

Coastal Resilience Master Plan - DRAFT

The Coastal Resilience Master Plan is made possible through grants from the National Fish and Wildlife Foundation and California State Coastal Conservancy.



Acknowledgments

Mayor

Todd Gloria

City Attorney

Corrine Neuffer, Chief Deputy City Attorney

City Council

Joe La Cava, District 1
Jennifer Campbell, District 2
Stephen Whitburn, District 3
Henry L. Foster III, District 4
Marni Von Wilpert, District 5
Kent Lee District 6
Raul Campillo, District 7
Vivian Moreno, District 8
Sea Elo-Rivera, District 9

City Planning Department

Heidi Vonblum, Planning Director
Kelley Stanco, Deputy Director
Julia Chase, Chief Resilience Officer
Kristy Forburger, Development Project Manager III
Jordan Moore, Senior Planner
Zaira Marquez, Associate Planner

City Department Contributors

Andy Field, Director, Parks and Recreation
James Gartland, Lifeguard Chief, Fire-Rescue
Karen Dennison, Assistant Director, Parks and Recreation
Mayra Medel, Interim Deputy Director, Parks and Recreation
Mark Berninger, Natural Resource Manager, Parks and Recreation
Cherlyn Cac, Senior Planner, Parks and Recreation
Michelle Abella-Shon, Program Manager, Parks and Recreation
Gretchen Eichar, Senior Planner, Parks and Recreation
Alex Gostomelskiy, Senior Civil Engineer, Stormwater Department
Michelle Hallack Alegria, Senior Civil Engineer, Stormwater Department
Emir Williams, Associate Civil Engineer, Stormwater Department
Kevin Anub, Associate Civil Engineer, Stormwater Department
Patrick Hadley, Deputy Director, Transportation Department
Everett Hauser, Program Manager, Transportation Department
Darren Genova, Project Officer II, Engineering and Capital Projects
Elizabeth Scroth-Nichols, Senior Civil Engineer, Engineering and Capital Projects
Nicholas Ferracone, Senior Civil Engineer, Engineering and Capital Projects
Maureen Hodges, Marine Safety Captain, Fire-Rescue
Sarah Pierce, Senior Planner, Sustainability and Mobility

Stakeholder Advisory Committee

California Coastal Commission
California Coastal Conservancy
California Department of Fish and Wildlife
California Department of Transportation
California Ocean Protection Council
California State Parks
County of San Diego
Port of San Diego
Regional Water Quality Control Board
San Diego Airport
San Diego Association of Governments
San Diego Bird Alliance
San Diego Regional Climate Collaborative
Scripps Institution of Oceanography
Surfrider Foundation
U.S. Department of the Navy
U.S. Fish and Wildlife Service
University of California, San Diego

Consultant Team

Harris & Associates
GHD
Citythinkers



Table of Contents

GlossaryF

Executive SummaryH

Plan Context and Background2

 Climate Resilient SD2

 Supporting Climate Plans and Assessments4

 Other City Coastal Resilience Initiatives6

 Evolving Shoreline10

 Tribal Cultural Significance11

 Sea Level Rise Science12

Purpose of the Coastal Resilience Master Plan16

 What the Plan Looks to Accomplish18

 Nature-Based Solutions19

Community Engagement and Feedback26

 Overview of Engagement Activities26

Project Concepts32

 Ocean Beach – Dog Beach34

 La Jolla Shores46

 Pacific Beach – Tourmaline Surf Park54

 Mission Beach62

 Ocean Beach – Beachfront (Pier)70

 Sunset Cliffs76

Next Steps86

 Moving the Projects Forward86

 Funding Opportunities87

 Monitoring and Implementation88

 Adaptive Pathways Approach89

References90

Appendices

 Appendix A: Coastal Resilience Master Plan Phase 1:
 Prioritizing Nature-Based Solution Pilots and Site Profiles

 Appendix B: Public Engagement Plan

 Appendix C: Community and Stakeholder Engagement Summaries

Glossary

Adaptation	“Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which minimizes harm or takes advantage of beneficial opportunities” (CCC 2024).
Adaptive Capacity	“The ability of a system to respond to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, and to cope with the consequences” (CCC 2024; Willows and Connell 2003).
Assets	People, resources, ecosystems, infrastructure and the services they provide. Assets are the tangible and intangible things people or communities value” (U.S. Climate Resilience Toolkit 2021).
Berm	A raised bank or terraced embankment used for erosion control and flood protection.
Consequence	The effect of climate change exposure on community structures, functions and populations and on the asset owner or service providers’ ability to maintain a standard condition or level of service (sometimes referred to as impacts) (CEMA and CNRA 2012).
Exposure	“The presence of people, infrastructure, natural systems, and economic, cultural, and social resources in areas that are subject to harm” (Bedsworth et al. 2018; IPCC 2012).
Extreme Events	The frequency of extreme events refers to how often these events occur over a certain time period. This frequency is usually described based on historical observations or return periods. For example, a 100-year event has a 1 in 100 (or 1 percent) chance of occurring in any given year.
Groin	A purpose-built structure used to protect a shoreline from coastal erosion by retaining sand.
Hard (Gray) Infrastructure	Engineered structures that typically rely on concrete, steel, and other human-made materials, focusing on control and mitigation of natural processes rather than working with them.
Hazard	“An event or condition that may cause injury, illness, or death to people or damage to assets” (U.S. Climate Resilience Toolkit 2021).

Impact	“Effects on natural and human systems that result from hazards” (U.S. Climate Resilience Toolkit 2021).
Indigenous Knowledge	Traditional tribal knowledge for the protection, management and monitoring of tribal cultural resources.
Nature-Based Solutions	Sustainable planning, design, environmental management, and engineering practices that incorporate or mimic natural features or processes into the built environment to promote climate adaptation and resilience (FEMA 2024a).
Outfalls	Where stormwater and wastewater are discharged into bodies of water.
Resilience	“The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption” (U.S. Climate Resilience Toolkit 2021).
Risk	The potential consequences if an asset, resource or community is damaged or lost, considered together with the likelihood of that loss occurring.
Sensitivity	“The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., climatic or non-climatic stressors may cause people to be more sensitive to additional extreme conditions from climate change than they would be in the absence of these stressors)” (CCC 2024).
Vulnerability	“The extent to which a species, habitat, ecosystem, or human system is susceptible to harm from climate change impacts. More specifically, the degree to which a system is exposed to, susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, as well as of non-climatic characteristics of the system, including its sensitivity, and its coping and adaptive capacity” (CCC 2024).
Wave Runup	The height above stillwater elevation reached by a wave along a beach or structure (FEMA 2023). This is typically the highest elevation along the shoreline that the wave reaches.

Executive Summary

The City of San Diego (City) contains over 17 miles of biologically rich coastline, is home to over one million people, and has a dynamic economy concentrated in trade, tourism and military. Climate change increasingly puts the City and its critical built and natural resources at risk of coastal flooding and erosion due to sea level rise and other potentially erosive factors such as extreme precipitation events. In anticipation of this threat, the City has prepared a Coastal Resilience Master Plan (CRMP) which will identify specific resilience and conservation needs along the coastline and develop a portfolio of nature-based solutions to promote resilience and protect critical coastal habitats.

The City is committed to building a climate resilient San Diego to protect its community members, infrastructure and natural resources from climate change impacts, including sea level rise. Sea level in San Diego is expected to rise five to fourteen times faster over the course of this century than it did in the previous century, leading to risks of increased flooding and coastal erosion.

San Diego's coastal environment contains many of the City's most appreciated natural resources, including beaches, bays, shoreline, coastal canyons and many rivers, streams and other watercourses. Coastal habitats are also home to many protected and vulnerable plant and animal species who contribute to the region's biodiversity. Additionally, the San Diego coastline provides incredible recreation value for the region and supports both tourism and marine-related industries. Planning for a resilient coastline is vital to ensuring that our coast continues to be a resource for all San Diegans for generations to come.

The Coastal Resilience Master Plan is one component of planning for a resilient coast. Through community and stakeholder engagement, project concepts for six locations along the City's coastline have been developed that will help mitigate risks of sea level rise while supporting coastal habitats, recreation opportunities, coastal access and protecting historic and cultural resources. As these project concepts move forward toward implementation, continued community and stakeholder engagement will help to refine the project concepts, raise awareness of climate change risk and adaptation opportunities and build a shared vision for our coast's future.



Plan Context and Background

Climate Resilient SD

Through the City’s Climate Action Plan, the City is taking steps toward a more sustainable future through programs and policies to reduce the City’s greenhouse gas emissions (City of San Diego 2022a). However, even with these efforts, the impacts of climate change are already being felt. San Diego is experiencing more frequent and intense heatwaves, increased wildfire risk, coastal flooding and erosion and more unpredictable and intense rain events.

These hazards impact San Diegans and our economy, infrastructure and the natural environment. The City has taken steps to mitigate these impacts to preserve the natural diversity of our region and to improve residents’ quality of life through existing plans, programs and projects. To further address these hazards and improve quality of life, the San Diego City Council adopted the City’s first-ever climate adaptation and resilience plan, Climate Resilient SD (City of San Diego 2024a). Climate Resilient SD is the City’s comprehensive plan to prepare for, respond to and recover from climate change-related impacts and improve local communities. Climate Resilient SD is a key first step, but there is still much work to be done and there is a role for each of us in building a more resilient future.

Climate Resilient SD addresses the four primary climate change-related hazards for the City: extreme heat, extreme rainfall or drought, wildfires and sea level rise. The plan includes a suite of goals, policies and strategies to minimize risk and increase the resilience of San Diego’s people, assets, economy and natural resources to climate change. The five main goals of Climate Resilient SD are:

- 1. Ensure communities are connected and informed to be best prepared for climate change.
- 2. Plan for and build a resilient and equitable city.
- 3. Safeguard, preserve and protect historic and Tribal Cultural Resources from the effects of climate change.
- 4. Support and prioritize thriving natural environments and enhance adaptability.
- 5. Maintain and ensure minimal disruption to all critical City services in the face of climate change hazards.

The climate adaptation strategies within the plan focus on increasing the City’s capacity to bounce back, and forward, after a climate event. As the City implements these strategies, continued engagement with the community will support a shared vision for a resilient San Diego.

Within Climate Resilient SD, Policy TNE-3, calls for prioritizing the implementation of nature-based climate change solutions wherever feasible. The Coastal Resilience Master Plan is a strategy under this policy that would “identify locations for implementation of nature-based solutions to mitigate coastal flooding and erosion, improve coastal resiliency, protect habitat and increase recreational opportunities for residents and visitors.”



Stakeholder and Community Engagement

Nature-based solutions are prioritized in Climate Resilient SD and in the Coastal Resilience Master Plan (CRMP), both for the multiple benefits they provide to the community, but also based upon public feedback. In a public survey for Climate Resilient SD, nature-based solutions were identified as the strong preference for coastal resilience approaches and over 89 percent of respondents supported the softer strategies (nature-based solutions) to harder strategies (traditional engineering) (Figure 1).

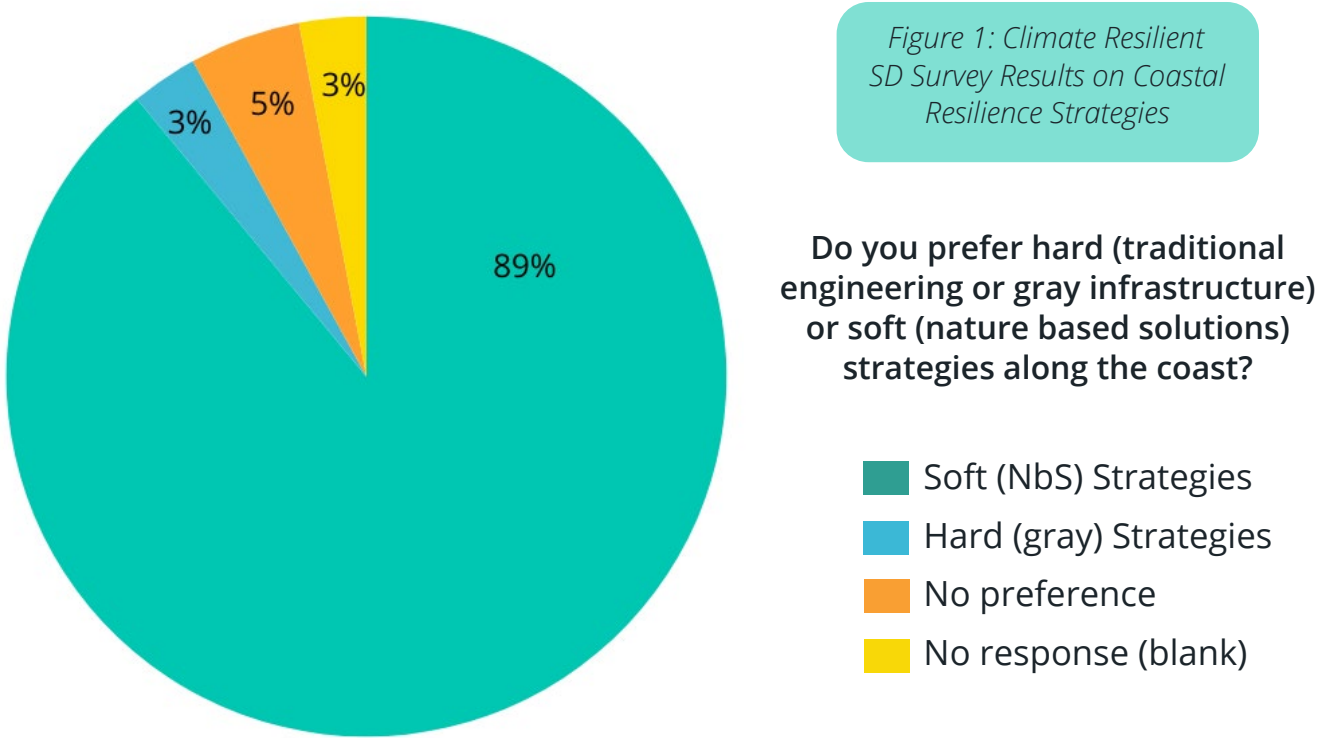


Figure 1: Climate Resilient SD Survey Results on Coastal Resilience Strategies

Do you prefer hard (traditional engineering or gray infrastructure) or soft (nature based solutions) strategies along the coast?

- Soft (NbS) Strategies
- Hard (gray) Strategies
- No preference
- No response (blank)

Supporting Climate Plans and Assessments

The City has completed multiple assessments to evaluate the current conditions of coastal resources and their vulnerability to sea level rise including Coastal Erosion Assessments, State Lands Sea Level Rise Vulnerability Assessment, Sea Level Rise Vulnerability Assessment and the Citywide Climate Change Vulnerability Assessment. These documents assess the current and potential future impacts of coastal flooding and erosion due to sea level rise. These technical documents helped inform the development of nature-based coastal resilience projects for the CRMP, including site selection and prioritization. While these studies focused more on City assets, infrastructure and the environment, Climate Resilient SD recognizes the importance of centering people in implementation of adaptation and resilience strategies.

Coastal Erosion Assessments

The City has completed multiple Coastal Erosion Assessments to better understand current conditions, anticipate future coastal erosion and assess long-term rates of cliff retreat. The City completed an assessment in 1993, 2003 and most recently, a Coastal Erosion Assessment Photograph Analysis Update in September 2018. Each assessment monitors 71 coastal sites along the City's 17-mile shoreline. These sites include bluff-top linear parks, bluff-top streets parallel to the coastal bluff and City streets that end at the bluff edge. The 2018 assessment includes photographs, risk ratings and site notes to help the City identify and prioritize coastal locations for remediation.

Over the 15-year period between assessments (2003–2018), erosion appears to have affected several pedestrian coastal access ways and staircases, bluffs and sea caves. The 2018 assessment rated 71 sites (City of San Diego 2003, 2018). Out of the 71 sites rated, 6 percent ranked with no rating, 55 percent ranked as low priority, 18 percent ranked as moderate priority and 21 percent ranked as high priority, with higher priority rankings reflecting greater pedestrian hazards and signs of potential bluff collapse. The recommendations from the 2018 assessment included establishment of a photo analysis update at least every 10 years, exploration of alternative data collection methods (e.g., citizen science photo submission) and prioritization of a technical analysis from which site level erosion and site management conclusions can be drawn (e.g., LiDAR remote sensing).



State Lands Sea Level Rise Vulnerability Assessment

The City's State Lands Sea Level Rise Vulnerability Assessment, which was completed in July 2019, assessed impacts to the City's granted lands in compliance with California Assembly Bill 691 (City of San Diego 2019a). In the report, the City analyzed the risks that sea level rise, storm surge and coastal erosion pose to City assets and public trust resources, such as parks, coastal habitats and coastal access points, located within granted public trust lands in San Diego. Through this assessment, the City identified the vulnerabilities of City assets and public trust resources and facilities, considered replacement or repair costs and assessed the impact to non-market values, such as ecosystem services, for the years 2030, 2050 and 2100.

Sea Level Rise Vulnerability Assessment

The City completed a Sea Level Rise Vulnerability Assessment in December 2019 (City of San Diego 2019b). This assessment analyzed the vulnerability of critical built, natural and cultural assets to coastal hazards, including sea level rise, storm surge and coastal erosion. Vulnerability was scored using exposure, sensitivity and adaptive capacity as determining factors. The assessment addressed vulnerabilities by City asset type for public safety assets (e.g., lifeguard stations), water and wastewater assets (e.g., pipes, pump stations), transportation and stormwater assets (e.g., bridges, outfalls), historic and tribal cultural resources, open space and environmental assets (e.g., recreation centers, parks, beaches) and other City assets (e.g., libraries).



Citywide Climate Change Vulnerability Assessment

The Citywide Climate Change Vulnerability Assessment, completed in February 2020, included the findings of the previously completed sea level rise vulnerability assessments but expanded the analysis to include consideration for wildfire, changes in precipitation and extreme heat events (City of San Diego 2020). The assessment evaluated critical City assets and resources (e.g., public safety, water, transportation, stormwater, open space and environment) for vulnerability-based exposure of each asset type to each climate change hazard and analyzed the sensitivity and adaptive capacity of each asset type. This assessment found many City assets and resources to be highly vulnerable to sea level rise, including: conservation areas and open space, beaches, lifeguard stations, community parks, recreation centers, drain pump stations and outfalls, bridges and major arterials and historical, tribal cultural and archaeological resources.

Other City Coastal Resilience Initiatives

The City is also leading and participating in additional coastal resilience initiatives including the following:

Chollas Creek Watershed Regional Park Master Plan

The Chollas Creek Watershed is a vital natural resource encompassing a network of water channels, parks and surrounding open space. The watershed stretches across the neighborhoods of City Heights, Eastern Area, Encanto, Southeastern San Diego, Barrio Logan, Greater Golden Hill, North Park and Normal Heights. The watershed plays a crucial role in maintaining the region’s ecological balance and providing essential habitat for numerous plant and animal species as well as providing opportunities for community-serving recreation. The Chollas Creek Regional Park Master Plan will be a long-term planning document developed by the City of San Diego in partnership with various stakeholders and community members to guide the sustainable future of Chollas Creek Watershed as a regional park (City of San Diego 2024b). The goals of the plan are to protect and enhance the Chollas Creek Watershed’s ecology; improve the watershed’s sustainability and resilience to the impacts of climate change; increase recreational opportunities; improve walking/rolling and biking within the watershed and adjacent to neighborhoods; and foster a sense of ownership and connection to the creek among community members.

De Anza Natural

De Anza Natural is the De Anza Cove Amendment to the Mission Bay Park Master Plan (City of San Diego 2024c). De Anza Natural aims to expand wetlands for habitat, public enjoyment, climate resilience and water quality benefits; create an iconic recreation destination that maximizes the benefit offered to the region by this waterfront amenity; provide for the highest and best use of the project area to serve the needs of a broad range of local and regional users; and identify a mix of uses that will provide sustainable revenue generating leaseholds for the City. De Anza Natural envisions enhanced recreational activities with new facilities, such as a multi-use waterfront trail and a small non-motorized boat lease area for the cove. The plan also includes space for low-cost visitor accommodations including camping and recreational vehicle facilities accessible to Mission Bay Park visitors, and it proposes an interpretive nature center. These spaces, set amid expanded and restored coastal wetlands, would provide new opportunities for eco-tourism and environmental education. The City is currently seeking approval of the Master Plan Amendment from the California Coastal Commission.

Land Development Code Updates

The Land Development Code contains regulations for the development and use of property, including zoning, subdivisions and other related land use activities. The City Planning Department monitors and continually updates the code to simplify and streamline the permitting processes, assure compliance with state and federal regulations, eliminate unnecessary barriers and align land use and development regulations with the City’s climate, equity and housing goals. Recent updates include regulations for development within the Coastal Zone and in areas of future sea level rise (City of San Diego 2024d).



Los Peñasquitos Lagoon Restoration

The goal of the Los Peñasquitos Lagoon Restoration project is to restore historical salt marsh in the lagoon, while also addressing sediment, trash, invasive species and flood attenuation (City of San Diego 2024e). It also includes freshwater management to improve the sustainability of the restored salt marsh and overall health of the lagoon. Phase 1 of the project restores the area southwest of the railroad berm and provides guidance for restoration planned under Phase 2 using an adaptive management approach. Phase 1 scope includes floodplain enhancements, improved storm drain infrastructure and restoration of approximately 146 acres of salt marsh.

The City of San Diego has prepared a draft addendum to the Los Peñasquitos Lagoon Enhancement Plan Final Environmental Impact Report for Phase 1 of the project. After the addendum is finalized, there will be further opportunities for public participation, including during the consideration of the site development permit and resource agency permitting.

Mission Beach Seawall Improvement Feasibility Study Preliminary Engineering Report

The Mission Bay Park ‘Ten-Year Plan’ identifies a list of priority projects, including navigational and safety dredging, wetlands and water quality improvements, shoreline protection, expansion of preserves and habitat and park facility improvements. To effectively and holistically analyze these projects and their associated environmental impacts, a Programmatic Environmental Impact Report is being developed with the primary goal of streamlining future environmental and permitting review and engaging the public to solicit community input throughout the process. Priority projects included in this effort include restoration of navigable waters and elimination of navigable hazards, wetland expansion, water quality improvements, protection and expansion of eelgrass beds, restoration of shoreline treatments, expansion of endangered or threatened species preserves and upland habitats on North Fiesta Island and San Diego River floodway levee and other deferred capital improvements (City of San Diego 2022b).

Ocean Beach Pier

Since the early 2000s, exposure to large waves and ongoing degradation has required structural repairs to Ocean Beach Pier with increasing frequency. The pier was temporarily closed several times in recent years due to damage suffered in storms and high surf. In 2024, The City of San Diego determined the safest and most cost-effective option for the Ocean Beach Pier is to keep the structure closed to public access while the City moves forward with a long-term solution to replace the 58-year-old pier.

The City is currently working to design the potential replacement of the pier based on public input, community impacts, environmental permitting, sustainability, operational usage, cost, historical significance and other factors (City of San Diego 2024f).



SANDAG Regional Beach Sand Replenishment Project

San Diego Association of Governments (SANDAG) developed the Beach Sand Replenishment program as part of their Shoreline Management and Monitoring programs (SANDAG 2023). The San Diego County coastline is subject to coastal erosion, exacerbated by development such as flood control projects and harbors and jetties that can both reduce sand that flows down rivers to beaches and suppress sand movement.

SANDAG’s Beach Sand Replenishment program supports efforts to nourish San Diego beaches with sand placement to restore and maintain coastal beaches, sustain recreation and tourism, enhance public safety, restore coastal sandy habitats and reduce the proliferation of protective shoreline structures (e.g., harbors and jetties). The City of San Diego participated in SANDAG’s Regional Beach Sand Project I project in 2001 and is participating in the Preliminary Planning Activities for Regional Beach Sand Project III.

Trails Master Plan

The Citywide Trails Master Plan has been identified as a key implementation item within the Parks Master Plan to establish a framework to guide equitable and sustainable design, enhancement and implementation of existing and new trails throughout San Diego (City of San Diego 2024g). The Trails Master Plan will provide a comprehensive plan for both natural and urban trails and pathways to connect communities with safe and enjoyable walking/rolling and biking connections while respecting and enhancing the overall natural environment. The Trails Master Plan will result in new policies that promote active mobility and equitable access to the City’s coastal resources and promote the creation and use of an interconnected trail network that provides easy access for all residents to connect with open spaces and coastal resources.



U.S. Army Corps of Engineers San Diego River and Mission Bay Maintenance Dredging Project

Mission Bay Park was developed from the 1940s through the 1960s in what was a vast tidal marsh. After the creation of Mission Bay into an aquatic park, dredging has occurred in 1973, 1983-84 and 2010 at varying volumes. In 2010, as part of maintenance dredging roughly 450,000 cubic yards of material was placed on Mission Bay. Mission Bay is dredged on an “as-needed” basis with an interval of approximately 20-30 years. The next dredging effort could provide an opportunity to align timing of the dredging with sediment/ material needed for some of the proposed project concepts within the Coastal Resilience Master Plan.

Evolving Shoreline

The coasts of San Diego have greatly shifted over time due to both natural and human-led influences. Geologic formations, rivers and ocean forces helped shape this diverse shoreline of San Diego's waterways, bays, beaches, cliffs and estuaries. Human development along the coast and in watersheds, particularly during the post-World War II boom, combined with harbor construction has also played a major role in shaping today's shoreline. Over the last century, coastal development and management, such as beach nourishment, flood control and transportation infrastructure, have greatly influenced the creation of new shorelines, the stabilization of existing shorelines and the modifications of natural systems. These historical lessons, combined with our understanding of existing hazards like El Niño and future impacts such as sea level rise, can help envision a future for San Diego that balances protection and conservation of important resources.

An evocative example of historic processes that can inform planning and decision making is the erosion along San Diego's cliffs and bluffs. Locations such as Sunset Cliffs, La Jolla and Torrey Pines have experienced significant coastal erosion over time. Figure 2 illustrates the evolving shoreline of Sunset Cliffs through a historical perspective.

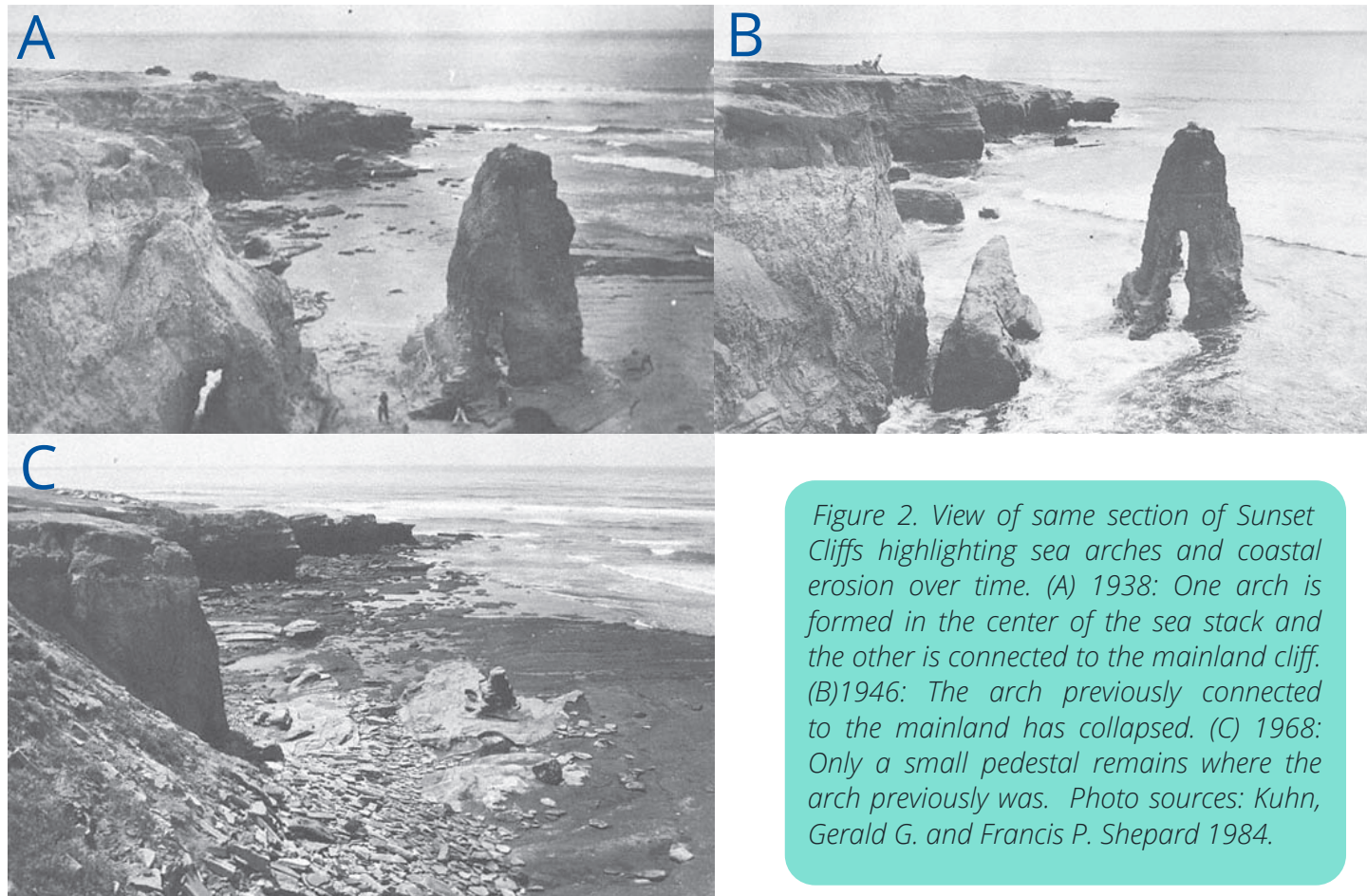


Figure 2. View of same section of Sunset Cliffs highlighting sea arches and coastal erosion over time. (A) 1938: One arch is formed in the center of the sea stack and the other is connected to the mainland cliff. (B) 1946: The arch previously connected to the mainland has collapsed. (C) 1968: Only a small pedestal remains where the arch previously was. Photo sources: Kuhn, Gerald G. and Francis P. Shepard 1984.

While cliff erosion is likely to increase with sea level rise and heavier rainfall events, modeling when and where erosion may take place can be difficult. Research from Scripps Institution of Oceanography indicates that cliffs cycle through periods of erosion and stability, meaning historic erosion rates are not always accurate predictors of future erosion (Dickson et al. 2023). Areas that have been stable for some time may start eroding, while areas that have been actively eroding may stabilize. It is hard to predict when and where cliff erosion may slow or accelerate.

Beach erosion is also likely to accelerate with sea level rise. While the City has previously conducted beach nourishment, which involves placing additional sediment onto a beach to combat the effects of erosion, it is unlikely that historic rates of nourishment will be enough to stop future beach erosion. A recent study found significant impacts to the shoreline will occur due to accelerated sea level rise, with 31-67 percent of beaches in Southern California lost by 2100 under a 3-foot sea level rise projection without large-scale human interventions (Vitousek et al. 2017).

While there is uncertainty in precise erosion rates and sea level rise projections, it is certain that the coastline of the future will look different than the coastline of today.



Tribal Cultural Significance

The Kumeyaay are the original inhabitants of the coast within the CRMP area. The word Kumeyaay translates as "the people who are on the cliffs" overlooking the Ocean. Their traditional territory includes desert, mountains, valleys and coastal regions. Kumeyaay habitation and use of the coast is well documented through cultural resources such as remains of villages, temporary habitation sites, quarries, resource exploitation sites and milling areas. The Kumeyaay have a vast knowledge of plants, animals and natural resources that are found along the coast, which allowed them to subsist throughout the years by harvesting sea creatures like kelp, lobster and crab; gathering trade commodities like salt, abalone, ochre and tar; and fishing using traditional tule boats. Areas along the coast remain sacred places to the Kumeyaay Nation, some of which are associated with the creation story of the Kumeyaay people. The Kumeyaay Nation continue their traditional cultural use of the coast, maintaining their connection with their ancestral lands and traditions.

Sea Level Rise Science

Tide gauge data in San Diego suggests sea level here has risen approximately 2.23 millimeters per year, based on monthly mean sea level data from 1906 to 2023, which is equivalent to a change of 0.73 feet in 100 years (NOAA 2024).

For California, sea level rise projections are established by the Ocean Protection Council (OPC). In June 2024, the OPC adopted the State of California Sea Level Rise Guidance: 2024 Science and Policy Update which updated the previous guidance from 2018. The updated guidance includes five scenarios: Low, Intermediate-Low, Intermediate, Intermediate-High and High. These scenarios are:

- Low: 1 ft by 2100 - The scenario is on the lower bounding edge of plausibility given current warming and sea level trajectories and current societal and policy momentum.
- Intermediate-low: 1.6 ft by 2100 - A reasonable estimate of the lower bound of most likely sea level rise in 2100.
- Intermediate: 3.3 ft by 2100 - A reasonable estimate of the upper bound of most likely sea level rise in 2100.
- Intermediate-high: 4.9 feet by 2100 - Intermediate-to-high future emissions and high warming; this scenario is heavily reflective of a world where rapid ice sheet loss processes are contributing to sea level rise.
- High: 6.6 feet by 2100 - High future emissions and high warming with large potential contributions from rapid ice sheet loss processes; given that deep uncertainties and ambiguity are embedded in this scenario a statement on the likelihood of reaching this scenario is not possible. This scenario should be used with caution and consideration of the underlying assumptions.



Figure 3 shows a comparison of the sea level rise scenarios between 2018 and 2024 OPC projections for the National Oceanic and Atmospheric Administration (NOAA) San Diego tide gauge.

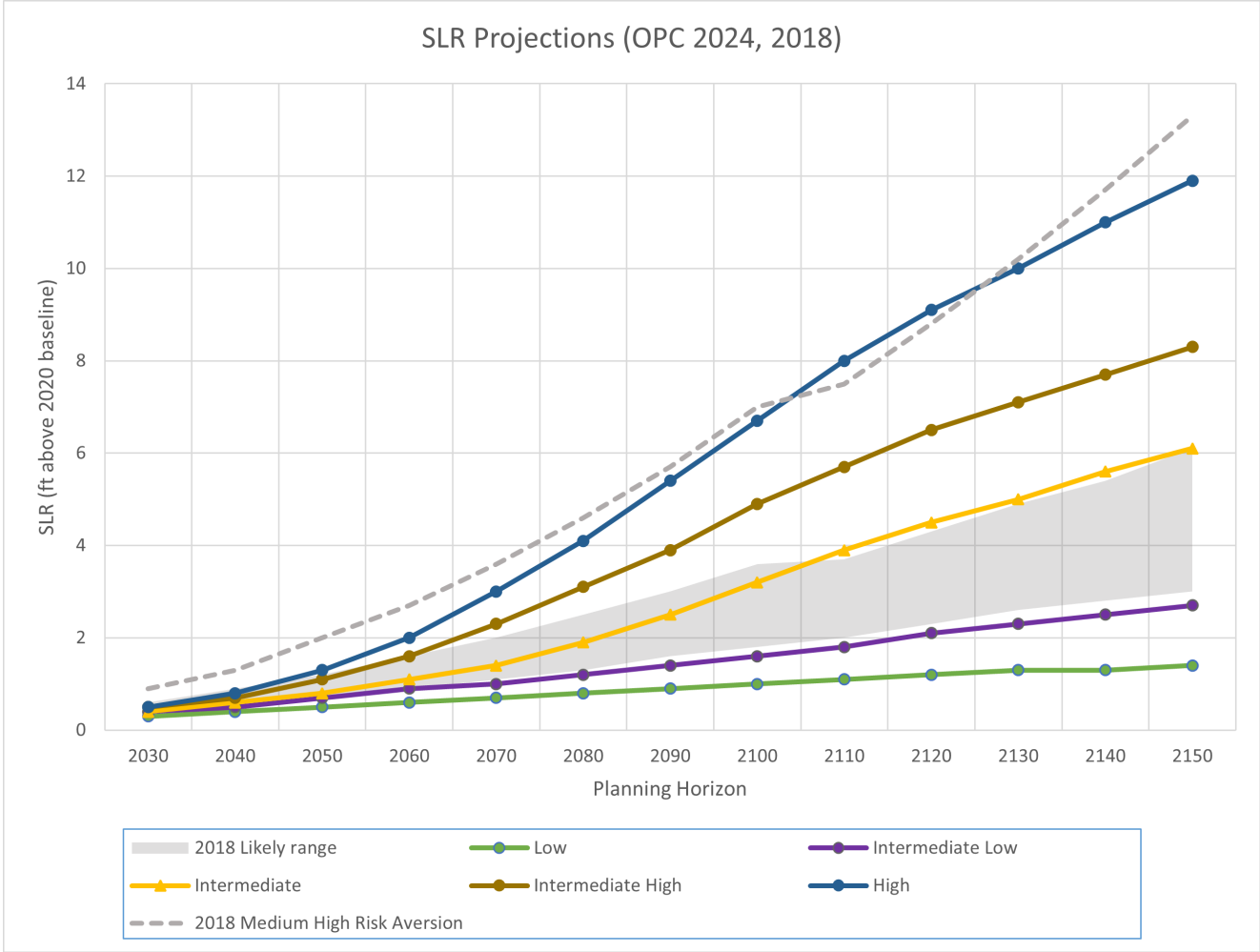


Figure 3. Sea level rise projections for the San Diego tide gauge (modified from OPC 2018, 2024)

These scenarios correspond to average global sea level rise magnitudes and do not have probabilities attached to them like the 2018 OPC scenarios. Instead, the latest scenarios are based on the ‘plausibility’ of occurring. Plausible ranges of sea level rise means the credible and reasonable range of future sea level rise supported by published, peer-reviewed publications and the consensus assessment of the Intergovernmental Panel on Climate Change Assessment Report 6 (IPCC AR6).

