THINK BLUE SAN DIEGO®

Integrated Drainage Engineering Analysis

SAN DIEGO BAY WATERSHED MANAGEMENT AREA

JUNE 2024

EXECUTIVE SUMMARY

The San Diego Bay Watershed Management Area (WMA) Integrated Drainage Engineering Analysis (San Diego Bay IDEA) brings together comprehensive data on watershed physical attributes, water quality, and stormwater conveyance assets. The San Diego Bay IDEA presents a prioritized set of projects that balance environmental, societal, and economic benefits while aligning with City of San Diego (City) programmatic objectives. The prioritization is achieved through a combination of watershed-scale modeling and statistical analysis.

The San Diego Bay WMA is a highly urbanized 444 square mile portion of San Diego County. The City developed a Watershed Master Plan (WMP) for Chollas Creek and Maple Canyon subwatersheds (City of San Diego, 2018a, City of San Diego, 2018b); therefore, per direction from the City, these subwatersheds were excluded from the study domain for this IDEA. The San Diego Bay IDEA includes 40-square miles of the WMA within the City of San Diego.

Watershed infrastructure in the SD Bay IDEA study area includes more than 192 miles of storm drain pipe, 14 miles of channels, and over 3,950 catch basins as part of the City's municipal separate storm sewer system (MS4). The City's MS4 system is an interconnected system of natural drainages and constructed drains, pipes, and channels. Collectively, the MS4 functions to convey drainage flows from impervious surfaces to receiving waters to protect the life and property of the City's citizens from potential flooding. Federal, state, and local regulations require the City to meet specific water quality standards in receiving waters.

Within San Diego Bay WMA, only the Chollas Creek subwatershed has a Total Maximum Daily Load (TMDL) applicable for metals (copper, lead, and zinc), and indicator bacteria. Other TMDLs exist across the watershed including San Diego Bay Shelter Island Yacht Basin TMDL for dissolved copper, and San Diego Bay Shoreline bacteria TMDL for Shelter Island Shoreline Park. However, recent studies have shown that the water quality limits are mostly being met and the MS4 is not the primary source of pollutants for these water quality conditions. Because the San Diego Bay IDEA project area did not include any TMDLs where the source of the impairments is primarily attributed to the MS4, pollutants of concern (POC) were identified from the San Diego Bay Water Quality Improvement Plan (WQIP) that may impair water quality conditions in the study area. The POC identified include metals (copper, lead, and zinc), nutrients, and dry weather flows.

Additionally, urbanization has impacted streams and habitat which limits ecological function, and low-lying areas are subject to potential storm and tidal inundation and flooding.

To address these challenges, the San Diego Bay IDEA uses an integrated analysis approach to identify project locations to improve flood resiliency, water quality, and stream/habitat conditions. The IDEA includes five main components:

- Review of existing GIS data, as-built drawings, and aerial imagery and field visits to key areas to define the storm drain system and drainage characteristics for the watershed study area
- Drainage assessment including hydrologic & hydraulic (H&H) modeling to identify stormwater flows and areas of flood concern
- Water quality and pollutant modeling to assess critical areas for water quality improvement
- Stream rehabilitation/habitat mitigation opportunities identified through desktop and field methods
- Integrated scoring of potential watershed improvement projects based on the drainage, water quality, and stream rehabilitation/habitat mitigation elements

The IDEAs project scoring and prioritization element follows the City-wide methodology for ranking the relative needs and merits of Capital Improvement Program (CIP) projects defined in City Council Policy 800-14 (800-14). The 800-14 framework includes elements for:

- Legal compliance and risk to health
- Safety and environment
- Asset condition and level of service
- Equal and equitable community investments
- Sustainability and conservation
- Funding availability
- Project readiness
- Multiple benefit and bundling opportunities

The San Diego Bay IDEA benefits City citizens by presenting a comprehensive plan for protecting, enhancing, and sustaining the quality of water resources in the San Diego Bay WMA. Implementing the projects identified by the San Diego Bay IDEA will reduce flood risk, enhance stream flow, improve water quality, conserve water resources, and preserve and enhance natural habitats and recreational areas.

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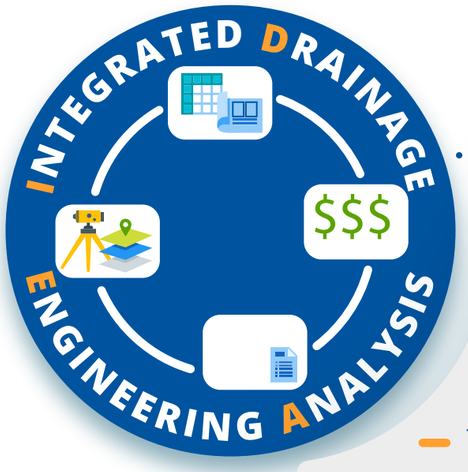


IDEA

- Technical Analysis
- Concept Development
- Benefit Modeling
- Cost Estimation

WHAT IS AN IDEA?

The City is responsible for protecting, preserving, enhancing, and restoring the quality of water resources in the City. The City's Stormwater Department (SWD) is responsible for managing stormwater to safeguard water quality as well as to reduce the risk of flooding, pursue the use of stormwater as a resource, and protect and revitalize natural habitats and recreation areas. The SWD is creating Integrated Drainage Engineering Assessments (IDEAs) for its watersheds to develop project-viable concept plans for a suite of projects to reduce flood risk, improve water quality, restore habitats, provide climate change resiliency, and possibly divert stormwater runoff into sanitary sewer systems for reuse and to meet multiple other City goals.

This San Diego Bay Watershed Management Area (WMA) IDEA (San Diego Bay IDEA) identifies projects and activities the City can implement to improve drainage, water quality, and stream rehabilitation and restoration as funding becomes available.

The IDEAs use a data-driven approach to analyze pertinent storm drain system features to support specific assessments related to drainage, water quality, and stream restoration and habitat enhancement. These focused assessments generate a suite of prioritized capital improvement projects (CIPs) aimed to provide multiple environmental, social, and economic benefits.

The goal of the San Diego Bay IDEA is to outline a comprehensive plan for protecting, enhancing, and sustaining the quality of water resources in the San Diego Bay WMA. Implementing the projects identified by the San Diego Bay IDEA will improve flood protection, water quality, conserve water resources, and preserve and enhance natural habitats and recreational areas.

DATA COMPILATION
Assemble data records for integrated analysis.

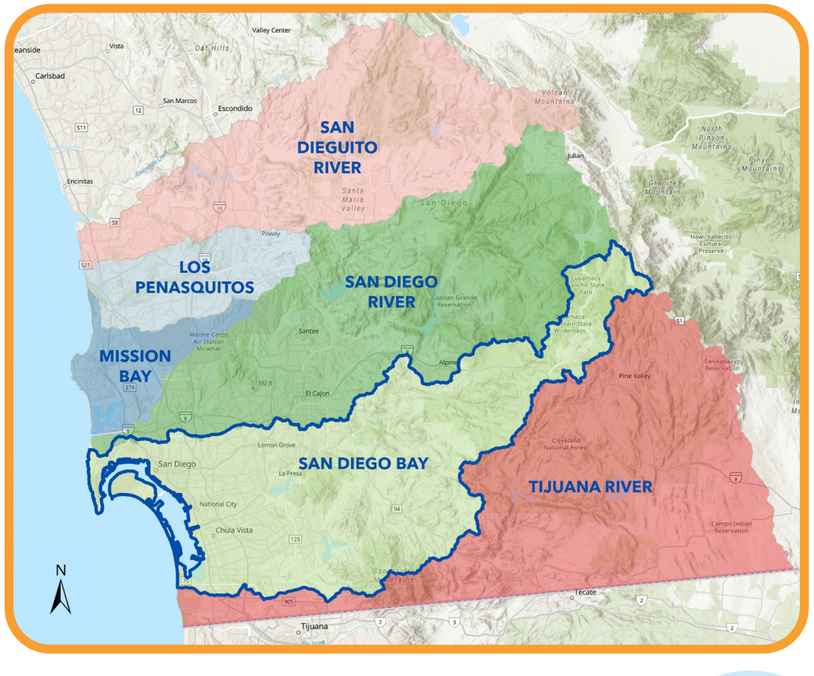
WATERSHED ASSESSMENT
Geospatial assessment of watershed and storm drain infrastructure.

PROJECT IDENTIFICATION
Strategic CIPs to address drainage, water quality, & stream restoration needs.

PRIORITIZED PROJECT LIST
Standardized scoring to prioritize multi-benefit CIPs.

BENEFITS

SAN DIEGO WATERSHEDS AND CITY JURISDICTION



213k Acres

86k Storm Drain Assets

6 Watershed Areas

CITY OF SAN DIEGO STORM DRAIN SYSTEM

The City manages a large municipal separate storm sewer system (MS4) that conveys storm water runoff from natural and developed areas to receiving waters such as lakes, rivers, creeks, streams, lagoons, and the Pacific Ocean.

The City's MS4 system is an interconnected system of natural drainages and constructed drains, pipes, and channels. Collectively, the MS4 functions to convey drainage flows from impervious surfaces to receiving waters to protect the life and property of the City's citizens from potential flooding.

Federal, state, and local regulations require the City to meet specific water quality standards in receiving waters, and the City complies by conducting studies, developing plans, and implementing pollution prevention programs and MS4 improvement projects.

