Chapter 5

Identification and Prioritization of Stormwater and Dry Weather Runoff Capture Project Opportunities

This chapter describes the identification and prioritization processes for GSI project opportunities, as well as the quantitative analyses used to quantify benefits of high priority project opportunities for the Santa Clara Basin. Implementation of these processes resulted in a prioritized list of potential project locations and assisted in the selection of high priority potential project locations for which concept designs were developed.

5.1 Identification and Prioritization Process

5.1.1 Process Overview

Public parcels and the public right-of-way are considered the primary locations to place potential GSI projects, and hence, were the focus of the identification and prioritization process. Thousands of public parcels and tens of thousands of public right-of-way segments exist across the County, and a meaningful method to identify and evaluate potential project locations was needed to sift through the high volume of potential project locations. Figure 5-1 presents a flow chart that outlines the processes used in the analysis.

Figure 5-1. Identification and Prioritization Processes for GSI Project Opportunities.

5.1.2 Selection of Models and Decision Support Tools

There are numerous models and tools available that can support the identification of potential stormwater and dry weather runoff capture projects and the metric-based benefits analysis for prioritization of projects. These models and tools can support two major processes for project identification and prioritization to support development of the SWRP, including:

1. **GIS Screening to Identify Project Opportunities** – Tools are available that can support project screening through automated procedures for analyzing and processing GIS datasets.
2. **Modeling of Project Benefits** – Continuous simulation hydrologic models are used to estimate the stormwater runoff volume and pollutant loads delivered to each project and the volumes captured and loads reduced through project implementation. These estimates can be used to further prioritize potential projects for implementation and provide important information to justify funding based on benefits received from the investment.

A memorandum entitled "Metrics and Methodologies for Identifying and Prioritizing GI Projects and Evaluation and Selection of Appropriate Models and Tools for the SWRP" was prepared that describes the available models and tools that can support the above processes, the evaluation of the models' and tools' suitability for development of the SWRP, and the models and tools that were ultimately selected. This memorandum is provided in Appendix 5-1.

5.1.3 Types of Project Opportunities

The SWRP focuses on the identification and prioritization of stormwater and dry weather runoff capture opportunities on public parcels and within the public right-of-way. The types of projects possible in these locations have been categorized as: 1) parcel-based low impact development (LID) projects; 2) regional stormwater capture projects; and 3) green streets. The project opportunities were split into these three categories because of fundamental differences in GSI measures used, project scale, and measures of treatment efficiency. For example, a different set of factors may determine the feasibility and efficiency of a large-scale regional facility compared to a rain garden designed for a small parking lot. A description of each type is provided below.

LID Projects

LID 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 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 the SWRP, LID projects are stormwater capture facilities that treat runoff generated from a publicly-owned parcel on that parcel.

Regional Stormwater Capture Projects
Regional projects capture and treat stormwater and dry weather runoff from off-site sources, including surface runoff and diversions from storm drains, channels, culverts, and streams. Benefits of regional stormwater capture projects include flood risk reduction, stormwater treatment and use, and groundwater recharge. These projects may take a variety of forms such as detention and retention basins, subsurface infiltration galleries, and constructed wetlands. The site characteristics will determine what types of regional projects are feasible, e.g., whether a project is on-line or off-line from the storm drain network, whether it is desirable to change the functionality of the site, whether the project is above ground or underground, and the size of the project.

Green Street Projects
Green street projects are stormwater and dry weather runoff capture opportunities in the public right-of-way that capture runoff from the street and adjacent areas that drain to the street. The technologies used for green streets are similar to those used in LID projects but are limited to the right-of-way. Green street projects may include bioretention (e.g., stormwater planters, stormwater curb extensions or stormwater tree filters), pervious pavement, and/or infiltration trenches. Green street projects may reduce stormwater runoff quantity, reduce pollutants and sediment, recharge groundwater, and help prevent localized flooding and ponding. In addition, they can provide other benefits such as urban greening, habitat for birds and pollinators, reduced urban heat island effect, and increased pedestrian and cyclist safety.

5.1.4 Datasets

A variety of datasets were used in the identification and prioritization of project opportunities. The SWRP Guidelines specify that a quantitative metrics-based analysis be used in the prioritization of projects. This resulted in a data-driven process that allowed the stormwater capture and treatment potential of a project opportunity to be evaluated without knowing the exact details of the project to be placed at any given location. The datasets and sources used in this process are presented in Table 5-1. Details on how these datasets were used in the analysis are presented in the subsequent sections.

Table 5-1. Data Sources Used in Identification and Prioritization Process

Dataset	Source	Description	Data Type	Process
2017 Parcel	County	Parcel shapefile containing information on ownership, land use, etc.	Polygon shapefile	Screening
2017 Street Centerline	County	Street line shapefile containing information on ownership, pavement type, speed limit, and functional use	Line shapefile	Screening

Dataset	Source	Description	Data Type	Process
DEM	National Elevation Dataset	Digital elevation model derived from LiDAR. Used to derive slope raster	Raster	Screening Prioritization
% Impervious	2011 NLCD	30-m resolution raster of impervious percentage	Raster	Prioritization
Hydrologic Soil Group	SSURGO	Shapefile containing dominant hydrologic soil group	Polygon shapefile	Prioritization
Storm Drains	SCVURPPP	Storm drain locations compiled using local GIS data from city/county agencies	Line shapefile	Prioritization
Subwatersheds	SCVWD	Subwatersheds used in conjunction with flood reports to determine flood-prone areas	Polygon shapefile	Prioritization
PCB Interest Areas	SCVURPPP	Parcels determined to have potential to generate PCBs in runoff based on old industrial/urban land uses	Polygon shapefile	Prioritization
Priority Development Areas (PDAs)	ABAG	Tracts designated as PDAs by ABAG	Polygon shapefile	Prioritization
Groundwater Recharge Areas	SCVWD	Areas with favorable soils that are conducive to groundwater recharge	Polygon shapefile	Prioritization
Geotracker Sites	State Board	Coordinates of active cleanup sites in California	Excel spreadsheet	Prioritization
Disadvantaged Communities	2010-2014 American Community Survey	Block groups that are a disadvantaged community (below 80% of statewide median household income)	Polygon shapefile	Prioritization
Community of Concern	Metropolitan Transportation Commission	Tracts designated as communities of concern by MTC	Polygon shapefile	Prioritization

5.2 Project Opportunity Identification and Screening

The following subsections outline the method used to screen public parcels and streets to identify project opportunities for the three types of stormwater and dry weather runoff capture projects described in Section 5.1.3.

5.2.1 Screening of Public Parcels

Public parcels can provide opportunities for LID projects or regional stormwater capture projects, depending on their size and drainage area. The first step was to identify public parcels that can support stormwater capture projects. Parcels were dissolved into areas of contiguous ownership, meaning that adjacent parcels owned by the same entity were merged and considered one "parcel". For ease of discussion, these contiguous ownership areas will continue to be referred to as "parcels" within the remainder of this document. Parcels were first screened for public ownership. Public parcels were identified through the "public flag" attribute in the County Assessor's parcel dataset. Parcels owned by a city, the County, SCVWD, State agencies, and various open space organizations (the Santa Clara Valley Open Space Authority, Midpeninsula Regional Open Space District, and Peninsula Open Space Trust) were included in this screening. Additionally, parcels with land use designations that are associated with public use (e.g., park, open space, or school) were added to the selection.

Once parcels were selected based on ownership or use, additional criteria were imposed to identify locations that can support either a regional stormwater and dry weather runoff capture project (capturing runoff from surrounding areas) or an on-site LID project (capturing on-site runoff only)[12]. All parcels that are less than 0.25 acres were determined infeasible for regional stormwater capture and were categorized as opportunities for on-site LID projects only. Parcels greater than or equal to 0.25 acres were considered large enough to support either regional or LID projects. Parcels with an average slope greater than 10% were screened out due to the potential for increased maintenance requirements and additional design challenges in implementing stormwater capture projects. A summary of the screening factors for selecting parcel-based project opportunities is presented in Table 5-2.