The scenarios presented in the 2024 guidance have a smaller range of values until 2050 (compared to the 2018 guidance), illustrating more confidence in mid-century projections. In the mid-term (2050–2100), the range of possible sea level rise trajectories expands with the range becoming increasingly larger over the long-term (towards 2100 and beyond). The medium-high risk aversion scenario (from the 2018 guidance) was previously commonly used as a design consideration for infrastructure (gray dashed line in Figure 3), and the H++ scenario was an extreme scenario used for critical infrastructure. However, due to the updates in the science, the 2018 medium-high risk aversion scenario is higher than every scenario in the new projections, and the H++ scenario was removed due to its implausibility.

The frequency of extreme flooding is expected to increase under all projections of sea level rise. In addition, rising seas will magnify the occurrence of severe floods (such as the 500-year flood) along the Pacific Coast of the United States. By elevating storm tide, sea level rise makes it easier for waves to surpass natural barriers, increasing the relative frequency of flooding along the coast. It is also possible that rising sea levels could raise groundwater levels, which could resurface toxic contaminants.

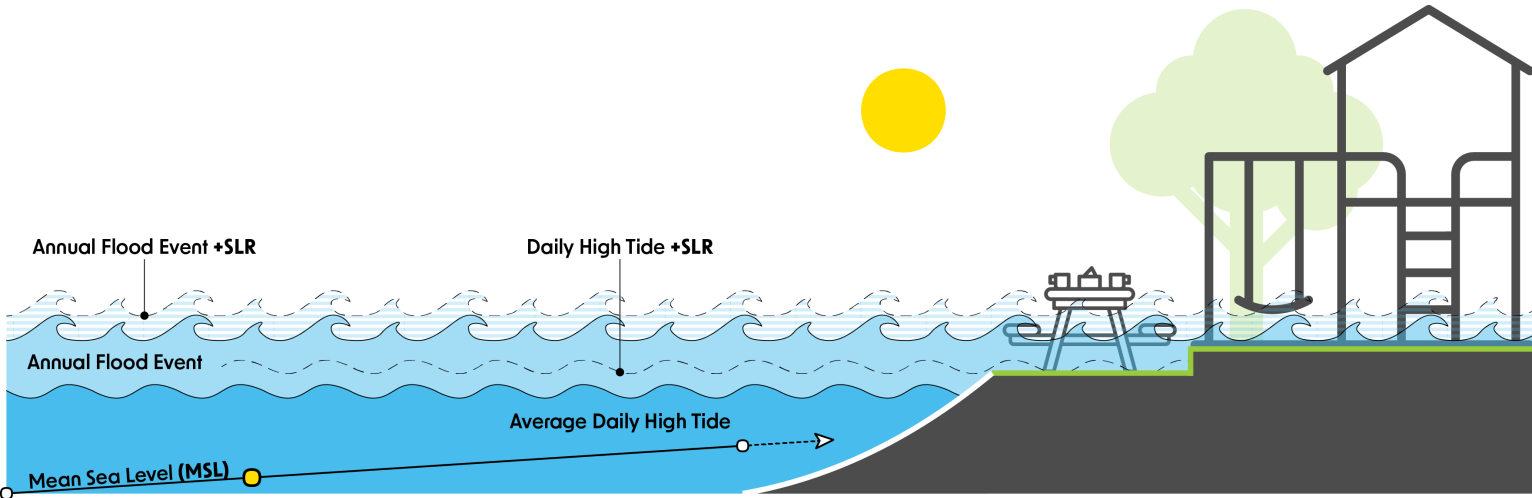


Figure 4. Flood and tidal events with sea level rise

Extreme Rainfall and Droughts

Changes in precipitation patterns, which includes extreme rainfall and droughts, is a difficult variable for climate change models to project. More variability in rainfall from year to year is expected along with more intense transitions between droughts and extreme rainfall events. California can experience wide swings in precipitation from drought years to El Niño years. But over the last 80 years, the average rainfall in San Diego has been about 10.13 inches annually (Western Regional Climate Center 2018). Annual average precipitation values from Cal-Adapt and technical sources embedded within it project only small changes in average annual rainfall for Southern California.¹ However, there is expected to be greater variability in precipitation and more intense transitions between dry and wet years. There may be more extreme dry years that are followed by extremely wet years, as recently occurred in 2015 to 2016 and 2016 to 2017. Extreme precipitation events, which historically occurred about every 25 years on average, are also expected to become 2.5 times more frequent in Southern California (Swain et al. 2018). This implies that what we experience as extreme now will be considered the norm in the future. These heavier rainfall events may contribute to coastal erosion events.

¹ Cal-Adapt is a web-based tool coordinated by the State of California that provides data and resources for climate change adaptation in California. Cal-Adapt provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement.

Case Study: Living Shoreline – Engineered Dune, Encinitas, CA



Photo Source: California Coastal Dune Science Network 2021a. Accessed July 16, 2024.

Engineered dunes were installed at Cardiff State Beach to protect the Pacific Coast Highway and enhance beach habitat. The highway was prone to frequent flooding and erosion and lacked sufficient accessways by foot to the beach. In response, sand dunes were constructed with dredged sand and placed on top of a buried rock revetment. Native vegetation is planted on top of the dunes. A sand fence installed parallel to the dune system is designed to keep sand away from the highway and a pedestrian footpath. This project now protects the highway from high tide and storm events, conserves habitat and improves access to the beach. Most recently, the living shoreline avoided extensive flooding of the highway during a January 2024 storm event. The storm eroded much of the dune, but the rock revetment remained intact. The dunes are being replenished with sand from the San Elijo Lagoon inlet.

Purpose of the Coastal Resilience Master Plan



The CRMP implements Climate Resilient SD, the City's climate adaptation and resilience plan, to inform the development of nature-based coastal resilience projects that allow the City to adapt to the impacts of sea level rise and enhance and protect the biological diversity of the City's coastline. Many of the City's critical assets, including open space, habitat and conservation areas and community resources are identified as highly vulnerable to sea level rise and erosion. Additionally, the coastline provides habitat for populations of endangered, threatened and key sensitive species protected by the City's Multiple Species Conservation Program

Subarea Plan including the Light-footed clapper rail, Western snowy plover and California least tern.

Further, the prioritization of nature-based solutions for coastal resilience through this project provides additional resilience, environmental and socio-economic benefits such as enhanced or protected habitat, coastal access, green jobs and environmental education opportunities. The projects identified in the CRMP will mitigate risk to climate change and provide co-benefits, such as habitat protection, water quality improvements, flood storage and recreation opportunities. The projects also consider ways to enhance access to the beach for all community members, such as increased public transportation to the beach, parking and pedestrian and bicycle infrastructure.

The purpose of the CRMP is to prepare the City to adapt to sea level rise through implementation of nature-based solutions where feasible. The main objectives are as follows:

- A. Prioritize the implementation of nature-based climate change solutions wherever feasible, consistent with Climate Resilient SD Policy TNE-3
- B. Address the effects of sea level rise and coastal flooding while leveraging additional co-benefits of nature-based solutions
- C. Protect and enhance critical coastal habitat and associated wildlife from the impacts of climate change
- D. Protect and enhance recreational opportunities
- E. Protect historical, archaeological and tribal cultural resources and incorporate Indigenous Knowledge into resilience efforts and adaptation strategies
- F. Increase coastal access for all community members, with prioritization of Communities of Concern



Resilient Climate Protections

Prioritize nature-based climate change solutions wherever feasible, consistent with Climate Resilient SD Plan Policy TNE-3

Address Sea Level Rise & Coastal Flooding

Address the effects of sea level rise and coastal flooding while leveraging additional co-benefits of nature-based solutions

Protect & Enhance Habitat/Wildlife

Protect and enhance critical coastal habitat and associated wildlife from the impacts of climate change



Enhance Recreation Opportunities

Protect and enhance recreational opportunities

Protect Historic & Cultural Resources

Protect historical, archaeological and tribal cultural resources and incorporate Indigenous Knowledge into resilience efforts and adaptation strategies

Increase Coastal Access

Increase coastal access for all community members, with prioritization of Communities of Concern

What the Plan Looks to Accomplish

The CRMP builds upon previously adopted planning and policy priorities and begins to understand what kind of coastal resilience solutions are possible along San Diego’s coast to protect against sea level rise driven flooding and erosion, while supporting a thriving coastline into the future that reflects community values and vision. The CRMP identifies specific resilience and conservation needs along the coast and develops a portfolio of nature-based solutions to promote resilience against the risk of climate change, protect critical coastal habitats and support coastal access in accordance with Climate Resilient SD. The coast is a valuable resource for all San Diegans and for those who visit the region. The CRMP aims to not only benefit the immediate coastal communities, but also to ensure coastal accessibility and habitat protection and viability. The coast is and should continue to be an accessible resource for all, where anyone can enjoy the natural and recreational benefits of a resilient, restored and protected coastline.



The CRMP looks beyond traditional coastal engineering techniques and includes nature-based solution pilot projects for prioritized sites along the City’s coastline. The CRMP is the first phase of this effort and includes high level concept designs. Future phases of work will include refinements to the designs, engineering, technical studies, permitting and construction.

The CRMP does not address the entirety of the City’s coastline and is not a comprehensive list of coastal resilience projects for the entire City of San Diego’s coastline. As noted in Other City Coastal Resilience

Initiatives, there are many other projects underway that address sea level rise and plan for a resilient coastline. The CRMP addresses select, prioritized sites that are well suited for nature-based solutions. It is anticipated that as projects move forward to implementation and as the City completes regular updates of both its vulnerability assessments and Climate Resilient SD, the CRMP will be updated to include additional sites. Site selection will consider updated science as well as community needs and priorities.

Nature-Based Solutions

Nature-based solutions are sustainable planning, design, environmental management and engineering practices that incorporate or mimic natural features or processes into the built environment to promote climate adaptation and resilience. In coastal settings, nature-based solutions incorporate ecological principles into shore protection strategies to support multiple benefits, including hazard adaptation and mitigation, natural resource resilience and enhancement and recreation and scenic resource preservation. While there are varying definitions specifically to nature-based solutions, a generally recognized definition of coastal nature-based solutions and nature-based adaptation strategies is: “A coastal adaptation and/or erosion control method that is comprised of natural or mostly natural elements, which contributes to the persistence and enhancement of coastal processes and ecological benefits while also offering protection services to inshore areas” (CCC 2021).

Multi-Benefit Overview

Nature-based solutions provide multiple benefits for coastal resilience planning. These solutions use natural features and processes to reduce flood risk, improve water quality, protect coastal property, restore and protect wetlands, provide ecological benefits, stabilize shorelines, reduce urban heat and add recreational space, among other benefits (FEMA 2024a).

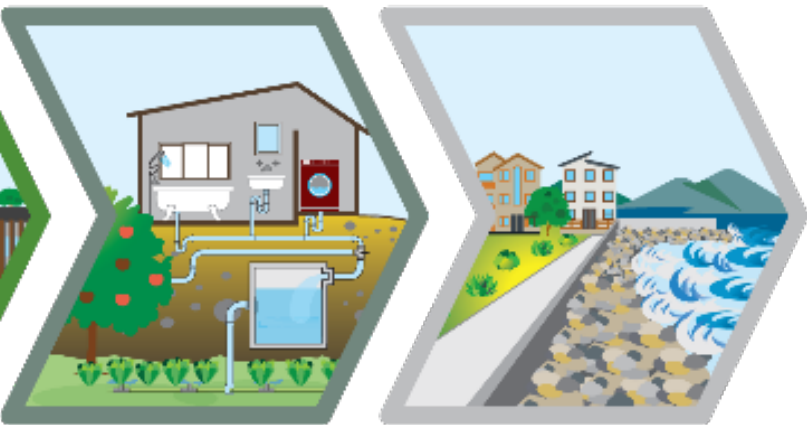
NATURAL

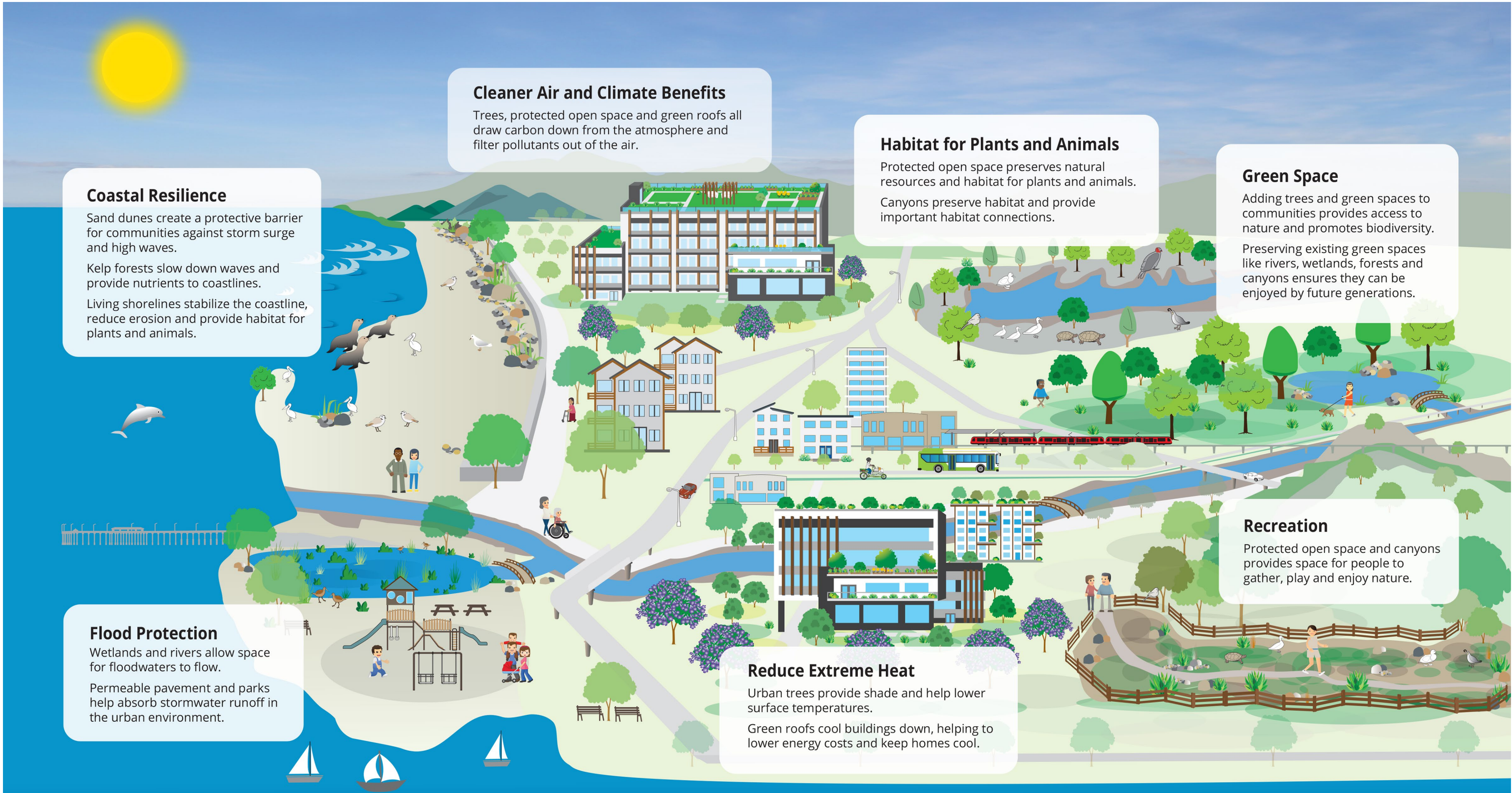


GREEN



GRAY





Coastal Resilience

Sand dunes create a protective barrier for communities against storm surge and high waves.

Kelp forests slow down waves and provide nutrients to coastlines.

Living shorelines stabilize the coastline, reduce erosion and provide habitat for plants and animals.

Cleaner Air and Climate Benefits

Trees, protected open space and green roofs all draw carbon down from the atmosphere and filter pollutants out of the air.

Habitat for Plants and Animals

Protected open space preserves natural resources and habitat for plants and animals.

Canyons preserve habitat and provide important habitat connections.

Green Space

Adding trees and green spaces to communities provides access to nature and promotes biodiversity.

Preserving existing green spaces like rivers, wetlands, forests and canyons ensures they can be enjoyed by future generations.

Recreation

Protected open space and canyons provides space for people to gather, play and enjoy nature.

Flood Protection

Wetlands and rivers allow space for floodwaters to flow.

Permeable pavement and parks help absorb stormwater runoff in the urban environment.

Reduce Extreme Heat

Urban trees provide shade and help lower surface temperatures.

Green roofs cool buildings down, helping to lower energy costs and keep homes cool.

Types of Nature-Based Solutions for Coastal Resilience

A description of the nature-based solutions to consider in planning for coastal resilience:

- Living shorelines stabilize and protect the shoreline using a combination of plants, sand, rock and other natural materials. They can help reduce wave energy, slow erosion and minimize flooding.



Living shorelines

- Engineered and passive dunes can be designed to combine the aesthetic and habitat benefits of a dynamic beach and dune system with the robust storm protection provided by a structural core. A spectrum of passive (e.g., sand fencing, wooden slates) to full engineered approaches is possible with dunes.



Engineered Dunes

- Waterfront parks are open space parks or recreational spaces in coastal areas that are designed to flood during extreme events, minimizing flooding elsewhere. During “normal” non-extreme event periods, they operate as community serving recreational facilities.



Stormwater parks

- Landward realignment refers to the modification of the alignment and shape of features, and mimics natural processes of balancing space and gradual transitions between elevations, slopes and habitat and use types.



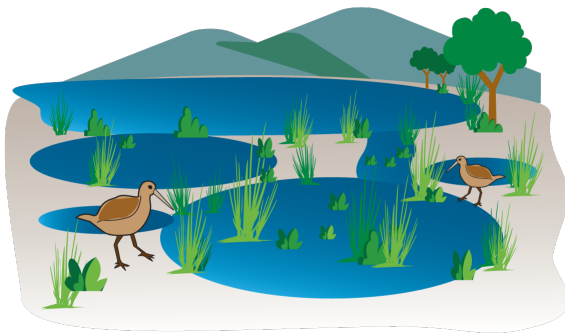
Landward Realignment

- Living levees/ecotone slopes incorporates a levee that, instead of dropping down sharply, slopes gently downwards towards the waterbody in the same way that the land naturally would. This allows for natural, gradual transitions—from open water to tidal mudflat, to tidal marsh, to “ecotone” or transitional upland habitat—to be re-established in these areas.



Living Levees and Ecotone Slopes

- Wetland creation/restoration encompasses enhancing wetland ecosystems characterized by permanent or seasonal inundation, which help mitigate flooding, provide habitat, improve water quality and absorb wave energy.



Wetlands and floodplains

- Reefs provide natural barriers to the shoreline, protecting it from erosion, strong waves and storm surge. Designing nature-based reef features can be performed on more exposed shorelines as well as in protected environments, such as bays with oyster reefs.



Oyster Reefs

Approaching Adaptation to Coastal Hazards

When developing nature-based solutions, it is important to consider the various options for coastal adaptation. In a coastal setting, there are generally three main categories to approach adaptation to coastal hazards such as flooding and erosion: protect, accommodate and relocate. In some instances, a combination of these options, a hybrid approach, is necessary initially or over time (i.e., a phased adaptation approach) to balance social, environmental and economic needs for coastal resiliency.

Protect: Strategies that seek to defend development and other resources through engineered efforts and generally prioritize existing alignment and certain uses.

Accommodate: Strategies that support retrofitting of existing structures (e.g., increase elevation) with a focus on repair and maintenance as impacts are realized. The level of use or service may need to be adjusted as status of assets change.

Relocate: Strategies that realign or relocate assets out of hazard areas and limit new development in vulnerable areas.

Hybrid: Strategies that blend protective and realignment elements using natural materials with structural designs while incorporating social and environmental considerations.

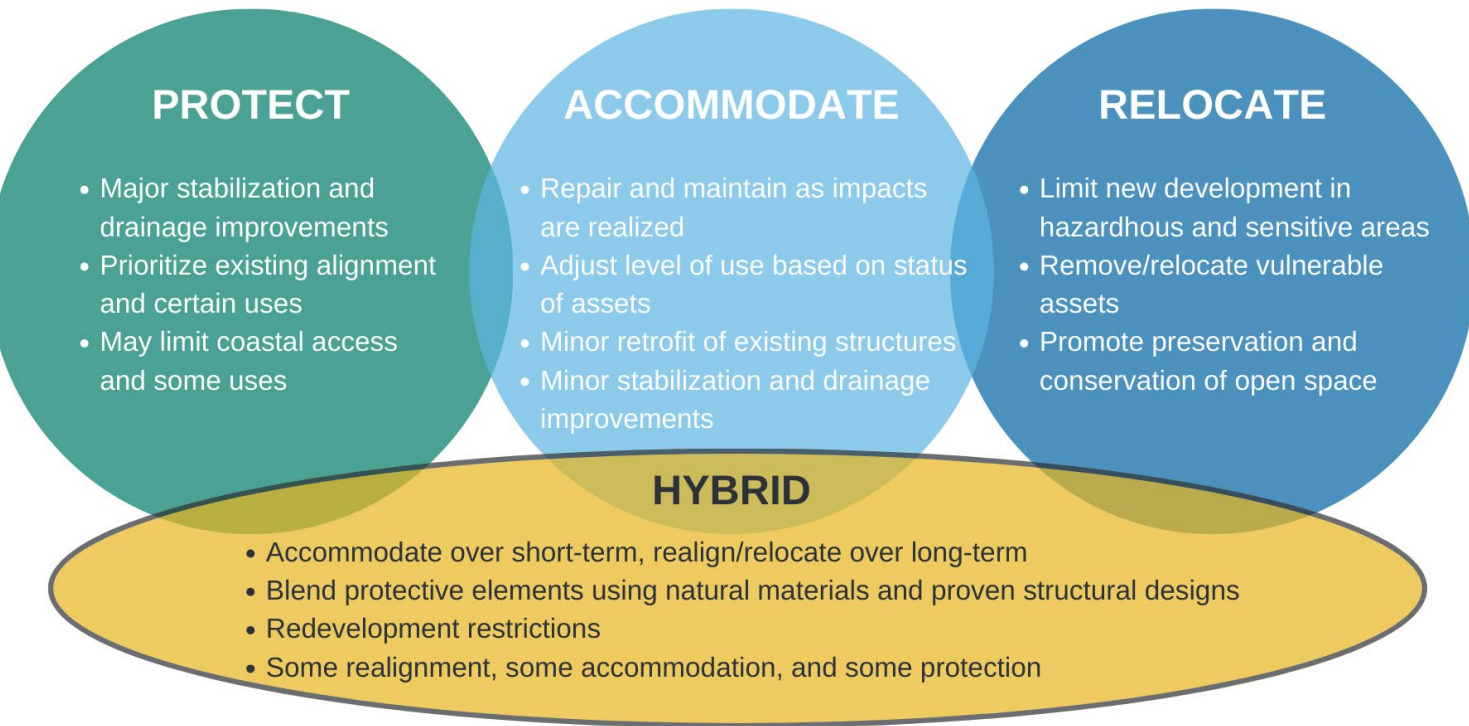


Figure 5. An overview of general coastal adaptation strategies, informed by California Coastal Commission Sea Level Rise Guidance 2018.

Nature-based solutions can encompass natural infrastructure and green infrastructure and provide a broad approach of fully soft or hybrid soft and engineered approach to projects. Conversely, gray infrastructure relies primarily on hard, engineered infrastructure focused on armoring or fixing shorelines and landscapes to gain protective or resilience benefits.

It is important to note that there are tradeoffs associated with every category and adaptation strategy. For example, strategies with more physical protection may protect the built environment and preserve certain uses but may compromise environmental aspects. Conversely, strategies that prioritize environmental features may not provide the same level of protection for built infrastructure but can offer environmental benefits and can reflect community values.

Different locations, assets and resource protection goals will require different types of strategies. The effectiveness of the different strategies detailed above will vary. In many situations, a hybrid approach that combines strategies from all three categories will be essential, and the selected strategies may need to evolve over time. When softer more natural solutions alone may not be preferred, a combination of both hard and natural infrastructure may be necessary to achieve resilience goals. Many of the nature-based solutions presented in this utilize a hybrid approach where natural infrastructure elements are incorporated and prioritized where feasible and practical in conjunction with some, mostly existing, hard armoring. Across all solutions presented, the goal is to design a suite of strategies that can work with the coastal setting to provide multiple benefits for the community, coastal protection and local environment.

Case Study: Landward Realignment, Surfer’s Point, Ventura, CA

Landward realignment and habitat restoration are being integrated into increasing resilience at Surfer’s Point. Phase I of the project added a new bike path and replaced the prior bike path and parking lot with a cobble beach backed by dunes. Infrastructure was relocated inland to support restoration and widening of the beach. Since Phase I’s completion, access to the beach has continued and wildlife has rebounded. Funding for Phase II was approved this June, which will work on some of the cobble berm and dune areas that have been eroded by storms and complete relocation of public amenities and parking.



Photo Source: California Coastal Dune Science Network 2021b. Accessed July 16, 2024.

Community Engagement and Feedback

Community engagement is a key component of developing the Coastal Resilience Master Plan as it ensures that community voices, priorities, concerns and local knowledge of the project sites are heard and incorporated into the planning effort. By actively involving community members, stakeholders and community organizations, the planning process benefits from diverse perspectives and local knowledge, leading to more robust resilience strategies and a shared vision of our coastline.

Overview of Engagement Activities

Stakeholder Advisory Committee

The City invited 22 stakeholder agencies to participate in an informal Stakeholder Advisory Committee (Committee) comprised of local, state and federal agencies, research institutions, coastal-focused environmental groups and transportation agencies. The Committee was formed to support the development of the CRMP and provide technical input on feasibility, benefits and prioritization of proposed nature-based solutions, as well as coordination efforts. For Phase 1 of the CRMP, three Committee meetings were held. The Committee will continue to be engaged in future phases of the CRMP to provide technical input on feasibility, design and implementation of nature-based solutions.

Community Engagement

Pop-Ups

The City conducted eight pop-up events in winter and spring of 2024. At each pop-up event, the City engaged with community members by presenting an overview of the CRMP project goals and draft design concept(s) for each site. Community members were invited to share feedback on the draft concepts and ask questions about the project. Informational flyers that included an overview the project, proposed project sites and a link to the Coastal Resilience Master Plan webpage were shared with community members. The webpage is regularly updates with information on the plan and upcoming community engagement opportunities.



Online Survey

In April 2024, the City launched an online survey seeking feedback from the public on each of the draft project designs for each of the sites within the CRMP. The online survey provided an overview of the sea level rise challenges facing each site and the key features of the proposed project design. The survey sought feedback from the community to inform project design, improve recreation opportunities and support coastal access. The online survey was live through the end of June 2024 and received 790 responses.

Community Workshops

In June 2024, the project team held two community workshops. The community workshops provided an opportunity for the project team and community stakeholders to dive deeper into the proposed features for each of the six sites, explore the range of nature-based solutions that are available for each site and provide meaningful insights into the recreation and access opportunities and challenges of each site. At each workshop, the project team presented an overview of the CRMP project purpose, planning process and sought feedback from the community on the draft project designs for each of the sites. Feedback received from the community helped to inform project design.



Community feedback received from all engagement activities helped to inform the project concepts to ensure that as the City designs for a more resilient coastline that is prepared for the challenges of sea level rise, we are centering community value and priorities. Continued community engagement as these project concepts are further refined, finalized and implemented will be essential for project success.

For an overview of all the community and stakeholder engagement efforts that has been conducted and potential future engagement opportunities, please refer to Appendix B, Public Engagement Plan.



Key Themes from Public Engagement Events

The following are summarized key themes gathered from the survey, pop-ups and workshops that have been held for the project to date.

Maintenance

Through both the pop-up events and community workshops, ongoing maintenance was a frequently raised issue. Many of the sites are subject to incorrect trash disposal resulting in waste along the beaches and pathways. Community members cited the need for more maintenance of facilities such as bathrooms, general repairs and increased cleaning of our beaches and coastline.

Safety

Another common theme was the desire for greater safety. Workshop participants from Sunset Cliffs expressed a need for greater safety along Sunset Cliffs Boulevard, including slowing the speed of motorized vehicles, designating safe crossings, providing protected and separated space for pedestrians and a desire for patrolling of the area. Greater enforcement at Ocean Beach – Dog Beach was also recommended to ensure the dunes did not become gathering locations for people or dumping areas.

Parking

Access to parking was a top priority for all sites. Most community members stated improving parking areas near the beach as an important aspect of the CRMP. Improving the parking area at Tourmaline Beach was noted as one priority for that site. Feedback from the pop-up event at La Jolla Shores indicated a preference to maintain the existing parking lot in its current configuration. For Sunset Cliffs, a range of suggestions regarding how to address parking were received, including relocating parking off the cliffs and replacing it with on-street diagonal parking, the use of timed and limited parking and adding parking at the north end of Sunset Cliffs.



Photo by GHD
Tourmaline Beach parking lot facing east

Access

Enhancing access to the coast is a top priority of the CRMP. From the survey, arriving by car was selected as the primary mode of access to each site. In general, feedback suggests beachgoers support increased access and an expansion of multiple modes of access (including pedestrian, bicycle and transit access). There is support for pedestrian and bicycle paths and to make the sites more pedestrian friendly. Emergency and Americans with Disabilities (ADA) access were also brought up as important considerations in the design of the proposed berms and dunes. Several comments included the need to preserve access to views and the desire for viewing platforms and seating areas. For Sunset Cliffs, many comments were received regarding potential reconfiguration of the street and traffic flow, with some stating it will improve access in the area and help control erosion, and others stating it will divert traffic into the neighborhood and cause greater congestion and parking impacts for residents and those visiting the Sunset Cliffs Linear Park.



Recreation/ Activities

All sites host a range of activities, from recreational to natural activities. Common activities include walking, sunset-watching, surfing, sitting and exercising, among others. In the survey, walking was selected as the primary activity for all sites. At Sunset Cliffs Natural Park, stakeholders expressed a desire for passive recreation activities, such as nature walks and sight-seeing. At Mission Beach and Ocean Beach, the need to preserve the volleyball courts was noted. For La Jolla Shores, the park, scuba diving staging area, playground and “The Map” were highlighted as special areas that need to be respected. For many sites, there is a concern about how much the beach will erode and how those activities may be curtailed by the impacts of sea level rise.

Education, Arts, & Culture

Engagement events highlighted the significant role of culture in each site. At the workshops and pop-ups, some shared different ways to raise awareness of the history and culture of the sites through art, interpretive signage and educational installations. At La Jolla Shores, a discussion about expanding the seawall revealed an opportunity to paint the back of the seawall with art that tells a story about the diverse and rich marine habitat in the area. Comments for Sunset Cliffs Natural Park included adding educational signage about the geology and habitat of the area.



Native Plants

Mixed comments were received regarding the use of native plants, especially for proposed dunes and perched beaches. Some indicated that ice plant, while it is an invasive species, helps prevent erosion and should be considered for the cliffs and dunes to control erosion and retain sand. Others indicated the City should use only native plants and drought-tolerant and water-saving plants.

Stormwater Drainage

A major theme of the outreach is the need to consider stormwater drainage in all adaptation strategies. Some stakeholders indicated that storm events are the primary cause of big flood events. Notes from the workshops and pop-ups assert that storm drainage contributes to significant erosion at Sunset Cliffs and Tourmaline, and to flooding at Ocean Beach, La Jolla Shores and Mission Beach. Stakeholders suggest stormwater improvements and management to enhance the project design, including diverting drainage away from the cliff edge at Sunset Cliffs and exploring “capping” the storm drain channel at Tourmaline.

Adaptation Strategies

The adaptation strategies presented focused on nature-based solutions. Several comments received included questions and concerns about how the proposed solutions would work. For example, comments added to workshop boards ask how dunes would work, if they will wash away, what plant material would work, how views would be impacted and how tall would they need to be? Access, including ADA and emergency access, were also noted as concerns. This feedback reflects the need for continued engagement and education around nature-based solutions, how they function, their benefits and operational considerations. For La Jolla Shores and Mission Beach, stakeholders asked if improvements to the existing seawall (expansion, adding height) would be a superior solution to the use of berms and dunes and were interested in the addition of flood gates.

Continued Outreach

There is a general interest and desire for the City to continue to engage with the various community organizations and groups.

For more detail on the community feedback received from the pop-up events, online survey and workshop, please refer to Appendix C, Community Engagement Summaries.

Case Study: Living Shoreline – Passive Dune, Beach Restoration Pilot Project, Santa Monica, CA

This pilot project restored about 3 acres of dune habitat. Actions to improve this location included seeding native vegetation, installing sand fencing and interpretative signs and integration of a beach pathway. This habitat’s plants capture windblown sand over time to create small dunes that prevent waves and extreme tides from flooding the beach and infrastructure. With the success of this pilot, the city of Santa Monica is implementing a larger project of about 5 acres. Since Phase I’s completion, access to the beach has continued and wildlife has rebounded. Funding for Phase II was approved this June, which will work on some of the cobble berm and dune areas that have been eroded by storms and complete relocation of public amenities and parking.



Photo Source: California Coastal Dune Science Network 2021c. Accessed July 16, 2024.

Project Concepts

The CRMP developed concept-level designs for six locations along the coast. Sites were initially selected for feasibility of implementing a nature-based solution that supports three primary factors:

- ▮ Increases resiliency to sea level rise;
- ▮ Provides habitat enhancement and preservation opportunities; and
- ▮ Supports and/or enhances coastal access, with a focus on disadvantaged communities.

Sites were investigated through a multi-criteria analysis to identify the location and site boundaries most viable for a nature-based concept, narrowing down to six locations which were identified as the most appropriate and feasible for nature-based solutions. For more detail on the site selection and prioritization process, please refer to Appendix A, Coastal Resilience Master Plan Phase 1: Prioritizing Nature-Based Solution Pilots and Site Profiles.

Project concepts were iteratively vetted with City departments, the Stakeholder Advisory Committee and community members. The concept designs included in the plan aim to balance the goals of the plan and reflect what is possible from a nature-based solutions approach. The development of the concept level design is a key first step in moving these projects forward to implementation. Additional community and stakeholder engagement, technical studies, environmental analysis, engineering and permitting will all be necessary before these designs are implemented.

Detailed site profiles for each of the six project sites are available in Appendix A.

Project Concept Descriptions

For each project site, a brief overview of the project site and proposed concept(s) at each site is provided. Each Project Concept Description includes a graphic showing concept-level design of the project concept, with cross section graphics and a list of key features. Each Project Concept Description includes items for further consideration that should be explored with City departments, relevant stakeholders and community members as the project concept designs move forward. Additional technical studies may be needed to further inform the project design.

Project sites are labeled A through F and concepts at each site are numbered (e.g., A-1, A-2). The pilot project, Ocean Beach – Dog-Beach, is featured first, followed by the other 5 sites, listed from north to south (Figure 7).

