CITY OF SAN JOSE

GREEN STORMWATER INFRASTRUCTURE PLAN

September 2019








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Executive Summary

The City of San José envisions a thriving watershed with healthy creeks and rivers and a healthy San Francisco Bay. Green stormwater infrastructure (GSI) is a tool that can help achieve this vision. The multidisciplinary approach of GSI uses soil, plants, and pervious surfaces to capture, treat, infiltrate, and/or use stormwater runoff. GSI can provide multiple benefits such as improved water quality, reduced localized flooding, potable water conservation, increased groundwater recharge, reduced urban heat island effect, and public space beautification. GSI can be integrated with building and roadway design, complete streets, drainage infrastructure, urban forestry, soil conservation, and landscaping. As California's weather becomes increasingly unpredictable and extreme, GSI strategies can provide the City with enhanced climate resiliency, local water supplies, and energy savings, consistent with the City's sustainability goals.

The City of San José has developed this Green Stormwater Infrastructure Plan (GSI Plan) to lay out the approach, strategies, targets, and tasks needed to transition traditional "gray" infrastructure to include green stormwater infrastructure over the long term and to implement and institutionalize the concepts of GSI into standard municipal engineering, construction, and maintenance practices.

The GSI Plan is intended to serve as an implementation guide for reducing the adverse water quality impacts of urbanization and urban runoff on receiving waters over the long term, and a reporting tool to provide reasonable assurance that specific pollutant reductions from discharges to local creeks and San Francisco Bay will be met. The GSI Plan is required by the City's Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit for the discharge of stormwater runoff from the City's storm drain system. The GSI Plan—along with the appended Reasonable Assurance Analysis (RAA) for bacteria—also describes how the City will reduce the storm drain system's contribution to bacteria loads entering the Guadalupe River, Coyote Creek, and other City watersheds per the Consent Decree with San Francisco Baykeeper.

The GSI Plan identifies methods to prioritize specific areas of the City and potential projects for GSI implementation, and generally maps out a GSI implementation plan through 2050. The GSI Plan describes guidance and standards for GSI project design and construction and how the City will track projects from construction through maintenance and monitoring. The GSI Plan also explains how GSI concepts and requirements are already addressed in current City policies and planning mechanisms and will be incorporated in future plan and policy updates.

Based on the prioritized opportunities for potential GSI projects, the RAA provided cost-benefit optimization to determine the most cost-effective combination of GSI projects needed throughout the city to address water quality improvement goals. The RAA included modeling to determine the needed GSI projects within each of the City's watersheds, and determined the citywide volume capture goals to reduce bacteria loads to the city's rivers and creeks. Results of the analysis informed the development of a GSI implementation strategy that outlines future goals for GSI project implementation and sets the stage for an adaptive management approach to GSI implementation that can adjust GSI strategies over time as further field investigations are performed, project concepts and cost estimates are developed, and lessons are learned through GSI project planning, design, construction, and assessment.

1.0 INTRODUCTION

City of San José

Green stormwater infrastructure (GSI) is a natural stormwater collection and treatment system that uses soil, plants, and pervious surfaces to capture and treat stormwater runoff. GSI facilities can also be designed to capture stormwater for uses such as irrigation and toilet flushing. The GSI Plan lays out the City's approach, strategies, targets, and tasks to transition traditional "gray" infrastructure to include green stormwater infrastructure over the long term, in a manner consistent with the City's planning and sustainability goals and regulatory requirements.

IN THIS CHAPTER

1.1 Agency Description & Background

Founded in 1777, the population of the City of San José (City) is approximately 1,051,316 (2018), making it the third most populous city in California. San José's position as a cultural, political, and economic center within a region that hosts a booming high-tech industry has earned the city the title "Capital of Silicon Valley." The city has grown tremendously since the 1950s when it began the transformation from a small community of farms and orchards to the residential and commercial center that it is today, resulting in challenges related to growth and density. However, as one of the most diverse cities in the United States, San José has talented, environmentally-active, and innovative residents who have committed their City to a leadership role on land use, housing and sustainability actions. San José has the advantages of a great climate with good access to natural amenities and community members who value outdoor-oriented lifestyles and sustainable living choices. The first capital of California and location of the first early sessions of the California State Legislature, San José has served as a center of cultural, political, and commercial life. The City is also a leader in environmental action.

In February of 2018, in line with the Paris Climate Agreement, the City approved Climate Smart San José, an initiative that includes the following goals:

1. Reducing carbon emissions to 40 percent below 1990 levels by 2030;
2. Becoming the first city in the world to produce 1 gigawatt of solar power by 2040 (enough power to serve 250,000 homes); and
3. Reducing per capita residential water consumption by 30 percent by 2030.

The City of San José goals for GSI dovetail with these and other environmental goals. The City is committed to working to advance GSI implementation and has taken a leadership role in early implementation of GSI facilities and coordinated closely with other agencies on regional efforts. One of the first steps of the GSI Plan development process was educating and informing department staff, managers, and City Council members on the purposes, goals, and benefits of GSI, the required elements of the GSI Plan, and steps needed to develop and implement the GSI Plan.

Hotel Valencia on Santana Row

1.2 Natural Setting

San José has a jurisdictional area of 180 square miles, and is located in the Santa Clara Basin, a sub-watershed of the larger San Francisco Bay watershed (the Bay) and a part of Santa Clara County, as shown in Figure 1-1. The Santa Clara Basin is bounded by the Diablo Mountains to the east and the Santa Cruz Mountains to the south and west. The City's six major watersheds (Coyote, Guadalupe, Lower Penitencia, San Tomas Aquino, Calabazas, and Baylands), all drain to southern San Francisco Bay. Within these watersheds, approximately 32,000 storm drain inlets receive runoff from surrounding urban areas into the storm drain system where it is carried and discharged to a creek, river, or the Bay.

The Coyote Creek watershed is the largest in the Santa Clara Basin watershed, covering 320 square miles, and includes two dammed reservoirs. The Guadalupe River watershed is approximately 171 square miles and discharges to the Lower South San Francisco Bay via Alviso Slough. Lower Penitencia Creek watershed, part of the Coyote Creek watershed, covers about 30 square miles, San Tomas Aquino Creek watershed encompasses about 45 square miles, and Calabazas Creek watershed covers about 20 square miles.

The City maintains approximately 25 square miles of park land (including 0.8 square miles of regional park land) that will remain in perpetuity as open space and largely undeveloped natural areas in the watersheds. This includes the 1.1-square mile Alum Rock Park and part of the Don Edwards San Francisco Bay National Wildlife Refuge.

The GSI Plan will primarily focus on implementation of GSI and sustainable drainage practices within the City's urban core and growth areas to maximize the capture, treatment, infiltration, and/or use of stormwater runoff from impervious surfaces.

Guadalupe River

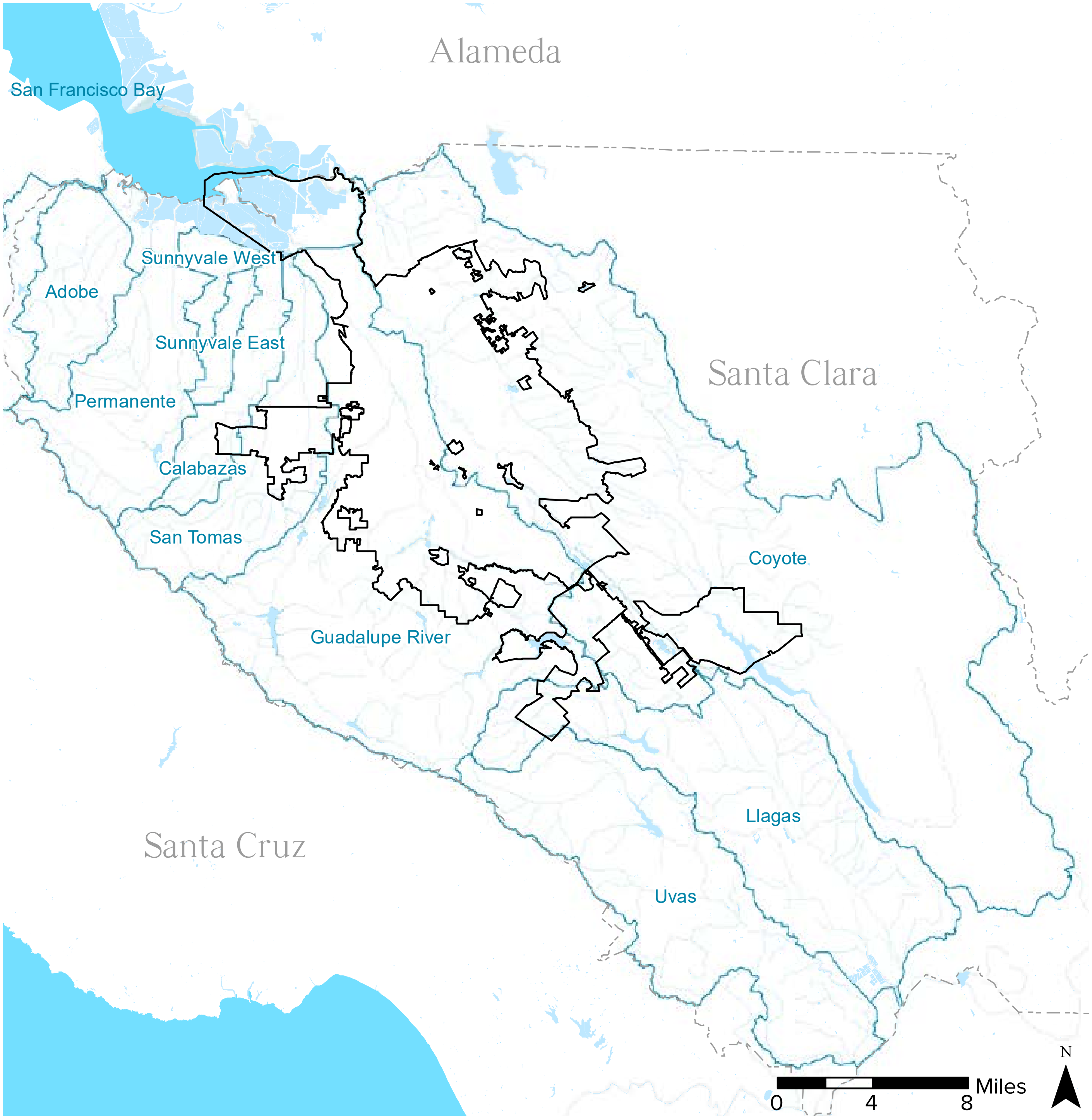


Figure 1-1. Map of South Bay Area with Santa Clara Basin Boundary, Major Watershed Boundaries, and San José Jurisdiction Boundary

LEGEND

- Santa Clara County
- San José City Limit
- Watershed Boundaries
- Streams
- Water Bodies
- Bay & Ocean

1.3 Regulatory Context

1.3.1 Federal & State Regulations & Initiatives

The U.S. Environmental Protection Agency (EPA) has authority under the Clean Water Act to promulgate and enforce stormwater related regulations. For the State of California, the EPA has delegated the regulatory authority to the State Water Resources Control Board (State Water Board), which, in turn, has delegated authority to the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) to issue National Pollutant Discharge Elimination System (NPDES) permits in the San Francisco Bay Region. Stormwater NPDES permits allow stormwater discharges from municipal separate storm sewer systems (MS4s) to local creeks, San Francisco Bay, and other water bodies as long as they do not adversely affect the beneficial uses of or exceed any applicable water quality standards for those waters. Since the early 2000s, the EPA has recognized and promoted the benefits of using GSI in protecting drinking water supplies and public health, mitigating overflows from storm sewers, and reducing stormwater pollution. The EPA has encouraged the use of GSI by municipal agencies as a prominent component of their MS4 programs.[1]

The State and Regional Water Boards have followed suit in recognizing not only the water quality benefits of GSI but the opportunity to augment local water supplies in response to the impacts of drought and climate change. The 2014 California Water Action Plan called for stormwater management solutions with multiple benefits and more efficient permitting programs. This directive created the State Water Board's "Strategy to Optimize Resource Management of Stormwater" (STORMS). STORMS' stated mission is to "lead the evolution of stormwater management in California by advancing the perspective that stormwater is a valuable resource, supporting policies for collaborative watershed-level stormwater management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests."[2]

These federal and state initiatives have influenced approaches in Bay Area municipal stormwater NPDES permits, as described in Section 1.3.2.

1.3.2 Municipal Regional Stormwater Permit

The City is subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I municipalities and agencies in the San Francisco Bay Area (Order R2-2015-0049), which became effective on January 1, 2016. The MRP applies to 76 municipalities and flood control agencies that discharge stormwater to San Francisco Bay, collectively referred to as Permittees.

Over the last 16 years, under Provision C.3 of the MRP and previous permits, new development and redevelopment projects on private and public property that exceed certain size thresholds ("regulated projects") have been required to mitigate impacts on water quality by incorporating post-construction stormwater control measures, including site design, pollutant source control, stormwater treatment, and flow control measures, as appropriate. Low Impact Development (LID) treatment measures that use natural treatment processes, such as rainwater harvesting and use, infiltration, and biotreatment, have been required on most regulated projects since December 2011.

MRP Provision C.3.j requires Permittees to develop and implement long-term GSI Plans for the inclusion of LID drainage design into storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs, and other elements. Much of the incorporation of GSI is intended to be accomplished by retrofitting existing impervious areas in public right-of-ways and on public property, in addition to continuing to implement LID on regulated projects.

1. See: https://www.epa.gov/green-infrastructure
2. See: https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/

1.3.3 Consent Decree with San Francisco Baykeeper

A Consent Decree between the City and San Francisco Baykeeper, a conservation group, became effective on August 11, 2016. As a result, the City agreed to develop a plan (Comprehensive Load Reduction Plan) and pursue funding for the purposes of improving stormwater quality and reducing stormwater flows to its major waterways and tributaries. This GSI Plan has been developed in a manner that fulfills the City's obligation under the Consent Decree. Specifically, the quantitative analyses described in later sections of the GSI Plan and the Reasonable Assurance Analysis Appendix demonstrate how the City can meet flow reduction requirements to address the critical bacteria storm described in the Consent Decree.

1.4 Purpose & Goals

The GSI Plan is a roadmap showing how the City of San José will transform its urban landscape and storm drainage systems from a singular reliance on traditional "gray" infrastructure, where stormwater runoff flows directly from impervious surfaces into storm drains and receiving waters, to an integrated approach that includes more resilient and sustainable "green" infrastructure systems. GSI systems disperse runoff to vegetated areas reducing and slowing flows, promote infiltration and evapotranspiration, collect runoff for non-potable uses, and treat runoff using biotreatment and other green stormwater infrastructure practices. The GSI Plan addresses GSI planning and implementation within the City of San José's jurisdiction. The GSI Plan also demonstrates the City's long-term commitment to implement GSI to reduce pollutants discharged to local waterways and meet regulatory requirements.

The GSI Plan achieves, assists, and aligns with the implementation of goals, policies, and actions from various City planning documents including the Envision San José 2040 General Plan - specifically, Action IN-3.17 to develop and implement a green streets plan. The GSI Plan is also consistent with the City's Climate Smart San José goals to be a sustainable city. Goals of the GSI Plan are shown in Figure 1-2.

Goals of the GSI Plan Include:

1. Protect beneficial uses of waterways within San José, including the Bay, and provide environmental and community benefits.
2. Capture, infiltrate, treat, and/or "repurpose" stormwater with multibenefit projects that can enhance public spaces, water supply, flood control, habitat, and green spaces.
3. Retrofit public right-of-ways to exhibit complete streets with GSI.
4. Reduce pollutants discharging to creeks from the MS4.
5. Demonstrate quantitatively the pollutant load reductions that can be achieved through implementation of GSI.

Figure 1-2. Goals of the GSI Plan

The GSI Plan serves as an implementation guide and reporting tool to provide reasonable assurance that pollutant reduction requirements in the City's stormwater discharge permit will be met. This is a major Citywide effort requiring close collaboration among City departments, especially those responsible for projects affecting future alignment, configuration, or design of impervious surfaces that produce stormwater runoff, as well as those responsible for operation and maintenance of existing and future GSI facilities.

Figure 1-3. GSI Plan Schedule

1.5 Overview of the GSI Plan

1.5.1 GSI Plan Development Process

The process began with the preparation of the City's GSI Plan Framework (Framework), a work plan describing the goals, approach, tasks, and schedule needed to complete the GSI Plan. Development of the Framework was a regulatory requirement to demonstrate the City's commitment to completing the GSI Plan by September 30, 2019. The City Council adopted the completed Framework in May 2017. Figure 1-3 shows the schedule milestones for the development of the GSI Plan.

The overall approach to developing the GSI Plan consisted of three main components:

1. Identifying the type, location, and priority of potential GSI facilities to meet pollutant reduction goals;
2. Reviewing City planning, policy, and ordinance documents for adequacy and consistency with GSI language, and updating them if needed to facilitate implementation; and
3. Incorporating technical guidance and information on funding, tracking, and maintenance mechanisms to facilitate GSI implementation.

As described in Section 5.2, the Santa Clara Valley Water District (Valley Water) and the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)[3] recently completed a Stormwater Resource Plan (SWRP) for the Santa Clara Basin (the portion of Santa Clara County that drains to San Francisco Bay). The SWRP identified and prioritized potential multibenefit GSI opportunities on public parcels and street right-of-ways within San José and other cities in the Santa Clara Basin. The GSI Plan builds on the SWRP output to further identify, evaluate, and prioritize potential stormwater improvements, while developing the comprehensive long-term GSI implementation roadmap for the City. The goal is to identify cost-effective, multibenefit projects that provide additional water quality, community, and environmental benefits.

3. SCVURPPP is an association of thirteen cities and towns in Santa Clara Valley, the County and Valley Water that share resources toward stormwater permit compliance and collaborate on projects of mutual benefit.

To help select locations for GSI facilities, the City utilized a reasonable assurance analysis (RAA) model that was developed using hydrologic, hydraulic, pollutant loading, and cost data. The model was used to determine areas of the City with higher pollutant loading and the most cost-effective ways to implement GSI facilities to provide reasonable assurance of the reduction of pollutant loads. The model outputs were coordinated with the Storm Sewer Master Plan to identify projects that can provide both flood protection and water quality improvement. GSI was also considered for planned traffic safety improvement projects to ensure street designs meet complete street guidelines, including proper stormwater runoff management.

1.5.2 Reasonable Assurance Analysis

The City conducted a reasonable assurance analysis (RAA) to quantitatively demonstrate the amount of stormwater runoff within the City's jurisdiction and the GSI that is needed to capture, treat, and/or infiltrate stormwater to reduce fecal indicator bacteria (FIB) loads to the City's creeks and San Francisco Bay. The City performed the RAA to demonstrate how GSI can be implemented to support attainment of a FIB load reduction standard identified in the Consent Decree with San Francisco Baykeeper, which considers an allowable frequency of exceedance of FIB water quality objectives based on natural conditions. The City is also collaborating on a parallel effort led by SCVURPPP to perform a similar RAA to assess the GSI needed to reduce loads of polychlorinated biphenyls (PCBs) and mercury to San Francisco Bay to meet requirements of the MRP.

The RAA is based on modeling tools that (1) simulate the rainfall/runoff processes in City watersheds and the associated stormwater discharges to the City's waterways and (2) estimate the volume or pollutant load reductions based on GSI opportunities identified in the GSI Plan. The RAA is consistent with multiple guidance documents developed by the U.S. Environmental

Guadalupe River Trail

Protection Agency, State of California, and the Bay Area Stormwater Management Agencies Association (BASMAA) that inform the types of models used, expectations for model performance, and methods for documenting and presenting results to demonstrate with reasonable assurance that stormwater control measures (including GSI) will reduce stormwater flows or pollutant loads to meet water quality goals. The RAA models consider thousands of alternative scenarios that represent various combinations of GSI projects located throughout the City, and they identify the most cost-effective implementation strategy to attain the FIB load reduction standard and MRP requirements for PCBs and mercury.

A full description of the RAA addressing FIB is included in Appendix B. The stormwater volume capture goal for FIB is greater than the PCB and mercury (Hg) goals, therefore, attainment of the FIB goal means that PCB and Hg objectives will also likely be met. Results of the SCVURPPP RAA addressing PCBs and mercury will be completed at a later time.

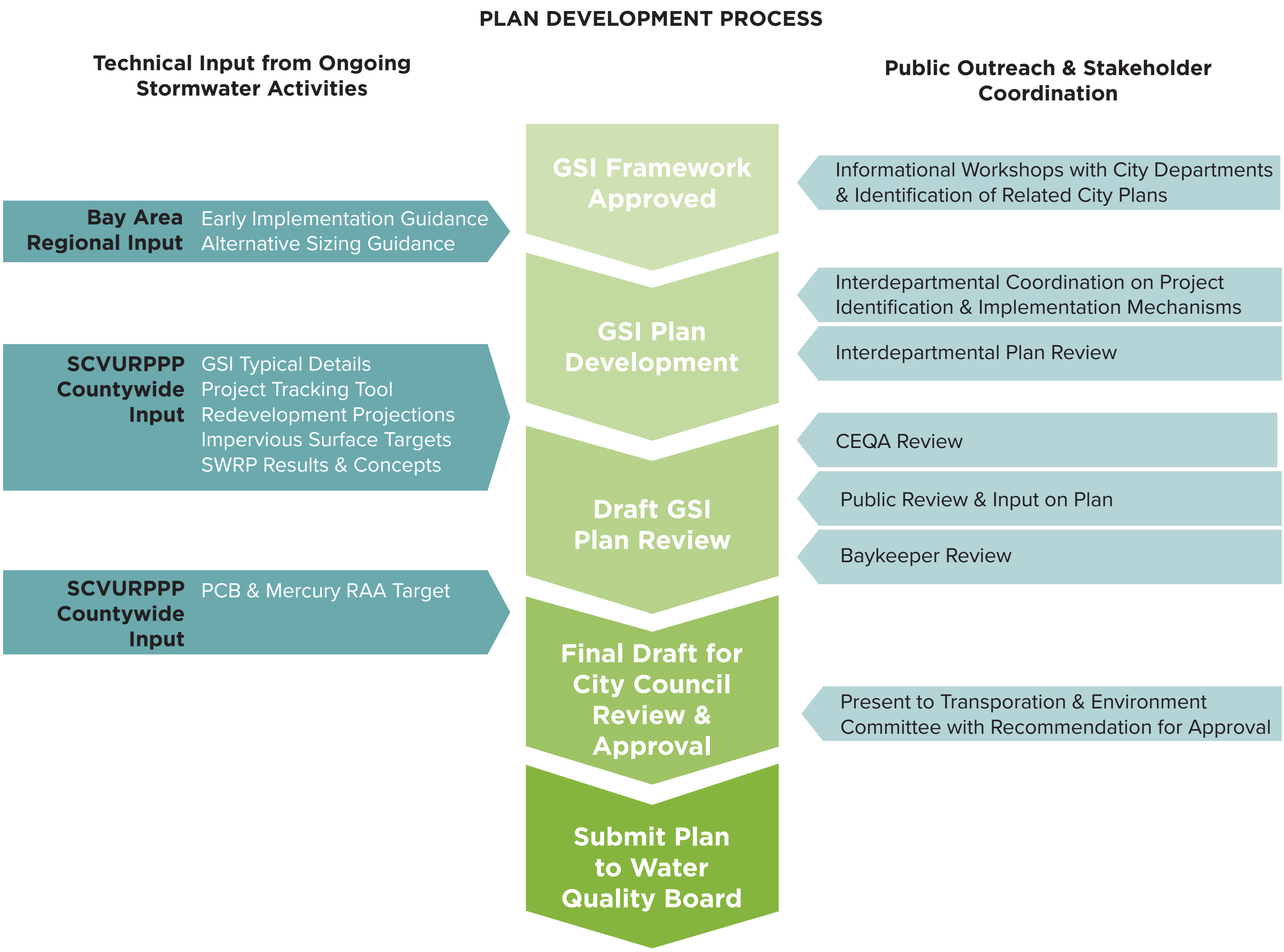


Figure 1-4. Plan Development Process

1.5.3 GSI Plan Sections & Appendices

The remainder of the GSI Plan contains the following information and appendices:

2 What is Green Stormwater Infrastructure?

Chapter 2 describes the impacts of urban development, the definition and purpose of GSI, the benefits of GSI, and types of GSI facilities, including bioretention, pervious pavement, infiltration, green roofs, and stormwater capture and use facilities. It also discusses the three GSI project type categories: green streets, LID retrofits, and regional projects.

3 GSI Coordination with Related Planning Documents

Chapter 3 describes the relationship of the GSI Plan to other planning documents and efforts within the City and how those planning documents have been updated or modified, if needed, to support and incorporate GSI requirements. For documents whose desired updates and modifications have not been accomplished by the completion of the GSI Plan, a work plan and schedule are laid out to complete them.

4 GSI Design Guidelines, Standards, & Specifications

Chapter 4 outlines the materials developed by SCVURPPP and the City of San José to provide guidelines, typical details, specifications, and standards for municipal staff and others in the design, construction, and operation and maintenance of GSI facilities.

5 GSI Project Prioritization Methodology

Chapter 5 presents the methodology used to identify priority candidate sites for GSI projects. This starts at a countywide scale, as described in the Santa Clara Basin Storm Water Resource Plan (SWRP), and is then further refined based on the City's priorities.

6 GSI Citywide Strategy

Chapter 6 outlines the short-term and long-term strategies for implementing a mix of prioritized potential GSI projects within the next 10 years and through 2050.

7 Implementation Plan

Chapter 7 discusses the variety of mechanisms to be employed by the City in order to implement the GSI Plan, including future planning and outreach, performance assurance, tracking, and funding.

A List of Acronyms

Appendix A provides a list of acronyms of terms used in the GSI Plan.

B Reasonable Assurance Analysis

Appendix B describes the Reasonable Assurance Analysis (RAA) conducted for the City of San José to quantify the amount and type of GSI projects needed to achieve stormwater quality improvement goals related to the reduction of bacteria in local creeks.

C Project Concepts

Appendix C includes concept drawings and fact sheets for potential regional GSI projects within the City, including a description of potential benefits and planning-level cost estimates.

D Maintenance & Monitoring Plan

Appendix D contains the City's Maintenance and Monitoring Plan that describes how the City will ensure proper maintenance through monitoring of GSI condition. It also describes maintenance activities needed for each type of GSI facility.

E Green Streets Prioritization Maps

Appendix E includes maps developed for prioritizing green street opportunities.

City of San José

2.0 WHAT IS GREEN STORMWATER INFRASTRUCTURE?

Green stormwater infrastructure can mitigate the impacts of urban development on natural systems while providing additional benefits. The City will employ GSI facilities including bioretention, permeable pavement, and infiltration facilities within the public right-of-way and in public spaces to meet water quality goals and provide community and economic benefits.

IN THIS CHAPTER

2.1 Definition & Purpose

2.1.1 Impacts of Urban Development

In natural landscapes, most of the rainwater soaks into the soil or is taken up by plants and trees. However, in urban areas, building footprints and paved surfaces such as driveways, sidewalks, and streets prevent rain from soaking into the ground. As rainwater flows over and runs off impervious surfaces, this "urban runoff" or "stormwater runoff" can pick up pollutants such as motor oil, metals, pesticides, pet waste, and litter. It then carries these pollutants into the City's storm drains, which flow directly to local creeks and San Francisco Bay, without any cleaning or filtering to remove pollutants.

As urban areas develop, the increase in impervious surface also results in increases in peak flows and volumes of stormwater runoff from rain events. Traditional "gray" stormwater infrastructure, like most of the City's storm drain system, is designed to convey stormwater flows quickly away from urban areas. However, the increased peak flows and volumes can cause erosion and habitat degradation in downstream creeks to which stormwater is discharged.

Storm Drain Draining to Guadalupe River

2.1.2 Green Stormwater Infrastructure Approach

The City is working to create sustainable or green streets, buildings, and parking lots that mimic natural landscapes by incorporating green stormwater infrastructure features. These features allow stormwater runoff from buildings, streets, and parking lots to soak into the ground and be filtered by soil. This reduces the quantity of water and pollutants flowing into storm drains and local creeks.

GSI uses soil, plants and pervious surfaces to capture, treat, infiltrate, and slow urban runoff. GSI facilities can also be designed to capture stormwater for uses such as irrigation and toilet flushing. GSI integrates building and roadway design, complete streets, drainage infrastructure, urban forestry, soil conservation, and sustainable landscaping practices to achieve multiple benefits.

In this GSI Plan, GSI refers to specific natural drainage practices in urban environments that retain, treat, infiltrate, evapotranspire, and harvest and use rainwater and stormwater runoff as a valuable resource instead of directly piping and discharging it to the Bay as quickly as possible. The primary focus of the GSI Plan is the integration of these practices into public parcels and right-of-ways.

Examples of GSI practices include: landscape-based stormwater "biotreatment" using soil and plants; pervious pavement systems (e.g., interlocking concrete pavers, porous asphalt, and pervious concrete); rainwater harvesting systems (e.g., cisterns); infiltration facilities (e.g., infiltration trenches and subsurface infiltration systems); and other methods to capture and use stormwater as a resource. These practices, also known as Low Impact Development (LID) site design and treatment measures, are described in more detail in Section 2.2.

2.1.3 Benefits of GSI

The advantage of the GSI approach to stormwater management is that GSI can provide many benefits beyond stormwater runoff control. These benefits include environmental, economic, and community improvements.

Environmental Benefits

GSI facilities are designed to capture, treat, infiltrate (where possible), and slow stormwater runoff. They can mitigate localized flooding and reduce erosive flows and quantities of pollutants being discharged to local creeks and the Bay. However, there are many ancillary benefits, especially for the types of GSI that use vegetation and trees. Vegetated GSI systems can help improve air quality by filtering and removing airborne contaminants from vehicle and industrial sources and can reduce urban heat island effects by providing shade and cooling landscapes. Increasing vegetation can also provide an ecological benefit by improving the biodiversity of plant types in the urban environment and providing habitat for birds, butterflies, bees, and other local species. Vegetated green roofs can also help insulate buildings, shade building surfaces, and reduce energy use. Together, these benefits help build resilience to the impacts of climate change and support sustainability goals.