Table 5-2. Screening factors for parcel-based project opportunities.

Screening Factor	Parcel Characteristic	Criteria	Reason
Public Parcels	Ownership	County, City, Town, SCVWD, State, Open Space Agencies	Identify all public parcels for regional storm and dry weather runoff capture projects or onsite LID retrofits
	Land Use	Park, School, Other (e.g., Golf Course)	

[12] Note that regional stormwater and dry weather runoff capture projects will likely be most cost-effective from the standpoint of maximizing stormwater capture but may be more complex in scale and funding than other types of GSI. Smaller scale GSI projects are less complex, provide stormwater quality benefits and are useful as public demonstration projects to promote GSI and LID.

Screening Factor	Parcel Characteristic	Criteria	Reason
Suitability	Parcel Size	≥ 0.25 acres	Opportunity for regional stormwater and dry weather runoff capture project
		< 0.25 acres	Opportunity for on-site LID project
	Site Slope	< 10 %	Steeper grades present additional design challenges

5.2.2 Screening of Public Rights-of-Way

Public rights-of-way (ROW) present an opportunity for implementation of green stormwater infrastructure within the streetscape. The County street centerlines dataset was used to identify candidate streets and screen for suitability based on road surface type and speed limit. Streets with speed limits over 45 miles per hour were removed from consideration for GSI implementation. Mild slopes are generally more suitable for green streets than steep slopes, so sections of street that have greater than a 5% slope were also removed from consideration. A summary of the screening factors for selecting ROW-based project opportunities is presented in Table 5-3**.**

Table 5-3. Screening Factors for Right-of-Way-Based Project Opportunities

Screening Factor	Street Section Characteristic	Criteria	Reason
Selection	Ownership	Public	Potential projects are focused on public and right-of-way opportunities
Suitability	Surface	Paved	Only roads with paved surfaces are considering suitable. Dirt roads are 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 some expressways and highways.

5.3 Quantitative Metrics-Based Benefits Analysis

An integrated metrics-based analysis was conducted to quantitatively assess benefits that may be achieved by stormwater capture projects placed at screened project opportunities. The analysis was conducted in two steps: (1) a metrics-based prioritization analysis to evaluate the potential benefit of every screened project opportunity and (2) modeling of volume and pollutant load reductions for the subset of high priority potential projects that were considered for conceptual design. The metrics used in the prioritization method were determined by the SWRP TAC, with stakeholder input, to be indicators of a site's potential to support a highly-effective, multi-benefit project. The result of the metrics-based prioritization analysis is a prioritized list of all screened project opportunities ranked by their potential to support multi-benefit high-performance projects. Volume and pollutant load reductions were then modeled for the subset of potential projects from that list that were considered for development of project concepts. The following sections describe the benefits received from typical stormwater capture projects, the metrics selected in the prioritization method to maximize these benefits, and the process used for the in-depth quantitative analysis of volume and pollutant load reductions.

5.3.1 Prioritization of Project Opportunities

The following sections outline the methodology used to prioritize stormwater capture project opportunities. Physical characteristics of the identified project opportunities are key considerations in the prioritization process, as these typically serve as surrogate indicators of the expected effectiveness of each project's ability to capture stormwater.

In addition to the physical characteristics, several other site characteristics were included in the prioritization analysis to consider local priorities of the SCVURPPP agencies and the potential for a project to achieve multiple benefits aside from stormwater capture. Because the site characteristics that are conducive for effective projects vary by project type, the three project types identified in Section 5.1 were evaluated independently and given a separate prioritization score.

The prioritization process also considered whether projects would achieve multiple benefits, such as: augmentation of local water supply through groundwater recharge or storage; pollutant and hydrologic source control; onsite/local infiltration and use; reestablishment of natural treatment and infiltration systems where appropriate; development, restoration and/or enhancement of habitat and open space through stormwater management; and use of existing publicly owned lands to capture, clean, store, and use runoff.

Physical Site Characteristics

On-site LID Project Opportunities

Parcels that were identified through the screening process as feasible LID project locations were prioritized to aid in the selection of projects that would be the most effective and provide the greatest number of benefits. Prioritization scoring criteria for LID projects on public parcels are presented in Section 5.3.2**.**

While LID projects have many of the same types of characteristics as regional projects, the scale of projects requires different spatial evaluation. LID projects typically treat only runoff generated on-site. This means that the drainage area for an LID project is typically no larger than the parcel size. For LID project prioritization, all physical characteristics were evaluated at the parcel scale.

Four physical characteristics were used in the prioritization of LID projects:

1. ***Parcel land use*** was used to prioritize sites that are more suitable for LID projects. Because LID projects treat runoff generated on-site, they are typically located where imperviousness is high, such as existing buildings, walkways, and pavements. Public buildings and parking lots were given the highest priority, followed by public open space, and schools and golf courses. Schools and golf courses were given lowest priority due to difficulties in coordinating construction schedules and disruption of use. Land use across the Santa Clara Basin is shown in Figure 5-2.
2. ***Impervious area***, averaged over the parcel area, was included in the prioritization because of the connection between highly impervious areas and large runoff potential. Because the primary goal is to reduce runoff, LID projects should be placed to treat sites that produce high runoff. Higher priority was given to parcels with high imperviousness. Impervious coverage across the Santa Clara Basin is shown in Figure 5-3.
3. ***Hydrologic Soil Group*** of soils within the parcel was also considered in the prioritization. Soil groups are categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the objectives of stormwater capture, highest priority was given to Soil Group A, with each subsequent group assigned fewer points. Hydrologic soil groups across the Santa Clara Basin are shown in Figure 5-4.
4. ***Slope***, averaged over the parcel, was the last physical characteristic in the prioritization of parcels for LID retrofit projects. Sites with relatively mild slopes provide the most feasible opportunities for stormwater capture. Constructing on steep slopes presents difficulties with implementation and performance of the LID structures. Percent slope across the Santa Clara Basin is shown in Figure 5-5.

Regional Stormwater Capture Project Opportunities
Parcels that were identified through the screening process as feasible regional project locations were prioritized to aid in the selection of projects that would be the most effective and provide the greatest number of benefits. Prioritization scoring criteria for regional projects on public parcels are presented in Section 5.3.2.

To determine the physical characteristics of each regional project opportunity, some characteristics required averaging of values over the potential drainage area. Since it is infeasible to accurately delineate every parcel's drainage area when doing an analysis at a countywide scale, a method was derived to establish a *representative drainage area* for each parcel. Several assumptions were made in determining the representative drainage area: (1) a regional project footprint will account for 25 percent of its parcel area, and (2) the estimated drainage area is 250 times the area of the project footprint.[13] Using these assumptions, the representative drainage area was drawn as a circular buffer around the centroid of each parcel centroid. For large parcels, the buffer was limited to 1,000 acres to limit uncertainty. Additionally, buffers were clipped to the County land boundary to remove sections that extend into a waterbody. The representative drainage area for each parcel was used to obtain average values for imperviousness and slope that were used in the prioritization scoring method. Five physical characteristics were used in the prioritization of parcels for regional stormwater capture:

1. ***Parcel land use*** was used to prioritize sites that are most likely to have adequate space for a regional project and cause minimal disturbance of existing use. Parks or other public open space were given the highest priority, followed by parking lots and parcels with other urban land use designations. Parcels with other urban land use designations were assumed to contain existing buildings that would require full or partial demolition to allow space for a regional project footprint. Schools and golf courses were given lowest priority due to difficulties in coordinating construction schedules and disruption of use. Land use across the Santa Clara Basin is shown in Figure 5-2.
2. ***Impervious area***, averaged over the representative drainage area, was included in the prioritization due to the connection between highly impervious areas and large runoff potential. Because the primary goal is to reduce runoff via stormwater capture, regional projects should be placed to treat areas that produce high runoff volumes. Higher priority was given to parcels with representative drainage areas with high imperviousness. Impervious coverage across the Santa Clara Basin is shown in Figure 5-3.
3. ***Parcel size*** was prioritized to ensure that regional project sites have adequate space to treat large drainage areas. Larger parcels were given higher prioritization scores.
4. ***Hydrologic Soil Group*** of soils within the parcel was also considered in the prioritization. Soil groups are categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the objectives of stormwater capture, highest priority was given to Soil Group A, with each subsequent group assigned fewer points. Hydrologic soil groups across the Santa Clara Basin is shown in Figure 5-4.
5. ***Slope***, averaged over the representative drainage area, was the last physical characteristic in the prioritization of parcels for regional projects. Sites with relatively mild slopes provide the most feasible opportunities for stormwater capture. Constructing stormwater capture projects on steep slopes presents implementation and performance difficulties. Percent slope across the Santa Clara Basin is shown in Figure 5-5.

