
4. GATE OPENINGS MAY BE PLACED AT CONTRACTOR'S OPTION, SUBJECT TO THE APPROVAL OF THE ENGINEER.
5. UPON COMPLETION OF PIER REPAIR, FENCING AND BOLTS SHALL BE REMOVED. FENCING SHALL BE STORED AS DIRECTED BY THE ENGINEER. THE DECK SHALL BE RESTORED TO CONDITIONS PRIOR TO THIS CONSTRUCTION.

Sheet 4 of 4

THE PORT AUTHORITY OF NY & NJ

ENGINEER OF DESIGN FOR ECONOMIC DEVELOPMENT AND PORT FACILITIES

CHIEF STRUCTURAL ENGINEER

Engineering Department
Design Divisions

Hoboken-Port Authority Piers

HOBOKEN PIER A PILE REPAIRS

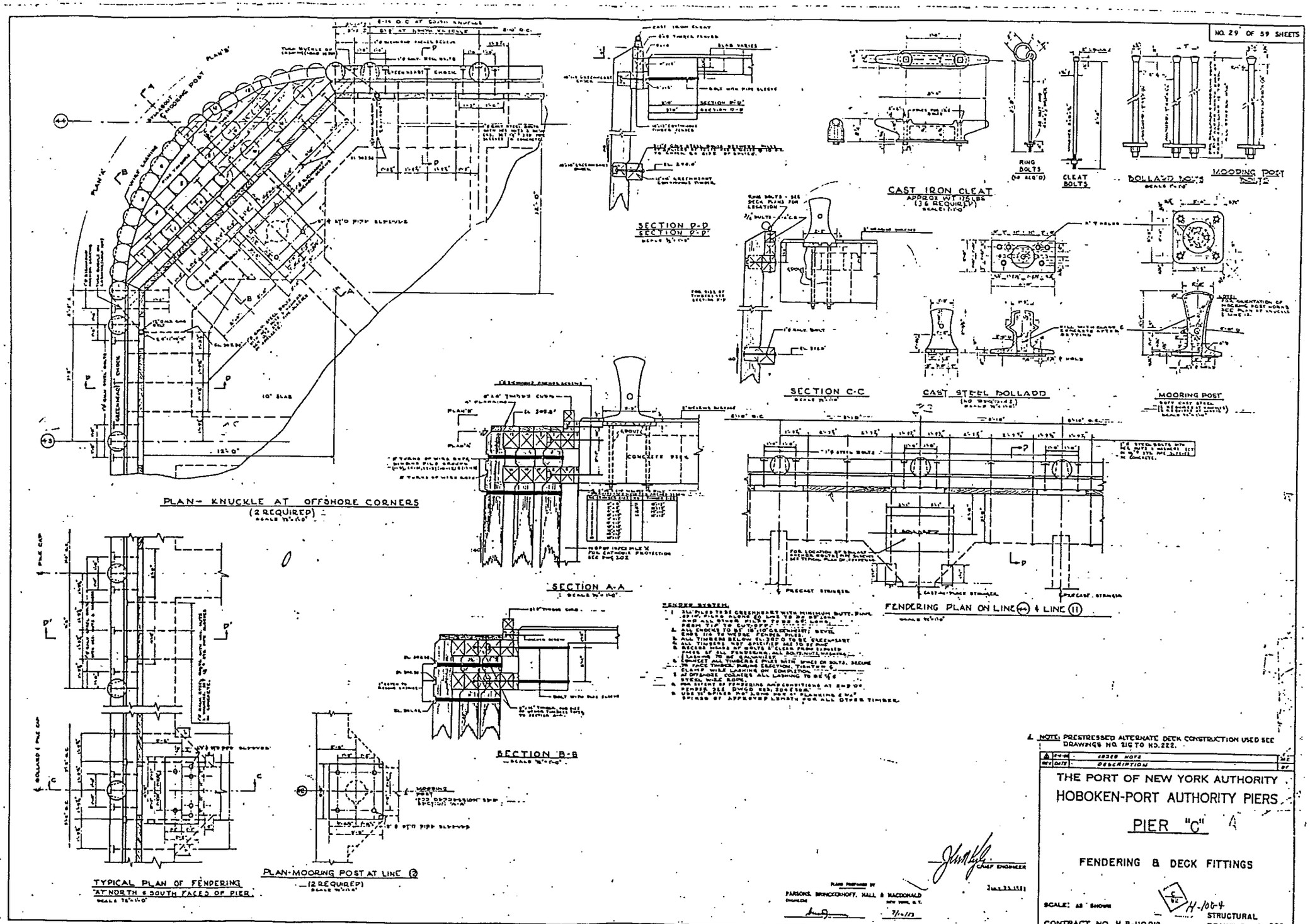
TEMPORARY SHORING DETAILS

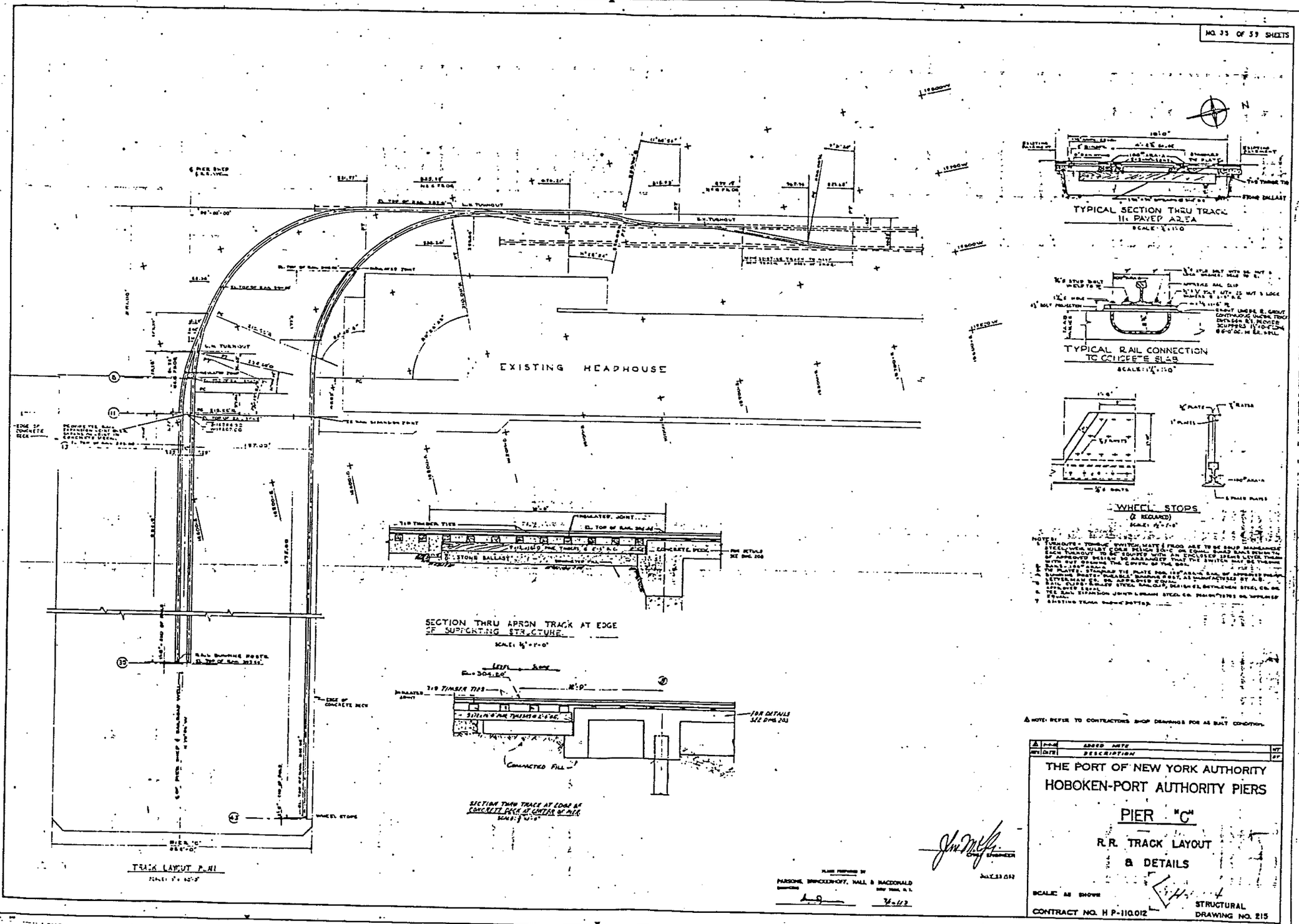
No.	Date	Revision	Approved

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

MY	J.R.	MY
Designed by	Drawn by	Task Leader

Date 3/11/86 Senior Engineer
Scale As Shown
Contract Number Drawing Number
HWD - 210.012 4


