Mare Island Infrastructure Assessment (MIIA) Project

Project Overview and Highlights

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North Bay Watershed Association
October 4, 2024 Board Meeting

Agenda

1. Project Background
2. Project Highlights
   - Water System
   - Sewer System
   - Storm/Flood Control System & Sea Level Rise
3. Questions & Answers

MIIA Project Need & Purpose

Project Need:

- Much of the existing infrastructure (water, sewer, storm) is from the original Navy development of the Island, starting in the 1850s
- Original design standard, criteria, and capacities unknown
- Much of infrastructure known to be in poor (or unknown) condition

Project Purpose:

Assess infrastructure systems on Mare Island so the City and VFWD have a complete understanding of improvements needed to successfully serve the island to ensure Mare Island's future is not constrained by infrastructure limitations.

MIIA Project Timeline

November 2022

Project Initiated

November 2022 to August 2024

Desktop and field evaluations

Oct 2023 to Aug 2024

Workshops to discuss preliminary conclusions, draft report

Sept 2024

Public meeting & presentation

Nov/Dec 2024

Report Finalized

City/Board Presentation

December 2024

Grant/Project Closes

(seeking extension)

MIIA Project Team & Disciplines

City of Vallejo Economic Development Department – led grant administration

City of Vallejo Water Department – Water System

City of Vallejo Public Works Department – Roads

Vallejo Flood and Wastewater District – Sanitary and Stormwater Systems

Mare Island Company – Mare Island developer

West Yost Consultant Team, including several specialist consultants

Funding from U.S. Economic Development Administration grant, Mare Island Company, City, and District

For Each System…

1) What is the current condition of the infrastructure?
2) What improvements are required to serve current and future needs?
   - ➢ Near-Term: 2027
   - ➢ Build-out: full development of Mare Island, 2063 (40 years)

Water System

Storm Drainage and Flood Control System

Sanitary Sewer System

Roads System

Dry Utility Systems

Did not cover: costing of improvements/recommendations, ownership, responsibilities

Water System Highlights

- Water Tank Condition and Seismic Assessment
- Water Pipeline Testing – Corrosion & Wall Thickness

Water Tank Assessment

Results:

- Exterior of the tank in good condition with isolated areas of moderate surface damage
- Interior concrete and structural components in good condition; interior piping has minor to moderate corrosion on fittings
- Seismic: maximum allowable water level in the tank should be limited to 7 feet below the roof soffit to maintain structural integrity during and after a seismic event

Concrete water tank (constructed 1999) located at the top of Club Dr. near USDA Forest Service building

Concrete support column (interior of tank)

Minor galvanic corrosion on inlet pipe flange (interior of tank)

Water Pipeline Field Condition Assessment

Eight (8) critical and representative metallic pipelines – visual assessment, broadband electromagnetic (BEM) testing, ultrasonic thickness (UT) testing to estimate wall thickness loss

Results:

- Exterior condition ranged from fair to good compared with pipelines of similar age, material
- Interior corrosion ranged from negligible to significant

Example 1: 20-inch cast iron pipe in Azuar Ave east of Building 1296

- 1931 pipe Class standard
- Minor surface corrosion; good exterior condition otherwise
- 18% wall thickness loss; moderate interior corrosion

Looking down at pipe, facing southwest

Side of pipe with minor surface corrosion

Water Pipeline Field Condition Assessment

Example 2: 12-inch cast iron pipe on the east side of Walnut Ave, between Building 521 and parking stalls

- 1908 pipe Class standard
- Minor surface corrosion; good exterior condition otherwise
- 22% wall thickness loss; significant interior corrosion

Photo 3-26. 12-inch cast iron pipe.

Photo 3-27. Minor surface corrosion.

Water Pipeline Field Condition Assessment

Table 3-10. Summary of Water Pipeline Testing Results

Site	Diameter and Material	Exterior Condition	Assumed Pipe Specifications				Maximum Thickness Loss			Interior Corrosion Level
			Class (Year of Standard)	Pressure Rating, ps	Nominal Thickness, inches	Casting Tolerance, inches	inches	Percent	Within casting tolerance?	
ID #2 Azuar Ave east of Bldg. 1296	20" CIP	Good	250 (1931)	250	0.88	0.08	0.160	18%	**No**	Moderate
ID Alt 2 West side of Nimitz Ave south of Causeway near Bldg. 599	14" CIP	Good	D (1908)	173	0.82	0.08	0.217	26%	**No**	Moderate
ID #1 Vault on the north side of the intersection of Nimitz Ave and Causeway	14" CIP	Fair	D (1908)	173	0.82	0.08	0.214	15%	**No**	Moderate
ID #4 West side of Nimitz Ave between Bldgs. 98 and 207	12" CIP	Fair	D (1908)	173	0.75	0.08	0.100	13%	**No**	Moderate
ID #9 East side of Walnut Ave opposite driveways for Bldg. 545	12" CIP	Good	B (1908)	86	0.62	0.08	0.041	7%	Yes	Negligible
ID Alt 1 West side of Walnut Ave just north of Connolly St	12" CIP	Fair	B (1908)	86	0.62	0.08	0.048	8%	Yes	Negligible
ID Alt 4 East of Walnut Ave between parking stalls and 521	12" CIP	Good	B (1908)	86	0.62	0.08	0.139	22%	**No**	Significant
ID Alt 3 West side of Nimitz Ave north of Building 680	10" DIP	Fair	50 (1965)	250	0.29	0.06	0.029	10%	Yes	Negligible

Extensive research to assign Class/Specification

Nominal thickness (specifications) compared to current thickness to determine if within specified casting tolerance