[13] Assumptions were derived from a survey of regional stormwater capture conceptual designs developed in the Los Angeles region for the Enhanced Watershed Management Programs.

Green Street Opportunities

Street segments that were identified through the screening process as feasible green street project locations were prioritized to aid in the selection of locations that would be the most effective and provide the greatest number of benefits. Prioritization scoring criteria for green streets in ROW are presented in Section 5.3.2.

To evaluate the physical characteristics of each street, street lines were discretized into segments of appropriate length for evaluating feasibility of distributed practices at the proper scale. Street lines in GIS were broken at each intersection to segment continuous roads into well-defined segments.

Since it is infeasible to accurately delineate drainage areas to every street for analysis at a countywide scale, a method was devised to establish a *representative drainage area* for each street segment. Representative drainage areas were based on an assumed ratio of contributing drainage area per length of street. Previous analyses in the Los Angeles region suggest a ratio of approximately 20 acres of drainage area per 1 mile of street length. Using these assumptions, the representative drainage areas were drawn as a buffer (approximately 85 feet on each side) around each street line equaling the estimated area described above. Buffers were clipped to the County land boundary to remove sections that extend into a waterbody. The representative drainage area for each street was used to obtain average values for imperviousness and slope that were used in the prioritization scoring method.

Three physical characteristics were used in the prioritization of suitable green streets:

1. ***Impervious area***, averaged over the representative drainage area, was included in the prioritization due to the connection between highly impervious areas and large runoff potential. Because the primary goal is to reduce runoff via stormwater capture, green streets should be placed to treat areas that produce high runoff. Higher priority was given to parcels with representative drainage areas with high imperviousness. Impervious coverage across the Santa Clara Basin is shown in Figure 5-3.
2. ***Hydrologic Soil Group*** of soils within the right-of-way was also considered in the prioritization. Soil groups are categorized based on their drainage properties, with Group A representing the most well-drained soils and Group D representing the least well-drained soils. Because infiltration is one of the benefits of green streets, highest priority was given to Soil Group A, with each subsequent group assigned fewer points. Hydrologic soil groups across the Santa Clara Basin is shown in Figure 5-4.
3. ***Slope***, averaged over the length of street segment, was the last physical characteristic in the prioritization of rights-of-way for green streets. Sites with mild slopes are ideal for green streets because they allow for street designs that capture more volume with reduced maintenance requirements. Percent slope across the Santa Clara Basin is shown in Figure 5-5.

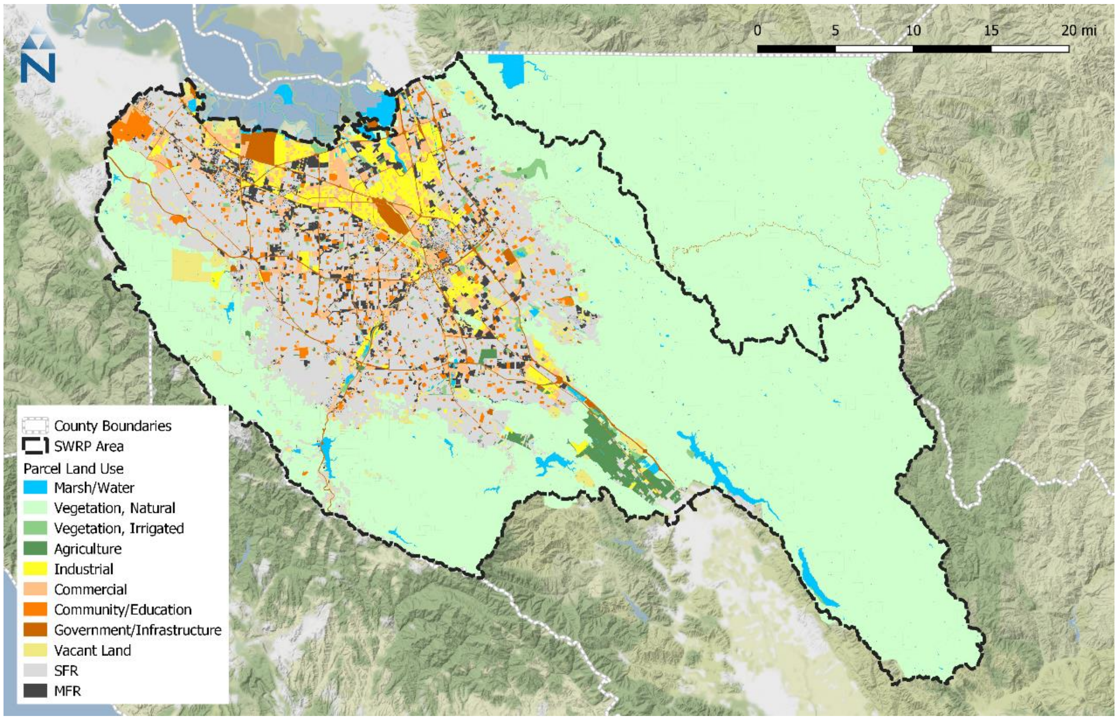

Figure 5-2. Parcel Land Use (Source: ABAG, 2005, and EOA, Inc., 2013)

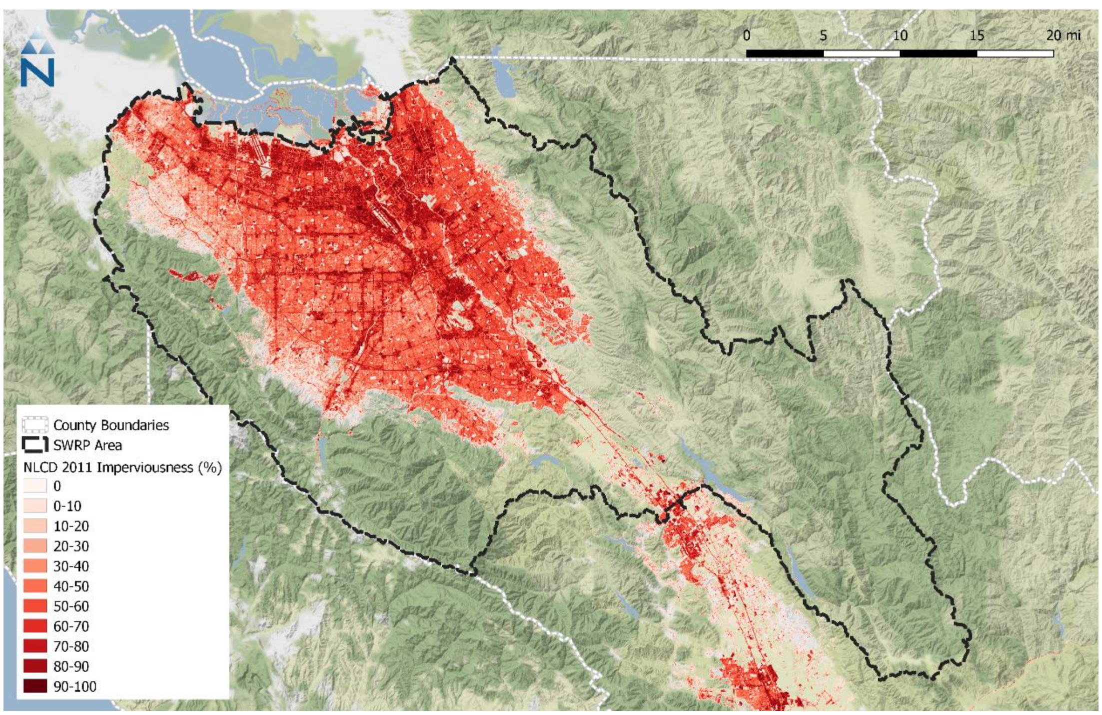

Figure 5-3. Percent of Impervious Cover (Source: National Land Cover Database (NLCD), 2011)