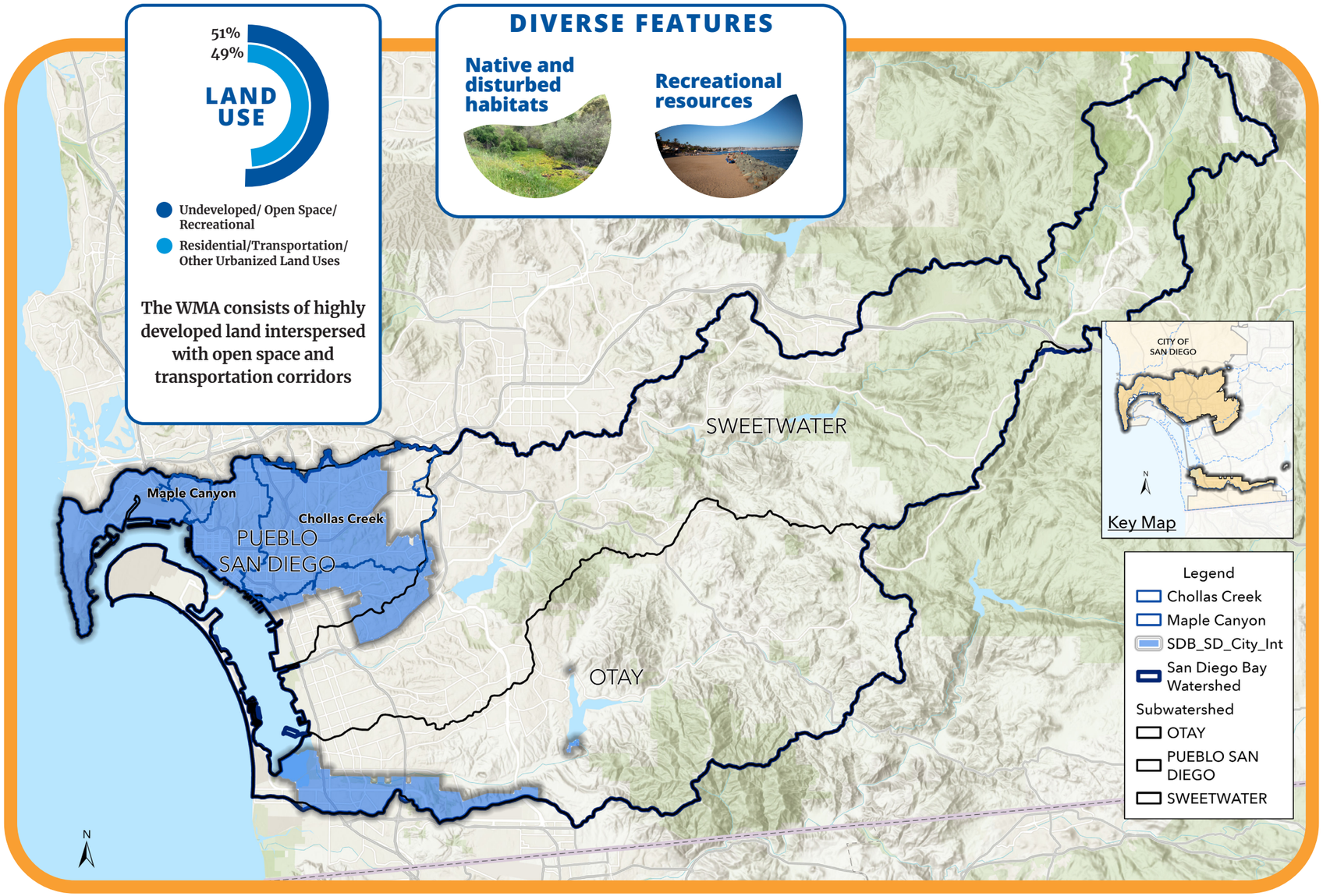
OVERVIEW OF THE
SAN DIEGO BAY WATERSHED

The San Diego Bay WMA encompasses 444 square miles (or approximately 283,000 acres) that extends eastward from San Diego Bay for more than 50 miles to the Laguna Mountains. The lower reaches of the watershed are primarily dominated by dense urban land use, while the upper reaches, east of Interstate Routes-125 and 54, are primarily made up of open space and vacant/ undeveloped land uses. The watershed is located in an arid coastal region with a Mediterranean climate characterized by an extended dry season with most of the average 10–11 inches of annual rain occurring during November to February. The watershed ranges in elevation from sea level at San Diego Bay to 6,000 feet above mean sea level at the eastern boundary. The WMA lies north of the Tijuana River, south of San Diego River and west of Anza Borrego.

The San Diego Bay WMA is located entirely within the boundaries of San Diego County and includes three hydraulic units (HUs):

- Pueblo San Diego (Pueblo)
- Sweetwater River (Sweetwater)
- Otay River (Otay)

Stormwater and non-stormwater flows from 11 jurisdictions or "Responsible Parties" (RPs) enter the watershed via storm drains and sheet flow. 86 square miles of the WMA (~19%) is part of City of San Diego jurisdiction. The City developed a Watershed Master Plan (WMP) for Chollas Creek and Maple Canyon subwatersheds (City of San Diego, 2018a, City of San Diego, 2018b); therefore, per direction from the City, these subwatersheds were excluded from the study domain for this IDEA. The San Diego Bay IDEA includes 40 square miles of the WMA within the City of San Diego.



OVERVIEW OF THE SAN DIEGO BAY WATERSHED

Currently, about 51% of the watershed remains undeveloped or has otherwise been dedicated to open space and recreational lands. Portions of the watershed are within the City's Multiple Species Conservation Plan Multi Habitat Planning Area (MHPA), which is composed of areas within the City designated for preservation of native habitat to support conservation of covered sensitive native species. The remaining 49% of the land area is being utilized as residential areas, roadways and transportation, and other urbanized land uses.

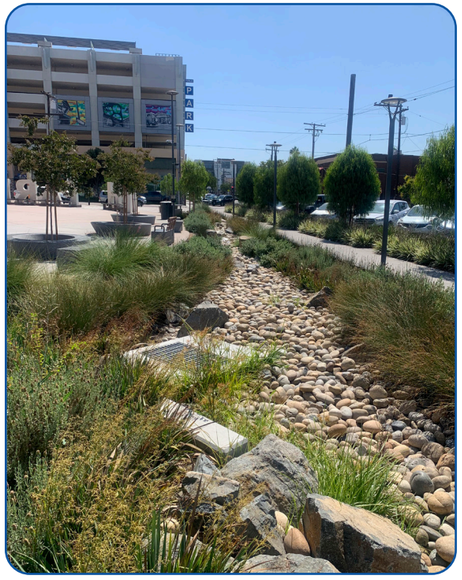
A large portion of the WMA and SD Bay IDEA is covered in impervious surfaces which include rooftops, driveways, roads, parking lots, and sidewalks. Due to the large amount of impervious cover, there is an increased potential for stormwater runoff within the WMA, affecting water quality and flood control.

OVERVIEW OF THE SAN DIEGO BAY WATERSHED

The San Diego Bay WMA is estimated to be home to approximately one-third (1.04 million) of the population of San Diego County, according to the 2010 U.S. Census. Given the urban nature of the the watershed, there are several pollutants that have the potential to negatively impact how residents, business-owners, and tourists use and interact with local water bodies.

The San Diego Bay WMA supports swimming, fishing, biking, walking, and other recreational activities. Additionally, the WMA consists of a variety of unique and diverse ecosystems that also serve as critical habitat for a number of endangered and threatened species.

While the study area for the San Diego Bay IDEA does not include any TMDLs attributed to the MS4, the City is interested in taking a proactive approach and setting meaningful water quality goals for these areas and further enhance the water quality across the watershed as part of the San Diego Bay IDEA. Pollutants of concern (POC) that may impair water quality conditions in the San Diego Bay IDEA study area include metals (copper, lead, and zinc), nutrients, and dry weather flows. Flooding is also an issue present in the watershed largely due to the urbanization and the age of the storm drain infrastructure within the study area.



Completed green infrastructure at the North Park Mini Park on 29th St in the Pueblo Hydraulic Unit.

Blocked off sinkhole at 3730 Mississippi St in the Pueblo Hydraulic Unit due to storm drain infrastructure deficiency.

Storm drain infrastructure can discharge high flows of untreated runoff to sensitive habitat and recreational areas of San Diego Bay.

PLANNING FRAMEWORK

REGULATORY DRIVERS

MUNICIPAL STORMWATER PERMIT

The MS4 Permit implements requirements of the Clean Water Act and Porter–Cologne Water Quality Control Act by establishing conditions for pollutant discharge from the storm drain system to local streams, coastal lagoons, and the ocean.

REGULATORY PERMITS

Multiple federal, state, and local agencies, tasked with natural resource protection, issue project permits that often require compensatory mitigation for habitat and/or species impacts. These permits include: U.S. Army Corps of Engineers, California Department of Fish and Wildlife, San Diego Regional Water Quality Control Board, California Coastal Commission, and the City Development Services Department.

TOTAL MAXIMUM DAILY LOADS (TMDLs)

TMDLs provide a framework for evaluating pollution control efforts and for coordinating federal, state, and local efforts to meet water quality standards for waters identified on the CWA Section 303(d) list of impaired waters.

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

Areas of Special Biological Significance (ASBS) are a network of 34 ocean areas monitored and maintained for water quality through special protections by the State Water Resources Control Board under the California Ocean Plan. There are no ASBS within the San Diego Bay WMA.

PLANNING DOCUMENTS

WATERSHED ASSET MANAGEMENT PLAN (WAMP)[1]

The Watershed Asset Management Plan is a long-range plan used to document the current state of assets (e.g., asset inventory, valuation, condition, risk) and to project long-range asset renewal (rehabilitation and replacement) requirements.

WATER QUALITY IMPROVEMENT PLANS (WQIP)

WQIPs are MS4 Permit-required planning documents that assess water quality conditions, identify Highest Priority Water Quality Conditions (HPWQCs) and associated water quality numeric goals and schedules for compliance, evaluate water quality improvement strategies to address sources of pollutants contributing to the HPWQC, develop a monitoring and assessment program, and include an adaptive management process.

JURISDICTIONAL RUNOFF MANAGEMENT PLAN (JRMP)

The City Jurisdictional Runoff Management Plan was developed to meet multiple requirements of the MS4 Permit.

[1]https://www.sandiego.gov/stormwater/plansreports

The SWD is made up of engineers, water quality scientists, planners, policy makers, field crews, fiscal specialists, and other support personnel who work to build, maintain, and modernize efficient stormwater infrastructure—infrastructure critical to supporting safe, sustainable, and thriving San Diego communities. The SWD's work lays the foundation for San Diego to meet and exceed Clean Water Act (CWA) and other regulatory requirements for water quality, floodplain management, and compensatory mitigation.

The San Diego Bay IDEA advances the SWD's watershed management goals as guided by the regulations into specific, prioritized activities that align with the City's capital improvement program (CIP) framework and asset management needs.

