BLUE GREENWAY

Restoration and Revegetation Guidelines for Contaminated and Impacted Areas

SF Environment AECOM

BLUE GREENWAY PLANNING AND DESIGN GUIDELINES

The Blue Greenway is a **unifying identity** for the San Francisco southeast.

Blue Greenway - Existing
Photo by San Francisco Department of the Environment

This restoration and revegetation guide is based on the *Blue Greenway Planning and Design Guidelines*, developed by the Port of San Francisco (Port) in 2011.[1] The focus of this guide is on the restoration and revegetation of contaminated and impacted lands along the Blue Greenway. This guide can be applied to similar properties along the San Francisco Bay and beyond, however, the site history, land cover type, and plant list were developed with specific consideration to southeast San Francisco.

Summary of the Port's Blue Greenway Planning and Design Guidelines

The Port's 2011 guidelines provide planning and design guidance for revitalizing and developing open space along the Blue Greenway. The design guidelines are based on national recreation standards and practices relating to habitat, restoration, and preservation. The design guidelines provide information about:

- Designing elevations consistent with sea level rise projections.
- Treating stormwater.
- Providing waterfront viewing areas.
- Incorporating a minimum of a 15-foot-wide (20-foot preferred) multi-use trail where feasible, that can be incorporated into the San Francisco Bay Trail system.
- Integrating mechanical exercise equipment into circulation systems (trails/paths).
- Incorporating interpretive signage of waterfront and neighborhood history.
- Identifying sites for public art.
- Providing amenities for bicyclists.

Guide Preparation

This revegetation guide was created by AECOM for the City and County of San Francisco, Department of the Environment (SFE), with input and contribution from multiple stakeholders.

Funding support has been provided from the US Environmental Protection Agency (EPA; Award No. #BF-00T98101). This guidebook is part of the Bayview Hunters Point brownfields community-wide assessment.

Though this project has been funded, wholly or in part, by EPA, the contents of this document do not necessarily reflect the views and policies of EPA.

Intended Audience

The intended audience for this guide includes public and private entities, community, and non-profit organizations with plans to redevelop or restore portions of the Blue Greenway, particularly along Yosemite Slough.

Front Cover Image: Near Yosemite Slough. *Photo by AECOM.*

[1] 2011 Port of San Francisco *Blue Greenway Planning and Design Guidelines*. Available at: http://sfport.com/blue-greenway-project

How To Use This Guide

PART I: INTRODUCTION, GOALS, AND HISTORY

Introduction and Goals - Project goals of the Blue Greenway and this revegetation guide, an overview of Yosemite Slough, and addressing contaminants.

Planting Goals - Planting objectives along the Blue Greenway, from improving wildlife habitat to stabilizing the San Francisco shoreline.

Site History Timeline - Background information on historic land use within the Yosemite Slough area and the Blue Greenway.

PART II: CURRENT CONDITIONS, CLIMATE CHANGE, AND PLANNED DEVELOPMENT

Current Conditions - A description of the diverse mosaic of wetland and shoreline, upland, and urban communities that occur along the Blue Greenway.

Addressing Contamination - An overview of contamination along the Blue Greenway and provision of guidance for cleaning up contaminated sites.

Future: Climate Change and Sea Level Rise - Changing climate as it relates to the Blue Greenway, projected impacts, and climate adaptation.

Planned Development - An overview of development projects currently planned or underway along the Blue Greenway.

PART III: GUIDELINES

Revegetation Guidelines - General and detailed recommendations for the restoration and development of shoreline communities, urban parks, and existing developed areas.

PART IV: RESOURCES

Plant List - Recommended plant list, suggesting specific plant species to be used in revegetation efforts, based on habitat type, benefit, and tolerance to environmental conditions.

Guide Preparers - A description of guide preparers and stakeholder involvement.

Additional Resources - References for additional information for local plant sourcing, *Phytophthora* and plant pathogen resources, invasive plant information, and a link to the *San Francisco Bay Conservation and Development Commission (BCDC)'s Shoreline Plants* do-not-plant list.

Purpose of Guide

This guide was prepared to provide stakeholders engaged in development and revitalization projects along the Blue Greenway - a waterfront open space corridor spanning the eastern shoreline of San Francisco, CA - detailed recommendations for the restoration and development of the natural shoreline vegetation communities, urban parks, and existing developed areas. These recommendations are designed to best benefit local communities, as well as plant and wildlife communities along the Blue Greenway. The Van Dyke Avenue Eastern Terminus site is adjacent to the Yosemite Slough, and is included in the reference to Yosemite Slough used herein. The Yosemite Slough is contaminated by petroleum hydrocarbons and is a focus area for this guidebook.

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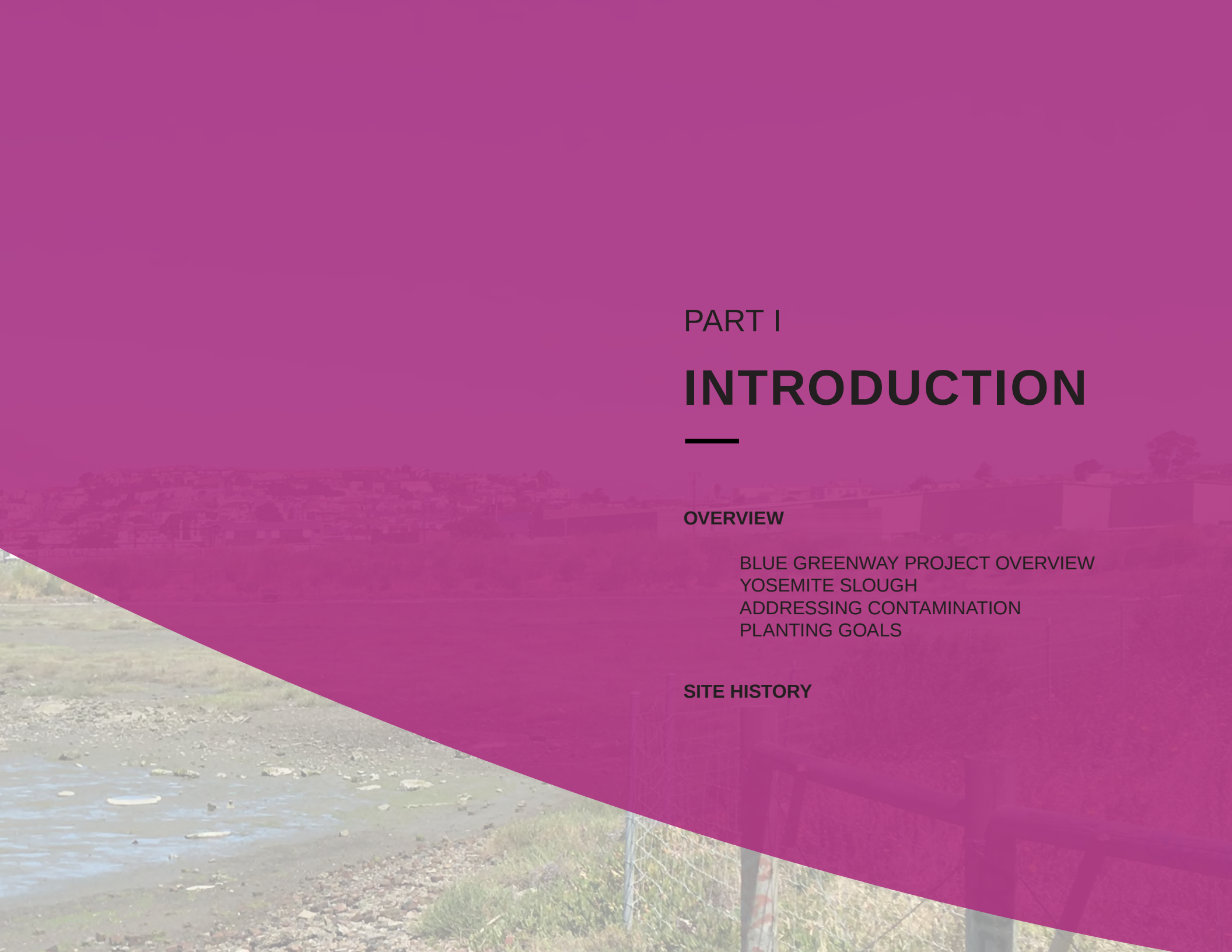
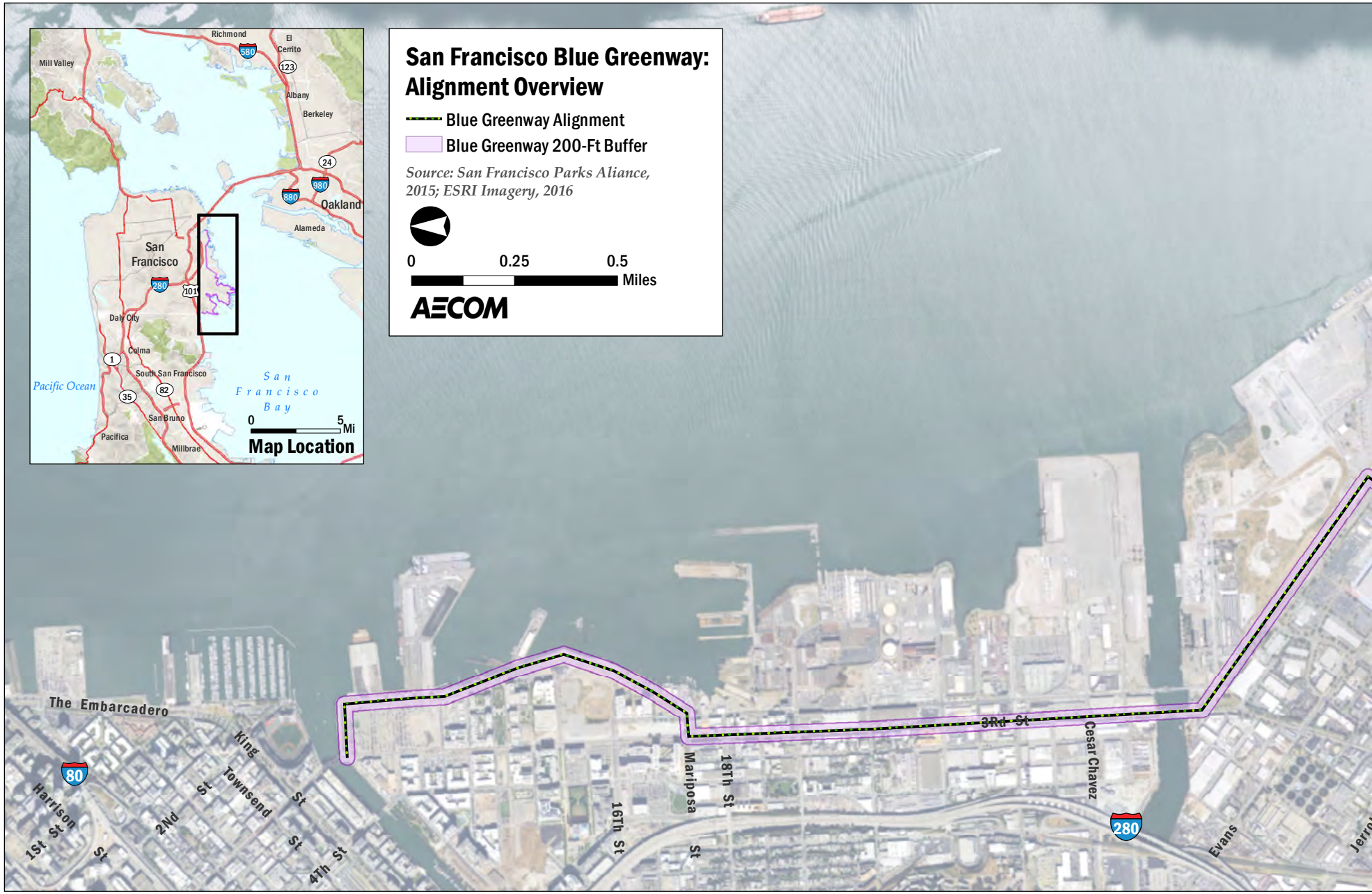


PART I

INTRODUCTION


San Francisco Blue Greenway: Alignment Overview
Blue Greenway Alignment
Blue Greenway 200-Ft Buffer
Source: San Francisco Parks Aliance, 2015; ESRI Imagery, 2016
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The Embarcadero
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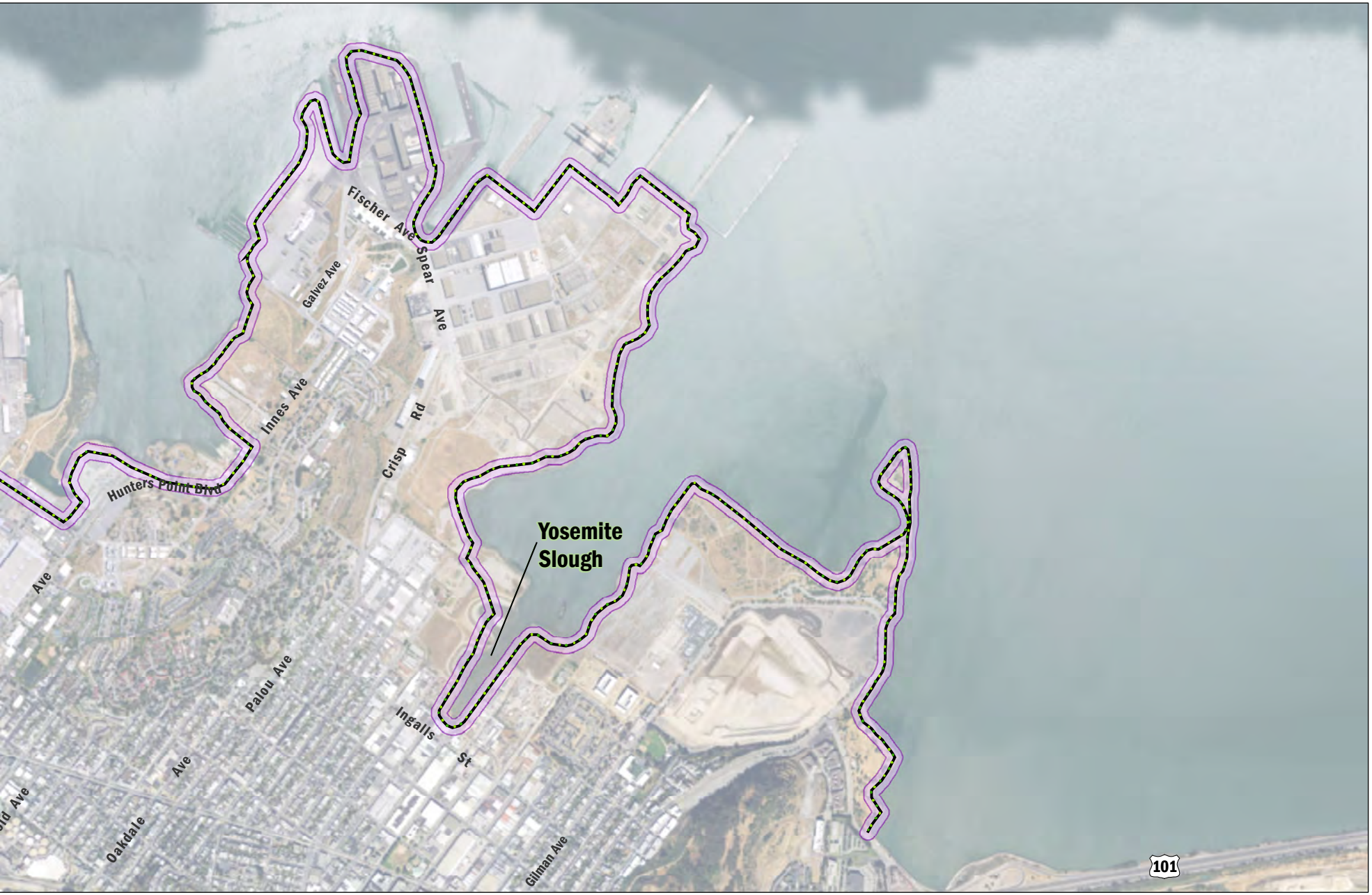


San Francisco Blue Greenway Alignment Overview
Map by AECOM

Photo by AECOM

This guide was prepared to provide stakeholders who are engaged in development and revitalization projects along the Blue Greenway, and Yosemite Slough in particular, with detailed recommendations for the restoration and development of natural shoreline vegetation communities, urban parks, and existing developed areas.

The Blue Greenway Project Development and Shoreline Restoration

Overview and Goals

The Blue Greenway Project is a City of San Francisco (City)-sponsored long-term vision to convert San Francisco's historically industrialized southeastern shoreline into a series of connected parks and open spaces. Once complete, it will be 13 miles long, extending from AT&T Park to Candlestick Point, including portions of sites such as Yosemite Slough, Hunter's Point, India Basin, Islais Creek, and Agua Vista Park. The main goal is to convert sections of the shoreline; particularly brownfield sites—former industrial sites—into wildlife habitat, public parks, and open spaces.[2] Efforts to restore and revitalize portions of the Blue Greenway are already underway.

The Blue Greenway will:

- Incorporate trails to contribute towards the long-term vision of completing the regional Bay Trail;
- Provide active transportation routes that connect employment centers of Mission Bay and downtown;[3]
- Create recreational opportunities and green infrastructure;
- Support environmental stewardship; and
- Become an advocate for waterfront access.[4]

Objectives of this guide are to:

- Improve Habitat and Habitat Connectivity;
- Remediate Contaminated Lands;
- Foster Community Stewardship;
- Create a Climate Resilient Landscape;
- Improve Public Access Experience;
- Protect Water Quality; and
- Stabilize Shoreline.

This guide serves as a companion to the following plans and guidelines: Port of San Francisco's *Blue Greenway - Planning and Design Guidelines*, San Francisco Park's Alliance *Blue Greenway Brownfields Area-Wide Plan*, San Francisco Bay Conservation and Development Commission's (BCDC) *Shoreline Plants - a Landscape Guide for the San Francisco Bay*, San Francisco Planning Department's Green Connections Program, and the San Francisco Plant Finder (http://sfplantfinder.org), along with other guides and materials.