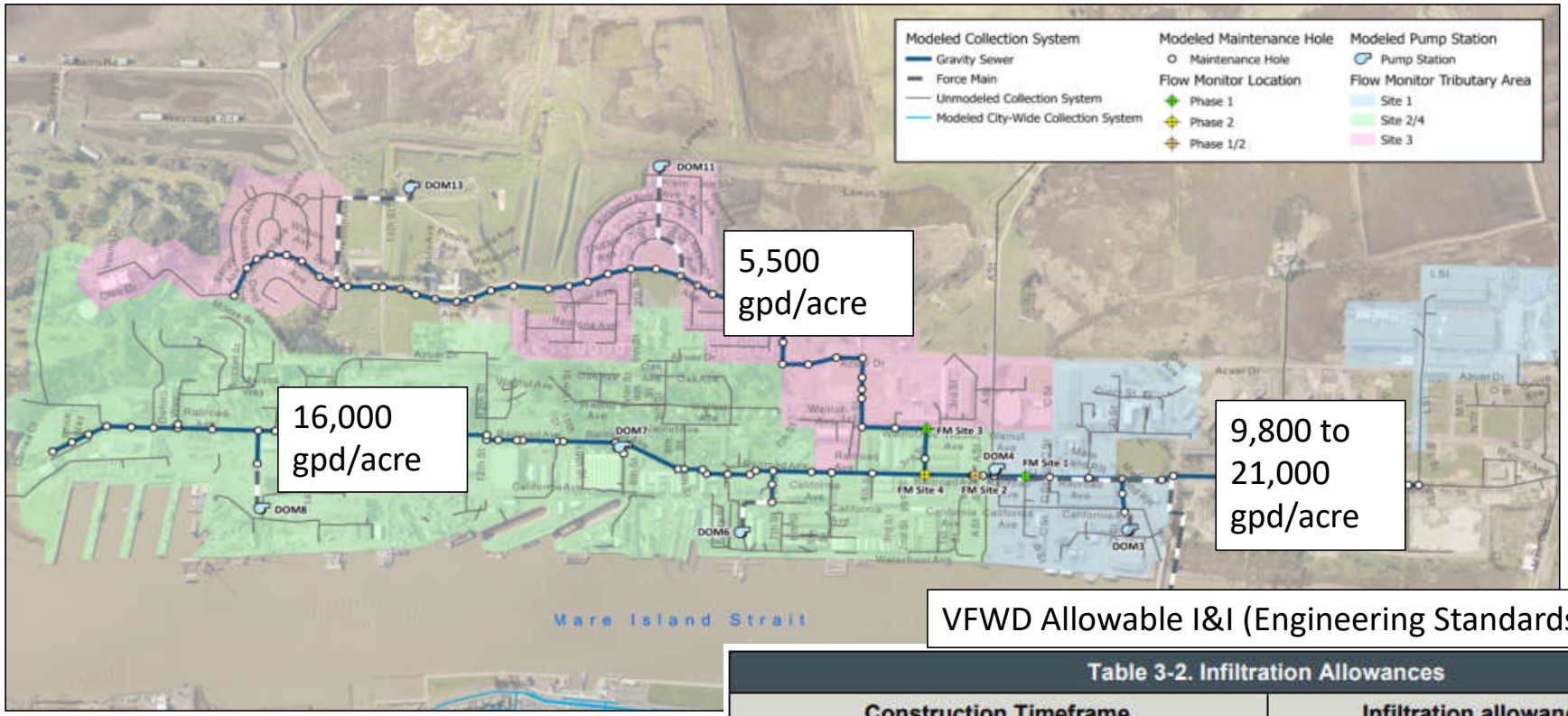
- Pipes with B (1908) pipe standard have a design pressure rating of 86 psi, just above City min. allowable service pressure of 80 psi, and below Mare Island normal operating conditions of 90-100 psi.
- City staff confirmed that changing pressures in the system, even as little as 5 psi have caused breaks and leaks.

Sanitary Sewer System Highlights

- Flow monitoring and I&I analysis
- CCTV of pipelines
- Smoke testing

Flow Monitoring

- Develop sewer flows and allow calibration of hydraulic model; I&I analysis
- Inflow and infiltration (I&I) is significant; up to **89% of peak storm flows**



VFWD Allowable I&I (Engineering Standards)

Table 3-2. Infiltration Allowances	
Construction Timeframe	**Infiltration allowance (gpd/acre)**
Built before January 1970	4,000
From 1970 – New development	600

Pipeline Condition Assessment – CCTV

- CCTV of 70 critical sewer pipelines using PACP standard
- Defects allow I&I to the system; exfiltration

Broken Pipe 4th St: 8” pipe South of Railroad Ave

Broken Pipe Walnut Ave: 8” pipe between Connolly St and Kansas St

Pipeline Condition Assessment – CCTV

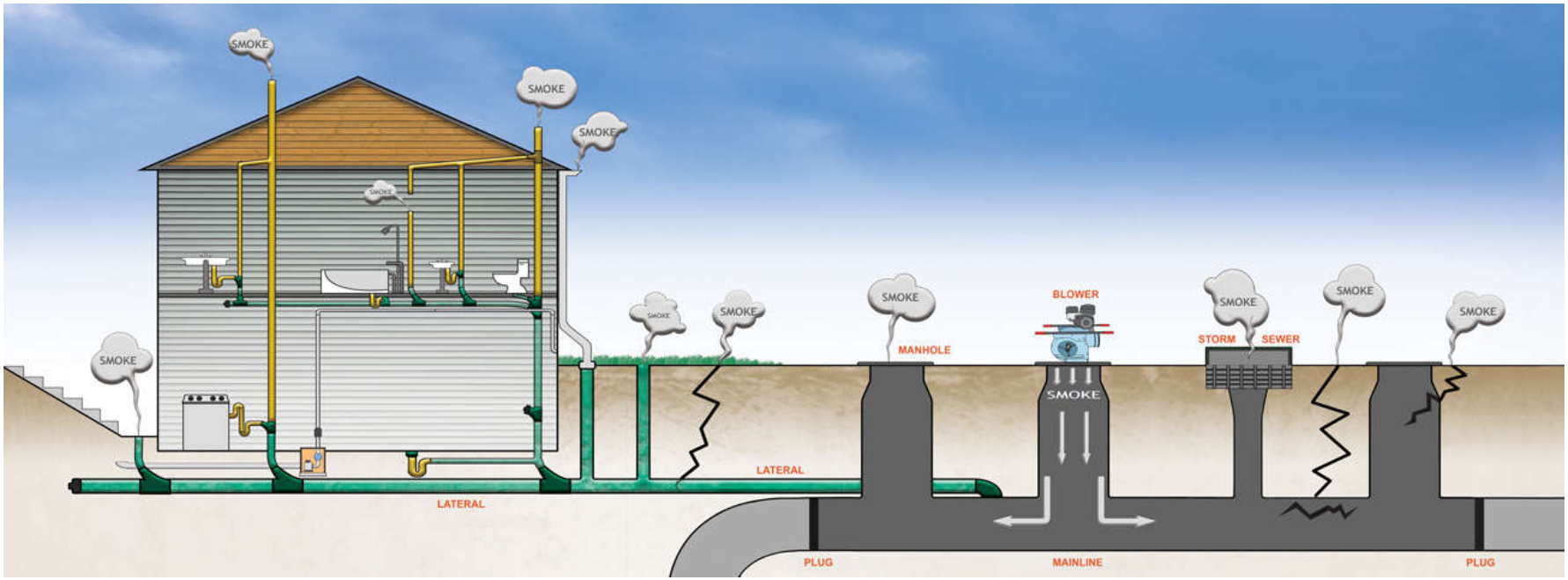
Bricks in 12” Sewer – 15th Street

Large offset in 8” – access street Bldg 71 between Kansas and 4th St

- 11 of 70 pipes (16%) inspected had severe (PACP Grade 4 or 5) structural defects

