Albany Neck & Bulb Transition Improvement Plan

Existing Conditions Memo_DRAFT

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Photo: J. Gibbs (WRT)

I. Introduction

1.1 Project Understanding

The Albany Neck and Bulb Transition Improvement Plan will describe measures aimed at improving recreation, habitat conservation, and shoreline resiliency values at the Neck and Bulb to support the transfer of City of Albany lands at the site to California State Parks (CSP) and the East Bay Regional Park District (EBRPD). Upon transfer, the property is to be designated as part of McLaughlin Eastshore State Park (MESP).

The purpose of this memo is to provide an assessment of existing conditions on the Neck and Bulb related to recreational assets, accessibility conditions, habitat and shoreline conditions, hazardous materials impacts, geotechnical conditions, and anticipated sea level rise impacts. The memo is divided into the following chapters:

- Chapter 2: Coastal Vulnerability Assessment
- Chapter 3: Habitat and Wildlife Assessment
- Chapter 4: Hazardous Materials Assessment
- Chapter 5: Geotechnical Hazards Assessment
- Chapter 6: Access and Recreation Assessment

1.2 Neck & Bulb History and Context

The Albany Bulb, Neck, and Plateau comprise approximately 65 acres of upland open space along the Albany waterfront. Formed by the dumping of construction debris and related fill materials on Bay mudflats during the 1960's, -70's, and 80's, Bulb ownership is shared between the City of Albany and EBRPD (Figure 1.1). The City owns most of the Bulb (approximately 36 acres), as well as a narrow right-of-way through the Neck that connects the Bulb to Buchanan Street Extension (approximately 4 acres).[1] EBRPD owns the rest of the peninsula, including the Plateau and shoreline areas on the north and south sides of the Neck. The California State Lands Commission owns Albany Beach between the City's right-of-way to the north and the privately-held Golden Gate Fields lands to the east.

Albany Beach and the southern shoreline of the Neck are currently the focus of an extensive habitat and public access enhancement project, the Albany Beach Restoration and Public Access Project.

With the adoption of the MESP General Plan in 2002, which officially established MESP, the long-term vision has been to incorporate the City-owned portions of the Neck and Bulb into the MESP boundaries. The General Plan outlines the Neck and Bulb's recreational, aesthetic, and habitat values, and describes a vision for the site's long-term use. However, transfer of the land from City to EBRPD ownership has been complicated by multiple factors, including hazardous conditions resulting from the weathering of construction debris, and the sustained presence of a community of homeless individuals. In the late 2000s/early 2010s, the City invested considerable resources into relocating the Bulb's residents and clearing years-worth of debris, providing the opportunity to commence the current planning effort. The Transition Plan will develop a conceptual plan to address hazardous conditions on the City-owned portions of the site such that it is suitable for transfer to California State Parks and the EBRPD. The Plan will also provide conceptual-level recommendations for elements that will improve access, recreational opportunities, habitats, and shoreline resiliency under anticipated sea level rise scenarios.

1.3 Technical Approach & Community Outreach

In preparing this memo, the consultant team has reviewed key existing documents and data related to the site and conducted site reconnaissance to visually inspect and identify the conditions of the Neck and Bulb. Site reconnaissance included a field survey of shore transects conducted by ESA. The survey recorded measurements of the existing grade for use in assessing the geometry and geomorphology of the site, as well as locating the approximate extents of landfill into the Bay.

The City and consultant team also convened a technical advisory committee (TAC) to advise on regulatory, technical, and operations issues and requirements relevant to the Transition Plan. The first meeting of the TAC was held on January 7, 2015, to solicit initial feedback on agency concerns and was comprised of the following members:

- Reid Boggiano, State Lands Commission
- Marcia Grefsrud, California Department of Fish & Wildlife
- Lee Huo, Association of Bay Area Governments (Bay Trail)
- Jeff Melby, California Coastal Conservancy

[1] The City's right of way extends through to the I-80/I-580 on-ramp; for purposes of acreage calculations in this memo, we are only considering the ROW through to the Golden Gate Fields properties (see Figure 1.1). The 36 acres described as "the Bulb proper" does not include outboard tidal mudflats or subtidal portions of San Francisco Bay within the City's parcel boundary.

- Vic Pal, State Water Resources Control Board
- Arthur Surdilla, Alameda County Department of Environmental Health
- Larry Tong, EBRPD
- Maggie Wenger, San Francisco Bay Conservation and Development Commission

In order to solicit a wide range of community and expert feedback, the City and consultant team held four stakeholder focus groups in January and February 2015 as well as a public community workshop. The stakeholder focus groups included individuals identified by City staff as having specialized knowledge related to the Neck and Bulb on a particular topic. Each focus group meeting emphasized a specific theme; these included access and recreation, habitat and conservation, access for visitors with dogs, and public art. Stakeholder focus group attendees included:

- Susan Adame, Albany Arts Committee
- Mary Barnsdale, Albany Landfill Dog Owners Group (ALDOG)
- Doug Donaldson, former Albany Arts Committee
- Peter Goodman, Albany Arts Committee Chair
- Sean Herman, GGAS Board Member
- Patricia Jones, Executive Director of Citizens for East Shore Parks (CESP)
- Paul Kamen, former Berkeley Waterfront Committee Member
- Claudia Kawczynska, Bark Magazine Editor, Friends of Cesar Chavez Park
- Norman La Force, Sierra Club and Sustainability, Parks, Recycling and Wildlife Legal Defense Fund (SPRAWLDEF)
- Robin Lasser, San Jose State University Professor, public artist
- Denise Macko, ALDOG
- Michael Mejia, former Director of the Albany High School Mountain Bike Team
- Susan Moffat, UC Berkeley City and Regional Planning Project Director
- Osha Neumann, Bulb artist
- Francesco Papalia, former Waterfront Committee Chair
- Peter Rauch, retired UC Berkeley Ecology Professor, Golden Gate Audubon Society (GGAS) Board Member
- Diane Sequoia, Point Isabel Dog Owners (PIDO)
- Amy Smolens, Albany Rollers and Strollers
- Linda Yoshikawa, ALDOG, East Bay Dog Alliance Working Group
- Pam Young, GGAS Board Member

The public community workshop took place on February 19, 2015, and included a presentation by the consultant team that described the scope of the project and initial existing conditions findings, an open house for community members to ask questions of City staff and the consultant team, and a public comment period.

Photo 1.1: *City staff and consultants on a tour of the site. Photo: S. Hammond (WRT)*

Figure 1.1: Land Ownership

Sources: NAIP 2014 (aerial photo), Alameda County 2015 (parcel data)

II. Coastal Vulnerability Assessment

2.1 Introduction

This coastal vulnerability assessment has been developed as part of the Albany Bulb and Neck Transition Plan for the City of Albany. We understand that the three primary objectives for the Albany Bulb and Neck Transition Plan are to:

- Maintain integrity of the landfill and prevent erosion
- Protect and enhance habitat
- Improve and enhance public access and opportunities for recreation

The purpose of this vulnerability assessment is to describe current physical coastal processes, evaluate the vulnerability of the shore for existing conditions and future conditions with sea level rise, and develop preliminary concepts for site improvements. Concepts are intended to mitigate the shoreline vulnerability and lower risk, while maintaining consistency with the policies set forth in the Eastshore State Park General Plan. We understand that shoreline improvement concepts presented herein will be further developed during subsequent stages of this study.
This report is organized as follows:

- **Key Terminology, Datums, and Extreme Values:** presents a summary of the tidal elevations and extreme water levels along the Albany Bulb shore, as well as defining terminology that is used in coastal flood studies.
- **Physical Conditions of the Albany Shore:** summarizes the conditions of the Albany Bulb shore based on site reconnaissance and surveys, and describes the different shore segments that will be used in the vulnerability assessment.
- **Jurisdiction, Policy, and Sea Level Rise Guidance:** presents a description of pertinent policies and guidance for incorporating sea level rise into planning, sea level rise projections, and defines vulnerability and risk terminology.
- **Coastal Vulnerability Assessment:** describes the assessment of vulnerability of the Albany Bulb shore to flooding and erosion for existing conditions and future conditions with sea level rise.
- **Preliminary Concepts of Shoreline Improvements:** summarizes potential conceptual improvements that can be implemented along the shore.

2.2 Key Terminology, Datums, and Extreme Values

This section presents a description of the terminology used in coastal flooding analysis, published tidal datums for Central San Francisco Bay and at the Albany Bulb shore, and extreme values of water levels and wave runup elevations that have been estimated by other studies.

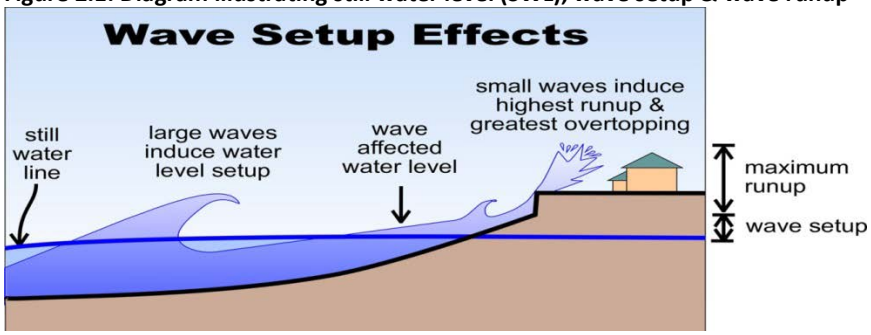
Coastal Flooding & Vulnerability Terminology

The following sections summarize terminology used in coastal flood studies and to characterize extreme events.

Water Levels and Wave Runup. Coastal flooding is caused by a combination of tides, storm surge, and the effects of waves, including wave setup and wave runup (Figure 2.1). These physical processes are derived from measurements of water levels and waves and from hydrodynamic models. Flood elevations are typically reported using the following terminology (FEMA 2005):

- The still water level (SWL) is the elevation of the free surface in the absence of waves and wave effects, and includes the astronomical tide, El Niño, and surge due to wind effects
- Wave setup is the additional elevation of the water level due to the effects of transferring wave-related momentum to the surf zone
- Wave runup is the the vertical extent of wave uprush on the shore or a structure
- The total water level (TWL) is the sum of the SWL, the wave setup, and wave runup

Figure 2.1: Diagram illustrating still water level (SWL), wave setup & wave runup



Source: ESA

Probabilities of Extreme Events. Recurrence frequencies are commonly used to describe the probability of an extreme event occurring within a given time period. The return period, or recurrence interval, is an estimate of the likelihood of an event and is based on the probability that the given event will be equaled or exceeded in any given year. For example, the 100-year SWL is the flood level that has a 1% chance of being equaled or exceeded in any given year. Similarly, the 100-year TWL can be calculated, although the 1% TWL does not correspond to any single physical event. Rather, it is an extrapolation of the TWL conditions from the largest events because of the limited duration of the available data (FEMA 2005). Wave overtopping occurs if the TWL exceeds the backshore elevation. The TWL primarily depends on the water level, wave conditions, and the beach face or structure slope.

Datums

Water level elevation is commonly referenced to NAVD[2] along the East Bay shore of Central San Francisco Bay. Table 2.1 presents published tidal datums for locations around Central San Francisco Bay, including the San Francisco Presidio, Richmond, and Berkeley tide gage stations.[3] Although the datums for Richmond Inner Harbor and Berkeley were derived with much shorter records of water level measurements, the water levels along the East Bay shore tend to be slightly higher than observed at San Francisco near the Golden Gate entrance. This report presents existing and future water surface elevations in feet relative to NAVD, and based the tidal datums on the values for the Berkeley station.

Extreme Values

The following sections summarize results of prior studies that estimated extreme SWL, waves conditions, and TWL in the vicinity of the Albany Bulb project study area. A summary of the parameters and values used in this study is presented below.

Still Water Level. Several studies have estimated extreme values of water levels in San Francisco Bay (USACE 1984; PWA 2007; DHI 2011; URS and AGS 2012). Although these studies rely on measurements at the Presidio tide gage, the extreme values differ due to differences in the methods used:

Table 2.1: Tidal Datums and Extreme Water Levels for Central San Francisco Bay

Datum	Still Water Level (feet NAVD)				
	San Francisco, 9414290	**Richmond, 9414863**	**Richmond Inner Harbor, 9414849**	**Berkeley, 9414816**	**Project Datum**
Highest Observed Water Level	8.72*	8.65**	--	--	--
Mean Higher High Water (MHHW)	5.92	6.06	6.01	6.23	6.23
Mean High Water	5.31	5.45	5.39	5.62	5.62
Mean Tide Level	3.26	3.29	3.24	3.44	3.44
Mean Sea Level	3.20	3.26	3.22	3.41	3.41
NGVD29	2.72	2.66	2.65	--	--
Mean Low Water	1.22	1.13	1.09	1.27	1.27
Mean Lower Low Water (MLLW)	0.08	0.00	-0.03	0.13	0.13
NAVD88	0.00	0.00	0.00	0.00	0.00
Lowest Observed Water Level	-2.82†	-2.51††	--	--	--

*Source: NOAA Tides and Currents; *1/27/1983 9:30 AM; **2/6/1998 3:54 PM; †12/17/1933 6:00 PM ; ††1/11/2009 1:48 AM*

- Length of time series: a study for FEMA used a shorter time series of 30 years (DHI 2011), whereas studies for the Port (URS and AGS 2012) and by USACE (1984) and PWA (2007) considered the full tidal data record extending to 1901.
- Extreme value distribution: USACE (1984) and URS and AGS (2012) fit a Weibull distribution to the data, while DHI (2011) fit a GEV distribution to the shorter time series, which gives higher values.

The 100-year SWL of 9.2 to 9.3 feet NAVD was reported by the study for the Port of San Francisco (URS and AGS 2012). In the study for FEMA, DHI (2011) reported a 100-year SWL of 9.6 to 9.8 feet NAVD, approximately 0.5 feet higher than the value developed by URS and AGS (2012) using the longer time series and less conservative extreme value distribution. The USACE (1984) study estimated the 100-year SWL to be approximately 9.0 feet NAVD in the vicinity of Albany.

[2] NAVD, or NAVD88, refers to the North American Vertical Datum of 1988, a fixed reference for elevations determined by geodetic leveling. The datum was derived from a general adjustment of the first-order terrestrial leveling nets of the United States, Canada, and Mexico.

[3] http://tidesandcurrents.noaa.gov

Approximately 0.2 feet of sea level rise has been calculated at the San Francisco Presidio tide gage since the report was published in 1984, which indicates the updated 100-year SWL would be about 9.2 feet NAVD.[4] This is similar to the value estimated by URS and AGS (2012) in a study for the Port of San Francisco.

Wave Runup and Total Water Level. In addition to the SWL, typical wave heights incident to the site have been estimated on the order of 1 to 3 feet, with runup heights between 3 and 6.4 feet (LSA et al. 2011). In a study for the East Bay Regional Park District (EBRPD), LSA et al. (2011) estimated the 100-year TWL to be approximately 15.1 feet NAVD along the shore of the Albany Neck – a steep shore consisting of concrete rubble and unconsolidated fill. In a subsequent study for the EBRPD, Coast and Harbor Engineering (CHE) estimated extreme wave heights between 4 and 6 feet using a SWAN model (CHE 2012). However, the CHE (2012) results are considered conservative due to the methods used in their analysis, which was intended for developing design criteria for a proposed rock revetment along the Albany Neck. Despite the difference in estimated wave heights resulting from a 100-year wind event for the two studies, CHE (2012) reported a 100-year TWL of 15.1 feet NAVD, identical to the LSA et al. (2011) study.

Draft work maps prepared by FEMA show the Albany Bulb shore designated as a "VE" zone with elevation 14 feet NAVD and the Albany Beach designated as a "VE" zone with elevation 15 feet NAVD. These values differ from the calculations by LSA et al. (2011) and CHE (2012), which estimated a total water level of approximately 15.1 feet NAVD on the Albany Neck, and approximately 12 feet NAVD at the beach. The spatial variation in the FEMA values may be due to a limited number of profiles selected for analysis. Appendix A presents a description of modeling results by DHI (2011) and the FEMA draft work map for the vicinity of Albany Bulb.

Summary of Parameters Used for this Study. For this study, the following parameters and values are assumed to be representative of the conditions at the Albany Bulb:

- 100-year SWL = 9.2 feet NAVD
- Total water level:
  - 100-year TWL = 15.1 feet NAVD for steep and armored shores
  - 100-year TWL = 11.9 feet NAVD for beaches and gentle slopes
- 100-year wave conditions:
  - Significant wave height = 3.3 feet
  - Peak period = 3.6 seconds

[4] The future extreme SWL is typically calculated by adding the sea level rise amount to the extreme still water level for existing conditions.

2.3 Physical Conditions of the Albany Bulb Shore

This section summarizes the conditions of the Albany Bulb shore and is based on site reconnaissance, field surveying, and data collection. Delineation and description of the different shore segments that will be used in the vulnerability assessment is presented in the Shore Segments Section below.

Site History & Context

The Albany Bulb and Neck is a landfill constructed along the east shore of Central San Francisco Bay. The site resulted from filling of the Bay with construction debris that was placed in cells made of slag dikes. The dikes were constructed using slag waste materials from nearby factories, and were built up to elevations a few feet higher than typical high tides. The cells formed by the slag dikes were filled with a variety of construction debris, including an extensive amount of concrete rubble and imported fill.

Grades at the site extend from below sea level to over 50 feet NAVD at the top of the Albany Bulb. Areas along the shore are typically in the elevation range of 0 to 15 feet NAVD, comprising the intertidal (approximately 0 to 6 feet NAVD) and backshore (approximately 6 to 15+ feet NAVD) zones. Although the site has not experienced a high degree of shoreline erosion over the last several decades, the backshore may be at much higher risk of erosion in the future due to accelerated sea level rise.

Site Visits & Field Observations

An initial site visit with the project team and the City of Albany staff occurred on October 28, 2014. At this site visit, initial observations were made on the shore types and shore processes, and the context for the project, including primary project objectives, was developed. This site visit occurred during high tide with water levels and waves inundating areas of the shore.

Field observations and elevation transects were collected during a second site visit on January 28, 2015. A habitat survey of the site was conducted on the same day and is described in the following chapter. The conditions during the site visit consisted of mild temperatures, clear skies, and a light breeze in the afternoon. This day was selected for the survey to take advantage of the low tide of 0.51 feet MLLW occurring at approximately 1:40 PM. The shore conditions were observed along the shore and used to discretize the shore into segments. A topographic survey was conducted to develop typical elevation profiles for each segment of shore, and to measure elevations of various assets at the site such as different

habitats, shoreline access trails, and the geometry of the landfill.[5] The measured profiles are used as the typical sections for each shore segment presented in this study.

Base Map Data Collection

A surface model of the existing topography of the project site was developed using publicly available LiDAR. A digital elevation model (DEM) was obtained from the NOAA's Digital Coast website, and imported into AutoCAD. The DEM was originally developed by NOAA and others as part of the California Coast Mapping Project and subsequent TopoBathy Project, which merged coastal LiDAR collected between 2009 and 2011 with available nearshore elevation data (NOAA 2013). For clarity, the base map presented in this study shows the elevation contours with 2-foot intervals.

Shore Segments

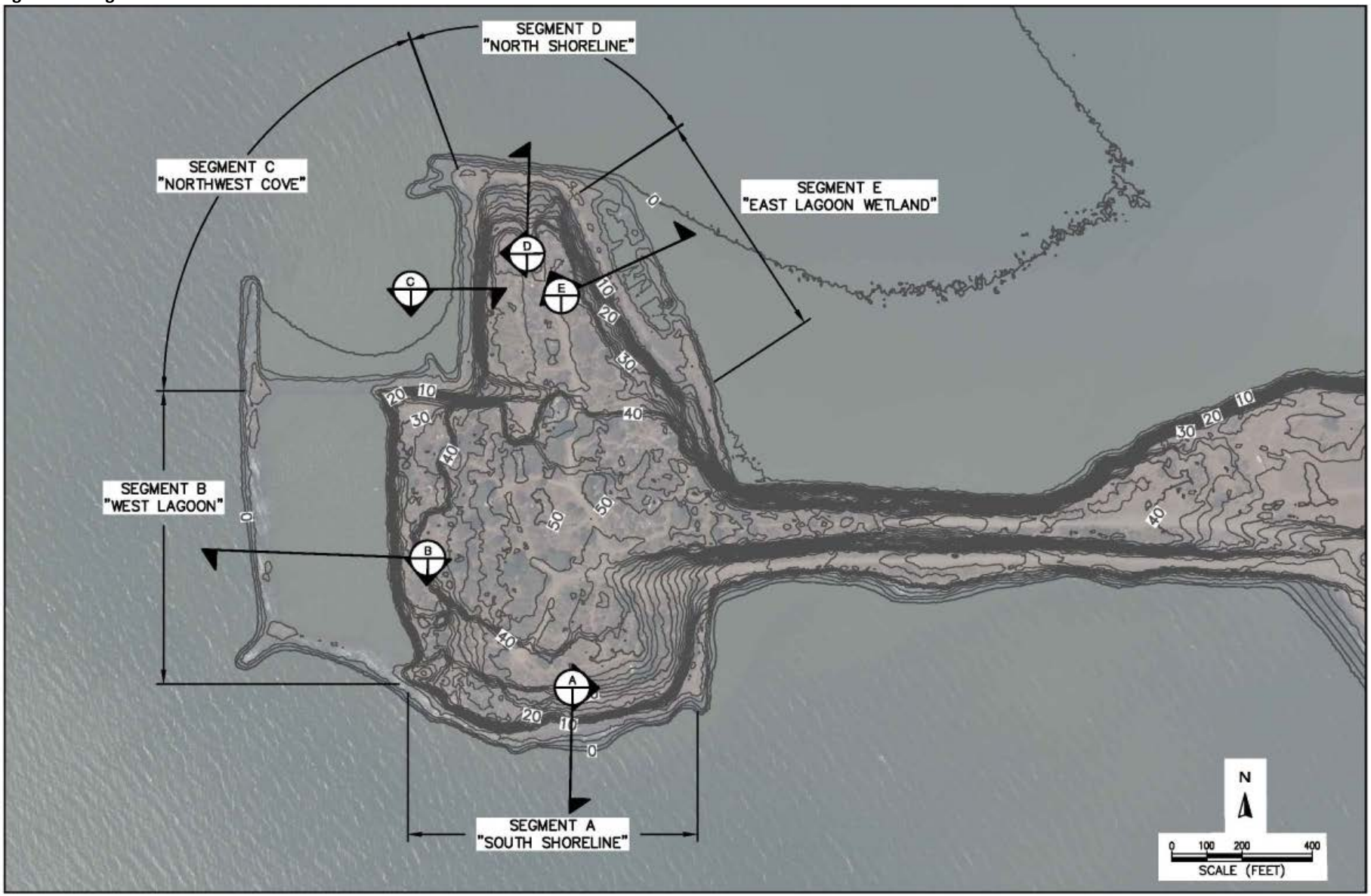
For purposes of this study, five segments of the shore were identified to have unique physical characteristics based on the geometry of the shore, geomorphic features, and the location relative to the exposure of waves and water levels. Figure 2.2 presents a plan view of the site with the limits of each of the shore segments described below. Figures 2.3 and 2.4 present typical cross sections of the five shore segments, annotated to indicate the main features of the section.

Segment A: South Shoreline. The South Shoreline segment stretches across approximately 800 feet of shore. The primary assets in this segment include rocky intertidal habitat and a rubble and slag dike that also functions as a shoreline access trail approximately 20 feet wide. The trail is backed by a steep landfill slope at the backshore that consists of concrete rubble and unconsolidated fill. Photos 2.1 and 2.2 show the South Shoreline segment with an extensive amount of concrete rubble and fill on the landfill slope and the trail that runs along the top of the rubble and slag dike. This segment is exposed to a long fetch across the Bay toward the southwest. The relatively low-lying surface of the shoreline access trail is periodically inundated by tides and flooded by wave runup and overtopping, as evidenced by puddles observed during the site visits. Section 'A' of Figure 2.3 shows a typical cross section of the South Shoreline segment.

Photos 2.1 & 2.2: *South Shoreline segment looking south (top) and north (bottom). Photos: L. White (ESA)*

[5] ESA performs land surveys and collects hydrographic data to augment traditional surveying services for the purposes of geomorphic interpretation, monitoring of project performance, and other specific uses consistent with Geologic and Landscape Surveys as defined in the Professional Land Surveyors' Act (California Business and Professionals Code). ESA does not provide traditional land survey services such as property boundaries and maps for general use by others. ESA recommends that these traditional surveying services – if needed - be accomplished by a licensed, professional land surveyor.

Figure 2.2: Segment Delineation



Source: NOAA 2013

Segment B: West Lagoon. The segment of shore on the far west of the Albany Bulb is designated as the West Lagoon segment, which stretches approximately 850 feet from the end of the South Shoreline to the north. The West Lagoon segment of shore is composed of: a rubble and slag dike that provides rocky intertidal habitat and serves as a tide-dependent shoreline access trail; a perched open water lagoon in an unfilled landfill cell; and a steep landfill slope at the backshore that consists of unconsolidated fill and concrete rubble. Photos 2.3 and 2.4 show the West Lagoon segment and composition of the rubble and slag dike that forms a large open water lagoon and the conditions of the landfill slope at the eastern edge of the lagoon. The dike acts as a low-crested breakwater that causes incident waves to break and dissipate during high tides, and completely blocks wave transmissions during lower tidal elevations. Section 'B' of Figure 2.3 shows a typical cross section of the West Lagoon segment.

Photos 2.3 & 2.4: *West Lagoon segment, looking west on the dike (top) and looking north at the landfill slope (bottom). Photos: L. White (ESA)*

Segment C: Northwest Cove. The Northwest Cove segment is a small cove that is semi-protected from waves by rubble and slag dikes that act as breakwaters. Inside the cove, extensive mudflats have established, and two pocket beaches are located in the southwest and southeast corners. Along the east boundary of the cove, perched coarse beaches have established above and in back of extensive amounts of concrete rubble, which implies the presence of wave action at the bottom of the landfill slope. Although the shore is lined with rubble, an informal shoreline access trail is used by visitors, and is backed by a steep landfill slope primarily composed of unconsolidated fill with rubble. Section 'C' of Figure 2.4 shows a typical cross section of the Northwest Cove segment.

Photos 2.5 & 2.6: *Northwest Cove segment; two small pocket beaches (top) and mudflat with rubble-lined shore (bottom). Photos: L. White (ESA) & G. Young (SCA)*

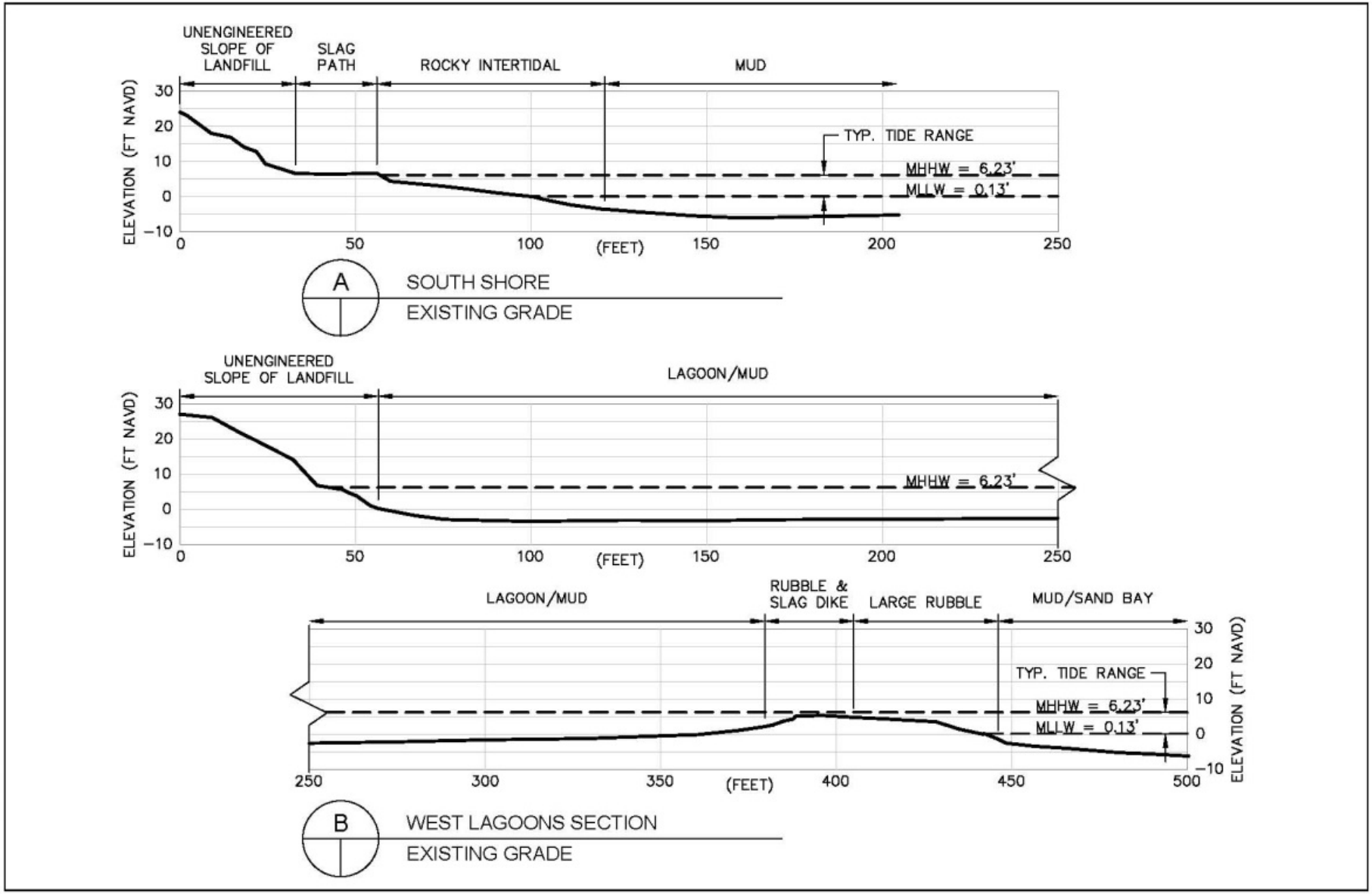
Segment D: North Shoreline. The North Shoreline segment runs west-east for approximately 300 feet of shore at the north end of the Albany Bulb. A public access trail extending from the interior of the Bulb to the shore terminates and "T's" at the shore. The shore face is composed of concrete rubble and rock that extends from mudflats offshore to an erosion scarp of unconsolidated fill. Although this segment is relatively sheltered from waves, the water levels and incident waves have caused considerable erosion on the edge of the trail. Photo 2.7 shows the eroding edge of the trail and concrete rubble during a low tide. Note the art pieces in the back of the photo; several statues have been constructed from debris and other materials in this location. Section 'D' of Figure 2.4 shows a typical cross section of the North Shoreline segment.

Photo 2.7: *North Shoreline segment;* eroding fill transitioning to concrete rubble and mudflats during low tide*. Photo: G. Young (SCA)*

Segment E: East Lagoon Wetland. The East Lagoon Wetland segment is located in the northeast section of the Albany Bulb. This segment includes approximately 600 feet of shore and is the most sheltered segment on the Bulb. A perched lagoon with wetland habitats has formed behind a rubble and slag dike, and is inundated during high tides. A shoreline access trail is backed by a steep landfill slope consisting of unconsolidated fill and rubble. Extensive mudflats are located just offshore of this segment. Section 'E' of Figure 2.4 shows a typical cross section of the East Lagoon Wetland segment.

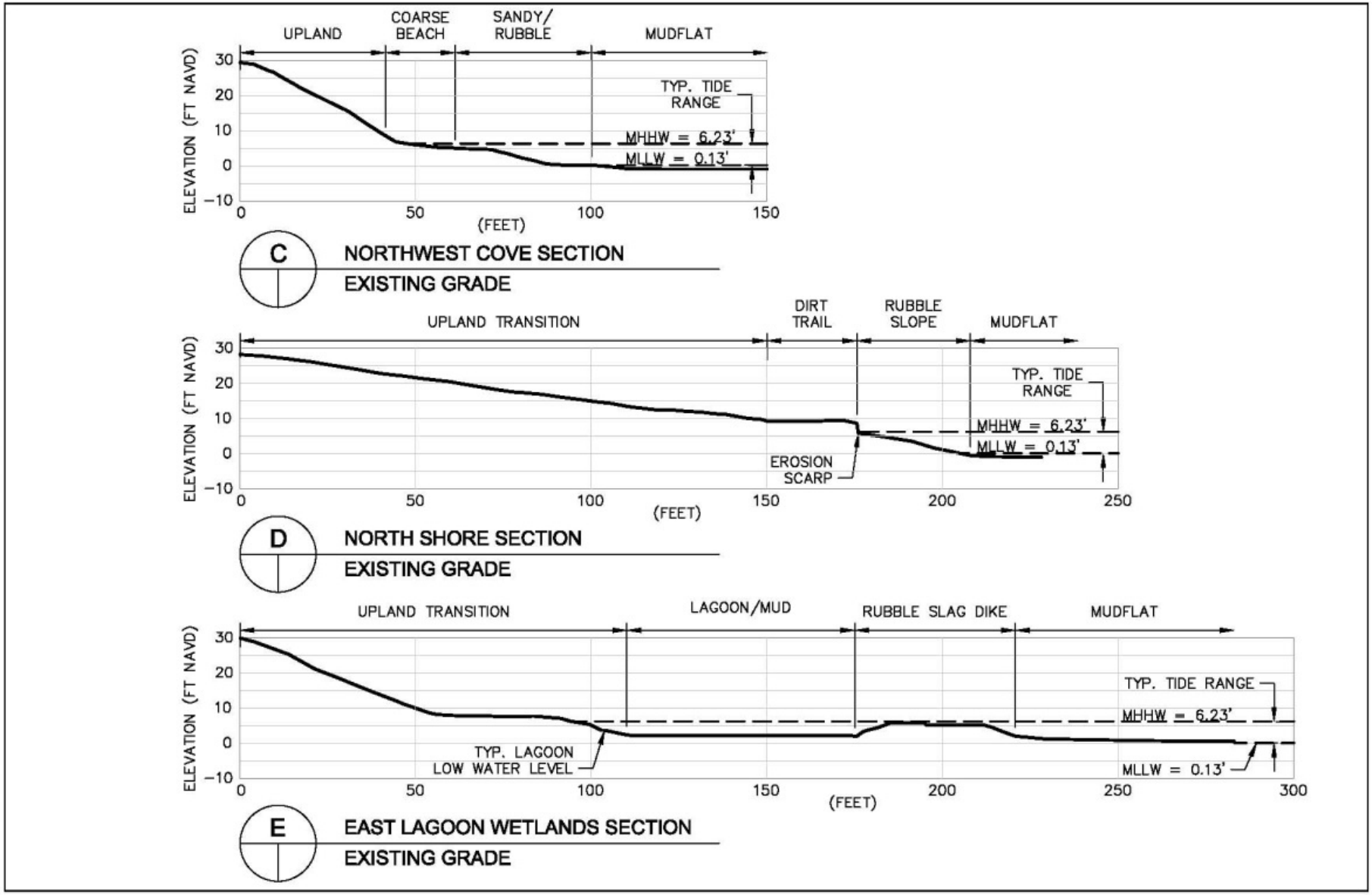
Photos 2.8 & 2.9: *East Lagoon Wetland segment; the lagoon is perched by a rubble and slag dike (top) and inundated during high tide (right). Photos: L. White (ESA)*

Figure 2.3: Typical Sections – South Shore & West Lagoon



Source: ESA 2015

Figure 2.4: Typical Sections – Northwest Cove, North Shore & East Lagoon Wetland



Source: ESA 2015

2.4 Jurisdiction, Policy & Sea Level Rise Guidance

This section describes pertinent policies and guidance for incorporating sea level rise into planning, sea level rise projections, and defines vulnerability and risk terminology. Guidance for assessing the risks of sea level rise has been issued by the State of California's Ocean Protection Council (OPC 2013). The OPC guidance generally presents projections of sea level rise through 2100, and describes recommended methods for evaluating risk and incorporating sea level rise into planning.

State of California Sea Level Rise Guidance Document

On March 15, 2013, the Ocean Protection Council (OPC) staff presented an update to the State of California Sea-Level Rise Interim Guidance Document. The purpose of the document remained the same, to help state agencies incorporate future sea-level rise impacts into planning decisions, and was updated to include the best available science from the National Academy of Sciences: Sea-Level Rise for the Coasts of California, Oregon, and Washington (NRC 2012). The guidance document seeks to enhance consistency across agencies as each develops its respective approach to planning for sea level rise. Table 2.2 summarizes the recommended sea level rise projections for use along the coast of California.

TABLE 1.2: RECOMMENDED SEA LEVEL RISE PROJECTIONS BY NRC (2012)

Time Period	Sea Level Rise Ranges	Mid-level Projection*
2000-2030	2 - 12 inches	6 ± 2 inches
2000-2050	5 - 24 inches	11 ± 4 inches
2000-2100	17 - 66 inches	36 ± 10 inches

* *The mid-level curve is referred to as a "projection" in some parts of the NRC (2012) report but is not referred to as such in the OPC (2013) State guidance adopting the NRC (2012) report. OneSF emphasizes the mid-level as a projection. However, the USACE, State, BCDC and California Coastal Commission (CCC) have not yet adopted this distinction and have maintained a range.*

The OPC's 2013 California Sea Level Rise Guidance Document contains seven recommendations for incorporating sea level rise into project planning:

1. Use sea level rise projections from the December 2009 Proceedings of National Academy of Sciences, along with agency- and context-specific considerations of risk tolerance and adaptive capacity;
2. Consider timeframes, adaptive capacity, and risk tolerance when selecting estimates of sea level rise;
3. Coordinate with other state agencies when selecting sea level rise projections, and use the same projections, where feasible;
4. Do not base future sea level rise projections on linear extrapolation of historic sea level observations;
5. Consider trends in relative local mean sea level;
6. Consider storms and extreme events; and
7. Consider changing shorelines.

The guidance document is expected to be updated regularly, to keep pace with scientific advances associated with sea level rise. This guidance is generally considered to be based on the best scientific data available as of the date of this summary, and is used by Bay Conservation and Development Commission (BCDC) when reviewing projects planned for the shoreline within BCDC's jurisdiction.

Physical Impacts of Sea Level Rise

Sea levels are rising and are expected to rise more quickly with the effects of global warming (NRC 2012). Globally, sea levels have risen primarily in response to thermal expansion of sea water and the melting of land ice in Greenland and Antarctica. Relative sea level rise is the local rate of sea level rise as determined by the global trend of sea level rise combined with regional sea level variations and local vertical land motion (VLM), and can vary significantly along the coast. Regional sea levels are affected on shorter time scales by changes in atmospheric pressure, winds, ocean currents and local ocean temperatures. Vertical land motion can occur due to tectonics (earthquakes, regional subsidence or uplift), sediment compaction, or subsidence caused by groundwater or oil and gas extraction (USACE 2011).

The following is a summary of anticipated physical impacts of sea level rise (summarized from CCC 2013):

- **Inundation (permanent wetting).** As sea level rises, more and more low-lying areas will be permanently inundated by daily tides, rendering most existing land uses and infrastructure in these areas inoperable. This type of inundation will correspond to slow and regular degradation of infrastructure, including shoreline protection. Operations and maintenance of infrastructure will also become increasingly difficult.
- **Flooding (temporary wetting).** Storms may cause flooding over larger areas because higher water levels at the coast can cause rivers or man-made outfalls to back up and cause flooding further upstream. Most coastal structures and development are designed for water levels such as a 10-year or 100-year storm . With sea level rise, these extreme storms

will happen more and more often (e.g. by mid-century, today's 100-year water level could occur once per year).

- **Increased erosion.** With higher sea levels, the amount of time that cliffs and dunes are pounded by waves at high tide (or during storms) would increase, causing greater erosion.
- **Increased wave heights and force.** Higher water levels allow waves to propagate further inland and break closer to shore. This leads to higher wave run-up and overtopping of levees and greater wave forces on structures at the coastline.
- **Changes in sediment supply and movement.** Sea level rise will cause changes to sediment supply and movement. Losses in sediment supply could worsen beach erosion and have adverse effects on long-term survival of coastal wetlands.
- **Saline intrusion.** An increase in sea level could cause salt water to intrude further into groundwater, contaminating drinking water supplies and/or increasing corrosion on buried utilities/infrastructure.

Assessing Vulnerability

Vulnerability of the shore along the Albany Bulb will be based on a combination site's exposure to flooding, its sensitivity, and its adaptive capacity:

- Evaluate *exposure*: degree to which an asset is exposed (e.g., depth of flooding due to sea level rise, wave run up and/or storm surge)
- Assess *sensitivity*: degree to which an asset is affected (e.g., temporary flooding causes minimal impact, or results in complete loss of asset or shut-down of operation)
- Determine *adaptive capacity*: ability of an asset to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or cope with the consequences

These criteria will consist of numeric rankings related to physical variables, including the inundation depth, the wave height and runup, and sea level rise amounts, and the approximate degree of the impacts. Numeric rankings for each variable will be used to develop a flooding vulnerability index for evaluating the relative vulnerability of different segments of the Albany Bulb shore.

Similarly, the increase in flood and erosion risk over time will be estimated as a function of the flood event likelihoods and consequences associated with each segment of shore along the Albany Bulb. *Consequences* are determined as a function of the potential impacts and the adaptive capacity of an asset. Consequences are higher when there are greater impacts and lower adaptive capacity. The evaluation of risk requires assuming a timeframe or time horizon to estimate the likelihood of an extreme event, and the consequences of impacting the primary assets within each shore segment.

Sea Level Rise Amounts for this Study

The amounts of sea level rise for this vulnerability study were based on the OPC (2013) guidance and the NRC (2012) projections. The high end of the ranges was used for the years 2050 and 2100:

- 24 inches (2 feet) of sea level rise by 2050
- 66 inches (5.5 feet) of sea level rise by 2100

Use of the high-end ranges in adaptation planning and design results in lower risk solutions because the likelihood of the higher sea level rise amounts occurring are lower. However, the high end ranges also will have the greatest impact on the shore, and so were selected as the most appropriate amounts to use for assessing the vulnerability of the Albany Bulb shore.

2.5 Vulnerability Assessment

Vulnerability of the assets located along the Albany Bulb shore is assessed by examining each asset's exposure, sensitivity and adaptive capacity. The primary assets considered include:

- The landfill
- Habitat zones
- Public access and recreation

In this section we first discuss the coastal hazards that may potentially impact the features at the Bulb. We then describe the assessment approach, including ranking criteria and a summary of the resulting vulnerabilities along each segment of shore. Finally, a series of tables and figures summarize the key hazards, modes of failure, risk, and consequences of failure.

Coastal Hazards

Different types of hazards are used to inform the vulnerability of the assets located along the shore of the Albany Bulb. These hazards include tidal inundation, flooding, wind wave erosion, and the associated impacts of sea level rise. Other

potential hazards, such as those related to seismic activity, are not included in this discussion.