In addition, GSI helps to make better use of stormwater as a water resource, by increasing local water supplies or offsetting use of potable water. Depending on soil characteristics and strata, GSI may promote infiltration into shallow groundwater layers or even help recharge deeper aquifers. GSI facilities have the potential to support development or augmentation of alternative water supplies, such as recycled water. Also, when designed with extra storage GSI can capture stormwater for later use as irrigation water or non-potable uses such as toilet flushing and cooling tower supply, thus conserving potable water supplies.

Economic Benefits

Strategic implementation of GSI has the potential to defer or even eliminate the need for typical and expensive gray infrastructure projects. By providing more storage within the watershed, GSI could help reduce the costs of conveying and pumping stormwater. In some situations, when cost-benefit analyses are performed, GSI may be the preferred alternative due to the multiple benefits provided by GSI as compared to conventional infrastructure. Installation of GSI can also be a less expensive alternative to gray infrastructure.

Community Benefits

Implementing GSI provides opportunities to increase the quality of neighborhoods and add community amenities. These include greening and beautifying public spaces by planting additional trees, installing green roofs that provide park-like spaces (if accessible), providing unique design opportunities for the integration of public art, and enhancing parks and public right-of-ways for public gathering. When traffic calming improvements such as curb extensions and bulb-outs at intersections are used to promote active transportation and increased pedestrian bicycle safety, there is an opportunity to use the additional space created by the improvements to integrate GSI facilities. The trend toward development of GSI facilities is also creating the need for a new “green workforce” to perform installation and maintenance of the facilities, which helps create jobs.

Jackie Brookner Stormwater Artwork at the Roosevelt Community Center in San José

2.2 Types of GSI Facilities

Integrating GSI into public spaces typically involves construction of stormwater capture and treatment measures in public streets, parks, and parking lots or as part of public buildings. Types of GSI measures that can be constructed in public spaces include: (1) bioretention; (2) pervious pavement, (3) infiltration facilities, (4) green roofs, and (5) rainwater harvesting and use facilities. Descriptions of these facility types are provided as follows.

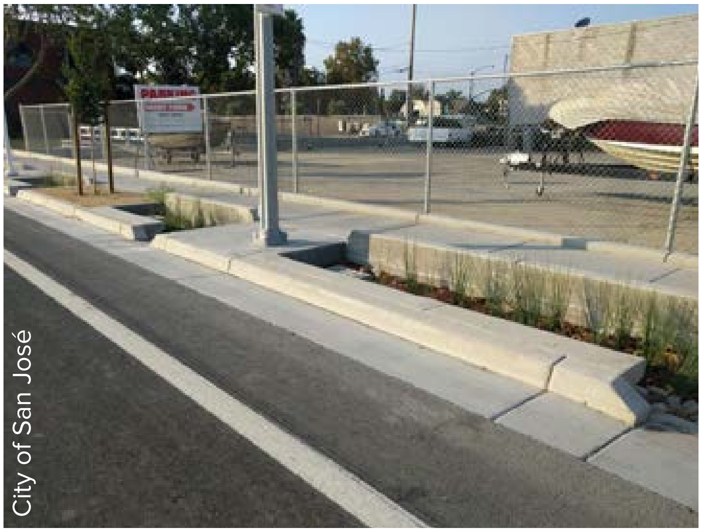
2.2.1 Bioretention Areas

Bioretention areas are depressed landscaped areas that consist of a ponding area, a mulch layer, plants, and a special biotreatment soil media composed of sand and compost, underlain by drain rock and an underdrain, if required. Bioretention is designed to retain and filter stormwater runoff through biotreatment soil media and plant roots, and either infiltrate stormwater runoff to underlying soils as allowed by site conditions, release treated stormwater runoff to the storm drain system, or both. They can be of any shape and size and are adaptable for use on a building or parking lot site or in the street right-of-way.

Bioretention systems in the streetscape have specific names: stormwater planters or stormwater curb extensions. A stormwater planter is a linear bioretention facility in the public right-of-way along the edge of the street, often in the planter strip between the street and sidewalk. They are typically designed with vertical (concrete) sides; however, they can also have sloped sides depending on the amount of space that is available.

A stormwater curb extension (or bulb-out) is a bioretention system that extends into the roadway and involves modification of the curb line and gutter. Stormwater curb extensions may be installed midblock or at an intersection. Curb bulb-outs and curb extensions installed for pedestrian safety, traffic calming, and other transportation benefits can also provide opportunities for siting bioretention facilities. Parking lots can accommodate bioretention areas of any shape in medians, corners, and pockets of space unavailable for parking.

Bioretention Curb Extension on Chynoweth Avenue



Linear Bioretention Facilities on Autumn Parkway

2.2.2 Pervious Pavement

Pervious pavement is hardscape that allows water to pass through its surface into a storage area filled with gravel prior to infiltrating into underlying soils. Types of pervious pavement include permeable interlocking concrete pavers, pervious concrete, porous asphalt, and grid pavement. Pervious pavement is often used in parking areas or on streets where bioretention is not feasible due to space constraints. Pervious pavement does not require a dedicated surface area for treatment and allows a site to maintain its existing hardscape.

There are two types of pervious pavers: Permeable Interlocking Concrete Pavers (PICP) and Permeable Pavers (PP). PICP allow water to pass through the joint spacing between solid pavers, and PP allow water to pass through the paver itself and therefore can have tighter joints. Porous asphalt and pervious concrete are similar to traditional asphalt and concrete, but do not include fine aggregates in the mixture, allowing water to pass through the surface. All types are supported by several layers of different sizes of gravel to provide structural support and water storage.

Permeable Pavement in Martha Gardens Alley Way

2.2.3 Infiltration Facilities

Where soil conditions permit, infiltration facilities can be used to capture stormwater and infiltrate it into native soils. The two primary types are infiltration trenches and subsurface infiltration systems. An infiltration trench is an excavated trench backfilled with a stone aggregate. Infiltration trenches collect and detain runoff, store it in the void spaces of the aggregate, and allow it to infiltrate into the underlying soil.

Subsurface infiltration systems are another type of GSI facility that may be used beneath parking lots or parks to infiltrate larger quantities of runoff. These systems, also known as infiltration galleries, are underground vaults or pipes that store and infiltrate stormwater while preserving the uses of the land surface above, such as parking lots, parks, and playing fields. Storage can take the form of large-diameter perforated metal or plastic pipe, concrete arches, concrete vaults, plastic chambers or crates with open bottoms.

Infiltration Trench

Subsurface Infiltration Gallery

2.2.4 Green Roofs

Green roofs are vegetated roof systems that filter, absorb, and retain or detain the rain that falls upon them. Green roof systems are comprised of a layer of planting media planted with vegetation, underlain by other structural components including waterproof membranes, synthetic insulation, geofabrics, and underdrains. A green roof can be either “extensive,” with 3 to 7 inches of lightweight planting media and low-profile, low-maintenance plants, or “intensive,” with a thicker (8 to 48 inches) of media, more varied plantings, and a more garden-like appearance. Green roofs can provide high rates of rainfall retention via plant uptake and evapotranspiration and can decrease peak flow rates in storm drain systems because of the storage that occurs in the planting media during rain events.

South San José Police Station Green Roof

Fourth Street Apartments Green Roof

2.2.5 Rainwater Harvest & Use Facilities

Rainwater harvesting is the process of collecting rainwater from impervious surfaces and storing it for later use. Storage facilities that can be used to harvest rainwater include rain barrels, blue roofs, aboveground or belowground cisterns, open storage reservoirs (e.g., ponds), and various underground storage devices (tanks, vaults, pipes, and proprietary storage systems). The harvested water is then fed into irrigation systems or non-potable water plumbing systems, either by pumping or by gravity flow. Uses of captured water may include irrigation, vehicle washing, and indoor non-potable use such as toilet flushing, heating and cooling, or industrial processing. The award winning public artwork Watershed designed by artist Peter Richards is a good example of a rainwater harvest system. This public artwork captures rainwater from the San José Environmental Innovation Center roof and channels it into a 6,600-gallon water storage tank which is then used to irrigate a grove of 100-year-old olive trees.

The two most common applications of rainwater harvesting systems are:

1. Collection of roof runoff from buildings; and
2. Collection of runoff from at-grade surfaces or diversion of water from storm drains into large underground storage facilities below parking lots or parks.

Rooftop runoff usually contains lower quantities of pollutants than at-grade surface runoff and can be collected via gravity flow. Underground storage systems typically include pretreatment facilities to remove pollutants from stormwater prior to storage and use.

San José Environmental Innovation Center

2.3 Types of GSI Projects

Applications for GSI facilities as part of GSI projects can be categorized as green streets, parcel-based LID retrofits, and regional projects as shown in Figure 2-1. The types of GSI projects described in this GSI Plan are typically constructed on publicly owned property or within public right-of-ways (e.g., along streets) and will often involve retrofitting an existing impervious area such that the area will drain to a pervious area and/or a GSI facility.

2.3.1 Green Streets

GSI roadway projects are typically called "green streets." Green street projects are located in the public right-of-way and capture runoff from the street and adjacent parcels. Green streets are distributed, small-scale GSI projects spread throughout an urban area that provide localized treatment and flood reduction for relatively small drainage areas. For example, green streets can include facilities such as bioretention bulb-outs, stormwater planters, or permeable pavers along street right-of-ways.

There are often opportunities to combine GSI projects with another type of street design known as "complete streets." This latter term refers to streets that incorporate all modes of travel equally and are designed to increase safety and access for cyclists and pedestrians regardless of age or ability. The integration of the goals of both complete streets and green streets has coined several new terms such as "living streets," "better streets" and "sustainable streets." This movement recognizes the multiple benefits that environmentally and holistically designed streets can achieve.

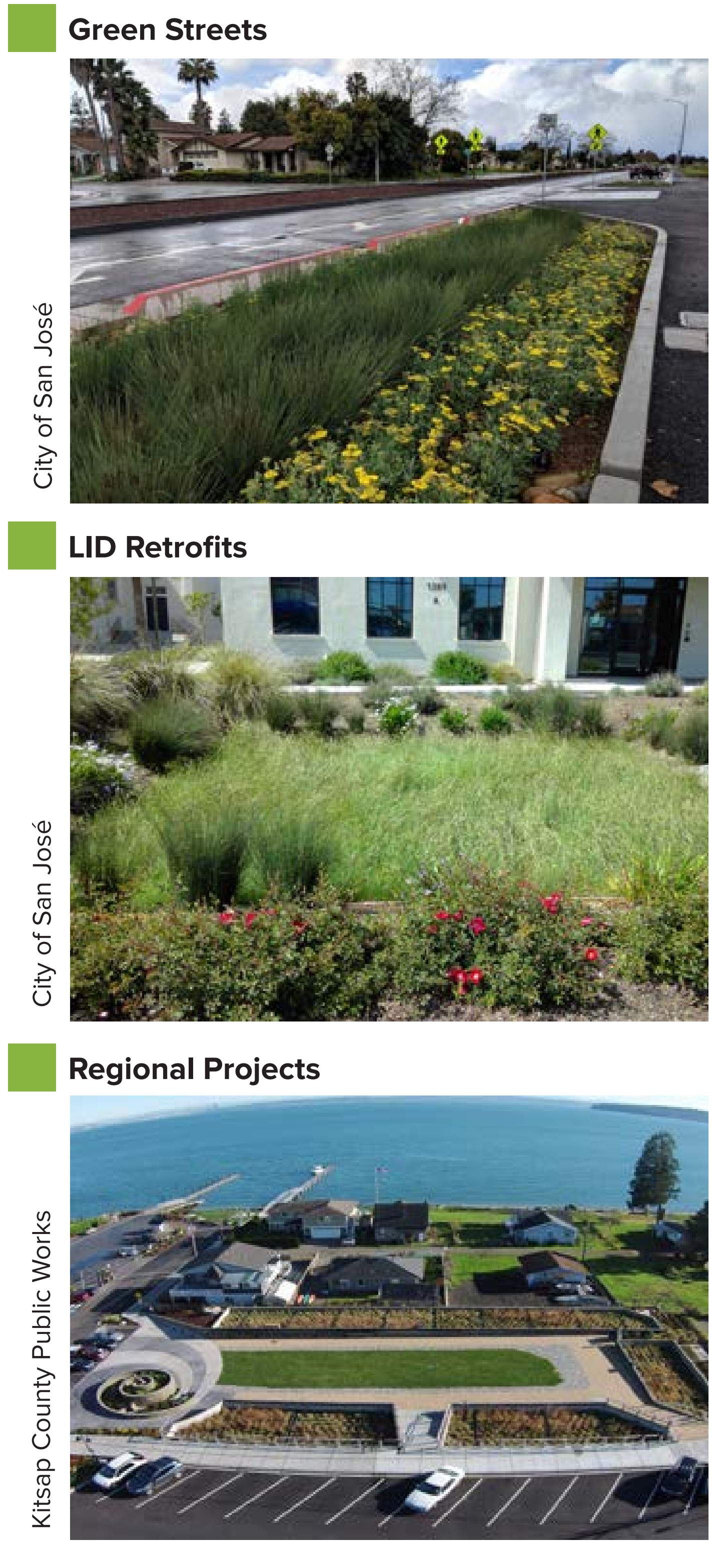


Figure 2-1. Green Streets, LID Retrofits, and Regional Projects

2.3.2 Parcel-Based Low Impact Development Retrofits

LID retrofit projects mitigate stormwater impacts by reducing runoff through capture and/or infiltration and treating stormwater on-site before it enters the storm drain system. LID retrofit projects may include bioretention facilities, infiltration trenches, detention and retention areas in landscaping, pervious pavement, green roofs, and systems for stormwater capture and use. These measures help to protect water quality by filtering stormwater through plants and soil and allowing stormwater to infiltrate into the ground, thus mimicking the pre-urbanized natural hydrology of the undeveloped site. For the purposes of this GSI Plan, LID retrofit projects are GSI facilities that are built on a parcel to treat runoff generated from impervious surfaces on that parcel. These projects may or may not be regulated projects (see Section 6.3).

2.3.3 Regional Projects

Regional GSI projects are large-scale stormwater capture and treatment measures that are intended to collect and treat runoff from a large drainage area, including runoff from on-site and off-site areas. Off-site surface runoff can come from diversions from storm drains, channels, culverts, and streams. These types of projects include aboveground or underground runoff capture facilities or subsurface infiltration galleries located in large open space areas or under existing uses (such as parking lots or parks) to which runoff from large areas of impervious surface can be directed. Benefits of regional stormwater capture projects include flood risk reduction, stormwater treatment and use, groundwater recharge, and the potential to augment alternative water supplies. They are often the most cost-effective projects due to the multiple benefits achieved and the economies of scale. The site characteristics and uses will determine what types of regional projects are feasible, e.g., how much flow the project can divert from the storm drain network, whether the project is aboveground or underground, and the size of the project. All projects proposed in City parks must conform to the City Charter Section 1700 Parks.

Permeable Pavement at Crescent Village Park in San José

GSI COORDINATION WITH RELATED PLANNING DOCUMENTS

City of San José

To enable its successful implementation, the GSI Plan has been developed to be consistent with existing City planning documents and will be integrated into planning documents currently under development.

IN THIS CHAPTER

3.1 GSI Support in Current City Plans

To ensure the success of the GSI Plan and its implementation, its goals, policies, and implementation strategies should align with Envision San José 2040 and other related planning documents. The MRP requires that municipal agencies review such documents and include in their GSI Plans a summary of any planning documents updated or modified to appropriately incorporate GSI requirements.

The City completed a review of its existing planning documents to determine the extent to which GSI-related language, concepts, and policies have been incorporated, starting with those that were identified in the City's Green Infrastructure Plan Framework (Framework). Additional documents were identified after the Framework was completed. In the future, new plans and updates to existing plans will contain appropriate language to further support the GSI Plan as needed.

The City of San José develops and has developed several planning documents that address different elements of City operations related to GSI including land use, transportation, sustainability, conservation, urban forestry, environmental leadership, infrastructure, employment, and housing.

3.1.1 Envision San José 2040 General Plan

The General Plan is the overarching document used to govern the City's goals, policies, and actions. The General Plan is updated in intervals with some sections, such as the Housing Element, being updated more frequently. The GSI Plan implements many General Plan goals, policies, and actions within various sections of the General Plan, including Measurable Sustainability (MS), Environmental Resources (ER), Community Design (CD), Transportation (TR), and Infrastructure (IN):

» Promote, require, and practice the use of GSI facilities, such as pervious pavement, bioretention and rainwater harvesting, on public and private land. (MS-3.4, MS-18.12, MS-18.14, ER-8.1, ER-8.2, ER-8.3, ER-8.5, ER-8.6, ER-8.7, CD-2.5, TR-2.12)

» Protect and enhance groundwater as a water supply, improve local watersheds, and reduce flood risk. (MS-20.3, ER-8.4, and ER-8.8)

» Promote, partner with, and educate the public and key stakeholders on the importance of responsible stormwater management. (ER-8.9 and ER-8.10)

» Provide and maintain adequate infrastructure to support the City's residents and businesses. (IN-1 and IN-3.16)

» Develop and implement a Green Street Plan consistent with the MRP. (IN-3.17)

The General Plan may be updated to include further policies to facilitate GSI during annual or four-year major reviews, as needed, to further support the GSI Plan. Specific plans are incorporated in the General Plan and updated through General Plan text amendments. Discretionary planning permits allowing new development must be consistent with the General Plan, regardless of its location within or outside of a Specific Plan area.

3.1.2 Urban Village Plans

Urban Village Plans are prepared by the City and community to provide a policy framework to guide new job and housing growth within each Urban Village boundary. Each plan describes the desired characteristics of future development, including buildings, parks, plazas and public art, streetscape and circulation, and financing for improvements or maintenance.

Urban Village Plans include discussion relevant to GSI and sustainability. A good example is the following language from The Alameda Urban Village Plan, Chapter 5 - Urban Design (UD) and Historic Preservation, Section 1 – Urban Design, Urban Design Goal #5 - Sustainability:

- Goal UD-5: Ensure that new development in The Alameda Urban Village maintains and improves quality of life and protects the environment.
- Policy UD-5-1: All projects shall be consistent with or exceed the City's Green Building, renewable energy, stormwater, and trash management policies, Ordinance and City Council Policies, and 2040 General Plan Environmental Leadership section as well as State and/or regional policies.
- Policy UD-5-2: Manage stormwater runoff in compliance with the City's Post-Construction Urban Runoff (6-29) and Hydromodification Management (8-14) Policies.
- Guidelines: Stormwater Management:
  - Require the use of native or drought tolerant plant species that require low water usage and maintenance.
  - Design and use natural drainage such as bioretention in on-site pocket parks and other landscaped areas to filter surface water runoff.
  - Use water permeable paving surfaces in parking lots and other paved areas to increase natural percolation and on-site drainage of stormwater.

The Alameda Urban Village Plan Chapter 6 – Circulation and Streetscape (CS) also includes important goals and policies such as:

- Goal CS-4: Contribute to greenhouse gas reduction and sustainability goals of the Envision San José 2040 General Plan by planning for green streets.
- Policy CS-4.2: Require the incorporation of stormwater runoff treatment (green infrastructure) into the public right-of-way (such as along sidewalks, in medians, bulb-outs, parks, and plazas) as part of public improvements to the maximum extent practicable. Allow centralized/ regional stormwater treatment facilities as an alternative approach.

Other examples of GSI policy language in Urban Village Plans include:

- This plan should address the potential for treating stormwater runoff in vegetative treatment systems integral with the parks and open spaces. While each specific project within the area should develop their own stormwater quality plan to treat stormwater at the point source, the backbone infrastructure that supports the entire plan may need regional areas to treat stormwater runoff from the streets and other public areas. (Diridon Station Area Plan)
- Different types of green infrastructure elements, such as rain gardens, vegetated swales, infiltration and flow-through planters, and stormwater tree wells should be employed as appropriate to local conditions. (East Santa Clara Urban Village Plan)
- Installation of rain gardens as part of protected bike lanes should be considered to take advantage of grade and drainage patterns. (East Santa Clara Urban Village Plan)

The General Plan governs these documents so they are not required to have GSI-related language; however, the City will continue to incorporate GSI-related language with future updates consistent with goals and policies to support sustainability as outlined in the General Plan.

The following Urban Village Plans are under development and will include GSI-related goals and/or policies:

» North 1st Street

» Alum Rock Avenue (east of 680)

» Southwest Expressway/Race Street Light Rail

» Berryessa BART

The following Urban Village Plans include GSI-related language:

» West San Carlos

» East Santa Clara

» Stevens Creek

» Santana Row/Valley Fair

» Diridon Station Area Plan

» Five Wounds

» South Bascom

» The Alameda

» Winchester Blvd

» Roosevelt Park

» Little Portugal

» 24th and Williams

3.1.3 San José Complete Streets Design Standards & Guidelines

The Complete Streets Design Standards and Guidelines document was developed to provide a comprehensive set of street design guidelines for the building and retrofitting of City of San José roadways. The guidelines, completed in 2018, "describe a comprehensive approach to the practice of mobility planning that recognizes that transportation corridors have multiple users with different abilities and travel mode preferences (such as walking, biking, taking transit and driving)."

The guidelines also recognize the need for integration of GSI in street design. Stormwater management policies are included in Section 3 of the guidelines ("Key Elements of Complete Streets") and recommended for inclusion in the design and scoping of complete street projects, as appropriate. Another section, "Stormwater Management through Green Street Design," provides an overview of various GSI elements and their applicability and function.

3.1.4 Climate Smart San José

Climate Smart San José is the community's Climate Action Plan. It articulates how every facet of the City—from buildings, to mobility, to growth of the city needs to transform to minimize climate impacts. It articulates how every facet of the City—from buildings, to mobility, to growth of the workforce—needs to transform to minimize climate impacts. The GSI Plan is consistent with the City's goals to be a sustainable, climate smart city.

Strategy 1.2 of Climate Smart San José includes embracing the Californian climate by "creating an urban landscape, in our homes and public places that is not just low water use, but attractive and enjoyable." Potential actions to support this strategy include:

» Convene to advance regional conversation to understand potential contribution of stormwater capture and reuse to region's water supply portfolio. (1.2-J)

» Run program to include green stormwater infrastructure (e.g., rain gardens) as part of complete streets requirements. (1.2-L)

3.1.5 Storm Sewer Master Plan

The City is developing a Storm Sewer Master Plan (Master Plan) that is intended to describe how the City will meet future demands for stormwater conveyance. Currently, the City is conducting a study to evaluate the storm sewer system capacity based on a 10-year storm event that will identify deficiencies in the system and recommend projects to address existing or potential flood issues. As part of the study, existing GSI installations and potential project concepts will be evaluated. The Master Plan will describe, to the extent feasible, the synergies and benefits that could be realized by implementing GSI projects in conjunction with storm sewer capacity improvement projects. The GSI Plan and Master Plan efforts will continue to be coordinated to ensure the goals of each plan are considered during preliminary planning and design phases of projects.

3.2 Work Plan for Future Integration of GSI Language into Related City Plans

Although current City plans are generally aligned with and support the GSI Plan, several City plans could benefit from additional GSI-related language. The following plans will be updated as needed in accordance with each document's scheduled update in Table 3-1. The City will review GSI Plan requirements when revising or updating existing planning documents or when developing new planning documents to ensure that GSI requirements and policies are incorporated. Examples of GSI-related language can be found in existing City plans, as described in Section 3.1 above, and in references such as SCVURPPP's Model Green Infrastructure Language for Incorporation into Municipal Plans (2016).

Table 3-1. GSI Language Integration Schedule

Name of Plan to be Completed / Updated	Anticipated Date of Completion / Update
San José Downtown Design Guidelines	FY 2019-20
General Plan / Specific Plans[1]	FY 2019-20
Community Forest Management Plan	FY 2019-20
Storm Sewer Master Plan	FY 2019-20
Berryessa BART Urban Village Plan	FY 2019-20
North 1st Street Urban Village Plan	FY 2020-21
Southwest Expressway/ Race Street Light Rail Urban Village Plan	FY 2020-21
Alum Rock Avenue (east of 680) Urban Village Plan	FY 2021-22

1. Specific plans are incorporated in the General Plan and updated through General Plan text amendments.

Alviso Marina Park Along San Francisco Bay

3.3 Regional Plans

The City of San José participates in the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of 13 cities, the County of Santa Clara, and the Santa Clara Valley Water District (Valley Water) that are permittees under the MRP. This partnership allows sharing of resources toward permit compliance and collaboration on projects of mutual benefit.

The City is working with SCVURPPP, Valley Water, and other agencies to integrate and coordinate several large-scale planning efforts including the following:

- Santa Clara Basin Stormwater Resource Plan (SWRP) – A collaboration between SCVURPPP and Valley Water during 2017-2018, the SWRP supports municipal GSI Plans by identifying and prioritizing potential multibenefit GSI opportunities on public parcels and street right-of-ways throughout the Basin and allows them to be eligible for state bond-funded implementation grants. The SWRP includes a list of prioritized GSI opportunity locations for each SCVURPPP agency, including San José.

- SCVURPPP's Reasonable Assurance Analysis (RAA) – To meet Municipal Regional Stormwater Permit (MRP) requirements, SCVURPPP has initiated a countywide effort to develop an RAA to estimate baseline PCB and mercury loads in stormwater discharges to the Bay from its member agencies' jurisdictions, determine load reductions to meet assigned load allocations, and set goals for the amount of GSI needed to meet the portion of PCB and mercury load reduction the MRP assigns to GSI. The RAA is planned for completion by September 2020, and some results from the efforts to date have informed this GSI Plan.

- The Bay Area's 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 more than 300 project proposals and a methodology for ranking those projects for the purpose of submitting a compilation of high priority projects for grant funding. The Santa Clara Basin SWRP was submitted to the Bay Area IRWMP Coordinating Committee and incorporated into the IRWMP as an addendum. As SWRP projects are proposed for grant funding, they will be added to the IRWMP list using established procedures.


City of San José

Guadalupe River Trail

4.0 GSI DESIGN GUIDELINES, STANDARDS, & SPECIFICATIONS

The City worked with the Santa Clara Valley Urban Runoff Pollution Prevention Program and its member agencies to create a Green Stormwater Infrastructure Handbook that will provide guidance for public and private GSI designers, contractors, operation and maintenance staff and inspectors. The Handbook includes typical design details and specifications that will be referenced by and incorporated into City standards as needed.

IN THIS CHAPTER

4.1 Development Process

The MRP requires that the GSI Plan include general design and construction guidelines, standard specifications, and details (or references to those documents) for incorporating GSI components into projects within the City of San José. These guidelines, details, and specifications should address the different street and project types within the City, as defined by its land use and transportation characteristics, and allow projects to provide a range of functions and benefits, such as stormwater management, bicycle and pedestrian mobility and safety, public green space, and urban forestry.

In 2018, the City finalized its Complete Streets Design Standards and Guidelines, which provide direction on how San José streetscapes should be designed for multimodal use depending on the street type, street dimensions, intersections, and mobility types. As mentioned in Chapter 3, this guidance document describes a wide range of functions associated with streets such as safe pedestrian travel, use as a public space, multiple modes of transit, urban forestry, and stormwater management through green street design. Specifically, as it relates to stormwater management, the document describes GSI elements that "should be considered and incorporated into the complete street design process."

In addition, the City of San José worked with the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and its member agencies to create a green stormwater infrastructure handbook[4] that provides guidance for public and private GSI designers, contractors, operation and maintenance staff, and inspectors. Part 1 of the GSI Handbook provides general design guidelines for GSI facilities within public right-of-ways and on public parcels. Part 2 of the Handbook includes typical design details and specifications compiled from a variety of sources within California and nationally modified for use in Santa Clara County. The City intends to use the GSI Handbook as a primary resource for GSI guidelines, details, and specifications. The contents of the GSI Handbook are described further in the next subsections, 4.2 and 4.3.

4.2 Guidelines for GSI Design

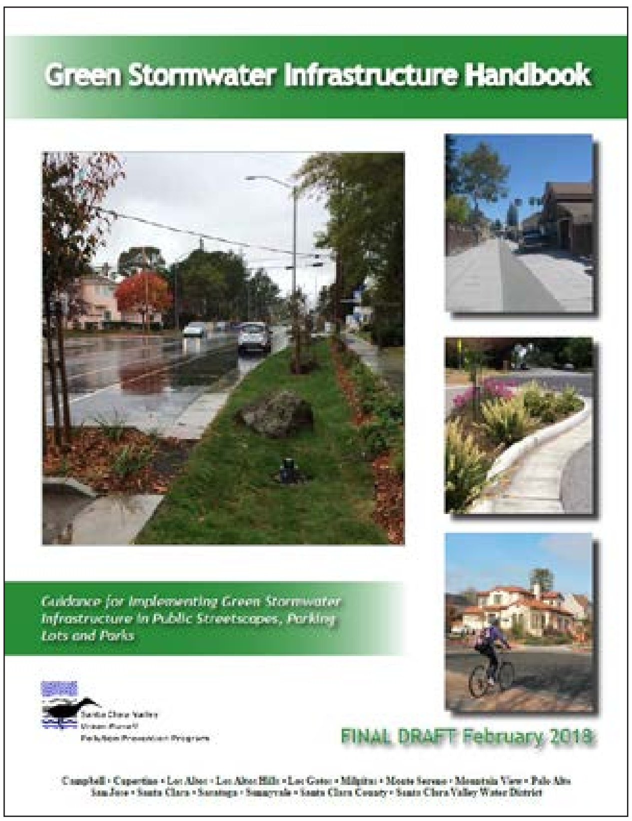
The GSI Handbook highlights the different design approaches to GSI facilities that are retrofitted into different locations in the public sphere such as roadways, parks, and parking lots. Part 1 of the Handbook provides guidance on selection, integration, prioritization, sizing, construction, and maintenance of GSI facilities. It includes sections describing the various types of GSI, their benefits, and design considerations; how to incorporate GSI with other uses of the public right-of-way, such as bicycle and pedestrian infrastructure and parking; and guidelines on utility coordination and landscape design for GSI. In addition, the Handbook provides guidance on post-construction maintenance practices and design of GSI to facilitate maintenance.

