PORT OF SAN FRANCISCO

MEMORANDUM

February 6, 2026

TO: MEMBERS, PORT COMMISSION
Hon. Gail Gilman, President
Hon. Stephen Engblom, Vice President
Hon. Willie Adams
Hon. Steven Lee
Hon. Ken McNeely

FROM: Michael Martin
Acting Executive Director

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Michael Martin
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SUBJECT: Informational presentation on the Port's Rapid Structural Assessment Program.

DIRECTOR'S RECOMMENDATION: Information Only – No Action Required

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EXECUTIVE SUMMARY

This staff report provides an informational update on the structural condition of the Port's over-water structures, primarily piers, wharves, and seawalls. The Port performs recurring engineering inspections of its over-water structures through its Rapid Structural Assessment (RSA) Program. Performing recurring inspections is necessary to identify and mitigate public safety issues with the Port's historic over-water structures. With funding limitations, it is not possible to repair and maintain all the Port's existing waterfront structures. The Port performs the highest priority repairs identified by the RSA Program, often working with tenants who have maintenance responsibility. For facilities where repairs are not prioritized, the RSA Program implements load restrictions, localized closures, and eventually fully closes facilities before safety incidents occur. While many of the Port piers and wharves do not have load restrictions or closures, the average condition of these structures falls between *Fair* and *Poor,* utilizing the overall system rating developed by the American Society of Civil Engineers (ASCE).

STRATEGIC OBJECTIVE

The Port's Rapid Structural Assessment Program supports the Port's Strategic Plan through the following goals:

Productivity
Attract and retain tenants to build an economically successful and vibrant waterfront.
The structural assessment program is critical to ensuring the safety of continued operations on the Port's piers and wharves, and provides information on facility conditions that is critical for assessing the viability of new tenants and uses.

Resilience
Reduce seismic and climate change risks to protect the waterfront, City neighborhoods, and infrastructure.
The structural assessment program provides age and condition information on our waterfront infrastructure, which is critical for the Port's resilience planning.

Evolution
Evolve the waterfront to respond to changing public and Port needs.
Regular inspections of the Port's marine substructures are critical for safe continued use of these 100-year-old structures, extending their functional life well beyond their original maritime use.

Engagement
Engage constituents and the public on Port functions and activities.
This report details the physical extent and condition of Port's marine substructures, which are often invisible to the general public.

BACKGROUND

The Port of San Francisco owns and operates approximately 7 million square feet of pile-supported over-water structures, an area roughly equivalent to the size of Yerba Buena Island. Over-water structures account for nearly half of the Port's jurisdictional area in the Embarcadero Waterfront, and about one quarter of the Port's total jurisdictional area, considering the Port's larger land-side footprint south of Mission Creek.

Compared to structures on land, deterioration of the Port's piers and wharves occurs relatively quickly due to the aggressive marine environment. Consequently, inspection of structures built over the water has been an important function of the Engineering Division since the earliest years of the Port. Inspection findings drove the progression from short-lived, untreated wood piles to the durable reinforced concrete piles that make up most of the historic waterfront that we know today. Most of the Port's piers, wharves, and seawall structures have now been standing for more than 100 years.

In 2002, the Port established a formal Rapid Structural Assessment (RSA) Program, recognizing the need for performing inspections of our marine substructures on a regular basis and for consistently documenting inspection findings. RSA inspections are performed by Port and consultant engineers, often with support from experienced boat pilots from the

Maintenance Division. During low tides, small work boats that can fit between closely spaced files are used to access the underside of marine substructures. While the Port does not have the fiscal resources to address all recommended structural repairs identified in the inspections, the RSA Program has been successful in identifying damage and limiting or ceasing operations at facilities before a safety incident occurs.

In 2015, ASCE published the Waterfront Facilities Inspection and Assessment Manual (manual) of engineering practice. The manual sets standards for the evaluation of marine substructures and components and provides guidance on inspection intervals. The Port has adopted the inspection interval recommendations in the manual of practice in its RSA Program. As a result, the Port has adjusted the inspection frequency of marine substructures as recommended by the manual; substructures in poor condition are inspected more frequently, and substructures in good condition are inspected less frequently. In addition, the manual's standardized terminology is used by Port and consultant engineers to consistently document inspection findings (e.g., a concrete pile with *minor* damage vs. *severe* damage).

Due to resource constraints, the scope of the Port's Rapid Structural Assessment inspections is generally less than the scope of a *routine inspection* as defined in the ASCE Manual. The primary gap is the manual's recommendation to routinely perform underwater structural inspection with qualified diver-inspectors. Such underwater inspections have significant costs and are logistically challenging, requiring specialist consultants to perform. Our current practice is to ensure that all marine substructures that the Port operates and maintains are frequently observed above water by experienced engineers, and to contract underwater inspections when above water inspections identify a need.

PROGRESS ON INSPECTIONS

Port staff last updated the Port Commission on the Rapid Structural Assessment Program at its February 22, 2022, meeting. The program had fallen behind in completing regular inspections primarily due to the COVID-19 pandemic. During that time, social distancing requirements prevented above-water inspections, which require at least two people together in a small work boat. In the 2022 update, the Engineering Division committed to addressing overdue inspections and to completing future inspections on-schedule.

Since the February 2022 update, all Port substructure inspections, except for some facilities under long-term lease agreements[1], have been inspected, and there are no outstanding substructure inspections at this time. This was accomplished by filling vacancies in the Engineering Division's structural engineering team and expanding the number of consultant firms capable of performing inspections in the 2022 and 2025 Engineering as-needed professional services contracts.

We have also reorganized our inspection program for building structures and superstructures to prioritize historic structures at elevated risk and inspections mandated by legacy lease terms. Historic structures at elevated risk are primarily pier sheds with

[1] Listed from north to south: PIER 39 leasehold (Pier 41 to Pier 35½); Pier 3; Ferry Building – Long-term leaseholds where tenant does not have an obligation to provide substructure inspection reports to Port of San Francisco

timber elements that are susceptible to dry rot. Leases executed for Port facilities in the 1970's obligated the Port to perform inspections and inform tenants of substructure and building structure conditions. At facilities with such leases, the Port continues to perform building structure inspections in addition to regular substructure inspections. For the remainder of the Port's buildings, the risk of structural deterioration is low, and RSAs are performed on an as-needed basis, such as when a concerning condition is noticed or when tenancy changes.

