San Francisco Planning

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MEMO TO THE PLANNING COMMISSION

HEARING DATE: JUNE 3, 2021

Record No.:	2018-013637CWP
Project Address:	Islais Creek Southeast Mobility and Adaptation Strategy Area between southern Dogpatch, Northern Bayview, Highway 101, and the San Francisco Bay
Zoning:	Various Zoning Districts (including but not limited to PDRs, P, M-2) Various Height and Bulk Districts (including but not limited to 40-X, 58-X, 65-J, 80-E) African American Arts and Cultural District
Block/Lot:	N/A
Project Sponsor:	Caltrans Sustainable Transportation Planning Grant Program California Department of Transportation, Division of Transportation Planning
Property Owner:	N/A
Staff Contact:	Lisa Fisher – Project Director / phone: 628.652.7450 / lisa.fisher@sfgov.org Luiz Barata – Project Manager / phone: 628.652.7326 / luiz.barata@sfgov.org
Recommendation:	None - Informational Only

Summary

The Draft Islais Creek Southeast Mobility Adaptation Strategy (ICSMAS) is a two-year effort, funded by an SB-1 grant from Caltrans and staff resources, that will be completed in June. It has been developed through a collaborative process led by SF Planning with key agency partners: the Port of San Francisco (Port), the San Francisco Municipal Transportation Agency (SFMTA), and the San Francisco Public Utilities Commission (SFPUC)—and an inter-disciplinarity consultant team led by AECOM. ICSMAS seeks to articulate near-, mid- (through 2050), and longer-term (through 2080) flood vulnerabilities in the Creek district—and establish smart protection pathways that enable today's investments to help mitigate and withstand flood risks into the future.

The ICSMAS project area sits between southern Dogpatch and northern Bayview neighborhoods, elevated highways to the west, and San Francisco Bay to the east. The project outlines a comprehensive adaptation vision for the district as a whole, and more detailed strategies for seven key City assets: the Port's Piers 80 and 96 and 94-96 backlands, SFMTA's Marin and Bus yards on the northwest creek bank, and Islais Creek and Illinois Street bridges. Key inputs to the strategies include the City's first combined flood modeling effort, which maps stormwater and coastal flooding plus sea level rise, and the community's resilience goals for the area. These goals were co-created with hundreds of stakeholders over the course of three in-person workshops in Winter 2019-2020 and will continue to guide all resilience planning in the Islais Creek district. In alignment with the five community goals, the ICSMAS flood adaptation pathways seek to:

1. Lead with equity and ensure an authentic and transparent process.
2. Improve and protect multi-modal transportation within the district and along critical connectors to the rest of the city.
3. Adapt important transit facilities to ensure reliable citywide MUNI operations over time.
4. Enhance shoreline open spaces and trails and improve the Islais Creek and Bay ecologies.
5. Protect and enhance production (PDR), industrial, and maritime areas to support economic growth and local jobs.

ICSMAS is one of multiple coordinated City efforts to protect and adapt the waterfront and adjacent communities to the unavoidable impacts of climate change. Its strategies, analysis, and community engagement activities have been coordinated with the broader Waterfront Resilience Program ("WRP") efforts led by the Port: the U.S. Army Corp of Engineer's (USACE's) Flood Study and Port Adapt Plan. ICSMAS will serve as a key input to these two projects and its partner agencies, including Planning staff, will continue to support the resilience planning and equity-focused community engagement needed in this district resuming this Fall and into 2022.

Background

The Islais Creek district is an historic wetland and already vulnerable to stormwater and coastal flooding today. The area, its community, and built assets are at severe risk to significant flooding and permanent sea level rise inundation (e.g., land lost) caused by climate change in the future. The area hosts several critical transit facilities, key transportation connections, most of the city's remaining maritime industrial and manufacturing uses, and a unique watershed ecosystem. It is also surrounded by historically under-served residential neighborhoods, regional highways, and the main sewage treatment plant. This strong and diverse neighborhood is home to much of San Francisco's African American community and its cultural district. Racial and environmental injustices persist and today the community suffers disproportionate pollution, social, economic, and health burdens, as well as disproportionate impacts of climate change. Therefore ICSMAS seeks to adapt and enhance critical multimodal transportation, economic, and open space assets in manners that maximize community benefits. Please see the ICSMAS report to follow for additional information.

Economically, the Islais Creek area supports some of the city's remaining production-distribution-repair (PDR) and industrial land uses and maritime cargo operations, which create and sustain skilled, middle-wage job opportunities. Regional Plans forecast growth in cargo and industrial/PDR uses in this district through 2050, including the Association of Bay Area Government's (ABAGs) and MTCs "Plan Bay Area 2050 Final Blueprint" that designates the Islais geography as a "Priority Production Area" to enable industrial areas to thrive and grow. Environmentally, Islais Creek is the terminus of for the larger watershed beginning in upper Glen Canyon and connecting through the Alemany maze. As an industrial area, much of the creek, shoreline, and adjacent lands are degraded; the unique Heron's Head Park highlights a regenerating ecosystem with rich biodiversity and opportunities for public enjoyment.

Project Description

ICSMAS is part of multiple coordinated City efforts to protect and adapt to the unavoidable impacts of climate change. It is outlined as a key strategy in the San Francisco Hazard and Climate Resilience Plan (HCR), adopted in June 2020 as the City's local hazard mitigation plan. Funded by a two-year Caltrans grant and City staff resources,

ICMSAS is a collaborative effort by a four-agency team led by Planning. In deep partnership with the Port, SFMTA and SFPUC (the City Team): Together, ICSMAS has:

- Assessed future flood risks through 2080 by conducting the City's first combined flood modeling effort: cumulative risk of sea level rise (SLR), with a 100-year storm (1:100 chance of occurrence per year), and stormwater flooding where a 3-hour rainfall event is coupled with SLR during a 2-year extreme tide
- Co-hosted a robust and diverse community engagement process
- Identified potential near-term and long-term adaptation strategies that address flood risk at the district and asset scale, while maximizing community benefits
- Organized strategies into adaptation pathways, a series of manageable steps to help manage risks over time under uncertain future climate conditions and ease decision-making processes

ICSMAS will serve as a key input to the comprehensive Waterfront Resilience Program, including: 1) the Port's Adapt Plan that seeks to reduce seismic and flood risk and enhance the 7.5 miles of Bay shoreline from Islais Creek to Fisherman's Wharf; and 2) the USACE Flood Study that explores a wide range of flood projections, adaptation strategies, and costs, and will identify the potential for federally funded projects.

The ICSMAS flood adaptation strategies and pathways have been designed to help deliver community goals around a sustainable economy, robust mobility, and healthy environment. Key adaptation moves that protect and enhance maritime, industrial and commercial areas include:

- Raise pier edges to preserve and optimize marine berths and terminals for regional cargo growth and disaster response and recovery operations, while protecting industrial areas for local jobs.
- Study cargo berthing and conveyance infrastructure for opportunities to offset deepwater berths and convey cargo to terminals located further inland from the vessel.

Strategy highlights that expand active transportation and transit, enhance traveler safety, and improve connectivity include:

- Expand and improve the Blue Greenway, including a re-alignment off Illinois Street to better connect Warm Water Cove Islais Creek
- Enhance key transit and truck corridors to improve East/West connectivity, provide alternatives to constrained creek crossings, and improve safety for all modes, especially people that walk and bike
- Revisit the need for freight rail to Pier 80 when the Illinois St bridge is reconstructed; and

Finally, key nature-based adaptation strategies that provide flood protection while increasing and enhancing parks and habitat areas include:

- Remove aging waterfront structures in favor of living shoreline edge conditions and expanded park areas that enhance biodiversity and increase passive recreation opportunities
- Maintain existing wetland areas and consider regrading areas where they could migrate over time as seas rise
- Prioritize green infrastructure (bioswales, rain gardens, street trees) for local stormwater management to reduce flood risk and peak flows, improve extreme heat and poor air quality resilience, and connect people with nature.

Stakeholder Engagement

In 2019 and early 2020, the WRP and ICSMAS Team held three in-person workshops, mixers, and walking tours, connecting with hundreds of residents, workers, property owners and local organizations. In addition to sharing the project scope and site analysis with attendees, the events were created as opportunities to co-create the community vision and goals to guide all resilience work for the district:

- Socially and environmentally resilient neighborhood
- Transportation system that is resilient and adaptable to flood risk
- Healthy environment for residents, workers and ecologies
- Sustainable economy that benefits local residents, workers and industries
- Authentic and transparent public engagement during and beyond planning

Community outreach continued with Y-Plan and 60 students from Malcom X Academy and the 50-strong 'I am Islais' poster campaign, which created a personal connection and neighborhood identity between the flood discussions and the people who are affected by it. From November 2020 through this Spring, the Port's WRP and City ICSMAS teams presented project updates at several community-based organization meetings reaching over 150 residents. Finally, this May, the City Team hosted two "Community Circle-Back" virtual events with invited stakeholders to share analysis, proposed flood adaptation strategies, and community benefits -- and prioritize small-group discussions to hear community thoughts and insights. President Walton kicked off one of the events with words of support for the effort and the inclusion of the community in the process, both to date and looking ahead to implementation. Community comments were collected, and an event summary will be shared on the Islais Creek web page.

Concurrently, the City Team is obtaining feedback from agency staff and leadership, including the three partner agencies, within Planning, Public Works, and more. The Port is managing review and feedback with its key tenants, BCDC, and the USACE. In addition to the Planning Commission, informational presentations were shared with the Port Commission (May 26), SFMTA Policy and Governance Committee (May 26), Port Southeast Advisory Committee (May 27), and the SFPUC Wastewater CAC (mid-May).

Community stakeholder, agency, and decision-maker feedback will inform the ICSMAS final report to Caltrans at the end of June and continue to inform the WRP's comprehensive resilience plans for this area. Islais Creek is a complex part of the city experiencing disproportionate social and climate vulnerabilities. The Planning Department is poised to further support this community and help advance equity, resilience, and environmental and climate justice together.

Considerations

Recent Public Comment

- Overall, attendees of the May 17-18 Community Circle-Back events felt the work reflects community values and priorities.
- Attendees are very keen for the City to provide over-due investments in this district—scoping and implementing ICSMAS strategies as soon as possible.

- Priority themes included enhanced multi-modal transportation infrastructure and safety, improved access and quality of the waterfront, more nature, and multi-hazard protection from floods/poor air quality/toxins.
- Both community members, President Walton, and Port Commissioners acknowledged Planning's intention to lead with equity in its resilience planning.

Continued Participation

- The Planning Department has helped articulate and advance the City's climate resilience work in recent years through its participation and leadership—including efforts to eliminate greenhouse gas emissions to stave the climate crisis and adapt to its unavoidable impacts.
- Planning staff have developed robust partnerships with the ICSMAS agencies, as well as SF Environment, Public Works, and the Office of Resilience and Capital Planning on several citywide plans, tools, and neighborhood efforts.
- As seen in other aspects of the Planning Department's and agency partners' efforts, the City's climate resilience and justice work continues to grow and staff resources are insufficient.

Timeline and Next Steps

The ICSMAS draft report, shared to follow, is under review by the City Team and respective agency leaders. In addition to the Planning Commission, informational presentations have been shared with the Port Commission (May 26), SFMTA Policy and Governance Committee (May 26), Port Southeast Advisory Committee (May 27), and the SFPUC Wasterwater CAC (mid-May). The City Team will prepare final edits to the Draft ICMSAS report based upon feedback from stakeholder engagement, and public agencies including the Port, SF Planning, SFMTA, SFPUC, Public Works. ICSMAS will be finalized by the end of June, fulfilling the requirements of the Caltrans funding grant. All final materials will be delivered to Caltrans and published to the SF Planning Islais Creek web page mid/late June.

Port's staff, in collaboration with Planning, SFMTA, and SFPUC, will ensure that the technical analysis, community partnerships, and innovative strategies identified in ICMSAS are brought into the next step of the WRP planning process (e.g., USACE Flood Study and the Adapt Plan). Likewise, stakeholders will have multiple opportunities for continued engagement with the Islais Creek area adaptation strategies when WRP work recommences in late 2021 or early 2022. During this planning process, USACE will identify the National Economic Development (NED) Plan, based on the best benefit-cost ratio and the Port Commission may identify a Locally Preferred Plan, which may be more costly than the NED Plan. As resourced, the City Team will concurrently support project scoping and funding pursuits for key near-term investments to address today's flooding and deliver priority community benefits, including CEQA analysis as needed. Furthermore, the team will continue to support the integration of this work with other multi-hazard climate resilience, environmental justice, cultural, and other needs and efforts in this vulnerable part of the city.

Attachments:

- Draft Islais Creek Southeast Mobility and Adaptation Strategy

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ISLAIS CREEK SOUTHEAST MOBILITY ADAPTATION STRATEGY

May 21, 2021 (DRAFT)

San Francisco Planning

SFMTA

Port of San Francisco

San Francisco Water Power Sewer

About This Project

A comprehensive set of adaptation pathways to protect the Islais Creek shoreline and surrounding district from inland and coastal flooding and sea level rise through 2080.

OVERVIEW:
As a historic wetland along the San Francisco Bay, the low-lying Islais Creek district is already vulnerable to stormwater and coastal flooding today, and at risk to significant flooding and sea level rise inundation caused by climate change in the future. The area hosts several critical transit facilities, key transportation connections, most of the city's remaining maritime industrial and manufacturing uses, and a unique watershed ecosystem. It is also surrounded by residential neighborhoods, regional highways, and the main sewage treatment plant.

The Islais Creek Southeast Mobility Adaptation Strategy (ICSMAS) seeks to provide a deeper understanding of the district's complex flood hazard risks and a comprehensive suite of adaptation pathways to protect the area and its key public assets from flooding and permanent inundation. The project is led by the San Francisco Planning Department (Planning), Municipal Transportation Agency (SFMTA), Port of San Francisco (the Port), and the San Francisco Public Utilities Commission (SFPUC), supported by a consultant team led by AECOM, and funded by a two-year grant from Caltrans along with City staff resources.

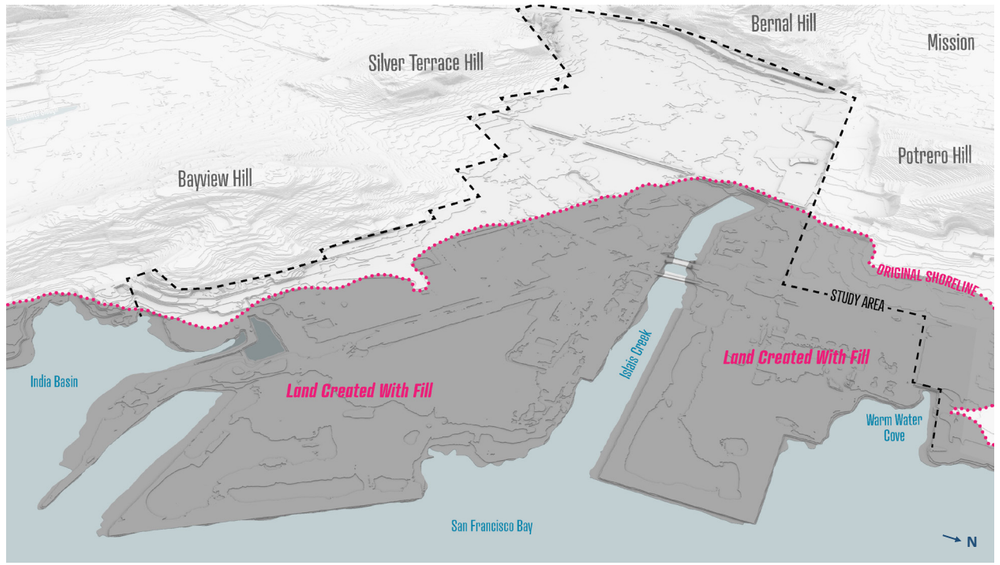
The effort seeks to adapt and enhance critical multi-modal transportation, economic, and open space assets that benefit the local community and city at large. By better understanding the future, the City may implement near-term flood protection measures that addresses today's threats in manners that will withstand rising tides through 2080. This holistic approach also ensures efficient and effective public investments that deliver maximum community benefits.

SETTING:
ICSMAS features the district between southern Dogpatch and northern Bayview neighborhoods, elevated highways to the west and the San Francisco Bay to the east. As shown in Figures 1 and 2, the district is a mix of hilly and flat residential neighborhoods, lower-lying areas full of warehouses and manufacturing, and large maritime-industrial piers. The city's original shoreline bifurcates the district meaning much of the flatter areas and all of the piers are constructed on landfill, particularly susceptible to sea level rise, coastal storm events, and wave run-up.

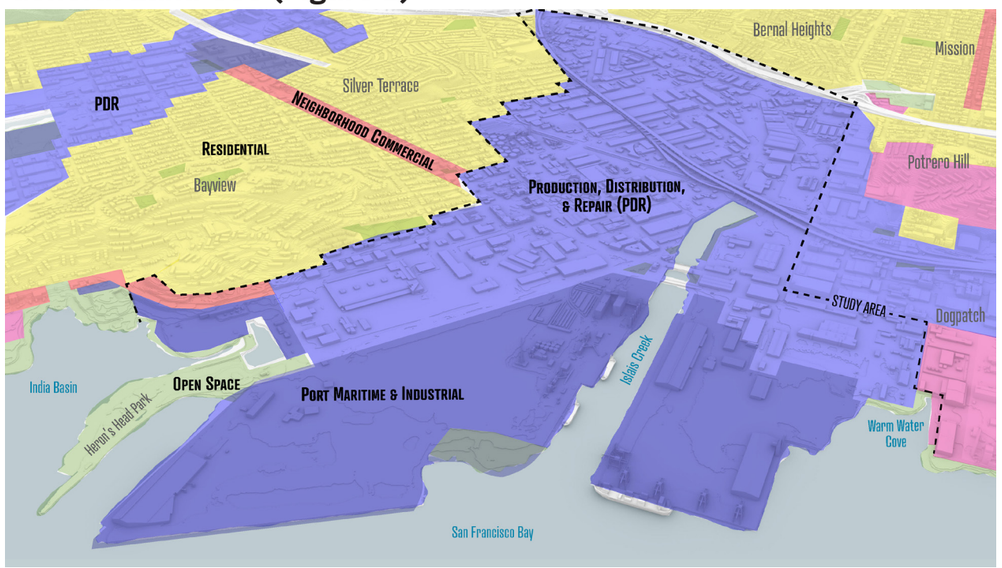
As shown in Figure 3 (next page), the Islais Creek district already experiences precipitation-based stormwater flooding and coastal storm events multiple times a year. A changing climate will have profound impacts on San Francisco's shoreline communities, critical infrastructure and transportation systems, and ecology. Sea levels are anticipated to rise by up to 6 to 10 feet by 2100. Over the next several decades, coastal flood events are projected to increase in frequency and extent. These climate threats require thorough planning and urgent action to help mitigate risks and build a more resilient city.

This strong and diverse neighborhood is home to much of San Francisco's African American community and its cultural district. As with most communities of color, racial injustice and disinvestment have unfairly disenfranchised the Bayview. This identified environmental justice community suffers disproportionate pollution, social, economic, and health burdens, as well as disproportionate impacts of climate change. During the 2017 heat wave, this concrete-heavy part of the city experienced ground temperatures upwards of 50 degrees hotter than in the city's northwest Golden Gate Park. ICSMAS is committed to serving and advancing this vulnerable community.

Local Topography and Geology (Figure 1)

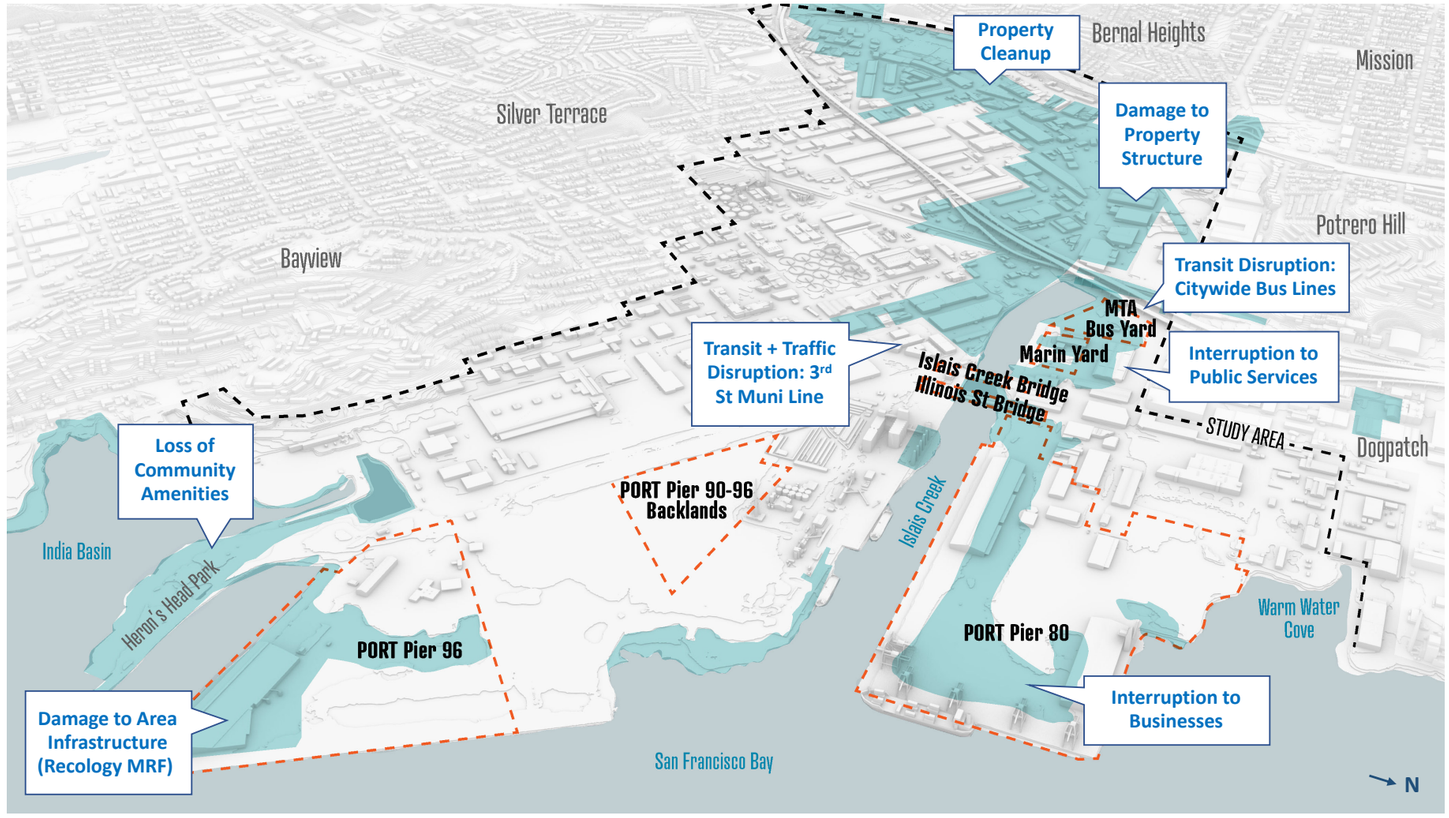


General Land Use (Figure 2)



About This Project

Current Flooding (Figure 3)



APPROACH:
The City team partnered with federal and State agencies to assess future climate risks and identify a range of potential adaptation strategies (i.e., physical infrastructure improvements, policy changes, and community investments). ICSMAS includes the City's first combined flood modeling effort, including stormwater and coastal flooding plus sea level rise to truly reveal the district's growing vulnerabilities. Proactive planning will help ensure the safety of San Francisco's citizens and prevent serious damage to vulnerable waterfront communities and city infrastructure over the long term. Please see the Methodology section for more detail.

As outlined in the next section, ICSMAS is inspired and grounded by community engagement and inputs. The City team convened community workshops at the beginning of the project to co-create a set of goals to guide the adaptation strategies. Building on this stakeholder input, staff worked together with its inter-disciplinary consultant team to envision a district-scale adaptation framework and develop asset-specific recommendations to ensure a resilient, creek-centered neighborhood. In alignment with the community goals, the ICSMAS flood adaptation pathways seek to:

a. Lead with equity and ensuring an authentic and transparent process.
b. Improve and protect multi-modal transportation within the district and along critical connectors to the rest of the city.
c. Adapt important transit facilities to ensure reliable citywide MUNI operations over time.
d. Enhance shoreline open spaces and trails and improve the Islais Creek and Bay ecology.
e. Protect and enhance production, industrial, and maritime areas to support economic growth and local jobs.