[2] 2012 San Francisco Parks Alliance Blue Greenway Brownfields Area-Wide Plan
[3] 2016 San Francisco Parks Alliance
[4] 2006 Task-Force Vision Statement

Yosemite Slough
Photo by AECOM

Yosemite Slough

This guide is targeted at restoring the Yosemite Slough and greater Blue Greenway area. There are two ongoing efforts to restore the ecology of Yosemite Slough. The California State Parks aims to restore the disturbed and pollution-burdened open spaces and shoreline of Yosemite Slough. The EPA Yosemite Slough Project is addressing contaminated slough sediments below the mean high-tide line.

Efforts at Yosemite Slough are part of the EPA's commitment to restoring the health of San Francisco Bay. Since 2008, EPA's San Francisco Bay Water Quality Improvement Fund has provided more than $44 million in competitive grants for 61 projects that are restoring water quality and wetlands, reducing polluted runoff, and greening development in San Francisco Bay and its watersheds. These grantees and their partners represent a network of more than 70 government agencies, resource conservation districts, land trusts, watershed groups, and non-profit organizations across the Bay Area's nine counties. This network has leveraged EPA's funds with an additional $153 million from partner agencies and organizations, resulting in more than $195 million invested in San Francisco Bay and its watersheds.[5] EPA's Brownfields program has also invested over $2million in Bay View Hunters Point to restore and revitalize properties along the Blue Greenway.

[5] EPA funding and Yosemite Slough information: https://www.epa.gov

Bird wading at Yosemite Slough
Photo by AECOM

A dumpsite along the Blue Greenway
Photo by AECOM

Addressing Contamination

Industrial activities and related contamination have heavily impacted the shoreline. This guide is specifically intended for contamination/ impacted properties along the Blue Greenway and it can be applied to other, similar properties along the San Francisco Bay. Contaminated lands along the Blue Greenway range in severity from those with known risk to people and the environment, to properties where the impact from contamination is relatively low.

Clean up is currently underway at properties posing the greatest risk, such as the Hunters Point Naval Shipyard, which is a federal Superfund site on the National Priority List. At Yosemite Slough, contamination is known to harm shoreline plants and animals. Restoration has occurred along the water's edge, and planning is underway to clean up contaminated sediments in the Slough. 900 Innes is a brownfield property within India Basin with relatively low-risk contamination, and cleanup efforts are also underway at this site.

Brownfields are defined as underutilized, potentially contaminated properties. These properties may be contaminated from varying sources, including industrial activities, gas stations, dry cleaners, pesticide use, asbestos, lead-based paint, and fuel storage tanks. These sources may have resulted in contamination from petroleum fuels prevalent in the upland area of Yosemite Slough, pesticides, heavy metals (such as lead and zinc), polychlorinated biphenyls (PCBs), or volatile organic compounds (VOCs) such as trichloroethylene, perchloroethylene, vinyl chloride, and carbon tetrachloride.

Risks primarily arise when people accidentally ingest or come in direct contact with contaminated soils, dust, sediments, surface water, or groundwater. Another important risk comes from VOC gases evaporating from underground VOC-contaminated soil and groundwater. These VOC gases can migrate and accumulate inside buildings where they can be inhaled.[6] The primary risks at Yosemite Slough are due to exposure of ecological receptors and their ability to bioaccumulate contaminants up the food chain.

[6] Contaminant and risk information: http://yosemite.epa.gov/

Planting Goals

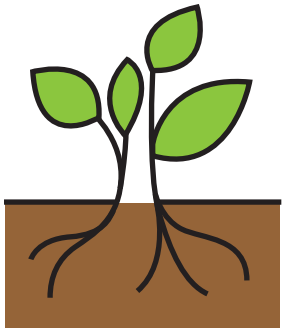
The following planting goals are intended to restore and revitalize the Blue Greenway for human, plant, and wildlife communities.

Improve Public Access Experience

Improvements of the interface of urban and natural areas along the Blue Greenway and San Francisco shoreline will drastically improve the visual aesthetic of the area, compared to existing conditions. The strategic placement of trails within the Blue Greenway corridor will allow the coexistence of thriving human, plant, and wildlife communities, in accordance with the "Recreation and Open Space Guidelines" set by the *San Francisco General Plan*, and with the Metropolitan Transportation Commission's *San Francisco Bike Plan*.

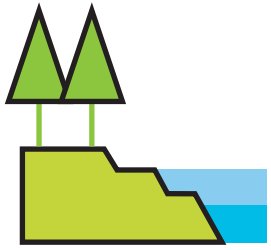
Foster Community and Stewardship

The long-term success of restoring the Blue Greenway will depend on participation by stewards, residents, and volunteers to maintain and protect restored areas. In addition, the Blue Greenway corridor historically has been an environmental justice site because of the proximity of residences to contaminated industrial and military lands.



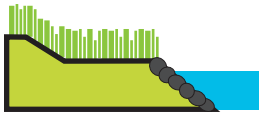
Remediate Contaminated Lands

The remediation of contaminated lands is a crucial first step to making these areas usable and habitable by humans and wildlife alike. This document provides guidance for planting species that naturally remove pollutants and heavy metals from brownfield sites.



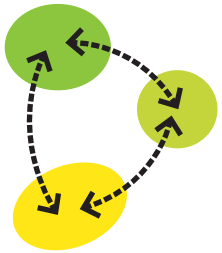
Create A More Resilient Landscape

Climate change and resulting sea level rise threaten flooding and degradation of both urban and natural communities. This document provides guidance for shoreline design and the restoration of specific habitat types to mitigate and minimize the effects of climate change.



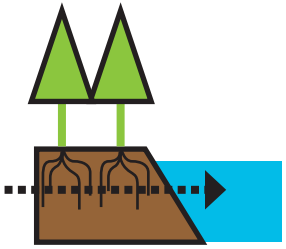
Stabilize Shoreline

Planting along the San Francisco shoreline is a cost-effective method to minimize erosion, improve the visual aesthetic of the shoreline, and restore valuable habitat for wildlife. Incorporating natural revegetation and establishing wider vegetated benches to help disperse wave energy is recommended.



Improve Habitat and Habitat Connectivitiy

Because habitat along the Blue Greenway is fragmented and varies in quality from historic development along the San Francisco shoreline, improvements to habitat and habitat connectivity along the Blue Greenway are key to the recovery and resilience of native species, as well as threatened and endangered species in the San Francisco Bay Area. Connected habitat along the San Francisco shoreline provides an important corridor for bird, fish, mammals, reptiles, amphibians, insects, and marine mammal migration and foraging.



Protect Water Quality

This guide focuses on the engineering and design of urban and natural shorelines in a manner that will help to reduce or eliminate pollutants commonly found in urban runoff.[7] This includes focusing on retention and infiltration of stormwater, reducing impervious surfaces along the Blue Greenway, and planting species along the shoreline that capture sediment and filter pollutants.

[7] In accordance with the San Francisco Stormwater Management Requirements and Design Guidelines (March 2016)

Site History and Timeline

"For thousands of years, indigenous Ohlone lived as part of the native landscape" along what is now the Blue Greenway

(Blue Greenway 2017)

1867

Mission Creek

California's Tidelands Act is passed. Mission Bay begins to be filled using debris from the densely populated South-of-Market district.

1868

Islais Creek

The tidelands around Islais Creek became home to "Butchertown," as meat packing industries were banned from the city center.

Late 1800s

India Basin from west side of India Cove looking east. 1900. *Source: Collection of Ruth Siemer*

1877

Burning of Shrimp Camp. *Source: San Francisco Public Library*

1881

1929

India Basin

Hunters Point Power plant opened along the shore of India Basin.

1929

1940s

Hunters Point

The Hunters Point Shipyards were at their peak, building warships used in World War II.

1946-1969

1960

Candlestick Park

Candlestick Park opened.

Candlestick Park on opening day, April 12, 1960. *Source: FoundSF.org*

1971

Historic Land Use (Human Uses)

Hunter's Point, California Dry Dock, ca. 1867. *Source: SF Public Library*

Hunters Point became the site of the first dry dock on the Pacific Coast.

Hunters Point

Islais Creek emerging from Glen Canyon, 1890's. *Source: Greg Gaar Collection, courtesy of FoundSF.org*

Until the late 1800s, Islais Creek is estimated to have provided up to 85 percent of the city's drinking water. Portuguese, Italian, and Irish immigrants used what is now Bayview for farms and gardens.

Islais Creek

Construction began on the California Sugar Refinery, later named the Western Sugar Refinery.

Warm Water Cove

Yosemite Slough, 1920 *Source: OpenSFHistory.com*

The U.S. Navy expanded the Hunters Point Naval Shipyard on land formerly used by a shrimping camp.

India Basin

Aerial photograph of Hunters Point. 1930 *Source: San Francisco Public Library*

The Naval Radiological Defense Laboratory conducted early research into radioactive materials.

Hunters Point

The park was dedicated as open space, as mitigation for creation of the Port of San Francisco's containerized shipping facility further south, at Islais Creek.

Agua Vista Park

Hunters Point Naval Shipyard, 1942
Source: San Francisco Public Library (via FoundSF.org)

Aerial View 2011. *Source: Google Earth*

Aerial View 2017. *Source: Google Earth*

1971

Islais Creek

The final slaughter house of "Butchertown" was closed.

Creation of park with Golden Gate Audubon as a public open space and wildlife habitat area.

Heron's Head Park

Filling Pier 98 in 1971. *Source: Ed Brady*

1974

The shipyard was closed.

Hunters Point Shipyard

1984

The Friends of Islais Creek group formed and took an active role in stewarding the channel as well as advocating for its regeneration.

Islais Creek

Aerial View. *Source: Bing Maps*

1989

Hunters Point

The U.S. Environmental Protection Agency placed the Hunters Point Naval Shipyard on the National Priorities List, a list of the most polluted sites in the country.

1996

Bayview Hunters Point Redevelopment Plan

The San Francisco Redevelopment Agency (now the Office of Community Investment and Infrastructure) adopted a plan for long-term community revitalization efforts. In 1999, Lennar Urban was named master developer for the Hunters Point Shipyard plan, a mixed-use redevelopment of the former naval base.

The Port of San Francisco, in partnership with Literacy for Environmental Justice, began working on creation of the park, regenerating wetlands and habitat, and providing an environmental education program to serve schools both locally in Bayview and beyond.

Heron's Head Park

1997

Lennar Urban proposed and was selected to become master developer for the former site of Candlestick Park. The combined Hunters Point Shipyard–Candlestick Point Development encompassed 780 acres.

Hunters Point Shipyard–Candlestick Point Development

2006

Hunters Point

The power plant was shut down by Pacific Gas and Electric Company and dismantling began.

2010

Yosemite Slough

The first phase of the Yosemite Slough Wetland Restoration Project was completed, transforming warehouses and contaminated soils to tidal wetlands.

Opening of Heron's Head Park EcoCenter with support from Literacy for Environmental Justice (LEJ) and local youth, the first 100% off-grid building in the City.

Heron's Head Park EcoCenter

Heron's Head Park EcoCenter.
Source: Port of San Francisco

2013

San Francisco Shipyard Homes

Lennar Urban began residential construction at Hunters Point Shipyard, and the first residents moved into San Francisco Shipyard Homes in 2014.

2017

Hunters Point Shoreline Park

Shoreline Park, adjacent to former Pacific Gas and Electric Company Power Plant, opened along Blue Greenway alignment. The park connects Heron's Head Park with India Basin Shoreline Park.

Crane Cove Park

Site preparation for the park is completed.

Phase 1 design and permitting begins for Mission Rock Park.

Mission Rock Park

See Part II for Planned Redevelopment Projects along the Blue Greenway.

Blue Greenway Redevelopment

Photo by AECOM

PART II

PRESENT AND FUTURE

CURRENT CONDITIONS

San Francisco's southeastern shoreline provides valuable feeding, nursing, and breeding habitats for many species of wildlife, despite the historic degradation of these sites and the existing industrialized setting. The coexistence of urban vegetation, native plants, cultivated plants, and weeds present a mosaic of open water and shoreline habitats for mammals, reptiles, amphibians, birds, and butterflies.

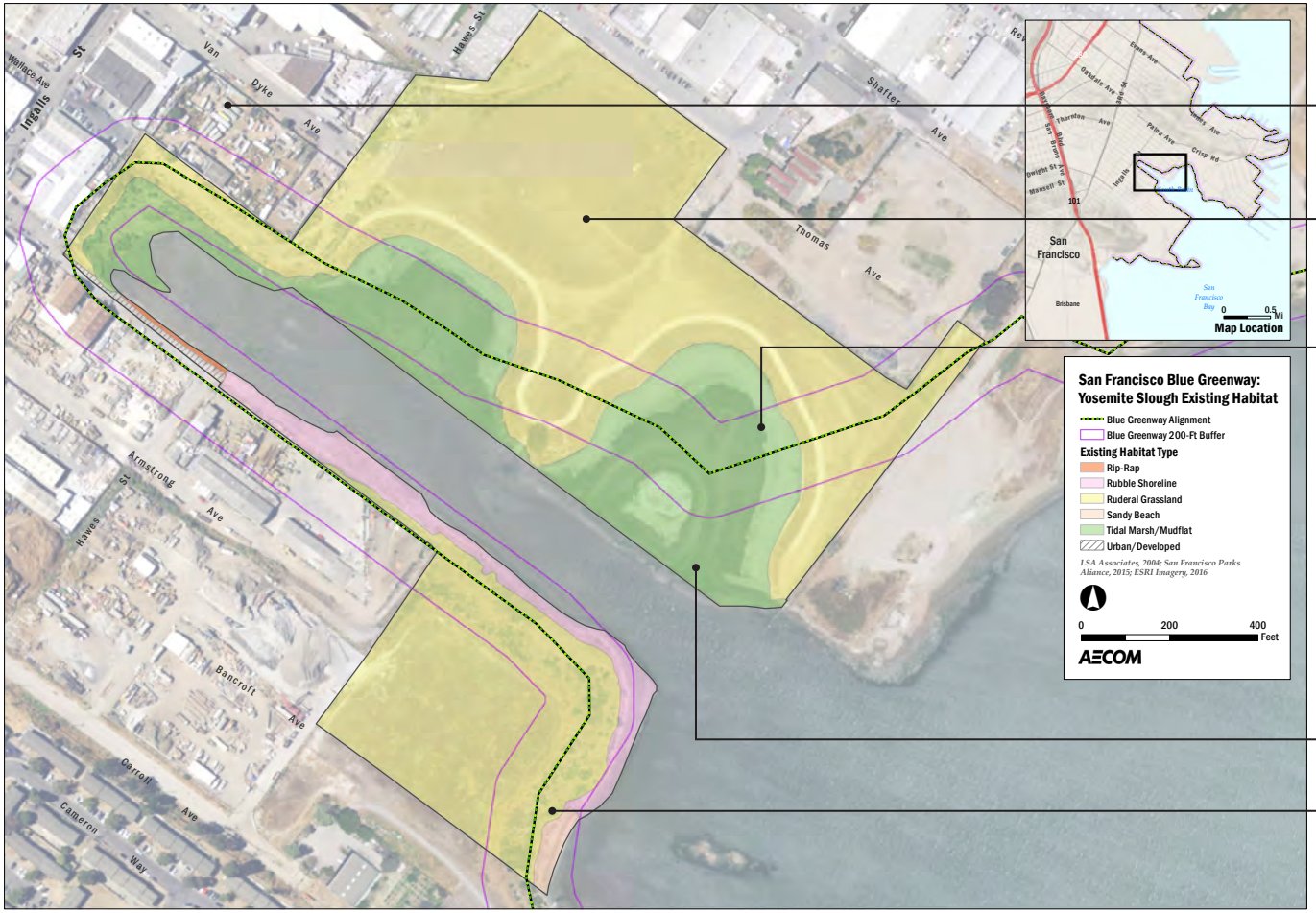
Infrastructure and Land Uses

i. The Blue Greenway historically was made up of tidal marshes and mudflats. Residential and industrial uses began in the 1850s and gradually filled in this habitat until 1972, when the current shoreline was established.

ii. In Yosemite Slough, wetlands were reduced significantly between 1900 and 1970, because of placement of fill and debris within the slough for residential, commercial, and industrial uses. The Yosemite Slough required remediation and California State Parks is currently conducting wetlands restoration.

01 Heron's Head Park
Photo by AECOM
02 Mission Bay, Channel Street
Photo by AECOM
03 Mission Bay
Photo by AECOM

Plant Communities along the Blue Greenway



E Developed Areas

C Coastal Grassland / Non-native Grassland

A Tidal Marsh

B Mudflat / Open Water

D Ruderal

The Yosemite Slough area contains diverse habitat types, from newly restored tidal marsh to historic infrastructure and developed areas.
Map by AECOM

Plant Communities along the Blue Greenway

Wetland and Shoreline Communities

Tidal marsh, mudflat and open water, and coastal beach and dune communities are the habitats that occur along the Blue Greenway shoreline.

Tidal Marsh. *Photo by AECOM*

Mudflat. *Photo by AECOM*

Open Water. *Photo by AECOM*

A

Tidal Marsh

Tidal marshes consist of coastal wetland vegetation that are inundated with salt or brackish water (freshwater-saltwater mix) based on the tidal cycle. Tidal marsh occurs within bays and estuaries where shorelines are sheltered from surf and are situated at elevations between mean sea level and annual high tides. Less than 10 percent of the historic tidal marsh is estimated to remain in the San Francisco Bay.[8] Once widespread along the Blue Greenway, tidal marsh now exists only in small, isolated, and low quality patches. Several threatened and endangered species occur in tidal marsh, including salt marsh harvest mouse, Ridgway's rail, California black rail, California least tern, green sturgeon, and salmonids. Tidal marsh also provides habitat for numerous other terrestrial and aquatic common species, including marine mammals.

B

Mudflat and Open Water

Open water describes all areas of the San Francisco Bay that are of low enough elevation (around mean sea level) to be devoid of vegetation, with the exception of sporadic eelgrass beds. Open water in the San Francisco Bay is influenced by both saltwater that enters the Bay via the Golden Gate and freshwater from the Sacramento–San Joaquin Delta. Below the elevation where tidal marsh species can survive, the shoreline margin of the San Francisco Bay is mudflat habitat, which is exposed during low tides and inundated during high tides. Both mudflat and open water provide important foraging habitat for numerous common fish, birds, and marine mammals.

[8] U.S. Fish and Wildlife Service (USFWS). 2013. Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. Region 8, Sacramento, CA.