Inundation resulting from tides is used as a key indication of the degree of exposure of an asset. Tidal inundation occurs when the asset elevation is less than typical tidal elevations. For this report we have used the mean higher high water (MHHW) datum as the measure of inundation. Over time, the inundated areas will increase due to sea level rise. Figure 2.5 presents a map of the inundated areas of the Albany Bulb for existing conditions, and with sea level rise at 2050 and 2100. Note that the low-lying and flatter areas area inundated by 2050. The narrow bands of inundation are due to the steepness of the landfill, and so the landfill does not appear to be very vulnerable to inundation. However, the inundation mapping does not include the effects of waves and wave runup: wave uprush on the shore impacts areas beyond those shown as inundated in the map and can cause potential erosion. The erosion hazard zone is not shown because the landfill is expected to be managed in a way so that it is not eroded. Appendix B presents a series of inundation maps for each reach.

Temporary flooding resulting from extreme coastal storm events is another indication for exposure. For this report we have used the 100-year still water level to characterize extreme coastal floods. Future 100-year SWL is expected to increase with sea level rise. Figure 2.6 presents a map of the flooded areas of the Albany Bulb for existing conditions, and with sea level rise at 2050 and 2100. Similar to the inundation maps, these maps do not include the effects of waves, and therefore the actual flood hazard extents may be greater than shown. Waves play an important role in erosion processes on the shore. Appendix B presents a series of flooding maps for each reach.

As described above, waves are an important driver of erosion and flooding processes, and therefore we have considered them in the vulnerability assessment. The wave runup elevations will be used to inform the conceptual improvements to the site to maintain landfill integrity and to prevent erosion.

Criteria and Ranking for Exposure, Sensitivity, and Adaptive Capacity

The vulnerability of the Albany Bulb shore was assessed for existing and future conditions with higher water levels. For this study, vulnerability is developed as a function of an asset's exposure, sensitivity, and adaptive capacity as defined by various physical parameters. A quantitative system was used to assign a ranking to each physical parameter and then calculate a vulnerability index for each shore segment.

Table 2.3 summarizes the physical parameters used to characterize exposure, sensitivity and adaptive capability, and the criteria used to rank each parameter from 1 to 5. Rankings of 1 are intended to translate to low vulnerability; that is very low exposure or sensitivity, or conversely, very high adaptive capacity.

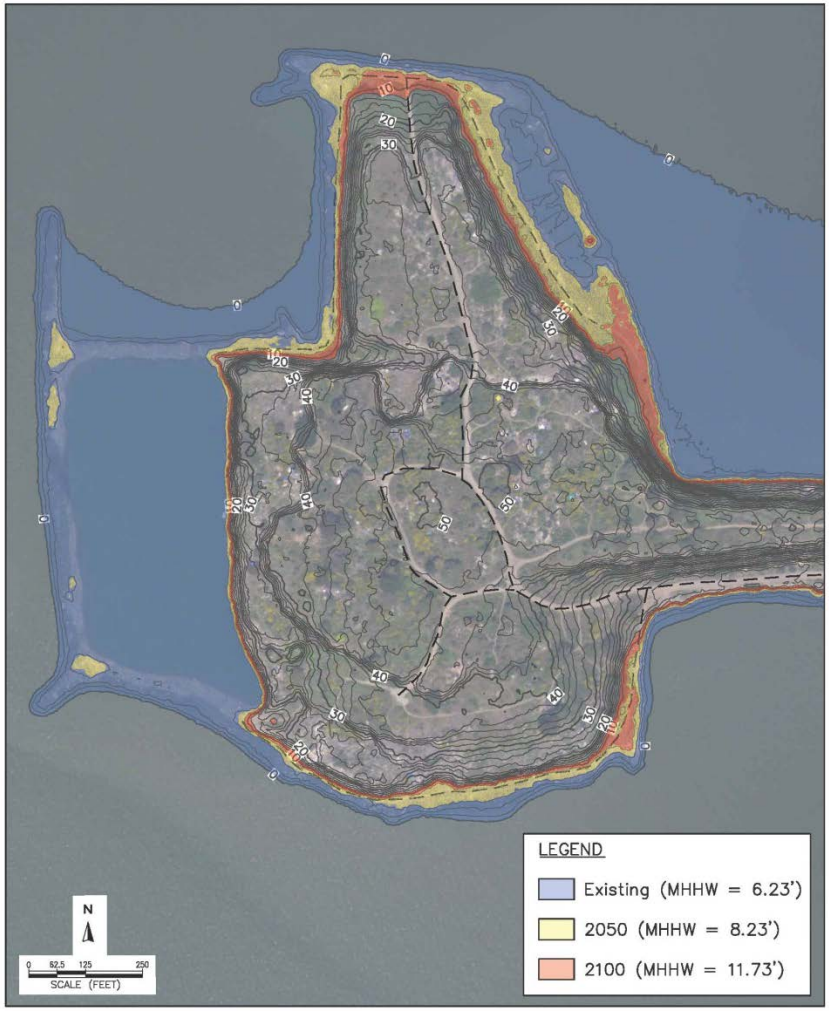
Exposure criteria provide a measure of the hydrologic drivers at the site, including water levels and waves. The following exposure criteria were developed to relate measured and estimated values to a rank:

- Fetch length: the length of fetch incident to the Albany Bulb ranges from very protected to over 10 miles of open water, and is a basic indicator of the degree of exposure.
- Inundation at MHHW: the depth of water at the toe of the backshore is an indicator of the potential for water levels and waves to impact sensitive slopes.
- Inundation from 100-year SWL: the flooding depth at the toe of the backshore is an indicator of the degree of flooding that can impact the landfill. Figures 2.7 and 2.8 show each of the shore segment profiles with the existing and future 100-year SWL.
- Extreme depth-limited wave height at toe: a measure of the potential extreme wave heights incident on a shore segment that could cause flooding and erosion.
- Extreme wave runup: a measure of the vertical height of wave uprush on the shore or a structure that can cause flooding and erosion.

Sensitivity criteria provide an indication of the degree of potential impact that can result from being exposed to hydrologic process. The following sensitivity criteria were developed to characterize the materials and slopes of the intertidal shore and the backshore:

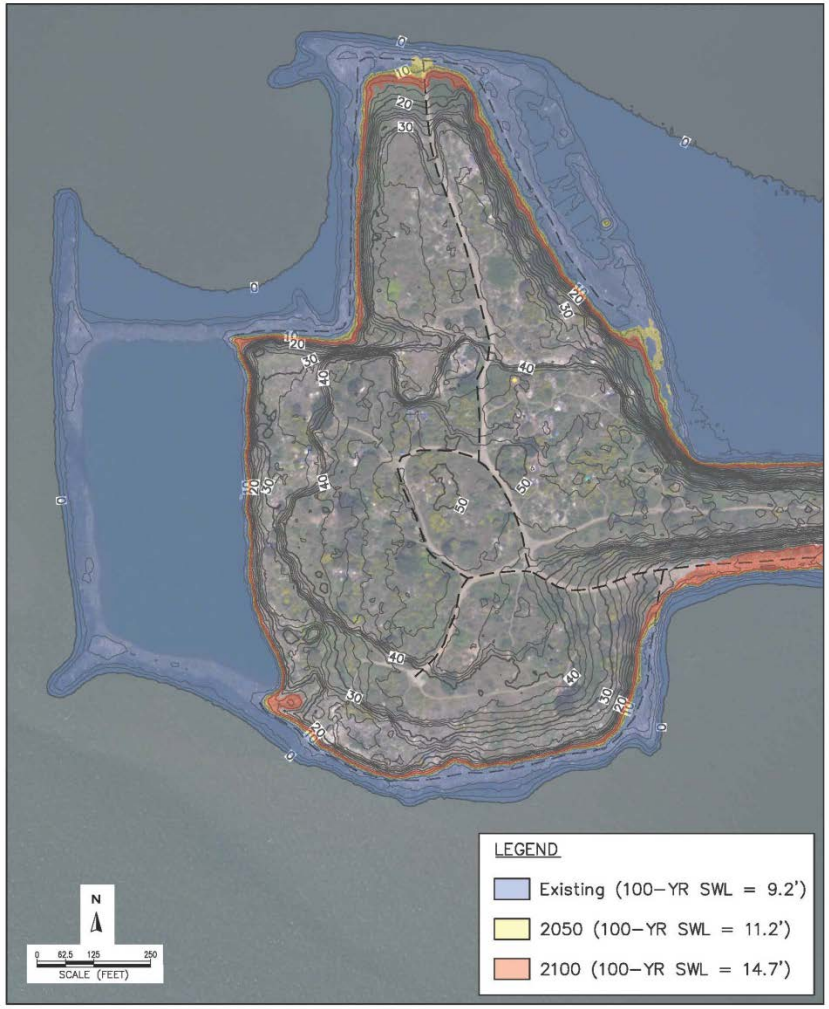
- Backshore materials: the backshore was characterized from being well protected by extensive armor rock and rubble, to being unprotected shore primarily composed of unconsolidated fill materials.
- Backshore slope: the slopes of the backshore landfill were estimated; steep slopes are more unstable and experience higher wave runup than gentler slopes, which tend to be more stable and dissipate the wave uprush.
- Intertidal shore materials: the various types of materials in the intertidal zone of the shore range from rocky and protected to unconsolidated fill and eroding scarps that are more sensitive.

Figure 2.5: Area Inundated at Existing and Future MHHW



Source: NOAA 2013
2-ft contours shown; MHHW = Mean Higher High Water

Figure 2.6: Area Inundated at Existing and Future 100-yr Still Water Level

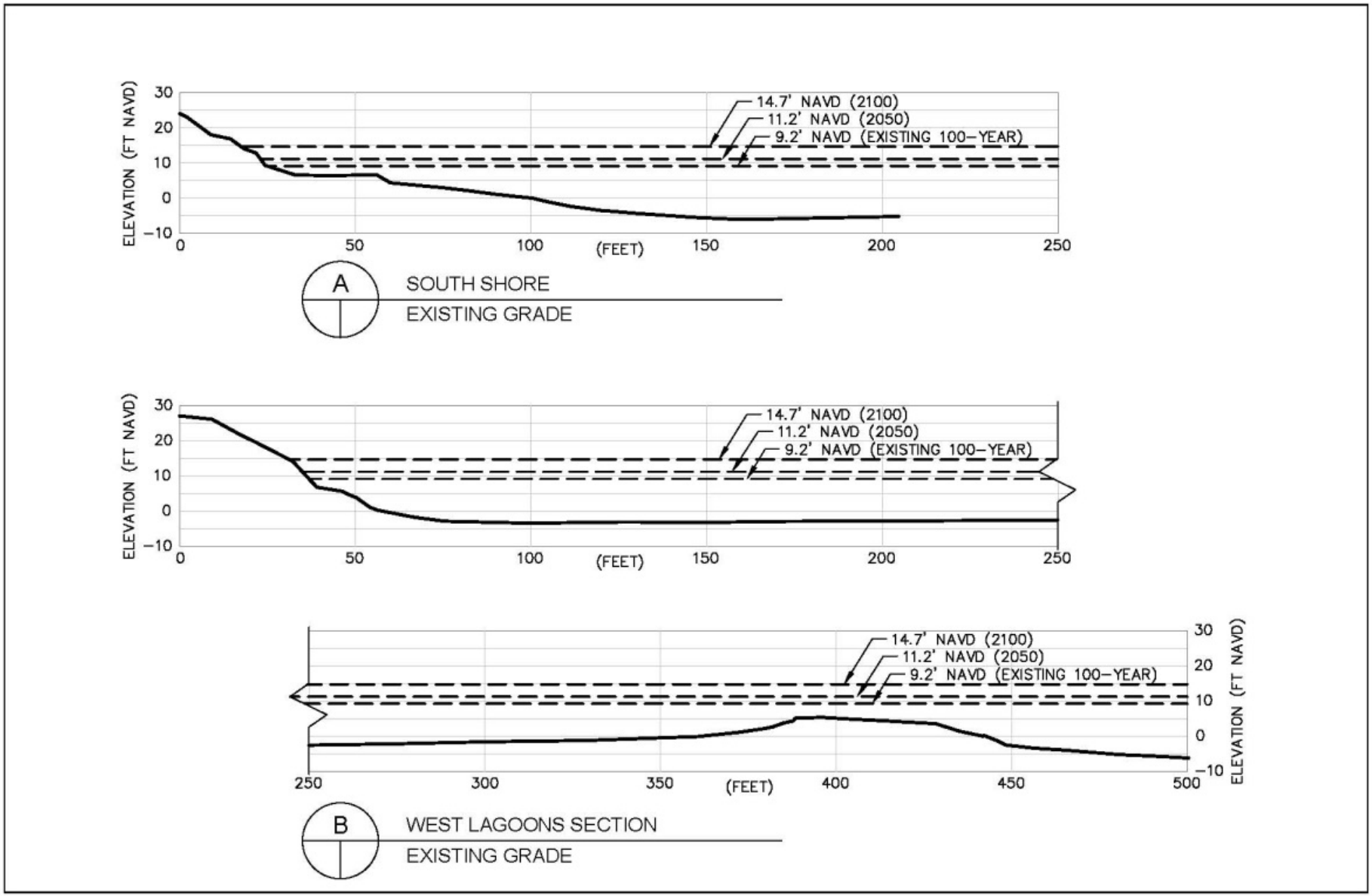


Source: NOAA 2013
2-ft contours shown; SWL = Still Water Level

TABLE 2.2: VULNERABILITY RANKING CRITERIA FOR EXPOSURE, SENSITIVITY AND ADAPTIVE CAPACITY

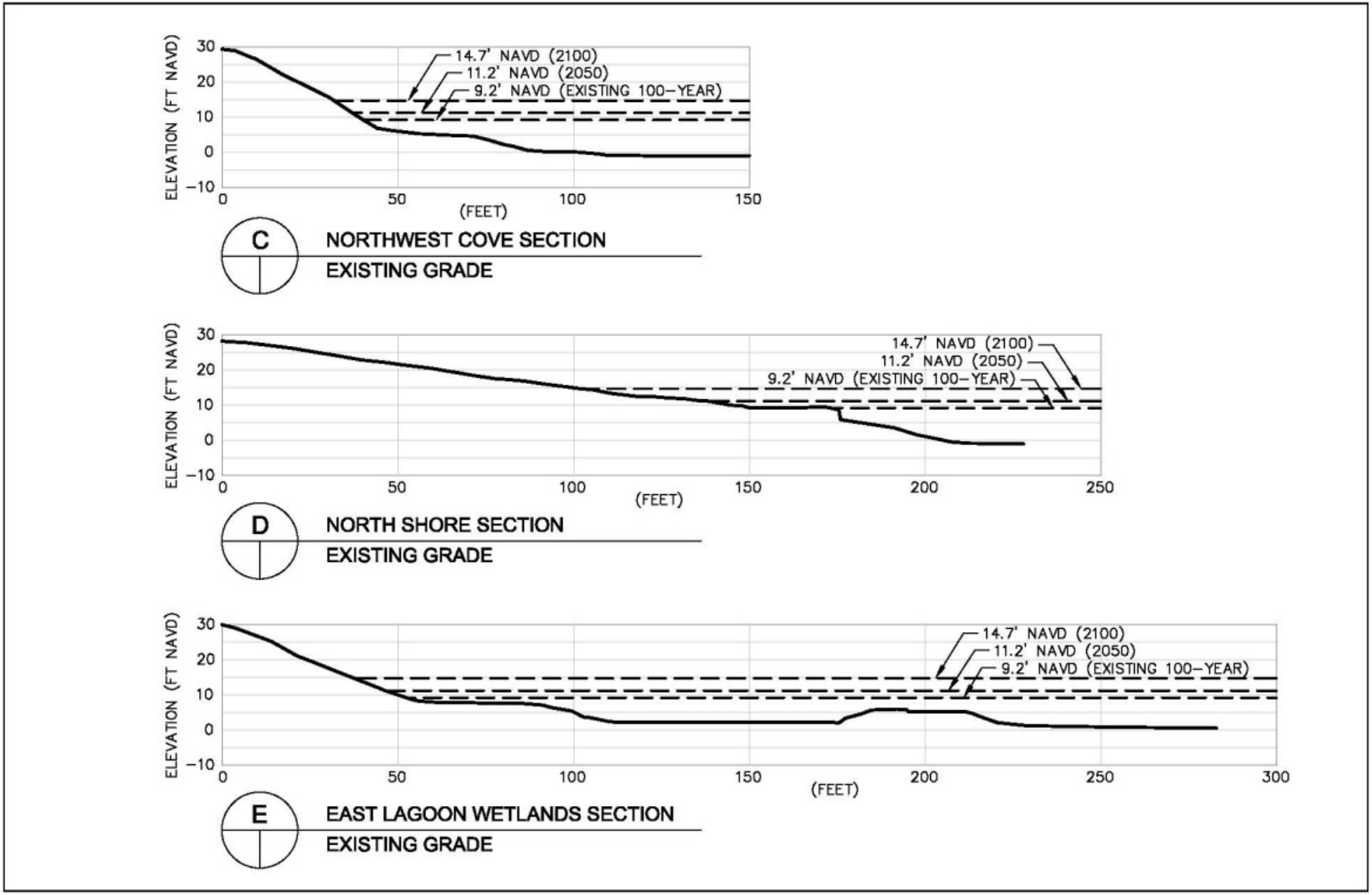
Exposure Criteria					
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Rank	1	2	3	4	5
Fetch Length (mi)	Protected	<2	2 – 5	5 – 10	>10
Inundation at MHHW (feet)	<0	0 – 1	1 – 3	3 – 5	>5
Inundation from 100-year SWL (feet)	<0	0 – 1	1 – 3	3 – 5	>5
Extreme Depth-limited Wave Height at toe (feet)	0	0 – 1	1 – 2	2 – 3	>3
Extreme Wave Runup Height (ft)	0	0 – 2	2 – 4	4 – 6	>6
Sensitivity Criteria					
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Rank	1	2	3	4	5
Backshore Materials	Armor rock and concrete rubble	Predominantly concrete rubble	Concrete rubble; unconsolidated fill	Unconsolidated fill with some rubble	Unconsolidated fill
Backshore Slope (H:V)	Gentle >10:1	10:1 – 5:1	Moderate 5:1 – 3:1	3:1 – 1:1	Steep <1:1
Intertidal Shore Materials	Rock, concrete rubble and slag	Predominantly concrete rubble	Coarse beach, wetland, mudflat with wave break	Unconsolidated fill with some rubble	Unconsolidated fill; existing erosion scarp
Intertidal Slope (H:V)	Gentle >20:1	20:1 – 10:1	Moderate 10:1 – 5:1	5:1 – 1:1	Steep <1:1
Adaptive Capacity Criteria					
	Very High	**High**	**Moderate**	**Low**	**Very Low**
Rank	1	2	3	4	5
Space for Backshore Transgression	Extensive room	--	Limited Room	--	No Room
Resilience of Shore Type	Coarse beach	Wetland	Mudflat	Armor and concrete rubble	Unconsolidated fill

Figure 2.7: South Shore and West Lagoon – Existing and Future 100-Year Still Water Level



Source: ESA 2015

Figure 2.8: Northwest Cove, North Shore & East Lagoon Wetland – Existing and Future 100-Year Still Water Level



Source: ESA 2015

- Intertidal slope: the slopes of the intertidal zone were estimated; gentle slopes dissipate wave energy and limit the wave runup elevations, and steep slopes cause much higher elevations of wave runup and have a lower stability and prone to erosion.

The following adaptive capacity criteria were developed to indicate how the different types of shore at the Albany Bulb would respond and cope with impacts:

- Space for backshore transgression: a measure of the room available for habitats and shoreforms to migrate to with higher water levels, or for adaptation strategies to be implemented.
- Resiliency of shore type: indicates the ability of particular shoreforms to respond to rising sea level, such as the ability of transgressional features like beaches and wetlands to move upward and landward if a sufficient amount of sediment is available, as compared to the more static features like rock armor and landfill.

For each of the five shore segments, ranks were assigned to each physical parameter based on the criteria listed in Table 2.3. More detail on calculation of the ranking (based on observed or estimated conditions) is included in Appendix C. For existing conditions, ranks were tabulated for the exposure, sensitivity and adaptive capacity criteria. For future years at 2050 and 2100, new ranks were tabulated only for the exposure; it was assumed that the sensitivity and adaptive capacity does not change in the future. This assumption is likely to result in relatively lower overall vulnerability than if a future case of adaptive capacity is developed, which is likely to be lower due to there being less space for transgression or for implementing adaptation approaches in the future.

Results of the Vulnerability Index

Overall values of exposure, sensitivity, and adaptive capacity were computed by averaging the ranks associated with each criterion. Similarly, the vulnerability index for existing and future conditions was estimated as the average of each shore segment's overall exposure, sensitivity, and adaptive capacity. Table 2.4 presents a summary of the calculated values of exposure, sensitivity, and adaptive capacity, and the resulting vulnerability index for each shore segment.

The calculated values of the vulnerability index vary widely between shore segments, and generally increase over time for all locations. The South Shore segment ranked the highest vulnerability, primarily due to its higher exposure and low adaptive capacity, relative to the other shorelines segments. The vulnerability index is most indicative as a relative measure of vulnerability between shore types. This is because the calculated values are not necessarily absolute measures of the actual vulnerability; but rather provide a quantitative and uniform approach to prioritize actions. The vulnerability index also does a fair job of indicating the vulnerability over time. Inspection of the overall exposure values reveals that although some shore segments are fairly protected for the existing condition, they may become highly exposed to flooding and erosion with higher sea levels. This is particularly evident for the West Lagoon segment, for which the rubble and slag dike located offshore limits wave action in the site for existing conditions. In the future, waves will likely transmit over the dike during periods of high tide, exposing the shore to wave action.

TABLE 2.3: VULNERABILITY INDEX FOR SHORE SEGMENTS AND SUMMARY OF RANKING

Calculated Vulnerability Index (Range 1 to 5: Low to High)					
Shore	**South Shoreline**	**West Lagoon**	**Northwest Cove**	**North Shoreline**	**East Lagoon Wetland**
Exposure					
Existing	4.0	3.4	2.4	1.8	1.4
2050	4.4	4.2	2.6	2.2	1.8
2100	4.8	4.8	3.4	2.2	2.4
Sensitivity	3.0	3.5	3.0	3.8	2.8
Adaptive Capacity	4.5	1.5	2.0	3.5	2.5
Vulnerability					
Existing	***3.8***	***2.8***	***2.5***	***3.0***	***2.2***
2050	***4.0***	***3.1***	***2.5***	***3.2***	***2.4***
2100	***4.1***	***3.3***	***2.8***	***3.2***	***2.6***

Actual assessment of the vulnerability should not rely solely on the calculated vulnerability index, and should include an assessment of the consequences for each asset. Because the selection of criteria involves a degree of subjectivity, the resulting values may not adequately represent potential impacts to assets that are not fully accounted for. For example, additional habitat related criteria may alter the results, particularly the East Lagoon Wetland segment, for which the

vulnerability is likely underestimated due to assumptions made in ranking its adaptive capacity.

Summary of Vulnerability and Consequences

The following tables and figures summarize the vulnerability of the primary assets identified in each shore segment. These primary assets include the landfill and its integrity, habitats, and access. For each of the five shore segments, the vulnerability is summarized using the following categories:

- Functions: what are the functions of the assets, and what service or value do they provide?
- Location: where are the assets located?
- Types of hazards: to what hazards are the assets potentially exposed?
- Proximity to hazard: how close is the asset located to the hazard?
- Modes of failure: how do the hazards impact the assets?
- Consequence of failure: what are the repercussions due to the impacts to the assets?

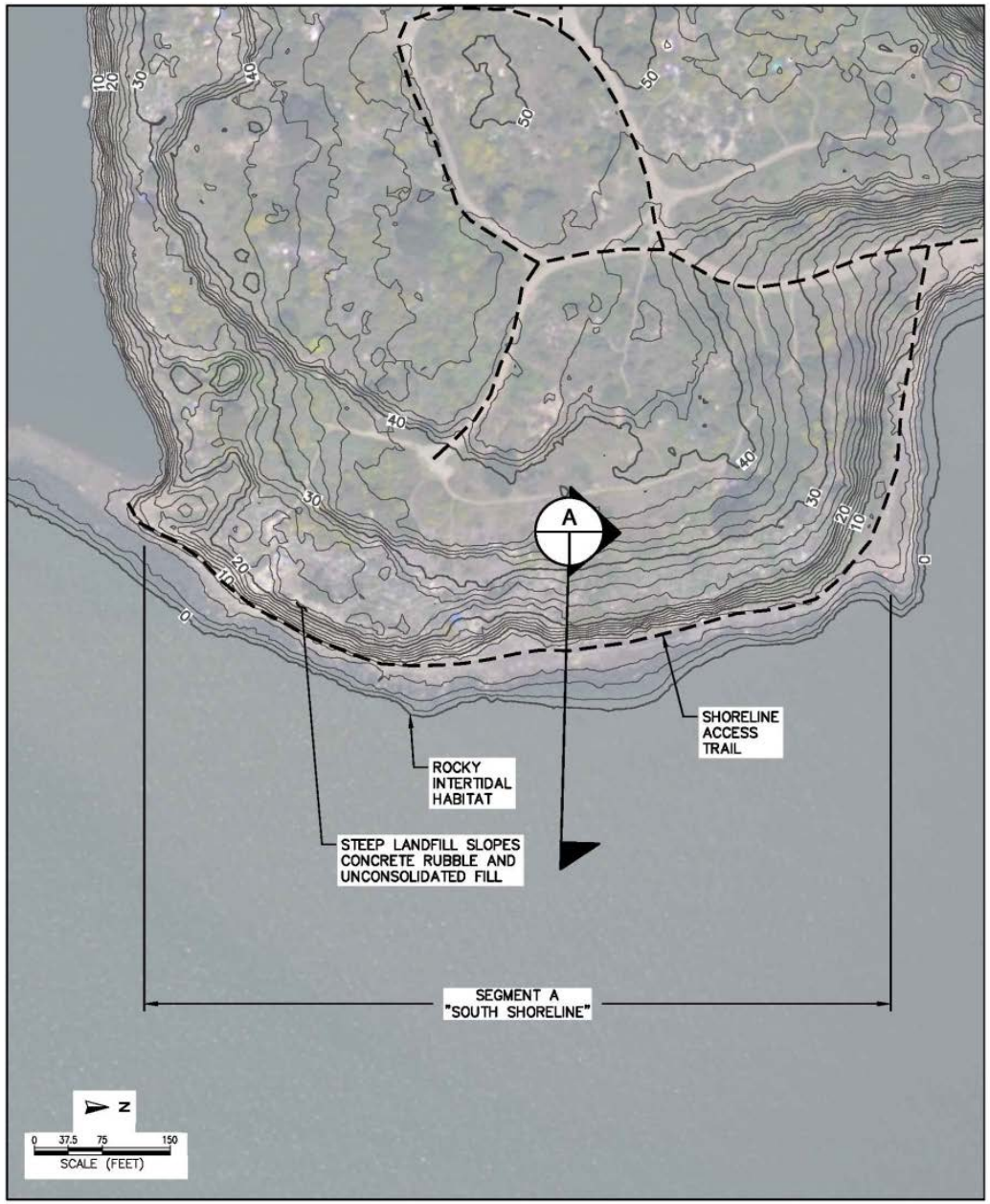
For each segment, the assets are shown in plan view, and vulnerabilities are summarized in table format, as follows:

- South Shoreline - Table 2.5 and Figure 2.9
- West Lagoon - Table 2.6 and Figure 2.10
- Northwest Cove - Table 2.7 and Figure 2.11
- North Shore line - Table 2.8 and Figure 2.12
- East Lagoon Wetland - Table 2.9 and Figure 2.13

TABLE 2.5: VULNERABILITY SUMMARY FOR SOUTH SHORELINE SEGMENT

Category	Landfill	Habitat	Access & Recreation
Function	• Landfill containing construction debris	• Rocky intertidal zones provide habitat for different algae, plants, birds, fish and mammals	• Trail provides shoreline access and passive recreation
Location	• South shoreline reach of landfill extends from subtidal elevations to over 50 feet NAVD	• Rocky intertidal habitat located along the shore of the Bulb at elevations between 0 and 6 feet NAVD	• Trail runs along the shore on top of a rubble and slag dike at approximate elevations between 6 and 8 feet NAVD
Types of Hazards	• Temporary flooding from extreme coastal storms • Increased erosion could result from waves rushing up on the slopes of the landfill • Tidal inundation from sea level rise	• Tidal inundation from sea level rise • Wind wave erosion	• Temporary flooding from extreme coastal storm events • Tidal inundation from sea level rise • Wind wave erosion
Proximity to Hazard	• Exposed portions of the landfill are located just a few feet above the existing high tide elevations and are periodically impacted by waves • Sea level rise will increase the exposure of tidal inundation and flooding before 2050	• The rocky intertidal habitat is located adjacent to the slag dike and the steep and unstable landfill slope	• The trail is located at or near the existing high tide elevations and regularly inundated by tides
Modes of Failure	• Extreme coastal flood event with large waves impacts the landfill, causing erosion • Tidal inundation increases with sea level rise and results in inundation allowing waves to directly impact the landfill, causing erosion	• Habitat is covered in landfill debris due to erosion and unraveling of the landfill • Tidal inundation limits type of habitat available	• Sea level and causes permanent inundation of the trail • Wind wave erosion of shore
Consequence of Failure	• Landfill causes environmental impacts to the Bay and water quality • Materials that are not compatible with habitat and recreation become exposed	• Loss of habitat	• Public access is lost

Figure 2.9: Assets for Segment A – South Shoreline

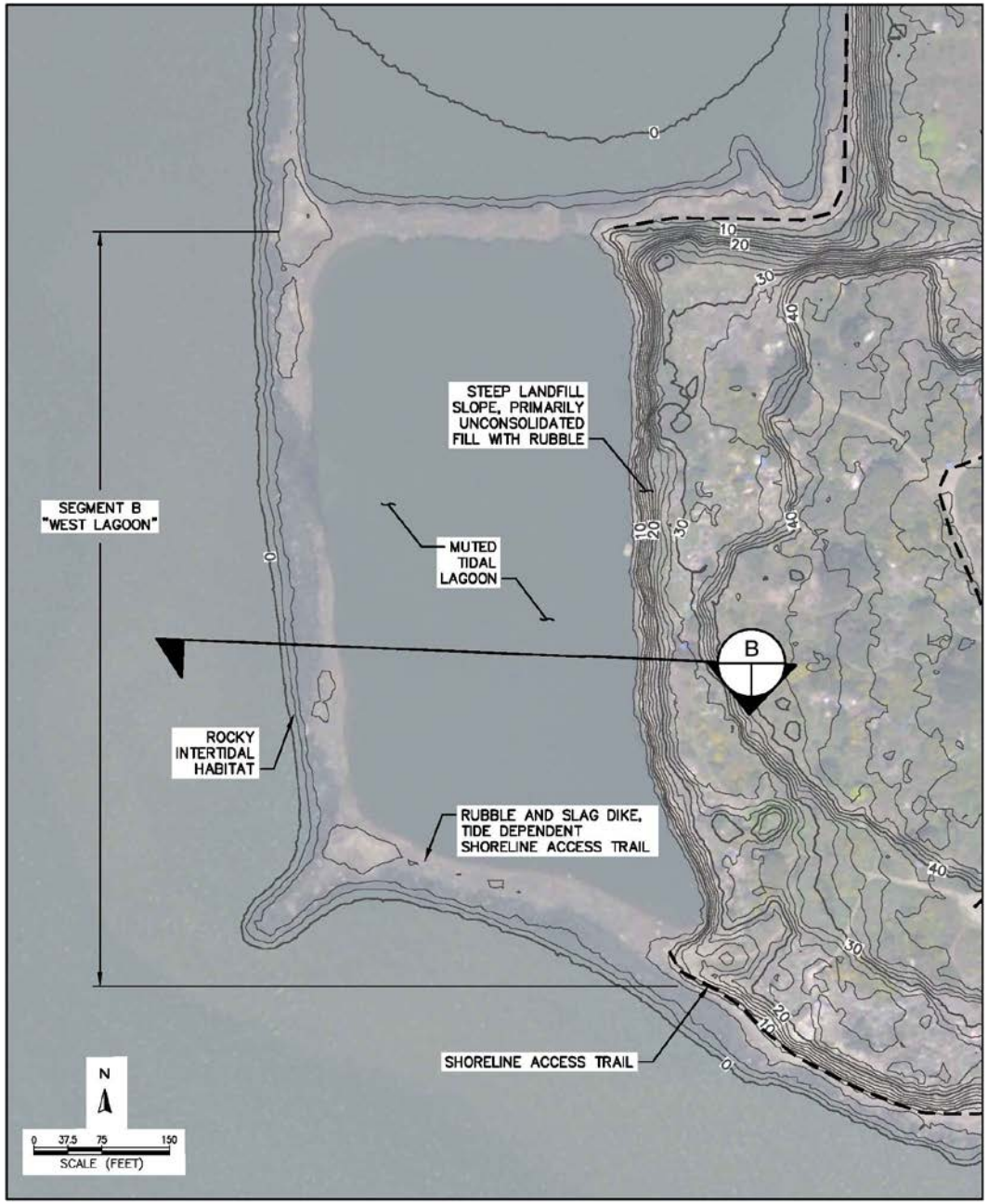


Source: NOAA 2013

TABLE 2.6: VULNERABILITY SUMMARY FOR WEST LAGOON SEGMENT

Category	Landfill	Habitat	Access & Recreation
Function	• Landfill containing construction debris	• Rocky intertidal zones provide habitat • Open water lagoon habitat	• Passive recreation area for birding and other observation of the Bay • Tidal dependent public access trail along slag dike
Location	• Slag and rubble dike around perimeter of lagoon up to approximately high tide elevation • Steep slope of landfill from lagoon up to elevations greater than 30 feet NAVD	• Rocky intertidal habitat along the outer edge of the slag and rubble dike • Open water lagoon located between the dike and the landfill uplands	• Tidal dependent trail located on crest of dike, approximately elevation 6-8 feet NAVD
Types of Hazards	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion of landfill	• Tidal inundation from sea level rise • Wind wave erosion	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion
Proximity to Hazard	• Exposed portions of the landfill are located just a few feet above the existing high tide elevations • Sea level rise will increase the exposure of tidal inundation, flooding, and wind waves	• Rocky intertidal habitat within existing tide range, and may be sensitive to changes in sea level elevation • Open water lagoon located near high tide elevation, likely to experience increased wave action as sea level increases	• The trail is located at or near the existing high tide elevations and regularly inundated by existing high tides
Modes of Failure	• Extreme coastal flood event with large waves impacts the landfill, causing erosion • Tidal inundation increases with sea level rise and results in inundation allowing waves to directly impact the landfill, causing erosion	• Habitat zone shrinks as it becomes more inundated with sea level rise	• Coastal flooding overtops the trail • Sea level rise permanently inundates the trail, making it inaccessible • Erosion of the trail
Consequence of Failure	• Erosion of landfill causes environmental impacts to the Bay and water quality • Materials that are not compatible with habitat and recreation become exposed	• Loss of habitat	• Public access is lost

Figure 2.10: Assets for Segment B – West Lagoon

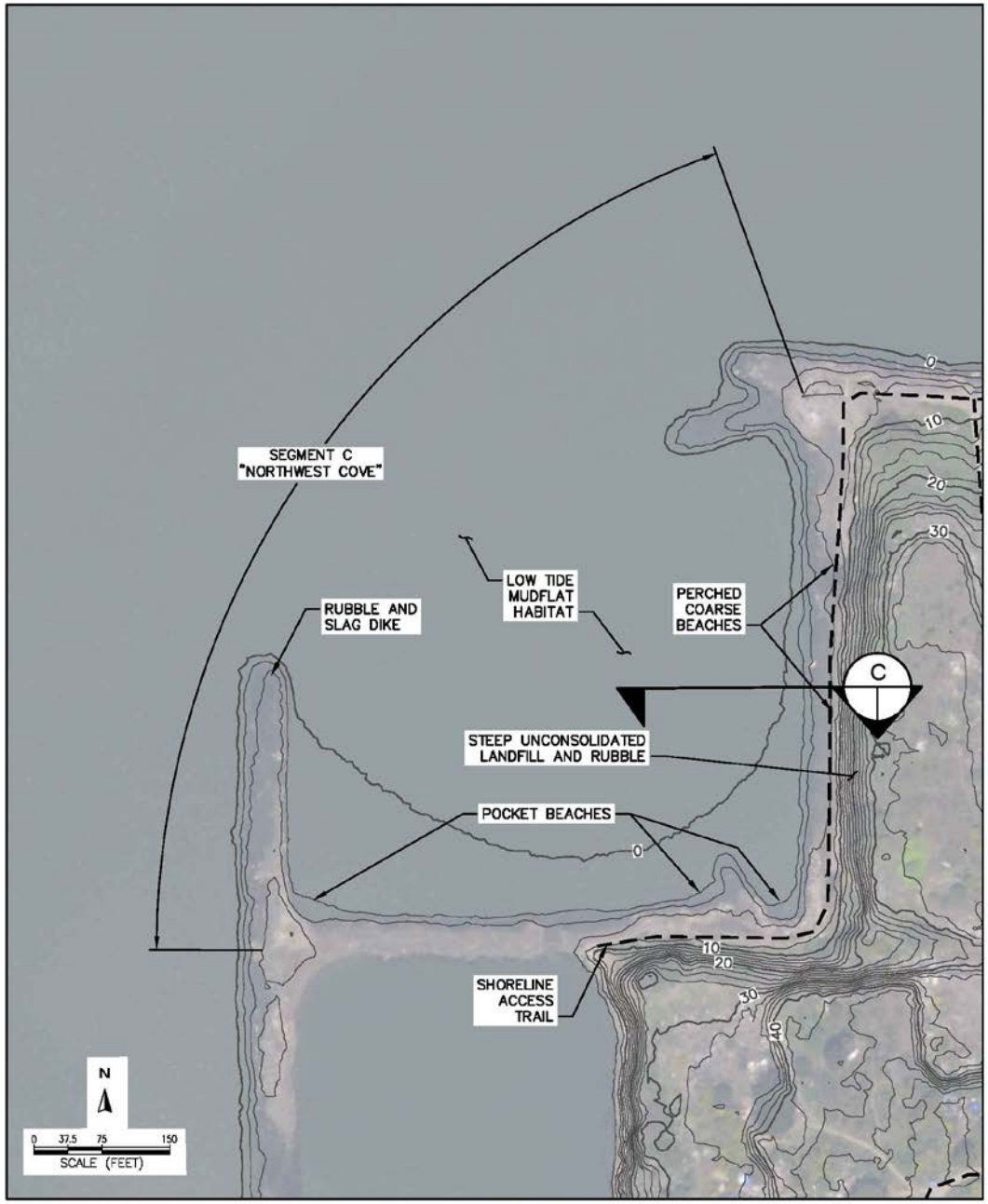


Source: NOAA 2013

TABLE 2.7: VULNERABILITY SUMMARY FOR NORTHWEST COVE SEGMENT

Category	Landfill	Habitat	Access & Recreation
Function	• Landfill containing construction debris	• Rocky intertidal habitat • Mudflat habitat • Coarse sand beaches	• Passive recreation area for birding and other observation of the Bay • Tidal dependent public access trail along slag dike
Location	• Steep slope of landfill located behind small cove with mudflats and beaches extends up to elevations greater than 30 feet NAVD	• Rocky intertidal habitat along the outer edge of the slag and rubble dike • Mudflat located in cove area	• Tidal dependent trail located adjacent to steep landfill slopes
Types of Hazards	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion of landfill	• Tidal inundation from sea level rise • Wind wave erosion	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion
Proximity to Hazard	• Exposed portions of the landfill are located just a few feet above the existing high tide elevations • Sea level rise will increase the exposure of tidal inundation, flooding, and wind waves	• Rocky intertidal habitat within existing tide rang • Mudflat and beaches in tidal elevation ranges	• The trail is located at or near the existing high tide elevations and regularly inundated by existing high tides
Modes of Failure	• Extreme coastal flood event with large waves impacts the landfill, causing erosion • Tidal inundation increases with sea level rise and results in inundation allowing waves to directly impact the landfill, causing erosion	• Habitat zone shrinks as it becomes more inundated with sea level rise • Sea level rise causes geomorphic changes of mudflat and beaches	• Coastal flooding overtops the trail • Sea level rise permanently inundates the trail, making it inaccessible • Erosion of the trail
Consequence of Failure	• Erosion of landfill causes environmental impacts to the Bay and water quality • Materials that are not compatible with habitat and recreation become exposed	• Loss of habitat	• Public access is lost