Part 1 of the Handbook also contains a section on proper sizing of GSI facilities. GSI facilities should be designed to meet the same sizing requirements as regulated projects, which are specified in Provision C.3.d of the MRP. In general, the treatment measure design standard is the capture and treatment of 80 percent of annual runoff (i.e., capture and treatment of stormwater from small, frequent storm events). Infiltration of the captured stormwater to the extent feasible is the goal of GSI facility design where site conditions allow. GSI facilities should be located and sized to treat the C.3.d volume and/or flow of runoff from all contributing impervious surface areas including private property and the public right-of-way (street and sidewalk). Similarly, for parking lots and public parks, GSI facilities should treat the C.3.d amount of runoff from all contributing impervious surface areas.

If a green street project cannot be designed to treat the C.3.d amount of runoff due to constraints in the public right-of-way or other factors, the City may still wish to construct the measure to provide some runoff reduction and water quality benefit and achieve other benefits (e.g., traffic calming, pedestrian safety). For these situations, the GSI Handbook describes regional guidance on alternative design approaches developed by BASMAA for use by MRP permittees.[5]

4. The SCVURPPP GSI Handbook is available online at [LINK TBD].
5. BASMAA, 2018. Guidance for Sizing Green Infrastructure Facilities in Street Projects.

Together with the San José Complete Streets Design Standards and Guidelines, the SCVURPPP GSI Handbook will be used during planning and implementation of GSI projects. When designing new streets or retrofitting existing streets, the Complete Streets Design Standards and Guidelines will be referenced for guidance on how and where to incorporate San José-desired street functions, including GSI. In coordination with these guidelines, project planners can reference Part 1 of the SCVURPPP GSI Handbook guidance on how to address common design approaches and site constraints, and provide design tools that can be customized based on the project-specific goals. Over time, these practices will become routine and innovation will improve the best practices, producing streets and spaces that are even more resilient, regenerative, and appealing.



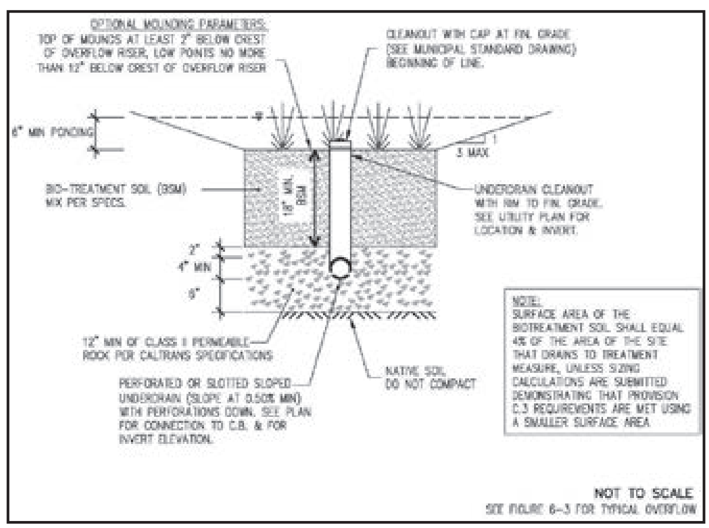
SCVURPPP's Green Stormwater Infrastructure Handbook

4.3 Typical Details & Specifications for GSI

Part 2 of the GSI Handbook consists of a compilation of typical details and specifications for the GSI facility types described in Section 2.2. Typical GSI design details were compiled from several sources including the San Francisco Public Utilities Commission, the California Stormwater Quality Association, the California Low Impact Development Initiative, the Bay Area Stormwater Management Agencies Association, the Cities of Philadelphia and Washington D.C., and several other exemplary programs. Several workshops were held by SCVURPPP in 2017 and 2018 to present and receive input from local agencies on various sections of and details in the draft GSI Handbook.

Based on this input, a revised draft GSI Handbook was developed containing a reduced set of details from primarily California sources, and distributed for SCVURPPP member agency comment. The final GSI Handbook contains typical details and specifications that have been modified for use in Santa Clara County, based on the comments received from SCVURPPP agencies, including San José. These details and specifications will be referenced by and incorporated into City standards, as needed.

The GSI Handbook details and specifications are flexible to allow for creativity and customization for specific locations. The City plans to use these typical details and specifications, in addition to details and specifications used on past GSI projects, for the design of future GSI projects and GSI components of capital projects.



Cross Section of a Bioretention Area (with Maximized Infiltration)

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City of San José

GSI PROJECT PRIORITIZATION METHODOLOGY

This chapter describes the process followed to identify and prioritize GSI project opportunities in San José. This process not only considers stormwater performance but also evaluates project constructability constraints, community and environmental benefits, and synergies with other planned City projects and goals.

IN THIS CHAPTER

5.1 Introduction & Background

Integral to the GSI Plan was the development of a standardized process to identify and prioritize GSI project opportunities in the City. This process focused on prioritizing capital project opportunities, which include green streets to manage right-of-way runoff, LID retrofits to manage public parcel runoff on-site, and regional projects to capture large drainage areas that span both streets and parcels. A two-phase prioritization process was conducted by the City to develop a ranked list of GSI project candidates. The list serves as the basis for generating the capital project recommendations presented in the GSI citywide strategy described in Chapter 6. Moreover, the criteria and mapping output from the prioritization process provides the tools needed to understand the costs and benefits of the identified opportunities and to assess future candidate projects as they arise. The two-step prioritization process included:

1. Countywide GSI Prioritization – SCVURPPP collaborated with the City and other permittees to develop the multibenefit scoring criteria used to prioritize street, parcel, and regional GSI opportunities throughout the County.
2. San José-Specific GSI Prioritization – The City refined the prioritization output from the countywide SCVURPPP process by applying more localized criteria, including stormwater performance effectiveness using runoff volume analyses from preliminary RAA modeling output, interdepartmental feedback, and site-level construction constraints.

5.1.1 Project Types

Green stormwater infrastructure project types employed in San José fall into the following categories: green streets, LID retrofits, and regional projects. These are the types of GSI capital projects that the City will implement to meet the water quality goals and multibenefit objectives defined in the GSI Plan.

GREEN STREETS

LID RETROFITS

REGIONAL PROJECTS

5.2 Countywide GSI Prioritization

The first step in San José's GSI project prioritization process was to participate in the evaluation of opportunities at the countywide level. This step was led by SCVURPPP and followed the State of California's guidance for developing a Stormwater Resource Plan (SWRP).

Water Code section 10563, subdivision (c)(1), requires a SWRP as a condition of receiving State grants for stormwater and dry weather runoff capture projects from any State bond approved by voters after January 2014. This requirement applies to Proposition 1, the water bond measure approved by voters in November 2014, which authorized $200 million in grants for multibenefit stormwater management projects. Funds provided for the purpose of developing a stormwater resource plan are exempt from this requirement. As a result, in conjunction with Valley Water, SCVURPPP applied for, and received a Proposition 1 planning grant from the State Board to develop a SWRP for the Santa Clara Basin.

The Santa Clara Basin SWRP (completed December 2018) provided an ideal opportunity for the SCVURPPP member agencies, including the City of San José, to proactively plan for future requirements of the MRP while providing essential information needed to explore funding needs, GSI opportunities, and Prop 1 grants for project implementation. Following the SWRP guidelines developed by the California State Water Resources Control Board (SWRCB) ensures that stormwater and dry weather runoff capture projects included within the SWRP are eligible for bond funds. These guidelines specify that the SWRP must employ quantitative methods to identify and prioritize stormwater and dry weather runoff capture projects, including the quantification of stormwater capture volumes and pollutant load reduction. The results of the Santa Clara Basin SWRP multibenefit prioritization process for green streets, LID retrofits, and regional projects is provided in the following subsections. Ultimately, as described in Section 5.3, these results served as input to the GSI Plan, which built upon the SWRP effort and refined the prioritized project list to cater it to the City's specific local conditions and goals.

5.2.1 Key Data Sources

The process used to analyze the Santa Clara watersheds and identify and prioritize GSI projects included the landscape elements that most affect hydrology and pollutant transport. Natural hydrology is influenced by physical characteristics such as impervious cover, soil type, and land segment slope. Percent imperviousness is the predominant factor in determining the quantity of runoff generated from a given area. Hydrologic Soil Group (HSG) categorizes soils based on drainage characteristics, with Group A consisting of well drained soils and Group D consisting of poorly drained soils. Slope is a factor in determining both the peak rate of runoff and the feasibility of implementing GSI projects to capture and infiltrate runoff. Additional datasets used to identify potential projects include ownership and public right-of-way data, as well as other special considerations. This data is summarized in Table 5-1.

The first step in countywide prioritization was to identify public parcels and streets that can support GSI projects. The screening process for parcels and streets is outlined in Table 5-2.

Bioretention in Commercial Parking Lot in San José

SWRP Data Sources

Characteristic	Data Source	Source Date
HYDROLOGY & POLLUTANT TRANSPORT		
Land Use	Association of Bay Area Governments Data Catalog	2005
Impervious Cover	National Land Cover Dataset (NLCD) - 30 meter resolution	2011
Hydrologic Soil Group	National Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO)	2016
Percent Slope	Derived from National Elevation Dataset (NED) - 10 meter resolution	2014
OWNERSHIP & PUBLIC RIGHT-OF-WAY		
Parcels	Santa Clara County Information Services Department	2017
Streets & ROW	Santa Clara County Information Services Department	2017
SPECIAL CONSIDERATIONS		
Flood Prone Streams	Santa Clara County One Water Plan: An Integrated Approach to Water Resource Management	2017
PCB Areas	SCVURPP (land use pre-1980, SWRCB Industrial Permit Facilities, pavement conditions, and site violations)	2017

Table 5-2. SWRP Parcel and Right-of-way Screening Methodology

Screening factor	Characteristic	Criteria	Reason
PARCEL			
Public Parcels	Ownership	County, City, Town, Valley Water, State, Open Space Agencies	Identify all public parcels for regional storm and dry weather runoff capture projects or on-site LID retrofits
	Land Use	Park, Public Building, Others (e.g. golf course)	
Suitability	Parcel Size	≥ 0.25 acres	Opportunity for regional stormwater and dry weather runoff capture project
		< 0.25 acres	Opportunity for on-site LID retrofit
	Site Slope	< 10%	Steeper grades present additional design challenges
RIGHT-OF-WAY			
Selection	Ownership	Public	Potential projects are focused on public and right-of-way opportunities
Suitability	Surface	Paved	Only roads with paved surfaces will be considered suitable. Dirt roads will be removed.
	Slope	< 5%	Steep grades present additional design challenges; reduced capture opportunity due to increased runoff velocity
	Speed	≤ 45mph	Excludes higher speed roads such as major arterials and highways

5.2.2 Prioritization Criteria

After the identification of feasible project locations, screened streets and parcels were prioritized to aid in the selection of potential project locations that would be most effective and provide the greatest number of benefits. In addition to physical characteristics, several special considerations were included in the prioritization methodology to consider high opportunity projects and currently planned projects provided by agencies, as well as consideration of multiple benefit projects. Specifically, projects were prioritized through the lens of the following seven categories:

1 Physical Characteristics

Physical conditions include land use, impervious area, parcel size, hydrologic soil group, and/or slope. Characteristics for a suitable project differ between project type, and a separate scoring system was developed for regional projects, green streets, and LID retrofit projects, as shown in Table 5-3.

2 Proximity to Storm Drains

The proximity to a storm drain is an important consideration in ensuring that a regional project can divert from large drainage areas upstream of that storm drain. Additionally, projects that are sited close to a storm drain benefit from lower diversion and pumping requirements.

3 Flood-prone Streams & Areas

Projects placed within the subwatersheds of flood-prone streams and areas affected by flooding can help to mitigate flood risks and reduce flood and hydromodfication impacts by limiting the volume of runoff that reaches the impacted streams.

4 PCB Interest Areas

PCBs are one of the primary pollutants of concern within the Bay Area; therefore, siting stormwater capture projects in PCB interest areas can potentially address water quality issues.

5 Priority Development Areas

The Association of Bay Area Governments describes PDAs as places identified by Bay Area communities as areas for investment, new homes, and job growth. Projects that are within a PDA can coincide with redevelopment and revitalization projects, potentially taking advantage of opportunities for coordinated efforts.

6 Co-located Planned Projects

Consideration of other potential or planned City projects opens opportunities for cost-sharing and maximizes multiple benefits achieved by a single project.

7 Multiple Benefits

While the reduction of pollutant loads is one of the primary objectives of green stormwater infrastructure, several other benefits can be achieved to improve cost effectiveness and increase buy-in. Potential benefits include but are not limited to: augmentation of local/alternative water supply; source control of pollutants and runoff volume; re-establishment of natural water drainage treatment and infiltration; restoration of pre-development drainage; creation, enhancement, or restoration of habitat; and community enhancement.

5.2.3 Prioritization Method

Through the City's input and input from the other SCVURPPP member agencies, the prioritization criteria were weighted to arrive at the final project prioritization methodology. The process resulted in assigned prioritization scores for each identified GSI opportunity within each of the three project categories (green streets, LID retrofits, and regional projects). These scores could then be further filtered or sorted to support ongoing prioritization of projects within a member agency's jurisdiction. The criteria and weighting are summarized for each project type in Table 5-3.

Table 5-3. Regional, LID, and Street Project Prioritization Methodology

Metric	Points						W
	0	1	2	3	4	5	
REGIONAL PROJECTS							
Parcel Land Use			School/Golf Course	Public Building	Parking Lot	Park/Open Space	
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Parcel Size (acres)	.25 ≤ X < .5	.5 ≤ X < 1	1 ≤ X < 2	2 ≤ X < 3	3 ≤ X < 4	4 ≤ X	
Hydrologic Soil Group		C/D		B		A	
Slope (%)		10 > X > 5	5 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
Proximity to Storm Drain (ft)	X < 1,000	1,000 ≥ X > 500		500 ≥ X > 200		200 ≥ X	
LID RETROFIT PROJECTS							
Parcel Land Use			School/Golf Course	Park/Open Space	Public Building	Parking Lot	
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	
Hydrologic Soil Group		C/D		B		A	
Slope (%)		10 > X > 5	5 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
GREEN STREET PROJECTS							
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	
Hydrologic Soil Group		C/D		B		A	
Slope (%)		5 > X > 4	4 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
ALL PROJECTS							
Within Flood-Prone Storm Drain Catchments	No					Yes	
Contains PCB Interest Areas	None			Moderate		High	2
Within Priority Development Area	No					Yes	
Co-located With Another Agency Project	No					Yes	
Augments Water Supply	No	Opportunity for capture & reuse				Above groundwater recharge area & not above groundwater contamination area	2
Water Quality Source Control	No	Yes					
Reestablishes Natural Hydrology	No	Yes					
Creates or Enhances Habitat	No	Yes					
Community Enhancement	No	Opportunity for other enrichment				Within DAC or MTC Community of Concern	

Notes: W = weighting factor
Source: Prioritization metrics for green streets, LID retrofit projects, and regional projects from Santa Clara Basin Stormwater Resource Plan (2018)

5.2.4 Green Streets

Based on results of the SWRP screening, approximately 5,000 street segments within the county were identified as high priority, i.e., scoring in the 90th percentile of screening. These street segments represent a single block or around a 300-foot segment of a continuous roadway. Of the high priority segments, more than 2,000 are in San José. These streets segments are characterized by well-draining soils, higher potential for capturing PCBs, and the other criteria listed in Table 5-3. The locations of these high priority streets are shown in Figure 5-1.

5.2.5 LID Retrofits on Public Parcels

Public, parcel-based low impact development projects within Santa Clara watersheds were additionally evaluated and prioritized for the SWRP. LID retrofit projects are designed to mitigate stormwater impacts by reducing runoff through capture and treatment of stormwater on-site before it enters the storm drain system. To prioritize LID retrofit sites, the SWRP analysis employed the same method described above to screen for public parcels, flood prone areas, PCB interest areas, and the other criteria listed in Table 5-3. More than 2,500 public parcels opportunities were evaluated in Santa Clara County for the SWRP, and more than 250 were identified as high priority, i.e., the 90th percentile of eligible parcels. Of these, almost 200 high priority LID parcel projects were identified in San José. The location and prioritization score (i.e., high, medium, or low) of the identified LID retrofit opportunities in San José are shown in Figure 5-2.

5.2.6 Regional Projects

Regional stormwater capture projects were also evaluated and prioritized within the Santa Clara watersheds. As with LID Retrofits, these projects were screened from public parcels. However, regional projects include opportunities to manage stormwater and dry weather runoff from other off-parcel sources, such as off-site surface runoff and diversions from storm drains, channels, culverts, and streams. Regional stormwater capture projects can provide flood protection, stormwater treatment and use, and groundwater recharge. The prioritization of regional projects followed the same method described above to screen public parcels and score project feasibility based on the criteria listed in Table 5-3. However, project sites less than 0.25 acres were considered unsuitable for regional projects, and therefore regional projects represent a subset of the full parcel list analyzed for LID Retrofits. The SWRP analysis evaluated more than 1,900 public parcels in Santa Clara County and identified more than 100 potential regional project opportunities within San José as high priority. The location and prioritization score (i.e., high, medium, or low) of the identified regional project opportunities in San José are shown in Figure 5-3.

Bioretention at Village Oaks Shopping Center in San José

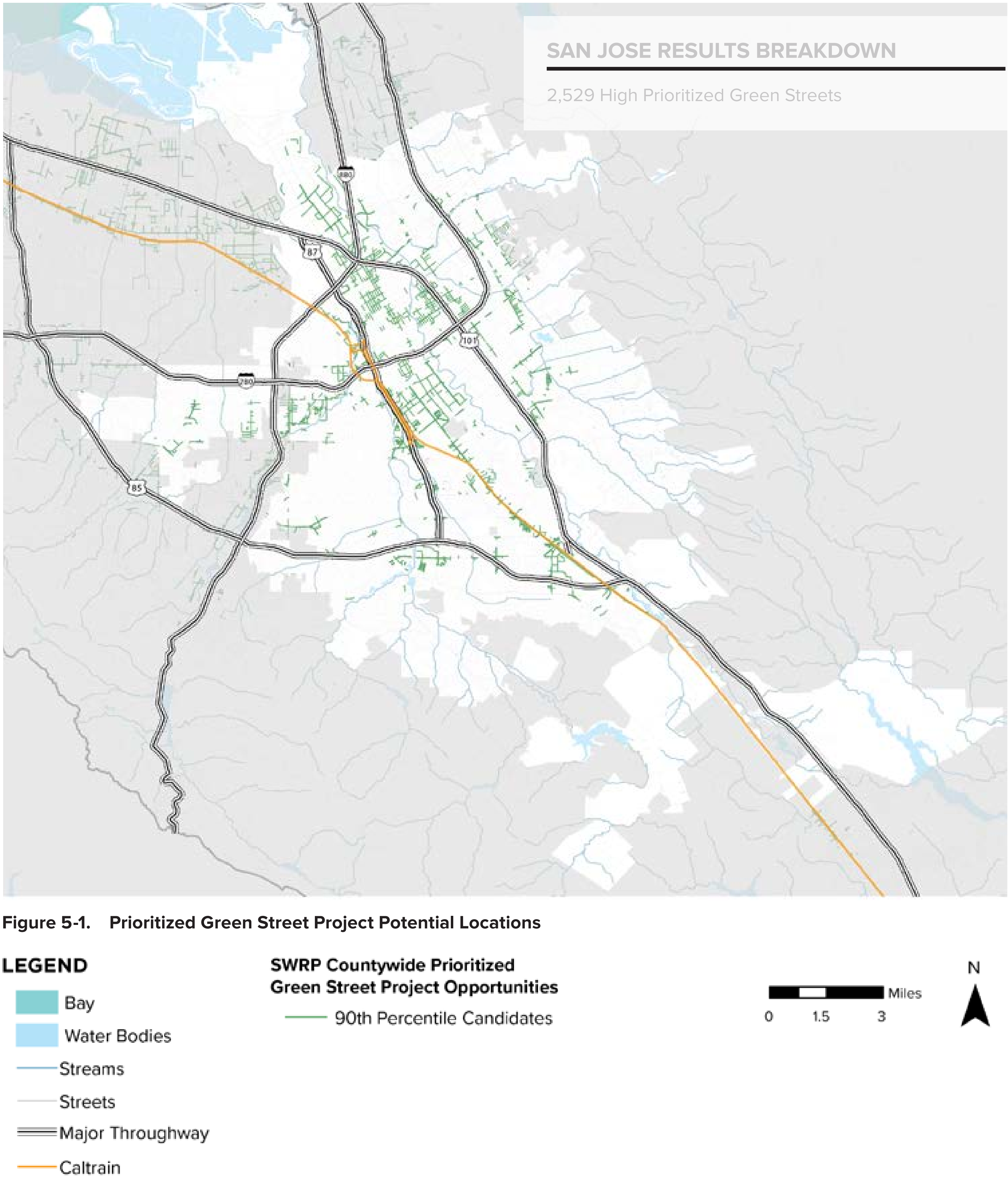


Figure 5-1. Prioritized Green Street Project Potential Locations

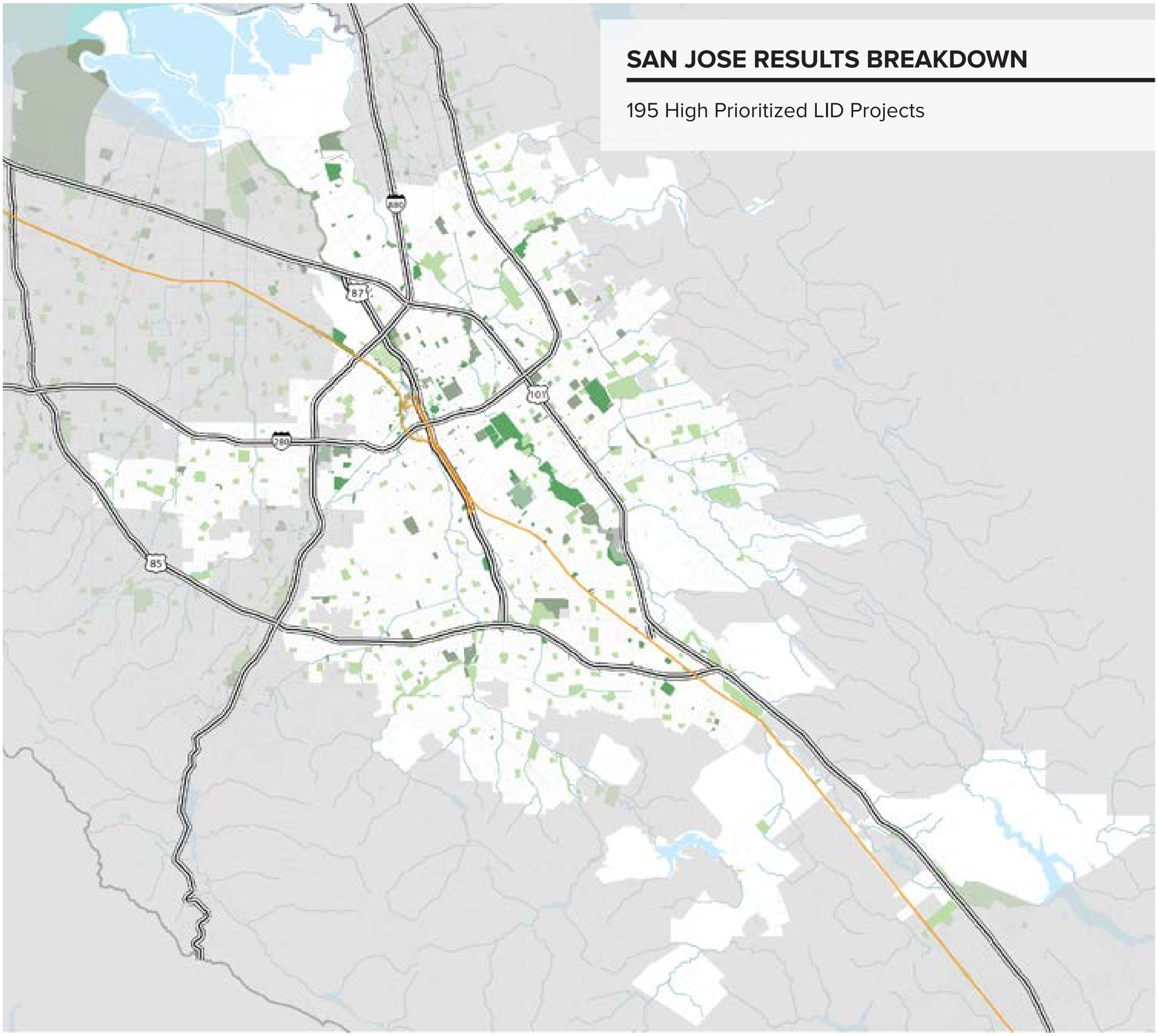


Figure 5-2. Prioritized LID Public Parcel Retrofit Project Potential Locations

LEGEND

- Bay
- Water Bodies
- Streams
- Streets
- Major Throughway
- Caltrain

SWRP Countywide Prioritized LID Project Opportunities

- High
- Medium
- Low

0 1.5 3 Miles

N

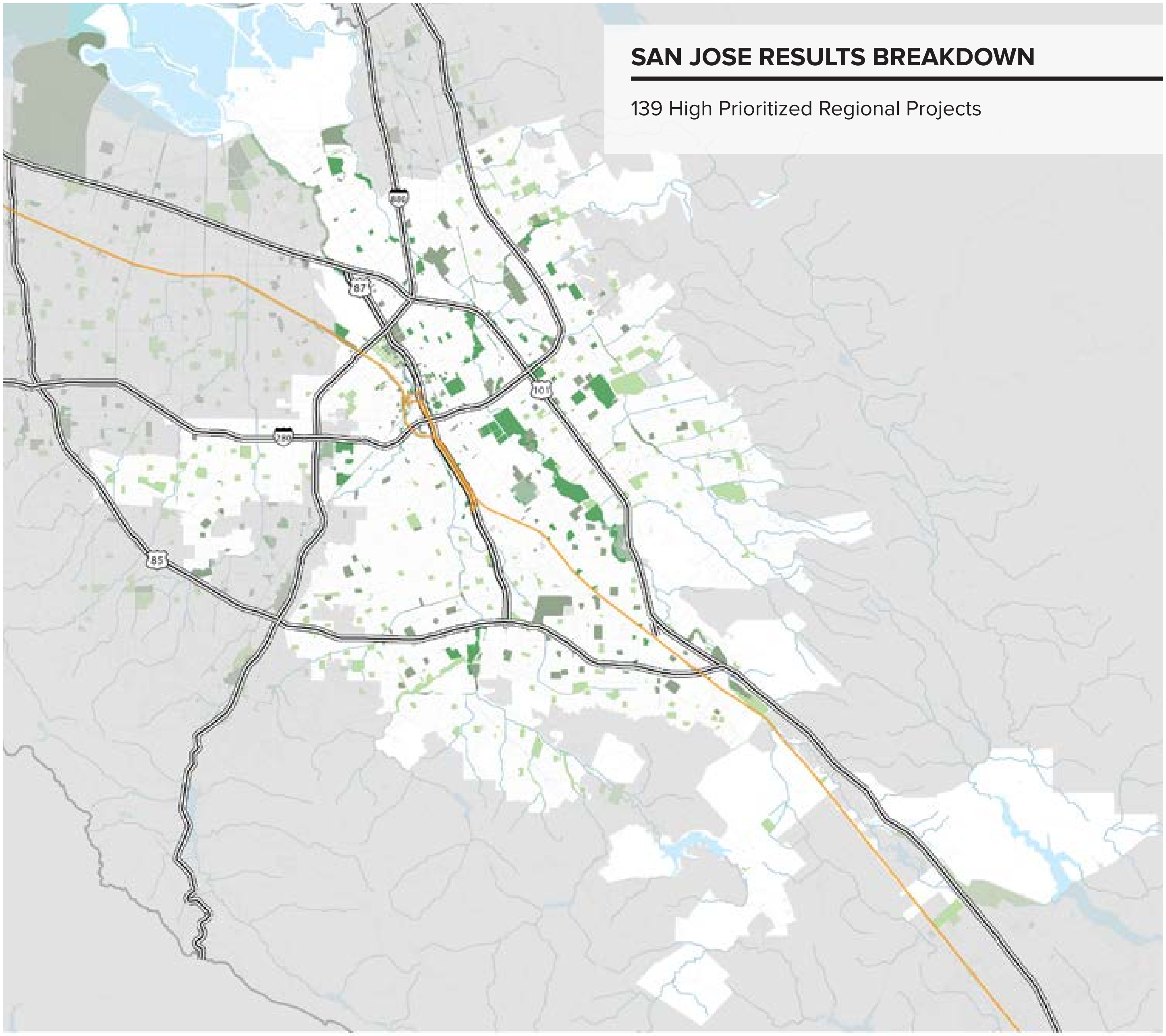


Figure 5-3. Prioritized Regional Project Potential Locations

LEGEND

- Bay
- Water Bodies
- Streams
- Streets
- Major Throughway
- Caltrain

SWRP Countywide Prioritized Regional Project Opportunities

- High
- Medium
- Low

Miles
0 1.5 3

N

5.3 San Jose-Specific GSI Prioritization

The San José-specific prioritization developed for the GSI Plan builds on the SWRP effort to refine, identify, evaluate, and prioritize potential GSI improvements. This city-specific prioritization process will continue to be refined over time as the City moves forward with implementing the GSI Plan to 2050. The goal of presenting the methodology herein is to document the criteria that led to the ranked GSI project opportunity list along with the tools needed to assess and prioritize future GSI opportunities. As with the SWRP, the prioritization is broken out between green street projects, LID retrofit projects, and regional projects. To properly weigh the criteria most critical to these project types, a slightly different prioritization process was developed for each and certain SWRP criteria were removed from consideration (e.g. DAC or MTC Community of Concern). However, the process follows a similar format of first evaluating stormwater benefits, then assessing constructability through interdepartmental coordination and refined utility constraint data, and finally overlaying co-benefit and project synergies to arrive at a refined prioritization ranking. An overview of the criteria and process that resulted in an updated prioritization is shown in Figure 5-4.