Plant Communities along the Blue Greenway

Wetland and Shoreline Communities

Coastal Beach and Dunes. *Photo by AECOM*

C Coastal Beach and Dunes

Coastal beaches along the Blue Greenway are made up of sand, fine and course gravel, and rocky debris. These beaches are sparsely vegetated or unvegetated and occur at the edges of development and have been degraded from nearby and recent development. In the past, sand was used to fill portions of open water to expand existing land areas. The sandy areas and beaches along the Blue Greenway do not provide quality habitat that coastal beaches and dune habitat do elsewhere in San Francisco; however, they do provide rest and foraging sites for migrating birds, as well as potential haul out sites for marine mammals.

Wetlands. *Photo by AECOM*

D Other Wetland

Other wetlands within the Blue Greenway generally are located within depressions that are ephemerally or seasonally ponded during the wet season for sufficient duration to support hydrophytic (water-loving) vegetation. Because of the developed and urban nature of the shoreline along the Blue Greenway, these depressions can also occur when there are earth-moving activities during development projects.

Plant Communities along the Blue Greenway

Upland Communities

Coastal grassland, coastal scrub, and coast live oak woodland are communities that occur inland from the shoreline, and provide refuge habitat for wildlife, nesting habitat for birds, and aesthetic appeal for pedestrians and bikers.

Coastal Grassland and Non-Native Grasslands. *Photo by AECOM*

Coastal Grassland and Non-Native Grasslands

Because of the developed and urban setting of upland areas along the Blue Greenway, grassland communities primarily are comprised of non-native and invasive species. Ruderal vegetation and shrubs, mainly coyote brush (*Baccharis pilularis*), are scattered throughout the grassland areas. Small, isolated colonies of native perennial bunch grasses that grow in a few areas along the Blue Greenway are generally from restoration projects. Numerous insect, amphibian, reptile, bird, and mammal species occur within grassland and other upland communities.

Coastal Scrub. *Photo by AECOM*

Coastal Scrub

Coastal scrub habitat is prevalent along California coastlines but is rare in upland areas within the Blue Greenway because of developed and urban areas often extending to the edges of the shoreline. Coastal scrub only occurs in one isolated patch along the shoreline of India Basin. No coastal scrub occurs within the Yosemite Slough area. The dense vegetation provides a food source, cover from predation, and refugia habitat for many wildlife species.

Coastal Live Oak Woodland. *Photo by AECOM*

Coast Live Oak Woodland

Coast live oak woodland is comprised of communities of oak trees over native or non-native grassland and/or scrub understory. Coast live oak woodland is valuable habitat for nesting birds, especially raptors that forage along coastlines.

Plant Communities along the Blue Greenway

Developed Communities

Existing infrastructure, riprapped shorelines, landscaped areas and parks, and ruderal areas make up the developed communities along the Blue Greenway.

24th Street facing west from Warm Water Cove. *Photo by AECOM*

Infrastructure - Parking, Roads, and Buildings

Infrastructure describes all portions of the Blue Greenway that are paved, graveled, or otherwise covered by buildings or other human-made structures. These areas generally are located upland from the shoreline, but also extend into open water habitat in the form of piers, docks, and boat launches, which are particularly prevalent at Hunters Point.

Riprap. *Photo by AECOM*

Riprap

Riprap is loose stone piled to form breakwater or other hardened surface, often to control erosion. Riprap rock varies in size, from 50 to 200 pounds. Riprap is common along the shoreline throughout the length of the Blue Greenway and serves to stabilize the shoreline from erosion caused by wave energy. Riprap may provide limited shelter for newly hatched fish and terrestrial and aquatic invertebrate species. Although riprap provides habitat for these species, it generally is not considered high quality habitat for native plant and wildlife species in the San Francisco Bay.

Plant Communities along the Blue Greenway

Developed Communities

Representational photo of a landscaped/ornamental area. *Photo by AECOM*

Landscaped/Ornamental - Including Parks

Landscaped areas are described as areas planted with native and non-native ornamental shrubs, forbs, and trees that provide visual, aesthetic, or recreational use, that do not typically provide native or historic habitat. These areas generally include parks and small patches of vegetation and trees planted along the edges of urban areas. Landscaped areas vary greatly but include mixes of non-native and native plant species.

Representational photo of a ruderal area. *Photo by AECOM*

Ruderal Areas

Ruderal areas are made up of weedy plant species, most specifically primary successional non-native and invasive annuals, which occur in fragmented patches along roadsides and other disturbed areas. The vegetative cover of these communities is similar to non-native grassland with the difference being that ruderal habitats are smaller and more fragmented.

Addressing Contamination

Introduction

The goal of the Superfund program is to clean up contaminated sites in order to protect public health and the environment. Remedial designs and actions take into consideration the likely future use of the site. Since 1980, EPA's Superfund program has cleaned up some of the nation's worst hazardous waste sites, as well as having responded to local and nationally significant environmental emergencies.

Since 1995, EPA's Brownfields program has empowered states, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. Brownfields grants and technical assistance continue to serve as the foundation of EPA's Brownfields Program. These grants support revitalization efforts by funding environmental assessment, cleanup, and job training activities.[9] EPA Brownfields funding has been used on properties in Bayview Hunters Point. However, this program cannot be used on Superfund sites, such as the Hunters Point Naval Shipyard Superfund site.

Main Contaminants of Concern

The main contaminants of concern often encountered along the shoreline consist of petroleum hydrocarbons from underground storage tank releases and spills, coal tar from manufactured gas plant production, and metals (mainly lead) from earthquake debris used as fill along the Bay margin.

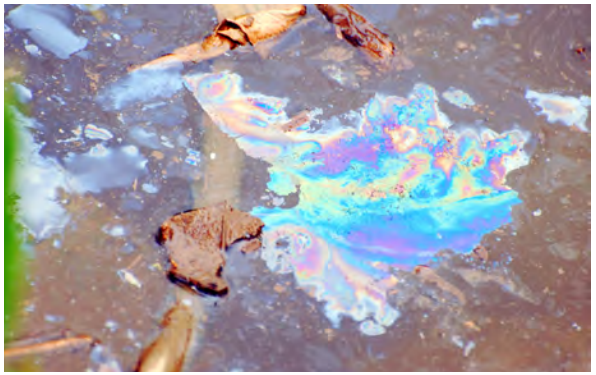
Depending on the nature of restoration and revegetation activities along the Blue Greenway, remedial alternatives for soil may consist of removal and offsite disposal to a licensed landfill, onsite encapsulation, and capping. Typically for small volumes of material offsite disposal is the typical method for addressing soil contamination. However, working within the Maher program, the final remedial approach to address site soil contamination will be developed as part of the Site Mitigation Plan preparation. In preparing a Site Mitigation Plan, consideration is also given to future property use and the need to be protective of human health and the environment. Additionally, during remedy evaluation sea level rise is now a consideration for sites located along the Bay margin as the selected remedy needs to be able to perform under elevated sea level conditions.

Definitions:

Brownfield: A property that is idle, abandoned, or underused that may be environmentally contaminated.

Superfund Site: Land contaminated by hazardous waste that has been identified and managed by the Environment Protection Agency, as a site for cleanup because it poses a risk to human health and the environment.

Maher Ordinance: The Maher Ordinance requires San Francisco Department of Public Health oversight for the characterization and mitigation of hazardous substances in soil and groundwater in designated areas zoned for industrial uses, sites with industrial uses or underground storage tanks, sites with historic Bay fill, sites in close proximity to freeways or underground storage tanks.[10]



Petroleum Pollution
Photo by Steve Snodgrass via Flickr

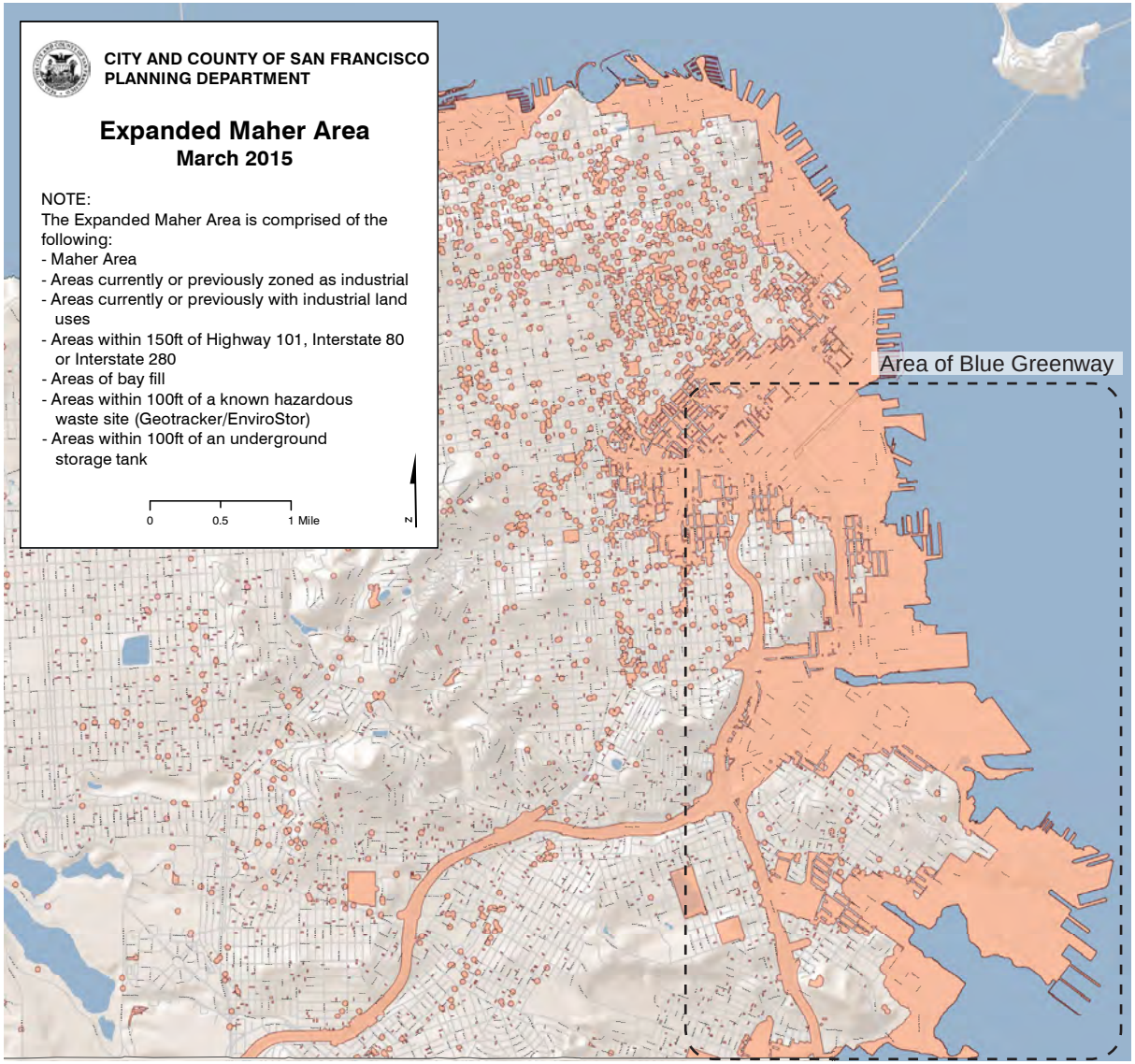
[9] U.S. Environmental Protection Agency. https://www.epa.gov
[10] From San Francisco Department of Public Health. Available: https://www.sfdph.org/dph/eh/HazWaste/Maher_FAQ.asp

Addressing Contamination

Maher Ordinance

Article 22A (also known as the Maher Ordinance) of the City and County of San Francisco, Department of Public Health (DPH) requires San Francisco Department of Public Health oversight for the characterization and mitigation of hazardous substances in soil and groundwater in designated areas zoned for industrial uses, sites with industrial uses or underground petroleum storage tanks (USTs), sites with historic Bay fill, and sites in close proximity to freeways.

A project may be in the program if it requires a building permit and will disturb a minimum of 50 cubic yards of soil in a designated Article 22A area, or is requested by the Planning Department to contact DPH. Due to the nature of the Blue Greenway as part of the Bay Trail, the entire alignment of the Blue Greenway falls within the jurisdiction of Article 22A. The Maher Area map can be found at the San Francisco Planning Department Library of Cartography online. A map of the Maher Area in the Blue Greenway is shown on the right, which is adopted from the March 2015 San Francisco Planning Department Expanded Maher Area map.



Adopted from the March 2015 San Francisco Planning Department Expanded Maher Area map. Available from http://sf-planning.org

Addressing Contamination

Maher Program

The main steps for the Maher program are listed below and shown on the decision flow chart:

1. A site history must be submitted for review and it will be determined whether you comply with section 22A or need to submit further documents. If the site history has no record of hazardous substances in the soil or ground water, the Director of Public Health or Environmental Health staff will provide you with a letter and copy the Director of Building Inspections that you have complied with the requirements of Article 22A and no further Maher related work is required.

2. A work plan for a subsurface investigation must be submitted to the Director of Health or the Environmental Health staff approval. The Director or Environmental Health staff will review the work plan and determine if the work plan meets the requirements found within Article 22A. After the work plan is approved, the work plan is implemented. A subsurface investigation report describes the work plan implementation and the analytical results of the sampling.

3. If the subsurface investigation report indicates that soil or groundwater samples have hazardous substances present, a site mitigation plan describing handling, management and mitigation of the contamination will be prepared and submitted to DPH Environmental Health for approval. The site mitigation plan shall be completed by a qualified person.

4. Implement the approved site mitigation plan.

5. A final project report describing site mitigation plan implementation and providing material disposal documentation must be submitted with a Maher certification statement. The Director will then provide a notification that the applicant has completed and complied with Article 22A.

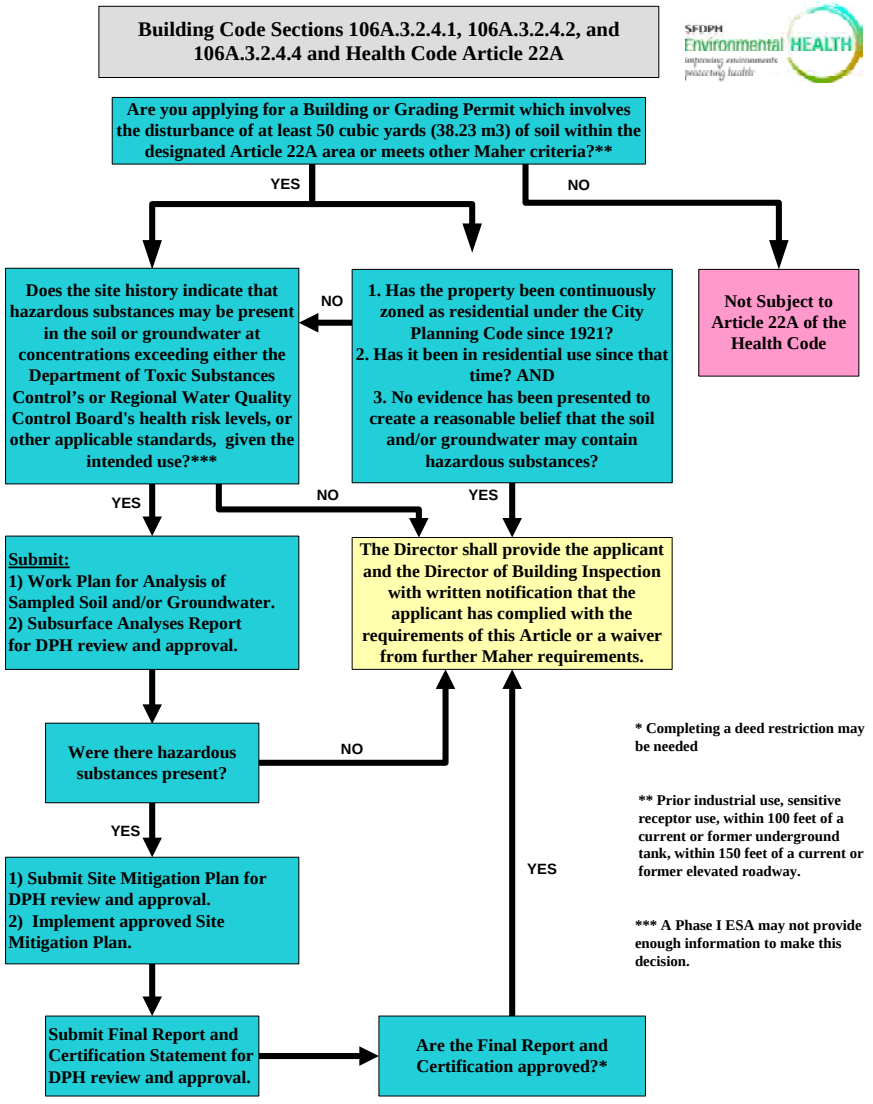


Image from San Francisco Department of Public Health

Addressing Contamination

900 Innes Avenue
Photo by Erik Skov

Contaminated Site Restoration and Revegetation

During site restoration and revegetation activities at contaminated sites along the Blue Greenway, consideration to the protection of site construction workers and the general public must be taken into consideration.

If a Site Mitigation Plan is developed and implemented under the Maher Program these elements are typically addressed through the development of a site specific health and safety plan for site construction activities to address potential exposure to contaminants, and the implementation of dust control and stormwater runoff control measures to mitigate the generation of fugitive dust and potentially contaminated stormwater discharge.

If contaminants are left in place onsite as part of the selected remedy, they are typically hard capped (concrete or asphalt) or covered with a sufficient soft cap (soil cap or vegetation) to mitigate the risk of exposure to remaining contaminants to site users. Typically a demarcation barrier is placed to indicate the transition from clean material into contaminated material so this transition can be readily identified.

Sites having contaminants that are left in place as part of the final remedy will often have a land use covenant, restricting the type of land use based on the nature and degree of remaining contamination, as well as other site restrictions (e.g. no use of site groundwater, no vegetable or fruit growing, etc.). The land use covenant typically requires the development of a materials management plan that identifies the area(s) where contaminants remain onsite and the measures to implement for managing and handling contaminated soil that may be encountered during future site work.

With the exception of the Hunters Point Naval Shipyard and the Yosemite Slough, the US EPA is not the regulatory oversight agency for cleanup of contaminated properties along the Blue Greenway alignment. Public, private, and nonprofit entities working to cleanup and revegetate brownfield sites along the Blue Greenway work with the San Francisco DPH as well as other potential regulatory stakeholders that may include the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) or the San Francisco Bay Regional Water Quality Control Board (RWQCB).