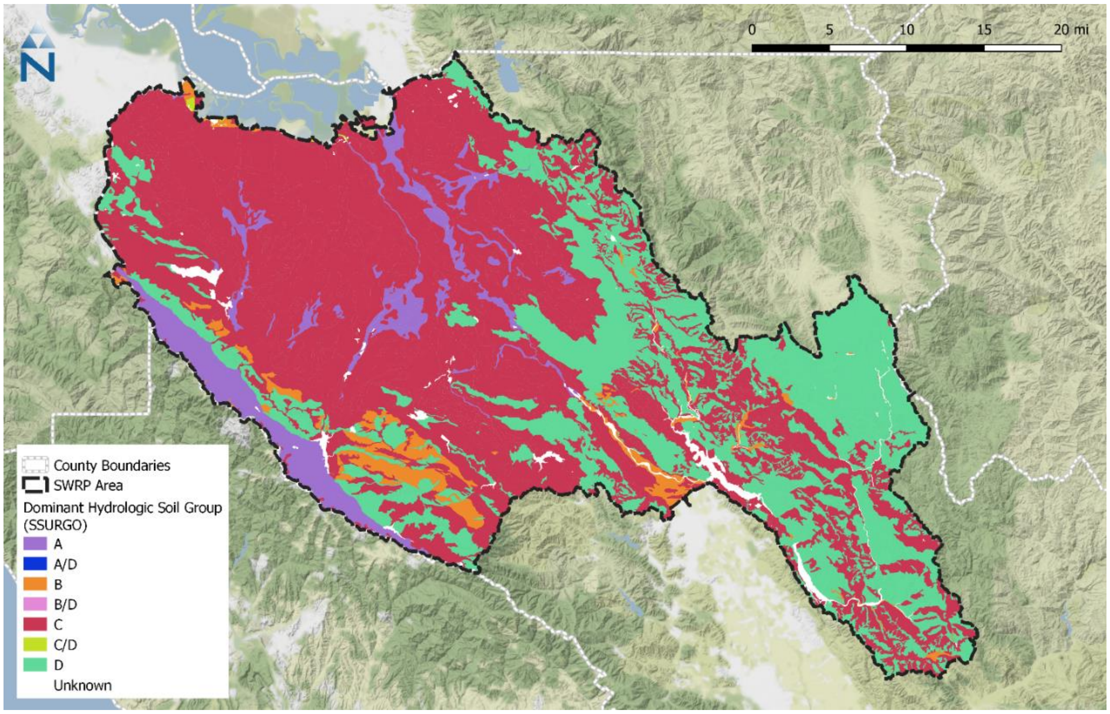

Figure 5-4. Hydrologic Soil Group (Source: Soil Survey Geographic Database (SSURGO) 2016)

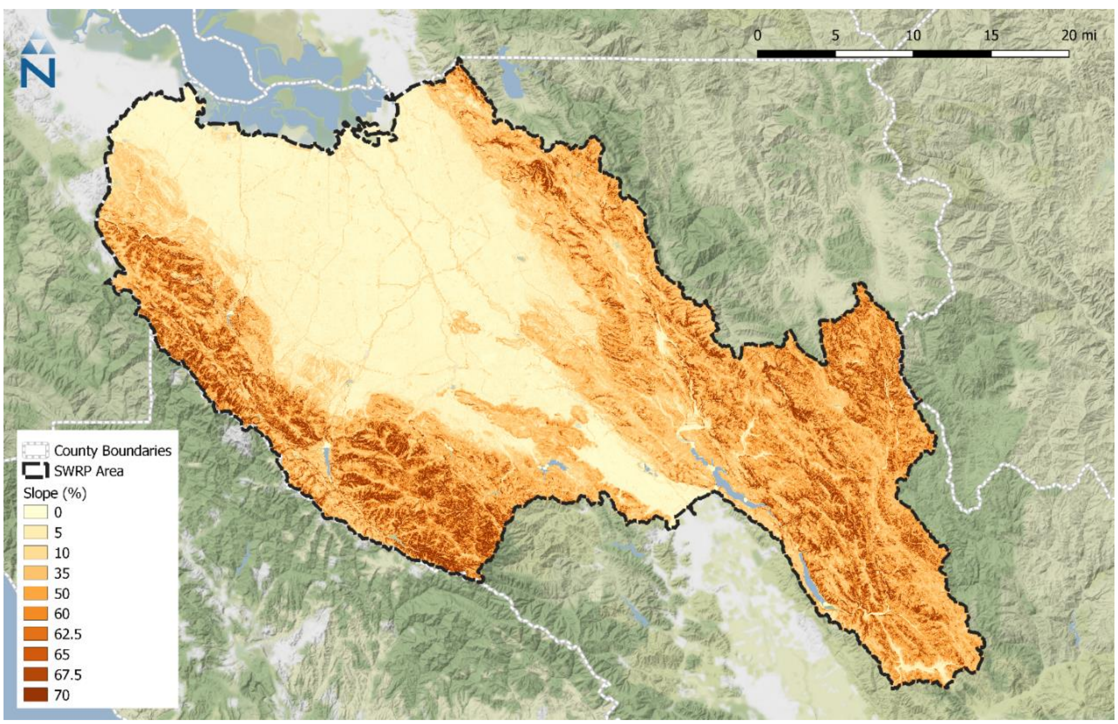

Figure 5-5. Percent Slope of Land Surface (Source: National Elevation Dataset (NED), 2014)

Other Site Characteristics

Proximity to Storm Drains

Regional projects most often capture and treat runoff that is diverted from large storm drains or channels. 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. Capital costs may increase substantially when runoff must be diverted a long distance. Prioritizing projects closer to the storm drain will promote efficient and economical projects. This metric utilized a countywide dataset of storm drains that are 24 inches in diameter or above.

Note that proximity to sanitary sewers, for the purpose of diverting dry weather runoff flows to sanitary systems as a source of recycled water, was not considered as part of this SWRP. There are a number of issues that need to be addressed with producers of treated wastewater, municipalities, water distribution companies, and other agencies in the County before these types of projects are evaluated. The SCVWD's Countywide Water Reuse Master Plan, currently under development, will be addressing water reuse needs within the region and may help inform the evaluation of potential dry weather flow diversion projects in the first update of the SWRP.

Flood-prone Streams and Areas

Regional, LID, and green street project sites were given higher priority according to proximity to flood-prone streams and areas affected by flooding. Projects placed within the subwatersheds of flood-prone streams and flood-prone areas will help mitigate flood risks and reduce flood and hydromodification impacts by limiting the volume of runoff that reaches the impacted streams. Regional stormwater capture projects can either slow the travel of runoff to the flood-prone stream through capture and slow release or remove the runoff volume entirely through infiltration or beneficial use. Distributed LID and green streets in subwatersheds of flood-prone streams and areas alter the imperviousness and hydrology so that less runoff contributes to flooding. Points for this category were given to any project that was located within subwatersheds containing flood-prone streams or areas. Flood-prone streams and areas were identified through regional plans or studies, including SCVWD's One Water Plan, and from SCVWD flood reports spanning the last 10 years. Figure 5-6 shows the subwatersheds containing flood-prone streams and areas.