Smoke Testing

- **Smoke Testing** involves blowing non-toxic, odorless smoke into the sewer system through manholes. The smoke travels through the sewer pipes and escapes through openings, such as cracks, leaks, or illegal connections. Observers above ground monitor where the smoke appears, indicating where potential issues (defects) exist.
- Defects allow I&I into the sanitary sewer system, taking up capacity



Smoke Testing

Smoke appearance at locations near Touro University

Cossey St and Moises Way

7th St and Railroad Ave

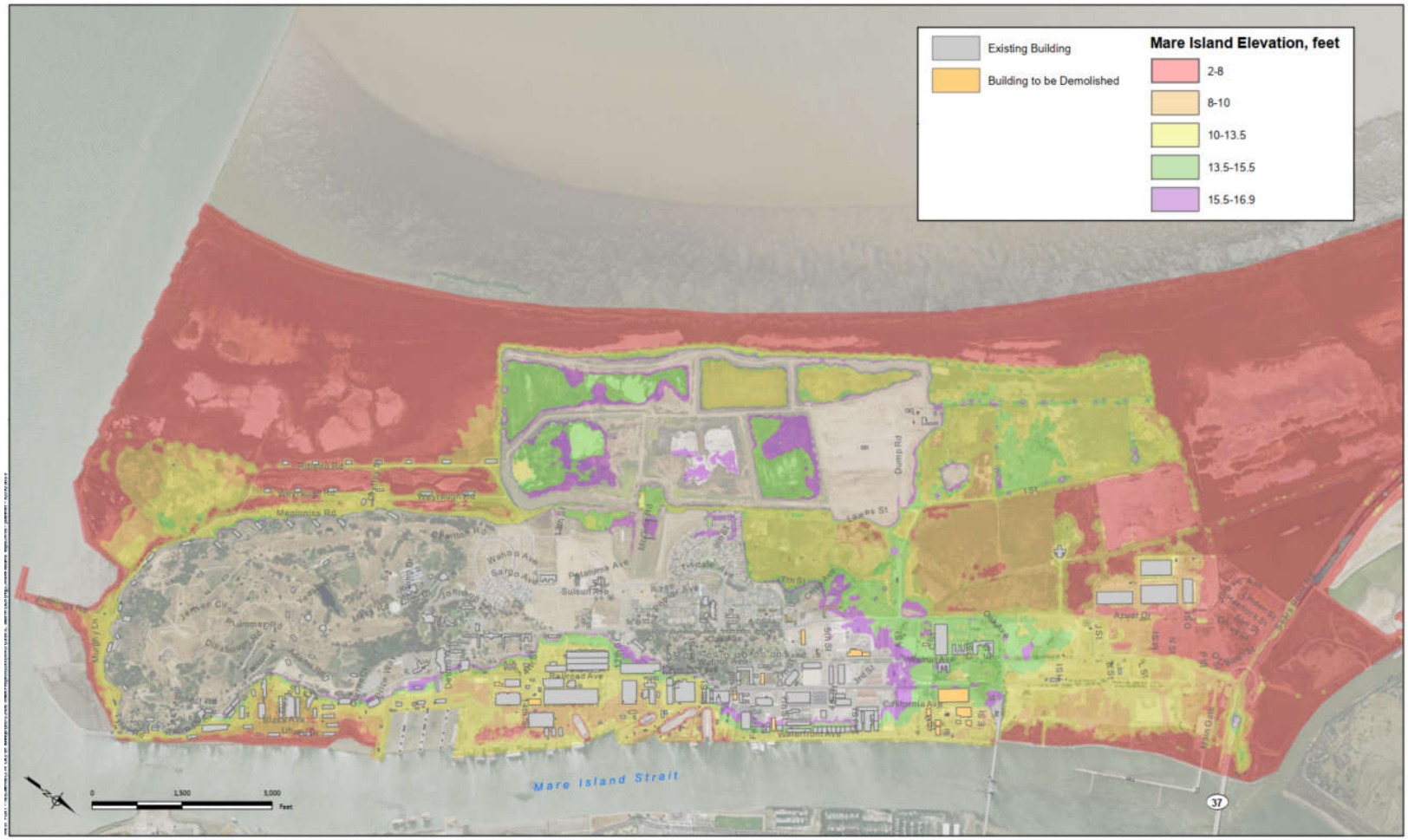
Storm Drainage/Flood Control System & Sea Level Rise

Key Evaluations

1. Evaluated the island for future Sea Level Rise (SLR)
2. Developed of computer model to evaluate capacity with respect to rainfall and SLR
3. Field condition assessment of lift station and other structures (select maintenance holes, drain inlets, and outlets to Mare Island Strait)
4. Desktop assessment of sea wall

❖ Previous evaluations by District concluded piped storm drainage systems are mostly inadequate with respect to capacity, so evaluations focused on future systems and did not evaluate existing infrastructure.

Existing Ground Elevations (NAVD88)