Future

Climate Change

The changing climate is projected to bring hotter, drier summers and potentially wetter winters in northern California, with more precipitation falling as rain rather than snow in the Sierra Nevada mountains. More extreme events—drought, heavy rainfall and flooding events, wildfires, and changes to nature's environmental clock—are expected. These regional changes will mean differences in San Francisco's water supply, changes to seasonal timelines, and an increase in extreme events, such as storm surge and wave events, flooding, and permanent inundation of wetlands and waterfront areas.

Sea Level Rise

Sea levels are projected to rise globally, which will have local effects on the Blue Greenway. Sea level rise and flooding endangers resources such as electric utilities, storm water and waste water systems, transportation, human, and natural systems. Along the Blue Greenway, contaminated properties along the shoreline are at risk of flooding, which could further expose the human, plant, and animal communities to contamination or hazardous materials.[11]

Areas that are built on shallow Bay fill are at higher risk because rising sea levels may influence groundwater levels and result in increased subsidence and liquefaction hazards.[12]

Mean Higher High Water (MHHW) is the average of the higher daily tide measured over several years (called the National Tidal Datum Epoch), using nearby tide stations. The existing MHHW level along the Blue Greenway is 6.55' NAVD88. By mid-century, the upper end sea level rise scenario is projected to rise 24", increasing the sea level along the Blue Greenway to 8.55' NAVD88. By late century, the upper end sea level rise scenario projected water level is expected to rise an additional 66", to 12.05' NAVD88.[13]

Proper planning and restoration is essential to ensure the safety of residents and properties that are vulnerable to sea level rise along the Blue Greenway corridor. Addressing contaminated areas now, along with implementing climate-smart restoration techniques will reduce these potential impacts.

Table 1: Sea Level Rise Estimates for San Francisco Relative to the Year 2000[12]

Year	Projections	Ranges
2030	6 ± 2 in	2 to 12 in
2050	11 ± 4 in*	5 to 24 in
2100	36 ± 10 in	17 to 66 in

** As a simplifying assumption, the 2050 most likely value selected for the inundation mapping effort is 12 inches rather than the 11 inch value noted in the table.*

Table 2: Factors That Influence Local Water Level Conditions in Addition to Sea Level Rise[12]

Factors Affecting Water Level	Typical Range CCSF Pacific Shoreline[a]	Typical Range CCSF Bay Shoreline[b]	Period of Influence	Frequency
Tides	5 to 7 ft	5 to 7 ft	Hours	Twice daily
Storm Surge	0.5 to 3 ft	0.5 to 3 ft	Days	Several times a year
Storm Waves	10 to 30 ft	1 to 4 ft	Hours	Several times a year
El Ninos (within the ENSO cycle)	0.5 to 3 ft	0.5 to 3 ft	Months to Years	2 to 7 years

[a] Baker and AECOM. 2012. *Intermediate Data Submittal #1: Scoping and Data Review.* San Francisco County, California. California Coastal Analysis and Mapping Project / Open Pacific Coast Study. Federal Emergency Management Agency Region IX.

[b] DHI. 2010. *Regional Coastal Hazard Modeling Study for North and Central Bay.* Prepared for Federal Emergency Management Agency, September.

[11] *Climate change and Sea Level Rise: Impacts on Bayview Hunters Point.* Prepared by Greenaction. 2017

[12] National Research Council. 2012. *Sea level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future.* Prepared by the Committee on Sea Level Rise in California, Oregon, and Washington and the National Research Council Board on Earth Sciences and Resources and Ocean Studies Board Division on Earth and Life Studies. March 2015.

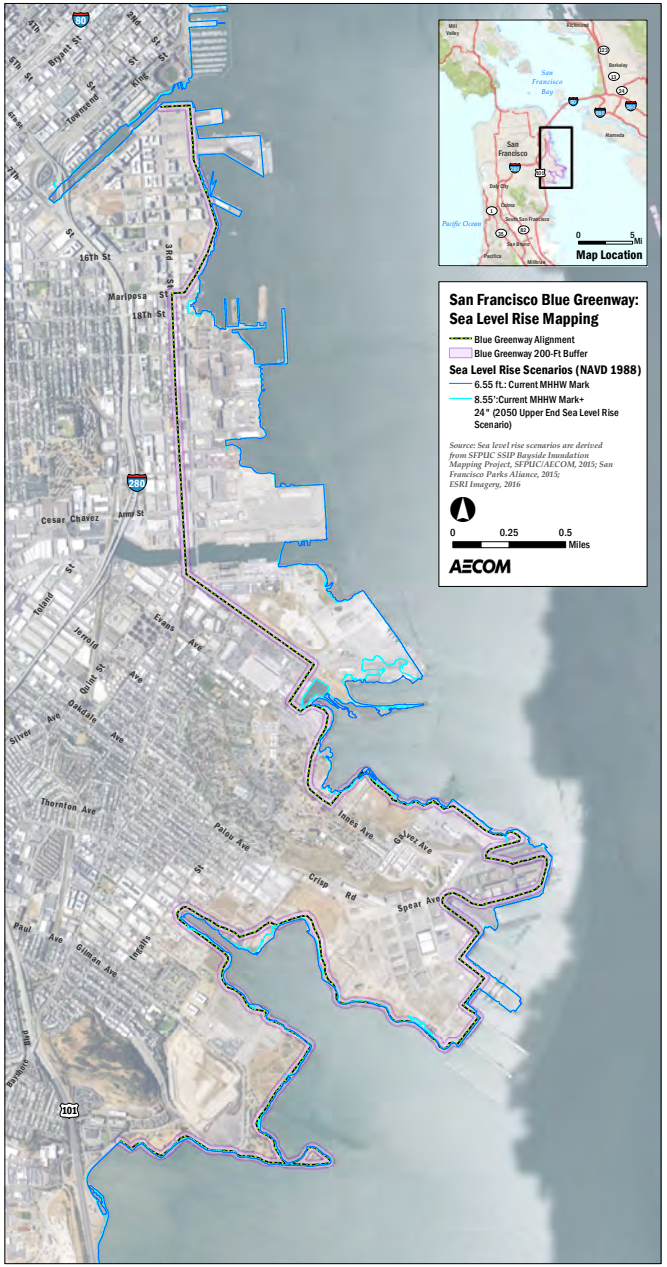
[13] *Climate Stressors and Impacts: Bayside Sea Level Rise Mapping Final Technical Memorandum.* Prepared for: SFPUC; Prepared by: Sewer System Improvement Program Program Management Consultant CS-165 (AECOM)

Future

Projected Sea Level Rise in 2050 and 2100

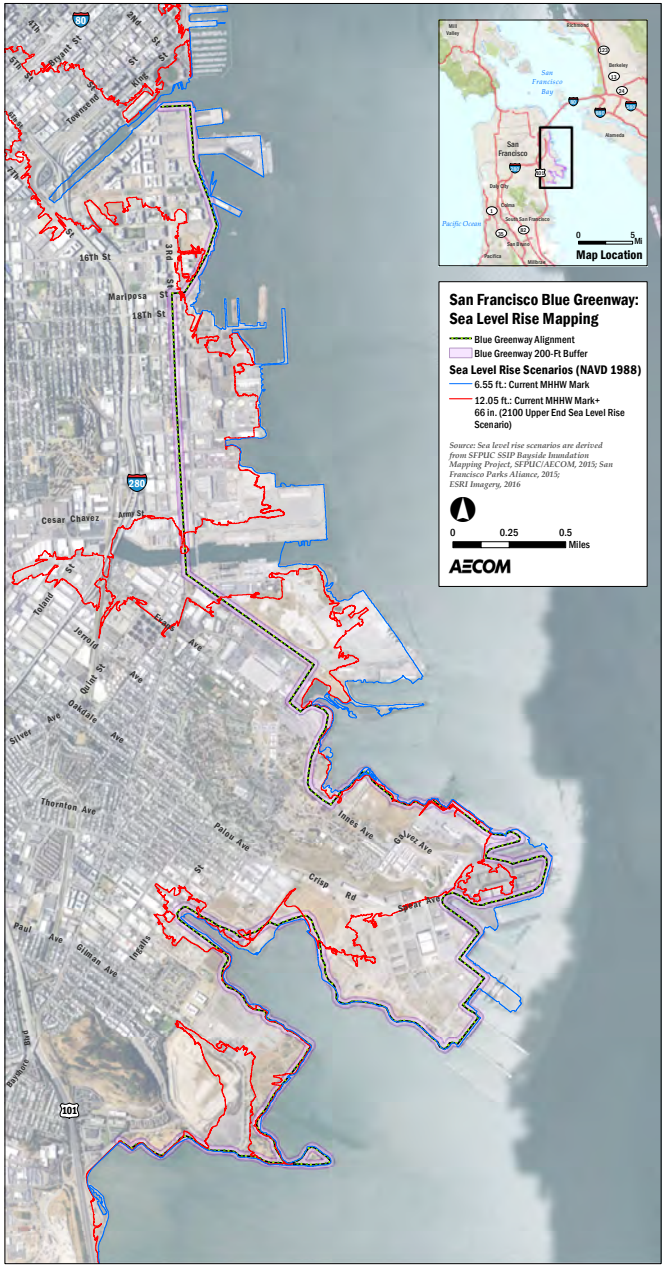
Projections are based on National Research Council, 2012.[12]

Sea Level Rise Mapping: Year 2050



Map by AECOM

Sea Level Rise Mapping: Year 2100



Map by AECOM

Future

Climate Adaptation

As the climate changes, plants and wildlife must adapt to their new environment or move to a more suitable environment, or they will not persist. Creating transitional habitats and connecting natural corridors along the Blue Greenway will help various species withstand climate change and other environmental stressors; this adaptation is forward-looking and climate-smart.

Designing the Blue Greenway to be climate resilient will involve taking into account species tolerance, corridor connectivity, and access to inland habitat migration with sea level rise:

a. Species Tolerance

Every species has a specific range of climate variables that it requires (e.g., temperature, water). Species with broader climate tolerances that can withstand temperature and precipitation extremes will be more resilient to climate change. Many California native plants have these traits, because they have evolved in California's dynamic wet winters and hot dry summers (see the plant list for details).

b. Corridor Connectivity

Creating habitat connectivity in the face of climate change will provide all species—both plants and wildlife—with opportunities to move across the landscape. This connectivity will increase in importance as pressures from the changing climate cause each species to move further to find mates, food sources, and suitable microclimate environments.

c. Transitional Habitat to Respond to Sea Level Rise

As the sea level rises, the sea water will inundate existing habitats and the bay shoreline and elevation will change. Species that live along the shoreline will need to adapt towards wetter conditions or move upslope/inland to survive. To assist this process, we can consider these processes during design. Mild slopes and wide shorelines allow plant species, that provide forage and cover for wildlife species, an opportunity to slowly migrate upslope in advance of complete inundation.

Climate-smart: The intentional and deliberate consideration of climate change in natural resource management, realized through adopting forward-looking goals and explicitly linking strategies to key climate impacts and vulnerabilities.[14]

Climate-Smart conservation addresses climate change impacts and other threats by using nature-based approaches to:[15]

- Reduce greenhouse gas emissions;
- Enhance the benefits nature provides to humans—clean air, fresh water, fisheries, pollination, recreation, and climate and flood control; and
- Improve the abilities of wildlife and people to adapt to the rapidly changing climate.

Climate-Smart conservation:[16]

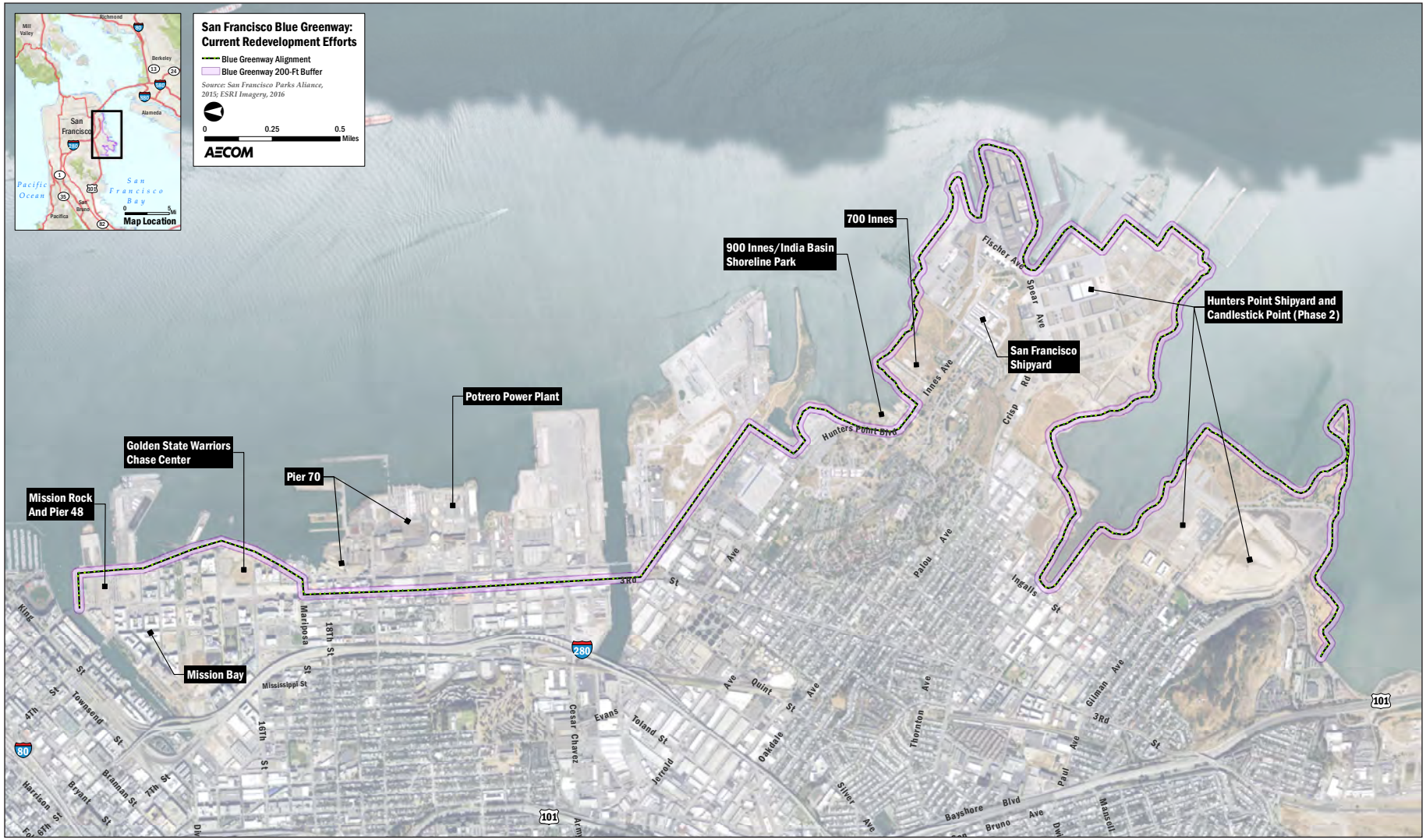
- adapts and is flexible and can respond to change;
- avoids maladaptation and unintended consequences; and
- provides mitigation benefit (sequesters carbon).

Climate-smart plant species are best to use in revegetation of the Blue Greenway.

[14] Stein, B. A., P. Glick, N. Edelson, and A. Staudt (editors). 2014. *Climate-Smart Conservation: Putting Adaptation Principles into Practice.* National Wildlife Federation, Washington, DC
[15] Point Blue Conservation Science. 2017. *Climate-Smart Conservation and Climate-Smart Restoration*. Available: http://www.pointblue.org/priorities/climate-smart-conservation/.
[16] Adopted from: Hutto, S. V., editor. 2016. *Climate-Smart Adaptation for North-central California Coastal Habitats*. Report of the Climate-Smart Adaptation Working Group of the Greater Farallones National Marine Sanctuary Advisory Council. San Francisco, CA.

Planned Redevelopment

Displayed in the figure below are redevelopment projects which are already planned or underway along the Blue Greenway.