PLAN- KNUCKLE AT OFFSHORE CORNERS
(2 REQUIRED)
SECTION D-D
SECTION C-C
SECTION A-A
SECTION B-B
CAST IRON CLEAT
APPROX WT 175 LBS
(36 REQUIRED)
RING BOLTS
CLEAT BOLTS
BOLLARD BOLTS
MOORING POST BOLTS
CAST STEEL BOLLARD
MOORING POST
FENDERING PLAN ON LINE (44) & LINE (11)
TYPICAL PLAN OF FENDERING AT NORTH & SOUTH FACES OF PIER
PLAN-MOORING POST AT LINE (2)
(12 REQUIRED)
FENDER SYSTEM
NOTE: PRESTRESSED ALTERNATE DECK CONSTRUCTION USED SEE DRAWINGS NO. 216 TO NO. 222.
REV DATE DESCRIPTION BY
THE PORT OF NEW YORK AUTHORITY
HOBOKEN-PORT AUTHORITY PIERS
PIER "C"
FENDERING & DECK FITTINGS
SCALE: AS SHOWN
CONTRACT NO. H P-110.012
STRUCTURAL
DRAWING NO. 209
CHIEF ENGINEER
PARSONS, BRINCKERHOFF, HALL & MACDONALD
ENGINEERS
NEW YORK, N.Y.


NO. 35 OF 59 SHEETS
EXISTING HEADHOUSE
TYPICAL SECTION THRU TRACK IN PAVED AREA
TYPICAL RAIL CONNECTION TO CONCRETE SLAB
WHEEL STOPS
SECTION THRU APRON TRACK AT EDGE OF SUPPORTING STRUCTURE
SECTION THRU TRACK AT EDGE OF CONCRETE DECK AT CENTER OF PIER
TRACK LAYOUT PLAN
THE PORT OF NEW YORK AUTHORITY
HOBOKEN-PORT AUTHORITY PIERS
PIER "C"
R.R. TRACK LAYOUT & DETAILS
SCALE: AS SHOWN
CONTRACT NO. H P-110.012
STRUCTURAL DRAWING NO. 215

APPENDIX B

STRUCTURAL ANALYSIS

BY T O'Fallon DATE 12/09/10

CHKD. _____ DATE _____

BOSWELL ENGINEERING

330 Phillips Ave., So. Hackensack, N.J. 07606
(201) 641-0770 Fax (201) 641-1831

SHEET NO. _____ OF _____

JOB NO. HO-417

SUBJECT Hoboken Pier A

REF.	CALCULATIONS	ANSWER

Pile Analysis of Piles Supporting Perimeter Brick Walkway

Spacing Between Piles

Parallel to Pile Cap	8.00	ft
Perpendicular to Pile Cap	21.50	ft

Dead Load

Concrete Pile Cap	2.75 ft * 2.75 ft * 8.00 ft * 150.00 lb/cf =	9,075	lb
Prestressed Deck Planks	1.00 ft * 8.00 ft * 21.50 ft * 150.00 lb/cf =	25,800	lb
Brick Walkway	1.25 ft * 8.00 ft * 21.50 ft * 150.00 lb/cf =	32,250	lb
Total		67,125	lb

Live Load

IBC Tab. 1607.1	Yards and Terraces, Pedestrian	8.00 ft * 21.50 ft * 100.00 lb/sf =	17,200	lb
IBC 1607.6	Minimum Truck Loading	8.00 ft * 21.50 ft * 50.00 lb/sf =	8,600	lb
IBC Tab. 1607.6	Truck Loading (Lane Load + Concentrated Load)	21.50 ft * 640 lb/ft + 26,000 lb =	39,760	lb
	Maximum Live Load		39,760	lb