Figure 2.11: Assets for Segment C – Northwest Cove

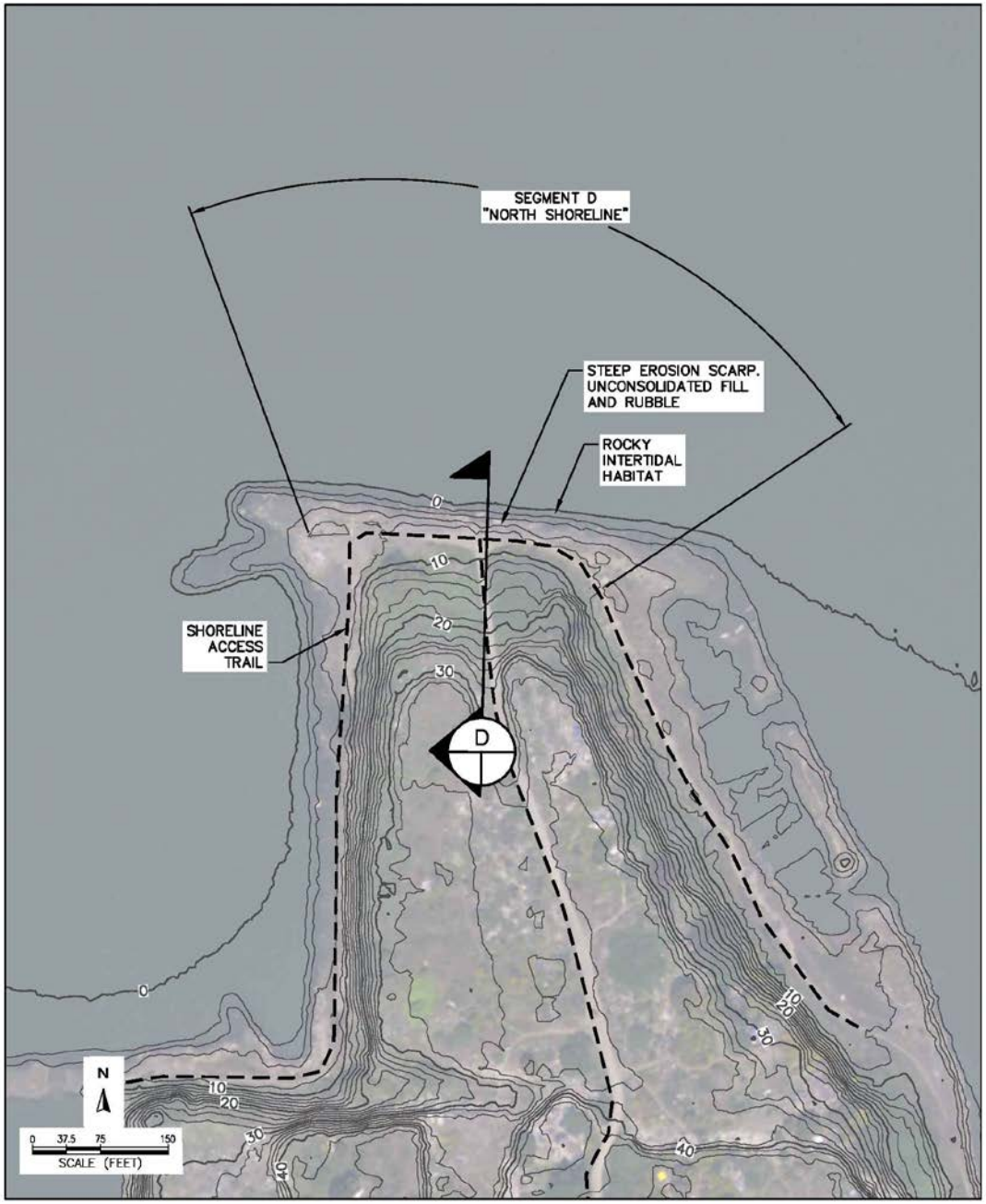


Source: NOAA 2013

TABLE 2.8: VULNERABILITY SUMMARY FOR NORTH SHORELINE SEGMENT

Category	Landfill	Habitat	Access & Recreation
Function	• Landfill containing construction debris	• Rocky intertidal habitat • Mudflat habitat	• Passive recreation area for birding and other observation of the Bay • Public access trail along shore
Location	• Landfill extends from tidal elevations to uplands areas	• Rocky intertidal habitat below trail and erosion scarp • Mudflat located offshore	• Trail located on shore above tidal elevations
Types of Hazards	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion of landfill	• Tidal inundation from sea level rise • Wind wave erosion	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise • Wind wave erosion
Proximity to Hazard	• Landfill material actively eroding at high tide elevation • Exposed portions of the landfill are located just a few feet above the existing high tide elevations • Sea level rise will increase the exposure of tidal inundation, flooding, and wind waves	• Rocky intertidal habitat within existing tide rang • Mudflat in tidal range	• The trail is located just above the existing high tide elevations • Active erosion of the landfill shore adjacent to public access trail
Modes of Failure	• Extreme coastal flood event with large waves impacts the landfill, causing erosion • Tidal inundation increases with sea level rise and results in inundation allowing waves to directly impact the landfill, causing erosion	• Habitat zone shrinks as it becomes more inundated with sea level rise • Sea level rise causes geomorphic changes of mudflat	• Coastal flooding overtops the trail • Sea level rise permanently inundates the trail, making it inaccessible • Erosion of the trail
Consequence of Failure	• Erosion of landfill causes environmental impacts to the Bay and water quality • Materials that are not compatible with habitat and recreation become exposed	• Loss of habitat	• Public access is lost

Figure 2.12: Assets for Segment D – North Shoreline

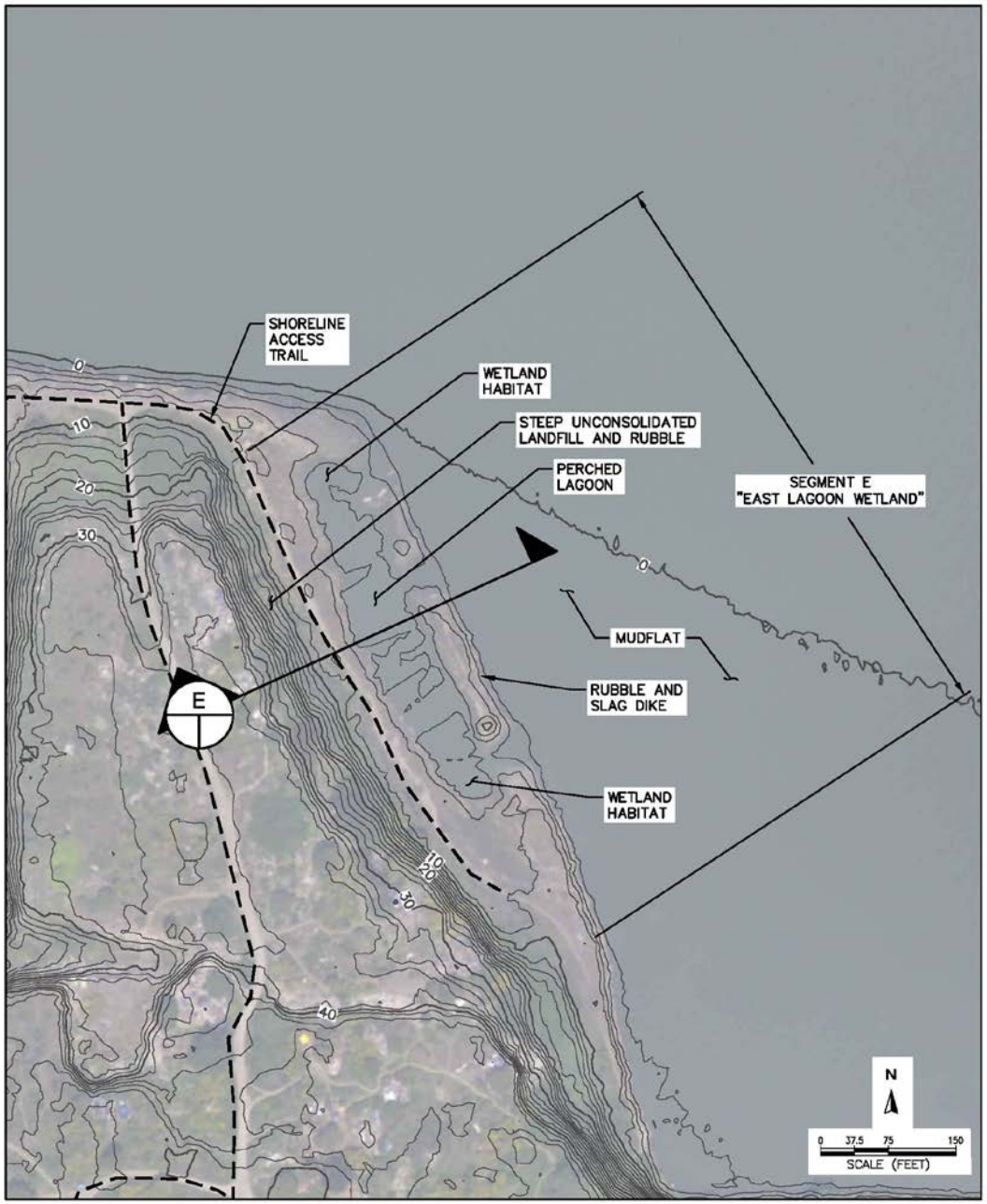


Source: NOAA 2013

TABLE 2.9: VULNERABILITY SUMMARY FOR EAST LAGOON WETLAND SEGMENT

Category	Landfill	Habitat	Access & Recreation
Function	• Landfill containing construction debris	• Rocky intertidal habitat • Muted lagoon and wetlands • Mudflat habitat	• Passive recreation area for birding and other observation of the Bay • Public access trail along shore
Location	• Landfill extends from tidal elevations to uplands areas	• Rocky intertidal habitat along slag and rubble dike • Muted tidal lagoon and wetlands located behind slag and rubble dike at low elevations of the landfill • Mudflat located offshore	• Trail located landward of lagoon wetland at bottom of landfill slope
Types of Hazards	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise	• Tidal inundation from sea level rise • Erosion	• Temporary flooding from extreme coastal storms • Tidal inundation from sea level rise
Proximity to Hazard	• Landfill material located at tidal elevations • Sea level rise will increase the exposure of tidal inundation, flooding, and wind waves	• Rocky intertidal habitat within existing tide range • Wetland and muted lagoon establish at high tide elevation • Mudflat in tidal range	• The trail is located just above the existing high tide elevations
Modes of Failure	• Extreme coastal flood event could inundate the site and cause erosion • Tidal inundation increases with sea level rise and results in inundation allowing waves to directly impact the landfill, causing erosion	• Habitat zone shrinks as it becomes more inundated with sea level rise • Sea level rise causes geomorphic changes of mudflat and wetlands	• Coastal flooding overtops the trail • Sea level rise permanently inundates the trail, making it inaccessible • Erosion of the trail
Consequence of Failure	• Erosion of landfill causes environmental impacts to the Bay and water quality • Materials that are not compatible with habitat and recreation become exposed	• Loss of habitat	• Public access is lost

Figure 2.13: Assets for Segment E – East Lagoon Wetland



Source: NOAA 2013

Sea level rise will impose irreversible changes on the assets located along the bulb. This is particularly evident for low-lying areas within 10 feet vertically of the existing high tide elevation. Figure 2.14 presents a water level exceedance curve for existing and future conditions at the Albany Bulb. The full record of water level measurements at the San Francisco Presidio tide gage was used to develop the exceedance curve, and was transformed to the Albany site based on the differences in the tidal ranges. The solid blue line represents the still water level as a function of the percent time that a particular water surface elevation is exceeded. For example, the minimum elevation recorded is exceeded 100% of the time, and the maximum elevation is exceeded 0% of the time. The solid red and green lines represent the future water level exceedance curves with sea level rise at 2050 and 2100, respectively. The black and red horizontal dashed lines in Figure 2.14 represent the existing MHHW and 100-year SWL elevations, respectively. Figure 2.14 shows that assets located at or near MHHW are very vulnerable to tidal inundation caused by sea level rise; MHHW is exceeded approximately 5% of the time under existing conditions, but will be exceeded approximately 40% and 90% of the time by 2050 and 2100, respectively. Similarly, the 100-year SWL is not exceeded often for existing conditions, but is expected to be exceeded 50% of the time by 2100, suggesting that it will be close to future mean tidal level (MTL).

Figure 2.14: Water Level Exceedance Curves for Existing and Future Conditions

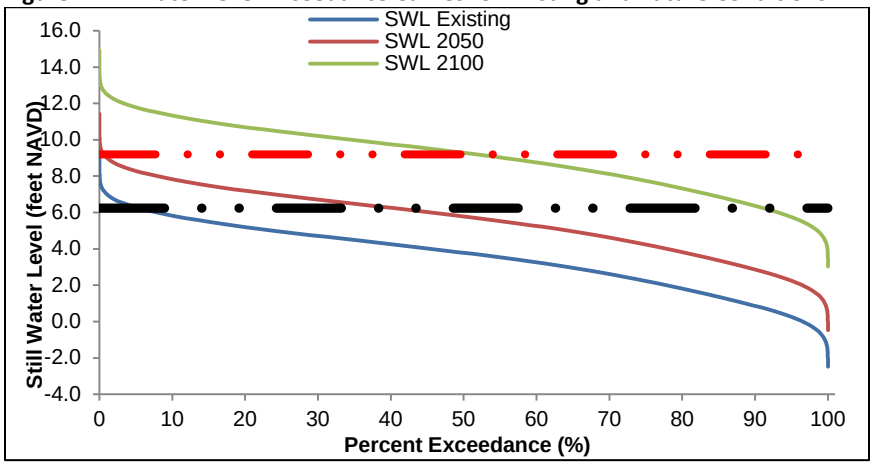
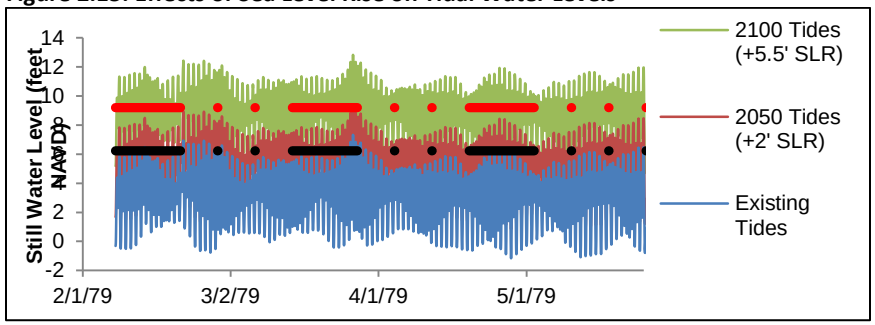


Figure 2.15 presents time series of existing and future water levels near the Bulb relative to the existing MHHW and 100-year SWL. The figure shows that the percent of time that the water level exceeds a particular elevation occurs in discrete events typical of tidal systems. For example, for the existing conditions, the MHHW elevation is exceeded by one or two high tides per day during spring tide periods that occur once or twice a month, and are not exceeded during neap tide periods when the tidal range is lower. The trail along the South Shoreline, for example, is located just above MHHW, and can be inundated every day for at least a few hours over periods of about 1 week long; the trail is not inundated for periods of up to two weeks during neap tides. However, this simplified assessment does not include wave actions, which can cause flooding of elevations greater than the SWL. With sea level rise, the MHHW elevation is exceeded every day, and therefore assets such as the trail will be permanently inundated by the tides, making it a poor candidate for continued public access. These charts are useful to evaluate the existing and future performance of the assets located in the vicinity of the existing and future tidal elevations.

Figure 2.15: Effects of Sea Level Rise on Tidal Water Levels



Source: NOAA Tides and Currents, Berkeley Station 9414816

2.6 Preliminary Concepts of Shoreline Improvements

Based on the vulnerability assessment and summary of existing and future conditions of the Albany Bulb site, shoreline improvement concepts will be developed during subsequent stages of this study. The section describes potential concepts for further refinement and consideration. The concepts presented are intended to address the primary objectives of: landfill integrity, habitat enhancement, and improved public access and recreation opportunities. This multi-objective approach lends itself to establishing a range of actions that can be implemented in different areas, or to serve multiple functions. The following subsections below describe three primary concepts – engineered revetment, pocket beaches and lagoon breaches – that will be developed further during the next stage of the study. In the final subsection, we describe how these three concepts may be combined, based on the principle of first stabilizing the shore of the landfill, and then enhancing habitat and/or public access as feasible.

Engineered Revetment

Reaches of the shoreline can be protected by construction of engineered revetments, consisting of large structure built of quarried armor stone extending from the toe of the landfill to approximately the vertical limits of extreme wave runup. The engineered revetment approach is effective at maintaining landfill integrity to prevent erosion, but is less compatible with habitat and public access features. However, for vulnerable sections of the shore, such as the South Shoreline, engineered revetment is likely to be the best candidate for protecting the landfill from erosive impacts of water levels and waves. Along the South Shoreline reach, the revetment would extend from the bed of the Bay at the landfill toe up the slope to the future 100-year TWL. The engineered revetment could be designed to the projected sea level conditions at 2050, with a plan to extend the revetment or construct higher in the future for higher sea level.

Photo 2.10 shows an engineered rock revetment at the Coyote Point Marina in San Mateo County. This type of structure could be constructed on the irregular shore of the Bulb as an overlay, where the existing concrete rubble is reworked to provide a more stable base, and then covered with bedding stone to create a smooth working surface on which rock slope protection fabric and armor stone is placed. The size of the rock should be selected based on the wave height to which the structure will be exposed. Design of the structure should attempt to minimize the amount of bay fill for permitting reasons.

Some alternatives for the engineered revetment include how the existing slopes are managed: slopes can be maintained as existing, resulting in higher armoring and potentially greater amount of Bay fill, or slopes can be laid back, resulting in lower top elevation of armoring and opportunity for integrating into the existing shore protection. These two alternatives rely on whether excavating the existing landfill materials and placement at upland locations or offhauling is acceptable. Benefits of cutting into the landfill include an improved stability due to the shallower slope, which increases public access opportunities and integration of other features into the improvements. However, once the landfill materials are excavated, placement elsewhere on the site may not be desired, and offhaul costs are likely to be high.

Implementation of the engineered revetments along the different shore segments of the Bulb may be phased and configured differently. The South Shoreline segment will likely consist of the largest rock and with the highest elevation of armoring because of the existing exposure to significant waves and water levels. The West Lagoon segment, on the other hand, is currently protected from wave impacts by the existing slag and rubble dike, and so therefore construction of the engineered revetment may be able to be delayed until after other measures are taken to improve the site. These kinds of considerations should go into the conceptual project development.

Photo 2.10: *Example of an engineered revetment at Coyote Point, San Mateo. Photo: B. Battalio (ESA)*

Pocket Beaches

Pocket beaches can be constructed in areas where the longshore drift is minimized by the presence of headlands or structures that alter the potential wave actions and prevent movement of sediment from the beach. Pocket beaches can be constructed by placing coarse sand on the shore in the intertidal zones up to elevations of the typical wave runup. Sandy pocket beaches are best suited to discrete locations that are relatively sheltered, and where small beaches currently exist.

Photo 2.11 presents an example of a constructed pocket beach along an engineered shore in Richmond. In this case, a gap in the engineered revetment was filled with sand, which created a stable beach and improved public access to the water. This is a good example of opportunity for integrating beaches into the engineered protection of the landfill.

Because beaches are shaped by the waves and water levels, they will move with long-term changes in sea level as long as sufficient sediment is available in the system. A wide beach that experiences an increase in sea levels over time will adjust on its own accord by increasing in elevation. However, this will likely result in a narrowing of the beach as well, and therefore a sufficient amount of sand should be placed initially in anticipation that the beach will transgress.

Photo 2.11: *Example of a constructed pocket beach along engineered shore in Richmond. Photo: B. Battalio (ESA)*

Beaches also provide a habitat benefit. Several types of birds and other animals use beaches as a home or for feeding. Sandy beaches are compatible with other adjacent habitat types too, and would cause fewer impacts as compared to an engineered revetment, such as wave reflection and scour.

Lagoon Breaches

The West Lagoon and East Lagoon Wetland can be enhanced to improve the habitat and the landfill protection functions by breaching in an optimal location that may encourage sedimentation and eventual creation of marshplain. Prior studies have considered breaching of the lagoons to create areas that could be converted into marsh. This would improve both habitat and create a resilient landscape feature that could transgress with sea level rise and protect the landfill.

The slag and rubble dike on the outboard of the West Lagoon could be breached to allow a greater tidal exchange with the Bay. Excavated material could be placed at locations on the southern side of the lagoon so that waves are blocked, and wave overtopping of the dike is minimized. The tidal actions may allow sedimentation in the lagoon cell and eventually develop into a marsh area. However, insufficient sediment or excessive tidal processes could limit the amount of sedimentation and subsequent vegetation, and at best the site may evolve to a mudflat. These actions would be compatible with placing sand along the landfill and armoring the backshore with rock.

At the East Lagoon Wetland, a breach of the dike would likely encourage relatively rapid development of a vegetated marsh. In its existing state, the lagoon does not drain and it is full of soft sediments. Opening up the lagoon to the tides with a breach could increase the sedimentation rates and consolidation to eventually create marsh that would be able to transgress into the future with sea level rise. Protection at the sheltered location of the East Lagoon Wetland segment can likely be limited to these softer approaches.

Synthesis of Concepts: Stabilize and Enhance

The primary approach for each segment will be to stabilize the shore of the landfill and then to enhance the habitat and the public access components. As described above, this will likely entail using a hard shoreline stabilization approach using armor stone and an engineered revetment overlay, a soft shoreline stabilization approach by creating a pocket beach or wetlands, or a combination of the hard and soft approaches.

Habitat and public access improvements will likely be dictated by the extents of the shoreline stabilization efforts. Habitat improvements can be integrated into the stabilization design so that the rocky intertidal habitat recovers onto the new

structures, or the mudflats, beaches and wetlands are able to evolve and respond adequately to sea level rise without being lost to erosion. Opportunities for improving access should be explored further to identify the best points for ongoing access. On the North Shoreline segment, the shore could be stabilized by laying the slope back at a shallower angle and reinforced with armor rock overlay, and then enhanced by constructing a public access pier that could be used for birding, fishing, and enjoyment of views.

Areas where public access and habitat enhancement compete should be considered closely to develop the best approach. For example, at the East Lagoon Wetland, public access should be located so as to not disturb wetlands plant and animal species.

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III. Habitat & Wildlife Assessment

3.1 Introduction

This section describes existing habitats and biological resources at the Albany Bulb and Neck, and identifies preliminary opportunities and constraints for habitat enhancement within the study area. This information represents a summary of prior studies by others augmented by limited field observations conducted by ESA staff as part of the Albany Bulb and Neck Transition Improvement Plan (Transition Plan). This information will be used to develop a vegetation management strategy for the site in a subsequent document.

The scope of the analysis included the following elements, described in greater detail below under "Methods":

- Review existing available information and technical studies, and verify that any prior searches conducted (California Natural Diversity Database and California Native Plant Society Electronic Inventory, and unofficial U.S. Fish and Wildlife Service species list) are up to date,
- Conduct a general characterization of shoreline conditions including mapping of different shoreforms, tidally influenced habitats and upland areas,
- Conduct plant, animal and wetland reconnaissance surveys within the project boundaries to verify site conditions as documented in past reports and technical studies,
- Identify sensitive plant communities and sensitive wildlife habitat areas,
- Conduct a general wetlands assessment to identify whether any water-associated features, such as wetlands, potentially subject to the jurisdictions of the U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board and California Department of Fish and Wildlife occur on the site (not: this does not include a detailed delineation of potential wetlands),
- Describe existing plant communities and their associated wildlife species that could potentially occupy the site using existing information and reconnaissance surveys,
- Summarize federal, state, and local plans and regulations as they pertain to biological resources in the area, and
- Include all of the above information in a technical memo.

3.2 Habitats and Biological Communities

This habitat assessment is based on two (2) main components:

1. **Review of Existing Information:** The Bulb and its immediate environs (including Albany Beach and the Albany Mudflats) have been a focus of local and regional park planning efforts for many decades. Planning efforts accelerated with the establishment of MESP in the early 2000s. As a result, there is extensive information and documentation describing existing habitats, plant and wildlife communities, and the potential presence/absence of special-status species. ESA staff reviewed this information to establish a baseline for comparison to conditions encountered during the field survey, below. Due to the volume of relevant documents extending back over a period of multiple decades, the review for this effort focused on the following recent (within the last 15 years) documents:
    - The biological resources section of EBRPD's 2012 Albany Beach Restoration and Public Access Project Final Environmental Impact Report (FEIR), prepared by Merkel & Associates.
    - Material describing the area's biological resources from the 2011 Existing and Future Conditions Report for the Albany Beach Restoration and Public Access Project, prepared by LSA.
    - A report developed by H.T. Harvey & Associates to support the 2005 Initial Study (IS) for the lifting of the Regional Water Quality Control Board (RWQCB)'s landfill closure order and proposed tidal restoration of the Bulb's West and East Lagoons. This report contains extensive survey data on shorebird usage of the site and is included as Appendix D.
    - Materials generated by EBRPD and its partners to support development of the 2002 Eastshore State Park General Plan.
    - Lists of local bird and plant observations maintained by volunteers from the Golden Gate Audubon Society (GGAS), Citizens for Eastshore State Park (CESP), and related stakeholder groups. Bird observations are compiled in Appendix D; plant observations are in Appendix E.

In addition, ESA staff also queried the following databases to determine if any rare plants or animals have been observed in the area since the time of the previous studies; the results of these queries are presented in Table 3.2:

- California Dept. of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB)
- California Native Plant Society (CNPS) RareFind Database

2. **Field Reconnaissance Survey:** ESA staff performed a one-day field reconnaissance survey of the Bulb and Neck on January 28, 2015 to assess existing habitats, identify sensitive plant communities and wildlife areas, and note any significant changes from the conditions described in earlier reports. The field survey did not include EBRPD lands at the plateau or north Neck shoreline, nor SLC lands at Albany Beach. The field survey did not include focused botanical surveys or protocol-level surveys for special-status wildlife species.

Like many areas along the San Francisco Bay shoreline, conditions at the Bulb can vary with the seasons, tide stage, weather, and other factors. It is important to emphasize that this habitat assessment provides a snapshot of overall conditions at the Bulb, and is not meant to exhaustively characterize the precise range of seasonal and spatial variability at the site. It is expected that future phases of design work, as well as regulatory compliance efforts (CEQA and permitting) will require more detailed examination and delineation of the site's habitats and biological resources.

3.3 Results

Habitats at the site can be broadly characterized into the following categories, displayed in Figure 3.1 and summarized in Table 3.2. Site topography (extracted from NOAA-OPC LiDAR)[6] is displayed in Figure 3.2.

- **Upland ruderal/coastal scrub:** This is the dominant habitat at the Bulb and Neck, covering a little over 28 acres of the site largely above +11 ft NAVD.
- **Muted tidal aquatic.** Open water portions of East (0.5 ac) and West Lagoons (5 ac) fall into this category.
- **Muted tidal salt marsh.** Much of the open water areas in East Lagoon are ringed by salt marsh, which similarly does not fully drain at low tide. This habitat covers approximately a tenth of an acre (0.10 ac).
- **Armored shoreline and pocket beaches.** The majority of the shoreline at the Bulb and Neck is artificial armoring comprised of rip-rap and construction debris such as asphalt/concrete chunks, covering approximately 6 acres. Small, discrete areas of the shoreline support approximately 0.2 acres of coarse gravel and cobble pocket beaches formed by the weathering of rip-rap and landfill debris.
- **Tidal mudflat.** Extensive intertidal mudflats extend from the northern shoreline of the Bulb and Neck to the Point Isabel peninsula. This region is commonly referred to as the Albany Mudflats. A little over 4 acres of mudflat exist within the boundaries of the City's parcels.
- **Tidal aquatic.** Open water areas of the Bay cover the remainder of the City's parcels. These habitats are well-described in other planning documents and are only briefly discussed here.

Table 3.1. Approximate Habitat Acreage at Neck & Bulb

Habitat	Acres
Upland/ruderal coastal scrub	28.1
Muted tidal aquatic	5.8
Muted tidal salt marsh	0.1
Armored shoreline	6.2
Beach	0.2
Tidal mudflat	4.1

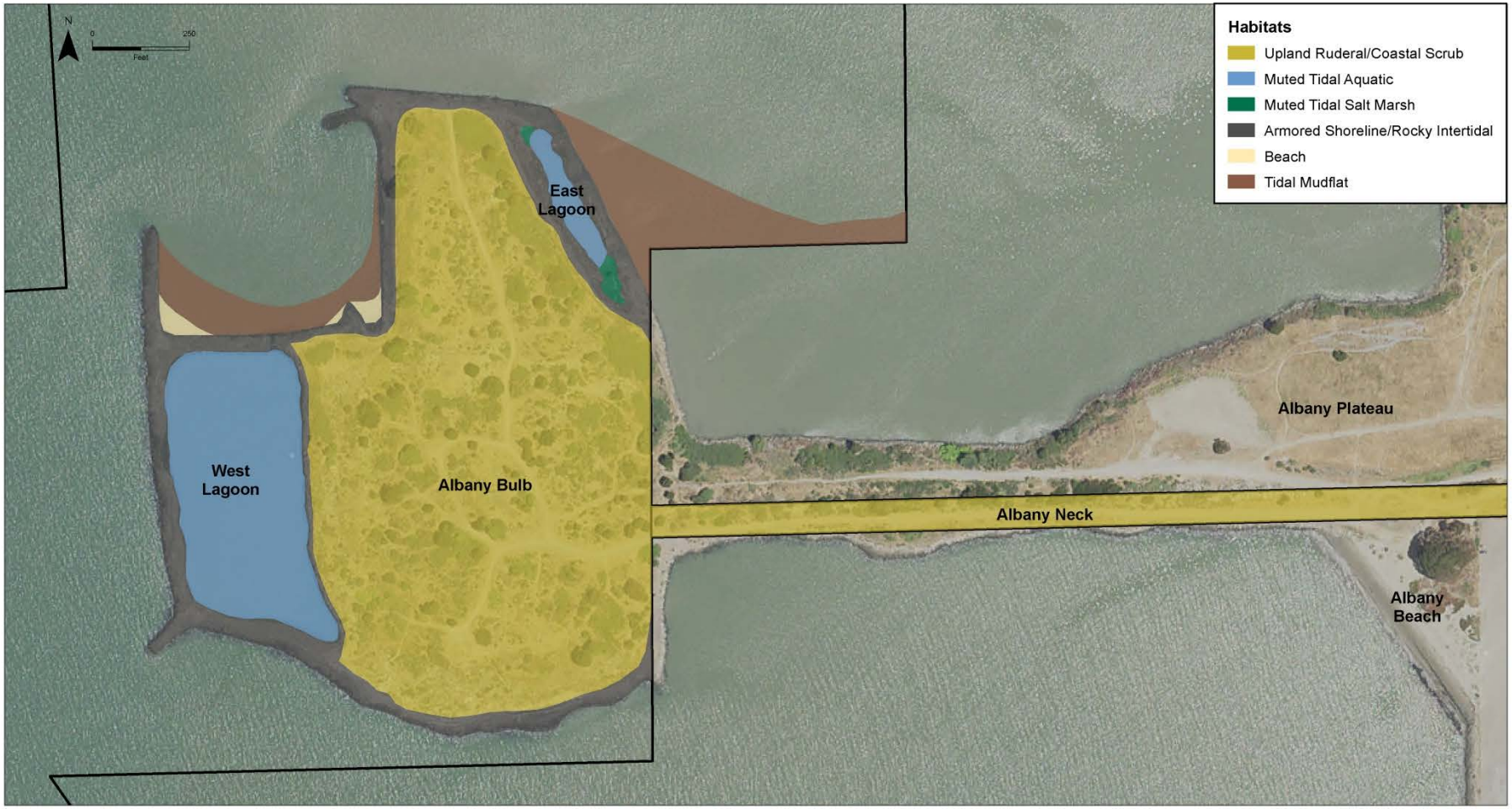
These habitats are described in greater detail below; the scientific names of relevant species are presented in Tables 3.3 through 3.5.

Upland Ruderal/Coastal Scrub

Upland ruderal/coastal scrub areas cover approximately 28 acres of the Bulb and Neck and range from roughly elevation +11 to + 51 ft NAVD. The ground surface in most areas is a mixture of fill soils and abundant landfill debris such as concrete and rebar. Many upland areas also contain garbage, assumed to be left from when the area supported a sizeable homeless encampment. Local artists have used landfill debris, garbage, and other refuse to create colorful art pieces dispersed throughout the area, particularly along the northern shoreline. 'Desire' trails crisscross the Bulb (Photo 3.1), and connect to more linear trails along the Neck that lead to and from Albany Beach, Golden Gate Fields, and Buchanan Street.

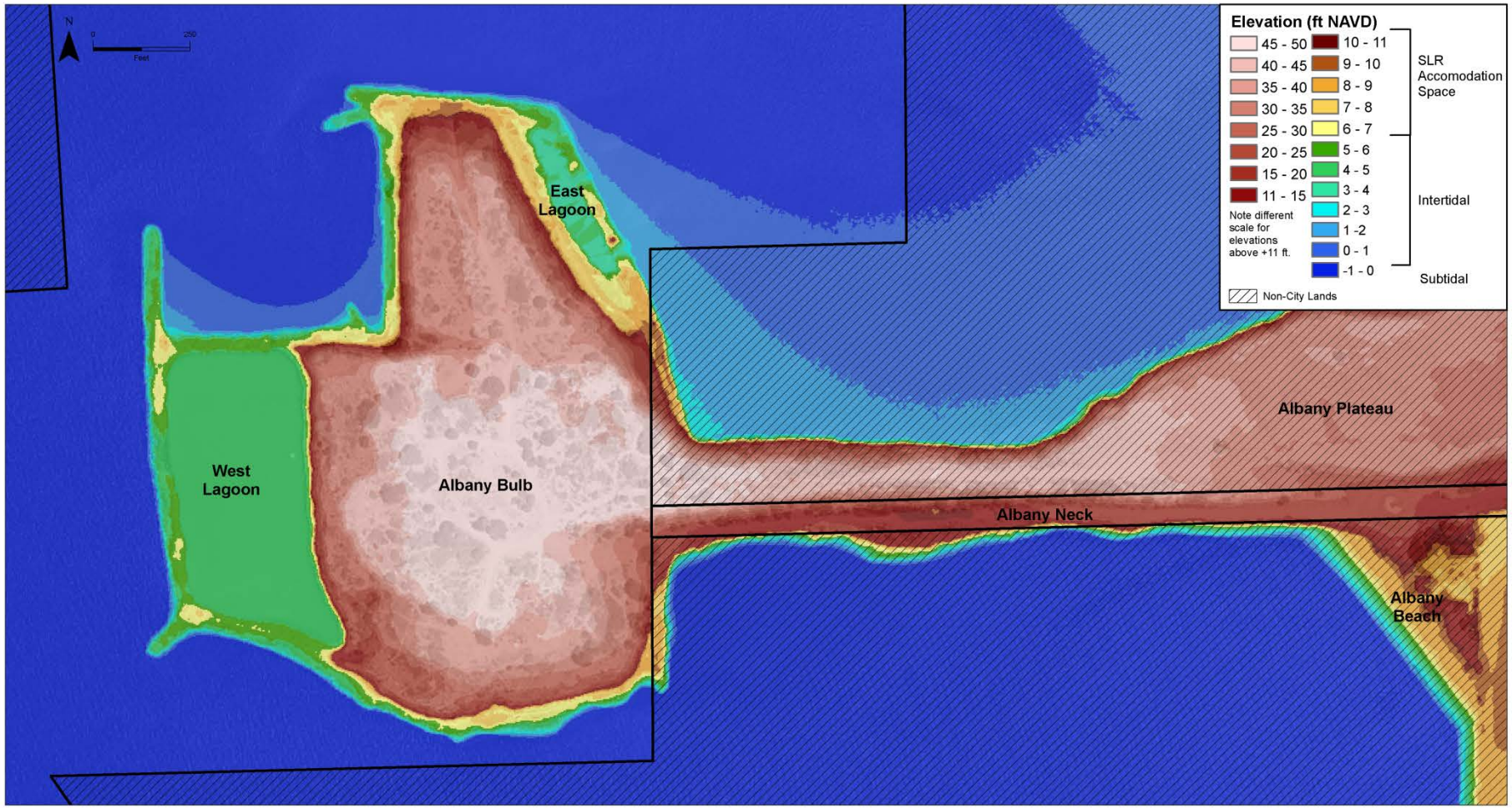
[6] LiDAR may underestimate the elevations of areas with dense vegetation, such as ruderal/coastal scrub; these data are presented for illustrative purposes only.

Figure 3.1: Habitat Areas



Sources: NAIP 2014, Alameda County 2015, ESA 2015

Figure 3.2: Site Topography from NOAA-OPC LiDAR



Sources: NAIP 2014, Alameda County 2015, NOAA-OPC 2011 (LiDAR)

Photo 3.1: *Upland ruderal/ coastal scrub habitats at the Albany Bulb. In this photo, taller eucalyptus trees dominate the canopy (background), while non-native acacias and native coyote brush make up the understory (foreground). Ground cover is provided by mostly non-native grasses and forbs, including the sourgrass (yellow flowers) in the photo's lower left corner. Photo: C. Toms (ESA).*

Vegetation. Upon the cessation of landfilling operations at the Bulb in 1983, upland areas were quickly colonized by ruderal vegetation including a mix of non-native annual grasses and weeds. Over time, native and non-native coastal scrub species began to colonize the landfill's nooks and crannies. Most of the trees and shrubs at the Bulb (with the exception of French broom and coyote brush, see below) are naturalized in the wild from ornamental plantings, and are species known to favor disturbed areas. It's possible that some individuals were actively planted at the site. Over time, these communities have matured into a structurally complex matrix of ruderal/coastal scrub that covers most of the upland portions of the site.

The ruderal/coastal scrub communities can generally be characterized by their components' position in the canopy. The tallest components of this community are a few individuals of non-native trees such as Tasmanian blue gum, Monterey cypress, and Monterey pine, as well as abundant acacia trees (including blackwood acacia, silver wattle, and kangaroo thorn). A few native buckeye trees are established in the northern part of the Bulb, and a grove of palm trees grows along the Bulb's southeast shoreline. The location of these trees within the site's landscape suggests that they were likely actively planted, instead of establishing from seed.

The shrub component of the canopy is dominated by shorter acacia trees, particularly the non-natives firethorn, cotoneaster, red valerian, French broom, and pampas grass, co-dominant with native coyote brush. The pampas grass stands can be locally dense, particularly in the northern portion of the site (Photo 3.2, Figure 3.3). Dense stands of non-native Himalayan blackberry are distributed throughout the site, particularly along its northeast shoreline. Small localized patches of native poison oak and coast live oak are also present, as well as native arroyo willow and blue elderberry in depressions between rubble piles. Ground cover in areas not covered by taller shrub/scrub vegetation is dominated by non-native annual grasses and forbs such as soft chess, ripgut brome, fennel, black mustard, Italian thistle, bull thistle, and sourgrass. Extensive patches of iceplant cover much of the Bulb's southern edge, and a large patch of English ivy is near the Bulb's center.

Photo 3.2: *Pampas grass dominates the vegetation in discrete areas of the Bulb, such as this patch along the Bulb's northern side. Note the taller Monterey pine and Monterey cypress in the background, and coyote brush in the foreground. Photo: C. Toms (ESA).*

Figure 3.3: Approximate Pampas Grass Locations

Source: Peter Rauch, date unknown

Birds. Birds in upland ruderal/coastal scrub areas include a diverse assemblage of species known from both urban and rural environments. Common year-round residents in higher areas of the canopy include many passerines such as white-crowned sparrow, golden-crowned sparrow, song sparrow, house finch, lesser goldfinch, black phoebe, northern mockingbird, bushtit, Bewick's wren, western bluebird, American robin, and Anna's hummingbird. The ground and lower portions of the canopy are utilized by finches and sparrows as well as mourning dove, California towhee, spotted towhee, and dark-eyed junco. Seasonal visitors include a broad range of migratory passerines including yellow-rumped warbler, Townsend's warbler, and ruby-crowned kinglet. Crows and ravens roost in large trees and forage throughout the site. Ruderal/coastal scrub habitats are also utilized by multiple raptor species, including red-tailed hawk, red-shouldered hawk, white-tailed kite, merlin, and northern harrier. See Appendix D for observations compiled by local EBird users.

Reptiles and Amphibians. Ruderal/coastal scrub areas likely provide habitat for relatively more disturbance-tolerant reptile and amphibian species such as western fence lizard, western toad, Pacific tree frog, and gopher snake.

Mammals. Ruderal/coastal scrub habitats support an extensive population of California ground squirrels, which dig burrows within the landfill rubble. These areas also likely support red fox, raccoon, Virginia opossum, Botta's pocket gopher, Norway rat, and house mouse. Feral domestic cats are also known from the area, and the entire Bulb is a popular spot for visitors to bring on- and off-leash dogs.

Muted Tidal Aquatic

Muted tidal aquatic habitats are limited to West Lagoon (6 ac) and East Lagoon (0.5 ac). West Lagoon (Photo 3.3) is a broad, deep, rectangular embayment that was never filled and is largely devoid of any emergent wetland vegetation, whereas East Lagoon (Photo 3.4) is a much narrower, shallower system that is partially filled on both its north and south ends. The filled areas within East Lagoon support emergent wetland vegetation that is described below under Muted Tidal Salt Marsh. The landfill berms that surround the lagoons range from roughly +5 to + 8 ft NAVD at West Lagoon, and from +3 to +8 ft NAVD at East Lagoon. Higher tides can overtop low points in the lagoons' perimeter berms, especially at East Lagoon, but the low points are not low enough to facilitate full drainage at low tide. The 2005 H.T. Harvey & Associates report mentions that the lagoons are "approximately 6 ft deep", but it is not clear at which tide stage this depth was measured.

Photos 3.3 and3. 4. *Muted tidal aquatic habitats in West Lagoon (top) and East Lagoon (bottom). Photos: C. Toms (ESA).*

Vegetation. Muted tidal aquatic areas in West and East Lagoons primarily support macroalga such as rockweed, sargassum, *Ulva* spp., and *Enteromorpha* spp. attached to rocky substrates. LSA (2011) also reports multiple species of red algae attached to the rip-rap. Eelgrass beds are present along the Bulb's southern shoreline, but are not known from inside either lagoon. Emergent wetland plants in East Lagoon are described in Muted Tidal Salt Marsh, below.

Fish and Aquatic Invertebrates. Though fish and aquatic invertebrates have not been recently sampled in either East or West Lagoon, they are likely host to species found in the adjacent shallows near the Central Bay and Brooks Island, such as topsmelt, northern anchovy, shiner surfperch, starry flounder, and speckled sandab. NOAA/CDFG-OSPR (1998) reported that American shad, bat ray, brown rockfish, chinook salmon, leopard shark, striped bass, and white croaker potentially occur within the nearby Richmond Harbor and Inner Harbor Channel areas. Common benthic macroinvertebrates in the area include gem clam, Baltic clam, soft-shelled clam, eastern mudsnail, ribbed mussel, and yellow shore crab.

Birds. Muted tidal aquatic areas support a broad range of waterfowl, particularly during the winter when large numbers of migrants flock to San Francisco Bay. Common visitors include American coot, greater and lesser scaup, double-crested cormorant, surf scoter, western grebe, pied-billed grebe, bufflehead, common goldeneye, ruddy duck, mallard, pintail, American widgeon, and Canada goose. Multiple species of gulls and terns also forage over open water areas. Shorebirds forage along the shallower edges of the lagoons; these species are listed under "Mudflats" below. See Appendix D for observations compiled by local EBird users.

Muted Tidal Salt Marsh

Small patches comprising roughly a tenth of an acre of emergent muted tidal salt marsh habitat grow within the northern and southern ends of East Lagoon (Photos 3.5 and 3.6), on sediment that is likely a combination of fill soils and Bay Mud carried in on the tides. Like open water areas in East Lagoon, the marshes do not fully drain at low tide due to the sill effect of the lagoon's rubble berm. Both marshes lack subtidal channels, though the southern marsh supports two (2) small pond features. Due to the rubble and armoring that were used to construct the lagoon's perimeter berm, the landward edges of these marshes are truncated, and vegetation quickly converts from salt marsh to upland ruderal weeds along the higher portions of the berm. Landward of the perimeter berm is a heavily used path; a less-well-worn path also exists on the berm between the lagoon and the Albany Mudflats.

Photos 3.5 and 3.6. *Small patches of muted tidal salt marsh at the southern (top) and northern (bottom) ends of East Lagoon. Photos: C. Toms (ESA).*

Vegetation. Vegetation in the muted tidal salt marshes is dominated by pickleweed, with multiple adjacent turfs of salt grass. A small patch of alkali bulrush grows at the seaward edge of the southern marsh. Gumplant (grows in its typical ring around the marsh's upper edges, and patches of alkali heath are also present. Other common salt marsh plants known from the area include fleshy jaumea, western marsh rosemary, and cordgrass.