Bioretention at Brokaw Commons in San José

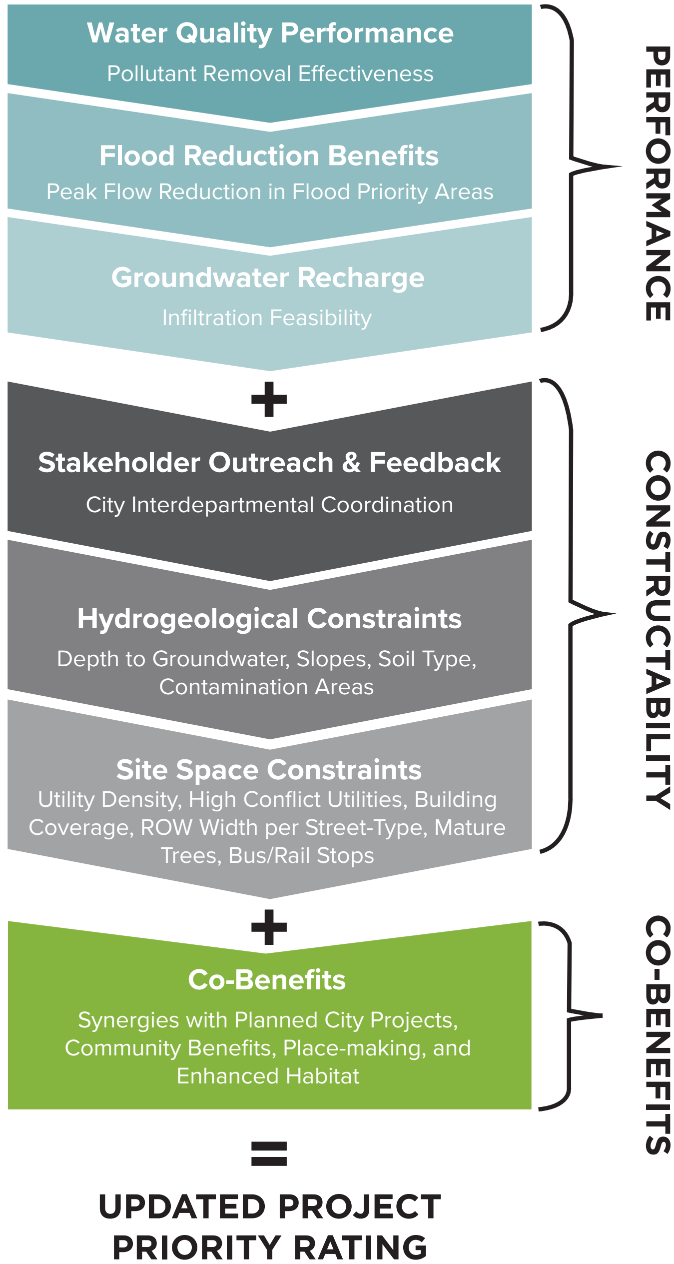


Figure 5-4. San José GSI Project Prioritization Considerations

5.3.1 Green Street Projects

The objective of the San José-specific green street prioritization process was to provide better granularity to the more than 29,000 street segments that were evaluated for green street opportunities in the SWRP prioritization, with each street segment representing a single block or approximately 300-feet of continuous roadway. Key new datasets, such as water quality spatial effectiveness results from preliminary RAA modeling output and expanded utility information to assess site space constraints, were leveraged to refine the scoring of the SWRP green street opportunities. The methodology is described herein and the results of the prioritization are presented within Chapter 6 GSI Citywide Strategy.

City of San José Green Streets Medallion Installed for Education and Outreach

A secondary objective of the prioritization was to create tools that visually convey the street rating results and can be used to support assessment of future green street opportunities as they arise. For this purpose, a series of maps were developed that demonstrate how performance, constructability, and co-benefit criteria combine to produce green street suitability ratings. First, separate maps of stormwater performance, geotechnical constraints, and site space constraints were developed by compiling numerous data layers that summarize overall technical suitability per street segment. The results of these maps were then overlaid with co-benefit and co-located project data to arrive at an updated opportunity rating map that reprioritizes the green street opportunities assessed in the SWRP. A summary of the methodology is presented in Figure 5-5 for green streets.

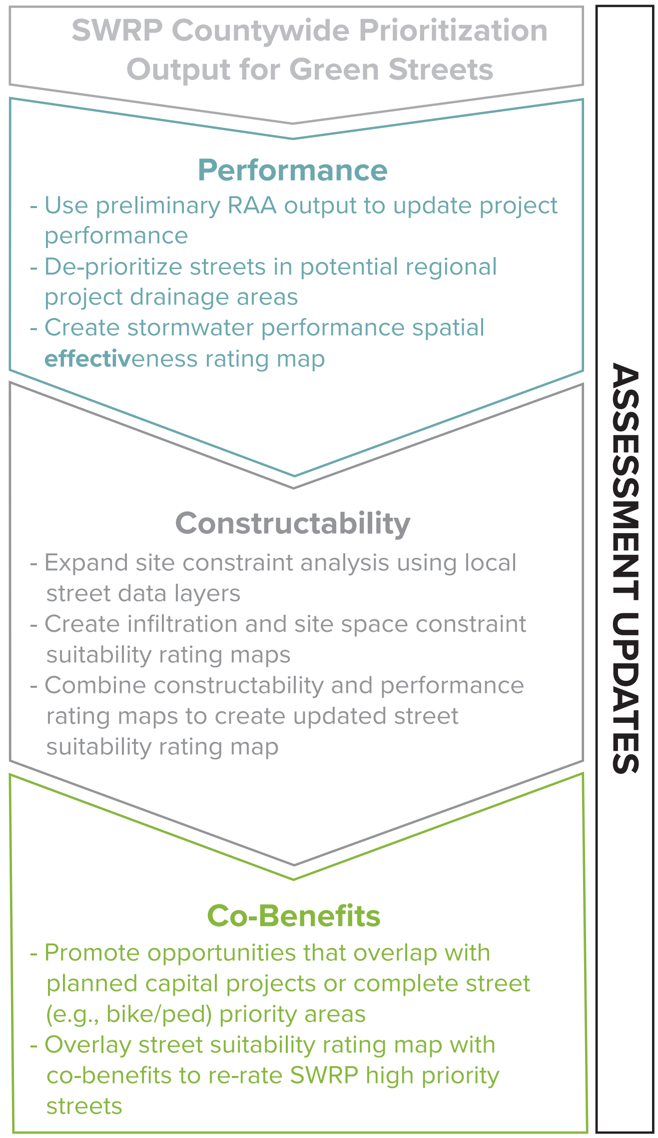


Figure 5-5. San José-specific Green Street Prioritization Process

The refined prioritization output enables the City to assess the potential impervious acres managed and resulting stormwater volume captured if a certain percentage of highly rated streets are retrofit as green streets. This potential is discussed further as part of the long-term citywide GSI strategy discussed in Chapter 6. Moreover, the suitability maps created for the prioritization can be used as a tool to assess street retrofits as collaboration opportunities arise. The prioritization criteria, as refined from the countywide prioritization, are presented in Table 5-4, and the rating maps are shown in Figure 5-6 through Figure 5-8. These maps, including the small inset maps, are provided in Appendix E with more resolution.

Table 5-1. Updated Green Street Prioritization Methodology

Metric	Points 0	1	2	3	4	5	W
STORMWATER PERFORMANCE							
Water Quality Effectiveness							
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Contains PCB Interest Areas	None			Moderate		High	2
Pollutant Removal per Acre Managed[1]	**None**	**Low**	**Moderately Low**	**Moderate**	**Moderately High**	**High**	**2**
Located Outside of Potential Regional Project Drainage Areas	**No**					**Yes**	
Groundwater Recharge Area							
Augments Water Supply	No	Opportunity for Capture & Reuse				Above Groundwater Recharge Area[3]	
Flood Reduction Effectiveness							
Within Flood-Prone Storm Drain Catchments	No			**Yes**		Yes	
Upstream of 10-yr Storm Flood Project Priority Areas[2]	**No**					**Yes**	
HYDROGEOLOGIC CONSTRAINTS (INFILTRATION FEASIBILITY)							
Hydrologic Soil Group		C/D		B		A	**2**
Groundwater Constraints	**In Contamination Area AND Depth to Groundwater < 10 ft**	**In Contamination Area OR Depth to Groundwater < 10 ft**		**Depth to First Groundwater 10 - 20 ft**		**Depth to First Groundwater > 20 ft**	
Slope (%)	> 5	5 ≥ X > 4	4 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X > 0	
SITE SPACE CONSTRAINTS (CONSTRUCTION FEASIBILITY)							
ROW Width by Street Class[4]		**Skinniest 33% by Class**		**Middle 33% by Class**		**Widest 33% by Class**	
Length Constraints per Block[5]		**Length Lost > 300 ft per 1,000 ft**		**Length Lost 200-300 ft per 1,000 ft**		**Length Lost < 200 ft per 1,000 ft**	
Utility Constraints[6]		**Multiple High Conflict Utilities**	**One High Conflict Utility or Water Main Length > 1,000 ft per 1,000 LF**	**Water Main Length 500 - 1,000 ft per 1,000 LF**	**Water Main Length 100 - 500 ft per 1,000 LF**	**Water Main Length < 100 ft per 1,000 LF**	
CO-BENEFITS & PROJECT SYNERGIES							
Co-Located With Another Planned Project[7]	No			**Priority Street for Condition Improvements**	**Priority Street for Safety or Bike/Ped Improvements**	**Overlaps Near-Term Streetscape Capital Project**	**2**

Notes: W = weighting factor, **Bold** = added criteria relative to SWRP. Gray text = SWRP criteria removed from San José-specific analysis. ft = feet, LF = linear feet

1. Percent imperviousness is superseded by pollutant loading per impervious acre managed. Pollutant removal effectiveness is estimated by the runoff depth per subwatershed during the critical bacteria storm.
2. Draft priority areas based on Storm Sewer Master Plan planned conveyance projects for 10-year Storm. Note, however, the Storm Sewer Master Plan model is being refined and updated and it is possible that some conveyance project locations/areas may change.
3. In recharge area and not above groundwater contamination area.
4. Right-of-way width of all streets divided into thirds by street class. The average (middle third) right-of-way width for separated secondary streets (A35) is 125'-133', for separated local neighborhood streets (A41) is 89'-105', and for major local neighborhood streets (A40) is 60'-88'.
5. Length constraints evaluated: laterals based on parcel density (2' per building), transit stops (10' per stop), curb ramps (4' per ramp), 24" diameter trees (2' buffer around tree), local bridge or overpass (60' per bridge), fire hydrants (4' per hydrant).
6. High conflict utilities included: major gas transmission mains, rail lines, and tunnels. If multiple water mains are located on a street, length equals total aggregate length.
7. Three-Year Pavement Plan used as indicator of priority streets for condition improvement needs. Vision Zero San José and San José Bike Plan 2020 used as indicators of priority safety, bike, and pedestrian needs. Near-term capital projects are based on the list provided for SWRP plus additional near-term streetscape projects, including Better Bikeways for Central San José.

Stormwater Performance

Stormwater performance effectiveness, shown in figure 5-6, was evaluated to prioritize projects in strategic locations that have the potential to improve water quality most cost-effectively, while also contributing to other stormwater capture benefits, such as flood mitigation and groundwater recharge.

Water Quality Effectiveness - Using model output from the RAA, areas were identified that are more effective for meeting water quality goals. Green street projects in these subwatersheds are therefore prioritized. Whereas, streets that are within the drainage area of potential regional stormwater management projects were given lower priority as the stormwater runoff from these streets will be captured and managed downstream. The water quality effectiveness submap shows the RAA results and PCB interest areas. It also indicates the drainage area of the potential regional projects.

Groundwater Recharge Area - Streets within groundwater recharge areas were given priority over streets outside of these areas since green street projects can provide infiltration to groundwater.

Flood Reduction Effectiveness - Streets within flood prone areas and within the watershed identified in the Storm Sewer Master Plan as priorities for conveyance improvements during the 10-year storm event were given additional prioritization points. Green street projects in these watersheds can provide flood reduction benefits.

Hydrogeologic Constraints (Infiltration Feasibility)

Shown in Figure 5-7, available hydrogeology information was used to give lower priority to streets with a high probability of constraints that would make infiltration infeasible. This includes poor draining soils, bedrock, high groundwater levels, and contaminated soils.

Hydrologic Soil Group - HSG soil types were used to identify and prioritize locations with well draining soils with the assumption that GSI projects in these areas provide better performance and are more cost effective than projects in areas with poor draining soils.

Groundwater Constraints - Depth to first groundwater was used to identify streets likely to have shallow groundwater that would make grading and infiltration for green streets infeasible. Additionally, any streets that fall within a GeoTracker site were given lower priority due to the risks associated with infiltrating at these sites. GeoTracker sites are areas with hazardous substances or waste discharges from underground storage tanks that the State Water Board tracks.

Slope - Slopes exceeding 5 percent make designing green stormwater infrastructure along streets less cost effective due to the need to excavate deeper to account for grade and the need to install check dams and energy dissipation systems for managing flow. Thus, streets that fall within steeper slopes were given a lower priority.

Green Street with Bioretention and Permeable Pavement on Park Avenue

Site Space Constraints (Construction Feasibility)

Constructability, as shown in Figure 5-8, was evaluated to identify streets that have adequate space available for a green street project. Lack of suitable space for GSI is a common constraint with green street implementation. Therefore, the prioritization process included additional analyses relative to the SWRP prioritization to refine this assessment. The constructability criteria accounts for width constraints, length constraints, and utility constraints within the right-of-way.

Width Constraints - The width of the right-of-way was calculated for each eligible street segment. These widths were assessed by street typology (e.g., primary, secondary/collector, or local) to identify streets that have a wide right-of-way relative to their typology. The widest third of streets in each street typology were given a higher priority and the skinniest third of streets in each street typology were given a lower priority. This identifies street segments that likely have adequate space between the driving lane edge and the edge of the right-of-way, where green stormwater infrastructure can be located.

Length Constraints - Right-of-way length constraints and utility constraints were also used to assess likely conflicts for green stormwater infrastructure implementation. Length constraints included trees per block, fire hydrants, and transit stops.

Utility Constraints - Utility conflicts were focused on shallow, large utilities that are more challenging to relocate as part of GSI implementation, such as water mains and major gas transmission mains. This data, where available, was coupled with other major utility constraints such as rail lines, tunnels, and major gas transmission lines to arrive at an overall utility constraint rating. The costs associated with designing around these utility conflicts is often prohibitive. Streets with these conflicts are therefore given a lower priority.

Technical Street Suitability

Each street segment was given a technical suitability score by combining the output from the three above categories: stormwater performance, hydrogeologic constraints, and site space constraints. Points and weighting were applied to each street segment as defined in Table 5-4. Street segments with a score of 35 or above were given a high or medium-high technical suitability rating. Street segments with a score below 25 were given a low technical suitability rating. These projects may be infeasible due to constructability constraints; however, due to the uncertainty and coarseness of the available hydrogeologic and space constraint data these streets may be found to be feasible upon a more detailed investigation of site soils and utilities. As future street improvement projects are proposed, the green street technical suitability map can be referenced as a planning level tool to assess the potential for GSI integration. A map showing the street technical suitability results is presented in Figure 5-9.

Green Street with Bioretention

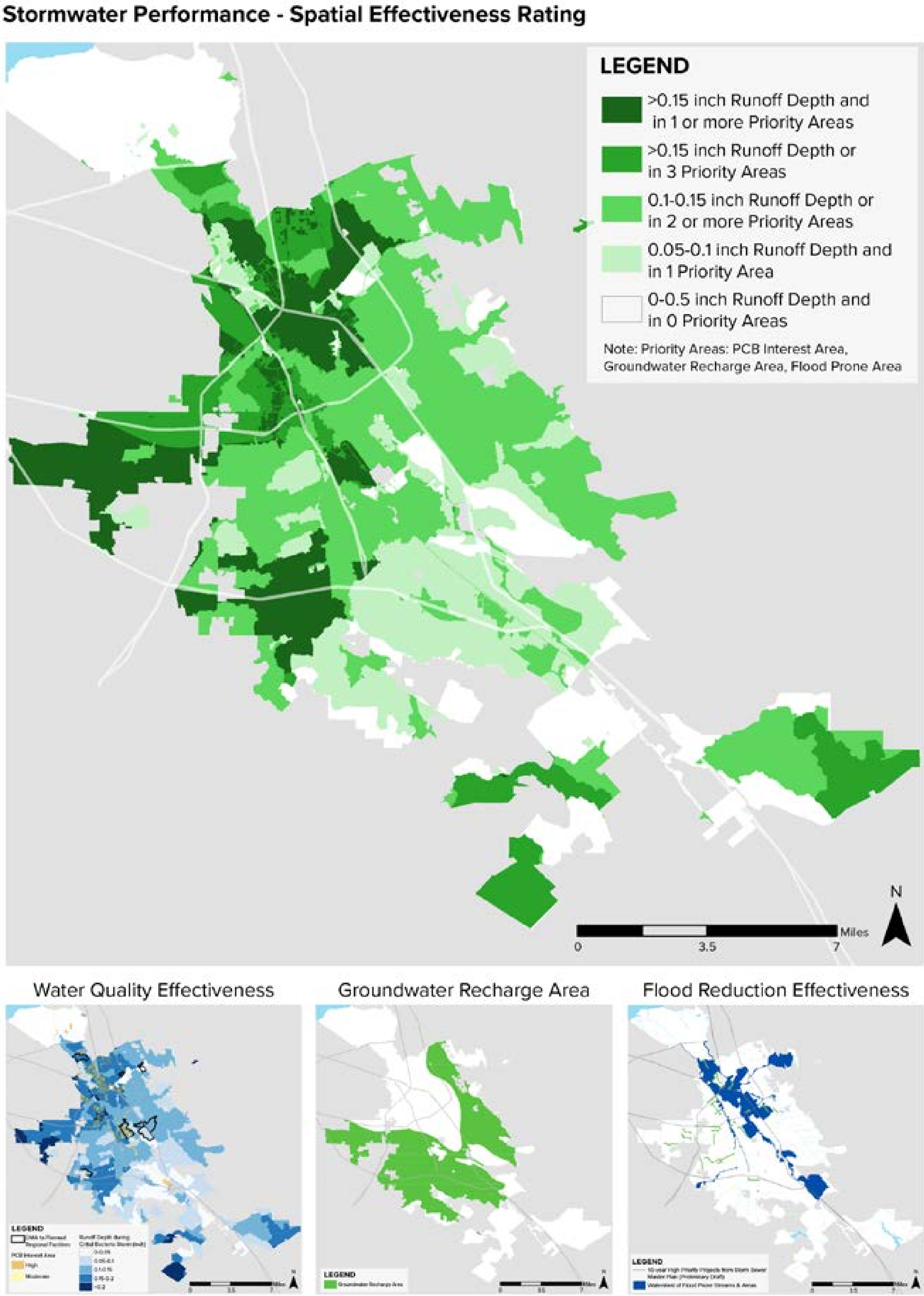


Figure 5-6. Stormwater Performance: Spatial Effectiveness Rating Map

Refer to Appendix E for enlarged maps

Hydrogeological Constraints - Desktop Suitability Rating

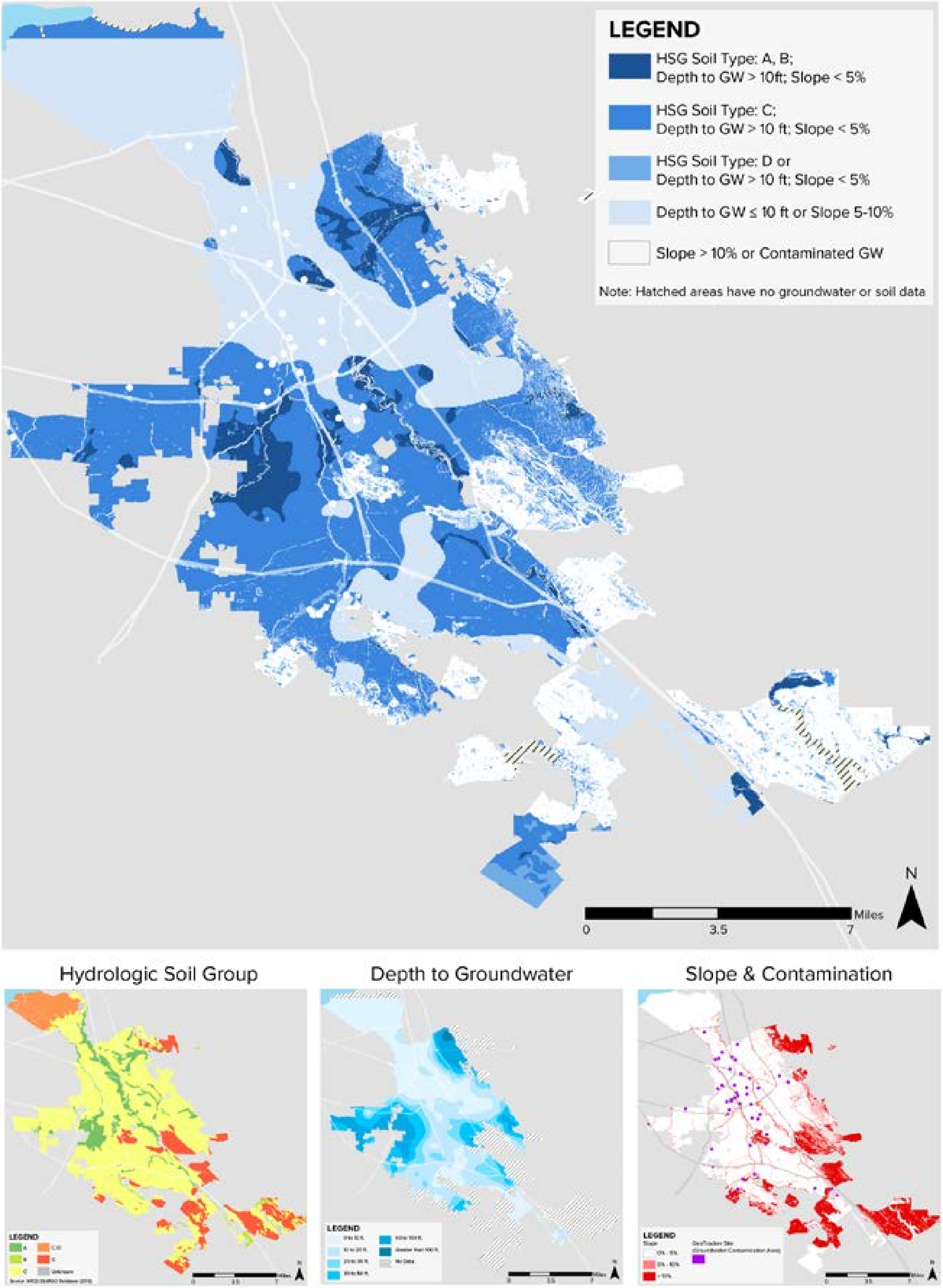


Figure 5-7. Hydrogeological Constraints: Desktop Suitability Rating Map

Refer to Appendix E for enlarged maps

Site Space Constraints - Desktop Suitability Rating

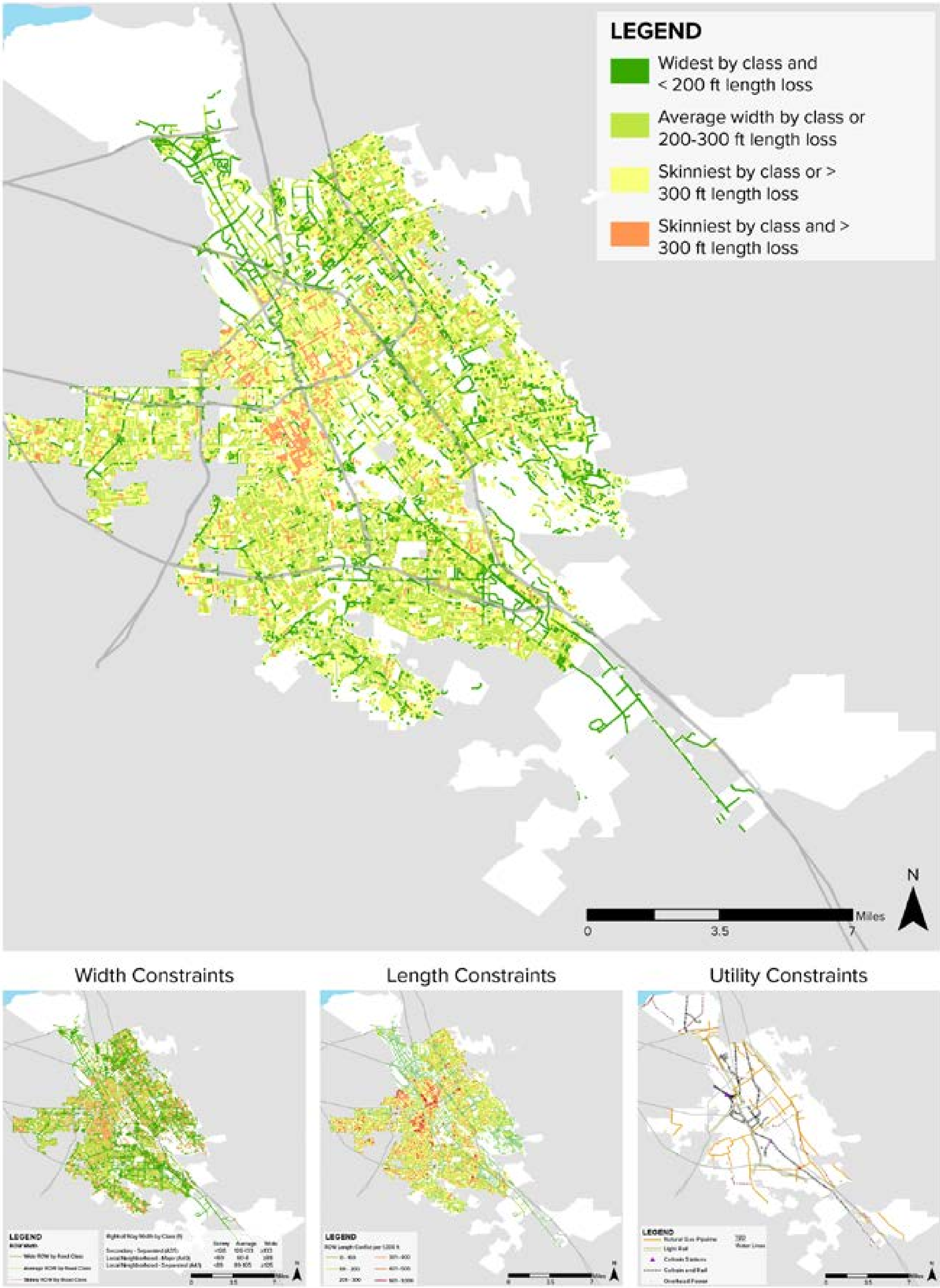


Figure 5-8. Site Space Constraints: Desktop Suitability Rating Map

Refer to Appendix E for enlarged maps

Technical Suitability

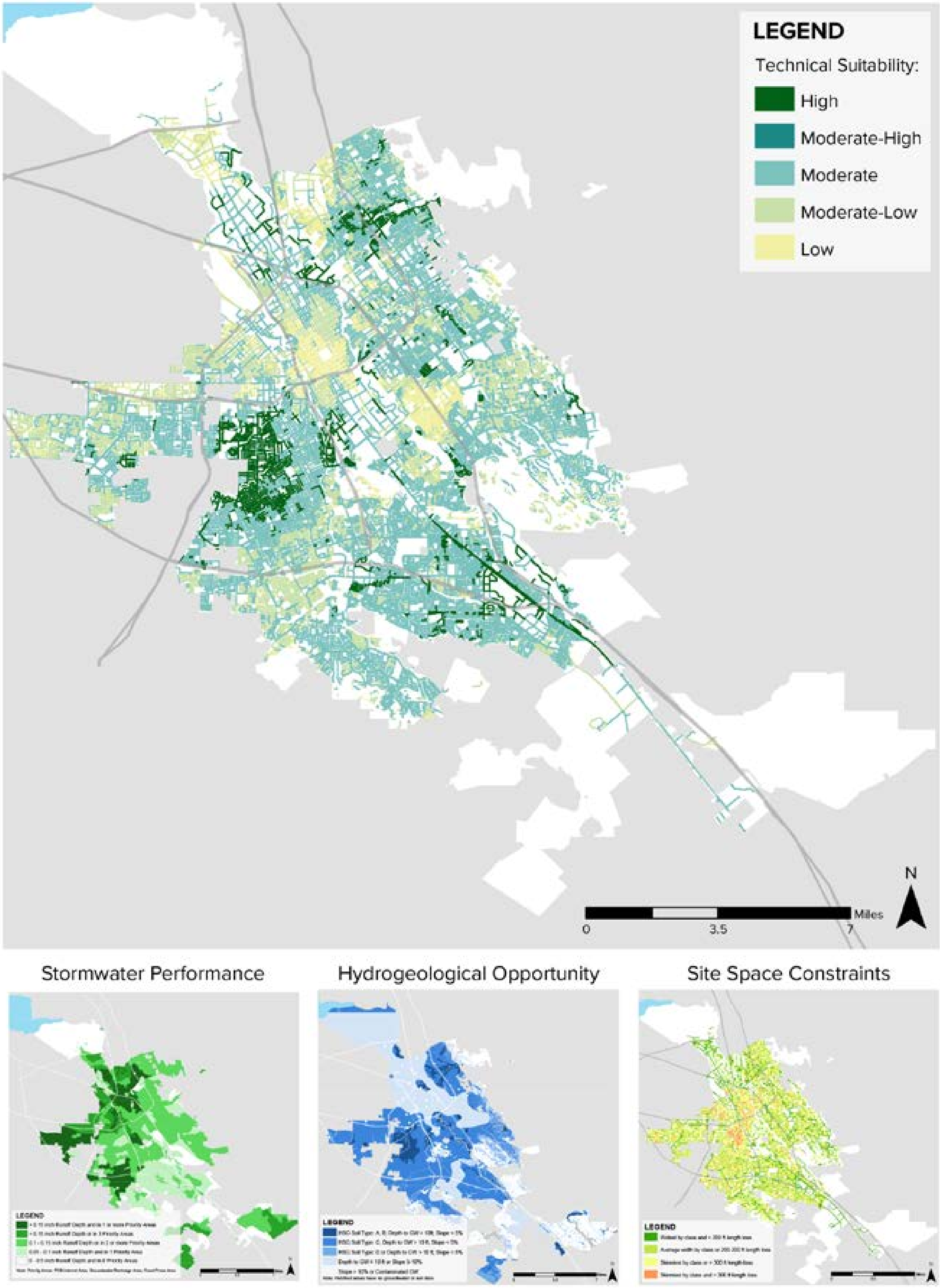


Figure 5-9. Technical Suitability Rating Map

Refer to Appendix E for enlarged maps

Project Synergies and Co-Benefits

Green street improvements are often co-located with other planned street improvement projects to provide synergistic benefits such as bike lanes, pedestrian improvements, traffic calming, and green corridors. The current project synergy and co-benefit data layers are presented in Figure 5-10. Although this map will continue to be updated throughout the life of the GSI Plan, for the purpose of creating an initial prioritization ranking of all street segments, the technical street suitability results were overlaid with the co-benefits and co-located project data to arrive at final updated project opportunity scores. These updated prioritization results are presented in Chapter 6 as part of establishing the citywide GSI strategy.

