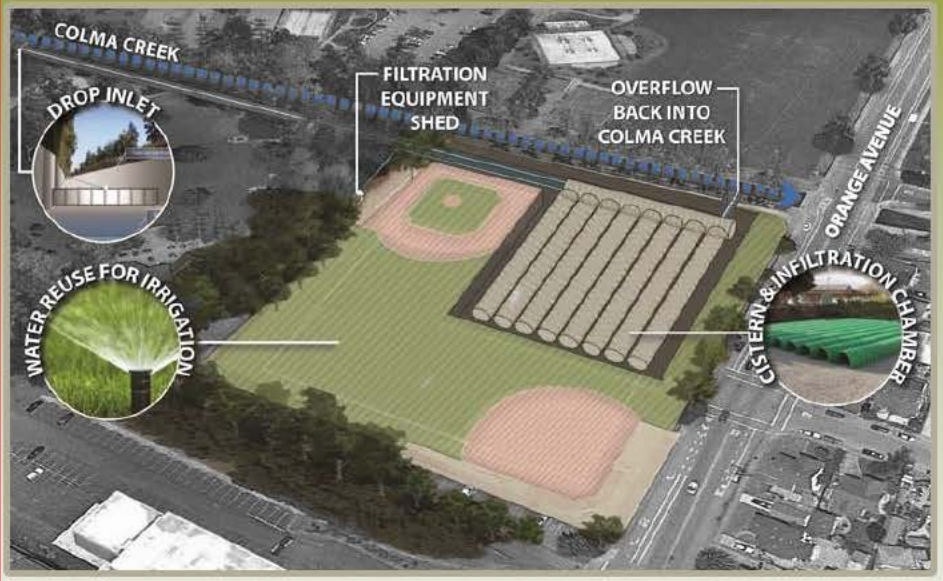
South San Francisco
Green Infrastructure Plan

Moving from Grey to Green Drainage Design



315 Maple Ave • South San Francisco, CA. 94080 • webpw@ssf.net • 650-877-6652

Acknowledgments

The City would like to acknowledge the City of Palo Alto, the City of Menlo Park, Santa Clara County, Alameda County, and Contra Costa County for sharing outlines and text from Green Infrastructure Plans.

The City would also like to acknowledge C/CAG for their support providing materials that have been included in this Green Infrastructure Plan and the development of the G*reen Infrastructure Design Guide* which is available online on their website at https://www.flowstobay.org/gidesignguide.

This plan was prepared by Schaaf & Wheeler with extensive support from department staff at South San Francisco Public Works, Economic and Community Development, Finance, Parks and Recreation, and City Council.

Disclaimer

The Green Infrastructure targets set forth in Chapter 4 are based on NPDES Permit No. CAS612008 dated November 19, 2015. The City will continue to re-evaluate the targets in the context of regulatory revisions, how much development occurs, and the amount of public GI projects that are able to be built.

Acronyms

BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
C3 Regulated Project	A development or redevelopment project that creates or replaces 10,000 square feet (sf) of impervious surface or 5,000 sf of impervious for special land use categories such as gasoline stations, parking lots, and restaurants
Caltrans	California Department of Transportation
C/CAG	City/County Association of Governments of San Mateo County
COA	Conditions of Approval
EPA	Environmental Protection Agency
GI	Green Infrastructure
GIS	Geographic Information System
LID	Low Impact Development
MRP	Municipal Water Quality
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyls
RAA	Reasonable Assurance Analysis
ROW	Right of Way
RWQCB	California Regional Water Quality Control Board for the San Francisco Bay Region
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SRP	Stormwater Resources Plan
TMDL	Total Maximum Daily Loads
WLAs	Wasteload Allocations

Table of Contents

Executive Summary

The purpose of this Green Infrastructure (GI) Plan is to demonstrate the City of South San Francisco's (City) continued commitment to improve water quality and meet requirements to reduce pollution of stormwater runoff to the San Francisco Bay. These requirements are contained in the San Francisco Bay Regional Water Quality Control Board's (RWQCB) Municipal Regional Permit (MRP) and include specific provisions for addressing key pollutants of concern, namely mercury, PCBs (polychlorinated biphenyls), sediment, and trash. The MRP also requires jurisdictions to transition from gray, or piped, infrastructure to green, or landscape-based, systems that capture, treat, and infiltrate runoff — GI.

This GI Plan will provide goals, policy changes, and programs to implement GI in private and public projects, and support the goals of the MRP. The purpose of this GI Plan is to provide a roadmap for the City to achieve the load reduction targets set forth in the MRP by implementing GI projects throughout the City. These GI projects while reducing pollution and runoff associated with stormwater runoff, also have the aim to create a balanced development condition; this includes improving biological functioning of plants, soils, and other natural infrastructure, and providing community benefits through stakeholder engagement and education.

Figure ES-1. Balanced Development that Allows Runoff to Infiltrate and Evaporate

1.0 Introduction

1.1 Regulatory Mandate

The California Regional Water Quality Control Board for the San Francisco Bay Region's (RWQCB's) Municipal Water Quality Permit (MRP) was last reissued in November 2015 mandating the implementation of a comprehensive program of stormwater control measures and actions designed to limit contributions of urban runoff pollutants to San Francisco Bay (Bay). MRP Provision C.3.j.i requires the City of South San Francisco to prepare a GI Plan to be submitted with its Annual Report to the RWQCB due September 30, 2019. The GI Plan is intended to provide the methods by which the total maximum daily load (TMDL) waste load allocations for urban runoff to the Bay will be met, and to set goals for reducing the adverse water quality impacts of urbanization and urban runoff on receiving waters. Table 1-1, presented below, links each section of this GI Plan to the applicable MRP provision.

Table 1-1. Green Infrastructure Plan Sections and Applicable MRP Provisions.

Section of Green Infrastructure Plan	Applicable MRP Provision
1.0 Introduction	C.3.j
2.0 Integration with City Plans and Documents	C.3.j.i. (2) (a)-(d), (h)-(i), C.3.j.i. (3)
3.0 Design Guidelines and Specifications	C.3.j.i. (2) (e)-(g)
4.0 Green Infrastructure Targets	C.3.j.i. (2) (a)-(c), (j), C.3.j.i. (3), C.3.j.ii.
5.0 Tracking and Mapping Systems	C.3.j.i. (2) (d)
6.0 Evaluation of Funding	C.3.j.i. (2) (k), C.3.j.ii.
7.0 Outreach and Education	C.3.j.i. (4), C.3.j.iii.
Appendix A City Plans and Suggested Updates to Include GI	C.3.j.i. (3)
Appendix B SMCWPPP RAA Plan	C.3.j.i. (2) (a)-(d), C.3.j.iii.
Appendix C Green Infrastructure Funding Report	C.3.j.i. (2) (k), C.3.j.ii.
Appendix D Outreach Materials	C.3.j.i. (4) (a)

1.2 The Problem

Rainfall is prevented from infiltrating into the ground when cities develop impervious areas such as streets, parking lots, roofs, etc. The impervious surface increases the flow and velocity of the stormwater runoff which is received by local creeks and eventually the Bay. The increased stormwater runoff and velocity can erode creeks and wash away important habitat for fish and macroinvertebrates that live in the creek or the Bay. In addition to these physical impacts to the receiving waterbodies, stormwater runoff from impervious areas carries various pollutants that are found on paved surfaces such as sediment, bacteria, oil and grease, trash, pesticides and metals. These pollutants come from various sources, including pet waste, lawn fertilization, cars, construction sites, illegal dumping and spills, and pesticide application. These pollutants wreak havoc in our creeks and the Bay. Implementing GI projects can reduce the impacts of urbanization on local creeks and the Bay.

1.3 City's Objectives & Vision

This GI Plan provides is an outline for the City to manage its stormwater while decreasing water quality impacts to the San Francisco Bay (Bay). This plan establishes guidelines for integrating GI measures into the City in combination with conventional storm drain system (gray) improvements to manage runoff from storm events. In addition, the integration of GI into the current storm drain system may provide cost-effective solutions when strategically planned and implemented. This GI Plan provides an opportunity to develop more resilient stormwater systems by incorporating sustainable stormwater systems to reduce runoff volumes and improve runoff water quality.

1.4 The Purpose of this Document

This GI Plan is intended to serve as an implementation guide to describe how the City will shift from conventional "collect and convey" storm drain infrastructure management to sustainable stormwater management, and focus on retrofitting existing gray infrastructure to include GI designs into new and existing public spaces, including streets, parks, and parking lots. This GI Plan puts forth a framework for identifying, and prioritizing City properties for potential GI project opportunities. In addition, this plan defines GI and Low Impact Development (LID) and provides examples that exist in the Bay Area.

1.5 What is Green Infrastructure and Low Impact Development

GI and LID in this Plan refers to engineered or man-made stormwater infrastructure that uses vegetation, soils, and natural processes to sustainably manage stormwater and create healthier urban environments. GI may be new construction or a retrofit of an existing storm drainage system, and aims to reduce runoff volumes and improve water quality through natural processes before discharging into local creeks and the Bay. Examples of GI include pervious pavement, infiltration basins, bioretention facilities or raingardens, green roofs, and rainwater harvesting systems. GI can be incorporated into construction on new and previously developed parcels, as well as new and rebuilt streets, roads and other infrastructure within the public right-of-way. This Plan focuses primarily on incorporating GI into City projects but also aims to change the general construction practices on both public and private projects to consider GI stormwater design.

Photo Credit: San Mateo County GI Design Guide

Photo Credit: San Mateo County GI Design Guide

Figure 1-1. Grey Stormwater Infrastructure (left) to Green Infrastructure (right)

1.6 Change of City Perspectives

An important aspect of GI Plan Implementation is shifting the focus to sustainability in stormwater management and incorporating GI and LID in the early stages of design for construction and maintenance projects. Per the MRP the City is required to "adopt policies, ordinances, and/or other appropriate legal mechanisms to ensure implementation of the GSI Plan." Policies in the City can be established to promote the integration of GI in capital improvement projects (CIPs) and providing multiple benefits from each public project. The City is currently working GI into public projects, and has updated conditions of approval (COAs) for private development to encourage the use of GI in future development, presented in Section 4.3.

2.0 Integration with City Plans and Documents

As part of the planning process, the City has reviewed its existing ordinances, plans, and documents related to the implementation of MRP requirements in order to identify items that need to be updated to include language to implement the GI plan.

2.1 City Plans

Several planning documents address different elements related to GI, including land use, transportation, sustainability, conservation, urban forestry, environmental leadership, infrastructure, and housing. In an effort to ensure that GI is considered and supported in the range of planning and design processes for these projects, the City has reviewed current and past planning documents to appropriately incorporate GI requirements. The most important update will be the General Plan update which is anticipated to be completed in 2021/2022.

The City uses area and master plans, as well as specific plans to coordinate planning future development and improvement projects throughout the City. Including GI and LID in planning documents will allow GI and LID approaches to be integrated to the early phases of design and allow for a more effective use of resources. Some of the planning documents listed in Attachment 1 already contain language to support the GI Plan. However, to be better aligned with the GI Plan, the City will need to modify language to require the integration of the *San Mateo Green Infrastructure Design Guide and Specifications* that are housed on the San Mateo County Wide Pollution Prevention Program's (SMCWPPP) website at www.flowstobay.org. It should be noted that the *San Mateo Green Infrastructure Design Guide and Specifications* are applicable to non-regulated GI projects (public or private) that are not subject to Provision C.3.i. Design guidance for C3 Regulated Projects in San Mateo County is housed on the San Mateo County Wide Pollution Prevention Program's (SMCWPPP) website at https://www.flowstobay.org/newdevelopment.

Per the MRP, language supporting GI will need to be added to these plans during their next update. If these updates do not occur during the current permit term, an interim policy will be adopted by the City Manager to direct staff to follow the GI Plan. The City's engineering standards for both the Departments of Public Works and Utilities were reviewed as part of the development of a process and recommendations for incorporation of the GI details and specifications from the Design Guide were suggested into the City standards. Appendix A contains a detailed list of City ordinances, plans and documents and suggested GI language to include when these documents are updated.

2.1 Regional Plans and Agencies

The City is a member of the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), an association representing twenty cities, the County of San Mateo, and the Flood Control District that collaborate on stormwater regulation and compliance with the intent to reduce the pollution carried by stormwater into local creeks, the Bay, and the Pacific Ocean. The City is working with SMCWPPP, C/CAG, and other agencies to integrate and coordinate several large-scale planning efforts related to stormwater management and GI including:

- Green Infrastructure Design Guide - The Countywide Program created the San Mateo Countywide Green Infrastructure Design Guide (Design Guide) to aid jurisdictions in gradually transitioning from gray to green infrastructure over time. The Design Guide includes design guidance, standards and typical details for green infrastructure implementation in public and private projects. More information on the Design Guide is provided in Chapter 3.
- San Mateo County Stormwater Resource Plan (SRP) - A collaboration between SMCWPPP, stakeholders, and the public to provide detailed analysis of stormwater and dry weather capture projects for the County. These projects aim to reduce flooding and pollution associated with stormwater runoff, improve biological functioning of plants, soils and other natural infrastructure, and provide community benefits through stakeholder engagement and education.
- Reasonable Assurance Analysis (RAA) – To meet MRP requirements SMCWPPP initiated a county-wide effort to develop an RAA to estimate baseline PCB and mercury loads at the subwatershed level and identify the most cost effective "recipe" of green infrastructure control measures to meet countywide pollutant load reductions. More details in Chapter 4.
- The Bay Area Integrated Regional Water Management Plan (IRWMP) – The Bay Area IRWMP is a comprehensive water resources plan for the Bay region that addresses four functional areas: 1) water supply and water quality; 2) wastewater and recycled water; 3) flood protection and stormwater management; and 4) watershed management and habitat protection and restoration. It provides a venue for regional collaboration and serves as a platform to secure state and federal funding. The IRWMP includes a list of over 300 project proposals, and a methodology for ranking those projects for the purpose of submitting a compilation of high priority projects for grant funding.
- San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook – The San Mateo County Sustainable Green Streets and Parking Lots Guidebook (Guidebook) provides guidance with designing green street and parking lot demonstration projects, and aims to inspire widespread changes that will improve San Mateo County's watershed health by reducing the impacts of urbanization on receiving waterbodies.
- San Mateo Countywide Sustainable Streets Master Plan (SSMP) – C/CAG was awarded a grant to prepare a sustainable streets master plan for the entire County. A consultant has been hired to put together this plan which is anticipated to be completed in 2020. The plan will contain climate change adaptation, street-scale opportunities, and periodization overlaid with community priorities and climate risk criteria. The plan will also contain a tracking tool.

In addition to SMCWPPP, the City is also a member of the San Mateo County Flood and Sea Level Rise Resiliency Agency that was established with a vision to make a "resilient shoreline" in San Mateo County by 2100. Portions of their funding will be spent on stormwater detention solutions and multi-benefit projects which will include GI as a core component.

The Colma Creek Flood Zone is one of the San Mateo County Flood Control Districts. While the primary function of the District is flood control, projects with multi-benefits are also considered.

3.0 Design Guidelines and Specifications

The MRP requires that the GI Plan include general design and construction guidelines, standard specifications and details for including GI components in projects throughout the City. These guidelines and specifications are intended to address a variety of project types in the City right-of-way based on the land use and transportation characteristics of the site, to allow projects to provide a range of functions and benefits, such as stormwater management, bicycle and pedestrian friendly streets, public green space, and street trees.

SMCWPPP, with input and feedback from its member agencies, including the City of South San Francisco, has developed a countywide *Green Infrastructure Design Guide* (Design Guide) to provide comprehensive guidance on the planning, design, construction, and operations and maintenance of GI for buildings, parking lots, sites, and streets. The Design Guide addresses the requirements of the MRP, fulfilling Section C.3.j.i.(2)(e) requiring design and construction guidelines for streets and projects and C.3.j.i.(2)(f) for developing typical design details and specifications for different street and project types. The Design Guide also addresses the part of C.3.j.i.(2)(g) related to a regional approach for alternative hydraulic sizing for non-regulated constrained street projects.

"C3 Regulated Project" refers to development projects that create or replace 10,000 square feet (sf) or more of impervious surface or 5,000 sf of impervious surface for special land use categories such as auto service facilities, uncovered parking lots, and restaurants. C3 Regulated Projects are required to provide stormwater quality treatment through the use of low impact development (LID). C3 Regulated Projects should follow the *C3 Stormwater Technical Guidance* which is located on the San Mateo County Wide Pollution Prevention Program's (SMCWPPP) website at https://www.flowstobay.org/newdevelopment.

3.1 Design Guidelines

In order to develop comprehensive guidelines throughout San Mateo County, C/CAG hired a consultant to prepare the *Green Infrastructure Design Guide* (Design Guide). The Design Guide includes a range of information related to GI, such as provision of policies and definitions; identification of different types of treatment and site design measures; summation of various benefits including a range of community benefits provided beyond stormwater management; presentation of before and after images of integrating GI into projects; introduction of complete streets concepts and design; discussion regarding BASMAA's regional approach for alternative sizing for non-regulated constrained green street projects; design and implementation considerations; operations and maintenance; and provision of typical construction details and specifications. The Design Guide explains how these concepts, considerations, and guidance can be used to effectively integrate GI into communities in new and redevelopment projects whether they are C.3 Regulated Projects or not.

General guidelines for overall streetscape and project design, construction, and maintenance have been developed so that projects have a unified, complete design and implement the range of functions associated with the projects. The MRP emphasizes the need for guidance related to green streets functions. The Design Guide includes implementation guidance specifically for stormwater management

and treatment within streets. The guidance supports safe and effective multimodal travel with a focus on the comfort of people walking and cycling; shared use as public space and an attractive and functional public realm; use of appropriate measures for different street and land use contexts and types; and the achievement of urban forestry goals and benefits. The Design Guide defines practices to give considerations to no missed opportunities and the efficient and effective coordination, review, and implementation of GI in public and private projects.

The City of South San Francisco will use the Design Guide and future amended versions to provide support and guidance in implementing GI within the City. The Design Guide can be found at SMCWPPP's website, https://www.flowstobay.org/gidesignguide .

The Design Guide presents key design and construction considerations when implementing GI features which include:

- Protecting existing improvements
- Designing for pedestrian circulation
- Deal with steep topography/using check dams and weirs
- Overflow options
- Designing for poor soils
- Dealing with utilities
- Capturing and conveying surface runoff
- Capturing and conveying rooftop runoff
- Soil Preparation, landscape grading, and mulch placement
- Effective placement of pervious pavement
- Choosing and placing appropriate plant material
- General sizing of green infrastructure facilities
- Construction administration process
- Specialized design consideration for San Mateo County

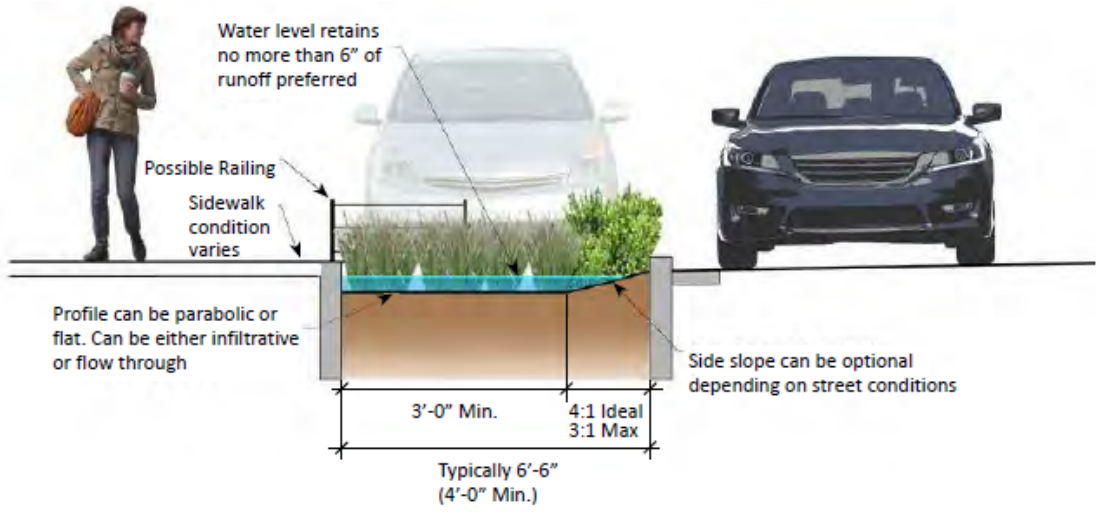
The design guide provides guidance for GI design for new construction and retrofit applications.

3.2 Details and Specifications

The details and specifications presented in the Design Guide were originally developed for the San Francisco Public Utilities Commission's (SFPUC) San Francisco Green Infrastructure Plan, and were included in the Design Guide so that designers and engineers can incorporate the GI details into their site plans. The Design Guide is meant to be a comprehensive resource for the City's, developers, and project sponsors for design, construction, and maintenance of GI in San Mateo County.

The design guide includes details for permeable pavement, stormwater planters, infiltration systems, stormwater curb extensions, utility protection and other components related to the construction of GI. Green streets represent the majority of the public GI projects, which will include a combination of stormwater planters, stormwater curb extensions, infiltration systems, and pervious pavement. Stormwater planters may be very useful for complete street retrofits, due to their compactness and

versatile application. Stormwater planters may be used between driveways, pedestrian walkways, or constructed in series along the street, and can be designed to capture and treat significant runoff. Stormwater curb extensions, also referred to as a bulb out, is a GI treatment measure which integrates a bioretention planter into the extension of a street curb, see Figure 3-1 from the Green Infrastructure Design Guide. In addition to water quality benefits, stormwater curb extensions benefit pedestrians by shortening distance to cross the street if they are located at an intersection, as well as adding green space in urban environments. Pervious pavement applications for the City include parking lots, plazas, sidewalks and roadways, parking strip, gutter line, and bicycle lanes. Pervious concrete, pervious asphalt and porous rubber infiltration systems have pore spaces within the material that allow for rain water to infiltrate through to the underlying ground, or be stored in the gravel base and connected to the stormwater system via under drains. An example detail for pavement components is presented below in Figure 3-1.



The Anatomy of a Stormwater Curb Extension

1. Cross section can be parabolic, trapezoidal, or flat-bottom
2. If side slopes are used they should be ideally set at a 4:1 slope (3:1 maximum) where a curb or low fence is not used, a flat shelf transitioning between the adjacent walking surface pavement and the slope
3. Preferred retention depth is 6" of stormwater (Maximum of 8" and in extreme constrained sites, a maximum of 12" if approved by the responsible jurisdiction)
4. Can be either infiltrative or flow-through with an underdrain system
5. Imported soil mixture (see C.3 **Regulated Project Guide** for soil specifications)
6. Native soil condition (an underdrain system may be needed with some native soil conditions)

Figure 3-1. Green Infrastructure Design Guide - Stormwater Curb Extension

4.0 Green Infrastructure Targets

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires the development of GI Plans (Provision C.3) and polychlorinated biphenyls (PCBs) and mercury control measure implementation plans (Provisions C.11 and C.12) that provide the necessary pollutant load reductions to meet total maximum daily load (TMDL) wasteload allocations (WLAs) over specified compliance periods. A key component of these plans is a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of PCBs and mercury to meet WLAs for municipal stormwater discharges to the Bay. The City/County Association of Governments (C/CAG) of San Mateo County, via its San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), led a county-wide effort to develop an RAA to estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs among San Mateo County Permittees, and set goals for the amount of GI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GI (SFBRWQCB 2015).

An important consideration for the RAA was the ability to track costs and benefits of different categories of GI projects within the model. This tracking was performed for GI project categories within each model subwatershed and municipal jurisdiction, and supports the selection of the most cost-effective implementation strategy to attain pollutant reduction goals. The RAA builds upon the previous planning efforts and represents the following generalized GI project categories in the model:

1. **Existing Projects**: Stormwater treatment and GI projects that have been implemented since FY-2004/05. This primarily consists of all of the regulated projects that were mandated to treat runoff via Provision C.3 of the MRP, but also includes any public green street or other demonstration projects that were not subject to Provision C.3 requirements. For C3 Regulated Projects in the early years of C.3 implementation, stormwater treatment may have been achieved through non-GI means, such as underground vault systems or media filters.
2. **Future New and Redevelopment:** All the C3 Regulated Projects that will be subject to Provision C.3 requirements to treat runoff via LID and is based on spatial projections of future new and redevelopment tied to regional models for population and employment growth.
3. **Regional Projects (identified)**: C/CAG worked with agencies to identify five projects within public parks or Caltrans property to provide regional capture and infiltration/treatment of stormwater, and included conceptual designs to support further planning and designs. Note – the model can be updated to include future identified projects to support adaptive management.
4. **Green Streets**: The SRP identified and prioritized opportunities throughout San Mateo County for retrofitting existing streets with GI in public rights-of-way. Green streets were ranked as high, medium, and low priority (within each subwatershed) based on a multiple-benefit prioritization process developed for the SRP.
5. **Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of either additional parcel-based GI or other Regional Projects. The SRP screened and prioritized public parcels for opportunities for onsite LID and Regional Projects. These opportunities need further investigation to determine the best potential projects.

The RAA considers the numerous GI project opportunities that exist within each municipal jurisdiction, and selects a suite or “recipe” of projects that can most cost-effectively address pollutant load reductions. The amount and combination of those GI projects can be determined through analysis of

estimated load reductions and implementation costs. Figure 4-1 presents an example GI recipe showing the distribution of selected GI project categories versus incremental reductions in pollutant loading and increasing cost.