Birds. The birds that utilize the marsh are a combination of passerine generalists from upland ruderal areas (above) and shorebirds that forage along the marsh's edges, including great egret, snowy egret, great blue heron, and willet. HT Harvey & Associates (2005) reports muted tidal salt marsh observations of song sparrows that were likely the Alameda subspecies. The wetlands do not contain dendritic channel networks and related features that would support the federally endangered Ridgway's rail (formerly California clapper rail, *Rallus obsoletus*). See Appendix D for observations compiled by local EBird users.

Mammals. Though not directly observed, raccoon, opossum, feral cats, rats, mice, and voles likely forage in muted tidal salt marsh habitats. Off-leash dogs frequently enter the marsh from the adjacent trail.

Armored Shoreline & Beaches

The 6 ac of shoreline surrounding the Bulb (including the berms surrounding East and West Lagoons) are armored with concrete rip-rap and rubble (Photo 3.7). Small areas of the northwestern portion of the shoreline (in the sheltered corners of the unfinished landfill cell) support approximately 0.2 acres of coarse gravel and cobble pocket beaches formed by the weathering of rip-rap and landfill debris.

Vegetation. As mentioned above under "Muted Tidal Aquatic", the armored shoreline supports attached macroalga such as rockweed, sargassum, *Ulva* spp., *Enteromorpha* spp., and red algae. Blooms of *Ulva* are especially common in the warm months of late summer and early fall, when nutrients in the Bay combine with ample sunshine to drive their explosive growth. Otherwise, the shoreline is largely unvegetated with the exception of the berm in between East Lagoon and the Albany Mudflats; its relatively finer substrate supports limited high salt marsh and abundant ruderal vegetation. Flat trail areas immediately upslope of the armoring in some locations support discrete patches of saltgrass, pickleweed, and alkali heath, especially along the northern shoreline on the opposite side of the peninsula from East Lagoon.

Aquatic Invertebrates. The armored rip-rap is host to multiple common shoreline invertebrates, such as sponges and bryozoans, barnacles, bay mussel, isopods, yellow shore crab, and native Olympia oyster, as well as a broad suite of aquatic

Photo 3.7. *Armoring lines the entire Bulb perimeter. Photo: L. White (ESA).*

and terrestrial insects that feed on the phytoplankton and zooplankton growing on the armored surface (epifauna). Together, these invertebrates form a diverse food base for nearshore foragers, particularly fish (see species listed above under "Muted Tidal Aquatic") and shorebirds (below).

Birds. The shoreline provides foraging habitat for multiple shorebirds, particularly rocky intertidal specialists such as spotted sandpiper, black oystercatcher, black turnstone, and ruddy turnstone, but also generalists such as willet. The shoreline provides high tide refugia for shorebirds that typically forage in adjacent mudflats (see "Mudflats" below), as well as roosting habitat for waterfowl. Crows, gulls, and other scavengers also forage amongst the epifauna and wrack deposited by the tides on the rip-rap. See Appendix D for observations compiled by local EBird users.

Mammals. Ground squirrels have excavated multiple burrows in portions of the shoreline that are high enough to not be inundated by the tides. Though not directly observed, raccoon, opossum, and feral cats likely forage within the armored shoreline at low tide. Visitors frequently walk their dogs on top of the armoring.

Tidal Mudflat

One of the most valuable habitats at the Bulb and Neck are the extensive unvegetated mudflats that surround the Bulb and Neck, particularly along its north side. Historic maps indicate that these mudflats are largely formed by sediments that have deposited in the area since the Gold Rush of the mid-1800s and subsequent reclamation/ reengineering of the East Bay shoreline. Approximately 4 ac of mudflats fall within the boundaries of the City's parcels. The mudflats provide crucial foraging habitat for a broad range of resident and migratory shorebirds at lower tides, and support foraging by dabbling and diving ducks at higher tides.

Birds. Shorebirds commonly observed at the mudflats include willet, American avocet, black-necked stilt, whimbrel, marbled godwit, long-billed dowitcher, western sandpiper, least sandpiper, dunlin, semipalmated plover, black-bellied plover, long-billed curlew, and wandering tattler. See Appendix D for observations compiled by local EBird users.

Photo 3.8. *Mudflats along the Bulb and Neck's northern shoreline. Photo: C. Toms (ESA).*

Tidal Aquatic

Open water areas of San Francisco Bay comprise the City's property outboard of the Bulb shoreline and are well-described in other planning documents. These habitats are generally host to the same species described under "Muted Tidal Aquatic", with two important exceptions: eelgrass communities and marine mammals.

Eelgrass beds. Extensive areas immediately offshore of Albany Beach feature beds of eelgrass (*Zostera marina*), a rare and highly productive subtidal habitat that is the focus of multiple conservation and restoration efforts throughout San Francisco Bay (see the Subtidal Goals Report, SCC 2010). Eelgrass mapping on non-City lands performed for the Albany Beach Restoration and Public Access Project (LSA 2011a) indicated that small beds are also present offshore of the Neck; similar beds may be present on City lands offshore of the Bulb. Future phases of project design should include eelgrass surveys offshore of the Bulb. Potential implementation actions in this area should protect existing eelgrass beds, and encourage the restoration of new beds where feasible.

Marine mammals. A river otter was observed by ESA staff off the Bulb's south shoreline during the January 2015 field visit; a search of observations from the River Otter Ecology Project (www.riverotterecology.org) indicates additional sightings in the area. The otter was in shallow waters at low tide, and was likely foraging for benthic macroinvertebrates such as clams and mussels. Pacific harbor seals and California sea lions may forage in the tidal waters offshore of the Bulb and Neck, but are not known to haul out along the site's armored shoreline. Other marine mammals such as harbor porpoise may utilize offshore waters on a transient basis.

Photo 3.9. *A river otter observed along the southern shoreline of the Albany Bulb on January 28, 2015. Photo: L. White (ESA).*

3.4 Special-Status Species

ESA staff queried the CNDDB and CNPS RareFind databases in order to determine the potential for listed (state or federally endangered, or candidates for listing) and/or special-status (otherwise protected) species to occur at the site. A three-quad search (San Quentin, Richmond, and Oakland West) was used instead of a nine-quad search in order to focus on shoreline species that are most likely to utilize the site under existing and/or enhanced conditions. These species are described below; the complete database results are listed in Table 14.

Plants

The only listed plant species with potential to occur at the site is the federally threatened and state endangered Santa Cruz tarplant (*Holocarpha macradenia*), though the potential is low due to the site's highly disturbed nature and the over 5-mile distance to the nearest known occurrence. Other special-status (CNPS listed) plant species with the potential to occur are:

- Fragrant fritillary (*Fritillaria liliacea*). This coastal scrub species has low potential to occur on site due to the site's highly disturbed nature.
- A series of tidal salt marsh specialists: Hairless popcornflower (*Plagiobothrys glaber*), Marin knotweed (*Polygonum marinense*), and Suisun marsh aster (*Symphyotrichum lentum*). All of these species have low potential to occur due to the degraded nature of salt marsh habitats at the site and/or distance from known occurrences.

Botanical surveys to identify these and other listed plant species should be implemented prior to any activities that could disturb their habitat.

Fish

Multiple listed fish species are moderately or highly likely to utilize Bay waters near the site, including green sturgeon (*Acipenser medirostris*), coho salmon (*Oncorhynchus kisutch*), steelhead (*Oncorhynchus mykiss*), chinook salmon (*Oncorhynchus tshawytscha*), and longfin smelt (*Spirinchus thaleichthys*). Activities along the shoreline that could impact tidal waters should implement standard avoidance measures for these species.

Invertebrates

Two insects on the state's Special Animals list have low potential to occur on the site: monarch butterfly (*Danaus plexippus*), which may use the site on a transient basis, and the San Francisco Bay Area leaf-cutter bee (*Trachusa gummifera*), whose habitat requirements are unknown.

Reptiles & Amphibians

No listed or special-status reptiles or amphibians have the potential to occur on site.

Birds

Federally/state listed birds with the potential to occur on or near the site include:

- Western snowy plover (*Charadrius alexandrinus nivosus*), which has low potential to occur at the Bulb/Neck itself but has utilized adjacent Albany Beach for winter foraging,
- American peregrine falcon (*Falco peregrinus anatum*), which is known to occasionally forage over the adjacent Albany Mudflats but is not expected to nest at the Bulb/Neck due to a lack of suitable habitat,
- California brown pelican (*Pelicanus occidentalis californicus*), which forages in tidal waters around the Bulb but is not expected to nest there due to a lack of suitable habitat, and
- California least tern (*Sternula antillarum browni*), which forages in tidal waters around the Bulb during summer months and has been observed nesting on artificially-created shell islands approximately 0.6 mi north of the site (LSA 2011a). This species is not likely to nest at the Bulb itself due to a lack of suitable habitat.

There is a broad suite of special-status birds that may utilize the Bulb and Neck for foraging, but with low potential for nesting. These birds include:

- Wading birds, waterfowl, and gulls/terns such as great egret (*Ardea alba*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), black-crowned night heron (*Nycticorax nycticorax*), double-crested cormorant (*Phalacrocorax auritus*), California gull (*Larus californicus*), Caspian tern (*Hydroprogne caspia*), and black skimmer (*Rynchops niger*). Protections for all of these species except black skimmer focus on conserving colony nesting sites. Though all of these species likely utilize adjacent mudflat, wetland, and open Bay habitats for foraging, they have low likelihood to breed at the site given the lack of suitable nesting habitat and/or level of human disturbance.
- Tidal salt marsh passerines such as saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*), Alameda song sparrow (*Melospiza melodia pusillula*), and San Pablo song sparrow (*Melospiza melodia samuelis*). Though all of these species may forage in the marginal muted tidal salt

marsh habitats at the site, the habitats are of too low a quality and too close to popular trails to support nesting.

- The freshwater marsh species yellow-headed blackbird (*Xanthocephalus xanthocephalus*), which may utilize the site for foraging as a transient but would not breed due to the lack of suitable habitat.
- Raptors including Cooper's hawk (*Accipiter cooperi*), short-eared owl (*Asio flammeus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), northern harrier (*Circus cyaneus*), and American kestrel (*Falco sparverius*). Though all of these species likely forage over the site's upland and shoreline habitats, they have low likelihood to breed at the site given the lack of suitable nesting habitat and/or level of human disturbance.

The only special-status birds with moderate potential to occur and breed at the site are loggerhead shrike (*Lanius ludovicianus*) and burrowing owl (*Athene cunicularia*). Loggerhead shrike is known to forage in the site's uplands, and may nest in ruderal/coastal scrub. Burrowing owls are known to winter at the Bulb and similar habitats such as Cesar Chavez Park in Berkeley, but efforts by EBRPD to encourage breeding at the Albany Plateau since 2007 have as of yet proven unsuccessful. Nesting surveys to identify these and other listed/special-status bird species should be implemented prior to any activities that could disturb their habitats or activities.

Mammals

No federally- or state-listed species are likely to occur at the site. A suite of bat species including pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*) have low to moderate potential to occur on the site, primarily as transients and in some cases possibly roosting in the site's larger trees. As described earlier, Pacific harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*) may forage in the tidal waters offshore of the Bulb and Neck, but are not known to haul out at the site.

Regulatory Jurisdiction

Potential shoreline stabilization and enhancement efforts at the Bulb would likely require a suite of permits similar to those currently being obtained for the Albany Beach Restoration and Public Access Project (LSA 2011b). The jurisdiction of each agency and their associated permits are briefly summarized below.

U.S. Army Corps of Engineers

Activities that would result in Bay or wetland fill would necessitate either an Individual Permit or Nationwide Permit under Section 404 of the Clean Water Act, under the jurisdiction of the U.S. Army Corps of Engineers (USACE). The type of permit would ultimately depend on the nature, scope, and location of the proposed activities and necessitate a formal wetland delineation to determine the extents of USACE jurisdiction. Potentially applicable Nationwide Permits include 13 (*Bank Stabilization*), 18 (*Minor Discharges*), 27 (*Aquatic Habitat Restoration, Establishment, and Enhancement*). Upon receiving a permit application, the USACE would initiate consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Services (NMFS) under Section 7 of the Endangered Species Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, and the Fish and Wildlife Conservation Act to assess the potential for permitted activities to result in "take"[7] of endangered fish or wildlife.

San Francisco Bay Regional Water Quality Control Board

In order for the USACE permit to be certified, the Regional Water Quality Control Board (RWQCB) would require a Clean Water Act Section 401 Water Quality Certification for actions in State waters. The RWQCB would rely on the federal jurisdictional delineation certified by the USACE in order to determine the limits of their jurisdiction. Actions must be compliant with the policies described in the San Francisco Bay Basin Plan as well as Waste Discharge Requirement Order 98-072, which officially closed the Albany landfill. Linear projects that disturb one or more acres of land must obtain coverage under the Construction General Permit Order 2009-009-DWQ.

California Department of Fish and Wildlife

Similar to the federal Endangered Species Act, Section 2080 of the California Fish and Game Code prohibits "take"[8] of state-listed endangered or threatened species not on the federal list (e.g. longfin smelt), and may require a Section 2081 Incidental Take Permit for any in-water actions.

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[7] Broadly defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect" an endangered species of fish or wildlife, under §9(a)(1) of the Endangered Species Act.

[8] Broadly defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" under Section 86 of the Fish and Wildlife Code.

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) enforces the federal Coastal Act and state McAteer-Petris Act within San Francisco Bay. BCDC has jurisdiction within Bay waters, along the Bay's shoreline, and extending in a band 100 ft upslope. Any actions within these areas would likely require a permit from BCDC; extensive actions would likely necessitate a Major Permit and associated public hearing.

3.5 Opportunities & Constraints

Despite (and in some ways because of) its highly disturbed nature, the Bulb provides habitat for an impressive array of wildlife, particularly birds. Efforts to improve these habitats must consider their existing ecological trajectories as well as public use objectives in order to identify feasible strategies for improvement. This section discusses preliminary opportunities and constraints for habitat improvement, based on the information presented above.

Opportunities

- **Invasive/non-native Vegetation.** This is both an opportunity and constraint. As previously discussed, though most of the dominant ruderal/coastal scrub vegetation at the Bulb and Neck is non-native, its structural variety and food supply attract and support a broad range of passerine birds. Much of the East Bay shoreline's mature coastal scrub has been lost to development, making habitats at the Bulb and Neck particularly important. Therefore, non-native vegetation management should be limited to those species that (1) provide little in the way of food or shelter for birds and (2) prevent the establishment of other species (even if non-native, such as acacia) that would otherwise provide increased ecological function. The plants that fit these criteria include pampas grass, French broom, ice plant, and English ivy. Pampas grass and French broom also present a potential public safety hazard by providing cover for illegal encampments that could lead to fire risks; a recent fire within the Corte Madera Ecological Reserve was traced to an illegal campfire hidden from view by dense pampas grass (which subsequently fueled the resulting brush fire). [9]

  Manual removal of pampas grass has been found to be highly effective, especially when the plants are removed before they go to seed (Cal-IPC 2000). Manual removal of English ivy and ice plant can also be effective, though these species generally require repeated treatment (and/or the use of herbicides/burning) due to their ability to resprout from their extensive root networks (ibid). French broom can be managed via hand-removal and herbicide application; however, due to the extensive distribution of this species at the Bulb and its considerable seed banks, it is unlikely that broom would ever be fully eradicated from the site. Vegetation control methods should follow the guidelines presented in the California Invasive Plant Council's "*Invasive Plants of California's Wildland*" guide. Areas of invasive/non-native plant removal should be actively revegetated with native coastal shrubs, including coyote brush, California blackberry (*Rubus ursinus*), *Ceanothus* spp., silver bush lupine (*Lupinus albifrons*), yellow bush lupine (*L. arboreous*), and quailbush (*Atriplex lentiformus*).

- **Tidal Restoration at East and West Lagoons.** The restoration of full tidal action at East Lagoon will improve the health of associated salt marsh habitats by allowing the marsh plain to fully drain at low tide. Pickleweed, the dominant species in the marsh, does not tolerate extensive inundation well, and full tidal drainage will likely allow the plant to spread further downslope in the lagoon, increasing the quantity and quality of marsh habitat. Restoration actions at East Lagoon should deepen the existing breaches in the outer berm enough so that (1) it no longer acts as a sill, and (2) the breaches are inundated at low tide. The latter will help isolate the outer berm between the breaches from human and dog access, so that these areas can serve as safe high-tide roosting habitat for shorebirds and waterfowl.

  Restoring full tidal exchange between West Lagoon and the Bay will likely improve water quality in the lagoon, which is largely disconnected except during very high tides. Breaches at West Lagoon should be as deep as those at East Lagoon to maintain the outer berm as roosting habitat isolated from humans and dogs. The precise location of the breaches along the West Lagoon berm should balance wildlife protection with public access and safety.

- **Establishment of California Sea Blite (*Suaeda californica*).** As previously mentioned, areas adjacent to the East Lagoon tidal marshes could potentially support the transplanting of federally endangered California sea blite, a perennial coastal shrub found in well-drained salt marsh and estuarine ecotone soils. The US Fish and Wildlife Service (USFWS) has

[9] http://www.marinij.com/marinnews/ci_24838957/corte-madera-fire-near-homeless-camp-doused-early

successfully reintroduced California sea blite at other San Francisco Bay shoreline locations with a history of disturbance, such as Pier 98, Pier 94, Emeryville Crescent, and Robert's Landing (San Leandro). Transplant protocols should generally follow the provisions of the USFWS Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (2014), with input from personnel with specific experience in the transplantation and establishment of sea blite at the sites listed above.

- **Exclusion Fencing and/or Educational Signage Near Sensitive Lagoon Habitats.** Existing muted tidal salt marsh communities at East Lagoon are immediately adjacent to a well-worn trail that experiences heavy use from visitors and dogs. It is likely that wildlife use of the lagoon and wetlands are compromised from disturbance by visitors, no matter their intention. Given the historic "hands-off" approach to Bulb management, it is unlikely that decommissioning of the trail near the lagoon would be well-received or successful without a significant investment in monitoring and enforcement. A more user-friendly (and likely successful) approach to reducing disturbance of lagoon wildlife could utilize exclusion fencing to facilitate viewing of the lagoon from the trail while preventing direct ingress and egress by dogs. Similar fencing is utilized father south within Eastshore State Park, near Berkeley's Cesar Chavez Park, to manage visitor use within an extensive area of ruderal/coastal scrub. Compliance would likely be increased if fencing was coupled with educational signage that explained to visitors the value of lagoon and wetland habitats to local and regional wildlife.

Constraints

- **Invasive/non-native Vegetation.** Given the dominance of non-native species at the site and its highly disturbed nature, it would be infeasible to attempt to manage and reduce non-native plant cover with the exception of the pampas grass, French broom, English ivy, and iceplant described above. Converting Bulb habitats from non-native to native-dominated would require intensive levels of re-grading and vegetation management that are inconsistent with the management objectives for the area described in the 2002 General Plan (*"Approaches that involve mass grading and the wholesale removal of vegetation are not appropriate"*). Upland ruderal/coastal scrub vegetation will likely continue to be dominated by non-native species into the foreseeable future, though careful stewardship can increase the relative percentage of the Bulb that supports native vegetation communities. Appropriate species for revegetation of areas where non-natives are removed include: coyote brush (Baccharis pilularis), blue elderberry (Sambucus mexicanus), ceanothus (Ceanothus spp.), silver bush lupine (Lupinus albifrons), California blackberry (Rubus ursinus), and other native shrubs. These hardy species are well-adapted to the environmental conditions found at the Bulb, and would provide food and shelter for a broad range of species, particularly passerines (perching birds).

- **Vulnerable Wetland Communities Along the Northern Shoreline.** Much of the Bulb's northern shoreline is adjacent to either muted tidal salt marsh habitat (e.g. near East Lagoon), or patches of salt marsh vegetation upslope of the immediate armoring (e.g. the Bulb's northwest shoreline). In order for these communities to persist as sea levels rise, they will have to move upslope, transgressing over areas that are currently upland ruderal habitats. However, much of the shoreline upslope of these wetlands is steep, with limited opportunities for transgression. Re-grading adjacent slopes to be more gradually sloped may not be feasible in some areas, given the unstable nature of the landfill material and the need to maintain landfill integrity. The area with the greatest likelihood for wetland transgression is the relatively flat trail area immediately west of East Lagoon. However, this area is highly disturbed by human/dog use, and the grade abruptly steepens after approximately 50 feet. In the short-term, localized grading and reduction of trail use impacts could facilitate SLR-driven wetland transgression of up to 2 to 3 feet (vertical); past that, tidal wetland habitats are likely to be "squeezed" out of existence between the Bay and the near-vertical scarp to the west.

  The March 2013 update to the State of California Sea Level Rise Guidance Document identifies a high SLR estimate of approximately 1, 2, and 5.5 feet of SLR by 2030, 2050, and 2100, respectively. Given the existing topography and high local suspended sediment loads, we can broadly estimate that existing tidal wetland habitats will persist in some fashion through 2050, likely through a combination of upslope transgression of high marsh habitats combined with the downshifting of existing high marsh communities to low marsh (Spartina) communities (currently nonexistent at the site). By 2100, SLR will squeeze intertidal habitats into small slivers along the landfill edge, and convert most (if not all) of existing tidal marsh habitats to mudflat/open water habitats.

3.6 Tables

Table 3.2: Select Vegetation Species Known from the Albany Neck & Bulb

Habitat	Common Name	Scientific Name	Status
Upland Ruderal/ Coastal Scrub			
canopy	silver wattle	*Acacia dealbata*	non-native
	blackwood acacia	*Acacia melanoxylon*	non-native
	kangaroo thorn	*Acacia paradoxa*	non-native
	buckeye	*Aesculus californica*	native
	Monterey cypress	*Cupressus macrocarpa*	locally non-native
	Tasmanian blue gum	*Eucalyptus globulus*	non-native
	Monterey pine	*Pinus radiata*	locally non-native
shrub-scrub	coyote brush	*Baccharis pilularis*	native
	red valerian	*Centranthus ruber*	non-native
	pampas grass	*Cortaderia* spp.	non-native
	cotoneaster	*Cotoneaster* spp.	non-native
	French broom	*Genista monspessulana*	non-native
	firethorn	*Pyracantha* spp.	non-native
	coast live oak	*Quercus agrifolia*	native
	Himalayan blackberry	*Rubus armeniacus*	non-native
	arroyo willow	*Salix lasiolepis*	native
	blue elderberry	*Sambucus nigra*	native
	poison oak	*Toxicodendron diversilobum*	native
ground cover	black mustard	*Brassica nigra*	non-native
	ripgut brome	*Bromus diandrus*	non-native
	soft chess	*Bromus hordeaceus*	non-native
	Italian thistle	*Carduus pyncocephalus*	non-native
	iceplant	*Carpobrotus edulis*	non-native
	bull thistle	*Cirsium vulgare*	non-native
	fennel	*Foeniculum vulgare*	non-native
	English ivy	*Hedera helix*	non-native
	sourgrass	*Oxalis pes-caprae*	non-native
Muted Tidal Aquatic			
	red algae	*Bangia fusco-purpurea*	native
	red algae	*Endocladia muricata*	native
	sea lettuce	*Enteromorpha* spp.	native
	rockweed	*Fucus gardneri*	native
	red algae	*Mastocarpus* spp.,	native
	sargassum	*Sargassum muticum*	native
	green algae	*Ulva* spp.	native
Muted Tidal Salt Marsh			
	alkali bulrush	*Bolboschoenus maritimus*	native
	salt grass	*Distichlis spicata*	native
	alkali heath	*Frankenia salina*	native
	gumplant	*Grindelia stricta*	native
	jaumea	*Jaumea carnosa*	native
	western marsh rosemary	*Limonium californicum*	native
	pickleweed	*Sarcocornia pacifica*	native
	cordgrass	*Spartina foliosa*	native
Tidal Aquatic			
	eelgrass	*Zostera marina*	native

Table 3.3: Select Bird Species Known from the Albany Neck & Bulb

Habitat	Common Name	Scientific Name
Upland Ruderal/ Coastal Scrub		
	red-tailed hawk	*Buteo jamaicensis*
	red-shouldered hawk	*Buteo lineatus*
	Anna's hummingbird	*Calypte anna*
	house finch	*Cardopodacus mexicanus*
	lesser goldfinch	*Carduelis psaltria*
	northern harrier	*Circus cyaneus*
	American crow	*Corvus brachyrhynchos*
	white-tailed kite	*Elanus leucurus*
	merlin	*Falco columbarius*
	dark-eyed junco	*Junco hyemalis*
	song sparrow	*Melospiza melodia*
	California towhee	*Melozone crissalis*
	northern mockingbird	*Mimus polyglottos*
	spotted towhee	*Pipilo maculatus*
	bushtit	*Psaltriparus minimus*
	ruby-crowned kinglet	*Regulus calendula*
	black phoebe	*Sayornis nigricans*
	yellow-rumped warbler	*Setophaga coronata*
	Townsend's warbler	*Setophaga townsendi*
	western bluebird	*Sialia mexicana*
	Bewick's wren	*Thryomanes bewickii*
	American robin	*Trudus migratorius*
	mourning dove	*Zenaida macroura*
	golden-crowned sparrow	*Zonotrichia atricapilla*
	white-crowned sparrow	*Zonotrichia leucophrys*
Muted Tidal Aquatic		
	western grebe	*Aechmophorus occidentalis*
	pintail	*Anas acuta*
	American widgeon	*Anas americana*
	mallard	*Anas platyrhynchos*
	lesser scaup	*Aythya affinis*
	greater scaup	*Aythya marila*
	Canada goose	*Branta canadensis*
	bufflehead	*Bucephala albeola*
	common goldeneye	*Bucephala clangula*
	American coot	*Fulica americana*
	California gull	*Larus californicus*
	Western gull	*Larus occidentalis*
	Herring gull	*Larus smithsonianus*
	surf scoter	*Melanitta perspicillata*
	ruddy duck	*Oxyura jamaicensis*
	double-crested cormorant	*Phalacrocorax auritus*
	pied-billed grebe	*Podilymbus podiceps*
	Forster's tern	*Sterna forsteri*
	common tern	*Sterna hirundo*
Muted Tidal Salt Marsh		
	great egret	*Ardea alba*
	great blue heron	*Ardea herodias*
	snowy egret	*Egretta thula*
	Alameda song sparrow	*Melospiza melodia pusillula*
	willet	*Tringa semipalmata*
Armored Shoreline & Beaches		
	spotted sandpiper	*Actitis macularius*
	ruddy turnstone	*Arenaria interpres*
	black turnstone	*Arenaria melanocephala*
	black oystercatcher	*Haematopus bachmani*
	California gull	*Larus californicus*
	Western gull	*Larus occidentalis*

Habitat	Common Name	Scientific Name
	Herring gull	*Larus smithsonianus*
	willet	*Tringa semipalmata*
Tidal Mudflat		
	dunlin	*Calidris alpina*
	western sandpiper	*Calidris mauri*
	least sandpiper	*Calidris minutilla*
	semipalmated plover	*Charadrius semipalmatus*
	black-necked stilt	*Himantopus mexicanus*
	long-billed dowitcher	*Limnodromus scolopaceus*
	marbled godwit	*Limosa fedoa*
	long-billed curlew	*Numenius americanus*
	whimbrel	*Numenius phaeopus*
	black-bellied plover	*Pluvialis squatarola*
	American avocet	*Recurvirostra americana*
	wandering tattler	*Tringa incana*
	willet	*Tringa semipalmata*

Table 3.4: Select Fish & Wildlife Species Known From the Albany Bulb & Neck

Habitat	Common Name	Scientific Name
Upland Ruderal/ Coastal Scrub		
Reptiles & Amphibians	western toad	*Bufo boreas*
	Pacific tree frog	*Hyla regilla*
	gopher snake	*Pituphis melanoleucus*
	western fence lizard	*Sceloporus occidentalis*
Mammals	domestic dog	*Canis domesticus*
	Virginia opposum	*Didelphis virginiana*
	domestic cat	*Felis catus*
	house mouse	*Mus musculus*
	raccoon	*Procyon lotor*
	Norway rat	*Rattus norvegicus*
	California ground squirrel	*Sperophilus beecheyi*
	Botta's pocket gopher	*Thomomys bottae*
	red fox	*Vulpes vulpes*
Muted Tidal Aquatic		
Fish & Aquatic Invertebrates	American shad	*Alosa sapidissima*
	topsmelt	*Atherinops affinis*
	speckled sandab	*Citharichthys stigmaeus*
	shiner surfperch	*Cymatogaster aggregata*
	northern anchovy	*Engraulis mordax*
	gem clam	*Gemma gemma*
	white croaker	*Genyonemus lineatus*
	yellow shore crab	*Hemigrapsus oregonensis*
	eastern mudsnail	*Illyanassa obsolete*
	ribbed mussel	*Ischadium demissum*
	Baltic clam	*Macoma baltica*
	striped bass	*Morone saxatilis*
	soft-shelled clam	*Mya arenaria*
	bat ray	*Myliobatis californica*
	steelhead	*Oncorhynchus mykiss*
	chinook salmon	*Oncorhynchus tshawytscha*
	starry flounder	*Platichthys stellatus*
	brown rockfish	*Sebastes auriculatu*
	leopard shark	*Triakis semifasciata*
Armored Shoreline & Beaches		
Aquatic Invertebrates	barnacle	*Balanus glandula*
	barnacle	*Chthamalus dalli*
	bryozoans	Ectoprocta
	yellow shore crab	*Hemigrapsus oregonensis*
	isopods	*Idotea* spp.
	bay mussel	*Mytilus edulis galloprovincialis*
	Olympia oyster	*Ostrea lurida*
	sponges	Porifera
Tidal Aquatic		
Marine Mammals	river otter	*Lontra canadensis*
	Pacific harbor seal	*Phoca vitulina*
	harbor porpoise	*Phococena phococena*
	California sea lion	*Zalophus californianus*

Table 3.5: Special Status Species Considered in Evaluation of Albany Bulb Project Site

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Species Listed or Proposed for Listing			
Plants			
Pallid manzanita *Arctostaphylos pallida*	FT/CE/1B.1	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub. Requires fire for reproduction. 185-465 m.	**Absent.** Suitable habitat not found onsite. Project area is outside species' known distribution.
Tiburon mariposa-lily *Calochortus tiburonensis*	FT/CT/1B.2	Valley grasslands. Affinity to serpentine soils. March – June	**Absent.** Species occurs at 50-150 meters and project area is outside species' known distribution. Known occurrence approximately five miles west of site across north Central SF Bay on Ring Mtn.
Tiburon paintbrush *Castilleja affinis* var. *neglecta*	FE/CT/1B.2	Open serpentine grassland slopes. April – June	**Absent.** Two known occurrences on the Tiburon Peninsula over five miles away from the project site, across north Central SF Bay.
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE/--/1B.1	Cismontane woodland, coastal dunes, coastal scrub, sandy terraces and bluffs or in loose sand. 3-120 m.	**Absent.** Suitable habitat not found onsite. Local occurrences are historical and species is thought to be extirpated from project area.
Santa Cruz tarplant *Holocarpha macradenia*	FT/CE/1B.1	Coastal prairie, valley and foothill grassland. Found on light, sandy soil or sandy clay; often with non-natives. 10-260 m.	**Low.** Available habitat very disturbed. Most occurrences observed in Wildcat Canyon Regional Park over five miles east of the study area.
Beach layia *Layia carnosa*	FE/CE/1B.1	On sparsely vegetated, semi-stabilized coastal dunes and coastal scrub. 0-60 m.	**Absent.** Suitable habitat not found onsite.
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE/CE/1B.1	Open, dry, rocky slopes and grassy areas, usually on serpentine. March – May	**Absent**. Suitable habitat not found onsite. Project area is outside species' known distribution. Nearest occurrence to project site across north Central SF Bay on San Quentin Peninsula.
Adobe sanicle *Sanicula maritima*	--/CR/1B.1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie. Found on moist clay or ultramafic soils. 30-240 m.	**Absent.** Suitable habitat not found onsite. Local occurrences are historical and species is thought to be extirpated from project area.
Tiburon jewelflower *Streptanthus niger*	FE/CE	Shallow, rocky serpentine slopes of valley and foothill grassland	**Absent.** Suitable habitat not found onsite.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
California seablite *Suaeda californica*	FE/--/1B.1	Margins of coastal salt marshes and swamps. 0-5 m.	**Absent.** Suitable habitat not found onsite. Local occurrences are historical or actively re-introduced populations; not likely to naturally recruit to site.
Showy rancheria clover *Trifolium amoenum*	FE/--/1B.1	Valley grassland and wetland-riparian areas. Usually occurs in wetlands, but occasionally not wetlands. April – June	**Absent.** No suitable habitat present. Project area is outside species' known distribution.
Fish			
Green sturgeon *Acipenser medirostris*	FT/--	Spends majority of life in ocean waters near shore, estuaries, and bays, spawns in fresh water rivers.	**Moderate.** Spawns upstream in Sacramento River, but is not known to spawn in San Francisco Bay. Travels through San Francisco Bay and may occasionally be present in project area waters. Project area waters are within designated Critical Habitat for the species.
Tidewater goby *Eucyclogobius newberryi*	FE/CSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego Co. to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**Low.** Suitable habitat not found in the project area.
Coho salmon - Central California Coast ESU *Oncorhynchus kisutch*	FT/CE	Central and northern California coastal rivers and streams.	**Moderate**. Migrating individuals may occasionally move through SF Bay waters within the project area. No spawning habitat available but Bay waters may provide juvenile rearing habitat
Steelhead - Central California Coastal DPS *Oncorhynchus mykiss*	FT/--	Spawns and rears in coastal streams between the Russian River and Aptos Creek, as well as drainages tributary to San Francisco Bay, where gravelly substrate and shaded riparian habitat occurs.	**High**. Migrating individuals may move through move through SF Bay waters within the project area. No spawning habitat available but Bay waters may provide juvenile rearing habitat
Steelhead - Central Valley DPS *Oncorhynchus mykiss*	FT/CT	The Central Valley steelhead DPS is thought to have occurred historically from the McCloud River and other northern tributaries to Tulare Lake and the Kings River in the southern San Joaquin Valley. The species remains widely distributed throughout the Sacramento River basin.	**High**. Migrating individuals may move through SF Bay waters within the project area. No spawning habitat available but Bay waters may provide juvenile rearing habitat

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Chinook salmon – Central Valley spring run ESU *Oncorhynchus tshawytscha*	FT/CT	Spawns and rears in Sacramento River and tributaries where gravelly substrate and shaded riparian habitat occurs.	**High.** Migrating individuals may move through move through SF Bay waters within the project area. No spawning habitat available Bay waters may provide juvenile rearing habitat.
Chinook salmon – Sacramento River winter run ESU *Oncorhynchus tshawytscha*	FE/CT	Spawning and rearing restricted to Sacramento River basin, migrate through San Francisco Bay and Sacramento-San Joaquin Delta, require clean, cold water and gravel beds for spawning.	**High.** Migrates through San Francisco Estuary. No spawning habitat available but Bay waters may provide juvenile rearing habitat.
Longfin smelt *Spirinchus thaleichthys*	FC/CT	Found throughout the nearshore coastal waters and open waters of San Francisco Bay-Delta including the river channels and sloughs of the Delta. Spawns in the Delta.	**Moderate.** No freshwater habitat available for spawning within the project area but larvae and dispersing and foraging juveniles and young adults may be present year-round.
Eulachon *Thaleichthys pacificus*	FT/CSC	Ocean waters from Northern California to southwest Alaska and into the southeastern Bering Sea. Spawn in freshwater streams within this range.	**Low.** No spawning habitat available but species may migrate through Bay waters.
Amphibians and Reptiles			
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT	Restricted to valley-foothill hardwood habitat of the coast ranges between Monterey and north San Francisco Bay. Inhabits south-facing slopes and ravines where shrubs form a vegetative mosaic with oak trees and grasses.	**Absent.** Suitable habitat not found onsite.
California red-legged frog *Rana draytonii*	FT/CSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to aestivation habitat.	**Absent.** Suitable habitat not found onsite. Nearest occurrence located 5 miles from the Project near San Pablo Dam.
California tiger salamander *Ambystoma californiense*	FT/CT	Central Valley DPS listed as threatened. Santa Barbara and Sonoma Counties DPS listed as endangered. Needs underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources for breeding	**Absent.** Suitable habitat not found onsite. Nearest local occurrence in Alameda over five miles south of project site.
Birds			
Golden eagle *Aquila chrysaetos*	BCC/FP	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons and large trees in open areas provide nesting habitat.	**Absent.** Suitable habitat not found onsite.
Western snowy plover *Charadrius alexandrinus nivosus*	FT/CSC	Sandy beaches, salt pond levees and shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Low.** Suitable habitat not found onsite. Known to utilize adjacent habitats at Albany Beach in winter (LSA 2011).