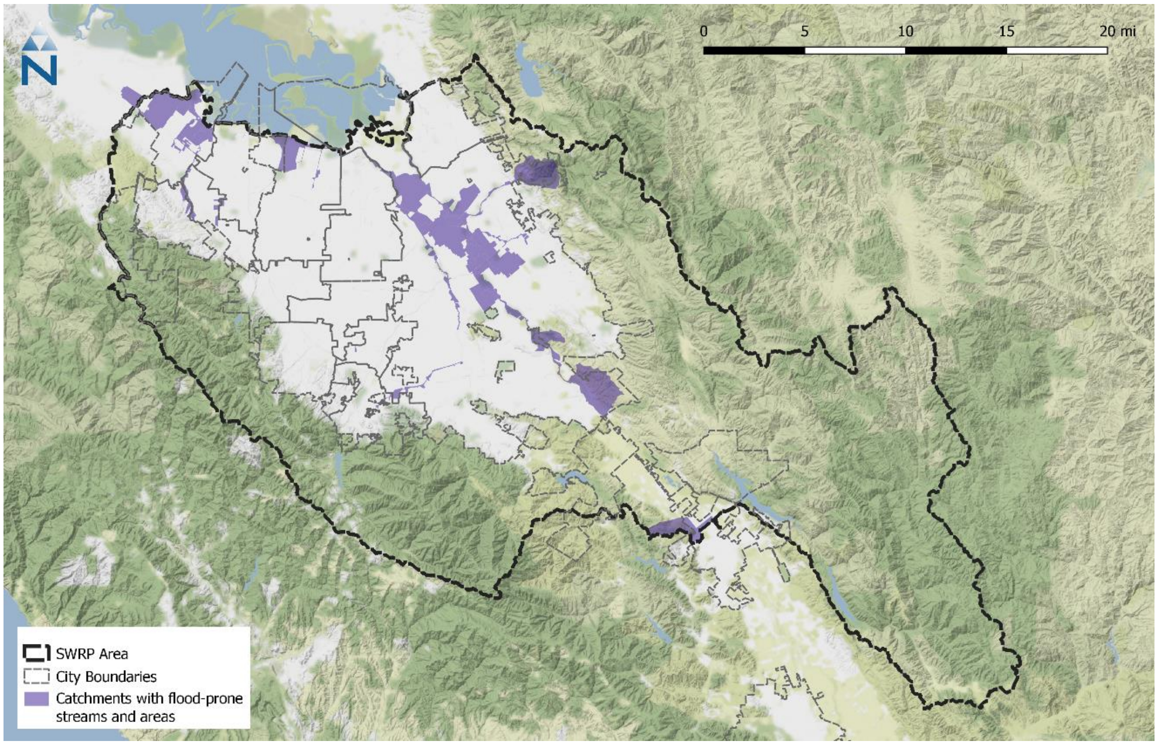

Figure 5-6. Subwatersheds Containing Flood-Prone Streams and Areas (Source: SCVWD HMP Storm Drain Catchments and SCVWD 2009, 2012, 2017 flood reports)

PCB Interest Areas

PCB interest areas were considered in the prioritization analysis to give higher priority to projects with potential for source reduction[14]. PCBs are one of the primary pollutants of concern within the Bay Area; therefore, siting of stormwater capture projects in PCB interest areas can potentially address surface water quality issues[15]. The interest areas are composed of two categories and are defined in Table 5-4. Higher scores were assigned to projects whose drainage areas contain PCB interest areas. Regional capture and green street projects received points in this category if the PCB interest area is within the project's representative drainage area. LID projects received points if the project parcel is a PCB interest area. Figure 5-7 shows PCB interest areas across the Santa Clara Basin.

[14] As part of the RAA required by the MRP to address PCB and mercury TMDLs and the GSI Plans, further analysis will be performed to determine the full extent that TMDLs will be addressed with GSI. Future updates of the SWRP can incorporate findings of the RAA.

[15] Projects near pollutant sources will include appropriate pretreatment prior to infiltration, or be designed to not allow infiltration, in order to protect groundwater quality.

Table 5-4. PCB Interest Area Categories

Interest Category	Description
High	Parcels, broader land areas, or stormwater catchments associated with land uses (most commonly old industrial, electrical, recycling, railroad, and military) that have a relatively higher likelihood of having elevated concentrations of PCBs (≥0.5 mg/kg) in street dirt, sediment from the MS4, or in stormwater runoff (particle concentration). These areas generally have not been redeveloped and do not contain stormwater treatment facilities.
Moderate	Parcels, broader land areas, or stormwater catchments associated with land uses (typically older non-industrial urban land uses) that have limited risk factors associated with PCBs. These areas generally have not been redeveloped and do not contain stormwater treatment facilities. Moderate interest areas are less likely to have elevated concentrations of PCBs.

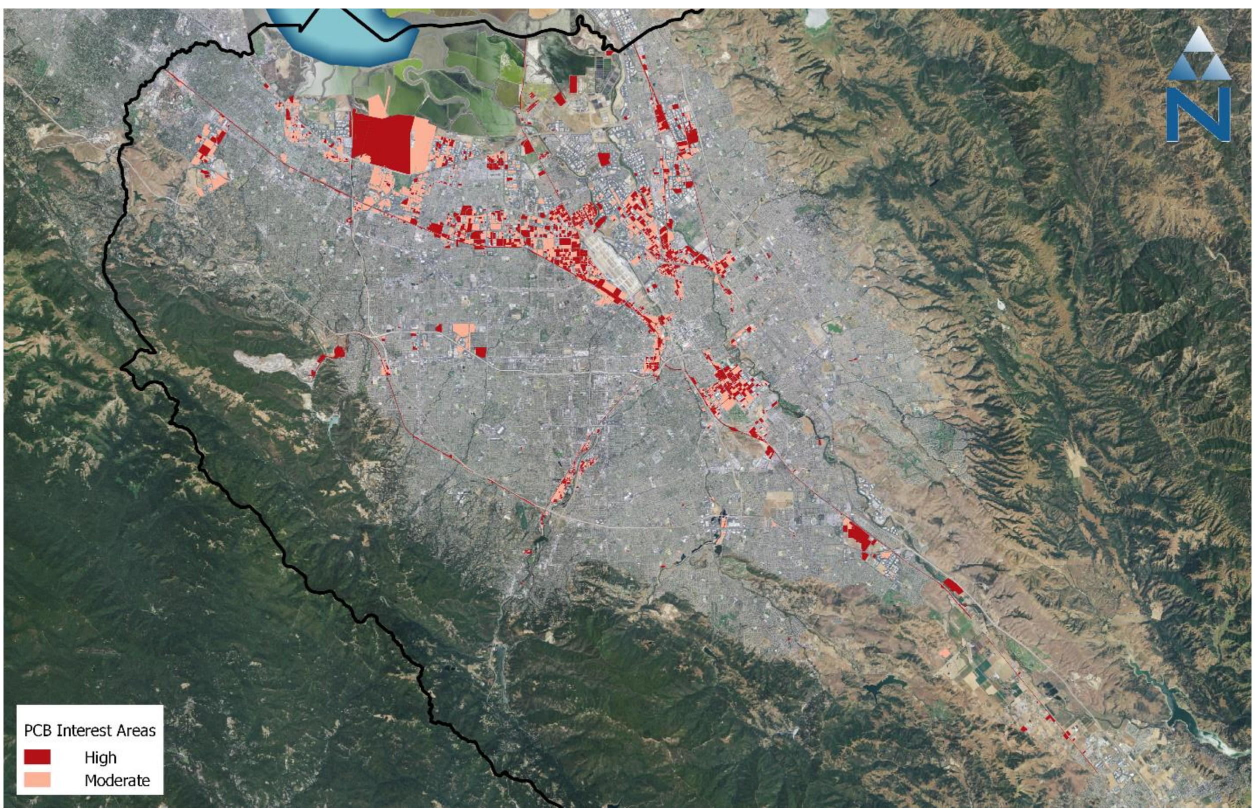

Figure 5-7. PCB Interest Areas (Source: EOA, Inc., based on ABAG land use data, 2005, and Santa Clara County Assessor's parcel data, 2014)

Priority Development Areas

Additional metrics were considered that help align the goals of GSI implementation with other regional priorities. One of these metrics is Priority Development Areas (PDAs). The Association of Bay Area Governments (ABAG) describes PDAs as places identified by Bay Area communities as areas for investment, new homes, and job growth. Projects that are within a PDA are likely to coincide with redevelopment and revitalization projects, taking advantage of opportunities for coordinated efforts. Projects within a PDA received additional points.