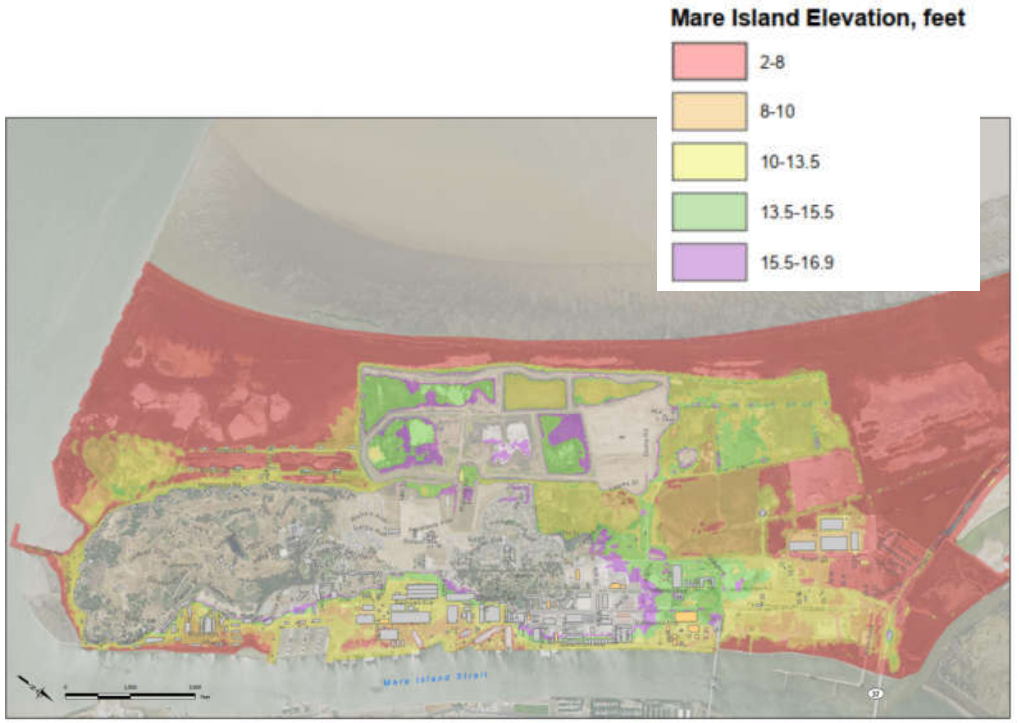
Current Water Surface Elevation

2024 Base Flood Elevation (BFE):

The Federal Emergency Management Agency (FEMA) BFE on Mare Island Strait is 10 feet based on the current FEMA Flood Insurance Rate Maps.

BFE is based on a still water surface elevation of 9.9 feet (includes tide, storm surge, and riverine flow, but not waves). Mare Island Strait has minimal wave hazard, so the BFE was established at → **10 feet**.

- Lowest areas of Mare Island at risk of flooding



Sea Level Rise (SLR) Evaluation

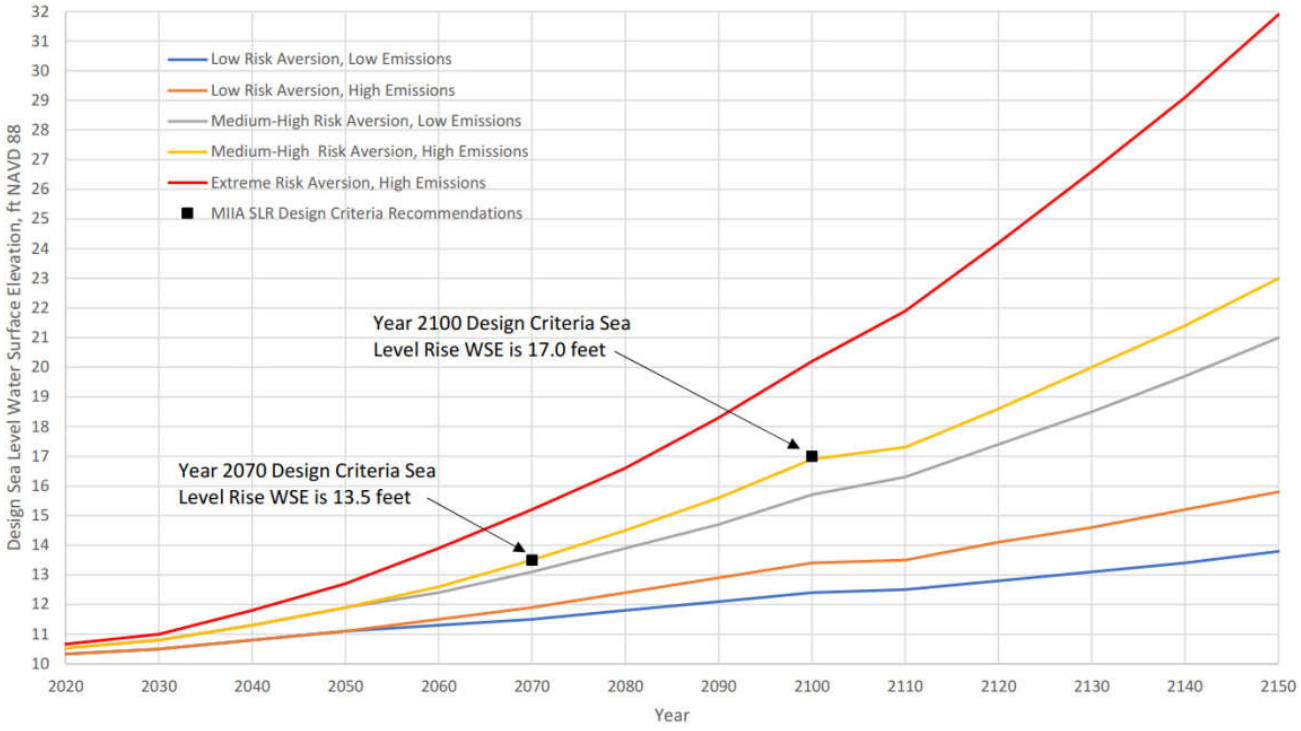


Figure 4-2. Forecast Design Sea Level Elevations Based on the State of California Sea-Level Rise Guidance, 2018 Update

- California 2018 SLR Guidance, set future design criteria for SLR
- Med-High Risk Aversion, High Emissions
- 2024 Guidance Document had just been released as draft

Sea Level Rise (SLR) Evaluation

Using 2018 SLR Guidance, identified SLR elevations for industry-standard Benchmarks (consistent with VFWD standards):

2070, Med-High Risk Aversion, High Emissions:

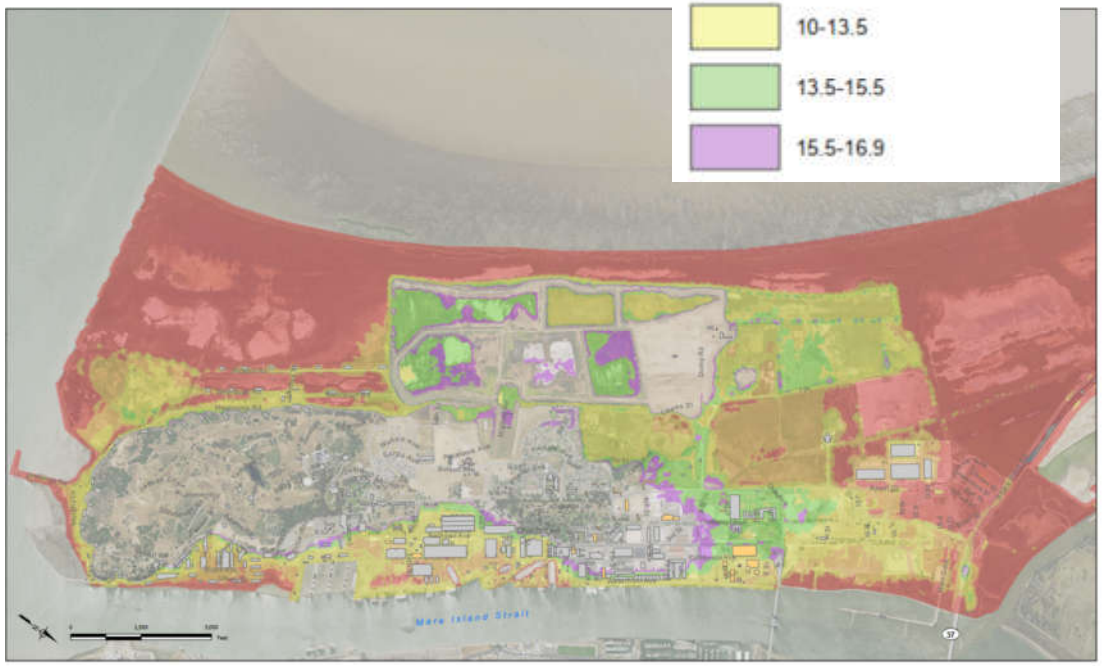
→ **13.5 feet**

- Some areas of Mare Island at risk of flooding

2100, Med-High Risk Aversion, High Emissions:

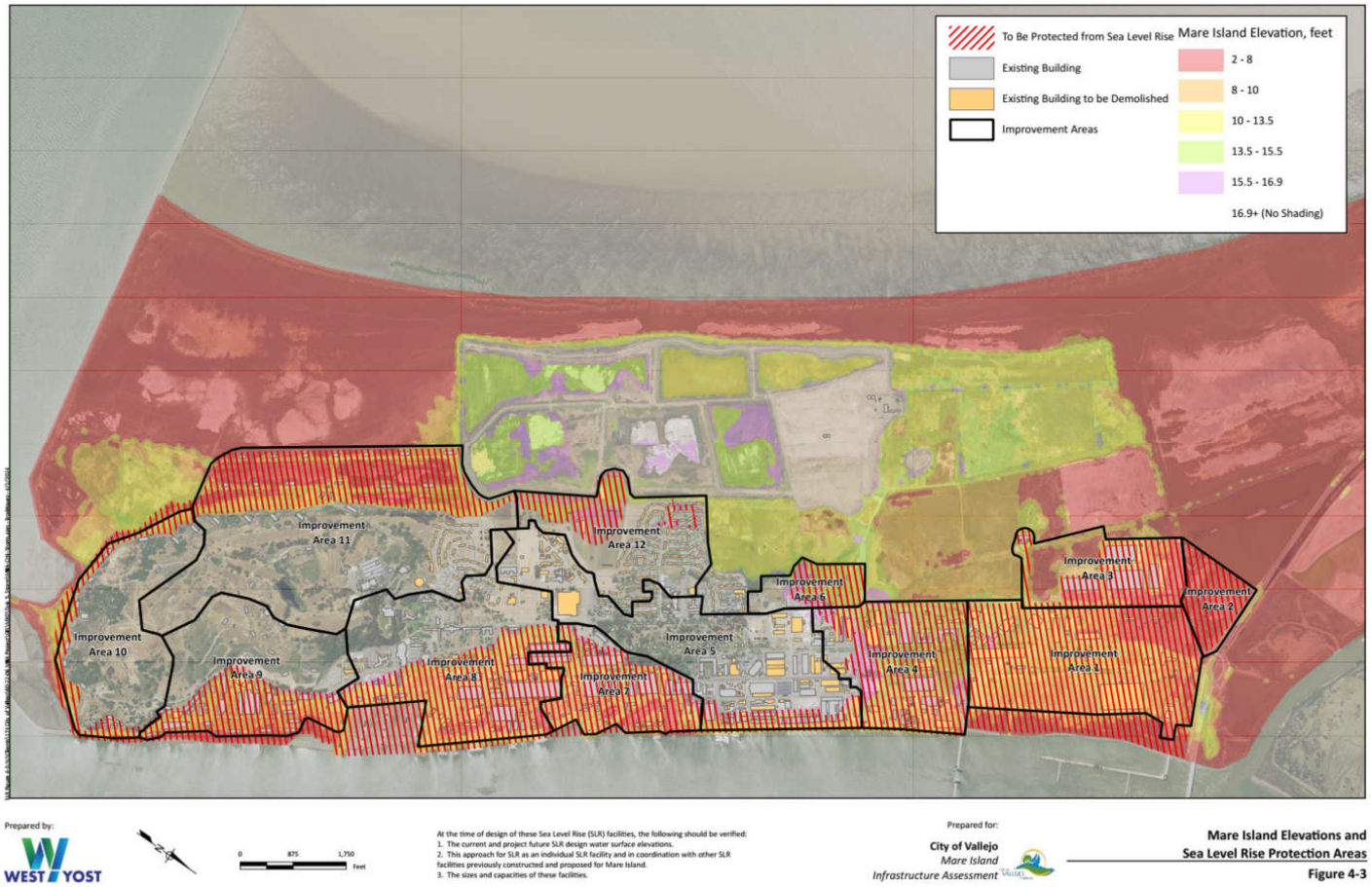
→ **17.0 ft**

- Many areas of Mare Island at risk of flooding



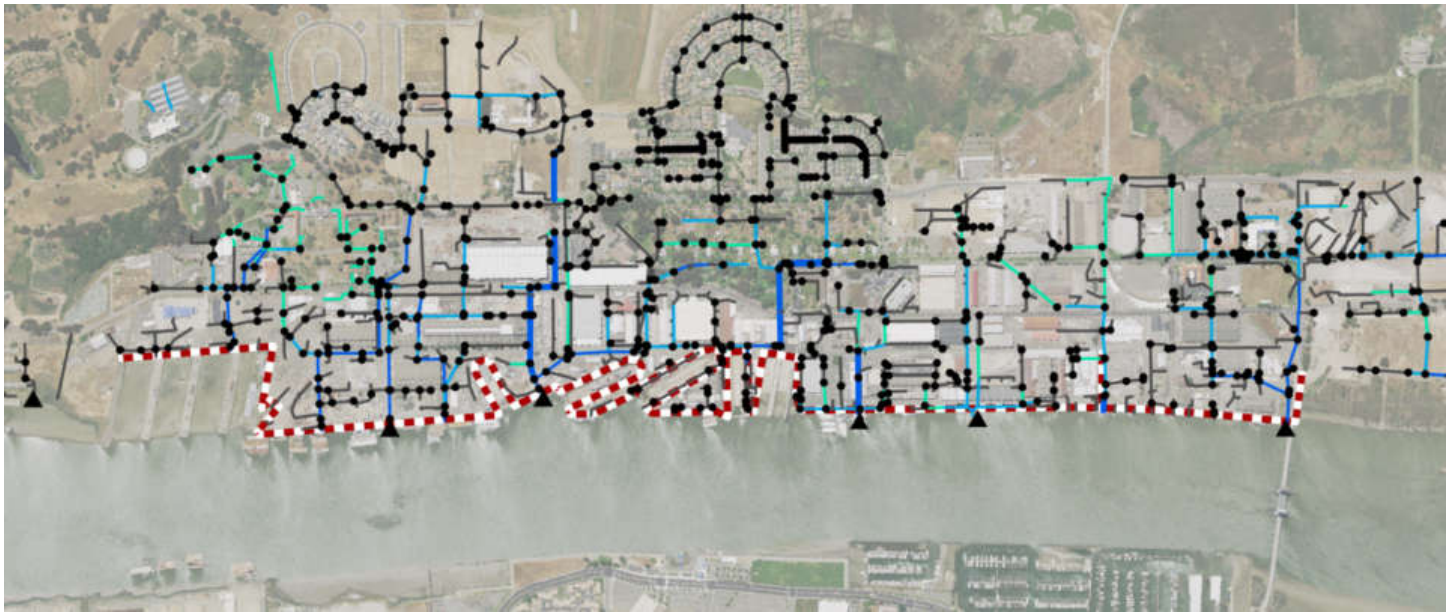
Sea Level Rise (SLR) Evaluation

- Identified areas to be protected (based on elevations, SLR, and future development)
- Used hydraulic/ hydrodynamic computer model to develop recommended improvements including new storm drains, lift stations, material fill, detention storage, and sea walls

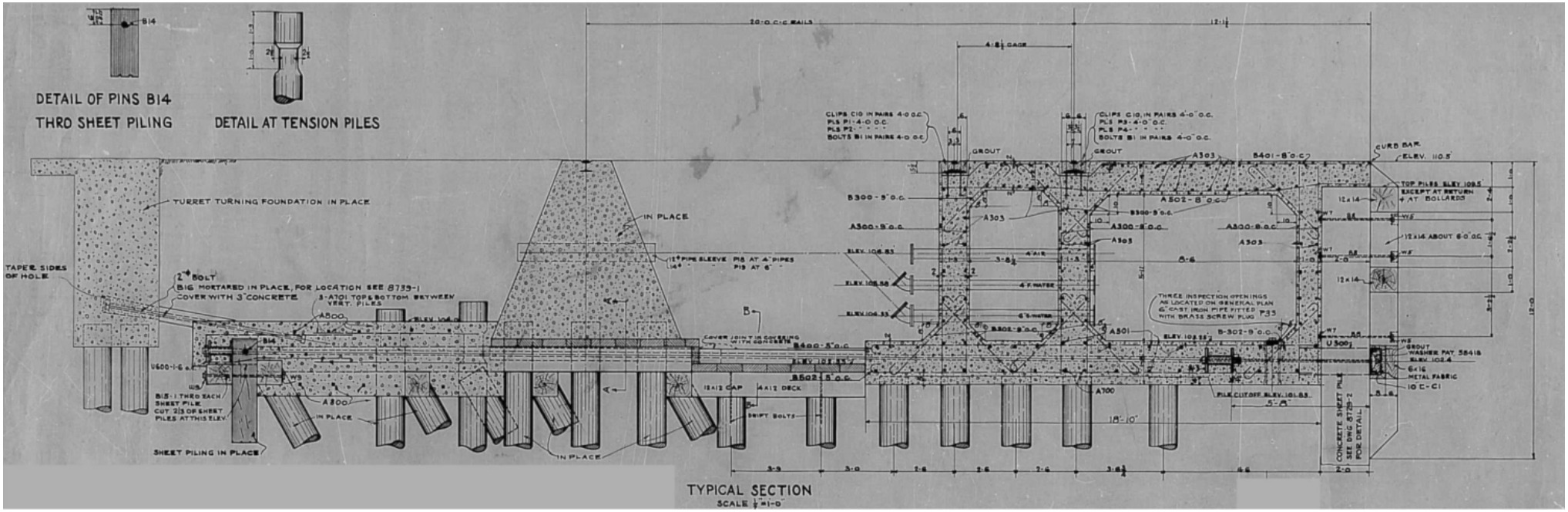


Sea Walls

- Runs from the Causeway in the north to the Finger Piers in the south ~ 2 miles
- Supports various marine infrastructure including quay walls, dry docks, and piers
- Earliest engineering drawings available – 1921 – which indicate repairs
- Later rehabilitated and extended in 1940s and 1980s