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
White-tailed kite *Elanus leucurus*	--/FP	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Moderate.** Species forages over the project site; potential nesting habitat in tall trees on site.
American peregrine falcon *Falco peregrinus anatum*	DL/DL&FPS	Woodlands, coastal habitats, riparian areas, coastal and inland waters, human made structures that may be used as nest or temporary perch sites.	**Low (nesting).** Known to occasionally forage over Albany mudflats (LSA 2002); not expected to nest in area due to lack of suitable sites.
California black rail *Laterallus jamaicensis coturniculus*	BCC/CT&FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Absent.** Existing marginal tidal marsh within project site lacks channel/slough habitat utilized by this species.
California brown pelican *Pelicanus occidentalis californicus*	DL/DL&FPS	Nests on protected islets near freshwater lakes and marine waters.	**Low (nesting).** Species forages in tidal waters adjacent to project site; no suitable nesting habitat at site.
Ridgway's rail (=California clapper) *Rallus obsoletus*	FE/CE&FP	Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	**Absent.** Existing marginal tidal marsh within project site lacks channel/slough habitat utilized by this species.
California least tern *Sternula antillarum browni*	FE/CE&FP	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	**Low (nesting).** Known to forage in tidal waters adjacent to site during summer months; observed nesting on artificial shell islands app. 0.6 mi north of site (LSA 2011).
Mammals			
Salt-marsh harvest mouse *Reithrodontomys raviventris*	FE/CE&FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Found primarily in pickleweed (*Salicornia* spp.). Does not burrow, builds loosely organized nests. Requires higher areas for flood escape.	**Absent.** Suitable high-quality tidal salt marsh habitat not found onsite.
Other Special-Status Species			
Plants			
Bent-flowered fiddleneck *Amsinckia lunaris*	--/--/1B.2	Cismontane woodland, valley and foothill grassland. 50-500 m.	**Absent.** Suitable habitat not found onsite.
Alkali milk-vetch *Astragalus tener* var. *tener*	--/--/1B.2	Alkali playa and flats, valley, annual, and foothill grassland, vernal pools, low ground, and flooded lands. 1-170 m.	**Absent.** Suitable habitat not found onsite.
San Joaquin spearscale *Atriplex joaquinana*	--/--/1B.2	Chenopod scrub, alkali meadow, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with species such as *Distichlis spicata* and *Frankenia*. 1-250 m.	**Absent.** Suitable habitat not found onsite. Local occurrences are historical and species is thought to be extirpated from project area.
Round-leaved filaree *California macrophylla*	--/--/1B.1	Cismontane woodland, valley and foothill grassland. Clay soils. 15-1,200 m.	**Absent.** Suitable habitat not found onsite.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Coastal bluff morning-glory *Calystegia purpurata* ssp. *saxicola*	--/--/1B.2	Coastal dunes and coastal scrub. 15-105 m.	**Absent.** Suitable habitat not found onsite. Project area is outside species' known distribution.
Bristly sedge *Carex comosa*	--/--/2B.1	Marshes and swamps, lake margins, wet places. 5-1005 m.	**Absent.** Suitable habitat not found onsite.
Point Reyes bird's-beak *Chloropyron maritimus* ssp. *palustris*	--/--/1B.2	Coastal salt marsh usually with *Salicornia*, *Distichlis*, *Jaumea*, *Spartina*, etc. 0-15 m.	**Absent.** Suitable habitat not found onsite.
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	--/--/1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub, on sandy soil on terraces and slopes. 5-550 m.	**Absent.** Suitable habitat not found onsite. Local occurrences are historical and species is thought to be extirpated from project area.
Western leatherwood *Dirca occidentalis*	--/--/1B.2	Broadleaf upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian for and woodland. on brushy slopes, mesic sites; mostly in mixed evergreen and foothill woodland communities. 30-550 m.	**Absent.** Suitable habitat not found in the project area.
Tiburon buckwheat *Eriogonum luteolum var. caninum*	--/--/1B.2	Chaparral, valley and foothill grassland, cismontane woodland, coastal prairie. Found on serpentine soils; sandy to gravelly sites. 0-700 m.	**Absent.** Suitable habitat not found onsite—no serpentine soils.
Fragrant fritillary *Fritillaria liliacea*	--/--/1B.2	Coastal scrub, valley and foothill grassland, coastal prairie. Often on serpentine; usually on clay soils, in grassland. 3-410 m.	**Low.** Local occurrence observed in Pt.Richmond; however, suitable habitat not found onsite.
Blue coast gilia *Gilia capitata* ssp. *chamissonis*	--/--/1B.1	Coastal dunes, coastal scrub. 2-200 m.	**Absent.** Suitable habitat not found in project area.
Diablo helianthella *Helianthella castanea*	--/--/1B.2	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland. Usually in chaparral/oak woodland interface in rocky, azonal soils. Often in partial shade. 25-1,150 m.	**Absent.** Suitable habitat not found onsite.
White seaside tarplant *Hemizonia congesta* ssp. *congesta*	--/--/1B.2	Coastal scrub, valley and foothill grassland, on grassy valleys and hills, often in fallow fields. 25-200 m.	**Absent.** Suitable habitat not found in project area. Project site outside species' range.
Marin western flax *Hesperolinon congestum*	FT/CT/1B.1	Chaparral and grassland, usually on serpentine barrens. April – July	**Absent.** No suitable habitat present. Project site outside species' range.
Water star-grass *Heteranthera dubia*	--/--/2B.2	Wetland and riparian areas. July – August	**Absent.** No suitable habitat present.
Loma Prieta hoita *Hoita strobilina*	--/--/1B.1	Chaparral, cismontane woodland, riparian woodland. Serpentine and mesic sites.	**Absent.** Suitable habitat not found in project area—no serpentine soils.
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	--/--/1B.1	Openings in closed-cone coniferous forest, coastal scrub, chaparral, old dunes, coastal sandhills. 10-200 m.	**Absent.** Suitable habitat not found in project area.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Rose leptosiphon *Leptosiphon rosaceus*	--/--/1B.1	Coastal bluff scrub. 0-100 m.	**Absent.** Suitable habitat not found in the project area.
Choris' popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	--/--/1B.2	Mesic sites in chaparral, coastal scrub, coastal prairie. 15-100 m.	**Absent.** Suitable habitat not found in the project area.
Hairless popcornflower *Plagiobothrys glaber*	--/--/1A	Coastal salt marshes and alkaline meadows. March – May	**Low.** Suitable habitat not found in marginal tidal salt marsh within project area.
Marin knotweed *Polygonum marinense*	--/--/3.1	Coastal salt marsh and coastal wetland and riparian areas. May – August	**Low.** Suitable habitat not found in marginal tidal salt marsh within project area.
Suisun Marsh aster *Symphyotrichum lentum*	--/--/1B.2	Freshwater wetlands and marshes and brackish marshes. May – November	**Low.** Historical observance in Point Molate, over three miles north of Project site; however, suitable habitat is not present in marginal tidal salt marsh within the project area.
Saline clover *Trifolium depauperatum var. hydrophilum*	--/--/1B.2	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites. 0-300 m.	**Absent.** Suitable habitat not found onsite.
Coastal triquetrella *Triquetrella californica*	--/--/1B.2	On soil in coastal bluff and coastal scrub.	**Absent.** No suitable habitat present.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Invertebrates			
Opler's longhorn moth *Adela oplerella*	--/*	From Marin Co & the Oakland area on the inner coast ranges south to Santa Clara Co. One record from Santa Cruz Co.	**Absent.** Suitable habitat not found onsite.
Sandy beach tiger beetle *Cicindela hirticollis gravida*	--/*	Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico. Clean, dry, light-colored sand in the upper zone. Subterranean larvae prefer moist sand not affected by wave action.	**Absent.** Suitable habitat not found onsite.
Monarch butterfly *Danaus plexippus*	--/*	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	**Low.** May occur in the project site on a transient basis. Suitable habitat for wintering monarch aggregates is not found onsite.
Bridges' coast range shoulderband *Helminthoglypta nickliniana bridgesi*	--/*	Inhabits open hillsides of Alameda and Contra Costa counties. Tends to colonize under tall grasses and weeds.	**Absent.** Suitable habitat not found in project area.
Lee's micro-blind harvestman *Microcina leei*	--/*	Xeric habitats in the San Francisco Bay region. Found beneath sandstone rocks in open oak grassland.	**Absent.** Suitable habitat not found in project area.
San Francisco Bay Area leaf-cutter bee *Trachusa gummifera*	--/*	Unknown.	**Low.** While exact habitat requirements of this species are unknown, there are no records of this species from the project area, and essentially no native habitat there.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Mimic tryonia (=California brackishwater snail) *Tryonia imitator*	--/*	Inhabits coastal lagoons, estuaries and salt marshes, from Sonoma County south to San Diego County. Found only in permanently submerged areas in a variety of sediment types; able to withstand a wide range of salinities.	**Absent.** Suitable habitat not found in project area. Historical collection from Lake Merritt in Oakland but believed extirpated from that site.
Fish			
Sacramento perch *Archoplites interruptus*	--/CSC	Historically found in the sloughs, slow-moving rivers, and lakes of the Central Valley. Prefers warm water. Aquatic vegetation is essential for young. Tolerates wide range of water conditions.	**Absent.** Not expected to occur in project area waters.
Pacific herring *Clupea pallasii*	MSFCMA	S.F. Bay is a major spawning ground for species. Preferred spawning substrate is eelgrass and algae but will also use pier pilings, riprap, and other rigid, smooth structures within Bay waters.	**Moderate.** This species spawns in San Francisco Bay, and occurs in the Oakland-Alameda Estuary. Potential to spawn in eelgrass beds off western and northern shores of Alameda.
Chinook salmon Central Valley ESU - fall/late fall run *Oncorhynchus tshawytscha*	--/CSC	Spawning and rearing restricted to Sacramento River basin. Migrate through San Francisco Bay and Sacramento-San Joaquin Delta, require clean, cold water and gravel beds for spawning.	**Moderate.** Could travel through the Oakland-Alameda Estuary during migration. No spawning habitat available in project area.
Amphibians and Reptiles			
Western pond turtle *Emys marmorata*	--/CSC	Aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg-laying.	**Absent.** Suitable habitat not found in project area.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Birds			
Cooper's hawk *Accipiter cooperi*	--/CDFW WL&3503.5	Woodland, chiefly of open, interrupted or marginal type. Nest sites are mainly in riparian growths of deciduous trees but also relatively common in urban areas.	**Low.** No suitable foraging or nesting habitat found onsite.
Great egret *Ardea alba*	--/* (rookery site)	Nest colonially in groves of trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Low (nesting).** Species forages in site marshes/mudflats; no nesting colonies in or near the project area.
Great blue heron *Ardea herodias*	--/* (rookery site)	Colonial nester in tall trees, cliff sides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	**Low (nesting).** Species forages in site marshes/mudflats; no nesting colonies in or near the project area.
Short-eared owl *Asio flammeus*	--/CSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields.	**Low.** No suitable foraging habitat in the project area.
Burrowing owl *Athene cunicularia*	--/CSC	Open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Moderate.** Known to winter at Albany Bulb and similar environs within Eastshore State Park. Efforts to encourage nesting at adjacent Albany Plateau have proven unsuccessful to date.
Red-tailed hawk *Buteo jamaicensis*	--/3503.5	Usually nests in large trees, often in woodland or riparian deciduous habitats. Also known to nest in urban parks and neighborhoods. Forages over open grasslands and scrublands.	**Low (nesting).** Species is known to forage at the project site; nesting is unlikely due to lack of suitable habitat.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Red-shouldered hawk *Buteo lineatus*	--/3503.5	Usually nests in large trees, often in woodland or riparian deciduous habitats. Forages over open grasslands and woodlands.	**Low (nesting).** Species is known to forage at the project site; nesting is unlikely due to lack of suitable habitat.
Northern harrier *Circus cyaneus*	--/CSC	Coastal salt and fresh-water marsh. Nests and forages in grasslands. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Low (nesting).** Marginal foraging habitat present at adjacent Albany Plateau; unlikely to nest in ruderal/ coastal scrub due to disturbance by trail users.
Snowy egret *Egretta thula*	--/* (rookery site)	Colonial nester, with nest sites situated in protected beds of dense tules. Rookery sites situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.	**Low (nesting).** Species forages in mudflats/marshes at the site; no suitable nesting habitat/ known colonies in or near the project area.
American kestrel *Falco sparverius*	--/3503.5	Frequents generally open grasslands, pastures, and fields; primarily a cavity nester in large trees near open areas.	**Low (nesting).** Species forages at site and may utilize large trees for nesting.
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	BCC/CSC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Low (nesting).** May forage in marginal tidal marsh habitat on site; unlikely to nest due to disturbance from trail users.
Caspian tern *Hydroprogne caspia*	BCC/* (nesting colony)	Nests on sandy or gravely beaches and shell banks in small colonies inland and along the coast. Inland fresh-water lakes and marshes; also, brackish/salt waters of estuaries and bays.	**Low (nesting).** Species forages in project area; no suitable nesting habitat at the site.
Loggerhead shrike *Lanius ludovicianus*	--/CSC	Occurs in semi-open country with utility posts, wires, and trees to perch on. Nests in bushes and trees.	**Moderate.** Species forages in project area; may nest in ruderal/coastal shrub habitat.
California gull *Larus californicus*	--/* (nesting colony)	Breeds primarily at lakes and marshes in interior western North America from Canada south to eastern California and Colorado. Birds that breed inland are migratory, most moving to the Pacific coast in winter. More recently, the species has been breeding in large numbers at the salt ponds of south San Francisco Bay. They nest in colonies, sometimes with other bird species.	**Low (nesting).** Known to forage at the site; no suitable nesting habitat in the project area.
Alameda song sparrow *Melospiza melodia pusillula*	BCC/CSC	Resident of salt marshes bordering central eastern San Francisco Bay. Inhabits pickleweed marshes; nests low in *Grindelia* (high enough to escape high tides) and in pickleweed.	**Low (nesting).** May forage in marginal tidal marsh habitat on site; unlikely to nest due to disturbance from trail users.
San Pablo song sparrow *Melospiza melodia samuelis*	BCC/CSC	Resident of salt marshes bordering San Pablo Bay. Inhabits pickleweed marshes; nests low in *Grindelia* bushes (high enough to escape high tides) and in pickleweed.	**Low (nesting).** May forage in marginal tidal marsh habitat on site; unlikely to nest due to disturbance from trail users.
Black-crowned night heron *Nycticorax nycticorax*	--/* (rookery site)	Colonial nester, usually in trees, occasionally in tule patches. Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.	**Low (nesting).** Species forages in site mudflats/marshes; no suitable nesting habitat/known colonies in or near the project area.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
Double-crested cormorant *Phalacrocorax auritus*	--/* (rookery site)	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	**Low (nesting).** Species forages in Bay waters around site; no suitable nesting habitat/known colonies in or near the project area.
Black skimmer *Rynchops niger*	BCC/CSC	Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites.	**Low (nesting).** Fairly common on Bay waters but few observations around Albany. Transient individuals may forage in the waters offsite. No suitable nesting habitat found in the project area.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	--/CSC	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds. Nests only where large insects are abundant, nesting timed with maximum emergence of aquatic insects.	**Low.** Suitable habitat not present. Transient individuals may pass through project site.
Mammals			
Pallid bat *Antrozous pallidus*	--/CSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Low.** Habitat generally unsuitable for this species, although may migrate through the project area.
Townsend's big-eared bat *Corynorhinus townsendii*	--/CSC	Mesic sites. Roosts in caves and open, hanging from walls and ceilings. Very sensitive to human disturbance.	**Moderate.** Documented occurrences of this species roosting in Berkeley Hills; however, suitable habitat not found onsite.
Silver-haired bat *Lasionycteris noctivagans*	--/*/WBWG-M	Primarily a coastal and montane forest dweller. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes and rarely under rocks. Needs drinking water.	**Low.** Habitat generally unsuitable for this species, although may migrate through the project area.
Hoary bat *Lasiurus cinereus*	--/*/WBWG-M	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths.	**Low.** May roost in trees onsite, particularly during migration periods in spring and fall.
San Pablo vole *Microtus californicus sanpabloensis*	--/CSC	Salt marshes of San Pablo Creek, on the south shore of San Pablo Bay. Constructs burrow in soft soil. Feeds on grasses, sedges and herbs. Forms a network of runways leading from the burrow.	**Absent.** Suitable habitat not found onsite.
Big free-tailed bat *Nyctinomops macrotis*	--/CSC/WBWG-M	Low-lying arid areas in southern California. Needs high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	**Absent.** Suitable habitat not found onsite.
Pacific harbor seal *Phoca vitulina*	MMPA/--	Coastal waters, and throughout Bay-Delta.	**Moderate.** Species is known to occur in the Central Bay, may forage near project area.
Alameda Island mole *Scapanus latimanus parvus*	--/CSC	Only known from 18 historical collections on Alameda Island. Found in a variety of habitats, especially annual and perennial grasslands. Prefers moist, friable soils. Avoids flooded soils.	**Absent.** Suitable habitat not found onsite.
Salt-marsh wandering shrew *Sorex vagrans halicoetes*	--/CSC	Salt marshes of the south arm of San Francisco Bay. Found at medium to high marsh 6-8 ft above sea level where abundant driftwood is scattered among pickleweed.	**Absent.** Suitable habitat not found within marginal tidal salt marshes at project site.

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/Other	General Habitat	Potential for Species Occurrence Within Project Site
California sea lion *Zalophus californianus*	MMPA/--	Coastal waters, and throughout Bay-Delta	**Low.** Species is known to occur in the Central Bay, may infrequently forage near project area; haulout and pupping areas are not present.

STATUS CODES

Federal (U.S. Fish and Wildlife Service [USFWS]):
FE = Listed as Endangered (in danger of extinction) by the federal government.
FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the federal government.
DL - Delisted
MSFCMA = Magnuson-Stevens Fishery Conservation and Management Act
MMPA = Marine Mammal Protection Act

State (California Department of Fish and Wildlife [CDFW]):
CE = Listed as Endangered by the State of California.
CT = Listed as Threatened by the State of California.
CR = Listed as Rare by the State of California (plants only)
DL = Delisted
CSC = California Species of Special Concern.
FP = Fully Protected
WL = Watch List
3503.5 = Protection for species of Falconiformes (hawks) and Strigiformes (owls).
*Special animal—listed on CDFW's Special Animals List.

California Native Plant Society (CNPS):
List 1A=Plants presumed extinct in California.
List 1B=Plants rare, Threatened, or Endangered in California and elsewhere.
List 2= Plants rare, Threatened, or Endangered in California but more common elsewhere.

An extension reflecting the level of threat to each species is appended to each rarity category as follows:

.1 – Seriously endangered in California.
.2 – Fairly endangered in California.
.3 – Not very endangered in California.

Western Bay Working Group (WBWG):
WBWGH = High priority; Species that are imperiled or at a high risk of imperilment.
WBWGM = Medium priority; Species that warrant a closer evaluation due to potential imperilment.

SOURCE:
California Department of Fish and Wildlife (CDFW). 2015. California Natural Diversity Database (CNDDB) for 7.5-minute topographic quadrangles Richmond, Oakland West, San Quentin, Commercial Version, Accessed February 2015.

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3.8 Personal Communications

Peter Rauch, professor emeritus, University of California, Berkeley (pampas grass and plant data in Appendix E)

Pam Young (EBird data in Appendix D)

IV. Hazardous Materials Assessment

4.1 Landfill Background

The Albany Bulb is part of the closed, unlined Class III landfill that resides on the eastern shore of San Francisco Bay in Albany California. Fill operations were conducted on behalf of the City of Albany between 1963 and 1983 to create the 40.8 acre "Bulb". It was constructed using dikes placed over shallow Bay Mud in San Francisco Bay to create cells for fill (land reclamation). The dikes were constructed with concrete rubble, soil, and steel mill slag. The resulting cells were filled with heterogeneous non-hazardous, inert waste comprising construction and demolition wastes such as soil, rock, concrete rubble (some containing rebar), asphalt debris, brick, wood and vegetative solid waste from landscape maintenance, street sweepings, and dredge spoils. It is estimated that a total of 2,000,000 cubic yards of material have been placed in the landfill with an average thickness of 40 feet. The Bulb is underlain with 55 to 66 feet of low permeable clay (Bay Mud).

Numerous studies have been conducted to evaluate landfill materials, including assessment for the presence of hazardous waste chemicals in soil and groundwater. Chemicals of potential concern (COPCs) that were investigated include petroleum hydrocarbons, heavy metals, volatile organic compounds, polynuclear aromatic hydrocarbons, and organochlorine pesticides. Although detected in samples collected from depths of 6 to 65 feet below ground surface, no COPCs have been detected in shallow soil at concentrations that represent a serious health concern.

During drilling operations completed in 1988 to characterize landfill materials, methane gas attributed to the decay of wood and organic vegetative matter at the base of the landfill was encountered and reportedly ignited as a result of the drilling operation. A follow-up study was conducted in 1988 to evaluate the potential presence of landfill-gas in the near-surface (4 to 6 feet below the ground surface). Results of that study detected no landfill gases indicative of hazardous waste in 4 of the 5 samples collected. A low concentration of chloroform (4 parts per billion) was detected in only one sample but was not detected in subsequent duplicate samples. Also, a low concentration of methane (3%) was detected in only one of the five samples. The detected methane concentration was below 5%, its lower explosive limit. These results are consistent with expectations for a landfill containing construction debris and suggest that, although detected, the presence of methane at the landfill may not be widespread or represent a significant explosive hazard at the landfill. By comparison, it is common to observe methane concentrations between 40 and 60% at landfills containing decomposing household waste.

Studies conducted by various engineering consultants indicate no water quality threat from the landfill to the surface water of San Francisco Bay, that water quality standards for the surrounding bay water and habitats were being met, that the uncapped landfill material posed a minimal public health risk, and that monitoring rather than capping the landfill was a preferred and significantly more cost effective alternative.

4.2 Regulatory Status

The Albany Landfill is currently under the jurisdiction of two departments within CalEPA. These include CalRecycle, which regulates and inspects active and closed solid waste management units (landfills), and the Regional Water Quality Control Board – SF Bay Region, which regulates water quality concerns, both surface water and groundwater.

With respect to CalRecycle, the landfill is listed as an open case (01-AA-0011) with no enforcement actions or violations pending. Typically, "clean closure" of a landfill requires removal of waste and/or capping and other engineering measures to protect against exposure to the landfilled waste as well as to protect water quality. Alameda County Environmental Health (ACEH) is the designated Local Enforcement Agency (LEA) that conducts quarterly inspection of the landfill and posts its reports to the CalRecycle website. During its last posted inspection (March 2014), ACEH noted erosion in the northwest portion of the landfill as an area of concern, but no mitigation was recommended or required. ACEH has indicated that their quarterly inspections are ongoing and will continue until CalRecycle terminates the requirement.

With respect to water quality issues, the Regional Water Quality Control Board (RWQCB) issued Order 99-068, which updated the Waste Discharge Requirements and rescinded the previous Order 84-089 that had prescribed certain landfill capping and maintenance requirements. The RWQCB's Order 99-068 confirmed that the landfill is not affecting water quality in the Bay and lagoons next to the Bulb because of the inert nature of the waste at the site; that capping the landfill did not appear warranted; and that maintaining the landfill as a wildlife and recreational area was acceptable. The Order includes the following prohibitions:

- Waste shall not be in contact with ponded water of any source.
- Further waste shall not be deposited or stored at the site.

- Leachate from waste and ponded water containing leachate or in contact with solid wastes shall not be discharged to water of the State or of the United States.
- Disposal of wastes shall not create pollution, contamination, or nuisance, as defined by the California Water Code.
- The discharger, or any future owner or operator of the site shall not cause certain impacts to surface or groundwater, including floating or suspended particulate; bottom deposits; aquatic growths; alteration of temperature, turbidity, or color; visible or floating deposits from petroleum origin; toxic or other deleterious substances to be present that may cause adverse impacts to aquatic biota, wildlife, or waterfowl.

The Order requires compliance with the Prohibitions, Specifications, and Provisions listed in the Order. The most notable requirement is that in the event that significant development is proposed for the landfill (e.g., grading or excavation work with the potential to encounter landfill waste), the operator is required to submit a revised closure/post-closure plan for the landfill along with a schedule for implementation that is acceptable to the Executive Officer of the RWQCB. The revised closure/post-closure plan must be submitted to the RWQCB at least 6 months prior to proposed development.

4.3 Observed Conditions

Site reconnaissance was conducted to evaluate existing surface conditions along portions of the Albany Neck and Bulb. In general, significant concrete and brick rubble, mill slag, and other debris consistent with onsite placement of construction waste is readily observed throughout the Bulb and Neck area. Miscellaneous rubbish and other non-hazardous debris resulting from day use and perhaps previous encampment activities are present. The following summarizes our observations relevant to hazardous materials concerns:

- A small fire pit, approximately 4 feet in diameter, was observed on the western vista. This fire pit contains ash waste and is likely the result of day use and/or previous encampment activities.
- Creosote treated timbers are present on the beach in the northwestern portions of the Bulb. These are relatively large timbers and are not uncommonly found as driftwood on beaches. In general the presence of the treated timber is considered low risk but it is prudent to avoid skin contact and ingestion.
- Asphalt roofing shingles (roughly estimated to be 2 to 5 cubic yards) are present and readily observed on the south-facing slope of the Neck.

4.4 Recommendations

Based on this information, the Bulb at the Albany Landfill is an open case under the jurisdiction of both CalRecycle and the RWQCB. The regulatory requirements for the future owner/operator are considered minimal and ongoing. In the event of significant site grading or intrusive activities, such work should be competed in a manner that prevents exposing landfill wastes to stormwater and prevents ponding, in addition to the typical stormwater pollution prevention and dust mitigation requirements in the Bay Area. Any proposed filling activities should be conducted in a manner to prevent buildup of methane gas potential present in portions of the landfill.

Although not strictly required, it is good and customary practice to develop a Soil Management Plan for major soil handling activities to ensure that the regulatory requirements (such as, but not limited to, stormwater control, pollution prevention, dust control, worker safety, soil handling including soil import and waste disposal, and biological monitoring requirements) are adequately presented and addressed prior to starting onsite construction activities. It is advisable that such a report should be presented to CalRecycle and the RWQCB along with the proposed development plans for the Bulb.

Based on observed conditions during site reconnaissance we make the following additional recommendations:

- Remove and properly dispose of the fire pit and resulting ash from the western vista.
- Evaluate onsite reuse and/or offsite disposal options for the creosote treated timber observed along the northwestern shoreline as part of future planning activities.
- Remove and properly dispose of asphalt roofing shingles observed along the Albany Neck. Such disposal should include testing for the potential presence of asbestos prior to arranging disposal at an appropriate landfill.

V. Geotechnical Hazards Assessment

5.1 Introduction

This geotechnical assessment is based on A3GEO's review of available information, site reconnaissance, and technical discussions with other members of the consultant team. The goal was to understand and document the geographic distribution of geotechnical materials within the primary study area. Historical aerial photographs and information/data contained in previous consultant-prepared reports were reviewed for this purpose.

5.2 Findings

Historical Aerial Photographs

The evolution of Albany Bulb is illustrated by historical aerial photographs, which were obtained through Pacific Aerial Surveys (Quantum Spatial) in Novato, California. Geo-rectified scans of photographs taken in 1969, 1971, 1973, 1975, 1977, 1981, 1983, 1985 and 2011 are shown in Figure 5.1. The earliest photographs show the diking and filling of impounded areas within the bay while the later photographs document the movements of material within the Bulb itself. The 1969 and 1971 photographs show the locations of impoundment dikes internal to the Bulb that are now obscured. This information was useful during A3GEO's subsequent evaluation of geotechnical materials and their likely geographical distribution within the Bulb.

Subsurface Data

A 1988 report by Levine Fricke includes logs of a boring and test pit in dike material near the Neck-Bulb intersection. The boring, drilled from near +32 feet, terminated on an obstruction at a depth of 43 feet (≈Elevation -11 feet). Groundwater was reportedly encountered at 42.5 feet (≈Elevation -10.5 feet); materials above that depth generally were characterized as moist (dry above a depth of about 6 feet). Levine Fricke's 1988 boring and test pit logs show the levee/dike fill includes debris in a silty sand matrix, "asphalt fill", gravelly sand and gravelly sandy clay. Modified California sampler blow counts (an insitu test that provides information related to soil density) range from 5 to 17, indicative of soil in a loose to medium dense condition, except where obstructions were met on construction debris.

Figure 5.1. Historic Aerial Photos of the Albany Bulb

1969 *1971* *1973*

1975 *1977* *1981*

1983 *1985* *2011*

Source: Pacific Aerial Surveys

Slope Stability Analysis

A 1986 study by Geomatrix analyzed levee slope stability for a landfill closure plan that included new armored buttress dikes at the bulb perimeter. Noting that slope stability was largely controlled by the strength of the Bay Mud below the fill, Geomatrix back-calculated bay mud shear strengths and used a consolidation time-rate plot to account for strength increase over time (a very simple guesstimate of $\phi = 30°$ and $c=0$ was used to model the fill strength). Factors of Safety of 1.2 and 1.6 were calculated for static short-term and long-term conditions, respectively (a Factor of Safety greater than 1.0 implies stability). Seismic displacements of "a foot or less" were "estimated" for "strong ground shaking" with movement extending "not more than 40 to 50 feet landward of the new dike crest" (i.e., the top of existing fill).The Geomatrix report provides no details on their seismic analysis methodology.

5.3 Issues & Opportunities

Fill Materials and Groundwater Levels

The only subsurface data found relating to the fill in the general region of the Bulb are the logs contained in the 1988 Levine Fricke report. Review of these data generally shows the fill within the Bulb includes variable materials that are poorly compacted. The boring and test pits by Levine Fricke (1988) appear to be on an area of dike fill; A3GEO did not find any subsurface data relating to the materials used as infill within the impoundment dikes. The historical aerial photographs reveal various episodes of excavation and filling within the confines of the Bulb; however it was not possible to discern much about the nature of the fill in the review of historical photographs. Although the Levine Fricke boring shows groundwater was encountered below sea level, it is anticipated that actual groundwater levels at the site are probably close to sea level, subject to tidal influences and may at times rise to higher levels during and following periods of prolonged and/or heavy rainfall.

Liquefaction Potential

Liquefaction is a phenomenon by which certain types of soils, when submerged, can settle, lose strength and gain mobility (i.e. flow) in response to earthquake groundshaking. Among the soils most susceptible to liquefaction are low-cohesion silts and sands in a loose to medium dense condition. Based on the limited available data and onsite observations, it appears that these types of fill soils likely exist below groundwater within the Neck and Bulb; however, the extent and spatial (horizontal and vertical) distribution of these materials is presently unknown. The consequences of liquefaction occurring within the Bulb could be limited to ground surface settlement with no attendant hazard. It is also possible that non-liquefied ground above the liquefied layer could move laterally towards the Bay waters; a phenomenon known as lateral spreading.

Bay Mud Properties and Stability Analyses

The 1986 Geomatrix report appears to reasonably characterize Bay Mud properties for stability analysis purposes. A3GEO agrees that the existing outboard slopes appear to have performed adequately and that static slope stability does not appear to be a significant concern. The Geomatrix report does not mention earthquake-induced liquefaction or lateral spreading, which would potentially involve greater ground displacements than the "foot or less" that Geomatrix predicts for a slope failure through Bay Mud. Also, geotechnical analysis methods and earthquake ground motions used in seismic analyses have evolved since 1986. Consequently, the potential for earthquake-induced slope failures to significantly affect the Neck and Bulb appears uncertain.

Seismic Hazard Conclusions

It is probably not possible to quantitatively assess liquefaction and lateral spreading potential at the site due to the variability of the fill materials, the absence of available data and the cost/difficulty of drilling new borings. The locations of seismic displacements/failures resulting from a large earthquake may be more or less randomly distributed where geotechnical conditions happen to be incrementally worse. As a result, the present recommendation is to not site any structures intended for human occupancy on the Neck and Bulb based on concerns related to the potential for ground failure, the rigorous investigation and analysis standards that would apply and the relative cost and difficulty of any hazard mitigation that may be required. The Neck and Bulb are within a State-designated "zone of required investigation" for liquefaction and geotechnical investigations for new structures intended human occupancy would need to comply with California Geological Survey Special Publication 117A (2008), "Guidelines for Evaluating and Mitigating Seismic Hazards in California."

Overall, given the intended use of the Neck and Bulb as natural open space for informal, passive recreational activities, and the absence of existing or proposed structures for occupation, the risk to personal safety resulting from liquefaction or lateral spreading that may occur as a result of infrequent seismic activity would appear to be quite low.

VI. Access & Recreation Assessment

6.1 Introduction

This chapter discusses access and recreation conditions on the Neck and Bulb, particularly as they relate to the vision for the Neck and Bulb set forth in the MESP General Plan and future management of the area by EBRPD. The assessment is based on field trips by the consultant team to observe current use and conditions, and on input from the City, and users and stakeholders obtained through focus group meetings and a community meeting. The discussion is organized according to the following topics: auto access and parking; biking and non-motorized transportation; walking/hiking and ADA accessibility; shoreline access/aquatic sports; bird watching/wildlife observation; visitors with dogs; vista points; art; structures/facilities and amenities; interpretation, programming, and wayfinding; and safety. For each topic, the discussion addresses existing access and use, current regulatory context, and issues and opportunities related to the area's use as a park. Where pertinent, improvements proposed as part of the Albany Beach Restoration and Public Access Project (Albany Beach Project) that will influence use of the study area are also discussed. The first phase of construction for the Albany Beach Project is scheduled to begin this summer (2015).

6.2 Auto Access & Parking

Existing Access

Due to the study area's relative isolation west of I-80 and the Amtrak tracks and north of Golden Gate Fields, the only publicly available automobile access is via Buchanan Street Extension. The street is four lanes with no street parking between the I-80 underpass and the Golden Gate Fields parking lot entrance; west of the lot entrance, the street transitions to a two lane road with head-in, perpendicular parking along the south side and a small turn-around loop at the west end. Parking in the approximately 42 parking spaces (including two handicap spaces) is limited to two hours and is located on Golden Gate Fields property. Paving conditions along both Buchanan Street Extension and the parking area show signs of age, with cracking and potholes present. Current occupancy of the parking spaces appears to be high during most hours, with some illegal parking occurring during peak periods (e.g., during particularly nice weather). Turnover in spaces, however, also appears to be fairly regular, so few people have been observed turning away from the area due to lack of parking. Parking proposed as part of the beach improvement project (see following discussion) will enhance parking capacity. In addition, the City has plans to remove the red curbs along the north side of the Buchanan Street Extension to create 42 on-street, parallel parking spaces, including 3 accessible stalls.

Photo 6.1. *Buchanan Street Extension and the existing Beach and Neck/Bulb parking lot. Photo: S. Hammond (WRT)*

Direct access to the Neck and Bulb (i.e., beyond the roundabout) via motorized vehicles is prohibited except for emergency and maintenance vehicles. The main trails along the Neck (including the recently widened upper trail and the soon to be improved lower trail) are wide enough to accommodate emergency and maintenance vehicles.

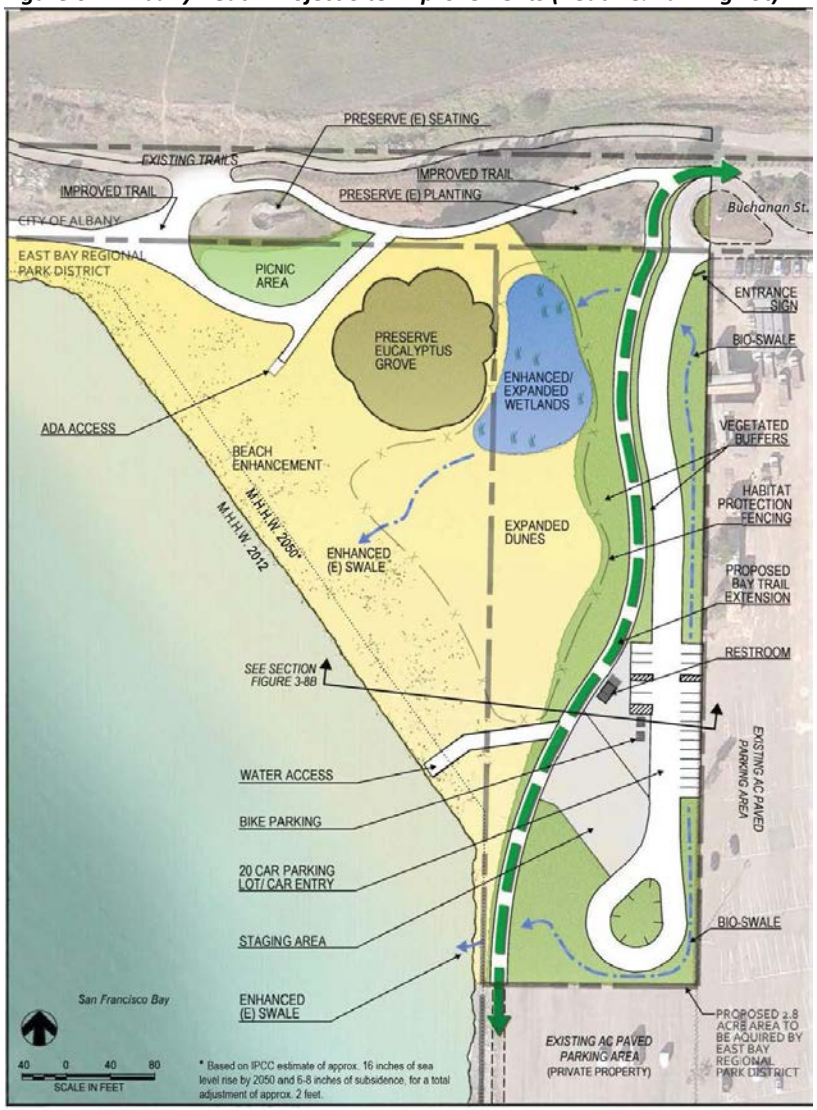
Planned Albany Beach Improvements

The Albany Beach Restoration and Public Access Project (Albany Beach Project) will provide improvements that enhance auto access and parking, including (see Figure 6.1):

- A new 20-vehicle asphalt and concrete curbed parking lot will be installed east of Albany Beach. Parking spaces will be designated for the following uses:
    - Five spaces designated for drop-off of non-motorized watercraft
    - Five ADA accessible spaces (including one van accessible)
    - Ten unrestricted spaces

- Parking lot access will be via a new two-way access driveway at the terminus of Buchanan Street Extension.

Figure 6.1: Albany Beach Project Site Improvements (Beach & Parking Lot)



Source: Final Environmental Impact Report, Albany Beach Restoration and Public Access Project, November 15, 2012

Current Regulatory Context

The MESP General Plan provides some guidance on auto access and parking issues. Specific to the Albany Neck and Bulb, it recommends the continued prohibition of vehicle access, other than for safety or maintenance personnel, beyond the loop at the end of Buchanan Street Extension (*Albany Area Guidelines, A-17*).

Parkwide, the General Plan encourages the provision and design of facilities for non-auto access to MESP to minimize traffic increases and demand for parking, and designates walking, biking, and non-motorized boating as the primary and preferred modes of transportation to and within the park (*Circulation Guidelines, Circ-3 and Circ-4*). Additional parkwide guidelines related to auto access and parking include the following:

- Ensure that adequate parking is provided to accommodate public access to the park and serve park uses and facilities (*Circ-17*).
- Minimize the use of upland habitat for the development of parking lots through strategies such as (*Circ-19*):
    - Shared parking arrangements with adjoining municipalities and landowners;
    - Use of on-street parking in public rights-of-way on both a permanent and special event basis;
    - Design and implement parking improvements in phases in order to be responsive to actual use and demand and to avoid development of too much parking;
    - Base parking demand projections on typical use patterns rather than worst case or special event scenarios;
    - Explore alternatives for accommodating special event parking conditions, such as the use of unpaved overflow parking areas, satellite parking areas, special event shuttle service, etc.

Issues & Opportunities

Given the area's relative isolation and limited, direct transit, bike, and pedestrian connections, automobile access appears to be the preferred mode of getting to and from the Neck and Bulb for most users. While parking currently seems to operating near capacity, the proposed beach parking is likely to alleviate any near term parking issues. Community members have expressed concerns that enhancement of the Bulb will only attract more people to the area, which could result in future demand for more parking. As noted, however, the MESP General Plan emphasizes the development of direct, convenient access via non-auto transportation modes to

all parts of MESP in order to reduce traffic and parking demand, and to protect limited upland resources. Along these lines, implementation of the Bay Trail linkage south to Gilman Street will enhance non-vehicular access. Also, as recommended in the MESP, exploring the potential for establishing a shared parking agreement with neighboring Golden Gate Fields, which has extensive parking that is only occasionally used, would increase parking capacity at the Neck/Bulb and Beach without the need to construct new parking facilities.

6.3 Transit Access

Existing Access

There is currently no direct public transit access to the Neck and Bulb. The closest local AC Transit route is the 25 Line, which runs every 40 minutes from 7 AM to 8:30 PM in a loop through Albany between Pt. Isabel and Downtown Berkeley. The 25 Line's nearest approaches to the Neck/Bulb entrance are at the intersection of Buchanan Street and Cleveland Avenue near a side entrance of the US Department of Agriculture Building, and at the intersection of Buchanan and Pierce Streets. Additionally, the L provides weekly AM and PM Transbay commuting service between San Pablo/Richmond and San Francisco. The nearest stop to the Neck/Bulb entrance is located at the intersection of Solano Avenue and Pierce Street. Both the 25 and L stops are east of the Amtrak tracks and I-80; completing the journey to the Neck/Bulb therefore entails crossing the Amtrak overpass and I-80 underpass by foot or bike, a distance of approximately 0.6 miles.

Current Regulatory Context

The MESP General Plan encourages the use of transit for accessing Eastshore State Park, although does not specifically address access to the Neck and Bulb. Parkwide guidelines call for:

- Providing more frequent transit service to the park, particularly when visitation is expected to be highest (*Circ-12*);
- Encouraging transit use by incorporating transit-friendly design (e.g. bus pullouts, transit, shelters, etc.) into the park (*Circ-13*);
- Exploring the feasibility of an Eastshore shuttle service to link key activity centers in the park and vicinity (*Circ-14*);
- Supporting a shuttle between the park and BART and Amtrak stations (*Circ-15*); and
- Exploring options for water-based transit to the park (*Circ-16*).

Issues & Opportunities

As noted, the MESP General Plan emphasizes the importance of transit as a key access mode to Eastshore State Park. A half mile or less walking distance between a transit stop and a rider's final destination is generally considered "transit accessible." Currently, the closest stop to the entrance of the Neck is 0.6 miles. While not an insurmountable distance for many MESP visitors, the unappealing pedestrian environment and experience crossing the Amtrak overpass and I-80 underpass represent a significant added burden to transit riders. A new bus or shuttle stop installed at the entrance of the Neck/Bulb or on the west side of the I-80 underpass, would bring visitors within 0.4 miles of the Neck trailhead and help them bypass the underpass and overpass, representing a significant improvement to transit access to the site. From a logistic and fiscal perspective, the number of expected visitors to the Neck/Bulb and Beach would be unlikely to support such an extension, but a route that linked several shoreline destinations such as the Bulb, Golden Gate Fields, Tom Bates Regional Sports Complex, and the Berkeley Marina with BART could significantly reduce dependence on the automobile to reach these destinations.

6.4 Biking and Non-Motorized Transportation

Existing Access & Use

Due to its location along the San Francisco Bay Trail, biking is a popular way to access the Albany Neck/Bulb. Although there is currently a gap in the Trail between Buchanan and Gilman Streets along the western edge of the Golden Gate Fields property, the East Bay Regional Park District (EBRPD) has plans to to complete the trail in this area pending resolution of litigation with the Golden Gate Fields owner. Completing this segment of trail will provide ready access from both the north and south.

Currently, Bay Trail bike access from the north and from Downtown Albany along Buchanan Street is complicated by the difficult roadway and sidewalk conditions at the I-80 underpass and Amtrak rail overpass. From the Bay Trail, bicyclists are directed toward the Neck/Bulb on the Albany Waterfront Trail, which is a shared bike/pedestrian path; potential for bike/pedestrian conflicts is high where the two trails merge due to the sharp, blind curve, narrow throughway, and lack of lane separation. With the construction of a multi-use path (Buchanan-Marin Bikeway Bay Trail Connector) on the south side of Buchanan street between San Pablo Avenue and the Amtrak overpass in 2014, cycling conditions between the Neck/Bulb and Downtown have recently improved, although challenges still remain, particularly related to the Amtrak overpass. Riding west on Buchanan, cyclists must navigate either the the high speed travel lanes to cross the rail overpass or ride on the sidewalk, which is extremely narrow on the overpass,

setting up conflicts with pedestrians and oncoming cyclists (there is no sidewalk on the south side of the overpass). Once they have reached the west side of the overpass, cyclists can continue on the alternate path constructed by the City in 2007 within the Caltrans right of way to avoid crossing the I-80 on-ramp at grade, although to reach the Neck/Bulb, they still must cross the I-80 off-ramp at grade. The City is currently working on a design to extend the bike lanes along Marin between Cornell Street and San Pablo Avenue in order to close the existing gap in the bike network between the Ohlone Greenway and the Bay Trail. While Bay Trail access from the south currently ends at Gilman Avenue, bicyclists use the southern portion of the Buchanan Street Extension and Golden Gate Fields parking lot near Fleming Point to reach the Neck/Bulb and to continue on the Bay Trail north.

Once bicyclists reach the Neck at the end of the Buchanan Street Extension, they have two options for accessing the Bulb—the upper trail and the lower trail (see Figure 6.2), which are designated as future SF Bay Trail spurs. The upper trail, which is located outside the study area, slopes gradually upward and runs along the crest of the Neck. This trail was recently widened by EBRPD to provide access for construction vehicles working on the Albany Beach Restoration Project. The lower trail, which is within the study area, remains at grade with Buchanan Street and runs along the Neck's southern shoreline. Both trails are roughly 25-30 feet wide with compacted soil surfaces, and are readily accessible for bicyclists. The two trails meet at a small trail loop at the top of the Bulb.

An extensive network of secondary trails extend out from the loop connecting throughout the Bulb. Two main spurs extend out from the loop: one all the way to the north shoreline and the other south along the top of the Bulb. Although not as well maintained as the two primary trails on the neck, both of these trails are also bicycle accessible, but with more potholes and rough patches. The rest of Bulb trails tend to be much narrower and more heavily obstructed by vegetation and rocks are generally much less accessible by bike, although mountain bikers can sometimes be found traveling on them.

There are three sets of bike racks available for use, one near the entrance of the Golden Gate Fields parking lot and two near the trail entrance to the Neck. In total, there is parking available for approximately 28 bikes.

Planned Albany Beach Improvements

The Albany Beach Project will provide numerous improvements related to biking and non-motorized transportation access. These include (see Figures 6.3, 6.4, and 6.5):

- Construction of a new 0.8 mile segment of the SF Bay Trail between the Buchanan Street Extension loop to the north and Gilman Street to the South.
- Installation of a low maintenance bicycle rack adjacent to the new Beach parking lot capable of holding at least 10 bikes, with expansion capability for up to up to 30 bikes.

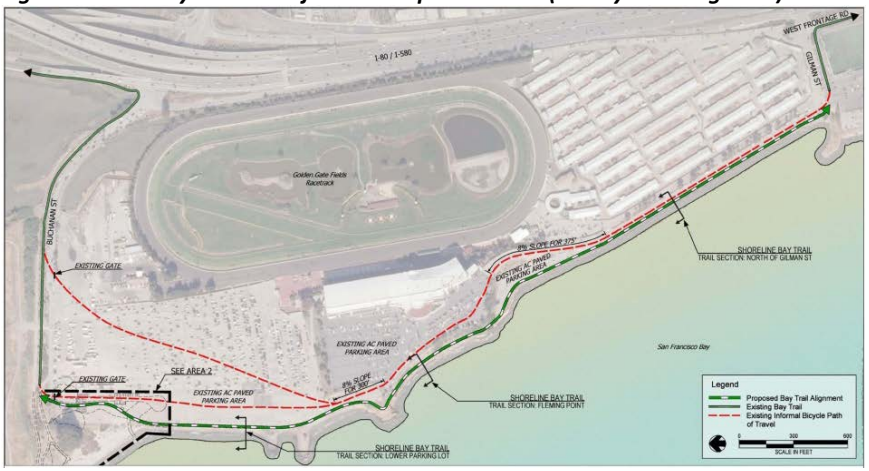
Repair of the existing trail surface on the lower Neck trail between the existing paved trail near the Buchanan Street Extension loop and the Bulb. Trail width will be narrowed from the existing 25- to 30-foot width to a minimum 14-foot width with 18-inch shoulders to avoid net Bay fill, maximize opportunities for additional shoreline habitat planting sites, and to manage site stormwater and drainage. The trail will be surfaced with a semi-permeable material and outsloped to provide diffuse drainage.