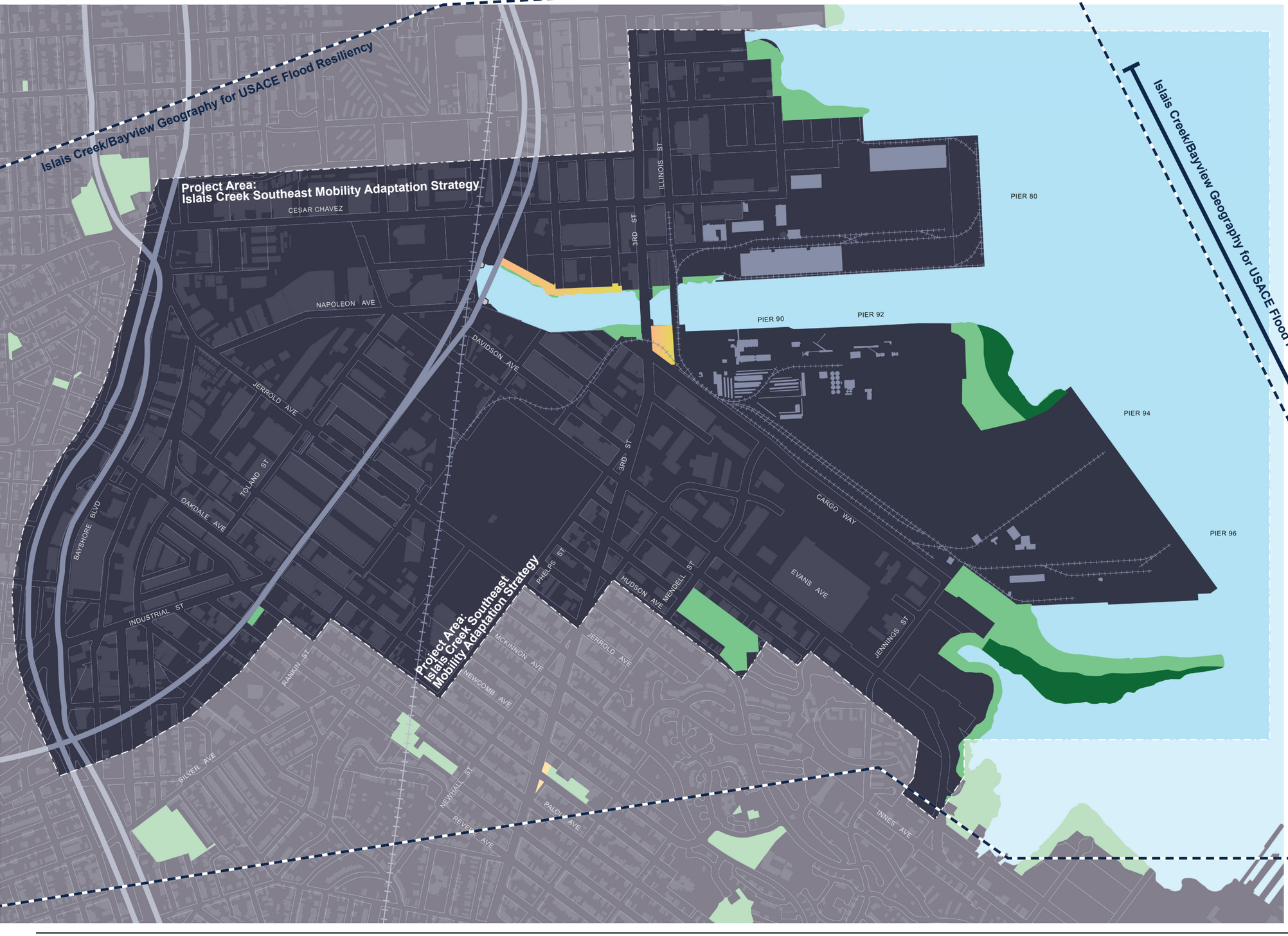
PLANNING CONTEXT AND COORDINATION:
In concert with ICSMAS, the City's Waterfront Resilience Program (WRP) is leading multiple coordinated efforts along its Bay and Ocean shorelines to protect and adapt to the unavoidable impacts of climate change. ICSMAS will serve as a key input to the range of seismic and flood adaptation alternatives being explored with the community through the main components of the WRP:

- The Flood Study, led by the US Army Corps of Engineers (USACE) and the Port, explores a range of flood adaptation strategies and costs with a goal of identifying a federally funded flood risk reduction project. This Study started in 2018 and is expected to be completed in 2025. During the process, USACE will identify a preferred Federal Plan and the Port, working with the community and City departments, can also identify a Locally Preferred Plan. The final plan recommended to Congress must have more quantifiable benefits (such as avoided flood damages) than it costs.
- The Port-led Adapt Plan is an interagency effort to reduce seismic and flood risk and enhance the 7.5 miles of Bayshore communities from Islais Creek to Fisherman's Wharf managed by the Port. It will prepare adaptation pathways and alternatives for the entire shoreline in this geography and determine a locally preferred set of measures. In addition to flood and seismic risks, the Adapt Plan will consider critical City Infrastructure, long-term tenant operations and capital Improvements, public trust responsibilities, and other adaptation efforts such as Heron's Head Park Shoreline Resiliency Project.

The ISCMAS work provides a robust and community-grounded vision for Islais District of the WRP and will facilitate early planning and funding coordination to protect critical City assets and deliver local benefits.

Across ICSMAS and the WRP, coordinated and meaningful community engagement is essential. In Winter 2020-21, the ICSMAS team joined the WRP at dozens of community organizations' meetings to share information about flood risks and critical assets in the area, discuss alternative measures for the Flood Study, and provide updates for ICSMAS. Likewise, the WRP team joined the final ICSMAS Community Circle-Back events in May 2021 to hear community feedback. Community engagement and interagency coordination will continue through preparation and decision-making of the WRP Flood Study and Adapt Plan in Fall 2021 and into 2022. Together we can ensure the Islais Creek district, its people, assets, and ecology, thrive in a sustainable, healthy, and resilient community.

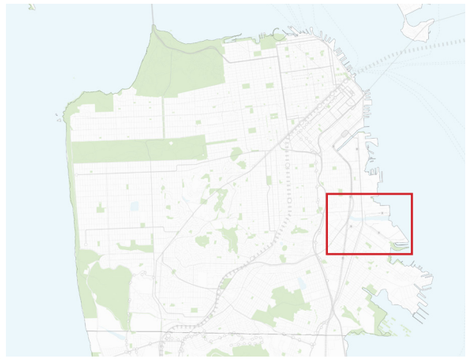
Project Area and Related Projects



Legend

- Existing Promenade or Plaza
- Existing Open Space
- Existing Marsh Wetlands
- Existing Buildings

Key Map



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Project Vision, Goals & Drivers

Foundational elements to inform, inspire, and align project priorities and outcomes.

At the outset of the project, the interagency ICSMAS team hosted three in-person community workshops in late 2019 and early 2020 to connect with residents, workers, property owners, local organizations, and service providers. In addition to sharing the project scope and site analysis with attendees, these engagement and listening events helped develop and confirm the community's goals for the project. These goals inspired the ICSMAS strategies and will continue to guide all flood resilience work in the Islais Creek area.

GOALS:

Transportation: A transportation system that is resilient and adaptable to flood risk.

- Adapt key transportation facilities and assets in the near term, increase system capacity and resiliency in the long term.
- Improve and expand transit, bicycle, and pedestrian connections within and through the area.
- Ensure accessible and equitable transportation between the waterfront, the City, and region for people and goods.

Environment: A healthy environment for residents, workers, visitors and ecologies.

- Identify multi-purpose solutions and strategies that benefit the entire Islais Creek watershed.
- Prioritize nature-based solutions and green infrastructure.
- Improve access to and create new resilient open spaces along the creek and Bay shoreline.

Economy: A sustainable economy that benefits local residents, workers, and industries.

- Support local, blue-collar industries, small businesses, and artists.
- Maintain and increase women and minority-owned businesses.
- Explore flexible land use regulations and building types that can accommodate future commerce and industry.
- Prepare local workforce for the current and future economy through training and mentorship.

Community and Social Equity: A socially and environmentally resilient neighborhood.

- Encourage neighborhood vitality, character, and diversity with mixed-income housing.
- Develop equitable solutions for a wide variety of community members.
- Adapt buildings, open spaces, and services for flooding that ensure safety and preparedness.
- Support neighborhood social resilience efforts now and into the future.

- **Governance:** Authentic and transparent public engagement during and beyond planning.
- Identify and share individual histories and stories about Islais Creek.
- Build a long-lasting basis of support with a transparent, authentic engagement process.
- Engage across generations, especially with youth, to build long-term understanding, capacity, and stewardship.
- Acknowledge the significance of the newly designated African American Arts and Cultural District.
- Establish a working group of public agencies to ensure integrated capital planning, funding, financing, and implementation of the Strategy.

I AM ISLAIS - Community Outreach

Methodology

An innovative and comprehensive approach to risk assessment and climate adaptation planning.

EXISTING CONDITIONS REVIEW AND SCENARIOS DEVELOPMENT
A thorough existing conditions review was carried out that included GIS data sets, previous studies in the project area, and future plans or proposals. It also included several levels of flood modeling, as outlined in the next section.

Building on this analysis and community engagement inputs, the ICSMAS Team then developed three “exploratory scenarios” for flood adaptation in the Islais Creek District through the 2080 time frame. Each “exploratory scenario” investigated strategies for protecting the creek and assets vulnerable to flooding in a manner that could maximize co-benefits to one of the community’s priorities: economics, mobility, and environment. This approach helped ensure the maximum cumulative number of opportunities were considered and ideas generated for area. From these three scenarios, a robust set of district- and asset-scale strategies was refined, as presented in this report.

REACHES AND ADAPTATION PATHWAYS
The strategies proposed in the District-Scale Concept have been grouped into **five Reaches** based on their geographic location and how the strategies work together to provide comprehensive flood protection. The Reaches are:

- Reach 1 – Northeastern Waterfront
- Reach 2 – Creek Channel Crossing
- Reach 3 – Northwestern Creek Bank
- Reach 4 – Southwestern Creek Bank
- Reach 5 – Southeastern Waterfront

Adaptation pathways are a sequence of linked strategies that are triggered by a change in environmental conditions, and in which initial decisions can have low regrets and preserve options for future generations” (Barnett et al, 2014). This approach is critical for managing risk under uncertain future conditions. It allows decision-makers to examine a variety of potential actions within the context of both current conditions and potential future conditions at multiple time scales. Depending on the geographic scale of the study and a variety of local conditions (community priorities, existing conditions, rate of change in the physical environment, political and policy considerations, etc.), adaptation pathways may be relatively simple or highly complex.

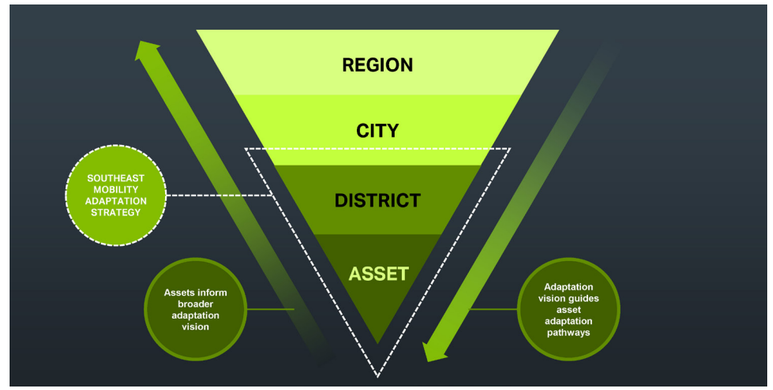
Adaptation Pathways are included that detail how and when the strategies could be implemented and phased, which will provide the City with clear guidance on how the shared vision of the District-Scale Concept and the specific strategies can move forward as future projects. An adaptation pathway is an implementation strategy comprised of a sequence of manageable steps that recognizes key inputs (e.g., funding, science, market forces) and associated decision-points over time, which together helps manage risk under uncertain future conditions. Rather than over-projecting and committing to a horizon of decisions and investments now, the approach is designed to schedule decision-making: it identifies what needs to be confirmed in the near-term versus in the future. Adaptation pathways therefore support strategic, informed, flexible, and structured decision- making, which allows the City to respond to a variety of future conditions (community priorities, sea level rise, etc.) while still remaining focused on long-term goals and generating public benefits.

The team also developed adaptation pathways for the Reaches. The focus of the ICSMAS **adaptation pathways** is on reducing the risk of sea level rise inundation and coastal and inland flooding over time, as these risks will increase with a warming climate. Risk from other hazards, such as earthquakes, tsunamis, heat waves, droughts, fires, and more are not directly addressed.

NOTE: As acknowledged in San Francisco’s recently adopted Hazards & Climate Resilience Plan, future phases of this work will continue to add considerations for other climate-related hazards such as extreme heat, poor air quality due to wildfire smoke, drought, and more.

ASSET-SPECIFIC ADAPTATION STRATEGIES
SF Planning, the Port, SFMTA, SFPUC and Public Works all have critical infrastructure along the shoreline, that serve both the local neighborhood and wider city. From this list of critical assets, the community and City identified **seven key assets** that would be studied in more detail at the 2050 time frame:

- Islais Creek Bus Facility
- Marin Yard
- Islais Creek Bridge
- Illinois Street Bridge
- Pier 80
- Pier 90-96 Backlands
- Pier 96



These asset-level strategies provide near-term protection, complement the preferred district-scale concept, and provide redundant resilience to other nearby interventions. **Three key assets** are studied in further detail, based on criteria such as timing of inundation, remaining life-span of asset, criticality of asset to the system:

- Islais Creek Bus Facility
- Islais Creek Bridge
- Pier 96

Hazard Mapping & Sea Level Rise Mapping

Combined Coastal and Precipitation-Based Stormwater Flooding Plus Sea Level Rise Inundation

As sea levels rise, coastal flooding, wave hazards, and rainfall-driven stormwater flooding are all likely to worsen. Therefore, the development of appropriate shoreline adaptation strategies must consider how sea level rise (SLR) may exacerbate all future flooding conditions.

A set of combined flood hazards maps were created to support the comprehensive adaptation pathways and asset-specific strategies. The maps depict the areas that could experience different types of flooding under six future SLR scenarios:

- **Storm Surge Flooding:** Extreme tide and storm surge events may cause Bay waters to rise above the shoreline elevation and flood low-lying inland areas. ICSMAS hazard mapping considers coastal flooding that could occur during a future 100-year extreme tide (i.e., the simultaneous occurrence of an astronomically high tide with strong storm surge) on top of SLR.
- **Wave Hazards:** Storms produce wind-driven waves that propagate across the Bay and runup and overtop the shoreline. Wave hazards are generally most damaging at or near the shoreline, causing coastal erosion and undermining shoreline structures. Waves can also overtop the shoreline and travel inland across low-lying, flat areas resulting in inland flooding. ICSMAS wave hazard mapping considers overland wave impacts associated with a 100-year coastal storm event.
- **Stormwater Flooding:** High-intensity rain events may result in runoff that exceeds the capacity of the City's stormwater management system, causing flooding in areas with limited or no connectivity to conveyance infrastructure or the Bay. ICSMAS stormwater hazard mapping considers flooding that could occur during a 100-year, 3-hour rainfall event coupled with SLR during a 2-year extreme tide. The City's combined sewer system is designed to handle stormwater from a 5-year storm, after which City streets are designed to convey overflow. In some areas of the city stormwater can overtop curbs, exposing adjacent buildings to flood risk.

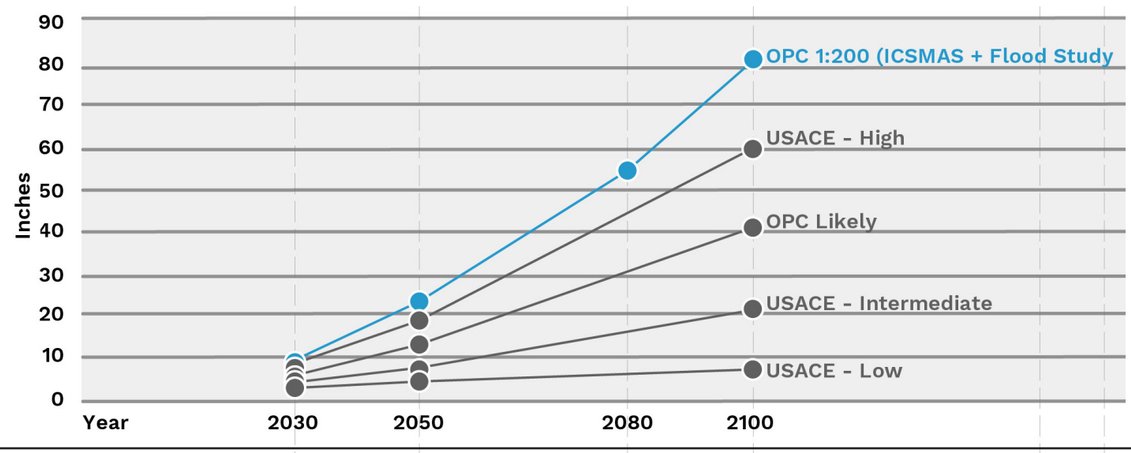
The combined flood hazard maps depict areas of overlapping hazards, assuming each type of flooding is independent. However, in areas where hazards overlap, the combined hazard is likely to be more severe than mapped; i.e., SLR inundation due to storm surge could increase the area impacted by stormwater flooding if both types of flooding occur concurrently. The information presented is sufficient to inform the development of flood risk reduction strategies; however, additional analysis may be warranted to support adaptation strategy design.

Sea Level Rise Scenarios:
Six SLR scenarios were selected for the combined flood hazard maps, per hazard data produced by the SFPUC for its Climate Adaptation Plan and maps used by BCDC as part of the Adaptation to Rising Tides program. The scenarios were chosen based on a review of existing mapping, identification of early shoreline overtopping locations, and alignment with other City efforts like the Port's Flood Study (with USACE) and Envision process for re-imagining the long-term future of the waterfront. The six SLR scenarios (12, 23, 41, 52, 83 and 122 inches of SLR) are additive to the respective 100-year storm condition for each flooding type, thus representing the potential hazards that may occur during a future 100-year storm condition.

For the purposes of developing the district-scale concept,sea level rise projections were selected in line with City and Ocean Protection Council (OPC) for this type of project (containing critical assets) for two key planning time horizons: 2050 and 2080. The two combined hazards maps shown here illustrate permanent sea level rise as well as the other three flooding types; please see the Appendix for the complete, detailed analysis and set of combined hazard maps.

- 2050: 1:200 Chance, MHHW +23" SLR
- 2080: 1:200 Chance, MHHW +52" SLR

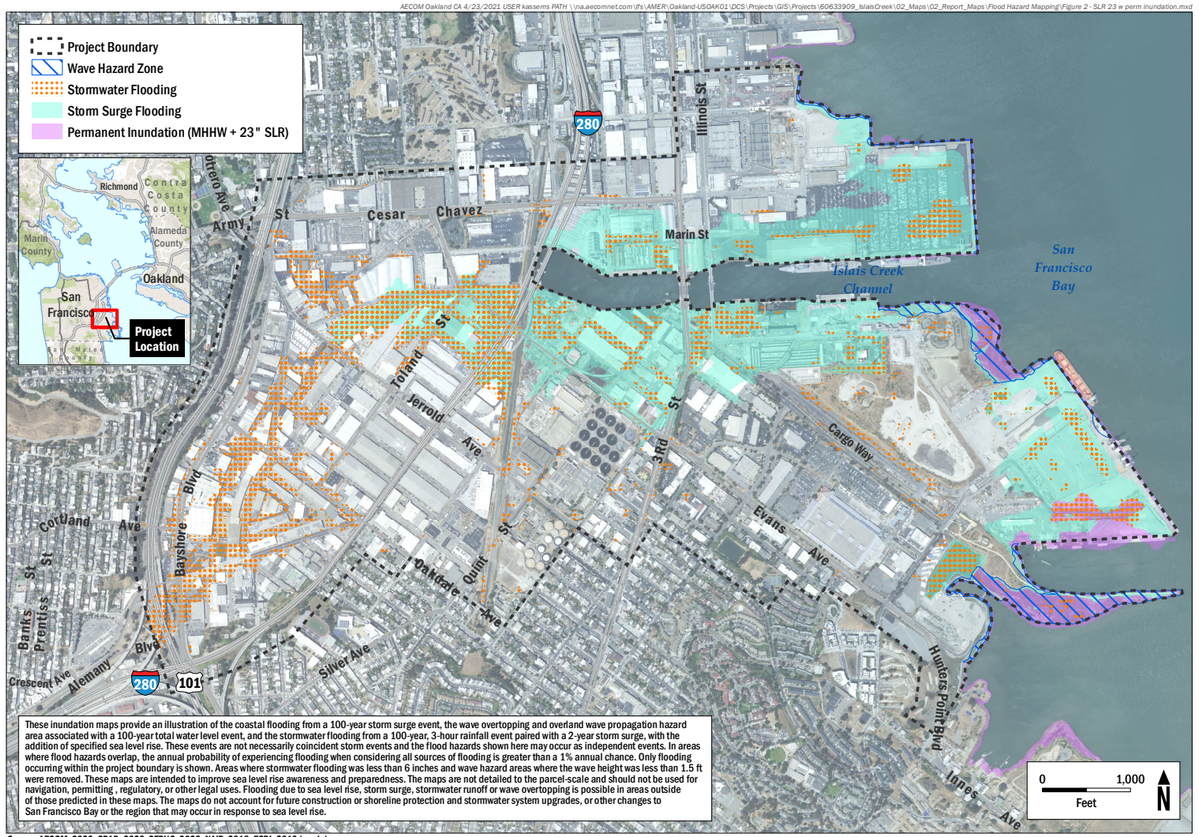
Sea Level Rise Scenarios



It is important to note that today's sea level rise projections vary, particularly beyond 2050 when the rate of sea level rise will be primarily determined by the success or failure of reducing greenhouse gas emissions (GHGs) in the next decades. The OPC 1:200 sea level rise projections used in ICSMAS assume lower success at containing GHG globally. As USACE uses a different set of SLR projections that assume a slower rate, The San Francisco Waterfront Resilience Study also includes OPC's projections but expands the set of projections to include USACE's Low, Intermediate and High projections, which assume a slower rate of SLR. Regardless of the eventual time frame, the water levels presented here will be reached at some point, but may differ by 10, 50 or 100 years. Adaptation Pathways are an excellent tool to adapt to this uncertain future because they allow planners to respond to higher or lower water levels when needed.

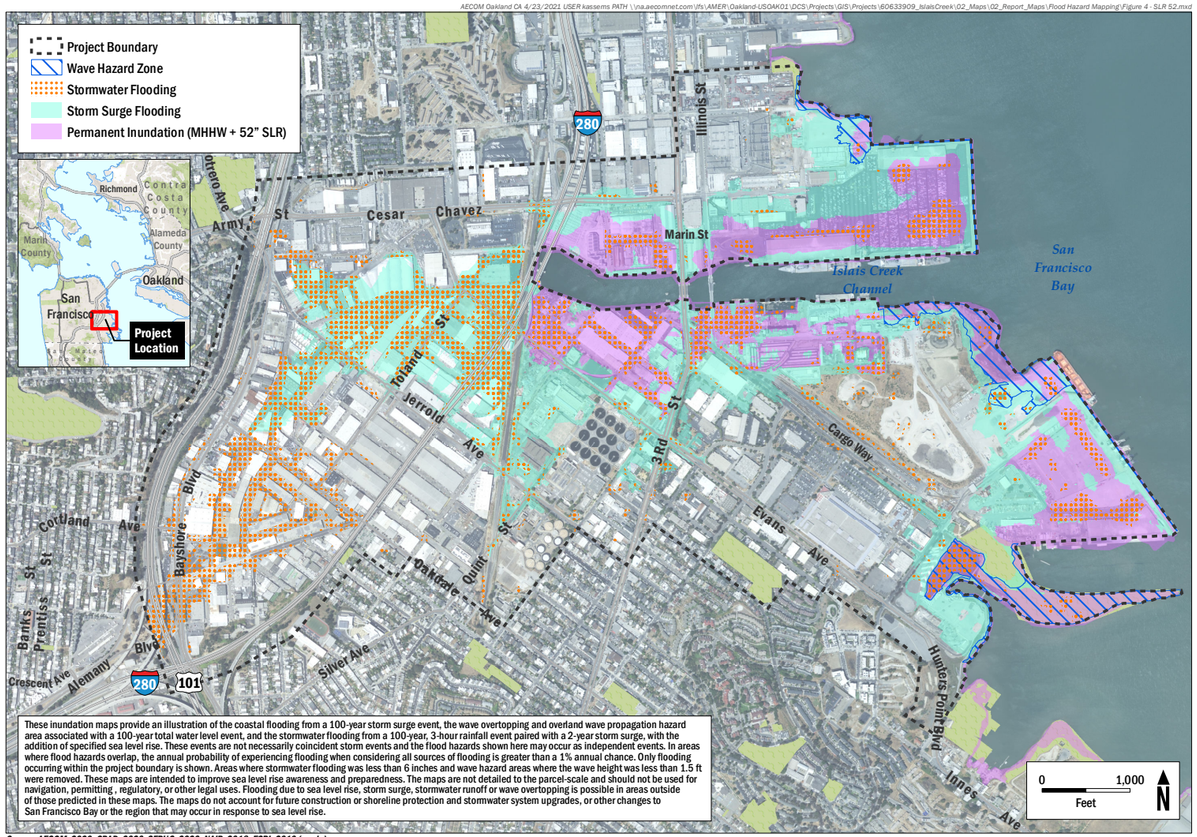
Sea Level Rise & Storm Surge Mapping

2050 COMBINED FLOOD HAZARD MAPPING
MHHW + 23” permanent SLR inundation (assuming 1:200 Chance SLR scenario) plus 100-year coastal storm surge (up to 41”) and stormwater flooding.