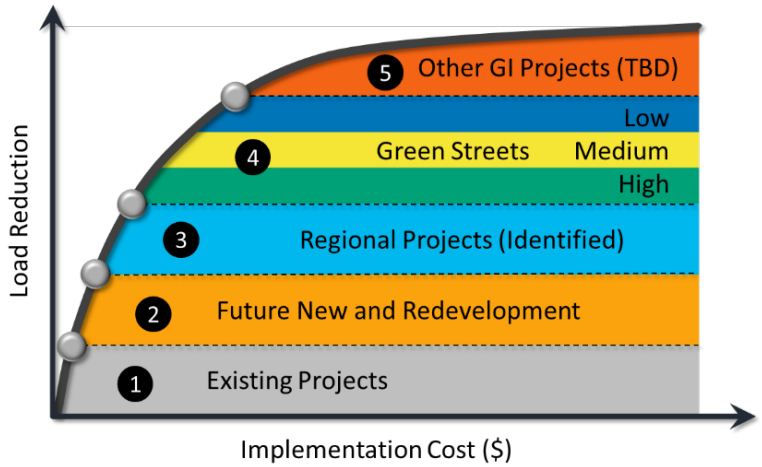


Figure 4-1. Example Implementation Recipe Showing General Sequencing of GI Projects

4.1 Reasonable Assurance Analysis (RAA) Overview

The RAA considers multiple perspectives and strikes a balance between detail and specificity while still leaving ample opportunity to allow for future adaptive management. The following are key considerations for the RAA output:

1. **Demonstrate PCBs and Mercury Load Reductions** – The primary goal of the RAA is to quantitatively demonstrate that GI Plans and Control Measure Implementation Plans will result in load reductions of PCBs and mercury sufficient to attain their respective TMDL WLAs and the component stormwater improvement goals to be achieved with GI. Based on the baseline hydrology and water quality model (Phase 1), the RAA determined that a 17.6% reduction in PCB loads is needed to meet the GI implementation goals established by the MRP. Zero reduction in mercury loads was determined to be needed from MRP areas because baseline loads were predicted to be below the TMDL WLA for San Mateo County. As a result, a 17.6% reduction in PCB loads is established as the primary pollutant reduction goal for the GI Plan.
2. **Develop Metrics to Support Implementation Tracking** – The MRP (Provision C.3.j) also requires tracking methods to provide reasonable assurance that TMDL WLAs are being met. Provision C.3.j states that the GI Plan "shall include means and methods to track the area within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area." Through C/CAG's current effort preparing a Sustainable Streets Master Plan for San Mateo County, a tracking tool will be developed that will enable calculation of metrics consistent with the results of the RAA and additional metrics relevant to sustainable street implementation. The tracking tool is planned for completion in 2020.
3. **Support Adaptive Management** – Given the relatively small scale of most GI projects (e.g., LID on an individual parcel or a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction goals. All the GI projects will require site investigations to assess feasibility and costs. As a result, the RAA provides a preliminary

investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction target. The RAA sets the GI Plan "goals" in terms of the amount of GI implementation over time to address pollutant load reductions. As GI Plans are implemented and more comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, the adaptive management process will be the key to ensuring that goals are met. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

The detailed analysis consisted of the modeling and optimization workflow, and is presented in Figure 4-2.

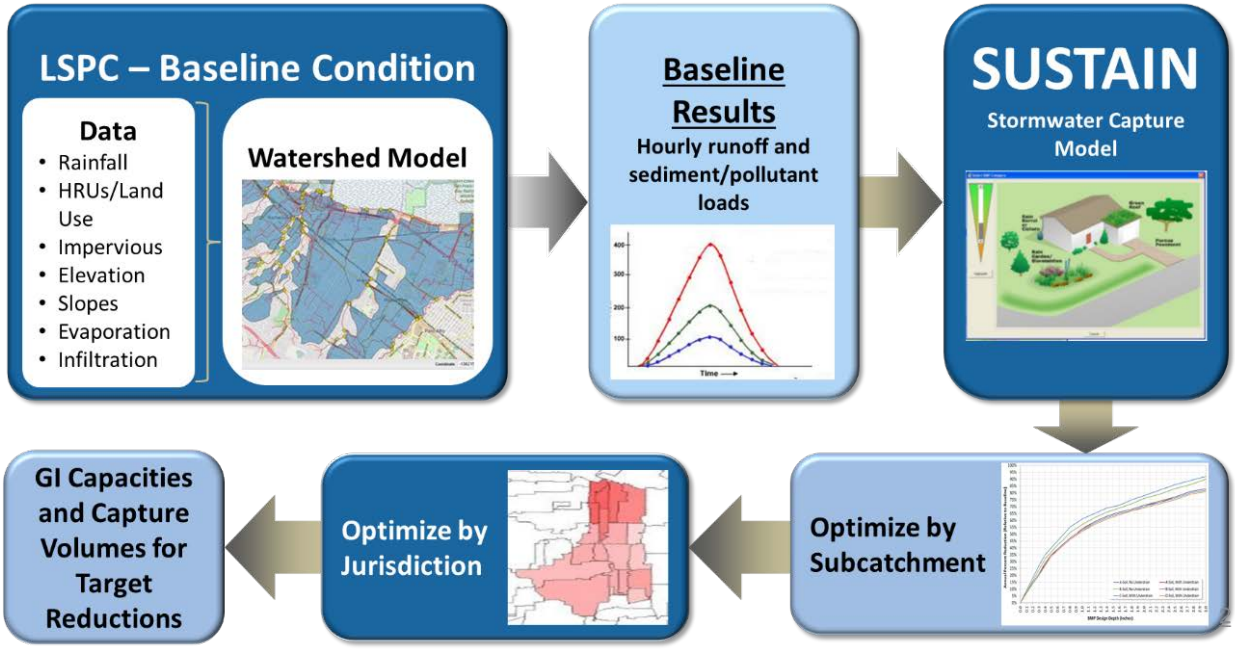


Figure 4-2. Modeling System Supporting the RAA.

The RAA presents alternative scenarios to inform implementation and the adaptive management process. These scenarios tested the underlining assumptions for GI implementation, and demonstrate the need for further research, collaboration among multiple Permittees, and incorporation of lessons learned in order to gain efficiencies and maximize the cost-effectiveness of GI to reduce pollutant loads over time. Four modeling scenarios were configured for this analysis, summarized in Table 4-1.

The following factors are considered for each model scenario:

- **Load Reduction Objective** - With a cohesive sediment load reduction objective, Scenarios 1 and 2 represent the most conservative approaches. Those scenarios assume that given the uncertainties about PCB source areas, targeting an overall 17.6% load reduction of cohesive sediment in general (silts and clays) achieves the PCB load reduction objective for GI. Scenarios 3 and 4 assume that PCB sources are spatially distributed based on analysis of land use types. The

cost-benefit optimization process targets those areas as having the highest likelihood of PCB sources. Scenarios 3 and 4 highlight the potential cost savings (relative to Scenarios 1 and 2) that could be realized if PCB sources are identified and targeted for GI implementation.

- **Jurisdictional verses Countywide** - There are many possible ways to achieve a 17.6% load reduction for all of San Mateo County. The "Jurisdictional" approach stipulates that each jurisdiction must individually achieve at least a 17.6% load reduction based on the population-based wasteload reduction for each jurisdiction. Conversely, the "Countywide" approach achieves the 17.6% load reduction countywide by allowing the model to allocate the countywide wasteload reduction via GI across jurisdictional boundaries. The countywide approach can provide significant cost savings over the jurisdictional approach, especially where pollutant sources are spatially concentrated.

Table 4-1. Model Scenarios Objectives and Cost-Benefit Evaluation.

Load Reduction Objective	Percent of Total GI Cost to Achieve Reduction Objective		
	Jurisdictional	Countywide	*Total Savings (Jurisdictional vs. Countywide)*
Cohesive Sediment 17.6% Reduction	**Scenario 1**	**Scenario 2**	→ *Savings*
Total PCBs 17.6% Reduction	**Scenario 3**	**Scenario 4**	→ *Savings*
Total Savings (Sediment vs. PCBs)	↓ *Savings*	↓ *Savings*	↘ *Overall Savings*

Based on the RAA results, the countywide approach should result in a roughly 34% cost reduction for each municipality and is a better reflection of a more realistic breakdown of GI throughout San Mateo County. Some agencies will have more GI opportunities and be able to do more, and some agencies will have fewer or more costly GI opportunities. A countywide approach is not only more cost effective, but it provides a vehicle for collecting funding for regional project opportunities, the costs of which can be shared by multiple jurisdictions. It also provides a vehicle for credit trading between agencies. Refer to the "Green Infrastructure Funding Nexus Evaluation" (SCI Consulting Group and Larry Walker Associates, January 2019) for more information about the concept of credit trading. This document is in Appendix C.

As the GI program develops, further discussions about collaborations will take place. The RAA has allowed for the possibility of credit trading by providing multiple management metrics for GI, such as impervious area to be treated in acreage, and GI capacity in acre-feet.

4.2 Implementation Milestones

Throughout the adaptive management process, the City will continue to verify feasible opportunities for GI projects to meet the final load reduction goals for 2040. The process will include the tracking of management metrics and continued re-evaluation of GI project opportunities considered for the RAA. For instance, the RAA assumed projected amounts of LID associated with new and redevelopment,

which are subject to change based on factors that are outside the control of the City. If less development occurs over time, more green streets or regional projects on public land may be needed to provide equivalent volume management. For the RAA and GI Plan, a preliminary schedule was developed in order to chart a potential course for GI implementation, which considered the various project opportunities. South San Francisco was divided into ten (10) subwatershed areas for the RAA analysis. The relative amount of GI capacities (normalized by area) for each subwatershed are shown in the Figure 4-3.

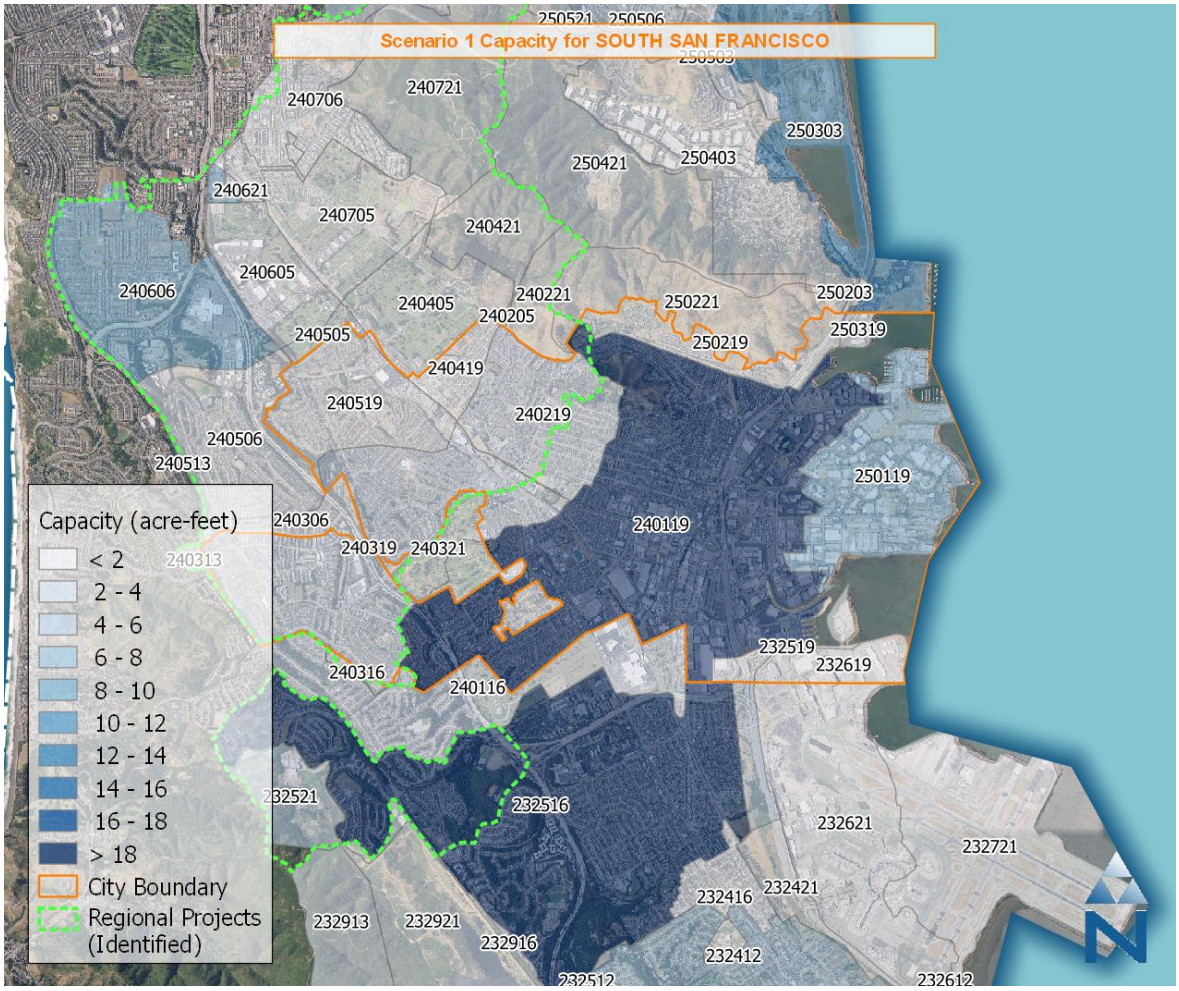


Figure 4-3. Map of GI capacities within each subwatershed of South San Francisco

The MRP requires reporting of goals for implementation of GI for interim milestones 2020 and 2030, in addition to the final milestone of 2040. In order to estimate the amount of GI to be implemented at these milestones, various assumptions were made in terms of the pace of implementation for various GI project types. The GI capacity milestones for South San Francisco are presented in Figure 4-4. Separate analyses determined the projected amount of LID associated with new development and redevelopment by 2020, 2030, and 2040. In addition, the Orange Memorial Park Storm Water Capture Project, described later in this document, is located in the City and is assumed to be built and operational by

2030. Finally, 33 percent of green streets required by 2040 are assumed to be implemented by 2030. More details on the implementation milestones may be found in Appendix C.

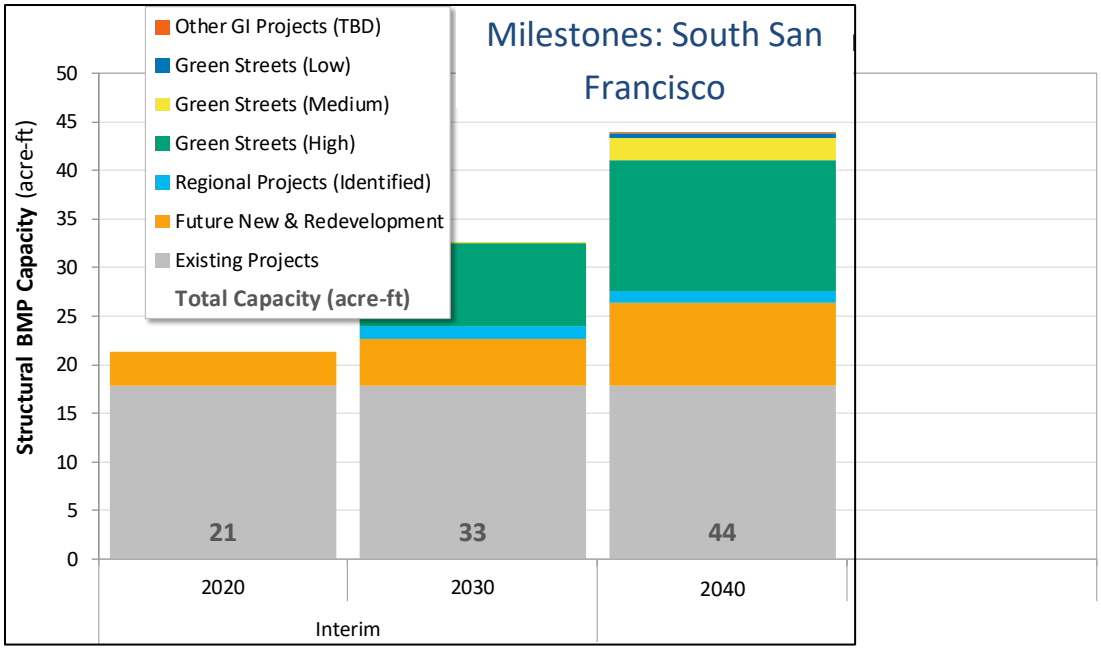


Figure 4-4. Summary GI Capacity for Interim and Final Implementation Milestones

4.3 Early Implementation Projects

The City is currently working on updating COAs for new developments to include GI and increase green space in frontage areas, per MRP Section C.3.j.ii. Early Implementation of Green Infrastructure Projects (No Missed Opportunities). The City is reviewing private and public projects that have the potential to include GI components within the public right of way (ROW). The following projects will include GI components:

Table 4-2. South San Francisco Development Projects Incorporating GI into Design

Development Projects in South San Francisco		
	Office/ R& D Projects	**GI or LID Component?**
1	494 Forbes Blvd	Yes; TBD
2	249 E Grand Office/R&D	Yes; Bioretention Areas
3	328 Roebling	Yes; TBD
4	Merck Campus	Yes; Bioretention Areas
5	475 Eccles	Yes; TBD
6A	Phase 1 - Gateway of Pacific	Yes; Bioretention Areas
6B	Phase 2 - Gateway of Pacific	Yes; Bioretention Areas
6C	Phase 3 - Gateway of Pacific	Yes; Bioretention Areas
7	Britannia Cove at Oyster Point	Yes; Bioretention Areas
8	Oyster Point Redevelopment	Yes; Bioretention Areas

Development Projects in South San Francisco		
8A	Phase IC and Phase ID	Yes; Bioretention Areas
8B	Phases IID - IVD	Yes; Bioretention Areas
8C	Phase IIC	Yes; Bioretention Areas
9	Genesis	Yes; Bioretention Areas
10	Genentech Building B-40	Yes; Bioretention Area
11	USDA Office Building	Yes; Bioretention Area
12	426 Victory Avenue	TBD
13	201 Haskins Way	Yes; Bioretention Area
14	Auto-Chlor System Building (465 Cabot)	Yes; Bioretention Areas
15	ARE Amenity Building	Yes; Bioretention Area
Commercial Projects		**GI or LID Component?**
16	Costco Fuel Facility Relocation, Phase II	Yes; Bioretention Area
17	550 Gateway Hotel	Yes; Bioretention Area
18	Marriott Fairfield Inn & Suites	Yes; Bioretention Area
19	Park SFO Expansion	Yes; Bioretention Areas
20	180 El Camino Real	Yes; Bioretention Areas
21	USDA (560 Eccles Ave)	Yes; Bioretention Area
22	681 Gateway Blvd	Yes; Bioretention Area
23	Wyndham Garden	Yes; TBD
24	141 Hickey Boulevard	Yes; TBD
25	Sing Tao Newspapers (215 Littlefield Ave)	Yes; TBD
26	160 Country Club Dr	Yes; Bioretention Areas
27	701 Airport Blvd	Yes; TBD
Residential/Mixed Use Projects		**GI or LID Component?**
28	418 Linden	Yes; Bioretention Area
29	201 Grand	Yes; Flow-through Planters
30	Oakmont Meadows	Yes; Bioretention Area
31	616 Maple	TBD
32	Mission & McLellan	Yes; Flow-through Planters
33	City Ventures	Yes; Bioretention Areas
34	988 El Camino Real	Yes; Flow-through Planters
35	410 Noor Avenue	Yes; TBD
36	818-824 Linden Avenue	Yes; TBD
37	645 Baden Avenue	Yes; TBD
38	40 Airport Blvd	Yes; TBD
39	200 Airport Blvd	TBD
40	124 Airport Blvd and 100 Produce Avenue	Yes; TBD
41	7 South Linden Avenue	Yes; TBD
47	South San Francisco PUC Site Development	Yes; Bioretention Areas
Civic Projects		**GI or LID Component?**

Development Projects in South San Francisco		
42	Caltrain Station Improvement Project	Yes; Bioretention Area
43	SSF Community Civic Center Campus	Yes; Bioretention Area
44	Linden Avenue Complete Streets	Yes; Bioretention Area
45	Grand Avenue Streetscape	Yes; Bioretention Area
46	Grand Boulevard Improvements	Yes; Pervious Pavement, and Bioretention Area

4.3.1 Orange Memorial Park Water Capture Project

The City received funding from the California Department of Transportation (Caltrans) for the Orange Memorial Park Regional Project (Project) that was listed in the Stormwater Resources Plan for San Mateo County (SRP) as a conceptual project. The Project is currently under design and includes the construction and operation of a water capture facility through the installation of a drop inlet, diversion channel, and inlet junction structure (trash screen) in the upper and western end of the Colma Creek channel and Park boundary (Figure 4-5). Captured water would be diverted into a series of storm pipes and pretreatment chambers that would lead to an underground stormwater storage reservoir in the southeastern corner of the Park. A portion of the storage would function as a cistern holding water for eventual non-potable irrigation use in and around the Park, and the remainder would function as an infiltration chamber. These storage facilities would be constructed underneath a portion of the Park's two existing ballfields. When storage capacity is exceeded, overflow from the system would be routed through an infiltration chamber before being metered back into the channel. This regional Project would have multiple benefits in addition to water quality improvements, including reducing flooding and reusing treated water for irrigation and groundwater recharge. The Project would capture and treat 8 to 13 percent of the annual drainage from approximately 6,300 acres of land in the City of South San Francisco, Town of Colma, the City of Daly City, and a portion of unincorporated San Mateo County.

The green infrastructure goals of the project include:

- Achieve load reductions in discharges of PCBs and mercury to San Francisco Bay for compliance with TMDL requirements;
- Reduce trash discharges to help meet MRP requirement of 100% reduction to the Bay by 2022;
- Implement green infrastructure improvements to capture and treat flows from Colma Creek, and utilize treated water for beneficial uses such as irrigation and infiltration;
- Alleviate flooding in lower reaches of Colma Creek;
- Implement solutions that minimize long-term operations and maintenance requirements and short-term construction impacts to park users.

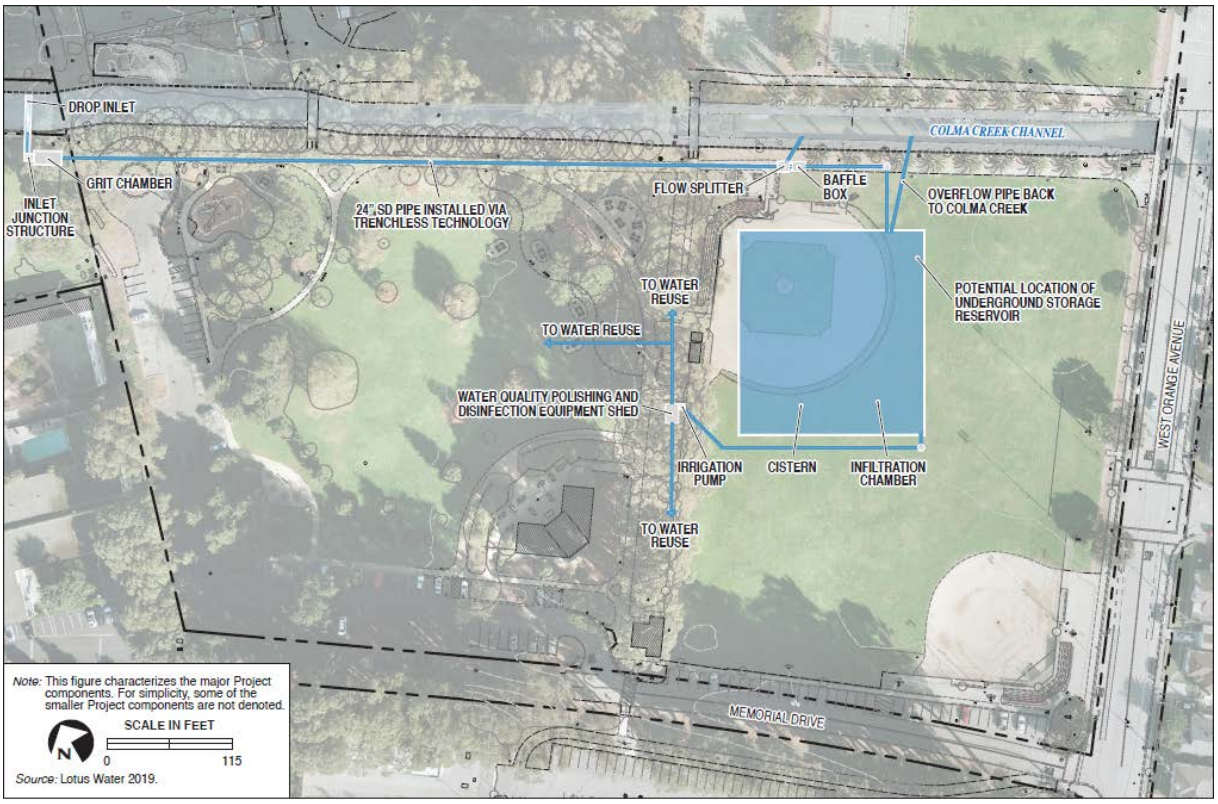


Figure 4-5. Concept for Orange Memorial Park

5.0 Tracking and Mapping Systems

The City/County Association of Governments (C/CAG) of San Mateo County, via its San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), led a county-wide effort to develop an RAA to quantitatively estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs among San Mateo County Permittees, and set goals to meet the PCB and mercury load reductions the MRP assigns to GI (SFBRWQCB 2015). The Baseline Modeling Report (Phase I) provides documentation of the development, calibration, and validation of the baseline hydrology and water quality model, and the determination of PCB and mercury load reductions to be addressed through GI implementation (SMCWPPP 2018). The Green Infrastructure Modeling Report (Phase II) provides documentation of the application of models to determine the most cost-effective GI implementation for each municipality, setting stormwater improvement goals for the GI Plan (SMCWPPP 2019).