STATUS OF LOAD RESTRICTED AND FULLY RESTRICTED SUBSTRUCTURES

RSA findings and recommendations are summarized in a standardized report format, which includes a structural rating indicated by a simple colored map of the facility. The structural rating coloring scheme is described below:

- *Green* (serviceable condition, no live load reductions or restrictions, and unrestricted use consistent with original design)

- *Yellow* (restricted use, load limit signs indicating reduced live loads and/or barricades, further structural review and structural repairs required)

- *Red* (restricted access, unsafe, poor structural condition)

Attachment 1 graphically depicts the current structural ratings of the Port substructures as of the date of this report.

The *Green-Yellow-Red* rating system communicates the current operational limitations for each substructure, with the findings valid until the date of the next recommended re-inspection.

It is important to note that a *Green*-rated facility may still have significant repair needs. The *Green* rating means that damage observed by inspection has not progressed to the point where a load restriction is warranted, based on engineering analysis and professional judgement. The damage observed in Green-rated structures is documented in the inspection report for future monitoring and prioritization of repair work.

IMPROVEMENTS SINCE FEBRUARY 2022

Since 2022, the Port has successfully completed new construction, facility rehabilitation, and facility demolition projects, often by leveraging public-private development partnerships. These projects offset the gradual degradation of our oldest waterfront structures and renew the Port's overall portfolio of infrastructure.

<u>New and Significantly Rehabilitated Assets:</u>
The Port and its public and private sector partners have completed significant new construction projects since February 2022:

- Wharf J9 Floating Dock
- Fire Station 35
- Mission Rock Phase 1

- China Basin Park and Bayfront Park
- Crane Cove Park Building 49
- Pier 70 Building 12

Although most of these projects do not provide new over-water structures, these projects are enormous contributions to the Port's overall portfolio of properties and infrastructure. Mission Rock Phase 1 alone consists of four new buildings totaling 1.2 million square feet, more square footage than 10 typical Port pier sheds.

Substructure Demolition Projects:
The Port has utilized the California State General Funds, Port Capital, as well as other sources, to demolish red-tagged timber structures in:

- Fisherman's Wharf (Smokehouse)
- South Beach (Pier 38 South Apron, with Pier 60 scheduled for removal in 2026)
- Southern Waterfront (Pier 50 South Apron, and portions of Pier 90).

These demolition projects are relatively quick to obtain regulatory approval and reduce the Port's liabilities associated with unused, decaying structures.

Substructure Repair and Replacement Projects:
The following projects completed since February 2022 directly improve the condition of the Port's substructures:

- Pier 47 Wharf J8 urgent timber pile repairs
- Pier 27 Fender 7 steel repairs
- Pier 23 North Apron damaged concrete pile and deck replacement
- Downtown Ferry Terminal Gates C & D steel boarding structure repairs (by Golden Gate Ferry)
- Ferry Building substructure maintenance (by Hudson Pacific Properties)

In all cases except the Ferry Building work, the completed project removed a significant operational restriction on the facility.

The completion of these repairs and new assets revitalize the waterfront for public and maritime use and allow for hosting events in safe locations where older facilities no longer have capacity.

NEW LOAD RESTRICTED AND UNSAFE AREAS OF PORT SUBSTRUCTURES

In the past four years, Port Engineering completed an unusually high number of substructure inspections in order to address the backlog of inspections that existed in February 2022. A small but significant number of substructure inspections resulted in new load-restricted areas (yellow tags) and unsafe areas (red tags).

Significant Reductions in Allowable Loading Since February 2022 (yellow-tags):

- Pier 45 West Apron adjacent to Shed D
- Pier 35 marginal wharf
- Pier 30-32 valley area

Unsafe Areas Identified Since February 2022 (red-tags):

- Localized portion of Pier 47, western end
- Localized portion of Pier 45 West Apron adjacent to Shed D
- Localized portion of Pier 43
- Localized portion of Pier 17½
- Localized portion of Pier ½
- Exterior deck north and east of the Agriculture Building – re-routing emergency egress where practical; some spaces cannot be leased
- Localized portion of Pier 50 Valley
- Pier 54 – entire pier closed, tenants relocated

Red-tag and yellow-tag areas can severely impact Port operations and tenant business. Inspection recommendations are carefully reviewed by Engineering staff. Once confirmed by Engineering, multiple Port divisions collaborate to inform impacted stakeholders, implement suitable signage and barricades, and develop near-term repair plans when feasible. The intent of implementing a load restriction or unsafe area is to prevent occupancy or loading that could result in a safety incident.

OVERALL SYSTEM RATINGS OF PORT SUBSTRUCTURES

As previously noted, many of the Port's 100-year-old marine substructures have significant repair needs, which may not be reflected in the *Green-Yellow-Red* rating system meant to communicate near-term operational limitations. A substructure rated *Green* may be in like-new condition or may need extensive repairs. The ASCE manual provides a standardized scale of *overall system ratings* ranging from *6 Good* to *1 Critical*. The full rating system is reproduced in the following Table 1:

Table 1: Definitions of Overall System Ratings by ASCE

6	*Good*	*No visible damage or only minor damage noted. Structural elements may show very minor deterioration, but no overstressing observed. No repairs are required.*
5	*Satisfactory*	*Limited minor to moderate defects or deterioration observed but no overstressing observed. No repairs are required.*
4	*Fair*	*All primary structural elements are sound but minor to moderate defects or deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.*
3	*Poor*	*Advanced deterioration or overstressing 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.*

Since 2023, Port Engineering Staff and its consultants performing RSA's have assigned an *overall system rating* as part of each inspection report. RSA inspections are less detailed than *routine inspections* as defined by the manual, and usually exclude underwater inspection unless needed. With those limitations known, the overall system rating still provides useful and actionable information to the Port. The 6-1 overall system rating provides more systematic asset management data than the *Green-Yellow-Red* system, especially in cases where a single pier may have unrestricted areas (*Green*), load-limited (*Yellow*), and unsafe for use (*Red*). The overall system rating is also used as guidance for how soon a re-inspection should occur, subject to the professional judgement of the inspecting engineer.