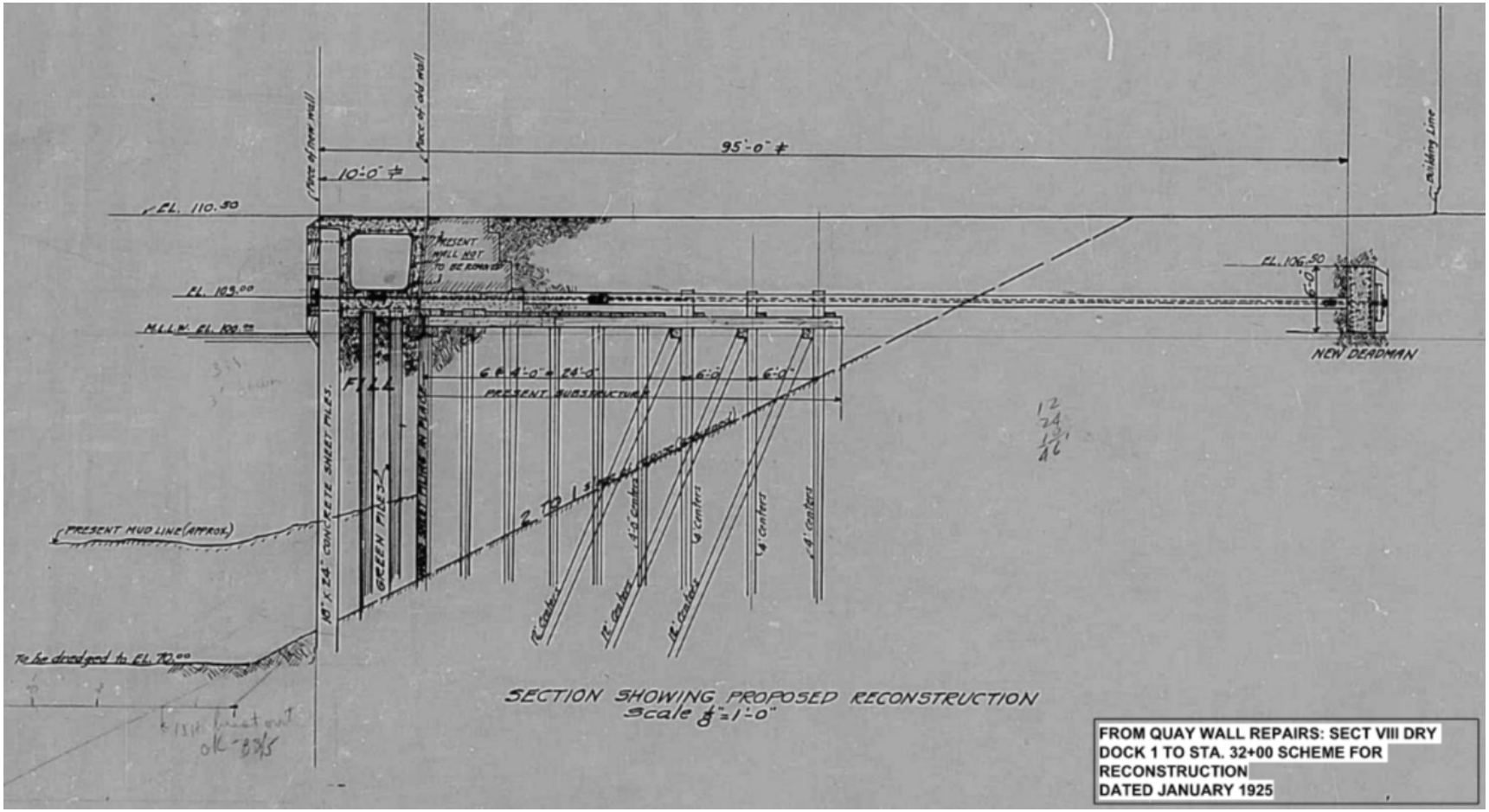


Sea Walls – 1924 Repair Drawings



FROM QUAY WALL REPAIRS: SECTION BETWEEN DRY DOCK NO. 2 AND TIMBER WHARF DATED MARCH 1924

Sea Walls – 1925 Repair Drawings

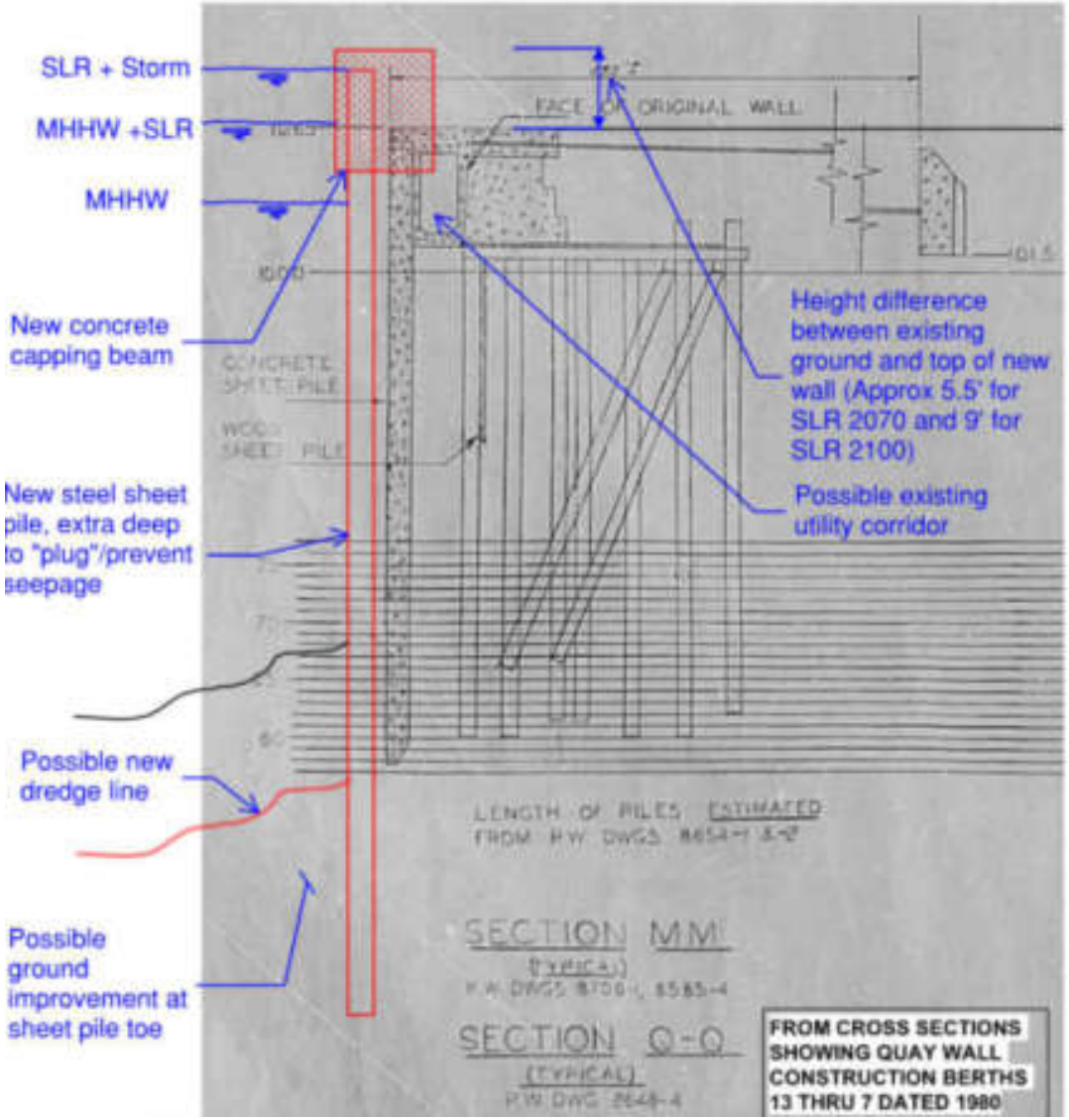


Sea Walls

1. Reviewed existing plans, documents
2. Discussed options and limitations associated with improving existing sea walls
3. Developed options for sea wall improvement

Retrofit option 1 (in red):