Photo 6.2. *Bike racks near the Neck trailhead. Photo: J. Francis (WRT)*

Figure 6.2: Existing Landmarks and Amenities

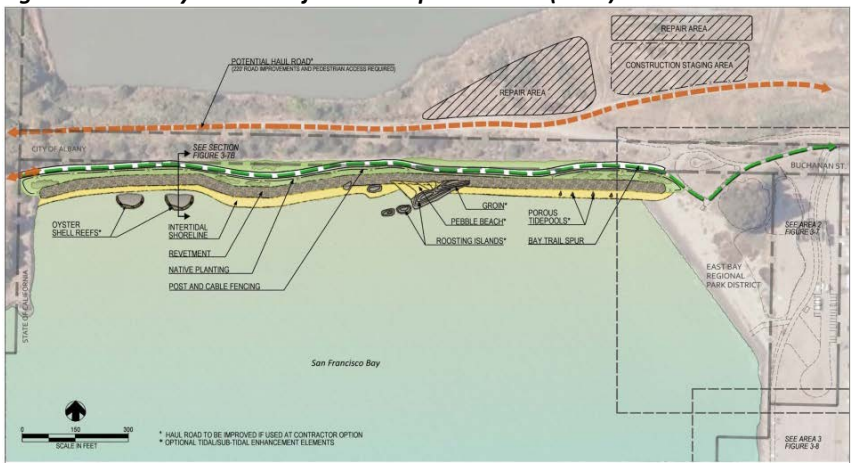
Sources: Susan Moffat, Kushal Lachhwani, Christina Gossman (UC Berkeley) 2014; WRT 2015

Figure 6.3: Albany Beach Project Site Improvements (SF Bay Trail Segment)



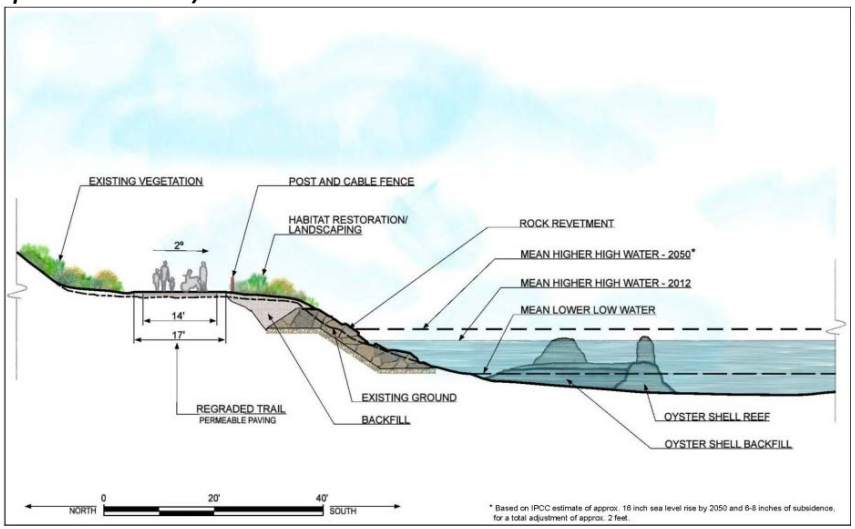
Source: Final Environmental Impact Report, Albany Beach Restoration and Public Access Project, November 15, 2012

Figure 6.4: Albany Beach Project Site Improvements (Neck)



Source: Final Environmental Impact Report, Albany Beach Restoration and Public Access Project, November 15, 2012

Figure 6.5: Albany Beach Project Site Improvements (SF Bay Trail Albany Neck Spur Cross Section)



Source: Final Environmental Impact Report, Albany Beach Restoration and Public Access Project, November 15, 2012

Current Regulatory Context

The MESP General Plan encourages pedestrian and bike access to Eastshore State Park, although does not specifically address access to the Neck and Bulb. Parkwide, the General Plan encourages the provision and design of facilities for non-auto access to the park (i.e. pedestrian, bike, bus, and boat) to minimize increases in traffic and demand for parking, while designating walking, biking, and non-motorized boating as the primary and preferred modes of transportation within the park (*Circulation Guidelines, Circ-3 and Circ-4*). Additional parkwide guidelines related to biking and non-motorized transportation access include the following:

- Provide a convenient and attractive system of multi-use trails that links all subareas of the park into an integrated whole (*Circ-6*);
- To the extent feasible, design and construct trail system to provide universal access (*Circ-7*);
- Support neighboring jurisdictions in their efforts to expedite completion of the Bay Trail (*Circ-9*);
- Improve access to the park from the Bay Trail by adding spurs, laterals, and loops from the main trail corridor into the park (*Circ-10*), and;

- Work with local jurisdictions to enhance bicycle and pedestrian trail connections from the adjacent communities into the park, with particular emphasis on providing safe, efficient, and attractive connections across (i.e., over or under) the I-80/580 corridor (*Circ-11*).

Issues & Opportunities

As noted, the MESP General Plan emphasizes the importance of biking as a key access mode to Eastshore State Park. Completion of the Albany portion of the SF Bay Trail as well as the Bay Trail Spur on the Neck's lower trail as part of the Albany Beach Project will close a major gap in pedestrian/bike network leading to the Neck/Bulb, although access from Downtown Albany and other points east will remain a challenge without improvements across I-80 and the Amtrak tracks to make bike/pedestrian access safer and more convenient.

Bike access to trails on the Bulb is considered a key priority by numerous stakeholders including Albany Rollers and Strollers and will be greatly facilitated by the completion of the Bay Trail Spur on the Neck. Some stakeholders have also emphasized the need to balance bike access with protection of existing wildlife habitat areas that may be sensitive to disturbance by bicyclists, particularly those riding mountain bikes, which have the ability to access secondary trails that traverse more sensitive areas. Most of the secondary trails are also quite narrow, so the potential for conflicts between pedestrians and bicyclists is a concern. Both of these issues are likely to take on greater urgency with the increased number of cyclists likely to visit the Bulb upon completion of the Bay Trail and spur. One opportunity to balance bike access with public safety and habitat protection is the designation of some pedestrian-only trails in more sensitive areas where bikes would be prohibited. The installation of bike racks on the Bulb could additionally allow cyclists to use the Bay Trail spur to access the Bulb and then park their bikes while they explore the various areas of the Bub.

The design of trail system on the Bulb was also discussed by stakeholders, with two primary options considered. The first is a "hub-and-spoke" system, similar to what exists now, in which there is a primary trail with secondary trails off of it that terminate at various vista points along the shoreline. This design is conducive to providing visitors with solitude, but is less conducive to accommodating a convenient circuit of the Bulb by visitors. The lack of connectivity between secondary trails and destination points also makes it more difficult, from a park management perspective, to maintain and monitor the park. Alternatively, a loop trail design with a primary trail around the perimeter of the upper portion of the Bulb—particularly along the western and southern areas—would allow visitors to efficiently circumnavigate the Bulb on bikes. Secondary trails would still extend off the main loop trail, connecting to key vista points and accommodating quieter, more secluded visitor experiences. The loop design also would enhance park operations by providing a more inter-connected trail network that facilitates maintenance and security access to a greater portion of the Bulb.

Photo 6.3. *Cyclists at the Bulb north shoreline. Photo: tacocat.com*

6.5 Walking/Hiking & ADA Accessibility

Existing Access & Use

Pedestrian access opportunities to the Neck/Bulb are similar to those for biking—along the Bay Trail and via Buchanan Street. As such, the challenges described along these routes in the biking section above also apply to pedestrian access.

Opportunities for walking and hiking on the Neck and Bulb are extensive (see Figure 6.2). As noted in the biking section above, numerous primary trails offer access to a large portion of the site. The network of secondary trails provides additional opportunities to explore, although many of these are informal and some may pose safety issues for visitors. Additionally, some secondary trails traverse or provide access to sensitive habitat areas that may be identified for protection in the future.

No specific measures have been taken to provide access to the Neck/Bulb for people with physical disabilities, although some of the existing trails could be candidates for ADA compliance due to their existing width, composition, and slope conditions.

Planned Albany Beach Improvements

The Albany Beach Project will provide numerous improvements related to walking/hiking and ADA accessibility. These include (see Figures 6.1, 6.3, 6.4, and 6.5):

- Construction of a new 0.8 mile segment of the SF Bay Trail between the Buchanan Street Extension loop to the north and Gilman Street to the South.
- Repair of the existing trail surface on the lower Neck trail between the existing paved trail near the Buchanan Street Extension loop and the Bulb. Trail width will be reduced from the existing 25- to 30-foot width to a minimum 14-foot width to maximize opportunities for additional shoreline habitat planting sites and manage site stormwater and drainage while avoiding net Bay fill. The trail will be surfaced with a semi-permeable material and outsloped to provide diffuse drainage.
- The northern access point connecting the existing trail system to Albany Beach will be re-aligned slightly, graded, and resurfaced to meet ADA standards and to accommodate future installation of a bench overlooking the beach.
- Installation of a beach access ramp for pedestrians and non-motorized watercraft access at the south end of Albany Beach.

Current Regulatory Context

For a summary of the regulatory context related to pedestrian and bike access, see the Biking and Non-Motorized Transportation Section above.

Photo 6.4. *The lower trail on the Neck. Photo: J. Gibbs (WRT)*

Photo 6.5. *Secondary trail on the Bulb. Photo: S. Hammond (WRT)*

Issues & Opportunities

The MESP General Plan emphasizes the importance of walking as a key access mode to Eastshore State Park. Completion of the Albany portion of the SF Bay Trail as well as the Bay Trail spur on the Neck's lower trail as part of the Albany Beach Project will close a major gap in pedestrian/bike network leading to the Neck/Bulb, although access from Downtown Albany and other points east will remain a challenge without improvements across I-80 and the Amtrak tracks to make bike/pedestrian access safer, more convenient and more appealing.

As with bike access, many stakeholders and community members have emphasized the importance of a robust trail network on the Bulb to allow for pedestrians to explore the site's various areas. Concerns also have been raised, however, about striking the right balance between human access and habitat protection in designing a future trail system. Possible strategies for balancing these concerns include closure of trails that traverse particularly sensitive habitat areas and/or using fences or vegetative barriers to restrict visitor access to such areas. Seasonal closure of some trails during roosting season could also help to minimize disturbance to bird populations using upland areas for their nests.

Trail safety is another existing issue. The concrete rubble, protruding rebar, and other construction debris that form the Bulb present opportunities for injury. While most of the primary trails on the Neck and Bulb are fairly well graded and free of hazards, conditions on, and adjacent to, secondary trails are much less consistent and include potential hazards. Similarly, large areas with exposed construction debris, although without trails, represent attractive areas for exploration and potential for injury. While eliminating all such hazards may not be feasible or desired on the Neck/Bulb, where the area's wildness is such a valued part of the site's identity, opportunities to minimize more egregious dangers to visitors should be explored, particularly where landfill materials like rebar pose more serious hazards.

Universal access is a goal of the MESP General Plan and the Albany Beach Project is already implementing designs that will enhance access to the Neck for people with physical disabilities. While universal access is feasible for many portions of the Bulb, ADA compliance to all areas may be impractical given the rugged nature of the fill materials.

Photo 6.6. *Hikers along the Bulb south shoreline. Photo: S. Hammond (WRT)*

6.6 Shoreline Access/Aquatic Sports

Existing Access & Use

Shoreline access is available at numerous locations on the Neck and Bulb, including the north, northeast, and northwest shorelines of the Bulb; the west lagoon; the south shoreline of the Bulb; and the southwest corner of the Neck. Ease of access varies depending on shoreline conditions, which range from beaches and mudflats to armored shoreline (see Figure 6.2). Some areas, such as the Yellow Brick Road located on the Bulb's south shoreline and the beach on the northwest shoreline, are accessible only during low tides. In other areas, like the west shoreline of the Bulb and the north shoreline of the Neck, slope and vegetation conditions adjacent to the shoreline prohibit access.

There are currently no defined locations providing shoreline access for fishing, boating, or other aquatic sport activities. Non-motorized watercraft are typically launched from Albany Beach, since non-emergency motorized vehicles are prohibited from the trails on the Neck and Bulb, although landing is possible at areas with beach-like conditions such as the Bulb's north and northwest shorelines.

Planned Albany Beach Improvements

The Albany Beach Project will provide numerous improvements related to shoreline and aquatic sports accessibility. These include (see Figure 6.1):

- Installation of a beach access ramp for pedestrians and non-motorized watercraft access at the south end of Albany Beach. An area will be graded and surfaced for staging non-motorized watercraft, installation of a bench, and access to the beach. Beach access will meet ADA standards. The staging area will be incorporated into the design of the parking lot.
- The existing northern access point connecting the existing trail system to Albany Beach will be re-aligned, graded, and resurfaced to meet ADA standards and to accommodate future installation of a bench overlooking the beach.

Current Regulatory Context

The MESP encourages shoreline access at the Neck and Bulb for the public and provides numerous site-specific guidelines. These include the following:

- Consider creation of small pocket beaches along the Neck to increase recreational access (*A-15*);
- Consider re-grading northwest corner of the Neck (at intersection with the Bulb) to shallow slope condition for creation of a sand or gravel beach (*A-15*), and;
- Provide shoreline stairs and/or ramp along the south side of the Neck and Bulb in order to enhance water access for windsurfers and other human powered watercraft. Work with windsurfers and other user groups to explore options for conveying equipment from the drop-off to the access point (*A-16*).

Additional parkwide guidelines related to shoreline access include the following:

- Enhance beach/Bay access for non-motorized watercraft by creating a vehicle drop-off and parking at the south end of the beach (*A-5*);
- Continuation of non-motorized boating is permitted in the open water area (i.e., non-preservation area) off the Albany shoreline (*A-27*);
- To the degree permitted by federal and state law, prohibit the use of motorized boats and motorized personal watercraft throughout the park, in order to minimize disturbance of aquatic habitats for eelgrass, waterfowl, and other water birds (*Marine-1*);
- To the degree permitted by federal and state law, prohibit the use of non-motorized vessels (e.g., kayaks, sailboats, rowboats, dragon boats, and sailboards) in all aquatic preservation areas Eastshore State Park General Plan III-25 (Albany Mudflats, Emeryville Crescent, Hoffman Marsh, and South Richmond marshes) to protect waterfowl and other water birds (*Marine-2*);
- To the degree permitted by federal and state law, fishing should be prohibited in aquatic preservation areas (*Marine-5*);

Photo 6.7. *Bulb northwestern shoreline. Photo: J. Francis (WRT)*

Photo 6.8. *Bulb southwestern shoreline. Photo: S. Hammond (WRT)*

- In aquatic recreation and conservation areas, encourage fishing from designated piers, structurally-protected shoreline areas, and from vessels (*Marine-6*);
- Support the concept of an aquatic Bay Trail by providing conveniently spaced shoreline access/resting points along the length of the park (*Visit-12*);
- Enhance the recreational use of Bay waters by kayakers, windsurfers, dragon boats, and other human-powered watercraft by providing safe and convenient Bay access facilities. Such facilities will be sited so that they respect sensitive shoreline habitat and features. The character of access accommodations (e.g., ramps, steps, gravel/sand beach, etc.) and their design shall be responsive to both the specific setting and the nature of the projected use. Such facilities should be designed to minimize dependence on regular, ongoing maintenance operations, and to avoid altogether activities that would require damaging the environment to remain operational (*Visit-14*), and;
- Provide upland facilities such as parking, restrooms, potable water, lay-down areas, etc. that support aquatic recreation uses (*Visit-15*).

Issues & Opportunities

Shoreline access for recreation and environmental education is a key priority of the MESP General Plan. As noted above, the beach access ramp designed as part of the Albany Beach Project will provide a key point of access for pedestrians and non-motorized watercraft. On the Neck and Bulb, pedestrians already have good access to the shoreline in multiple locations, although improvements such as stairs could make reaching the shoreline even easier where there are significant grade changes.

Launching watercraft from the Neck and Bulb is problematic for a couple reasons. The restriction on motor vehicle access makes it extremely difficult to get watercraft out onto the Neck/Bulb, and the most suitable shoreline conditions (i.e., beach) are located at the far northwest corner of the Bulb. Although a stakeholder proposed the concept of allowing limited motor vehicle access on the Neck/Bulb to facilitate boat launching, such access would not be allowed under the MESP General Plan.

Anticipated sea level rise will have important implications for shoreline access. Higher water levels will cut off shoreline access for much longer periods in low-lying areas like the Yellow Brick Road trail along the Bulb's south shoreline and the beach along the northwest shoreline (see Chapter 2).

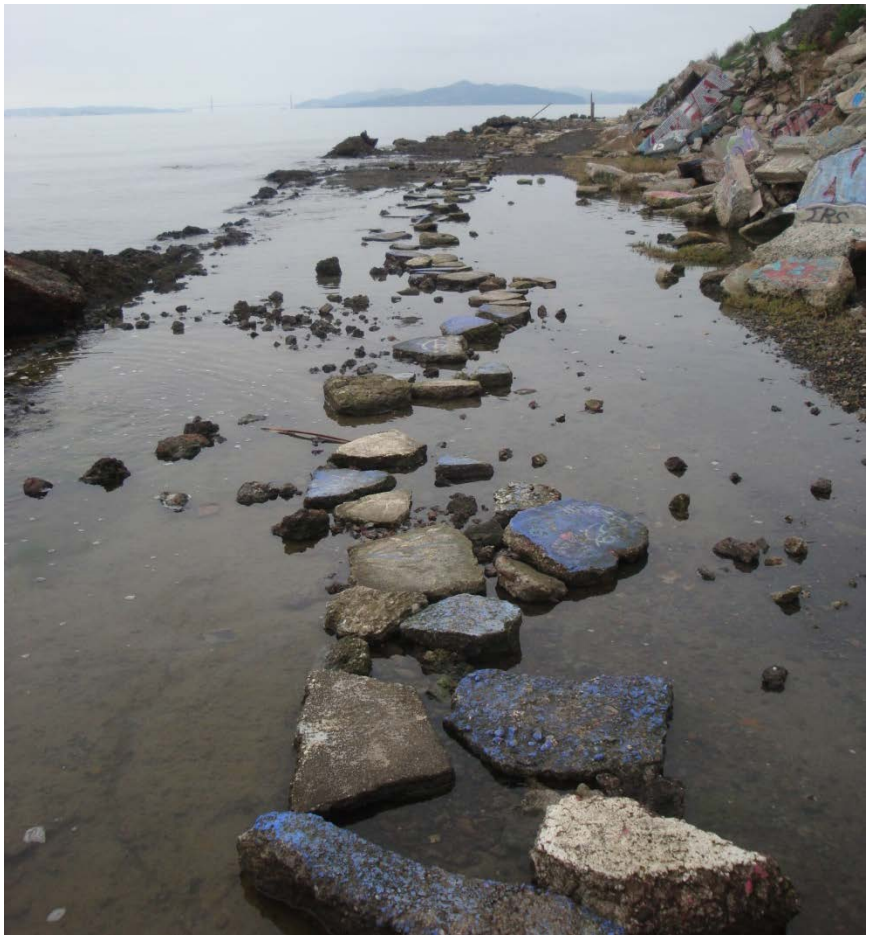


Photo 6.9. *The Yellow Brick Road at mid-tide. Photo: J. Francis (WRT)*

6.7 Nature Appreciation

Existing Resources & Use

As discussed in Chapter 3, the Neck and Bulb host a variety of upland and aquatic birds and wildlife within an exotic mix of native and non-native vegetation. For many visitors, birdwatching and enjoyment of the unusual mix of exotic and native vegetation are prime attractions and character-defining elements of the site. The 'wildness' of the Neck and Bulb means that virtually all areas of the Neck and Bulb have potential value for nature appreciation, from the upland ruderal habitat to the shoreline beaches and lagoons. Topography and vegetation patterns are the only things that limit access and observation opportunities on the Neck and Bulb.

Photo 6.10. *View of the east lagoon from the upper Neck trail. Photo: S. Hammond (WRT)*

Current Regulatory Context

The MESP encourages the protection of bird and wildlife habitat areas and provides site-specific guidelines. These include the following:

- Protect and enhance upland habitat for wildlife at the Albany Bulb, Albany Neck, and the northern and eastern perimeter of Albany Plateau (the conservation areas). Enhance the upland scrub habitat by removing noxious weeds and planting locally native species (*A-12*);
- Provide fencing and/or buffers to protect the tidal marsh on the northeast shoreline of the Bulb (in the small lagoon) from disturbance (*A-14*);

The MESP includes many additional parkwide guidelines related to protection of bird and wildlife habitat areas. The following is a selection of the guidelines most relevant to the Neck and Bulb and should not be considered an exhaustive list:

- Ensure that new visitor facilities and associated services reflect a balance between the need for resource protection, recreation, and interpretation and education (*Visit-3*);
- Incorporate interpretive and educational facilities and programs into the park. Appropriate facilities may include interpretive centers, observation platforms/bird blinds, vista points, interpretive signage, and public art (*Visit-16*);
- Enhance existing trails and introduce new trails that ensure opportunities for visitors to enjoy the diverse topography, biotic communities, avian habitat areas, and scenic views in the park project. Provide fencing or signing of trails where necessary to protect adjacent resources (*Visit-17*);
- Work with appropriate bird watching groups and other groups specializing in avian resources to identify services, programs, and facilities that would enhance the public's ability to understand and appreciate the avian resource (*Visit-18*);
- Provide long-term protection for the existing upland and nontidal wetland habitat within designated preserves and conservation areas, and minimize impacts on these areas due to development of trails and other park facilities. These areas provide habitat for the burrowing owl, northern harrier, white-tailed kite, other raptors, and loggerhead shrike. Upland wildlife habitat should also be protected within Recreation Areas to the extent feasible, consistent with the design of planned facilities (*Wildlif-1*);
- Provide long-term protection and enhancement of foraging and nesting habitat for burrowing owls at the upland Conservation Areas in the park, particularly at the Berkeley Meadow and the Albany Neck and Bulb. To the extent feasible, preserve burrowing owl den-sites (rodent burrows, riprap, or rubble piles) that are present in the park, and allow ground squirrel populations to persist (as a source of burrows) (*Wildlif-2*);
- A program of interpretive signs and exhibits that discuss the value of tidal marshes, tidal mudflats, and subtidal habitats for California clapper rails, California black rails, shorebirds, waterfowl, marine mammals, and other wildlife will be implemented. Other interpretive exhibits should discuss the wildlife values associated with upland and seasonal wetland habitats and any associated special-status species (Wildlif-7);

- Plantings in upland buffers between trails and sensitive habitat areas where necessary to provide a visual screen to minimize wildlife disturbance will be installed. At a minimum, the plantings should consist of locally native shrubs, but they may also include locally native herbaceous species. Such would also provide cover for wildlife and could be used to screen fencing from view, if desired (*Wildlif-9*);
- Disturbance to wildlife will be minimized by restricting access by people and dogs to sensitive wetland and upland habitat areas. Marsh birds, shorebirds, waterfowl, and other water birds are vulnerable to disturbance when people and dogs are allowed too close to important nesting, feeding, or roosting areas. Park visitors and dogs can also disrupt nesting activities of raptors and other birds in upland areas. Trails and other facilities should be sited to maintain appropriate distances from sensitive areas. Signs should be posted restricting access to sensitive habitat areas. Fencing and vegetative buffers can be used between trails and sensitive habitat areas, as necessary to minimize disturbance of wildlife. Dogs can be prohibited from sensitive habitat areas or restricted to access while on leash (*Wildlif-11*);
- Provide opportunities for visitors to gain an understanding of the park's significant natural resources, including how the present day habitats have developed on highly disturbed land, and how they change through succession (*Interp-6*);
- Describe the Pacific flyway and interpret the role of the park project in supporting the phenomenon of seasonal migration (*Interp-7*);
- Interpret the rich diversity of avian species that use the park project for resting, nesting, and foraging, and explore their compatibility with a bustling, noisy urban waterfront (*Interp-8*);

Issues & Opportunities

Protecting and enhancing bird and wildlife habitat on the Neck and Bulb is a key objective of the MESP General Plan. Numerous stakeholders interviewed felt that the best way to do so is to leave the site as is; in other words, make as few improvements as possible and allow natural processes to run their course in order to support habitat areas. Some stakeholders suggested that some wildlife species—particularly birds—might benefit from enhanced protection through methods such as vegetative barriers, permanent and/or seasonal trail closure, creation of habitat islands by breaching landfill dikes in the west and northeast lagoons, and, as a last resort, fencing. However, other stakeholders held that neither the quality of existing upland habitat or evidence of wildlife disturbance warranted such measures, and that recreation and habitat values could continue to successfully coexist as they currently do. As discussed in further detail in the Visitors with Dogs section below, there also continues to be concern regarding the ongoing practice of allowing dogs to run off-leash on the Neck and Bulb and its effect on wildlife.

Photo 6.11. *The Neck and Bulb's upland and shoreline areas are home to birds and other wildlife. Photo: wellsphere.com*

Another perspective offered was that there should be a more balanced approach on the Albany waterfront as a whole between habitat preservation and provision of recreational opportunities. Given that the Albany Plateau is being managed primarily as habitat, it was recommended that the Neck and Bulb be used primarily for recreational purposes. On the surface, however, this recommendation is inconsistent with the MESP classification of the Neck and Bulb for conservation.

6.8 Visitors with Dogs

Existing Access & Use

The Neck and Bulb are popular dog-walking destinations for residents from Albany and surrounding communities. Visitors include those walking their own dogs as well as professional dog walkers, who are typically accompanied by many off-leash dogs. Onsite visual surveys conducted in 2014 for the Supplemental Environmental Impact Report (SEIR) for the Albany Beach Project provide data on the number of visitors with dogs on the Neck; the Bulb was outside the study area of the survey, although it is reasonable to expect that many Neck visitors would also visit the

Bulb. The data indicate that there were 190 average daily users on the Neck, 94 of which (49%) were accompanied by a dog. There was an average of 123 total dogs, 99 of which (80%) were off leash.[10]

Photo 6.12. *A professional dog walker on the Neck. Photo: S. Hammond (WRT)*

Current Regulatory Context

The MESP guidelines related to visitors with dogs are the following:

- Disturbance to wildlife will be minimized by restricting access by people and dogs to sensitive wetland and upland habitat areas. Marsh birds, shorebirds, waterfowl, and other water birds are vulnerable to disturbance when people and dogs are allowed too close to important nesting, feeding, or roosting areas. Park visitors and dogs can also disrupt nesting activities of raptors and other birds in upland areas. Trails and other facilities should be sited to maintain appropriate distances from sensitive areas. Signs should be posted restricting access to sensitive habitat areas. Fencing and vegetative buffers can be used between trails and sensitive habitat areas, as necessary to minimize disturbance of wildlife. Dogs can be prohibited from sensitive habitat areas or restricted to access while on leash (*Wildlif-11*);
- Dog use and activity in the park project will be managed according to State Parks' guidelines in order to protect habitat values and enhance public safety. As such, dogs will not under any circumstances be permitted in management sub-zones designated as preservation areas or on any beach. The Point Isabel/North Point Isabel area is the only area of the park project in which off-leash dog use will be permitted (*Oper-5*).

Additionally, the East Bay Regional Park District and State Parks each have their own policies regarding visitors with dogs to their parks. Policies relevant to the Neck and Bulb include the following:

- **East Bay Regional Park District (see Ordinance 38 for official rules)**
    - Dogs must be leashed (six-foot maximum) and under control at any posted area, parking lot, picnic site, lawn or developed area.
    - No dogs or other animals are permitted at any swimming pool, beach, wetland or marsh, or designated nature study area.
    - Owners must always carry a leash (six-foot maximum).
    - Dogs may be off-leash in open space and undeveloped areas of parklands, provided they are under control at all times. Undeveloped areas are un-posted and unpaved trails or open space areas that are separated from developed areas by a distance of at least 100 yards or by fences.
    - Dangerous animals are not allowed in the parks.
    - Dogs must not be allowed to interfere with, bother, or harass park users, other animals, or wildlife. If you are a party to a dog bite or dog attack incident, you must stop and offer assistance and exchange information with the other party/parties.
    - You must remove your dog's waste from all park property and dispose of it in a garbage can or carry it out of the park. DO NOT LEAVE DOG WASTE IN PLASTIC BAGS ALONG THE TRAILS. This is considered littering. For your convenience, plastic bags are provided in many parks and along some trails, but as a precaution, please carry extras with you.

[10] Supplemental Environmental Impact Report, Albany Beach Restoration and Public Access Project for the East Bay Regional Park District, SCH # 2012032072, December 22, 2014, pp. 6-8

  - Any person who walks or exercises a dog or dogs for a fee or who walks more than three (3) personal dogs must obtain and have in their possession a revocable annual permit.
  - Animals may not be left unattended at any parkland.

- **State Parks**
  - During the day, keep your dog on a leash that is no longer than six feet in length.
  - Please do not take your dog (unless it is a service animal) into buildings or trails, unless it's designated.
  - For sanitary reasons, dogs are not permitted on most beaches, unless it's designated. Always check with a park ranger for any rules specific to the park you are visiting.
  - Please keep your dog calm and quiet. Vicious or unusually noisy dogs will not be allowed in the park.
  - At night, please keep your dog in your tent or vehicle to prevent conflicts between your dog and other dogs or passing campers.
  - Please understand that Park Superintendents have the discretion to further restrict areas open to pets (i.e., trails, buildings, etc.).
  - A rabies certificate or dog license may be required to bring a dog into a State Park.

Issues & Opportunities

The presence and effect of off-leash dogs in MESP has long been an issue that elicits strong opinions on all sides of the debate. On the one hand, advocates for people with dogs feel that there are already very few open areas in East Bay where park visitors are allowed to exercise their dogs off-leash, and that parkland should be reserved for such use, in addition to Point Isabel/North Point Isabel. On the other hand, conservation advocates argue that off-leash dogs are disruptive to wildlife habitats, particularly those on the Neck and Bulb which are important roosting and feeding locations for birds, and that restricting dog access is important for protecting them. Off-leash dogs are also a concern for visitors who are not comfortable around dogs.

As noted above, adopted policies established by the MESP General Plan prohibit off-leash dogs in all areas of MESP except for Point Isabel/North Point Isabel. EBRPD and State Parks policies also restrict off-leash dogs in most areas. However, enforcement of these policies has been a consistent challenge for EBRPD due to a lack of staff and resources.[11] The Albany Beach Project SEIR notes that EBRPD expects to enforce the existing dog policies at current levels even after implementation of the Albany Beach Project. Barring significant funding increases in the future, EBRPD enforcement of dog policies is likely to be similar on the Neck and Bulb if these properties are transferred to EBRPD.

6.9 Vista Points

Existing Resources & Use

Due to its unique location, orientation and configuration, the Neck and Bulb offer spectacular views of San Francisco Bay, the San Francisco skyline, the Golden Gate, Oakland-Bay, and Richmond bridges, Mt. Tamalpais, and the East Bay hills and shoreline from vantage points and trails throughout the area. As noted on Figure 6.2, numerous locations, particularly on the Bulb, offer particularly sweeping views and some, such as Mad Marc's Castle, Stephanie's View Bench, and The Library, include informal enhancements (e.g., art, make-shift seating, etc.) that reflect their history of being used as defined vista points. Currently, none of these sites provides formal access improvements or amenities for visitors.

Photo 6.13. *View of San Francisco Bay and Marin County from the Bulb west shore with the tidal lagoon in the foreground. Photo: S. Hammond (WRT)*

[11] Supplemental Environmental Impact Report, Albany Beach Restoration and Public Access Project for the East Bay Regional Park District, SCH # 2012032072, December 22, 2014, p. 9

Current Regulatory Context

MESP guidelines recommend creation of a vista point/seating area on the bluff at the west end of the Bulb with interpretive exhibits that describe key features of the landscape visible from this setting and the history of the Bulb and its formation (*A-19*).

Issues & Opportunities

Given the number of excellent vista point locations established through years of use by visitors to the Neck and Bulb, there is an opportunity to preserve and potentially enhance these areas for future visitors. Determining how much improvement and/or amenities should be introduced to these vista points is a question. Stakeholder input ranged from leaving as is to enhancing vista points with appropriate improvements and amenities. Some locations may be suitable for a wider range of amenities such as benches, picnic tables, trash receptacles, interpretive signage, etc., whereas a smaller range of amenities may be more appropriate at others. Factors to consider in determining amenity suitability include ease of access, proximity to habitat areas and trails, size of viewing area, among others.

6.10 Art

Existing Resources

For years, art has been an important feature of the Neck and Bulb. Most of the existing art works are either paintings on rocks and concrete fill material or sculptures made of found objects. Created by many artists over the years, some of whom occupied long-term encampments on the Bulb, the art is viewed by many as a part of the cultural landscape of the site that contributes to its unique sense of place. In many cases, the artists responsible for specific works are unknown. Over time, the integrity of many of the art works—particularly the sculptures—has deteriorated due to constant exposure to the elements and lack of maintenance. The locations of some of the most highly visible artistic works are noted in Figure 6.6.

Only two art installations on the site, both located near the entrance of the Neck, were officially sanctioned and commissioned by the City of Albany; these include "The Cove" (see the Structures/Facilities section below) and the heron sculpture in the center of the Buchanan Street Extension loop.

Current Regulatory Context

The MESP guideline related to public art on the Neck and Bulb is the following:

- Consistent with the Eastshore park project's cultural resource guidelines, the practice and products associated with unauthorized artistic expression (e.g., installations, structures, paintings, etc.) on the Albany Bulb will be reviewed in accordance with State Parks' systemwide cultural resource procedures prior to their removal (*A-21*).

Additional parkwide guidelines are the following:

- Incorporate interpretive and educational facilities and programs into the park project. Appropriate facilities may include interpretive centers, observation platforms/bird blinds, vista points, interpretive signage, and public art (*Visit-16*);
- Explore the feasibility of establishing a formal program of public art consistent with the mission of State Parks and the interpretive themes of the Eastshore park project (*Aesth-8*);
- If it is determined that a public art program is feasible, work with appropriate arts organizations, artists, and interested public to identify how a public art program could be managed and by whom, and prepare a Public Art Management Plan that will guide the use of public art in the park project (*Aesth-9*);
- The mission of the Public Art Management Plan should be to (*Aesth-10*):
    - Provide a forum for exploring the relationship between the arts, preservation of the natural environment, historic preservation, and recreation;
    - Promote public understanding and appreciation of the environmental, historical, cultural, and sociological context of the park through the use of art;
    - Foster expressions of art and design which will reflect the unique environmental and cultural resources of the Eastshore;
    - Foster work that is diverse, high quality, and reflects the ethnic, geographic, and cultural diversity of the Bay Area's population.

Issues & Opportunities

Evaluating the significance and cultural impact of art is by nature a subjective exercise, yet there is a strong feeling among stakeholders and community members that the artistic works on the Neck and Bulb are important, character-defining elements of the site. Less well-defined is what role art can and should play on the Neck and Bulb in the future. As noted, current MESP guidelines state that existing art work on the Bulb will be evaluated and removed in accordance with State Parks' cultural resource procedures. Stakeholders have made the case that alternative strategies should be considered and have proposed a number of ideas for the management of existing and future artworks that pick up on the MESP's recommendation to explore the establishment of a public arts program.

- **Existing Art.** The central question around existing art works is whether they should be preserved, and if so, how? Inherent in many of the discussions around the role of art on the Neck and Bulb is the temporal nature of the existing works. Most were created with simple, found and impermanent materials. They are exposed to the elements, and generally were not intended to last in perpetuity. That said, the meaning they bestow upon the site is widely recognized, and their absence could change the cultural landscape. Ideas for how to address existing artworks include:
    - Catalogue/document all remaining art as a cultural reference;
    - Leave all exiting works in place, removing pieces (primarily sculpture) that represent a danger due to deterioration;
    - Exhibit sculptural pieces removed from the site in a public space (e.g. museum, as public art, etc.), and;
    - Attempt to find the artists who created the work, and ask what they would like done with their artwork.
- **New Art Installations.** There is no clear consensus among stakeholders as to whether new art installations should be permitted on the Neck and Bulb in the future. While some see the continuation of some sort of art program as a natural continuation of the site's artistic heritage, others believe that, while the site's use as a medium for creative expression was valuable and should be recorded, the moment for such a use has passed. For those who feel that the Neck and Bulb should continue as a place for artistic expression, many questions have been raised regarding the nature and management of future works. These include:
    - Should artworks be permanent, temporary, or should there be a mix of each?
    - How might the Neck and Bulb be programmed to accommodate performance as well as visual artworks?
    - How should existing and future art installations be integrated into site interpretation?
    - Should there be an official, sanctioned program that curates future works, or should artists be allowed to continue producing unofficial works? If there is an official program, who will curate and manage it (e.g. EBRPD, City of Albany Arts Commission, a new or existing non-profit, etc.)?

While each of these questions will require significant discussion and input among a larger group of stakeholders, on the last question, numerous stakeholders interviewed felt that the best option for management of a public art program on the Neck and Bulb would be to work with an existing or new, art-focused non-profit with experience curating, managing, and fundraising for public art (e.g. Black Rock Arts Foundation, Zero1, Richmond Art Center, etc.).

Photo 6.14. *Sculptures on the Bulb north shoreline. Photo: S. Hammond (WRT)*

Figure 6.6: Art on the Neck & Bulb

Sources: Susan Moffat, Kushal Lachhwani, Christina Gossman (UC Berkeley) 2014; WRT 2015

6.11 Structures/Facilities and Amenities

Existing Resources & Use

There are few structures on the Neck and Bulb and those existing are either portable or informal. There are no utility connections to provide power or water. Existing structures include the following:

- **Portables.** Two portables are located within the City right of way near the entrance of the Golden Gate Fields parking lot. They are owned by the City of Albany and were used as temporary housing for former residents of the Bulb after long-term encampments there were removed. They are currently vacant and for sale. Once sold, they will be removed from the site.
- **Portable Toilet.** A portable toilet is located at the end of the Buchanan Street Extension loop adjacent to the trail entrance to the Neck.
- **The Cove.** The Cove is a public art project commissioned by the City of Albany and designed in 1998 by Albany resident Carlo Ferretti. It is located near the trail entrance to Albany Beach and the intersection of the upper and lower Neck trails. Built into the side of a small mound, the horseshoe-shaped, terraced structure is constructed of recycled concrete slabs recovered from a city repaving project. It is used as a gathering location for environmental education as well as a fire pit/hang out area. Its east-facing orientation provides protection from the wind.
- **Mad Marc's Castle.** Constructed as a former encampment from construction debris held together by poured in place concrete, Mad Marc's Castle is an informal structure at the southwest corner of the Bulb. Its location provides a commanding view of the Bay and San Francisco skyline, but is difficult to reach via secondary trails.

Other existing facilities and amenities on the Neck and Bulb include a limited number of benches, trash receptacles, and dog waste bag dispensers shown on Figure 6.2.

Planned Albany Beach Improvements

The Albany Beach Project will provide new facilities and amenities, including (see Figure 6.1):

- A double (two toilet stalls) vault toilet facility will be installed near the non-motorized watercraft staging area just east of Albany Beach and adjacent to the new parking lot.
- Approximately three picnic tables and trash/recycling receptacles will be installed, with at least one ADA accessible table.
- Installation of a beach access ramp for pedestrians and non-motorized watercraft access at the south end of Albany Beach. An area will be graded and surfaced for staging non-motorized watercraft, installation of a bench, and access to the beach. Beach access will meet ADA standards. The staging area will be incorporated into the design of the parking lot.

Photo 6.15. *Mad Marc's Castle. Photo: S. Hammond (WRT)*

Photo 6.16. *The Cove. Photo: S. Hammond (WRT)*

Current Regulatory Context

The MESP General Plan does not include any guidelines related to the provision of permanent or temporary buildings/structures or facilities such as restrooms on the Neck or Bulb. The current City of Albany General Plan includes a policy prohibiting construction of any building or structure within 100 feet of the Albany shoreline.

Issues & Opportunities

The construction of bathroom facilities and a beach access ramp as part of the Albany Beach Project represent important investments in the site that will greatly enhance the experience of visitors to both the Beach and the Neck/Bulb. While additional structures for concessions or a visitors center on the Albany Plateau just east of the Neck were contemplated in the past, they were to be associated with sports facilities that were subsequently established in Berkeley as the Tom Bates Regional Sports Complex. The geotechnical assessment conducted for this transition plan does not recommend siting structures intended for human occupancy on the Neck or Bulb due to the potential for ground failure during a seismic event, the rigorous investigation and analysis standards that would apply on the site, and the relative cost and difficulty of any hazard mitigation that would be required to build a structure (see Chapter 5: Geotechnical Assessment). Based on the geotechnical assessment, a structural assessment of Mad Marc's Castle should be completed to determine its viability for safe, continued use.

Locations around the Neck and Bulb for other amenities such as benches, picnic tables, and trash receptacles should be explored. As one stakeholder noted, however, the provision of these amenities will need to be accompanied with a strong program for maintenance in order to ensure that the facilities are kept in good condition and that trash produced as a result of picnickers is collected regularly. The repurposing of landfill materials such as concrete blocks was also mentioned as a creative way to use recycled materials in the design of benches and wayfinding signage as a way of referencing the site's history.

6.12 Interpretation, Programming & Wayfinding

Existing Resources

Existing interpretive resources on the Neck and Bulb are few, consisting of two signs near the Cove and the entrance to Albany Beach. The signs include information on San Francisco Bay landmarks visible from the Neck and Bulb and a very brief history of the origins of the site. The signs are in generally poor condition due to graffiti and lack of maintenance. There is currently no wayfinding signage on the Neck or Bulb. Various organizations utilize the site for environmental education programming, including the Berkeley Marina Shorebird Center, which organizes shoreline cleanups 3-4 times per year with adolescents and teens. In addition to picking up shoreline debris, the cleanup actions include wildlife surveys, water sampling, and tide pool exploration that teach youth about the unique shoreline environment on the East Bay.

Photo 6.17. *Interpretive signage at the Neck trailhead. Photo: J. Gibbs (WRT)*

Planned Albany Beach Improvements

The Albany Beach Project will provide numerous improvements related to site interpretation. These include (see Figure 6.1):

- A park entrance sign will be installed at Buchanan Street.
- Interpretive exhibits will be installed at two locations.
- Informational signs will be installed near the park entrance and on trails to assist with pedestrian and bicycle circulation, and to display park rules and regulations.

Current Regulatory Context

The MESP General Plan includes numerous guidelines related to the interpretation of MESP, which are organized according to interpretive themes. Several of these

themes are particularly relevant to the environmental and cultural history of the Neck and Bulb:

- **Park Unifying Theme: "Connections: Linking the Urban and Natural Environments on the Eastshore."** The park project's interpretive potential embodies the confluence of the urban environment and nature. Thus, the unifying theme encourages an appreciation of the significant natural and cultural influences on the park in the past, present and future.
- **Primary Theme: "Connecting with the Water: The Evolution of a Shoreline."** An exploration of the natural and cultural processes that have shaped the shoreline through history and will continue to exert pressure for change in the future.
- **Primary Theme: "Connecting with the Land: Nature and the City."** An exploration of the vegetation and wildlife native to San Francisco Bay, its role in the larger environment, and nature's incredible adaptability and transformative powers.
- **Primary Theme: "Connecting with the Future: 'Garbage' vs. Resource Recovery."** An exploration of the role of refuse in the formation of the park and how today's responsible conservation and waste management practices can prevent future degradation of the environment.