The RAA recommends management metrics for the GI Plan that are based on metrics that can be easily measured and tracked throughout implementation. Table 5-1 provides details on the implementation plan for the 10 subwatersheds within the City's jurisdiction (represented by each row in table). At the left side of the table in Table 5-1 are columns under the header "Management Metrics for GI," which include performance metrics for "% Load Reduction PCBs (Annual)," "Annual Volume Managed (acre-ft)," and "Impervious Area Treated (acres)." The "% Load Reduction PCBs (Annual)" and "Annual Volume Managed (acre-ft)" metrics are based on annualized results represented in the RAA modeling system that are directly comparable to TMDL WLAs. The "% Load Reduction PCBs (Annual)" provides a relative comparison of the load reduction to be achieved within each subwatershed. The "Annual Volume Managed (acre-ft)" shows the acre-feet of water captured and infiltrated and/or treated within each subwatershed, resulting in a total annual volume of 528.2 acre-feet of stormwater managed in the City of South San Francisco for an average year. This 528.2 acre-feet of stormwater managed could serve as the primary metric to be tracked for GI implementation. In other words, stormwater volume managed is being used as a unifying metric to evaluate GI effectiveness. "Impervious Area Treated (acres)"is an additional metric suggested by the MRP for implementation tracking. As a result of adaptive management, the implementation plan may change over time and alternative GI projects can be substituted without having to re-run the RAA model, as long as the "Management Metrics for GI," representing the goals for the GI Plan, remain on track.

The San Mateo County Sustainable Streets Master Plan (SSMP) which is currently under development will contain a tracking tool for the City to use to track GI projects, mainly green streets, which works with the projected schedule of milestones showing that the City will start street greening between 2020 through 2030. The current LID projects that are constructed as part of the new and redevelopment projects are currently tracked by the City through their annual reporting to the RWQCB.

Table 5-1. Scenario 1: GI implementation strategy for the City of South San Francisco (sediment target, with regional identified project)

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232519	24%	4.67	4.55	0.15	0.10	--	0.08	0.00	--	--	0.3
232619	31%	0.29	0.07	--	0.01	--	--	0.01	0.01	0.00	0.0
240119	24%	3.67	321.35	10.40	4.09	0.01	9.43	0.30	--	--	24.2
240219	16%	68.00	25.93	0.18	0.80	0.25	1.26	--	--	--	2.5
240319	16%	165.61	28.27	0.74	1.07	0.61	1.38	--	--	--	3.8
240419	24%	37.28	9.66	0.05	0.14	0.09	0.38	--	--	--	0.7
240519	16%	83.65	14.14	0.14	0.38	0.31	0.87	--	--	--	1.7
250119	27%	150.75	161.72	5.91	1.21	--	0.00	1.84	0.49	--	9.5
250219	16%	13.46	9.87	0.30	0.58	--	0.00	0.19	--	--	1.1
250319	3%	0.79	1.32	--	0.08	--	--	--	--	--	0.1
Total	**18.0%**	**528.2**	**576.9**	**17.9**	**8.5**	**1.3**	**13.4**	**2.3**	**0.5**	**0.0**	**43.8**

6.0 Evaluation of Funding

The total cost of GI includes costs for planning, capital (design, engineering, construction) and ongoing expenditures, including operations and maintenance (O&M), utility relocation, and feature replacement. It is likely that no single source of revenue will be adequate to fund the implementation of GI, and a portfolio of funding sources will be needed. There are a variety of approaches available to help fund up-front and long-term investments.

This section discusses the City's current stormwater management funding sources as potential future funding options to complement the current funding. It should be noted that this list is a starting point; the City is working towards developing a thorough funding strategy to implement this GI Plan.

6.1 Current Funding Sources

The stormwater program at the City is funded by a local assessment referred to as the Stormwater Fund, Gas Tax, Measure M, and the General fund. The C/CAG Stormwater Fund was established in 1993 to support the local implementation of stormwater permit compliance activities and is a parcel tax. The stormwater program is further subsidized by monies from the Gas Tax and the General Fund to address the increase in stormwater permitting requirements. All monies in the stormwater program are applied to efforts related to MRP compliance.

6.2 Evaluation of Additional Funding Sources

As required by the MRP, the City conducted an evaluation of potential funding options for the design, construction, and operations and maintenance (O&M) of GI projects. There are grant funding opportunities for LID and GI at the regional, state, and federal level. C/CAG also funded the development of the San Mateo County Stormwater Resource Plan (SRP), to identify and prioritize regional GSI projects in San Mateo County. As a result of Senate Bill 985, which has been incorporated into the California Water Code, stormwater capture projects must be included in a prioritized list of projects in a SRP in order to compete for state grant funds from any voter-approved bond measures. The GI projects identified in the SRP, presented in Table 6-1, are eligible to apply for the Storm Water Grant Program (SWGP) Proposition 1 (Assembly Bill 1471, Rendon).

Table 6-1. Projects submitted by South San Francisco for SRP

Project Name	Project Description	Project Type	Location
Orange Memorial Park	High opportunity stormwater capture project with a large multi-jurisdictional capture area approximately 6,300 acres.	Regional Project	Orange Avenue at Colma Creek
Grand Avenue	High opportunity green street project with the capacity to treat 1.3 acre-ft / year of impervious surface.	Green Street	Grand Avenue in the vicinity of downtown South San Francisco and the South San Francisco Caltrain Station

The Clean Water State Revolving Fund (CWSRF) program is a federal-state partnership that provides grants and low interest loans for water infrastructure projects, including GI projects. In addition, the SSMP is also a plan that will be used in the future to obtain grant funding for street GI projects.

Finally, C/CAG developed a Green Infrastructure Funding Nexus Evaluation report, presented in Appendix C, which discusses other funding options such as special taxes, property relations fees, and general obligation bonds.

7.0 Outreach and Education

An important step in the development and implementation of the GI plan is outreach and education with City staff, elected officials, and residents regarding the purpose, goals, and implementation of the GI plan. A summary of the outreach efforts is described below.

7.1 City Staff Outreach & Education

In 2018, the City developed a Green Team that included City staff members of a variety of departments to ensure that all departments are aware and understand the intent of the Green Infrastructure Plan and the change in development design from grey to green stormwater infrastructure. The Green Team met regularly with various departments, in both small- and large-scale settings throughout this GI planning process. These meetings focused on discussing GI requirements, obtaining early and frequent feedback, and building connections to work together in GI planning/design, implementation, maintenance, and monitoring strategies and requirements.

7.2 Public Outreach & Education Efforts

SMCWPPP has supported the City and other municipalities by providing outreach on a County-wide scale. For the public, SMCWPPP developed a factsheet, and poster titled “Green Infrastructure for a Sustainable San Mateo County” that is posted on SMCWPPP’s website, distributed at events, and used by member agencies to educate their residents. The factsheet and poster may be found in Appendix D.

SMCWPPP has a green infrastructure webpage aimed at educating residents on LID/GI measures that they can integrate into their yards and garden components, and generate support for future green street projects. In addition, SMCWPPP has a green streets webpage which a map of installed green streets in San Mateo County.

7.3 Council Presentations

In February 2019, City consultant and a representative from the RWQCB presented the development process for the GI Plan and the anticipated adoption schedule for the plan. In July 2019, consultant and C/CAG representative presented to Council at a Study Session to discuss the draft plan and potential cost implications and funding options. Finally, in August 2019 the Final GI Plan was presented to City Council for adoption.

8.0 References

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2015. *NPDES Phase I MS4 Municipal Regional Stormwater Permit (MRP) for San Francisco Bay Region*. Order No. R2-2015-0049. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2016. *C.3. Stormwater Technical Guidance, Version 5.0*.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2016. *Stormwater Resource Plan for San Mateo County.* Stormwater Resource Plan for San Mateo County. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2017. *Stormwater Resource Plan for San Mateo County*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2018. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2019. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase II Green Infrastructure Modeling Report*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2019. *Green Infrastructure Design Guide, First Edition*.

APPENDIX A

City Plans and Suggested Updates to Include GI

Document Type	Document	Title	Date	City Point Person	Next Update	Sections for GI Language Changes	Proposed Changes
CODES/ORDINANCES/PLANS	General Plan	Introduction	Mar-99	Billy Gross	2020	p 1-14 (GENERAL PLAN THEMES > #9)	… such as streets, parks, storm drainage, **green infrastructure**, and fire safety, are established to ensure that growth does no to exceed carrying capacity.
CODES/ORDINANCES/PLANS	General Plan	Land Use	Feb-99	Billy Gross	2020	p 2-4 (Land use Framework)	**Inclusion of new green infrastructure strategies into city-owned landscapes to improve water quality and reduce need to irrigate landscape.**
CODES/ORDINANCES/PLANS	General Plan	Planning Sub-Areas Element	Feb-99	Billy Gross	2020	p 3-16 (Parking, Loading, and Streetscape)	**Include reference to Green Infrastructure Design Guide on https://www.flowstobay.org/ for design of the public right of way.**
CODES/ORDINANCES/PLANS	General Plan	Transportation		Billy Gross	2020		
CODES/ORDINANCES/PLANS	General Plan	NA	Feb-99	Billy Gross	2020	Health and Safety, Open Space and Conservation	
CODES/ORDINANCES/PLANS	Housing Element	NA	Oct-99	Billy Gross	To be updated as part of General Plan 2020		
CODES/ORDINANCES/PLANS	Municipal Code	*Title 13 Public Improvements*		City Attorney	2019/2020		
CODES/ORDINANCES/PLANS	Municipal Code	*Title 14.04 Stormwater Management and Discharge Control*		City Attorney	2019/2020	p 1/11 (14.04.020 Purpose and intent)	**Including of new green infrastructure strategies into city-owned landscapes to improve water quality and reduce need to irrigate landscape.**
CODES/ORDINANCES/PLANS	Municipal Code	*Title 14.04 Stormwater Management and Discharge Control*		City Attorney	2019/2020	p 4/11 (14.04.131 Stormwater treatment requirements)	Stormwater treatment requirements as specified in NPDES Permit No. CAS612008 **and the city's Green Infrastructure Plan, which is scheduled to be adopted in 2019, are mandated…**
CODES/ORDINANCES/PLANS	Municipal Code	*Title 14.04 Stormwater Management and Discharge Control*		City Attorney	2019/2020	p 4/11 (14.04.134 Low Impact Development)	**LID includes green infrastructure and other water quality strategies that are requirements of the Municipal Regional Permit, see the County's Green Infrastructure Plan, planned for adoption in 2019, for more information.**
CODES/ORDINANCES/PLANS	Municipal Code	*Title 19.16 General Design and Improvement Standards*		City Attorney	2019/2020	(19.16.050 Watercourses and drainage)	Implementation of green infrastructure to aid in managing and treating stormwater runoff.
CODES/ORDINANCES/PLANS	Municipal Code	*Title 19.20 Street Design*		City Attorney	2019/2020	(19.20.010 Conformance to table required)	Opportunity for green streets including permeable pavements, street trees, and pedestrian and bicycle-friendly streets.
CODES/ORDINANCES/PLANS	Municipal Code	*Title 19.24 Improvements*		City Attorney	2019/2020	(19.24.020 Improvements required)	
CODES/ORDINANCES/PLANS	Municipal Code	*Title 19.40 Standard Subdivision Procedure*		City Attorney	2019/2020	(19.40.120 Discharge determination)	
CODES/ORDINANCES/PLANS	Municipal Code	*Title 20.210 Bay West Cove Specific Plan District*		City Attorney	2019/2020	(20.210.007 Open Space Standards)	Opportunity for stormwater management and treatment with the use of green infrastructure.
CODES/ORDINANCES/PLANS	Municipal Code	*Title 20.330 On-site Parking and Loading*		City Attorney	2019/2020	(20.330.010 Parking Area Design and Development Standards)	Include language more specific to Green Infrastructure
DEVELOPMENT REGULATIONS	Grading Regulations	NA		Jason Hallare	2019/2020		
DEVELOPMENT REGULATIONS	Design Standards	NA		Jason Hallare	2019/2020		**Include reference to Green Infrastructure Design Guide on https://www.flowstobay.org/ for green storm drain design.**
DEVELOPMENT REGULATIONS	Drainage Review	NA		Jason Hallare	2019/2020		
DEVELOPMENT REGULATIONS	South San Francisco Design Review Guidelines	NA	unknown	Jason Hallare	2019/2020		
DESIGN STANDARDS	Engineering Design Standards and Specifications	NA		Matt Ruble	2019/2020		
MASTER/ACTION PLANS	Bicycle Master Plan	*Chapter 3.2 Citywide Plans and Municipal Code*	February-11	Matt Ruble	2019	p 3-7 (3.2.6 Capital Improvement Program)	Include language more specific to Green Infrastructure in streets and storm drain subsections.
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p I-3 (Design Goals and Objectives)	**Include new green infrastructure strategies into city-owned landscapes to improve water quality and reduce need to irrigate landscape.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p I-7 (Goals to improve active transportation)	**Include reference to Green Infrastructure Design Guide on www.flowstobay.com for green storm drain design.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p I-10	**Include GI language in "1.3 REGIONAL PLANS"**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p II-12 (Design Standards)	**Implement green street design where feasible on projects, particularly in those locations that are identified as opportunities in the City's Green Infrastructure Plan, once adopted in 2019. Design and other guidance for the implementation of green street.infrastructure are provided in the County's Green Infrastructure Design Guide.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p III-17 (Sidewalks > OPPORTUNITIES)	**Identify opportunities for green infrastructure**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p VI-7 (6.1 Goals and Objectives)	**Adopt a Green Streets policy that facilitates environmentally sensitive design of the public right of way.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p A-5 (Pedestrian Bulb-outs)	**This area may include integrated green infrastructure.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p A-6 (Design Summary > Furnishing/Landscape Zone)	**This area may include integrated green infrastructure.**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p A-8 (Design Summary > Street Trees)	**Identify opportunities for green infrastructure**
MASTER/ACTION PLANS	Pedestrian Master Plan	NA	February-14	Matt Ruble	2019	p A-16 (Discussion)	**This area may include integrated green infrastructure.**
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 46 (Measure 1.1)	**Adopt a Green Streets policy that facilitates environmentally sensitive design of the public right of way.**

MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020		
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 53 (Measure 3.4 > #2)	**Trees provide water quality benefit by taking water, minerals, chemicals, and other elements up their roots; and delay and limit stormwater runoff by leaves and bark catching rain before it hits the ground. Refer to the Municipal Regional Permit and the Green Infrastructure Plan for more information and how street trees can be used as a green infrastructure strategy; the GI Plan is scheduled to be adopted in 2019.**
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 53 (Measure 3.5)	**Provide educational materials to the community about green infrastructure strategies that can improve water quality and reduce need to irrigate landscape.**
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 59 (Measure 6.2)	**Include water harvesting and other green infrastructure strategies to provide additional irrigation sources.**
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 59 (Measure 6.2)	**Include new green infrastructure strategies into city-owned landscapes to improve water quality and reduce need to irrigate landscape.**
MASTER/ACTION PLANS	Climate Action Plan	NA	February-14	Billy Gross	To be updated as part of General Plan 2020	p 59 (Measure 6.2)	**Retrofit and include new green infrastructure strategies into city-owned landscapes to improve water quality and reduce need to irrigate landscape.**
MASTER/ACTION PLANS	Storm Drain Master Plan	NA	February-16	Bianca Liu	2020/2021		Include GI projects in CIP recommendations
SPECIFIC PLANS	South San Francisco BART Transit Village Plan	NA	August-01	NA	NA		
SPECIFIC PLANS	South El Camino Real General Plan	NA	April-10	NA	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Downtown Specific	NA	February-15	NA	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	El Camino Real/Chestnut Avenue Area Plan	NA	July-11	NA	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Oyster Point Specific Plan	NA	February-11	NA	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Genetech Master Plan	NA	April-07	Tony Rozzi	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Grand Avenue Streetscape Specific Plan	NA	NA	Jake Gilchrist	2021		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Orange Memorial Park Master Plan	NA	NA	Greg Mediati	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Urban Forest Master Plan	NA	NA	Greg Mediati	2019		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**
SPECIFIC PLANS	Parks and Recreation Master Plan	NA	July-15	Greg Mediati	NA		**Identify opportunities for green infrastructure and update the specific plan if there are future revisions to it.**

APPENDIX B

SMCWPPP RAA Plan

To:	Matt Fabry, San Mateo Countywide Water Pollution Prevention Program
From:	Stephen Carter, Paradigm Environmental
Date:	5/3/2019
Re:	Green Infrastructure Plan text summarizing results of the Reasonable Assurance Analysis for the City of South San Francisco

Paradigm is currently leading C/CAG's efforts to perform a Reasonable Assurance Analysis that demonstrates the amount of green infrastructure needed to meet the portions of the PCB and mercury load reductions required by the Municipal Regional Stormwater Permit to address Total Maximum Daily Load wasteload allocations over specified compliance periods. Results of the Reasonable Assurance Analysis can be used to set goals for green infrastructure implementation, which can be incorporated within Green Infrastructure Plans currently being prepared by the C/CAG member agencies. The following is example text that each C/CAG member agency can use as a template to tailor discussions incorporated within each agency's Green Infrastructure Plan. The purpose of this example text is to provide a consistent narrative for discussion of the Reasonable Assurance Analysis and outcomes for the Permittees of San Mateo County. This portion of the Reasonable Assurance Analysis only addresses the Green Infrastructure requirements of the Municipal Regional Permit, not the other source control measures that will be evaluated in the Total Maximum Daily Load implementation plans submitted in September 2020. Each agency may tailor this text, incorporating their respective Reasonable Assurance Analysis results specific to each jurisdiction. The text also refers to the following two separate documents that can either be included within appendices of each Green Infrastructure Plan, or referenced as separate documents:

- San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report (June 2018)
- San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase II Green Infrastructure Modeling Report (under development)

1 REASONABLE ASSURANCE ANALYSIS AND GREEN INFRASTRUCTURE IMPLEMENTATION GOALS

The Municipal Regional Stormwater Permit (MRP) (Order No. R2-2015-0049) requires the development of Green Infrastructure (GI) Plans (Provision C.3) and Polychlorinated Biphenyls (PCBs) and Mercury Control Measure Implementation Plans (Provisions C.11 and C.12) that provide the necessary pollutant load reductions to meet Total Maximum Daily Load (TMDL) wasteload allocations (WLAs) over specified compliance periods. A key component of these plans is a Reasonable Assurance Analysis (RAA) that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of PCBs and mercury to meet WLAs for municipal stormwater discharges to the Bay. The City/County Association of Governments (C/CAG) of San Mateo County, via its San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), led a county-wide effort to develop an RAA to estimate the baseline PCB and mercury loads to the Bay, determine load reductions to meet WLAs among San Mateo County Permittees, and set goals for the amount of GI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GI (SFBRWQCB 2015). The reports described below include documentation of the county-wide RAA, including:

- Phase I Baseline Modeling Report (Phase I) – Provides documentation of the development, calibration, and validation of the baseline hydrology and water quality model, and the determination of PCB and mercury load reductions to be addressed through GI implementation (SMCWPPP 2018).
- Phase II Green Infrastructure Modeling Report (Phase II) – Provides documentation of the application of models to determine the most cost-effective GI implementation for each municipality, setting stormwater improvement goals for the GI Plan (SMCWPPP 2019).

The following sections provide an overview of the purpose of the RAA, and a summary of RAA results for the City of South San Francisco (City) to serve as stormwater improvement goals that set the stage for an adaptive management approach.

1.1 Purpose of the Reasonable Assurance Analysis

In 2017, the U.S. Environmental Protection Agency (EPA) Region 9 released *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning* (EPA RAA Guide) (USEPA 2017), which provides guidance on the technical needs of the RAA and considerations for model selection. Building upon the EPA RAA Guide, the Bay Area Stormwater Management Agencies Association (BASMAA) prepared the *Bay Area Reasonable Assurance Analysis Guidance Document* (Bay Area RAA Guidance) (BASMAA 2017), which provides specific guidance on modeling to support RAAs performed in the Bay Area to meet MRP requirements, address TMDLs for PCBs and mercury, and support GI planning. The EPA RAA Guide and Bay Area RAA Guidance both outline essential steps for performing an RAA, as depicted in Figure 1-1.

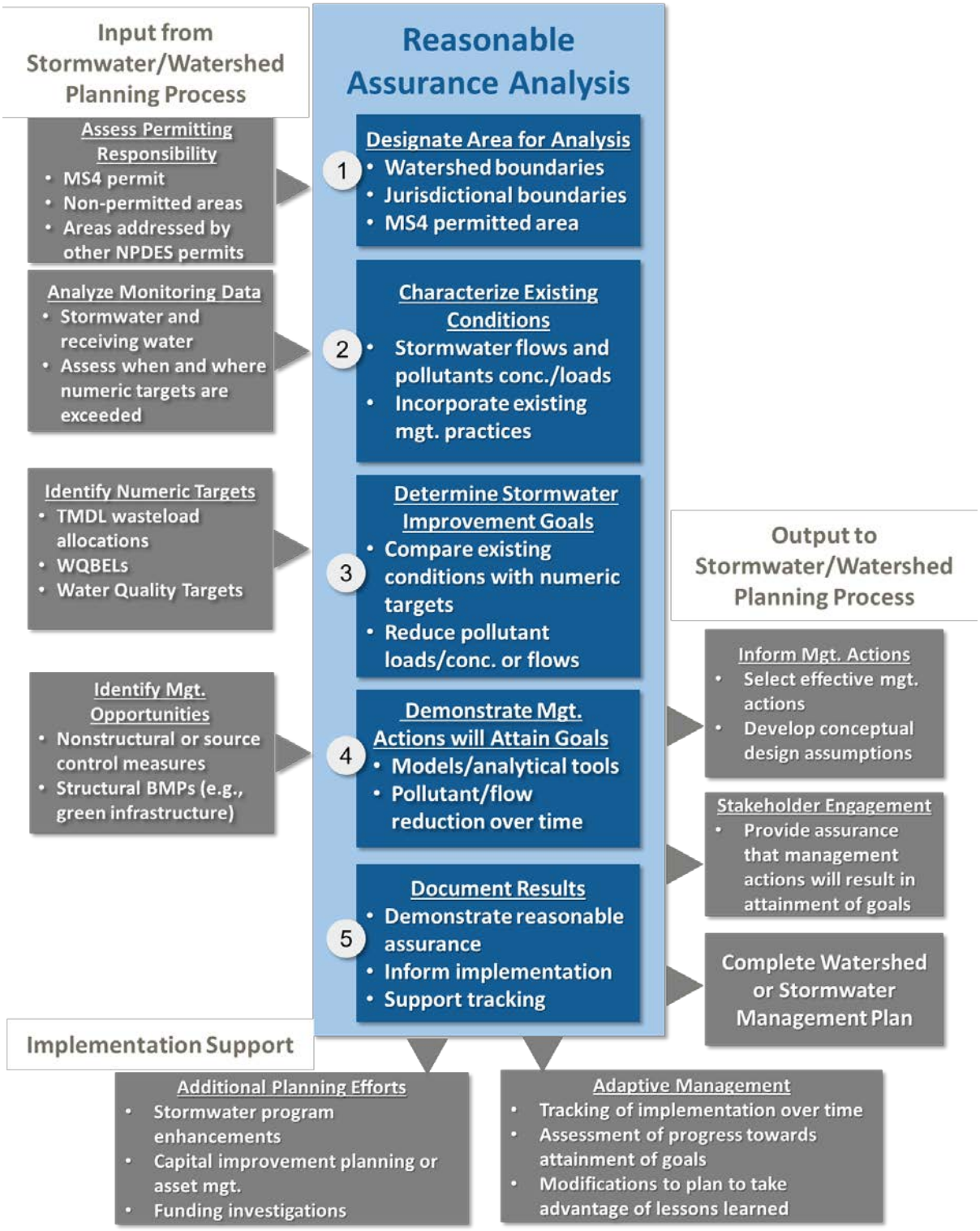


Figure 1-1. RAA Process Flow Chart (USEPA 2017).

Depending on the audience, the purpose of the RAA can vary in terms of what constitutes reasonable assurance, and it is important to consider not just the targets for pollutant load reductions, but also the effectiveness of information management and engineering and economic feasibility. The EPA RAA Guide provides an example of three differing perspectives for defining reasonable assurance (USEPA 2017):

- **Regulator Perspective** - Reasonable assurance is a demonstration that the implementation of a GI Plan will result in sufficient pollutant reductions over time to address TMDL WLAs or other targets specified in the MRP.
- **Stakeholder Perspective** - Reasonable assurance is a demonstration that specific management practices are identified with sufficient detail, and implemented on a schedule to ensure that necessary improvements in water quality will occur.
- **Permittee Perspective** - Reasonable assurance is based on a detailed analysis of the TMDL WLAs and associated MRP targets themselves, and a determination of the feasibility of those requirements. The RAA may also assist in evaluating the financial resources needed to meet pollutant reductions based on schedules identified in the MRP.

Phase I and Phase II provide full documentation of the technical approaches and results of the SMCWPPP RAA, which are consistent with the recommendations of the EPA RAA Guide and Bay Area RAA Guidance.