Map of planned redevelopments along the Blue Greenway
Map by AECOM

Photo by AECOM

PART III

GUIDELINES

REVEGETATION GUIDELINES:

A GENERAL

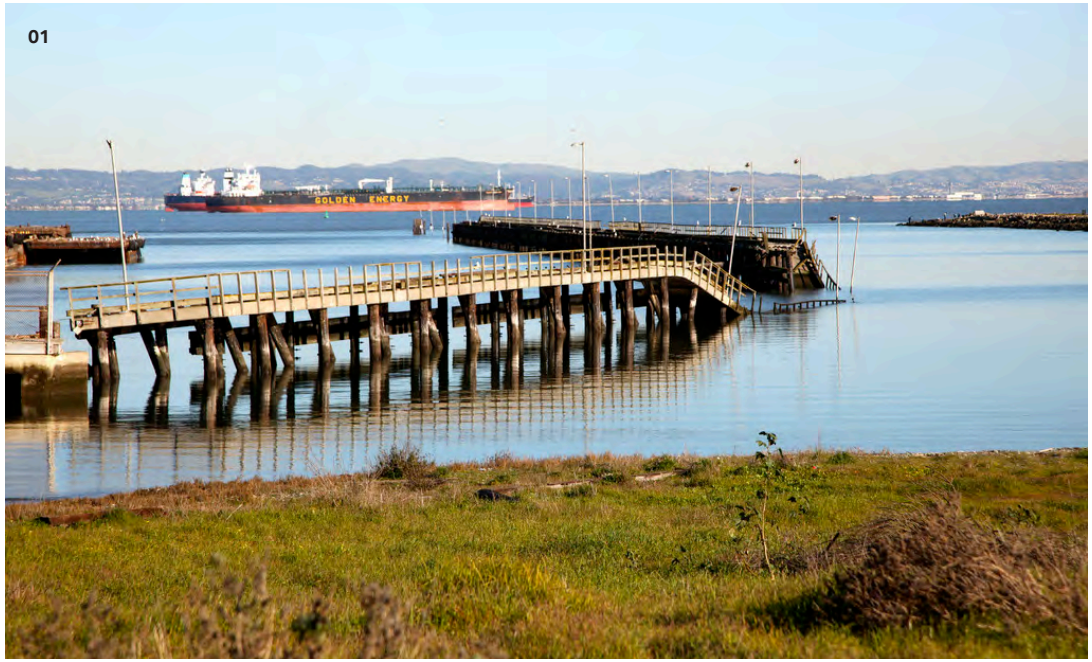
B SHORELINE

C URBAN PARKS

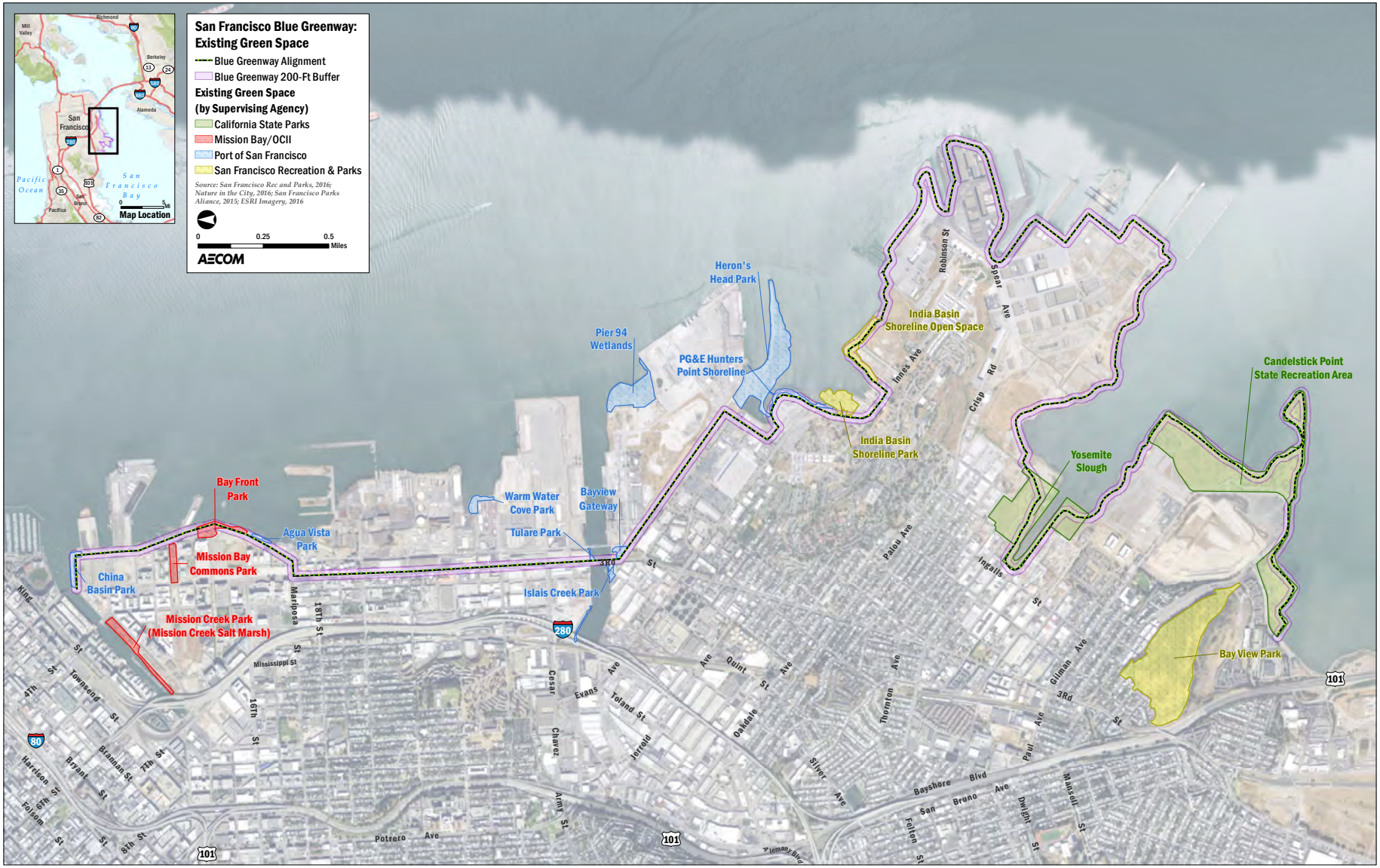
D DEVELOPED AREAS

REVEGETATION GUIDELINES

Part III of this guide provides specific guidelines for the revegetation of shorelines, urban parks, and developed areas impacted by contamination that can be found along the Blue Greenway. The revegetation goals differ between each of these land cover types based on their intended use and unique potential. Detailed revegetation guidelines for shoreline areas focus on native species habitat restoration and shoreline stabilization; detailed guidelines for urban parks focus on improving the public experience, water quality, and habitat; and developed areas include improving public access, connectivity, and remediating contaminated lands.



01 Herons Head Park
Photo by torbakhopper via Flickr
02 Yosemite Slough and the surroundings.
Photo via Google Earth



Map of existing green spaces along the Blue Greenway
Map by AECOM

A Revegetation Guidelines: General

A1 Team

A strong team will increase efficiency in the restoration and development process, and ensure a project is implemented to the highest standards.

i. Set Goals and Design for the End User

Formulate goals during the inception of a project that are geared toward the end-user of the space being restored or developed. Track those goals frequently during the planning stages of a project to make sure the project stays true to its intended purpose and community needs. Engage stakeholders and nurseries early to ensure a smooth project process from conception through build.

ii. Form a Multi-Disciplinary Team

Involve experts to ensure a successful revegetation project, including restoration ecologists, climate-change ecologists, geotechnical engineers, botanists, biologists, hydrologists, stakeholders, and the local community.

iii. Plan and Fund Long-Term Management

Ensure that sufficient resources are secured for long-term management of revegetation sites during the early planning phases of a project. Funds should be set aside for activities such as managing weeds, replanting failed plantings, removing informal trails, and repairing shoreline erosion. Because of the prevalence of non-native and invasive species within and adjacent to properties along the Blue Greenway, weed management will be crucial for successful revegetation. Responsible parties should be identified for weed removal and replanting of natives as necessary for a period of no less than 5 years.

iv. Educate and Foster Community Stewardship

The shoreline is an ideal location to foster community stewardship and to educate the public about the environment and native habitats along the Blue Greenway. Diverse populations utilizing the corridor may otherwise not have exposure to natural landscapes. Incorporate signage where possible with information on habitat value, water conservation, and stewardship. Use the community engagement process to identify local residents who could engage in long-term maintenance, restoration and planting/gardening projects, cleanup projects, and community education programs.

v. Learn from Other Projects

Research current and past project along the Blue Greenway and elsewhere to learn from their successes and mistakes. Refine your planting palette and planting methods based on which plants performed well in adjacent planting and restoration projects.

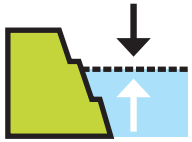
A2 Planning and Design

Revegetation Guidelines: General

Goal setting and planning is critical to the success of a restoration or development project.

i. Preserve Natural Habitat Areas

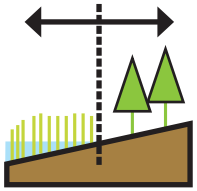
The preservation of large parcels of land can provide habitat for terrestrial birds, small mammals, reptiles, amphibians, and butterflies. In contrast, intensive landscaping and recreational use will reduce the value of these areas to native wildlife. Keeping some areas along the Blue Greenway wild is important. Establishing trails through undeveloped parcels and managing for invasive plants, may help minimize disturbance.[17]



ii. Design to the Correct Elevation

Tidal systems depend on proper elevation to be successful. Consider the elevation tolerances and hydrologic needs of the species being planted and whether settlement is anticipated, or sediment accumulation is likely.

iii. Plan Transitional Habitat for Climate Change and Sea Level Rise



Transitional habitat between shoreline wetlands and uplands should be maximized to the extent feasible, based on the space constrictions of the site, to allow wetland migration with sea level rise. This will provide the natural landscape with opportunity for adaptation. This includes connecting the wetland and upland habitats with low-gradient slopes (e.g., 10:1) and planting Facultative Wetland (as defined by the U.S. Army Corps of Engineers) plant species with broader moisture tolerance. Shallow slopes protect shoreline from erosion and wave energy and allow transition species to thrive at their natural elevations above sea level. Example species are noted in the plant list. Vegetation and transition zones should be determined using elevation and hydrologic regime. Overlap planting of wetland and upland vegetation zones and plant species based on the existing site conditions.

iv. Provide Wildlife Corridors

The Blue Greenway, generally located along the San Francisco shoreline, is a critical corridor for wildlife movement and migration. Development along the Blue Greenway should consider incorporating vegetation that provides habitats for species to use for cover, forage, nesting, and promoting pollinators. The San Francisco Green Connections Design Toolkit,[18] as well as this guide, should be used to develop plans that improve connectivity for wildlife throughout the city.

v. Include Structural Habitat

Incorporate structural habitat elements into the project design to attract wildlife, including nest boxes, bird blinds, green walls, and roof gardens and parks. In addition, incorporate elements that detract certain wildlife from areas focused on human use, such as geese deterrents. In attracting wildlife to more urban areas, ensure that structures are designed using the San Francisco Planning Department Standards for Bird Safe Buildings to minimize the risk of bird strikes.[19]

[17] Refer to the LSA Yosemite Slough Watershed Wildlife Survey 2003-2004

[18] http://www.sf-planning.org/ftp/files/Citywide/green_connections/Green-Connections-Final-Report_CH5-Design-Toolkit.pdf

[19] San Francisco Planning Department Standards for Bird Safe Buildings: http://sf-planning.org

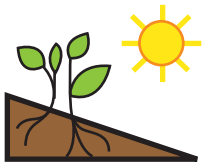
A3 Site Preparation and Planting

Revegetation Guidelines: General

There are many steps involved in planting a site; however, the following guidelines assist in ensuring success, thereby reducing plant failure and additional planting costs.

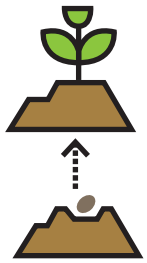
i. Plant Natives

Prioritize planting native species over non-native ornamental vegetation. Native plants are adapted to the local environmental conditions and require fewer resources to establish and maintain. Native vegetation also provides habitat for native wildlife species and serve to connect habitat along the Blue Greenway. Select native plants carefully, considering soil texture, slope aspect, hydrology and light preferences. Do not plant non-native ornamental species listed in Cal-IPC database.[20] Use the Plant List provided in this guide and reference the San Francisco Plant Finder tool.[21]



ii. Plant Species with Multiple Functions

As detailed in the Planting List, plant species can serve numerous functions, such as providing wildlife habitat, remediation and bio-filtration, protection of water and air quality, drought resistance, erosion control, and aesthetic appeal. Species that serve several of these functions should be planted so that the plant communities can benefit humans and wildlife, water, and soil quality simultaneously.



iii. Plant from Seed or Clean Nursery Stock to Prevent Introduction of Pathogens

Plant pathogen (e.g., *Phytophthora* spp.) are becoming widespread in nurseries and can weaken or kill plants and spread to existing native vegetation. If contaminated nursery stock is out-planted, then revegetation efforts may fail and native habitat may become contaminated. Ways to limit the risk of introducing plant pathogens to revegetation sites include: planting from locally collected seed and divisions rather than container stock, inspecting nurseries to ensure that they are following Best Management Practices for reducing the spread of pathogens, testing container stock for pathogens prior to outplanting, and decontaminating boots, vehicles, and tools during site preparation, site implementation, and site maintenance. These practices also aid in reducing the spread of invasive weeds.[22]

iv. Increase Vegetation Cover and Habitat Features

Increasing the vegetative cover and providing other cover features, such as rock piles and brush piles, will improve habitat value and encourage wildlife use. For example, rock piles may provide habitat for burrowing owls, which historically have occupied the Blue Greenway. Cover features provide refuge for mitigating species and helps species, such as the endangered salt marsh harvest mouse, escape predation. Providing additional cover on the undeveloped parcels will be particularly important if debris and trash are removed, as this material currently provides cover for wildlife.[23]

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[20] California Invasive Plant Council - Invasive Species Database: http://www.cal-ipc.org National Wildlife Federation, Washington, DC
[21] San Francisco Plant Finder Tool: www.sfplantfinder.org
[22] www.calphytos.org
[23] Refer to the LSA Yosemite Slough Watershed Wildlife Survey 2003-2004

A3 **Site Preparation and Planting**

Revegetation Guidelines: General

v. Source Locally

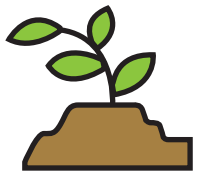
Plants sourced from local populations and grown in local nurseries will be better adapted to the soil and climate of the Blue Greenway. Identify nursery stock, divisions, and/or native seed that are sourced from naturally occurring local populations. When possible, seed for nursery stock should be collected from San Francisco or San Mateo counties. Often, seed can be collected and plants can be salvaged from sites before the start of construction. It is important to plan far in advance to contract local nurseries to grow desired species and coordinate grow specifications. Local nurseries include, but are not limited to Bay Natives Nursery, Candlestick Point Native Plant Nursery at Yosemite Slough, Sutro Stewards Native Plant Nursery, and Yerba Buena Nursery.

vi. Control Weeds Early and Throughout Establishment

If planting in soil that contains large amounts of weed seeds, consider irrigating the sites for up to three weeks to germinate the existing seedbank, and then till or hand pull weed seedlings. Target species that have a high or moderate Cal IPC Rating.[24] Repeat at least twice before planting native species. In addition, plan for weekly or bi-weekly weed removal during the plant establishment phase, which is typically the first year after planting. Many invasive and native seeds can survive in the soil for multiple years; these methods exhaust the seed bank so that invasive seeds do not naturally recruit as the native plants establish, and avoid the use of pre-emergence herbicides.

vii. Provide Supplemental Irrigation As Appropriate for All Plantings

Although many Bay Area species are drought tolerant once established, supplemental irrigation during the first two to three years after planting can greatly increase their survival rate and save the cost of new plants acquisition, re-planting, and other associated expenses. Irrigate with non-potable water. Irrigation frequency and duration should be based on the plant community. Adjust irrigation based on soil infiltration rate, temperature and precipitation, and reduce irrigation gradually. Wetland and riparian plants especially benefit from overhead irrigation because many of them are rhizomatous; aerial irrigation allows them to expand laterally and form a dense network of roots. It is critical that a strong root network develop in contact with the ground water table to increase the chance of long-term survival. Upland species are better suited for drip irrigation because many of them are susceptible to fungal diseases, which are exacerbated during the warm season with overhead irrigation.



viii. Prepare Soil

Before implementing any revegetation project, the site should be prepared properly to ensure restoration success. Soils should be analyzed for texture, salinity, nutrient content, and contamination before selecting the planting palette and the need for soil amendments. Much of the Blue Greenway is on fill material, which may have become affected by or contaminated from heavy industrial use. Soils may need to be remediated, replaced, capped, decompacted, or amended to establish plantings. Depending on habitat, the top 12 inches of soil should be decompacted. Native soils with native vegetation should not be disturbed.

[24] Refer to the LSA Yosemite Slough Watershed Wildlife Survey 2003-2004


San Francisco Blue Greenway: Land Cover Types
Blue Greenway Alignment
Blue Greenway 200-Ft Buffer
Existing Park/Green Space
Land Cover Type
Developed
Shoreline
Urban Park
Source: San Francisco Parks Aliance, 2015; ESRI Imagery, 2016
0
0.25
0.5
Miles
AECOM
Map Location
0
5
Mi
Richmond
El Cerrito
Mill Valley
Albany
Berkeley
Oakland
Alameda
San Francisco
Daly City
Colma
South San Francisco
San Bruno
Pacifica
Millbrae
Pacific Ocean
San Francisco Bay
Pier 94 Wetlands
Bay Front Park
Agua Vista Park
Warm Water Cove Park
Bayview Gateway
Islais Creek Park
China Basin Park
The Embarcadero
Mission Bay Commons Park
Tulare Park
Mission Creek Park (Mission Creek Salt Marsh)
3Rd St
16Th St
Mariposa St
18Th St
Cesar Chavez
Harrison St
1St St
2Nd St
Townsend St
4Th St
Evans

Map of vegetation types along the Blue Greenway
Map by AECOM

B Revegetation Guidelines: Shoreline

B1 Restoration Objective: Stabilize Shoreline

Representation of riprap to stabilize shoreline
Photo by AECOM

Whenever possible, establishing natural vegetation communities along the Blue Greenway is the preferred approach for controlling erosion and protecting shorelines. Although installing riprap may be an effective method for dealing with shoreline erosion, steep shoreline slopes, and wave energy, riprap does not provide high-quality habitat for wildlife, water quality benefits, or the aesthetic appeal of vegetation. In addition, riprap may not be appropriate to install in areas that have contaminated soils.

Vegetated shorelines may require a wider vegetation bench and shallower slope, compared to riprap, to dissipate wave energy and support the viability and resilience of the plant community. Therefore, for shorelines that already are steeply sloped, grading and/or filling may be required to achieve a more gradual slope. Where establishment of a wider bench is not possible because of existing constraints, a combination of vegetative stabilization techniques and riprap, or planting within riprap is preferable to installing or maintaining existing bare riprap.[25]

[25] For further guidance on this topic, refer to the BCDC report, *Protecting Shoreline Property from Tidal Erosion: An Analysis of the Effectiveness and Environmental Impacts of Administratively Authorized Protective Structures.*

Revegetation Guidelines: Shoreline

B2 Restoration Objective: Improve Habitat and Habitat Connectivity

The shoreline of the San Francisco Bay has been heavily developed, and native vegetation communities that once were prevalent along the southeastern shoreline of the San Francisco peninsula now are rare and fragmented. Therefore, many species that once occupied these habitats—including Ridgway's rail, California black rail, California least tern, salt marsh harvest mouse, green sturgeon, and protected salmonids—have become locally rare or extirpated.

Restoration of natural habitats, focusing on tidal marsh, beaches, and dunes along the shoreline, has the potential to dramatically increase the quality of habitat for threatened, endangered, and common species.