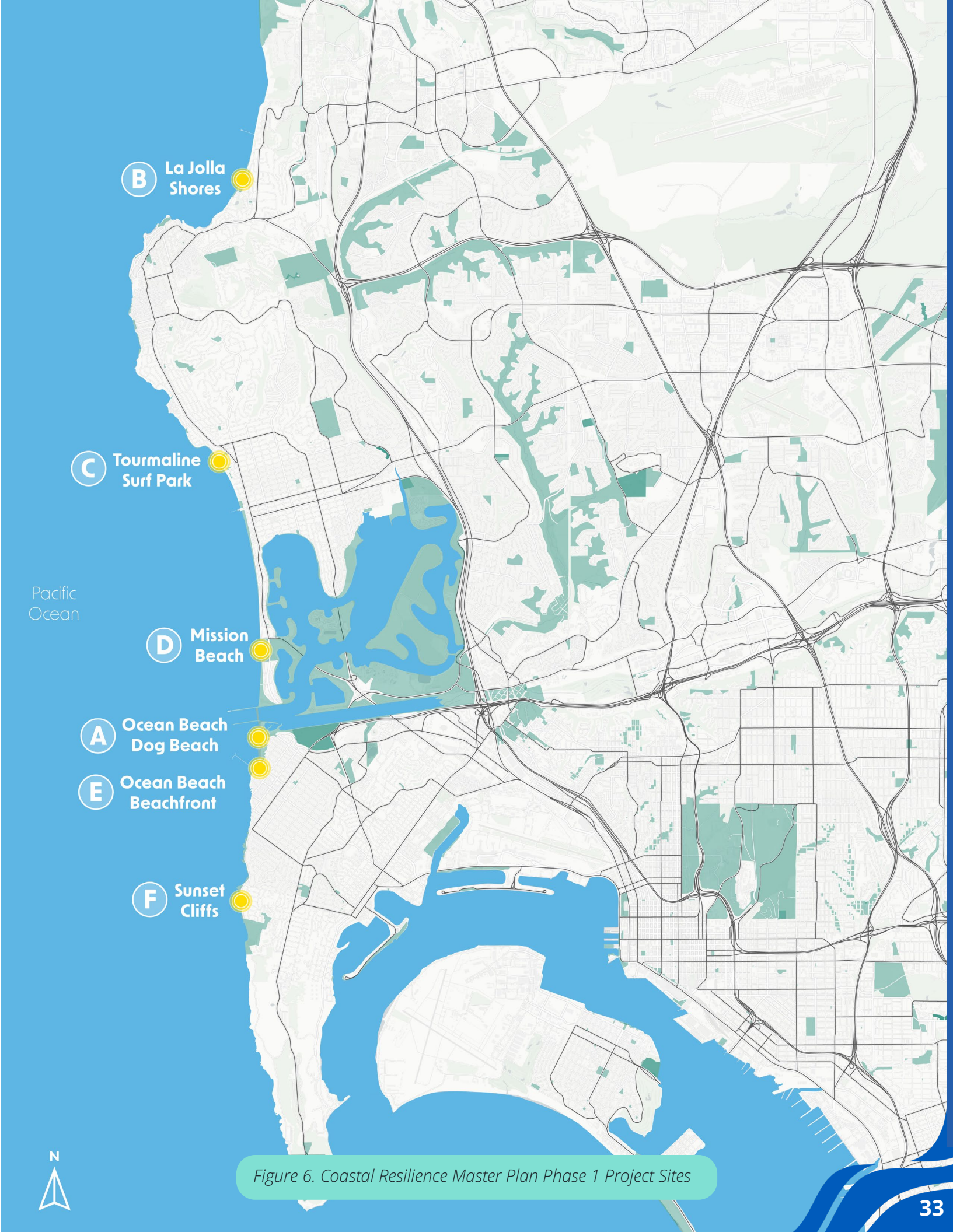


Figure 6. Coastal Resilience Master Plan Phase 1 Project Sites

An aerial photograph showing the coastal area of Ocean Beach and Dog Beach in San Diego. The image captures a mix of urban, recreational, and natural spaces. On the left, there are residential buildings and a parking lot filled with cars. A large, well-maintained green lawn occupies the center-left. To the right of the lawn is a paved path lined with low-lying shrubs. Further right is a wide, sandy beach area with some people visible. The ocean is in the background, with waves breaking near the shore. A long pier extends into the water on the far left, and a rocky breakwater is visible on the far right. The sky is clear and blue.

Ocean Beach – Dog Beach

Ocean Beach – Dog Beach

The Ocean Beach – Dog Beach project site is approximately 13 acres comprising open space beach and shoreline, a developed parking lot and a small portion of native dune and scrub habitat in the eastern portion of the site. The project site includes a portion of the San Diego River Bikeway and adjacent areas; however, it is located outside of the San Diego River Levee footprint. If the project footprint changes and it is determined that the project may impact the levee, continued coordination with the City's Stormwater Department and the U.S. Army Corps of Engineers would be required.

The concept for Ocean Beach – Dog Beach includes a new multi-use path for cyclists and pedestrians fronted by elevated sand dunes along the beach. The multi-use path and sand dunes would be located along the landward edge of the beach, adjacent to the existing parking lot (refer to Concept A-1 figures). The sand dunes, which are inspired by the City's existing winter berm program, would provide flood protection to the coastal park infrastructure and community of Ocean Beach by adding elevation to the back of the beach and by providing a reservoir of sand to the beach that can be utilized during erosive conditions. The proposed sand dunes would make this annual feature a permanent fixture at the project site and would be designed to provide protection from existing and projected

flooding impacts associated with sea level rise. The proposed multi-use path and sand dunes would include pedestrian and emergency access points along the project site and maintain existing parking onsite. The orientation/angle of the accessways would be designed to limit flood water from entering walking paths and accessways during extreme events (e.g., combined high wave energy and high tide). For instance, accessways might be angled away from the dominant wave direction to minimize direct water entry. Small berms and elevation increases might be included in vehicle and pedestrian accessways to divert water away from the paths, providing additional protection against flooding. To retain sand in the dune system, sand fencing would be used particularly during establishment of the dune vegetation (refer to Concept A-1 figures).

An optional component of the concept would be to relocate the existing restroom facility further inland to reduce vulnerability and continued exposure to coastal flooding and sea level rise. Another optional component of the concept would be to provide an express shuttle that runs from an appropriate transportation center (e.g., Old Town Transit Center) to the Ocean Beach – Dog Beach project site (refer to Concept A-2 figures).



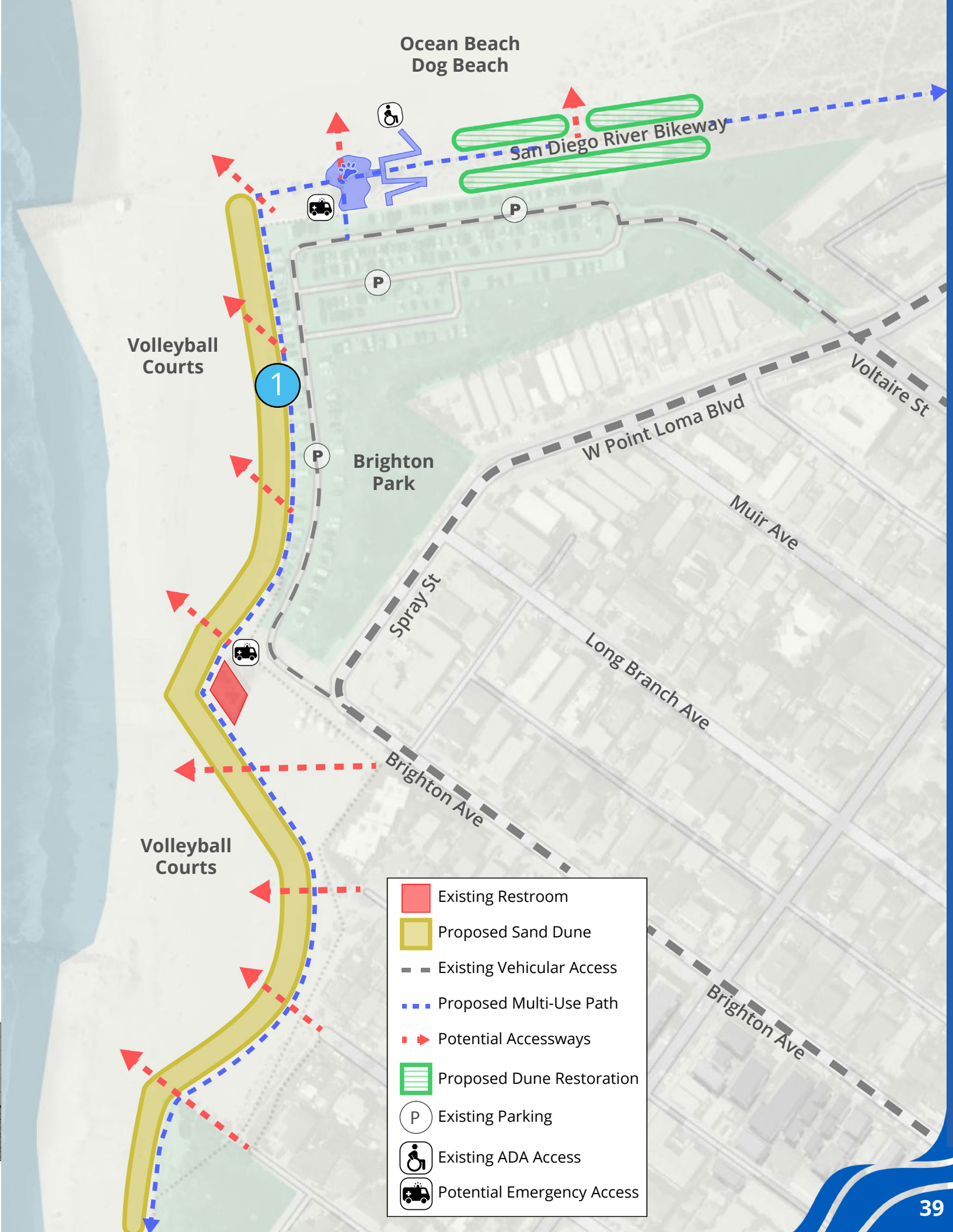
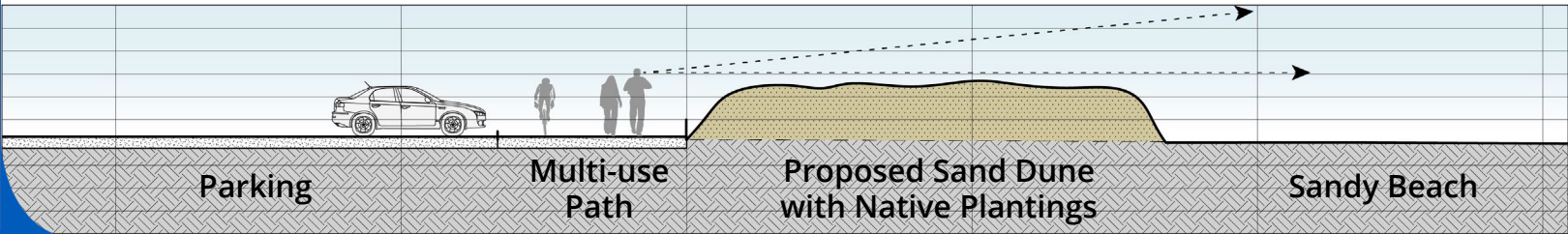
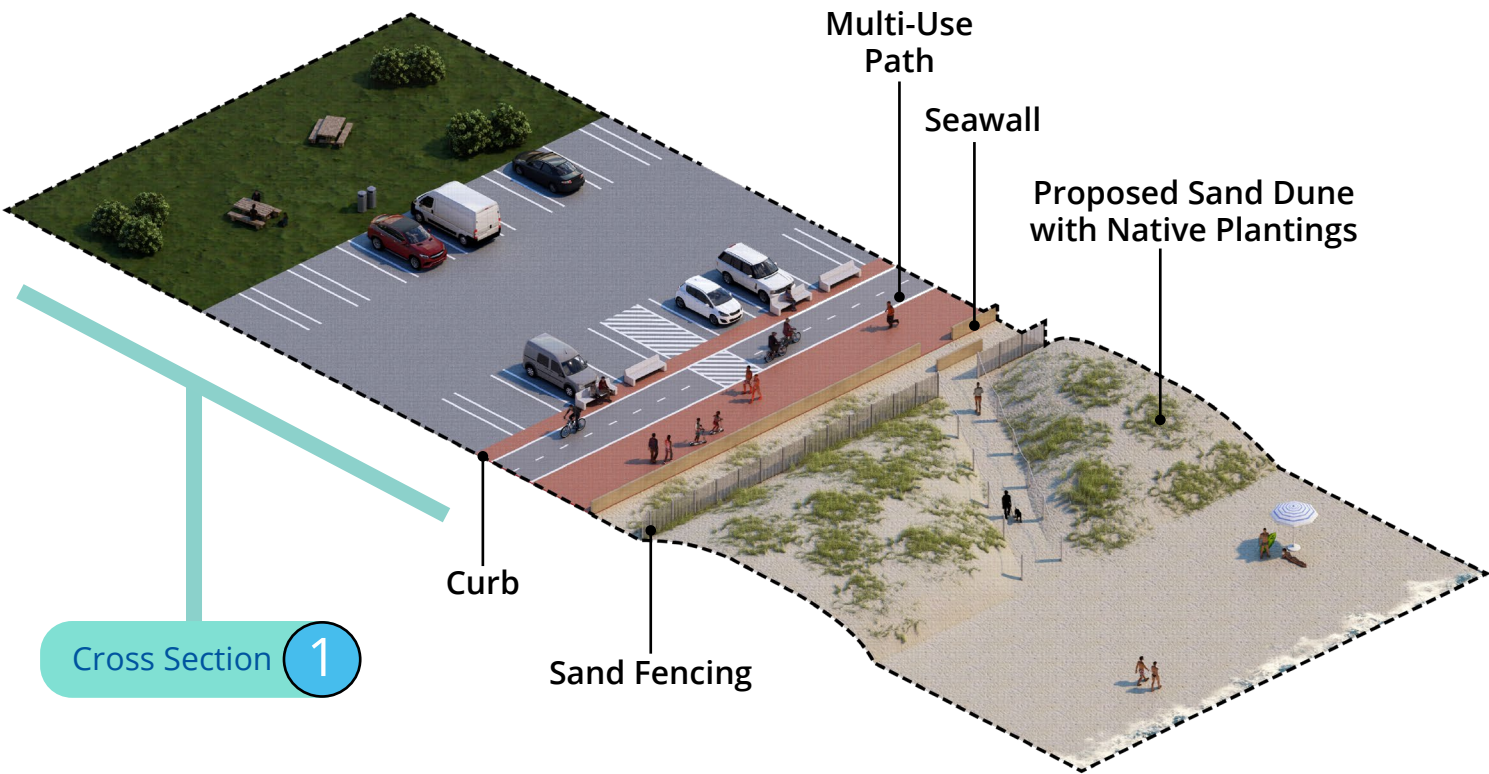
Photo by GHD

Ocean Beach - Dog Beach facing north
towards the mouth of the San Diego River

Project Concept A-1: Dunes

Key Features

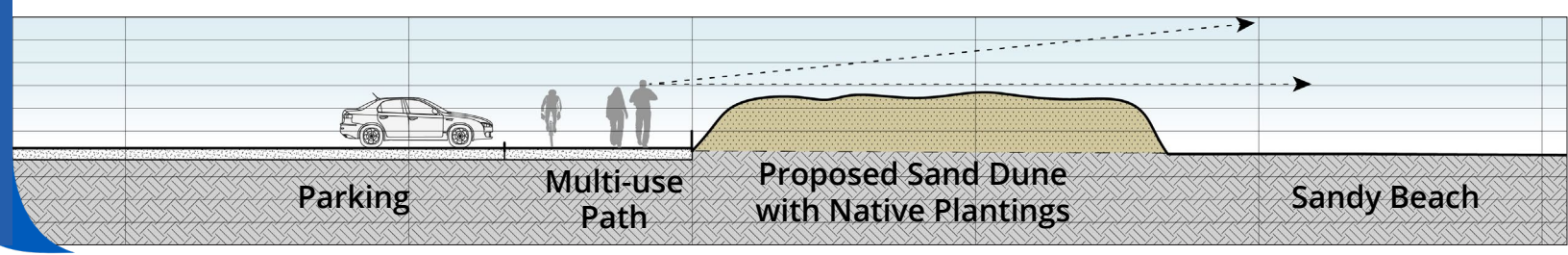
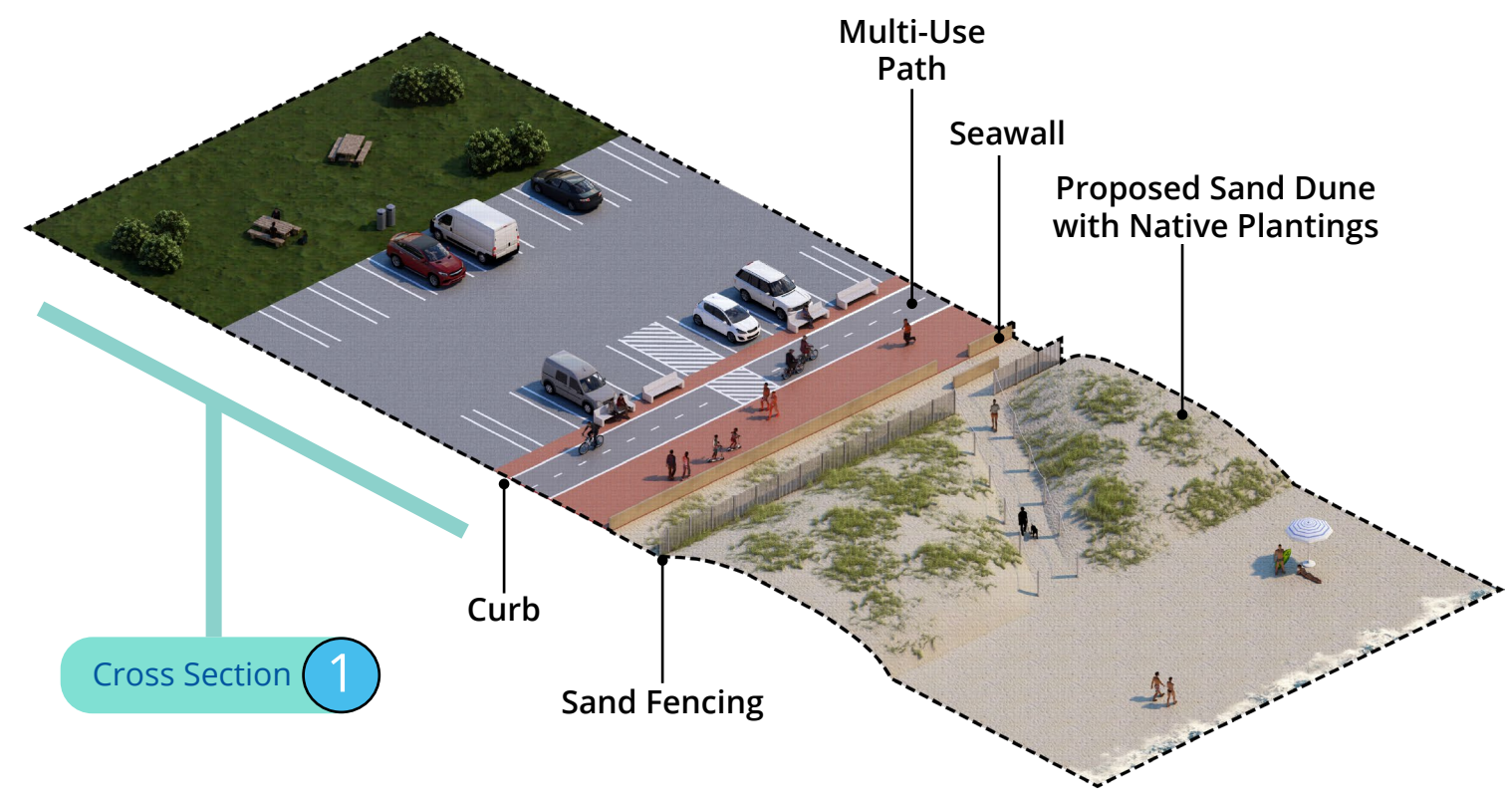
- ▶ Vegetated dune along beachfront
- ▶ Multi-use path to connect San Diego River Trail, Dog Beach and Ocean Beach Pier
- ▶ Dune restoration near Smiley Lagoon
- ▶ Beach accessways through the dune at key points
- ▶ No change to parking



Project Concept A-2: Resilient Relocation

Key Features

- ▶ Vegetated dune along beachfront
- ▶ Multi-use path to connect San Diego River Trail, Dog Beach and Pier
- ▶ Dune restoration near Smiley Lagoon
- ▶ Beach accessways through the dune at key points
- ▶ Bathroom relocation to a centralized, more protected inland location
- ▶ Potential public transit stop



- Relocated Restroom
- Proposed Sand Dune
- Existing Vehicular Access
- Proposed Multi-Use Path
- Potential Accessways
- Proposed Dune Restoration
- Existing Parking
- Existing ADA Access
- Potential Emergency Access
- Potential Shuttle Stops

For Further Consideration

- Explore opportunities to tie-into San Diego River Park Trail improvements, including trail upgrades, as identified in the San Diego River Trail, Trail Enhancement Plan.
- Identify where impacted volleyball courts could be relocated to maintain overall number of courts (10 permanent, 4 seasonal).
- Explore addition of express shuttle stop that would run from nearby transportation center (e.g., Old Town Transit Center) to the project site to improve access to the coast and reduce vehicle dependence and congestion.

San Diego River Trail: Trail Enhancement Plan

In 2016, the San Diego River Park Foundation completed a Trail Enhancement Plan for the San Diego River Trail. The Trail Enhancement Plan establishes a framework for implementation of a comprehensive river park system, guided by 5 principles: restore and maintain a healthy river system, unify fragmented lands and habits, create a connected continuum with a sequence of unique places and experiences, reveal the river valley history, and reorient development toward the river to create value and opportunities for people to embrace the river. The plan covers the entire estuary segment of the San Diego River Trail and overlaps with a portion of the Ocean Beach – Dog Beach project sites. Recommendations from this plan could be included in the Ocean Beach – Dog Beach project design as the project concepts moves forward, including but not limited to trail improvements, signage and wayfinding, and inclusion of additional rest points and shade structures.

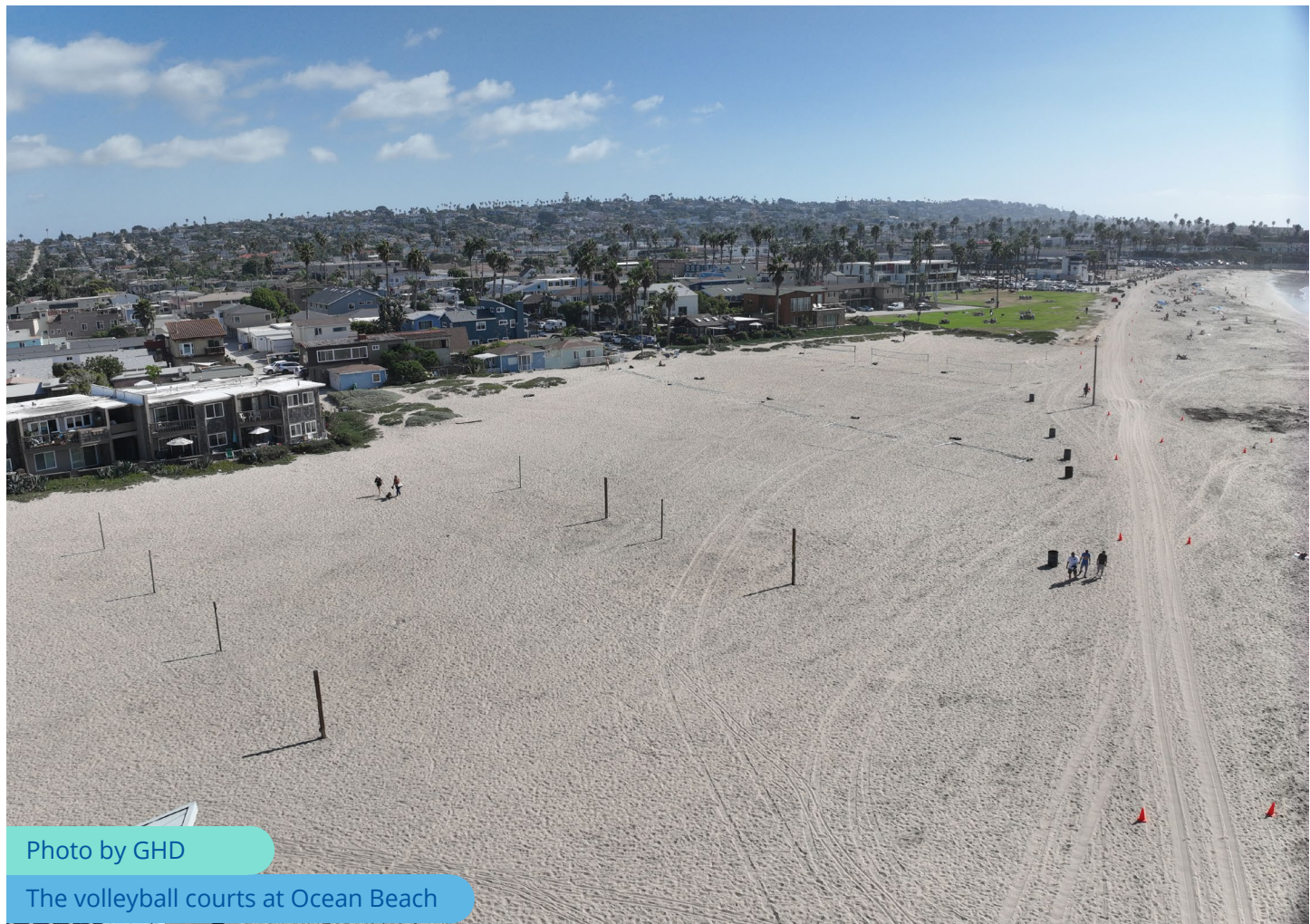
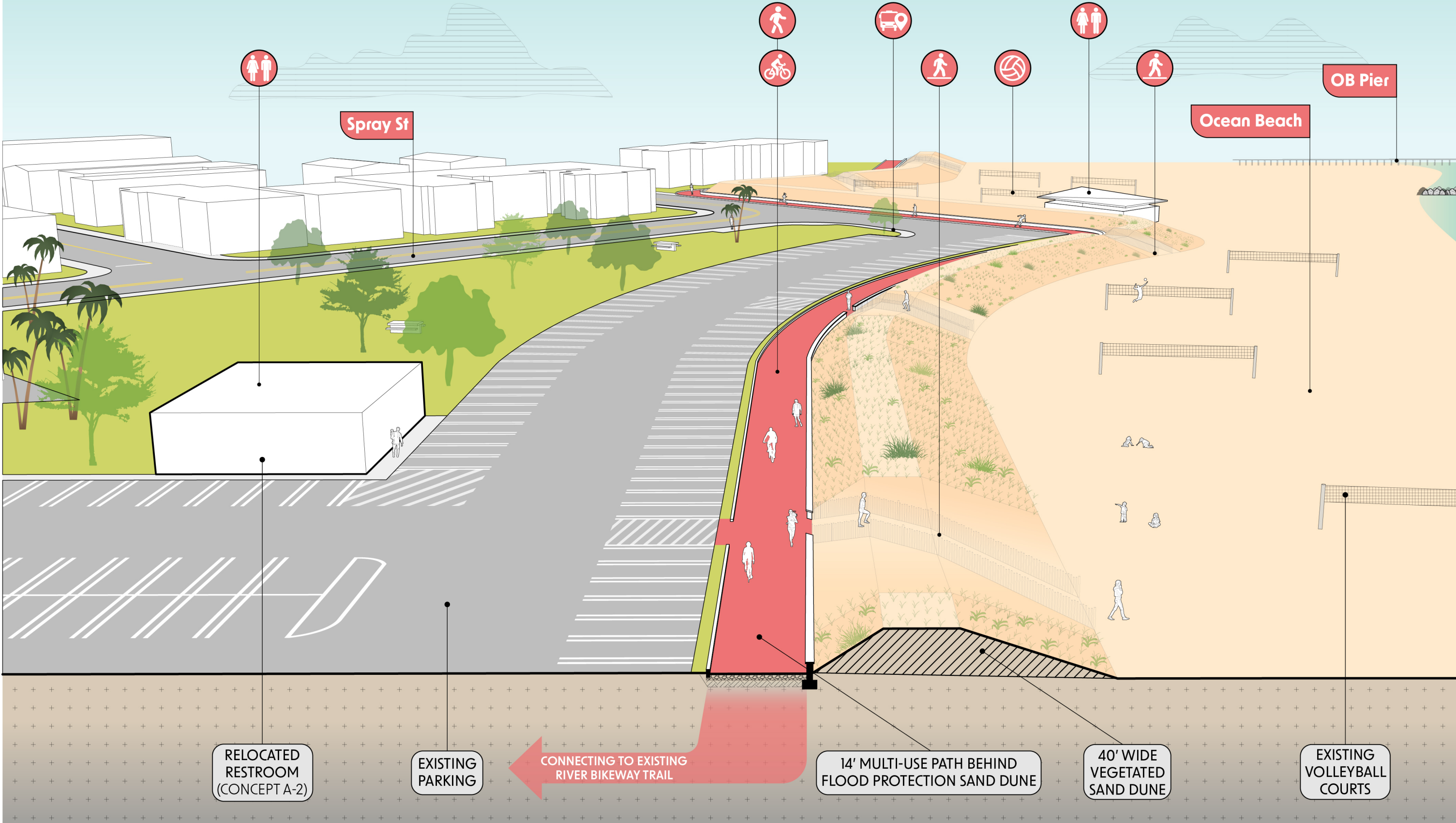


Photo by GHD
The volleyball courts at Ocean Beach



San Diego River Park Foundation

Ocean Beach Dog Beach - Draft Project Concept



-  Path/Walk
-  Restrooms
-  Biking
-  Access Path
-  Shuttle Stop
-  Volleyball

La Jolla Shores



La Jolla Shores

The La Jolla Shores project site is approximately 21 acres and extends from the intersection of Paseo Del Ocaso and El Paseo Grande at the northern boundary to Avenida De La Playa at the southern end. The site includes open space beach, shoreline, parkland and the La Jolla Shores parking lot, which provides approximately 360 vehicle parking spaces. The La Jolla Shores project site consists of two grassy park areas (La Jolla Shores Park to the north and Kellogg Park to the south) separated by a paved parking lot located immediately east of a boardwalk (La Vereda pedestrian path) and sandy beach area to the west.

The Amphitheatre Design concept (Concept B-1) to maintain the existing alignment for La Jolla Shores would construct two different flood protection strategies across the site. Along the seaward (western) borders of La Jolla Shores Park and Kellogg Park, an elevated linear earthen dike would be constructed between the grassy area and the La Vereda pedestrian path. The earthen dike could be contoured and planted with native plants to integrate more natural elements and provide ecological benefits. Along the seaward border of the parking lot (between the parking lot and the La Vereda pedestrian path), a terraced seatwall would be constructed to provide a viewing and seating area while also providing flood protection benefits. The seatwall could be constructed with concrete or fill that is graded and encapsulated by concrete retaining walls, pavers and other stonework. Using fill

in combination with pavers could create a more welcoming environment. This approach allows for terraced seating areas that are planted, offering picnicking opportunities in an amphitheater style.

The Reconfigured Park concept (Concept B-2) would realign the parking lot and grassy recreational areas essentially swapping the seaward edge of the parking lot for a more inland alignment where the parking lot would be reoriented more linearly along Camino del Oro. A grassy recreational area would be added along the entire western edge of the site (formerly parking lot) creating a large linear and continuous grassy park. The project design would keep existing footprints of the grassy recreational areas and parking lot intact (the total area of recreational space would remain the same and the total number of parking spaces would remain the same). The design of the grassy recreation areas could incorporate the elevated earthen dike with an amphitheater design as described above, or it could incorporate a gradual slope across the entire area.



The picnic areas at La Jolla Shores Park

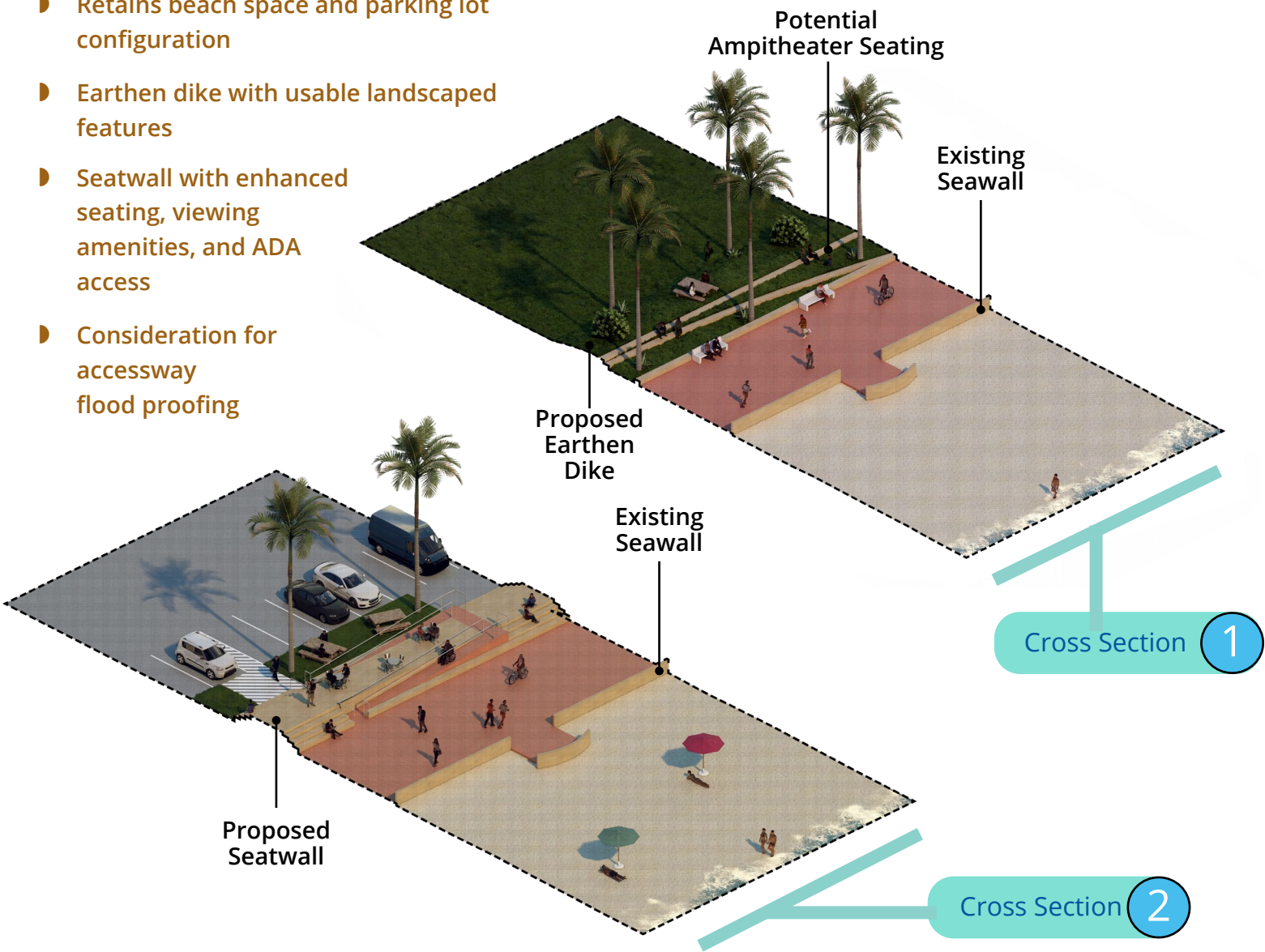


La Jolla Shores beach facing south

Project Concept B-1: Amphitheater Design

Key Features:

- Retains beach space and parking lot configuration
- Earthen dike with usable landscaped features
- Seatwall with enhanced seating, viewing amenities, and ADA access
- Consideration for accessway flood proofing



Objectives Implemented



- Existing Lifeguard Station
- Existing Restrooms
- Proposed Elevated Earthen Dike
- Proposed Seat Wall
- Proposed Floodwall
- Existing Vehicular Access
- Proposed Pedestrian Access
- Potential Accessways
- Existing Parking
- Existing Playground
- Existing Community Area
- Existing ADA Access
- Emergency Access



Recreation

Earthen Dike/
Amphitheater Seating

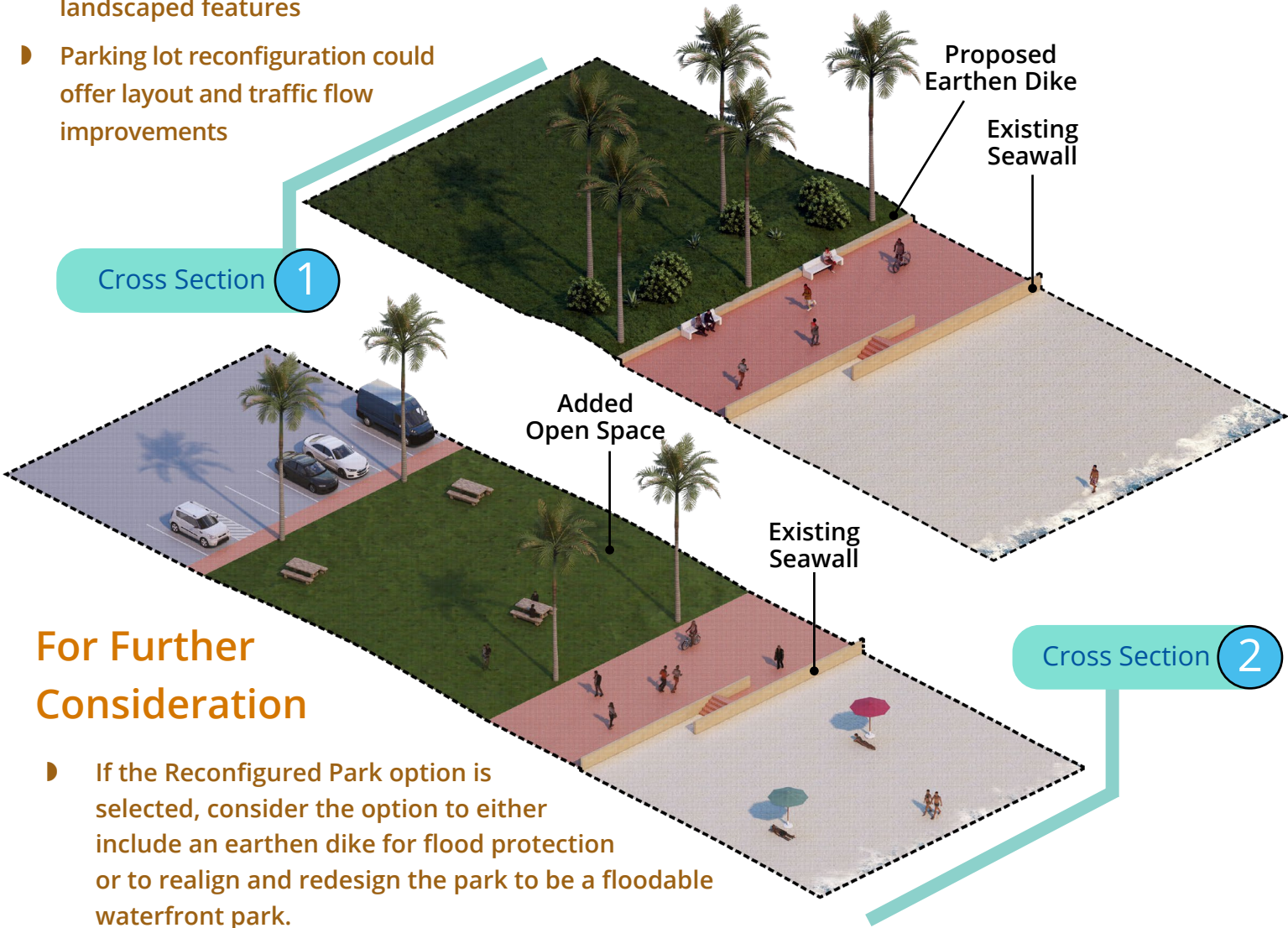
Strand

Sandy Beach

Project Concept B-2: Reconfigured Park

Key Features

- Retains beach space
- Continuous grassy recreational area along the entire length of the park
- Earthen dike with usable landscaped features
- Parking lot reconfiguration could offer layout and traffic flow improvements
- Consideration for accessway flood proofing
- Consideration for opportunities to expand recreational areas and play structures at the southern end of the park




For Further Consideration

- If the Reconfigured Park option is selected, consider the option to either include an earthen dike for flood protection or to realign and redesign the park to be a floodable waterfront park.
- Consider opportunities to raise awareness of history and culture of the site, such as through art, interpretive signage and educational installations.
- Option to add a new or relocated restroom facility to replace the one that would be removed from the parking lot to create a reconfigured park.