Co-located Planned Projects

Higher scores were given to potential project locations where a multi-benefit stormwater capture project could be implemented in parallel with new or redevelopment projects or municipal capital improvement projects. Co-locating stormwater capture projects with other planned improvement projects opens opportunities for cost-sharing and maximizes multiple benefits achieved by a single project. SCVURPPP member agencies submitted lists of potential or planned capital improvement project locations with relevant information, such as project description, contact information, and multiple benefits received from each project. Stakeholder groups were also given the opportunity to submit projects to be considered as co-located opportunities. Parcels and rights-of-way that are located near potential co-located projects were given higher priority, with additional points awarded for each benefit perceived to be an outcome of the project.

Additional Benefits

One of the primary objectives of the SWRP is to maximize the number of benefits received for each project opportunity. While the reduction of pollutant loads is one of the primary objectives of green infrastructure (from the stormwater regulatory perspective), several other benefits can be achieved to improve cost effectiveness and gain public support. Mindful planning and design to include multiple benefits can aid in public acceptance and community engagement, while creating avenues for funding stormwater capture projects. Each project opportunity received at least one additional point for each anticipated benefit identified from the following list:

1. Project is expected to augment local water supply through groundwater recharge or beneficial use. In the case of groundwater recharge, water quality should not be negatively impacted[16]. Projects located above groundwater recharge areas received 5 points unless located near areas of existing groundwater contamination. Projects within

[16] The District's Water Supply and Infrastructure Master Plan (SCVWD, 2012; updated 2016) calls for new groundwater recharge ponds on the west side of the valley to augment groundwater recharge capacity. Projects located in this area may be prioritized for implementation.

500 feet of an active Geotracker[17] cleanup site did not receive this point. Projects with opportunity for capture and use received 1 point.[18]

2. Project provides source control of pollutants and wet-weather or dry-weather runoff volume (1 point).
3. Project reestablishes natural water drainage treatment and infiltration where appropriate, or mimics natural pre-development drainage (1 point).
4. Project creates, enhances, or restores habitat and open space through stormwater management. This includes habitat directly created by the green infrastructure or the enhancement of stream habitat through reduction of hydromodification (1 point).
5. Project promotes community enhancement, which encompasses a variety of benefits, such as the beautification of neighborhoods, mitigation of heat island effect through urban greening, improves traffic, and promotes pedestrian/bicycle use. Projects that are located within either a Disadvantaged Community or a Community of Concern identified by the Metropolitan Transportation Commission received 5 points in this category. Projects that may contain other community enhancement elements received 1 point.

Maps of Communities of Concern and Disadvantaged Communities within the SWRP planning area are shown in Figures 5-8 and 5-9, respectively.

[17] The GeoTracker database includes contaminated sites in the California DTSC Envirostor database, as well as EPA-regulated sites. In addition, GeoTracker contains various unregulated projects as well as permitted facilities. GeoTracker is considered an all-inclusive database with emphasis on groundwater quality and so was the only database considered in the prioritization process.

[18] Depth to groundwater is an important consideration during the design of stormwater capture projects with an infiltration component. Adequate separation is required between the bottom of the infiltrating structure and the seasonal high groundwater table, per the MRP and SCVURPPP and SCVWD guidelines. This requirement is in place to ensure proper infiltration and to avoid groundwater contamination. Depth to groundwater, while not explicitly represented in the screening and prioritization methodology, was considered on a site-by-site basis during development of project concepts.

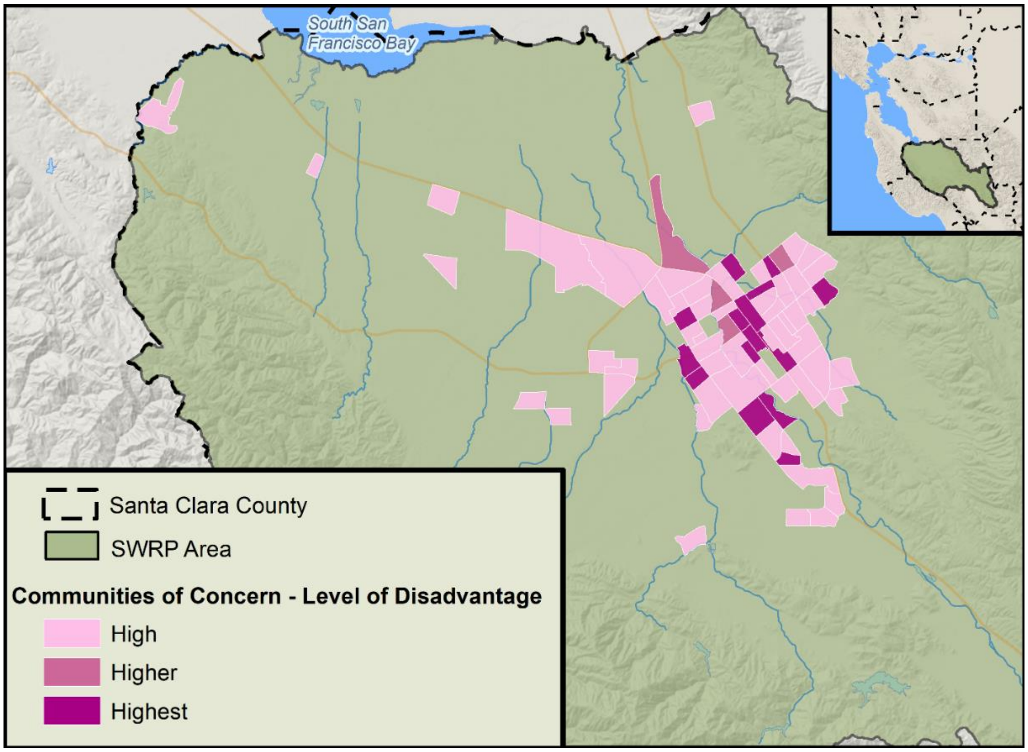

Figure 5-8. Communities of Concern within the SWRP Area (Source: Metropolitan Transportation Commission; American Community Survey 2012-2016, 5-year estimates)