01


02


03


04

01 Ridgway's rail
Photo by Michael Pazzani via Flickr
02 Green sturgeon
Photo by A.T. Vorob'ov of Russian Federal Research Institute of Fishery and Oceanography (VNIRO)
03 California least tern
Photo by U.S Fish and Wildlife Service (USFWS) Pacific Southwest Region
04 Salt marsh harvest mouse
Photo by U.S Fish and Wildlife Service (USFWS)

Revegetation Guidelines: Shoreline

B2 Restoration Objective: Improve Habitat and Habitat Connectivity

The **restoration** of tidal marsh habitat is arguably the most **valuable** and **effective** method for improving wildlife habitat along the Blue Greenway

Tidal Marsh
Photo by AECOM

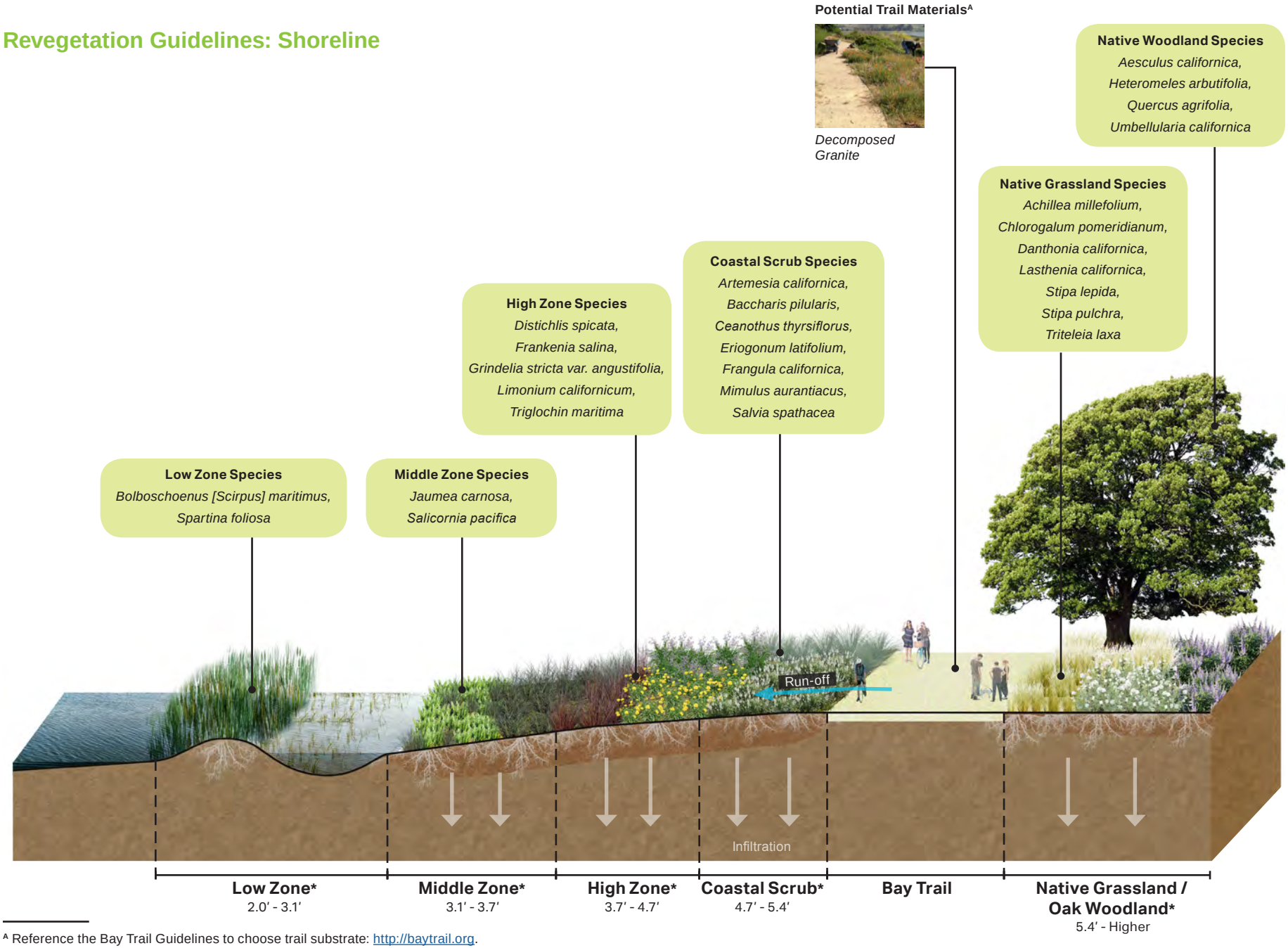
a. Tidal Marsh Restoration

i. The majority of threatened and endangered species that inhabit the San Francisco shoreline rely on tidal marsh vegetation. For example, salt marsh harvest mouse uses pickleweed as its primary source of forage and cover, and Ridgway's rail generally nests in tall stands of cordgrass. Only small patches of tidal marsh vegetation exist along the Blue Greenway, most of which are from mitigation or restoration projects (e.g. Heron's Head Park), which currently do not, or only marginally support these special-status species.

ii. The transition zone between upland areas and tidal marshlands should be graded and planted appropriately:

- The slope that transitions tidal marsh areas to upland areas should be as shallow as spatial restrictions allow, to protect the tidal marsh from erosion and wave energy, and to allow transition species to thrive at their natural elevations above Mean Sea Level.
- Shallow slopes are recommended for tidal marsh resilience. As sea levels rise, if transition slopes are too steep, then certain communities within the tidal marsh may disappear entirely. With a shallower slope, tidal marsh vegetation can move up the transition zone as the sea level rises.
- Species planting in tidal marsh will be a spectrum along minute changes in elevation:
  - between mean higher high tide and extreme high tides—transition zone tidal marsh plants, such a saltgrass
  - between mean high tide and mean higher high tide—pickleweed
  - between mean sea level and mean high tide—cordgrass
- When possible, plant species to target the recovery of threatened and endangered wildlife. For example, Ridgway's rail requires large stands of cordgrass for nesting, and salt marsh harvest mouse requires large areas of pickleweed with access to vegetated upland areas for refuge during high tide.
- Separate tidal marsh areas from tree groves, and avoid planting trees adjacent to tidal marsh habitat. Trees, although desirable for shade, aesthetics, and bird habitat, also provide perches for predatory birds (raptors) of native tidal marsh species, such as salt marsh harvest mouse.

Revegetation Guidelines: Shoreline



[A] Reference the Bay Trail Guidelines to choose trail substrate: http://baytrail.org.

* All zone elevations are in NAVD88

B2 Restoration Objective: Improve Habitat and Habitat Connectivity

A greater **quantity** of connected habitat will result in higher **quality** habitat

b. Enhance Habitat Connectivity

i. Tidal marsh and beach/dune habitat should be connected to transitional and upland habitats as much as possible, or should be planned for connectivity with habitat in future development or restoration projects. Proper project siting can ensure connectivity is included during design and planning phases.

ii. For locations where no vegetative bench is possible because of severe spatial constraints, planting native species within riprap can provide a narrow corridor of habitat connectivity for wildlife to use as cover while migrating or dispersing along the shoreline to larger patches of suitable habitat.

iii. Whenever possible, avoid leaving in place or designing shoreline with no vegetative cover. A complete lack of vegetation cover along sections of shoreline prevents certain species, such as salt marsh harvest mouse, from dispersing between larger patches of habitat, and can result in reduced genetic diversity and local extirpation of threatened and endangered species.

c. Design Shoreline Habitat to Minimize Impacts from Pedestrians and Bikers

Establish protective barriers, preferably of native vegetation, that exclude pedestrians and bikers from habitat intended for wildlife recovery, especially with regard to tidal marsh and beach/dune habitat. Special-status species generally are averse to human presence and noise, and many types of shoreline vegetation are sensitive to human traffic. The installation of appropriate upland plant communities, such as dense coastal scrub, can act as physical, visual, and auditory buffers between areas planned for recreation and areas planned for habitat restoration.[26]

B3 Restoration Objective: Improve Public Access Experience

Along the Blue Greenway, design the Bay Trail to occur as far inland as possible, to allow a wide shoreline margin for habitat. Replacing developed, undeveloped, or riprapped shoreline with tidal marsh or coastal beaches/dunes will increase the visual aesthetic for recreational visitors using the Bay Trail. Provide designated water access for pedestrians and bikers. For additional guidance to improve recreation and public access experience, please reference the BCDC Bay Plan Recreation Policy.[27]

B4 Restoration Objective: Protect Water Quality

The establishment of tidal marsh or coastal beach/dune vegetation through planting will result in a higher quality filtration system that decreases the amount of pollutants that enter the Bay via surface waters. Where trails and roadways occur near the shoreline, use porous surfaces where feasible to reduce runoff of contaminants.

Coastal Beach and Dune
Photo by AECOM

[26] For further guidance on this topic, refer to the BCDC report, *Public Access and Wildlife Compatibility.*
[27] BCDC Bay Plan Recreation Policy: http://www.bcdc.ca.gov.

C Revegetation Guidelines: Urban Parks

C1 Restoration Objective: Improve Habitat and Habitat Connectivity

Wildlife habitat and native vegetation should be incorporated within and along the boundaries of urban parks, whenever feasible.

a. Habitat

Guide pedestrians and bikers along planned routes using vegetation. Ensure that access points to the shoreline and viewing locations are available to the public, so that unplanned foot traffic does not result in trampled vegetation and degraded habitat.

b. Seedlings

During initial restoration activities of native vegetation, fence vegetation communities until they are well established and dense enough to detract foot traffic.

C2 Restoration Objective: Improve Public Access Experience and Foster Community and Stewardship

Photo by Chris Doig via Wikipedia

a. Provide Multifunctional Recreation

Urban parks should provide multifunctional recreation opportunities following the guiding principles in the Recreation and Open Space element of the City of San Francisco's General Plan. Include community gardens, aroma gardens, and habitat gardens within park spaces to provide valuable wildlife forage and nectar sources as well as recreation.

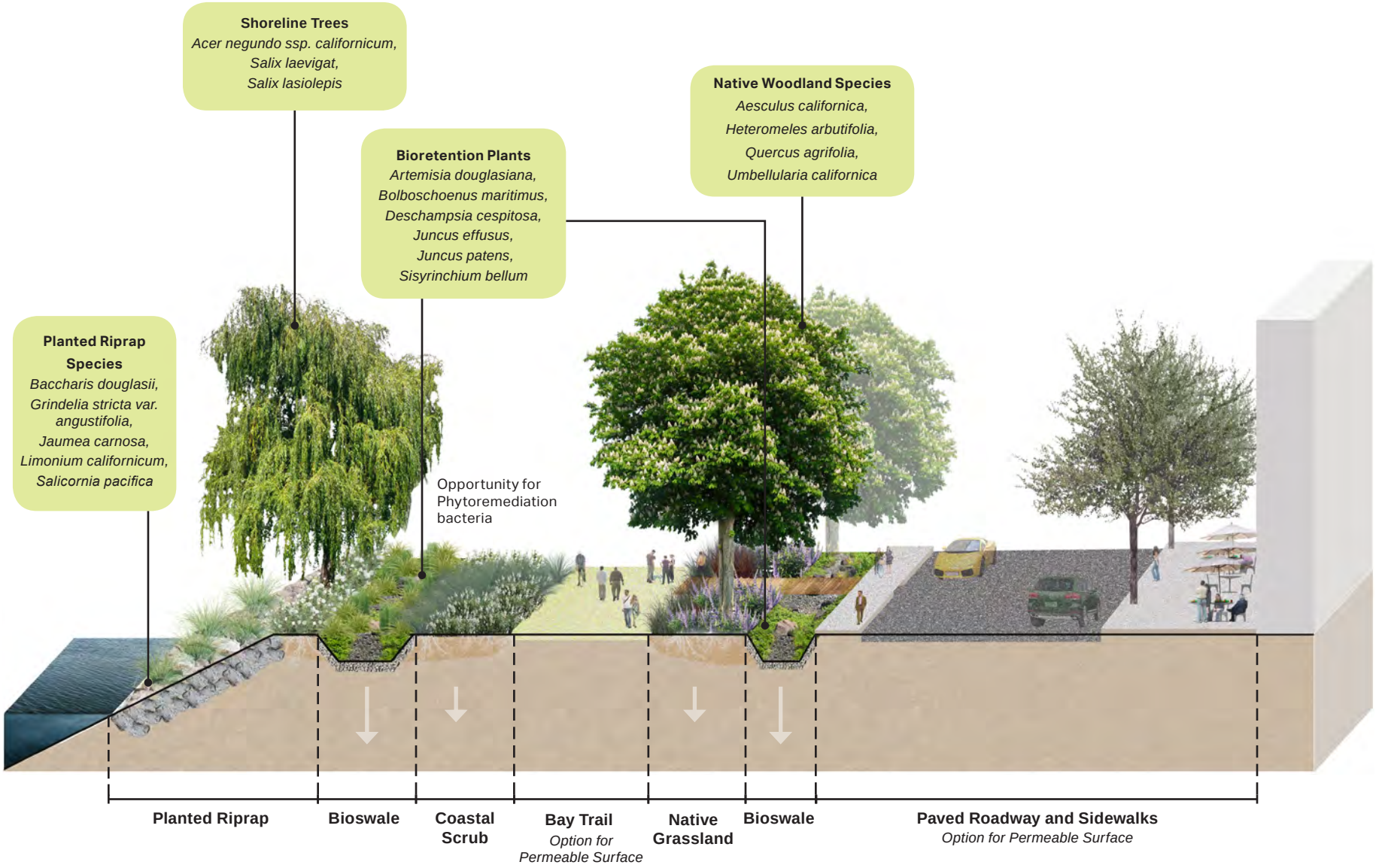
Construct bike and jogging paths with porous surfaces or using boardwalks to limit runoff and compaction. Surround picnic facilities and sporting fields with native trees and landscaping. Use native vegetation to direct and confine pedestrian traffic to established walkways and kayak launches.

b. Enhance Aesthetics

When choosing plants for urban parks consider the view and whether bay views or screenings are desired.

Plant dense, low-growing (less than 4 foot in height) coastal scrub vegetation to preserve bay views and benefit wildlife by discouraging informal trails to the shoreline. Consult with nurseries for recommendations on variants of native species (e.g., coyote brush, ceanothus, manzanita) that grow prostrate (outward along the ground) rather than erect (upward). In areas adjacent to prime wildlife habitat, plant tall, dense vegetation to serve as a visual screen and reduce the impact of recreational users on nesting and foraging wildlife species. Screening vegetation can also be used to block the built environment and improve the user experience.

Revegetation Guidelines: Urban Parks



Revegetation Guidelines: Urban Parks

C3 Restoration Objective: Protect Water Quality and Water Conservation

***Festuca* and *Heuchera* - An example of a drought-resistant landscaping plants.**
Photo by Jean Jones via Flickr

a. Replace Lawns

Although popular for recreational purposes, sod generally requires large quantities of water and fertilizer. Avoid installation of sod in any areas not specifically designed for heavily trafficked recreational purposes, such as sporting greens. Where grass is desired, but foot traffic is minimal to moderate, install sod of native turf grasses, such as seashore bentgrass (*Agrostis pallens*) and native fescues (*Festuca rubra*, *F. occidentalis*, and *F. idahoensis*) and keep mowed height to two inches or higher. These native species are more drought-tolerant than non-native sod, and certain species mixes do not require mowing.

b. Use Drought-Resistant Landscapes

Where other landscaping is provided, plant drought-resistant native vegetation, such as manzanita, sage brush, coyote brush, buckwheat, and toyon, to reduce water requirements.

D Revegetation Guidelines: Developed Areas

D1 Restoration Objective: Improve Habitat and Habitat Connectivity

Developed areas include residential, office, and industrial (warehouses and shipyards) land uses. These areas are made up of hardscape and buildings, with interspersed landscaping, ruderal patches, lawns, and occasional trees.

24th Street, facing west from Warm Water Cove
Photo by AECOM

a. Habitat Restoration

Certain developed portions of the Blue Greenway provide limited opportunities for establishing species habitat, such as along 3rd Street, which is offset from the shoreline and heavily urbanized/paved. Tree planting in these areas, where feasible, can provide habitat for birds and insects. Other portions of heavily developed areas, such as the illegal dumping areas at Yosemite Slough that San Francisco is working to clean up, or paved areas along the shoreline that currently are underutilized, should be targeted for habitat restoration. The shorelines along heavily industrialized areas (i.e., warehouses and pier bulkheads) may be particularly valuable for habitat restoration, because these areas are generally isolated from most human presence and noise.

Restoration and maintenance (often overlooked in areas beyond public view) of these shoreline would provide crucial connectivity for wildlife between larger disconnected habitat.

b. Infrastructure Considerations

Although developed areas are used by some native wildlife, such as gulls, the diversity of species in these areas typically is low compared to other areas (e.g., parks, restored lands). Conversion of undeveloped parcels to parking or other infrastructure would further reduce the amount of habitat available for land birds as well as small mammals, reptiles, amphibians, and butterflies.[28] Where parking or other infrastructure is required, consider multi-story structures that occupy less space, porous pavement, vegetated shade structures, incorporation of trees and landscaping, and dispersed parklets (landscaping occupying one or two parking spots) to improve habitat value. These types of structures can incorporate living habitat elements such as rooftop gardens, living walls, and other incorporated green spaces.

c. Plant Selection

Select plants based on their ability to withstand the harsh environmental conditions common in developed areas. These plants should be tolerant of air and water pollution, drought, and vandalism.

[28] Refer to the LSA Yosemite Slough Watershed Wildlife Survey 2003-2004

Revegetation Guidelines: Developed Areas

D2 Restoration Objective: Improve Public Access Experience, and Foster Community and Stewardship

Photo by Association of Bay Area Governments

Photo by AECOM

a. Recreational Access and Space

Provide as much space as possible for the Bay Trail along developed sections of the Blue Greenway, by removing parking spaces and limiting roadways and other hardscape to the minimum amount feasible. Incorporate permeable building materials instead of traditional asphalt. Plant trees along the Bay Trail to provide shade and wind buffers along the Blue Greenway for pedestrians and bikers.

b. Aesthetics

When possible, plant vegetation along roads, sidewalks, parking, and other hardscape along the Blue Greenway to improve the public experience. Replace or cover hardscape with trees, planting beds, or large planter boxes. Install signs, maintain habitat, and enforce regulations to discourage illegal dumping.

The Blue Greenway should provide pedestrians and bikers with a more natural/greener experience than surrounding roads. Where the Blue Greenway is adjacent to the shoreline, plant trees with open understories to allow unobstructed views to the Bay.