- Existing Lifeguard/Restrooms
- Proposed Elevated Earthen Dike
- Proposed/Added Open Space
- Existing Restroom
- Restroom To Be Removed
- Existing Vehicular Access
- Proposed Pedestrian Access
- Potential Accessways
- Existing Parking
- Potential Parking Relocation
- Existing Playground
- Existing Community Area
- Existing ADA Access
- Emergency Access



An aerial photograph of the Pacific Beach coastline. The image shows the ocean with waves breaking onto a sandy beach. A large green semi-transparent oval is overlaid on the right side of the image, containing the title text. Below the oval, a parking lot filled with cars is visible, followed by a grassy area with palm trees and a paved road. The background shows residential houses and cliffs.

Pacific Beach – Tourmaline Surf Park

Pacific Beach – Tourmaline Surf Park

The approximately 4-acre Pacific Beach – Tourmaline Surf Park project site is located along and at the end of Tourmaline Street. The stretch of beach at this project site is naturally narrow due to the coastal bluff-backed setting and contains open space beach and shoreline to the west, a developed parking lot and landscape areas to the east and stormwater infrastructure along the northern perimeter of the project site boundary.

The concept for Pacific Beach – Tourmaline Surf Park would convert the existing shoreline protection feature into a hybrid nature-based solution. The existing rip rap would be buried to provide a core layer and topped with a mix of cobble and sand. The proposed sand and cobble dune would be vegetated with native plantings, which would provide ecological benefits through introduction of rare plant species and habitat for various avian species. The proposed sand dune would provide protection for the existing access ramp, restroom and parking lot from existing and projected flooding impacts associated with sea level rise, as well as provide a reservoir of sand and cobble to the beach that can be utilized during erosive conditions. A wide section along the top of the dune would remain unvegetated to allow for sitting and viewing space, similar to the existing sandy area near the top of the access ramp. Existing seating areas are limited to a couple of benches and logs at the west end of the parking lot. Some visitors also sit on the existing revetment. Additional seating and enhanced viewing areas would be integrated into the top

of the vegetated dune, increasing the usability and aesthetics of the site. Formalized pedestrian access would be integrated into the northern end of the dune, which would improve safety for visitors and limit foot traffic effects (e.g., minor erosion and trampling) on the vegetated dune (refer to Concept C-1 figures).

An optional component includes covering or undergrounding the existing drainage culvert along the north edge of the project site. Additional optional stormwater improvements include an underground vault beneath the parking lot to capture runoff and provide water quality treatment.



Photo by GHD

The parking lot, restrooms and access ramp at Tourmaline Surf Park

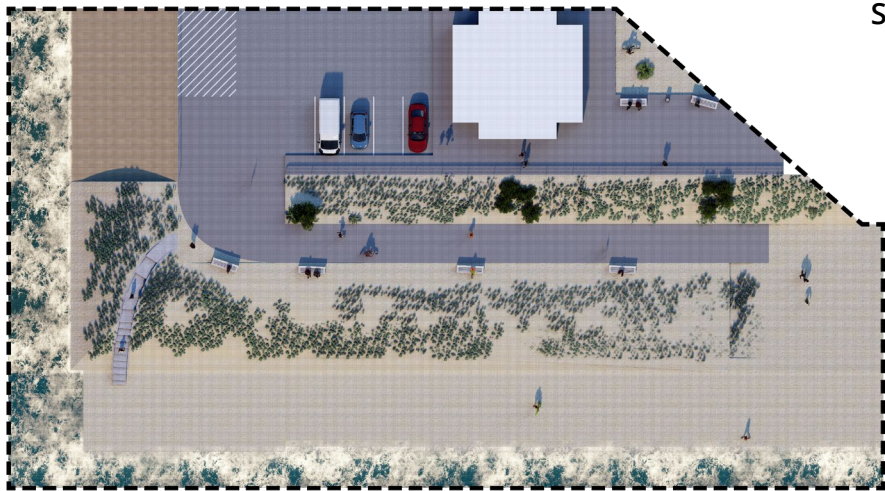
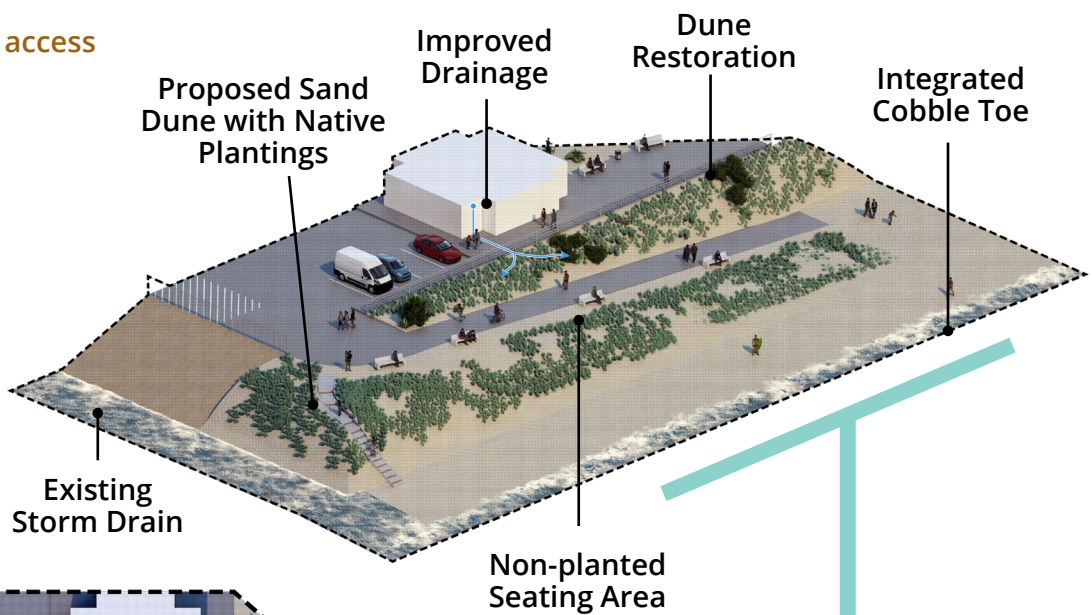


Tourmaline Surf Park facing north

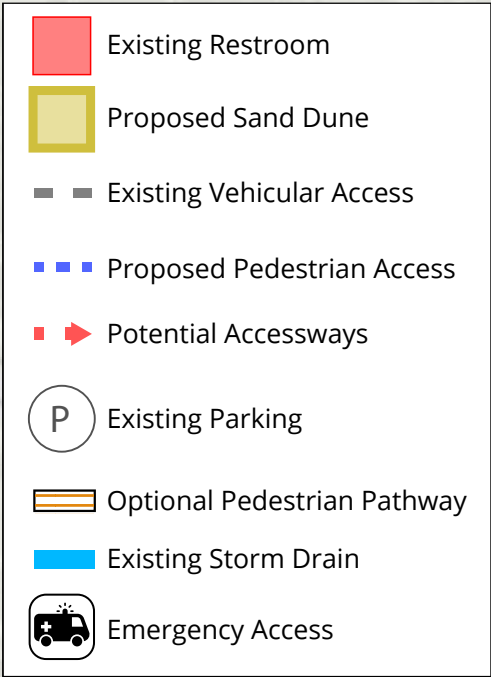
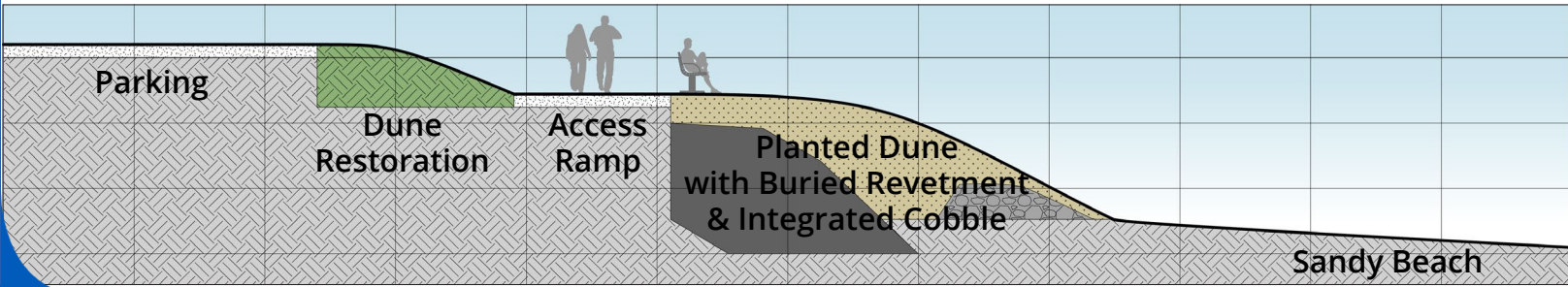
Project Concept C-1: Resilient Surf Park

Key Features

- Vegetated dune leveraging existing material
- Enhance existing seating, access and aesthetics
- Retain public and vehicular access via ramp
- Improve access on north end of ramp



Cross Section 1



Tourmaline Surf Park

For Further Consideration

- ▶ Consider additional optional design features including undergrounding of the storm drain culvert and development of an underground vault for water quality benefits. Initial review by the Stormwater Department confirmed the potential for both of these design features at this project site, however additional assessments would be needed as this project concept moves forward to confirm asset condition, maintenance requirements and model climate change conditions for the channel to determine if additional capacity may be needed.
- ▶ Consider realignment of parking lot for better flow of traffic and enhanced visitor safety.
- ▶ Consider opportunities for addition of ADA pedestrian walkways for enhanced access and safety to the beach.



Case Study: Stormwater Infrastructure Integration with Coastal Accessway, Fletcher Cove Beach Park, Solana Beach, CA

Fletcher Cove was created in the 1920s and has seen access, recreation, and stormwater infrastructure improvements over the last century. Similar to Tourmaline Beach, the northern end of Fletcher Cove includes a stormwater drainage system that helps move water from the elevated inland bluff down to the beach area. By undergrounding the pipes and placing them alongside the beach access ramp, the drainage system at Fletcher Cove is effectively hidden in plain sight. Given this similar configuration, Fletcher Cove in Solana Beach serves as an analogous site to Tourmaline Beach, offering comparable coastal features and highlighting opportunities to potentially increase public access at Tourmaline by undergrounding the stormwater drainage infrastructure. This conceptual option for Tourmaline includes undergrounding the existing culvert, which would allow for pedestrian access and the implementation of other amenities on the newly available space.





Mission Beach

Mission Beach

The approximately 8-acre Mission Beach project site consists of an approximately 0.3-mile stretch of Mission Beach bounded by Ventura Place to the north and San Fernando Place to the south, encompassing the beach area fronting Belmont Park and Mission Beach Park. The project site consists primarily of the sandy beach area west of Ocean Front Walk.

The Sand Dune concept for Mission Beach (Concept D-1) would construct an elevated sand dune seaward (west) of the seawall and Ocean Front Walk. The proposed sand dunes would be vegetated with native plantings, which would provide ecological benefits. The sand dunes, which are inspired by the City's existing winter berm program, would provide flood protection to the community of Mission Beach by adding elevation to the landward side of the beach and by providing a reservoir of sand to the

beach that can be utilized during erosive conditions. The proposed sand dunes would be a permanent fixture at the project site and would be designed to provide protection from existing and projected flooding impacts associated with sea level rise.

The Perched Beach concept for Mission Beach (Concept D-2) considers swapping out grass recreational space at Mission Beach Park, the southern area of the project site, for a perched sand beach. A perched beach is an elevated beach area that would provide increased usable beach space during higher water levels and offers a reservoir of sand for the adjacent beach area. This would be achieved by realigning the seawall and Ocean Front Walk inland. This concept could be implemented in conjunction with a dune feature stretching north along the project site.



Photo by GHD
Mission Beach and Belmont Park facing south

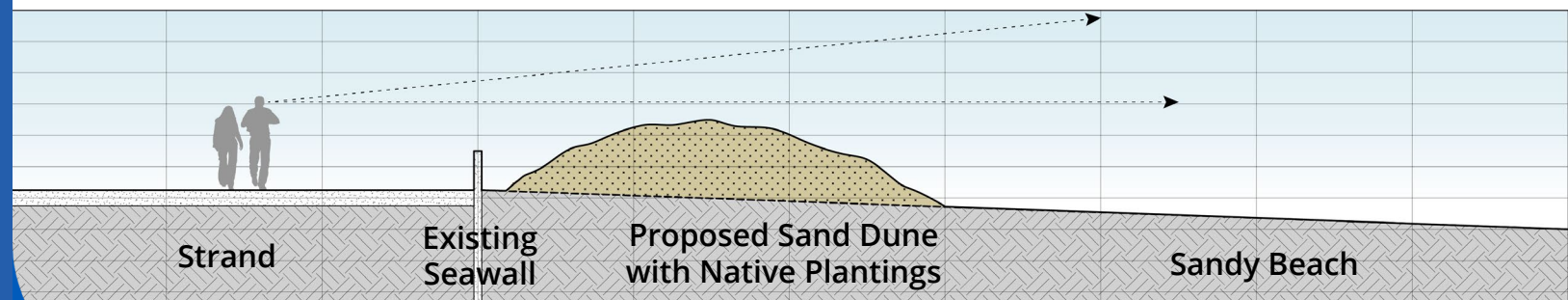
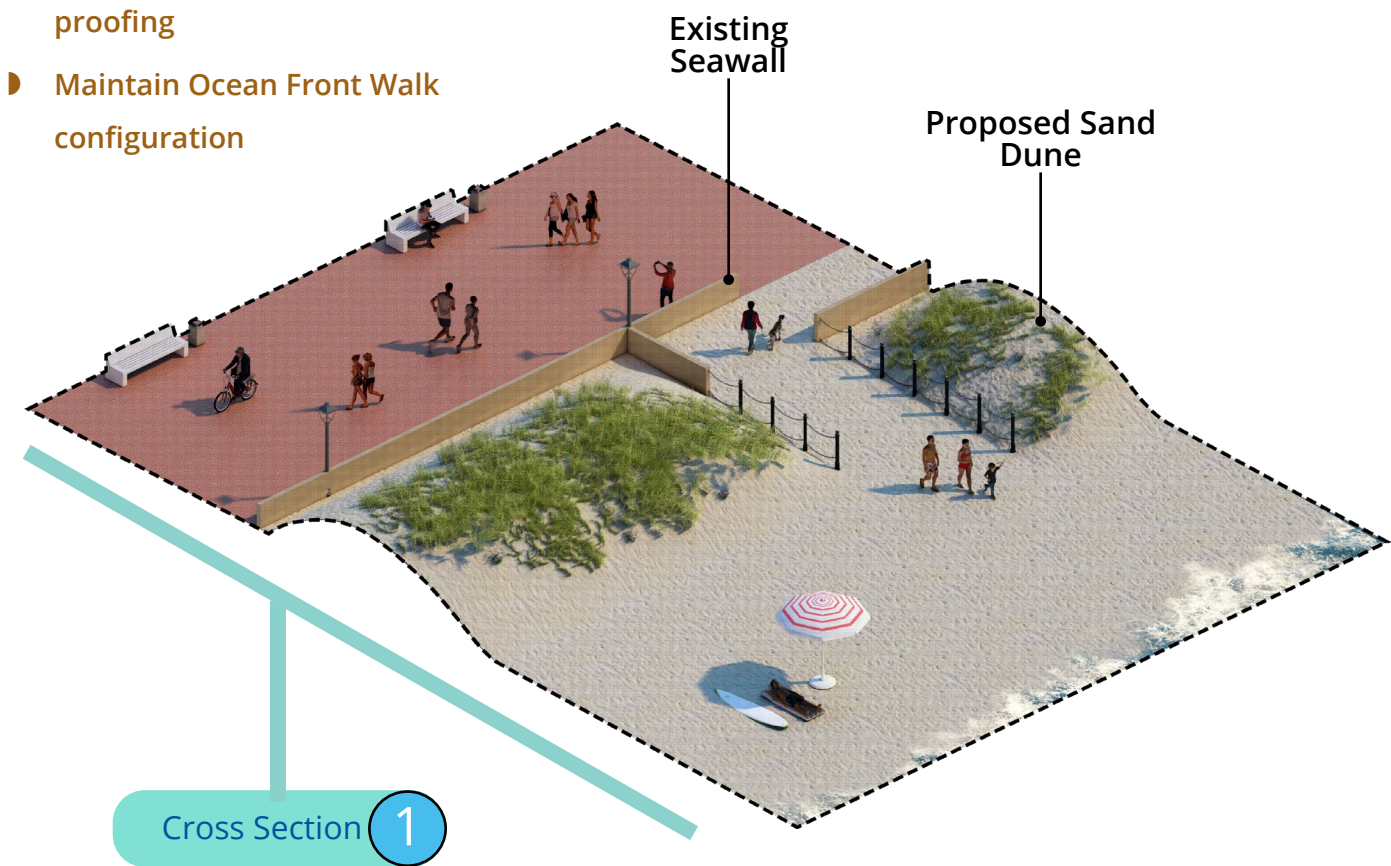


Photo by GHD
Mission Beach facing north

Project Concept D-1: Dune Design

Key Features:

- ▶ Vegetated dune with native planting
- ▶ Maintain accessways with consideration for accessway flood proofing
- ▶ Maintain Ocean Front Walk configuration



- Existing Restroom
- Existing Lifeguard Tower
- Proposed Sand Dune
- Existing Vehicular Access
- Proposed Pedestrian Path
- Proposed Ped. Accessways
- Existing Parking
- Proposed ADA Access
- Emergency Access

Mission Beach Boardwalk

1

Ocean Front Walk

Belmont Park

Mission Blvd

Mission Beach Park

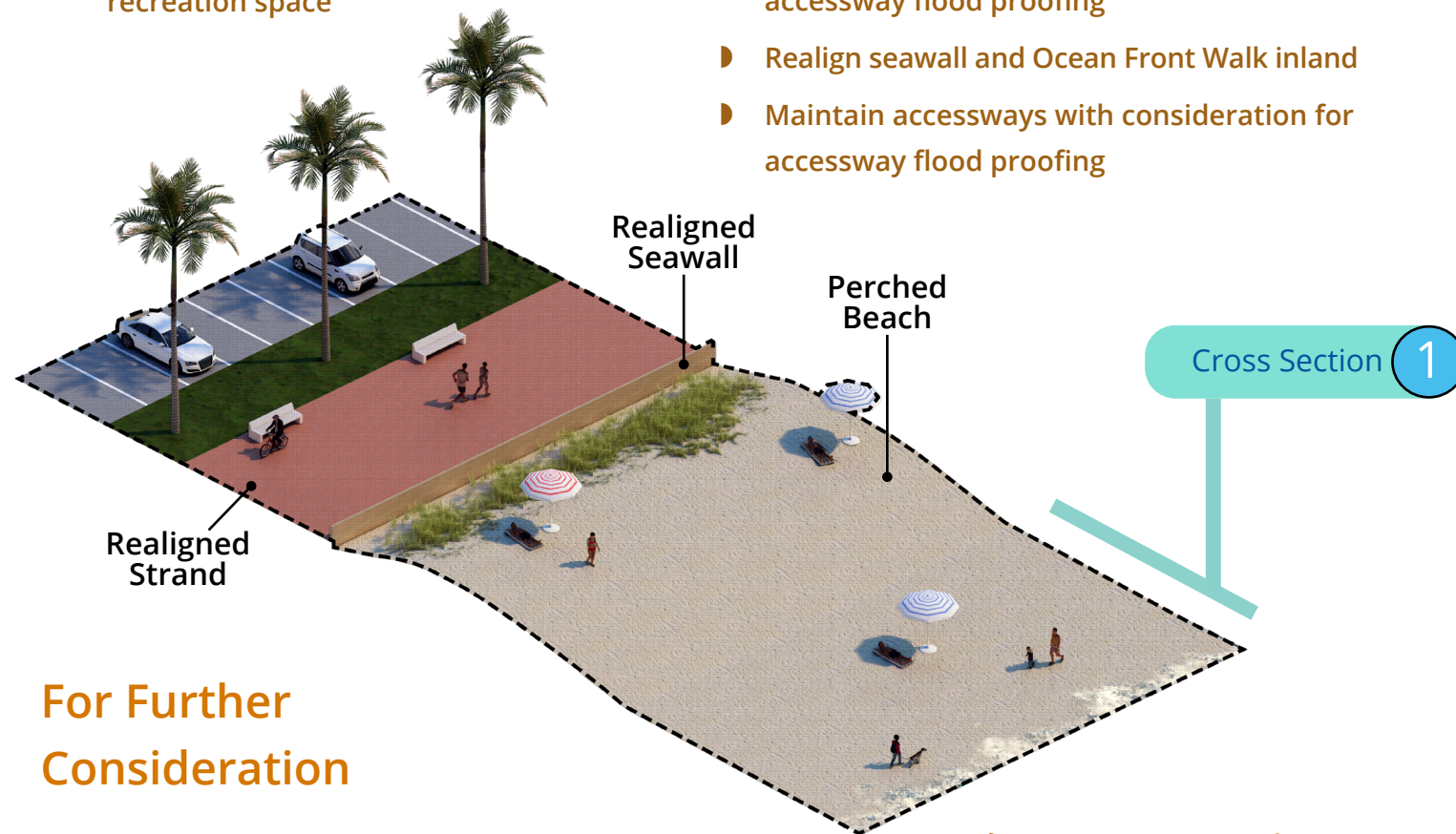
San Fernando Pl

Project Concepts: Mission Beach

Project Concept D-2: Perched Beach

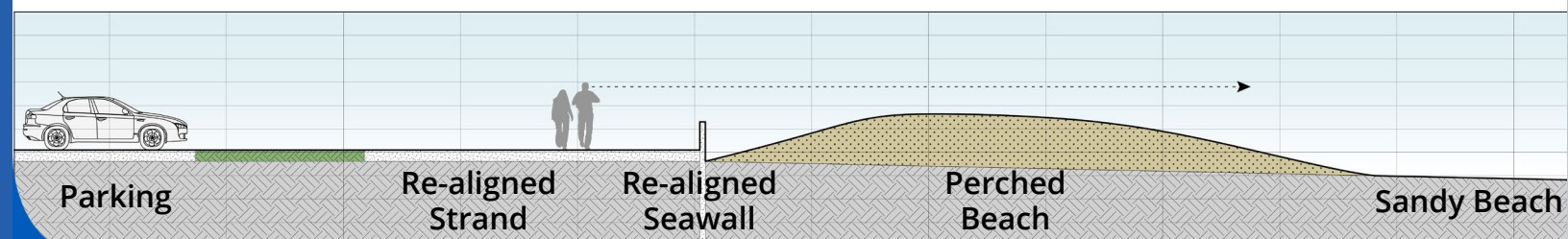
Key Features

- Vegetated dune with native planting
- Perched beach for additional beach recreation space
- Maintain accessways with consideration for accessway flood proofing
- Realign seawall and Ocean Front Walk inland
- Maintain accessways with consideration for accessway flood proofing



For Further Consideration

- The Mission Beach seawall is a historical resource with eligibility for listing on the National Register. If the Perched Beach option is chosen, additional review will be required for compliance with all applicable regulations.
- Ensure continued opportunities for volleyball at or near the project site.



Objectives Implemented



- Existing Restroom
- Existing Lifeguard Tower
- Proposed Sand Dune
- Existing Vehicular Access
- Proposed Pedestrian Path
- Proposed Ped. Accessways
- Existing Parking
- Proposed ADA Access
- Emergency Access

Mission Beach Boardwalk

Belmont Park

Mission Blvd

Mission Beach Park

San Fernando Pl

Project Concepts: Mission Beach

Ocean Beach – Beachfront (Pier)



Ocean Beach – Beachfront (Pier)

The Ocean Beach – Beachfront (Pier) project site is immediately adjacent to and south of the Ocean Beach – Dog Beach site. The approximately 12-acre project site consists of open space beach and shoreline, as well as a developed parking lot, with a small portion of commercial development along the southeastern edge. The site extends from the groin at the south end of the Ocean Beach – Dog Beach project site to the Ocean Beach Pier.

Similar to Ocean Beach – Dog Beach, the concept for Ocean Beach – Beachfront would construct a multi-use path for cyclists and pedestrians fronted by an elevated vegetated sand dune. The dunes and path would be located along the landward edge of the beach and would connect to the proposed improvements at the Dog Beach project site. As such, the multi-use path would connect the existing western terminus of the San Diego River Trail to the

Ocean Beach Pier (refer to Concept E-1 figures). The proposed multi-use path and sand dunes would include pedestrian and emergency access points along the project site and maintain all existing parking. As this project moves forward, there is the opportunity to align the project design with

other improvements, including an upgrade to the existing lifeguard station and local park and amenity enhancements at Veterans Park and Saratoga Park. As this concept is developed there are opportunities to combine aspects of these other ongoing efforts and to leverage external funding sources.

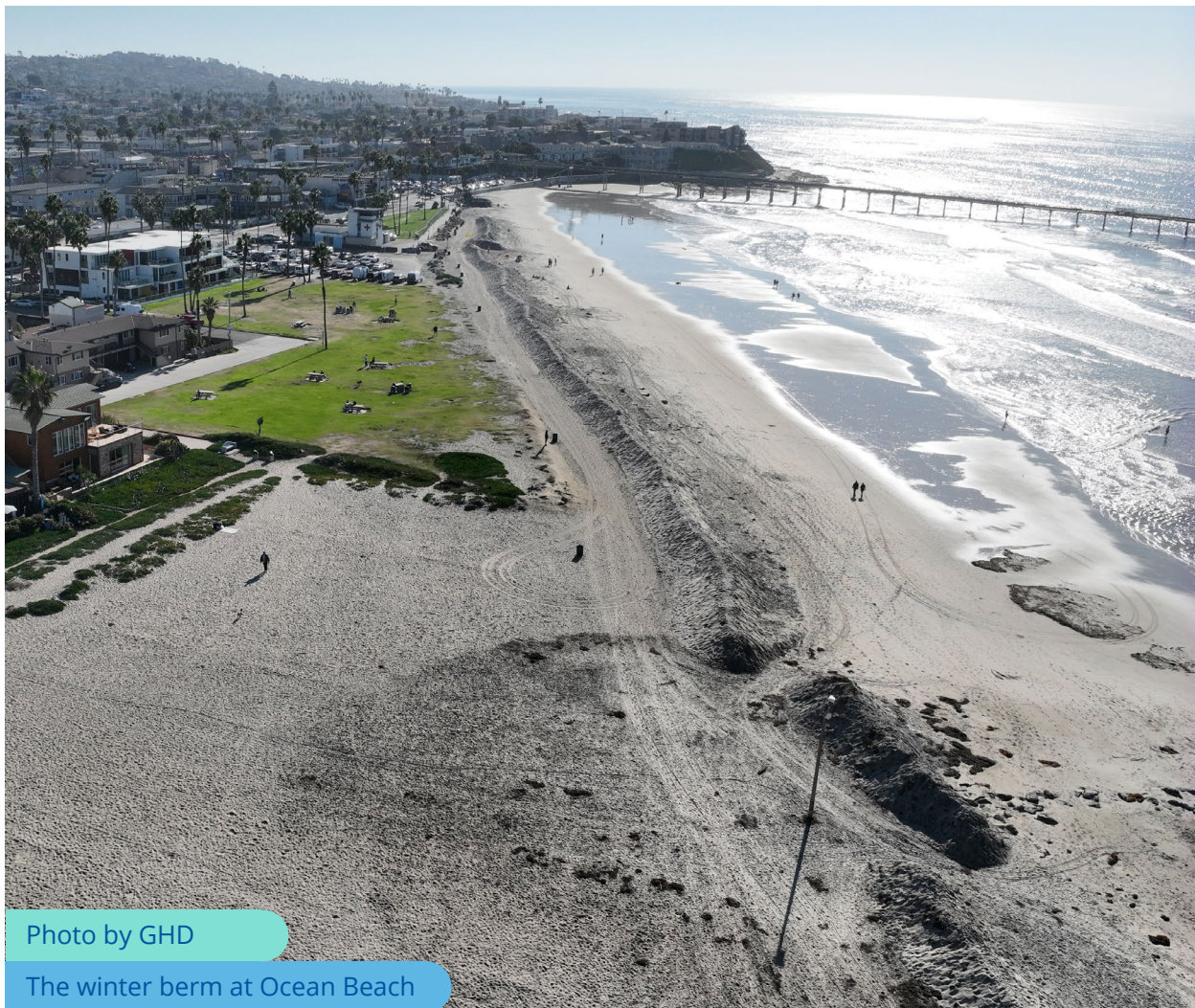


Photo by GHD

The winter berm at Ocean Beach



Photo by GHD

Ocean Beach Pier

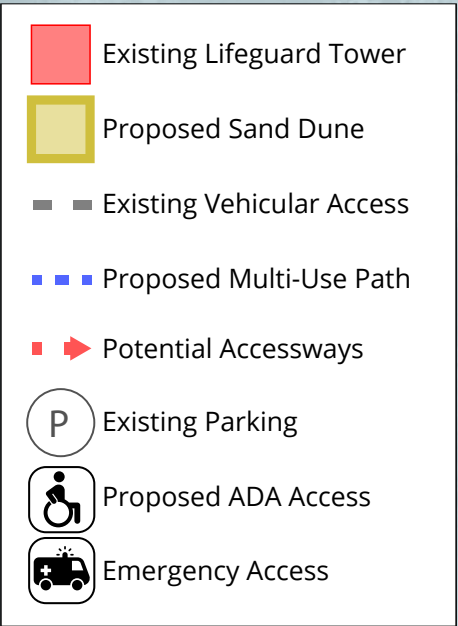
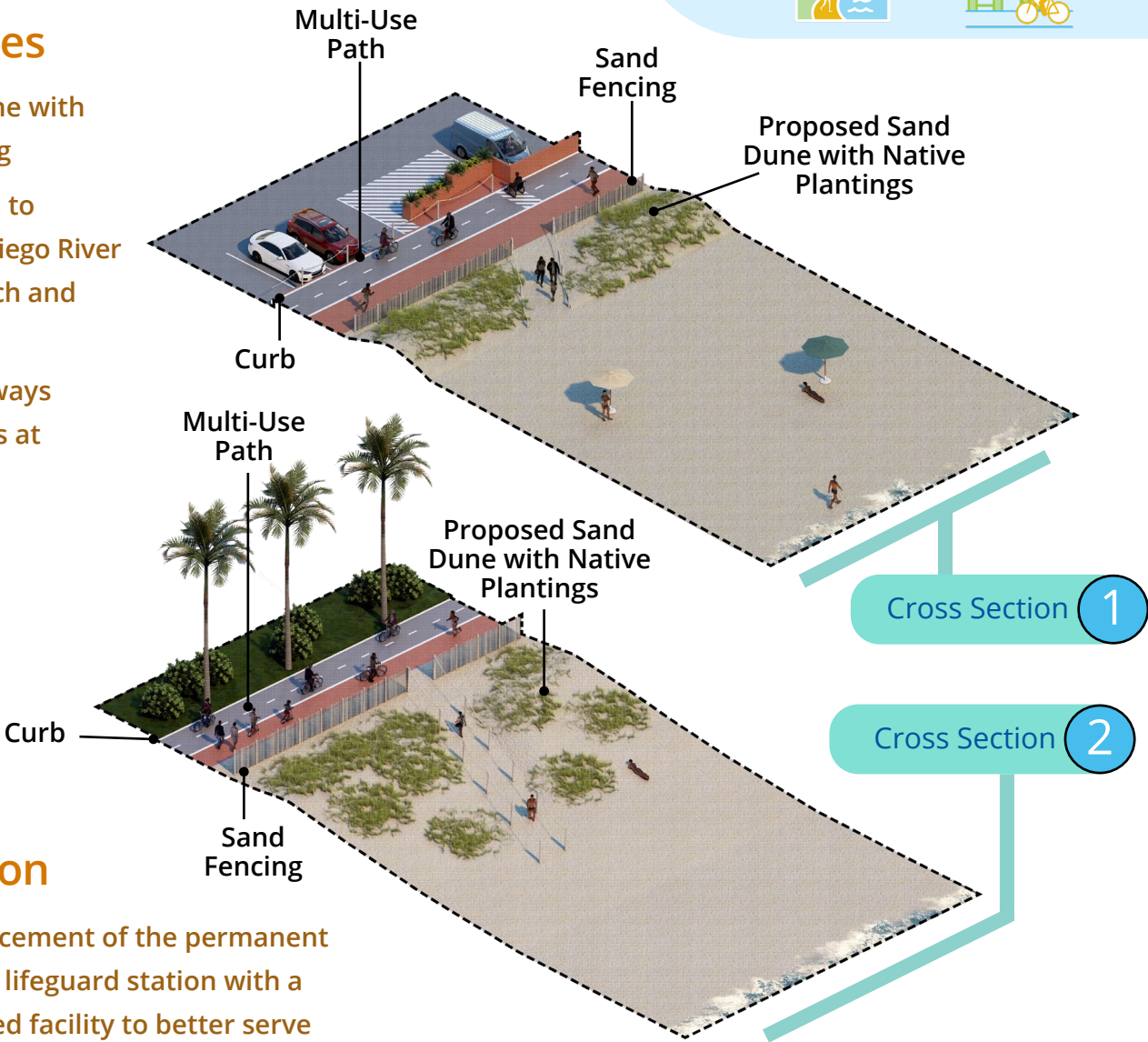
Project Concept E-1: Dunes

Key Features

- Vegetated dune with native planting
- Multi-use path to connect San Diego River Trail, Dog Beach and Pier
- Beach accessways through dunes at key locations
- No change to parking

For Further Consideration

- Include replacement of the permanent Ocean Beach lifeguard station with a new, upgraded facility to better serve operational needs.
- Align project design with proposed enhancements to Veteran's Park and Saratoga Park.
- Consideration of opportunities to add additional recreational opportunities and play structures at Saratoga Park or Ocean Beach Veteran's Park



Sunset Cliffs



Sunset Cliffs

Sunset Cliffs Boulevard is a two-way, two-lane roadway that runs north-south adjacent to the Sunset Cliffs Linear Park and along an actively eroding cliff to the west. Sunset Cliffs Linear Park runs between Adair Street to the north and Ladera Street to the south including an approximately 1.2-mile-long stretch of open space shoreline and coastal trail adjacent to the Pacific Ocean to the west and Sunset Cliffs Boulevard to the east.

One option for the Sunset Cliffs project includes a road reconfiguration on Sunset Cliffs Boulevard which would create a new separated multi-use path for pedestrians and bicyclists with a one-lane, one-way southbound vehicular travel lane. This concept is in early stages of development, analysis and community engagement to inform the concept.

Another option for the Sunset Cliffs project is to realign the parking lots along the northern portion of the project site away from the cliff edge. This option includes trail enhancements, revegetation of the linear park with native vegetation, drainage improvements as necessary and removal of the paved parking lots from the cliff edge to pull-in parking spaces along the roadway (refer to Concept F-1 figures).

Given the narrow cliff edges and limited amount of recreational space consisting of informal trails, the major focus for the Sunset Cliffs project is to enhance the existing resources without compromising the structural integrity of the cliff or current infrastructure.