To manage, protect, and maintain water quality, flood-safe communities, and healthy habitats, the SWD must adapt to meet evolving circumstances, referred to here as "drivers." These include urbanization, a changing climate, stormwater-related water quality regulations, drainage requirements, and mitigation requirements. In addition, there are drivers that go beyond those codified in current regulations and reflect overall City priorities, including creating a sustainable and resilient San Diego, enriching neighborhoods for an inclusive City and addressing aging infrastructure throughout the City. The SWD must also ensure that communities of concern are not disproportionately impacted and ensure that an equitable approach to addressing these drivers is taken.

Each of these drivers has led to the broadening of SWD responsibilities over time.

KEY PRIORITY AREAS

SWD activities are organized around six Key Priority Areas:

- Protect Clean Water
- Ensure Flood-Safe Communities
- Provide Clean and Green Streets
- Enhance Our Communities and Protect Our Habitats
- Capture Stormwater for Use
- Prioritize Education, Outreach and Engagement

The SWD Watershed Asset Management Plan (WAMP) was originally developed in 2013 as a long-range planning document to estimate the cost for SWD to fulfill intended service levels. The SWD funding needs are broken into three primary categories: O&M, Planning, and CIP/Think Blue Infrastructure. The WAMP 2.0, finalized in 2021, is a planning document that outlines the stormwater projects, tasks, actions, program elements, and funding needs for O&M and CIPs within City jurisdiction.

The San Diego Bay IDEA is intended to integrate SWD goals, regulatory drivers, planning documents, and other elements of an overall City-specific planning framework by developing diverse projects to meet the SWD program's multiple objectives. This is accomplished by:

- intentionally applying robust scientific principles to leverage existing data and information
- engaging strategically to formulate prioritized goals
- employing engineering practices to develop specific and feasible project concepts.

FRAMEWORK TO REACH OUTCOMES

The San Diego Bay IDEA provides a master plan for stormwater system capital improvement projects for the portion of the watershed within City jurisdiction. The master plan effort includes five main components:

- Data compilation and update for the storm drain system and drainage characteristics for the watershed study area
- Drainage assessment including hydrologic & hydraulic (H&H) modeling to identify stormwater flows and areas with flood concern
- Water quality and pollutant modeling
- Stream restoration/habitat mitigation opportunity identification including infrastructure conversion and/or removal sites
- Standardized project scoring

The data and methodology used to develop the San Diego Bay IDEA within each component is summarized next.

Within each of these categories, the IDEA master plan process was applied to develop specific technical reports for the drainage, water quality, and stream restoration/mitigation opportunity components. Within each of these individual components, a suite of CIPs were identified and developed to a preliminary concept level. The following sections present key information from the technical reports for the drainage, water quality, and stream restoration/mitigation opportunity components.

DATA COMPILATION AND REVIEW

Storm drain Geographic Information System (GIS) data including pipe dimension, inlet type and sizing, and drainage areas were obtained from as-built drawings, desktop review including Google Streetview, high resolution aerial imagery, topography and surface condition status, and in some cases field verification, where necessary. Additional storm drain system data was also obtained for the portions of the watershed in other jurisdictions, including Caltrans.

DRAINAGE

Watershed-level drainage assessment was conducted to estimate surface runoff. A dynamic rainfall-runoff simulation model captures the effect that spatial variability in topography, drainage pathways, land cover/use, and soil characteristics have on runoff generation. Modeled information then allows for stormwater runoff hydraulic analysis and water quality from primarily urban areas.

WATER QUALITY

Water quality analysis was conducted through use of the high resolution spatial data, available receiving water quality data and pollutant assessment studies, previously conducted watershed modeling (e.g. WQIP modeling), and pollutant load simulation modeling.

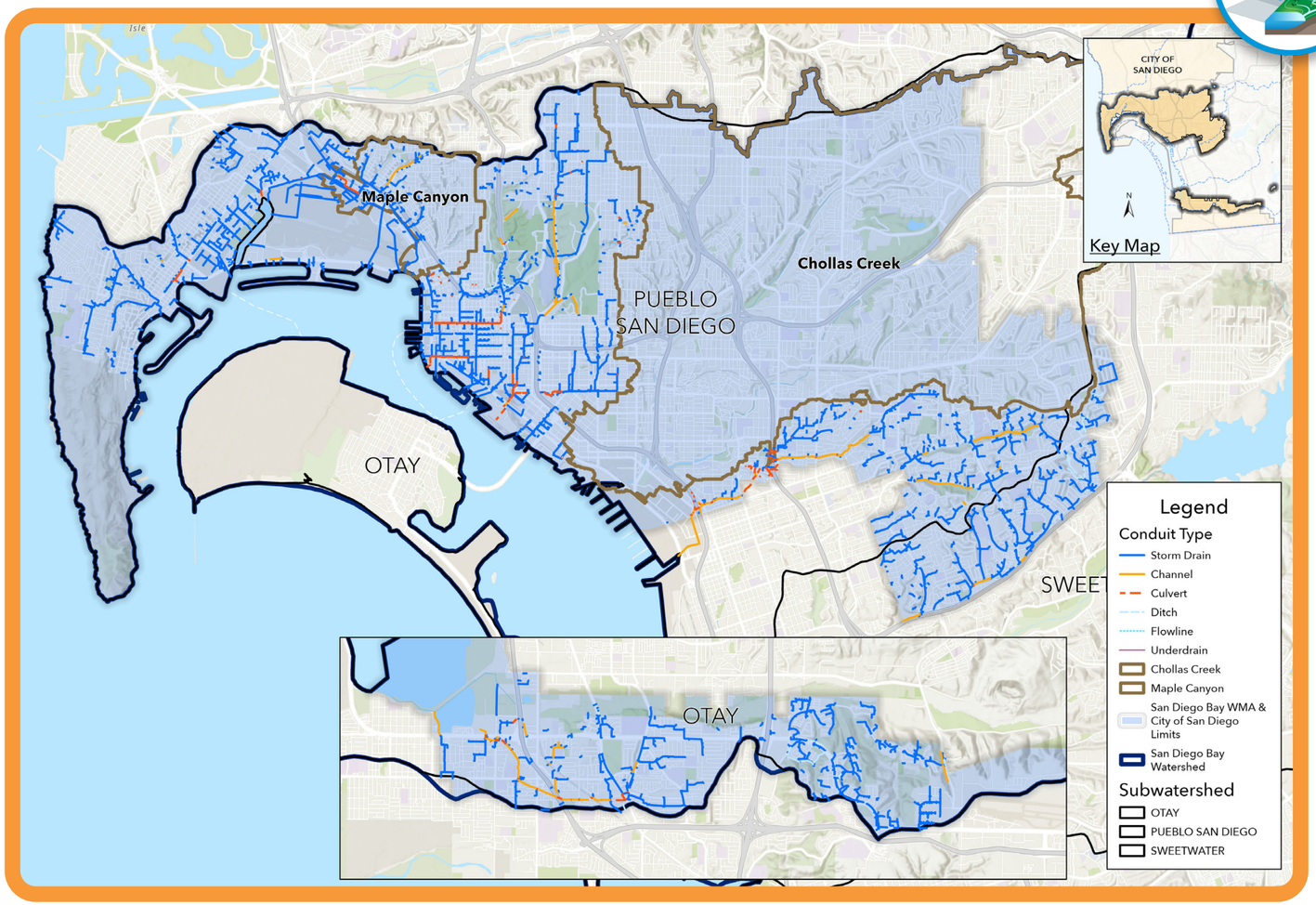
STREAM RESTORATION/ HABITAT MITIGATION OPPORTUNITIES

An extensive desktop review of available data, aerial imagery, and literature was conducted to rank potential study areas likely to support restoration/mitigation opportunities. Field and engineering evaluations were performed to further refine and identify feasible restoration sites.

STANDARDIZED PROJECT SCORING

The San Diego Bay IDEA is intended to formulate a suite of CIPs to address stormwater-related technical needs for drainage and water quality improvements, including stream restoration and habitat mitigation to support project implementation and regulatory compliance. Within the City, CIPs that create permanent structures, create structural changes, or restore City assets to enhance the asset's overall value, prolong its useful life, or adapt it to new uses, are subject to a formal evaluation process (City of San Diego 2022; Council Policy 800-14). The capital planning prioritization process optimizes the use of available resources to produce equal and equitable outcomes for citizens.

The San Diego Bay IDEA effort adapted the standardized Council Policy 800-14 framework to incorporate criteria specific to stormwater drainage, water quality, and stream rehabilitation/habitat mitigation projects. Additionally, previously conducted SWD work developed a specialized project scoring framework for stream rehabilitation/habitat mitigation projects. The specialized stream rehabilitation/mitigation project scoring framework may be used separately to score and prioritize sites with potential for habitat improvements to satisfy regulatory agency mitigation requirements.



Conveyance system throughout San Diego Bay Watershed.

DRAINAGE SYSTEM
DATA COLLECTION

This section describes the San Diego Bay WMA IDEA Data Collection and Updates (Appendix 1).

The linkage between watershed-scale planning and the prioritization of site-scale individual projects is made possible through the availability and analysis of high-resolution data to allow for accurate geospatial representations of the study area. The first component in the IDEA framework is the data collection regarding the existing storm drain infrastructure and drainage conditions, including corrections to a Geographic Information System (GIS) inventory of structure and conveyance features within the study area. The data collection step included reviewing the available as-built drawings; Google Earth observations; and field visits to verify the location and properties of drainage structures and conveyance assets. The results of the data collection effort were used to update the City's GIS inventory of storm drain structure and conveyance features within the study area for use in the drainage assessment, water quality, and stream restoration efforts.

A high-resolution geospatial dataset is essential to perform detailed hydrologic and hydraulic drainage and water quality analyses. Geospatial data necessary for these modeling efforts include: an accurate topographic representation of the study area, ground cover/land use information, and existing storm drain inventory. Additional information regarding other existing utility infrastructure in the area (underground gas, electric, fiber optic, water, and sewer lines) is also desirable for evaluating potential conflicts when recommending infrastructure improvements. During this IDEA process, Geographic Information System (GIS) data was compiled from various sources to develop a comprehensive data set to be used in the modeling process.