D3 Restoration Objective: Remediate Contaminated Lands

Photo by AECOM

Photo by Milwaukee Metropolitan Sewerage District

a. Remediate Existing Soil Contamination

Prior to development or restoration, soils should be tested to determine both nutrient content and the presence of any soil contamination. In areas containing petroleum hydrocarbon contamination, developers should consider soil removal and off site disposal. Depending on the extent of contamination, capping and demarcation of remaining contaminated soil may also be an option. These methods also apply to soils with metals and other types of contamination. In some cases, vegetation (often in association with soil microbes) can uptake toxins from the soil [Refer to Plant List]. The remediation method will depend on the anticipated use of the site and the ability of the selected remedial approach to be protective of human health and the environment.

b. Reduce Stormwater Runoff Contamination

Where possible, install bioswales as runoff catchments adjacent to developed areas. Plant bioswales with native vegetation such as purple needlegrass (*Stipa pulchra*), red fescue (*Festuca rubra*), California barley (*Hordeum californicum*) and meadow barley (*Hordeum brachyantherum*). A diverse seed mix with a range of moisture tolerances will be more adaptable to site specific conditions.

Photo by AECOM

PART IV

RESOURCES

A PLANTING LIST

B GUIDE PREPARERS

C ADDITIONAL RESOURCES

A Planting List

This planting list was adapted from the BCDC's *Shoreline Plants A Landscape Guide for the San Francisco Bay*, available at http://www.bcdc.ca.gov/planning/SPLG.pdf. San Francisco native and drought-tolerant plants are preferred. Visit SF Plant Finder for a San Francisco-based plant list toolkit, available at http://www.sfplantfinder.org/

				Habitat							Function								Plant Tolerances								
Plant Common Name	Plant Scientific Name	Plant Type (Tree, shrub, vine, forb, grass, fern, groundcover)	Native Status (San Francisco [SF], Bay Area [BA], California [CA])	Tidal Marsh	Freshwater Wetland	Riparian	Coastal Dune	Coastal Scrub	Woodland	Grassland	Wildlife Forage	Wildlife Nesting/Cover	Remediation/Biofiltration	Wetland/Upland Transition	Erosion Control	Aesthetic (Showy)	Groundcover	Visual Screening	Salinity	Drought	Shade	Full Sun	Deer	Chemical Contamination	Poor Soil	Comments
Bigleaf maple	*Acer macrophyllum*	tree	BA			X						X			X	X		X			X	X				Fast-growing deciduous tree 20-100' tall; sun to part shade; occasional water; excellent shade tree; good wildlife shelter
California box elder	*Acer negundo* ssp. *californicum*	tree	SF			X						X		X	X	X		X			X	X			X	Good in tough soil, fast growing
Yarrow	*Achillea millefolium*	forb	SF				X	X	X	X					X	X	X			X		X	X			Attracts bees/butterflies
Deerweed	*Acmispon glaber*	shrub	SF				X	X			X									X		X			X	
California Buckeye	*Aesculus californica*	tree	SF			X			X		X	X			X	X						X	X			Attracts butterflies, good in multiple conditions
California Dandelion	*Agoseris grandiflora*	forb	SF						X	X			X													Low water requirement
Hall's bent grass	*Agrostis hallii*	graminoid	SF							X			X									X			X	
Diego bent grass	*Agrostis pallens*	graminoid	SF							X			X									X			X	
Red alder	*Alnus rubra*	tree	SF		X	X						X	X					X			X	X			X	Deciduous tree grows 40-50' tall by 20-30' wide, tolerates brackish marsh
Coast fiddleneck	*Amsinckia spectabilis*	forb	SF				X	X												X		X				Prefers sandy soil. Easy to grow from seed. Attracts painted lady butterfly.
Pearly everlasting	*Anaphalis margaritacea*	forb	SF				X	X	X											X		X				Perennial forb with soft grey-green foliage and inconspicuous white flowers, attracts butterflies, easy to grow
Vine Hill manzanita	*Arctostaphylos densiflora*	shrub	CA				X	X			X	X			X	X		X		X			X		X	Needs well drained soil, drought tolerant, attracts butterflies
Little sur manzanita	*Arctostaphylos edmundsii*	shrub	CA				X	X			X				X	X	X			X	X	X	X		X	Likes shade, attracts butterflies, needs well drained soil
Hooker's manzanita	*Arctostaphylos hookeri*	shrub	CA					X			X	X			X	X		X		X		X	X		X	Attracts butterflies, drought and sandy soil tolerant
Glossyleaf manzanita	*Arctostaphylos nummularia*	shrub	CA					X	X		X				X	X				X						Attracts butterflies, needs shade and good drainage
Sandmat manzanita	*Arctostaphylos pumila*	shrub	CA				X	X			X				X	X	X		X	X		X	X		X	Good cover in sandy soil near coast
Bearberry manzanita	*Arctostaphylos uva-ursi*	shrub	CA				X	X	X		X				X	X	X		X							Attracts butterflies, forms dense mats
Dutchman's pipevine	*Aristolochia californica*	vine	SF					X	X		X					X	X			X	X	X				Attracts butterflies (pipevine swallowtail), unusual showy flowers, will grow well on shrubs/small trees
Coast sagebrush	*Artemisia californica*	shrub	SF					X				X						X		X		X			X	Good filler, wind/drought tolerant, smells good
Mugwort	*Artemisia douglasiana*	forb	SF		X	X	X	X	X	X		X	X	X	X				X		X	X				Adaptable to wide ranges of moisture regimes, fills gaps between larger plants
Dune sagewort	*Artemisia pycnocephala*	shrub	SF				X								X	X				X		X				Restricted to coastal sand dunes
California saltbrush	*Extriplex californica*	shrub	SF	X			X								X					X					X	Regionally extinct, tolerates drought/heat/wind/alkaline/saline/clayey soil
Quail bush	*Atriplex lentiformis*	shrub	CA	X										X		X				X					X	Tolerates drought/heat/wind/alkaline/saline/clay soils, good habitat plant
Marsh baccharis	*Baccharis douglasii*	shrub	SF	X	X	X						X		X					X	X						Grows in high zone of salt marsh, thrives easily, provides wildlife shelter
Dwarf coyote brush	*Baccharis pilularis* ssp. *consanguinea*	shrub	SF					X				X			X		X		X	X		X	X	X	X	Erect shrub form. 6'tall, tolerates salt spray/alkaline/poor soils, thrives easily, provides wildlife shelter
Coyote Brush	*Baccharis pilularis* ssp. *pilularis*	shrub	SF					X	X			X						X		X		X	X	X	X	Prostrate shrub form. Low water use, high drought/ $CaCO_3$ tolerance, likes sandy soils and seems to be deer proof
California holly grape	*Berberis pinnata*	shrub	SF					X			X					X				X	X					Yellow flowers to blue berries, drought tolerant, attracts birds, full sun
Alkali bulrush	*Bolboschoenus maritimus*	graminoid	SF	X	X								X		X				X			X		X		Extremely salt tolerant, grows in salt/brackish marshes
Saltmarsh bulrush	*Bolboschoenus robustus*	graminoid	SF							X			X						X			X		X		Grass like leaves, grows easily, and flowers in summer

Planting List

				Habitat								Function								Plant Tolerances								
Plant Common Name	Plant Scientific Name	Plant Type (Tree, shrub, vine, forb, grass, fern, groundcover)	Native Status (San Francisco [SF], Bay Area [BA], California [CA])	Tidal Marsh	Freshwater Wetland	Riparian	Coastal Dune	Coastal Scrub	Woodland	Grassland	Wildlife Forage	Wildlife Nesting/Cover	Remediation/Biofiltration	Wetland/Upland Transition	Erosion Control	Aesthetic (Showy)	Groundcover	Visual Screening	Salinity	Drought	Shade	Full Sun	Deer	Chemical Contamination	Poor Soil	Comments
Harvest brodiaea	*Brodiaea elegans* ssp. *elegans*	forb	SF					X	X	X						X		X				X				Usually occurs in non-wetlands, but sometimes occurs in wetlands, purple-blue flowers
Dwarf brodiaea	*Brodiaea terrestris* ssp. *terrestris*	forb	SF					X	X	X						X		X				X				Purple-pink flowers, affinity for serpentine soils. No summer irrigation.
California brome grass	*Bromus carinatus* ssp. *carinatus*	graminoid	SF					X		X	X		X		X				X			X				Hard to get native seed,
Spice bush	*Calycanthus occidentalis*	shrub	CA		X				X			X				X		X			X					Moist, shady places; often found in streamsides and canyons in the wild
Red maids	*Calandrinia menziesii*	forb	SF					X	X	X						X	X									Occasionally found in wetlands, pink flowers
Yellow mariposa lily	*Calochortus luteus*	forb	SF					X	X	X						X						X			X	Very low water requirement, summer dormant, yellow flowers, tolerates a variety of soils. Does not tolerate summer irrigation.
Coast morning glory	*Calystegia purpurata*	vine	SF					X	X						X	X	X					X				Attractive vine; will grow both on ground and on adjacent shrubs
Stemless morning glory	*Calystegia subacaulis*	forb	SF						X	X						X	X					X				Vine, purple flowers
Dense sedge	*Carex densa*	graminoid	SF		X	X																				Seasonally wet meadows
Slough sedge	*Carex obnupta*	graminoid	SF		X	X															X					Moist areas; sometimes grows in shade
Meadow sedge	*Carex praegracilis*	graminoid	SF							X					X							X				Tolerates foot traffic, likes moisture
Dwarf sedge	*Carex tumulicola*	graminoid	SF							X					X						X					Wide clumping grass, likes upland locations
Bush anemone	*Carpenteria californica*	shrub	CA					X	X			X				X		X			X	X				Shrub 6' tall by 4' wide, likes sun and good drainage
Indian paintbrush	*Castilleja foliolosa*	forb	BA					X							X	X						X			X	Can be hard to grow, hemiparastic, orange flowers
Franciscan paintbrush	*Castilleja subinclusa* ssp. *franciscana*	forb	SF					X	X	X	X				X	X						X				Hemiparasitic; favors hosts from composite family such as artemisia, sagebrush, coyotebush, pearly everlasting
Point Reyes ceanothus	*Ceanothus gloriosus* var. *exaltatus or gloriosus*	shrub	BA				X					X			X	X	X					X	X			Attracts butterflies, hummingbirds and bees, tolerates wind, needs well drained soil. Both varieties are native to coastal Marin County are watch list rare plants.
Maritime ceanothus	*Ceanothus maritimus*	shrub	CA					X				X			X	X						X	X			White-lavender flowers, attracts butterflies, hummingbirds, and bees, needs well drained soil. CNPS Rare Plant (CRPR 1B)
Carmel ceanothus	*Ceanothus thyrsiflorus* var. *griseus*	shrub	CA					X								X	X					X				Attracts butterflies, hummingbirds and bees, tolerates wind, needs well drained soil, grows fast. The cultivar "Yankee Point" (*Ceanothus griseus* var. *horizontalis* - invalid name) is from Carmel; do not use, as it could hybridize with SF-native plants. This plant can take over; plant accordingly.
Blue blossom	*Ceanothus thyrsiflorus* var. *thyrsiflorus*	shrub	SF					X				X			X	X		X		X	X	X			X	Blue flower spikes, attracts butterflies, hummingbirds, and bees, very hardy, needs well drained soil. This plant can take over; plant accordingly.
Redbud	*Cercis occidentalis*	tree	BA						X							X		X				X	X		X	10-20' tall, magenta flowers, needs good drainage, little water, can grow as espalier
Birch-leaf mountain-mahogany	*Cercocarpus betuloides* var. *betuloides*	tree	BA					X	X			X				X		X		X		X			X	Attractive small tree with showy fruits
Soap root	*Chlorogalum pomeridianum*	forb	SF					X	X	X	X										X	X			X	White flowers
Indian thistle	*Cirsium brevistylum*	annual forb	SF					X	X	X	X	X				X					X	X				Attractive pink flowers; attracts bees, butterflies, insects
Farewell-to-spring	*Clarkia rubicunda*	forb	SF				X	X	X	X						X						X			X	Likes sandy soil, pink flowers
Yerba buena	*Clinopodium douglasii*	forb	SF					X	X		X						X				X					Low growing mint, may be used as lawn substitute
Creek dogwood	*Cornus sericea*	shrub	SF		X	X						X		X		X		X								Deciduous shrub, 4-6' tall, for riparian and wetland edges
Western hazelnut	*Corylus cornuta* var. *californica*	tree	SF						X							X					X	X				Mixed evergreen forest, 5-12' tall, bright yellow color, needs shade
Tall flatsedge	*Cyperus eragrostis*	graminoid	SF		X	X								X					X			X	X	X	X	Spreads rapidly, flowers are yellow, needs sun, lots of water, tolerates variety of soils

Planting List

				Habitat							Function								Plant Tolerances							
Plant Common Name	**Plant Scientific Name**	**Plant Type (Tree, shrub, vine, forb, grass, fern, groundcover)**	**Native Status (San Francisco [SF], Bay Area [BA], California [CA])**	**Tidal Marsh**	**Freshwater Wetland**	**Riparian**	**Coastal Dune**	**Coastal Scrub**	**Woodland**	**Grassland**	**Wildlife Forage**	**Wildlife Nesting/Cover**	**Remediation/Biofiltration**	**Wetland/Upland Transition**	**Erosion Control**	**Aesthetic (Showy)**	**Groundcover**	**Visual Screening**	**Salinity**	**Drought**	**Shade**	**Full Sun**	**Deer**	**Chemical Contamination**	**Poor Soil**	**Comments**
California oatgrass	*Danthonia californica*	graminoid	SF		X				X	X	X	X	X	X	X							X	X		X	Can withstand heavy foot traffic and grazing, grows in variety of soil types
Coast tarweed	*Deinandra corymbosa*	forb	SF					X		X												X	X			Grows well in eastern part of SF
Pacific hairgrass	*Deschampsia cespitosa* ssp. *holciformis*	graminoid	SF							X	X		X						X		X	X				Tolerates light foot traffic/salinity, provides forage
Slender hairgrass	*Deschampsia elongata*	graminoid	SF		X	X				X	X															Provides good forage
Blue dicks	*Dichelostemma capitatum*	forb	SF					X	X	X						X			X	X		X	X	X	X	Blue violet flowers, needs good drainage, full sun/no water, tolerant of many conditions. Does not tolerate summer irrigation
Salt grass	*Distichlis spicata*	graminoid	SF	X	X								X		X		X		X			X	X	X		Forms dense mats, brackish marshes, high zone of salt marshes
Bluff lettuce	*Dudleya farinosa*	forb	SF					X								X			X			X			X	Fleshy-succulent like leaves, full sun, good on coast, needs well drained soil
Giant wildrye	*Elymus condensatus*	graminoid	SF				X	X							X					X		X				Spreads quickly thru underground runners, sun and little water
Blue wildrye	*Elymus glaucus*	graminoid	SF						X	X					X						X				X	Likes part shade/little water, can be invasive, good for slope stabilization
Slender wheatgrass	*Elymus trachycaulus*	graminoid	BA							X					X							X			X	Bunchgrass grow 3', good for erosion control
Creeping wildrye	*Elymus triticoides*	graminoid	SF						X	X				X	X					X		X				Spreads rapidly, competitive with non-native soils
California fuchsia	*Epilobium canum* ssp. *canum*	forb	BA					X	X		X					X	X			X		X	X		X	Scarlet flowers, full sun, little to no water, attracts hummingbirds, butterflies, and bees
Watson's willowherb	*Epilobium ciliatum* ssp. *watsonii*	forb	SF	X	X	X							X									X			X	Tolerates variety of conditions/soil types, but prefers a wet habitat
Seaside daisy	*Erigeron glaucus*	forb	SF				X	X								X	X			X		X				Blue green leaves/lavender flowers, full sun, little water, good drainage, attracts butterflies
Yerba santa	*Eriodictyon californicum*	shrub	SF					X	X	X	X	X								X		X				Attracts bees, birds, small mammals, and black-tailed deer, drought tolerant, fire following species
Santa Cruz island buckwheat	*Eriogonum arborescens*	shrub	CA					X								X		X	X	X		X				1-6' tall, full sun, good drainage, little water, tolerates wind/heat/drought/ salt spray, attracts butterflies and bees, used in mass for erosion control
Saint Catherine's lace	*Eriogonum giganteum*	shrub	CA					X								X		X	X	X		X				Mass of flowers, full sun, good drainage, little water, tolerates heat/ wind/drought/salt spray, attracts butterflies and bees, good as informal screen
Red-flowered buckwheat	*Eriogonum grande* var. *rubescens*	shrub	CA					X			X					X				X		X				Rosy flowers, full sun, good drainage, little water, filler
Coast buckwheat	*Eriogonum latifolium*	shrub	SF					X							X				X	X		X			X	Full sun, forms mounds, good drainage, little water, tolerates wind/heat/drought/ salt spray, attracts butterflies and bees
Naked eriogonum	*Eriogonum nudum* var. *nudum*	shrub	SF				X	X	X		X					X				X		X			X	Use in mixed border for airy effect, white/pink/yellow flowers. Var. *auriculatum* also reported from SF, but var. *nudum* known form Hunters Point Area. Only use auriculatum as a backup if needed.
Golden yarrow	*Eriophyllum confertiflorum* var. *confertiflorum*	shrub	SF					X	X	X		X				X				X					X	1-2 ft. tall with bright yellow flowers, prefers good drainage, attracts butterflies
Common wooly sunflower	*Eriophyllum lanatum var. achilleoides*	shrub	CA					X	X											X						Full sun, good drainage, yellow flowers, little to no water
Catalina silver lace	*Eriophyllum nevinii*	shrub	CA					X								X										Full sun, good drainage, little to no water, good border plant
Seaside wooly sunflower	*Eriophyllum staechadifolium*	shrub	SF					X				X								X		X				Full sun, good drainage, little to no water
rough-leafed aster	*Eurybia radulina*	forb	SF					X	X	X																Often grows in dry, brushy slopes in the wild
California poppy	*Eschscholzia californica*	forb	SF				X	X		X					X	X				X		X			X	Full sun, no water, tolerates poor soil
California fescue	*Festuca californica*	graminoid	SF					X	X	X					X						X				X	Best in part shade, good for erosion control
Fescue bunchgrass	*Festuca idahoensis*	graminoid	SF					X	X	X					X		X					X				Perennial clumping grass, full sun, and part shade