Table 2 below provides the overall system ratings for Port-sub areas, averaged by total area. The Port does not have such ratings for major marine substructures with long-term leases[2] because even when tenants are required to provide RSA inspections by lease, they are not required to provide the overall system rating. Generally, the excluded long-term lease substructures are in better condition due to improvements made as a condition

[2] Listed from north to south: PIER 39 leasehold (Pier 41 to Pier 35½); Exploratorium leasehold (Pier 17 to Pier 15); Wharves at Piers 1 ½, 3, and 5; Pier 3; Pier 1; Ferry Building; Ballpark Promenade Substructure

of the long-term lease. Excluding such long-term leaseholds is useful because the data below represents only the substructure assets that Port and our direct tenants have a current responsibility to maintain and repair.

Table 2: Overall System Ratings Averaged for Port Substructures

Location	Average Overall System Rating [3]	Substructures Excluded
All Port Substructures	3.5	*See sub-areas below*
Fisherman's Wharf	3.8	Piers 41-35½
North-East Waterfront	3.4	Piers 15-17, 1-5
South Beach	3.1	Ferry Building, Ballpark Promenade
Southern Waterfront	3.8	Pier 52, 54, 70 (fully vacated piers)

The average Port-managed substructure falls between *4 Fair* and *3 Poor*, with minor variation between different geographic sub-areas. The differences in sub-area ratings correlate with the average age of substructures within these sub-areas, with older marine substructures generally being in worse condition. Ratings for individual marine substructures are shown on a Port-wide map in **Attachment 2**.

FUTURE ENVIRONMENTAL FACTORS

A combination of future environmental factors will contribute to accelerated deterioration of the Port's substructures and make inspection and repair of these assets more difficult and costly. With sea level rise, the underside of pier decks will be more frequently exposed to damaging seawater. The available low tides needed to inspect and perform repair work underneath the piers will also decrease as sea levels rise. In addition, environmental degradation of the reinforced concrete that makes up most of the Port's remaining historic substructures will accelerate unless repairs are made. Combined, these factors will drive up the cost of future repair projects beyond the typical yearly escalation in construction costs.

CAPITAL PLANNING

The Port's latest ten-year Capital Plan identifies an unfunded state of good repair investment need of approximately $1.9 billion across all of the Port's assets. Aging marine substructure assets represent a significant proportion of this maintenance backlog and are literally the foundation that supports all other assets that make up our over-water facilities. Substructure condition ratings from the RSA Program are a key piece of information in the complex decision-making of where to invest the Port's limited capital resources. The program is also a critical safety net for facilities not selected for repair investments, monitoring for continued deterioration, and modifying operations when required.

[3] Averaged by area of over-water structure: (sum of [facility area × facility rating]) ÷ (sum of [facility area]). Large facilities influence the average more than smaller facilities.

CONCLUSION

The safety of Port facilities is critical to the Port's mission and business lines. Performing regular inspections is necessary to identify and mitigate public safety issues with our historic buildings, piers, wharves, and seawalls. With funding limitations, it is not possible to repair and maintain all the Port's existing waterfront structures. The Port performs the highest priority repairs identified by the RSA Program, often working with tenants who have maintenance responsibility. For facilities where repairs are not prioritized, the RSA Program implements load restrictions, localized closures, and eventually fully closes facilities before safety incidents occur. The Port uses a simple Green-Yellow-Red rating system to communicate these operational limits. While many Port facilities are rated Green (capable of supporting design loads), the average condition of the marine substructures operated by the Port falls between *Fair* and *Poor,* utilizing the overall system rating developed by ASCE.

Like much of the Port's operations, the RSA Program was impacted by the COVID-19 pandemic, but since the last update to the Port Commission in 2022, all Port-leased and Port-maintained substructures have been inspected, and regular substructure inspections are occurring on schedule. Staff have made incremental improvements to this critical program, prioritizing marine substructures, historic buildings at elevated risk for deterioration, and adopting more practices from the ASCE Waterfront Facilities Inspection and Assessment manual. The importance of the RSA Program will grow as our facilities progressively age and are subjected to sea level rise impacts. Port Engineering continually assesses the effectiveness of the program and will implement improvements necessary to maintain public safety.

Prepared by: Matthew Bell, Acting Chief Harbor Engineer
Engineering

For: Wendy Proctor, Deputy Director
Engineering

EXHIBITS

1. List of Yellow-Rated Substructures – Restricted Use
2. List of Red-Rated Substructures – No Use Permitted Without Repairs

ATTACHMENTS

1. Substructure Load Restriction Map
2. Substructure Overall System Rating Map

Exhibit 1

List of Yellow-Rated Substructures – Restricted Use

Facility	Structural Problem
Wharf J11	Deteriorated wood piles
Pier 47	Deteriorated wood piles
Pier 45 Aprons	Deteriorated wood piles
Pier 43½	Deteriorated wood deck framing
Pier 35 Substructure	Corrosion damage in structural concrete piles, beams, and slab
Pier 33½ Marginal Wharf - North End	Corrosion damage in structural concrete piles, beams, and slab
Pier 33 Substructure	Corrosion damage in structural concrete piles, beams, and slab
Pier 31 Substructure	Marginal wharf and outer end have corrosion damage, mainly in concrete beams
Pier 29½ Substructure	Corrosion damage in structural concrete piles, beams, and slab
Pier 29 Substructure	Corrosion damage primarily in deep concrete deck girders
Pier 23.5 Substructure	Spalling of beams, girders, and slab panels
Pier 17½ Marginal Wharf	Corrosion damage in structural concrete piles, beams, and slab
Pier 17	Corrosion damage at marginal wharf deck and east end
Pier 9½ Marginal Wharf	Corrosion damage in structural concrete piles, beams, and slab
Pier 9 – Portions of North Apron	Deteriorated wood piles
Pier ½	Beams and slab show spalling, deterioration, racks
Ferry Plaza	Localized area with corrosion damage in concrete deck slab
Pier 26	Corrosion damage in structural concrete piles, beams, and slab
Pier 26½	Deteriorated wood piles
Pier 28½ Marginal Wharf	Corrosion damage in structural steel beams and concrete deck slab
Pier 30-32	Corrosion damage in structural concrete piles, beams, and slab