Additional parkwide guildelines related to wayfinding include the following:

- Design an identity and wayfinding program for the Eastshore park project that will establish design guidelines and standards for park signage, and provide guidelines for the location and distribution of signs throughout the park project (*Aesth-1*).
- Establish primary and secondary entry points to the park project, and develop design standards for these "gateway" areas that will create a sense of arrival and establish an initial identity and sense of place for the park project. Design standards and guidelines for entry points should distinguish primary and secondary gateways (*Aesth-2*).

Issues & Opportunities

The Neck and Bulb have a rich environmental and cultural history that offers numerous interpretive themes for exploration, from its days as a landfill, to its more recent history as an encampment community, artistic canvas, and wildlife habitat. While it is clear that the Neck and Bulb have a fascinating story for visitors to learn, the format of the site's interpretation could take multiple forms, including signage, docent talks and tours, wildlife tours, an art trail, programmed events, and others—a holistic interpretive program might include all of these elements and more. Depending on the status of future art programming on the Neck and Bulb, art could be a consistently renewed interpretive element on the site.

While acknowledging the many opportunities for site interpretation and programming, there were also many voices among the stakeholders interviewed that cautioned against over-programming or over-curating the Neck and Bulb. For many, exploration, discovery, spontaneity, and the site's "gritty" character have been key ingredients that make it a fun and exciting place to visit and they would like to see those characteristics maintained to the greatest extent possible.

A small number of stakeholders expressed interest in seeing commercial activity on the Neck and Bulb such as a café/concession stand and/or food trucks. Such uses would generally not be consistent with State Parks' classification of the Neck and Bulb as a Conservation area. Similarly, allowing food trucks west of the Buchanan Street Extension would be inconsistent with guidelines restricting vehicle access to the Neck and Bulb.

6.13 Public Safety and Personal Security

Existing Conditions

Public safety and personal security are both potential concerns at the Neck and Bulb. Public safety relates primarily to potential hazards presented by exposed construction debris. Personal security relates to visitors' sense that they are free from threat related to illegal or unauthorized uses that occur as a result of the area's remoteness.

Although not a consistent condition throughout, the Neck and Bulb include significant areas where exposed areas of concrete rubble and protruding rebar represent potential hazards to visitors. During the summer of 2015, the City of Albany undertook field work to identify existing known locations of protruding rebar on the Bulb, as shown in Figure 6.7. Due to the uneven surfaces and sharp edges of some landfill materials, these areas present high potential for tripping and injury, including anything from a twisted ankle to broken limbs, to lacerations and impaling on protruding rebar. That said, the majority of the Neck and Bulb area has either soil or vegetative cover that minimizes exposed hazards and the potential for such injury. Over time, however, as vegetation is trimmed back and/or soil erosion occurs, additional rebar locations that are currently covered by soil or vegation may be exposed.

The relative isolation of the Neck and Bulb from the rest of Albany is one of the area's charms, but also results in a lack of the natural surveillance that occurs when

Figure 6.7: Existing Known Rebar/Debris Locations on the Bulb

there is a regular and robust public presence. Historically, this lack of surveillance allowed illegal and unauthorized activities (e.g., drug dealing, homeless encampments, etc.) to take place on the Bulb that contributed to a perception that of the area was not always safe or welcoming. In the past year, the City has taken significant steps to eliminate this as an issue by relocating people who were living on the Bulb, increasing regular police patrols of the area, and thinning vegetative cover to enhance visibility.

Currently, EBRPD officers provide 3-4 daily patrol checks of Albany Beach 7 days a week, which include vehicular and/or foot patrols of the Beach, Albany Plateau and Neck areas. EBRPD's helicopter makes 1-2 daily aerial checks of the area 7 days a week. City of Albany Police officers currently provide 5 daily patrol checks of the Neck and Bulb on foot and/or motorcycle.

Due to the lack of electricity on the site and its function as a conservation and habitat area, the Neck and Bulb do not have lighting. However, since the area is closed to the public an hour after sunset, this is not a significant security issue.

Current Regulatory Context

The MESP General Plan includes a guideline related to the safety hazards associated with construction debris on the surface of the Neck and Bulb (e.g., unstable rubble piles, unsafe structures and protruding rebar). It calls for implementation of a clean-up program for these materials that minimizes disturbance to upland wildlife habitat. Approaches that involve mass grading and the wholesale removal of vegetation are not considered appropriate. Given the magnitude of the task, priorities for clean-up, areas for potential closure to public access, and appropriate phasing should be identified (*A-13*).

Additional parkwide guidelines related to lighting include the following:

- In order to minimize disturbance to wildlife, lighting shall not be permitted in areas designated as preservation areas or in areas with sensitive habitat values. Night lighting should generally be restricted to the more developed areas of the park project (i.e., buildings, paths, parking lots, etc.) consistent with security and safety needs. Lighting plans shall be reviewed for compatibility with habitat values prior to construction (*Aesth-5*).
- Lighting levels (i.e., intensity/foot-candles) should generally be kept as low as possible, consistent with public safety standards. Luminaires should focus the light downward and prevent the splay of ambient light to other areas. Whenever possible use path-level or bollard type fixtures that keep the light source closer to the ground. Color-tinted and lower wattage lamps should be used to help reduce lighting-related disturbance (*Aesth-7*).

Issues & Opportunities

While the hazards represented by exposed landfill material remains an issue for some, the general consensus from stakeholders was that such materials were generally viewed as an important element contributing to the area's character and

Photo 6.18. *Concrete rubble with exposed rebar. Photo: S. Hammond (WRT)*

sense of place. As such, they generally should not be removed or buried, but should remain as a reminder of the site's history. In addition, the widespread distribution of such debris makes implementing a site-wide removal program both unreasonably costly and damaging to the area's vegetation and habitat values. Stakeholders also suggested that the exposed construction materials generally did not represent a greater threat than natural conditions one experiences at many regional, State and National parks.

Stakeholders appear to prefer a targeted approach that focuses remediation of hazardous conditions along the most highly trafficked portions of the Neck and Bulb while leaving other areas as is. There appears to be a general feeling that protruding rebar represents the most significant threat to public safety, and that

Photo 6.19. *The Albany Police Department regularly patrols the Neck and Bulb. Photo: J. Gibbs (WRT)*

remediation of areas with unsafe rebar would be appropriate. Remediation of hazards could be accompanied by a signage program warning visitors of hazardous conditions and a monitoring and maintenance program that identifies and removes newly discovered/uncovered rebar and other hazardous conditions.

While the isolation of the Neck and Bulb is one of its most important attributes, allowing visitors a place for quiet reflection away from the busy urban life of the Bay Area, it also can pose a hazard to personal safety. As the Neck and Bulb become more well-known destinations within the MESP, they will gradually benefit from the natural surveillance that comes with more visitation. Additionally, the City of Albany Police has made clear that it is committed to maintaining ongoing patrols on the Neck and Bulb indefinitely, which will provide considerable public safety benefits.

Given the Neck and Bulb's status as habitat and conservation area, illumination of the area generally is not considered appropriate. However, trailhead illumination at the entrance of the Neck (Buchanan Street Extension roundabout) may be appropriate for visitors making their way back to the parking area on Buchanan Street Extension at twilight.

VII. Appendices

Appendix A: Coastal Modeling Prepared for FEMA Studies

APPENDIX A
Coastal Modeling Prepared for FEMA Studies

Summary of Coastal Modeling Results (DHI 2011)

This appendix summarizes the results of modeling performed for the FEMA coastal studies by DHI (2011). The following figures and information summarize the water levels and wave heights estimated in the vicinity of the Albany Bulb.

Flood hazard mapping is currently being completed by FEMA along the shore of northern Alameda County. The mapping is the culmination of several technical studies by the FEMA team, including modeling of the extreme water levels, wind waves and swell waves along the shoreline of the Central and North San Francisco Bay (DHI 2011). These data were used to establish special flood hazard zones along the shore that accounts for wave runup and overtopping of coastal features and structures.

Table A-1 summarizes the approximate results of the DHI modeling presented in DHI (2011) for FEMA in the vicinity of the Albany Bulb & Neck Transition Plan project location. The values summarized in this memorandum were extracted from figures below, so they are approximate.

TABLE A-1
SUMMARY OF DHI (2011) SWL AND WAVE HEIGHTS IN THE VICINITY OF ALBANY BULB

Parameter	100-year	500-year
Still Water Level (ft NAVD)	9.0-9.5 ft NAVD	10.0-10.5 ft NAVD
Wind Wave (seas) (feet)	3.0-4.0 feet	3.0-4.0 feet
Swell (feet)	0.5-1.0 feet (some areas 1.0-2.0 feet)	0.5-1.0 feet (some areas 1.0-2.0 feet)

Source: DHI (2011)

Wave runup and overtopping analyses were completed using these values, which resulted in a basis for establishing 100-year special flood hazard zones. At the Albany Bulb project site, the southern shore of the Neck, and the south, west, and north shores of the Bulb are in a “VE” zone with elevation 14 feet NAVD. The wetland area on the northeast shore of the Bulb is designated an “AE” zone with elevation 10 feet NAVD. The draft FEMA work map information and figure are described further below.

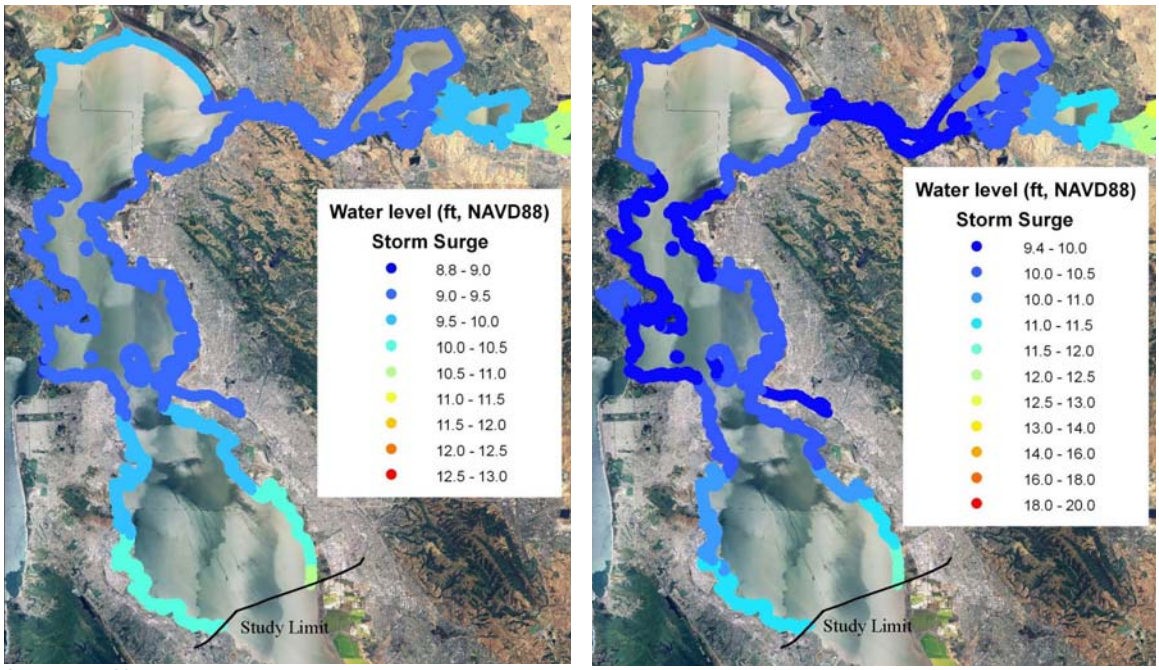
Special Flood Hazard Areas are referred using the following zoning terminology:

- Zone A: areas of coastal flooding with no wave hazard; or waves less than three feet in height; and

- Zone V: areas of coastal flooding subject to the additional hazards associated with wave action.

Still Water Level

100-year still water level at the Albany project site is in the 9.0-9.5 ft NAVD range. The 500-year SWL in the 10.0-10.5 ft NAVD range (Figure A-1).



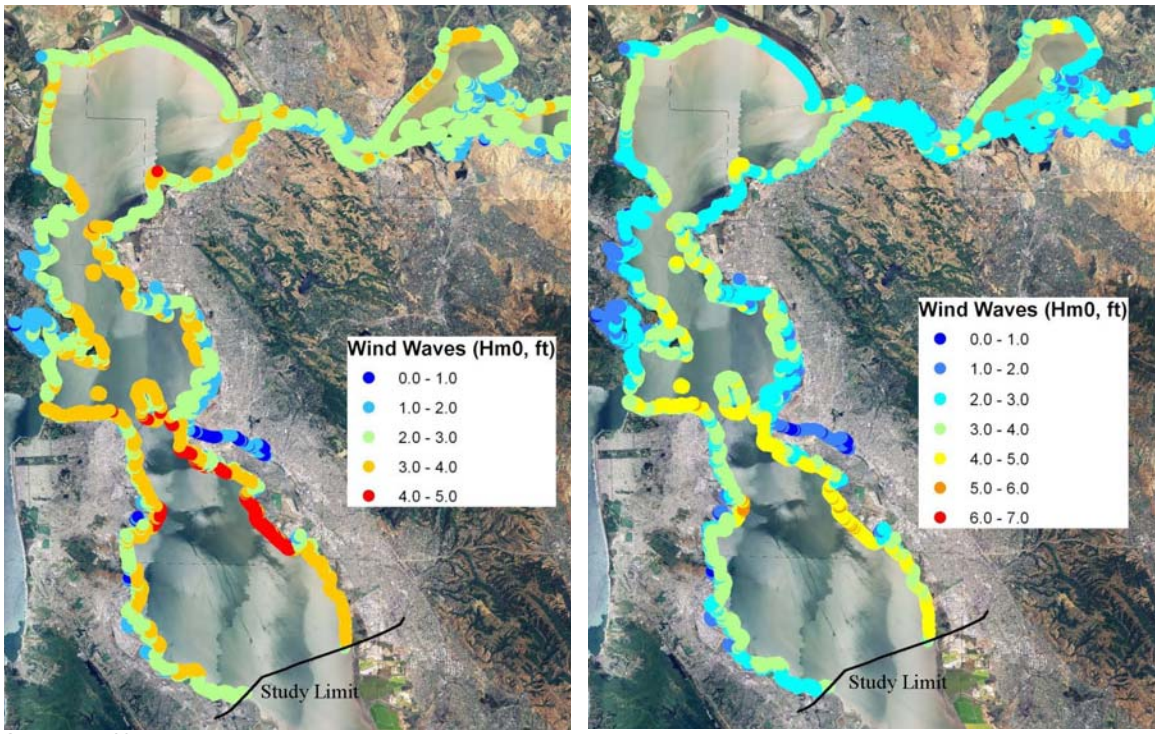
Source: DHI 2011

Figure A-1
100-year SWL (left) and 500-year SWL (right) for SF Bay FEMA Study

Waves

Modeled waves included both the wind waves (seas) and swell penetrating through the Golden Gate. Figure A-2 presents the distribution of the wind waves along the central and north bay shoreline for 100-year and 500-year recurrence. At the Albany project location, the wind waves were approximately in the 3.0-4.0 ft range for both the 100-year and 500-year recurrence intervals.

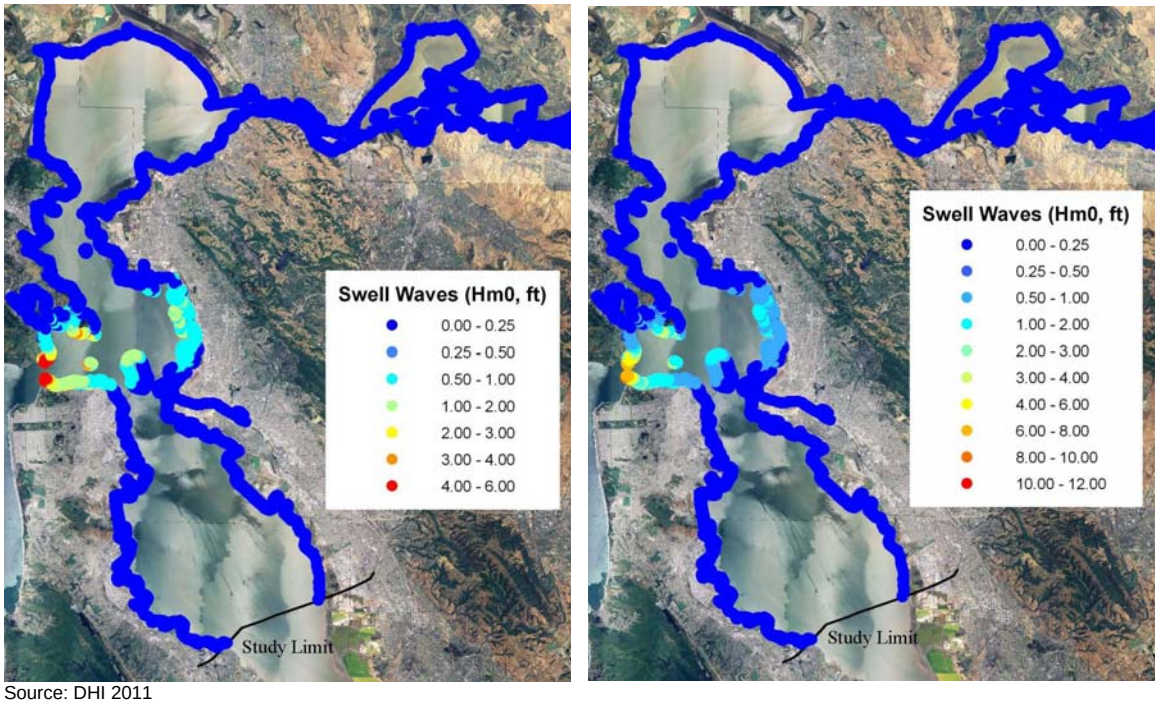
Similarly, the distribution of extreme swell height around the central and north bay shoreline is presented in Figure A-3 for the 100-year and 500-year recurrences. At the Albany project location, the swell wave height is primarily in the 0.5-1.0 foot range with some areas in the 1.0-2.0 foot range for the 100-year and 500-year recurrences.



Source: DHI 2011

Figure A-2

Distribution of extreme wind wave heights in feet for Central and North San Francisco Bay for the 100-year event (left) and 500-year event (right)



Source: DHI 2011

Figure A-3

Distribution of extreme swell wave heights in feet for Central and North San Francisco Bay for the 100-year event (left) and 500-year event (right)

Draft Work Map

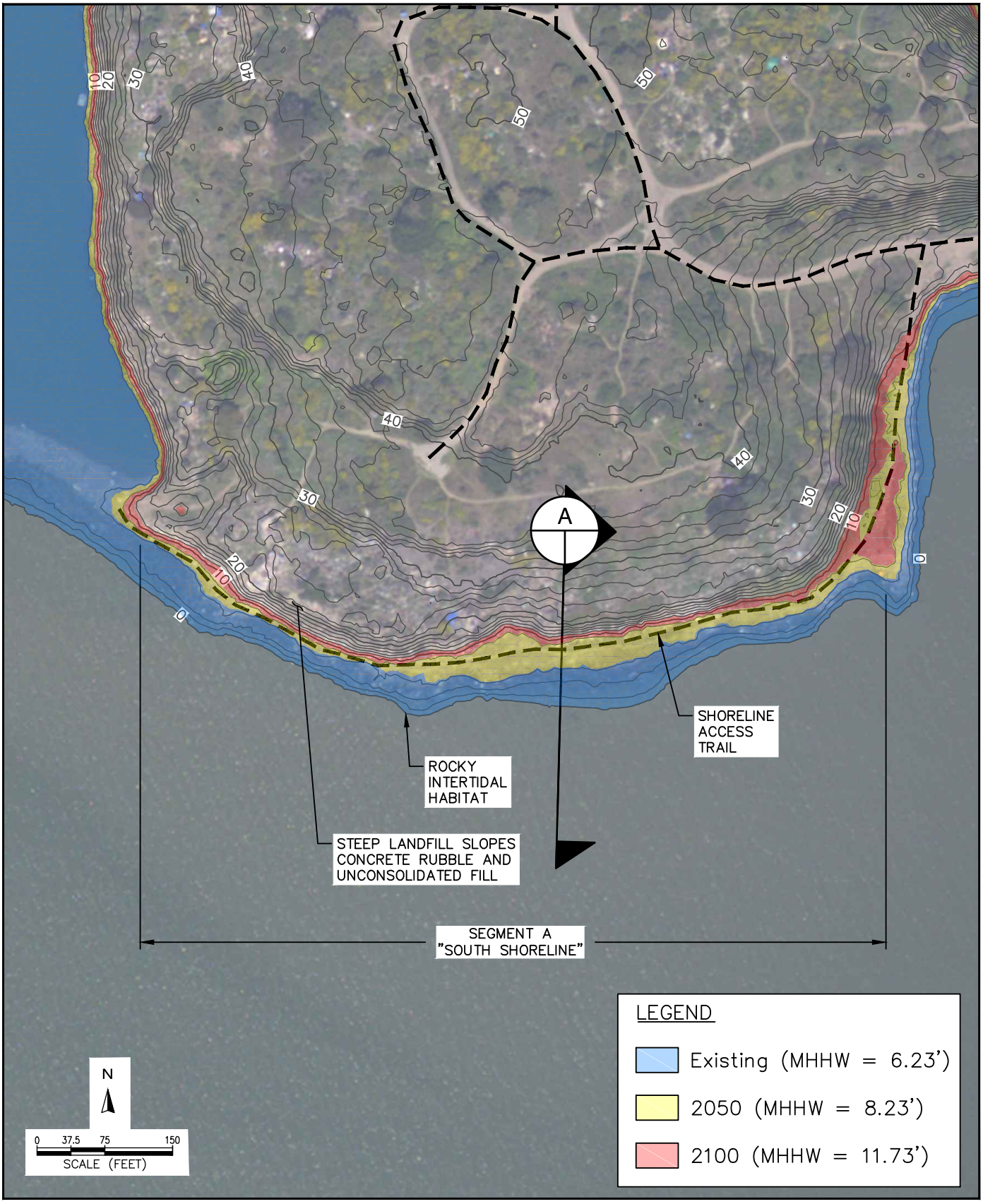
FEMA is currently performing coastal engineering analyses and mapping of the San Francisco Bay shoreline to revise and update the flood and wave data for the Alameda County Flood Insurance Study report and Flood Insurance Rate Map panels along the Central San Francisco Bay shoreline. Figure A-4 presents draft work maps that were made available to the public for review and comments. The comment period ended on June 21, 2014. FEMA is in the process of responding to comments and producing the Preliminary FIRMs for northern Alameda County, with an expected release date of April 2015.

The draft work map in the vicinity of the Albany Bulb project site shows that the south shore of the Neck and the south, west, and north shores of the Bulb are designated as "VE" zones with an elevation of 14 feet NAVD. The wetland area on the northeast shore of the Bulb is designated as an "AE" zone with an elevation of 10 feet NAVD.

Source: Google Earth; FEMA

Figure 4
Draft FEMA Work Map for the Albany Bulb site

Appendix B: Inundation and Flood Maps for Shore Segments



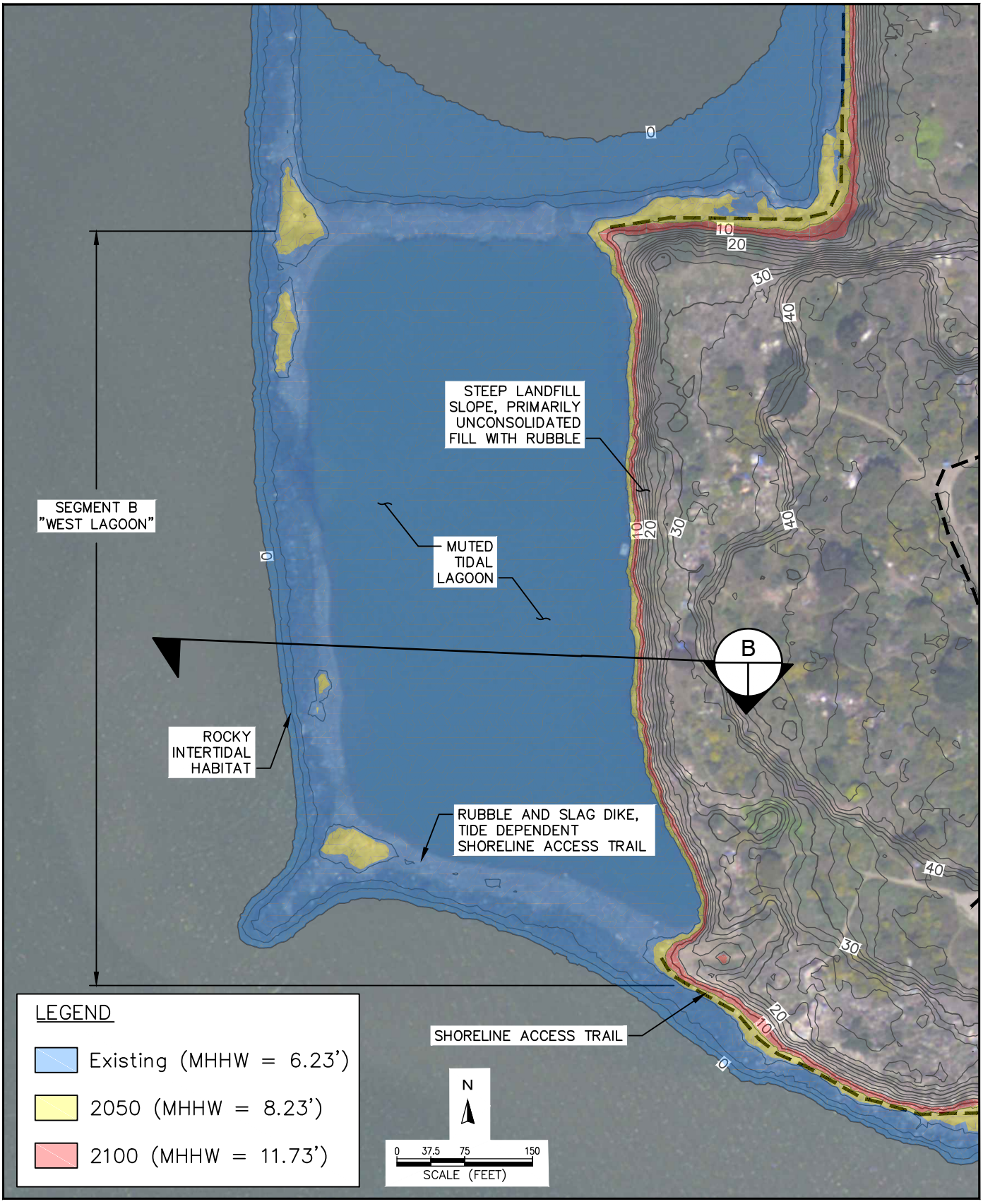
SOURCE:NOAA 2013; 2-ft Contours Shown; MHHW = Mean Higher High Water

Albany Bulb & Neck Transition Project . D140613.00

Figure B-1

Plan View: South Shoreline
Area Inundated at Existing and Future MHHW

ESA



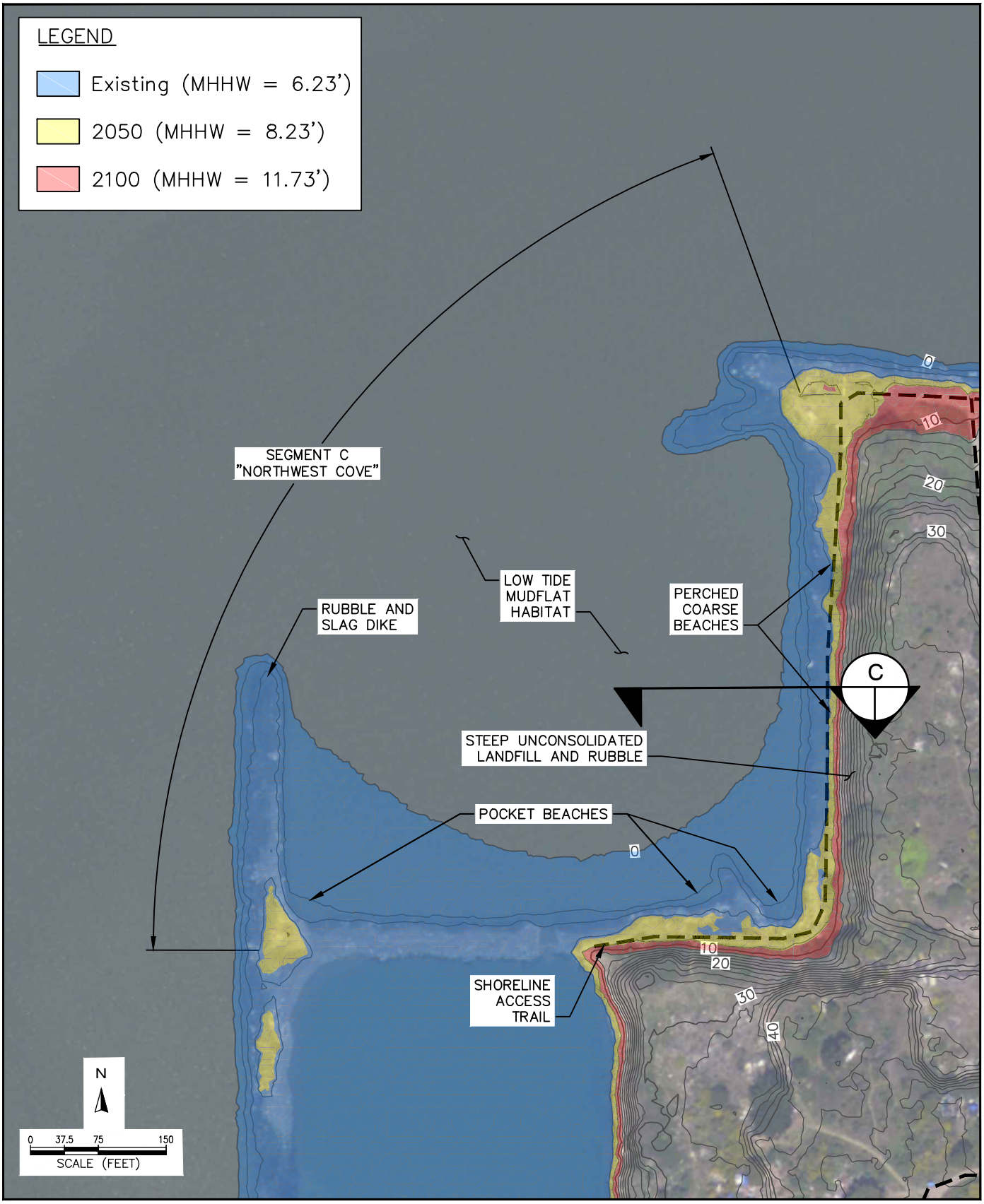
SOURCE:NOAA 2013; 2-ft Contours Shown; MHHW = Mean Higher High Water

Albany Bulb & Neck Transition Project . D140613.00

Figure B-2

Plan View: West Lagoon
Area Inundated at Existing and Future MHHW

ESA



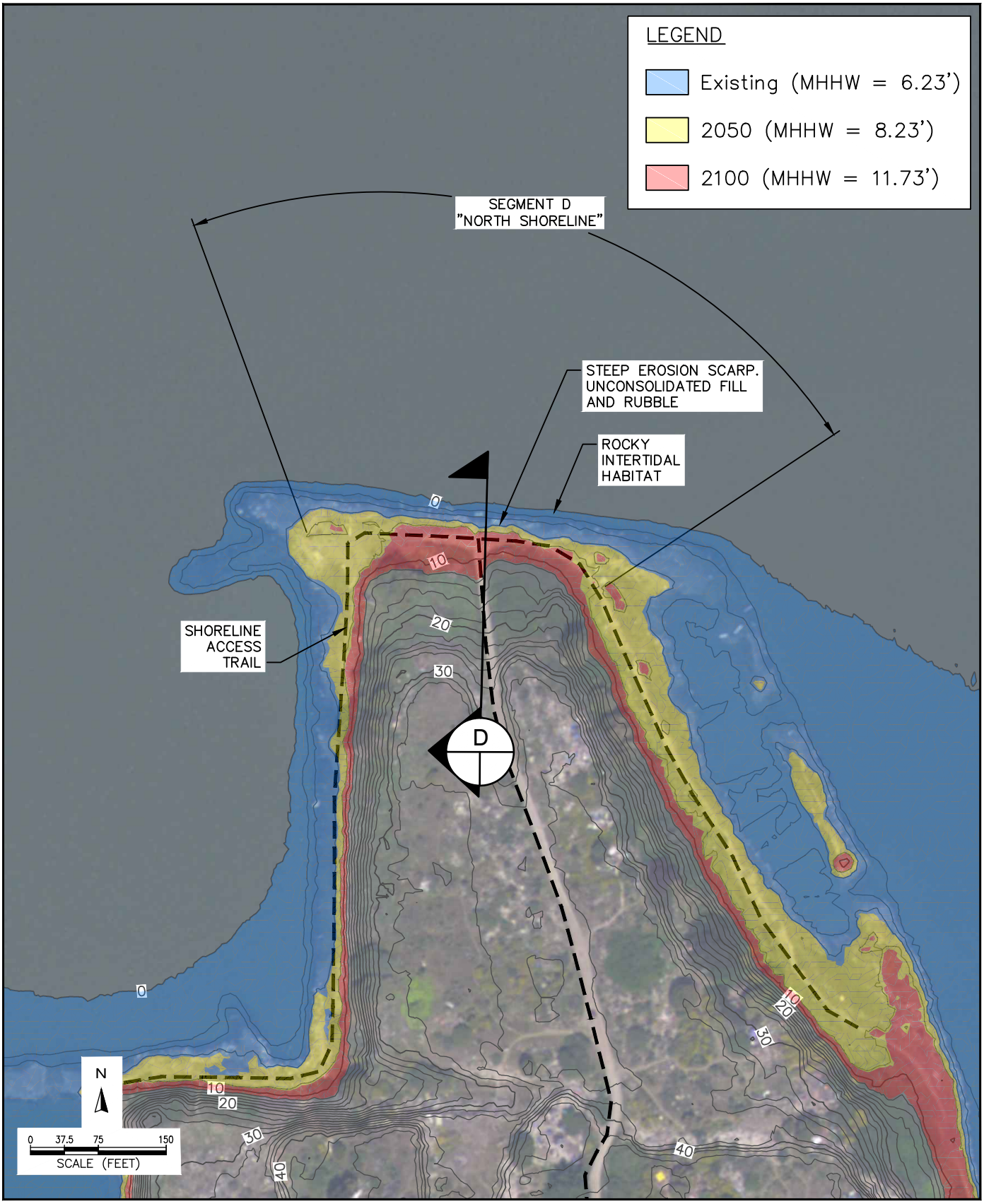
SOURCE:NOAA 2013; 2-ft Contours Shown; MHHW = Mean Higher High Water

Albany Bulb & Neck Transition Project . D140613.00

Figure B-3

Plan View: Northwest Cove
Area Inundated at Existing and Future MHHW

ESA



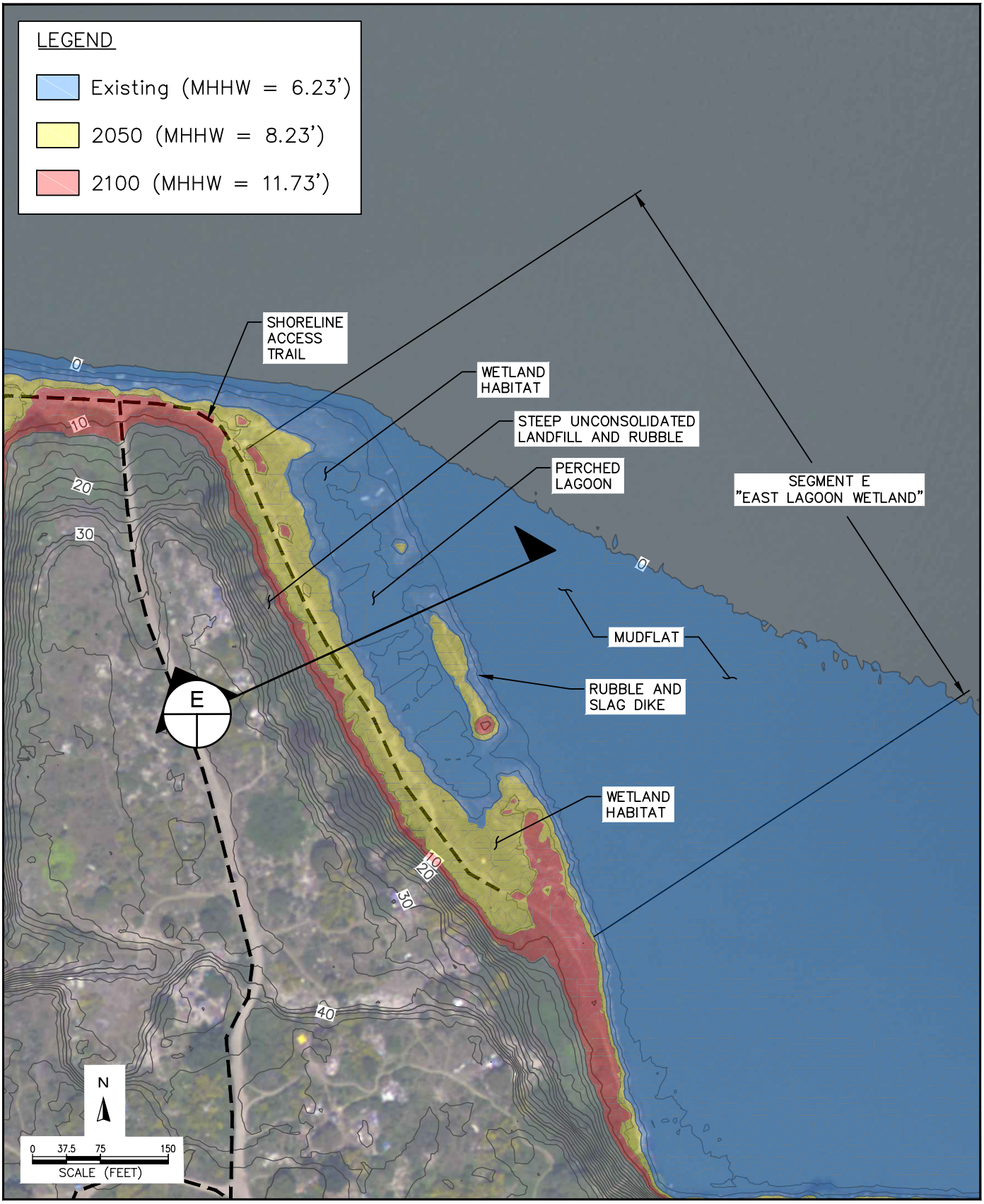
SOURCE:NOAA 2013; 2-ft Contours Shown; MHHW = Mean Higher High Water

Albany Bulb & Neck Transition Project . D140613.00

Figure B-4

Plan View: North Shoreline
Area Inundated at Existing and Future MHHW

ESA



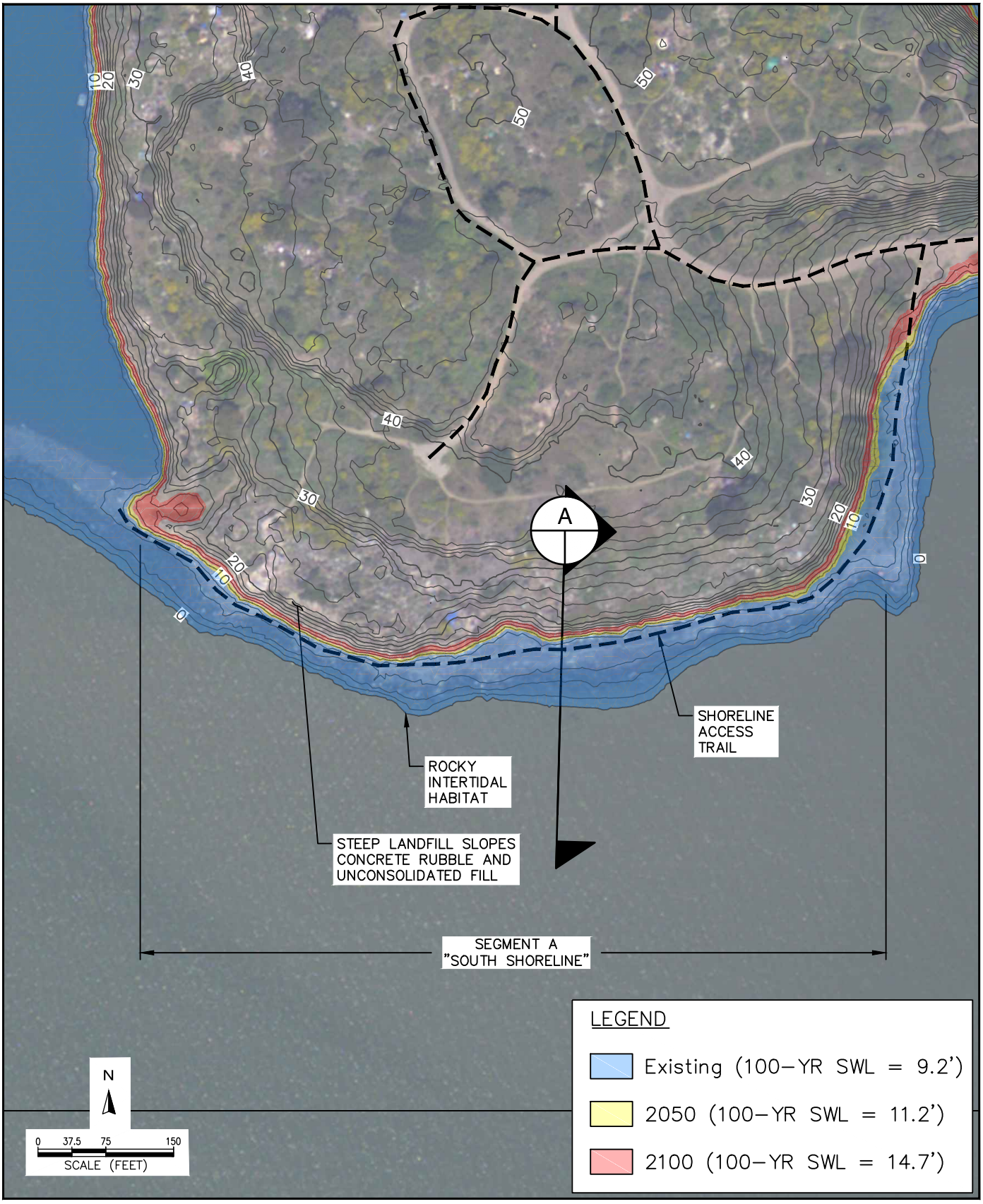
SOURCE:NOAA 2013; 2-ft Contours Shown; MHHW = Mean Higher High Water