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

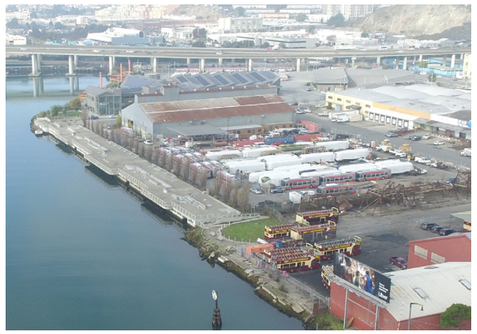
2080 COMBINED FLOOD HAZARD MAPPING
MHHW + 52” permanent SLR inundation (assuming 1:200 Chance SLR scenario) plus 100-year coastal storm surge (up to 41”) and stormwater flooding.



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

Key Assets at Risk, Selected for ICSMAS Focus

1 Islais Creek Bus Facility



2 Marin Yard

3 Islais Creek Bridge

4 Illinois Street Bridge

5 Pier 80

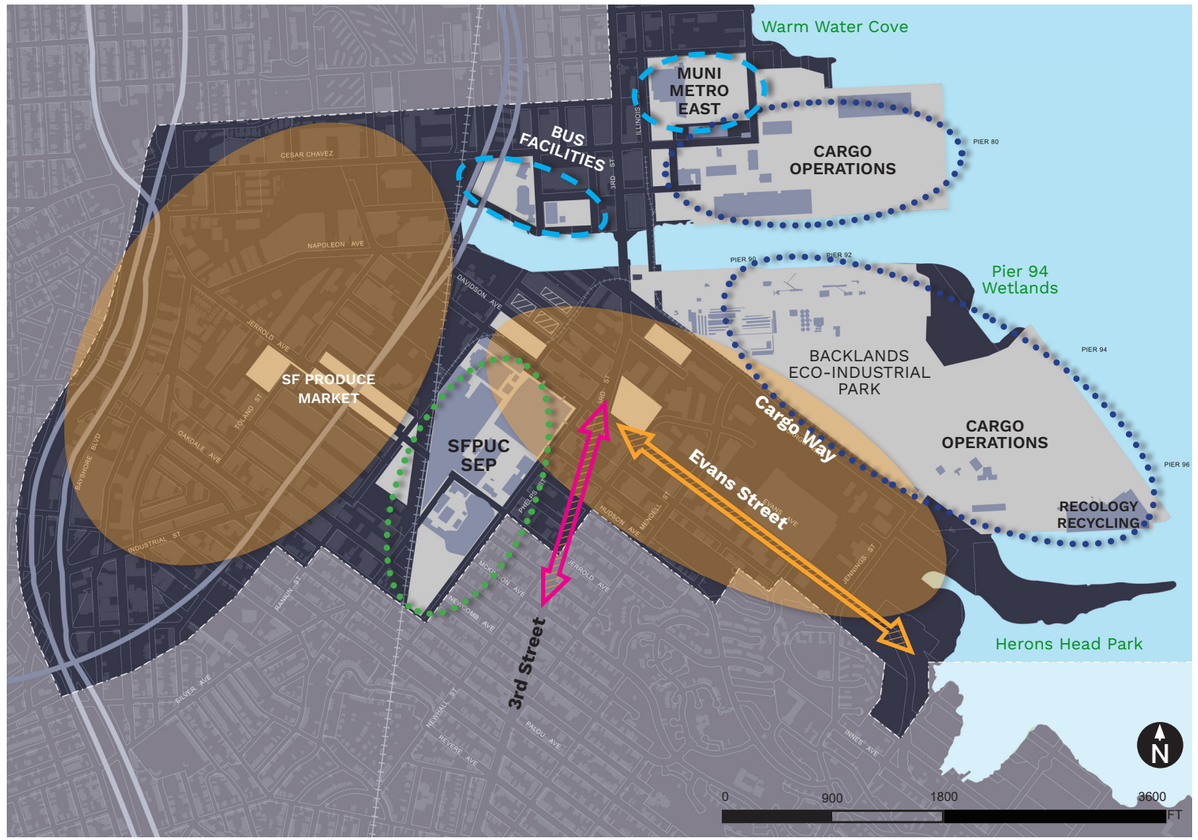
6 Pier 90-96 Backlands

7 Pier 96

Adaptation Summary, District-Scale

Economic, Open Space, and Mobility Benefits for the District

Economic Opportunity (through 2080)



Legend

POTENTIAL JOB GROWTH ZONES

- Production, Distribution, Repair (PDR) areas
- Maritime Industrial area (SF Port)
- PDR, Multi-modal Corridor
- Mixed-use, Multi-modal Corridor
- SFMTA Facilities
- SFPUC Facilities

LAND USE

- City-owned Parcels
- Existing Buildings
- Project Area

Economically, the Islais Creek area supports some of the city's last remaining production-distribution-repair (PDR), industrial, and maritime cargo uses. These uses help create and sustain a critical sector of skilled, middle-wage job opportunities, which helps maintain a diverse economic and employment base in San Francisco. This area is the city's only location that can support deep-water port berthing, including land-intensive cargo terminal operations. Maritime functions also rely upon adjacent usable land for efficient operations, storage, and transportation of materials. The piers, large-vessel berths, and terminal areas are also critical components of the City's disaster response capability. Finally, the district's proximity to the Dogpatch and Bayview residential neighborhoods also supports a diverse labor pool.

PDR & Mixed-Use Commercial
ICSMAS supports opportunities to enhance and grow production, distribution, and repair (PDR) PDR businesses in several zones on the west and south sides of Islais Creek, especially along Evans Street. The unique building typologies and sizes foster light manufacturing and craftsman, as well as automotive, machinery, and processing businesses.

As a major transit corridor, 3rd Street also has the potential to host increased density of residential, retail, and other local services, which in turn could help pay for adaptation strategies and other neighborhood benefits. The acknowledgement of the Bayview as the City's African American Arts and Cultural District also provides further opportunities to support local businesses in collaboration with community groups. Finally, with affordable housing needs in mind, mixed-used development could also be introduced along key transit corridors and/or in City-owned parcels as operations are consolidated and modernized, such as the Islais Creek Bus Facility, the Marin Yard and Muni Metro East.

Maritime Industrial
ICSMAS offers multiple measures to preserve and optimize maritime terminals and their industrial uses. It also recommends studying cargo berthing and terminal infrastructure that could facilitate relocating or consolidating cargo functions inland.

The Port's Maritime Eco-Industrial Center Strategy for Piers 80–96 co-locates maritime with industrial uses to enable product exchange, optimize resource use, incorporate green design and technologies onsite, foster resource recovery and reuse, provide economic opportunities that employ local residents, minimize environmental impacts, and provide safe public open space for enjoyment and habitat.

Regional plans forecast growth in cargo, industrial, and PDR uses in this area through 2050. The recent San Francisco Bay Conservation and Development Commission's (BCDC's) "Seaport Plan", the Maritime Element of Metropolitan Transportation Commission's (MTC) Regional Transportation Plan, identifies sufficient shoreline areas to accommodate future growth in maritime cargo, minimizing the need for new Bay fill for port development. It's 2050 cargo forecast identified San Francisco Pier 96 as a key expansion site required to have sufficient capacity for Ro-ro (automobile) and Dry Bulk cargo under a moderate-growth scenario, assuming the continued full utilization of Piers 80, 90, 92, and 94. ABAG's (Association of Bay Area Government) and MTC's "Plan Bay Area 2050 Final Blueprint" also designates the Islais geography as a "Priority Production Area" to enable industrial growth that expands middle-wage jobs close to more-affordable housing. Regional objectives for economic growth and related transportation systems are an Important consideration for this district-wide adaptation strategy.

Adaptation Summary, District-Scale

Environment & Open Space (through 2080)

Nature-based shoreline adaptation strategies aim to provide flood protection while increasing parks and habitat areas:

- Remove aging waterfront structures in favor of living shoreline features that restore a natural edge condition and create passive recreation opportunities (Warm Water Cove Park and southwestern creek bank)
- Consider expanding open space in opportunity areas that could be developed as a public/private partnership (Southwestern creek bank)
- Maintain existing wetland areas and consider regrading areas where they could migrate over time. (Pier 94 Wetlands, Heron's Head Park)
- Introduce green streets, street-level green infrastructure to reduce localized urban flood risk, reduce peak flows, increase biodiversity and enhance neighborhood character.

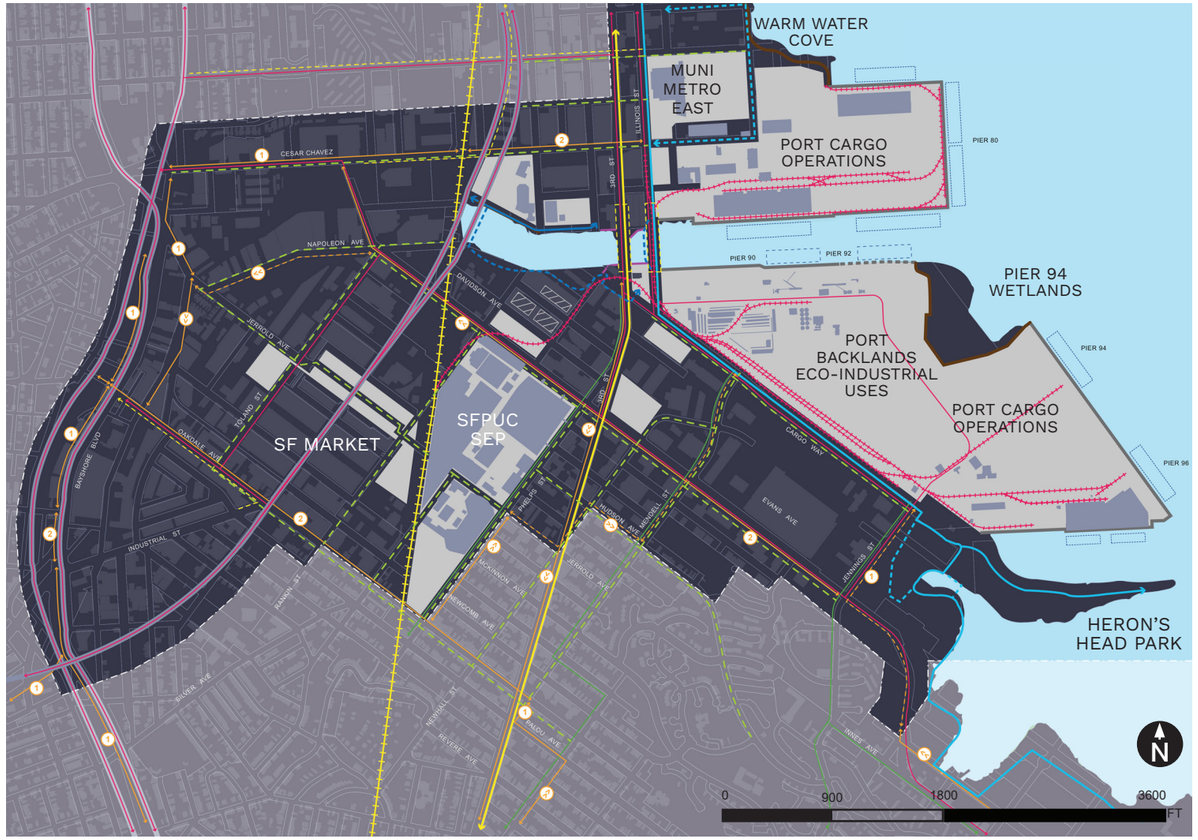
Legend

OPEN SPACE
- Existing Promenade or Plaza
- Existing Open Space
- New or Improved Open Space
- New Floodable Park
- New or Improved Marsh Wetlands
- New Eel Grass Beds
- New Oyster Reefs
- New Beach
- New Rock Groyne
- New Green Streets

LAND USE
- Opportunity Area: Open Space & Mixed-Use
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Existing Promenade or Plaza
- Project Area

Mobility (through 2080)



ICSMAS seeks climate adaptation investments that expand active transportation and transit, enhance traveler safety, and improve connections between maritime and industrial uses and regional highway and rail systems:

- Implement improvements to the Blue Greenway along Illinois St and Cargo Way. Consider potential additions to improve access to the waterfront.
- Enhance key transit corridors to improve East/West connectivity including Evans Ave, which helps ease the burden on the Islais Creek and Illinois St bridges and reduces North/South traffic.
- Improve the bike and pedestrian network for safe, enjoyable experience for those using it.
- Maintain and enhance truck and freight rail to sustain cargo and maritime operations. Revisit need for freight rail to Pier 80 when the Illinois Street Bridge is reconstructed.
- Use green streets/infrastructure (e.g. bulbouts) to slow traffic and create safety buffers from vehicles.

Legend

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing/ Primary
- Proposed Addition

MUNI CORRIDOR
- Existing
- Proposed Addition

BIKEWAYS
- Existing Class 1, 2 or 3 (<<)
- Proposed Class 1, 2 or 3 (<<)

VEHICULAR
- Existing Truck Route

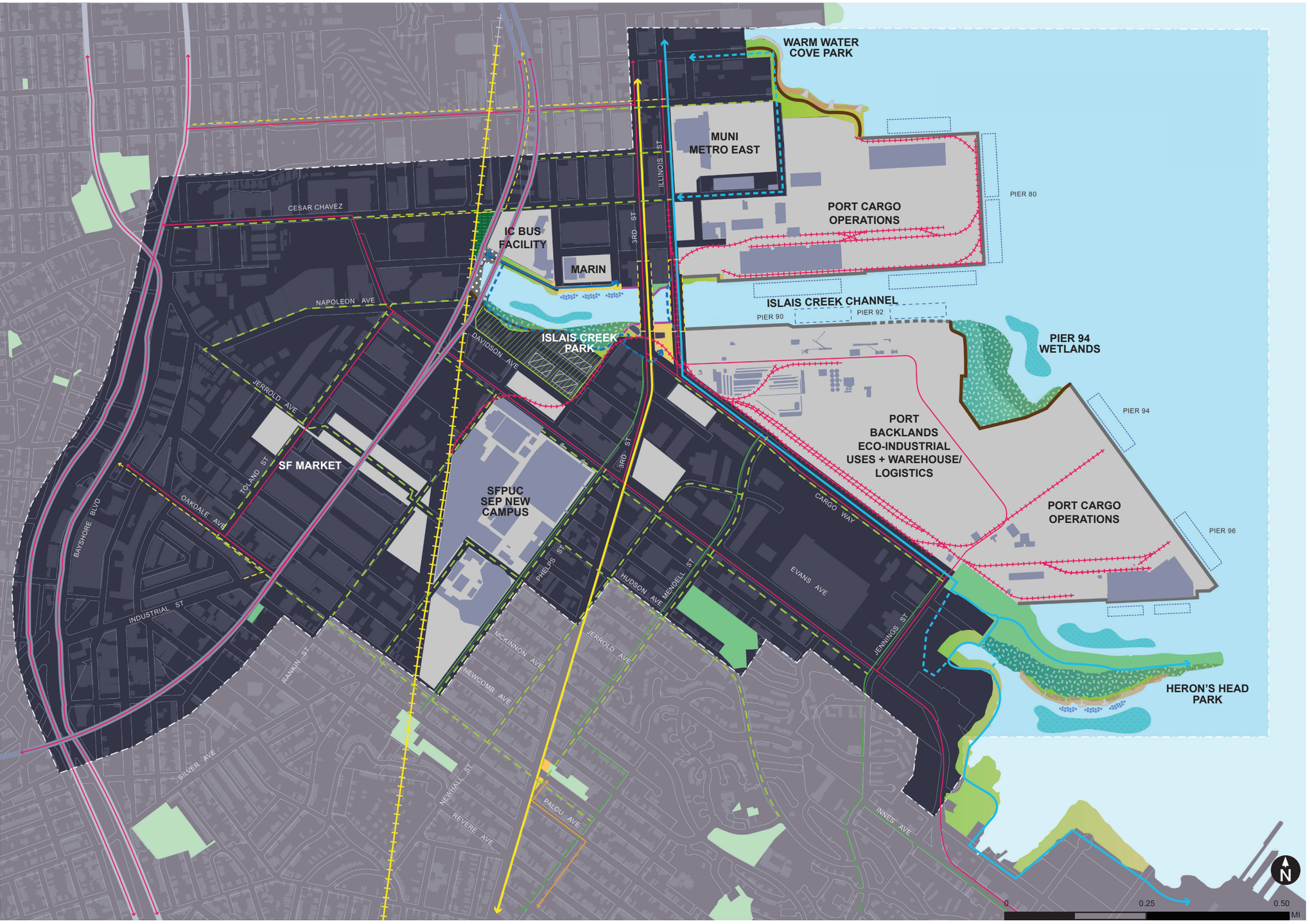
RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

LAND USE
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Project Area

District-Scale Adaptation Framework (through 2080)



The District-Scale Concept is based on a framework of adaptation strategies that relate to one another within the project area, such as key circulation corridors by mode, open space opportunities, and current and future land uses for example. The concept is based on the project goals and objectives and vetted through the public process.

Legend

NATURE-BASED FLOOD PROTECTION
- Existing Open Space
- New or Improved Open Space
- New or Improved Marsh Wetlands
- New Eel Grass Beds
- New Oyster Reefs
- New Beach
- New Rock Groyne
- New Green Streets

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Replaced Bridge
- Existing Promenade or Plaza

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing
- Proposed

MUNI CORRIDOR
- Existing (T Third Street)

VEHICULAR
- Existing Truck Route

RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

LAND USE
- Opportunity Area: Open Space & Mixed-Use
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings
- Project Area

Hard
Nature-Based
Earthen
Event-Based

Toolkit Strategies

SEAWALL

A hardened vertical structure, that is anchored into and above the ground on both sides.

BEACH CREATION

Supporting or creating a beach through strategic placements of fine or coarse sand – can attenuate waves in front of other structures.

LEVEE

Engineered structure made of packed earth with an impermeable core.

RAISED EDGE

Adding a hardened lip or wall to an existing shoreline structure.

NATURE BASED / HYBRID SHORELINE

A variety of solutions that support flood protection and wave attenuation properties of natural shorelines.

AUTOMATIC BARRIERS

Installed mechanical devices that can be raised during storm events.

RAISED PIER

Raising a pier, either from underneath by increasing the height of the support structures, or by adding to the height of the pier surface itself.

FLOODABLE PARKS

Shoreline recreation and open spaces that are designed to accommodate water during storm events without resulting in permanent damage.

DEPLOYABLE BARRIERS

Flood barriers that can be temporarily installed during storm events.

REVETMENT

Armoring placed on the slope of embankments or berms as a defense against erosion - revetments can be constructed from large rocks, tetrapods, etc.

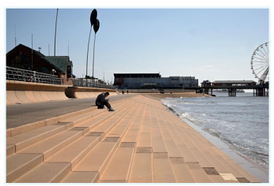
LIVING EDGE

A gently sloping earthen structure, possible backed by a levee, providing and ecotone slope for marsh vegetation and attenuating wave action.

STORMWATER MANAGEMENT

Diffuse inland green infrastructure strategies that absorb stormwater to prevent ponding and reduce peak flows during flood events.

WAVE ATTENUATION EDGE

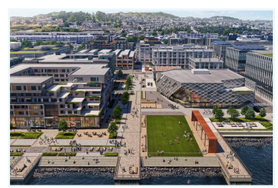


Structural armoring built on the slope of embankments, such as interlocking concrete tiles or steps.

OFFSHORE SOLUTIONS

Structures that are placed in the water offshore to attenuate wave action – may be hardened structures or green/living structures.

LAND USE CHANGE



Strategies that allow the shoreline edge to migrate inland, with associated land use changes behind.

RAISE INFRASTRUCTURE

Elevating bridges, roads, or other infrastructure to be above flood waters. Raised infrastructure can also contribute to the protection of inland assets.

BERM

Earthen non-engineered mounds, potentially vegetated.

RAISE STRUCTURE

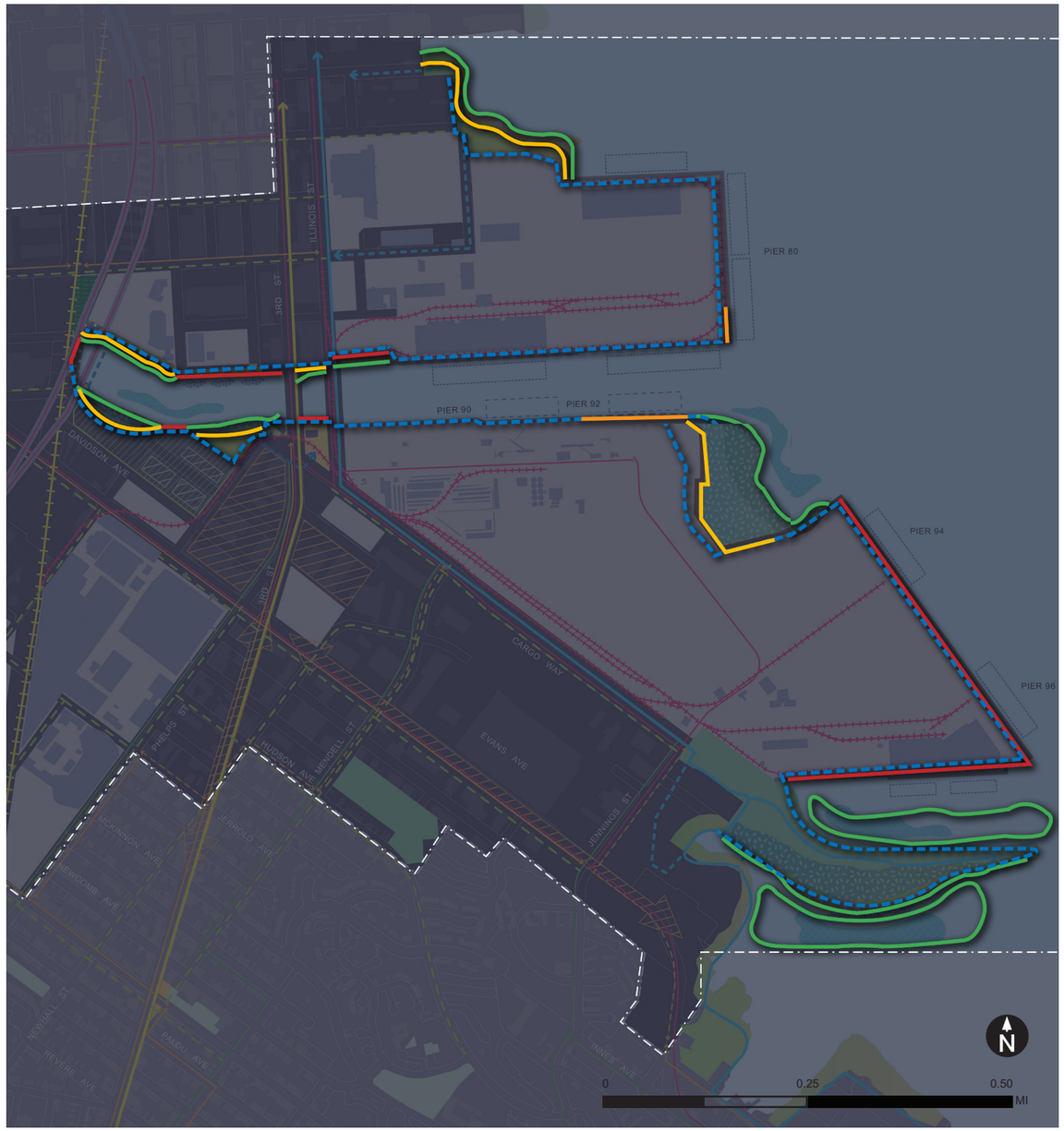
Elevating individual structures inland to be above flood waters, with measures like pile supports or elevated foundations.