Facility	Structural Problem
Pier 38 Substructure	Corrosion damage in structural concrete slab and structural steel beams. Unpermitted modifications by past tenant.
Pier 40	Corrosion damage in structural concrete slab and structural steel beams
Pier 48½ Marginal Wharf	Corrosion damage in structural concrete piles, beams, and slab
Pier 50 Shed A (North) Apron	Deteriorated wood piles
Pier 50 - Portions of Valley	Corrosion damage in structural concrete piles, beams, and slab
Pier 48½ Marginal Wharf	Corrosion damage in structural concrete piles, beams, and slab
Pier 68 – Portions of High Water Platform	Corrosion damage in structural concrete beams.
Pier 90 Wharf near Illinois St.	Deteriorated wood piles
Pier 92 Timber Apron, west end	Deteriorated wood piles

Exhibit 2

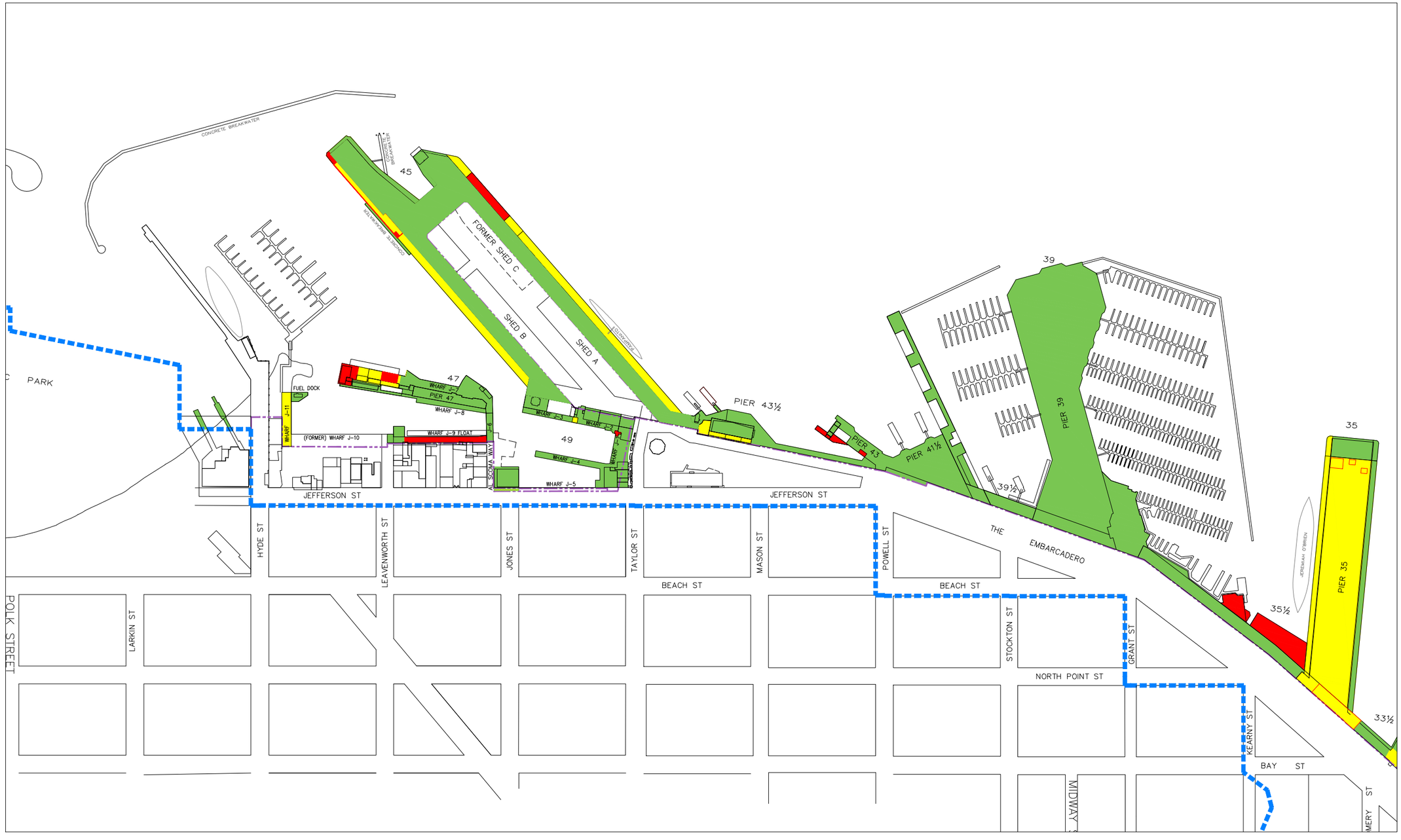
List of Red-Rated Substructures – No Use Permitted Without Repairs

Facility	Structural Problem
North end of Pier 47	Deteriorated wood piles
Pier 45 Aprons	Deteriorated wood piles requiring localized red tag areas on West Apron, and large red tag area on East Apron adjacent to former Shed C
SWL 302 Lease Parcels	Section of deck with dry rot and damaged pile
Wharf J9	Failed railing and deteriorated timber seawall. Does not impact newly constructed floating dock at Wharf J9
Fisherman's Grotto	Localized area with deteriorated wood piles, repairs planned in 2026
Pier 43	An inaccessible portion of the deck is red-tagged due to pile deterioration, timber deck deterioration and lack of guardrails. A localized portion of the publicly accessible deck is barricaded due to one missing pile.
Pier 35½ Timber Decks	Dry rot in deck boards and girders (Maintained by PIER 39)
Pier 33 North Apron	Depressed track not infilled and thus not suitable for pedestrian use
Pier 19 North Apron	Deteriorated wood deck and piles at portion of timber apron that could not be demolished because it is inside Pier 19½ shed building.
Pier 17½	Localized area with severe damage to reinforced concrete deck slab. Will be temporarily mitigated by steel plating above deck.
Pier 9 North Apron – Lower Rail Deck	Deteriorated timber decking at unused depressed track area
Pier ½	Localized area barricaded as a precaution due to beam with apparent severe damage and no available record drawings to assess observed damage in detail
Agriculture Building – North & East exterior decks	Corrosion damage in structural concrete piles, beams, and slab. Significant areas with no remaining reinforcing steel.
Tidal Steps at Pier 14	Corrosion damage to reinforced concrete steps.
Tidal Steps at Rincon Park	Corrosion damage to reinforced concrete steps.
Pier 26 North Apron	Depressed track not infilled and thus not suitable for pedestrian use
Pier 28 South Apron	Wood framing infill over depressed rail track is deteriorated