Existing rip rap shoreline protection at Sunset Cliffs



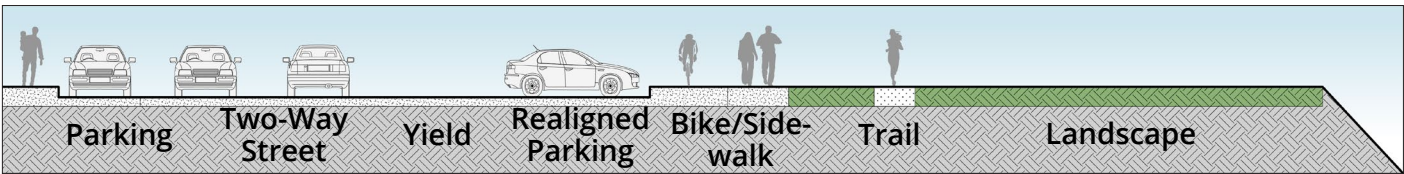
Unstable cliffs areas at Sunset Cliffs

Project Concept F-1: Resilient Cliff Design Options

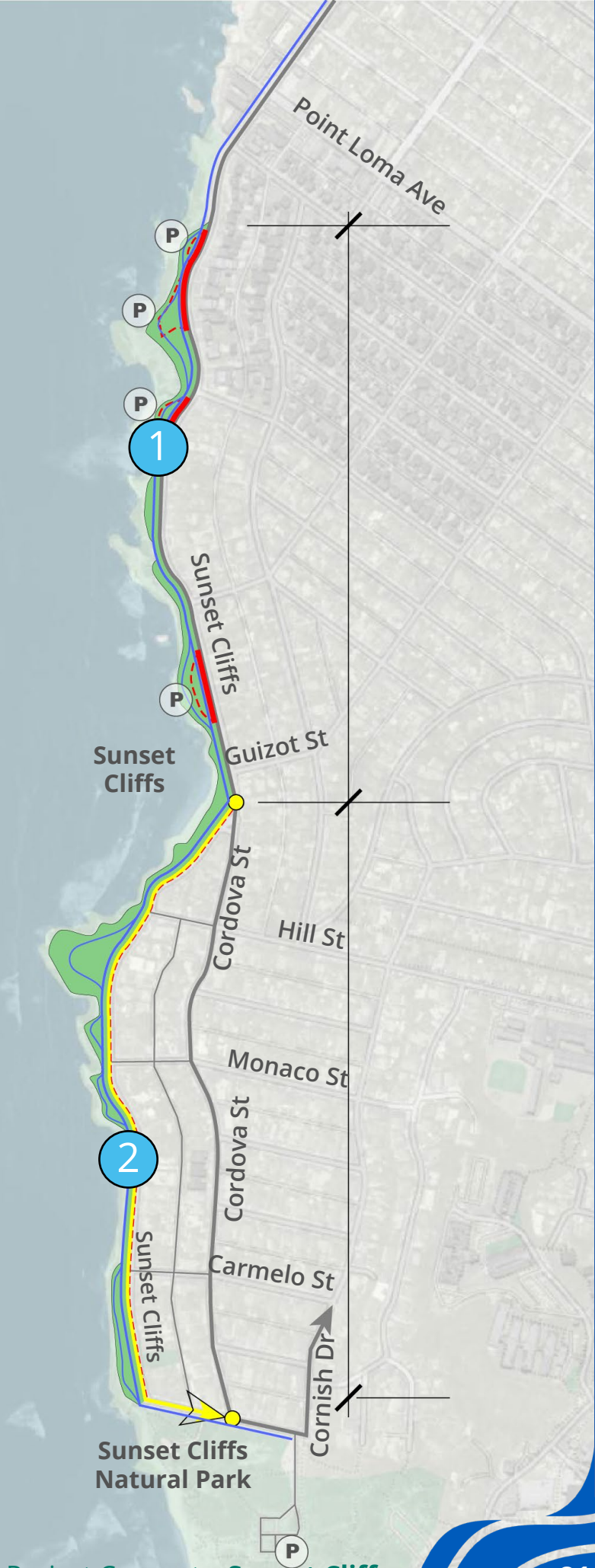
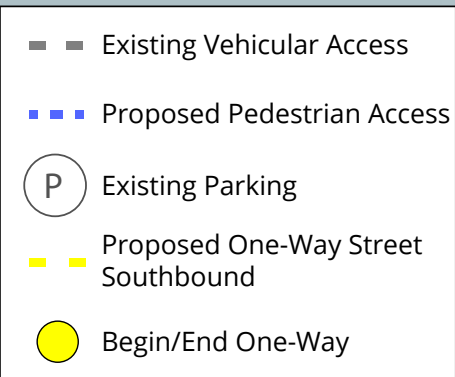
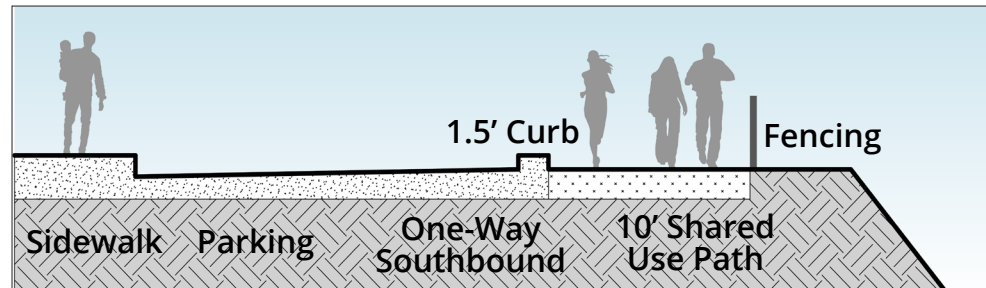
Design Options



- Preserve existing two-way street until intersection of Cordova Street
- Realign existing parking lots pulled back from cliffside
- Propose protected dedicated paths for pedestrians adjacent to realigned parking areas
- Re-vegetate clifftop with native plantings to strengthen cliff structure and provide additional green space



- Propose one-way street from Cordova Street intersection south to Ladera Street
- Preserve parallel parking spaces along the eastern edge of the street
- Propose protected dedicated paths for pedestrians
- Re-vegetate clifftop with native plantings to strengthen cliff structure and provide additional green space
- Propose shared-lane (sharrow) with bikes and vehicles adjacent to path



Key Features

- ▶ Parking lot realignment
- ▶ Trail realignment and/or enhancements
- ▶ New multi-use path with reconfigured roadway
- ▶ Native plantings



Shoreline protection at Sunset Cliffs facing south

For Further Consideration

- ▶ Consider inland drainage components to further reduce stormwater flow on and through the cliffs, as this drainage has potential to increase coastal erosion. Drainage capture, transport and discharge infrastructure improvements at the individual street level could help reduce additional contributions to cliff erosion.
- ▶ Consider parking options along stretch of Sunset Cliffs to support public safety, visitor access and coastal resilience, including but not limited to: timed or paid parking and realignment of parking.
- ▶ Evaluate traffic flow with proposed road reconfiguration. Complete traffic studies and evaluate opportunities to enhance pedestrian and bicyclist safety, such as through high visibility crosswalks, roundabouts and speed bumps.
- ▶ Consider opportunities for educational signage regarding site geology, local history and habitat.

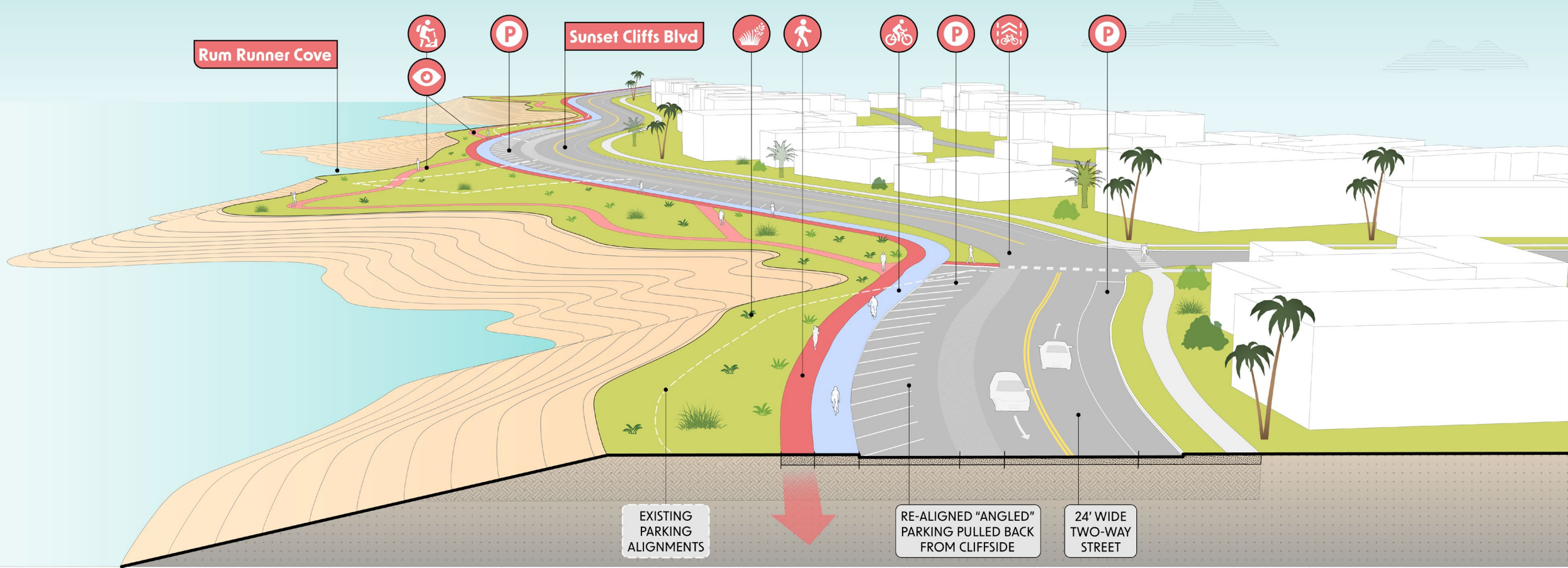
Case Study: Circulate Walk Audit, Sunset Cliffs Boulevard

In May 2024, Circulate San Diego held a walk audit along Sunset Cliffs Boulevard to identify safety hazards and gaps in the pedestrian and bicyclist network between Froude Street and Ladera Street. The walk audit identified many opportunities for increased pedestrian and bicyclist safety along this stretch of roadway, including the addition of traffic calming measures, crosswalks, and protected pathways for pedestrians. In particular, the audit notes the limited space for pedestrians between Monaco St. and Ladera St. and the need for more uniformity of the pedestrian network.

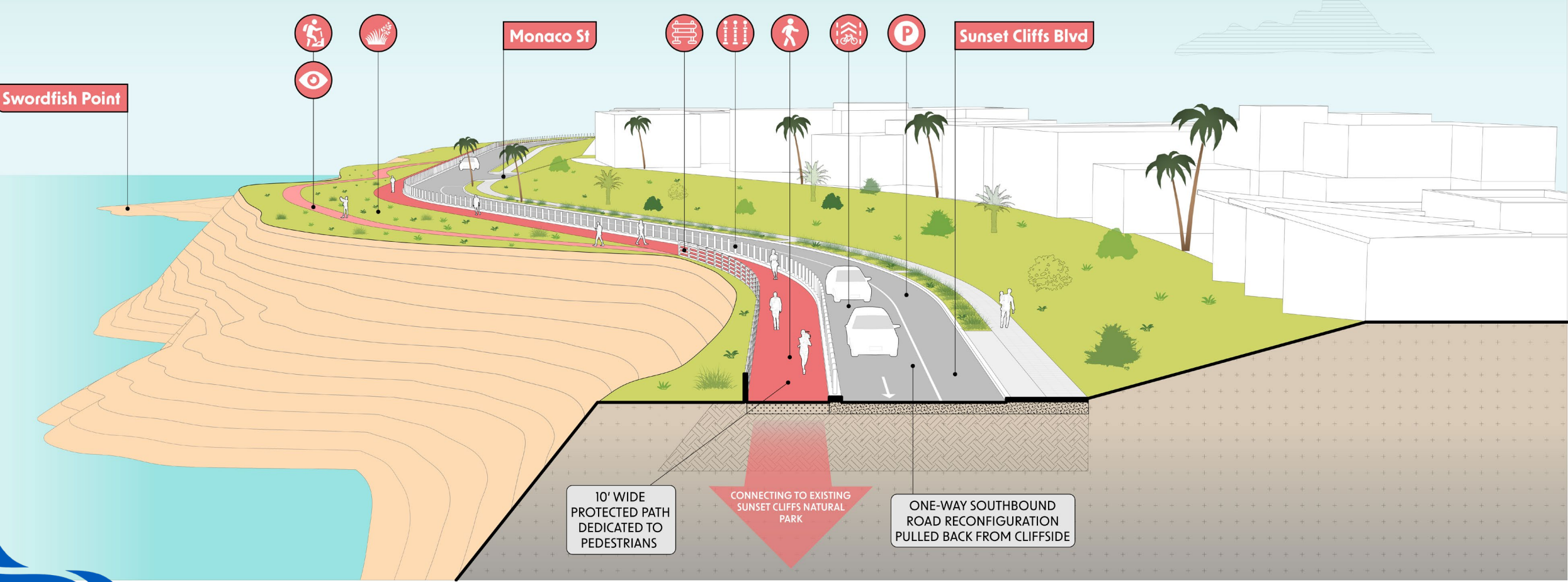






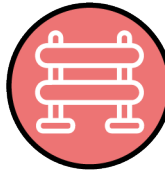
Circulate San Diego 2024

Sunset Cliffs North - Draft Project Concept



Sunset Cliffs South - Draft Project Concept



-  Coastal Trail
-  Viewpoint
-  Bollards
-  Path/Walk
-  Re-Vegetation
-  Shared Lane
-  Biking
-  Fencing

Next Steps

Moving the Projects Forward

The CRMP includes concept level designs for six locations along the coast. Following adoption of the plan, it is anticipated that these project designs will be further refined through both internal and external engagement. The City will continue to engage with community members, Tribes and other stakeholders to inform the project designs and implementation. The next phase of the plan will include moving three additional project sites forward to initial engineering (30% design). The City will complete additional technical studies, including coastal engineering analysis, materials sourcing study, ecological basis of design, baseline geotechnical, additional environmental analysis and other assessments as needed. Contingent upon availability of funding and resources, the projects will then move into final design, permitting and construction.

As noted earlier, the CRMP addresses select, prioritized sites that are well suited for nature-based solutions. It is anticipated that as projects move forward to implementation and as the City completes regular updates to vulnerability assessments and the Climate Resilient SD, the CRMP will be updated to include additional sites. Site selection will consider updated science as well as community needs and priorities.



Funding Opportunities

The City will continue to identify grant opportunities to advance the projects evaluated in the CRMP and when feasible, to evaluate future sites for coastal improvements. Incorporating nature-based solutions as a climate resilient strategy is being prioritized across the federal government and the State of California, from the Inflation Reduction Act to California's statewide Climate Adaptation Strategy and Natural and Working Lands Climate Smart Strategy. Tied to federal and state ambitions are available funding opportunities to plan for and implement nature-based solutions for coastal resiliency. At the federal level, these include:

- NOAA's Climate Resilience Regional Challenge (NOAA 2024b)
- FEMA's Building Resilient Infrastructure and Communities program (FEMA 2024b)
- National Coastal Resilience Fund from the National Fish and Wildlife Foundation (NFWF 2024)

In addition, the State of California has numerous funding sources via the:

- State Coastal Conservancy
- California Coastal Commission
- Ocean Protection Council
- California Office of Planning and Research Integrated Climate Adaptation and Resiliency Program

The City will also continue to monitor alternative funding mechanisms such as climate resilience district, sales tax measures and bonds. The ability to create a climate resilience district was authorized under Senate Bill 852. Climate resilience districts can be formed for the purposes of raising and allocating funding for climate resilience projects that address sea level rise. The bill would allow the City to adopt a resolution allocating tax revenues to the district, subject to certain requirements. It would provide for the financing of the activities of the district by, among other things, levying a benefit assessment, special tax, property-related fee, or other service charge or fee and may require a ballot measure with voter approval depending upon the finance mechanism selected. Additional analysis of this opportunity is necessary.

The City may also consider other financing mechanisms, such as green bonds. Green bonds are public sector, private sector or multilateral institution debt issuances used to finance climate-friendly or other environmental projects. Green bonds can raise money for any environmental purpose, including projects that don't directly reduce greenhouse gas emissions—for example, water management, pollution control, toxic waste cleanup or climate adaptation (Chiang 2017).

Monitoring and Implementation

Monitoring of the City’s coastline is critical for assessing resources as impacts are realized and to continue informing coastal management and individual project development. A coordinated monitoring program is vital to track coastal changes, create a catalogue of hazard impacts and management activities and monitor the performance of implemented projects.

Currently, as a part of the SANDAG regional shoreline monitoring, semi-annual (i.e., twice a year) shoreline transect monitoring occurs in the spring and fall throughout the County of San Diego with 14 of these transects lying along the City of San Diego: Ocean Beach (1), Mission Beach (4), Pacific Beach (1), La Jolla/ Scripps Pier (4) and Torrey Pines/Blacks (4). These transect surveys are intended to understand the seasonal and long-term changes of beach width and nearshore volume along each profile. This provides an understanding of the natural sediment processes on the City’s beaches and how management efforts contribute to these shoreline changes.

The SANDAG shoreline change monitoring efforts can be supplemented by additional monitoring of coastal processes, including coastal erosion, cliff erosion and failure and flooding events. As projects are implemented, monitoring programs should be designed to integrate with adaptive management pathways developed for each project. The following table provides a general overview of potential monitoring that should be considered to assess the performance of the projects, identify needed maintenance activities and track impacts over time to better inform future adaptive management actions.

Conceptual Monitoring for Implemented Projects

Metric	Monitoring Method		Frequency
Beach Erosion	Beach profile surveys (back beach to depth of closure) Subaerial beach surveys via photogrammetry or LiDAR		Semi-annual Surveys Extreme Events
Flooding	Flood elevation thresholds (e.g., mild and moderate) are determined and tracked using combined tide and wave observations. Site observations and asset closure tracking.		Ongoing Extreme Events
Cliff Erosion	High-tech	Topographic surveys	Semi-annual Surveys Extreme Events
	Low-tech	Site amenities (e.g., colored pavers, benchmarks, signs) indicating bluff erosion	Ongoing
Biological	Surveys for vegetation and key species usage (e.g., shorebirds)		Annual
Maintenance Costs	Financial tracking of repair and hazard cleanup activities		Annual
Feature Integrity	Structural condition inspection or protective features		Annual Post Extreme Events
Public Access/ Usability	Site observations Closure tracking Aggregated Big Data sources		As Needed Extreme Events



Photo by GHD

Adaptive Pathways Approach

As the project concepts are further developed and refined through technical studies, an adaptive pathways approach can assist with long-term decision-making processes and the phasing of adaptation strategies. Adaptive pathways are a management approach that leverage observations to track impacts over time, assess the performance of implemented adaptation strategies and inform ongoing management and maintenance to guide the City’s coastal resilience planning and implementation efforts.

An adaptive pathways approach means creating a framework for implementing adaptation strategies with physical or observational thresholds identified, that can signal when a transition from one strategy to another may be necessary. This approach will require assessing the interplay and feedback loop between implementation and monitoring, integrating both elements to present adaptive pathways, potential thresholds and a monitoring framework. It is important to note that specific project level designs are still in the conceptual phase at the time of the CRMP development. Additional technical studies, community outreach and design refinement are necessary to better craft an adaptation pathways approach for each project.

References

- Bedsworth, Louise, Dan Cayan, Guido Franco, Leah Fisher, and Sonya Ziaja. 2018. California's Fourth Climate Change Assessment: Statewide Summary Report. SUM-CCCA4-2018-013.
- California Coastal Dune Science Network. 2021a. Cardiff Living Shorelines Project. Accessed November 2024. <https://www.resilientcoastlines.com/projects/cardiff-living-shorelines-project>.
- California Coastal Dune Science Network. 2021b. Surfer's Point Managed Shoreline Retreat Project. Accessed November 2024. <https://www.resilientcoastlines.com/projects/surfer-s-point-managed-shoreline-retreat-project>.
- California Coastal Dune Science Network. 2021c. Santa Monica Beach Restoration Pilot Project. Accessed November 2024. <https://www.resilientcoastlines.com/projects/santa-monica-beach-restoration-pilot-project>.
- CCC (California Coastal Commission). 2021. Nature-Based Adaptation Strategies. August. Accessed November 2024. <https://documents.coastal.ca.gov/assets/lcp/mrfcj/Nature-Based-Adaptation-Strategies-for-Public-8.23.21.pdf>.
- CCC. 2024. California Coastal Commission Sea Level Rise Policy Guidance: Draft 2024 Update. Accessed November 2024. https://documents.coastal.ca.gov/assets/slr/CCCSLRPolicyGuidance_2024Update_PublicReviewDraft.pdf#:~:text=Adaptation:%20Adjustment%20in%20natural%20or%20human%20systems,uncertainty%20and%20challenges%20of%20climate%20change%20decision%2Dmaking.
- CEMA and CNRA (California Emergency Management Agency and California Natural Resources Agency). 2012. California Adaptation Planning Guide: Planning for Adaptive Communities.
- Circulate San Diego. 2024. City of San Diego and California Office of Traffic Safety (OTS) Walk Audit Reports (FY 2023-24): Sunset Cliffs Boulevard. Accessed November 2024. https://assets.nationbuilder.com/circulatesd/pages/7482/attachments/original/1719964872/WFT_Report_Sunset_Cliffs_Blvd.pdf?1719964872.
- City of San Diego. 2003. 2003 Coastal Erosion Assessment Update from Sunset Cliffs Park to Torrey Pines State Beach. Document No.: C-11542.
- City of San Diego. 2018. City of San Diego Coastal Erosion Assessment Photo Analysis Update: 1993/2003–2018 (ICF 00687.17).
- City of San Diego. 2019a. City of San Diego State Lands Sea Level Rise Vulnerability Assessment. July. Accessed November 2024. <https://www.sandiego.gov/sites/default/files/state-lands-sea-level-rise-vulnerability-assessment.pdf>.
- City of San Diego. 2019b. Sea Level Rise Vulnerability Assessment. December. Accessed November 2024. <https://www.sandiego.gov/sites/default/files/sea-level-rise-vulnerability-assessment.pdf>.
- City of San Diego. 2020. Climate Change Vulnerability Assessment. February. Accessed November 2024. <https://www.sandiego.gov/sites/default/files/climate-change-vulnerability-assessment.pdf>.
- City of San Diego. 2022a. Climate Action Plan. Accessed November 2024. <https://www.sandiego.gov/sustainability-mobility/climate-action/cap>.
- City of San Diego. 2022b. Mission Beach Seawall Improvements Feasibility Study Preliminary Engineering Report. November.
- City of San Diego. 2024a. Climate Resilient SD. Accessed November 2024. https://www.sandiego.gov/sites/default/files/2024-08/climate-resilient-sd_3-22-24.pdf.
- City of San Diego. 2024b. Chollas Creek Watershed Regional Park Master Plan. Accessed November 2024. <https://www.sandiego.gov/planning/chollas-creek-master-plan>.
- City of San Diego. 2024c. De Anza Natural. Accessed November 2024. <https://www.sandiego.gov/planning/programs/work-programs/de-anza-natural>.
- City of San Diego. 2024d. Land Development Code Updates. Accessed November 2024. <https://www.sandiego.gov/planning/work/land-development-code>.
- City of San Diego. 2024e. Los Peñasquitos Lagoon Restoration Phase 1. Accessed November 2024. <https://www.sandiego.gov/cip/projectinfo/featuredprojects/los-penasquitos-lagoon-restoration-phase1>.
- City of San Diego. 2024f. Ocean Beach Pier Renewal. Accessed November 2024. <https://www.sandiego.gov/cip/ocean-beach-pier-renewal>.
- City of San Diego. 2024g. Citywide Trails Master Plan. Accessed November 2024. <https://www.sandiego.gov/planning/citywide-trails-master-plan>.
- Dickson, M.E., H. Matsumoto, W.J. Stephenson, Z.M. Swirad, C.F. Thompson, and A.P. Young. 2023. "Sea-Level Rise May Not Uniformly Accelerate Cliff Erosion Rates." *Nature Communications*: 14, 8485. Accessed November 2024. <https://doi.org/10.1038/s41467-023-44149-3>.
- FEMA (Federal Emergency Management Agency). 2023. Guidance for Flood Risk Analysis and Mapping: Coastal Wave Runup and Overtopping. Accessed November 2024. https://www.fema.gov/sites/default/files/documents/fema_rm-coastal-wave-runup-and-overtopping-nov-2023.pdf.
- FEMA. 2024a. Nature-Based Solutions. Accessed November 2024. <https://www.fema.gov/emergency-managers/risk-management/climate-resilience/nature-based-solutions>.
- FEMA. 2024b. Building Resilient Infrastructure and Communities. Accessed November 2024. <https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities>.
- IPCC (Intergovernmental Panel on Climate Change). 2012. "Glossary of Terms." In *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, by IPCC, 555-564. New York, NY: Cambridge University Press. Accessed November 2024. <https://www.ipcc.ch/site/assets/uploads/2018/03/wg2TARannexB.pdf>.
- Chiang, John. 2017. *Growing the U.S. Green Bond Market, Volume 1: The Barriers and Challenges*. January. Accessed November 2024. https://www.treasurer.ca.gov/greenbonds/publications/reports/green_bond_market_01.pdf.

Kuhn, Gerald G., and Francis P. 1984. Shepard Sea Cliffs, Beaches, and Coastal Valleys of San Diego County: Some Amazing Histories and Some Horrifying Implications. Berkeley: University of California Press. Accessed November 2024. <http://ark.cdlib.org/ark:/13030/ft0h4nb01z/>.

NFWF (National Fish and Wildlife Foundation). 2024. National Coastal Resilience Fund. Accessed November 2024. <https://www.nfwf.org/programs/national-coastal-resilience-fund>.

NOAA (National Oceanic and Atmospheric Association). 2024a. Relative Sea Level Trend: 9410170 San Diego, California. Accessed November 2024. https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=9410170

NOAA. 2024b. NOAA Climate Resilience Regional Challenge. Accessed November 2024. <https://coast.noaa.gov/funding/ira/resilience-challenge/>.

OPC (Ocean Protection Council). 2018. State of California Sea-Level Rise Guidance: 2018 Update. Accessed November 2024. https://opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf.

OPC. 2024. State of California Sea Level Rise Guidance: 2024 Science and Policy Update. June. Accessed November 2024. <https://opc.ca.gov/wp-content/uploads/2024/05/California-Sea-Level-Rise-Guidance-2024-508.pdf>.

SANDAG (San Diego Association of Governments). 2023. Beach Sand Replenishment. Accessed November 2024. <https://www.sandag.org/projects-and-programs/environment/shoreline-management/beach-sand-management/beach-sand-replenishment>.

San Diego River Park Foundation n.d. Creating a Better Future for the San Diego River. Accessed November 2024. https://www.sandiegoriver.org/our_vision.html.

Swain, D. L., Langenbrunner, B., Neelin, J. D., & Hall, A. 2018. Increasing precipitation volatility in twenty-first-century California. Nature Climate Change, 1. Accessed November 2024. <https://www.nature.com/articles/s41558-018-0140-y>.

U.S. Climate Resilience Toolkit. 2021. Glossary. Accessed November 2024. <https://toolkit.climate.gov/content/glossary>.

Vitousek, Sean, Patrick L. Barnard, Patrick W. Limber, Li H. Erikson, and Blake Cole. 2017. “A Model Integrating Longshore and Cross-Shore Processes for Predicting Long-Term Shoreline Response to Climate Change.” Journal of Geophysical Research: Earth Surface. 122. 10.1002/2016JF004065.

Western Regional Climate Center. 2018. SAN DIEGO LINDBERGH FLD, CALIFORNIA (047740): Period of Record Monthly Climate Summary. Accessed November 2024. <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7740>

Willows, R.I., and R.K. Connell, eds. 2003. Climate Adaptation: Risk, Uncertainty and Decision-making. UKCIP Technical Report. UKCIP, Oxford. Accessed November 2024. https://sciencepolicy.colorado.edu/students/envs_5120/UKCIP_2003.pdf.





This page intentionally left blank.

Appendix A

Coastal Resilience Master Plan
Phase 1: Prioritizing Nature-Based
Solution Pilots and Site Profiles



Appendix A:
Coastal Resilience Master Plan Phase 1:
Prioritizing Nature-Based Solution Pilots and
Site Profiles Engagement Plan

Prepared for:



Prepared By:



Harris & Associates

November 1, 2024

3

Introduction

Sites Considered for
Coastal Resilience Master Plan

28

Site Selection

Priority Criteria for
Site Selection Scoring

35

Project Concept Development

Ocean Beach – Dog Beach (Pilot Project)
La Jolla Shores
Pacific Beach – Tourmaline Surf Park
Mission Beach
Ocean Beach – Beachfront (Pier)
Sunset Cliffs

Phase 1 of the development of the Plan included the evaluation of feasibility, risk, and benefits of developing nature-based solutions at 11 coastal locations in the City, listed here from north to south and including the following (Figure 1):

- Torrey Pines State Beach – Los Peñasquitos Lagoon
- Black's Beach
- La Jolla Shores
- Marine Street Beach
- Windansea Beach
- Pacific Beach – Tourmaline Surf Park
- Mission Beach
- Ocean Beach – Dog Beach
- Ocean Beach – Beachfront (Pier)
- Sunset Cliffs
- Naval Training Center Park

For each of the 11 locations, a brief description of the site is provided along with the following exhibits:

- An aerial image of the project site with the boundaries of the City's Multi-Habitat Planning Area (MHPA), as applicable
- Coastal Storm Modeling System (CoSMoS) flood projections
- A photo of the site

The City's MHPA delineates core biological resource areas and corridors targeted for conservation. The MHPA was included in the site selection process, as protection and enhancement of habitat for key plant and wildlife species is a priority of the Coastal Resilience Master Plan (CRMP) Phase I (refer to Social and Biological Criteria discussion).

CoSMoS is a dynamic modeling approach developed by the U.S. Geological Survey (USGS) to provide more detailed predictions of coastal flooding due to both future sea-level rise and storms integrated with long-term coastal evolution (i.e., beach changes and cliff/bluff retreat). CoSMoS models all the relevant physics of a coastal storm (e.g., tides, waves, and storm surge), which are then scaled down to local flood projections for use in community-level coastal planning and decision-making.

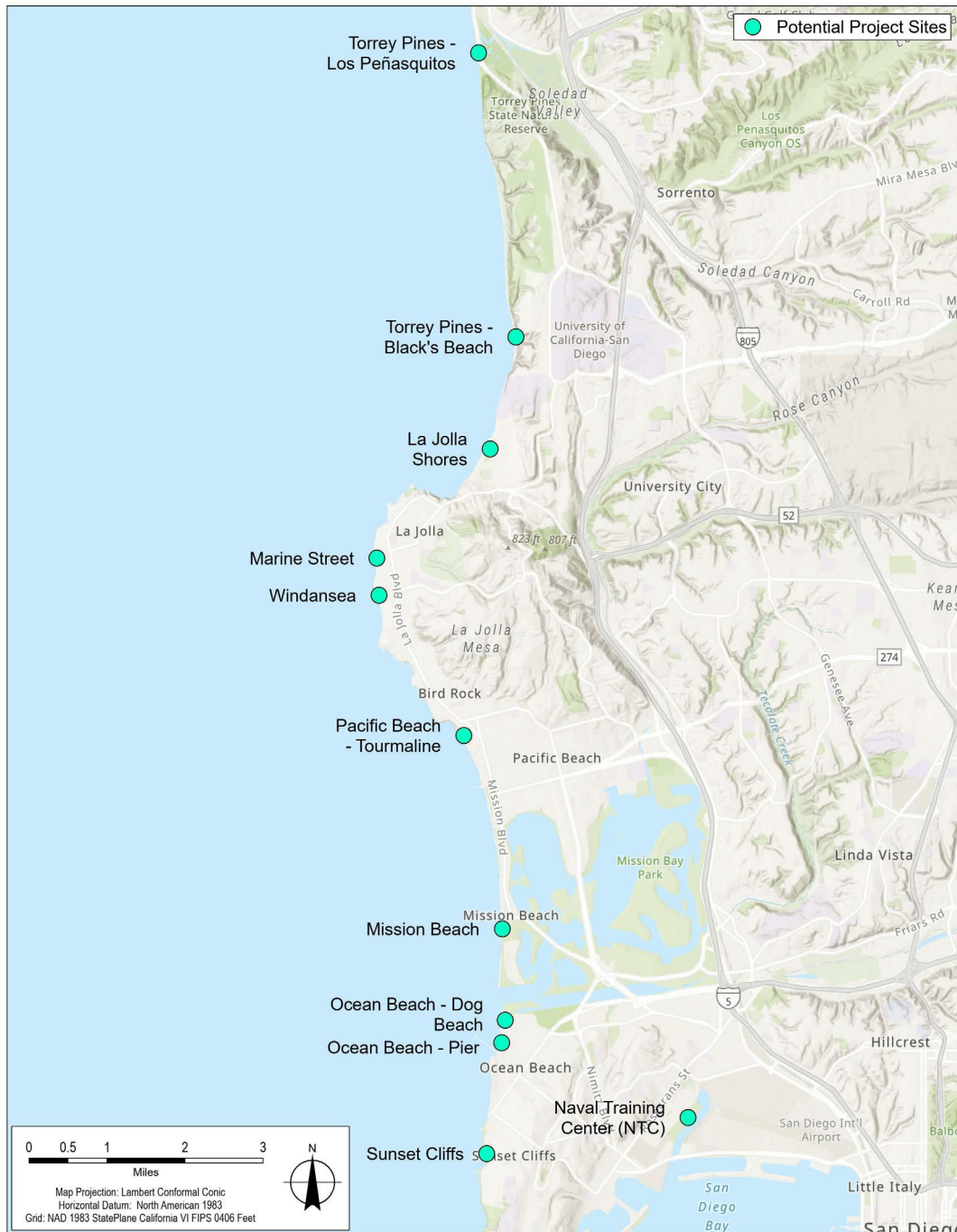


Figure 1. Eleven potential project sites were considered across the City for nature-based solutions as part of Phase 1

Torrey Pines State Beach – Los Peñasquitos Lagoon

This site consists of an approximately 0.55-mile-long shoreline fronting the South Lot at Torrey Pines State Beach and an informal parking lot in the City's jurisdiction along North Torrey Pines Road. Existing revetment and riprap front the roadway, and natural cobble features help protect the shoreline. Two state park parking lots, along with the parking area in the City's right-of-way support this heavily used beach that connects to a robust trail network. This site includes MHPA within its boundaries.



Figure 2. Torrey Pines State Beach



Figure 3. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 1. Torrey Pines State Beach (Photo credit: Mike Hastings)

Torrey Pines State Beach – Black's Beach

This site is an approximately 0.55-mile-long narrow, bluff-backed shoreline segment in the vicinity of Black's Beach. Steep and often precarious trails provide limited pedestrian access from public parking to the beach area below. Restrooms and private parking are available at the end of Black's Beach Trailhead, a paved roadway only publicly accessible by foot and bike, at the south end of the site boundary. This site includes MHPA within its boundaries.



Figure 4. Torrey Pines State Beach – Black's Beach

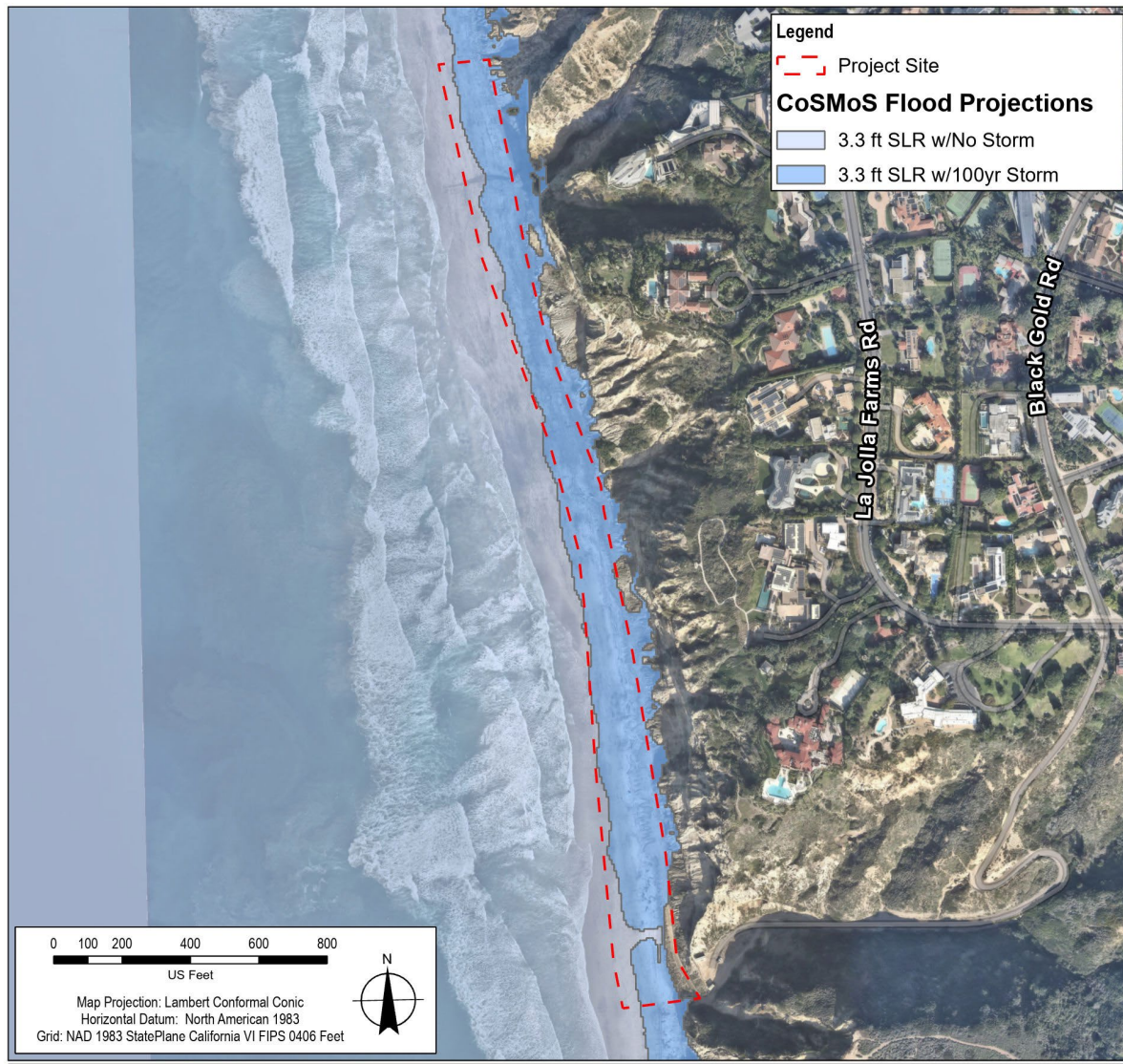


Figure 5. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 2. Torrey Pines State Beach – Black's Beach (Photo credit: Alex Lawson)

La Jolla Shores

La Jolla Shores is a recreational beach in La Jolla, approximately 0.5-mile-long, with a shoreline backed by a large parking lot and two grassy recreation areas. A walking strand protected by a low-lying seawall runs the entire length of this site. This site does not include MHPA within or near its boundaries.