Albany Bulb & Neck Transition Project . D140613.00

Figure B-5

Plan View: East Lagoon Wetland
Area Inundated at Existing and Future MHHW

ESA



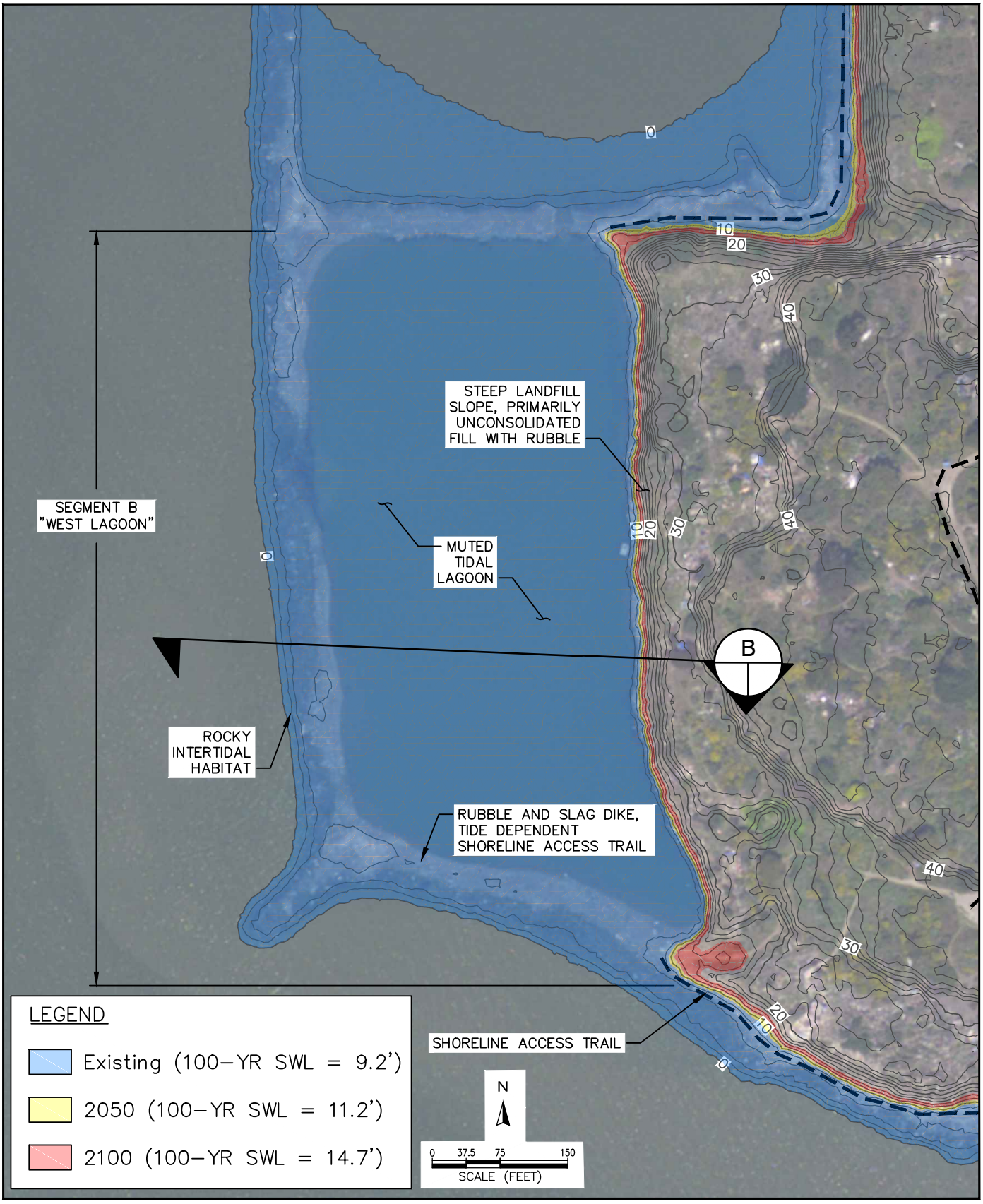
SOURCE:NOAA 2013; 2-ft Contours Shown; SWL = Still Water Level

Albany Bulb & Neck Transition Project . D140613.00

Figure B-6

Plan View: South Shoreline
Area Inundated at Exisitng and Future 100-yr Still Water Level

ESA



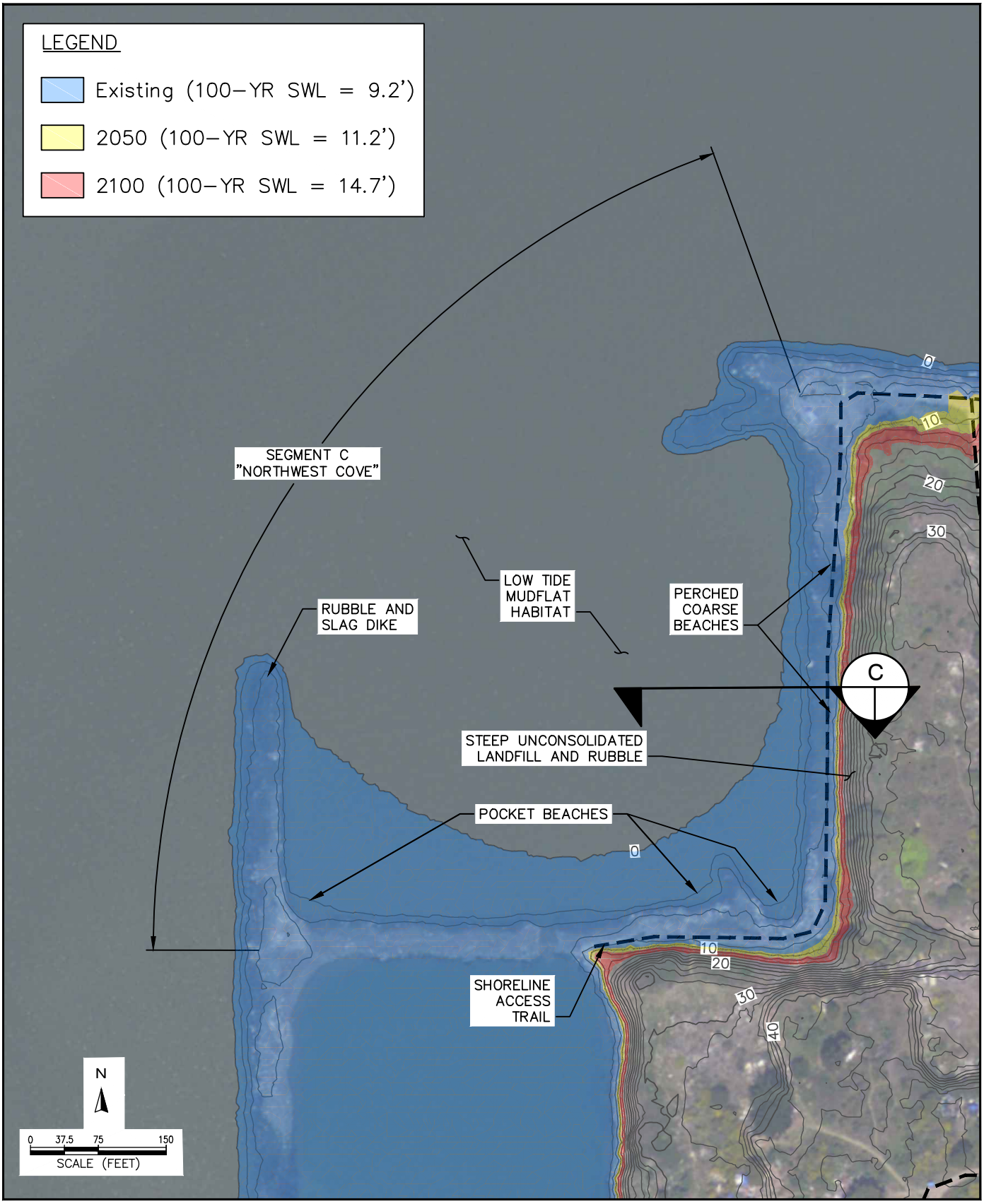
SOURCE:NOAA 2013; 2-ft Contours Shown; SWL = Still Water Level

Albany Bulb & Neck Transition Project . D140613.00

Figure B-7

Plan View: West Lagoon
Area Inundated at Existing and Future 100-yr Still Water Level

ESA



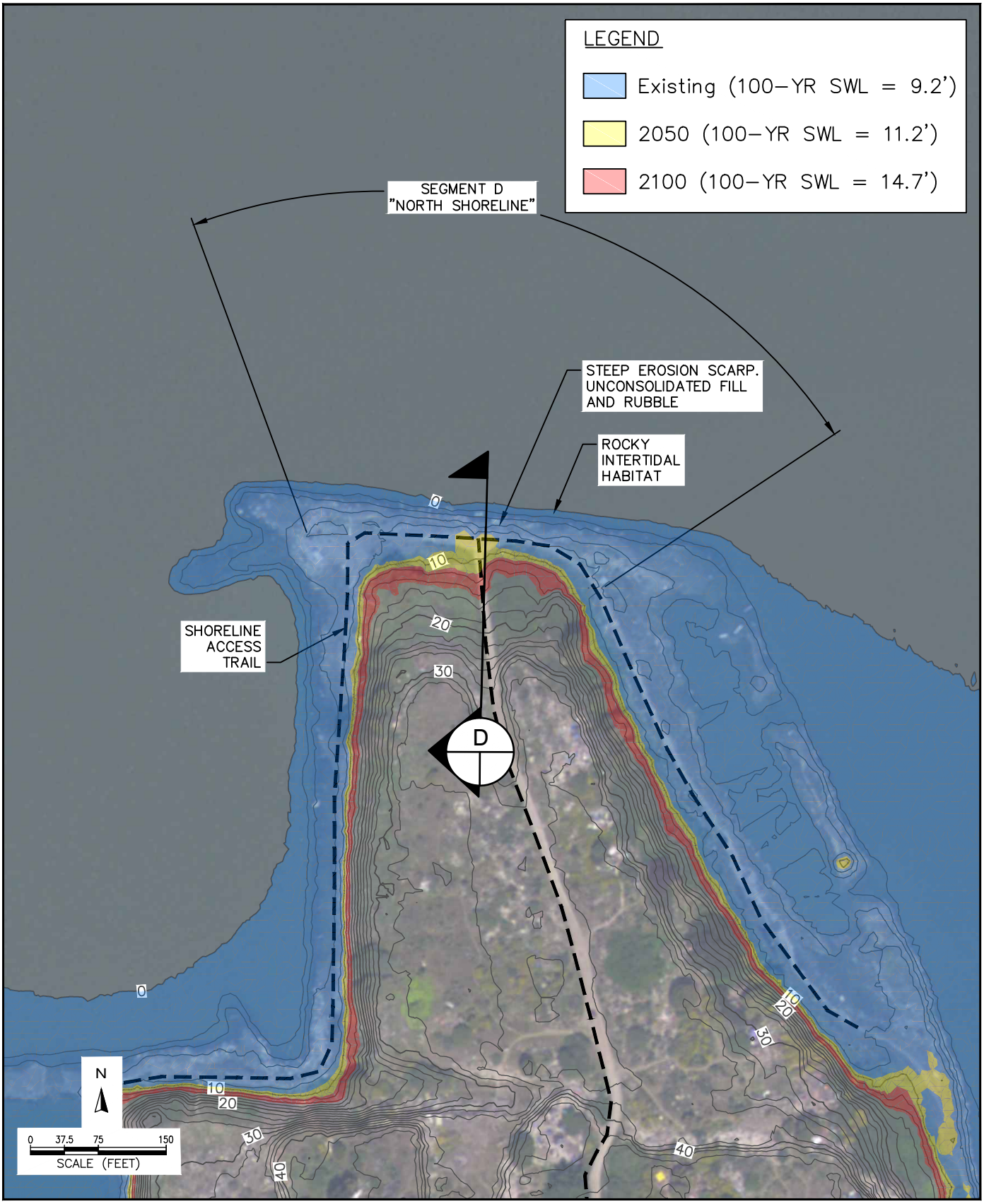
SOURCE:NOAA 2013; 2-ft Contours Shown; SWL = Still Water Level

Albany Bulb & Neck Transition Project . D140613.00

Figure B-8

Plan View: Northwest Cove
Area Inundated at Existing and Future 100-yr Still Water Level

ESA



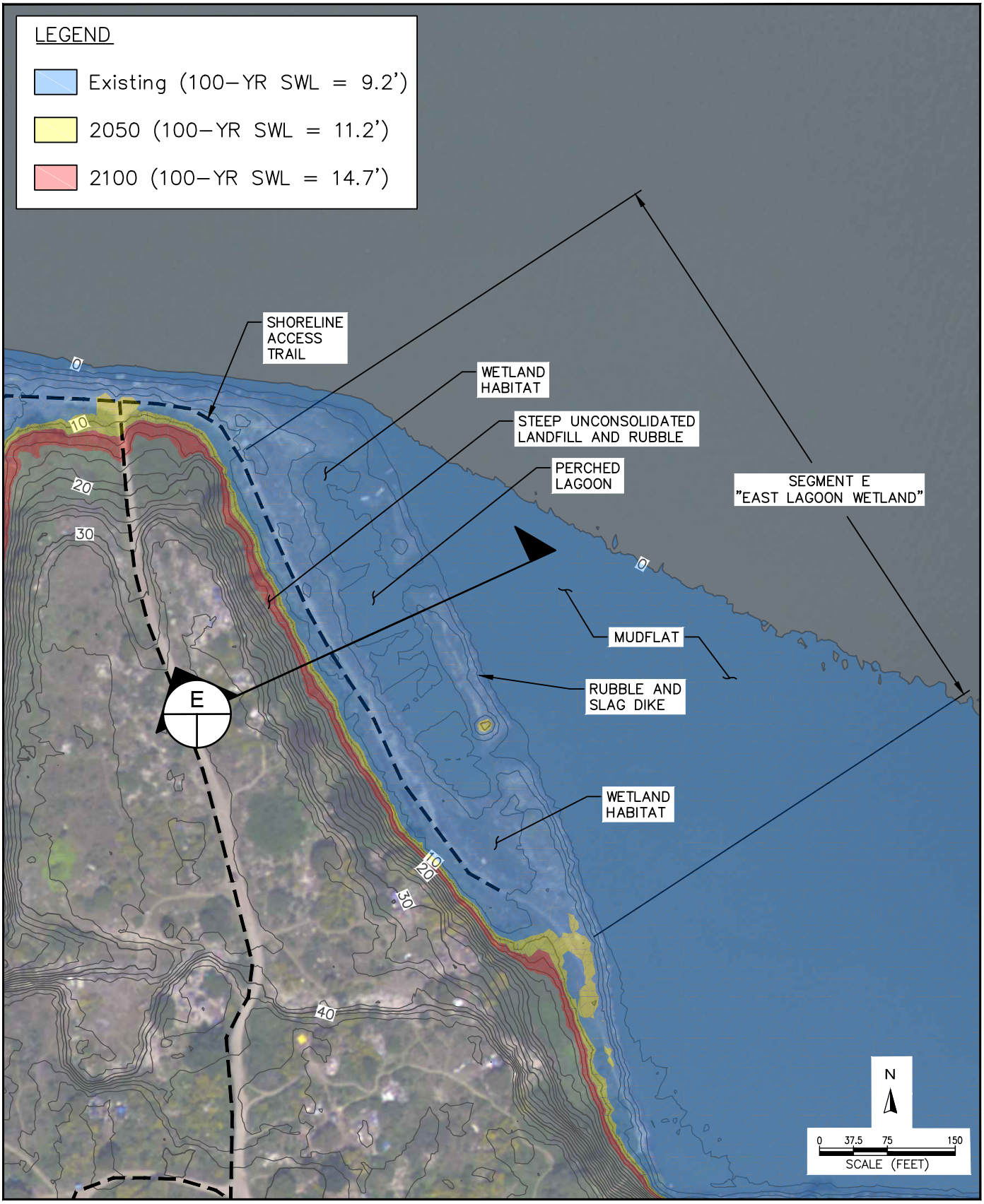
SOURCE:NOAA 2013; 2-ft Contours Shown; SWL = Still Water Level

Albany Bulb & Neck Transition Project . D140613.00

Figure B-9

Plan View: North Shoreline
Area Inundated at Existing and Future 100-yr Still Water Level

ESA



SOURCE:NOAA 2013; 2-ft Contours Shown; SWL = Still Water Level

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Figure B-10

Plan View: East Lagoon Wetland
Area Inundated at Existing and Future 100-yr Still Water Level

ESA

Appendix I: Vulnerability Criteria, Ranking, and Results

APPENDIX C
Vulnerability Criteria, Ranking, and Results

Summary of Vulnerability Tables

The following tables were prepared to summarize the calculation of a vulnerability index for each shore segment identified for the Albany Bulb site, including the parameters and criteria used to rank the exposure, sensitivity and adaptive capacity along each shore segment. The final Table C-5 presents the resulting vulnerabilities of each shore segment over time.

Table C-1 presents a summary of the criteria used to assign ranks on a scale of 1 to 5 (low to very high) to physical parameters for the exposure, sensitivity and adaptive capacity of the site. The exposure parameters are primarily related to the hydrologic variables, including inundation depths at the shore, depth-limited wave heights and wave runup. Sensitivity parameters were developed to describe the relative types of material the shore is composed of, its erodibility and stability, and its slope. Adaptive capacity is described by the space available for future adaptation and the resiliency of the shore type.

Table C-2, C-3, and C-4 summarize the ranks assigned to various exposure, sensitivity, and adaptive capacity parameters for each shore segment, respectively. The exposure ranking was performed for existing conditions, and for the years 2050 and 2100 with sea level rise. Sensitivity and adaptive capacity was assumed not to vary over time. The ranks were averaged over all criteria for each shore segment to calculate the overall exposure, sensitivity and adaptive capacity of each shore segment.

Table C-5 presents the resulting vulnerability index over time for each shore segment. This was calculated as an average of the exposure, sensitivity, and adaptive capacity for each shore segment.

TABLE C-1
VULNERABILITY RANKING CRITERIA FOR EXPOSURE, SENSITIVITY AND ADAPTIVE CAPACITY

Exposure Criteria

	Very Low	Low	Moderate	High	Very High
Rank	1	2	3	4	5
Fetch Length (mi)	Protected	<2	2 – 5	5 – 10	>10
Inundation at MHHW (feet)	<0	0 – 1	1 – 3	3 – 5	>5
Inundation from 100-year SWL (feet)	<0	0 – 1	1 – 3	3 – 5	>5
Extreme Depth-limited Wave Height at toe (feet)	0	0 – 1	1 – 2	2 – 3	>3
Extreme Wave Runup Height (feet)	0	0 – 2	2 – 4	4 – 6	>6

Sensitivity Criteria

	Very Low	Low	Moderate	High	Very High
Rank	1	2	3	4	5
Backshore Materials	Armor rock and concrete rubble	Predominantly concrete rubble	Concrete rubble; unconsolidated fill	Unconsolidated fill with some rubble	Unconsolidated fill
Backshore Slope (H:V)	Gentle >10:1	10:1 – 5:1	Moderate 5:1 – 3:1	3:1 – 1:1	Steep <1:1
Intertidal Shore Materials	Rock, concrete rubble and slag	Predominantly concrete rubble	Coarse beach, wetland, mudflat with wave break	Unconsolidated fill with some rubble	Unconsolidated fill; existing erosion scarp
Intertidal Slope (H:V)	Gentle >20:1	20:1 – 10:1	Moderate 10:1 – 5:1	5:1 – 1:1	Steep <1:1

Adaptive Capacity Criteria

	Very High	High	Moderate	Low	Very Low
Rank	1	2	3	4	5
Space for Backshore Transgression	Extensive room	--	Limited Room	--	No Room
Resilience of Shore Type	Coarse beach	Wetland	Mudflat	Armor and concrete rubble	Unconsolidated fill

TABLE C-2
EXPOSURE RANKING FOR EXISTING AND FUTURE CONDITIONS

Exposure Rank: Existing

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Fetch Length	5	5	3	2	1
Inundation at MHHW	2	2	1	1	1
Inundation from 100-year SWL	4	4	2	2	3
Extreme Depth-limited Wave Height at toe	4	3	3	2	1
Extreme Wave Runup Height	5	3	3	2	1
Existing Total Exposure Rank	***4.0***	***3.4***	***2.4***	***1.8***	***1.4***

Exposure Rank: 2050

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Fetch Length	5	5	3	2	1
Inundation at MHHW	3	4	1	1	2
Inundation from 100-year SWL	4	4	2	2	4
Extreme Depth-limited Wave Height at toe	5	4	4	3	1
Extreme Wave Runup Height	5	4	3	3	1
2050 Total Exposure Rank	***4.4***	***4.2***	***2.6***	***2.2***	***1.8***

Exposure Rank: 2100

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Fetch Length	5	5	3	2	1
Inundation at MHHW	5	5	4	1	4
Inundation from 100-year SWL	4	4	2	2	5
Extreme Depth-limited Wave Height at toe	5	5	4	3	1
Extreme Wave Runup Height	5	5	4	3	1
2100 Total Exposure Rank	***4.8***	***4.8***	***3.4***	***2.2***	***2.4***

TABLE C-3
SENSITIVITY RANKING FOR EXISTING SHORE SEGMENTS

Sensitivity Rank: Existing

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Backshore Materials	3	4	4	5	5
Backshore Slope (H:V)	5	5	3	2	2
Intertidal Shore Materials	1	1	3	5	3
Intertidal Slope (H:V)	3	4	2	3	1
Total Sensitivity Rank	***3.0***	***3.5***	***3.0***	***3.8***	***2.8***

TABLE C-4
ADAPTIVE CAPACITY RANKING FOR EXISTING SHORE SEGMENTS

Adaptive Capacity Rank: Existing

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Space for Backshore Transgression	5	1	3	2	3
Resilience of Shore Type	4	2	1	5	2
Total Adaptive Capacity Rank	***4.5***	***1.5***	***2.0***	***3.5***	***2.5***

TABLE C-5
VULNERABILITY INDEX FOR SHORE SEGMENTS

Calculated Vulnerability Index (Range 1 to 5: Low to High)

Shore	South Shoreline	West Lagoon	Northwest Cove	North Shoreline	East Lagoon Wetland
Exposure					
Existing	4.0	3.4	2.4	1.8	1.4
2050	4.4	4.2	2.6	2.2	1.8
2100	4.8	4.8	3.4	2.2	2.4
Sensitivity	3.0	3.5	3.0	3.8	2.8
Adaptive Capacity	4.5	1.5	2.0	3.5	2.5
Vulnerability					
Existing	***3.8***	***2.8***	***2.5***	***3.0***	***2.2***
2050	***4.0***	***3.1***	***2.5***	***3.2***	***2.4***
2100	***4.1***	***3.3***	***2.8***	***3.2***	***2.6***

Appendix D: EBird Observations

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< Hotspot Map

Albany Bulb

Alameda County, California, US — Get Directions

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Overview | Recent Visits

147 Species | 85 Checklists

Updated 21 sec ago.

Last Seen | First Seen | High Counts | Bar Charts | Hide Details

	SPECIES NAME	COUNT	DATE	BY
1	Tundra Swan	18	31 Dec 2014	Nel Bennings hof
	We observed a small flock of Tundra Swans flying over the bay going North.			
2	American Wigeon	1	31 Dec 2014	Nel Bennings hof
3	Northern Shoveler	1	31 Dec 2014	Nel Bennings hof
4	Green-winged Teal	1	31 Dec 2014	Nel Bennings hof
5	Canvasback	1	31 Dec 2014	Nel Bennings hof
6	Greater Scaup	1	31 Dec 2014	Nel Bennings hof
7	Bufflehead	1	31 Dec 2014	Nel Bennings hof
8	Red-throated Loon	3	31 Dec 2014	Nel Bennings hof
9	Eared Grebe	1	31 Dec 2014	Nel Bennings hof
10	Western Grebe	1	31 Dec 2014	Nel Bennings hof
11	Clark's Grebe	1	31 Dec 2014	Nel Bennings hof
12	Double-crested Cormorant	1	31 Dec 2014	Nel Bennings hof
13	Brown Pelican	1	31 Dec 2014	Nel Bennings hof
14	American Avocet	1	31 Dec 2014	Nel Bennings hof
15	Long-billed Curlew	1	31 Dec 2014	Nel Bennings hof
16	Marbled Godwit	1	31 Dec 2014	Nel Bennings hof
17	Least Sandpiper	1	31 Dec 2014	Nel Bennings hof
18	Western Gull	1	31 Dec 2014	Nel Bennings hof
19	Forster's Tern	1	31 Dec 2014	Nel Bennings hof
20	Anna's Hummingbird	1	31 Dec 2014	Nel Bennings hof
21	American Crow	1	31 Dec 2014	Nel Bennings hof
22	Common Raven	1	31 Dec 2014	Nel Bennings hof
23	Ruby-crowned Kinglet	1	31 Dec 2014	Nel Bennings hof
24	Hermit Thrush	1	31 Dec 2014	Nel Bennings hof
25	Northern Mockingbird	1	31 Dec 2014	Nel Bennings hof
26	Yellow-rumped Warbler	1	31 Dec 2014	Nel Bennings hof
27	California Towhee	1	31 Dec 2014	Nel Bennings hof
28	White-crowned Sparrow	1	31 Dec 2014	Nel Bennings hof
29	Golden-crowned Sparrow	1	31 Dec 2014	Nel Bennings hof
30	House Finch	1	31 Dec 2014	Nel Bennings hof
31	Canada Goose	X	22 Aug 2014	sandy steinman
32	Snowy Egret	X	22 Aug 2014	sandy steinman

Recent Visits

Checklists submitted within the last hour are not shown.

OBSERVER	DATE	SPECIES
Nel Bennings hof	31 Dec 2014	30
sandy steinman	22 Aug 2014	22
Wen Hsu	22 Aug 2014	20
Wen Hsu	21 Aug 2014	20
J. Wawashkeshi	17 Aug 2014	8
L L	17 Aug 2014	8
Wen Hsu	6 Aug 2014	18
Fred Werner	30 Jun 2014	7
Michael Simmons	17 Jun 2014	13
Fred Werner	22 Feb 2014	22

More Recent Visits...

Top eBirders

BY SPECIES | BY CHECKLISTS

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1	Patricia Langenhahn	94
2	Amy McDonald	74
3	Wen Hsu	73
4	Doug Hendricks	71
5	James McNamara	64
6	Peter Ralph	62
7	John Poole	58
8	Jack Zeiver	52
9	Julia Putman	50
9	Pete Dunten	50

	SPECIES NAME	COUNT	DATE	BY
33	**Turkey Vulture**	X	22 Aug 2014	sandy steinman
34	**Osprey**	X	22 Aug 2014	sandy steinman
35	**Willet**	X	22 Aug 2014	sandy steinman
36	**Western Sandpiper**	X	22 Aug 2014	sandy steinman
37	**Red-necked Phalarope**	X	22 Aug 2014	sandy steinman
38	**Ring-billed Gull**	X	22 Aug 2014	sandy steinman
39	**Rock Pigeon**	X	22 Aug 2014	sandy steinman
40	**Mourning Dove**	X	22 Aug 2014	sandy steinman
41	**Black Phoebe**	X	22 Aug 2014	sandy steinman
42	**European Starling**	X	22 Aug 2014	sandy steinman
	Greater/Lesser Scaup	X	22 Aug 2014	Wen Hsu
43	**American White Pelican** flyover	1	22 Aug 2014	Wen Hsu
44	**Greater Yellowlegs**	4	22 Aug 2014	Wen Hsu
45	**California Gull**	X	22 Aug 2014	Wen Hsu
46	**House Sparrow**	X	22 Aug 2014	Wen Hsu
47	**Great Egret**	1	21 Aug 2014	Wen Hsu
48	**Black-bellied Plover**	X	21 Aug 2014	Wen Hsu
	swallow sp.	2	21 Aug 2014	Wen Hsu
49	**Spotted Sandpiper**	5	17 Aug 2014	J. Wawashkeshi
50	**Olive-sided Flycatcher**	1	17 Aug 2014	J. Wawashkeshi
51	**Bushtit**	3	17 Aug 2014	J. Wawashkeshi

	SPECIES NAME	COUNT	DATE	BY
	gull sp.	X	6 Aug 2014	Wen Hsu
	House/Purple Finch	X	6 Aug 2014	Wen Hsu
	peep sp.	6	30 Jun 2014	Fred Werner
52	**Caspian Tern**	1	30 Jun 2014	Fred Werner
53	**Song Sparrow**	1	30 Jun 2014	Fred Werner
54	**Ruddy Duck**	3	17 Jun 2014	Michael Simmons
55	**Cattle Egret**	3	17 Jun 2014	Michael Simmons
56	**Whimbrel**	16	17 Jun 2014	Michael Simmons
57	**American Goldfinch**	4	17 Jun 2014	Michael Simmons
58	**American Coot**	10	22 Feb 2014	Fred Werner
59	**Herring Gull**	30	22 Feb 2014	Fred Werner
60	**Western Meadowlark**	6	22 Feb 2014	Fred Werner
61	**Mallard**	4	8 Jan 2014	Monica Fletcher
62	**Northern Pintail**	X	16 Dec 2013	Wen Hsu
63	**Lesser Scaup**	X	16 Dec 2013	Wen Hsu
64	**Cooper's Hawk**	1	16 Dec 2013	Wen Hsu
65	**Black-necked Stilt**	2	16 Dec 2013	Wen Hsu
66	**Dunlin**	X	16 Dec 2013	Wen Hsu
67	**American Pipit**	7	16 Dec 2013	Wen Hsu
68	**Red-tailed Hawk**	2	15 Dec 2013	Robert Clark
69	**Say's Phoebe**	1	15 Dec 2013	Robert Clark
70	**Fox Sparrow**	1	15 Dec 2013	Robert Clark
71	**Eurasian Wigeon**	1	9 Dec 2013	Wen Hsu
72	**Glaucous-winged Gull**	2	8 Dec 2013	Nathan Williams
73	**Great Blue Heron**	1	6 Nov 2013	Wen Hsu
74	**Red-winged Blackbird**	1	6 Nov 2013	Wen Hsu

	SPECIES NAME	COUNT	DATE	BY
75	**Cackling Goose**	1	5 Nov 2013	Wen Hsu
	It swam next to a medium size Canada Goose, the latter has larger bill, and overall much large size.			
76	**Black Oystercatcher**	2	5 Nov 2013	Wen Hsu
77	**Semipalmated Plover**	X	5 Nov 2013	Wen Hsu
78	**Killdeer**	X	5 Nov 2013	Wen Hsu
79	**Mew Gull**	1	5 Nov 2013	Wen Hsu
80	**Peregrine Falcon**	1	5 Nov 2013	Wen Hsu
	Caught a large dark bird and carried it to a pole in the water to eat.			
81	**Savannah Sparrow**	2	5 Nov 2013	Wen Hsu
82	**Pied-billed Grebe**	2	26 Oct 2013	Patricia Folsom
83	**Black-crowned Night-Heron**	1	26 Oct 2013	Patricia Folsom
84	**White-tailed Kite**	1	26 Oct 2013	Patricia Folsom
	Short-billed/Long-billed Dowitcher	3	26 Oct 2013	Patricia Folsom
85	**Bewick's Wren**	1	26 Oct 2013	Patricia Folsom
	Horned/Eared Grebe	5	19 Oct 2013	Christine Carino
	Western/Clark's Grebe	3	19 Oct 2013	Christine Carino
86	**Wandering Tattler**	1	19 Oct 2013	Christine Carino
87	**Common Yellowthroat**	2	19 Oct 2013	Christine Carino
88	**Yellow Warbler**	1	19 Oct 2013	Christine Carino
89	**Elegant Tern**	X	18 Sep 2013	logan kahle
	tern sp.	1	11 Jun 2013	Wen Hsu
90	**Ash-throated Flycatcher**	1	11 Jun 2013	Wen Hsu

	SPECIES NAME	COUNT	DATE	BY
91	**Western Scrub-Jay**	X	11 Jun 2013	Wen Hsu
92	**Northern Rough-winged Swallow**	10	11 Jun 2013	Wen Hsu
93	**Barn Swallow**	2	11 Jun 2013	Wen Hsu
94	**Lesser Goldfinch**	X	11 Jun 2013	Wen Hsu
95	**Surf Scoter**	5	2 Feb 2013	Los Quetzales
96	**Common Goldeneye**	1	2 Feb 2013	Los Quetzales
97	**Black Turnstone**	28	2 Feb 2013	Los Quetzales
	Near delapidated pier south of main doggie beach			
98	**Gadwall**	X	11 Jan 2013	Wen Hsu
99	**Red-shouldered Hawk**	X	11 Jan 2013	Wen Hsu
	Two American Crows perched by it on the same tree. When it left by its perch, crows gave chase, and followed it to another tree.			
100	**Sharp-shinned Hawk**	1	5 Jan 2013	Bill Mitchell
101	**Horned Grebe**	2	1 Jan 2013	Los Quetzales
	Sharp-shinned/Cooper's Hawk	1	16 Dec 2012	Bill Mitchell
102	**Great Horned Owl**	1	8 Oct 2012	seth mcnaught
	roosting in tree halfway down a slope to the water, after a minute of observation, it flushed and flew along the waterline until it passed out of view behind foliage.			
	cormorant sp.	3	2 Sep 2012	Bill Mitchell
	Accipiter sp.	1	2 Sep 2012	Bill Mitchell
	Probably Cooper's hawk; banded tail, but only a brief glimpse			
103	**Common Murre**	1	2 Sep 2012	Bill Mitchell
104	**Short-billed Dowitcher**	1	20 Aug 2012	Anonymous e Birder
105	**Allen's Hummingbird**	1	22 Mar 2012	Aaron Maizlish

	SPECIES NAME	COUNT	DATE	BY
106	**Ring-necked Duck**	17	18 Mar 2012	Christine Hayamizu
	Common/Barrow's Goldeneye	X	22 Jan 2012	Colin Jensen
107	**Red-breasted Merganser**	X	22 Jan 2012	Colin Jensen
108	**Pelagic Cormorant**	3	8 Jan 2012	Los Quetzales
109	**American Kestrel**	1	8 Jan 2012	Los Quetzales
110	**Greater White-fronted Goose**	1	8 Jan 2012	Phil Capitolo
111	**Brandt's Cormorant**	1	8 Jan 2012	Phil Capitolo
112	**Rock Wren**	1	8 Jan 2012	Phil Capitolo
113	**House Wren**	1	8 Jan 2012	Phil Capitolo
114	**Lincoln's Sparrow**	1	1 Jan 2012	Pete Dunten
115	**Lesser Yellowlegs**	4	18 Sep 2011	Doug Hendricks
116	**Northern Flicker**	1	18 Sep 2011	Doug Hendricks
117	**Northern Harrier**	1	23 Apr 2011	Doug Hendricks
118	**Long-billed Dowitcher**	3	23 Apr 2011	Doug Hendricks
119	**Orange-crowned Warbler**	1	23 Apr 2011	Doug Hendricks
120	**Wilson's Warbler**	1	23 Apr 2011	Doug Hendricks
121	**Brown-headed Cowbird**	3	23 Apr 2011	Doug Hendricks
122	**Barrow's Goldeneye**	1	21 Feb 2011	Patricia Langenhahn
123	**Belted Kingfisher**	1	22 Dec 2010	Peter Ralph
124	**Common Loon**	1	9 Jan 2010	Patricia Langenhahn
	Western x Glaucous-winged Gull (hybrid)	1	9 Jan 2010	Patricia Langenhahn

	SPECIES NAME	COUNT	DATE	BY
125	**Burrowing Owl**	1	9 Jan 2010	Patricia Langenhahn
126	**Brewer's Blackbird**	1	9 Jan 2010	Patricia Langenhahn
127	**Violet-green Swallow**	1	31 May 2009	Peter Ralph
128	**Sanderling**	X	19 Apr 2009	Robert Smith
129	**Pacific Loon**	1	19 Jan 2009	James McNamara
130	**Western Kingbird**	1	31 Aug 2008	Jeffrey Lewis
131	**Red Knot**	1	27 Jul 2008	Robert Clark
132	**Tree Swallow**	X	9 Mar 2008	Patricia Langenhahn
133	**Surfbird**	2	2 Mar 2008	Amy McDonald
134	**White-winged Scoter**	1	2 Dec 2007	Amy McDonald
135	**Cinnamon Teal**	X	11 Nov 2007	Christine Hayamizu
	Greater/Lesser Yellowlegs	X	11 Nov 2007	Christine Hayamizu
136	**Common Tern**	1	26 Sep 2007	Julia Putman
137	**Warbling Vireo**	1	3 Jul 2007	Peter Ralph
138	**Purple Finch**	11	26 Jun 2007	Peter Ralph
139	**Cedar Waxwing**	25	13 Apr 2007	John Poole
140	**American Robin**	X	16 Jan 2007	Jack Zelver
141	**Spotted Towhee**	X	16 Jan 2007	Jack Zelver
142	**Dark-eyed Junco**	X	16 Jan 2007	Jack Zelver
143	**Golden-crowned Kinglet**	X	6 Jan 2007	Daniel George
144	**Thayer's Gull**	X	27 Dec 2006	John Ascher
145	**Least Tern**	2	2 Jun 2001	Mike Prince
146	**Cliff Swallow**	X	25 May 1998	Bruce Mast
147	**Ruddy Turnstone**	1	30 Aug 1992	Steve Glover

Appendix E: Plants Observed at the Albany Bulb & Neck, 1994

PLANTS OBSERVED AT THE ALBANY WATERFRONT	
(Observed at the bulb, neck and beach on August 19, 1994)	
Compiled by Barbara Ertter, botanist, August 19,1994	
NATIVES	
Woody 6	
Herbaceous 11	
Grass(like) 4	
Aquatic 1	
TOTAL 22	
NON-NATIVES	
Woody 20	
Herbaceous 32	
Grass(like) 13	
TOTAL 65	
TOTAL PLANTS OBSERVED: 87	
Non-natives include at least 5 different acacias, 1 designated "noxious" by the California Department of Agriculture (kanagaroo thorn, Acacia paradoxa); 2 different eucalyptus; and several other plants known to be invasive in the East Bay, notably French broom (Genista monspessulana), yellow star-thistle (Centaurea solstitialis), fennel (Foeniculum vulgare), and pampas grass (Cortaderia jubata). The best representation of natives was on the beach and marshes, where natural recolonization is probably taking place. The marsh gumweed (Grindelia stricta var angustifolia), is on the California Native Plant Society List 4, a watch list for plants of limited distribution. Although locally common around San Francisco Bay, the marsh gumweed occurs only in coastal salt marshes from Marin to San Luis Obispo counties.	
(**bold** = native)	
TREES AND SHRUBS	
Acacia dealbata	(silver wattle)
Acacia melanoxylon	(blackwood acacia)
Acacia paradoxa	(kangaroo thorn)
Acacia retinoides	(everblooming acacia)
Acacia sp.	(acacia species)
Albizzia lophantha	(plume albizzia)
Argyranthemum foeniculaceum	
Baccharis pilularis	(coyote brush)
Cotoneaster pannosus	(cotoneaster)
Eucalyptus camaldulensis	(red gum)
Eucalyptus globulus	(blue gum)
Genista monspessulana	(French broom)
Grindelia stricta var angustifolia	(gumweed)
Heteromeles arbutifolia	(toyon)
Lavatera cretica	(tree mallow)
Lonicera japonica	(Japanese honeysuckle)
Mimulus aurantiacus	(bush monkeyflower)
Myoporum laetum	(myoporum)
Nicotiana glauca	(tree tobacco)
Phoenix canariensis	(Canary Island date palm)
Prunus sp.	(flowering plumcherry)
Rosmarinus officinalis	(rosemary)
Rubus discolor	(Himalayan blackberry)
Salix lasiolepis	(arroyo willow)
Salix sp.	(willow)
Vitis vinifera	(grape)
HERBACEOUS PLANTS	

Amaryllis belladona	(naked lady)
Ambrosia chamissonis	(beach-bur)
Anagailis arvensis	(scarlet pimpernel)
Atriplex trianzularis	(spearscale)
Carduus pycnocephalus	(Italian thistle)
Carpobrotus chilensis	(sea fig)
Carpobrotus edulis	(ice plant)
Centaurea melitensis	(tocalote)
Centaurea solstitialis	(yellow star-thistle)
Centranthus ruber	(red valerian)
Chenopodium ambrosioides	(Mexican tea)
Chenopodium multifidum	
Convolvulus arvensis	(bindweed)
Cotula coronopifolia	(brass-buttons)
Euphorbia characias	(spurge)
Euphorbia oblongata	(spurge)
Euthamia occidentalis	(western goldenrod)
Foeniculum vulgare	(fennel)
Gnaphalium sp.	(cudweed)
Heterotheca grandiflora	(telegraph weed)
Hirschfeldia incana	
Jaumea carnosa	(Jaumea)
Lobularia maritima	(sweet alyssum)
Lotus comiculatus	(birdfoot trefoil)

Madia sp.	(tarweed)
Malva nicaeensis	(bull mallow)
Medicago polymorpha	(California burclover)
Melilotus alba	(white sweetclover)
Melilotus indica	(sourclover)
Phyla nodiflora var nodiflora	
Picris echioides	(bristly ox-tongue)
Plantago coronopus	
Plantago lanceolata	(English plantain)
Raphanus sativus	(wild radish)
Rumex crispus	(curly dock)
Rumex pulcher	(fiddle dock)
Rumex salicifolius var crassus	
Salicornia virginica	(pickleweed)
Salsola soda	
Spergula arvensis ssp arvensis	(spurrey)
Spergularia macrotheca var macrotheca	
Tetragonia tetragonioides	(New Zealand spinach)
Xanthium strumarium	(cocklebur)
GRASSES AND GRASSLIKE PLANTS	
Avena barbata	(slender wild oat)
Bromus diandrus	(ripgut brome)
Bromus hordeaceus	(soft chess)
Bromus sp.	(bromus species)

Cortaderia jubata	(pampas grass)
Cynodon dactylon	(Bermuda grass)
Cyperus eragrostis	
Distichlis spicata	(saltgrass)
Hordeum murinum ssp leporinum	
Juncus patens	(rush)
Lolium multilflorum	(Italian ryegrass)
Pennisetum clandestinum	(Kikuyu grass)
Phalaris aquatica	(Harding grass)
Phragmites australis	(common reed)
Piptatherum miliaceum	(smilo grass)
Polypogon monspeliensis	(rabbitfoot grass)
bamboo	
AQUATICS	
Zostera marina	(eel-grass)