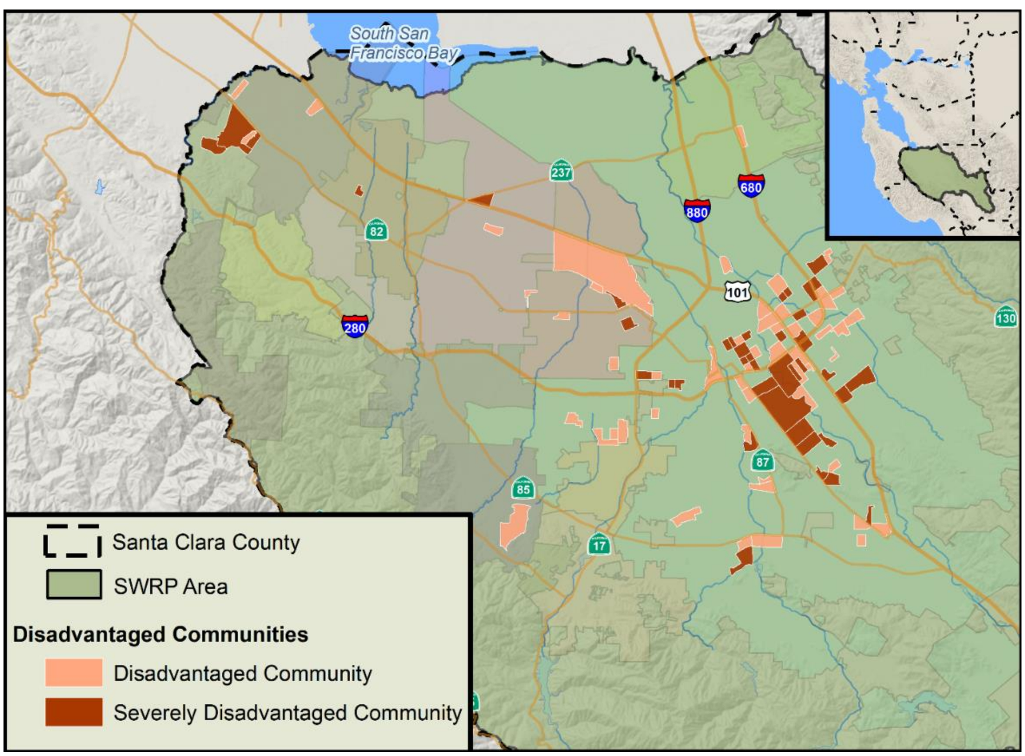

Figure 5-9. Disadvantaged Communities within the SWRP Area (Source: State of California SB 535; American Community Survey 2012-2016, 5-year estimates)

5.3.2 Final Project Prioritization Scoring

There are three separate prioritization scores for each of the three project types identified in Section 5.1: on-site LID projects, regional stormwater capture projects, and green streets. Three separate scoring systems are used because the ideal site conditions for an effective stormwater capture project depends on the type of project implemented. Every screened parcel larger than 0.25 acres received two scores: one for regional project opportunity and one for onsite LID retrofit opportunity. Screened parcels smaller than 0.25 acres were only given a score for LID retrofit opportunity. Every screened street segment was given one score for green street opportunity.

For each project opportunity, scores were assigned for each metric described above. In addition, based on input from the SCVURPPP agencies and the TAC, the *Impervious Area*, *PCB Interest Area*, and *Augments Water Supply* metrics were each assigned a weighting factor of 2. Scores in those categories were multiplied by the weighting factor. Those metrics were determined to hold extra importance in determining the effectiveness of stormwater capture projects. Each prioritization score was determined by summing the points received across all metrics. Tables 5-5 through 5-7 outline the three scoring systems used to assign each project a score.

LID Project Opportunities

Table 5-5 provides the final scoring metrics for LID projects, and Figure 5-10 shows the potential locations of the LID project opportunities.

Table 5-5. Prioritization Metrics for LID Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Parcel Land Use			Schools/ Golf Courses	Park / Open Space	Public Buildings	Parking Lots	
Impervious Area (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Hydrologic Soil Group		C/D		B		A	
Slope (%)		10 > X > 5	5 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X	
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 and use				Above groundwater recharge area and 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	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

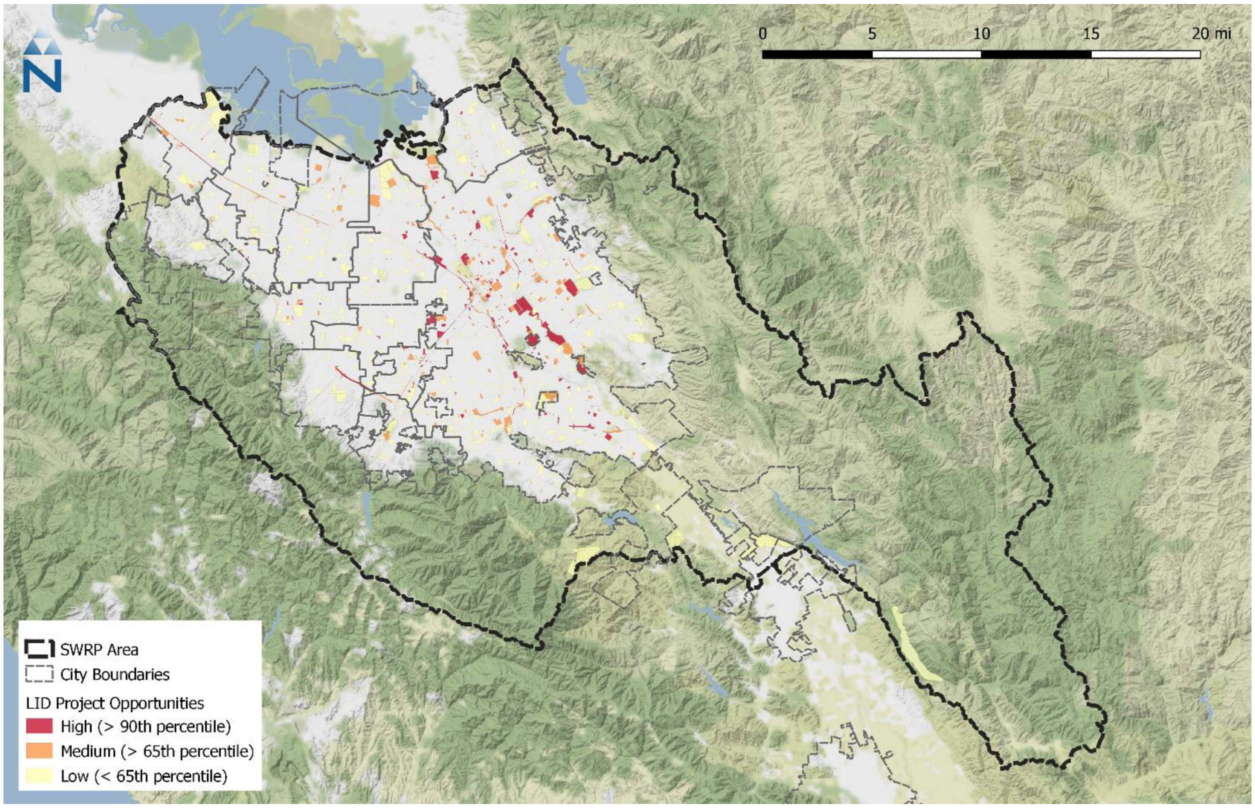

Figure 5-10. Prioritized LID Project Opportunities

Regional Stormwater Capture Project Opportunities

Table 5-6 shows the final scoring metrics for regional projects, and Figure 5-11 shows the locations of the regional project opportunities.

Table 5-6. Prioritization Metrics for Regional Stormwater Capture Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Parcel Land Use			Schools/Golf Courses	Public Buildings	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)	0.25 ≤ X < 0.5	0.5 ≤ 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 (feet)	X > 1,000	1,000 ≥ X > 500		500 ≥ X > 200		200 ≥ X	
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 and use				Above groundwater recharge area and 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	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