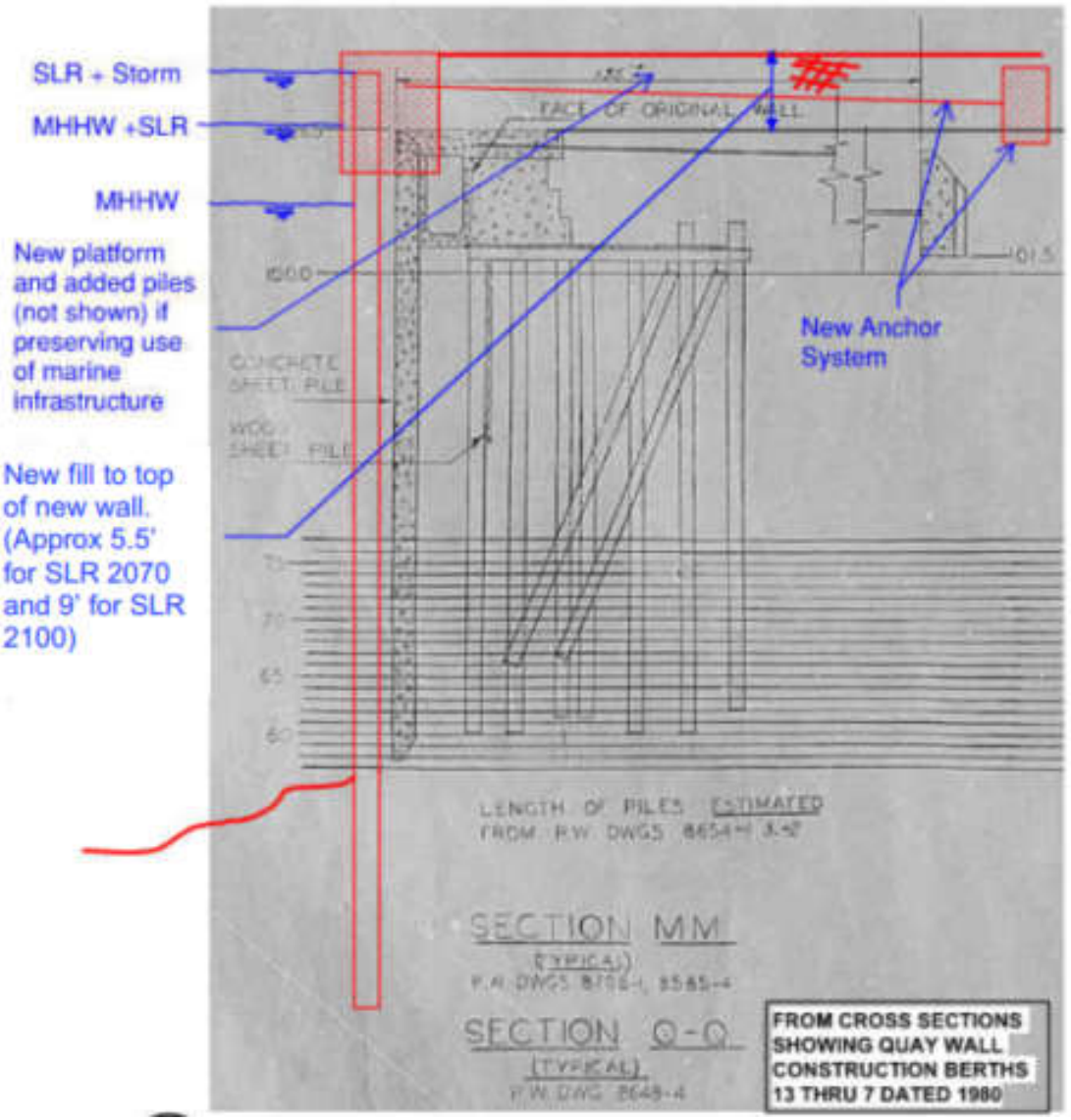
- new sheet pile wall in front of existing wall
- new concrete capping structure
- Height of cap for SLR; would restrict access for landslide operations



Sea Walls

Retrofit option 2 (in red):

- new sheet pile wall in front of existing wall
- new concrete capping structure
- new fill to top of wall level and anchor system
- Improvements to surface to suit intended uses



SLR and Sea Wall – Recommendations

Further investigation is required to progress the sea wall component of Mare Island redevelopment and to determine whether it is viable to retrofit the existing sea walls to serve to 2070 and 2100 SLR, and to inform design alternatives for new sea walls.

Key recommendations:

- **Physical Condition Assessment and Survey of Sea Walls :** Visual assessment to understand current structural condition and construction/materials; survey of elevations and positions of sea wall structures to support design and costing.
- **Development of Future Facilities Plan for Wharfage**: Provide for planned vessel operations and berthage. Impacts assumptions on access, service provision, dredge depth, berthing loads, operational expenditures.
- **Hydrological, Geotechnical, and Hydrogeological Investigations:** supports design of retrofits; informs stormwater management and disposal plan (pumping estimates); liquefaction potential; stability of existing sheet piles; options for ground improvement at toes of existing sea walls; existing reclaim and additional fill impacts, consolidation and settlement; assessment of seepage at sheet pile toes (provide seepage pumping water estimates)
- **Bathymetric Surveys:** Determine levels and bathymetry of seabed in front of the existing and proposed sea walls to inform dredging requirements; stability of existing sea walls; design alternatives for retrofit of existing and design of new sea walls
- **Consider State-of-the-art approaches to Redevelopment for SLR:** New and innovative solutions to SLR are constantly being developed both locally and globally; much can be learned from the approaches being used in other areas.
- **Engage with Specialist Marine Engineering Expertise:** both consultants and construction contractors
- **Future Land Use Considerations :** Collaboration with owners of existing marine infrastructure and developers to understand how to best to approach future land use re: redevelopment of the sea walls.

Storm Drainage/Flood Control & SLR – General Recommendations

For MIIA, to demonstrate a tangible infrastructure solution, existing design criteria and guidance documents were used for the development of capital improvements.

- Acknowledge that the design criteria used are based guidance documents that are **continually evolving as the knowledge base expands**. As the scientific understanding of the impacts of climate change are further refined, **it is expected that international, federal, State, and local agencies will continue to refine/validate prior projection models on climate and sea level rise trends to further inform updates to the guidance documents**.
- Development of future solutions to address storm drainage and sea level rise on Mare Island should be based on use of the **most current and best available science** at the time specific project elements are designed and constructed. While this report emphasizes capital improvements, **solutions should be integrated with site-specific and community-level adaptation planning, regional and cross-jurisdictional collaboration**, and consider the **site-specific land uses and unique characteristics** of Mare Island.

Next Steps

1. Receive feedback on MIIA preliminary results; finalize recommendations and MIIA report
2. MIIA Grant tentatively closes December 2024; City seeking extension and additional funding for sewer and sea wall condition assessment work
3. Mare Island Company to utilize MIIA recommendations to support new Mare Island Specific Plan and Infrastructure Plan
4. City/District perform additional assessments and planning to support development
5. City/District identify future funding sources to implement recommendations

Questions & Answers