PIPES AND CHANNELS
MORE THAN **1.15M**
LINEAR FEET OF PIPES, CULVERTS, AND ENGINEERED CHANNELS

DRAINAGE STRUCTURES
MORE THAN **10,600**
INLETS, CLEANOUTS, HEADWALLS, AND OTHER DRAINAGE STRUCTURES

PUMP STATIONS
5
MAJOR STORMWATER PUMP STATIONS

ASSESSING DRAINAGE

This section describes the San Diego Bay WMA IDEA Drainage Assessment (Appendix 2).

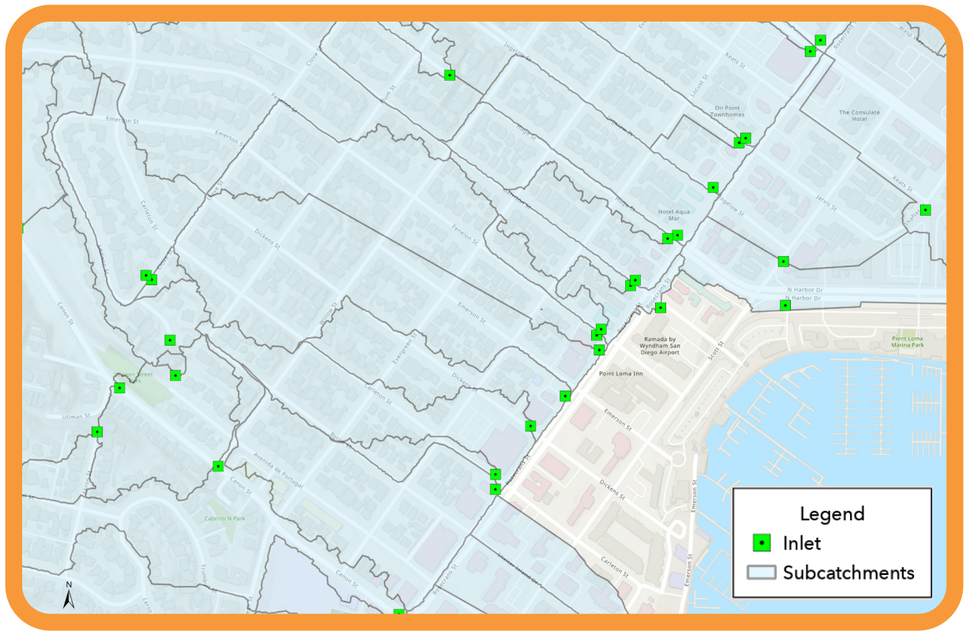
WHERE DOES IT FLOOD?

Coupled 1-D/2-D Analysis

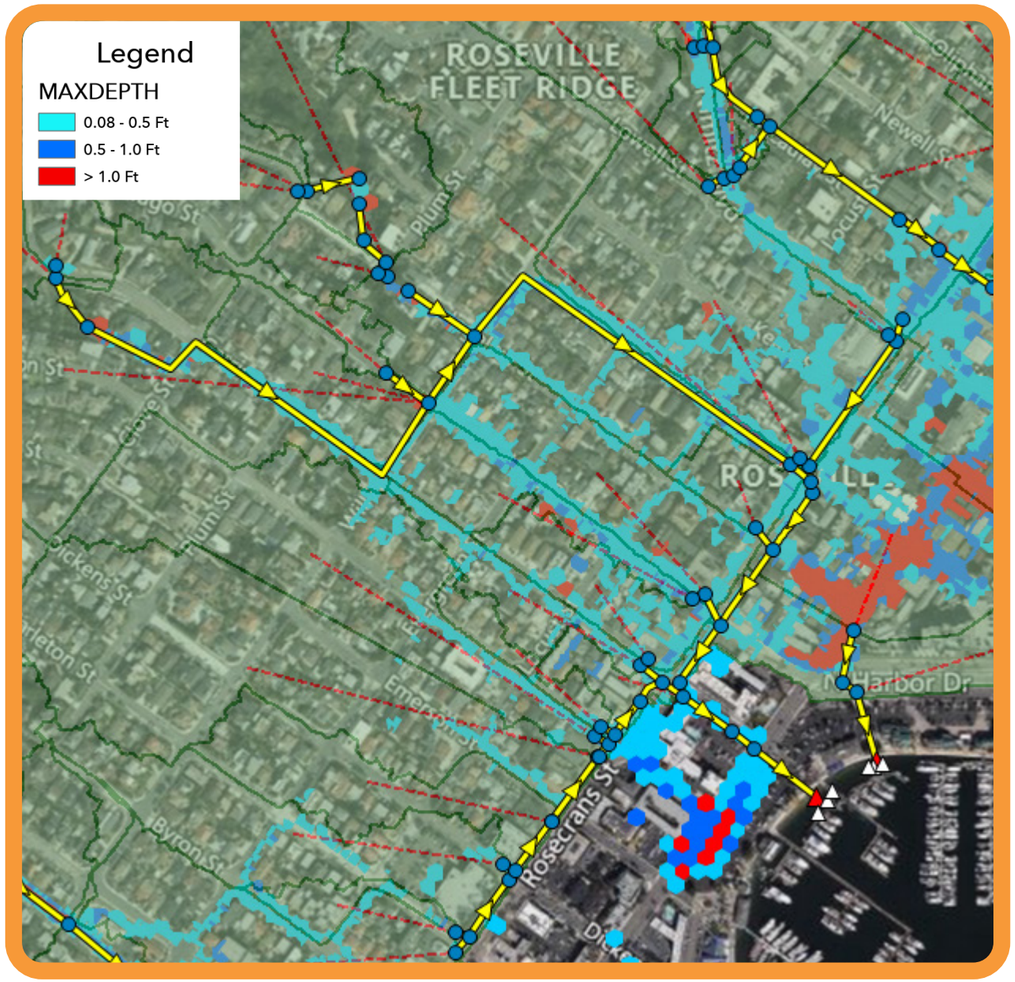
With updated stormwater conveyance data and recently collected high-resolution topography data, the drainage area for each inlet in the City of San Diego was delineated.

Existing condition drainage assessment was accomplished using an integrated 1-D/2-D hydrologic and hydraulic (H&H) model that combines surface and sub-surface drainage patterns within the study area. Integrated 1-D/2-D modeling renders a high-resolution visualization of surface inundation and storage of storm water flow for the duration of a design storm.

Results from the "existing condition" model were used as the basis for informing proposed drainage infrastructure recommendations to be included in a "proposed condition" model. Model results were obtained for the 24-hour storms at the 2-, 5-, 10-, 25-, 50-, and 100-year return period from the precipitation data obtained from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation Frequency Data Server (PFDS). The 2-D component of the analysis also allowed for the evaluation of the benefit provided by surface storage conveyance capacity after the addition of storm drain infrastructure. The objective was to reduce flood depths in the right-of-way (ROW) to 6 inches or less, (i.e., flood depths would be less than the standard curb height per City of San Diego Standard Drawings – 2018 and storm water conveyance would be contained within the ROW).



Sample of drainage delineations within SD Bay



2-D model results showing extent of flooding (Along Rosecrans St to SD Bay)

Model Validation

The existing condition model results were validated based on: review of reports for flooding the City received from the public, locations where SWD Operations staff reported flooding occurs, and the SWD needs list of proposed stormwater conveyance system projects. Peak flow rates from the models were also compared to peak flows in the published Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS).

ASSESSING DRAINAGE

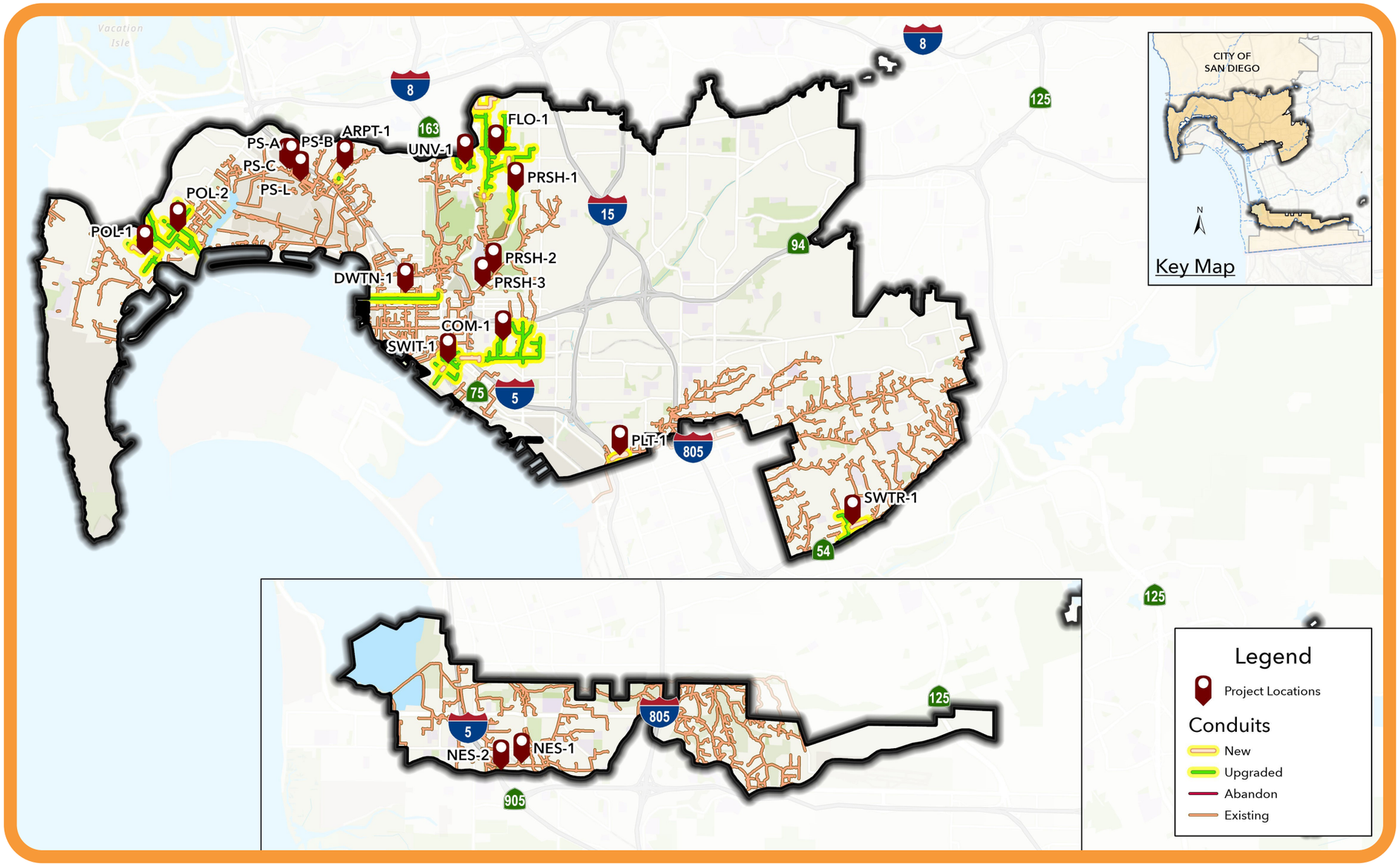
IMPROVING DRAINAGE

Once locations with flooding were validated, improvements to alleviate flooding within the study area were proposed.