1.2 Preliminary Identification of Opportunities for GI Projects

To support the RAA and GI Plans, C/CAG has initiated a number of planning efforts that identify opportunities for GI implementation. The following is a summary of those efforts:

- **LID for New Development and Redevelopment** – The MRP includes a Provision (C.3) for the integration of LID within new development and redevelopment. As LID techniques are implemented as new development and redevelopment occurs throughout the City, the benefits of such practices in terms of reducing urban runoff flows and associated pollutant loads can be considered as part of the pollutant load reductions attributed to implementation of GI. C/CAG worked with San Mateo County Permittees to compile information on LID practices that have been implemented within new development and redevelopment since water year 2003 (baseline year for the TMDL). C/CAG also performed an analysis to project the number of acres of future new development and redevelopment to be addressed through Provision C.3 by 2040. The RAA considers existing LID practices and projections of LID in future new development and redevelopment areas to estimate anticipated PCBs and mercury load reductions from 2003 to 2040.
- **Countywide Stormwater Resource Plan (SRP)** – The SRP is a

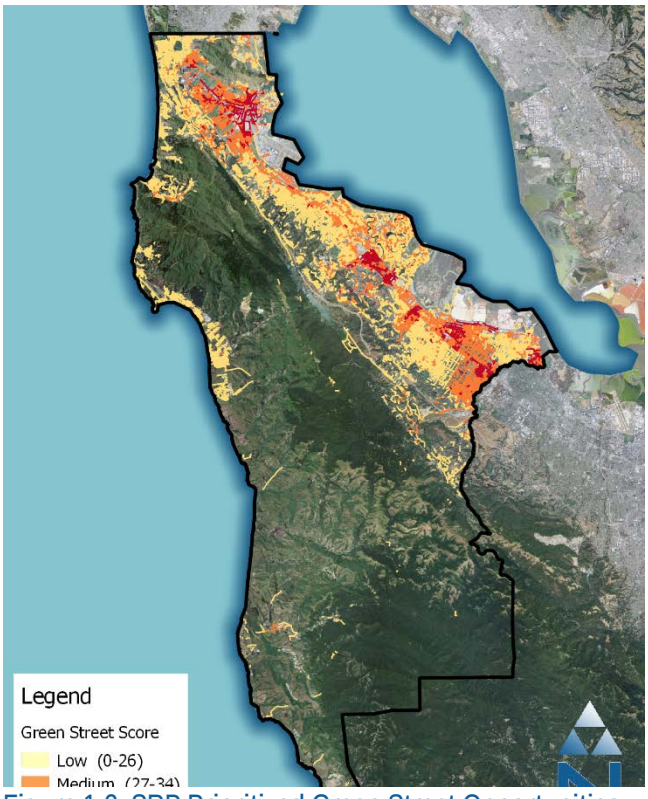


Figure 1-2. SRP Prioritized Green Street Opportunities.

comprehensive plan that identifies and prioritizes thousands of GI project opportunities throughout San Mateo County and within each municipal jurisdiction. Prioritized project opportunities include: (1) large regional projects within publicly owned parcels (e.g., public parks) that infiltrate or treat stormwater runoff generated from surrounding areas (e.g., diversion from neighborhood storm drain system; diversions from creeks draining large urban areas); (2) retrofit of publicly owned parcels with GI that provide demonstration of onsite LID designs; and (3) retrofit of public street rights-of-way with GI, or "green streets." The SRP included a multi-benefit scoring and prioritization process that ranks GI project opportunities based on multiple factors beyond pollutant load reduction (e.g., proximity to flood prone channels, potential groundwater basin recharge). Figure 1-2 provides an example of green street opportunities identified, scored, and prioritized by the SRP throughout San Mateo County (SMCWPPP 2017).

The above efforts and resulting technical products provide preliminary identification of opportunities for GI projects. Those GI project opportunities serve as the foundation for the RAA and GI Plans as strategies are developed for implementation plans to meet the PCBs and mercury load reduction goals per the TMDL.

1.3 Description of the RAA Model

C/CAG performed a comprehensive, countywide modeling effort to provide: (1) simulation of baseline loads of PCBs and mercury for each of the County's watersheds and municipal jurisdictions discharging to San Francisco Bay; (2) estimation of necessary load reduction goals to meet requirements of the MRP and TMDL WLAs; and (3) determination of the amount of GI needed to address load reduction goals based on project opportunities identified Section 1.2. The RAA also provides analysis of alternative implementation scenarios through cost-benefit optimization that can inform cost-effective GI implementation within each municipal jurisdiction. These results set goals for GI Plans developed by each Permittee.

The analytical framework selected to support the San Mateo Countywide RAA is based on a linked system of models (Figure 1-3). Component models of the linked system include:

- **Loading Simulation Program C++ (LSPC)** – The hydrologic and water quality model selected for the baseline model of San Mateo County watersheds was the Loading Simulation Program in C++ (LSPC) (Shen et al., 2004), a watershed modeling system that includes Hydrologic Simulation Program – FORTRAN (HSPF) (Bicknell et al. 1997) algorithms for simulating watershed hydrology, erosion, water quality, and instream fate and transport processes. The model can simulate upland loading of sediment, mercury, and PCBs and instream delivery and transport. LSPC is built upon a relational database platform, making it ideal for collating diverse datasets to produce robust representations of natural systems. LSPC integrates GIS outputs, comprehensive data storage and management capabilities, the original HSPF algorithms, and a data analysis/post-processing system into a convenient PC-based Windows environment. The algorithms of LSPC are identical to a subset of those in the HSPF model with selected additions, such as algorithms to address land use change over time. LSPC is an open-source public-domain watershed model available from EPA.
- **System for Urban Stormwater Treatment & Analysis Integration (SUSTAIN)** – Developed by EPA's Office of Research and Development, SUSTAIN was primarily designed as a decision-support system for selection and placement of GI projects at strategic locations in urban watersheds. It includes a process-based continuous project simulation module for representing flow and pollutant transport routing through various types of GI projects. A

distinguishing feature of SUSTAIN is a robust cost-benefit optimization model that incorporates dynamic, user-specified project unit-cost functions to quantify the costs associated with project construction, operation, and maintenance. The cost-benefit optimization model runs iteratively to generate a cost-effectiveness curve that is sometimes comprised of millions of GI project scenarios representing different combinations of projects throughout a watershed. Those results are used to make cost-effective management recommendations by evaluating the trade-offs between different scenarios. The "benefit" component can be represented in several ways: (1) reduction in flow volume (2) reduction in load of a specific pollutant or (3) other conditions including numeric water quality targets, frequency of exceedances of numeric water quality targets, or minimizing the difference between developed and pre-developed flow-duration curves (USEPA 2009, Riverson et al. 2014).

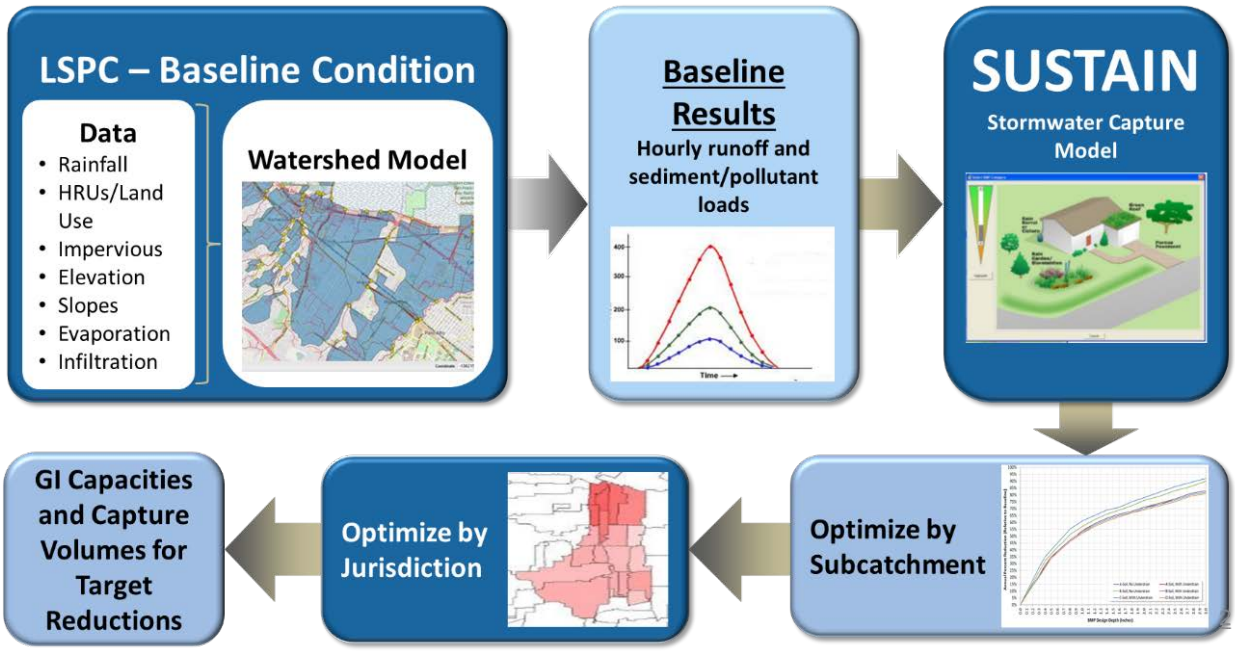


Figure 1-3. Modeling System Supporting the RAA.

For this analysis, model cost functions were developed from literature, including an inventory of projects in the Los Angeles region. Because of uncertainty regarding the true costs to C/CAG member agencies, results were normalized for relative comparison—the relative costs between project types is well represented for the optimization of project types in the RAA. In other words, although it is not be recommended to use the RAA costs to project county-wide or city-wide implementation costs, they are sufficiently resolved for comparing alternative implementation scenarios and selecting the most cost-effective strategies and combination of GI, LID, and regional stormwater capture projects to meet pollutant reduction targets.

The LSPC model provides a characterization of existing conditions and determination of necessary pollutant load reductions to meet requirements of TMDLs and the MRP. SUSTAIN provides analysis of the amount of GI needed to provide the portion of the load reduction assigned to GI by the MRP. The Phase I and Phase II reports provide more detailed discussion of the models and their application to the San Mateo County watersheds.

1.4 Model Considerations to Inform GI Plans

An important consideration for the RAA was the ability to track costs and benefits of different categories of GI projects within the model. This tracking was performed for GI project categories within each model subwatershed and municipal jurisdiction, and supports the selection of the most cost-effective implementation strategy to attain pollutant reduction goals. The RAA builds upon the previous planning efforts and represents the following generalized GI project categories in the model:

1. **Existing Projects**: Stormwater treatment and GI projects that have been implemented since FY-2004/05. This primarily consists of all of the regulated projects that were mandated to treat runoff via Provision C.3 of the MRP, but also includes any public green street or other demonstration projects that were not subject to Provision C.3 requirements. For regulated projects in the early years of C.3 implementation, stormwater treatment may have been achieved through non-GI means, such as underground vault systems or media filters.
2. **Future New and Redevelopment:** All the regulated projects that will be subject to Provision C.3 requirements to treat runoff via LID and is based on spatial projections of future new and redevelopment tied to regional models for population and employment growth.
3. **Regional Projects (identified)**: C/CAG worked with agencies to identify five projects within public parks or Caltrans property to provide regional capture and infiltration/treatment of stormwater, and included conceptual designs to support further planning and designs. Note – the model can be updated to include future identified projects to support adaptive management.
4. **Green Streets**: The SRP identified and prioritized opportunities throughout San Mateo County for retrofitting existing streets with GI in public rights-of-way. Green streets were ranked as high, medium, and low priority (within each subwatershed) based on a multiple-benefit prioritization process developed for the SRP.
5. **Other GI Projects (to be determined)**: Other types of GI projects on publicly owned parcels, representing a combination of either additional parcel-based GI or other Regional Projects. The SRP screened and prioritized public parcels for opportunities for onsite LID and Regional Projects. These opportunities need further investigation to determine the best potential projects.

The RAA considers the numerous GI project opportunities that exist within each municipal jurisdiction, and selects a suite or "recipe" of projects that can most cost-effectively address pollutant load reductions. The amount and combination of those GI projects can be determined through analysis of estimated load reductions and implementation costs. Figure 1-4 presents an example GI recipe showing the distribution of selected GI project categories versus incremental reductions in pollutant loading and increasing cost.

Cost-benefit optimization of GI project opportunities was included to build upon the preliminary C/CAG SRP planning efforts above, and to properly inform and set meaningful goals for GI Plans. For each optimized combination of GI projects, SUSTAIN provides an estimate of the resulting pollutant load reduction and implementation costs, allowing for the comparison of

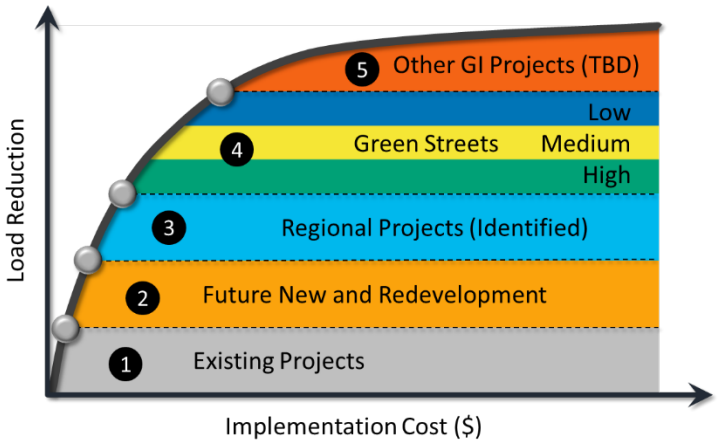


Figure 1-4. Example Implementation Recipe Showing General Sequencing of GI Projects.

GI implementation scenarios and the selection of the most cost-effective implementation plan to address pollutant reduction goals, whether at the scale of an individual jurisdiction or across municipal boundaries.

1.5 Goals for Green Infrastructure Implementation

As discussed in Section 1.1, depending on the perspective of the regulators, stakeholders, or Permittees, the purpose and expectations of the RAA can vary in terms of how reasonable assurance is demonstrated. As a result, the output from the RAA must consider multiple perspectives and strike the right balance between detail and specificity while still leaving ample opportunity to allow for future adaptive management. The following are key considerations for the RAA output:

- **Demonstrate PCBs and Mercury Load Reductions** – The primary goal of the RAA is to quantitatively demonstrate that GI Plans and Control Measure Implementation Plans will result in load reductions of PCBs and mercury sufficient to attain their respective TMDL WLAs and the component stormwater improvement goals to be achieved with GI. Based on the baseline hydrology and water quality model (Phase I), the RAA determined that a 17.6% reduction in PCB loads is needed to meet the GI implementation goals established by the MRP. Zero reduction in mercury loads was determined to be needed from MRP areas because baseline loads were predicted to be below the TMDL WLA for San Mateo County. As a result, a 17.6% reduction in PCB loads is established as the primary pollutant reduction goal for the GI Plan. However, there is some uncertainty in terms of how PCB source areas are represented in the model, which will require more monitoring and analysis in the future to gain an improved understanding of PCB source areas and the ability to target these areas with GI. Since PCBs are generally understood to be transported with cohesive sediment (e.g., silt and clay), cohesive sediment load can serve as a surrogate on which to base a load reduction target. The RAA considers a 17.6% reduction of cohesive sediment load as a more conservative surrogate until a better understanding is reached in terms of specific PCB source areas within the County. If additional PCB source areas are confirmed, these areas could be targeted for source control measures or additional GI implementation, likely resulting in greater effectiveness for GI to reduce PCB loads in those areas, and thus redistributing or reducing the overall amount of GI needed to meet the load reduction target based on sediment loading estimates.
- **Develop Metrics to Support Implementation Tracking** – The MRP (Provision C.3.j) also requires tracking methods to provide reasonable assurance that TMDL WLAs are being met. Provision C.3.j states that the GI Plan "shall include means and methods to track the area within each Permittee's jurisdiction that is treated by green infrastructure controls and the amount of directly connected impervious area." Through C/CAG's current effort preparing a Sustainable Streets Master Plan for San Mateo County, a tracking tool will be developed that will enable calculation of metrics consistent with the results of the RAA and additional metrics relevant to sustainable street implementation. The tracking tool is planned for completion in 2020.
- **Support Adaptive Management** – Given the relatively small scale of most GI projects (e.g., LID on an individual parcel or a single street block converted to green street), numerous individual GI projects will be needed to address the pollutant reduction goals. All the GI projects will require site investigations to assess feasibility and costs. As a result, the RAA provides a preliminary investigation of the amount of GI needed spatially (e.g., by subwatershed and municipal jurisdiction) to achieve the countywide pollutant load reduction target. The RAA sets the GI Plan "goals" in terms of the amount of GI implementation over time to address pollutant load reductions. As GI Plans are implemented and more

comprehensive municipal engineering analyses (e.g., masterplans, capital improvement plans) are performed, the adaptive management process will be key to ensuring that goals are met. In summary, the RAA informs GI implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analyses performed over time.

The RAA output, or goals for GI implementation, attempt to identify the appropriate balance in terms of detail and specificity needed to address the above considerations. The RAA also considered multiple alternative scenarios that can inform implementation and the adaptive management process. These scenarios tested the underlining assumptions for GI implementation, and demonstrate the need for further research, collaboration among multiple Permittees, and incorporation of lessons learned in order to gain efficiencies and maximize the cost-effectiveness of GI to reduce pollutant loads over time. Four modeling scenarios were configured for this analysis (as summarized in Table 1-1):

Table 1-1. Model scenarios objectives and cost-benefit evaluation.

Load Reduction Objective	Percent of Total GI Cost to Achieve Reduction Objective		
	Jurisdictional	Countywide	*Total Savings (Jurisdictional vs. Countywide)*
Cohesive Sediment 17.6% Reduction	**Scenario 1**	**Scenario 2**	→ *Savings*
Total PCBs 17.6% Reduction	**Scenario 3**	**Scenario 4**	→ *Savings*
Total Savings (Sediment vs. PCBs)	↓ *Savings*	↓ *Savings*	↘ *Overall Savings*

The following factors are considered for each model scenario:

- **Load Reduction Objective** - With a cohesive sediment load reduction objective, Scenarios 1 and 2 represent the most conservative approaches. Those scenarios assume that given the uncertainties about PCB source areas, targeting an overall 17.6% load reduction of cohesive sediment in general (silts and clays) achieves the PCB load reduction objective for GI. Scenarios 3 and 4 assume that PCB sources are spatially distributed based on analysis of land use types. The cost-benefit optimization process targets those areas as having the highest likelihood of PCB sources. Scenarios 3 and 4 highlight the potential cost savings (relative to Scenarios 1 and 2) that could be realized if PCB sources are identified and targeted for GI implementation.
- **Jurisdictional verses Countywide** - There are many possible ways to achieve a 17.6% load reduction for all of San Mateo County. The "Jurisdictional" approach stipulates that each jurisdiction must individually achieve at least a 17.6% load reduction based on the population-based wasteload reduction for each jurisdiction. Conversely, the "Countywide" approach achieves the 17.6% load reduction countywide by allowing the model to allocate the countywide wasteload reduction via GI across jurisdictional boundaries. The countywide

approach can provide significant cost savings over the jurisdictional approach, especially where pollutant sources are spatially concentrated. Figure 1-5 conceptually illustrates the jurisdictional versus countywide optimization approaches. Where there is cooperation among jurisdictions, results from these two scenarios can provide a useful analytical framework for cost-sharing and implementation of the most cost-effective management scenarios.

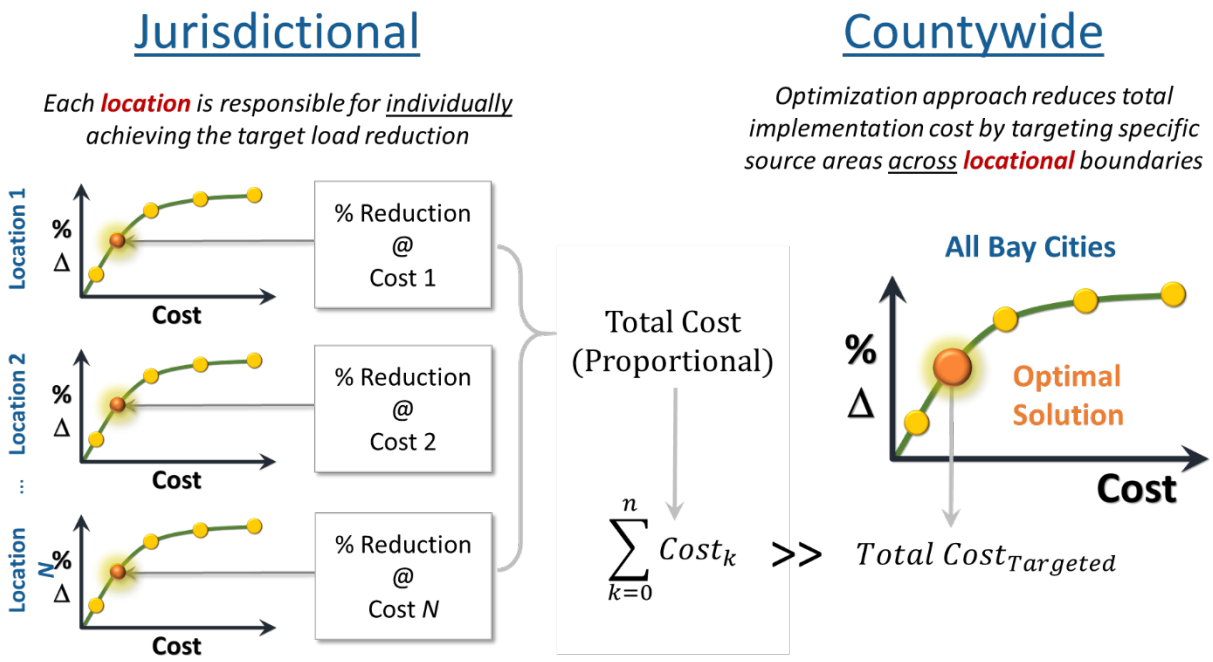


Figure 1-5. Jurisdictional vs. countywide approaches for cost-benefit optimization

Results of each of the four RAA scenarios are documented in Phase II. These results can inform the adaptive management process for GI implementation, and help garner support for collaborative efforts for GI implementation or further research of PCB source areas that can seek more cost-effective implementation strategies over time. Figure 1-6, Table 1-2, and Figure 1-7 provide a summary of Scenario 1 RAA results for the City of South San Francisco. Scenario 1 represents the most conservative scenario for GI implementation. The following steps outline how the process for formulating the scenario in the RAA model and using the results to set goals for GI implementation.

First: Based on GI project categories defined in Section 1.4, SUSTAIN was used to simulate effectiveness/load reductions and estimate planning-level costs for various combinations of GI projects within the City's jurisdiction (along the x-axis of Figure 1-6, from low pollutant reduction/effectiveness to high reduction/effectiveness). "Existing Projects" were locked in the model and included those GI projects included in the FY 2016-17 MRP Annual Report to the Water Board. "Future New & Redevelopment" is an estimation of the LID that will likely be implemented in the future in redevelopment areas (based on Provision C.3). "Green Streets" were based on prioritized and ranked (High, Medium, and Low) street retrofit opportunities reported in the SRP. For the City of South San Francisco, the "Regional Project (Identified)" refers to the regional project located within Orange Memorial Park that is currently under consideration by the City. "Other GI Projects" refer to additional GI projects needed, but specific locations for project opportunities within certain subwatersheds are yet to be determined.

Second: As depicted in Figure 1-6, a 17.6% reduction of modeled PCB for the City was identified as the target reduction to be attained through the implementation of GI (for Scenario 1, cohesive sediment reduction is used as a surrogate to represent load reduction of PCBs).

Third: SUSTAIN is used to provide cost-optimization and selection of the most cost-effective combination of GI projects to attain the target reduction. In Figure 1-6, this solution can be viewed as the vertical slice that intersects the point on the x-axis at 17.6% reduction. The combination of GI structural capacities in that slice at the 17.6% load reduction represents the proposed GI implementation plan for the City of South San Francisco produced by the model. Table 1-2 provides details on that implementation plan for the ten (10) subwatersheds within the City's jurisdiction (represented by each row in table). Optimization results recommend that varying amounts of GI capacity in different subwatersheds (different rows) are needed to achieve the most cost-effective solution, but the overall PCBs load reduction addresses 17.6% (bottom row of table). The relative amount of GI capacities (normalized by area) for each subwatershed are shown in the map in Figure 1-7.