Facility	Structural Problem
Pier 38 – Remaining north apron	Entire Pier 38 is closed to public.
Pier 40, North-east corner	One steel girder has severe corrosion damage that was not addressed in past repairs by Redevelopment Agency.
Pier 48 North and South Aprons	Deteriorated and missing wood piles. South apron was functionally replaced by an external egress structure but timber structure remains.
Pier 50 – Portions of Valley	Areas not used for vehicle traffic have corrosion damage in structural concrete piles, beams, and slab.
Pier 52	Obsolete timber pier partially collapsed.
Pier 54	Corrosion damage in structural concrete piles, beams, and slab. Significant areas with no remaining reinforcing steel.
Pier 60	Obsolete timber pier partially collapsed. Slated for demolition in 2026.
Pier 68 - Portion of High Water Platform (Area 8)	A portion of the High Water Platform with concrete cylinder columns has excessive settlement.
Pier 70 Wharf 7 & 8	Obsolete pier structures are partially collapsed.
Pier 92 Timber Apron	Localized areas of damaged timber deck due to arson.
Pier 96 LASH Barge Mooring Pier	Obsolete timber mooring pier has partially collapsed.

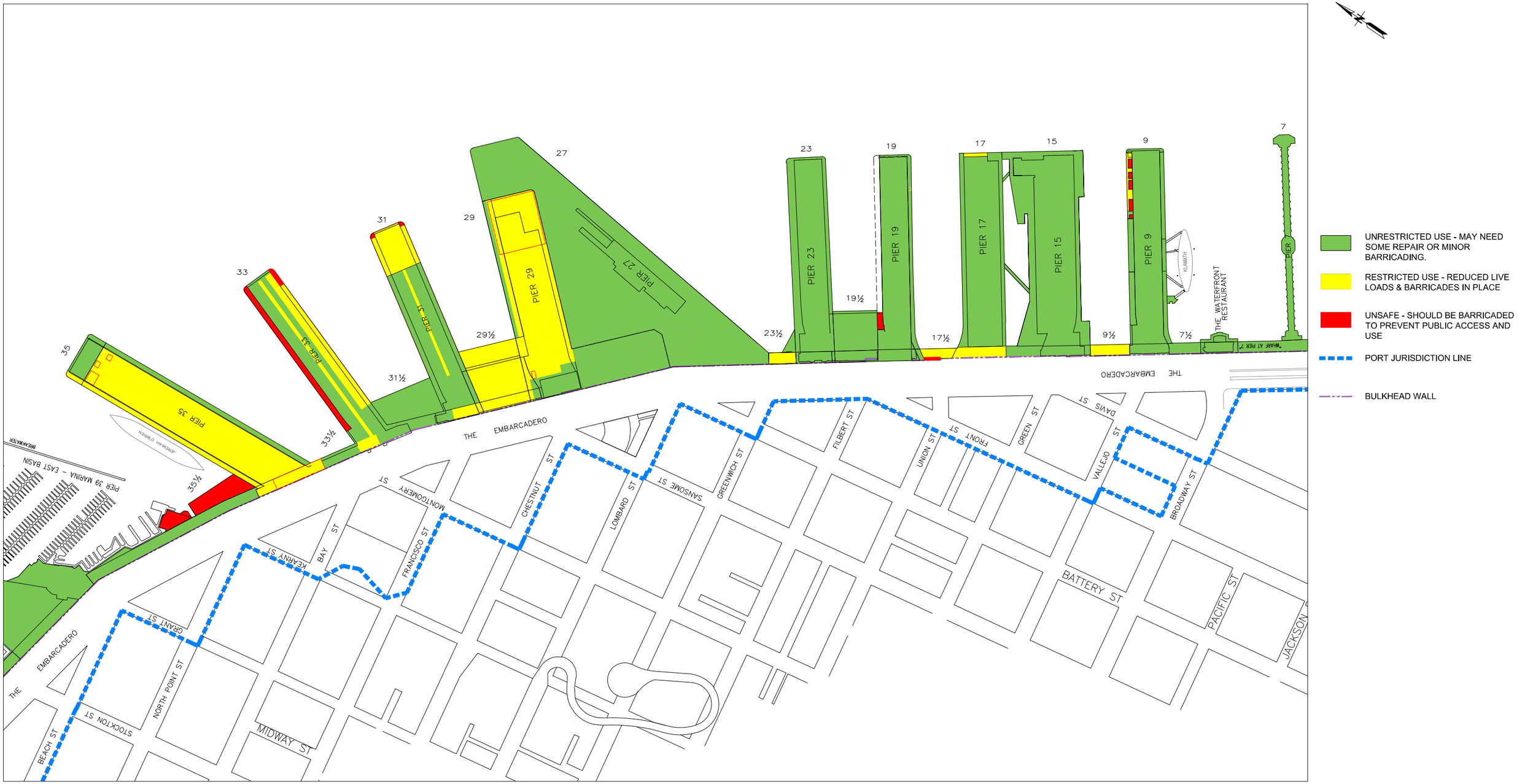
Attachment 1
Substructure Load Restriction Map

Attachment 1: Port Substructures
Load Restriction Map



- UNRESTRICTED USE - MAY NEED SOME REPAIR OR MINOR BARRICADING.
- RESTRICTED USE - REDUCED LIVE LOADS & BARRICADES IN PLACE
- UNSAFE - SHOULD BE BARRICADED TO PREVENT PUBLIC ACCESS AND USE
- PORT JURISDICTION LINE
- BULKHEAD WALL