Figure 6. La Jolla Shores



Figure 7. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 3. La Jolla Shores (Photo credit: Alex Lawson)

Marine Street

This site consists of a relatively stable beach along La Jolla stretching approximately 0.19 miles, containing a robust offshore and sandy beach habitat supported by seaweed and kelp that washes ashore (i.e., wrack). City-owned sections of the beach are separated by private property and only the southern portion of City-owned beach is accessible by public accessways. The beach is mostly backed by seawalls. Low relief bluffs connect to extensive offshore reefs with sandy beach widths fluctuating seasonally. This site includes MHPA within its boundaries.



Figure 8. Marine Street Beach

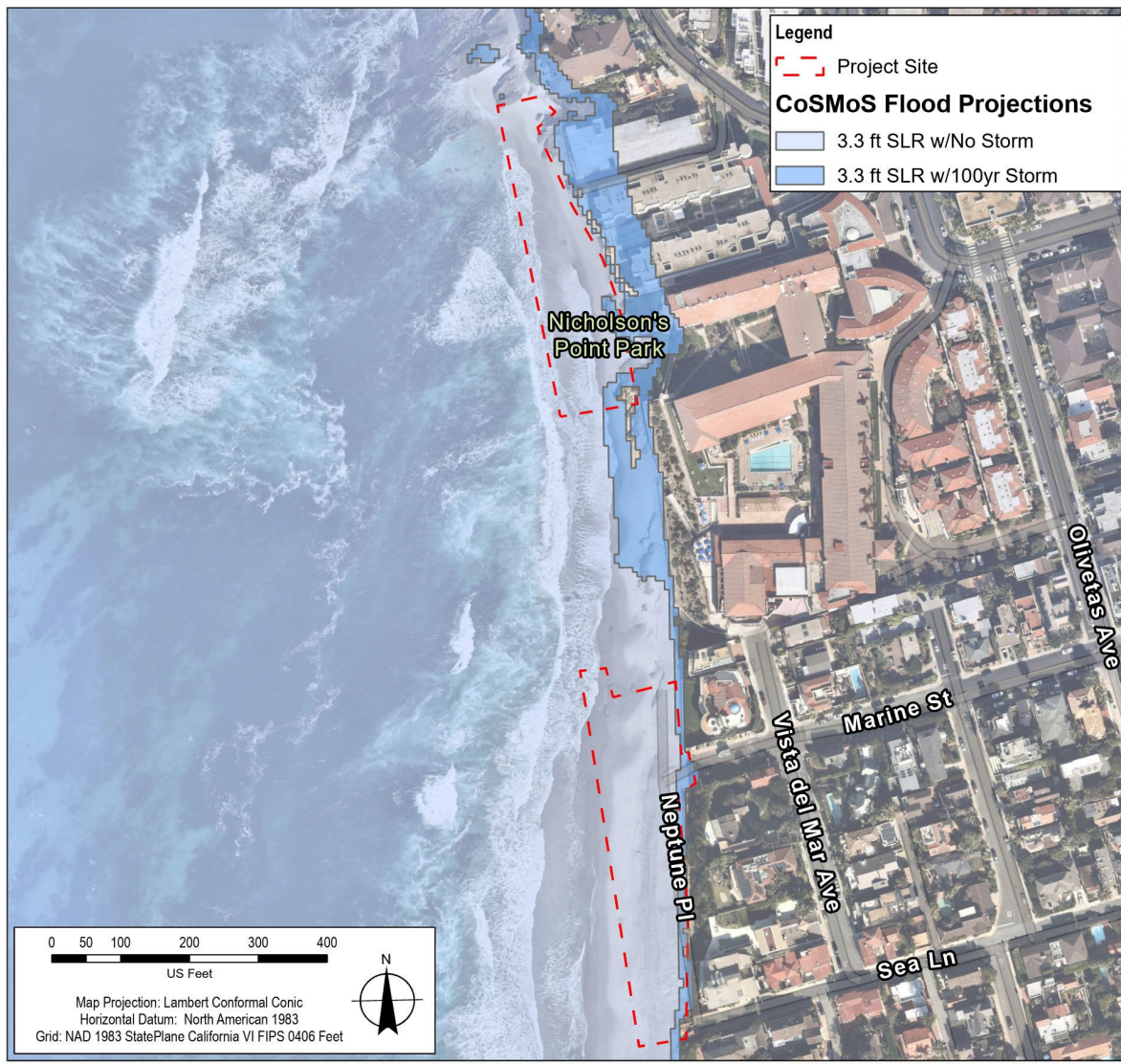


Figure 9. USGS CoSMoS flood hazards with 3.3 feet of sea-level rise with and without a 100-yr storm

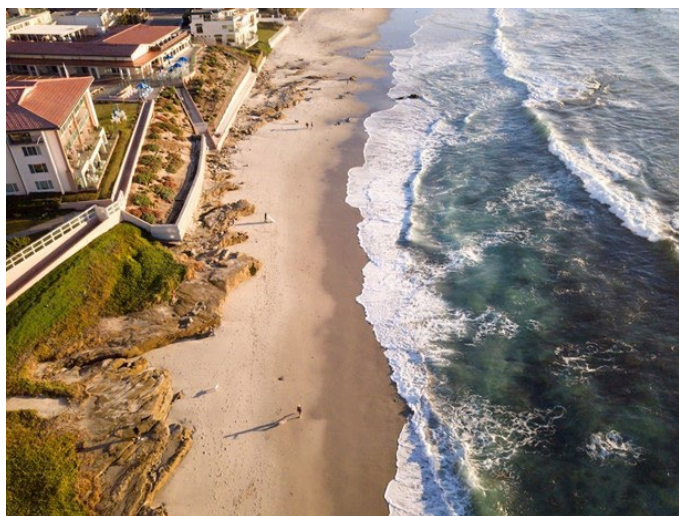


Photo 4. Marine Street Beach (Photo Credit: Yulia M)

Windansea Beach

Windansea is an approximately 0.18-mile-long narrow, bluff-backed beach in La Jolla, consisting primarily of scattered bedrock formations along the beach with seasonal sand. Robust nearshore reefs provide quality surfing and a trail adjacent to the road allows for highly desired coastal views. A small parking lot with benches fronts the southern end of the beach. This site does include MHPA within its boundaries.



Figure 10. Windansea Beach

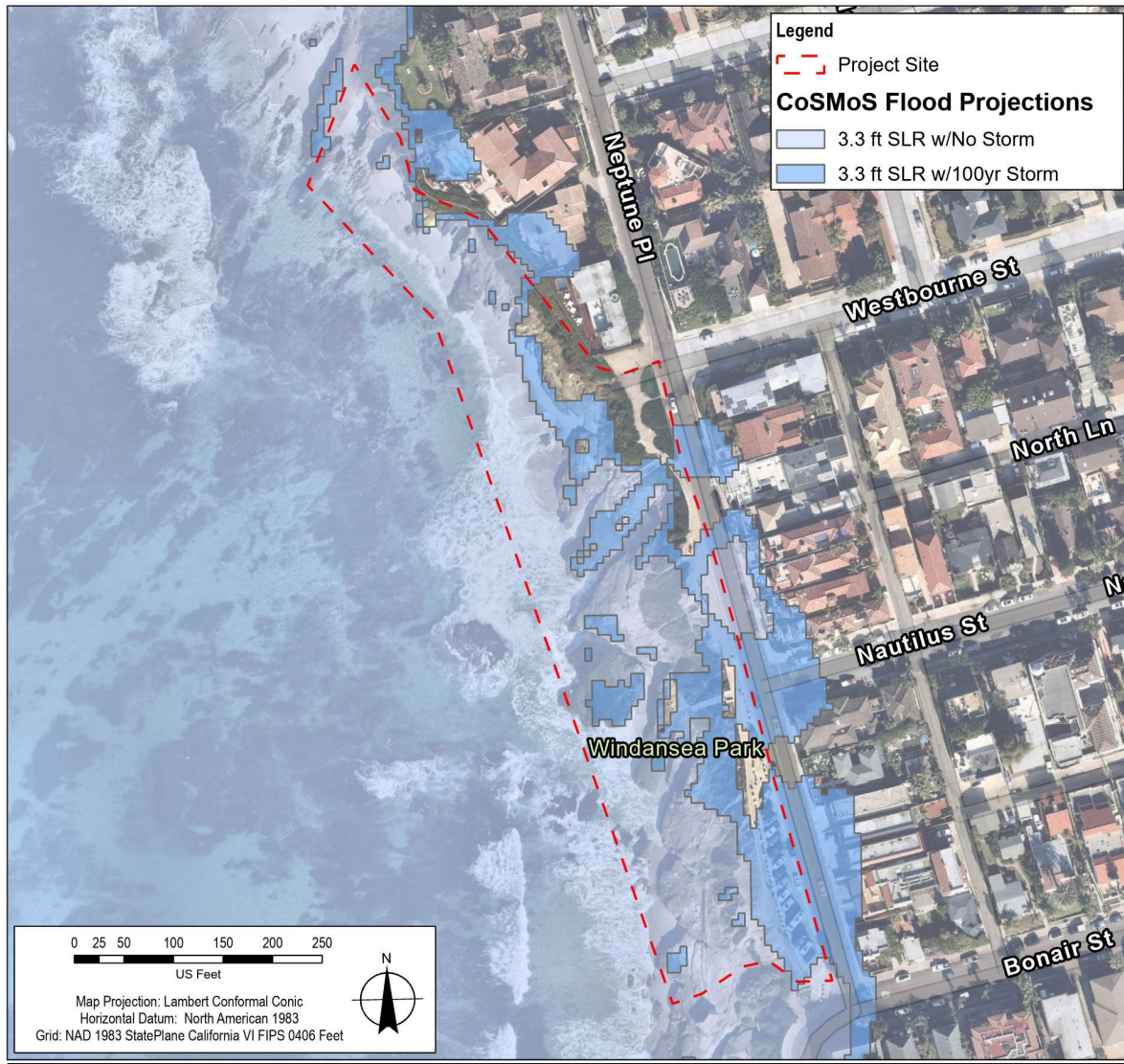


Figure 11. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 5. Windansea Beach (Photo Credit: Jeeheon Cho)

Pacific Beach – Tourmaline

A recreational beach in Pacific Beach, Tourmaline is an established surfing beach with a parking lot and some picnic amenities. A maintenance access ramp and protection feature consisting of riprap and cobble front the parking lot and restroom area. This site does not include MHPA within or near its boundaries.



Figure 12. Tourmaline Beach



Figure 13. USGS CoSMoS flood hazards with 3.3 feet of sea-level rise with and without a 100-yr storm



Photo 6. Tourmaline Beach (Photo Credit: GHD)

Mission Beach

One of the most visited beaches in San Diego, Mission Beach is a recreational beach, backed by a low-lying seawall with several accessways. A large, expansive commercial and recreational area sits between the seaward beach and bayshore complicating vulnerabilities and risks to hazards. This site does not include MHPA within or near its boundaries.



Figure 14. Mission Beach

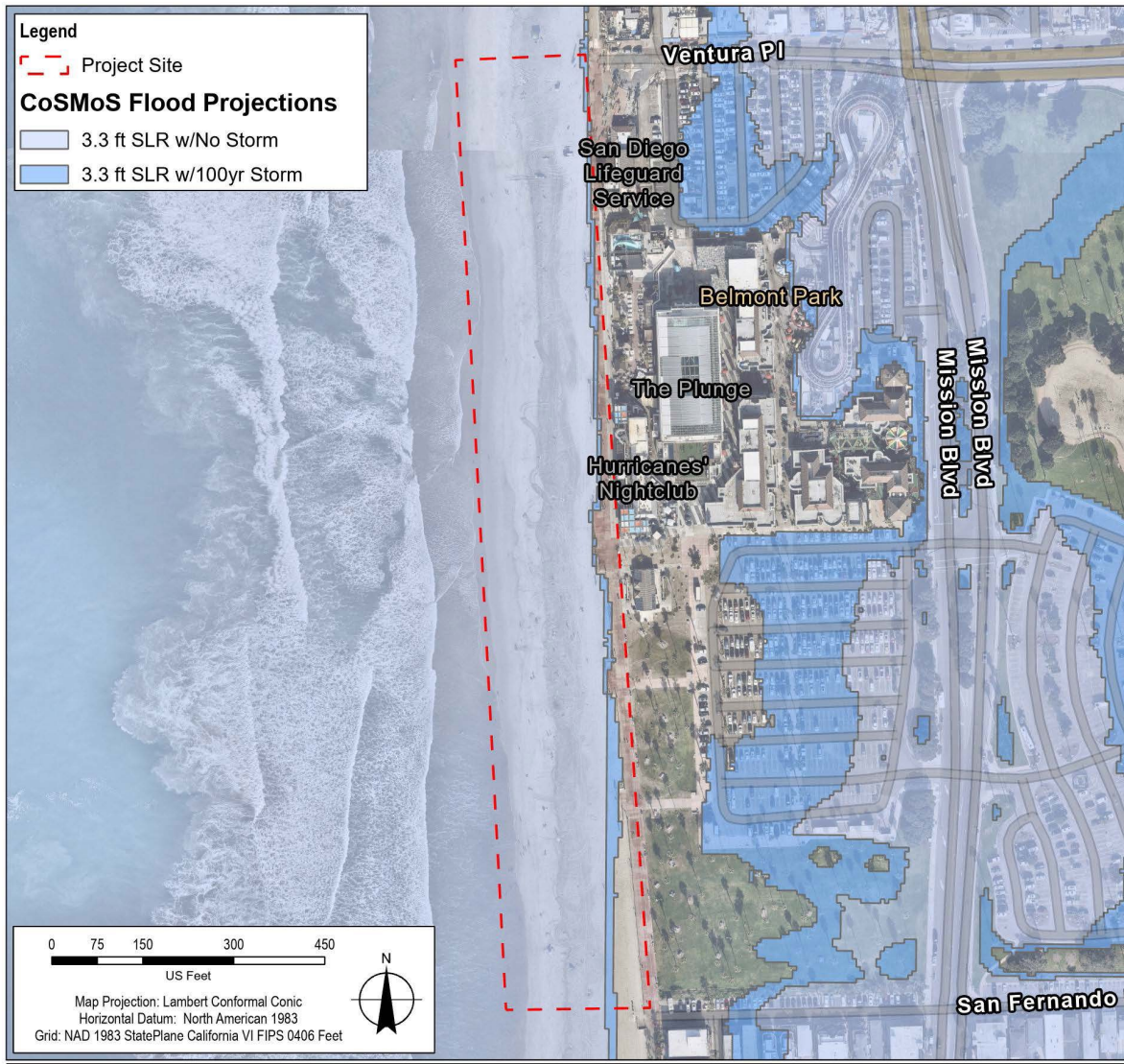


Figure 15. USGS CoSMoS flood hazards with 3.3 feet of sea-level rise with and without a 100-yr storm



Photo 7. Mission Beach (Photo Credit: GHD)

Ocean Beach – Dog Beach

Ocean Beach Dog Beach experiences northward sediment transport and benefits from an existing groin and jetty structures that assist with stabilizing the beach. A parking lot backs the beach with temporary sand stabilizing structures blocking excessive nuisance sediment being blown inland. Located at the mouth of the San Diego River, adjacent areas to the site support a beach with recreational dog use as well as a trail system through dunes and wetland within the river system. This site includes MHPA along the northern edge of its boundaries.



Figure 16. Ocean Beach – Dog Beach

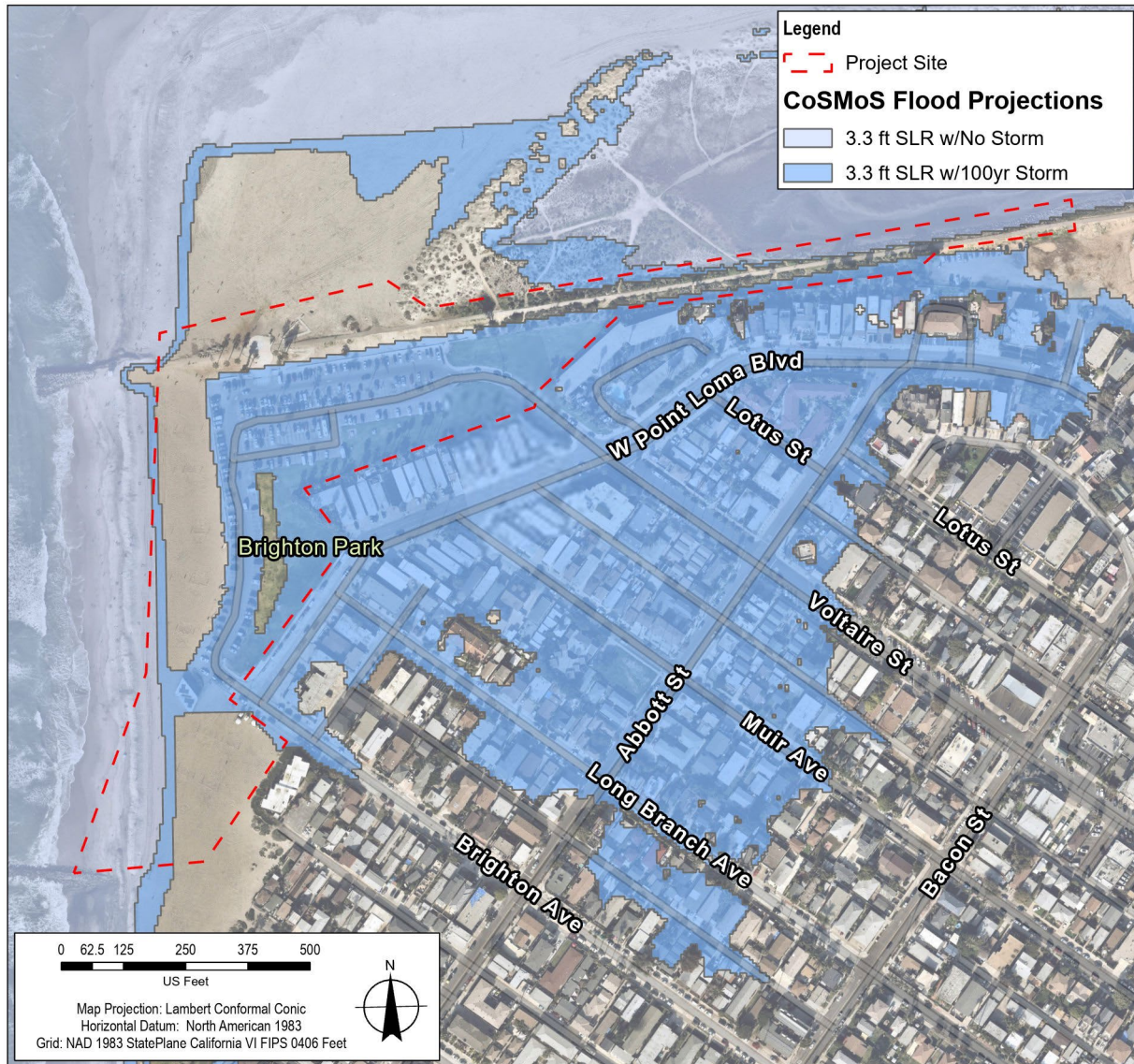


Figure 17. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 8. Ocean Beach – Dog Beach (Photo Credit: GHD)

Ocean Beach – Beachfront (Pier)

Located directly north of Ocean Beach Pier and south of the “Avalanche” groin, this site contains two heavily used waterfront areas and strand protected by an existing low-lying revetment and seawall. This site includes MHPA that is in near vicinity of its boundaries.



Figure 18. Ocean Beach – Beachfront



Figure 19. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 9. Ocean Beach – Beachfront (Photo Credit: GHD)

Sunset Cliffs

The Sunset Cliffs site is an approximately one-mile-long reach consisting of a two-way road along an actively eroding bluff. There are multiple parking areas along the roadway, one formal accessway to the waterfront, and several informal accessways and an 18-acre linear park along the cliffs. Existing bluff toe-fills help mitigate current and future erosion concerns. This site includes MHPA directly south of its boundaries.



Figure 20. Sunset Cliffs



Figure 21. USGS CoSMoS bluff retreat with 3.3 ft of sea-level rise



Photo 10. Sunset Cliffs (Photo credit: Alex Lawson)

Naval Training Center Park

The Naval Training Center Park is an approximately 0.7-mile-long shoreline along the San Diego Bay comprised of historic revetment piles and backed by a large waterfront park. Behind this park lies several large parking lots, a popular commercial area, and a school. This site does not include MHPA that is within or near its boundaries.



Figure 22. Naval Training Center Park

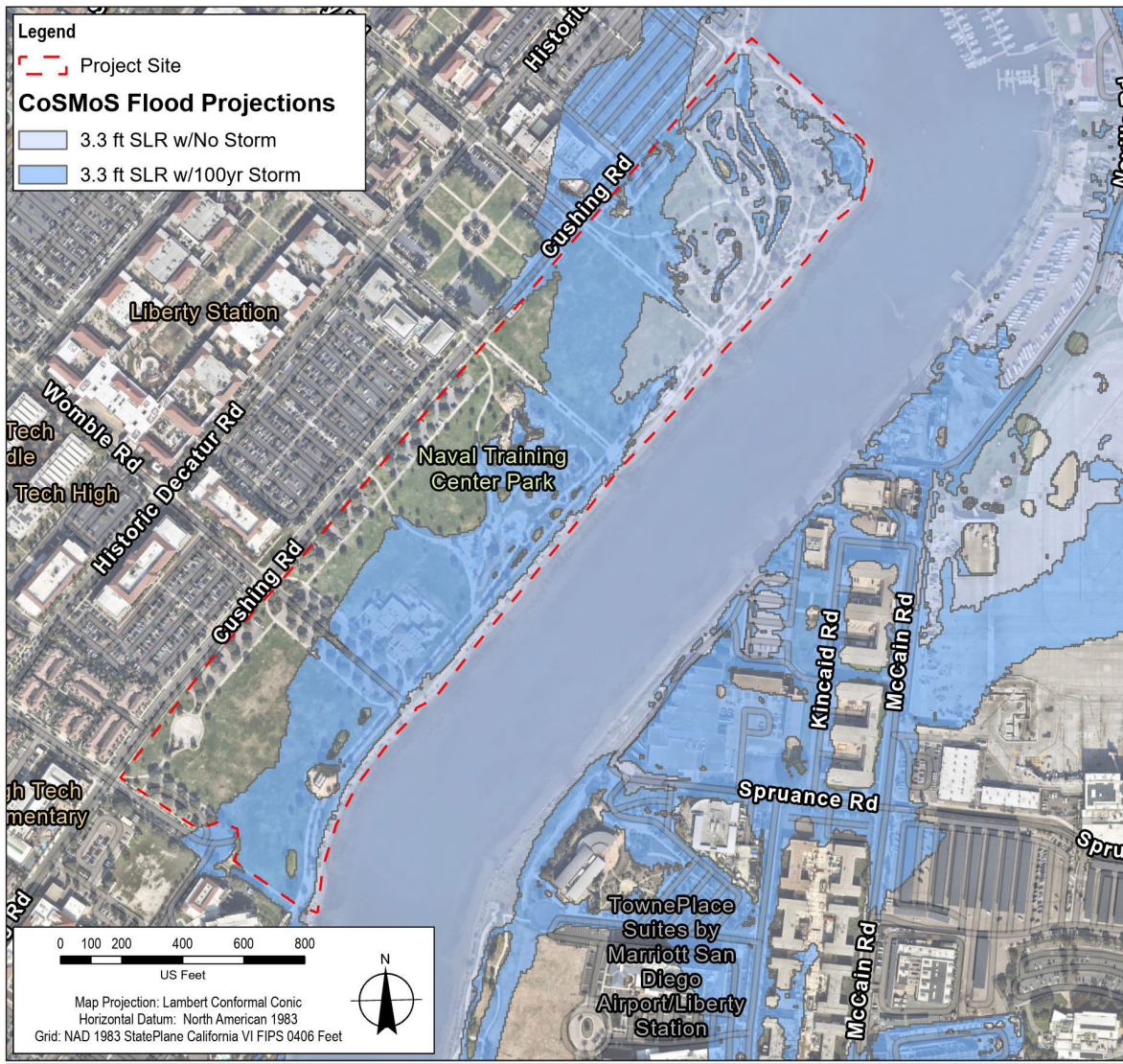


Figure 23. USGS CoSMoS flood hazards with 3.3 ft of sea-level rise with and without a 100-yr storm



Photo 11. Naval Training Center Park (Photo credit: GHD)

Priority Criteria for Site Selection

These 11 locations were selected after a review of the City's sea-level rise and climate vulnerability assessments of coastal resources. The City's prior climate adaptation and resilience efforts focused on identifying vulnerabilities and risks to critical City assets and resources, such as water infrastructure, stormwater infrastructure, parks and open space.

Climate Resilient SD prioritizes nature-based solutions based on the multiple benefits they provide, including protection and/or restoration of natural or modified ecosystems, protection of critical infrastructure, providing access to nature, improving human well-being and providing biodiversity benefits. Climate Resilient SD calls for the CRMP to prioritize nature-based solutions for coastal resilience. As such, this initial suite of sites was selected for feasibility of implementing a nature-based solution that supports three primary factors:

- Increases resiliency to sea-level rise;
- Provides habitat enhancement and preservation opportunities; and
- Supports and/or enhances coastal access, with a focus on disadvantaged communities.

The 11 sites were investigated through a multi-criteria analysis to identify the location and site boundaries most viable for a nature-based concept and narrow down to six locations most appropriate and feasible for nature-based solutions. The concepts for each site are compared in a multi-criteria decision matrix to support understanding of the proposed solutions for each site. The matrix includes an assessment of the community, resilience, economic and ecosystem benefits of each option.

Social and biological and physical criteria were used to narrow the 11 original coastal sites to six priority sites, chosen based on a combination of factors, including sea-level rise vulnerability, feasibility of implementation, stakeholder feedback and existing barriers to implementation. The overarching goal is for these projects, when implemented, to enhance coastal access, protect critical habitat and species and reduce risk to coastal storms and flooding. The sites were assessed against a multi-criteria analysis that considered these factors, as described below.

Social and Biological Criteria

To further narrow down the selection of potential projects in the CRMP Phase 1, existing social and biological designations were used as well as other general base map layers. The social and biological layers used in this analysis are described as follows:

- City ownership was a crucial factor in site selection, as any project pursued would need to fall within the City's jurisdiction with its ability to fund, plan, implement and monitor a project largely located on City-owned property without having to coordinate with another landowner group or body.
- City's MHPA was developed by the City in cooperation with the wildlife agencies (U.S. Fish and Wildlife Service and California Department of Fish and Wildlife), property owners, developers and environmental groups. The MHPA delineates core biological resource areas and corridors targeted for conservation. Within the MHPA, limited development may occur. Currently, the MHPA is focused on terrestrial habitats and ecosystems; as the CRMP Phase 1 focuses on coastal habitats, the site selection process considered subtidal, tidal and coastal strand ecosystems. The MHPA was included in the site selection process, as protection and enhancement of habitat for key plant and wildlife species was a stated priority of the CRMP Phase I.
- Communities of Concern is the City's term for communities with very low to moderate access to opportunity based on the City's Climate Equity Index (2019c). Updated in 2021, this factor was used to help identify projects in coastal areas that could help support coastal and beach access to Communities of Concern.

Physical Criteria

The analysis of priority project sites also reviewed the physical limitations or vulnerabilities of each of the 11 sites of interest:

- The site selection analysis considered how permitting, construction and other implementation factors would likely impact a potential project. These considerations determine a site's ease of implementation.
- Sea-level rise scenarios for flooding, storm surge and coastal and cliff erosion from USGS CoSMoS were used to determine the sea-level rise vulnerabilities, erosion thresholds and tipping points and how the existing uses of each site would be compromised by projected coastal impacts. In combination with the data from previous vulnerability assessments, these hazard overlays helped generate site-specific understandings of substantial loss of services, thresholds for significant impacts and flood connectivity across a site under various sea-level rise scenarios.
- Assumptions for high-level project concepts that could be pursued at each site were necessary to evaluate the feasibility of a nature-based solution and its capacity to reduce vulnerabilities while improving access, enhancing habitat areas and providing coastal resilience. Feasibility of nature-based solutions was considered to screen out sites that could not support nature-based solutions. Some of the project sites were determined to require the use of primarily gray infrastructure solutions to improve resiliency to sea-level rise.

A scoring matrix (Table 1) was used to evaluate each potential site based on the priority criteria described above. Site selection scoring considered the following six criteria:

- City ownership of the site
- Impacts to the existing MHPA
- Project benefits to Communities of Concern
- Ease of implementation (e.g., permitting process, constructability of the site)
- Sea-level rise vulnerability and associated risk to habitat and public access
- Feasibility to develop nature-based solutions at the site

The scoring was designed to include scale and variation between the indicators described under the scores 0/1, 3 and 5, which is why scores 2 and 4 do not include indicator descriptions.

Table 1. Site Selection Scoring Matrix Based on the Priority Criteria

Criteria	Score				
	0/1	2	3	4	5
City Ownership	Site not within City-owned area		Site mostly within City-owned area		Site fully within City-owned area
MHPA	Project will impact existing MHPA negatively		No MHPA exists but project may provide some habitat benefits		MHPA will be protected, enhanced or made resilient with project
COC	Project will not benefit COC		Project will moderately support COC		Project will provide benefits to COC
Ease of Implementation (Permitting, Constructability)	Major hurdles to implement; many permitting challenges; difficult constructability		Some hurdles to implement; some permitting challenges; moderate challenges to constructability		Little to no hurdles to implement; few permitting challenges; easily constructible
SLR Vulnerability / Impacts to Habitat and Public Access	Site is not vulnerable to SLR		Site currently somewhat vulnerable and will exacerbate with SLR		Site currently very vulnerable and will exacerbate with SLR
NBS Feasibility	Would need to pilot mostly untested NBS; project uncertain of providing resilience benefits		Potential NBS exist but challenging to fit site; project will likely provide moderate resilience benefits		Established NBS methods can be used; project will likely provide significant resilience benefits

Notes: COC = Communities of Concern; MHPA = Multi-Habitat Planning Area; NBS = nature-based solution; SLR = sea-level rise

Through an iterative process, each site was reviewed and evaluated with the CRMP Phase 1 project team. City interdepartmental feedback was considered to finalize the scores and provided key information, which led to modification of the potential project sites. For example, Marine Street Beach was not selected as a project sites. While Marine Street Beach represents a unique coastal asset that supports a robust habitat area, an initial review did not provide evidence to support that implementing a nature-based solution in this area would provide substantial benefits to coastal access or the existing habitat or greatly reduce existing coastal hazard vulnerabilities. In reviewing sea-level rise flooding and erosion modeling, available habitat information, and sediment dynamics, the CRMP Phase 1 project team decided that while project concepts could be developed to enhance some of the coastal accessways, a nature-based approach would not provide significant benefits and should not be prioritized as this time. Nevertheless, Marine Street Beach does represent a good opportunity as a local reference site, and it is recommended that the City continues to monitor how this beach responds to storms and future sea-level rise.

After an initial screening and discussion with City departments and complementary projects in process, it was determined advantageous to add Mission Beach to the list of potential sites for nature-based solutions. The bayside of Mission Beach is vulnerable to flooding and currently has projects in development focused on increasing resilience to these hazards. Another existing project underway is evaluating updates the Mission Beach seawall. Given the characteristics of Mission Beach's ocean side features, it was determined that investigating nature-based solution concepts for this area presents an advantageous opportunity to develop pilot concepts that could be feasible for an important recreational and commercial corridor that would also be applicable to other areas of the City's coastline.

Table 2 provides scoring information for each of the evaluated criteria considered for each of the original 11 sites in descending order of the total score. To determine specific scores for ease of implementation and feasibility of nature-based solutions, high-level project concepts were considered for each location to better rank how the six criteria described above would likely impact a potential project. Assumptions for high-level project concepts that could be pursued at

Table 2. Multi-Criteria Analysis of Potential Pilot Project Sites

Site	COC	City Ownership	Ease of Implementation	MHPA	SLR Vulnerability and Need	NBS Feasibility	Total	Notes (basic concepts considered to provide scores)
Ocean Beach – Dog Beach	5	5	4	5	5	4	28	A dune feature and realignment of amenities – This site presents multiple opportunities to shift hardscape areas, provide additional elevation and buffer space and enhance resilience to coastal hazards while continuing to serve diverse user groups and recreation types.
Ocean Beach – Pier	5	5	5	3	4	5	27	Segmented dune features that integrate with the existing seawall and hardscape – This site can leverage existing protective elements, integrate with the ongoing pier improvement project and blend softened and nature-based amenities across the project site.
Mission Beach	3.5	5	4	3	4	5	24.5	Segmented dune features that integrate with the existing seawall – This site provides the opportunity to pilot a project at a heavily used City site that includes robust commercial and lifeguard services which can be scaled up and expanded to other similar areas.
Pacific Beach – Tourmaline Surf Park	2	5	5	3	4	5	24	A dune that incorporates the existing cobble and revetment – This site has the potential to increase viable habitat area and improve resilience while preserving existing lifeguard and maintenance access. Potential redesigns of the parking lot can enhance stormwater management and ensure better access flow for visitors and the community.
La Jolla Shores	0	5	4	3	5	4	21	A waterfront park and space realignment – This site can integrate the existing seawall protection while also providing buffer space for access and recreation to persist despite sea-level rise.
Sunset Cliffs	0	5	3	3	2	4	17	A roadway reconfiguration and/or realignment – This site could increase adaptive capacity of the corridor and provide improved access elements. As coastal squeeze impacts usable beach and erosion continues to threaten the bluff, shifting transportation patterns and increasing multimodal access amenities can offer time and space for longer-term planning.
Marine Street Beach	0	1.5	4	5	3	2	15.5	Dune enhancement and/or artificial reef – This site can leverage its pocket beach setting that offers natural geometry. Lack of a parking lot and a fully armored back beach with many private properties limit the opportunities to modify adjacent amenities.
Naval Training Center Park	0	4	2	3	2	4	15	An ecotone project with trail realignment – The shoreline along this site can be rehabilitated to enhance wetland habitat. Additionally, the ample backshore space allows for the integration with existing visitor serving amenities. While challenges with contaminated sediment and coordination across jurisdictions, this site could represent a ‘no regrets’ demonstration project.
Torrey Pines State Beach – Los Peñasquitos Lagoon	0	3	1	4	3	4	15	A roadway realignment project – This site represents a vulnerable and important transportation corridor where tradeoffs between habitat, beach use and access intersect. While a NBS is possible, the scale of the site requires significant multi-jurisdictional coordination and long-term visioning to be successful.

Table 2. Multi-Criteria Analysis of Potential Pilot Project Sites

Site	COC	City Ownership	Ease of Implementation	MHPA	SLR Vulnerability and Need	NBS Feasibility	Total	Notes (basic concepts considered to provide scores)
Marine Street Beach	0	1.5	4	5	3	2	15.5	Dune enhancement and/or artificial reef – This site can leverage its pocket beach setting that offers natural geometry. Lack of a parking lot and a fully armored back beach with many private properties limit the opportunities to modify adjacent amenities.
Naval Training Center Park	0	4	2	3	2	4	15	An ecotone project with trail realignment – The shoreline along this site can be rehabilitated to enhance wetland habitat. Additionally, the ample backshore space allows for the integration with existing visitor serving amenities. While challenges with contaminated sediment and coordination across jurisdictions, this site could represent a ‘no regrets’ demonstration project.
Torrey Pines State Beach – Los Peñasquitos Lagoon	0	3	1	4	3	4	15	A roadway realignment project – This site represents a vulnerable and important transportation corridor where tradeoffs between habitat, beach use and access intersect. While a NBS is possible, the scale of the site requires significant multi-jurisdictional coordination and long-term visioning to be successful.