Shoreline Protection - Toolkit Strategies

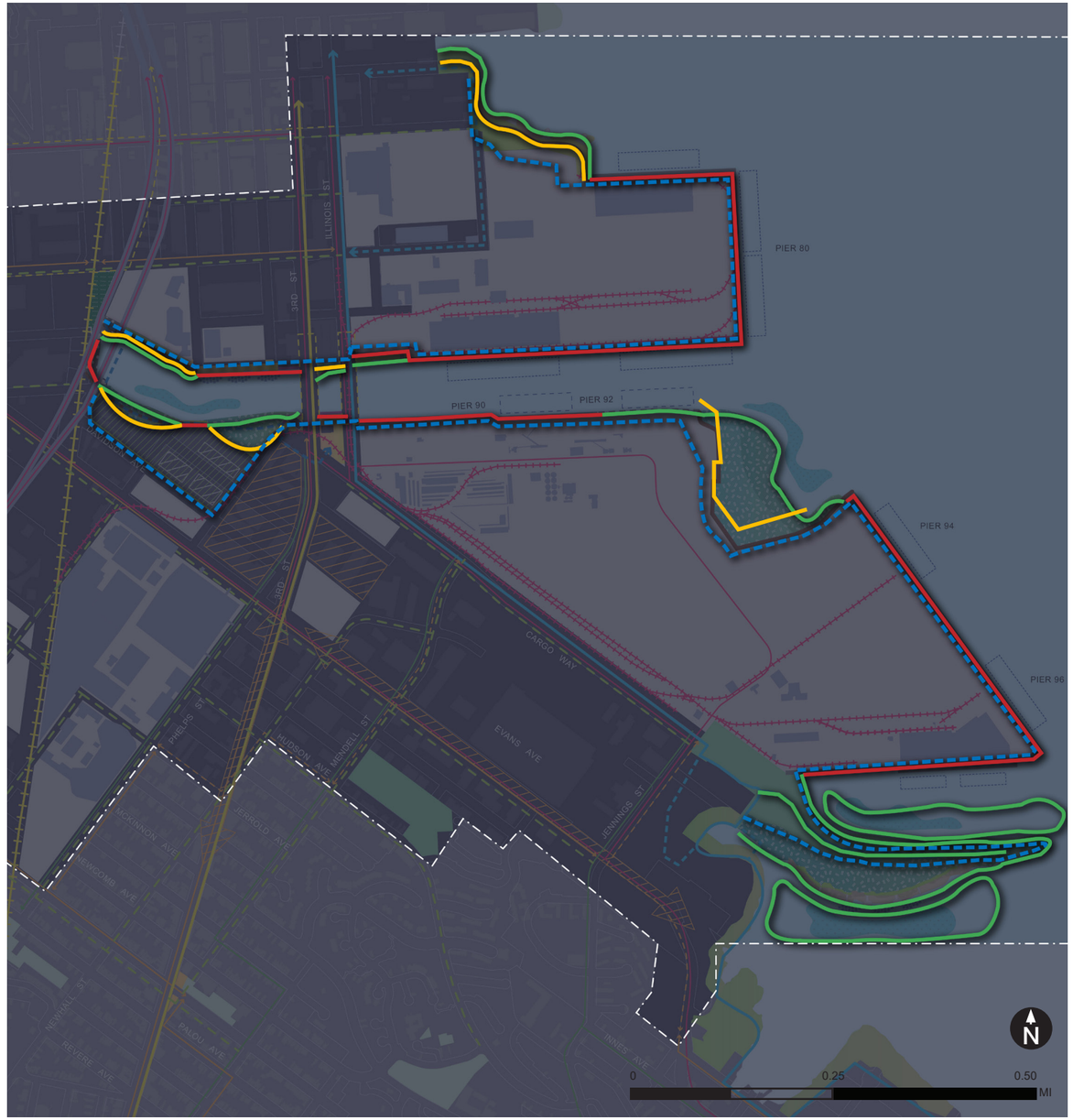
Legend

- Hard
- Nature-Based
- Earthen
- Event-Based
- Line of Defense

Shoreline Protection through 2050



Shoreline Protection through 2080



Adaptation Pathways & Key Asset Strategies, by Reach

These five Reaches are grouped adaptation strategies organized by related geographical area.

1. **Reach 1 - Northeastern Waterfront:**
Introduce nature-based shoreline adaptation strategies to expand Warm Water Cove Park and elevate and protect Pier 80 to support maritime function.

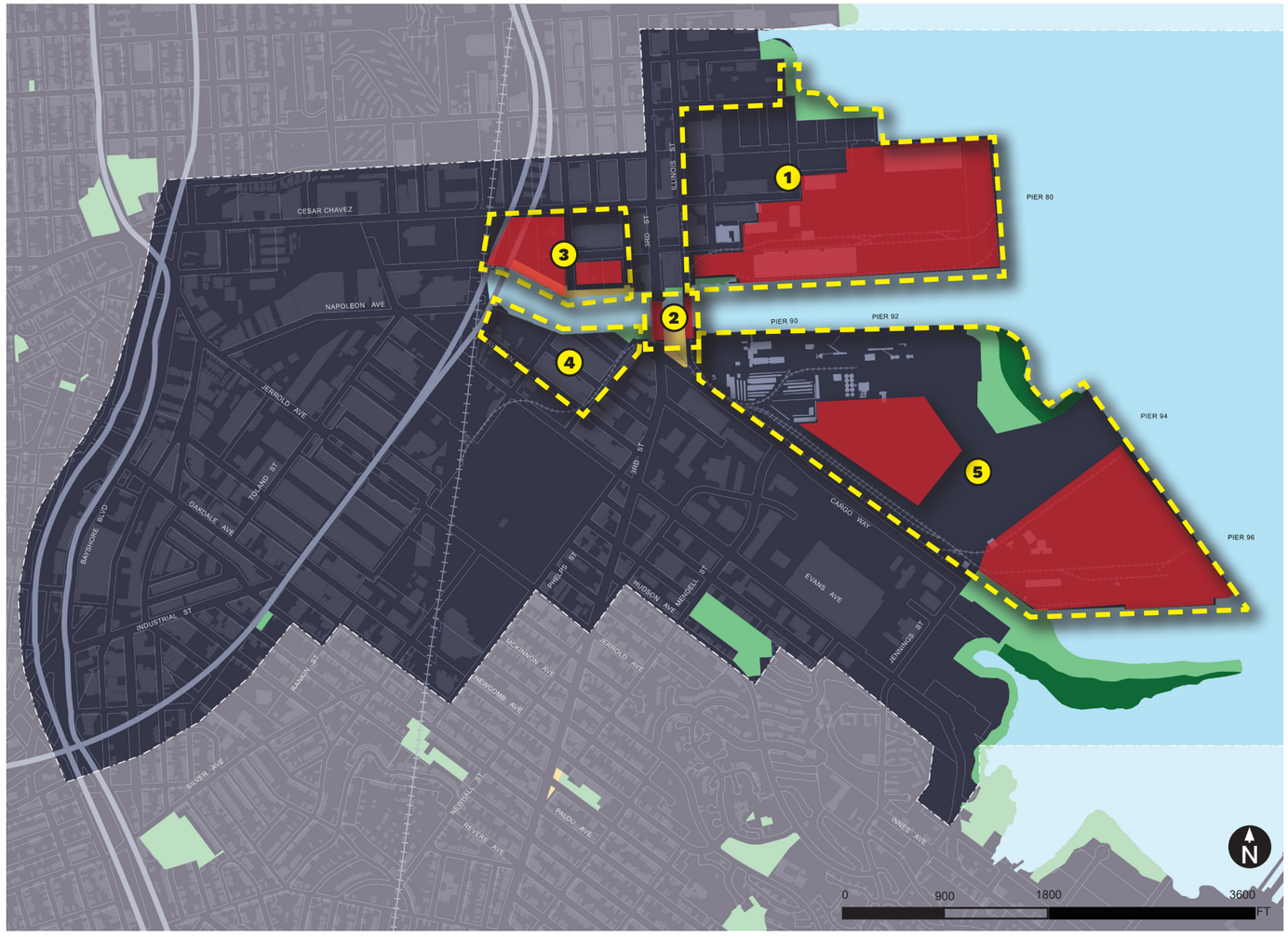
2. **Reach 2 – Creek Channel Crossing:**
Rehabilitate and replace Islais Creek Bridge and Illinois Street Bridge.

3. **Reach 3 – Northwestern Creek Bank:**
Introduce flood protection measures at critical SFMTA facilities and enhance public access to the creek's shoreline.

4. **Reach 4 – Southwestern Creek Bank:**
Create new tidal marsh and expand Islais Creek Park.

5. **Reach 5 – Southeastern Waterfront:**
Optimize use of cargo terminal and industrial operations at Piers 90-96 and the Backlands.

Adaptation Reaches: Key Plan



1. Northeastern Waterfront

Introduce nature-based shoreline adaptation strategies to expand Warm Water Cove Park and elevate and protect Pier 80 to support maritime function.

Existing Conditions

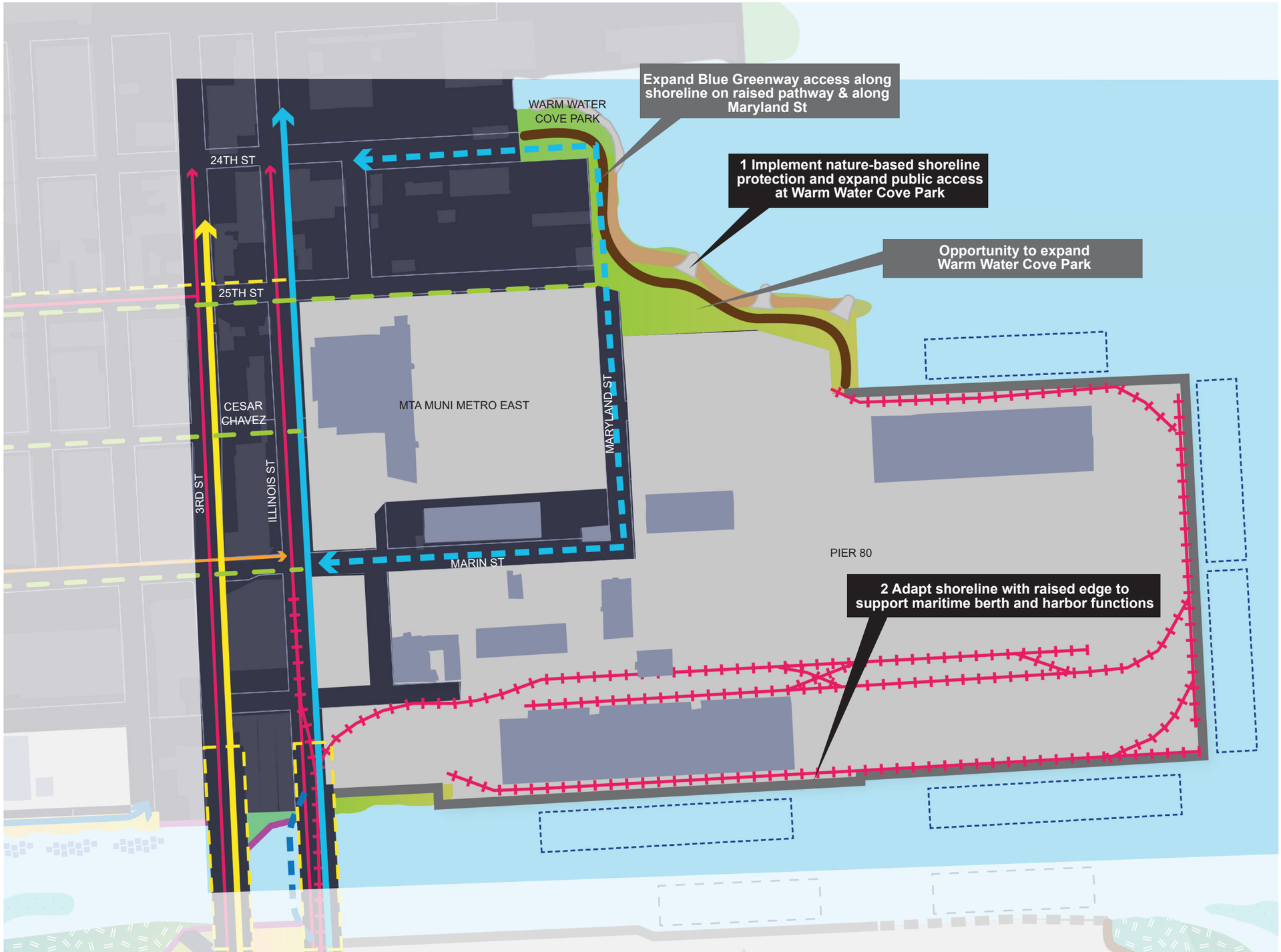
Site Photos

Pier 80

Muni Metro East

Warm Water Cove Park

Northeastern Waterfront Through 2080



Legend

NATURE-BASED FLOOD PROTECTION
- Existing Open Space
- New or Improved Open Space
- New or Improved Marsh Wetlands
- New Eel Grass Beds
- New Oyster Reefs
- New Beach
- New Rock Groyne
- New Green Streets

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Replaced Bridge
- Existing Promenade or Plaza

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing/ Primary
- Proposed Addition

MUNI CORRIDOR
- Existing
- Proposed Addition

BIKEWAYS
- Existing
- Proposed

VEHICULAR
- Existing Truck Route

RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

LAND USE
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings

N

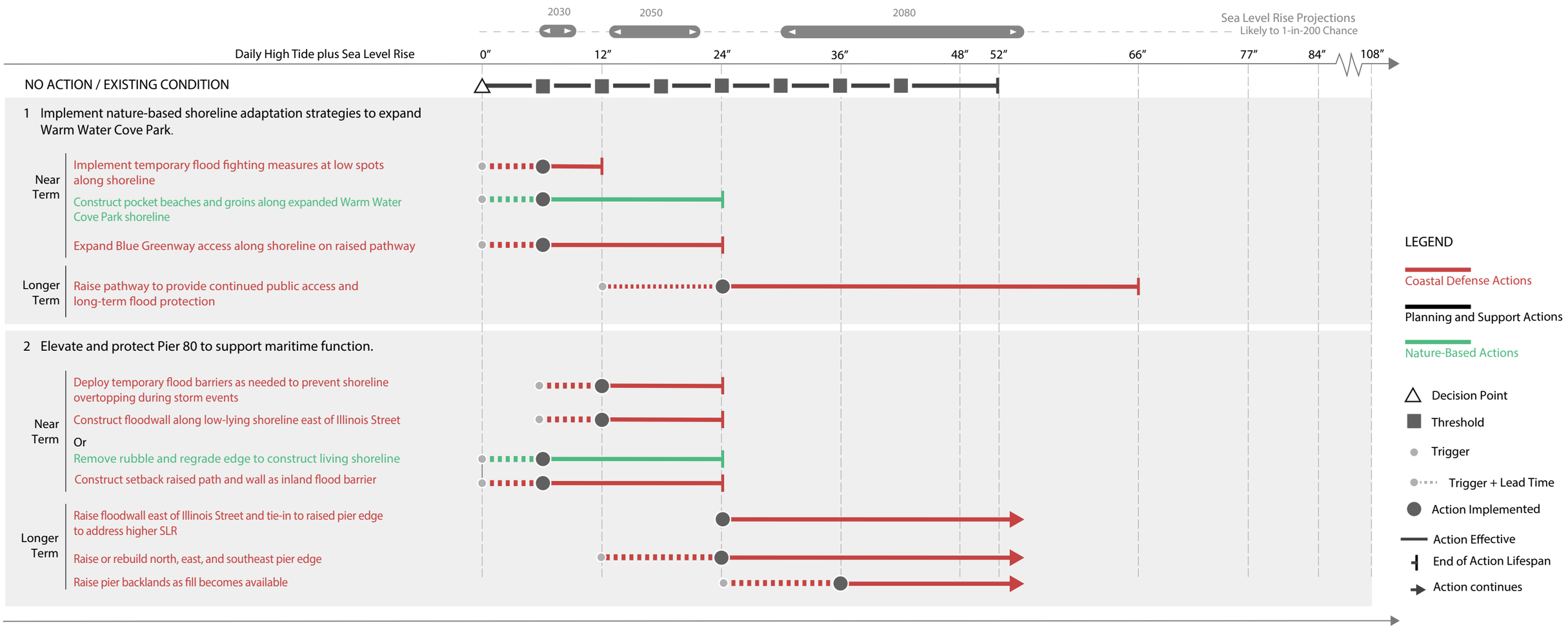
0 0.25 0.50 MI

Northeastern Waterfront

Introduce nature-based shoreline adaptation strategies to expand Warm Water Cove Park and elevate and protect Pier 80 to support maritime function.

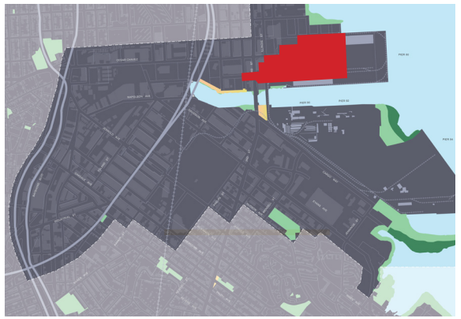
	1 Implement nature-based shoreline adaptation strategies to expand Warm Water Cove Park	**2 Elevate and protect Pier 80 to support maritime function**
Near Term	• Implement temporary flood fighting measures at key low spots in between Warm Water Cove Park and the northern edge of Pier 80 • To protect the northern edge of Pier 80, Muni Metro East, and the full potential of Warm Water Cove Park, construct a series of pocket beach features by placing coarse sand and gravel on top of the existing revetment along the expanded Warm Water Cove Park shoreline and stabilize with groins. Construct headland anchor points at the north and south ends of the shoreline to retain the beach material. Place tide pool features in the new headlands to provide intertidal habitat for marine organisms. • Re-nourish the beaches, as needed, as sand and gravel disperse along the shoreline to maintain a natural edge. With 24 inches of sea level rise, it is likely that the beach will become submerged. If it is desired that the beach have a longer lifespan, then the project could include setting back the existing shoreline, relocating the existing revetment landward, and providing space for the beach to migrate over time; however, this would be a more substantial project and would occupy a larger footprint. • Expand the Blue Greenway access along the shoreline at Warm Water Cove Park, connecting to Illinois Street via 24th Street. • Consider adding a kayak launch at Warm Water Cove Park at the northern tip of the park. This location is closest to existing parking and would be easily accessible for launching. Additional evaluation of maritime hazards in this area should be conducted to confirm that safe use of adjacent waterways is possible.	• Preserve deepwater berths and large vessel access for working waterfront uses and emergency staging at Pier 80. • Deploy temporary flood barriers (such as sand bags or deployables) as needed along the edge of Pier 80 to prevent shoreline overtopping during storm events. Floodproof any critical maritime buildings and equipment and establish an event-response plan to relocate sensitive inventory prior to flood events. • Construct a floodwall along the low-lying segment of shoreline east of Illinois Street and west of the developed edge of Pier 80. This is a low spot and flood pathway that may result in flooding of the Pier 80 backlands. An alternative to a traditional floodwall along this low-lying segment of shoreline would be to construct a living shoreline and provide public access connecting to Illinois Street. A setback raised path could be constructed along a more inland alignment to provide flood protection and expand public access.
Longer Term	• Raise the pathway along the shoreline to provide continued public access and long-term flood protection for higher levels of sea level rise • Expand rock revetment upslope as needed to provide protection for raised pathway	• Raise the floodwall that was previously constructed east of Illinois Street and tie-in to a raised Pier 80 edge to provide continued sea level rise protection • Raise or rebuild the north, east, and southeast wharf structures along the edge of Pier 80 to protect flexible deepwater berthing operations at Pier 80. • Raise the Pier 80 backlands as fill becomes available. The extent to which the backlands need to be raised for continuity with the raised pier edge will depend on the future maritime uses. Raising wharf elevations will require extensive ramps and drainage infrastructure to maintain operations. Alternatively, increasing the backland terminal elevation to match raised wharf edges would reduce drainage challenges associated with differential wharf and terminal elevations. • Improve liquefiable soils and artificial fill near the wharves. This will support future raising and mitigate known seismic hazards. • Equip berths and other maritime operations with zero-emission docking capabilities where feasible.

Adaptation Pathways - Northeastern Waterfront



Pier 80 (Selected Key Asset) - Summary of Strategies by 2050

Location



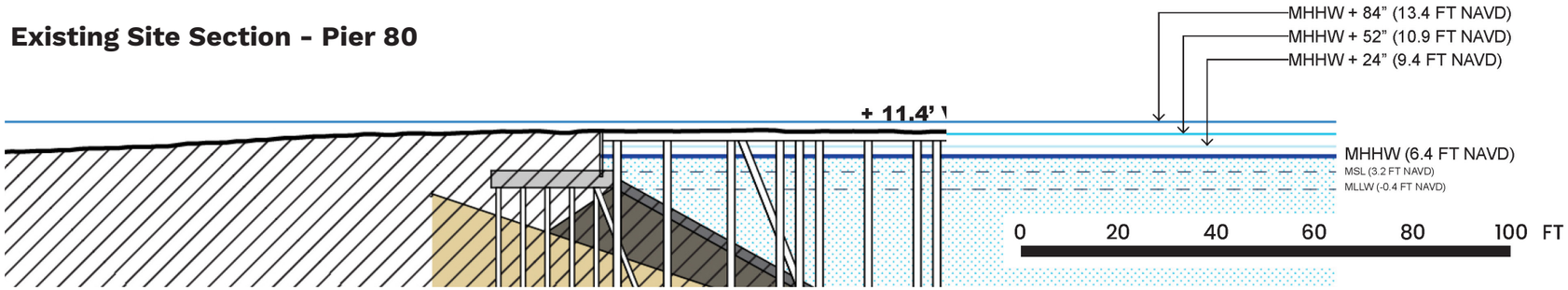
Initial Exposure

- Very minor permanent overtopping with 24” SLR
- Widespread temporary flooding during 100-year storm with 12” SLR

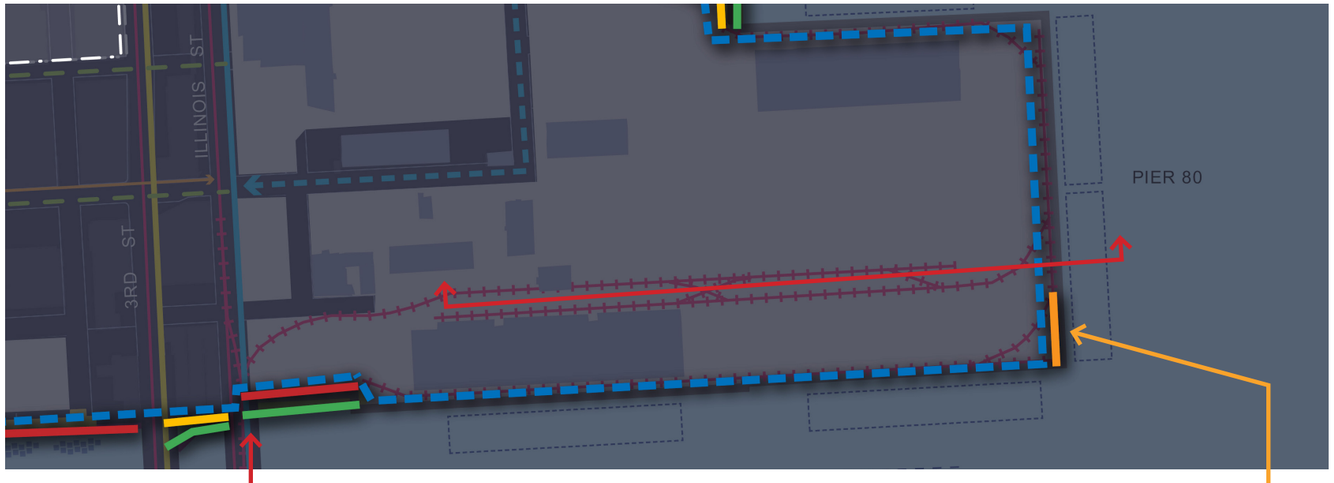
Existing Shoreline Typology

- **Structure - On Pile:** concrete structures that extend out over the water and are supported by timber or concrete piles

Existing Site Section - Pier 80



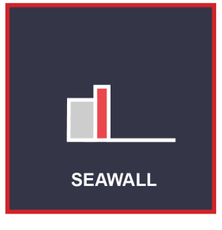
Toolkit Strategies By 2050



Legend

- Hard
- Nature-Based
- Earthen
- Event-Based
- Line of Defense

Recommended Strategy

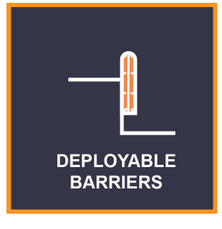


Construct floodwall along low-lying shoreline

Additional Strategy Options

Remove rubble and regrade edge to construct living shoreline. Construct setback raised path and wall as inland flood barrier

Recommended Strategy

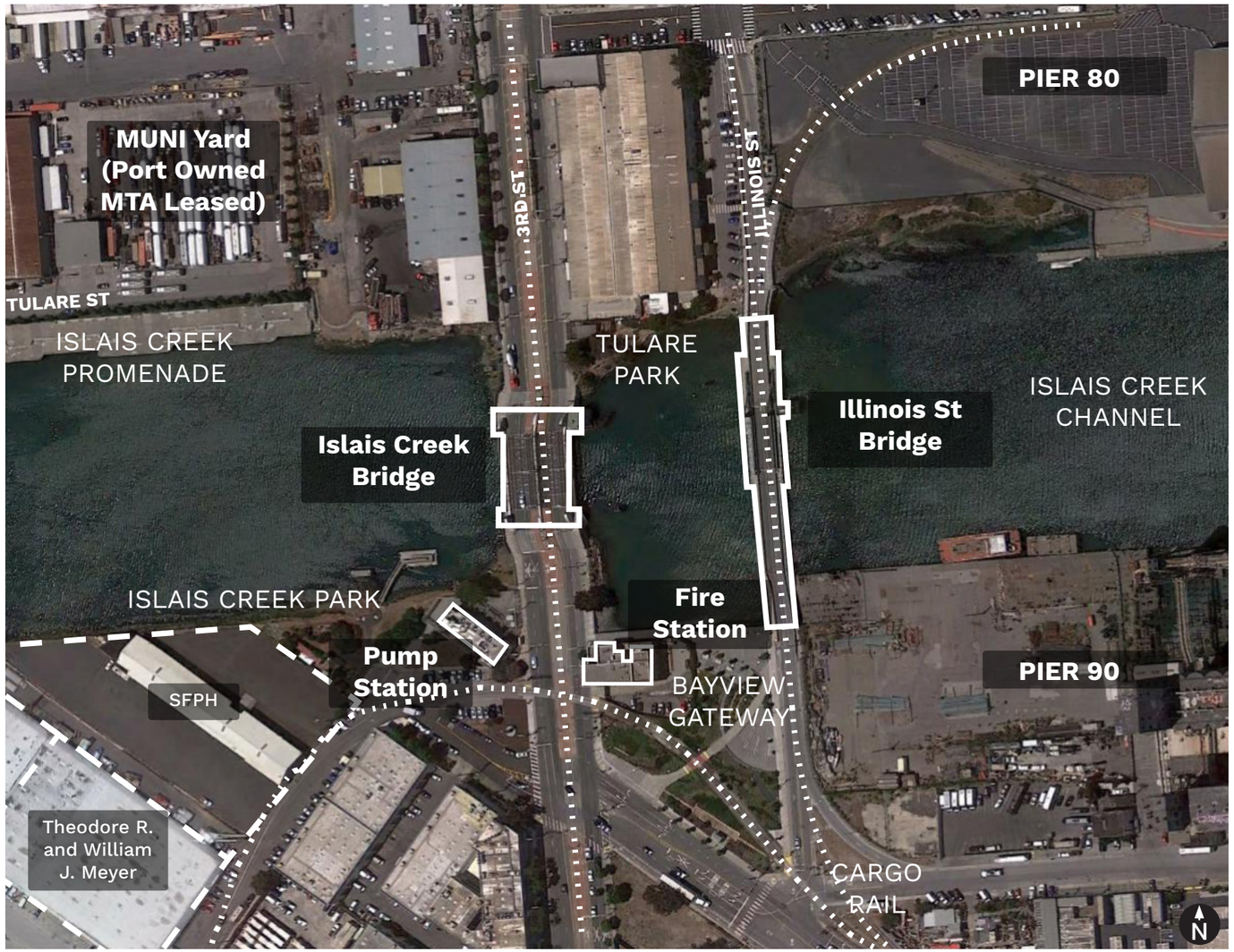


Deploy flood barriers that can be temporarily installed during storm event along overtopping edge

2. Creek Channel Crossing

Rehabilitate and replace Islais Creek Bridge and Illinois Street Bridge.