Attachment 1: Port Substructures
Load Restriction Map



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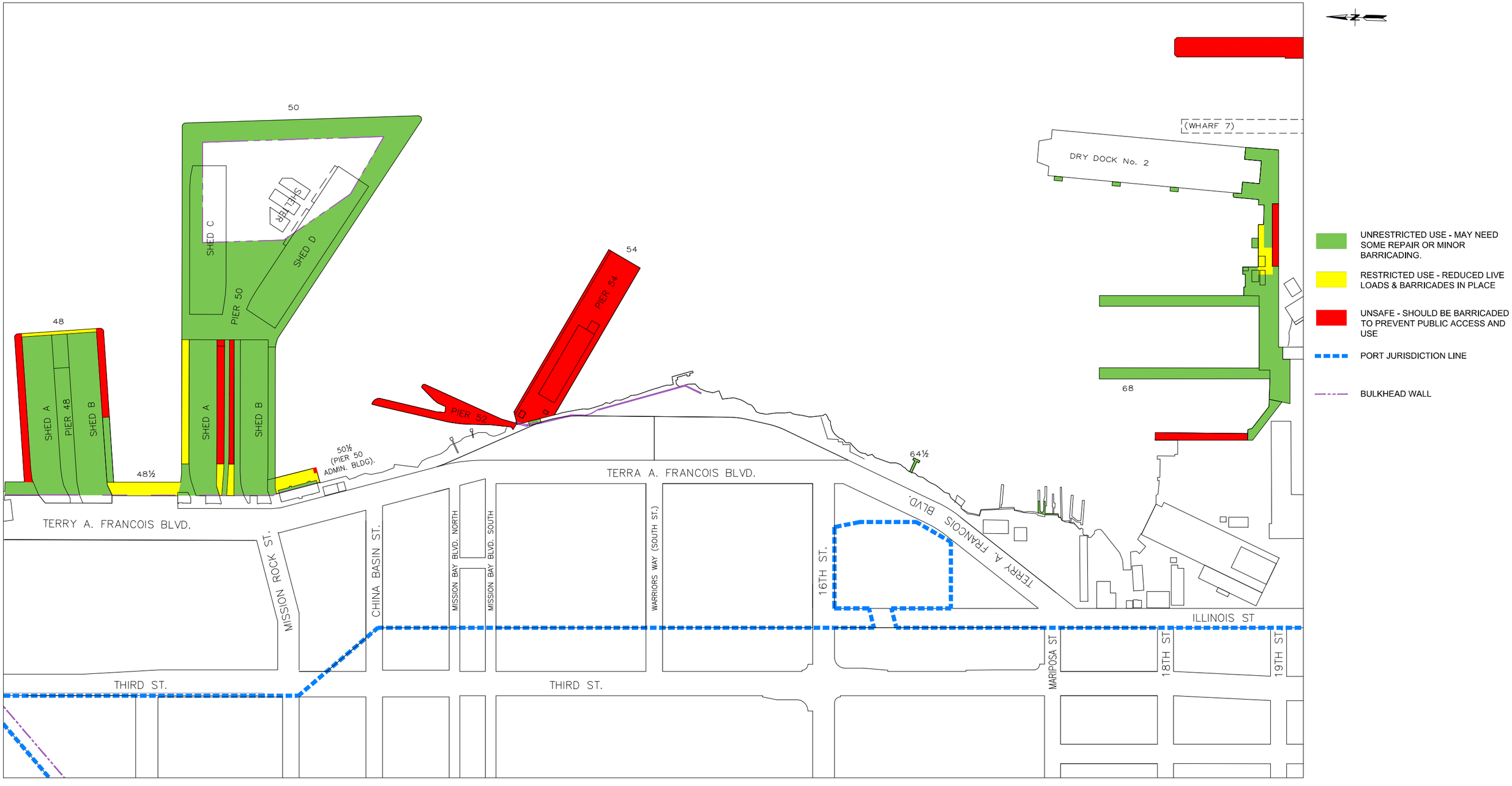

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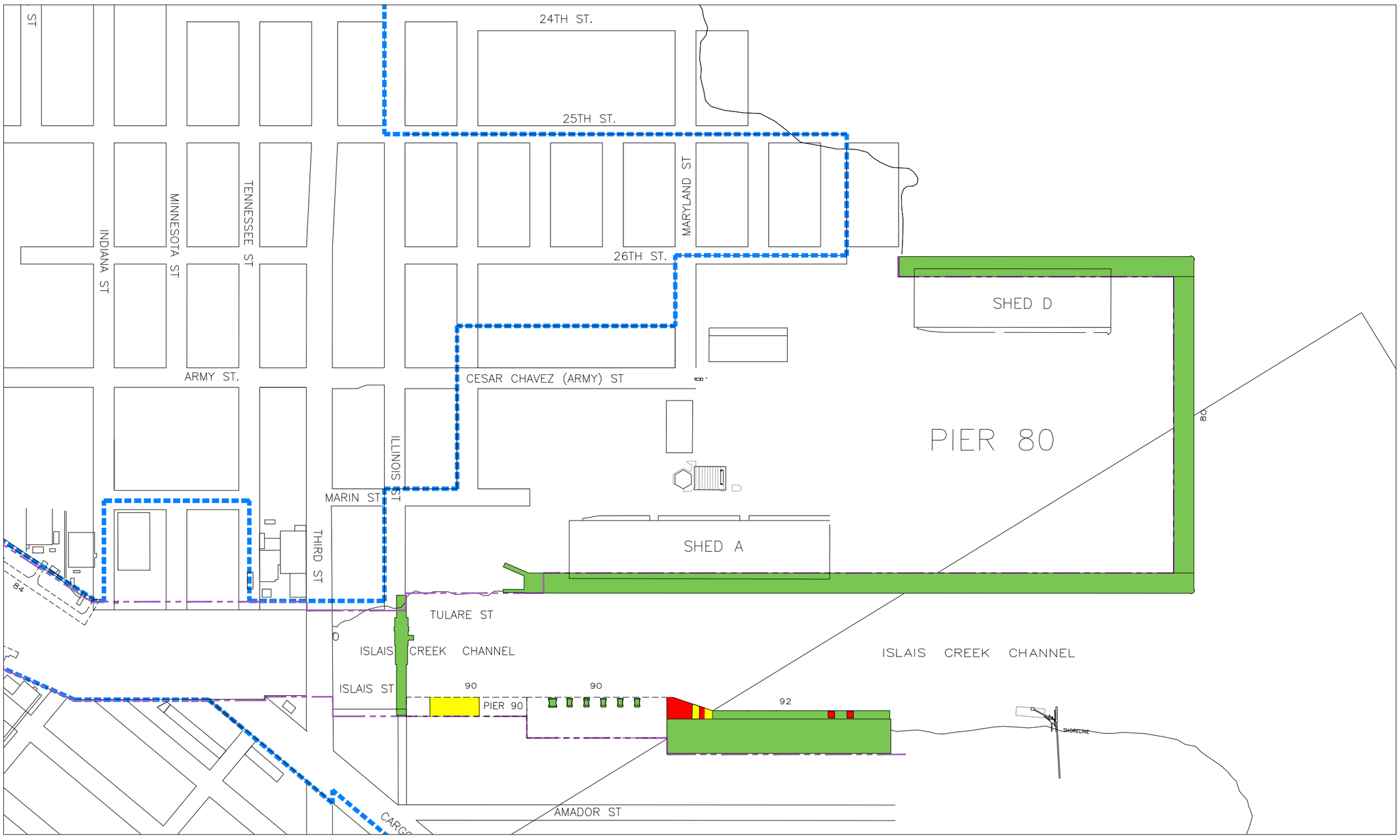