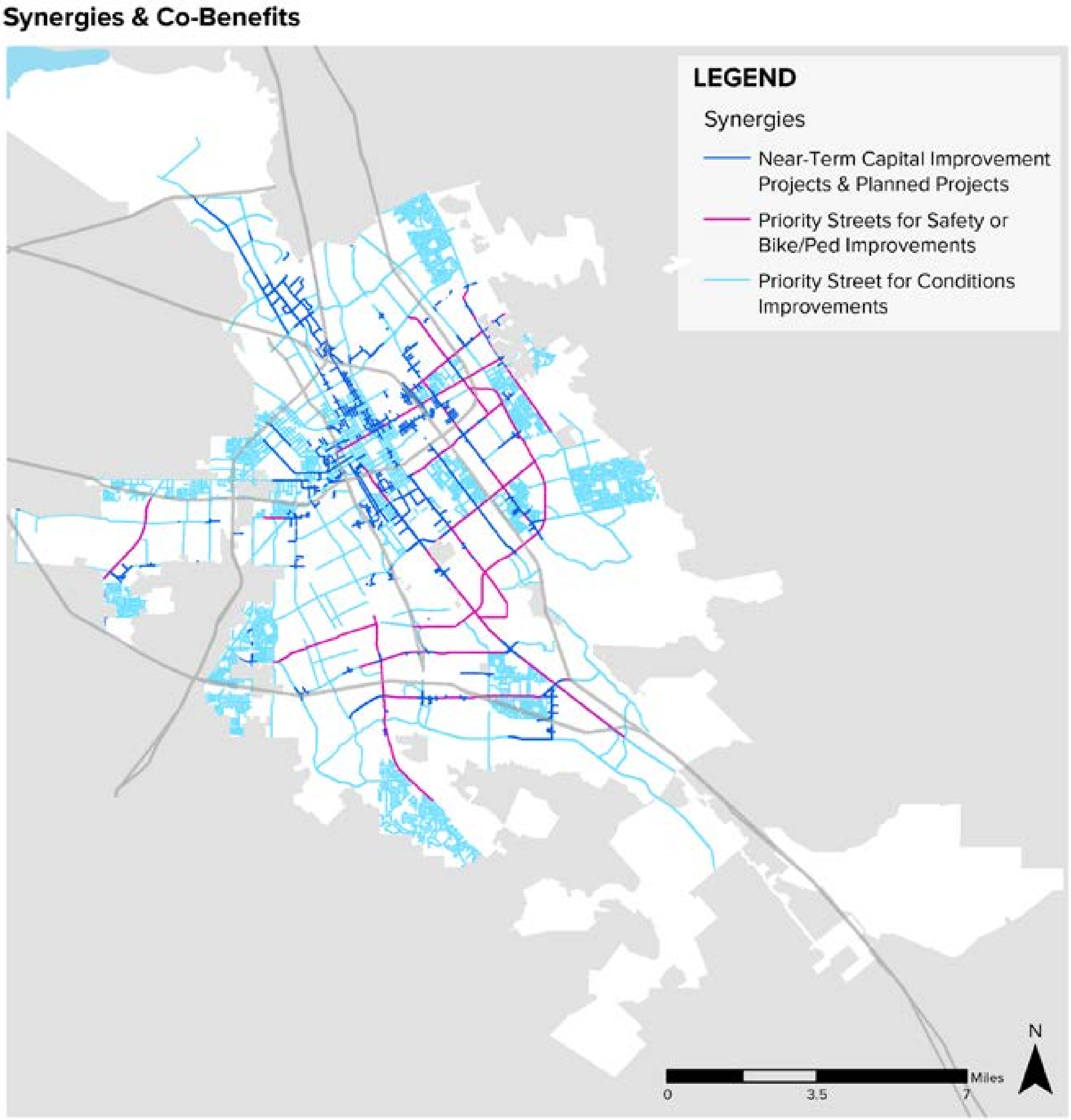


Figure 5-10. Project Synergies and Co-Benefits

5.3.2 LID Retrofit Projects on Public Parcels

The prioritization results from the SWRP process identified close to 200 high priority LID retrofit opportunities within San José which cover more than 1,800 acres of public parcel land and approximately 950 acres of impervious cover. These parcels mainly include public buildings, schools, parks, parking lots, and open spaces. These parcels include land owned by City of San José, Santa Clara Valley Transportation Authority, Santa Clara County, State of California, and others.

This SWRP prioritization output will support the City's current annual process of reviewing planned capital projects to assess LID retrofit opportunities. During this process, the Stormwater Performance and Hydrogeological Constraint rating maps described above for evaluating green streets can be used to further inform potential opportunities and constraints for LID retrofit opportunities.

Bioretention in Park Parking Lot

5.3.3 Regional Projects

The prioritization results from the SWRP process produced 139 high priority potential regional project retrofit opportunities within San José. Using SCVURPPP's Santa Clara Basin SWRP online map and accompanying database, potential regional project locations were identified within San José and further evaluated using spatial information for each site. An initial set of potential project locations from the 139 high priority sites identified in the SWRP were evaluated using the methods described in this section. When SWRP-identified high priority locations were determined to be infeasible based on the initial analysis, the City used the same process to evaluate medium- and low-priority locations identified by the SWRP. A critical parameter within this re-evaluation of regional project opportunities was the estimated drainage area that could be routed to the site. An overview of the process used to select the preferred regional project locations is shown in Figure 5-11.

From the top prioritized regional project locations identified in the SWRP, each site was evaluated further to account for stormwater performance, constructability, and co-benefits. These sites were individually evaluated to estimate the potential drainage area based on the storm drain network found in the City's Utility Viewer. Sites with a drainage area exceeding 100 acres were promoted as potential candidates for regional projects. Of the candidate regional project sites, those that have predominately A or B-type soils were identified. These candidate sites were further prioritized based on space available. Sites that could accommodate a regional stormwater facility without impacting existing park use were prioritized. Sites that were constrained but had adequate groundwater separation were also prioritized as potential subsurface storage sites.

To verify the availability of space and ensure current use was not impacted, several criteria were evaluated including estimated driplines of mature trees, surrounding land use, park size, recreational use types, and current understanding of community needs. The Park Condition Assessment (PCA) score was used to identify parks that could benefit from a project that could provide an amenity or that could be coupled with additional park improvements. Sites that were recently improved or are scheduled for improvements were deprioritized, i.e., if more than $500,000 was spent on improvements as part of capital improvements in the last five years or future planned improvements cannot align with a stormwater project. These prioritized candidate sites were further refined based on feasibility as determined by land management and status of contracts and lease agreements.

The candidate regional project sites that were selected and prioritized as a result of this evaluation are included in the citywide GSI strategy presented in Chapter 6.

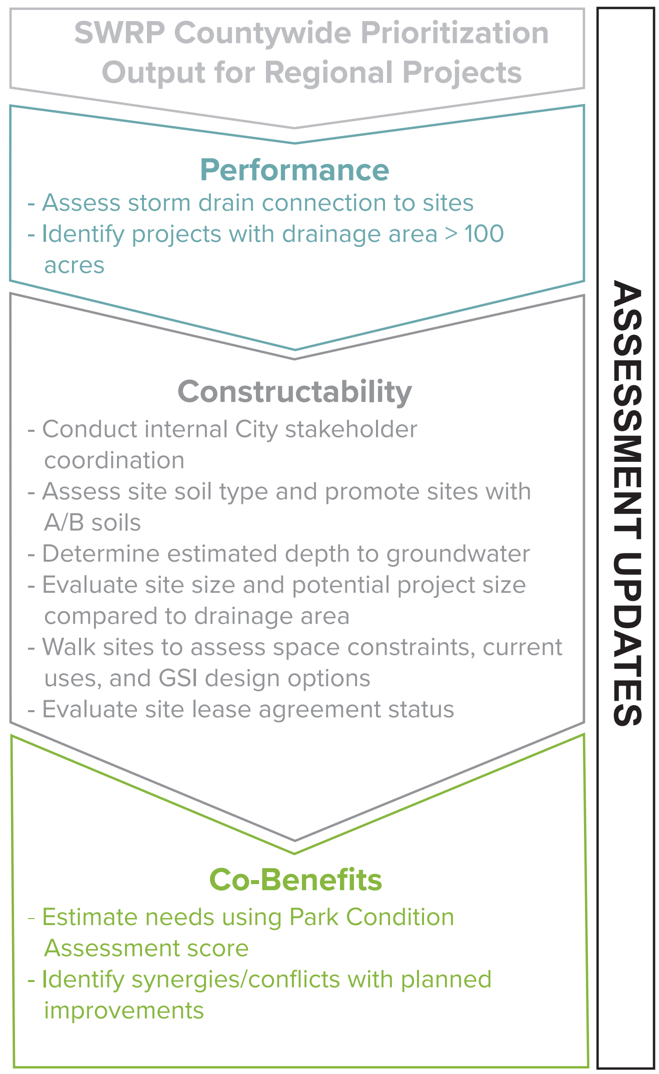


Figure 5-11. San José-specific Regional Project Prioritization Process

City of San José

6.0 GSI CITYWIDE STRATEGY

This chapter defines water quality goals based on the results of the RAA and presents the results of city-specific prioritization to demonstrate how GSI project types (i.e., existing GSI projects, C.3 regulated projects, regional projects, green streets, and public-parcel LID retrofits) can combine to meet these goals by 2040 and 2050.

IN THIS CHAPTER

6.1 GSI Strategy Overview

The GSI Plan represents a long-term City vision to transition from a gray stormwater collection network to an integrated system that includes green and gray infrastructure. The goal of the integrated green-gray system is to achieve water quality goals cost-effectively, while maximizing overall City benefits. Once completed, the City's Storm Sewer Master Plan will lay out the planned gray projects and objectives. The gray improvements—such as pipe upsizing and pump station improvements—increase overall system capacity and ensure structural reliability of the collection network. In complement, the GSI Plan lays out the strategy for green improvements. The green—or GSI—reduces or treats runoff prior to it entering the gray system. In this way, the gray and green work together to ensure the best possible stormwater management system that minimizes flooding and reduces pollutants to receiving waters.

Meeting San Francisco Bay MRP water quality goals for PCBs and mercury by 2040 and Consent Decree goals for Fecal Indicator Bacteria (FIB) reduction to streams by 2050 requires a multifaceted GSI strategy. The appended RAA evaluates the costs and benefits of many different potential GSI strategies. Based on the results of this analysis, a long-term GSI implementation strategy is presented in this chapter that identifies a recommended mix of projects to meet the 2040 and 2050 water quality goals. The GSI project types used in the strategy include those prioritized in Chapter 5—regional projects, green streets, and public-parcel LID retrofits—as well as early implementation GSI projects and C.3 new and redevelopment regulated projects. Early implementation projects are GSI projects that have already been implemented by the City or were already scheduled for implementation prior to development of the GSI Plan. C.3 regulated projects are those implemented as part of new development and redevelopment to meet the post-construction stormwater treatment requirements of the MRP and City Council Policy 6-29. An example of how these GSI project types build on each other within the strategy to achieve stormwater capture goals is displayed in the graph of Figure 6-1 and the example maps shown in Figure 6-2 and 6-3.

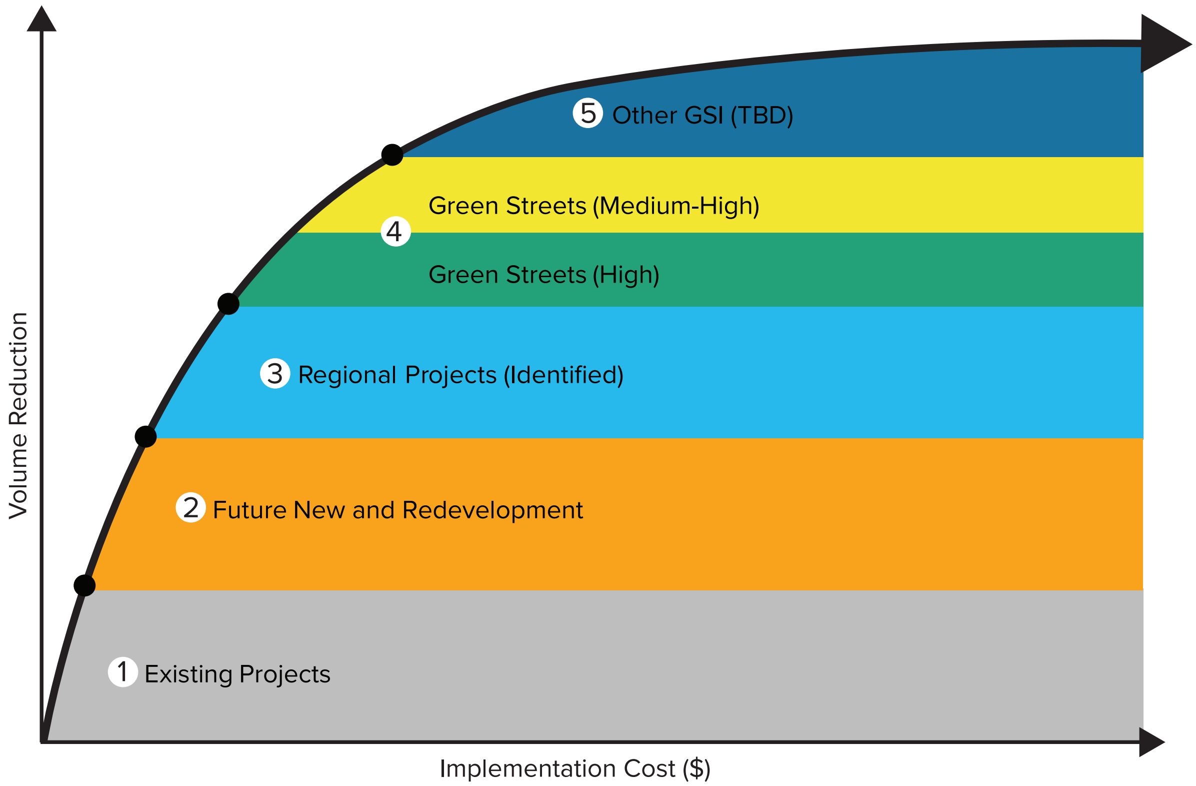


Figure 6-1. Multifaceted GSI Strategy

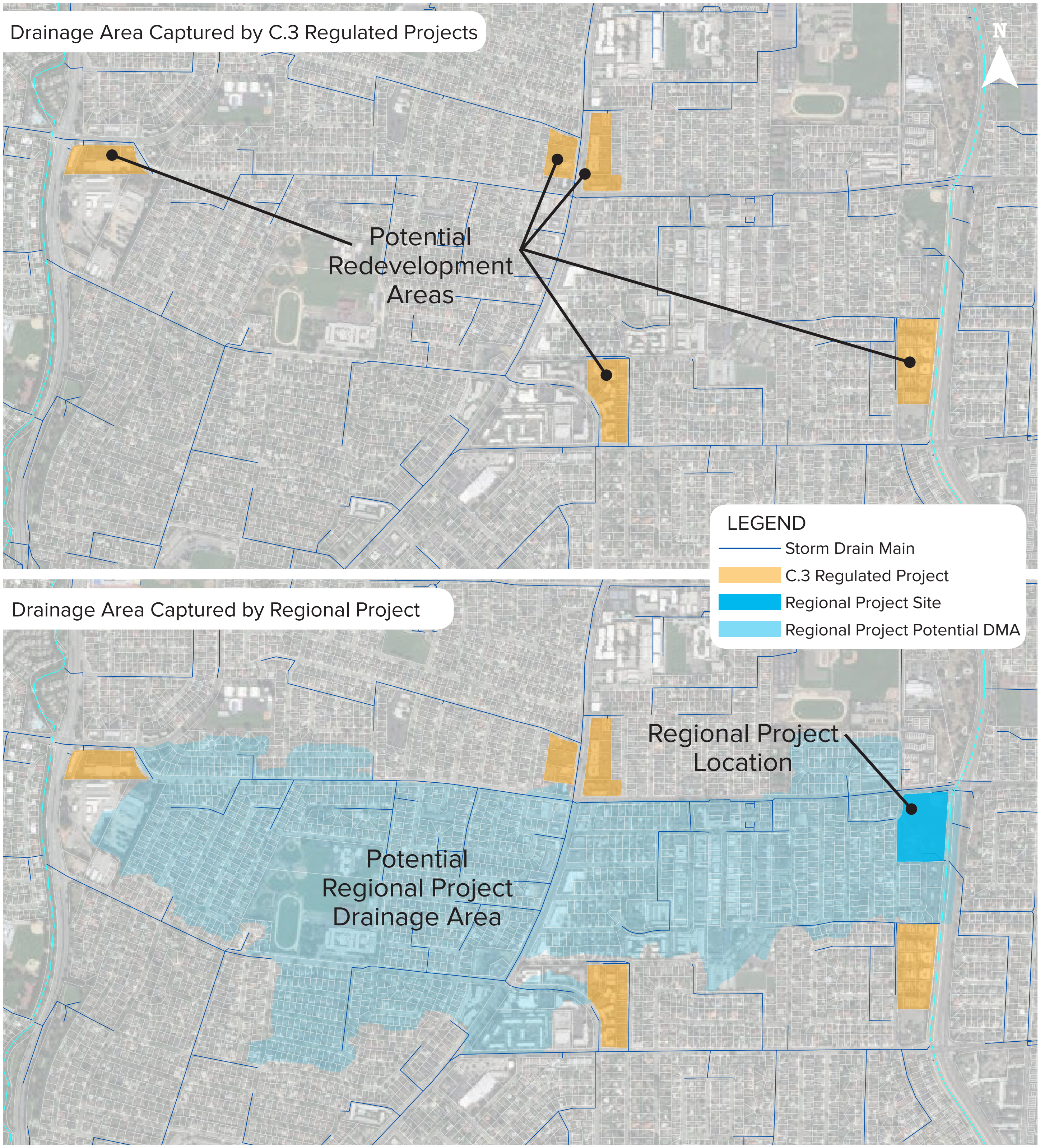


Figure 6-2. Graphical Representation of Example Drainage Areas Captured by GSI Project Types

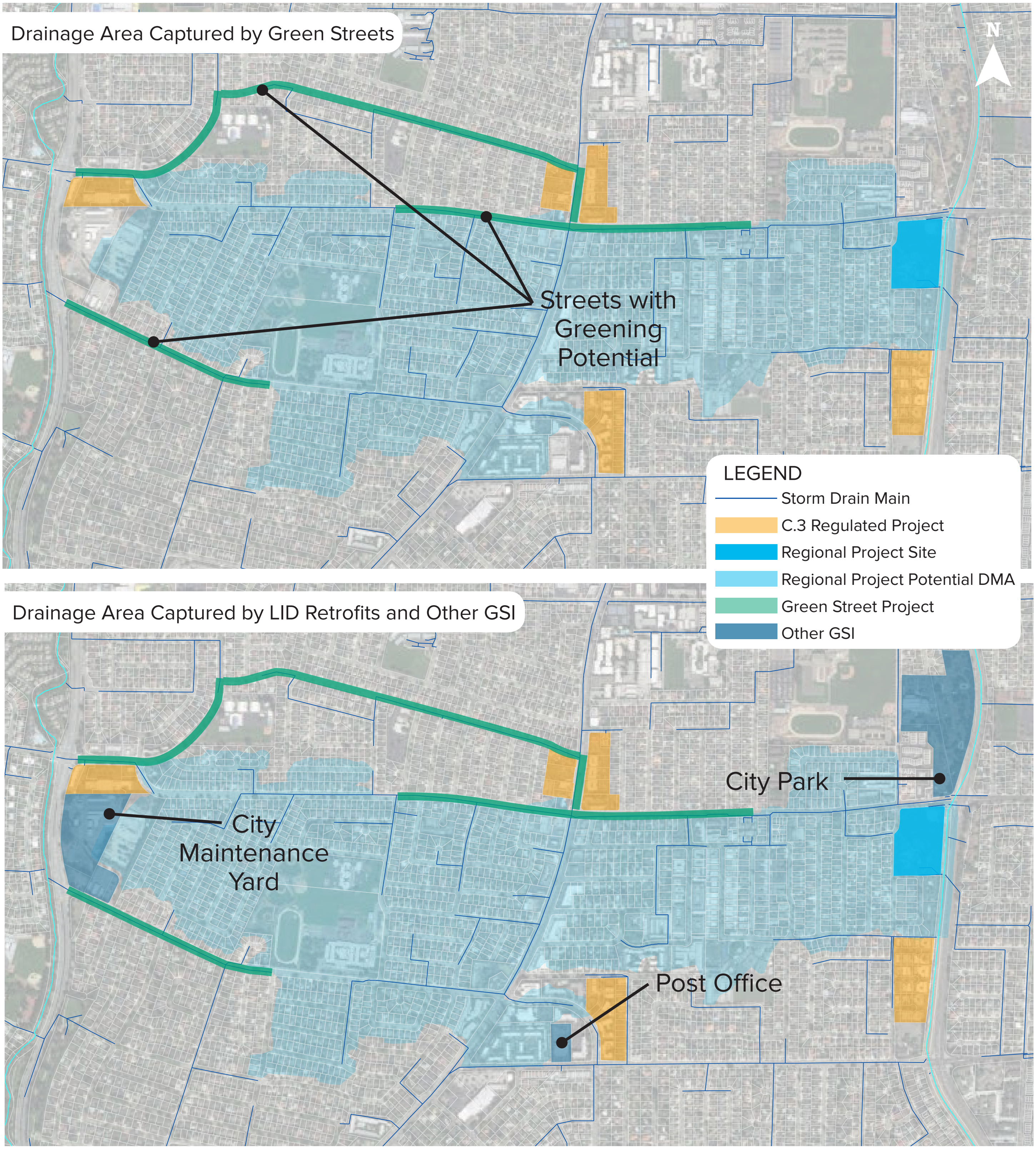


Figure 6-3. Graphical Representation of Example Drainage Areas Captured by GSI Project Types

The ultimate objective of the selected project mix is to address the citywide stormwater volume capture goal, which was established through the RAA to represent 833 acre-feet of volume associated with the 24-hour critical bacteria storm (see Appendix B). As the stormwater volume capture goal for FIB is greater than the PCB and mercury (Hg) goals, attainment of the FIB goal means that PCB and Hg objectives will also likely be met. Each subsequent section in this chapter presents the potential stormwater capture by each of the GSI project types. These sections define the results of project prioritization—or in the case of private projects, the results of long-term projections of new and redevelopment—to quantify the potential impervious area managed by GSI and the progress over time toward reaching the capture goals.

The citywide strategy presented in this chapter forms the core of the GSI Plan and enables the City to establish the near-term steps for GSI Plan implementation, as defined in Chapter 7. The recommended strategy was selected based on achieving the stormwater capture goals as cost-effectively as possible, while maximizing multiple benefits. For a more detailed cost-benefit analysis of the various project combinations evaluated, refer to the RAA in Appendix B. Note, as the GSI Plan is a living document that forecasts over a 30-year horizon, this initial strategy to achieve water quality objectives can and likely will be refined through an adaptive management process.

6.2 Existing & Early Implementation Projects

Since the issuance of the MRP, several GSI projects have already been implemented and contribute towards the FIB reduction goal. Existing and early implementation projects include both private development projects regulated under Provision C.3 of the MRP (implemented through City Council Policy 6-29) and several City projects where GSI has either been implemented or scheduled for construction in the near term.

6.2.1 Existing C.3 Regulated Projects

Provision C.3 requires new development and redevelopment projects that create and/or replace defined amounts of impervious surface to implement post-construction control measures to address stormwater runoff generated on-site and comply with other applicable elements of the provision. These projects are known as "C.3 Regulated Projects" or "regulated projects." Regulated projects include private development or redevelopment projects, such as multi-family residential buildings, commercial office buildings, or shopping plazas, as well as public projects, such as libraries, police stations, and parking lots, exceeding the impervious surface thresholds identified in the MRP. For most regulated projects, post-construction control measures must include LID site design, source control, and treatment measures, such as bioretention, pervious pavement, and infiltration trenches. These are the same types of facilities described in the GSI Plan for implementation on nonregulated projects on public parcels and right-of-ways. GSI facilities on regulated projects help achieve multiple benefits within city watersheds and are considered part of the City's total inventory of GSI facilities.

Over the last 10 years, approximately 2,000 acres of development in the City have been subject to the Provision C.3 regulations, resulting in more than 2,000 installations of bioretention areas, pervious pavement, and other GSI facilities. The City tracks the locations of these facilities and conducts an operation and maintenance verification inspection program to ensure that they are maintained properly. The City will continue to require future regulated projects to incorporate appropriate GSI facilities, as part of the City's long-term GSI implementation strategy.

6.2.2 Existing & Early implementation City Projects

Some street improvement projects already planned for design and construction can be modified to incorporate GSI in addition to or in lieu of traditional drainage infrastructure to achieve multiple benefits while helping reach water quality goals. The City actively looks for these types of opportunities, which has resulted in several green street projects being constructed and more scheduled for implementation. These existing and early implementation green street projects shown in Figure 6-5 include:

- Martha Gardens Green Alleys (Completed)
- Park Avenue Green Avenue Pilot Project (Completed)
- Chynoweth Avenue Green Street (Completed)
- Horace Mann and Washington Neighborhood Green Alleyways Improvements (In Construction)
- San Carlos Safety Improvement Project (Scheduled for design)

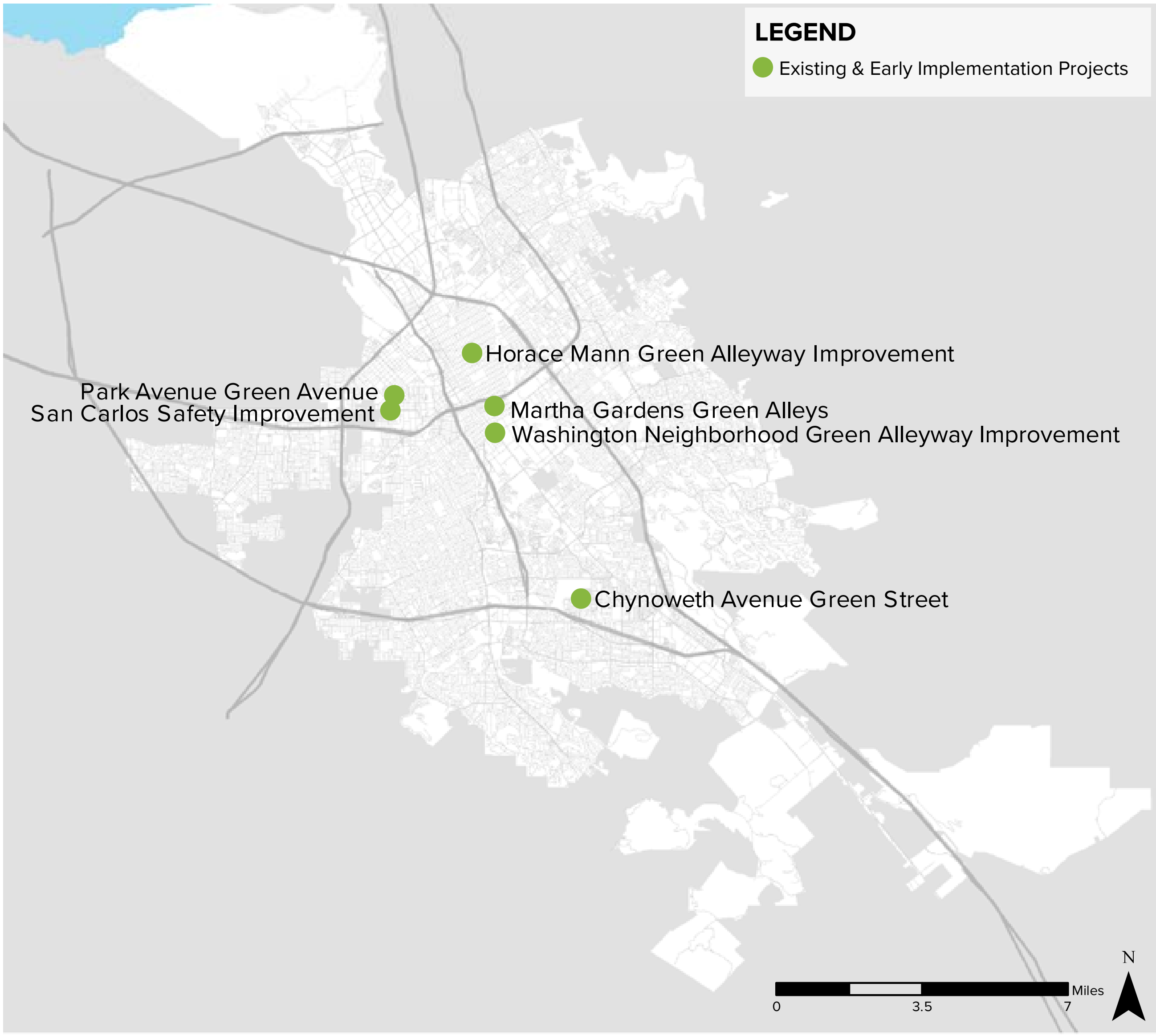


Figure 6-4. Map of Existing and Early Implementation Projects

6.2.3 Martha Gardens Green Alleys

The Martha Gardens Green Alleys Pilot Project is located immediately south of downtown and Interstate 280 in the Spartan-Keyes neighborhood and includes three blocks of alleys running from the project area terminus at Interstate 280 to Martha Street between Second and Third streets. The Martha Gardens Green Alleys are situated in a residential neighborhood that is characterized by single-family Victorian homes, many of which have intact carriage houses along the rear alleyway.