Existing Conditions



Site Photos

Tulare Park (between both bridges)

Islais Creek Bridge

Illinois Street Bridge

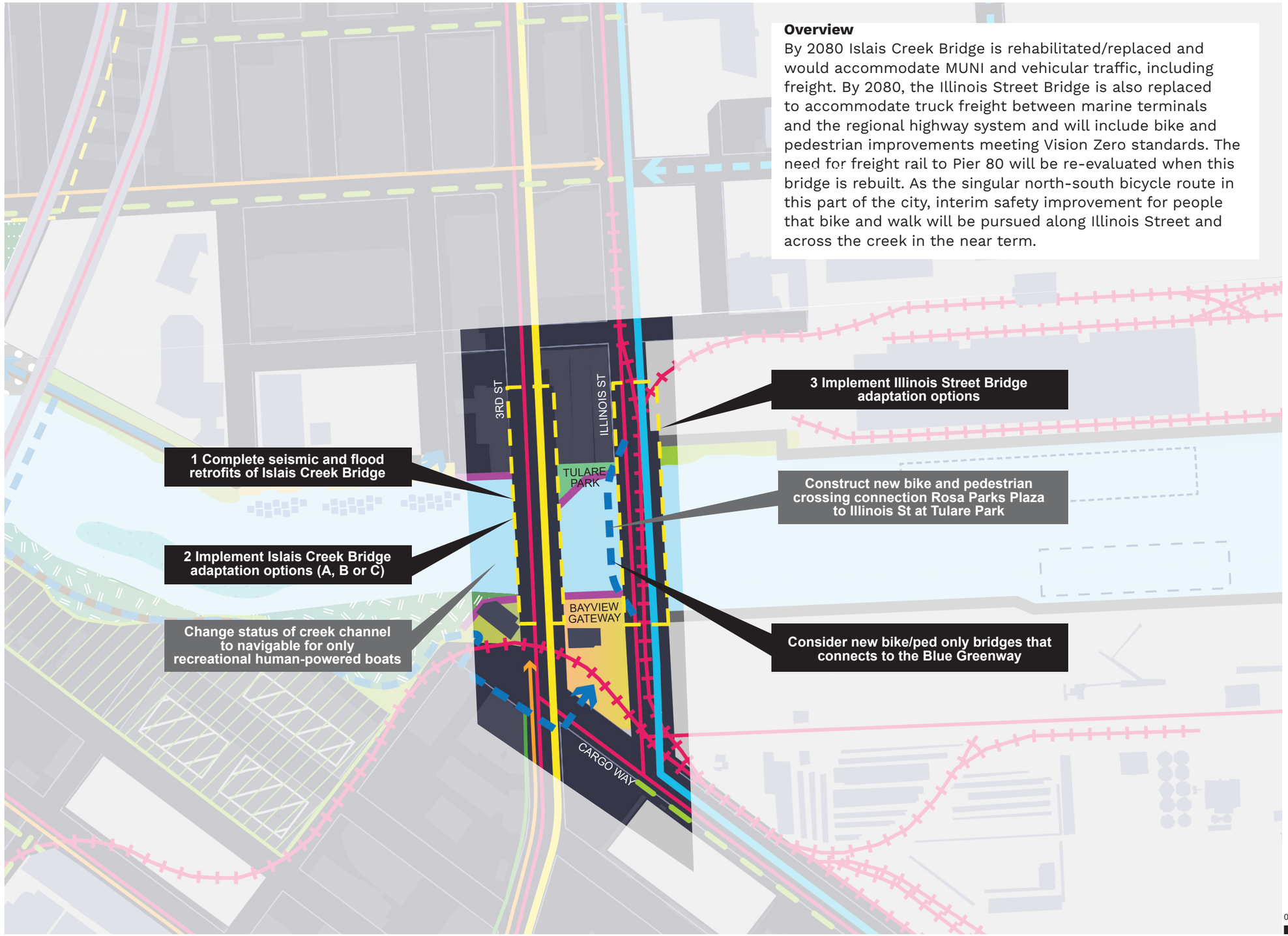
Background

Islais Creek Bridge Rehabilitation Project led by Public Works is intended to extend the life of the bridge by 50 years (2070-2080). This is a rehabilitation and retrofit of the superstructure, with some upgrades to MUNI above surface that support the overhead wire.

The project is currently on hold and reached 65% Design. Estimated construction to start in 2022-2024. The project is awaiting approval on federal funding, administered through Caltrans. Current funding for the rehabilitation project is only for seismic retrofit and does not include funding for sea level rise related upgrades.

Additional nearby projects include replacement of PUC pipes in 2022 parallel to the creek and the dogleg around the Islais Creek and Illinois Street bridges.

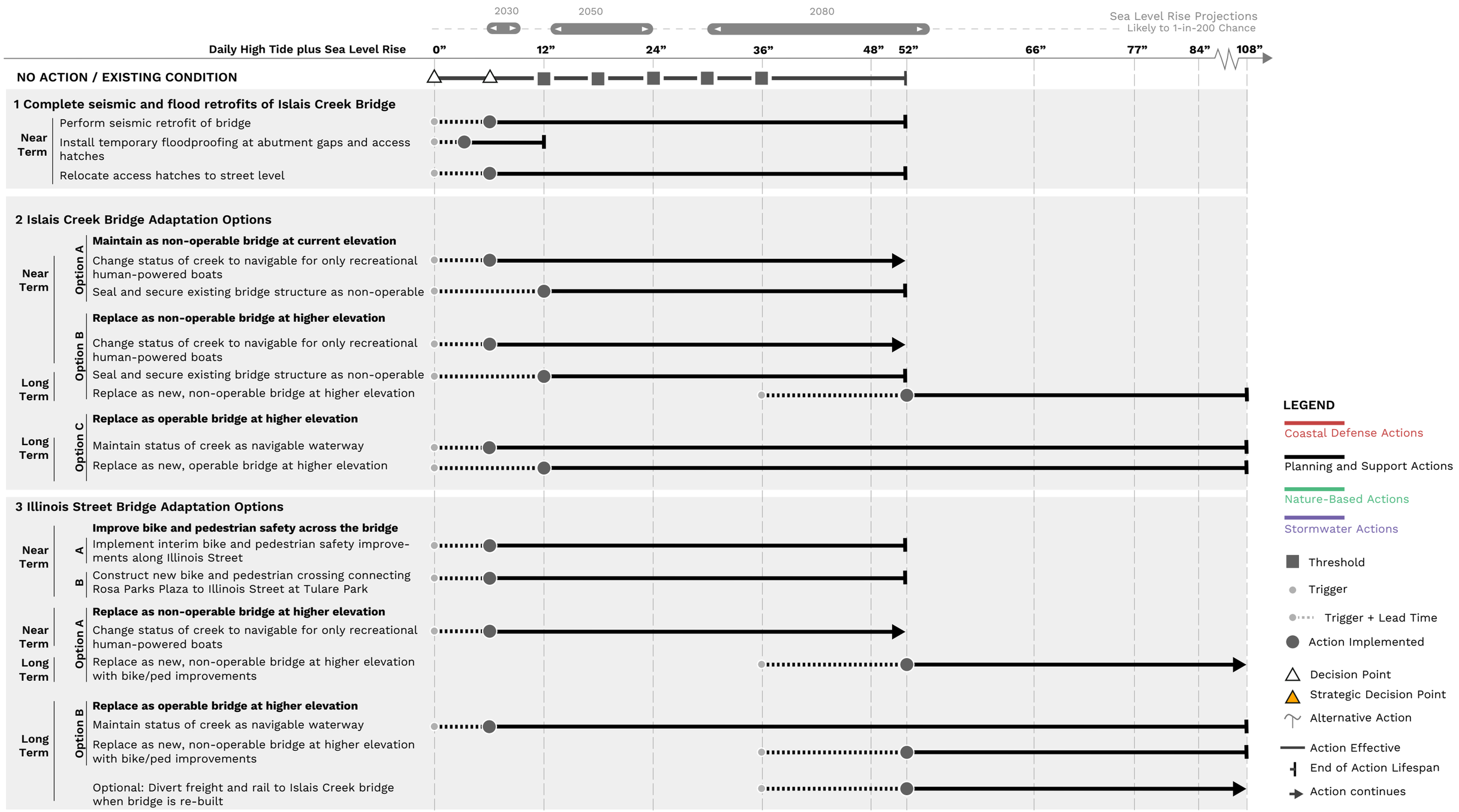
Creek Channel Crossing



Creek Channel Crossing

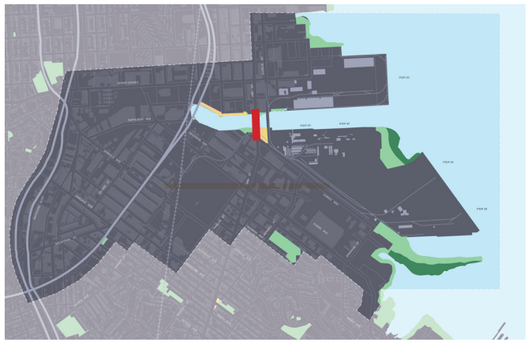
	1 Complete seismic and flood retrofits of Islais Creek Bridge	2 Islais Creek Bridge Adaptation Options	3 Illinois Street Bridge Adaptation Options
Near Term	• Perform seismic retrofit of bridge. • Install temporary (removable) floodproofing at abutment gaps and floodproof access hatches, Or • Relocate access hatches to street level (if feasible) Or, • Consider foregoing the current rehabilitation project because its life span is only for 50 years (2070-2080 planning horizon) and funding is for a seismic retrofit only and does not include sea level rise related upgrades. An option to adapt to SLR by 2030 (12") will be needed to protect access hatches, machinery pit and gap at abutment from flooding. Instead, implement one of the long-term adaptation options if additional funding can be secured.	• A technical traffic feasibility analysis is a recommended next step. Assume bridge would continue to accommodate MUNI and vehicular traffic, including freight. These bridge projects should be phased in a way that one of the bridges remains open while the other is under construction. The priority is to rehabilitate or replace the Islais Creek Bridge first. • Change status of the creek to navigable for only recreational human-powered boats. If successful with status change, consider options A and B. • OPTION A & B - Maintain as non-operable bridge at current elevation: Change status of the creek to navigable for only recreational human-powered boats. By 2030 (+12" SLR) seal and secure existing bridge structure as non-operable, to protect access hatches, machinery pit and gap at abutment from flooding through 2080 (+52" SLR). Or, • OPTION C - By 2030 (+12" SLR) replace as operable bridge at higher elevation considering SLR anticipated over lifespan of structure (approximately 75 years). Maintain status of creek as navigable waterway. Replace as new, operable bridge at higher elevation. Consider the flood risk of access hatches, machinery pit and gap at abutment from flooding (if applicable, depending on bridge design). Replace both the sub and superstructures and the new elevation shall aim to keep the bridge's operable components out of flood risk. The approaches shall be raised and sloped no steeper than 6-7% given the MUNI rail limitations. Assume the high point of the bridge is closer to the northern edge and is not centered on the creek, due to the physical constraint of the pump station and fire station to the south.	• A technical traffic feasibility analysis is a recommended next step or next project. These bridge projects should be phased in a way that one of the bridges remains open while the other is under construction. The priority is to rehabilitate or replace the Islais Creek Bridge first. • As the singular north-south bicycle route in this part of the city, interim safety improvement for people that bike and walk will be pursued along Illinois Street and across the creek in the near term. To improve bike and pedestrian safety across the bridge, implement interim bike and pedestrian safety improvements along Illinois Street, or construct a new dedicated bike and pedestrian crossing connecting Rose Parks Plaza to Illinois Street at Tulare Park. • OPTION A & B – Continue existing use of bridge in its current configuration until the structures reaches the end of its functional lifespan (approximately 2080).
Longer Term		• OPTION B – By 2080, Replace as non-operable bridge at higher elevation, considering SLR anticipated over lifespan of structure (approximately 75 years). Re-evaluated rail, transit, bike, and pedestrian needs and incorporate as-needed into new bridge design.	• OPTION A - Replace as non-operable bridge at a higher elevation: If successful with navigability status change, replace as new, non-operable bridge at higher elevation with bike/ped improvements. Or, • OPTION B - Replace as operable bridge at higher elevation. Maintain the status of the creek as a navigable waterway. Replace as new, non-operable bridge at a higher elevation with bike/ped improvements. • The need for freight rail to Pier 80 will be re-evaluated when this bridge is rebuilt. Consider diverting freight and rail to the Islais Creek bridge when bridge is designed and replaced to reduce the loads bridge will have to be designed to.

Adaptation Pathways - Creek Channel Crossing



Islais Creek Bridge (Selected Key Asset) - Summary of Strategies by 2050

Location



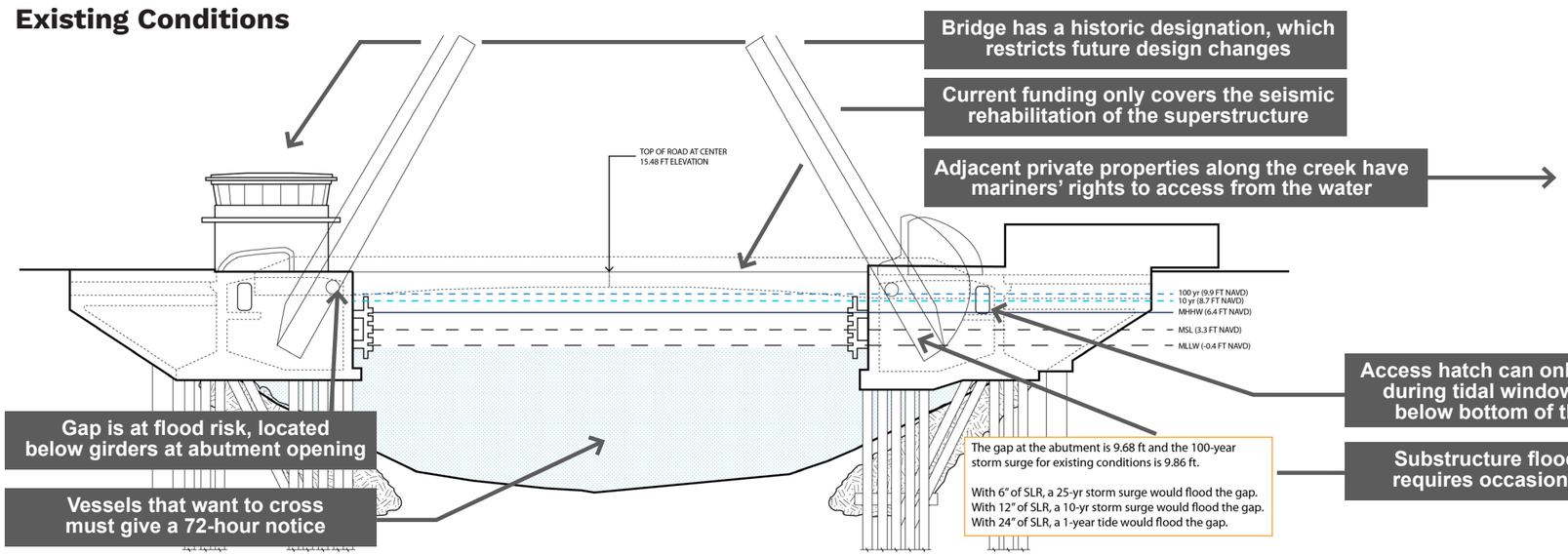
Initial Exposure

- Temporary flooding during 100-year storm with 24” SLR

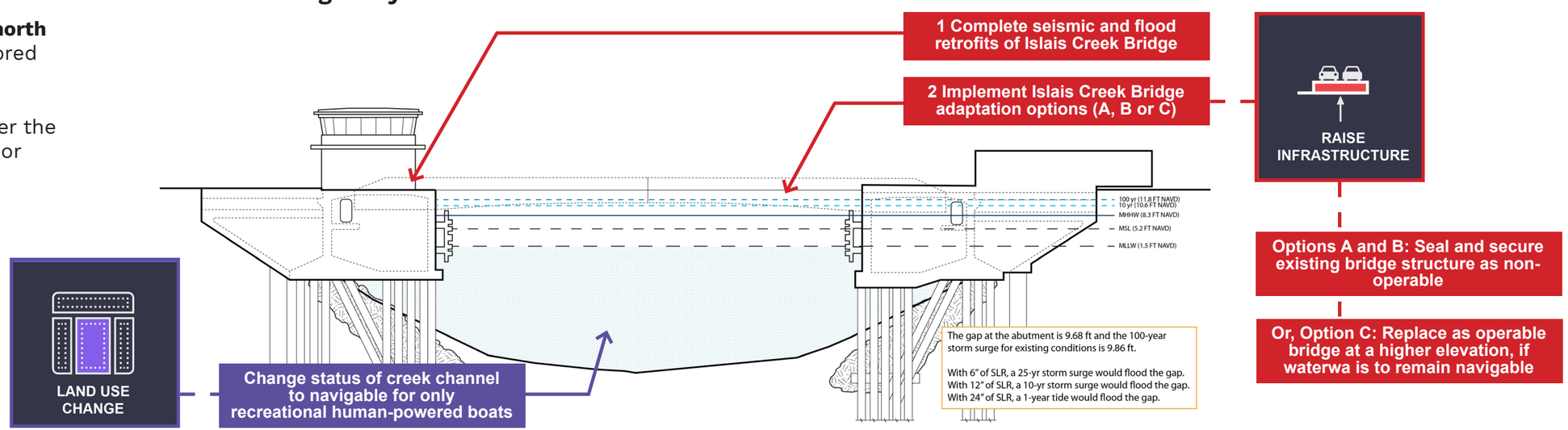
Existing Shoreline Typology

- **Embankment - Armored (north and south banks):** shoreline that is fully armored with riprap or broken concrete.
- **Embankment - Partially Armored (north bank):** gradient between fully armored shoreline and unarmored earthen shoreline.
- **Structure - On Pile:** extends out over the water and are supported by timber or concrete piles.

Existing Conditions

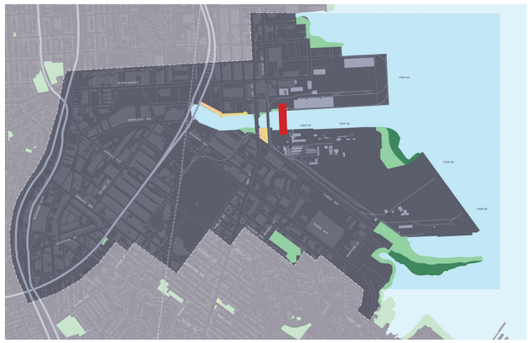


Toolkit Strategies By 2050



Illinois Street Bridge (Selected Key Asset) - Summary of Strategies by 2050

Location



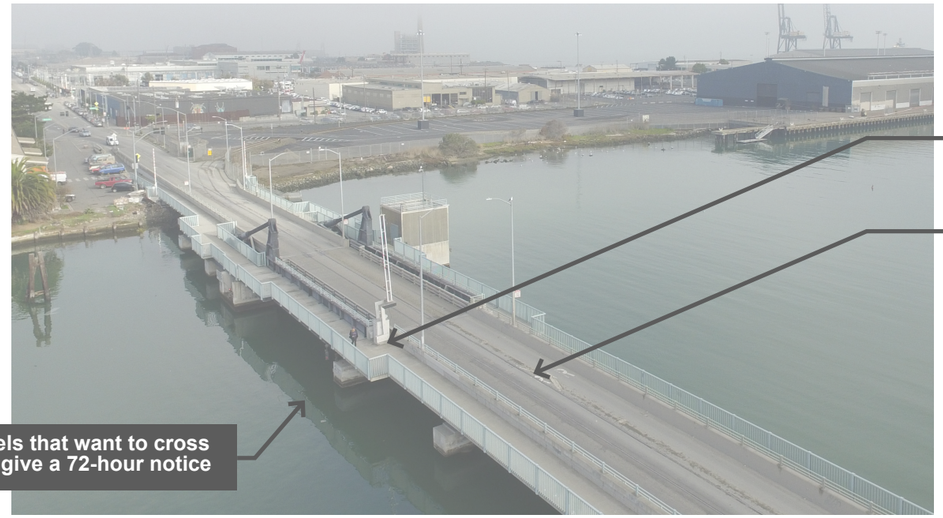
Initial Exposure

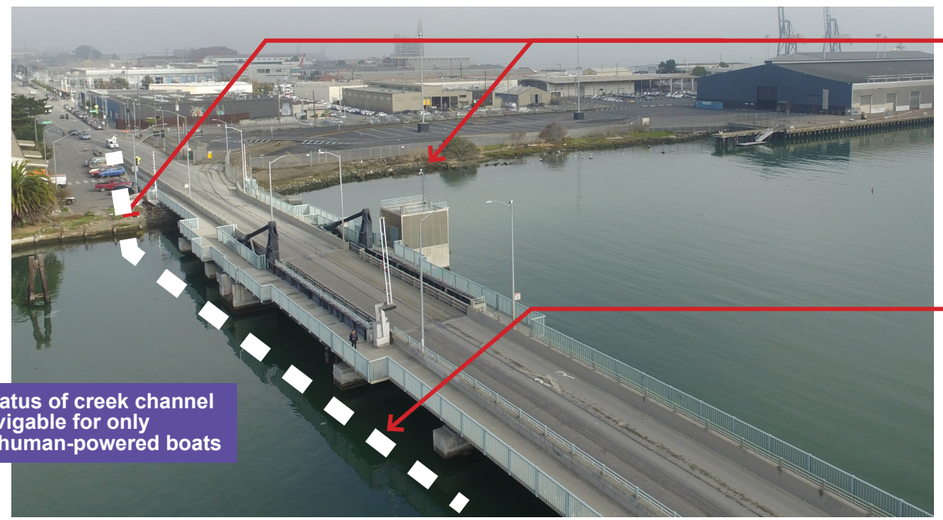
- Temporary flooding during 100-year storm with 24” SLR

Existing Shoreline Typology

- **Embankment - Armored (north and south banks):** shoreline that is fully armored with riprap or broken concrete.
- **Embankment - Partially Armored (north bank):** gradient between fully armored shoreline and unarmored earthen shoreline.
- **Structure - On Pile:** extends out over the water and are supported by timber or concrete piles.