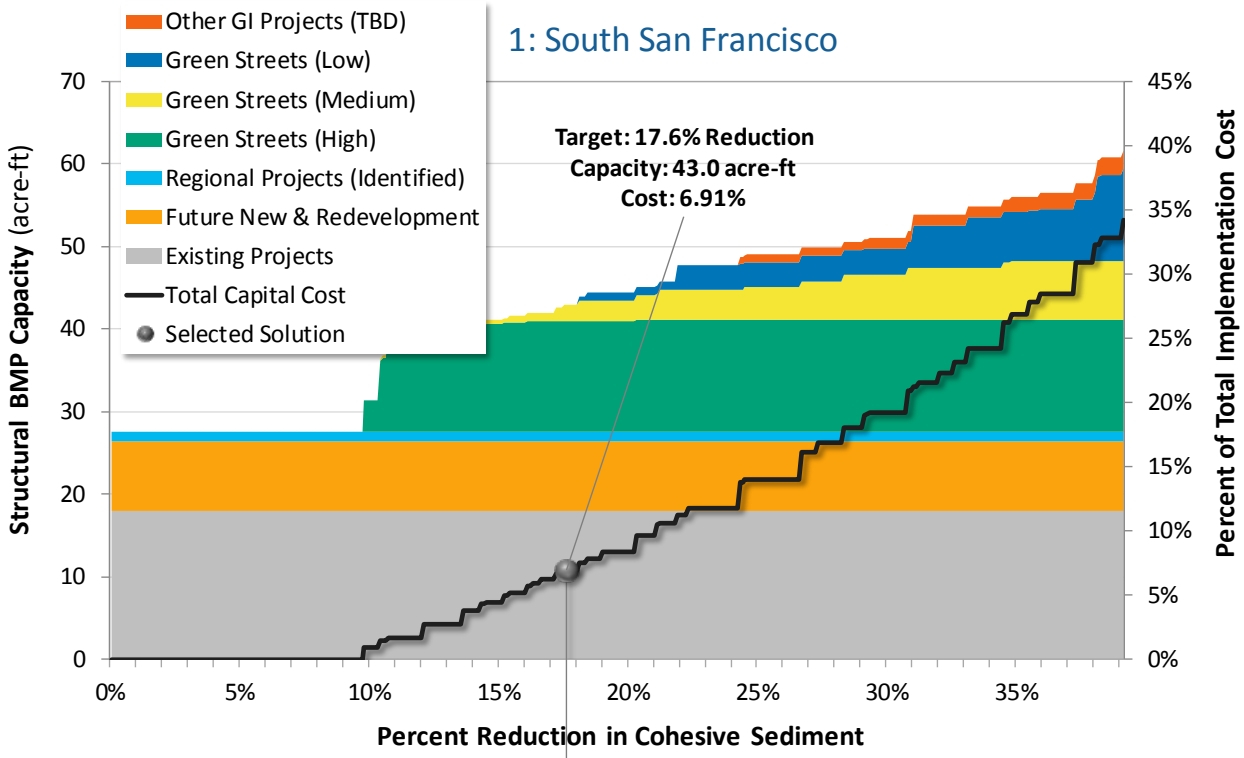


Figure 1-6. Scenario 1: Optimization summary for the City of South San Francisco (sediment target, with regional identified project).

Table 2. Scenario 1: GI implementation strategy for the City of South San Francisco (sediment target, with regional identified project)

Subwatershed ID	Management Metrics for GI			Green Infrastructure Capacity to Achieve 17.6% Reduction Target (Capacity expressed in units of acre-feet)							
				Existing/Planned			Green Streets				
	% Load Reduction PCBs (Annual)	Annual Volume Managed (acre-ft)	Impervious Area Treated (acres)	Existing Projects	Future New & Redevelopment	Regional Projects (Identified)	High	Medium	Low	Other GI Projects (TBD)	Total BMP Capacity (acre-ft)
232519	24%	4.67	4.55	0.15	0.10	--	0.08	0.00	--	--	**0.3**
232619	31%	0.29	0.07	--	0.01	--	--	0.01	0.01	0.00	**0.0**
240119	24%	3.67	321.35	10.40	4.09	0.01	9.43	0.30	--	--	**24.2**
240219	16%	68.00	25.93	0.18	0.80	0.25	1.26	--	--	--	**2.5**
240319	16%	165.61	28.27	0.74	1.07	0.61	1.38	--	--	--	**3.8**
240419	24%	37.28	9.66	0.05	0.14	0.09	0.38	--	--	--	**0.7**
240519	16%	83.65	14.14	0.14	0.38	0.31	0.87	--	--	--	**1.7**
250119	27%	150.75	161.72	5.91	1.21	--	0.00	1.84	0.49	--	**9.5**
250219	16%	13.46	9.87	0.30	0.58	--	0.00	0.19	--	--	**1.1**
250319	3%	0.79	1.32	--	0.08	--	--	--	--	--	**0.1**
Total	**18.0%**	**528.2**	**576.9**	**17.9**	**8.5**	**1.3**	**13.4**	**2.3**	**0.5**	**0.0**	**43.8**

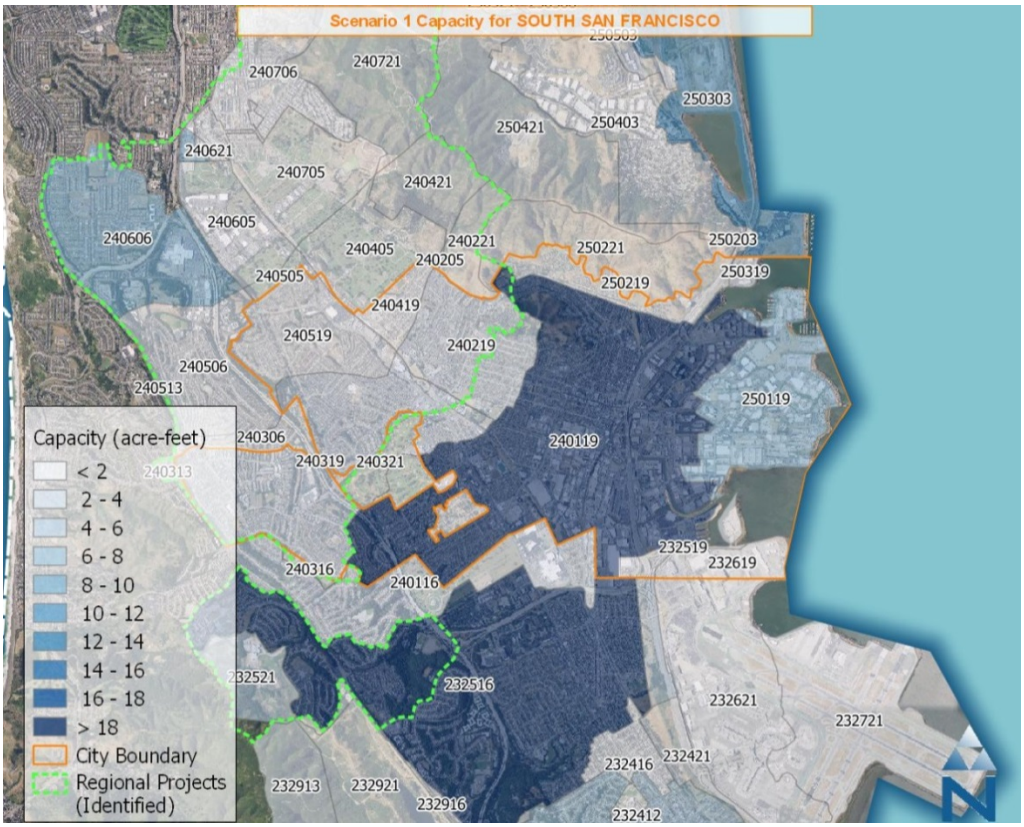


Figure 1-7. Scenario 1: Map of GI capacities within each subwatershed of the City of South San Francisco (sediment target, with regional identified project).

As can be seen in the above results, the cost-optimization favored implementation of different combinations of GI projects within each subwatershed. These combinations were based on: (1) number and type of GI project opportunities identified within each subwatershed, and (2) cost-effectiveness given various characteristics associated with GI control measure efficiency (typically governed by infiltration rates), higher sediment (or PCBs) generation in upstream areas, etc. During implementation, it is almost certain that the actual implementation of GI will not follow the RAA output exactly; however, the recipe provides "management metrics" by subwatershed (described below) to guide the adaptive management process. Dimensions and location of GI projects will vary based on on-the-ground feasibility and site-specific constraints. GI performance varies based on factors like the physical properties of the facility and upstream drainage area managed. For these reasons, it is not recommended that *GI capacity* serve as the focus for stormwater improvement goals for the GI Plan.

The RAA recommends management metrics for the GI Plan that are based on metrics that can be easily measured and tracked throughout implementation. At the left side of the table in Table 1-2 are columns under the header "Management Metrics for GI," which include performance metrics for "% Load Reduction PCBs (Annual)," "Annual Volume Managed (acre-ft)," and "Impervious Area Treated (acres)." The "% Load Reduction PCBs (Annual)" and "Annual Volume Managed (acre-ft)" metrics are based on annualized results represented in the RAA modeling system that are directly comparable to TMDL WLAs. The "% Load Reduction PCBs (Annual)" provides a relative comparison of the load reduction to be achieved within each subwatershed. The "Annual Volume

Managed (acre-ft)" shows the acre-feet of water captured and infiltrated and/or treated within each subwatershed, resulting in a total annual volume of 528.2 acre-feet of stormwater managed in The City of South San Francisco for an average year. This 528.2 acre-feet of stormwater managed could serve as the primary metric to be tracked for GI implementation. In other words, stormwater volume managed is being used as a unifying metric to evaluate GI effectiveness. "Impervious Area Treated (acres)"is an additional metric suggested by the MRP for implementation tracking. As a result of adaptive management, the implementation plan may change over time and alternative GI projects can be substituted without having to re-run the RAA model, as long as the "Management Metrics for GI," representing the goals for the GI Plan, remain on track.

1.6 Implementation Schedule

Throughout the adaptive management process, the City will continue to verify feasible opportunities for GI projects to meet the final load reduction goals for 2040. The process will include the tracking of management metrics and continued re-evaluation of GI project opportunities considered for the RAA. For instance, the RAA assumed projected amounts of LID associated with new and redevelopment, which are subject to change based on factors that are outside the control of the City. If less development occurs over time, more green streets or regional projects on public land may be needed to provide equivalent volume management. For the RAA and GI Plan, a preliminary schedule was developed in order to chart a potential course for GI implementation, which considered the various project opportunities.

The MRP requires reporting of goals for implementation of GI for interim milestones 2020 and 2030, in addition to the final milestone of 2040. In order to estimate the amount of GI to be implemented at these milestones, various assumptions were made in terms of the pace of implementation for various GI project types. Separate analyses determined the projected amount of LID associated with new development and redevelopment by 2020, 2030, and 2040. In addition, the Orange Memorial regional project, in the City is assumed to be built and operational by 2030. Finally, 33 percent of green streets required by 2040 are assumed to be implemented by 2030. The resulting schedule presented in Figure 1-4 demonstrates anticipated interim and final milestones for GI implementation in terms of structural capacity (corresponding to the capacities presented at the right side of Table 2). These interim and final GI capacities are subject to adaptive management; however the 2040 Management Metrics for GI (left side of Table 2) sets the ultimate goal for GI planning efforts and tracking.

Table 2 also provides a comparison of the amount of GI capacity estimate to be needed in the City to address 2040 goals for Scenario 1 (jurisdictional) and Scenario 2 (countywide) (see Table 1-1). The countywide scenario would require significant additional discussion among San Mateo County Permittees in order to provide cost-share agreements that would result in more GI implementation within the City of South San Francisco, likely resulting in less GI implemented in other city or unincorporated County jurisdictions. However, comparison of these scenarios further demonstrates the need for an adaptive management framework to further investigate the most cost-effective approach to countywide GI implementation.

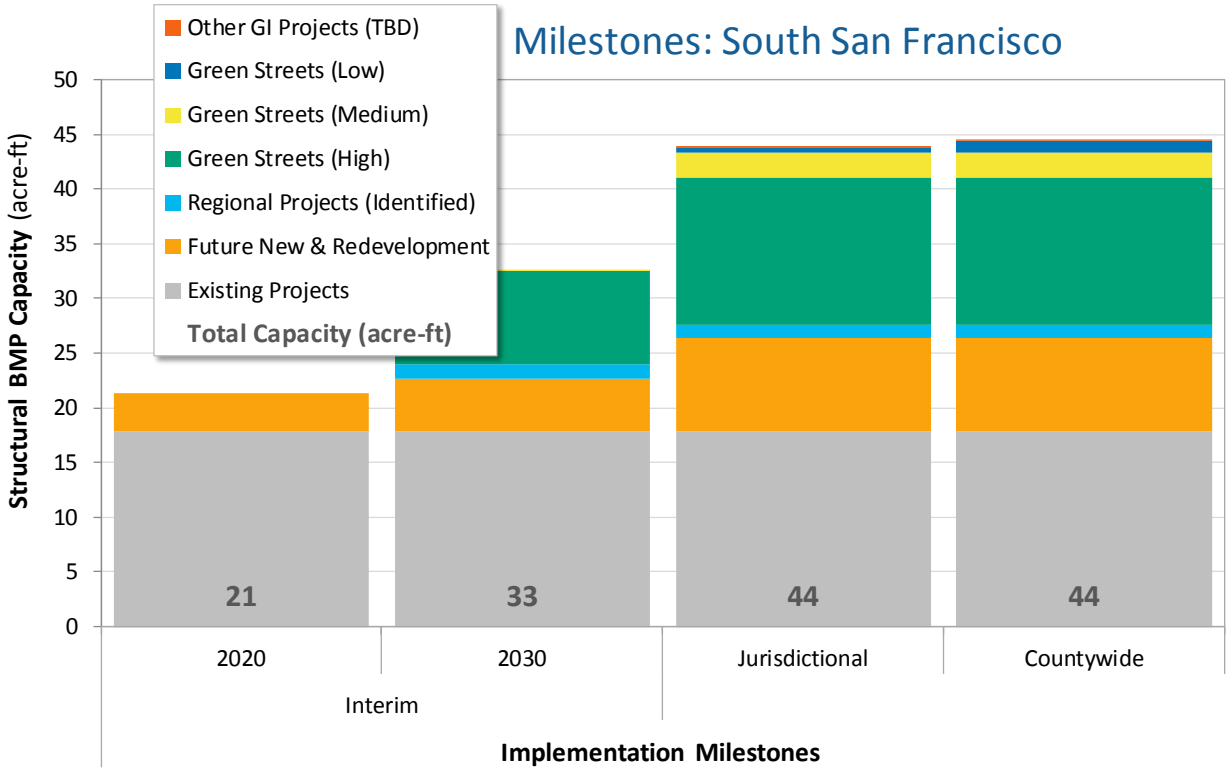


Figure 1-8. Summary GI capacity for interim and final implementation milestones.

2 REFERENCES

BASMAA (Bay Area Stormwater Management Agencies Association). 2017. *Bay Area Reasonable Assurance Analysis Guidance Document*. Bay Area Stormwater Management Agencies Association, Oakland, CA.

Bicknell, B. R., , J. C. Imhoff, A. S. Donigian, R. C. Johanson. 1997. *Hydrological Simulation Program – FORTRAN (HSPF), User's Manual For Release 11*. EPA – 600/R-97/080. U.S. Environmental Protection Agency, Athens, GA.

Riverson, J., K. Alvi, J. Zhen, R. Murphy. 2014. *SUSTAIN Application User's Guide for EPA Region 10*. U.S. Environmental Protection Agency Region 10, Office of Water and Watersheds, Seattle, WA.

Shen, J., A. Parker, and J. Riverson. 2004. A New Approach for a Windows-based Watershed Modeling System Based on a Database-supporting Architecture. *Environmental Modeling and Software*, July 2004.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2006. *Mercury in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report for Revised Total Maximum Daily Load (TMDL) and Proposed Mercury Water Quality Objectives*. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2008. *Total Maximum Daily Load for PCBs in San Francisco Bay: Final Staff Report for Proposed Basin Plan Amendment*. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SFBRWQCB (San Francisco Bay Regional Water Quality Control Board). 2015. *NPDES Phase I MS4 Municipal Regional Stormwater Permit (MRP) for San Francisco Bay Region*. Order No. R2-2015-0049. San Francisco Bay Regional Water Quality Control Board, San Francisco, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2017. *Stormwater Resource Plan for San Mateo County*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2018. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2019. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase II Green Infrastructure Modeling Report*. Prepared by Paradigm Environmental and Larry Walker Associates for San Mateo Countywide Water Pollution Prevention Program, Redwood City, CA.

USEPA (U.S. Environmental Protection Agency). 2009. *SUSTAIN—A Framework for Placement of Best Management Practices in Urban Watersheds to Protect Water Quality*. EPA/600/R-09/095. U.S. Environmental Protection Agency, Office of Research and Development, Edison, NJ.

USEPA (U.S. Environmental Protection Agency). 2017. *Developing Reasonable Assurance: A Guide to Performing Model-Based Analysis to Support Municipal Stormwater Program Planning*. U.S. Environmental Protection Agency Region 9, San Francisco, CA.

APPENDIX C

Green Infrastructure Funding Report

Green Infrastructure Funding Nexus Evaluation

Part of a Project for the San Mateo Countywide Water Pollution Prevention Program:

Green Infrastructure Planning

January 2019

Task 5.7

Project Team:

SCIConsultingGroup

LARRY WALKER ASSOCIATES

(THIS PAGE INTENTIONALLY LEFT BLANK)

TABLE OF CONTENTS

(THIS PAGE INTENTIONALLY LEFT BLANK)

1 INTRODUCTION

1.1 INTRODUCTION

The San Francisco Bay Regional Water Quality Control Board's (Regional Water Board) 2015 Municipal Regional Permit (referred to as MRP 2.0) includes specific provisions for addressing key pollutants of concern, including mercury, PCBs (polychlorinated biphenyls), and trash. The MRP 2.0 also requires jurisdictions to transition from gray, or piped, infrastructure storm drainage systems to green, or landscape-based, systems that capture, treat, and infiltrate runoff. In other words, Green Infrastructure.

The MRP 2.0 defines green infrastructure as: Infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments that mimic nature by soaking up and storing water. Following this definition to its natural conclusion would mean turning the urban landscape of San Mateo County back into green fields. Clearly, that cannot happen, but every action to permeate the hardened urban surfaces and once more expose the soil to the natural precipitation would move our environment further in that direction.

1.1.1 THE ROLE OF STORMWATER MANAGEMENT

This endeavor falls generally under the umbrella of stormwater management, but it also stretches the meaning of stormwater management as municipalities have long envisioned it. Over the past century of urban expansion, stormwater management meant collecting and conveying "nuisance" runoff to receiving waters. The revisions to the Clean Water Act in the late 1980s and the first NPDES[1] permits for MS4s[2] in the early 1990s are serving to redefine stormwater management profoundly. Over the past two decades the trend in the NPDES permits has become clear – municipalities must change how they view their roles as stormwater managers. Where they had once focused strictly on traditional public infrastructure, NPDES now pushes them to focus on other practices (public AND private) such as pest management, enforcing commercial and industrial discharges, and construction sites – later growing to permanent controls on new development (including low impact development, hydrograph modification, capture and reuse), trash capture, and, finally, green infrastructure (GI). MRP 3.0 and 4.0 promise to move further along this path.

But just when more and more municipalities are realizing that stormwater management should be considered an enterprise or utility on par with water and sewer utilities, others are beginning to realize that stormwater management may have already outgrown "utility" status. It may not actually fit neatly inside the box of a discrete enterprise but must permeate through all their planning and land use responsibilities as well. It is also pushing the limits of what a municipality is empowered to do regarding behavior and practices on private property. This is manifest in the range of documents that make up the Green Infrastructure Plans.

[1] Acronym stands for the National Pollutant Discharge Elimination System from the Clean Water Act. Permits are issued under this system to municipalities and other entities that discharge stormwater to receiving waters (creeks, bays, etc.).

[2] Acronym stands for municipal separate storm sewer systems.

1.1.2 GREEN INFRASTRUCTURE STRETCHES PRIOR FUNDING MODELS

Funding for GI is no less vexing. Under the old model, stormwater funding was for management and upgrade/expansion of traditional public stormwater infrastructure (inlets, pipes, pump stations, creeks, channels, and levees). GI expands on the concepts of low impact development and hydrograph modification for private development sites and applies them to the broader universe of infrastructure in general – both public and private – and the funding models for these activities are not well developed.

Traditional stormwater funding has always been a challenging field with many hurdles that are changing as rapidly as the regulations pertaining to stormwater quality. Dedicated and sustainable stormwater funding is usually found in the form of a property-related fee (similar to water and sewer fees). Proposition 218 requires these to be focused around services provided and each property's share of the cost of those services. GI expands the universe of infrastructure beyond the traditional drainage facilities to roads, landscaped areas and other facilities. As a result, great care must be taken as traditional stormwater funding sources are applied to the GI goals. In addition, there are inherent difficulties in applying public funding to private facilities, which will necessarily play a role in meeting the GI goals.

Proposition 218 was a constitutional amendment approved by California voters in 1996 and was intended to make it more difficult for municipalities to raise taxes, assessments and fees (such as property-related fees). As currently interpreted by the courts, Proposition 218 requires that stormwater fees must be approved through a ballot measure – a much higher threshold than for the sister utilities of water, sewer and refuse collection which must only conduct a public hearing. The result is that in the past two decades, only a handful of municipalities have been able to put any new stormwater revenue mechanisms in place. This has served to make stormwater a second-class utility and has dealt a serious blow to achieving the "One Water" goals that are so important to solving challenges such as supply shortages and pollution.

This report looks into common existing funding mechanisms (fees, taxes, developer fees, etc.) as well as recently pioneered funding strategies such as alternative compliance funds, enhanced infrastructure finance districts, etc. Many municipalities are finding that no single source of revenue is adequate to fund its stormwater needs, and GI funding will be no different. It is expected that the most successful funding strategy will be a "portfolio" approach containing multiple funding sources. The end product will be a tool box of options.

1.2 BACKGROUND

The City/County Association of Governments of San Mateo County (C/CAG), a joint powers agency whose members are the County of San Mateo and the 20 incorporated cities and towns, administers the San Mateo Countywide Water Pollution Prevention Program (Countywide Program) to assist its member agencies with meeting requirements to reduce pollutants in stormwater runoff. These requirements are contained in the San Francisco Bay Regional Water Quality Control Board's (Regional Water Board) Municipal Regional Permit (MRP 2.0) and include specific provisions for addressing key pollutants of concern, including mercury, PCBs (polychlorinated biphenyls), and trash. The MRP 2.0 also requires jurisdictions to transition from gray, or piped, infrastructure storm

drainage systems to green, or landscape-based, systems that capture, treat, and infiltrate runoff – Green Infrastructure.

The MRP 2.0 defines GI as: Infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, GI refers to the patchwork of natural areas that provide habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, GI refers to stormwater management systems that mimic nature by soaking up and storing water.

To aid jurisdictions in transitioning from gray to green infrastructure, MRP 2.0 requires each agency to prepare and adopt a GI Plan by September 2019. The Regional Water Board describes the purpose of the GI Plans as follows:

- Over the long term, the Plan is intended to describe how the Permittees will shift their impervious surfaces and storm drain infrastructure from gray, or traditional storm drain infrastructure where runoff flows directly into the storm drain and then the receiving water, to green – that is, a more resilient, sustainable system that slows runoff by dispersing it to vegetated areas, harvests and uses runoff, promotes infiltration and evapotranspiration, and uses bioretention and other GI practices to clean stormwater runoff; and
- The Plan shall also identify means and methods to prioritize particular areas and projects within each Permittee's jurisdiction, at appropriate geographic and time scales, for implementation of GI projects. Further, it shall include means and methods to track the area within each Permittee's jurisdiction that is treated by GI controls and the amount of directly connected impervious area.

The GI Plan is required to include targets for the amount of impervious surface to be retrofitted over time in order to achieve specific reductions in mercury and PCBs discharging to San Francisco Bay. It also must address policies, guidance, funding and other means for jurisdictions to ensure implementation, operation, and maintenance of sufficient GI, to meet these target water quality thresholds.

1.3 GOALS OF THIS REPORT

This report builds on C/CAG's 2014 efforts to develop a dedicated and sustainable funding source. Although that effort has not yet moved to the implementation stage, it did produce a Funding Options Report in 2014 that identified a number of traditional stormwater funding sources. This report is not intended to duplicate that 2014 effort, but rather update it as necessary and supplement it with strategies more in line with GI challenges.

The MRP 2.0 provision C.3.j.i(2)(k) requires a GI Plan to include "an evaluation of prioritized project funding options, including, but not limited to: Alternative Compliance funds; grant monies, including transportation project grants from federal, State, and local agencies; existing Permittee resources; new tax or other levies; and other sources of funds." While other sub-tasks of the project identified a prioritized list of potential public GI projects and estimated the potential redevelopment of private parcels (which would require use of low impact development, or "LID") on a drainage-area-specific

basis, this Sub-Task (5.7) will provide an evaluation of funding sources that could potentially pair with the types of projects identified.

It is the goal of this report to identify and evaluate the feasibility of various funding strategies to enable member agencies to complete their GI Plans in a thorough and timely manner. This report will provide a general overview of funding mechanisms common to stormwater management, with keys to how they relate to GI.

1.4 REPORT STRUCTURE

- **Chapter 2** provides a background of the overall GI planning efforts by C/CAG including general discussion of the three types of funding needs (Planning, Capital and Operations and Maintenance).
- **Chapters 3 and 4** discuss various funding opportunities and strategies. These are grouped into two categories: Traditional funding strategies (such as fees, taxes and assessments), Chapter 3; and potential strategies for meeting GI needs, Chapter 4.
- **Chapter 5** provides a summary and a set of recommendations.
- **Appendices** include:
    - A summary matrix of the various funding mechanisms intended as a quick reference guide to member agencies to help them keep sight of the broad scope of funding possibilities;
    - An alternative compliance case study; and
    - The 2014 C/CAG report: Potential Funding Source Analysis and Recommendations.

It is worth noting that the summary matrix in Appendix A contains some additional information such as pros and cons and applicability to costs for staff, planning, capital and operations and maintenance ("O&M"). This matrix should be considered a key document containing unique information.

2 OVERVIEW OF FUNDING NEEDS

As member agencies have developed early elements of their GI Plans, it has become evident that downstream funding needs will be substantial and varied in its scope. GI, by its very nature, is a flexible and variable approach to reducing stormwater pollutants, and therefore will continue to evolve in the coming years in its efficacy, costs, and approaches. It is difficult to assign dollar amounts to some of the elements at this stage, but below we discuss some of the factors that need to be considered.