Prior to the project, the three blocks of alleys had deteriorating pavement or were unpaved, creating hazards for pedestrians and cyclists and generating dust and sediment. They lacked standard drainage infrastructure, and during the rainy season, stormwater collected sediments which flowed or tracked onto adjoining streets where the water drained to the storm sewer and discharged to the Guadalupe River.

By retrofitting three blocks of existing alleyways with green stormwater infrastructure features, the Martha Gardens Green Alleys Pilot Project eliminated sediment sources and reduced stormwater runoff by infiltrating stormwater from urban hardscape through porous pavers into underground infiltration trenches. Stormwater from approximately 2 acres of urban development drains through approximately 5,000 square feet of porous pavers into underground infiltration trenches and dry wells, thereby reducing the volume and rate of runoff discharged to the local storm drain system and ultimately the Guadalupe River. The project eliminated approximately 35,000 square feet of sediment sources by replacing deteriorated asphalt in the alleys with a durable surface of high albedo "green concrete" that drains to the infiltration devices.

Project construction took place from April through August in 2015. The $1.4 million project was funded through a combination of Proposition 84 Stormwater Grant funds and a funding match provided by the City of San José.

Figure 6-5. Martha Gardens Green Alley – Before and After

6.2.4 Park Avenue Green Avenue Pilot Project

The Park Avenue Green Avenue Pilot Project is located west of downtown San José, in the Shasta-Hanchett Neighborhood, and spans from University Avenue to Sunol Street along Park Avenue. The project was planned and constructed in conjunction with the City's Park Avenue Multimodal Improvements Project to install new bicycle lanes, improve sidewalk access, and narrow traffic lanes.

The Park Avenue Green Avenue Pilot Project retrofitted the street to capture, store, and infiltrate runoff at its source. This project demonstrates how stormwater management facilities can be integrated with pedestrian and cyclist safety improvements. The project installed bioretention areas and permeable pavement at four intersections, spanning approximately 1.4 miles. Stormwater from approximately 1 acre of urban development drains through approximately 5,500 square feet of bioretention divided into seven different cells. Permeable pavers at three of the intersections reduce the amount of impervious surface by approximately 2,800 square feet and provide rainwater storage and filtration. The project replaced 8,300 square feet of impervious surfaces along this main thoroughfare.

The $1.3 million project was funded through a combination of Proposition 84 Stormwater Grant funds and a funding match provided by the City of San José. The Proposition 84 Stormwater Grant Program awarded $857,551 in grant funds and the City of San José provided $459,973 in match funds. Project construction began in January 2017 and was completed in October 2017.

Figure 6-6. One of the Bioretention Areas Along Park Ave – Before and After

6.2.5 Chynoweth Avenue Green Street

The Chynoweth Avenue Green Street Project is located along a neighborhood street in South San José bordered by Martial Cottle Park to the north and residential single-family homes to the south. The project area runs along Chynoweth Avenue, spanning from immediately east of Canoas Creek to Snell Avenue. The goal of this green stormwater infrastructure project was to provide treatment to previously untreated flows conveyed on City streets by integrating green stormwater infrastructure methods into traffic and safety improvements. The project installed stormwater bioretention area bulb-outs between newly installed street parking for the adjacent county park and constructed a median separating two lanes of travel.

The project involved the reconstruction of a residential street to eliminate excess lane width while constructing seven new bioretention areas on the northern side of the street to treat stormwater runoff from approximately two acres of urban development. The project created approximately 5,600 square feet of bioretention areas, installed approximately 19,500 square feet of porous asphalt sidewalk, planted 17 broad-leaf evergreen trees, and eliminated approximately 40,000 square feet of existing impervious pavement and a barren dirt median that previously contributed sediment to the storm drain system.

The $2.2 million project was funded through a combination of Proposition 84 Round 2 Integrated Regional Water Management (IRWM) Implementation Grant funds and a funding match provided by the City of San José. The Proposition 84 Round 2 IRWM Implementation Grant Program provided approximately $1,977,881 in grant funds and the City of San José provided approximately $235,426 in match funds. Project construction began in May 2017 and was completed in February 2018.

Figure 6-7. Chynoweth Avenue Bioretention

6.2.4 Horace Mann & Washington Neighborhood Green Alleyways Improvements

The Horace Mann and Washington Neighborhood Green Alleyways Improvements project is near the intersection of Julian and North 9th streets (Horace Mann Neighborhood) and Humboldt and Sherman streets (Washington Neighborhood), within the Guadalupe River watershed. The alleyways do not have standard drainage infrastructure. They consist of deteriorated asphalt that creates hazards to residents, bicyclists, and pedestrians and generates dust, sediment, localized flooding, and ponding. In lieu of traditional storm drain infrastructure, the project installed green stormwater infrastructure to resolve these problems. The project scope included the installation of permeable pavers with underground infiltration trenches and new asphalt. The new asphalt and impervious surfaces from surrounding areas drain to the permeable pavers and infiltration trenches that will remove pollutants and reduce urban runoff flow. The project provides long-term water quality benefits and improves roadway and pedestrian safety.

The project is estimated to cost $1.6 million and will be funded by the Community Development Block Grant Fund, which supports improvements in low- and moderate-income residential neighborhoods. Construction began in October 2018 and is scheduled to be completed in 2019.

6.2.6 San Carlos Safety Improvement Project

The San Carlos Safety Improvement Project is located on West San Carlos Street between Highway 880 and McEvoy Street, within the Guadalupe River watershed. The goal of the project is to enhance safety by slowing traffic, improving pedestrian crossings, and retrofitting the streetscape design to appropriately reduce vehicle lane widths. The project will remove and modify right-turn slip lanes to slow turning traffic and increase pedestrian bicycle safety.

Green stormwater infrastructure is planned to be incorporated into the safety elements such as mid-block and intersection bioretention bulb-outs. The type and location of each GSI facility is yet to be finalized but is likely to consist of bioretention facilities. Street trees and landscaping will also be planted as part of the site improvements.

The project is estimated to cost $10 million and will be funded through a combination of City match funds and two federal grants: the Surface Transportation Program and the Congestion Mitigation and Air Quality Improvement Program. Project design is scheduled to begin in 2020 and construction is slated to begin in 2022 with an estimated project completion in 2024.

6.2.7 Existing & Early Implementation Project Performance

In total, the existing and early implementation projects manage 1,244 acres of impervious area as shown in Figure 6-8. These projects capture and treat 34 acre-feet of runoff during the critical bacteria storm. These existing projects represent a small fraction of progress toward the stormwater capture goal of 833 acre-feet.

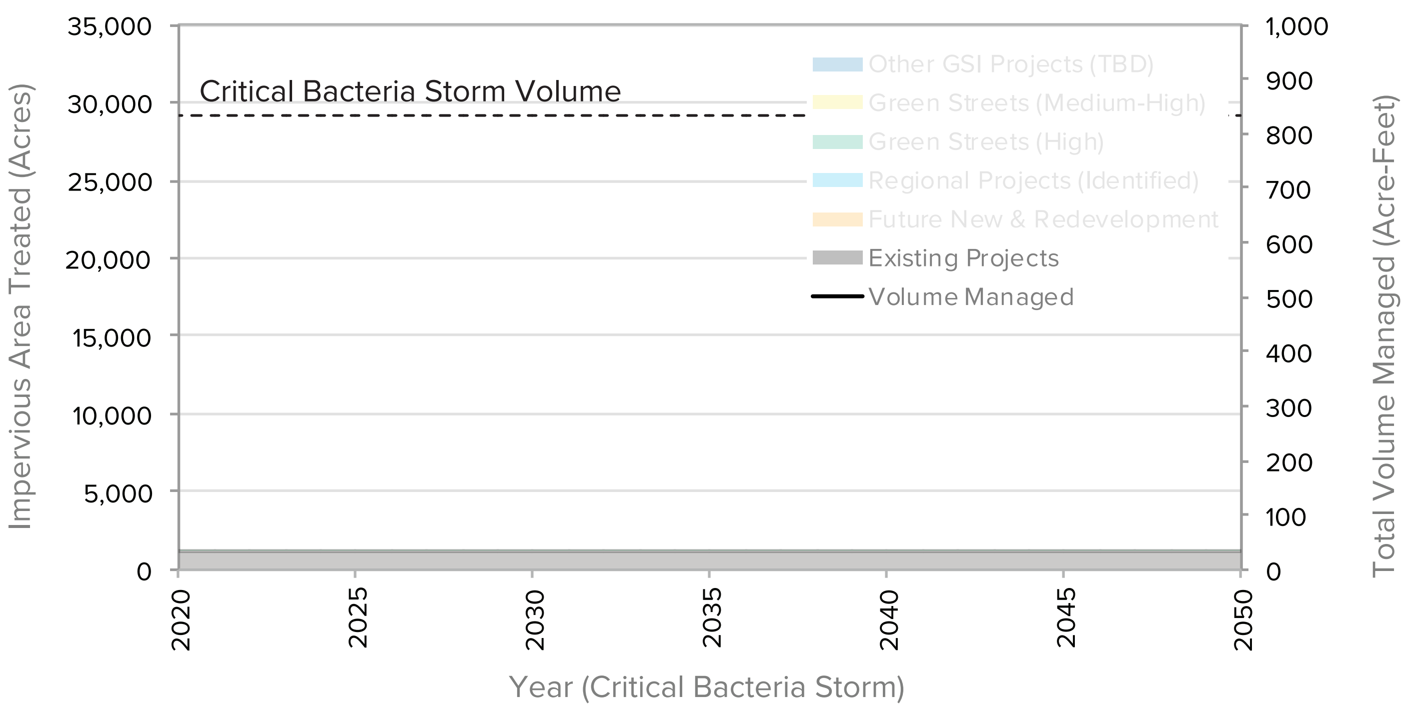


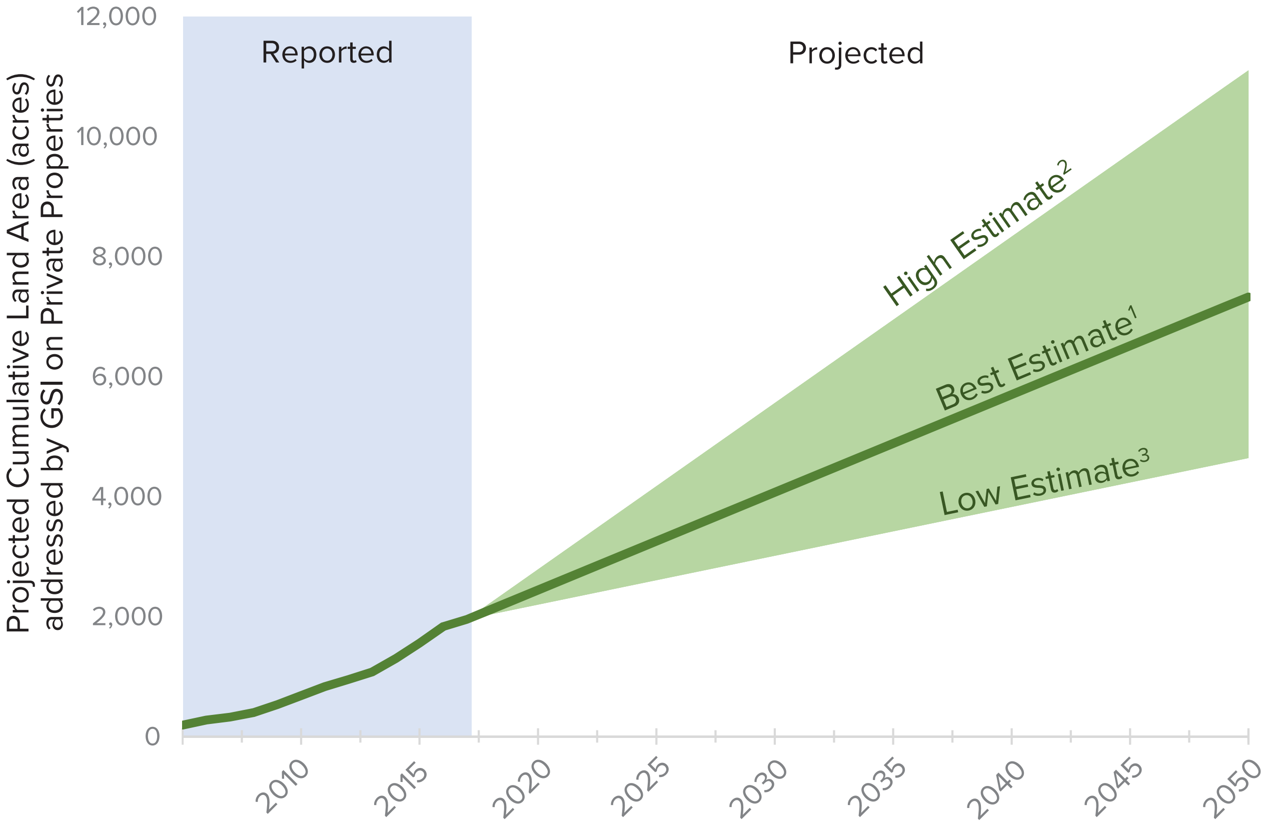
Figure 6-8. Projected Volume Managed by GSI: Existing GSI + C.3 Regulated Projects

6.3 Future New Development & Redevelopment

While Provision C.3 has already resulted in the development of existing GSI projects, new and redevelopment from now until 2050 is expected to spur additional implementation of GSI projects. The City worked with SCVURPPP to develop and apply a methodology, based on historic development trends and the City's General Plan, to predict the amount of land area that will be redeveloped in the City and for which stormwater runoff will be addressed via GSI installed on privately owned parcels from 2018 to 2050.

To develop impervious surface retrofit targets, the first step in the process was to estimate the acres of redevelopment and the associated GSI implementation that will occur in the City by 2020, 2030, 2040, and 2050. The City worked with SCVURPPP to develop and apply a methodology, based on historic development trends and the City's General Plan, to predict the amount of land area that will be redeveloped in the City and for which stormwater runoff will be addressed via GSI facilities installed on privately owned parcels over these time horizons.

Figure 6-9 displays the projected amounts of regulated project areas treated with GSI facilities over the required time frames, based on this methodology. Given the uncertainty of development rates in the future, with the expected boom and bust cycles that have historically occurred, the graph displays a best estimate with low and high ranges below and above the target. The resulting projections, also presented in Table 6-1, indicate that the amount of private redevelopment in San José treated by GSI is likely to increase by 3 to 4 times the current (2017) amount by 2050.



1. Best estimate – rate of redevelopment based on 10-year average (2008-2017)
2. High estimate – rate of redevelopment from General Plan build-out projections
3. Low estimate – projected from 50% of "Best Estimate"

Figure 6-9. Existing and Projected Cumulative Land Area Anticipated to be Addressed via GSI Facilities Installed on Private Property in the City of San José by 2020, 2030, 2040, and 2050

Table 6-1. Projected Cumulative Land Area (acres) Anticipated to be Addressed via GSI Facilities Installed on Private Property in the City of San José by 2020, 2030, 2040 and 2050

Year	Low[1]	Best[2]	High[3]
Current (2017)	-	1,956	-
2020	2,200	2,445	2,788
2030	3,014	4,073	5,560
2040	3,828	5,701	8,333
2050	4,642	7,329	11,105

1. Low estimate – projected from 50% of "Best Estimate"
2. Best estimate – rate of redevelopment based on 10-year average (2008-2017)
3. High estimate – rate of redevelopment from General Plan build-out projections.

Bioretention at Montecito Vista Urban Village

The second step was to estimate the acres of impervious surface associated with future redevelopment. To do this, it was necessary to predict the likely locations, extent, and land uses of the redeveloped areas. Growth patterns and time horizons for development in San José's growth areas, as identified in the General Plan, along with algorithms to identify which parcels were likely to redevelop, resulted in estimates of the location and extent of land area that is predicted to be addressed by GSI facilities by 2030, 2040, and 2050. Then, using the 2011 National Land Cover Database (NLCD) imperviousness dataset and the predicted locations of GSI implementation, estimates of the amount of impervious surface that would be retrofitted with GSI on privately-owned parcels were developed.

Table 6-2 lists the total and impervious area predicted to be retrofitted by 2030, 2040, and 2050 in the City of San José via new GSI implementation on private parcels. The impervious area captured by projected C.3 regulated projects and how this contributes to the City's overall GSI strategy is shown in Figure 6-10.

Table 6-2. Predicted (2020-2050) Extent of Impervious Surface Retrofits via GSI Implementation on Privately Owned Parcels in the City of San José by 2030, 2040, and 2050

Period	2020-30	2030-40	2040-50	Total (2020-50)
Total Area (acres)	1,447	1,628	1,628	4,703
Impervious Area (acres)	890	822	942	2,654

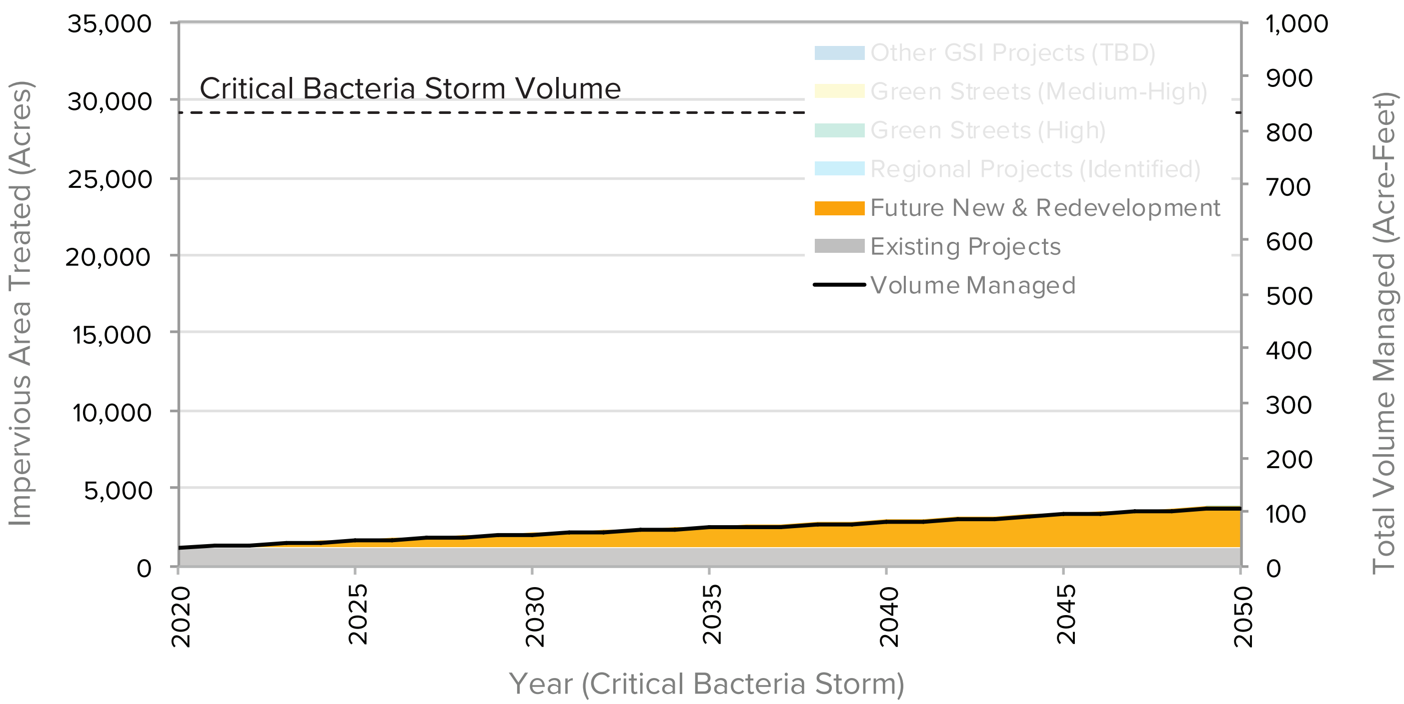


Figure 6-10. Projected Volume Managed by GSI: Existing GSI + C.3 Regulated Projects

6.4 Regional GSI Projects

Based on the prioritization described in Section 5.3, six potential regional projects were identified and advanced through concept design. While these represent the top identified sites, the City is continuing to evaluate additional regional project locations and eliminate infeasible regional project locations. Future identified sites may be added to the current list. These additions would offset green street and LID retrofit needs, resulting in a refinement of the City's overall GSI strategy.

The regional project prioritization process included identifying the sites with best technical suitability for regional stormwater capture and consideration of park uses, community priorities, and other capital project schedules. Then, site visits were conducted to assess design options and evaluate the site's multibenefit potential. Concept designs were developed for the top sites based on available information. The concepts, listed below, are described in detail in Appendix C.[6]

- Tully Community Ballfields Regional Stormwater Capture Project
- Kelley Park Stables Regional Stormwater Project
- Roy M Butcher Park Regional Stormwater Project
- Vinci Park Regional Stormwater Capture Project
- River Oaks Pump Station Regional Stormwater Capture Project
- Kelley Park Disc Course Regional Stormwater Capture Project

A map of the potential project locations and drainage area is shown in Figure 6-11.

Drainage Area of Regional Project Candidates

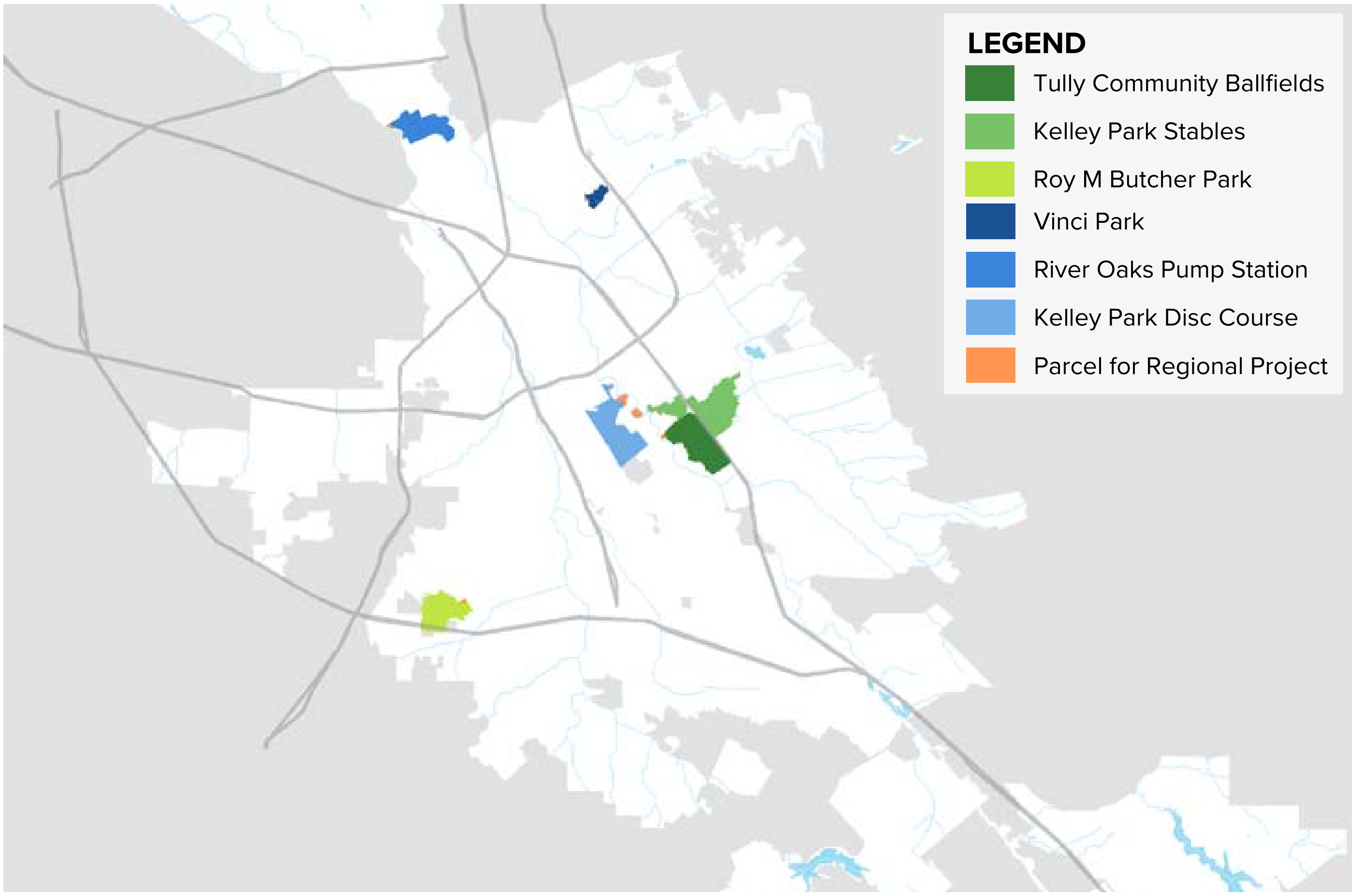


Figure 6-11. Location and Drainage Area of Regional Project Candidates

6. These concepts are intended to facilitate applications for funding, such as state grants, and to support City outreach coordination. More stakeholder outreach will be conducted prior to any concepts moving forward to implementation.

The size of the drainage area and the layout of the stormwater treatment systems were developed based on maximizing water quality treatment and infiltration. Surface stormwater features were prioritized to provide community amenities and minimize costs. However, subsurface systems were determined to be necessary for portions of three of the projects (i.e., Butcher Park, Tully Ballfields, and Vinci Park), where space was limited and existing stormwater infrastructure is too deep to allow gravity drainage to a surface facility.

Each concept design, including the suitability and location of subsurface systems, considered space and geotechnical constraints, such as slopes, soil type, depth to groundwater, depth to bedrock, and contaminated soils. These constraints were assessed based on the available data from the City's GIS spatial data, site visit evaluations, and additional site information obtained from NRCS Soil Survey (soils data), UC Davis SoilWeb (hydrologic soil group), Valley Water (groundwater depths and recharge areas), and GeoTracker (contamination areas). The design configuration and overall cost-effectiveness is highly dependent on encountered subsurface conditions at sites with shallow groundwater or highly variable soil types. As with all potential project sites, additional physical investigations, such as borings and infiltration rate tests, are needed to verify feasibility of the project concept and inform required changes to the design.

The stormwater performance of each project was evaluated for water quality, flood reduction, and groundwater recharge benefits. Water quality performance was quantified using the results of the RAA modeling. This modeling summarized both the volume capture goals per subwatershed as well as the projected mercury, PCB, and FIB reduction per project. Expected performance of each concept is presented in Appendix C in addition to a budget-level cost estimate. The projected costs of the regional projects are summarized in Table 6-3.

In addition to providing stormwater benefits, the concepts were developed to promote environmental benefits in communities. Figure 6-12 shows an example concept site map and a rendering of treatment facilities at the site with trails and signage.