Toolkit Strategies By 2050





3. Northwestern Creek Bank

Introduce flood protection measures at critical SFMTA facilities and enhance public access to the creek channel's shoreline.

Existing Conditions

Site Photos

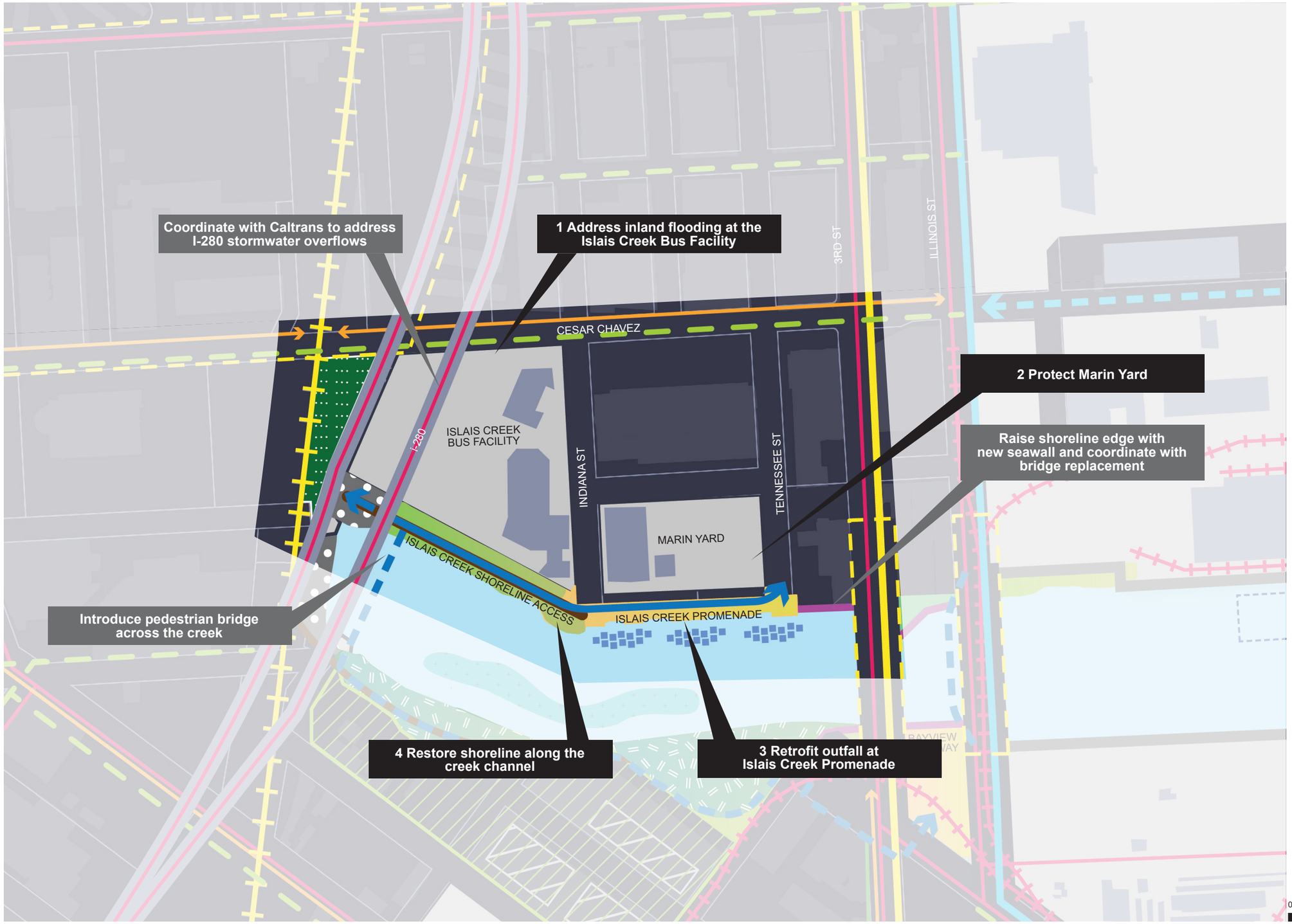
Islais Creek Shoreline Access

Islais Creek Shoreline Access (under I-280)

Islais Creek Bus Facility

Islais Creek Promenade and Marin Yard

Northwestern Creek Bank



Legend

NATURE-BASED FLOOD PROTECTION
- Existing Promenade or Plaza
- Existing Open Space
- New or Improved Open Space
- New or Improved Marsh Wetlands
- New Eel Grass Beds
- New Oyster Reefs
- New Beach
- New Rock Groyne
- New Green Streets

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Replaced Bridge
- Existing Promenade or Plaza

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing/ Primary
- Proposed Addition

MUNI CORRIDOR
- Existing
- Proposed Addition

BIKEWAYS
- Existing
- Proposed

VEHICULAR
- Existing Truck Route

RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

LAND USE
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings

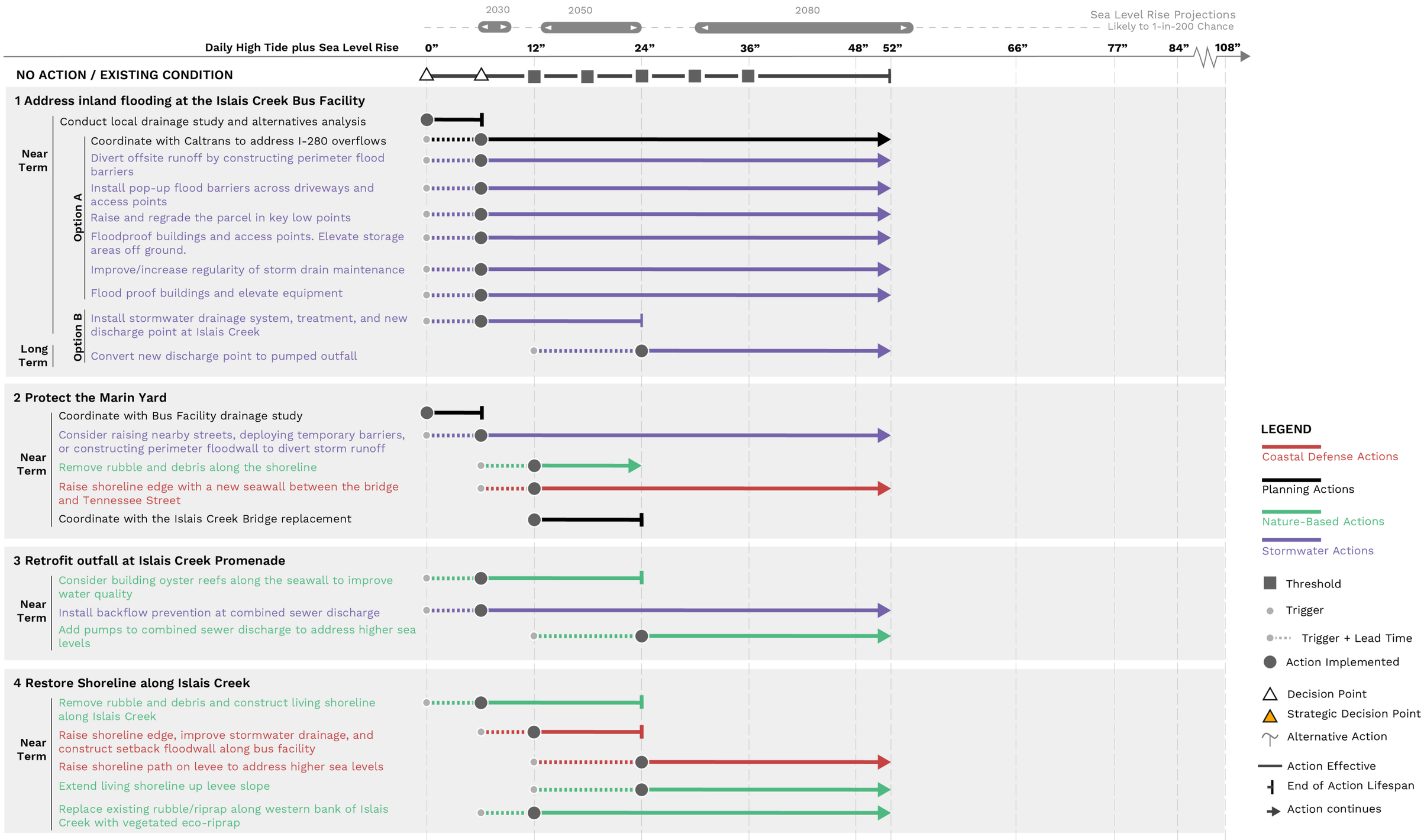
N

0 0.25 0.50 MI

Northwestern Creek Bank

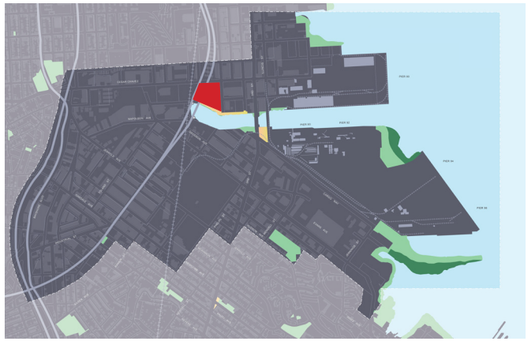
	1 Address inland flooding at the Islais Creek Bus Facility	2 Protect the Marin Yard	3 Retrofit outfall at Islais Creek Promenade	4 Restore shoreline along Islais Creek	5 Introduce a pedestrian bridge at the end of the creek
Near Term	• Coordinate with Caltrans to address overflows of ponded stormwater from the I-280 overpass above the bus facility. • A local drainage study and alternative analysis should be conducted at the bus facility and Marin Yard to identify the causes of stormwater related flooding and evaluate potential solutions. Two high level options (described below) are identified and would be evaluated further in the study to determine technical feasibility, effectiveness, and costs and benefits of each. • Option A – Manage local stormwater issues by a combination of actions targeted at (1) reducing or eliminating surface runoff from adjacent streets onto bus facility property and (2) mitigating potential flood impacts onsite. Actions may include diverting offsite runoff by constructing perimeter flood barriers (permanent and temporary pop-up barriers at entry points), raising and regrading low spots on the property, floodproofing buildings, elevating storage areas and electrical/mechanical equipment off the ground, and increasing the frequency of storm drain maintenance. • Option B – Install a separated stormwater drainage system within the bus facility property to collect, convey, treat, and discharge stormwater directly to Islais Creek. This would eliminate the connection to the combined sewer system, which currently backs up and floods low-lying areas on the bus facility property. While there would be challenges associated with permitting a new stormwater discharge point to the Bay, this may be the most effective option to address local stormwater flooding at the site.	• Coordinate with the local drainage study at the Islais Creek bus facility to identify stormwater strategies that may be mutually beneficial to both sites. Ensure that actions at the bus facility do not worsen flooding issues at the Marin Yard and vice versa. • Consider raising adjacent streets, deploying temporary flood barriers, or constructing a permanent perimeter floodwall around the facility to divert storm runoff from adjacent areas. • By 2030 (12 inches of SLR), remove rubble and debris along the shoreline from Islais Creek Bridge to Tennessee Street and raise shoreline edge with a new seawall to address shoreline overtopping and flood pathway. • Coordinate with actions at Islais Creek Bridge. If bridge is replaced, look for opportunities to tie-in shoreline protection to bridge abutment and potential expand public access along the shoreline.	• By 2030 (12 inches of SLR), install backflow prevention at the Islais Creek North combined sewer discharge (CSD). Installation of backflow prevention at CSD is identified as a high-priority action for SFPUC. • Consider building oyster reefs along the seawall to improve water quality and create aquatic habitat.	• By 2030 (12 inches of SLR), remove rubble and debris along the shoreline and construct a living shoreline project along the creek bank. A living shoreline could be implemented by regrading the shoreline and placing fill to create a more gradual edge that could sustain vegetated marsh and mudflat. • By 2030 (12 inches of SLR), raise the shoreline edge along the existing pedestrian path by adding a small curb wall, improve stormwater drainage along the path, and construct a higher floodwall setback from the shoreline to protect the bus facility.	• Consider constructing a boardwalk or pedestrian bridge to connect the north and south banks of the creek. This would contribute towards creation of a complete loop of the western portion of the creek for pedestrians and bikes.
Longer Term	• Option B – By 2050 (24 inches of SLR), convert the new Islais Creek stormwater outfall to a pumped outfall when necessary to address higher sea level conditions in the future.	• Raise seawall along shoreline as needed to address higher sea levels in the future.	• By 2050 (24 inches of SLR), install pumps at the Islais Creek North CSD when needed to address higher sea levels in the future.	• By 2050 (24 inches of SLR), raise the shoreline path on a levee to protect the bus facility and address higher sea levels • Extend the living shoreline up the levee slope to provide space for marsh vegetation to migrate upslope in response to SLR.	

Adaptation Pathways Northwestern Creek Bank



Islais Creek Bus Facility (Selected Key Asset) - Summary of Strategies by 2050

Location



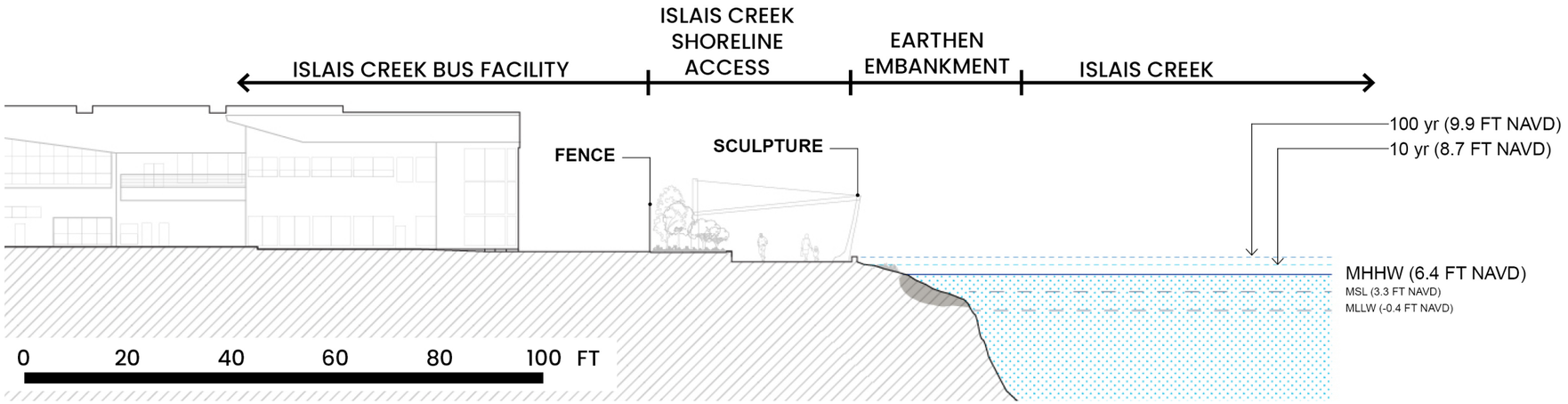
Initial Exposure

- Widespread temporary flooding during 100-year storm with 12” SLR

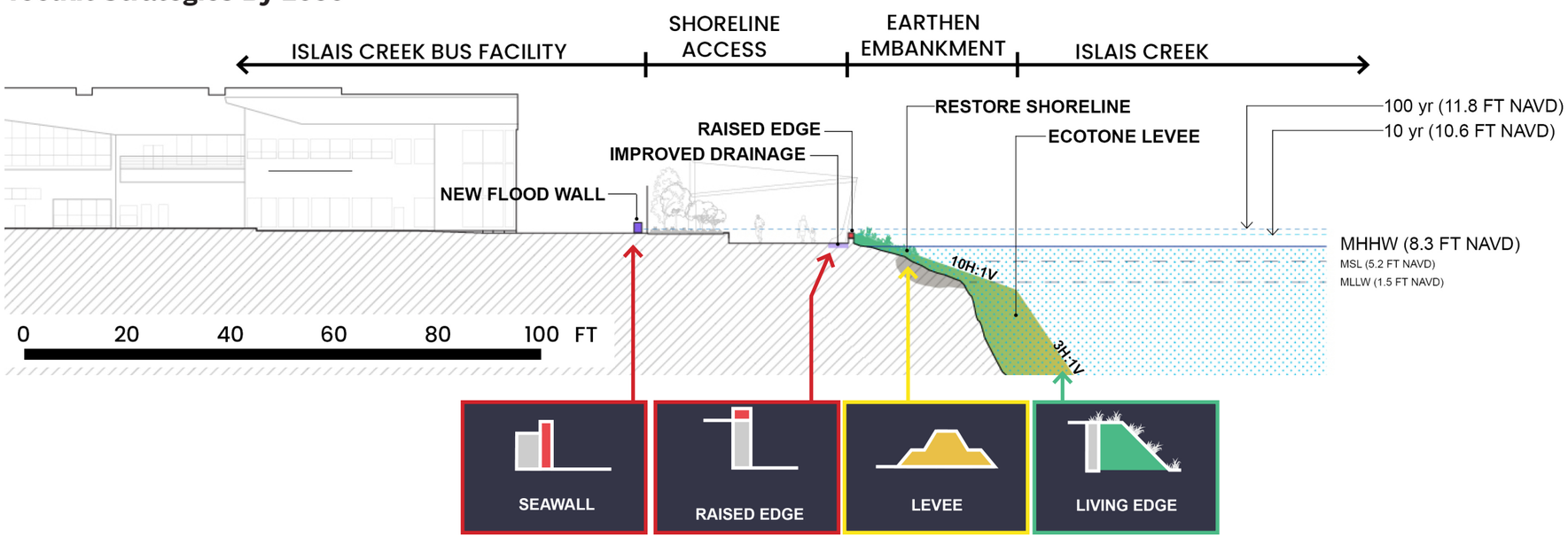
Existing Shoreline Typology

- **Embankment - Partially Armored:** between fully armored shoreline and unarmored earthen shoreline

Existing Conditions

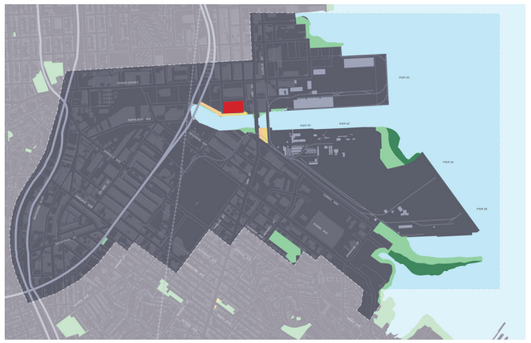


Toolkit Strategies By 2050



Marin Yard (Key Selected Asset) - Summary of Strategies by 2050

Location



Initial Exposure

- Widespread temporary flooding during 100-year storm with 12” SLR

Existing Shoreline Typology

- **Structure - Bulkhead:** hard vertical surfaces, generally constructed out of concrete or metal.

Existing Conditions

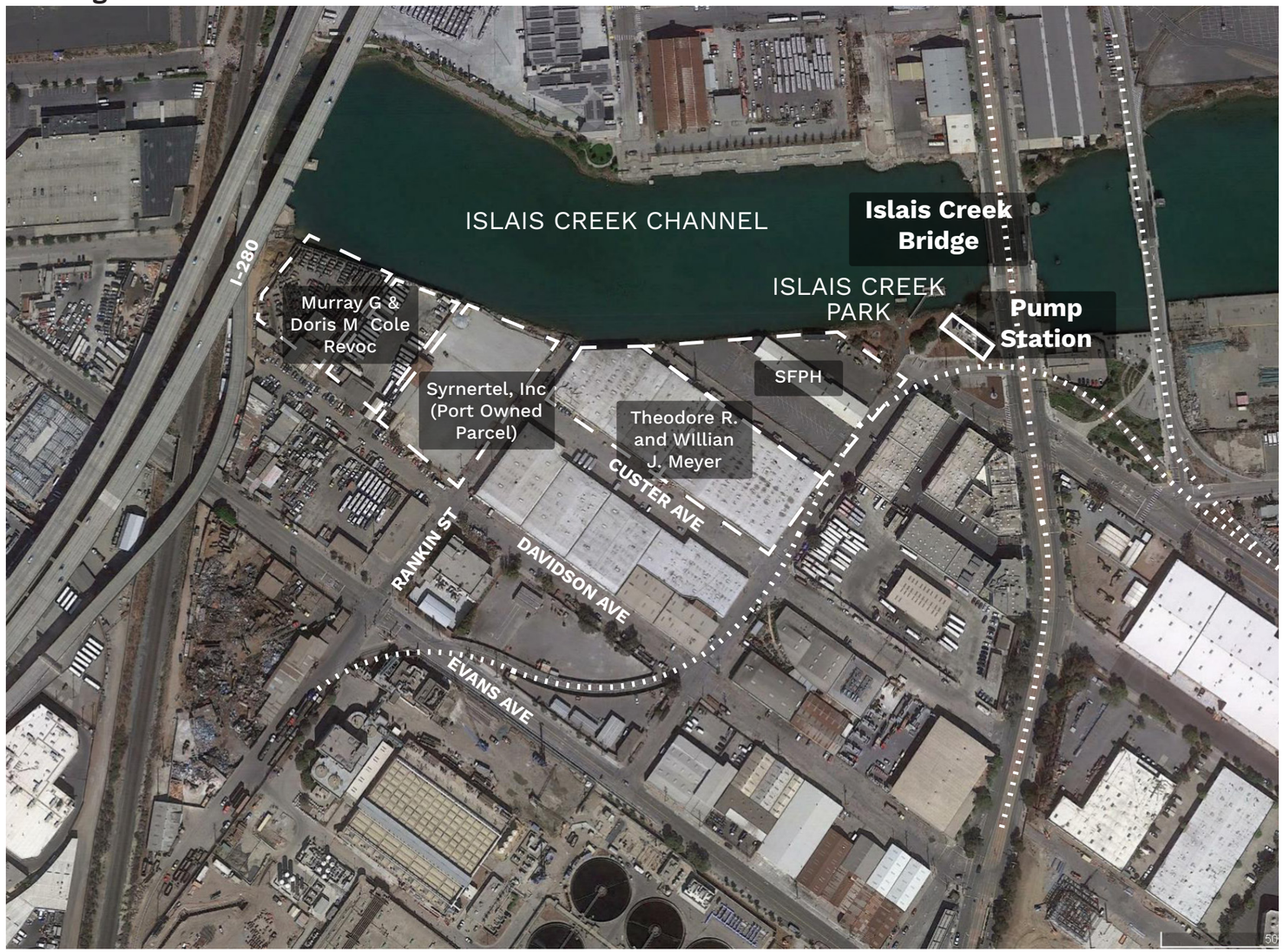
Toolkit Strategies By 2050

Construct floodwall along low-lying shoreline. Coordinate with Islais Creek Bridge replacement and connect to Islais Creek Promenade for continuous protection.

4. Southwestern Creek Bank

Create new tidal marsh and expand Islais Creek Park.