By way of structure, we have divided the task into three primary elements: Planning needs; capital improvement needs; and operations and maintenance needs. However, as funding is contemplated it is worth noting that not all of these elements can be funded by all funding sources. For example, bond funding is typically only applicable to capital improvement programs and cannot fund early planning or operations demands downstream. Appendix A contains a matrix of funding sources that cross references each source against the types of activities to which it does or does not apply. This factor should be considered as the GI plans are finalized.

2.1 PLANNING NEEDS

2.1.1 PLANNING EFFORTS TO DATE

There has been a substantial planning effort underway since the issuance of MRP 2.0 to assist member agencies to develop their GI Plans and educate staff and elected officials. This has included the formation of the Technical Advisory Committee to help guide the countywide effort to provide frameworks or work plans for member agencies; and conducting staff workshops and briefings for municipal officials. The planning effort has developed or updated several major documents, collectively referred to as the GreenSuite, to help guide future GI efforts including:

- Green Infrastructure Design Guide:
  - Topics include policy and overview, buildings and sites, sustainable streets, implementation, operations and maintenance among others.
  - Appendices include a glossary, references, typical GI details, specifications for GI materials, O&M checklists, and this GI Funding Nexus Evaluation.
- Regulated Projects Guide

2.1.2 FUTURE PLANNING EFFORTS

Looking forward, member agencies will need to continue to update and supplement these planning documents in order to keep pace with ongoing and future MRP requirements and the information needs of municipal staff to implement GI projects. In addition, each member agency will be required to track and document GI implementation over time. This includes tracking planned and implemented projects and modeling pollutant loads reduced for compliance purposes. Finally, there will be ongoing efforts to coordinate with C/CAG and BASMAA groups in coming years to coordinate regionally consistent approaches to GI planning and implementation.

Also included in the planning category are the ongoing Education and Outreach efforts to help educate the public, developers, agency staff, and elected officials on GI and LID planning, policy, design and implementation.

2.2 CAPITAL IMPROVEMENT NEEDS

MRP 2.0 Provision C.3.h.i.(2)(a) requires each member agency's GI Plan to include the identification of potential and planned GI projects, both public and private, on a drainage-area specific basis for implementation and assessment of potential load reductions by 2020, 2030, and 2040. On the public-sector side, the GI Plans call for the routine incorporation of GI into capital improvement projects to help meet the pollutant reduction requirements. On the private-sector side, development and redevelopment projects have been required to incorporate LID features into project proposals for more than a decade.

C/CAG has worked with its member agencies to define the methods for moving from the long-term planning and estimating of performance of future GI through to the tracking and modeling of actual construction and performance over time. For public sector projects, C/CAG established prioritization criteria and identified potential projects utilizing a methodology for bridging the long-range generalized planning with identification of suitable potential for potential GI projects on public lands using clear and documented assumptions that will allow member agencies to develop capital improvement projects that incorporate GI.

A summary of planned GI projects as well as other projects targeted for retrofitting to impervious surfaces is still being developed.

Funding for capital projects can be obtained from most types of sources including sustainable fees, taxes and assessments, one-time grants and loans, and through creative partnerships and in-lieu programs.

2.3 OPERATIONS AND MAINTENANCE NEEDS

As with all built features, GI will require O&M efforts to keep the improvements in a serviceable condition. However, GI has the added requirement that the "green" element remain as effective as designed. Although many GI improvements appear to be landscape features when viewed from the surface, they are in fact types of mini-treatment facilities, which have more specialized maintenance requirements than typical landscape features. Therefore, the O&M efforts and costs can be substantial and may require a different mix of skills and trained labor to undertake the maintenance. To better define the maintenance needs, C/CAG is developing an Operations and Maintenance Manual.

Funding for O&M is often the most restricted as it rarely can be sustained from grant funds or bond programs. Sustainable fees, taxes and assessments are the most common ways to fund O&M, but those mechanisms often require a ballot measure and therefore are difficult to secure at meaningful levels.

3 TRADITIONAL TYPES OF STORMWATER PROGRAM FUNDING

In 2014 C/CAG engaged SCI to study and make recommendations on strategies to fund water pollution prevention programs required in the previous MRP. One of the deliverables from that effort was the Potential Funding Sources Analysis and Recommendations Report, which described, analyzed and evaluated various funding mechanism alternatives available for stormwater programs. That 2014 Report forms a solid basis from which to evaluate funding options for GI as well. This section will provide a brief overview of the 2014 Report, which is included herein as Appendix C. This discussion will also provide some important updates to the 2014 Report – particularly regarding Senate Bill 231.

There are several ways to categorize funding. This report looks at whether funding is ongoing funding, one-time funding, or debt financing (one-time funds that are repaid in an ongoing manner). This report also distinguishes between balloted and non-balloted, as any funding source that requires a ballot measure will obviously bring with it more challenges. The matrix below helps to visualize these two axes and illustrates a few examples of each.

	Sustainable / Ongoing	One-Time	Long-Term Debt
Balloted	Taxes, Fees & Assessments		GO Bonds *
Non-Balloted	Regulatory Fees Re-Alignment Developer Fees	Grants	COPs ** Revolving Fund

** General Obligation Bonds; ** Certificates of Participation*

3.1 LOCAL FUNDING STRATEGIES THAT REQUIRE A BALLOTED PROCESS

There are two basic types of balloted measures appropriate for stormwater funding, namely, special taxes and property-related fees. Successfully implemented balloted approaches have the greatest capacity to significantly and reliably fund stormwater management, but they are often very challenging. Generally, the most important key to a successful ballot measure is to propose a project or program that is seen by the voting community to have a value commensurate with the tax or fee. The two greatest challenges are to craft a measure that meets this threshold, and then to effectively communicate the information to the community.

Since balloted funding mechanisms tend to be the most flexible and sustainable, they are often seen as underpinning an agency's entire program. Not only can they pay directly for services or projects, but a dedicated and sustainable revenue stream can also be leveraged to help secure grants, loans, partnerships, and many other opportunities that present themselves. Without such a dedicated revenue stream, those opportunities must often be missed.

3.1.1 SPECIAL TAXES

Special taxes are decided by registered voters and require a two-thirds majority for approval. Traditionally, special taxes have been decided at polling places corresponding with primary and general elections. More recently, however, local governments have had success with single issue special taxes by conducting them entirely by mail and not during primary or general elections. Special taxes are well known to Californians and are utilized for all manner of services, projects, and programs. They are usually legally very stout and flexible and can support an issuance of debt such as loans or bonds in most cases.

There are several types of special taxes, but the most common for stormwater services are parcel taxes. Parcel taxes are levied against real property and can be calibrated for some parcel metric such as acreage, size of building, impermeable area, type of use, or simply a flat rate where each parcel pays the same amount. One thing that distinguishes taxes from fees is that taxes do not necessarily need to have a direct nexus between the amount of the tax and the service received. As such, tax mechanisms can exempt certain types of property (e.g., public property) or owners (e.g., seniors or low income). While exemptions may reduce revenues somewhat, they are usually very popular with voters. Examples of parcel taxes that have been successfully implemented for stormwater services are in the cities of Culver City, Los Angeles, Santa Cruz, and Santa Monica. The most recent successful parcel tax measure was in Los Angeles County where the Flood Control agency passed a tax that will raise as much as $300 million per year for projects that would capture, treat and recycle rainwater.

Other types of special taxes include sales, business license, vehicle license, utility users, and transient occupancy taxes. These types can also be implemented as a general (not special) tax, where they would only require a simple 50% majority for passage. But to qualify as a general tax, it must be pledged only for an agency's general fund with no strings attached, in which case any GI or stormwater services must compete with other general funded services such as police, fire and parks. Although a general tax requires only a simple majority, voters tend to show better support for special taxes where the purpose of the tax is explicitly identified.

3.1.2 PROPERTY-RELATED FEES

A Proposition 218-compliant, property owner balloted, property-related fee is a very viable revenue mechanism to fund stormwater programs. Property-related fees are decided by a mailed vote of the property owners with a simple majority (50%) threshold required for approval, with each parcel getting one vote. The property-related fee process is generally not as well known, and it is more time consuming and is more expensive than the special tax process, but it is much more common for funding stormwater management, and in many communities, more suitable to meet the voter approval threshold. One of the more successful municipalities to implement a property-related fee for stormwater services is Palo Alto, where they have succeeded twice.

As they pertain to GI, property-related fees remain a flexible and stout funding source. However, under Proposition 218 property-related fees must apply to defined services within a defined service area, and the costs of providing those services must be spread equitably over the properties that receive the services. The scope of GI is stretching the traditional boundaries of stormwater services,

and great care must be taken when crafting a property-related stormwater fee structure. But just as water agencies have embraced conservation efforts and watershed habitat protections, so, too, can stormwater agencies carefully expand into the area of GI.

3.1.3 GENERAL OBLIGATION BONDS

The voting public is very familiar with general obligation (GO) bond measures, which typically come in the form of a general obligation bond and require a two-thirds majority for passage. Bonds are issued to raise funding up front and are repaid through a tax levied against property on the annual property tax bill. These levies are based on property value, so higher value properties pay a higher portion of these taxes. Because the rate of taxation is based on value, ballot measures cannot state an annual amount that would be paid by an individual. This is usually an advantage, as the voter is presented with a bond amount (e.g., $25 million bond measure) for a project or program, and votes based on that without knowing exactly what it will cost them or for how long.

One primary restriction on GO bonds is that they can only be used for capital projects. While that includes land acquisition, planning, design and construction, the costs for maintenance and operations cannot be paid from the bond proceeds.

Selling bonds for GI has become more viable this year with a clarification from the Government Accounting Standards Board (Statement #62, or "GASB 62") that distributed infrastructure can be considered an asset upon which an agency can capitalize and therefore more easily be included in a bonded debt program. Distributed infrastructure is a term for smaller improvements that are often distributed around an area – sometimes on private property – like green roofs, rain barrels, bioswales, and pervious pavements. GASB goes so far as to include the cost of rebate programs for distributed infrastructure as well.

Examples of stormwater-related GO bonds successfully implemented include Berkeley's Measure M ($30 million – partly for GI, 2012) and Los Angeles' Measure O ($500 million, 2004).

3.1.4 CHALLENGES WITH BALLOTED APPROACHES

Ballot measures are inherently political and are often outside of the areas of experience and expertise of most stormwater managers. For any measure to have a fair chance, the community must be well informed, and their preferences and expectations must be woven into the measure. This requires significant outreach and research, which is something best handled by specialized consultants, and can take considerable time and resources.

Over the past 15 years, there have been fewer than two dozen community-wide measures attempted for stormwater throughout California, and the success rate is just over 50%. Very few attempts have been made to pass a stormwater ballot measure even though there may be over 500 agencies with stormwater needs, because success is not assured. Clearly this is a high bar to clear, and any agency considering a balloted approach must carefully weigh the pros and cons before proceeding.

Funding strategies are discussed in greater detail in Appendix C, which also includes a list of balloted efforts throughout the State along with a discussion on why they succeeded or failed.

3.1.5 KEYS TO A SUCCESSFUL BALLOTED APPROACH

Know your needs and how to fix them: This often will come from a needs analysis or a strategic planning effort. The more popular fixes usually include capital projects that the community sees as fixing a problem they know about. For example, a new storm drain pump station that will alleviate chronic local flooding, or a spreading basin that will replenish the aquifer and create environmental habitat with some recreational opportunities.

Know your community's priorities: If the agency's needs are not seen as priorities by the community, a ballot measure will likely fail. This is usually measured by a public opinion survey, which would identify priorities as well as willingness to pay for the proposed program. Top priorities identified in the survey should be folded back into the proposed measure to demonstrate that the agency is responsive to the community.

Communicate with the voters: Community engagement must be tailored to fit the measure and the community it is designed to serve. It can range from a brief set of outreach materials (website and flyer) to a comprehensive branding and information effort that can take several months or longer, complete with town hall meetings and media coverage. Knowing your stakeholders and opinion leaders is a must, and special efforts with those groups are always recommended. Note that advocacy by a public agency is strictly forbidden by law, so legal counsel should be involved at some point to help distinguish between educational outreach and advocacy.

Know where you stand with the voters: For instance, do voters trust the agency? Do they believe that you will deliver on your promises? How have past ballot measures worked out? Know the answers to questions like these; and if you do not like the answers, figure out how to correct for that.

Plan for the needed resources: Many public agencies hire professional consultants for critical elements of this process from needs analysis to surveys and community engagement. While these consultants can be costly, it is usually well worth the expense if they can deliver a successful measure. Considerable agency staff time may also be required, since this is a very iterative process that must be presented to the public by agency representatives, not consultants.

3.2 SENATE BILL 231 – THE END OF BALLOTING FOR STORMWATER FEES?

As stated earlier, water and sewer fees are exempt from the voter approval requirements of Proposition 218. Senate Bill (SB) 231, signed by Governor Brown on October 6, 2017, provides a definition for sewer that includes storm drainage. This clarification would give stormwater management fees the same exemption from the balloting requirement that applies to sewer, water, and refuse collection fees, and would make stormwater property-related fees a non-balloted option – something very attractive to municipalities. Unfortunately, the Howard Jarvis Taxpayers Association, who authored and sponsored Proposition 218, is expected to file a lawsuit against any municipality that adopts a stormwater fee without a ballot proceeding. Therefore, the SB 231 approach must be given a very cautionary recommendation at this time. Any agency considering moving in that direction should consult with other agencies and industry groups to coordinate their efforts in a strategic manner and avoid setting an unfavorable legal precedent. C/CAG staff is keeping abreast of developments in this area and would be a good first point of contact.

3.3 LOCAL FUNDING STRATEGIES THAT DO NOT REQUIRE A BALLOTED PROCESS

Non-balloted approaches are those which can be implemented without voter approval. They can be as simple as charging a plan check fee, or as complex as realigning functional units or financial budget structures within an agency. The table below illustrates some examples of non-balloted approaches.

Type of Approach	Examples	Comments
Regulatory Fees	Plan Check Fees Inspection Fees	Proposition 26 (2010) has significantly limited the applicability.
Realignment of Services	Water Supply Sewer Refuse Collection	Leverage and integrate stormwater elements that qualify under water, sewer and/or refuse collection categories.
Business License Fees	Business License Fee	Applies to commercial operations with clear impacts on stormwater such as restaurants, vehicle repairs.
AB 1600 Fees	Developer Impact Fees	Similar to impact fees aimed at improving water and sewer systems, or parks and schools.
Integration into Projects with Existing Funding	Transportation or Utility Projects	Takes advantage of multi-benefit projects that also further stormwater goals.

While not subject to local voters' or property owners' "willingness to pay" limitations, these non-balloted approaches may encounter a certain amount of public resistance, particularly from specific groups that will be impacted by these approaches (e.g., businesses will resist additional business license fees). In addition, each one of these approaches requires that a nexus be drawn between the fee and the impact on the payer of the fee in order to not be considered a tax. Therefore, a nexus study or cost of service analysis needs to be developed in each case.

As they pertain to GI funding, developer fees and partnerships with transportation or utility projects may have the most applicability, particularly when integrated into other emerging strategies such as discussed in Section 4 of this report. Realignment of services is discussed in more detail in the following section. All these funding sources are discussed in more detail in Appendix C.

3.3.1 DEVELOPMENT IMPACT FEES

Development impact fees pose an interesting option for cities that anticipate growth of any scale. "A development impact fee is a monetary exaction other than a tax or special assessment that is charged by a local governmental agency to an applicant in connection with approval of a development project for the purpose of defraying all or a portion of the cost of public facilities related to the development project. (Gov. Code § 66000(b).) The legal requirements for enactment of a development impact fee program are set forth in Government Code §§ 66000-66025 (the "Mitigation

Fee Act"), the bulk of which were adopted as 1987's AB 1600 and thus are commonly referred to as "AB 1600 requirements." A development impact fee is not a tax or special assessment; by its definition, a fee is voluntary and must be reasonably related to the cost of the service provided by the local agency. If a development impact fee does not relate to the impact created by development or exceeds the reasonable cost of providing the public service, then the fee may be declared a special tax and must then be subject to a two-thirds voter approval. Developer impact fees are exactions of either money or built improvements from a developer to mitigate the impacts to the public infrastructure of that development."[3]

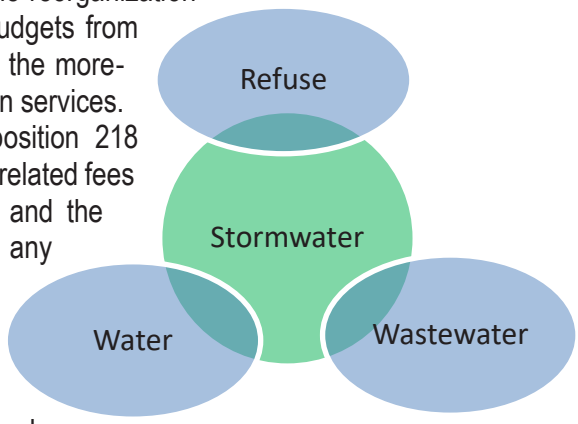
Developer fees are typically done in one of two ways: 1) through predetermined fees tied to a nexus study and charged to applicable development projects; or 2) on an ad hoc basis drafted for a particular development. While the former requires a rigorous nexus study and is often based on the expectation of significant future development, it will apply to all future development and provides a known cost for developers as they plan projects. The latter method is often attractive for municipalities that have no adopted developer fees and allows for flexibility in determining impacts and creative methods for mitigating them. However, the ad hoc method carries with it a higher burden for the agency to demonstrate the reasonable nexus and a rough proportionality to the impact created by the development project. It also deprives developers from knowing in advance the cost to their projects.

One of the impacts of new development that can be tied to a fee is that of stormwater quality. Most new development is already subject to C.3 requirements, which mitigate many of the direct stormwater pollution impacts for a particular site. Therefore, it may be difficult to demonstrate additional impacts that can be mitigated through planned GI. One way would be to tie local or regional GI needs to the community at large and include each project's fair share of the associated costs in a development fee structure for GI. Another way may be to develop an overall stormwater impact fee nexus (including GI) that can be applied to new development.

[3] *A Short Overview of Development Impact Fees*, City Attorneys Department, California League of Cities, 2003. http://www.ca-ilg.org/sites/main/files/file-attachments/resources__overviewimpactfees.pdf

3.3.2 DELIVERY OF STORMWATER SERVICES: RE-ALIGNMENT OF MUNICIPAL SERVICES

One approach for delivering stormwater services that has significant appeal is realignment. Realignment is the term used here to describe the reorganization of management, staffing, service units and/or budgets from "traditional" stormwater management services to the more-easily funded water, sewer and/or refuse collection services. This applies to the distinctions drawn in Proposition 218 between stormwater and the other three property-related fees where stormwater requires a ballot proceeding and the other three enterprises do not. Therefore, any stormwater activity that falls within the scope of the other three services can be funded by fees without a ballot proceeding.



For example, trash capture activities and infrastructure can be considered refuse collection and can be funded by garbage fees. Another example could be certain kinds of low impact development where stormwater is infiltrated into the ground where it contributes to the replenishment of the drinking water aquifer.

This may not be as easy as it seems. First, any fee structure must rely on an analysis of how costs for service are spread across property types. Second, reorganizing budgets or service units within a municipal structure can be challenging, and in many areas those non-stormwater services are delivered by special districts instead of the municipality making reorganization impossible. Finally, just because the water, wastewater or refuse collection services do not need to pursue a ballot measure to increase rates, the public's willingness to pay is still at issue and a public hearing is still required. Many rate payers pay close attention to any rate increase, and elected officials are under constant pressure to keep increases to a minimum.

3.4 GRANTS AND LOANS

3.4.1 GRANTS[4]

Federal, state, and regional grant programs have funding available to local governments to support GI efforts. These grant programs include:

- California Proposition 1 (Water Quantity, Supply, and Infrastructure Improvement Act of 2014) Stormwater Implementation Grant Program;
- US Environmental Protection Agency: San Francisco Bay Water Quality Improvement Fund;

[4] This section is taken from a Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program

- California Water Resources Control Board: 319(h) Non-Point Source Implementation Program;[5]
- California Department of Water Resources: Integrated Regional Water Management Program Implementation Grants;
- California State Parks: Land & Water Conservation Fund and Rails-to-Trails Programs;
- California Department of Forestry and Fire Protection: Urban and Community Program;
- Strategic Growth Council: Urban Greening Program;
- California Office of Emergency Services (OES) 404 Hazard Mitigation Grant Program;
- Caltrans Cooperative Implementation Agreements or Grants Program; and
- One Bay Area Grant Program (transportation projects).

Other potential grant resources that may be tapped in the future to support GI include Greenhouse Gas Reduction Funds derived from the California Cap and Trade Program.

As a result of Senate Bill 985, now incorporated into the California Water Code, stormwater capture and use projects must be part of a prioritized list of projects in a Stormwater Resource Plan in order to compete for state grant funds from any voter-approved bond measures. Advantages of using grant funding may include the following:

- Grants can fund programs or systems that would otherwise take up significant general fund revenues;
- Grants often fund new and innovative ideas that a local agency might otherwise be reluctant to take on using general funds;
- Grants can be leveraged with other sources of funding increasing the viability, benefits, and/or size of a project; and
- Successful implementation of a grant-funded project can establish a record that can lead to other grants.

Challenges with using grants as a funding approach typically include:

- Grants are opportunistic in that local governments have no control over when grant monies will become available. However, in some cases opportunities to apply for grants and the anticipated level and timeline of the funding are scheduled well in advance;
- Grants are often available only once for the same purpose, which can lead to agencies creating ever "new" programs to qualify for funds. Other "strings" can be attached to the grant creating implementation or maintenance complexities;
- Grants are competitive. Considerable resources may be required to apply for a grant with no guarantee of success;

[5] Projects or activities required by or that implement a National Pollutant Discharge Elimination System permit, including urban, area-wide stormwater programs covering discharges from a MS4, are not eligible for funding under Section 319(h) grants.

- Some level of matching funds is usually required. Some types of funds cannot be matched with other types. For example, some federal funds are pass-through via the state, but they are still considered federal and may therefore not be eligible as a match with other federal funds; and
- Most grants have a requirement for the agency to provide adequate post-project maintenance for the improvement. This can impose significant costs on the agency that are not funded by the grant.

While grant funding can help propel a GI program forward, it typically requires another source of funding to cover grant obligations such as matching funds or post-project maintenance. This understanding helps to underscore the importance of an underlying, dedicated and sustainable revenue source such as a stormwater fee or tax.

3.4.2 LOANS

Long-term debt financing can be a valuable tool to use for funding important projects and programs. It is not a source of new funding in and of itself, but rather allows an agency to leverage an ongoing revenue stream by borrowing money for immediate needs such as capital construction, which is then repaid over time. While GO bonds (discussed above) are a type of debt instrument that requires voter approval, other forms of long-term debt do not require voter approval such as certificates of participation (COPs) or loans from a state revolving fund (SRF). COPs are a type of municipal bond that usually has relatively low interest rates but is only secured by the agency's ability to repay and can have substantial administrative costs.

The California Clean Water State Revolving Fund (CWSRF) is one type of SRF that may be a good option for agencies. These loans are secured by a reliable source of revenue such as dedicated fees or taxes, and typically have below-market interest rates and very low administrative costs. In the past these loans have been for wastewater treatment plants but are now opening up to green stormwater projects. The CWSRF also has a principal forgiveness program for projects related to water or energy efficiency and stormwater runoff sustainability or mitigation projects. The program can forgive up to 50% of eligible capital costs and 75% of eligible planning costs, up to a cap of $4 million.

Debt financing for GI has become more viable this year with a clarification from the Government Accounting Standards Board (Statement #62, or "GASB 62") that distributed infrastructure can be considered an asset upon which an agency can capitalize and therefore can more easily be included in a bonded debt program. Distributed infrastructure is a term for smaller improvements that are often distributed around an area – sometimes on private property – like green roofs, rain barrels, bioswales, and pervious pavements. GASB goes so far to include the cost of rebate programs for distributed infrastructure as well.

It is important to note that while long-term debt provides immediate funding for projects, it is not a new source of funds. It simply converts a dedicated, sustainable revenue stream (e.g., fees or taxes) into near-term funding. Without the dedicated, sustainable revenue stream, long-term debt is not usually an option.

3.5 ASSESSMENTS & SPECIAL FINANCING DISTRICTS

Special financing districts are not the same as special districts, which are a form of governance with their own elected board and scope of services. Special financing districts are simply financial structures created by local governments for the purpose of levying taxes, fees, or assessments for specific improvements and/or services provided. These include benefit assessments, community facilities districts, business improvement districts, and infrastructure financing districts.

Most special financing districts require a balloting of affected property owners, but these are typically either a very small area (like a business district) or are applied to single land owners such as a developer in the process of a new development.

3.5.1 BENEFIT ASSESSMENTS

Benefit assessment districts can levy charges that correlate to special benefits conferred on property by virtue of improvements or services. These can range from landscaping, lighting, recreation facilities, parks, fire protection, mosquito abatement, and even cemeteries. Most benefit assessment districts are governed by a statute, which can vary depending on the type of service or improvement. All benefit assessments must comply with Proposition 218, which limits assessments to the special benefits conferred, but cannot be levied based on any general benefit (such as to properties outside the district boundary or to the general public at large). The portion of the benefits that are general must be funded from sources other than the benefit assessments – such as a city's general fund. This general benefit factor can become prohibitive in some cases.

As they pertain to GI, property owners in a watershed could be assessed to fund stormwater runoff management programs that provide direct benefit to properties within that watershed or sub-basin. The watershed unit may be particularly effective and equitable as programs can be tailored to address specific priorities identified within that watershed and would include the diverse socio-economic demographics from the hills to the flatlands typical to a Bay Area urban watershed.

Benefit assessments are not taxes or fees and must be approved by a weighted majority[6] of the affected property owners that cast votes. Benefit assessments typically are collected as part of the annual property tax bill.