Table 6-3. Summary of Regional Concepts

Project Name	Impervious Drainage Area (Acres)	Cost Estimate ($2019)				
		Design Fees[1]	Construction Costs[1]	Project Administ-ration Costs[1]	30-yr O&M Cost[2]	Total Lifecycle Cost[3]
Tully Ballfields	280	$1,843,000	$15,359,000	$2,765,000	$5,949,000	$26,000,000
Kelley Park Stables	349	$1,935,000	$16,127,000	$2,903,000	$8,099,000	$29,000,000
Roy M Butcher Park	189	$1,365,000	$11,373,000	$2,047,000	$4,781,000	$20,000,000
Vinci Park	37	$940,000	$7,831,000	$1,410,000	$3,764,000	$14,000,000
River Oaks Pump Station	213	$787,000	$6,561,000	$1,181,000	$3,468,000	$12,000,000
Kelley Park Disc Course	423	$1,738,000	$14,484,000	$2,607,000	$6,537,000	$25,000,000
Total	1,383	$8,608,000	$71,735,000	$12,912,000	$32,598,000	$126,000,000

1. If a concept is carried forward for future implementation, then costs should be escalated from 2019 dollars to the projected year. Design fees include design, permitting, and environmental. Project administration includes City costs associated with project management and construction oversight.
2. Based on similar precedent projects, preliminary annual O&M costs are estimated as 1% of the total design plus construction costs. If a concept is carried forward for future implementation, then a detailed O&M plan should be developed and O&M costs updated to reflect the schedule of activities therein, and the baseline year for the lifecycle analysis should be updated from 2019 to the projected construction completion date.
3. Net present value, assumes 30-year asset life, 3% escalation rate for O&M.

Figure 6-12. Left: Potential Location of Regional Project. Right: Rendering of Regional Project with Trails and Signage

The scale of the regional projects makes them more cost-effective than other GSI capital project types, such as green streets or LID retrofit projects. Moreover, their scale and location within the public realm (e.g., at parks) presents a greater opportunity to integrate benefits that can be realized by the largest number of City residents. For these reasons, regional projects make up a large component of the City's capital project strategy. These projects, coupled with C.3 regulated projects on public and private developments, form the core of the citywide GSI strategy. As discussed in the following sections, green street and LID retrofit projects have been prioritized to further diversify the GSI portfolio and supplement this core to increase overall reliability in achieving the long-term water quality goals. The volume captured and impervious area managed by the potential regional projects is shown in Figure 6-13.

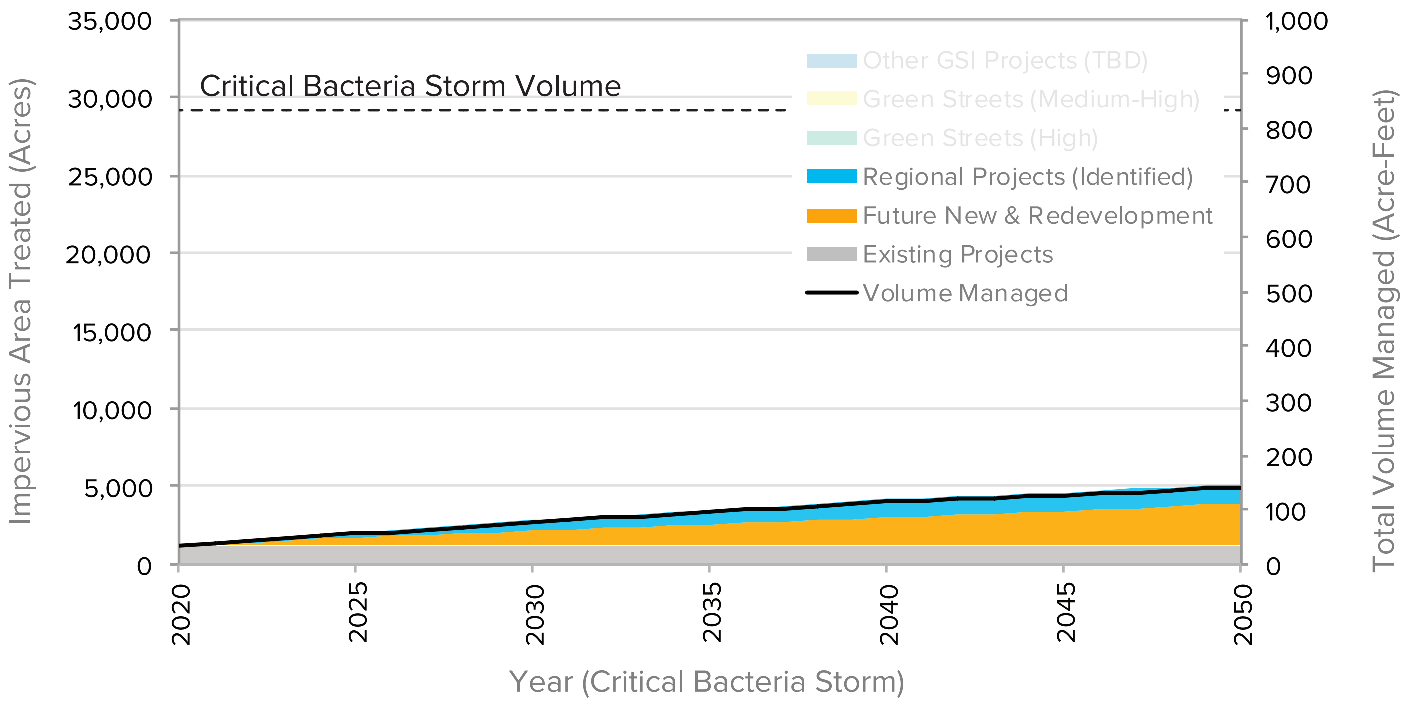


Figure 6-13. Projected Volume Managed by GSI: Existing GSI + C.3 Regulated Project + Regional Projects

6.5 Green Streets

As with the early implementation green street projects discussed in Section 5.3.1, the City will continue to assess the feasibility of green stormwater infrastructure integration into streetscape improvement projects. Co-locating green streets with other City initiatives has the potential to improve capital program cost efficiency and reduce net construction impacts, while helping to address improvement needs and goals of the City. These goals include water quality improvements as well as complete street benefits such as traffic calming, improved bike and pedestrian safety, and increased green space for climate change adaptation. Key City initiatives whose objectives overlap with the goals of green streets and may serve as partners for implementation include: San José Complete Streets Design Guidelines, Vision Zero San José (including "Walk n' Roll San José"), San José Bike Plan 2020, and Central San José Bikeways Projects.

The results of the prioritization described in Section 5.3.1 facilitates this process of identifying where the most technically suitable sites for green streets overlap with other City co-benefit goals and planned projects. Figure 6-14 displays the results of the green street technical suitability and co-benefit assessment conducted for the GSI Plan. The technical suitability and co-benefit results were overlaid to prioritize green street segments based on the total score with those scoring more than 45 points being ranked highest based on the data available during the GSI Plan development.

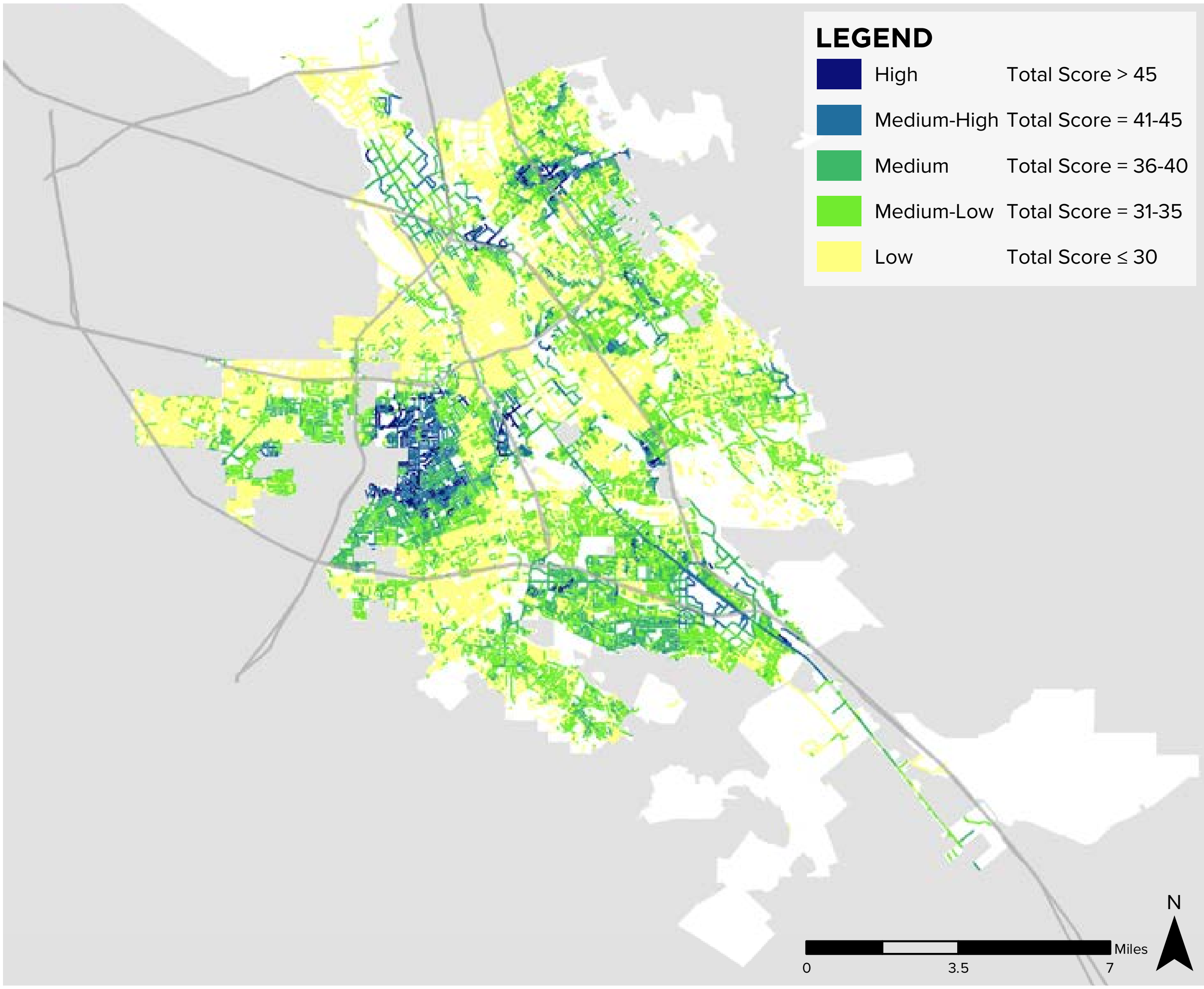


Figure 6-14. Prioritized Green Streets

The prioritization results are coupled with the RAA volume capture needs per subwatershed to establish the green street portion of the citywide GSI strategy (see Appendix B). The quantities of green street capture per subwatershed represent an initial strategy that will involve ongoing coordination among City departments and continued assessment of funding and grant opportunities. The strategy and the prioritized green street list will be reviewed annually to continue to identify opportunities for green street implementation. Including the contribution from all high and medium-high priority green streets, the total progress toward water capture goals is shown in Figure 6-15.

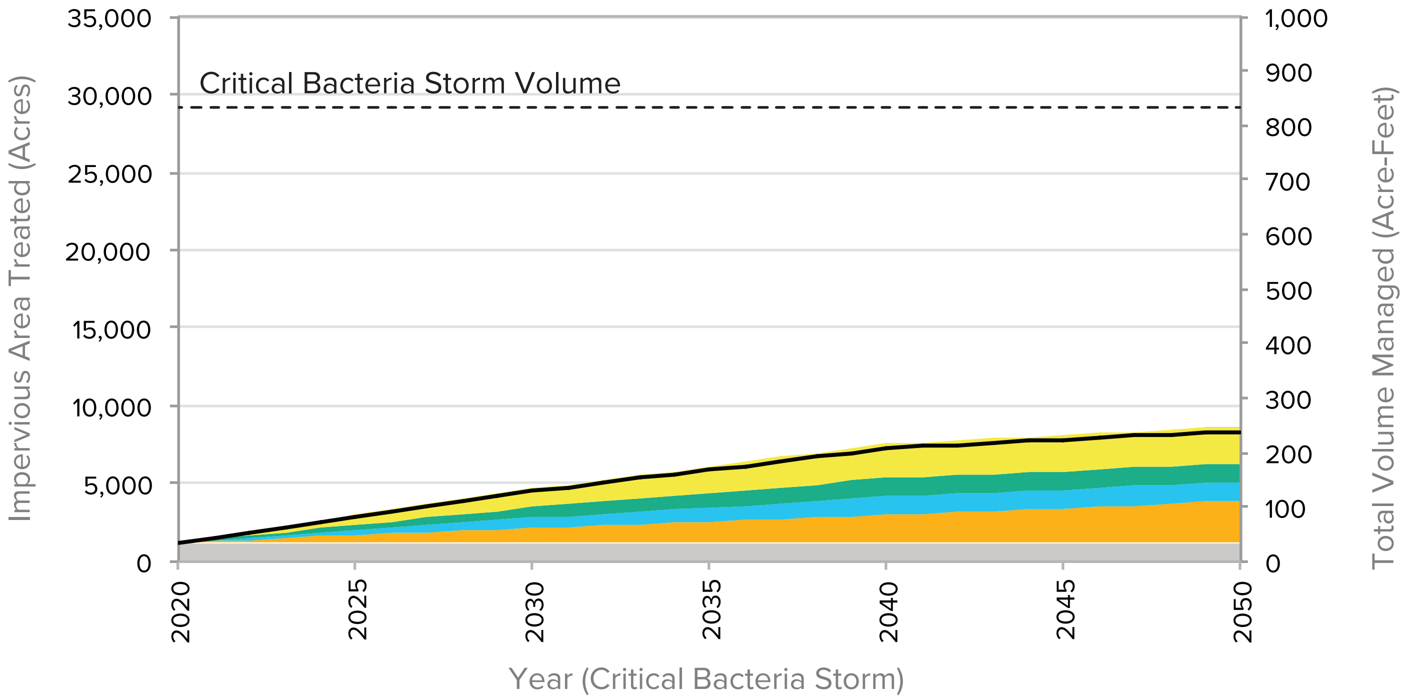


Figure 6-15. Projected Volume Managed by GSI: Existing GSI + C.3 Regulated Projects + Regional Projects + Green Streets

Legend

6.6 Other GSI Projects

While the projects discussed in the previous sections provide significant stormwater capture, they do not provide enough to capture the full critical bacteria storm citywide. The remaining runoff volume from the critical bacteria storm that is not captured by the existing, C.3 regulatory, identified regional, or green street projects will be addressed through other GSI projects yet to be determined. This category serves as a placeholder to set goals in terms of needed storage capacity of GSI projects throughout the city in addition to the identified project opportunities discussed in the previous sections. Further investigation can determine how these goals can be met utilizing a combination of strategies. Increased future development resulting in more C.3 regulated projects, can be considered in conjunction with additional public GSI projects not discussed in the previous sections. These public GSI projects may include (1) LID on public parcels, (2) additional regional projects yet to be identified, and (3) additional green streets, possibly including lower priority green streets identified in Section 6.5.

LID on public parcels were identified as part of the SWRP and GSI Plan prioritization efforts. Whereas the SWRP countywide GSI prioritization effort resulted in more than 2,400 high priority green street locations, the SWRP effort returned a more manageable number of high priority LID retrofit sites at fewer than 200. The City will use this prioritized list, coupled with the stormwater performance and geotechnical suitability maps developed as part of the GSI Plan, to support its existing process of evaluating LID retrofit opportunities within planned City projects. However, as these opportunities are relatively limited in scale and can be dependent on co-location with proposed public parcel capital projects, meeting these remaining capture needs per subwatershed may ultimately be achieved in combination with other project types, such as additional regional projects or green streets.

While six regional projects identified in the SWRP and GSI Plan prioritization were previously discussed as part of the GSI implementation strategy, additional regional projects yet to be identified may account for a portion of the remaining volume needed for full capture of the critical bacteria storm. Regional projects tend to be more cost-effective than LID projects due to economies of scale, so additional regional projects may be a part of the strategy for achieving FIB reduction goals through other GSI projects yet to be identified. Further analysis will need to be performed to determine if additional sites are appropriate for regional GSI projects.

Remaining volume capture may also be addressed through implementation of additional green street projects that were identified as lower priority and not considered in the RAA. The RAA only considered green street sites from the highest two priority categories, high and medium-high, in the cost optimization. Additional green streets may be implemented on sites identified as lower priority from the GSI Plan prioritization effort. Green street project sites will need to undergo feasibility analysis to determine suitability for implementation and are subject to further investigation. The lower priority green streets are shown in Figure 6-14 (Section 6.5).

GSI on Bassett Street in San José

The additional GSI projects will undergo feasibility analyses and site investigations to determine specific sites for implementation. While the GSI Plan and RAA inform GSI implementation goals, the strategy for implementation is subject to adaptive management as new information is obtained. The strategy will be refined as the GSI Plan is implemented and more comprehensive municipal engineering analyses (e.g., master planning, capital improvement planning) are performed. As shown in Figure 6-16, the total GSI citywide strategy, with the inclusion of other GSI projects to be determined, addresses the FIB goal for capture of the critical bacteria storm.

The project strategy presented in this chapter provides the direction needed to establish the immediate next steps to realize the City's gray to green stormwater vision. These next steps of GSI Plan implementation, along with the legal, technical, and funding mechanisms put in place to enable them, are described in Chapter 7.

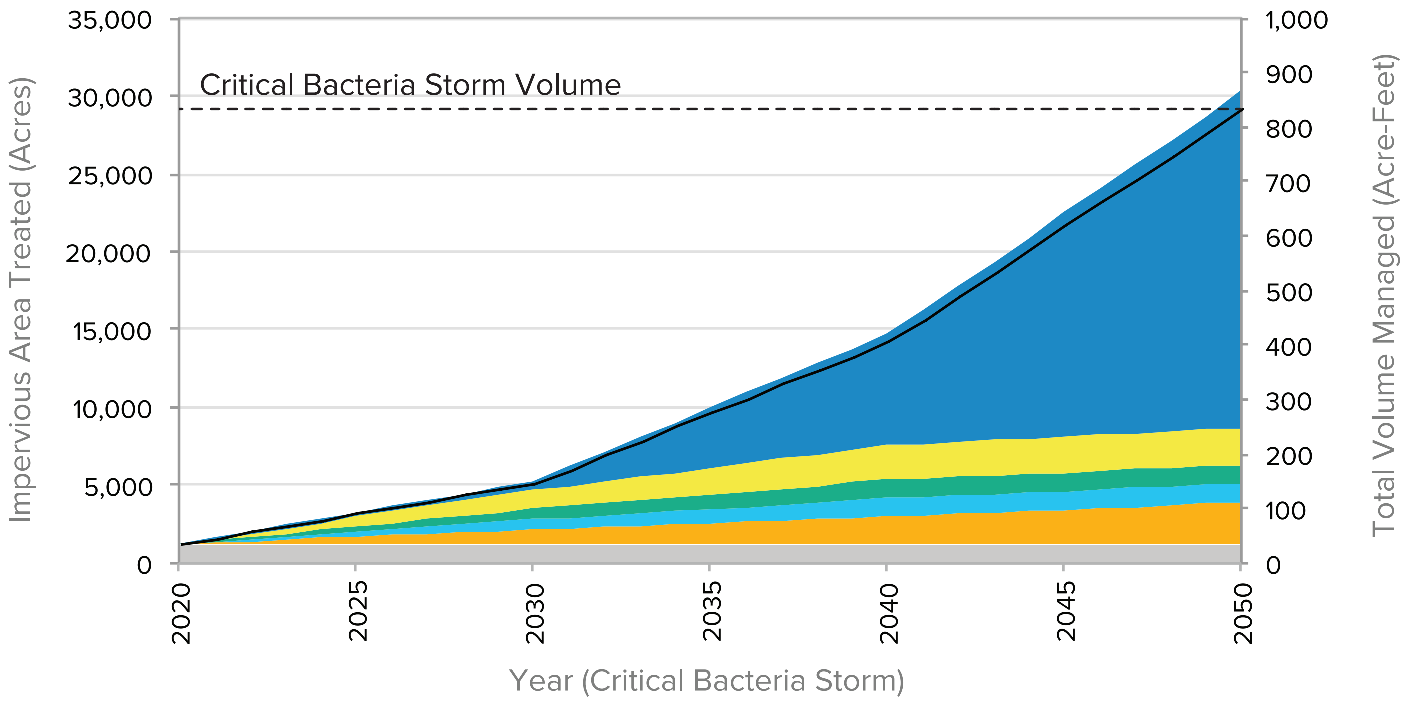


Figure 6-16. Projected Volume Managed by GSI: Existing GSI + C.3 Regulated Projects + Regional Projects + Green Streets + Other GSI Projects

Legend

7.0 IMPLEMENTATION PLAN

Bioretention in San José

This chapter defines the process for implementing the prioritized projects to achieve the projections defined in Chapter 6. The implementation plan has three main components: (1) the workplan defining the steps to implement the prioritized capital projects, (2) the legal and funding mechanisms that enable implementation, and (3) the technical tools that ensure implemented projects perform and enable quantification of overall progress toward the citywide goals.

IN THIS CHAPTER

7.1 Workplan for Prioritized Projects

The following workplan defines the process for implementing the prioritized regional, green streets, and LID retrofit projects identified to meet citywide water quality goals. This includes describing the near-term steps and schedule to move projects into the design phase, as well as establishing the procedures for integrating these prioritized projects into the City's capital planning framework.

While the scope of the workplan described in this section is public GSI projects, it is important to note that the City is simultaneously implementing other types of stormwater improvement projects across San José. This includes conducting design review and post-construction inspection of C.3 regulated projects on new and redevelopments, as well as implementing gray stormwater projects to improve water quality and increase flood control. Gray improvements being implemented by the City include trash capture devices to reduce trash and sediment entering San José's rivers and streams, as well as storm sewer projects to increase system capacity, reduce illicit (non-stormwater) flows into the system, and improve structural reliability.

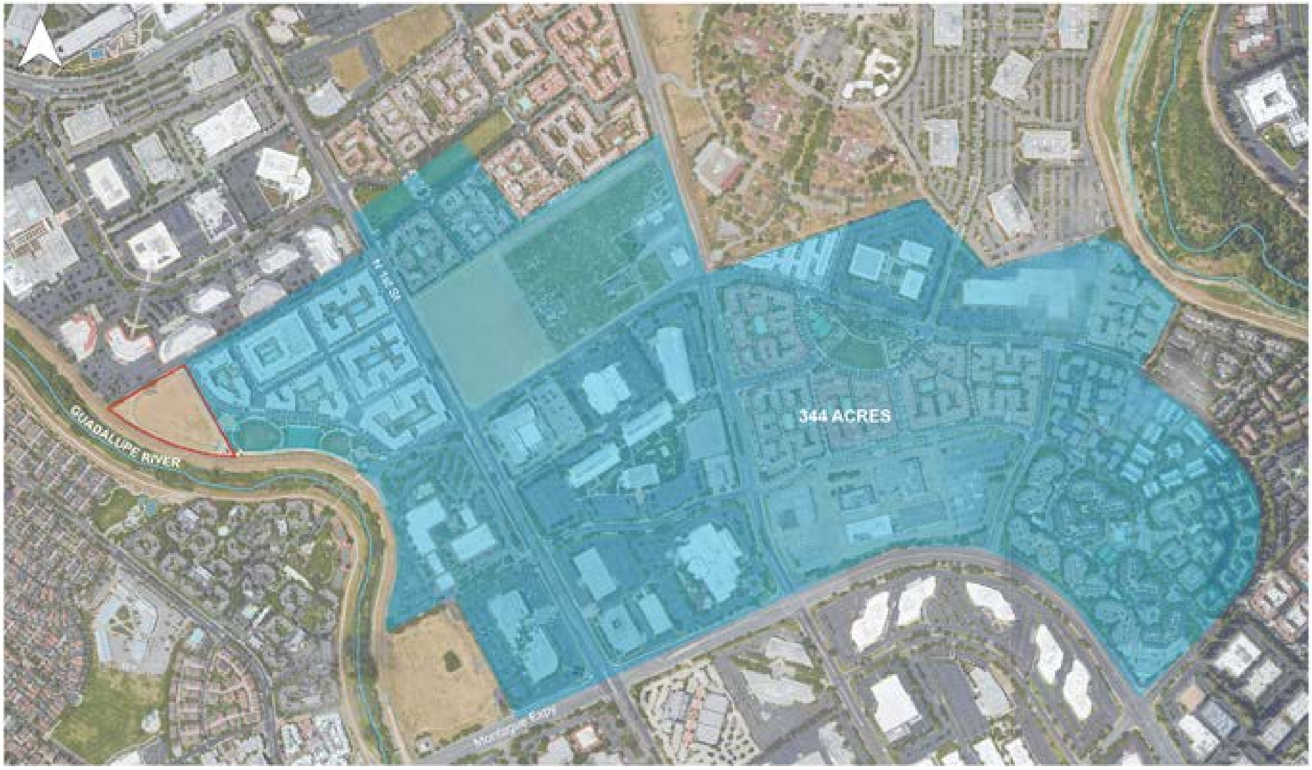
Installation of a Trash Capture Device in San José

7.1.1 Regional Projects Workplan

To meet milestones defined in the MRP and the Consent Decree, the City has created a preliminary implementation schedule for the prioritized regional projects defined in Chapter 6. The regional projects are located on City-owned parcels that contain sufficient space to capture runoff from a large drainage area. The drainage area and site location of one of the potential regional concepts are shown in Figure 7-1 and Figure 7-2, respectively. Concept designs for each of the potential regional projects—including project description, drainage areas, site layout, expected benefits, and full cost breakdown—are provided in Appendix C.

The projected costs and draft schedule for prioritized regional and green street projects are shown in Figure 7-3 and Figure 6-4, respectively. The proposed schedule and list of projects are for planning purposes only, as both are contingent upon ongoing review and coordination among departments as well as community outreach, and funding. The schedule, costs, and concept designs developed for the GSI Plan provide the necessary information to advance implementation of the regional projects through next steps including feasibility assessments, interdepartmental coordination, and community outreach.

RIVER OAKS REGIONAL PROJECT - CONCEPT SITE DRAINAGE AREA



LEGEND

Project Footprint

Creek / Channel

Potential Drainage Area

Figure 7-1. Example Regional Project Concept Drainage Area

Figure 7-2. Site Location and Render of a Potential Regional Project

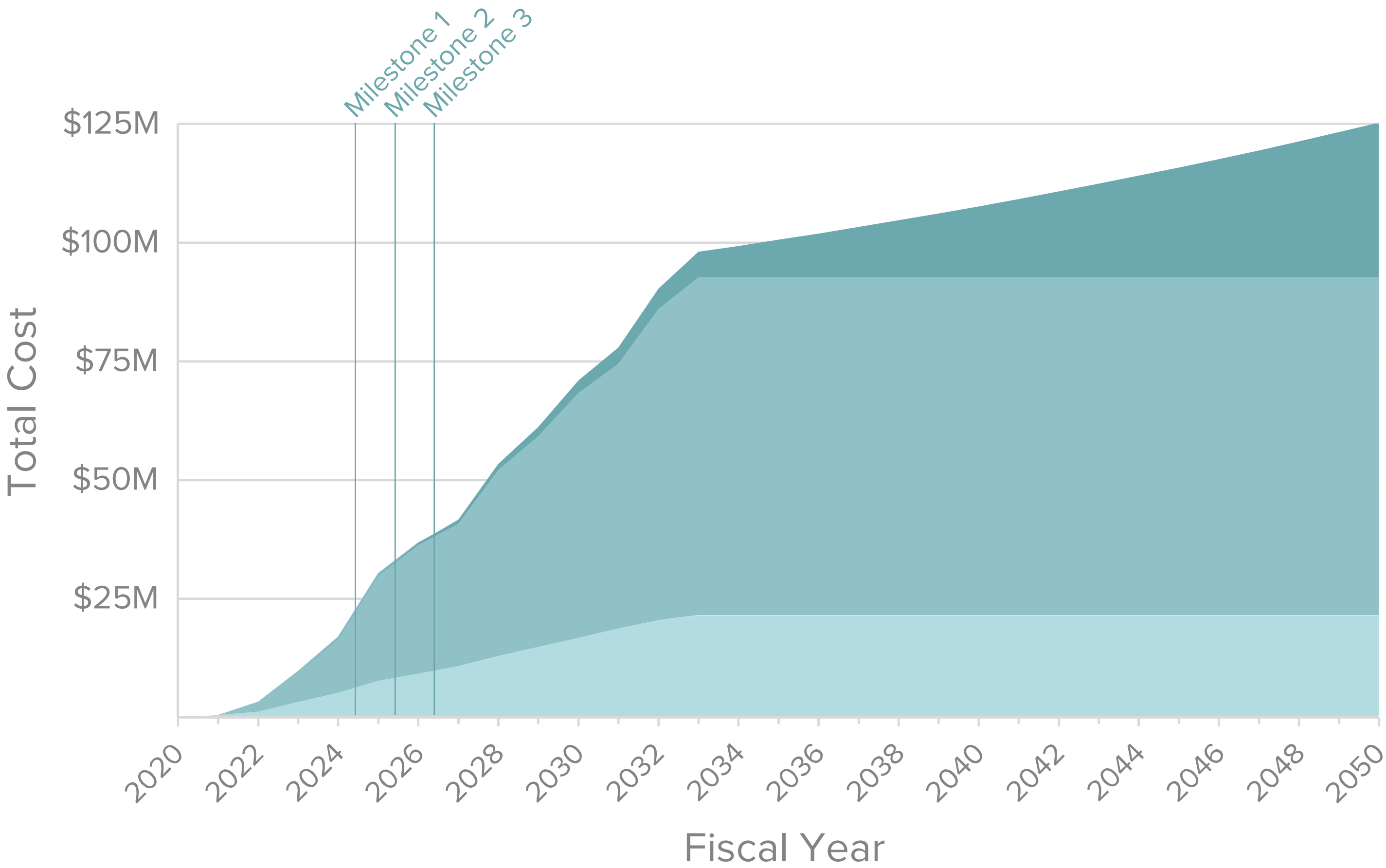


Figure 7-3. Projected Costs of Prioritized Regional Projects to 2050[7]

Design and Project Management Costs
Construction Costs
O&M Costs (Escalated)

7. For City planning purposes only; final project selection and schedules are contingent upon further coordination and stakeholder outreach.