Existing Conditions

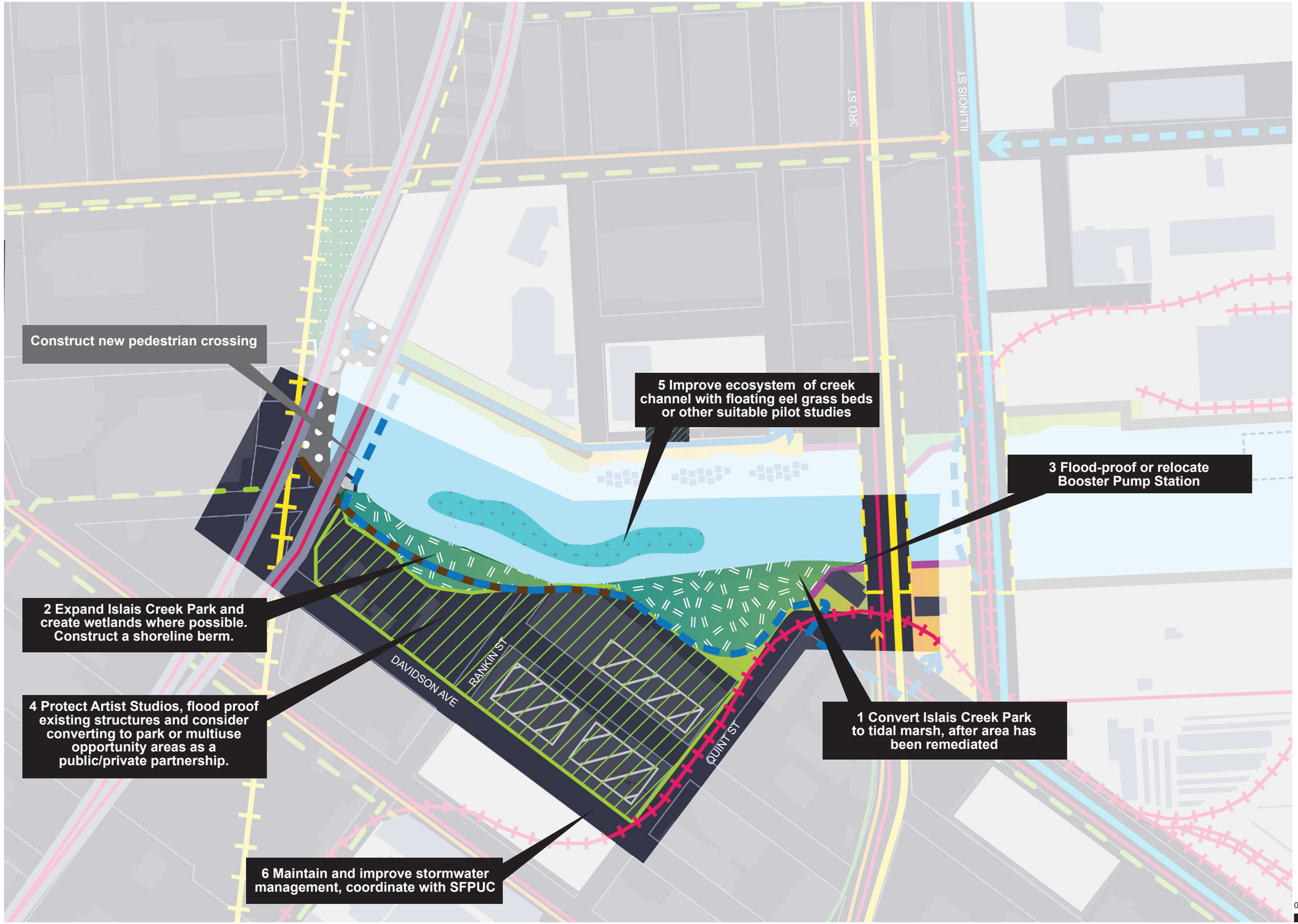


Site Photos

View of Southwestern Creek Bank

View from the channel towards SFPH and Theodore R sites

Reach 4 By 2080 - Enlargement Plan



Legend

NATURE-BASED FLOOD PROTECTION
- Existing Promenade or Plaza
- Existing Open Space
- New or Improved Open Space
- New or Improved Marsh Wetlands
- New Eel Grass Beds
- New Oyster Reefs
- New Beach
- New Rock Groyne
- New Green Streets

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Replaced Bridge
- Existing Promenade or Plaza

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing/ Primary
- Proposed Addition

MUNI CORRIDOR
- Existing
- Proposed Addition

BIKEWAYS
- Existing
- Proposed

VEHICULAR
- Existing Truck Route

RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

LAND USE
- Opportunity Area: Open Space & Mixed-Use
- City-owned Parcels (Consolidated & Optimized)
- Existing Buildings

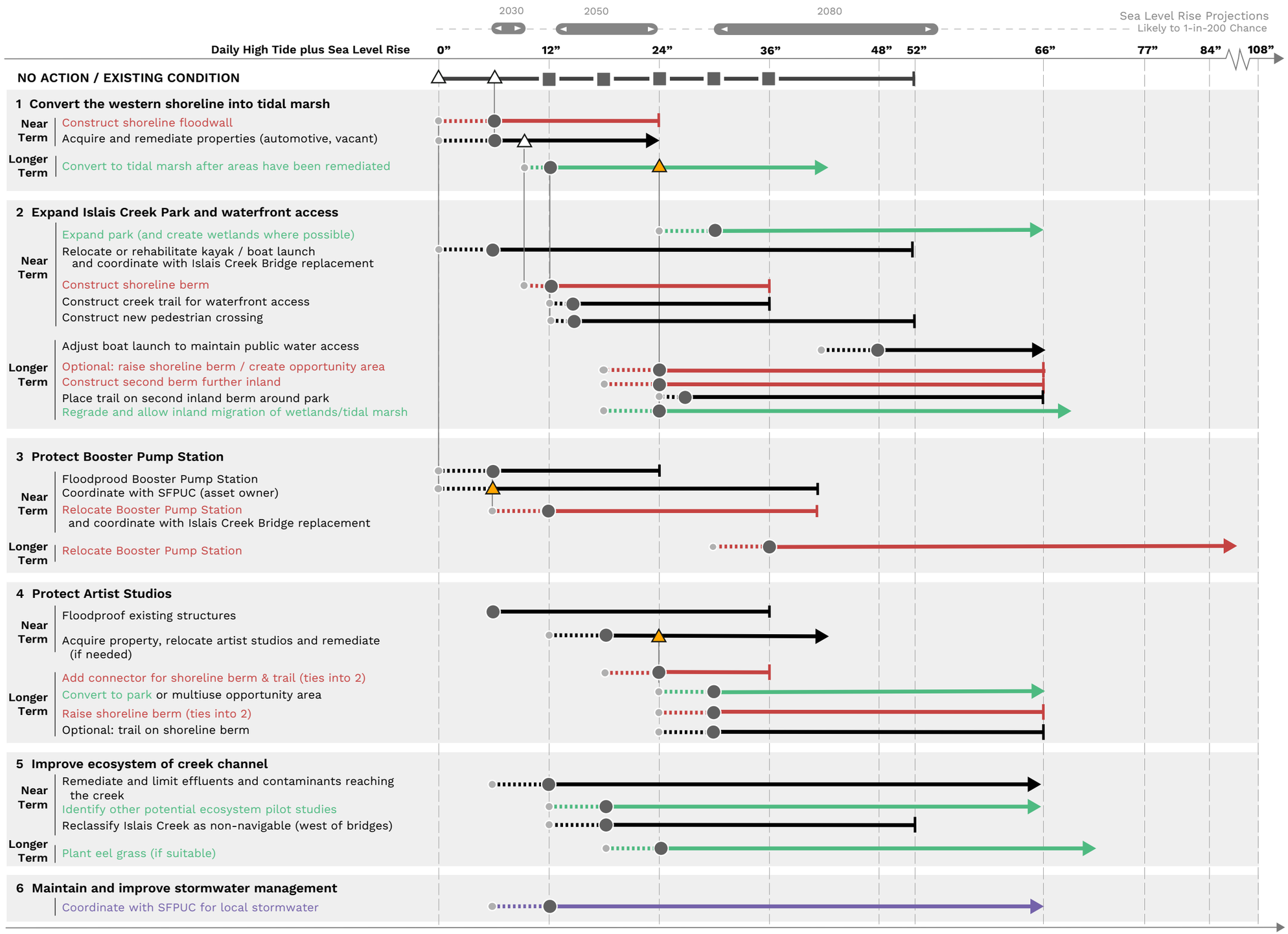
N

0 0.25 0.50 MI

Southwestern Creek Bank

	1 Convert the western shoreline into tidal marsh to protect from sea level rise	2 Expand the existing Islais Creek Park and Waterfront Access	3 Protect Booster Pump Station	4 Protect Artist Studios, then retreat	5 Improve the creek ecosystem	6 Improve stormwater management
Near Term	• Acquire properties (automotive, vacant property next to Park) and remediate. • Construct sheet pile floodwall and remediate contaminants in the existing fill area to provide limited flood mitigation through 24 inches of sea level rise (Any existing sheetpile wall may require a condition assessment and possible removal before a new sheetpile wall is constructed.) • Removal of rubble and riprap along the shoreline is recommended. • Consider a private-public partnership at opportunity sites to consolidate uses and protect them from flooding. These areas could be converted into a shared open space and development project, with the goal of keeping artists studios and other existing uses.	• Expand the existing Islais Creek Park and create wetlands where possible. • Relocate or rehabilitate the existing kayak launch to maintain public water access. (With community users, re-design for with flood adaptation to 52" SLR, consider beach area or boardwalk) • Coordinate this improvement with the Islais Creek Bridge replacement. • Construct shoreline berm; transform to shoreline park and wetlands (an engineered berm, likely a small earthen or ecotone levee, that serves as the first line of defense against coastal flooding, protects up to 36 inches of sea level rise. It will separate the new bayside tidal wetlands from the landside area and could be designed with a creek trail on top.) • Introduce new continuous creek trail to improve waterfront access. Coordinate with pedestrian creek crossing project. • Construct new pedestrian crossing (further inland from Third Street Bridge, but outside of I 280 ROW to comply with Caltrans standards)	• Relocate the Booster Pump Station, or floodproof and relocate later (Floodproofing and associated maintenance requirements could be done within the operations and maintenance planning for the facility. Floodproofing could allow the pump station to remain at its current site beyond 36" SLR.) • Coordinate with Islais Creek Bridge replacement; coordinate with owner SFPUC (The station currently pumps treated effluent from the Southeast Treatment Plant to the Bay through the Southeast Bay Outfall. Relocation or replacement of the pump station could be timed with the permanent raising of Islais Creek Bridge (Reach 2– Creek Crossing), due to the close proximity of the two structures.	• Floodproof existing structures: Current owners could floodproof to address current and near-term urban stormwater risk. • Acquire property, relocate artist studios, and remediate. • Add connector for shoreline berm, trail.	• Remediate contaminants. • Limit effluents and other contaminations reaching the creek channel. • Reclassify Islais creek as non-navigable (west of bridges) and identify ecosystem enhancements pilot studies to create habitat and improve water quality	• Improve stormwater management on non-Port lands by separating the combined sewer system and increasing open space areas that could handle occasional flooding. • Nearby streets could be improved with green infrastructure. • Coordinate with SFPUC for local stormwater management, including the Port's separate sewer system on Port lands. In coordination with SFPUC, local stormwater management techniques (e.g. drainage) must be incorporated into all coastal defense and other infrastructure actions to minimize surface ponding and localized flooding.
Longer Term	• Convert to tidal marsh after area has been remediated. • Construct a flood protection structure or berm inland of the tidal marsh and allow the marsh to gradually migrate landward toward this second line of defense as sea level rises.	• Keep waterfront access by adjusting kayak boat launch to rising water levels. • Option: Raise shoreline berm for additional protection up to 66" SLR (could conflict with (1) tidal marsh creation) • Construct second berm further inland; expand park; optional trail on inland berm around park. (2nd berm constructed to a higher elevation, with protection up to 66" SLR.) • The role of the shoreline berm (i.e., the first line of defense) will gradually shift from providing flood protection from extreme coastal storms to providing protection from smaller storms.	• Relocate Booster Pump Station	• Option: Raise shoreline berm for additional protection up to 66" SLR, convert to flood-proofable multiuse opportunity area; optional trail on shoreline berm (could be in conflict with (1) tidal marsh creation)	• Improve the creek ecosystem with planting eel grass in a portion of the Islais Creek Channel (timing would depend on navigation requirements, as eelgrass is not compatible with dredging)	

Adaptation Pathways



5. Southeastern Shoreline

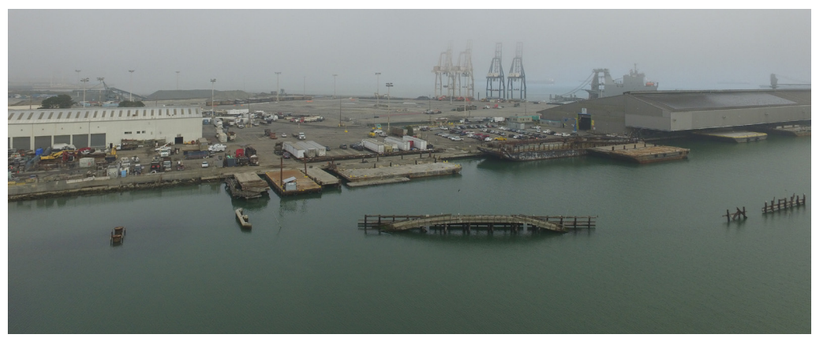
Optimize the Port's maritime cargo and industrial areas (Pier 94-96 and Backlands) to facilitate sustainable economic growth and deliver local community benefits.

Existing Conditions

Site Photos

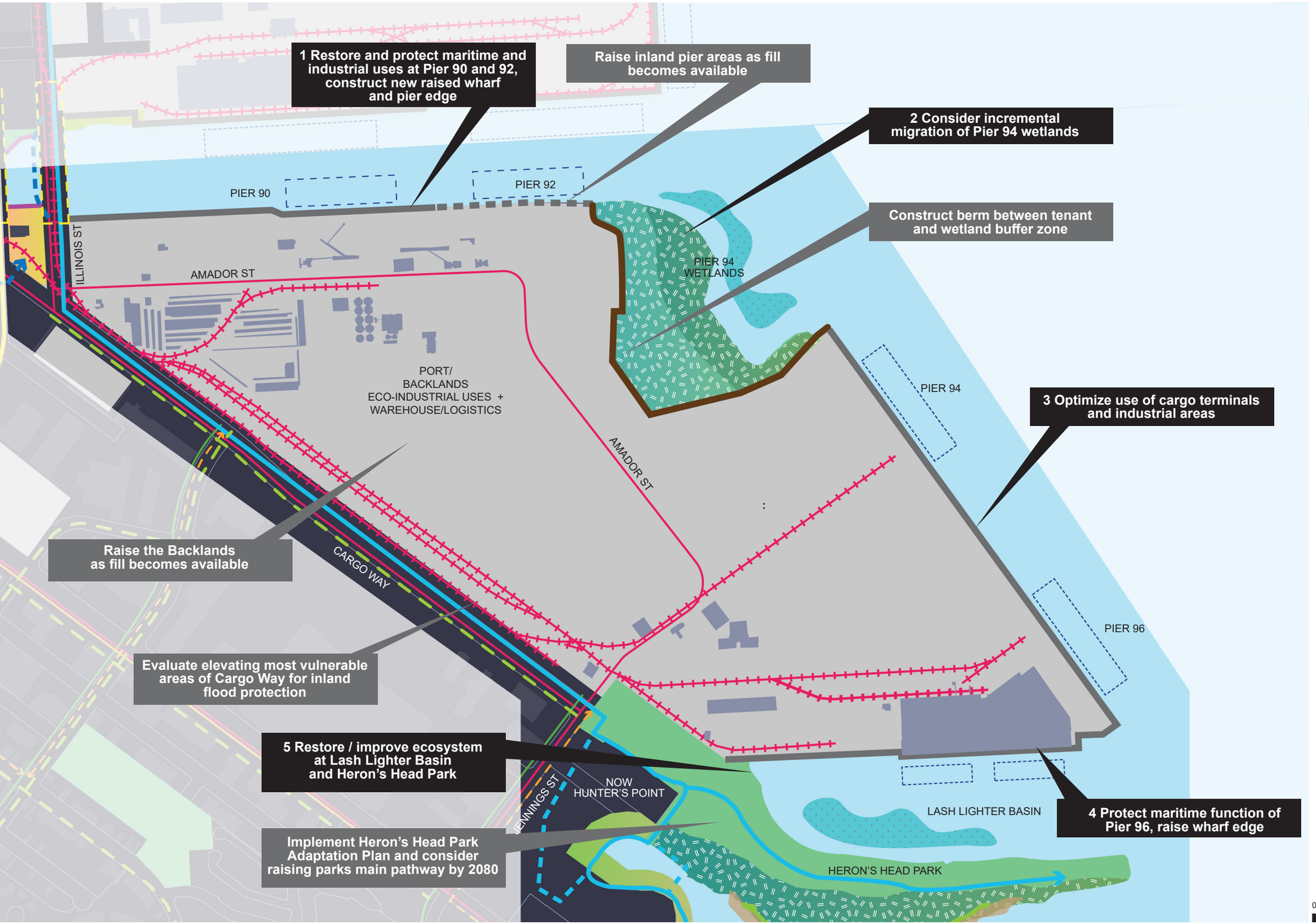
Piers 90, 92, and 94 Wetlands

Backlands



Pier 96 (view from Lash Lighter Basin)

Reach 5 By 2080 - Enlargement Plan



Legend

NATURE-BASED FLOOD PROTECTION
- Existing Promenade or Plaza
- Existing Open Space
- New or Improved Open Space
- New or Improved Marsh Wetlands
- New Eel Grass Beds
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- New Beach
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- New Green Streets

HARD FLOOD PROTECTION
- Raised & Rebuilt Pier Edge
- New Pier Edge
- New Flood Wall
- New Berm
- Replaced Bridge
- Existing Promenade or Plaza

BLUE GREENWAY
- Primary
- Proposed Addition

CREEK TRAIL
- Existing/ Primary
- Proposed Addition

MUNI CORRIDOR
- Existing
- Proposed Addition

BIKEWAYS
- Existing
- Proposed

VEHICULAR
- Existing Truck Route

RAIL
- Existing Freight Rail
- Existing Caltrain Line

MARITIME
- Deep Water Berth
- General Water Berth

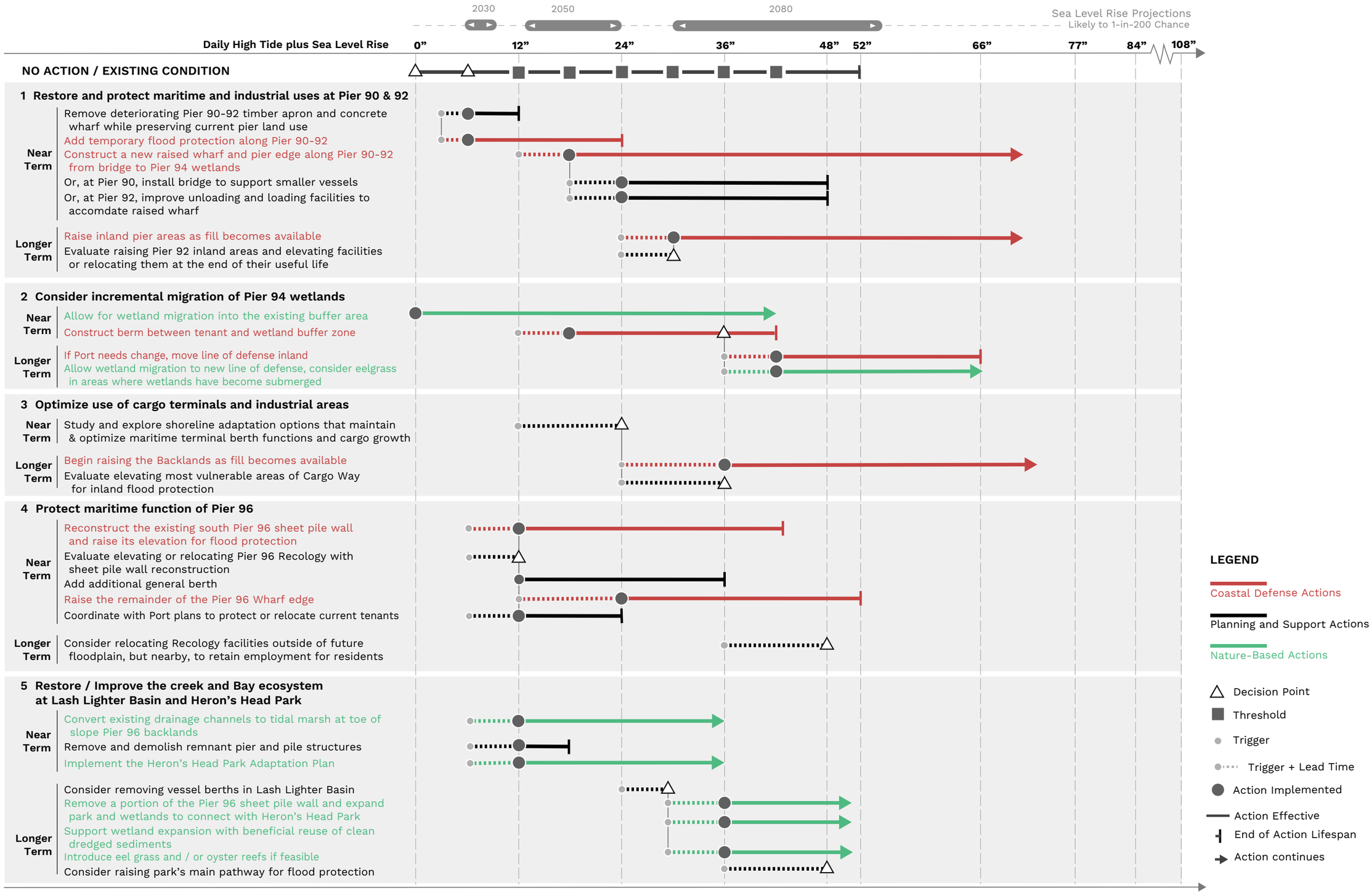
N

0 500 1000 1500 FT

Southeastern Shoreline

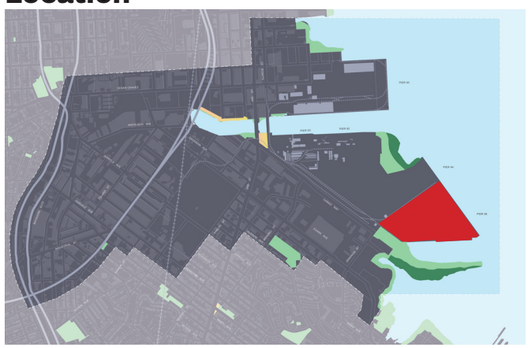
	1 Restore and protect Maritime and Industrial Uses at Pier 90-92	2 Consider incremental migration of Pier 94 wetlands	3 Optimize use of cargo terminals and industrial areas to facilitate growth as forecast by regional plans for 2050 and deliver local economic benefits	4 Protect maritime function of Pier 96	5 Restore/ Improve the creek and Bay ecosystem at Lash Lighter Basin and Heron's Head
Near Term	• Remove the deteriorating Pier 90-92 timber apron and concrete wharf, while preserving bulk cargo and cement batch plant functions at Pier 92. • Consider temporary/event-based flood protection strategies along Pier 90-92 (e.g. sand bags or deployables) • Construct a new raised wharf and pier edge along Pier 90-92 from the Illinois Street Bridge to the Pier 94 wetlands. The wharf will support one existing and one new berth and additional maritime functions (allow sufficient distance between vessel berths and the bridge). • Coordinate with the Illinois Street Bridge replacement to ensure continuous coastal protection. • At Pier 90, install bridge to support smaller harbor services craft. • At Pier 92, improve dry bulk barge unloading facilities by installing offshore mooring dolphins, offshore dry-bulk hopper, and elevated conveyor bridge to transfer material over shoreline to land.	• Given that the existing Pier 94 wetlands are low-lying areas vulnerable to permanent flooding by 2050, allow for wetland migration into the existing buffer area and up to the edge of the aggregate/sand import leasehold boundary (line of defense). • Construct a flood protection structure or berm between the tenants and the wetland buffer zone	• Coordinating with the Port's Piers 80-96 Maritime Eco-Industrial Center Strategy, look for opportunities to optimize the current terminal and industrial areas. • With further study, explore shoreline adaptation options that maintain maritime terminal berth functions and facilitate cargo growth within Port Priority Use areas of the BCDC Seaport Plan, including new berthing or cargo conveyance infrastructure as needed to reach deep water berths. • Maximize the use of industrial areas designated as Priority Production Areas within the MTC/ABAG Plan Bay Area.	• By 2050 reconstruct the existing sheet pile wall along the Pier 96 edge adjacent to Lash Lighter Basin and raise its elevation for flood protection. This reach is the most vulnerable stretch of shoreline in the study area. • In tandem with reconstructing the sheet pile wall, evaluate the next planned major investment in recycling facilities at Pier 96. Consider elevating this facility or finding a different way to retain these facilities in the general area to retain jobs for the Bayview neighborhood. • Raise the wharf edge along the remainder of Pier 96. • Coordinate with Port plans to protect or relocate the current tenants. • Maintain existing general vessel berth and add a second general berth (lower draft) along Pier 96 in Lash Lighter Basin. Maintain existing deep vessel berths along the Pier 96 Bay edge.	• Consider incremental wetland migration areas, where possible. • Convert existing drainage channels to tidal marsh at toe of slope Pier 96 backlands. • By 2050, remove and demolish any remnant pier and pile structures within Lash Lighter Basin. • By 2050, implement the strategies identified in the Port's Heron's Head Park Adaptation Plan.
Longer Term	• By 2080, consider raising pier areas inland of the raised wharf with fill to protect uses from sea-level rise and rising groundwater in the long term. At the end of the useful life of existing batch operations at Pier 92, evaluate elevating these facilities or potentially relocating these facilities upland, with conveyor access to berths on the south side of the Creek.	• If the need for industrial uses decreases (e.g. cement and aggregate, and if cargo operations are relocated or the adjacent terminal area is not needed for port operations and circulation), this area could be used to allow for the migration of the Pier 94 wetlands by regrading the berm and expanding the area inland to allow for wetland migration and survival with rising water levels. • Consider eelgrass in the marsh areas that become submerged when maritime use eases and as water levels rise. Note that existing water depths Bayward of the existing marsh are likely too deep to support eelgrass.	• Begin raising the Backlands with fill to protect uses from sea-level rise and rising groundwater in the long term. • Consider elevating the most vulnerable areas of Cargo Way to provide another option for inland flood protection and a resilient connection between Hunters Point and the City by advancing the Cargo Way plan • Provide improved multi-modal access and improved north-south access to Bayview and Hunters Point Shipyard. Cargo Way and companion flood improvements would be the City's "line of defense".	• Consider relocating Recology facilities outside of the future floodplain, but nearby, to retain employment for residents. • When vessel berthing and traffic is no longer needed in Lash Lighter Basin, eel grass could be introduced to enhance habitat in this area. (see 5)	• If the two general berths along the Pier 96 edge can be eliminated, consider replacing a segment of Pier 96 sheet pile wall immediately west of the Pier 96 shed (adjacent to Heron's Head Park) with nature-based flood protection and expanded open space to connect with the park and Eco Center. Coordinate with Port regarding plans for any tenants before sheet pile wall is removed. • Introduce eelgrass beds by 2050 to promote sediment accretion, improve water quality, promote creek biodiversity, and to protect the northern shoreline of Heron's Head Park. • Evaluate opportunities for beneficial reuse of clean dredge spoils for purposes of improved nearshore habitat and tidal marsh in this area of the waterfront. • Continue to monitor the success of the adaptation plan to assess if longer term adaptation strategies are needed. • Consider raising the park's main pathway by 2080 and continue to maintain the eelgrass beds and headlands.