3.5.2 COMMUNITY FACILITIES DISTRICTS (MELLO-ROOS)

Community Facilities Districts, more commonly known as "CFDs" or "Mello-Roos Districts", are a form of special tax, and must be approved by property owners or registered voters.[7] Similar to benefit assessments, these are often formed during the development process for a finite set of parcels owned by a single entity, and thus there would only be a single ballot. Oftentimes, formation of a CFD will be included in the conditions of approval for a development, so the balloting is more of a formality.

---

[6] In a ballot proceeding for a benefit assessment, ballots are weighted by the amount of the assessment to be levied. As a result, property owners faced with large assessments wield more weight in the balloting.

[7] A CFD tax is balloted to property owners if there are fewer than 12 registered voters in the district. Otherwise the balloting is by registered voters.

As a tax, the structure of the charges and the use of the funding is much more flexible than for a benefit assessment. For instance, publicly-owned property can be exempted as well as other classes of properties (such as commercial properties in a school-based CFD). In addition, general benefit does not need to be considered or funded from other sources. Finally, CFD taxes are easily structured to allow for future expansion to other properties that are developed in the future. They need not be contiguous to the original (or seed) development.

As they pertain to GI, the flexibility inherent in a CFD tax would allow flexibility in the types of improvements or services that are funded. However, as a tool primarily used for new development, the proceeds may be restricted to improvements and services for those new developments only.

3.5.3 BUSINESS IMPROVEMENT DISTRICTS

A Business Improvement District (BID) is a mechanism in which businesses and property owners tax themselves and manage the funds to build or maintain certain assets. The BID can be set up and administered by the community members. For example, the Dogpatch and Northwest Potrero Hill Green Benefit District (http://dnwph-gbd.org) is a Green Business Improvement District in San Francisco developed to fund and maintain the public-realm landscaping in the area. The landscape staff used to maintain this landscaping can be trained in GI maintenance practices and qualified in sustainable landscaping services.

3.5.4 ENHANCED INFRASTRUCTURE FINANCING DISTRICTS

In 2014, the California Legislature approved the Enhanced Infrastructure Financing District (EIFD) structure. EIFDs have emerged as a potential replacement for Redevelopment Agencies which were eliminated in 2012. Cities and counties may create EIFDs to capture *ad valorem* tax increments, similar to the now-defunct Redevelopment Agencies, to invest within the specific District boundaries or out-of-area projects that have a tangible benefit to the District. EIFDs are not limited to blighted areas and can directly, or through bond financing, fund local infrastructure including highways, transit, water systems, sewer projects, flood control, libraries, parks, and solid waste facilities. However, similar to grant funding and certain bond financing, EIFD funding cannot be used for ongoing operations and maintenance of facilities.

The tax increment is defined as the increase in ad valorem property taxes due to increases in assessed value associated with improvements. However, the one percent ad valorem tax is split amongst many local agencies with school districts typically receiving approximately 50% of that revenue – a share that is not eligible for EIFD participation. Other tax-sharing agencies can participate in an EIFD, but that participation is strictly voluntary. As a result, the revenue potential of an EIFD is estimated to be about 20% of a comparable redevelopment agency.

The formation of an EIFD requires consent from all the participating local agencies through a Joint Powers Authority but does not require voter approval unless bonds are to be issued. Other requirements include the preparation of an Infrastructure Financing Plan and formation of a Public Finance Authority. If an EIFD is proposed for an area that had been a redevelopment agency, the successor agency must have a Finding of Completion for all redevelopment obligations prior to

receiving any new tax increment. An EIFD can run for up to 45 years, which provides flexibility in the issuance of bonded debt.

This financing structure may be a good fit for localized areas where stormwater infrastructure and water quality are major concerns – particularly environmental clean-up on private properties. An EIFD can be created with multiple municipalities, so it can span political boundaries making it a good fit for a watershed approach to GI funding. However, no EIFDs are known to include multiple jurisdictions at this time.

EIFDs also present a few challenges. Very few EIFDs have been formed in the State, and GI has not been highlighted in any of the plans to date (see table below showing the types of improvements of existing EIFDs). The EIFD concept is aimed at funding improvements that spur development in a district, which in turn increases the assessed property value (and thus the property tax revenues). The improvements are therefore seen as an economic engine that generates its own revenue (increased property taxes, or tax increment). Whether GI can be viewed as a viable "economic engine" has not yet been demonstrated, but the case could possibly be made.

Another drawback for EIFDs is the pace of revenues. Because the "economic engine" must come before the properties increase in value, funding is typically provided through bonds (or debt of some sort). This requires a revenue stream of substance and reliable pace in order to qualify for reasonable bond rates. For this reason, EIFDs are typically structured around major, transformative community infrastructure projects such as transportation (e.g., rail station, new freeway access) or primary infrastructure such as streets, sidewalks, parks, water, sewer and other utilities. While GI may fit well within a suite of infrastructure projects, it may be a weak "economic engine" on its own. Furthermore, any agency contemplating the formation of an EIFD (a cumbersome and expensive task) is likely to favor the more high-powered engines. In addition, EIFDs typically rely on other revenue sources such as grants, bonds, assessments, taxes and private sources in order to help cover revenue gaps with the tax increment revenues.

One possible example of a GI-based EIFD could be an industrial area that requires mitigation for PCBs, mercury or other pollutants where the mitigation measure may lie outside the area (e.g., a regional GI project). Since EIFD proceeds may be spent outside the district when there is a tangible benefit to the district, the EIFD may fund part or all of the GI project. Furthermore, if there are fewer than 12 registered voters in the EIFD, the approval for bonds would be a landowner (not registered voter) election – oftentimes more politically viable. Finally, the EIFD may also impose other taxes (subject to voter approval) that could serve as seed-money funding until the tax increment revenues are mature enough to support bonds.

SUMMARY OF PROS AND CONS

Pros	Cons
No voter approval required (unless bonds are to be issued)	Voter approval is required if bonds are to be issued (55% majority)
No blight finding is required	Revenue potential is about 20% of a comparable RDA
Proceeds can be used for a wide variety of improvements	Proceeds cannot be used for operations, maintenance and repairs
May be used with other funding sources such as grants, bonds, assessments, taxes or private sources	Revenues start slow and build only after properties are developed - bonds may have to be delayed until revenues can support them
Proceeds can be spent outside district if a tangible benefit is provided to district	CEQA review may be required
Multiple agencies can join together	Getting approval from other agencies can be difficult
As a legal government entity, an EIFD may impose other taxes and assessments (subject to voter approval)	Improvements must have a 15-year life
No low- or moderate-income housing requirement	
Areas need not be contiguous	

EXAMPLES OF EIFDS

Only a handful of cities have formed an EIFD. Three recent EIFDs are highlighted in the table below to illustrate the process, financial structure, revenue potential and other features of an EIFD.

City	West Sacramento	La Verne	Otay Mesa (San Diego)
Other Agencies	none	none	none
Sub Areas	14	3	none
Size (acres)	4,144	144	~ 9,500
Duration	45 years	45 years	45 years
Housing Relocations?	none	none	none
Improvements	54% - Transportation 23% - Econ Dev 10% - Parks & Rec 10% - Parks & Rec 10% - Parks & Rec 5% - Parking 4% - City Buildings 4% - Water, Sewer, Drainage	57% - Water 21% - Ped Access 9% - Streets & Traffic 7% - Sewer 6% - Other Utility	75% - Transportation 17% - Park 3% - Water & Sewer 2% - Police 2% - Fire 2% - Library
Drainage Improvements	$5m (0.3%)	not specified	not specified
Cost of Improvements	$1.1b (2017)	$33m (2017)	$1.2b (2014)
Other Funding?	yes	yes	
Cumul Tax Increment	$1.23b (2017)	~ $50m (2017)	~ $500m (2014)

For a summary of EIFDs and the processes involved with formation, please visit the League of California Cities website:
https://www.cacities.org/Policy-Advocacy/Hot-Issues/New-Tax-Increment-Tools

4 POTENTIAL STRATEGIES FOR MEETING GREEN INFRASTRUCTURE NEEDS

As discussed above, traditional stormwater funding options were already out of step with a contemporary view of stormwater management imperatives before GI became a priority. Once again, the "need" outstrips the "ability to fund" as GI expands the horizon of possibilities in managing our built environment and the role stormwater and other water elements play in that endeavor. In this section, several emerging strategies are discussed that have been adapted to GI and other stormwater approaches both inside and outside of California. The have been grouped into two categories:

4.1 ALTERNATIVE COMPLIANCE

The MRP 2.0 contains a vast array of elements for which compliance is required, both for private development and for public agencies. For many individual cases, compliance may be impractical or impossible, and the Regional Water Board has shown a willingness to consider alternate compliance in one form or another. Provision C.3.e.i. of the MRP 2.0 allows the following alternative compliance options:

- Construction of a joint stormwater treatment facility;[8]
- Construction of a stormwater treatment system off-site (on public or other private property); and
- Payment of an in-lieu fee[9] for a regional project (on another public or private property).

Each option comes with obligations for municipal staff in addition to other pros and cons for the municipality and developer. Currently, qualified urban infill redevelopment projects in the Bay Area

[8] The MRP 2.0 defines Joint Stormwater Treatment Facility as a facility built to treat the combined runoff from two or more Regulated Projects.

[9] The MRP 2.0 defines In-lieu Fees as a monetary amount necessary to provide both hydraulically-sized treatment (in accordance with Provision C.3.d.) with LID treatment measures of an equivalent quantity of stormwater runoff and pollutant loading, and a proportional share of the operation and maintenance costs of the Regional Project.

that have site constraints that limit use of LID treatment measures often take advantage of the Special Project option in MRP 2.0 Provision C.3.e.ii. However, the Special Project option may not be included in future MRPs, and municipalities may want to start taking advantage of the alternative compliance option to fund and/or construct municipal GI projects. Some municipalities may have to update the stormwater section of their municipal codes to allow for one or more of these alternative compliance options.[10]

There have been numerous examples of off-site construction of LID facilities in the Bay Area. One such example is in the City of Emeryville in 2017. A summary of this project was presented as a case study in the Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program. This is reproduced in Appendix B.

4.1.1 IN-LIEU FEE CHALLENGES

In-lieu fees are attractive in the GI arena as they could be a source of funding for regional projects that help an agency meet their GI Plan goals. There are two basic ways to collect in-lieu fees for alternative compliance: Ad hoc approach; and structured approach.

The ad hoc approach is done on a case-by-case basis and is usually negotiated with an individual developer depending on the financial and logistical circumstances. This presents challenges and opportunities, but the agency's leverage is limited to its discretionary authority and compliance with local regulations and the MRP 2.0. One advantage is that the outcome can be customized to the project. For instance, compliance could be severed into any (or all) of three options: on-site construction; off-site construction; and in-lieu fee contribution. An ad hoc approach allows for out-of-the-box thinking. This is often the course followed for agencies that have few and sporadic development projects. But for agencies with a steady stream of development, it can be laborious to the point of overwhelming.

A structured approach would typically follow the developer fee model (AB 1600). This would end up with a set of in-lieu fees adopted and published in the agency's master fee schedule. However, the path to that end must include a comprehensive nexus study complete with goals, objectives, project lists, and a reasoned methodology linking development impacts or compliance needs to projects – possibly by geographic or watershed zones – and options for variations and other administrative chores. For agencies that are larger and experience numerous development projects (particularly small to midsized projects), the effort to adopt in-lieu fees would be worthwhile. It allows staff to simply apply the scheduled fees to each project as it comes around. At the same time, for larger projects that enter into a developer agreement, those adopted fees could be set aside for a more creative or appropriate ad hoc approach.

One key element to an in-lieu fee program is the identification of in-lieu projects. Since GI is still an emerging art or science, there are few templates available to identify GI projects and their life-cycle

[10] Taken from the Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program.

costs. However, the GI Plans being developed in conjunction with this report will go a long way toward meeting this challenge.

4.1.2 CREDIT TRADING PROGRAM

Another type of alternative compliance program is a credit trading program. Credits are created by one property owner whose project has the capacity to overbuild the on-site LID, which is then traded to other property owners who may not be able to meet their MRP 2.0 requirements. The program is typically managed by a government agency and can create incentives to treat stormwater in excess of the NDPES permit requirements on regulated sites, while also creating incentives to install systems that treat stormwater on non-regulated sites. One example of a credit trading program is the one developed by Washington D.C.'s Department of Energy and the Environment.[11] The MRP 2.0 does not specifically mention credit trading programs, but such a program could be developed in consultation with the Regional Water Board as a form of alternative compliance.[12]

As this applies to GI, the public agency could become more than just the broker of credits and become a creator or consumer of credits to be applied toward its GI goals. These credits would be a form of currency, analogous to the in-lieu fees described in the previous section.

4.2 PARTNERSHIPS AND OTHER STRATEGIES

By teaming up with other entities, an agency may not generate additional funding directly, but partnerships offer many other benefits that can aid in the overall resources needed to deliver projects such as GI improvements. These can come in the form of economy-of-scale savings or multi-benefit projects that can achieve multiple goals for a single price. Several such strategies, as well as some other beneficial strategies, are discussed below.

4.2.1 MULTI-AGENCY PARTNERSHIPS

Some resources and project opportunities do not match agency boundaries, and multi-agency partnerships can take advantage of those situations. For example, regional projects are a natural fit for multi-agency partnerships. Every agency tends to have strengths and weaknesses: Some are excellent at grant writing and obtaining grants but lack in project delivery capacity or local environmental conditions that fit certain grants (such as GI opportunities), while other agencies may have complementary strengths. By sharing resources and funding, regional projects can be delivered more efficiently – "more bang for the buck." Economy-of-scale savings can help cut costs – in some cases substantially – and GI projects and programs are no exception.

Challenges and opportunities abound in such partnerships. For example, developing mechanisms for sharing the planning, capital, operations and maintenance and administrative chores can be challenging. On the other hand, these types of projects can be an opportunity to be either a generator of trading credits or a way to invest trading credits (as described in an earlier section). In addition, such partnerships can be a source of multi-benefit projects – projects that can achieve GI goals as well as other important public and private goals.

[11] https://doee.dc.gov/src

[12] Taken from the Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program.

4.2.2 TRANSPORTATION OPPORTUNITIES

For more than ten years, local development projects have been required to incorporate some sort of LID and hydrograph modification features. More recently, transportation projects have come under NPDES requirements to include similar elements. The complete streets and green streets movements have brought more attention to incorporating environmental mitigation elements, such as LID, into traditional transportation projects – even where NPDES permits do not require it. The resulting multi-benefit projects have begun to demonstrate how transportation funding can be leveraged to satisfy stormwater – and GI – goals economically.

In San Mateo County, where the governing body for transportation funding (C/CAG) is the same as for NPDES compliance, there have been many examples of transportation funds being leveraged to include stormwater quality elements. Even for federally funded projects, Caltrans is becoming more flexible in these applications. One example is the Active Transportation funding.

4.2.3 CALTRANS MITIGATION COLLABORATION

Caltrans operates under its own statewide NPDES permit in parallel with municipal permitees. In many cases, Caltrans and local agencies operate along the same drainage system with one discharging into the other's facilities. Thus, NPDES requirements are sometimes a shared obligation. In some cases, Caltrans has funding available to mitigate various pollutant loading that can be shared with local agencies through Cooperative Implementation Agreements to pursue local or regional GI projects. In this way, Caltrans can often meet its pollutant load mitigation requirements outside their limited rights of way while benefiting local watershed objectives using Caltrans funding in partnership with the local agencies.

4.2.4 PUBLIC-PRIVATE PARTNERSHIPS (P3)[13]

Public-Private Partnerships (P3s) have the potential to help many communities optimize their limited resources through agreements with private parties to help build and maintain their public infrastructure. P3s have successfully designed, built, and maintained many types of public infrastructure such as roads and drinking water/wastewater utilities across the U.S. Until a few years ago, there were no efforts to develop P3s specifically for stormwater management or Clean Water Act requirements.

The EPA Region 3 Water Protection Division (WPD), in the mid-Atlantic region, has been researching, benchmarking, and evaluating P3s for their potential adaptation and use in the Chesapeake Bay watershed. On December 6, 2012, the EPA Region 3 WPD hosted a P3 Experts Roundtable in Philadelphia, PA. The goal of the P3 Roundtable was to provide a forum for a targeted group of private sector representatives to discuss in detail the feasibility, practicality, and benefits of using P3s to assist jurisdictions in the finance, design, construction, and O&M of an urban stormwater retrofit program. The results of this Roundtable were published in "A Guide for Local Governments," the foundation and approach for applying a stormwater P3 model across the Chesapeake Bay

[13] This section is taken from the Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program.

watershed. This guide provides communities with an opportunity to review the capacity and potential to develop a P3 program to help "close the gap" between current resources and the funding that will be required to meet stormwater regulatory commitments and community stormwater management needs. In addition, this guide and the tools presented (fees/rebates, credit/offset trades, and grants/subsidies) are a continuing effort, commitment, and partnership between EPA Region 3 and communities in the Chesapeake Bay region. EPA believes it will help to raise the bar and further advance the restoration goals and objectives for the Chesapeake Bay (EPA 2015).

In California, P3-enabling legislation was enacted by the state in 2007, and since then several agencies have used P3s for public infrastructure projects, such as Caltrans with the Presidio Parkway (Doyle Drive) approach to the Golden Gate Bridge in San Francisco, and the State of California judicial system with a courthouse in Long Beach.[14] However, to date, there are no known P3s that have been developed in the state for the explicit purpose of implementing GI. Prince George's County in the Chesapeake Bay watershed is the most often cited example of a GI program using a P3; however, they are able to use their stormwater fee for their program.

In California there is a scarcity of agencies that have stormwater fees that can be leveraged in a P3 program – this is related to the historically difficult Proposition 218 process of establishing dedicated stormwater funding. California stands alone in that regard – all the other states make it easier to establish such funding streams. However, under SB 231, this may be changing in the near future as a select group of municipalities begin to navigate the new options allowed under that legislation.

The non-profit organization, WCX (the West Coast Infrastructure Exchange), has promoted Prince George's P3 model in California and the west coast and released a report on water resiliency projects in 2016.[15] WCX is involved at the state and regional levels to increase awareness of P3s and other infrastructure tools.

Advantages of using P3s include:

- Leveraging public funds while minimizing impacts to a municipality's debt capacity;
- Accessing advanced technologies;
- Improved asset management;
- Drawing on private sector expertise and financing;
- Benefits to the local economic development and "green jobs;" and
- Relieving pressure on internal local government resources.

[14] For other examples of P3s in California go to: https://en.wikibooks.org/wiki/Public-Private_Partnership_Policy_Casebook
[15] http://westcoastx.com/assets/documents/Resilience%20Report/WCX%20Resilience%20Report.pdf

4.2.5 FINANCIAL CAPABILITY ASSESSMENT[16]

In 2014, the EPA implemented a process by which communities that meet certain financial capability criteria can apply for some relief in the schedules for compliance with some of their NPDES stormwater permit elements. This process is called the "Financial Capability Assessment Framework for Municipal Clean Water Act Requirements." The framework is designed to help communities develop a more accurate and complete picture of their ability to pay for Clean Water Act obligations, emphasizing factors beyond the 2% threshold for median income.

The new framework builds on EPA's 1997 "Combined Sewer Overflows—Guidance for Financial Capability Assessment and Schedule Development," but emphasizes the role of supplemental information. The framework mentions a host of factors that can be used to assess a community's financial condition, including poverty rates, income distributions, bond ratings, debt levels, historic water and sewer rates, and more. Additionally, the framework encourages communities to examine all Clean Water Act obligations, from combined sewer overflow consent decree actions, to stormwater permit programs, to wastewater treatment plant upgrades. In this way, the framework also builds on EPA's 2012 Integrated Planning Framework.

It should be noted that this assessment does not help to generate additional funding, nor does it allow an agency to avoid compliance with permit requirements. It can allow an agency to work with the EPA and the Regional Board to work out an alternative compliance schedule depending on the community's financial capabilities.

4.2.6 VOLUNTEERS

Volunteerism is alive and well in the Bay Area. In some cases, local agencies cultivate volunteer programs to assist in achieving various goals; in other cases, volunteer groups work under the direction of non-profit organizations. Habitat stewardship and protection is one area that garners much attention from volunteers, and their work often overlaps with municipal stormwater management services. This type of activity can have some application for GI in the form of planting and caring for landscaped improvements such as rain gardens and bioswales.

While the work performed by a volunteer workforce can help a local agency meet its GI goals, it can also be difficult to recruit, oversee, and manage volunteers. Reliability and quality of work can be challenging at times, too.

Benefits of a volunteer program can include public education and building community support for the agency's stormwater management program (and possibly a future fee implementation). One example of a volunteer program that supports GI is the Green Street Steward Program in Portland, Oregon.

[16] This section is taken from the Green Infrastructure Funding Options technical memorandum dated February 13, 2018 from the Santa Clara Valley Urban Runoff Pollution Prevention Program.

5 SUMMARY, RECOMMENDATIONS AND NEXT STEPS

5.1 SUMMARY

This paper has illustrated the reasons stormwater, as a primary municipal service, is largely less valued and more difficult to fund than similar services including water, sewer, and refuse collection. While stormwater began to emerge as a fully regulated public works enterprise a few years before Proposition 218 was enacted in 1996, that new status was not widely embraced by public agencies or acknowledged by taxpayer advocates. Further, Proposition 218 was not sufficiently explicit on the key question of whether stormwater qualifies for the water, sewer, and refuse collection exemption from the voter approval requirement. This issue was settled in 2002 when the appellate court ruled[17] that any new or increased stormwater fee would be required to obtain voter approval. However, SB 231 (2017) attempts to push back on the Salinas decision, and may prove to be the vehicle for putting funding for stormwater services on par with the other water-related services.

GI funding is both a subset of and an expansion of stormwater funding. By aiming at a significant increase in permeating rain water into the ground, GI enters into the disciplines of aquifer geology, soils engineering, road pavement, transportation, landscaping, habitat management, and other onsite and offsite planning, design and construction considerations. The need to finance activities such as strategic, policy and financial planning, capital construction, and operations and maintenance across these disciplines further complicates the challenge.

No single funding strategy will typically suffice. Most agencies will need to develop several funding sources – a portfolio approach. For instance, a sustainable, dedicated fee or tax will form a solid base from which to work but is rarely sufficient in the amount of revenue that can be realized. However, that type of revenue stream can be leveraged to win grants, take on long-term debt, and pursue opportunities for partnering or participating in credit-trading programs.

5.2 RECOMMENDATIONS

Several funding mechanisms have been explored in this report. However, this is just a starting point for funding the scope of GI projects envisioned by the GI plans. As those GI plans are further drafted and adopted, the funding aspect must be explored further. It is recommended that the member agencies select a limited number of funding options or strategies for further study and identify some specific priority funding options at the outset of GI Plan adoption. For instance, the member agencies may choose to look further into enhanced infrastructure financing districts as a way to fund certain types of GI. Parcel taxes or property-related fees may be worth developing as they would form a backbone of revenue that can open many other possibilities such as grants, partnerships, and long-term debt. And developing a credit trading program can help bring public and private participants to the same table to help achieve the ambitious GI goals of the current and future MRPs.

[17] Howard Jarvis Taxpayers Association versus the City of Salinas, Sixth Appellate District, 2002.

As member agencies proceed to develop their individual GI Plans, they are encouraged to draw from the information contained in this report to select potential funding sources to investigate further. Considerations should include the following elements:

- Collaborating with neighboring agencies to explore cross-boundary opportunities such as EIFDs, watershed-based solutions and regional projects; and
- Reviewing case studies from around the country with discussion of how those examples could be tailored to meet GI goals;
- Collaborating with similar efforts in other Bay Area counties, BASMAA, and CASQA;[18]
- Cultivating support from agency leadership (Council and City Manager); and
- Understanding the costs associated with certain options.

C/CAG may also consider conducting workshops that help educate member agency staff on the nuances of funding opportunities and challenges.

It is also worth noting that, while member agencies are working on their individual GI Plans, the County and C/CAG are currently developing a proposal for a new agency to plan, build and maintain projects of regional significance which could complement, or possibly supplement, local GI needs as well as address sea level rise and flooding challenges. Funding could be provided through a countywide property tax or similar mechanism.

5.3 ADDITIONAL RESOURCES

This report is intended to introduce member agencies to many funding strategies, but there is much more to be learned in the form of case studies, work done in other regions or states, or new, emerging strategies not included here. Several other outlets of information are provided below, and the reader is urged to explore these further.

5.3.1 EPA WATER FINANCE CLEARINGHOUSE

The Environmental Protection Agency has long recognized that funding challenges can be a significant barrier to successful GI implementation. In an effort to help public agencies around the country, they have developed a website as a clearing house for information on funding for drinking water, wastewater and stormwater infrastructure. It can be found at the following url:
https://ofmpub.epa.gov/apex/wfc/f?p=165:1::::::

The Water Finance Clearinghouse includes two searchable databases: one contains available funding sources for water infrastructure and the second contains resources, such as reports, weblinks, webinars, etc., on financing mechanisms and approaches that can help communities access capital to meet their water infrastructure needs.

[18] This acronym stands for the California Stormwater Quality Association.

The Water Finance Clearinghouse was developed by EPA's Water Infrastructure Finance and Resiliency Center, an information and assistance center identifying water infrastructure financing approaches that help communities reach their public health and environmental goals.

5.3.2 S.T.O.R.M.S.

The State Water Board has launched a program entitled, "Strategy to Optimize Resource Management of Storm Water" (STORMS, or Storm Water Strategy). One key element of this program is "Project 4b, Eliminate Barriers to Funding Storm Water Programs," which will utilize focused stakeholder workshops to identify barriers to stormwater projects and strategies for local agencies to meet those challenges.