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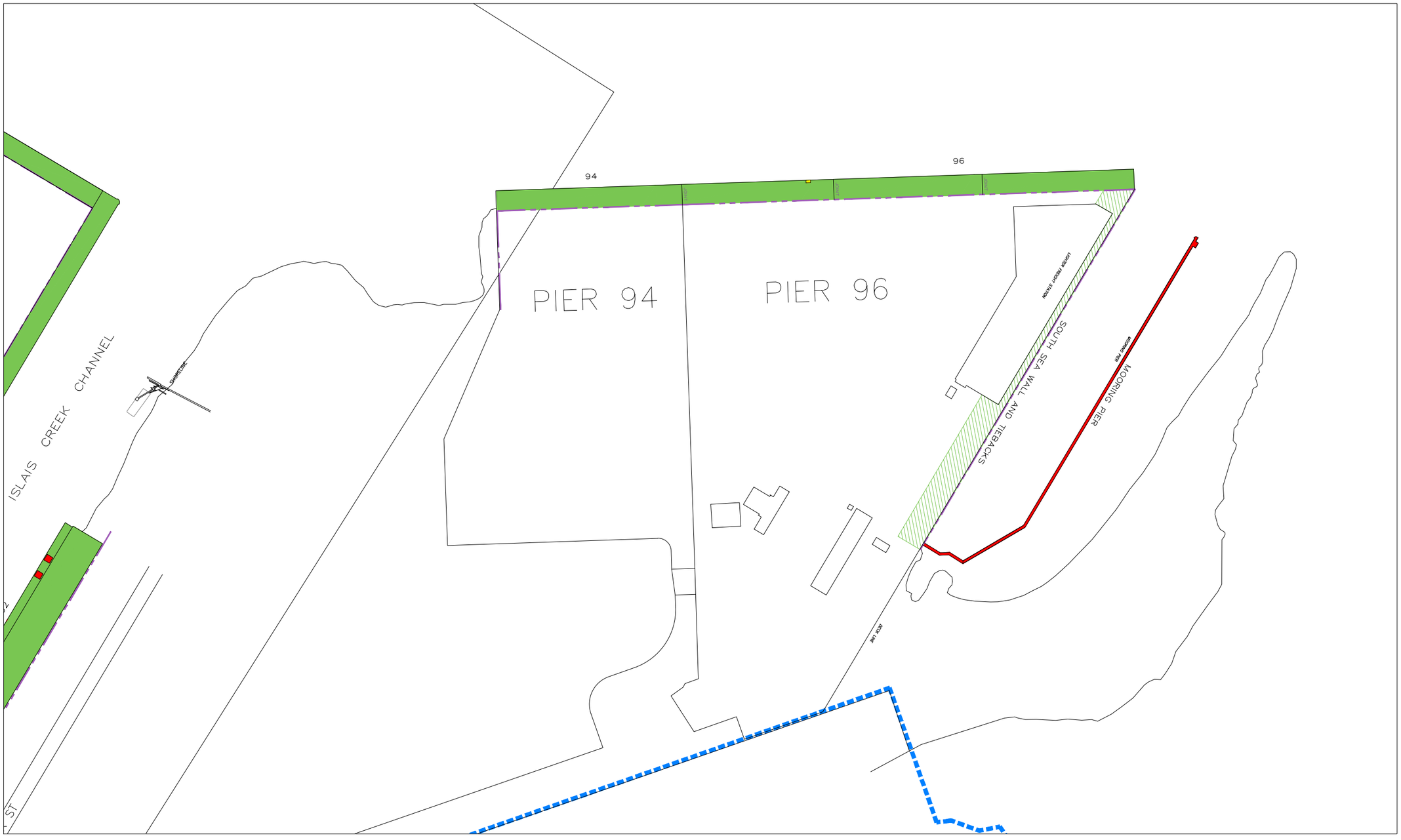
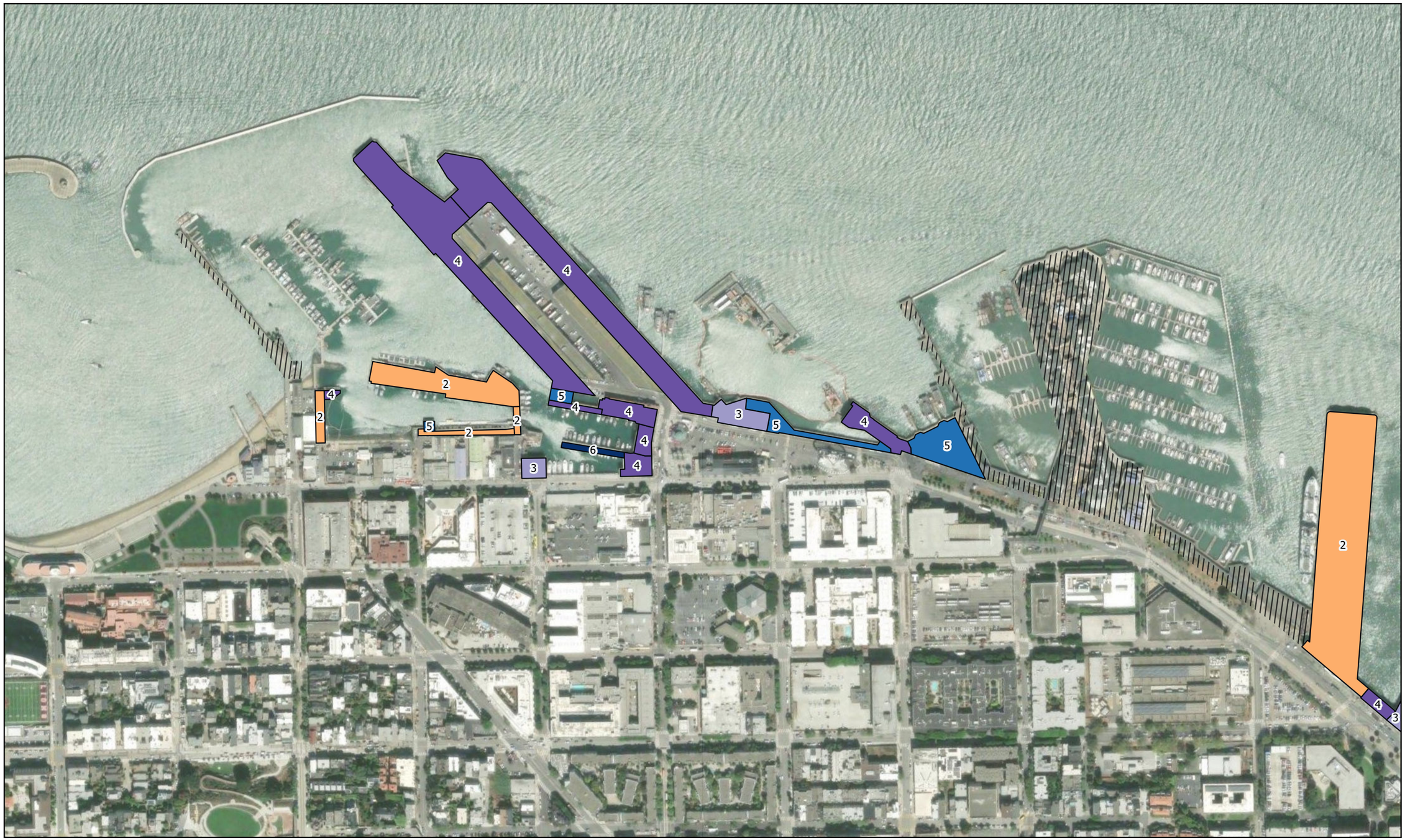