As a goal of this study, the results from the existing drainage infrastructure assessment have been leveraged to identify and prioritize drainage infrastructure CIPs for the City. This was accomplished via a series of steps:

1. Hydrologic and hydraulic analysis of the existing storm drain infrastructure throughout the City.
2. Storm drain pipe size recommendations for storm drain infrastructure which was determined to have deficient conveyance capacity.
3. Strategic detention basins were identified to attenuate increases in the peak flow rates back to rates similar to existing conditions.
4. Coordination with City staff to verify and determine additional infrastructure improvements based on knowledge of known problem areas, and locations currently lacking drainage infrastructure.
5. Grouping individual infrastructure improvements into CIP bundles.

By working closely with City staff, the project team was able to identify and refine a list of nineteen (19) multi-phased CIPs projects deemed the most critical to address current storm drain conveyance deficiencies, while considering effects of future development activity in the City.



Proposed Condition CIP Project Locations

ASSESSING DRAINAGE

PLANNING FOR THE FUTURE

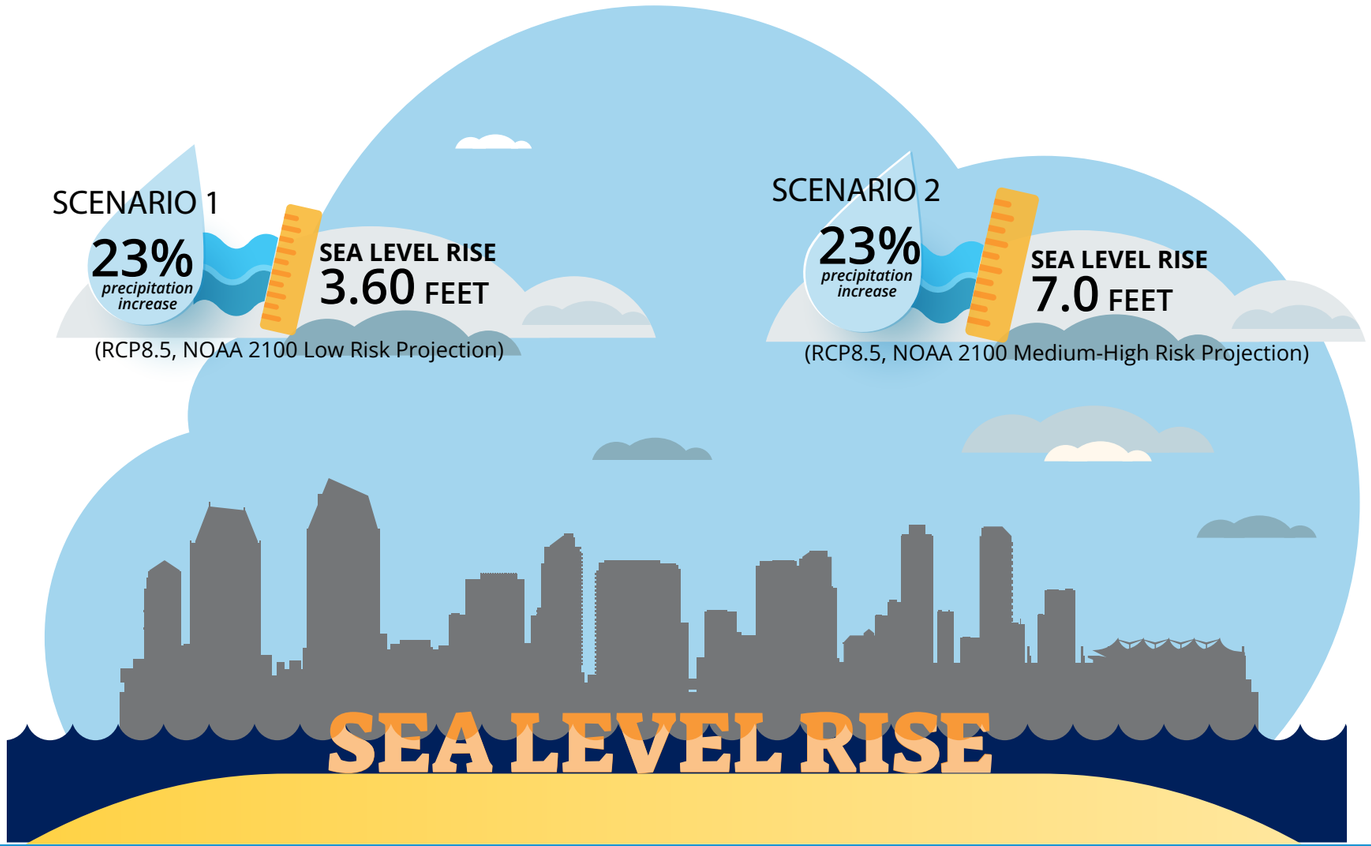
Because stormwater conveyances usually have a long useful life, proposed drainage improvements were sized to account for projected future effects of climate change.

As summarized in the graphic below, two climate change scenarios based on sea level rise and future precipitation increases were considered. These scenarios are based on sea level rise projections from the National Oceanic and Atmospheric Administration (NOAA) and precipitation change estimates based on Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) projections of greenhouse gas levels.

When possible, drainage improvements were sized for Climate Change Scenario 2. When constraints such as insufficient downstream conveyance system capacity or back water effects from projected sea level rise prevented improvements from providing flood protection for Scenario 2, the next most protective feasible scenario given project constraints was used to size proposed improvements. In all cases, improvements were sized to address future climate change to the extent feasible.

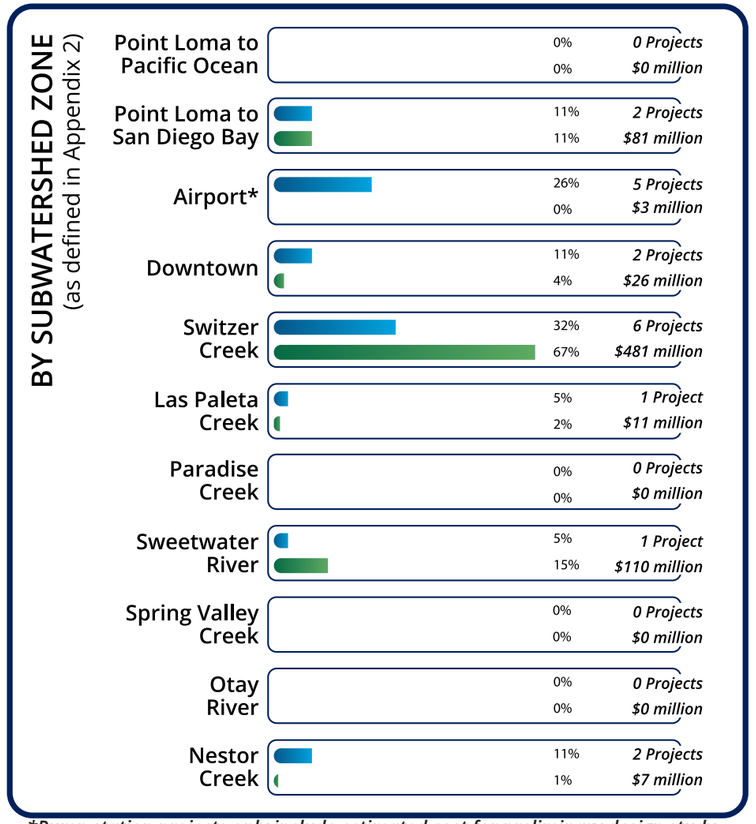
Nineteen (19) multi-phase drainage projects to reduce flooding were identified throughout the watershed. The total estimated capital cost of these projects is $719 million. Each project has been prioritized following the Council Policy 800-14 approach. Project fact sheets for the top projects and associated prioritization scores are in Appendix 2. The project fact sheets include:

- causes of current flooding,
- descriptions of proposed improvements,
- evaluations of potential utility conflicts and similar constraints, level of service that the proposed improvements are expected to provide,
- a map of the project, and
- a detailed preliminary cost estimate.



19 PROPOSED PROJECTS
TO REDUCE FLOODING

$719 MILLION
ESTIMATED COST



**Pump station projects only include estimated cost for preliminary design study.*

ASSESSING WATER QUALITY

This section describes the San Diego Bay WMA IDEA Water Quality Assessment (Appendix 3).