Project Concept Development

These six highest scoring locations are analyzed in the CRMP Phase 1 at greater detail for suitability of nature-based solutions. The nature-based solutions were developed by gathering relevant data to assess each site's unique opportunities and constraints to ensure feasibility. The concepts for each site included incorporating factors related to community, resilience, economics, and ecosystem benefits. Based on the analysis of feasibility, risk, and benefits of the nature-based solutions at each project site, the CRMP Phase 1 developed up to three nature-based solution concepts (i.e., potential projects) at the six sites. One location (the Pilot Project) is analyzed at the 15 percent design level. The concepts are presented graphically (i.e., plan and section views or illustrations) and described broadly in terms of mass and scale.

Ocean Beach – Dog Beach (Pilot Project)

Site Conditions and Constraints

The Ocean Beach – Dog Beach project site is approximately 12.83 acres comprising open space, beach and shoreline, a developed parking lot and a small portion of native dune and scrub habitat in the eastern portion of the site (refer to Figure 16, Ocean Beach – Dog Beach). The majority of the site is a curved sandy beach for dogs and their owners with the mouth of the San Diego River (to the north), where it meets the Pacific Ocean (to the west). Immediately north of the San Diego River is the Quivira Jetty. A smaller jetty (referred to locally as the Stub Jetty) is located west of lifeguard tower at the northern end of the project site. The eastern portion of the project site meets Smiley Lagoon. The San Diego River Trail runs south of Smiley Lagoon from east to west along the northern border of the project site. South of the San Diego River Trail is an L-shaped parking lot that serves the project site.

The L-shaped parking lot provides approximately 300 vehicle parking spaces. The parking lot is a one-way flow lot that is often congested with drivers looking for parking. The northern and western borders of the parking lot are lined with approximately 3-foot-tall concrete k-rails that help to prevent sand from blowing into the parking lot and provide limited coastal flood protection. Along the eastern border of the parking lot is Brighton Park, a grassy landscaped area interspersed with concrete picnic benches. A public restroom facility with water fountains and outdoor beach showers is provided south of the parking lot and west of Spray Street. There are 10 volleyball courts along the back of the beach near the parking lot. An additional four volleyball courts are located near the southern end of the project site. The project site is bordered to the southeast by single-family and multi-family residential development and to the west by the Pacific Ocean. The project site is directly adjacent to the Ocean Beach – Beachfront (Pier) project site to the south, separated by the Avalanche Groin.

Due to the orientation of and wave exposure at Ocean Beach – Dog Beach, the site experiences an overall northward sediment transport. The shoreline of the Ocean Beach – Dog Beach project site is relatively stable due to the long Quivira Jetty, which separates the San Diego River channel and the Mission Bay entrance north of the project site, an existing short jetty (Stub Jetty)

at the northern end of the site and a groin (referred to locally as the Avalanche Groin) at the southern end of the site. Both the jetty and groin structures assist with stabilizing the generally wide, sandy beach. However, the Ocean Beach – Dog Beach project site is currently susceptible to coastal flooding and erosion, especially during storm events, that will worsen with future sea-level rise. In particular, the restroom at the southern end of the parking lot is exposed to coastal flooding in the existing condition.

The City currently implements a linear sand berm at the project site as part of the annual winter berm program, in which a sand berm (approximately 6 to 8 feet high and 30 feet wide) is constructed in the fall (generally in October) to reduce impacts of coastal flooding to the beach amenities and Ocean Beach community during heavy winter storms. The winter berm is built along the beach from the Stub Jetty to Avalanche Groin. The winter berm is then flattened during the spring (generally in March) once the storm season is over to provide additional sediment that reduces the effects of coastal erosion. Berm maintenance and repairs occur as needed at any time of the day or night, depending on the severity of the repairs needed and the tide. Construction of the berm involves the use of trucks and front-end loaders. Approximately 75 truckloads of material are used to construct the winter berm along Ocean Beach.

The project site includes a portion of the San Diego River Bikeway and adjacent areas; however, it is located outside the San Diego River Levee footprint. If the project footprint changes and it is determined that the project may impact the levee, continued coordination with the City's Stormwater Department and the U.S. Army Corps of Engineers would be required.

Project Concept Description

The Dunes concept for Ocean Beach – Dog Beach (Concept A-1 of the CRMP Phase 1) includes a new multi-use path for cyclists and pedestrians fronted by elevated sand dunes along the beach. The multi-use path and sand dunes would be located along the landward edge of the beach, adjacent to the existing parking lot. The sand dunes, which are inspired by the City's existing winter berm program, would provide flood protection to the coastal park infrastructure and community of Ocean Beach by adding elevation to the back of the beach and by providing a reservoir of sand to the beach that can be used during erosive conditions. The proposed sand dunes would make this annual feature a permanent fixture at the project site and would be designed to provide protection from existing and projected flooding impacts associated with sea-level rise. The proposed multi-use path and sand dunes would include pedestrian and emergency access points along the project site and maintain the same number of parking spots on site. The orientation/angle of the accessways would be designed to limit flood water from entering walking paths and accessways during extreme events (e.g., combined high wave energy and high tide). For instance, accessways might be angled away from the dominant wave direction to minimize direct water entry. Small berms and elevation increases might be included in vehicle and pedestrian accessways to divert water away from the paths, providing additional protection against flooding. To retain sand in the dune system, sand fencing would be used particularly during establishment of the dune vegetation (refer to Concept A-1 figures in the CRMP Phase 1).

The Resilient Relocation concept (Concept A-2 of the CRMP Phase 1) includes two optional components at the Ocean Beach – Dog Beach project site. One optional component would be to relocate the existing restroom facility farther inland to reduce vulnerability and continued exposure to coastal flooding and sea-level rise. The existing restroom south of the parking lot

could be relocated to a more central location within the grass landscaped areas next to the parking lot. The restroom would need to be assessed to determine if relocation is possible or if reconstruction would be necessary. The new location of the restroom would be more accessible to users of the parking lot and would significantly increase the resilience of this facility due to the proposed location landside of the proposed sand dune.

Another optional component of the concept would be to provide an express shuttle that runs from an appropriate transportation center (e.g., Old Town Transit Center) to the Ocean Beach – Dog Beach project site. To support this transit service, a shuttle stop would be provided within the parking lot at the Ocean Beach – Dog Beach project site or along an adjacent street. This express shuttle could improve access to the beach and associated recreational facilities and could reduce parking lot congestion and vehicle trips to the project site.

The eastern edge of the project site abuts the Smiley Lagoon area where the City of San Diego, the San Diego River Park Foundation and San Diego Audubon Society have partnered on the Ocean Beach Estuary Enhancement Project. The project supports improved habitat, managed invasive plants, increased community awareness and environmental education and balanced human use near high quality habitat. The Ocean Beach – Dog Beach proposed project design aligns with this project effort through proposed dune restoration at the eastern edge of the project site, near the Ocean Beach Estuary Enhancement Project.

La Jolla Shores

Site Conditions and Constraints

The La Jolla Shores project site is approximately 21 acres and extends from the intersection of Paseo Del Ocaso and El Paseo Grande at the northern boundary to Avenida De La Playa at the southern end. The site includes open space beach, shoreline, parkland and the La Jolla Shores parking lot, which provides approximately 360 vehicle parking spaces. The La Jolla Shores project site consists of two grassy park areas (La Jolla Shores Park to the north and Kellogg Park to the south) separated by a paved parking lot located immediately east of a boardwalk (La Vereda pedestrian path) and sandy beach area to the west (refer to Figure 6, La Jolla Shores). The two park areas are interspersed with concrete picnic tables; fire pits; large eucalyptus, palm, and other trees and green hedges. A playground structure is located at the southwest corner of Kellogg Park. Each park area includes public restrooms and showers near the southwest corners of the two parks. The La Jolla Shores Lifeguard Station, a permanent lifeguard facility, is located in the southwest corner of the parking lot.

The La Vereda pedestrian path separates the sandy beach to the west and the parks and parking lot to the east. Along the western border of the pedestrian path is a 2-foot-tall seawall, and concrete benches line the eastern border of the pedestrian path. The site is bordered to the east by residential development and to the west by the open waters of the Pacific Ocean.

The La Jolla Shores project site is located along a northwest facing shoreline and is already exposed to the effects of coastal flooding with overtopping of the seawall occurring during extreme tide and wave events. A suite of strategies has been developed that looks at both maintaining the existing alignment of the coastal resources and realigning the park layout to relocate park infrastructure farther away from coastal hazards and join both park areas.

Project Concept Description

The Amphitheater Design concept (Concept B-1) to maintain the existing alignment for La Jolla Shores would construct two different flood protection strategies across the site. Along the seaward (western) borders of La Jolla Shores Park and Kellogg Park, an elevated linear earthen dike would be constructed between the grassy area and the La Vereda pedestrian path. The earthen dike could be contoured and planted with native plants to integrate more natural elements and provide ecological benefits. Along the seaward border of the parking lot (between the parking lot and the La Vereda pedestrian path), a terraced seatwall would be constructed to provide a viewing and seating area while also providing flood protection benefits. The seatwall could be constructed with concrete or fill that is graded and encapsulated by concrete retaining walls, pavers and other stone work. Using fill in combination with pavers could create a more welcoming environment. This approach allows for terraced seating areas that are planted, offering picnicking opportunities in an amphitheater style.

Two earthen dikes would be constructed under this design option, including one along the western edge of La Jolla Shores Park on the north side of the project site and one along the western edge of Kellogg Park on the south side of the project site. The final crest height of the earthen dikes would be established following additional technical analysis of projected sea-level rise and coastal flooding at the site. Ground cover on the earthen dikes could be grass (similar to the existing recreational areas), drought tolerant and native species or a combination of vegetation types. Additionally, the seaward side of the earthen dikes could be terraced in an amphitheater style to offer enhanced viewing and passive recreational opportunities. The southern earthen dike would follow the edge of the grassy landscaped area of Kellogg Park; therefore, it would be situated on the landward side of the existing playground, bathrooms, and educational infrastructure on the southwestern corner of the park. The proposed terraced seatwall would extend along the entire seaward edge of the existing parking lot, with the exception of the area around the lifeguard station. The seatwall design would generally have an amphitheater style shape and function with seating and picnic opportunities terraced on the ocean-facing side. The terraces of the seatwall could be designed to incorporate pavers, minor vegetation and planter boxes to soften the feature, as well as appropriate safety features (e.g., handrails and railings). Accessways through the terraced seatwall would be integrated at key points with both staired terraces and access ramps compliant with the Americans with Disabilities Act (ADA). A small concrete floodwall (roughly 100 feet long) at the same height of the seatwall would be constructed between the lifeguard station and the parking lot to provide a continuous layer of flood protection (refer to Concept B-1 figures of the CRMP Phase 1).

The Reconfigured Park concept (Concept B-2) would reconfigure the parking lot and grassy recreational areas essentially swapping the seaward edge of the parking lot for a more inland alignment where the parking lot would be reoriented more linearly along Camino del Oro. A grassy recreational area would be added along the entire western edge of the site (formerly parking lot) creating a linear and continuous grassy park (refer to Concept B-2 figures of the CRMP Phase 1).

The project design would keep existing footprints of the grassy recreational areas and parking lot intact (the total area of recreational space would remain the same and the total number of parking spaces would remain the same). The goal of this design would be to create a waterfront park design moving the parking lot farther away from potential flood hazards. This strategy would use a softer shoreline solution that can accommodate temporary flooding without

increasing gray protective features. This offers a reduction of potential visual impacts and potential increasing usable recreational space by joining the two areas. The design of the grassy recreation areas could incorporate the elevated earthen dike with an amphitheater design as described above, or it could incorporate a gradual slope across the entire area.

Pacific Beach – Tourmaline Surf Park

Site Conditions and Constraints

The approximately 3.65-acre Pacific Beach – Tourmaline Surf Park project site is located along and at the end of Tourmaline Street, west of La Jolla Boulevard. The stretch of beach at this project site is naturally narrow due to the coastal bluff-backed setting. The project site contains open space beach and shoreline to the west, a developed parking lot and landscape areas to the east, and stormwater infrastructure along the northern perimeter of the project site boundary. The Pacific Beach – Tourmaline Surf Park project site is bordered to the north, south and east by residential development and to the west by the open waters of the Pacific Ocean. The project site consists of Tourmaline Street west of La Jolla Boulevard, including the landscaped recreational area immediately north of this roadway, the Tourmaline Beach parking lot and a ramp entrance to the beach on the west. Two small grassy landscaped recreational areas are located on either side (north and south) of the parking lot entrance along Tourmaline Street (refer to Figure 12, Tourmaline Beach). The grassy area to the north of Tourmaline Street provides two picnic areas.

The Pacific Beach – Tourmaline Surf Park project site is along a west-facing shoreline and is characterized by a narrow sandy beach backed by coastal bluffs. Offshore reefs help dissipate wave energy at this site and also make this a popular location for surfers. A narrow valley cuts east-west through the bluff at the project site and provides coastal access via a roadway (Tourmaline Street) down to the parking lot and beach. Between the parking lot and beach sits a restroom with showers and a paved access ramp, which provides access to the beach for pedestrians and vehicles. The access ramp is an important City resource for public safety (i.e., lifeguard access) as well as maintenance vehicles. Therefore, the access ramp is buffered with a shoreline protection feature consisting of large boulders (i.e., riprap) and cobble to preserve the pedestrian and vehicle access along the ramp and prevent undermining of the parking lot. A vegetated median between the restroom and the access ramp provides additional protection to the restroom from coastal flooding.

While formal coastal access is directed along the ramp toward the southern end of the riprap, it is common for surfers and beachgoers to descend the north end of the riprap near the outfall of a drainage culvert that borders the north edge of the project site.

Cobble is native to this beach and is typically exposed with a narrower beach during the winter and a wider and sandier beach in the summer. The City implements the winter berm program adjacent to the south of the project site. This winter berm is approximately 6 to 8 feet high, up to 20 feet wide, and approximately 400 feet long. The winter berm is constructed in the fall to reduce impacts of flooding to the beach amenities and preserve the pedestrian and vehicle access along the ramp.

Project Concept Description

The concept for Pacific Beach – Tourmaline Surf Park (Concept C-1) would convert the existing shoreline protection feature into a hybrid nature-based solution. The existing riprap would be buried to provide a core layer and topped with a mix of cobble and sand. The proposed sand and cobble dune (with a rock core) would be vegetated with native plantings, which would provide ecological benefits through introduction of rare plant species and habitat for various bird species. The proposed sand dune would provide protection for the existing access ramp, restroom, and parking lot from existing and projected flooding impacts associated with sea-level rise as well as provide a reservoir of sand and cobble to the beach that can be used during erosive conditions. A 10-foot-wide section along the crest of the dune would remain unvegetated to allow for sitting and viewing space, similar to the existing sandy area near the top of the access ramp. Existing seating areas are limited to a couple of benches and logs at the west end of the parking lot. Some visitors also sit on the existing revetment. Additional seating and enhanced viewing areas would be integrated into the top of the vegetated dune increasing the usability and aesthetics of the site. Formalized pedestrian access would be integrated into the northern end of the dune. This could come in the form of a traditional staircase or an integrated approach (e.g., a “lily pad” feature comprised of a series of specifically placed rocks) on the north end of the dune that would improve safety for visitors and limit foot traffic effects (e.g., minor erosion and trampling) on the vegetated dune (refer to Concept C-1 figures of the CRMP Phase 1).

Overall, this proposed vegetated sand dune would allow for continued shoreline protection and use of the access ramp while improving the resilience of the feature, enhancing habitat opportunities, increasing the aesthetics of the site, maintaining existing parking on site, and preserving coastal access. In addition, restoration of the existing vegetated median between the restrooms could occur where the invasive iceplant would be removed from the existing vegetated median and replaced with appropriate native vegetation. Vehicle and pedestrian access is currently prevented across this median due to the railing adjacent to the restrooms, and this area could serve as a restoration area where trampling impacts would be very limited. Additionally, water runoff from the shower currently flows down the access ramp. The restoration of the vegetated median could be designed to integrate drainage from the shower area, which would help irrigate the dune plants while reducing slip hazards along the walkway and access ramp.

An optional component includes covering or undergrounding the existing drainage culvert along the north edge of the project site. While this infrastructure is important to convey stormwater, especially during rain events, it currently occupies space along the parking lot that could be optimized for public recreation. There is no continuous sidewalk or walkway along the parking lot, requiring pedestrians to traverse through the parking lot to reach the beach. By covering or undergrounding the culvert, a walkway could be placed over the feature to support pedestrian access to the coast and improved pedestrian safety. Additionally, this dedicated pedestrian accessway along the parking lot would provide a better connection between the beach and the two underutilized picnic areas, which are currently separated from other gathering areas. With this option, the pedestrian accessway improvements on the northern end of the dune could be integrated with the covered or underground culvert. Additional optional stormwater improvements include an underground vault beneath the parking lot to capture runoff and provide water quality treatment. These features can be integrated within the concepts for the site as the designs are further developed. Initial review by the Stormwater Department confirmed the potential for both of these design features at this project site however additional

assessments would be needed as this project concept moves forward to confirm asset condition, maintenance requirements, and model climate change conditions for the channel to determine if additional capacity may be needed.

Mission Beach

Site Conditions and Constraints

Mission Beach is an approximately 2.18-mile-long west-facing beach that runs from Pacific Beach to the north to the entrance channel into Mission Bay to the south. The beach is bounded by the Pacific Ocean to the west and the Mission Beach Boardwalk (Ocean Front Walk) to the east (refer to Figure 14, Mission Beach).

The approximately 8.13-acre Mission Beach project site consists of an approximately 0.3-mile stretch of Mission Beach bounded by Ventura Place to the north and San Fernando Place to the south. The project site consists primarily of the sandy beach area west of Ocean Front Walk. The project site encompasses temporary lifeguard towers and the Mission Beach Lifeguard Station, a permanent lifeguard facility, located east of the project site, on the west side of the northern Belmont Park parking lot. The land immediately east of the project site across Ocean Front Walk includes commercial and recreational uses, such as Belmont Park, associated parking lots to the north (approximately 250 vehicle parking spaces) and south (approximately 450 vehicle parking spaces) and Mission Beach Park at the southern end. A public restrooms facility is located south of Belmont Park and west of the southern parking lot.

A 3-foot-tall seawall provides a border on the west side of Ocean Front Walk. Within the Mission Beach project site, there are seven gaps in the seawall, which provide access between the beach and Ocean Front Walk. These seawall breaks are protected by staggered seawalls to reduce flood vulnerabilities. However, the Mission Beach project site and inland areas are already exposed to the effects of coastal flooding from overtopping events that move water and sediment over the seawall resulting in flooding and sediment/debris accumulation at Ocean Front Walk.

Project Concept Description

Two general concepts (Concept D-1 and Concept D-2) encompass a suite of options for Mission Beach.

The Sand Dune concept for Mission Beach (Concept D-1) would construct an elevated sand dune seaward (west) of the seawall and Ocean Front Walk. The proposed sand dunes would be vegetated with native plantings, which would provide ecological benefits. The sand dunes, which are inspired by the City's existing winter berm program, would provide flood protection to the community of Mission Beach by adding elevation to the landward side of the beach and by providing a reservoir of sand to the beach that can be used during erosive conditions. The proposed sand dunes would be a permanent feature a permanent fixture at the project site and would be designed to provide protection from existing and projected flooding impacts associated with sea-level rise.

Appropriate openings and passageways would be designed into the dune structure to ensure public access to the beach, limit flood pathways, and integrate with the existing structural protection of the seawall breaks (refer to Concept D-1 figures of the CRMP Phase 1). As described for the Pilot Project at Ocean Beach – Dog Beach, the orientation/angle of the accessways would

be designed to limit flood water from entering accessways and walking paths during extreme events (e.g., combined high wave energy and high tide). For instance, accessways might be angled away from the dominant wave direction to minimize direct water entry. Small berms and elevation increases might be included in vehicle and pedestrian accessways to divert water away from the paths, providing additional protection against flooding. The dune would be planted or seeded with a native mix of vegetation appropriate for coastal dunes in the area.

The Perched Beach concept for Mission Beach (Concept D-2) considers swapping out grass recreational space at Mission Beach Park, the southern area of the project site, for a perched sand beach. A perched beach is an elevated beach area that would provide increased usable beach space during higher water levels and offers a reservoir of sand for the adjacent beach area. This would be achieved by realigning the seawall and Ocean Front Walk inland. The elevated perched beach would provide more beach space that is usable during higher water levels and offers a reservoir of sand for the adjacent beach area. This concept could be implemented in conjunction with a dune feature stretching north along the project site (refer to Concept D-2 figures of the CRMP Phase 1).

Ocean Beach – Beachfront (Pier)

Site Conditions and Constraints

The Ocean Beach – Beachfront project site is immediately adjacent to and south of the Ocean Beach – Dog Beach site. The approximately 11.9-acre project site consists of open space beach and shoreline, as well as a developed parking lot, with a small portion of commercial development along the southeastern edge. The site extends from the groin at the south end of the Ocean Beach – Dog Beach project site to the Ocean Beach Pier. The Ocean Beach – Beachfront project site primarily consists of sandy beach between small single-family residences to the east and the Pacific Ocean to the west. The beach is wide at the northern end and becomes narrower and tapers off to the south as it reaches the Ocean Beach Pier (refer to Figure 18, Ocean Beach – Beachfront).

The northeastern part of the beach supports four volleyball courts used by beach volleyballers. South of the volleyball courts are two grassy landscaped areas (Saratoga Park to the north and Ocean Beach Veterans Plaza to the south) separated by a small, paved public parking lot that provides approximately 66 vehicle spaces, including three ADA accessible parking spaces and one electric vehicle charging station. Public restrooms are provided at the southern end of the parking lot. A permanent lifeguard facility (Ocean Beach Lifeguard Station) is located at the southern edge of the parking lot adjacent to the public restrooms. The Ocean Beach Veterans Plaza is often used by art vendors and for community events, such as silent discos, drum circles, and yoga classes. South of the Veteran's Plaza and north of the pier is another paved public parking lot, which provides approximately 84 vehicle spaces and four motorcycle spaces.

Existing rock riprap protects the northern parking lot area, lifeguard station, and most of Ocean Beach Veterans Plaza from coastal impacts. Additionally, an approximately 2-foot-tall seawall lines the southeastern border of the beach adjacent to a pedestrian path between the southern portion of the Veterans Plaza and the tidepools south of the pier. One gap in the seawall providing beach access is located near the intersection of Abbot Street and Newport Avenue.

Project Concept Description

Similar to Ocean Beach – Dog Beach, the concept for Ocean Beach – Beachfront (Pier) would construct a multi-use path for cyclists and pedestrians fronted by an elevated vegetated sand dune. The dunes and path would be located along the landward edge of the beach and would connect to the proposed improvements at the Dog Beach project site. As such, the multi-use path would connect the existing western terminus of the San Diego River Trail to the Ocean Beach Pier (refer to Concept E-1 figures). The proposed multi-use path and sand dunes would include pedestrian and emergency access points along the project site and maintain all existing parking.

As this project moves forward, there is the opportunity to align the project design with other improvements, including an upgrade the existing lifeguard station and local park and amenity enhancements at Veterans Park and Saratoga Park. As this concept is developed there are opportunities to combine aspects of these other ongoing efforts and leverage external funding sources.

Sunset Cliffs

Site Conditions and Constraints

Sunset Cliffs Boulevard is a two-way two-lane roadway that runs north–south adjacent to the Sunset Cliffs Linear Park and along an actively eroding cliff to the west. Sunset Cliffs Linear Park runs between Adair Street to the north and Ladera Street to the south including an approximately 1.17-mile-long stretch of open space shoreline and coastal trail adjacent to the Pacific Ocean to the west and Sunset Cliffs Boulevard to the east (refer to Figure 20, Sunset Cliffs).

A number of informal trails break off from the main Sunset Cliffs coastal trail and lead toward lookout points along the cliffside. An informal beach access path leads down to No Surf Beach, and a formal accessway with stairs is provided at the southern boundary (the intersection of Sunset Cliffs Boulevard and Ladera Street). The area immediately south of this project site (Sunset Cliffs Natural Park) is in the MHPA of the Multiple Species Conservation Program Subarea Plan. Along this stretch of road, widths between Sunset Cliffs Boulevard and the cliff edge vary widely (less than 5 feet to more than 300 feet). This condition results in varying amounts of space for trails, paths, and gathering spaces for recreational uses, which mostly consist of walking, jogging, ocean viewing, biking, and surfing. There are no formal bike lanes within the Sunset Cliffs project site, only sharrow (i.e., shared vehicle and bicycle route) designations exist for the roadway. Due to the generally narrow space between the guardrail and cliff edge, pedestrians must typically walk along or even within the road for certain segments of the Sunset Cliffs trail.

Four small parking lots that provide approximately 65 total vehicle spaces for Sunset Cliffs are located west of Sunset Cliffs Boulevard and northwest of Froude Street. South of Hill Street dispersed parallel parking spaces occur on the west side of Sunset Cliffs Boulevard from Luscomb's Point to Ladera Street. Additionally, parallel parking is available on both sides of all of the cross streets that intersect with Sunset Cliffs Boulevard.

Project Concept Description

A suite of solutions was considered for Sunset Cliffs with a focus on shifting management strategies from reacting to bluff erosion to preparing a proactive approach to address the coastal hazards (refer to Concept F-1 figures of the CRMP Phase 1).

One concept for Sunset Cliffs includes a road reconfiguration on Sunset Cliffs Boulevard, which would convert the roadway into a one-lane one-way southbound vehicular travel lane with a separated multi-use path for pedestrians and bicyclists. Currently the design is in early stages of development, with further analysis, and community engagement to refine and finalize the project concept.

One potential concept would be to implement the road reconfiguration at the southern portion, between Guizot Street and Ladera Street. This project would initially be tested through temporary pilot (trial) phases to monitor the project and incorporate lessons learned back into the project design. As such, the road reconfiguration and separated multi-use path would be initially simulated through cones, signage, and other temporary traffic calming devices (e.g., water filled Jersey barriers) that are easily moved and modified. Pilot road reconfiguration layouts could be trialed on a single or multiple, weekday or weekend basis coupled with substantial public outreach and engagement to better inform the design of a more permanent solution. One or more traffic studies would also be completed to better inform the roadway design and identify potential impacts and mitigation strategies. Following completion of the pilot and additional studies and outreach, an optimized design approach would be established identifying the portion of the roadway that would be permanently reconfigured to realign vehicle, bicyclist, and pedestrian travel away from the cliff edge.

Additional project elements would include habitat enhancement through removal of invasive species and installation of native plants along the Sunset Cliffs Linear Park. Trail enhancement, interpretative signage and drainage improvements would also be implemented along the Sunset Cliffs project site, where feasible and appropriate.

An additional project concept is to realign the parking lots along the northern portion of the project site away from the cliff edge. Parking lots could be reoriented to pull in parking spots with no net loss of parking. Drainage from these parking lots may contribute to cliff erosion and could be assessed during realignment. Realignment of the parking lots could enhance pedestrian safety and provide opportunity to realign the trail and provide additional vegetated area within the park.

Given the narrow cliff edges and limited amount of recreational space consisting of informal trails, the major focus for the Sunset Cliffs project is to enhance the existing resources without compromising the structural integrity of the cliff or current infrastructure. Inland drainage components could also be considered to further reduce stormwater flow on and through the cliffs to reduce erosion. Drainage capture, transport and discharge infrastructure improvements at the individual street level would help reduce additional contributions to cliff erosion.



This page intentionally left blank.

Appendix B

Public Engagement Plan



Appendix B: Public Engagement Plan

Prepared for:



Prepared By:



3

Overview

Introduction
Importance of Public Engagement
Project Goals and Objectives
Outreach and Engagement Approach
Engagement Methods
Engagement Partners
Key Stakeholders

9

What Has Been Done So Far?

Stakeholder Advisory Committee
Pop-up Outreach Events
Online Survey
Community Workshops

11

What's Next?

Stakeholder Advisory Committee Meetings
Pop-Ups
Public Meetings and Workshops
Tribal Engagement
Digital Engagement
Educational Campaigns
Public Hearings

13

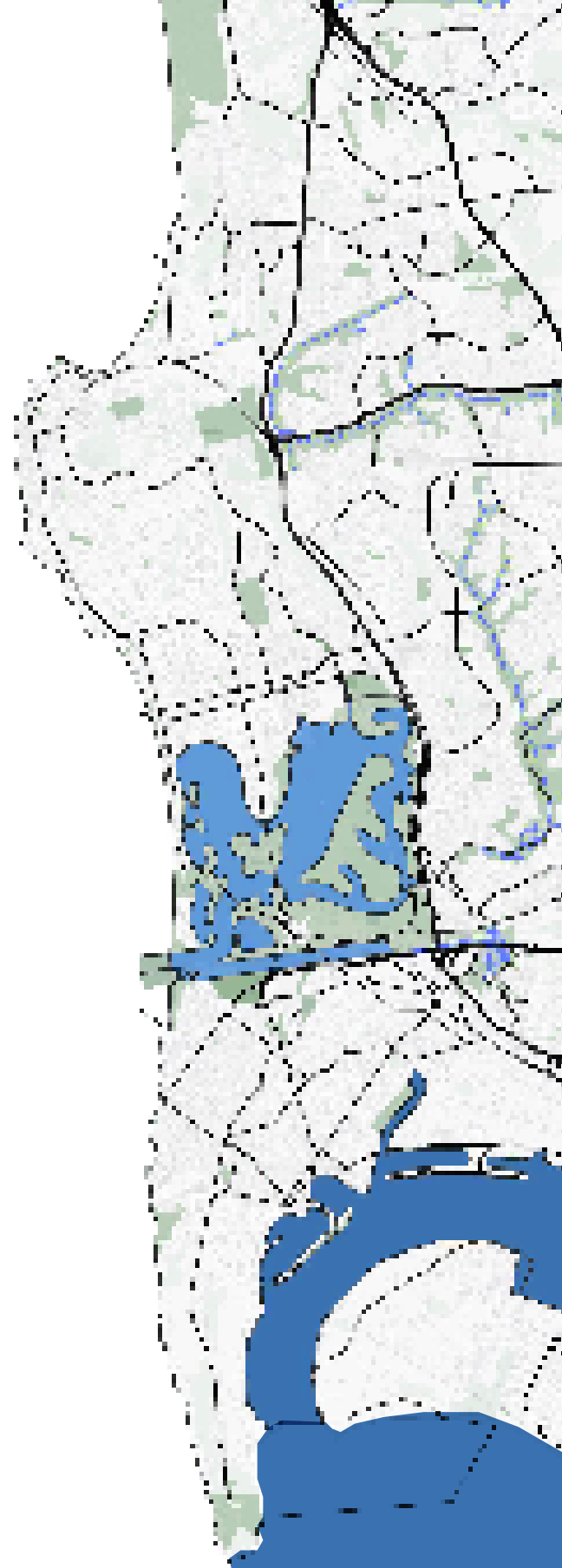
How Do I Stay Involved?

Project Timeline
Schedule of Upcoming Events
Project Website
Email Newsletters
Social Media


The City of San Diego (City) received grant funding from the National Fish and Wildlife Foundation and the California State Coastal Conservancy to develop a Coastal Resilience Master Plan (CRMP). The CRMP is an implementation action of Climate Resilient SD.

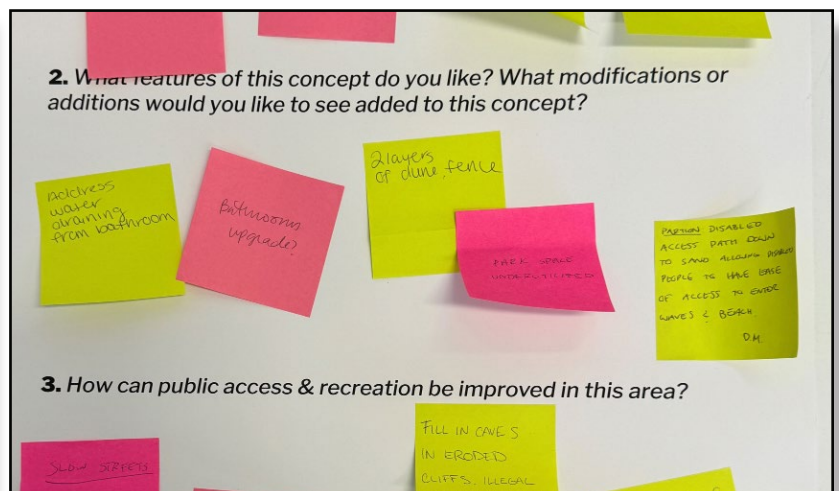
The plan will identify nature-based solutions for locations along San Diego's coast to improve the resilience of our communities to sea level rise while also benefiting wildlife, habitat and natural coastal resources.

The plan will include the development of concept-level designs for six locations along San Diego's coast, a pilot project, technical studies, and completion of a California Environmental Quality Act (CEQA) environmental analysis. Throughout plan development, the City will engage with stakeholders and community members through a stakeholder advisory committee, pop-up engagement events, and community workshops and webinars.



Public engagement is crucial for the success of the CRMP, as it ensures that the voices and concerns of the local community are heard and addressed. By actively involving residents, stakeholders, and community organizations, the planning process can benefit from diverse perspectives and local knowledge, leading to more robust and widely supported resilience strategies. Engaging the public helps build trust, transparency, and a sense of shared ownership in the initiatives designed to protect and enhance the coastal areas. Moreover, it fosters a collaborative environment where community members are more likely to contribute to and advocate for the long-term sustainability and resilience of San Diego's coastal ecosystems and communities. Where each engagement type and event falls on the spectrum has been identified to ensure a well-balanced mix of opportunities to engage is provided.

	INFORM	CONSULT	INVOLVE	COLLAB	EMPOWER	INCREASING IMPACT ON THE DECISION 
Public Participation Goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.	
Promise to the Public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.	

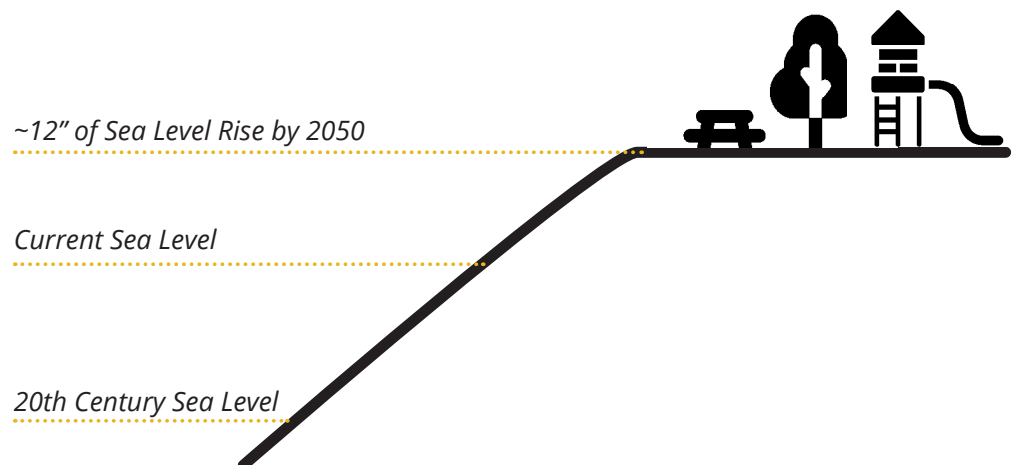
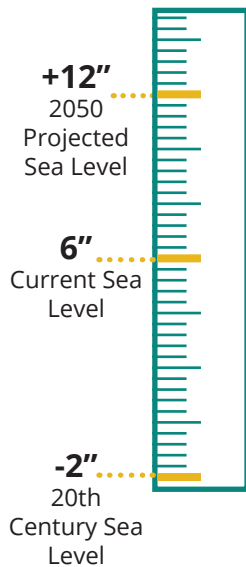
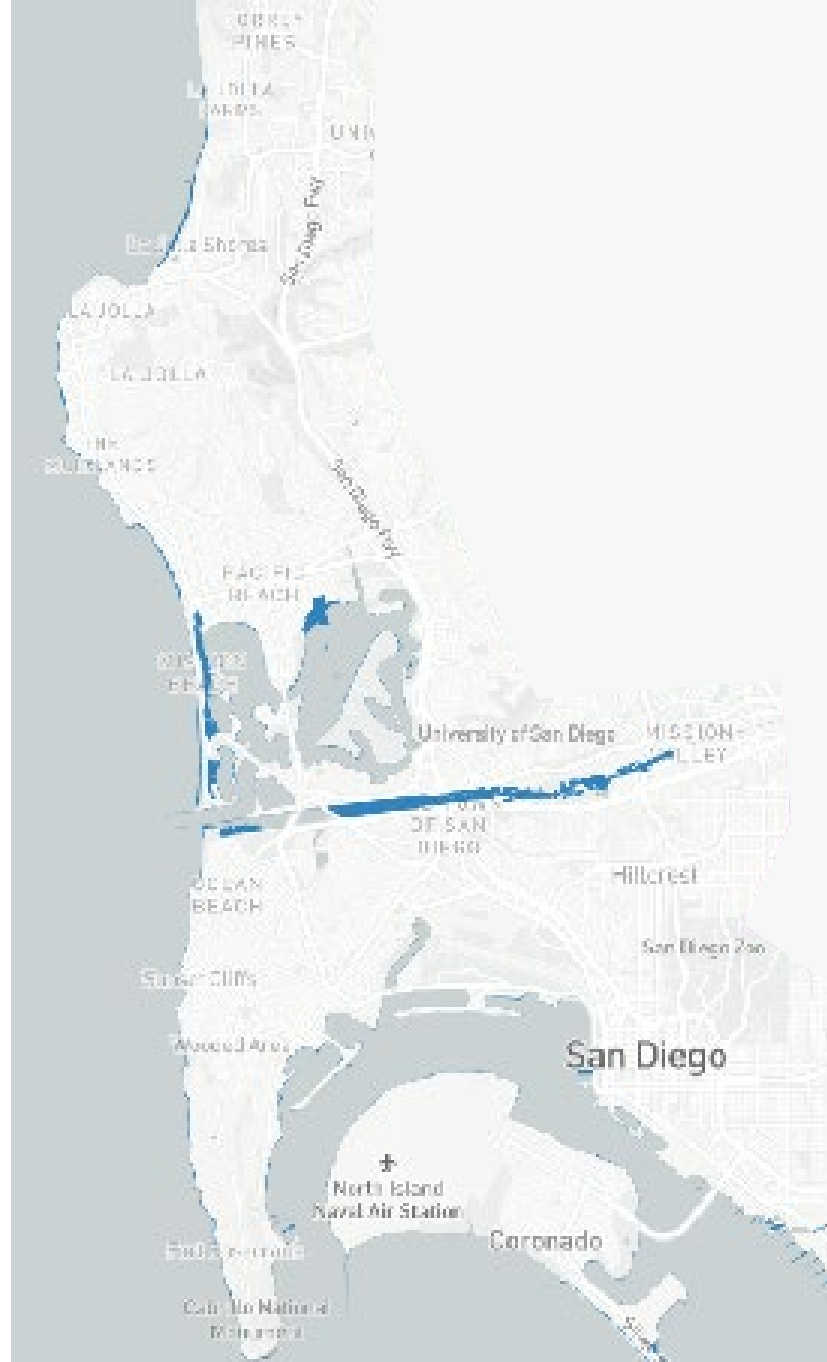


Project Goals and Objectives

Climate change increasingly puts the City and its critical built and natural resources at risk of coastal flooding and erosion due to sea level rise. The CRMP will identify specific resilience and conservation needs along the coastline and develop a portfolio of nature-based solutions to promote resilience, protect critical coastal habitats, and support coastal access. The CRMP will engage the public; analyze sites based on feasibility, risk, and benefits; develop nature-based solutions for the most feasible locations; and select a pilot project, as described further below.