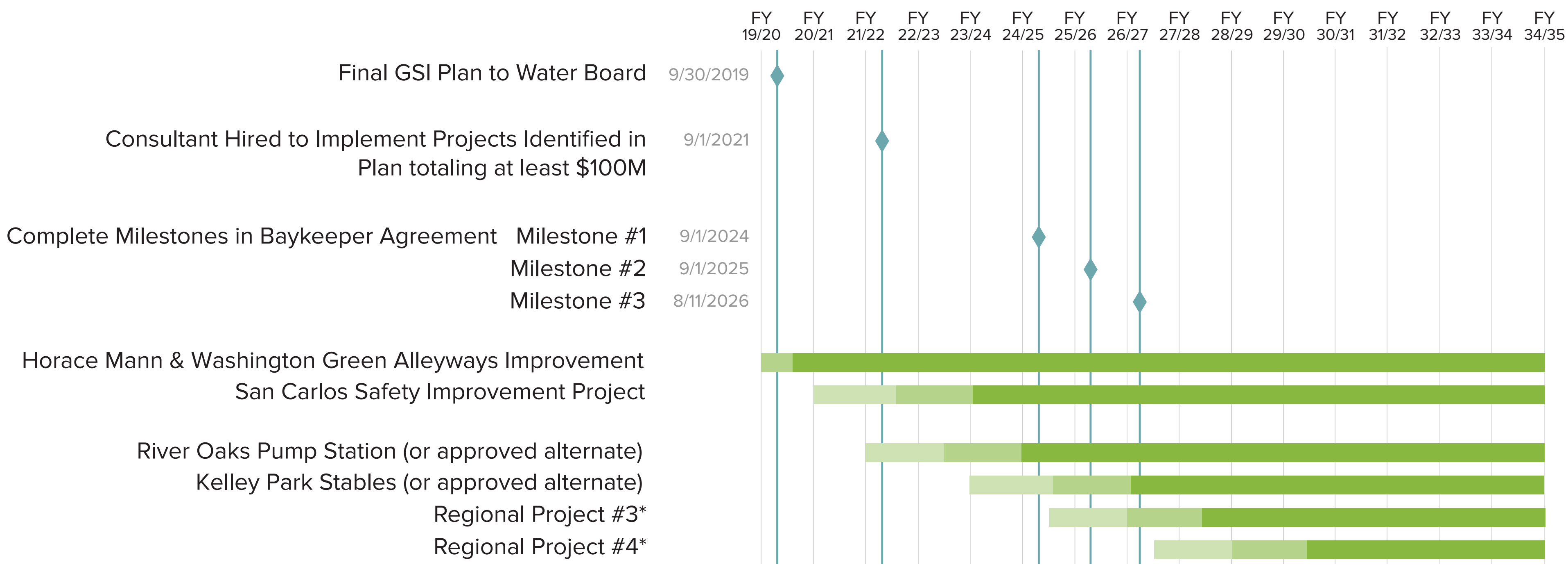


Figure 7-4. Draft Schedule for Prioritized Regional and Green Street Projects to 2050[8]

Design phase
Construction phase
Operations & maintenance phase (continues in perpetuity)

Milestone 1: Completed design, environmental, and geotechnical analysis of projects identified in the Plan representing at least $25M in total project costs.
Milestone 2: Award Contracts for Projects totaling at least $25M. Completed design, environmental, and geotechnical analysis of projects identified in the Plan representing at least $35M in total project costs.
Milestone 3: Award Contracts for Projects totaling at least $35M. Completed design, environmental, and geotechnical analysis of projects identified in the Plan representing at least $50M in total project costs.

* Potential regional projects include Vinci Park, Kelley Park Disc Course, Butcher Park, and Tully Ballfields.. The order these will be implemented has not been determined. These projects may be replaced with an approved alternative regional project.

8. For City planning purposes only; final project selection and schedules are contingent upon further coordination and stakeholder outreach..

7.1.2 Green Streets Workplan

As described in Chapter 6, to progress toward meeting Consent Decree and MRP milestones, the City used the RAA results (Appendix B) to quantify the number of green streets needed per subwatershed to meet water quality goals. This information was coupled with the San José-specific prioritization tool to identify proposed green street locations in these subwatersheds. The City will continue to use this approach to proactively identify street locations that are most suitable for a green street project. As funding becomes available, the City can construct green streets in the high-priority locations.

In addition to proactively identifying and implementing green street projects through the process described above, the City will also evaluate opportunities to integrate GSI into planned City street projects. The City prepares and maintains a list of public infrastructure and streetscape projects planned for implementation that have the potential for GSI facilities. For each public project with implementation potential, the City evaluates how GSI can be included to the maximum extent practical. This process led the City to identify and implement the early implementation GSI projects described in Chapter 6. The RAA capture goals and GSI Plan prioritization tool will be used to augment this ongoing process of identifying street projects with GSI potential.

The green streets implementation workplan is as follows:

1. As described in Chapter 6, use the GSI Plan prioritization and RAA results to identify the high priority green street projects per subwatershed to meet capture goals.

2. Each year, review the City's list of planned street projects to identify overlap with high priority green streets.

3. For the areas of overlap identified in Step 2 and the green street priority projects identified in Step 1, follow the BASMAA guidance[9] to confirm that the candidate projects have the potential to integrate GSI.

   3.1 Information Collection – Identify location of catch basins and drainage pathways. Assess ability to substitute pervious pavements for impervious pavements.

   3.2 Preliminary Sizing and Drainage Analysis – Identify the most feasible GSI locations within the streetscape and roughly delineate the drainage area. Establish the sizing factor (facility area/tributary area), with a guideline of ≥ 4 percent sizing for bioretention and ≥ 0.5 for dispersal to landscape or pervious pavement (i.e., a maximum of 2:1 ratio of impervious area to pervious). Site reconnaissance will likely be necessary to fill data gaps through visual observation.

   3.3 Barriers and Conflicts – Update the site space constraints data based on visual assessment of utility locations, length constraints (e.g., bus stops, driveways, hydrants, mature trees), and sidewalk widths. Also evaluate the extent to which GSI would be an "add on" to the proposed project versus an integrated element of a complete street.

   3.4 Project Budget and Schedule – Consider sources of funding that may be available for integrating GSI into the project. Note any constraints on project schedule that would preclude including time to integrate GSI into the design and construction. Note any constraints on project schedule that would complicate aligning a separate funding stream for the GSI elements.

9. BASMAA Development Committee. 2016. Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Program Projects. May 6, 2016.

If, after following the BASMAA guidance, the project still has GSI potential, proceed to the next step.

4. Gather additional data to assess design feasibility and coordinate with the co-located street project (if applicable) to include GSI in the project design.

   4.1 Conduct a site visit to review proposed GSI locations, discuss potential concerns, and field-verify site constraints.

   4.2 Compile as-built and private utility data to update utility conflict assessment.

   Update the space constraint analysis based on field visit and gathered utility data.

5. Perform on-site survey and geotechnical investigations.

   5.1 Conduct utility survey to verify alignment and depth of potential utility conflicts.

   5.2 Conduct a geotechnical investigation (infiltration test/soil boring/environmental analysis) to confirm soil type, infiltration rate, and soil contamination potential.

   Update hydrogeological and space constraint analyses based on utility survey and geotechnical analysis.

If the project is deemed feasible and funding is available it can continue through project implementation following the City's standard capital project delivery process.

7.1.3 LID Retrofits Workplan

As with green streets, the City has an ongoing process to evaluate public projects on parcels for potentially locating green stormwater infrastructure. This process includes several steps that follow the guidance established by BASMAA (BASMAA 2016). The GSI Plan identifies the quantity of GSI needed to achieve water quality goals and prioritizes the LID retrofit sites based on technical site suitability and co-benefit opportunities. The City will integrate its ongoing process of evaluating planned projects on parcels with this additional information from the GSI Plan to significantly improve the process of identifying and implementing the best LID retrofit opportunities. The workplan to implement prioritized LID retrofit sites is as follows:

1. As described in Chapter 6, use the GSI Plan results to establish the high priority LID retrofit projects needed to achieve water quality goals.

2. Proactively review the City's list of planned parcel projects to identify overlap with high priority LID retrofit locations.

3. For these areas of overlap, follow the BASMAA guidance[10] to confirm that the planned parcel projects have the potential to integrate GSI.

   3.1 Information Collection – Identify location of roof leaders, downspouts, area drains, and site drainage pathways. Identify landscape and paved areas downgradient from roofs and pavements that could serve as GSI locations. Assess ability to substitute pervious pavements for planned impervious pavements.

   3.2 Preliminary Sizing and Drainage Analysis – Identify the most feasible GSI locations within the site and roughly delineate the drainage area. Establish the sizing factor (facility area/tributary area), with a guideline of ≥ 4 percent sizing for bioretention and ≥ 0.5 for dispersal to landscape or pervious pavement (i.e., a maximum of 2:1 ratio of impervious area to pervious). Site reconnaissance will likely be necessary to fill data gaps through visual observation.

10. BASMAA Development Committee. 2016. Guidance for Identifying Green Infrastructure Potential in Municipal Capital Improvement Program Projects. May 6, 2016.

3.3 Barriers and Conflicts – Assess space constraints data based on visual assessment of utility locations and building footprints. Confirm property ownership information and identify potential easements. Evaluate the extent to which GSI would be an "add on" to the proposed project versus an integrated element of the site.

3.4 Project Budget and Schedule – Consider sources of funding that may be available for integrating GSI into the project. Note any constraints on project schedule that would preclude including time to integrate GSI into the design and construction. Note any constraints on project schedule that would complicate aligning a separate funding stream for the GSI elements.

If, after following the BASMAA guidance, the project still has GSI potential, proceed to the next step.

4. Coordinate to include GSI in the project design.

4.1 Conduct a site visit to review proposed GSI locations, discuss potential concerns, and field-verify site constraints and drainage features.

4.2 Field-verify location of utility laterals and confirm easement locations.

Update the space constraint analysis based on field visit.

5. Perform on-site soil investigations.

5.1 Conduct an infiltration test to confirm rate of infiltration. Include soil testing if warranted based on site potential for soil contamination (e.g., contamination potential due to historical land use, proximity of underground storage tanks, or existing groundwater contamination spatial data layers). Include a soil boring if design includes a subsurface infiltration system or if available data indicates the potential for shallow depth to groundwater or bedrock.

Update hydrogeological data based on results.

If the project is deemed feasible and funding is available it can continue through project implementation following the City's standard capital project delivery process.

7.2 Implementation Mechanisms

The GSI Plan quantifies volume capture needs and prioritizes specific projects for near-term integration into CIPs and long-term integration into City planning efforts. However, implementation of these projects is still contingent upon the City having the proper legal mechanisms to implement the Plan, and identifying sufficient funding sources for GSI planning, design, construction, and maintenance.

7.2.1 Legal Mechanisms

As described in Section 1.3, the City of San José and other municipalities subject to Provision C.3 of the MRP must require post-construction stormwater control measures on regulated development projects. Post-construction stormwater controls reduce pollutants from flowing to streams, creeks, and the Bay and reduce the risk of flooding by managing peak flows.

Chapter 20.95 of the City's Municipal Code includes stormwater management requirements that are consistent with the MRP. It contains references to two Council policies that govern the requirements for post-construction stormwater controls:

» Council Policy 6-29, Post-Construction Urban Runoff Management

» Council Policy 8-14, Post-Construction Hydromodification Management

The City's Municipal Code establishes legal authority for the City to require regulated private development projects to comply with MRP requirements. GSI capital projects must conform to the sizing and design requirements contained in Provision C.3 except under certain limited circumstances and they are primarily public projects under control of the City. The City's General Plan, along with its Urban Village Plans, Complete Streets Plan and other plans described in Chapter 3 govern and direct the City's actions in developing and implementing the GSI Plan. The City also intends to use the SCVURPPP GSI Handbook and associated guidelines, details, and specifications to assist with the design of GSI projects (see Chapter 4).

The City intends to evaluate its implementation of projects as part of this GSI Plan and, as needed, may consider whether additional policies or ordinances could help facilitate GSI Plan implementation in the future.

7.2.2 Funding Mechanisms

The City of San José currently uses a combination of federal and state grants and storm sewer fees to fund construction and O&M of CIP projects. The workplan for prioritized projects presented in Chapter 7 defines more than $100 million in spending on high priority regional projects. In addition, the workplan defines the process to significantly increase annual implementation of green street and LID retrofits to reach capture goals. Recognizing that current revenue sources would not be sufficient to fund these expenditures, the City conducted a study to evaluate funding alternatives to meet the revenue shortfall. The City reviewed potential funding mechanisms in the following ways:

» Benchmarked funding mechanisms being used by a sampling of other California agencies

» Reviewed legal requirements and limitations on the City's ability to implement various mechanisms

» Completed preliminary ratepayer focus groups and phone surveys to assess attitudes about stormwater, including the potential for a finance measure to fund improvements to storm sewer infrastructure

The California Constitution imposes a number of requirements and limitations on the City's ability to increase revenues that apply to funding options for stormwater management. These stormwater funding options and their limitations are summarized in Table 7-1.

In addition to those summarized in Table 7-1, other GSI funding options currently used and/or being considered by the City, include:

» Grants: To date, the City has secured several grants totaling more than $4 million to design and construct early implementation GSI projects.

» Integration with Transportation Projects: Installing and maintaining GSI facilities as part of integrated roadway programs can reduce total City costs and enable pursuit of funding mechanisms that might not normally be available to a traditional stormwater project.

Table 7-1. Stormwater Funding Options & Limitations

Revenue Mechanism	Description	Requirements	Restrictions on Use
General Tax	Revenue for any purpose, e.g., City's general business tax	Majority approval required at an election consolidated with a regularly scheduled general election for members of the City Council, unless an emergency is declared by unanimous vote of the City Council.	Use allowed for any governmental purpose
Special Tax	Revenue for specific purpose, e.g., City's special transient occupancy tax for cultural activities and facilities	Two-thirds voter approval	Limited to purpose specified in ballot measure
Property-Related Fee	A charge imposed on a parcel or upon a person as an incident of property ownership, including a user fee or charge for a property-related service	Notice and Majority Protest Procedures for sewer, water and refuse collection fees For other types of property related fees, majority approval by property owners **or** two-thirds approval by registered voters	Fee amount must correlate to service provided to the parcel charged and fee revenue cannot fund general government services
Assessment District Fee	A charge upon real property by an agency for a special benefit conferred upon the real property located within the boundaries of the assessment district	Notice and Majority Protest Procedures[1] Vote is weighted according to proportional financial obligation of affected property	Charge is limited to fund improvements which provide a direct and special benefit to property and not for general benefits or general government services. Charge must be for the reasonable cost of the "proportional special benefit" to the parcel.
Parcel Tax or Tax Imposed Through a Community Facilities District	Flat tax imposed on real property	Cannot be based on property value (ad valorem) Two-thirds qualified electors approval required	Parcel taxes limited to purpose specified in ballot measure. For CFDs, maintained or construction of pubic improvements consistent with San Jose Municipal Code Chapter 14.27.
General Obligation Bonds	Bonds issued by the City. Repayment secured by a promise to levy additional taxes in an amount as necessary to pay debt service on the bonds	Two-thirds voter approval required	Bond proceeds may be spent on the acquisition or improvement of real property only

1. The State Constitution does not specify the authority to establish an assessment district. As a charter city, San José may utilize the authority to establish an assessment district under State law or may follow provisions in the City's Municipal Code authorizing the establishment of an assessment district. However, the requirements under the State Constitution described above must also be followed.

Options that the City may consider in the future include:

» Alternative Compliance: Providing regulated projects with alternative mechanisms for C.3 stormwater compliance (e.g., when compliance cannot be achieved on-site) can leverage development activities to build and maintain public GSI systems. Credit trading programs can incentivize nonregulated properties to retrofit impervious surfaces. Some alternative compliance mechanisms are currently allowed under the MRP, but more complex approaches like in-lieu fees and credit trading will require development of new programs and ordinances.

» Public-Private Partnerships (P3s): This is an option in which GSI facilities are jointly funded by the City and a private organization or land owner for the benefit of both parties.

Based on analysis of the funding gap and consideration of preliminary public opinion research, the funding mechanisms deemed to be most feasible thus far are general obligation bond funding, a parcel tax, and grants. To better determine the feasibility and fiscal impacts of these alternatives, the City is currently conducting follow-up analyses. The goals of these follow-up tasks include:

1. Develop a more thorough funding analysis/ strategy of the two most feasible funding mechanisms: General Obligation Bonds (to fund capital projects) and Parcel Tax (for O&M), or other mechanisms as outlined in Table 7-1.

2. Develop and implement a more comprehensive outreach/polling plan to more clearly appraise the support for the recommended funding strategies that require voter approval.

3. Refine the analysis of additional stormwater infrastructure and program needs, including increased regulatory requirements, infrastructure improvements, and operations and maintenance costs.

San José Disaster Preparedness, Public Safety, and Infrastructure General Obligation Bond

In 2018, the voters of San José passed the ballot Measure T – The Disaster Preparedness, Public Safety and Infrastructure Bond. The measure authorizes the City to issue up to $650 million in general obligation bonds for a comprehensive investment in San José's infrastructure. As the City grew, many of the critical facilities that are relied upon for safety, transportation, and water became outdated and undersized. To address the infrastructure needs, the City developed a list of bond projects that included street and bridge repair, LED lighting, upgrades to existing and construction of new safety facilities, storm system conveyance and flood prevention projects, and environmental protection projects.

The Disaster Preparedness, Public Safety and Infrastructure Bond list of projects allocates approximately $25 million to clean water projects. The goal of priority projects, likely to include green stormwater infrastructure, is to provide multiple benefits by simultaneously delivering clean water to the Bay and beautifying existing City owned open space.

A mix of funding sources is necessary to meet the cost schedule for prioritized regional projects outlined in Section 7.1.1. While refining its funding strategy per the results of the analyses outlined above, the City will continue to pursue funding of at least $100 million by December 31, 2020 as set forth in the Baykeeper consent decree.

Operations and Maintenance of Green Stormwater Infrastructure

Effective operation and maintenance is essential to the success of green stormwater infrastructure and improvement of water quality. The City currently maintains an inventory of green stormwater infrastructure facilities on public property and in the public right-of-way. However, as this inventory grows, the City will have a significant annual resource demand beyond what is currently available. The City will need additional funding sources and will continue to evaluate options.

7.3 Performance Assurance

With a workplan, legal authority, and funding mechanisms in place, the remaining key element of a successful implementation plan is the technical guidance to assure project performance. The City has developed several key technical tools to guide and track GSI performance, as described in the following subsections.

7.3.1 Technical Guidance Tools

The success of the GSI Plan is contingent upon the performance of implemented GSI facilities meeting or exceeding the model-predicted performance. GSI performance assurance is required for projects on both private and public property. To increase reliability that implemented projects perform as predicted, the City has compiled a suite of tools that set the standards for GSI design, construction, inspection, and maintenance. These tools are summarized in Table 7-2.

SCVURPPP C.3 Handbook

The C.3 Handbook was written to help developers, builders, and project applicants select and size appropriate post-construction stormwater controls for their projects. The handbook provides the regulatory background and requirements under the MRP.

SCVURPPP GSI Handbook – Part I

The GSI Handbook provides guidance on sizing and design of stormwater controls. GSI projects in San José, including regulated projects and other projects on private property, will be designed and built in accordance or consistent with the best practices presented in the GSI Handbook. The models used to simulate GSI performance are structured so that they accurately capture the standard details and specifications of various facility types, thereby allowing the models to simulate the GSI facility hydraulics accurately.

SCVURPPP GSI Handbook – Part II

Part II of the GSI Handbook includes a comprehensive set of design details and specifications for typical green stormwater infrastructure that the City can utilize to support the design and construction of GSI.

San José Complete Streets Design Standards & Guidelines

The Complete Street Design Guidelines provides design guidance for integrating green stormwater infrastructure into streetscapes while considering other street uses. GSI can be used to complement complete street design when included in traffic calming and pedestrian safety.

Table 7-2. GSI Performance Assurance – Technical Guidance Documents

Guidance Topic	Project Phase	Guidance Document
Sizing Requirements	Planning & Design	SCVURPPP C.3 Handbook
		San José GSI Plan (See Chapter 4)
Design Guidance	Planning & Design	SCVURPPP GSI Handbook – Part I
		SCVURPPP GSI Handbook – Part II
		San José Complete Streets Design Standards & Guidelines
Typical Details & Specifications	Design & Construction	SCVURPPP GSI Handbook
Maintenance & Monitoring Plan	Inspection & Maintenance – Program Oversight	San José GSI Maintenance and Monitoring Plan (See Appendix D)
Maintenance Field Guide	Inspection & Maintenance – Field Work	San José GSI Maintenance Field Guide

San José GSI Maintenance and Monitoring Plan

Once GSI projects have been constructed in conformance with City standards, the City has developed a thorough inspection and maintenance program to provide assurance that the facilities will perform as intended over their lifespan. Long-term maintenance and inspection activities are described in detail in the Maintenance & Monitoring Plan (Appendix D). The Maintenance and Monitoring Plan (MMP) describes the structure of the citywide maintenance and monitoring program established to assure compliance with the MRP and reduction of flow during the equivalent of the 82nd percentile 24-hour storm.

San José GSI Maintenance Field Guide

The Maintenance Field Guide is a companion document to the MMP that provides detailed instructions to field personnel on the inspection and maintenance of various GSI types on both public and private property as a means of ensuring ongoing compliance with the MRP requirements. Observations made during an inspection at the beginning of a maintenance task inform maintenance activity needs. Lessons learned from the existing maintenance and the monitoring program serve as the basis for revising design standards.

Figure 7-5. Key Technical Tools

GSI Database

The City maintains a database of GSI projects and associated project activities. Once the status of a project is updated to reflect that GSI has been installed, then that particular installation enters an inspection cycle. From that point on, inspection records are uploaded to the database, and facilities are adaptively managed to meet the observed needs of each project. This comprehensive project data tracking system provides assurance that inspections and maintenance are being conducted in compliance with the MRP requirements. The MMP (Appendix D) and the following section describe in detail the process of tracking completed GSI projects. The tracking is done to both document performance toward water quality goals and maintain asset management information.

7.3.2 Project Tracking Plan

A required component of the GSI Plan is to develop a process for tracking and mapping completed public and private GSI projects and making the information available to the public. The City will continue to implement existing internal tracking procedures for processing public and private projects with GSI, meeting MRP reporting requirements, and managing inspections of stormwater treatment facilities. For a detailed description of the City's internal tracking process, refer to the Maintenance and Monitoring Plan (Appendix D). In addition to these existing procedures, the City will provide data to SCVURPPP for countywide tracking of completed public and private GSI projects. This countywide tracking tool can be used to document a project's pollutant reduction performance as well as overall total progress toward City or county-level water quality goals.

Countywide Data Tracking System

SCVURPPP has developed a centralized, web-based data management system with a connection to GIS platforms for tracking and mapping all GSI projects in the Santa Clara Valley. This product is called the SCVURPPP Green Stormwater Infrastructure (GSI) Database. The GSI Database provides a centralized, accessible platform for City staff to efficiently and securely upload and store GSI project data, and enhances SCVURPPP's ability to efficiently and accurately calculate and report water quality benefits associated with GSI projects. It also allows selected GSI project information and maps to be made publicly available.

Additional details about the GSI Database are presented below.

Data Types - The database structure can accommodate input, storage and display of various types of data that comprise all the information about a given GSI project. The information stored in the database includes project details provided by City staff as well as information compiled and/or calculated by SCVURPPP for each project.

Data inputs can include:

» Project Location – This field is linked to GIS files for mapping purposes. The project location information allows the project to be identified on a map, provides the project area, and identifies associated GIS data layers (e.g., land-use(s), soil types).

» Project Type – This field describes whether the project is public or private, and whether it is a C.3 regulated project, LID parcel-based retrofit, green street, or regional project. This information may help determine how pollutant load reductions are calculated.

» Project Status – This field denotes if the project is under construction or complete.

» Stormwater treatment types and relevant characteristics – These fields include the land area treated, hydraulic sizing criteria used, and other factors important for calculating pollutant reductions.

» Additional (Supporting) Information – This includes other project-related files such as pictures, construction drawings, plan sheets, etc.

» GIS data layers (land-use classifications, soil types, impervious area, rainfall data, etc.)

» Load reduction accounting calculation methods

Data Collection Process - The primary GSI data collection process is implemented at the City level. City staff will continue to collect and manage information on GSI projects within the City's jurisdiction using its existing data management systems (described in Section 6.4.2). City staff upload GSI information into the GSI Database through a web-based data entry portal. Additionally, City staff can upload other types of data files such as pictures or PDFs into the system. The data are secured with different levels of permissions depending on the user (e.g., SCVURPPP staff, City staff, or the public).

Data Outputs - Outputs of the GSI Database include information required for regulatory annual reports as well as the data needed to calculate pollutant loads reduced, runoff volume reductions, and impervious area reduced. Maps displaying project locations and other related attributes such as pollutant generation, watershed boundaries, and water bodies can also be produced.

Figure 7-6 presents the flow of general data inputs to the GSI Database and some anticipated data outputs that can be made available to the City and the general public.

The GSI Database includes the capacity to calculate project-specific pollutant load reductions achieved based on BASMAA's *Interim Accounting Methodology for TMDL Loads Reduced (BASMAA 2017).*

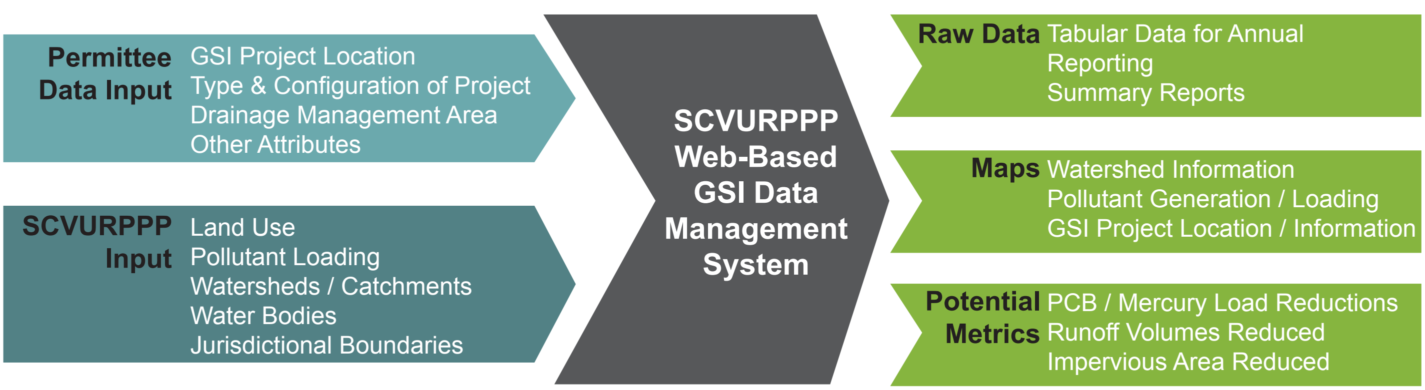


Figure 7-6. Structure and Capabilities of SCVURPPP GSI Database

8.0 CONCLUSION

Lotus Water

Green stormwater infrastructure is a powerful tool that the City of San José is utilizing to create a healthier, more sustainable urban future. Planning and investing in nature-based stormwater management technologies ensures the City is moving toward achieving long-term goals to improve water quality, reduce flooding risks, mitigate climate change impacts, and restore natural hydrology.

The GSI Plan serves as a roadmap showing how the City of San José will transform its urban landscape and storm drainage systems from a singular reliance on traditional “gray” infrastructure to an integrated approach that includes more resilient and multibeneficial “green” stormwater infrastructure systems. Traditional “gray” stormwater infrastructure, of which most of the City’s storm drain system is comprised, is designed to convey stormwater flows quickly away from urban areas. However, the peak flows and volumes can cause erosion and habitat degradation in downstream creeks to which stormwater is discharged. GSI systems reduce and slow flows, promote infiltration and evapotranspiration, collect runoff for non-potable uses, and treat runoff.

GSI integrates building and roadway design, drainage infrastructure, urban forestry, soil conservation and sustainable landscaping practices to reduce the impact of stormwater flows on downstream systems and can provide additional benefits over traditional infrastructure, such as greening of public spaces, increased pedestrian safety, and habitat restoration. These benefits help build resilience to the impacts of climate change and support sustainability goals. GSI helps to make better use of stormwater as a valuable resource, capturing it to recharge groundwater supplies or using it to meet non-potable demands, such as irrigation or toilet flushing.

The GSI Plan addresses planning and implementation within the City of San José's jurisdiction and demonstrates the City's long-term commitment to implement GSI to reduce pollutants discharged to local waterways and meet regulatory requirements. The GSI Plan serves as an implementation guide and reporting tool to provide reasonable assurance that pollutant reduction requirements in the City's stormwater discharge permit will be met. Implementation of this plan is a major Citywide effort requiring close collaboration among City departments, especially those responsible for projects affecting future alignment, configuration, or design of impervious surfaces that produce stormwater runoff, as well as those responsible for operation and maintenance of existing and future GSI facilities.

Given the relatively small scale of most GSI projects (e.g., LID on an individual parcel, single street block converted to green street), thousands of GSI projects will ultimately be needed throughout the City to meet the quantified Citywide water quality goals. Although GSI projects will require site investigations to assess feasibility and costs, the analyses conducted for the GSI Plan provide a preliminary investigation of the amount and type of GSI needed spatially (e.g., by subwatershed) to achieve these goals. However, as the GSI Plan is implemented and more comprehensive municipal engineering analyses (e.g., master planning, capital improvement planning) are performed, an adaptive management process will be key to ensuring that goals are met. In summary, this GSI Plan can inform implementation goals, but the pathway to meeting those goals is subject to adaptive management and can potentially change based on new information or engineering analysis performed over time.

Green Street in Residential Development, South San José