Attachment 2
Substructure Overall System Rating Map

Attachment 2: Port Substructures
Overall System Rating per ASCE



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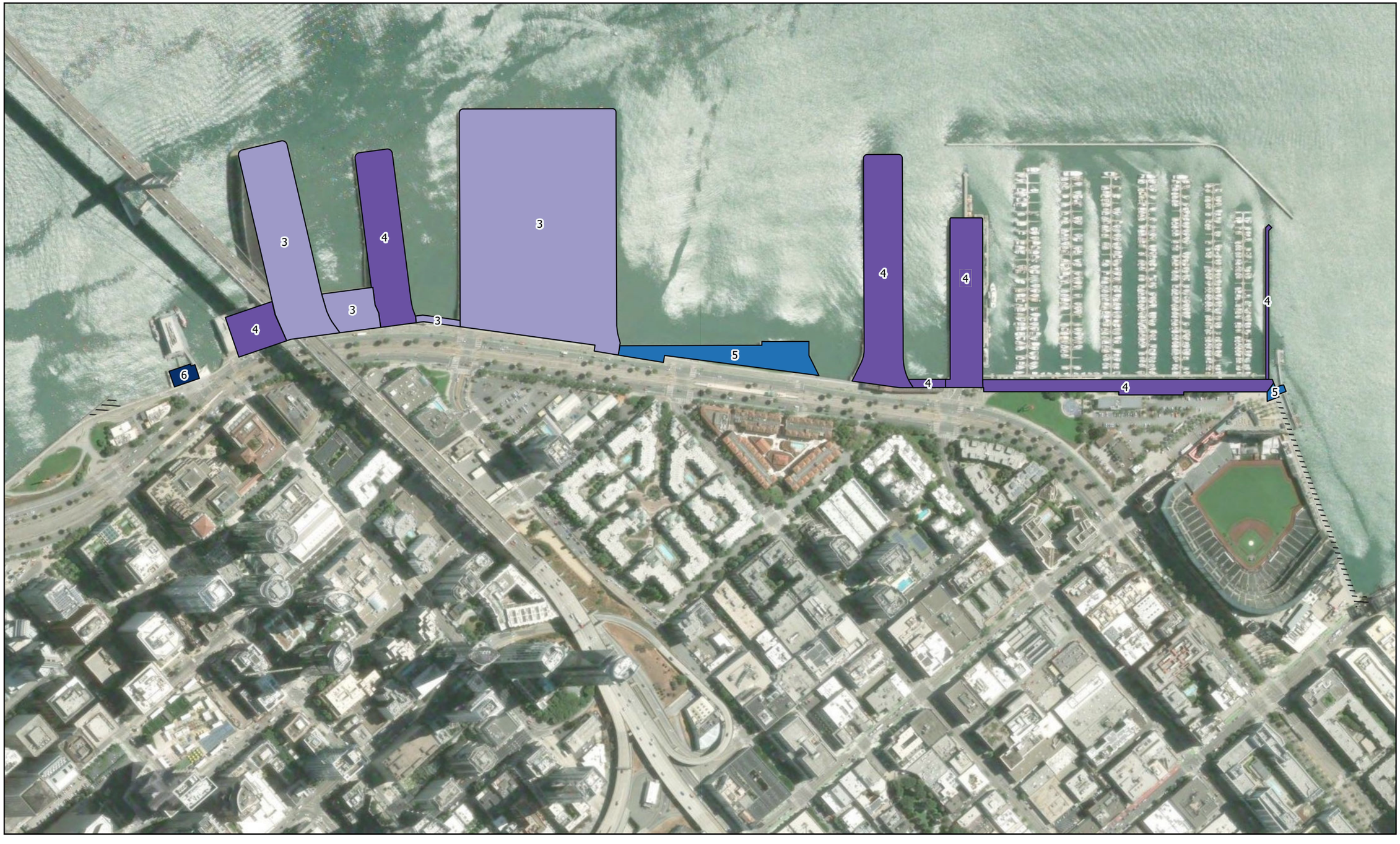

Attachment 2: Port Substructures
Overall System Rating per ASCE

Attachment 2: Port Substructures
Overall System Rating per ASCE

ASCE Rating

- 6 *Good*
- 5 *Satisfactory*
- 4 *Fair*
- 3 *Poor*
- 2 *Serious*
- 1 *Critical*
- *No Rating*

N

0 250 500 1,000 Feet

Attachment 2: Port Substructures
Overall System Rating per ASCE