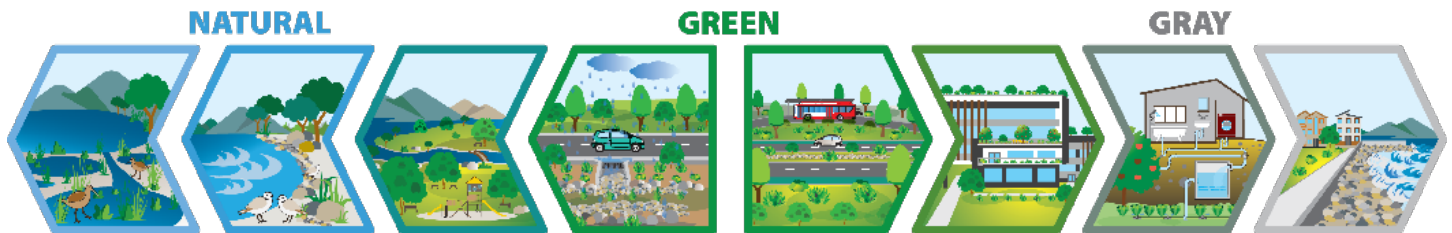
During the 20th century, sea levels rose **0.71** feet in San Diego. **By 2100**, San Diego could experience up to **6.6 feet** of sea level rise.

Sea level rise will mean more flooding and faster rates of erosion along the coastline, and will be worsened by other means of flooding events that we already experience.



Project Goals and Objectives

The CRMP evaluates 10 locations along the coast that are vulnerable to sea level rise for the development of nature-based solutions at a conceptual level. Based on selection criteria, six locations most appropriate for nature-based solutions are selected. These locations will be analyzed in greater detail for the CRMP with multiple project concepts developed for each site and workshopped with City departments, a Stakeholder Advisory Committee, and community members to refine and determine the most suitable project concept for each site.



The CRMP will evaluate nature-based solutions, including both green and natural infrastructure. Green infrastructure encompasses a wide range of built or engineered solutions modeled after nature, while natural solutions often refer to restoration activities. Nature-based solutions are prioritized, due to their multiple benefits and alignment with policy and funding priorities. Public engagement for the Climate Resilient SD (CRSD) has shown a clear preference for nature-based solutions to support coastal resilience. Additionally, our designs aim to increase coastal access, improve habitat and wildlife protection, provide recreational opportunities, and boost resilience against potential upstream impacts.

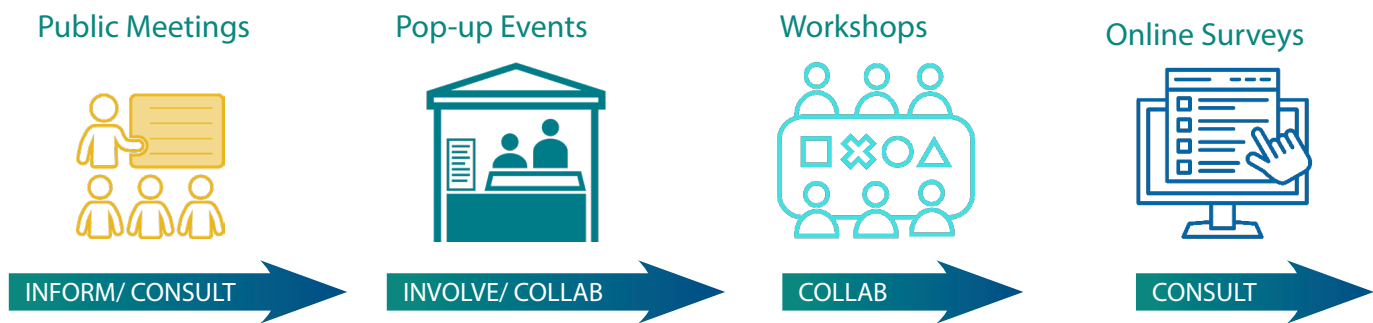
Outreach and Engagement Approach

Community engagement for this project will include multiple opportunities and ways to engage to ensure diverse community voices are heard and community feedback is incorporated throughout the planning process. Outreach and engagement efforts are anticipated to include interactive online feedback platforms, workshops, and pop-up engagement events. Engagement materials will be provided in multiple languages, and translation services will be offered as needed. Community engagement to complete development of the CRMP will focus on gathering feedback from stakeholders on the CRMP and proposed project ideas. Following completion of the CRMP, community engagement will focus on continued interaction with stakeholders and education opportunities around nature-based solutions and resilient coastlines.



Engagement Methods

A range of engagement methods are required to ensure active and meaningful engagement with stakeholders. Pop-up events provide for good one-on-one conversations and include interactive boards and graphics with prompting questions and space to annotate concepts and add notes. Workshops provide an opportunity for group work, with tabletop exercises focused on nature-based concepts for each site, a group brainstorming exercise, an opportunity for “storytelling” to allow participants to share personal and cultural experiences for each site, and a larger group discussion and public comment period. Digital Engagement (such as online surveys and a project website) allow stakeholders who are not able to make it to the pop-up events and workshops an opportunity to participate on their time.



Engagement Partners

The following represent a few of our current engagement partners for the project:



CALIFORNIA
**OCEAN
PROTECTION
COUNCIL**



Coastal Conservancy
STATE of CALIFORNIA

UC San Diego



SCRIPPS INSTITUTION OF
OCEANOGRAPHY

Every successful engagement and outreach program starts with a clear identification of key community stakeholders. A working list of key stakeholders is provided below. This list focuses on stakeholders and organizations that may have a direct impact on the CRMP. However, everyone is welcomed to participate and engage in the CRMP. Outreach methods are designed to allow for a diverse and inclusive community planning process.

Key Internal Stakeholders:

- City of San Diego City Planning Department
- City of San Diego Engineering & Capital Projects
- City of San Diego Fire Rescue
- City of San Diego Sustainability and Mobility Department
- City of San Diego Parks & Recreation
- City of San Diego Stormwater
- City of San Diego Transportation

Key External Stakeholders:

- Army Core of Engineers
- Audubon
- CA Coastal Commission
- CA Department of Fish and Wildlife
- CA Ocean Protection Council
- CA State Parks
- Caltrans
- Circulate SD
- Coastkeeper
- County of San Diego
- Department of the Navy
- Groundwork SD
- Port of San Diego
- Regional Water Quality Control Board
- San Diego Airport
- San Diego Foundation
- San Diego MTS
- San Diego Regional Climate Collaborative
- San Diego River Conservancy
- SANDAG
- Scripps Institution of Oceanography
- State Coastal Conservancy
- Surfrider
- U.S. Fish and Wildlife Services
- UC San Diego
- Wildcoast

Key Community Groups:

- Beautiful PB
- Bird Rock Community Council
- Discover PB
- Enhance La Jolla
- La Jolla Community Planning Association
- La Jolla Community Planning Group
- La Jolla Parks and Beaches
- La Jolla Recreation Advisory Group
- La Jolla Shores Association
- La Jolla Town Council
- Mission Beach Planning Group
- Mission Beach Town Council
- Ocean Beach Community Development Corporation
- Ocean Beach Main Street Association
- Ocean Beach Planning Group
- Ocean Beach Town Council
- Pacific Beach Planning Group
- Pacific Beach Town Council
- Peninsula Planning Group
- Point Loma Association
- Sunset Cliffs Natural Park Council



What Has Been Done So Far?

Stakeholder Advisory Committee

The City invited 22 stakeholder agencies to participate in a Stakeholder Advisory Committee comprised of local, state, and federal agencies, research institutions, coastal-focused environmental groups, and transportation agencies. The Committee was formed to support the project and provide technical input on feasibility, benefits, and prioritization of proposed nature-based solutions, as well as coordination efforts. For Phase 1 of the CRMP, three Committee meetings were held.

1

Meeting 1 (June 2023): Project Kickoff: Project team introduced the project, role of the Committee, prioritization criteria, and site selection process.

2

Meeting 2 (September 2023): Project Team presented initial concepts for the project sites and obtained feedback on additional considerations.

3

Meeting 3 (June 2024): Project Team presented on CRMP planning process, shared revised concept designs and received feedback on designs and additional considerations.

Pop-Up Outreach Events

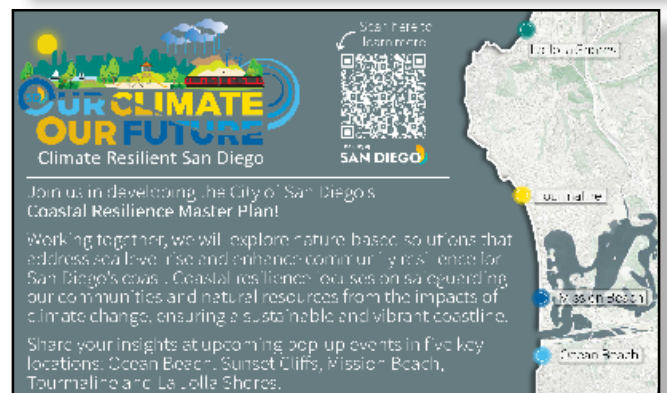
The City conducted eight pop-up events in winter and spring 2024. Pop-up events are a good way for city staff to go out and engage with the community. They enable the City to reach people where they are.

Pop-Up Events Conducted in Phase 1:

- **February 28th, 2024** – Ocean Beach Farmer's Market: 4pm – 8:30pm
- **April 13th, 2024** – Tourmaline Beach: 9am – 12pm
- **April 20th, 2024** – EarthFest at Balboa Park: 11am – 3pm
- **April 22nd, 2024** – Valencia Park/Malcom X Branch Library: 3:30pm – 5:30pm
- **April 25th, 2024** – Tourmaline Beach: 5:30pm – 7:30pm
- **April 27th, 2024** – Sunset Cliffs at Ladera Boulevard: 9am – 12pm
- **May 11th, 2024** – La Jolla Shores Park at the MAP: 9am – 12pm
- **May 25th, 2024** – Mission Beach at Belmont Park: 9am – 12pm



A summary of input received from the Pop-up Outreach is available on the project website under separate cover.



Online Survey

What is the most important feature of this location to you?

For example: Walking paths, beach space

Type your answer here... |

OK

What activities do you do here?

Choose as many as you like

RUNNING

SWIM

BIKING

PICNIC

RELAXING

SURFING

The City launched an online survey for community members to learn more about the project and provide feedback on the sites. The survey was launched at the end of April and open through the end of June, 2024. The survey was marketed through the project webpage, Climate Resilient SD email list, Stakeholder Advisory Committee, fliers, and the pop-up events. The survey sought to better understand how the community used and accessed the project locations, what they valued about the coastline, gather feedback on the project design, and understand ways to improve coastal access and recreation opportunities at the site.



A summary of input received from the Online Survey is available on the project website under separate cover.

Community Workshops

Workshops allow community stakeholders to gather around a topic or project. City staff and the consulting team provided a space and format that facilitated sharing ideas and concerns and encouraged brainstorming and collective problem-solving around potential nature-based solutions across the six selected sites. Two workshops were held in June 2024, each focused on three of the six site locations for the CRMP.

1

Ocean Beach & Sunset Cliffs

June 24, 2024; 5 - 7 p.m.

Ocean Beach Recreation Center, 4726 Santa Monica Avenue, San Diego CA 92107

2

Mission Beach, Tourmaline, & La Jolla Shores

June 25, 2024; 5 - 7 p.m.

La Jolla Riford Library Community Room, 7555 Draper Ave, La Jolla CA 92037



A summary of input received from the Community Workshops is available on the project website under separate cover.



What's Next?

More community outreach and engagement is planned for Phase 2 of the CRMP. Engagement efforts will focus on refining elements of the draft CRMP. Stakeholders will have an opportunity to weight in on and shape the proposed nature-based solutions for each of the six sites. Outreach events will narrow in on the design, engineering, and programming considerations for each site.

Stakeholder Advisory Committee Meetings

The Stakeholder Advisory Committee developed as part of Phase 1 will continue to be engaged in Phase 2. The committee will provide technical input on feasibility, design, and implementation of nature-based solutions. The committee will meet over the duration of the project, including coordination for the updated CRMP, engineered designs, and technical reports.

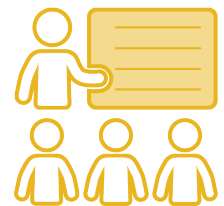
Pop-ups

Pop-ups provide a great opportunity to remain visible and stay connected with community stakeholders. They are also a successful method of outreach to underrepresented Communities of Concern. The City team will host additional community pop-ups with a focus on outreach to communities that are traditionally excluded from public engagement or who have not yet been engaged in the CRMP. This may include popping up at high-traffic locations and at community events.



Public Meetings and Community Workshops

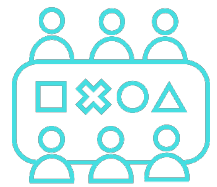
Workshops provide an interactive, hands-on approach to outreach that is not always possible through pop-up events, meetings, and online surveys. Additional workshops will allow community stakeholders to “dive” deeper into the features of the six sites, explore the range of nature-based solutions that are available for each site, and provide meaningful insights into the design, activities and access opportunities of each site. Workshops will provide the opportunity for collaborative and participatory development of a shared future vision of the coast, with consideration for sea level rise, helping to inform project design and provide a long-term frame for future coastal planning.



Tribal Engagement

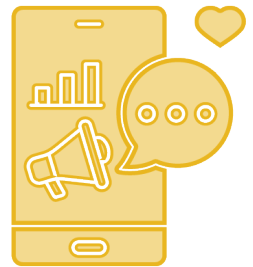
The City team will initiate Tribal Engagement by contacting all local tribes via email and mail to introduce the project and invite representatives of the tribes to participate in the planning process. The City's goal is to work collaboratively with the tribal community to incorporate tribal perspectives and traditional knowledge, address tribal concerns, acknowledge tribal history, and develop site specific measures to create coastal resilience.

Tribal engagement will look to establish a co-stewardship relationship. Specific engagement will be determined by the tribes but may include participation in the Stakeholder Advisory Committee, participation through listening sessions, workshops and community or tribal events, and/or other engagement opportunities. Additional outreach will involve contacting organizations and agencies that work closely with tribal nations.



Digital Engagement

Digital forms of engagement offer a good alternative to meetings, pop-ups, and workshops and can provide a more inclusive and accessible option for individuals or groups who may not have either the time or means to participate in more traditional forms of outreach. The CRMP project should consider hosting a webinar that “flips” the traditional town hall format into an online forum. Online surveys, audiobooks, and interactive mapping could also be offered through the project website and on online engagement platforms (such as Social Pinpoint or Konveio). And interactive storytelling could be added through an ESRI Storymap for the project.



Educational Campaigns

Following the release of the CRMP, ongoing educational campaigns will raise awareness of climate change impacts and sea level rise adaptation strategies, and communicate the trade-offs associated with coastal resilience planning efforts. This effort should include best practices and capacity building resources that may be shared with collaborators and partner organizations as they continue to champion the cause of coastal resilience in our region.

Public Hearings

Following release of the draft plan, the CRMP will move forward through the public review and hearing process where there will be additional opportunity for community members to provide feedback and give testimony.



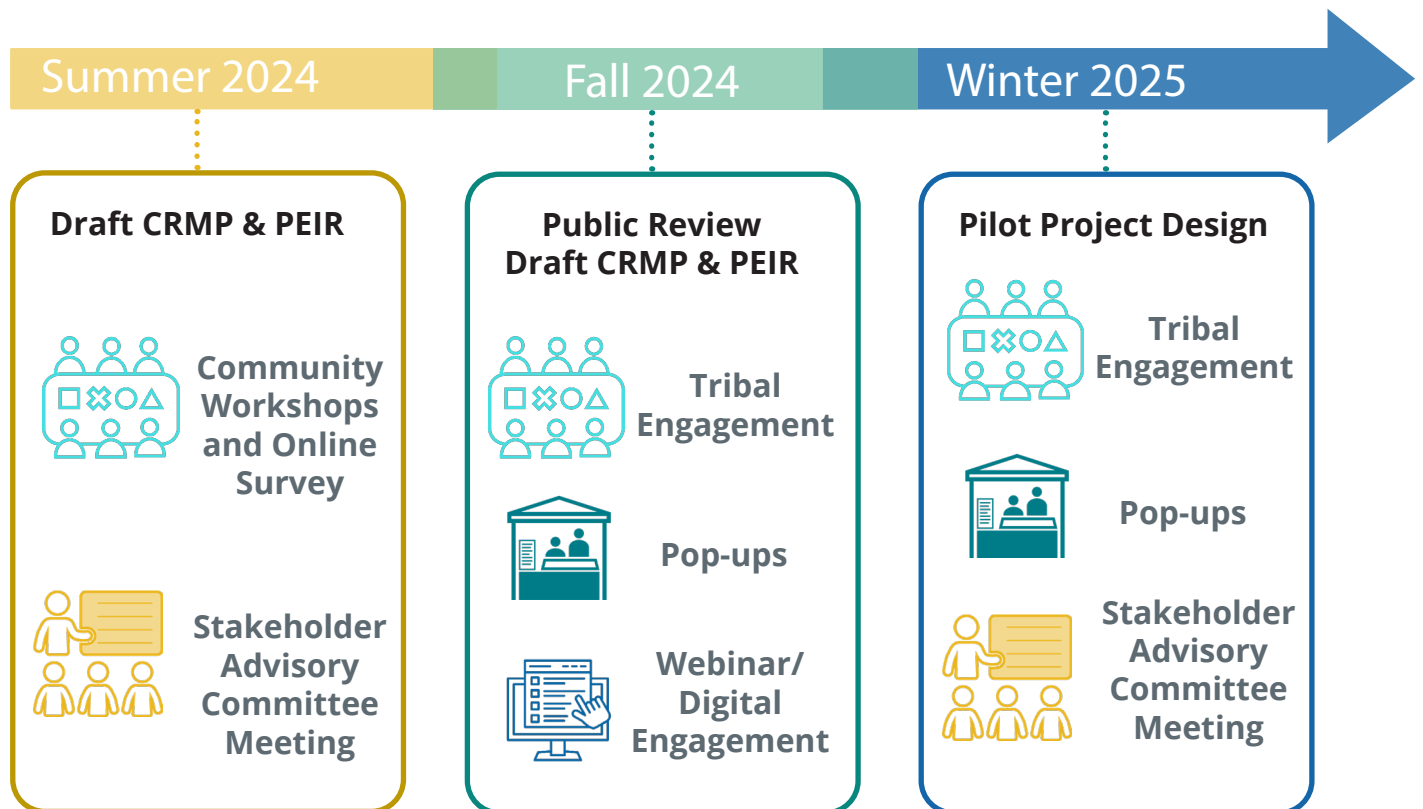
How Do I Stay Involved?

Project Timeline

Community engagement for the CRMP builds on the community engagement and education efforts beginning in 2018 for the Climate Resilient SD Initiative.



Schedule of Upcoming Events



The CRMP project provides multiple ways to stay engaged! Scan the QR Codes below to connect with our various informational resources and to stay informed and get involved.

Project Website:



[https://www.sandiego.gov/
climate-resilient-sd/projects/
coastal-resilience-master-plan](https://www.sandiego.gov/climate-resilient-sd/projects/coastal-resilience-master-plan)

Email Newsletters:



Social Media:





This page intentionally left blank.

Appendix C

Community and Stakeholder Engagement Summaries



Appendix C:

Community and Stakeholder Engagement Summaries

Prepared for:



Prepared By:



August 2024

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Sit on
seawall

Bike/
rollerblade
on
boardwalk

Walking,
biking,
beach

2

**What features of this concept do you like?
What modifications or additions would you like
to see added to this concept?**

Plantings
that retain
sand

More
drainage
holes in
seawall

Dunes will
make area
look more
naturalized

Locks or
tidal gates

Rolled berm
about 1'-2'
high

Dunes will
work

Expand
proposed
vegetation

Maintain
walkability,
separate
bikes and
pedestrians

Accessibility
walking on
beach

Seawall
maintenance

3

**How can public access & recreation be
improved in this area?**

Dedicated
area for
dogs

Keep
boardwalk
clean after
storms

Separation
from homes

More trash
receptacles

Go further
south
where more
flooding
occurs

Taller
seawall

Summarized Workshop Boards (Key Themes)

1

**Tell us a story of the “Day in the Life”;
How do you experience the site?**

2

**As a group, discuss different future scenarios
(e.g., severe storms, sea level rise, coastal
erosion) and brainstorm resilience strategies.**

3

**Mark areas of concern or interest on
the map and suggest improvements.**

**What additional amenities or
features would enhance the
usability and appeal of these
nature-based coastal areas?**

**How can we improve the
proposed public access and
recreational facilities while
ensuring environmental
sustainability?**

Homes need
protection

Seasonal
berms

Ice plant
works to hold
sand back
and prevent
erosion

Don't over-
groom the
beach

Other native
plants that
could work
as well

Fill & raise
by 5' entire
area

Provide stepped
seat wall behind
proposed dune
in front of
Belmont Park

Setback perched
beach to extend
into existing
grass area -
provide more
towel space

Dune mounds
like Smiley
Lagoon around
and in seawall

Winter berm
program

Summarized Survey Responses (Key Themes)

1

How do you primarily use Mission Beach?

37%
Visit the beach

37%
Visit the strand

9.9%
Visit Mission Beach Park or Belmont Park

16%
Other uses

2

What activities do you do in Mission Beach?

83.9%
Walking

67.6%
Relaxing

59.7%
Biking

53.2%
Swimming

46.8%
Surfing

45.2%
Running

3

How do you access / visit this location?

46.9%
Car

29.6%
Walk

16%
Bike

2.5%
Public Transit

4.9%
Other

4

Feedback on concept designs:

Majority in favor of dunes, some unsure if dunes will work

Concern about blocking views

Preference for planted dunes

Make artificial surf reef

Need more Parking & Bus Access

Fix Boardwalk

Need more access points to beach

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Walking dog

Running,
swimming

Walking
everyday

Sitting on
the beach

2

**What features of this concept do you like?
What modifications or additions would you like
to see added to this concept?**

Continuous
bikeway

Non-toxic
materials

Anything
to preserve
beach
naturally

Multiple
access
points to
dog beach

Multi-
use path
separating
sand from
asphalt

Jetty
misplaced,
crescent
beach

Fencing
before
dunes

Maintain
green open
space

Concerns
with height/
length of
dunes

Include dog
waste bags
along the
path

Interference
with
pedestrian
and bicycles
- currently
chaotic

Stormwater
issue is
more
prevalent

3

**How can public access & recreation be
improved in this area?**

Pier project
is priority

Multi-modal
access for
bikes

Prioritize
pedestrians

Preserve
volleyball
courts

Bio-based
paving
material
for path
(e-concrete)

Redo
restroom

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Walking pier

Fishing

More
equitable

2

**What features of this concept do you like?
What modifications or additions would you like
to see added to this concept?**

Supports
bike
connection

Gradual
dune
preferred

More
equitable

Beach re-
nourishment

Elevated
boardwalk

Native
planting
from local
sources

Ethically
sourced
sand

Dune re-
nourishment

Seawall in
front of
dune

Veterans
Park
opportunity

3

**How can public access & recreation be
improved in this area?**

More
Benches

Remove
parking to
improve
path

Playground
in Veterans
Park

Sand
retention

Layer dune
sand to
allow root
establishment

"Re-Beach"
case study

Summarized Workshop Boards (Key Themes)

1

**Tell us a story of the “Day in the Life”;
How do you experience the site?**

2

**As a group, discuss different future scenarios
(e.g., severe storms, sea level rise, coastal
erosion) and brainstorm resilience strategies.**

3

**Mark areas of concern or interest on
the map and suggest improvements.**

**What additional amenities or
features would enhance the
usability and appeal of these
nature-based coastal areas?**

**How can we improve the
proposed public access and
recreational facilities while
ensuring environmental
sustainability?**

I love this
plan!

Multi-use
path please

Likes
proposed
sand dune
with native
plants

Consider
rain
drainage

Wooden
fences
usually
vandalized

Consider
ADA access

Viewing
platforms
from
Saratoga
Park

Height of
dune not
blocking
views

Separate
paths, not
multi-use

Save the
volleyball
courts!

Need
improvements
on Spray St
at the end of
West Point
Loma Blvd

Collect
and reuse
rainwater

Protect/replace
bike path at
dog beach;
more dunes

Dunes by dog
beach are
good, dunes by
main lifeguard
tower are bad

Make more
pedestrian
friendly

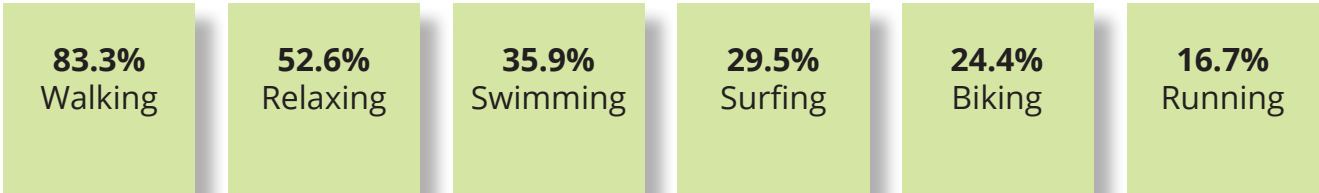
Sand dunes
need to be
stabilized

Summarized Survey Responses (Key Themes)

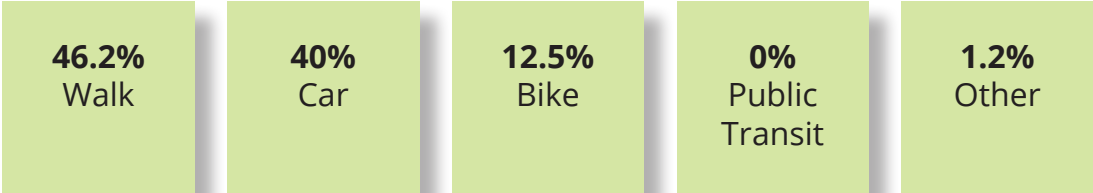
1 How do you primarily use the OB Dog Beach?



2 What activities do you do at the OB Dog Beach?



3 How do you access / visit this location?



4 Feedback on concept designs:



Summarized Survey Responses (Key Themes)

1

How do you primarily use the OB Beachfront?

44.7%
Leisure activity

28.9%
Athletics/
Sports

15.8%
Community events

10.5%
Other uses

2

What activities do you do at the OB Beachfront?

32.4%
Walking

24.3%
Relaxing

4.1%
Biking

14.9%
Swimming

14.9%
Surfing

1.4%
Running

3

How do you access / visit this location?

32%
Car

57.3%
Walk

9.3%
Bike

0%
Public
Transit

1.3%
Other

4

Feedback on concept designs:

Like multi-use path

Majority in favor of dunes with native plants

Maintain volleyball courts

No disturbance to native habitat

Dislike Mission Beach-style boardwalk

Add more parking and public transit

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Walking
everyday

Riding bike

Scuba diving

Kayaking/
surfing

Sports
gatherings

Recreation
space

2

**What features of this concept do you like?
What modifications or additions would you like
to see added to this concept?**

Stormwater
drainage
integration
needed

Less
concrete/
nature
based

Planted dune
in front of sea
wall facing
bathroom/
playground

Sand
Fencing

Improved
signage/
Need
Lockers

Dikes make
sense
- multi-
functional

Boardwalk
that includes
biking and
walking

Keep grassy
areas closer
to beach

Maintain
parking and
green open
space

ADA
accessibility

Designated
bike lanes

Raise
seawall, add
educational
journey
along wall

3

**How can public access & recreation be
improved in this area?**

Sand dune
makes more
sense

Camino del
Oro - one
way?

Raise sea
wall to stop
overtopping

Placemaking
- exercise
integration

Improvements
to boardwalk

Add flood
gates

Summarized Workshop Boards (Key Themes)

1

**Tell us a story of the “Day in the Life”;
How do you experience the site?**

2

**As a group, discuss different future scenarios
(e.g., severe storms, sea level rise, coastal
erosion) and brainstorm resilience strategies.**

3

**Mark areas of concern or interest on
the map and suggest improvements.**

**What additional amenities or
features would enhance the
usability and appeal of these
nature-based coastal areas?**

**How can we improve the
proposed public access and
recreational facilities while
ensuring environmental
sustainability?**

Raise parks
by 5 feet

Elevated
boardwalk
that drains

Area of
proposed
berm is scuba
diving staging
area

Permeable
pavers

Replace sea
wall

Elevated
wood
or brick
boardwalk

More
drainage to
existing sea
wall

Reconfigure
two parks
into one park
with parking
behind

Raise the
whole site

New sand
volleyball
courts at north
corner of La
Jolla Shores
park

Remove
concrete
between parking
and boardwalk -
fill with earthen
dunes

Summarized Survey Responses (Key Themes)

1

How do you primarily use La Jolla Shores?

33.8%
Leisure
activity

46.2%
Athletics/
Sports

15.4%
Community
events

4.6%
Other uses

2

What activities do you do at La Jolla Shores?

60.8%
Walking

62.7%
Relaxing

29.4%
Picnic

62.7%
Swimming

51% Surfing

23.5%
Biking

3

How do you access / visit this location?

69.1%
Car

19.1%
Walk

10.3%
Bike

1.5%
Public
Transit

0%
Other

4

Feedback on concept designs:

Need better
drainage

Majority
preference
for seatwall

Significant
approval for
earthen dike

Fewer
preferences
for
proposed
path

Wayfinding
signage to
direct multi-
modal lanes

No action is
needed here

Need better
bike access
and parking

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Walking

Beach clean-ups, walking everyday

Dog walking and surfing

Sitting on the beach

Like sitting on rocks, hopes to use in the future as well

PB Surf Club Events

2

**What features of this concept do you like?
What modifications or additions would you like to see added to this concept?**

Better path and keep seating

Keep log and 'natural' seating

Permeable beach access material

Native vegetation

Storm water pollution controls on storm drain

Improve/reinforce end of concrete path

Add storm runoff control higher up in drain

Address water draining from bathroom

Two layers of dune fencing

Park space underutilized

Disabled access to the beach

3

How can public access & recreation be improved in this area?

Formalize ditch path

Protect beaches and parks

More benches and fire pits

No impacts to surf break

No meter parking/no parking time cap

Add more dog bags/stations

Summarized Workshop Boards (Key Themes)

1

**Tell us a story of the “Day in the Life”;
How do you experience the site?**

2

**As a group, discuss different future scenarios
(e.g., severe storms, sea level rise, coastal
erosion) and brainstorm resilience strategies.**

3

**Mark areas of concern or interest on
the map and suggest improvements.**

**What additional amenities or
features would enhance the
usability and appeal of these
nature-based coastal areas?**

**How can we improve the
proposed public access and
recreational facilities while
ensuring environmental
sustainability?**

Better, safer
access

Add more
seating

Safer parking
area -
interference
with
pedestrians

Access
improvements

Dunes not
sustainable

Talk to the
surfers

Lifeguard
access
concerns

Educational
signage
on back of
benches

Porous bench
design to
prevent sand
buildup and
grime

Extend
revetment and
cobble toe under
access ramp and
expand seating
area

Add ground
lighting
along path

More trash
receptacles
- support
cleanup
efforts

Secure
benches to
ground - will
shift from
erosion

Protection
for
pedestrians
in parking
lot

“Gentle
steps” with
sequential
landings

Definitely need
pedestrian
pathway &
access to the
beach at end of
the storm drain
(ADA compliant)

Extend
walking path
to La Jolla
Blvd

Add
roundabout
at La Jolla
Blvd

Summarized Survey Responses (Key Themes)

1

How do you primarily use Tourmaline Beach?

19.4%
Leisure
activity

75%
Athletics/
Sports

0%
Community
Events

5.6%
Other uses

2

What activities do you do at Tourmaline Beach?

53.4%
Walking

46.6%
Relaxing

43.1%
Swimming

77.6%
Surfing

15.5%
Picnic

17.2%
Running

3

How do you access / visit this location?

27%
Walk

58.1%
Car

14.9%
Bike

0%
Public
Transit

0%
Other

4

Feedback on concept designs:

More bike
racks

Improved
stormwater
drainage

Majority
support
vegetated
dune

Mixed
opinions
on rip-rap
concept

More bench
seating

Less Traffic

Better
walkways
are needed

Summarized Pop-Up Boards

1

How do you currently enjoy this space?

Surfing

Yoga/jogging

Sunset
watching/
tourist
destination

Walking

Views &
walking

Hiking

2

**What features of this concept do you like?
What modifications or additions would you like
to see added to this concept?**

More
efficient
parking

Fencing
design;
preserve
view

Supports
one-way
traffic

Concern
for 10'
path being
enough
space

Separate
paths from
bikes and
cars

Prevent
erosion
caused by
human use

Additional
riprap and
potential
reef habitat

One-way
traffic is
good

Likes multi-
use path for
pedestrians

Supports
keeping
parking as
proposed
here

More
pedestrian
access

'Circulate'
San Diego -
collaboration

3

**How can public access & recreation be
improved in this area?**

Diagonal
parking

Speed
bumps

Naturally
preserve
as much as
possible

No parallel
parking

Fencing -
allow for
rescues

Decrease
car traffic

Sunset Cliffs

Summarized Workshop Boards (Key Themes)

1

**Tell us a story of the “Day in the Life”;
How do you experience the site?**

2

**As a group, discuss different future scenarios
(e.g., severe storms, sea level rise, coastal
erosion) and brainstorm resilience strategies.**

3

**Mark areas of concern or interest on
the map and suggest improvements.**

Likes bike path - needs repair	Protect natural park	Natural activities only	Use only native plants	Beach access improvements	One-way concern - space for recreation
Pro one-way	Move project to north section of Sunset Cliffs	Boulders from rip-rap only cause more erosion	Drainage plan	Ice plant protects cliffs	Consider storm drainage erosion issues
More trash and bathroom facilities	Visitor parking on north end	Use Catalina to improve traffic flow	Roundabout at Cordova	Four parking lots are a problem	Need separate bike lane/ crosswalks
Current access through guardrail is a barrier	Collaboration with community groups	Solve resilience on northern end first	One-way opens up more parking	Shuttle service with a remote parking area	Speed bumps/ traffic circles to slow traffic

Sunset Cliffs

Summarized Survey Responses (Key Themes)

1

How do you primarily use Sunset Cliffs?

37.1%
Leisure
activity

32.9%
Athletics/
Sports

13.4%
Community
events

16.6%
Other uses

2

What activities do you do at Sunset Cliffs?

82.4%
Walking

56.8%
Relaxing

22.4%
Picnic

48%
Yoga/
Stretching

27.1%
Running

21.9%
Biking

3

How do you access / visit this location?

54.9%
Car

38.2%
Walk

5.2%
Bike

0.5%
Public
Transit

1.2%
Other

4

Feedback on concept designs:

Additional
benches
and trash
receptacles

Stormwater
drainage
management
needed

Majority
support for
lane-diet
but concern
about parking

Keep space
natural

Need traffic
controls

Parking
needs to be
addressed:
timed, paid

Public
Transit

No
bathrooms
in the area

Access to
this site is
important

Better paths
for walking
and biking