WATER QUALITY DRIVERS

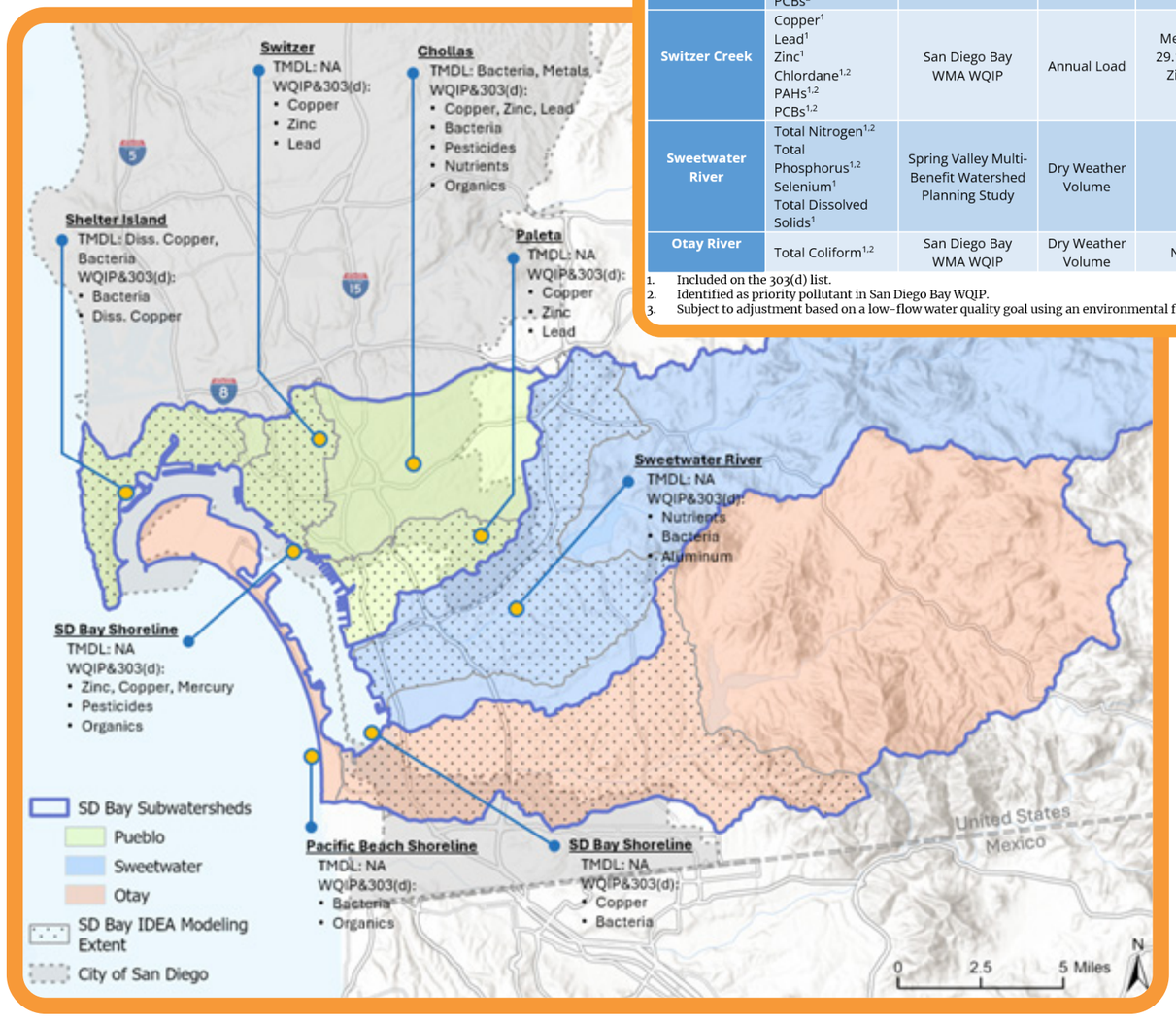
This section describes the San Diego Bay WMA IDEA water quality condition assessment and analysis (Appendix 4). Within San Diego Bay WMA, Chollas Creek subwatershed (located within Pueblo HU) has a TMDL applicable for metals (dissolved copper, lead, and zinc), and indicator bacteria. Other TMDLs include San Diego Bay Shelter Island Yacht Basin TMDL for dissolved copper, and San Diego Bay Shoreline bacteria TMDL for Shelter Island Shoreline Park. However, recent studies have shown that the water quality limits are being met mostly and MS4 is not the primary source of pollutant for these water quality conditions and therefore they were not the subject of this IDEA.

A summary of pollutants of concern (POCs) for San Diego Bay WMA are provided on the map. The map shows locations identified in San Diego Bay WQIP with one or more priority conditions. The applicable TMDLs and summary of impairments based on 2020-2022 303(d) list are also included. For a more detailed list of POCs across the watershed, refer to Appendix 4 table 1-2. As mentioned in the analysis technical report and illustrated on the map, the San Diego Bay IDEA water quality analysis extent did not include any TMDLs where the source of the impairments is primarily attributed to MS4. However, the City has adopted a proactive approach for this IDEA to identify meaningful water quality goals based on the priority conditions further enhancing the water quality across the watershed and receiving waters. However, the City has adopted a proactive approach for this IDEA to identify meaningful water quality goals based on the priority conditions to further enhance the water quality across the watershed and receiving waters.

Water Quality Goals Selection for San Diego Bay non-TMDL Areas

Subwatershed	POCs for Setting Reduction Goal	Previous Study Used to Establish Goals	Critical Condition	Target Reductions Water Quality Goals from Previous Analysis	Reduction Target Translated to Proposed Water Quality Goal for IDEA
Paleta Creek	Copper[1] Lead[1] Chlordane[2] PAHs[2] PCBs[2]	San Diego Bay WMA WQIP	Annual Load	Metals and Organics: 29.1% (consistent with Zinc reductions for Chollas)	% TSS reduction
Switzer Creek	Copper[1] Lead[1] Zinc[1] Chlordane[1,2] PAHs[1,2] PCBs[1,2]	San Diego Bay WMA WQIP	Annual Load	Metals and Organics: 29.1% (consistent with Zinc reductions for Chollas)	% TSS reduction
Sweetwater River	Total Nitrogen[1,2] Total Phosphorus[1,2] Selenium[1] Total Dissolved Solids[1]	Spring Valley Multi-Benefit Watershed Planning Study	Dry Weather Volume	TN: 1.0 mg/L, TP: 0.1 mg/L	100% dry weather capture[3]
Otay River	Total Coliform[1,2]	San Diego Bay WMA WQIP	Dry Weather Volume	N/A - dry weather	100% dry weather capture[3]

1. Included on the 303(d) list.
2. Identified as priority pollutant in San Diego Bay WQIP.
3. Subject to adjustment based on a low-flow water quality goal using an environmental flows approach.



ASSESSING WATER QUALITY

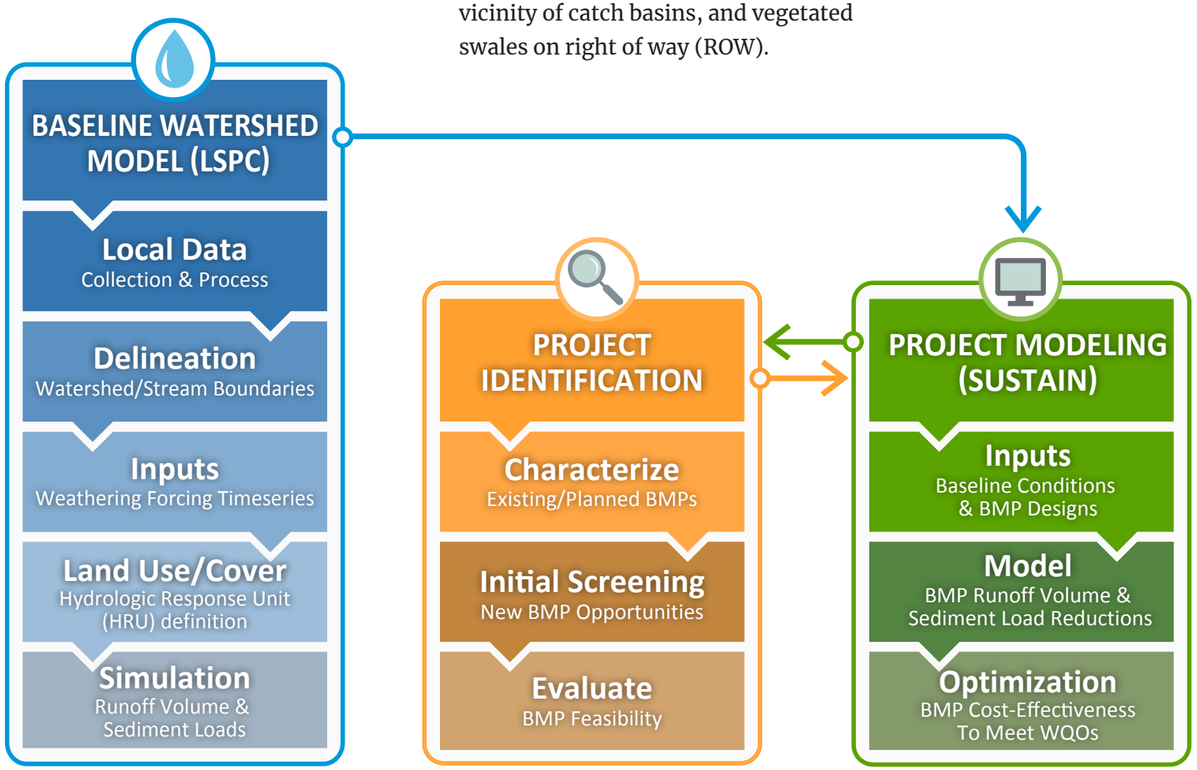
WATER QUALITY MODELING SYSTEM

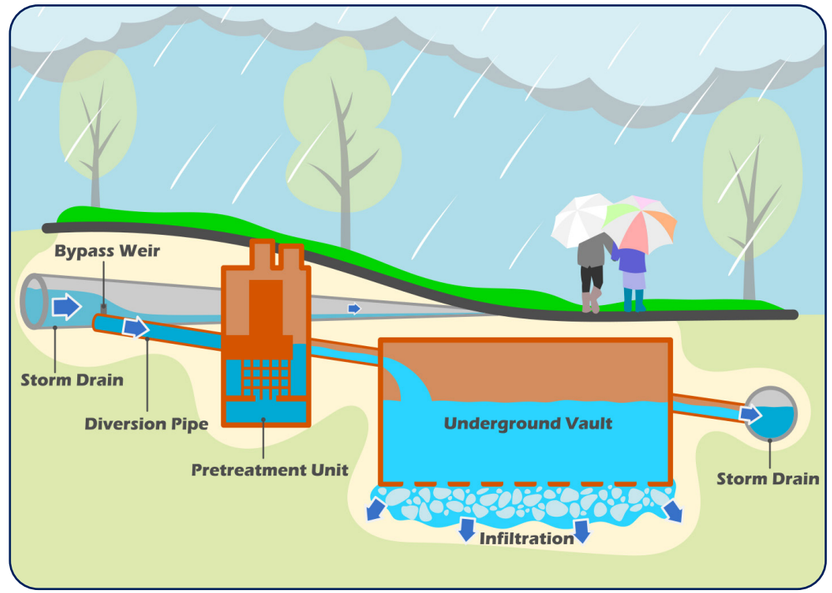
The water quality modeling system for San Diego Bay IDEA includes a watershed model (i.e. LSPC) that simulates the runoff and pollutant loads across the watershed, and a BMP model (i.e. SUSTAIN) which receives the outputs from the watershed model and simulates the effectiveness of the BMPs in reducing runoff and pollutant loads. The modeling system was used to establish the baseline loads, quantify the required runoff/pollutant reductions to meet water quality goals, and assess the performance of structural BMPs for meeting the water quality goals. The approach utilized an iterative process for project identification and evaluation to optimize BMP location, type, sizing, and other factors to meet water quality objectives.