Reach 5 - Adaptation Pathways



Pier 96 (Key Asset) - Summary of Strategies by 2050

Location



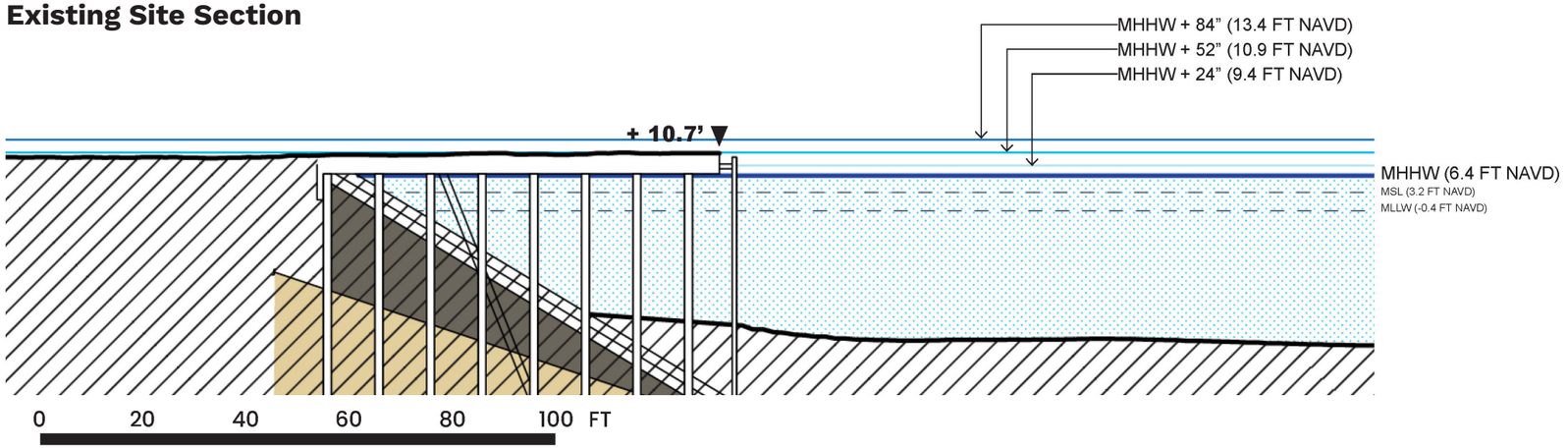
Initial Exposure

- Some permanent inundation with 24” SLR
- Temporary flooding during 10-year storm with 0” SLR

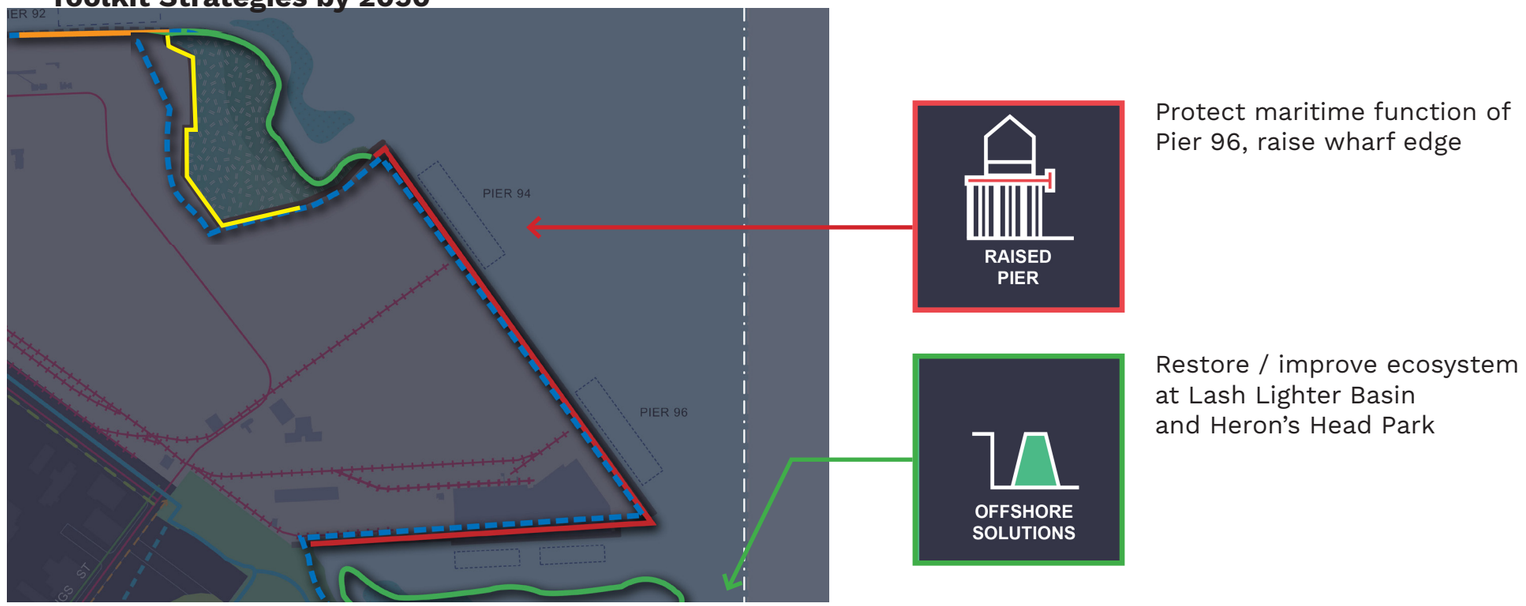
Existing Shoreline Typology

- **Structure - Bulkhead:** hard vertical surfaces, generally constructed out of concrete or metal.

Existing Site Section



Toolkit Strategies by 2050



Protect maritime function of Pier 96, raise wharf edge

Restore / improve ecosystem at Lash Lighter Basin and Heron’s Head Park

Backlands (Key Asset) - Summary of Strategies by 2050

Location

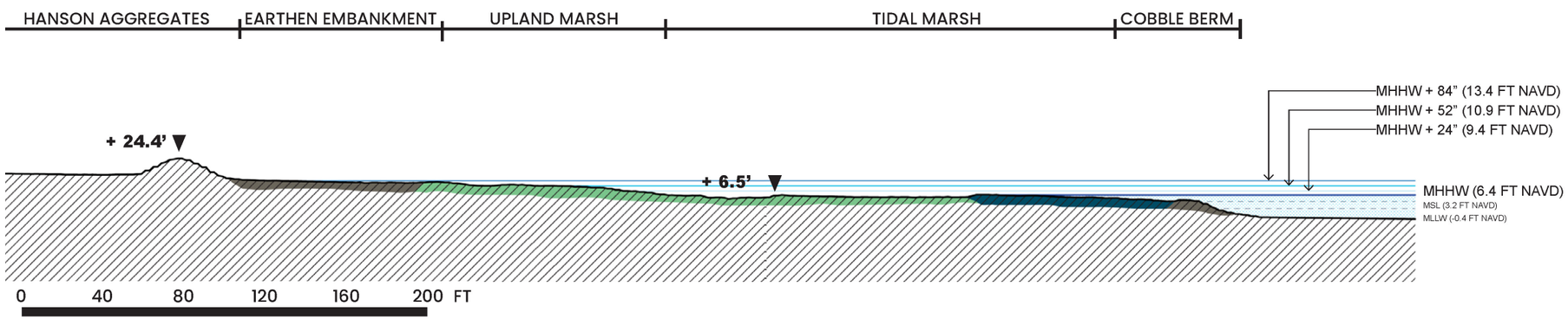
Initial Exposure

- No exposure to temporary or permanent flooding with 24” SLR or 52” SLR

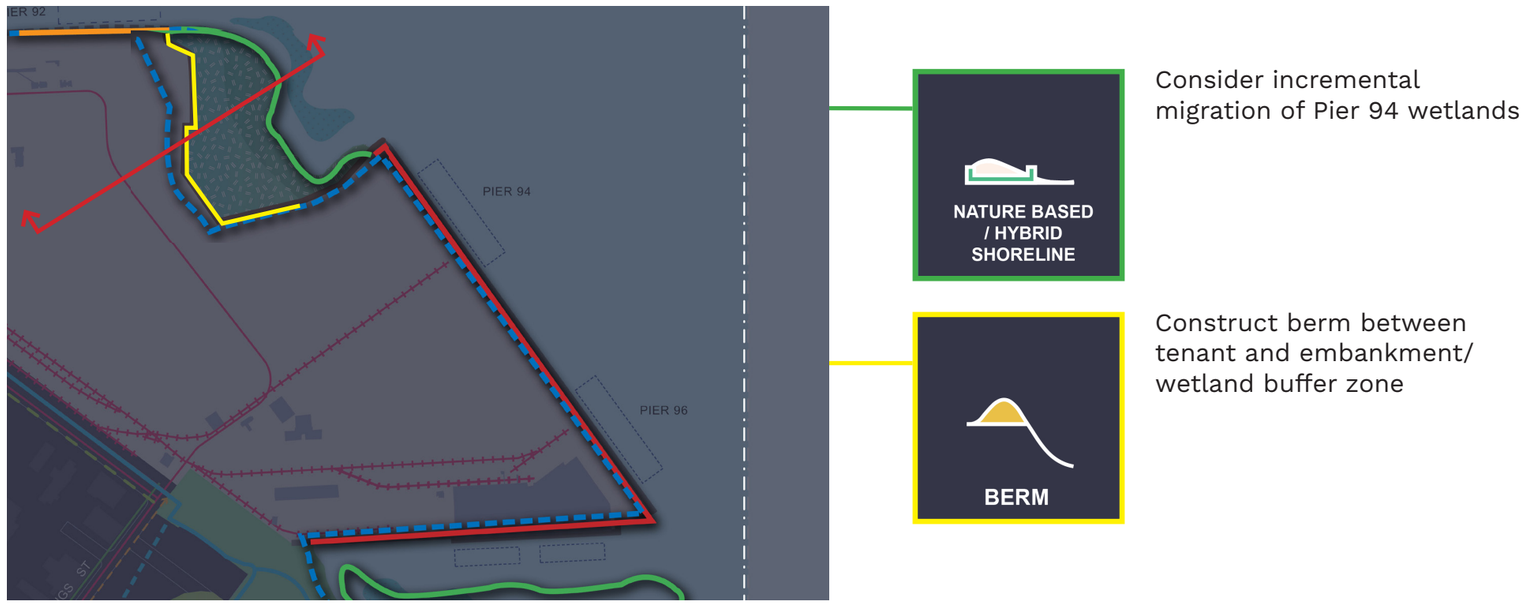
Existing Shoreline Strategy

- Adjacent to partiality Armored Embankment (Pier 94 Wetlands) and Structure On Pile (Pier 80)

Existing Site Section (through Backlands and Pier 94 Wetlands)



Toolkit Strategies by 2050



Consider incremental migration of Pier 94 wetlands

Construct berm between tenant and embankment/ wetland buffer zone

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AnMarie Rodgers, Director, Citywide Planning Division
Adam Varat, Deputy Director, Citywide Planning Division
Lisa Fisher, Resilience & Sustainability Lead, ICSMAS Project Director
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PORT OF SAN FRANCISCO
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- Adaptation Financing
- Port Planning
- Landscape Design
- Transportation Engineering
- Cost Estimating
- Environmental Permitting

SILVESTRUM CLIMATE ASSOCIATES
- Environmental Planning
- Adaptation Strategies

FEHR & PEERS
- Transportation Planning

LOTUS WATER
- Water Resources Engineering

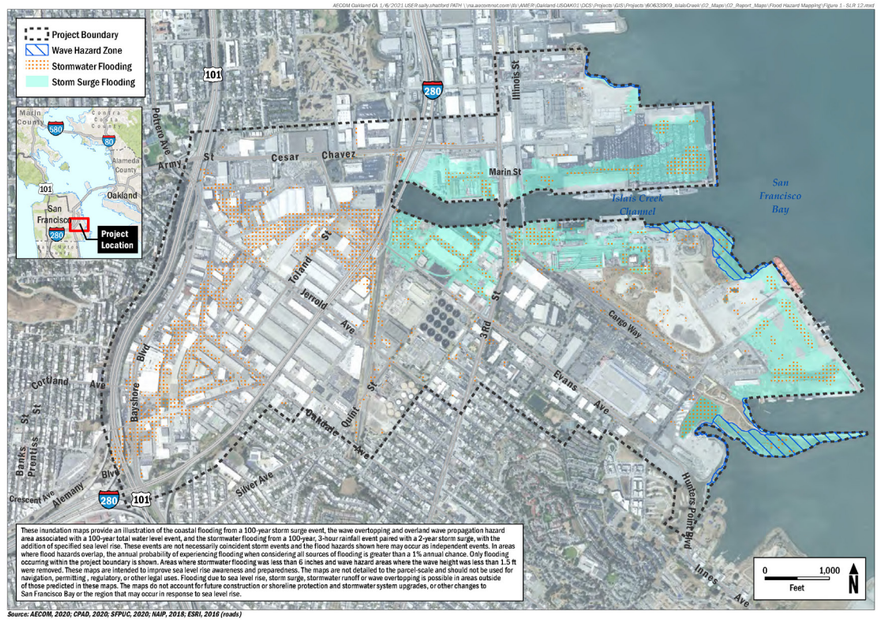
ANDREA BAKER CONSULTING
- Public Outreach

TECHNICAL APPENDIX

Hazard Mapping

Combined Coastal and Stormwater Flood Hazard Mapping

A set of combined flood hazards maps was created to support the ICSMAS alternatives development efforts. The memo titled Islais Creek Combined Flood Hazard Analysis and Mapping (January 26, 2021) describes the process used to create the maps. The maps depict areas that could experience flooding under six future SLR scenarios during the 100-year storm condition for three types of flooding: SLR inundation, Stormwater flooding and Wave Hazards.



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

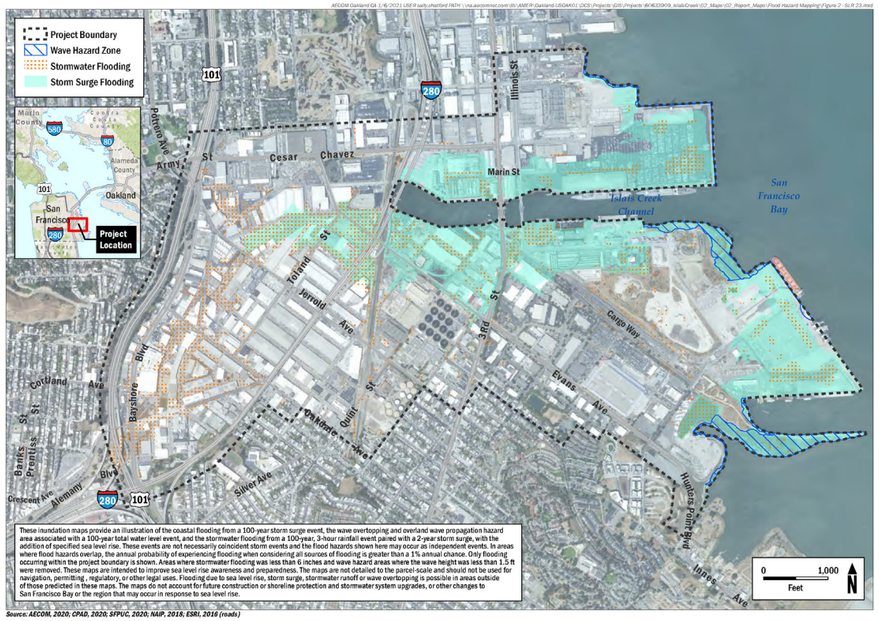
AECOM

Islais Creek Southeast Mobility Adaptation Strategy

Combined Coastal and Stormwater Flood Hazard Mapping

FIGURE 1

100-Year Storm + 12" Sea Level Rise



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

AECOM

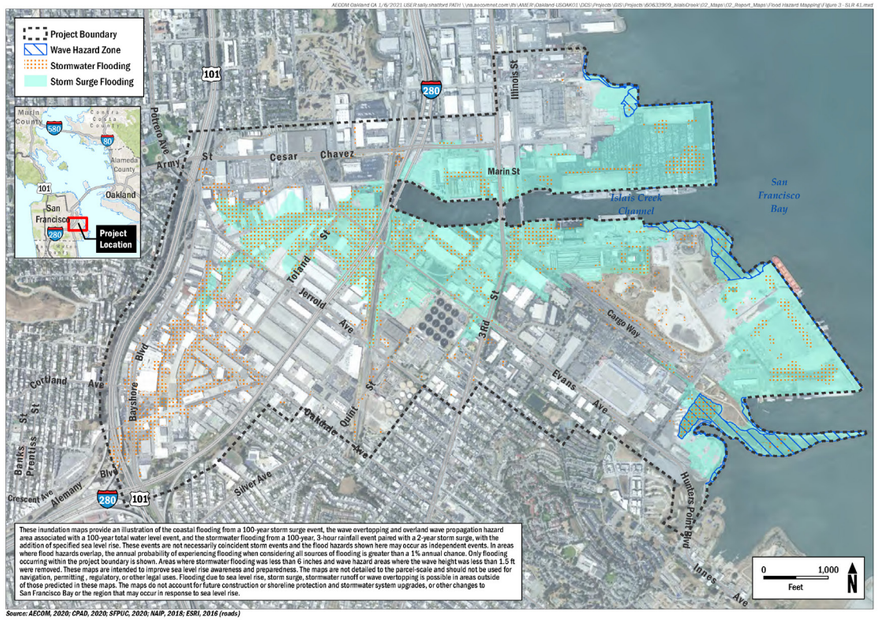
Islais Creek Southeast Mobility Adaptation Strategy

Combined Coastal and Stormwater Flood Hazard Mapping

FIGURE 2

100-Year Storm + 23" Sea Level Rise

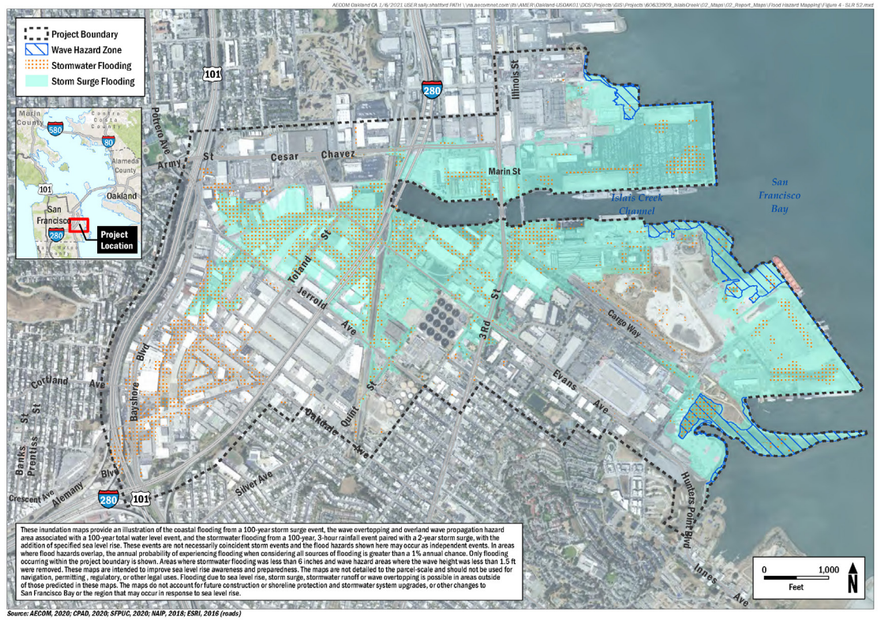
Combined Coastal and Stormwater Flood Hazard Mapping



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

AECOM
Islais Creek Southeast Mobility Adaptation Strategy
Combined Coastal and Stormwater Flood Hazard Mapping

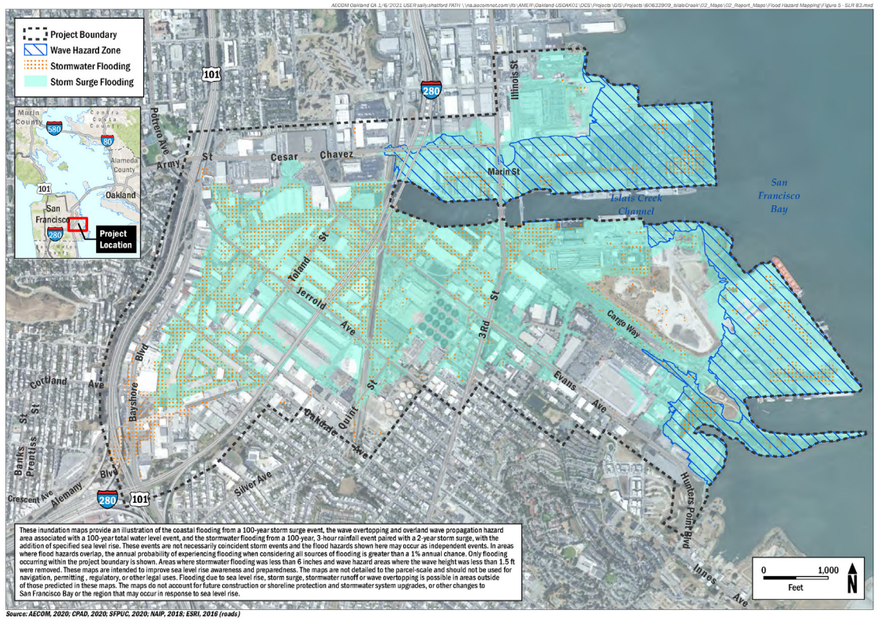
FIGURE 3
100-Year Storm + 41" Sea Level Rise



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

AECOM
Islais Creek Southeast Mobility Adaptation Strategy
Combined Coastal and Stormwater Flood Hazard Mapping

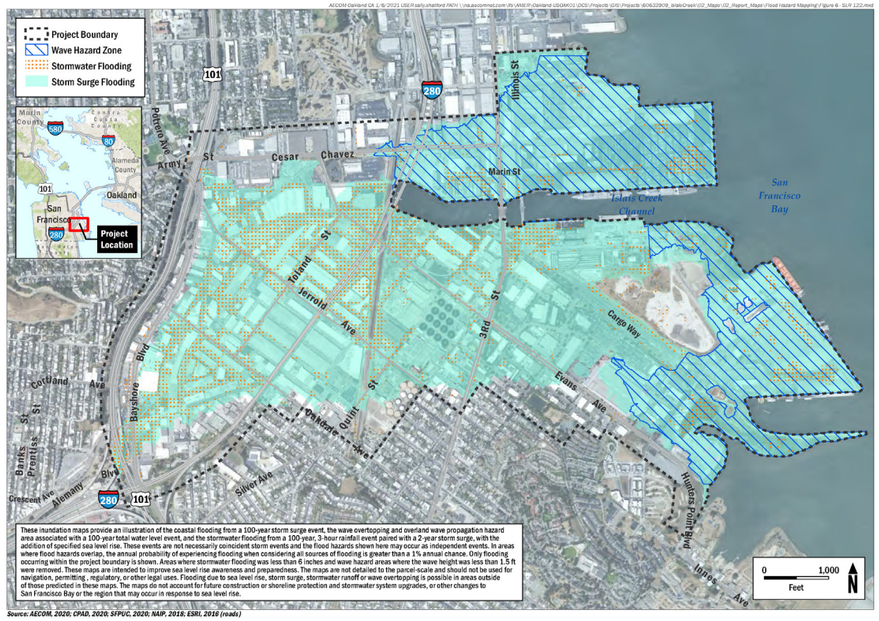
FIGURE 4
100-Year Storm + 52" Sea Level Rise



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

AECOM
Islais Creek Southeast Mobility Adaptation Strategy
Combined Coastal and Stormwater Flood Hazard Mapping

FIGURE 5
100-Year Storm + 83" Sea Level Rise



Source: AECOM, 2020; CPAD, 2020; SFPUC, 2020; NAIP, 2018; ESRI, 2016 (roads)

AECOM
Islais Creek Southeast Mobility Adaptation Strategy
Combined Coastal and Stormwater Flood Hazard Mapping

FIGURE 6
100-Year Storm + 122" Sea Level Rise