Watch for these workshops in the near future. The website can be found here:
https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/

5.3.3 CASQA WHITE PAPERS

The California Stormwater Quality Association (CASQA) developed the following white papers in 2017:

- Stormwater Funding Barriers and Opportunities (CASQA 2017); and
- Use of Triple Bottom Line Analyses to Support Stormwater Objectives (CASQA 2017).

These and other resources will be posted on the CASQA Stormwater Funding Resources web page:
https://www.casqa.org/resources/funding-resources

5.3.4 RESILIENT BY DESIGN FINANCING GUIDE

The Resilient by Design ("RbD") Bay Area Challenge was "a year-long collaborative design challenge bringing together local residents, public officials and local, national and international experts to develop innovative community-based solutions that will strengthen our region's resilience to sea level rise, severe storms, flooding and earthquakes." Part of that effort included a finance advisory team that issued a Financing Guide to provide guidance to design teams. The updated guide (Financing Guide 2.0) produced at the conclusion of the process provides an excellent overview of finance options and strategies for achieving funded projects. That guide can be found at the following url:
https://static1.squarespace.com/static/579d1c16b3db2bfbd646bb4a/t/5b5f4da288251b0f228a990e/1532972477684/RBD+Financing+Guide+%28NHA+Advisors%29+Final+Version+2a.pdf

5.4 CONCLUSION

The way forward is not entirely mapped out for GI and other stormwater funding challenges. However, the tools already being used can be put to good use by a multitude of local agencies as they traverse and overcome barriers to stormwater program implementation. Developing multi-benefit projects and multi-agency partnerships will further help open funding doors as well.

Stormwater professionals, including municipal staff, elected representatives, consultants, academics, and others must redouble their efforts to effectively convey to decision-makers and the

general public the importance of water quality and the funding of water quality. No longer can stormwater professionals be satisfied with a lower status, but instead, must be creative, progressive, political, forward-thinking and demanding.

6 APPENDICES

The following pages contain three appendices:

A. Funding Matrix – A summary of the funding strategies contained in this report;

B. Alternative Compliance Case Study from Emeryville, CA; and

C. Potential Funding Source Analysis and Recommendations – Draft, C/CAG, 2014.

6.1 APPENDIX A – FUNDING MATRIX

Summary Matrix Contents

(This Page Intentionally Left Blank)

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
Traditional Mechanisms								
3.1.1 Parcel Taxes	Can fund all or any parts of a GI program as stipulated in the ballot question and authorizing ordinance	Usually a 2/3 majority of voters (general taxes require only 50% majority, but can only go to General Fund)	* Flexible and legally stout; * Debt can be issued in most cases; * Most voters are familiar with Parcel Taxes	* Requires voter approval at the 2/3 level; * Must compete with other ballot measures	X	X	X	X
3.1.1 Other Special Taxes	* Business License Tax; * Vehicle License Fees; * Sales Tax; * Utility Users Tax; * Transient Occupancy Tax	Typically require a 2/3 voter approval	* Most are flexible in how they can be used; * 50% threshold can be used if a general tax	* 2/3 voter approval is diffucult to attain; * Ballot measure can be expensive; * If a general tax, then GI must compete with other General Fund needs; * Must compete with other ballot questions	X	X	X	X
3.1.2 Property-Related Fees	Establishes Storm Drainage as a separate utility service and can fund all or any parts of a GI program	Prop 218 compliance; * Rigorous rate study; * Must define services and service area; * Property owners approval for non-Water, -Sewer, and -Garbage	* Flexible and legally stout; * Debt can be issued in most cases	* Ballot measure required if for a Storm Drain service - usually voted on by property owners (Not registered voters); * Ballot measure requires significant public outreach; * Public not familiar with balloted property-related fees	X	X	X	X
3.1.3 General Obligation Bonds	Can fund Capital GI Projects through debt taken on by municipality	* Voter approval at 2/3 level; * Will need Financial Advising Consultant	* Can fund capital projects or programs with debt paid back over time through property taxes; * Typically easier to pass than a parcel tax; * Taxes based on property value, so annual obligation of individual prop owner is vague	Can only be used for capital costs - Cannot be used for O&M or staff costs		X	X	
3.2 Senate Bill 231	Allows for adoption of property-related fees without having to go to ballot	* Cost of Service Analysis * Rate Study * Prop 218 Protest Hearing	Avoids the cost and risk of a ballot measure	* Taxpayers groups vow to sue on grounds of consititution / court provisions; * Governing boards will still have political pressure to not raise rates	X	X	X	X
3.3 Regulatory Fees	Fees and charges for performing administrative activities related to GI	Cannot exceed the actual cost of performing activities such as permit issuance, inspections, on-site mitigation, etc.	* No voter approval is needed; * Usually included in Master Fee Schedule; * Most municipalities already have these in place	Does not pay for capital improvements or O&M	X			

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
3.3 Developer Impact Fees	Could incorporate fees for mitigating stormwater impacts to help fund GI - Would not relieve developer of NPDES requirements	Must comply with AB 1600 and include a rigorous nexus study	Could partially fund GI	* Requires a nexus study, often times by a consultant; * Nexus study must demonstrate connection between development and GI need; * Administration of funds requires resources; * AB 1600 requires 5-year window for programming funds;		X	X	
3.3.1 Re-Alignment	GI that promotes groundwater recharge, diversion to wastewater treatment, or trash capture can be incoporated into existing property-related fee structures without need for ballot measure	Prop 218 compliance for realignment to Water, Sewer or Garbage - must demonstrate applicability	* Existing non-balloted fee mechanisms can help pay for GI services; * Enhances integration of GI into other muncipal activities; * Causes other utilities to recognize the value of GI programs	* Limited to activities attributable to other funded revenue centers; * Prop 218 hawks could challenge; * Outside revenue center will need to raise rates to fund GI activity - politically unpopular; * Has not been widely used; * May be unpopular with Water, Sewer and Garbage managers; * Water or sewer may be handled by separate agencies, making realignment impossible	X	X	X	X
3.4.1 Grants	One-time infusion of funds for qualifying projects from State or other granting authority	* Project concept must conform to grant requirements; * Most grants are competetive with limit funding available	* Grants are outside sources of funding that do not need to be repaid; * Readiness is a plus, so can benefit a project or program that is well developed and possibly designed; * Some State Revolving Fund loans can be converted to grants through forgiveness clauses	* Projects must be tailored to grant requirements, possibly causing scope and schedule creep; * Most grants require matching funds from other sources; * Most grants require commitment to post-project O&M, but do not fund those activities; * Little control over timing - can be difficult to coordinate with other funding sources; * Competitive nature lowers chances of obtaining grant; * Applying for grants can be time-consuming and require outside help from a grant writer; * Grant administration requires significant resources	X	X	X	???

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
3.5.4 Enhanced Infrastructure Financing Districts (EIFD)	Captures property tax increment similar to redevelopment (RDA) for building and maintaining infrastructure like GI	With No Debt: * Establish a Public Finance Authority; * Adopt a Financing Plan; * Resolution(s) from participating agencies With Debt: * All of the above; * Get approval from at least 55% of voters in District	* Can fund many types of projects; * Does not require a vote (unless debt is part of the plan, then a 55% majority is required); * Can include multiple municipalities and special districts, so area can be tailored to needs (e.g., watersheds, high legacy pollutant areas, countywide); * Does not require a blight finding; * Can overlap with former RDA areas; * Works well with master planned community with a single land owner; * Planning costs can be paid for from proceeds (with limitations); * EIFD can go for up to 45 years	* Education districts are not permitted to participate, so revenues would be much less than RDA; * If overlapping a former RDA area, then cannot proceed until RDA is issued a finding of completion from the State; * GI is only a small piece of what an EIFD can do - it may take a back seat to other, larger community concerns; * Some agencies (i.e., special districts) may not agree to their portion of tax increment to be diverted thereby reducing revenue potential	???	X	X	
Alternative Compliance								
4.1 Alternative Compliance	Allows developers who cannot meeting GI requirements on-site to build (or pay for) off-site construction of GI elements	Municipality would need to have alternative projects ready - could bedone case-by-case	* Enables higher density development in certain areas (such as TOD and PDA); * Enables GI in public spaces that private developers would not normally participate in; * Funds can be pooled to finance larger or regional projects that can be more effective; * Post-project O&M can be added in the form of a cash payment or other consideration; * Municipality can be flexible in enforcement to allow hybrid compliance;	* Ad hoc negotiation with developers can be challenging * Agency will need to have off-site or regional projects ready to bring to negotiation	X	X	X	X

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
3.4.2 Loans	Debt instruments can help accelerate project deliver while paying off debt over time	* Must have dedicated revenue stream to pay off debt; * Must have adequate credit rating to secure reasonable interest rates; * Some Bonds require voter approval	* Can leverage a modest revenue stream by borrowing money up front for rapid project delivery while paying off debt over longer periods of time; * Accelerates project delivery and makes coorination with other funding or projects easier	* Must have dedicated revenue stream to service debt; * Some debt mechanisms require voter approval (GO Bonds, Revenue Bonds, EIFD Bonds)	???	X	X	
Special Financing Districts								
3.5.1 Benefit Assessments	Can fund the construction and maintenance of GI projects	Prop 218 compliance; * Rigorous Engineer's Report; * Must deduct general benefit from special benefit; * Property owners approval is required through a ballot proceeding (weighted voting); * Works best with new development due to voting requirement	* Flexible and legally stout; * Can fund both construction and maintenance; * Can use bonded indebtedness	* General Benefit must be separated and paid for by other sources; * Votes are weighted by assessment amount, favoring large land owners		X	X	X
3.5.2 Community Facilities Districts	Can fund the construction and maintenance of GI projects	Requires vote by majority of landowners or 2/3 majority of registered voters	* Usually formed by developer, so only one ballot is cast; * Very flexible - can fund all aspects; * Subsequent annexation is simple; * Tax rate can be tiered to allow for retirement of debt yet continue with O&M; * Annual administration is more streamline than benefit assessments	* Difficult to form in an existing community due to 2/3 majority requirement; * Known as a Mello-Roos tax - which can have a negative connotation		X	X	X
3.5.3 Business Improvement Districts	Business and property owners tax themselves to build and maintain GI improvements	Formed by a municipality through a notice and protest hearing process.	* Flexible and legally stout; * Can fund both construction and maintenance; * Local improvements can generate local support and involvement * GI improvements can also be amenities; * Can enhance sense of ownership and pride in the neighborhood when results are visible	* Cannot use debt financing; * Opposing businesses can disrupt the progress; * Can burden businesses & property owners so they are unwilling to support other funding measures		X	X	X

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
4.1.1 In-Lieu Fee Challenges	Allows developers who cannot meet GI requirements to pay into fund that would finance off-site or regional projects	Municipality would need to estimate the costs of of mitigation - could bedone case-by-case	* Enables higher density development in certain areas (such as TOD and PDA); * Enables GI in public spaces that private developers would not normally participate in; * Funds can be pooled to finance larger or regional projects that can be more effective; * Municipality can be flexible in enforcement to allow hybrid compliance; * Municipality may consider informal fee process, negotiating each individual developer through COA; * Funds can be leveraged for grants or loans	* Case-by-case approach can be difficult; * Developers will try to evade costs; * May need to comply with AB 1600	X	X	X	X
4.1.2 Credit Trading Programs	Creates GI Credit program for developers and others to trade GI responsibilities to others who have better capability to meet GI goals	A municipality (or regional entity) must create credit trading program including: * Definition of GI Credits; * Relative Value of Credits; * Timing of responsibilities; * Eligibility	* Allows developers who cannot meet NPDES or GI requirements to buy credits created by other entities; * Encourages developers or other entities who have greater GI capacity to over-build GI in order to sell credits in future; * Present value of future O&M costs can be incorporated into credit value; * Allows for flexibility to guide GI to areas with greater pollutant loading need; * May save developers money	* Very few Programs (to use as an example) have been implemented - particularly in California; * Credits may need to stay within same watershed; * Overbuilding GI in some areas may not help other areas; * Overbuilding GI can lead to overlapping GI zones; * Unclear if developers are willing to overbuild on speculation of future sale of credits; * Unclear how value of credits would be established; * Unclear if municipality would be credit broker, or if developers can deal directly with each other; * May be difficult to apply credits to public rights of way; * Costing future O&M is difficult		X	X	X

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
Partnerships								
4.2.1 Multi-Agency	Encourages partnerships with non-Stormwater agencies to explore GI co-benefits in their work	Examples may include: * Spreading basins for groundwater agencies; * GI project sites on school grounds; * GI on housing authority sites	* Can generate credits for Credit Trading Program; * Expands GI potential and awareness; * Flexible; * Can leverage limited GI funding to greater benefit	* Not cookie-cutter; requires customization; * May be diffucult to find partners	X	X	X	???
4.2.2 Transportation	Encourages partnerships with transportation agencies to explore GI co-benefits in their work and take advantage of Complete Streets or Green Streets programs	Examples may include: * Permeable pavements; * Roadside rain gardens; * Cisterns	* Most municipalities are also transportation agencies, so internal project coordination more likely; * Can generate credits for Credit Trading Program; * Expands GI potential and awareness; * Can leverage limited GI funding to greater benefit; * Recent increase in Gas Tax may make more room for GI elements	* Not cookie-cutter; requires customization; * May be diffucult to find partners; * Road condition woes prevail, making it difficult to shift funding to GI and other amenity-type elements; * Transportation grants may preclude using funds for GI	X	X	X	???
4.2.3 Caltrans Mitigation	Caltrans looks for opportunities for off-site mitigation of stormwater impacts of their highways	Local municipalities may enter in a cooperative agreement with Caltrans to build GI as a way for them to mitigate stormwater impacts of their highways	* Caltrans may furnish funding for local or regional projects that help them meet their obligations; * Locals can propose solutions that benefit both Caltrans and the local agencies	* Caltrans cooperative agreements can be cumbersome and bureaucratic; * Projects that work for Caltrans may be difficult to develop		X	X	???
4.2.4 Public-Private ("P3")	Private enterprises can provide overall solutions to GI programs through better access to resources and capital	P3 is primarily a delivery system for projects where debt provides near-term funding and project acceleration	* Bypasses some of the bureaucracy; * Can make existing funding sources work more efficiently; * Draws on private sector expertise and financing; * Debt may be tax-exempt; * Debt accelerates project delivery; * Can include design, build, finance, operate; * Debt is private - may not affect public ageny's debt capacity	* Does not provide additional funding; * Dedicated revenue stream is needed - cash flow is an important element		X	X	X

Funding Category	GI Nexus	Requirements	Pros	Cons	Staff	Planning	Capital	O&M
4.2.5 Financial Capability Assessment	Can allow an agency to delay compliance with certain NPDES permit requirements	Follow EPA guidelines for application	Allows a qualifying agency to defer compliance with certain Permit compliance requirements	* Not a source of funding - only can grant time extenstions to Permit compliance; * Communities must meet several criteria such as poverty rates, income distibutions, bond ratings, etc.				
4.2.6 Volunteers	Volunteer groups can be a resource for GI operations and maintenance (O&M) as well as program planning	* To be effictive, volunteers need organization and oversight; * Can be used to supplement paid contractors, or perform entire projects	* "Free" labor; * Some volunteers provide needed expertise; * Increases awareness of GI program; * Some non-profit organizations have ready-made volunteer groups that are trained and organized; * Can build public support for dedicated revenue mechanism such as a fee; * Education program for community	* Requires significant staff resources to recruit, organize, train and plan & supervise the work; * Can be unreliable - hard to build schedule and cost forecasts around volunteer work force; * Can create conflict with prevailing wage requirements; * Difficult to incorporate into project construction work		X	???	X

(This Page Intentionally Left Blank)

6.2 APPENDIX B – ALTERNATIVE COMPLIANCE CASE STUDY IN EMERYVILLE, CA

In July 2017, the City Council of the City of Emeryville approved the use of an alternative compliance option for a portion of a private property owner's 14.5-acre mixed use redevelopment project building 674 multi-family residential units, 180,000 square feet of retail, and 120,000 square feet of office space. The majority of the project will use on-site LID to treat stormwater runoff. However, because one four-acre parcel of the site contained several existing buildings and pavement that were to be retained and required treatment, the property owner chose to propose to the City the use of an alternative compliance option in the MRP 2.0. There are several challenges to constructing LID stormwater treatment measures on this parcel including contaminated soil, a high seasonal groundwater table, conflicts with existing and planned utilities, clayey soils, tidal flows, and limited space.

The City used an "Off-site Stormwater Improvement Agreement" to detail the requirements of the property owner, who will construct approximately 6,300 square feet of GI measures (bioretention facilities) in the City's public right-of-way and in a City park to treat runoff from an amount of impervious surface greater than what would have been treated on-site. The key purposes of the agreement are to:

- Describe the conditions that led to the approval of off-site stormwater treatment;
- Set forth a process and timeframe for approval of plans and construction; and
- Describe maintenance responsibility and a calculation of cost for maintenance.

The off-site locations for GI were chosen through a consensus-based process and provide benefits to both the City and the property owner, including the following:

- Net water quality benefit compared with on-site provision of treatment measures through increases in pollutant of concern type and load reductions and increases of square footage of catchment and treatment area using the C.3.d sizing criteria;
- Increased cyclist and pedestrian safety through the use of stormwater curb extensions as traffic calming measures at intersections and in mid-block areas;
- Replacement of trees in poor health with new trees and improved planting conditions;
- Replacement of turf and other conventional landscapes with new sustainable, Bay-Friendly landscaping with a lower maintenance cost;
- Reductions in pollutant (e.g., PCBs, mercury and trash) discharges to the Bay by treating runoff from a larger variety of land uses and roadways as opposed to just roof tops on-site;
- Lower net cost for the property owner; and

- Progress towards meeting MRP 2.0 GI implementation long-term goals.

The developer has agreed to bear the costs of design, construction and post-project operations and maintenance. The developer will contract with design and construction firms and pay for the City-required plan check fees, insurance and permits necessary to build the improvements. The system designs will be approved by the City and inspected via the normal process for any work in the public right-of-way or on public property.

Operation and maintenance costs for the planned improvements were calculated based on the present value of a growing annuity. The present value of maintenance for a period of thirty years has been agreed upon by the City and the developer at $154,000 (or approximately $0.80 per square foot of treatment area per year in today's dollars), to be provided to the City by the developer as described in the Improvement Agreement in a lump sum after the improvements have been accepted by the City. The City will then assume responsibility for the maintenance of the treatment areas.
The O&M agreement for the on-site LID measures of the development project will reference the Improvement Agreement and the approval by the City of the alternative compliance option.

6.3 APPENDIX C – POTENTIAL FUNDING SOURCE ANALYSIS AND RECOMMENDATIONS

In 2014 C/CAG engaged SCI to study and make recommendations on strategies to fund water pollution prevention programs required in the previous MRP. One of the deliverables from that effort was the Potential Funding Sources Analysis and Recommendations Report, which described, analyzed and evaluated various funding mechanism alternatives available for stormwater programs at that time. That 2014 Report forms a solid basis from which to evaluate funding options for GI as well.

This report is included on the following pages.

APPENDIX D

Outreach Materials

GREEN INFRASTRUCTURE FOR A SUSTAINABLE SAN MATEO COUNTY

From mitigating flood risk to protecting our Bay and waterways, green or nature-based infrastructure can lessen the impacts of climate change and heavy storms in San Mateo County. Build green infrastructure to help build a stronger, safer, and more prepared community.

GREEN INFRASTRUCTURE AT WORK

REDUCE POLLUTION

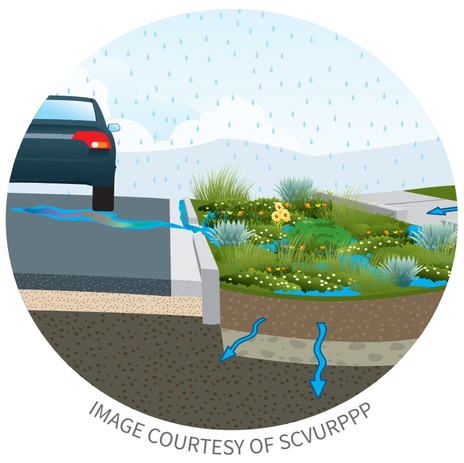
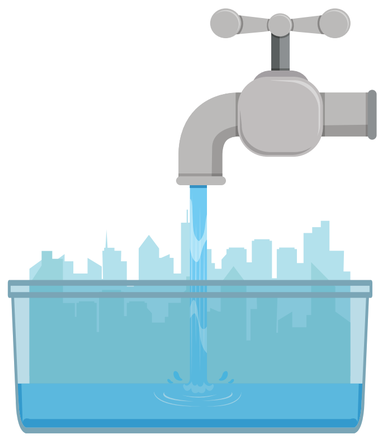


IMAGE COURTESY OF SCVURPPP

Reduces pollutants from entering the Bay and ocean and filters air pollutants & particulates

KEEP WATER LOCAL

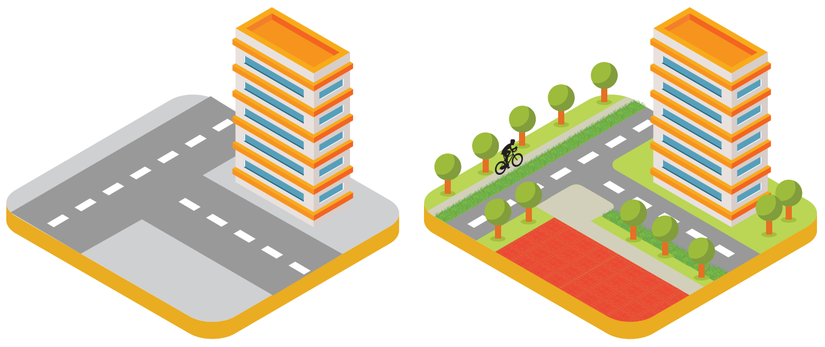


Captures and increases stormwater infiltration into the ground to help recharge local groundwater supply

MANAGE FLOOD RISK

Mitigates flood risk by slowing and reducing stormwater runoff during storms

PROMOTE SAFER COMMUNITIES

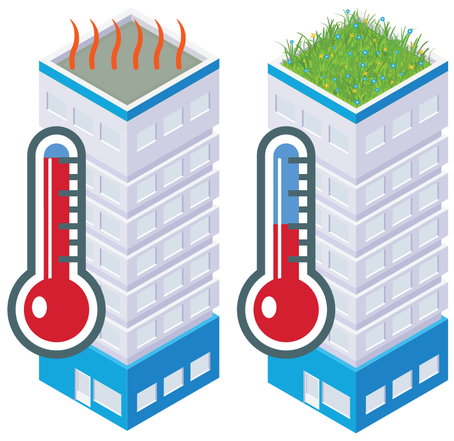


Promotes traffic calming and increases bike & pedestrian safety through planned community designs

INCREASE NATURAL HABITAT

Increases wildlife habitat in urban areas with added vegetation

LOWER URBAN HEAT ISLAND EFFECTS



Cools urban areas by deflecting sun radiation and providing shade

flowstobay.org

SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM

Clean Water. Healthy Community.

GREEN INFRASTRUCTURE FOR A SUSTAINABLE SAN MATEO COUNTY

Mitigating flood risk, protecting our Bay and waterways, creating safer communities— these are just a few ways green infrastructure (also known as nature-based infrastructure) can lessen the impacts of climate change and heavy storms. Green infrastructure means a stronger, safer, and more prepared San Mateo County.

HOW DOES GREEN INFRASTRUCTURE WORK?

There are various types of green infrastructure (GI) that range in size, scale, and function. The vast majority are built to be multi-beneficial which can provide habitat, flood protection, cleaner air, and cleaner water. GI that uses vegetation, soils, and natural processes, manage water and create healthier urban environments by mimicing nature that both captures and soaks up water. The natural filtration that occurs through most GI also works to remove pollutants and improve water quality.

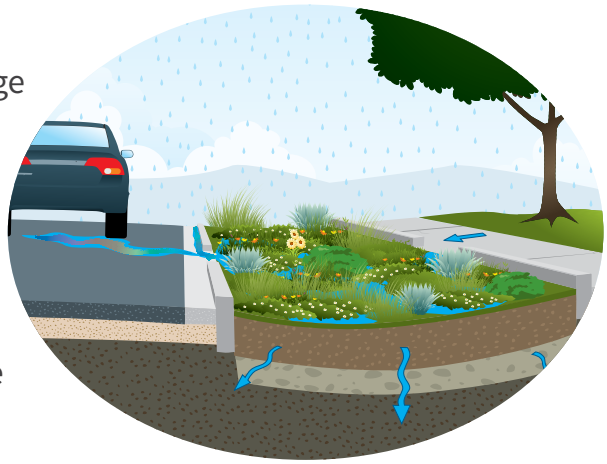


IMAGE COURTESY OF SCVURPPP

GREEN INFRASTRUCTURE AT WORK

01

REDUCE POLLUTION

Green inrfrastructure that employs natural filtering processes which reduces water pollutants such as PCBs, mercury, and trash from entering the Bay and ocean and while it works above ground to filter air pollutants and particulates.

02

MANAGE FLOOD RISK

Green infrastructure can mitigate flood risk by slowing and reducing stormwater runoff during storms.

03

PROMOTES SAFER COMMUNITIES

Promotes traffic calming and increases bike and pedestrian safety through planned community designs.

04

KEEPS WATER LOCAL

Captures and increases stormwater infiltration into the ground to help recharge local groundwater supply.

05

INCREASE NATURAL HABITAT

Increases wildlife habitat in urban areas with added vegetation.