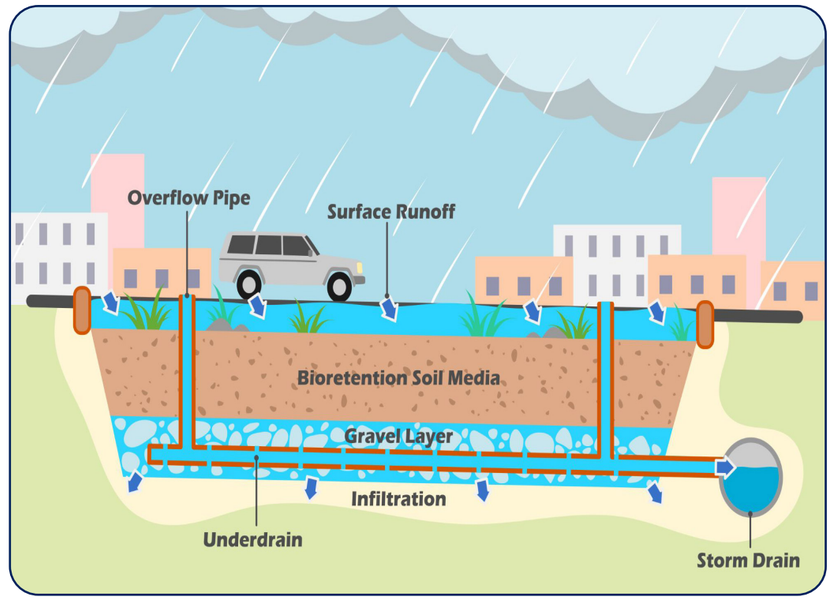
Two types of BMPs were considered for the San Diego Bay IDEA:

- Regional Multi-Use Treatment Areas (MUTAs), Surface bioretention basins and underground vaults were considered as options.
- Distributed Green Street BMPS, options considered were flow through filtration systems (e.g. Filterra units) located in vicinity of catch basins, and vegetated swales on right of way (ROW).

The locations for implementing potential BMPs were pinpointed by analyzing the GIS layer of city-owned parcels and ROW. The process involved several screenings and quality checks. A GIS layer was created to identify the areas that are deemed infeasible for BMP implementation due to any conflicts (i.e. exclusion layer). The Exclusion layer was created by buffering and overlaying various GIS layers including dry and wet utilities, floodplains, streams and river, and environmentally sensitive areas among others. The layer was then used to identify the best locations for implementing BMPs.







Two types of proposed MUTAs considered: an Underground Vault or Surface Bioretention.

ASSESSING WATER QUALITY

WATER QUALITY PROJECTS AND COMPLIANCE

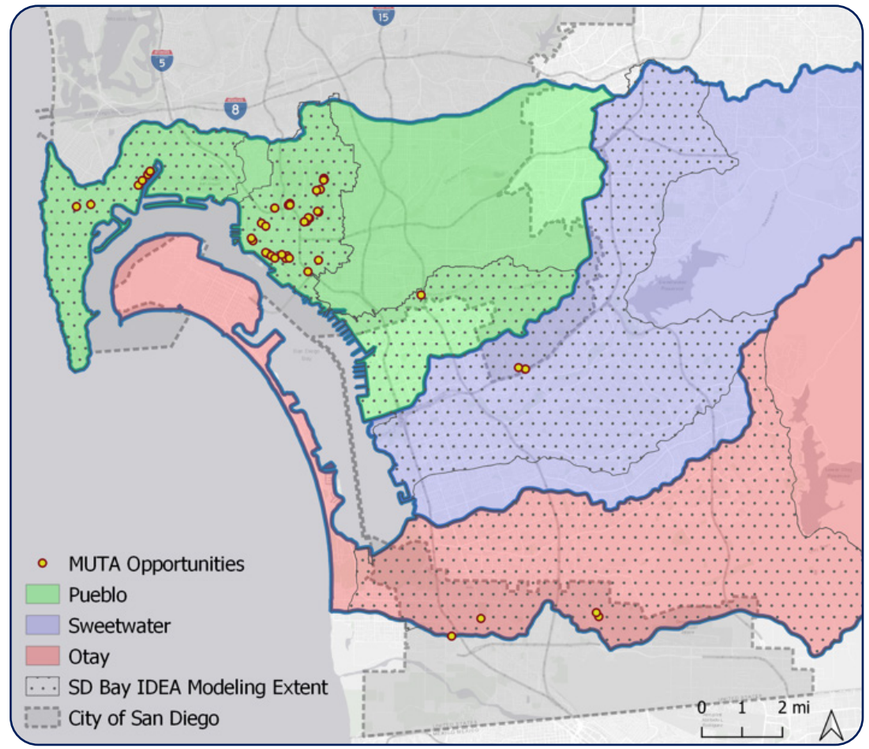
After identifying and assessing the feasibility of projects, they were evaluated in terms of pollutant reduction benefits and costs. Note that for San Diego Bay IDEA, the effectiveness of MUTAs were considered for analysis to account for City's preference in implementing larger BMPs that provide significant water quality benefits with less operation and maintenance requirements. For pollutant reduction benefits, projects were assessed individually and collectively to assess the progress toward selected water quality goals for the non-TMDL areas of San Diego Bay WMA. Percent Total Suspended Solids (TSS) and percent dry weather volume capture were simulated from the identified BMPs iteratively towards achieving the water quality goals selected for each subwatershed. The associated costs for each BMP were also quantified. For the San Diego Bay IDEA, there were only a few existing BMPs and their size and drainage area were very small which resulted in their effectiveness to be negligible.

CLIMATE CHANGE IMPACTS

Review of climate change impacts is crucial to shaping resilient project designs and estimating project performance. Southern California is expected to have more extreme weather swings, which can include extreme dry years, extreme wet years, dry to wet whiplash, and severe storm sequences. These variables intricately affect both baseline stormwater runoff conditions in the watershed and the efficacy of projects. To account for effects of climate change, models from Coupled Model Intercomparison Project 5 (CMIP5) under the two commonly used Representative Concentration Pathway (RCP) scenarios (i.e. RCP 4.5 and RCP 8.5) were used to simulate the projections of flow and water quality under future climatic conditions. The performance of the proposed BMPs were then quantified under each scenario. Overall, the average across the GCMs demonstrated decreased performance from the proposed MUTAs for TSS reduction (wet weather conditions) under both RCP 4.5 and 8.5. This is while the MUTAs showed slightly increased performance under future climatic conditions for dry weather capture. These findings could be attributed to the fact that on average basis, climate change models show larger magnitude of high flows and smaller magnitude of low flows for future conditions. Beyond precipitation and temperature changes, all proposed project sites near coastal areas were checked for potential tidal influence under projected sea level rise. This paragraph about the effects of seal level rise will be completed after finalizing the drainage analysis with sea level rise.

AVERAGE ANNUAL TSS AND RUNOFF VOLUME REDUCTION

Switzer and Paleta	Sweetwater and Otay
17 Proposed MUTAs $158M	12 Proposed MUTAs $59M
Annual TSS load reduced by 27.5% or 107 tons	*Annual runoff reduced by 12.0% or 250 ac-ft**
	** Inclusive of dry weather capture provided by wet weather MUTAs*



MUTA Opportunities within SD Bay IDEA Project Area

ASSESSING STREAM CONDITIONS

This section describes the San Diego Bay WMA IDEA Habitat Mitigation and Stream Restoration Assessment (Appendix 4).

Desktop assessment identified candidate site opportunity locations through aerial imagery and storm drain infrastructure geospatial information.

THE SITES

16
LOCATIONS FOR FIELD RECONNAISSANCE

Field reconnaissance was conducted to assess stream conditions and identify potential restoration/mitigation opportunities at locations in the Pueblo-San Diego, Sweetwater, and Otay Sub-watersheds.

4
LOCATIONS FOR ENGINEERING ANALYSIS

Engineering analysis was used to evaluate existing concrete-lined conveyance facilities for partial or complete removal of concrete-lining. Existing underground conveyance facilities were evaluated for potential day lighting of flows into new naturalized streams.

All potential sites were evaluated for fatal flaws like:

- Excessive grade cuts,
- Increased flood risk
- Native vegetation type conversion, and
- Developed land use conversion.

18
LOCATIONS EVALUATED AND SCORED

A total of 18 stream restoration/mitigation sites, ranging from <1 acre to approximately 315 acres, were scored and ranked. Six of the 18 sites were further conceptualized for stream restoration and mitigation opportunities.

6
SITES CONCEPTUALIZED FOR RESTORATION/ MITIGATION OPPORTUNITIES

Example of potential habitat restoration through infrastructure removal at Seventh Street.