Load Combinations

IBC EQ 16-1	Load 1	1.4 * D =	93,975	lb
IBC EQ 16-2	Load 2	1.2 * D + 1.6 * L =	144,166	lb

All reference AISC 360-05 Specification for Structural Steel Buildings unless otherwise noted

	Unbraced Column	L_b =	15.00	ft.
AISC Table C-2	Effective Length Factor	K =	1.00	
	Design Axial Load	P_u =	144.2	kip

Member Properties HP14x89 A36

Full Section

Specified minimum yield stress	F_y	=	36	ksi	Cross sectional area	A	=	26.1	in^2
Modulus of Elasticity of Steel	E	=	29,000	ksi	Moment of inertia	I_x	=	904	in^4
Beam depth	d	=	13.83	in	Radius of Gyration	r_x	=	5.88	in
Web thickness	t_w	=	0.615	in	Moment of inertia	I_y	=	326	in^4
Flange width	b_f	=	14.695	in	Radius of Gyration	r_y	=	3.53	in
Flange Thickness	t_f	=	0.615	in					

Deteriorated Section (50% Section Loss)

Beam depth	d	=	13.522	in	Cross sectional area	A	=	13.0	in^2
Web thickness	t_w	=	0.3075	in	Moment of inertia	I_x	=	441	in^4
Flange width	b_f	=	14.388	in	Radius of Gyration	r_x	=	5.83	in
Flange Thickness	t_f	=	0.3075	in	Moment of inertia	I_y	=	153	in^4
					Radius of Gyration	r_y	=	3.43	in

Axial Load Design Compression

Full Section

	Slenderness Ratio $K * L / r_y$	51.0	
	$K * L / r_y \leq 200$	OK	
	$4.71 * \sqrt{(E / F_y)}$ =	133.7	
AISC E3-4	$F_e = (\pi^2 * E) / (K * L / r_y)^2$ =	110.08	
AISC E3-2	if $K * L / r_y \leq 4.71 * \sqrt{(E / F_y)}$ $F_{cr} = F_y * [0.658^{(F_y/F_e)}]$	31.4	ksi
AISC E3-3	if $K * L / r_y > 4.71 * \sqrt{(E / F_y)}$ $F_{cr} = 0.877 * F_e$	NA	ksi
AISC E3-1	Nominal Compression Axial Strength $P_n = A_g * F_{cr}$ =	819.4	kip
	Resistance Factor for Compression Φ_c =	0.85	
	$\Phi_c P_n$ =	696.5	kip
	$\Phi_c P_n \geq P_u$	OK	

Deteriorated Section

	Slenderness Ratio $K * L / r_y$	52.5	
	$K * L / r_y \leq 200$	OK	
	$4.71 * \sqrt{(E / F_y)}$ =	133.7	
AISC E3-4	$F_e = (\pi^2 * E) / (K * L / r_y)^2$ =	103.70	
AISC E3-2	if $K * L / r_y \leq 4.71 * \sqrt{(E / F_y)}$ $F_{cr} = F_y * [0.658^{(F_y/F_e)}]$	31.1	ksi
AISC E3-3	if $K * L / r_y > 4.71 * \sqrt{(E / F_y)}$ $F_{cr} = 0.877 * F_e$	NA	ksi
AISC E3-1	Nominal Compression Axial Strength $P_n = A_g * F_{cr}$ =	404.9	kip
	Resistance Factor for Compression Φ_c =	0.85	
	$\Phi_c P_n$ =	344.2	kip
	$\Phi_c P_n \geq P_u$	OK	