Planting List

				Habitat							Function								Plant Tolerances								
Plant Common Name	Plant Scientific Name	Plant Type (Tree, shrub, vine, forb, grass, fern, groundcover)	Native Status (San Francisco [SF], Bay Area [BA], California [CA])	Tidal Marsh	Freshwater Wetland	Riparian	Coastal Dune	Coastal Scrub	Woodland	Grassland	Wildlife Forage	Wildlife Nesting/Cover	Remediation/Biofiltration	Wetland/Upland Transition	Erosion Control	Aesthetic (Showy)	Groundcover	Visual Screening	Salinity	Drought	Shade	Full Sun	Deer	Chemical Contamination	Poor Soil	Comments
Red fescue	*Festuca rubra*	graminoid	SF		X			X	X	X	X		X		X		X		X	X		X		X	X	Good for lawn substitute, attracts deer, elk, moose, small mammals, and birds
Coast strawberry	*Fragaria chiloensis*	forb	SF				X	X			X				X	X	X		X		X					Attracts birds, bees, butterflies; needs some shade or water if grown away from coast
Woodland strawberry	*Fragaria vesca*	forb	SF					X	X		X				X	X	X				X		X			Low water usage, deer resistant, does best in part shade, attracts birds and butterflies
Coffeeberry	*Frangula californica*	shrub	SF					X	X		X	X			X	X		X		X		X			X	Tolerates poor soils, hardy grower, red berries, good habitat plant, attracts butterflies
Alkali heath	*Frankenia salina*	forb	SF	X										X			X		X			X			X	Forms dense mat, grows in clay or saline soils
Flannel bush	*Fremontodendron californicum*	shrub	BA					X	X			X				X		X		X		X	X		X	Fast growing, large yellow flowers, needs sun and good drainage, 20' tall and 10-15' wide
Coast silktassel	*Garrya elliptica*	shrub/tree	SF					X	X			X				X		X			X	X	X		X	10-20' tall, long white flowers
Carolina geranium	*Geranium carolinianum*	forb	BA						X							X					X					Pink flowers, needs part shade and gravelly-clay soils
Purple spot gilia	*Gilia clivorum*	forb	SF					X	X	X						X										Full sunlight, low water requirement, blue/orange flowers
Sea-milkwort	*Glaux maritima*	forb	SF	X										X			X		X			X			X	Grows in middle zone of salt marsh
Gumplant	*Grindelia hirsutula* var. *hirsutula*	forb	SF					X			X					X	X					X			X	Bright yellow flowers
Pacific gumplant	*Grindelia stricta* var. *angustifolia*	forb	SF	X				X			X			X		X	X					X			X	Showy yellow flowers
Toyon	*Heteromeles arbutifolia*	shrub	SF					X	X		X	X			X	X		X		X		X			X	Little or no water, attracts butterflies and hummingbirds, good drainage, and full sun
Telegraph weed	*Heterotheca grandiflora*	forb	SF					X	X				X						X	X		X			X	Occurs naturally in wetlands, good for restoration, has thistles/yellow flowers, tolerates variety of soils, drought tolerant, attracts bees and butterflies. Possible extirpated, but previously found at Bayshore Station.
Cream bush	*Holodiscus discolor* var. *discolor*	shrub	SF					X	X		X	X		X		X		X			X	X				Good habitat plant, attracts butterflies, larvae, birds and bees, creamy/white flowers and red fall color
Meadow barley	*Hordeum brachyantherum*	graminoid	SF		X					X											X	X			X	Grows in clumping form
California horkelia	*Horkelia californica*	forb	SF					X		X											X	X				Attracts butterflies and pollinators
Douglas' iris	*Iris douglasiana*	forb	SF					X	X	X			X		X	X	X				X	X	X			Spreads easily from rhizomes
Fleshy jaumea	*Jaumea carnosa*	forb	SF	X		X	X							X			X		X							Occurs naturally in wetlands, little yellow flowers, grows in mats, common in middle zone of marsh
Common rush	*Juncus effusus*	graminoid	SF	X	X						X	X	X	X	X				X			X		X	X	Good shoreline protection/stabilization, survives polluted conditions, attracts variety of small mammals
Wire grass	*Juncus patens*	graminoid	SF		X	X				X			X									X				Prefers moist soil
Junegrass	*Koeleria macrantha*	graminoid	SF							X												X			X	Prefers sun and good drainage, flower stalks
California goldfields	*Lasthenia californica*	forb	SF		X			X	X	X						X	X		X			X				Occasionally found in wetlands, yellow flowers, tolerates salinity
Hillside pea	*Lathyrus vestitus*	vine	SF			X		X	X			X									X	X			X	Vine with showy flowers, generally will not dominate the plants that it grows on
Tree mallow	*Lavatera assurgentiflora*	shrub	CA					X	X							X		X	X	X		X				6-12' tall, pink/purple flowers, tolerates heat/wind/drought/salt spray, attracts butterflies
Pitcher sage	*Lepechinia calycina*	shrub	SF					X	X			X										X			X	Provides cover and nesting material
Sea lavender	*Limonium californicum*	forb	SF	X										X					X			X				Pale purple flowers, grows above tide lines
Common lomatium	*Lomatium utriculatum*	forb	SF						X	X						X						X			X	Yellow flowers are in bundles, attracts bees
California honeysuckle	*Lonicera hispidula*	vine	SF					X	X		X	X					X				X					Vine that grows as both ground cover and on upright plants, but generally will not take over the plants it is growing on.
Silver bush lupine	*Lupinus albifrons* var. *collinus*	shrub	SF					X	X		X	X				X				X		X			X	Blue-violet fragrant blooms, little water, good drainage, full sun, attracts butterflies and bees

Planting List

				Habitat								Function								Plant Tolerances								
Plant Common Name	**Plant Scientific Name**	**Plant Type (Tree, shrub, vine, forb, grass, fern, groundcover)**	**Native Status (San Francisco [SF], Bay Area [BA], California [CA])**	**Tidal Marsh**	**Freshwater Wetland**	**Riparian**	**Coastal Dune**	**Coastal Scrub**	**Woodland**	**Grassland**	**Wildlife Forage**	**Wildlife Nesting/Cover**	**Remediation/Biofiltration**	**Wetland/Upland Transition**	**Erosion Control**	**Aesthetic (Showy)**	**Groundcover**	**Visual Screening**	**Salinity**	**Drought**	**Shade**	**Full Sun**	**Deer**	**Chemical Contamination**	**Poor Soil**	**Comments**
Coastal bush lupine	*Lupinus arboreus*	shrub	SF				X	X	X		X	X				X		X	X			X	X		X	Yellow flowers, attracts birds, bees, and butterflies, deer resistant, full sun/sandy soil
Miniature lupine	*Lupinus bicolor*	forb	SF					X	X	X			X			X	X					X			X	Purple flowers, low water usage- summer dormant, attracts butterflies and bees, does well in disturbed areas
Summer lupine	*Lupinus formosus* var. *formosus*	forb	SF						X	X	X					X									X	Full sun, good drainage, little water, attracts bees and butterflies
Arroyo lupine	*Lupinus succulentus*	forb	SF			X			X	X						X							X		X	Needs sun/well drained soil, purple flowers attract bees, deer resistant
Varied lupine	*Lupinus variicolor*	shrub	SF							X						X	X					X			X	Nice along edges, full sun/good drainage, attracts bees and butterflies
Ironwood	*Lyonothamnus floribundus* (ssp. *asplenifolius* or *floribundus*)	tree	CA						X									X		X		X				Prefers heat, wind protection.
California man-root	*Marah fabacea*	vine	SF				X	X	X					X			X			X		X				Vine, occurs naturally in wetlands, summer dormant
California melic	*Melica californica*	graminoid	SF							X	X											X			X	Tolerates bad soils, and good forage
Sticky monkeyflower	*Mimulus aurantiacus* var. *aurantiacus*	shrub	SF					X	X		X					X				X		X			X	Orange flowers, full sun, good drainage, attracts butterflies and bees, little water
Coyote mint	*Monardella villosa* ssp. *franciscana*	shrub	SF					X	X	X	X					X				X		X			X	Attracts bees, butterflies, hummingbirds
Pacific wax myrtle	*Morella californica*	shrub	SF			X		X	X		X	X						X	X			X			X	Tolerates wind/salt spray, good habitat plant, moderate water, bay scent
Deergrass	*Muhlenbergia rigens*	graminoid	CA			X			X	X		X			X	X						X				Bunchgrass, flower stalks, and little water
Coffee fern	*Pellaea andromedifolia*	forb	SF				X	X												X		X			X	Prefers rocky areas
Royal penstemon	*Penstemon spectabilis*	forb	CA					X	X							X				X		X	X		X	Blue/purple/pink/white flowers, attracts butterflies hummingbirds, and bees
California Phacelia	*Phacelia californica*	forb	SF					X	X								X			X		X			X	Attracts bees, butterflies, insects
Ninebark	*Physocarpus capitatus*	shrub	BA			X		X				X		X	X	X					X	X				Dense clusters of white flowers, shade. From North Coast Region.
Shore pine	*Pinus contorta* ssp. *contorta*	tree	CA				X					X						X	X			X	X		X	Fast growth, 20-35' tall, contorted by ocean winds, tolerates salt spray
Bishop pine	*Pinus muricata*	tree	BA					X	X			X				X		X	X		X	X	X			Fast growth, 40-80' tall, 20-40' wide, tolerates coast
Torrey pine	*Pinus torreyana*	tree	CA					X	X			X				X		X		X		X	X			Fast growth 40-60' tall, 30-50' wide, good in open spaces and parks
California plantain	*Plantago erecta*	graminoid	SF				X	X	X	X	X						X			X		X			X	Primary host plant for Bay Checkerspot butterfly, part sun/shade, attracts butterflies, tolerates wide variety of soils, very low water usage, fast growing
California Sycamore	*Platanus racemosa*	tree	BA			X					X	X				X				X	X	X		X	X	Needs full sun, provides food/nesting for birds and butterflies, drought tolerant/ chemical contamination tolerant/ poor soil tolerant once established
Swordfern	*Polystichum munitum*	fern	SF						X											X	X					Little water needed, spreads quickly
Fremont cottonwood	*Populus fremontii* ssp. *fremontii*	tree	BA			X						X			X			X			X	X				40-60' tall, 25-35' wide, use male trees
Bitter cherry	*Prunus emarginata*	shrub	SF					X	X		X	X						X								Small dciduous tree to 13-14' tall
Hollyleaf cherry	*Prunus ilicifolia* ssp. *Ilicifolia*	shrub	SF					X	X		X	X				X		X		X		X			X	Evergreen; good as hedge/screen, moderate water, 10-25' tall
Live oak	*Quercus agrifolia*	tree	SF						X		X	X				X		X		X		X				Tolerates drought,/ heat/ wind 30-75' tall, 60-100' wide, good drainage, no summer water, few plants can grow in understory
California buttercup	*Ranunculus californicus*	forb	SF			X				X											X	X				No water in summer, yellow blooms, full sun
Lemonade berry	*Rhus integrifolia*	shrub	CA					X			X	X						X		X		X	X		X	Good windbreak/ screen, full sun/drainage, good habitat plant
Sugar bush	*Rhus ovata*	shrub	CA					X			X	X				X		X				X			X	Good windbreak/ screen, full sun/drainage, good habitat plant

Planting List

				Habitat							Function								Plant Tolerances							
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golden currant	*Ribes aureum* var. *gracillimum*	shrub	BA			X			X		X	X			X	X				X	X	X				Attracts birds, hummingbirds, butterflies, bees
Pink flowering currant	*Ribes sanguineum* var. *glutinosum*	shrub	SF			X	X	X	X		X	X			X	X					X		X		X	Fuchsia red flowers, has thorns/berries, provides food for hummingbirds, birds, and small mammals, part shade, indirect watering, deer resistant
California rose	*Rosa californica*	shrub	SF			X		X	X		X	X		X	X	X		X			X	X				Excellent for bank stabilization, good forage/nesting
California blackberry	*Rubus ursinus*	shrub/vine	SF			X		X	X		X	X		X	X		X			X	X	X			X	Forms mounds, produces blackberries, has thorns
Golden dock	*Rumex fueginus*	forb	SF	X	X	X								X			X					X				Low growing attractive plant
Pickleweed	*Salicornia pacifica*	forb	SF	X										X			X		X			X				Low growing succulent, salt tolerant, grows in middle zone of salt marsh
Red willow	*Salix laevigata*	tree	SF			X						X	X	X				X			X	X				Grows along edges of marshes/ streams
Arroyo willow	*Salix lasiolepis*	tree	SF	X		X						X	X	X				X	X		X	X				Grows along edges of marshes/ streams, informal screen
Purple sage	*Salvia leucophylla*	shrub	CA					X			X	X			X	X				X		X			X	Sprawling form, purple pink flowers, full sun, attracts hummingbirds, butterflies and bees
Black sage	*Salvia mellifera*	shrub	BA					X			X	X			X	X				X		X			X	Pale purple flowers, little water, attracts bees, butterflies, and hummingbirds
Hummingbird sage	*Salvia spathacea*	forb	SF			X	X	X	X		X					X	X			X	X	X	X			Tolerates variety of soils, prefers dry shady habitats, very drought tolerant, attracts hummingbirds, butterflies, bees, and birds, deer resistant, purple flowers
Creeping sage	*Salvia sonomensis*	forb/subshrub	BA					X							X	X	X			X		X				Fast-growing drought-tolerant ground cover. Warm areas with good drainage. Attracts bees, butterflies, hummingbirds
Blue elderberry	*Sambucus nigra* ssp. *caerulea*	shrub	SF			X		X	X		X	X		X	X	X		X		X	X	X				Good habitat plant/screen, attracts butterflies and hummingbirds, some plants are poisonous
Purple sanicle	*Sanicula bipinnatifida*	forb	SF						X	X																Bright green to dark purple color, bears prickly fruits
California bulrush	*Schoenoplectus californicus*	graminoid	SF	X	X						X	X	X	X				X	X			X		X		Common in brackish marshes
Bee plant	*Scrophularia californica*	forb	SF				X	X	X		X			X								X				Reddish flowers
Checkerbloom	*Sidalcea malviflora*	forb	SF					X	X	X						X	X					X				Pink purple flowers, dormant in summer- no water
Blue-eyed grass	*Sisyrinchium bellum*	forb	SF					X	X	X			X			X	X					X			X	Purple flowers, self sows, tolerates poor soils
California goldenrod	*Solidago velutina* ssp. *californica*	forb	SF			X			X	X												X				Blooms late summer, grows in masses
California cord grass	*Spartina foliosa*	graminoid	SF	X								X		X					X			X				Common in low zone of salt marsh, be aware of hybridization with non-native species
Foothill needle grass	*Stipa lepida*	graminoid	SF							X					X					X		X			X	Dormant in summer, good drainage/ full sun
Purple needlegrass	*Stipa pulchra*	graminoid	SF					X		X												X			X	Full sun, grows well from seed; seeds are wildlife forage
California sea-blithe	*Suaeda californica*	forb	SF	X										X			X		X			X				Upper zone of salt marsh, federally endangered. Small populations in a few restorations sites in SF.
California aster	*Symphyotrichum chilense*	forb		X		X		X	X	X				X	X	X	X						X			Grows rapidly
Creeping snowberry	*Symphoricarpos mollis*	shrub	SF						X		X	X		X			X			X	X	X				Vine, drought tolerant, prefers shade, easy to grow
Seaside arrow-grass	*Triglochin maritima*	graminoid	SF	X										X												Grows in dense clumps
Ithuriel's spear	*Triteleia laxa*	forb	SF						X	X	X					X						X				Blue/purple/lavender flowers, attracts bees, butterflies, and mammals, low water usage, full shade; does not tolerate summer irrigation
Broad-leaved cattail	*Typha latifolia*	graminoid	SF	X	X	X					X	X	X	X		X			X	X		X		X	X	Tolerate salinity/reduced soil conditions/drought, attracts geese, muskrats, and birds
California bay	*Umbellularia californica*	tree	SF			X			X		X	X				X		X			X	X				Can be hard to grow, susceptible to fungus, and fragrant
California grape	*Vitis californica*	vine	BA			X			X		X	X		X	X	X	X	X		X	X	X				Vine, pink leaves, purple berries, full sun, moderate water. Can hybridize with *Vitis vinifera* .
Mule's ears	*Wyethia angustifolia*	forb	SF					X	X	X						X				X		X				Bright yellow flowers

B Guide Preparers

Stakeholder Involvement

This revegetation guide was created by AECOM for San Francisco Department of the Environment with input and contribution from various stakeholders. Funding support has been provided from US Environmental Protection Agency (EPA Award No. #BF-00T98101). This guidebook is part of the Bayview Hunters Point (BVHP) brownfields communitywide assessment.

A special thank you to the many agencies and organizations that provided feedback:

- The Port of San Francisco
- San Francisco Recreation and Park
- California State Parks
- Literacy for Environmental Justice
- San Francisco Parks Alliance
- San Francisco Planning Department
- San Francisco Bay Conservation and Development Commission (BCDC)
- San Francisco Department of Public Works
- San Francisco Department of Public Health
- San Francisco Office of Community Investment and Infrastructure
- San Francisco Public Utilities Commission
- The Trust for Public Land
- Golden Gate Audubon
- Greenaction for Health & Environmental Justice
- United States Environmental Protection Agency (EPA)
- Nature in the City

Warm Water Cove.
Photo by AECOM

C Additional Resources

Plant Sources

- Bay Natives (http://www.baynatives.com)
- Candlestick Point Native Plant Nursery at Yosemite Slough (http://www.candlestickconnect.org)
- Sutro Stewards Native Plant Nursery (https://www.sutrostewards.org)
- Yerba Buena Nursery (http://www.yerbabuenanursery.com)
- San Francisco Plant Finder (http://www.sfplantfinder.org) and Resources (http://sfplantfinder.org/resources.html)
- Native Plant Nurseries (http://sfplantfinder.org/resources.html#plant-nurseries)
- Pollinator-Friendly Nurseries (https://sfenvironment.org/plant-nurseries-bee-friendly)

Phytophthora and Plant Pathogen Resources

- California Oak Mortality Task Force (http://www.calphytos.org)

Invasive Plant Information

- California Invasive Plant Council - Invasive Species Database (http://www.cal-ipc.org)

Do Not Plant List

- BCDC Shoreline Plants: A landscape guide for the San Francisco Bay (http://www.bcdc.ca.gov/planning/SPLG.pdf)

Panorama of the Yosemite Slough.
Photo by AECOM

Back Cover Image: Candlestick Point State Recreation Area. *Photo by AECOM.*


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