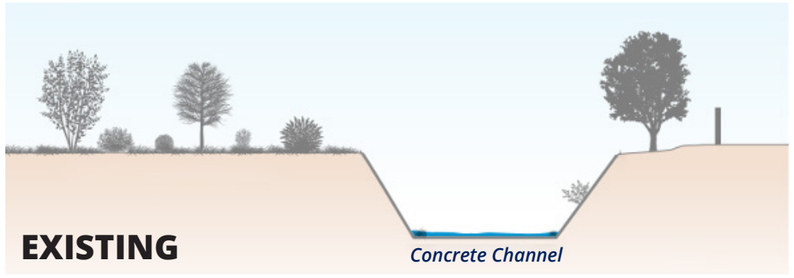
ASSESSING STREAM CONDITIONS

THE DESIGNS

Designs were developed to increase ecological function, typically by establishing more diverse native plant communities through creation or enhancement and, where feasible, increasing hydrologic residence time or infiltration. In addition, infrastructure conversion/removal sites were developed to allow for restoration of habitat in areas where current conditions limit natural channel or stream condition. Each site concept design optimized these objectives in the context of constraints and opportunities present at each site location.

Project details for six of the 18 evaluated and scored sites as detailed in Appendix 4 include:

- A fact sheet with a narrative describing the existing and proposed site design,
- A map depicting estimated GIS limits and design intent for grading, infrastructure removal, and/or habitat enhancement,
- Standard scoring evaluation, and
- Typical conceptual restoration/mitigation technique cross-sections.



Cross-section showing opportunity for stream rehabilitation through conversion/removal of concrete channels.

THE BENEFITS

Stream restoration/mitigation concepts would expand of create naturalized conveyance areas in support of multiple SWD objectives, including:

- Compensatory mitigation,
- Water quality improvement or protection, and
- Community benefits.

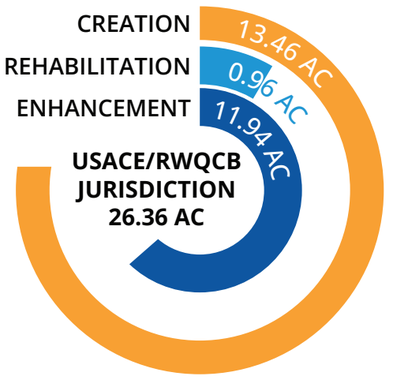
Sixteen sites have some potential to provide compensatory mitigation credits to satisfy requirements of one or more regulatory agencies. Mitigation types include creation (i.e., establishment), restoration/rehabilitation, and enhancement. Mitigation estimates total approximately 32 acres.

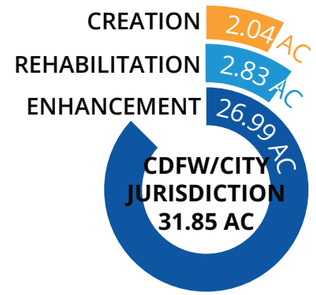
The 16 sites present some opportunity for water quality improvement, with the infrastructure conversion/removal sites likely to provide the greatest pollutant reduction benefits.

Several potential project sites have opportunities for recreation improvements (e.g., trails) and potentially flood risk reduction and climate resilience/adaptation.

STREAM REHABILITATION/ MITIGATION PROJECT BENEFIT SUMMARY

Potential mitigation acreage generated from the 6 proposed projects calculated in two categories.





[1] Habitat creation within the jurisdiction of USACE, CDFW, RWQCB, and the City, generally within existing or expansion of low-flow channel.

[2] Habitat creation within the jurisdiction of City and CDFW, generally on the banks and floodplain adjacent to the low-flow channel.

INTEGRATED SCORING

WEIGHT 25 — Legal Compliance and Risk to Health, Safety, and Environment

This element preferentially scores projects that:

- … avoid or minimize risk to health,
- … address urgency to reduce potential hazards, and/or
- … minimize liability for failure to comply with state or federal laws or requirements.

WEIGHT 25 — Asset Condition and Level of Service

This element:

- addresses substandard asset conditions and failure,
- addresses areas with higher population densities and areas experiencing the most growth,
- improves overall asset reliability,
- extends asset useful life,
- reduces short- and long-term maintenance expenditures, and
- identifies infrastructure or facility deficiencies noted in General or other City plans.

WEIGHT 20 — Equal and Equitable Community Investment

This element favorably scores projects that

- address economic development and revitalization efforts,
- reduce or avoid negative community impacts,
- address disparities in Structurally Excluded Communities that enhance neglected assets,
- improve services and response time in public safety and general service facilities,
- are located in certain defined communities, and
- improve access for people of all ages and abilities.

WEIGHT 15 — Sustainability and Conservation

This element scores projects that

- benefit the Community of Concern identified in the Climate Equity Index,
- advance City greenhouse gas emission goals,
- promote climate resiliency,
- improve community health and natural environment,
- promote infill development, open space and land-form preservation,
- promote habitat protection and biological diversity, or
- enhance urban runoff management.

WEIGHT 5 — Funding Availability

This element preferentially scores projects that:

- … identify funding source(s),
- … are likely to receive grant funding, and/or
- … require funding to complete an ongoing phase.

WEIGHT 5 — Project Readiness

This element scores projects that

- … are further along the project life cycle process and
- … have expeditious delivery timelines.

WEIGHT 5 — Multiple Category & Bundling

This element preferentially scores projects that

- … reduce construction costs by potentially bundling with adjacent projects of other asset types and
- … provide for partnering or bundling opportunities with other local, state, or federal agencies.

The San Diego Bay IDEA incorporates the City-wide capital planning prioritization process identified in Council Policy 800-14. Within this framework, the SWD identifies as an Asset Managing Department (AMD) assigned to assess and plan projects according to SWD-specific calculated risk assessment and operational maintenance strategies. The IDEA is the core planning document for flood resiliency and water quality assets that improve stormwater quality and flood control assets or services in the San Diego Bay Watershed.

A suite of seven weighted prioritization scoring factors are applied to the stormwater drainage, water quality, and stream restoration/habitat mitigation projects developed as part of the IDEA program. Each factor, with the exception of the Multiple Category Benefit and Bundling Opportunities factor, is divided into subcategories to delineate refined components in support of project-specific scores. The base subcategory descriptions and relative weighting were developed based on collaboration with Engineering & Capital Projects Department staff. Subsequently, as part of the San Diego Bay IDEA development, the SWD augmented a subset of the base subcategory descriptions and relative weighting with tailored narrative and slightly modified relative subcategory scores to better relate to stormwater-specific CIP elements. Finally, the SWD created a tailored scoring matrix based on the seven weighted prioritization scoring factors, base and augmented subcategory descriptions and relative weighting, and tailored criteria descriptions to allow for specific drainage, water quality, stream restoration/mitigation, and aging or failed asset replacement/rehabilitation and emergency CIP project scoring.

Standardized project scoring applied to stormwater-related CIPs within the drainage, water quality, and stream restoration/habitat mitigation project categories allows for an integrated prioritized project list. The integrated prioritized list included as part of this San Diego Bay Watershed IDEA allows for infrastructure planning and implementation consistency with the City-wide planning prioritization process such that SWD activities are aligned with City climate, equity, and strategic plan goals.

	Project ID	Category	Name	Score	Cost
1	COM1	Flood Resiliency	San Diego Bay IDEA - COM-1	89.63	$209,763,600.00
2	PLT	Flood Resiliency	San Diego Bay - Paleta Creek	88.63	$11,347,200.00
3	NES2	Flood Resiliency	San Diego Bay - Nester Creek 2	87.38	$5,130,000.00
4	PRSH3	Flood Resiliency	Pershing Drive Channel Improvements at City Yard	86.25	$2,091,000.00
5	DTWN1	Flood Resiliency	San Diego Bay - Downtown	85.75	$22,514,400.00
6	NES1	Flood Resiliency	San Diego Bay - Nester Creek 1	83.5	$1,731,600.00
7	FLO1	Flood Resiliency	San Diego Bay - Florida Street	82.5	$132,633,600.00
8	SWIT1	Flood Resiliency	San Diego Bay - Switzer - 1	81	$337,622,000.00
9	PRSH1	Flood Resiliency	San Diego Bay - Pershing - 1	80.13	$42,868,800.00
10	POL	Flood Resiliency	San Diego Bay - Point Loma - 1	75.25	$15,670,800.00
11	UNIV	Flood Resiliency	San Diego Bay - University Avenue - 1	73.25	$7,554,000.00
12	POL2	Flood Resiliency	San Diego Bay - Point Loma - 2	71.88	$65,721,600.00
13	ARPT1	Flood Resiliency	San Diego Bay - Washington Street Detention Basin	71.25	$1,411,200.00
14	SWTR1	Flood Resiliency	San Diego Bay - Sweetwater - 1	70.88	$110,134,800.00
15	PRSH2	Flood Resiliency	San Diego Bay - Pershing - 2	59.75	$13,245,600.00

PRIORITIZED PROJECT LIST

The IDEAs project development process, combined with the 800-14 framework scoring and prioritization element was used to develop an integrated project list.

NEXT STEPS

The San Diego Bay WMA IDEA is a living document. As the watershed framework for local land use, stormwater infrastructure, rainfall and flooding patterns, water quality, habitat and open space change, its contents and prioritized project recommendations should reflect current goals and issues. The identified projects have been scored and prioritized based on current conditions and City priorities. In time, conditions and/or City priorities including Council Policy 800-14 can change via City Council action. These potential changes and/or project details developed as part of the preliminary design process may require review and/or update of the IDEA methodology, content, project scoring, or outcomes.

The next steps for the prioritized San Diego Bay WMA IDEA projects are feasibility assessment and implementation. The feasibility assessment process will be used to perform site-specific evaluation of the concept projects to determine viability within potential constraints such as existing infrastructure, contributing area and drainage patterns, long-term operations approach and capacity, and cost-benefit. The implementation approach requires careful consideration of watershed needs, available funding, planning and design, construction, and long-term maintenance resources. Additionally, these considerations need to be balanced with needs in other City jurisdiction watersheds such that the SWD is efficiently and effectively managing the storm drain system to convey drainage flows to protect life and property and comply with federal, state, and local regulations for water quality standards in receiving waters.

View of San Diego Bay from Shelter Island

APPENDIX 1

DATA COLLECTION

APPENDIX 2

DRAINAGE REPORT

APPENDIX 3

WATER QUALITY TECHNICAL REPORT

APPENDIX 4

HABITAT MITIGATION AND STREAM RESTORATION

THINK BLUE SAN DIEGO®

Integrated Drainage Engineering Analysis

SAN DIEGO BAY WATERSHED MANAGEMENT AREA

JUNE 2024