BY T O'Fallon DATE 12/09/10

CHKD. _____ DATE _____

BOSWELL ENGINEERING

330 Phillips Ave., So. Hackensack, N.J. 07606
(201) 641-0770 Fax (201) 641-1831

SHEET NO. _____ OF _____

JOB NO. HO-417

SUBJECT Hoboken Pier A

REF.	CALCULATIONS	ANSWER
	Pile Analysis of Piles Supporting Grass Fill Area	
	Spacing Between Piles	
	Parallel to Pile Cap	11.00 ft
	Perpendicular to Pile Cap	21.50 ft
	Dead Load	
	Concrete Pile Cap: 2.75 ft * 2.75 ft * 11.00 ft * 150.00 lb/cf =	12,478 lb
	Prestressed Deck Planks: 1.00 ft * 11.00 ft * 21.50 ft * 150.00 lb/cf =	35,475 lb
	Soil Fill: 4.25 ft * 11.00 ft * 21.50 ft * 120.00 lb/cf =	120,615 lb
	Total	168,568 lb
	Live Load	
IBC Tab. 1607.1	Yards and Terraces, Pedestrian: 11.00 ft * 21.50 ft * 100.00 lb/sf =	23,650 lb
	Load Combinations	
IBC EQ 16-1	Load 1: 1.4 * D =	235,995 lb
IBC EQ 16-2	Load 2: 1.2 * D + 1.6 * L =	240,122 lb
	All reference AISC 360-05 Specification for Structural Steel Buildings unless otherwise noted	
	Unbraced Column: L_b =	15.00 ft.
AISC Table C-2	Effective Length Factor: K =	1.00
	Design Axial Load: P_u =	240.1 kip

Member Properties — HP14x89 — A36

Full Section

Specified minimum yield stress	F_y	=	36	ksi	Cross sectional area	A	=	26.1	in^2
Modulus of Elasticity of Steel	E	=	29,000	ksi	Moment of inertia	I_x	=	904	in^4
Beam depth	d	=	13.83	in	Radius of Gyration	r_x	=	5.88	in
Web thickness	t_w	=	0.615	in	Moment of inertia	I_y	=	326	in^4
Flange width	b_f	=	14.695	in	Radius of Gyration	r_y	=	3.53	in
Flange Thickness	t_f	=	0.615	in					

Deteriorated Section (50% Section Loss)

Beam depth	d	=	13.522	in	Cross sectional area	A	=	13.0	in^2
Web thickness	t_w	=	0.3075	in	Moment of inertia	I_x	=	441	in^4
Flange width	b_f	=	14.388	in	Radius of Gyration	r_x	=	5.83	in
Flange Thickness	t_f	=	0.3075	in	Moment of inertia	I_y	=	153	in^4
					Radius of Gyration	r_y	=	3.43	in

Axial Load Design Compression

Full Section

REF.	CALCULATIONS	ANSWER
	Slenderness Ratio: $K * L / r_y$	51.0
	$K * L / r_y \le 200$	OK
	$4.71 * \sqrt{(E / F_y)}$ =	133.7
AISC E3-4	$F_e = (\pi^2 * E) / (K * L / r_y)^2$ =	110.08
AISC E3-2	if $K * L / r_y \le 4.71 * \sqrt{(E / F_y)}$: $F_{cr} = F_y * [0.658^{(F_y/F_e)}]$	31.4 ksi
AISC E3-3	if $K * L / r_y > 4.71 * \sqrt{(E / F_y)}$: $F_{cr} = 0.877 * F_e$	NA ksi
AISC E3-1	Nominal Compression Axial Strength: $P_n = A_g * F_{cr}$ =	819.4 kip
	Resistance Factor for Compression: Φ_c =	0.85
	$\Phi_c P_n$ =	696.5 kip
	$\Phi_c P_n \ge P_u$	OK

Deteriorated Section

REF.	CALCULATIONS	ANSWER
	Slenderness Ratio: $K * L / r_y$	52.5
	$K * L / r_y \le 200$	OK
	$4.71 * \sqrt{(E / F_y)}$ =	133.7
AISC E3-4	$F_e = (\pi^2 * E) / (K * L / r_y)^2$ =	103.70
AISC E3-2	if $K * L / r_y \le 4.71 * \sqrt{(E / F_y)}$: $F_{cr} = F_y * [0.658^{(F_y/F_e)}]$	31.1 ksi
AISC E3-3	if $K * L / r_y > 4.71 * \sqrt{(E / F_y)}$: $F_{cr} = 0.877 * F_e$	NA ksi
AISC E3-1	Nominal Compression Axial Strength: $P_n = A_g * F_{cr}$ =	404.9 kip
	Resistance Factor for Compression: Φ_c =	0.85
	$\Phi_c P_n$ =	344.2 kip
	$\Phi_c P_n \ge P_u$	OK