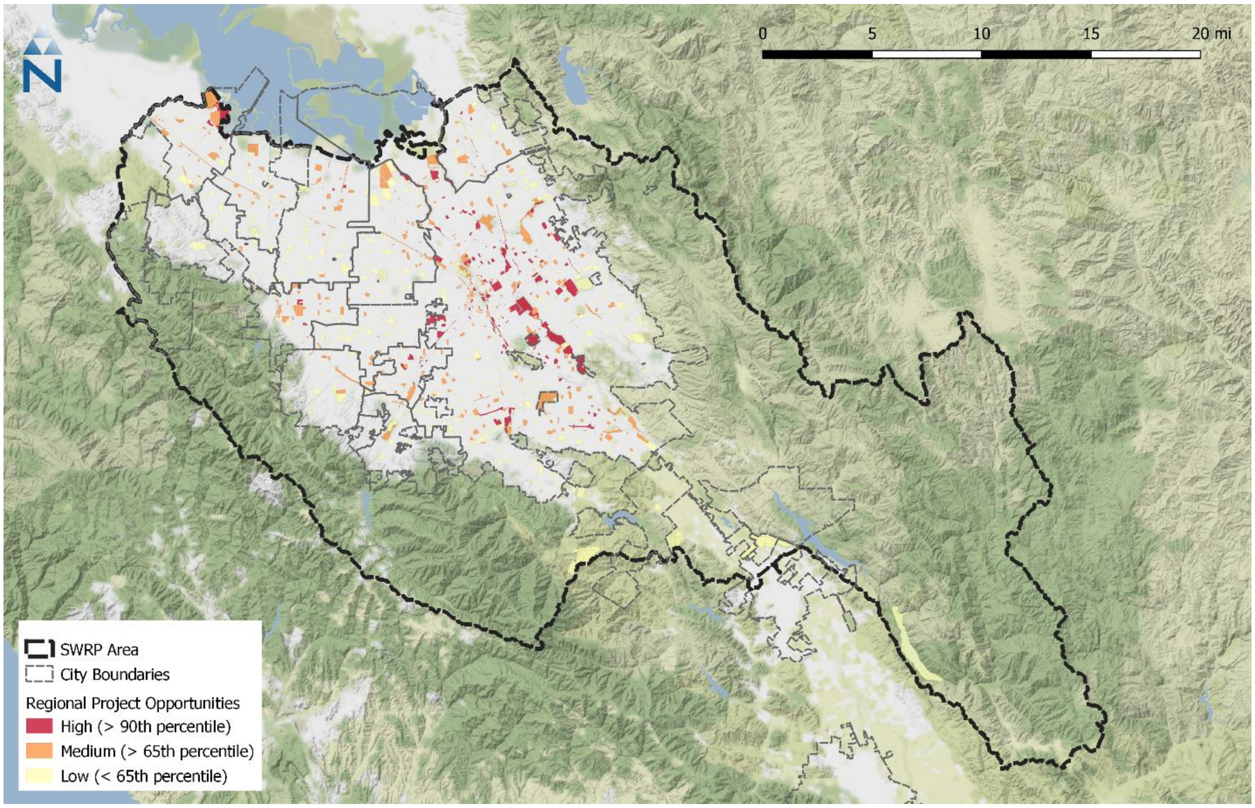

Figure 5-11. Prioritized Regional Project Opportunities

Green Street Opportunities

Table 5-7 shows the final scoring metrics for green street projects, and Figure 5-12 shows the locations of the green street project opportunities.

Table 5-7. Prioritization Metrics for Green Street Project Opportunities

Metric	Points						Weighting Factor
	0	1	2	3	4	5	
Imperviousness (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	70 ≤ X < 80	80 ≤ X < 100	2
Hydrologic Soil Group		C/D		B		A	
Slope (%)		5 > X > 4	4 ≥ X > 3	3 ≥ X > 2	2 ≥ X > 1	1 ≥ X > 0	
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 and use				Above groundwater recharge area and 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	Opportunities for other enhancements				Within DAC or MTC Community of Concern	

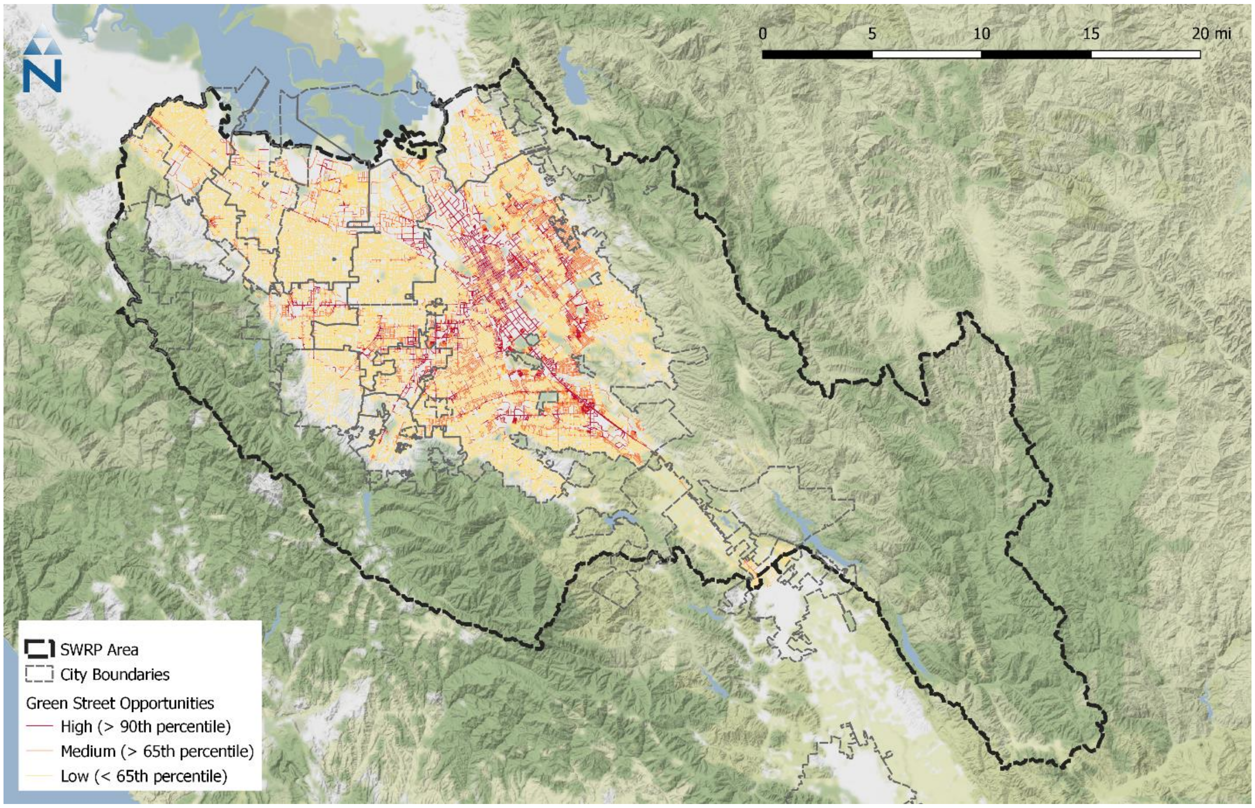

Figure 5-12. Prioritized Green Street Project Opportunities

The prioritization analysis resulted in a score for each type of project opportunity. For qualitative comparison, the projects were grouped into three priority categories: (1) High – consisting of projects that scored in the 90th percentile countywide, (2) Medium – consisting of projects that scored between the 65th and 90th percentile countywide, and (3) Low – consisting of all other projects that scored below the 65th percentile countywide. A summary of the project opportunities based on prioritization for each of the three project types (regional, LID and green streets) is shown in Table 5-8.

Table 5-8. Project Prioritization Summary by Project Type

Priority	Number of Project Opportunities (Countywide)		
	LID	Regional	Green Street
High	244	162	4,445
Medium	588	529	11,524
Low	1,726	1,292	36,614
TOTAL	**2,558**	**1,983**	**52,583**

The screening process resulted in over 50,000 locations for potential green street projects. To limit the green streets project opportunities to a meaningful and manageable number in the SWRP, an additional screening was performed. Green street opportunities that scored in the 90th percentile by jurisdiction were selected to be included in the SWRP. The 90th percentile screening was performed by jurisdiction rather than countywide to distribute green street project opportunities geographically. This process reduced the green streets project opportunities from over 50,000 locations to less than 5,000 locations. The summary of the number of 90th percentile green streets project locations by jurisdiction is shown in Table 5-9. Each jurisdiction has an opportunity to implement green streets projects to meet the requirements of the MRP.

Table 5-9. Number of 90th Percentile Green Street Project Opportunities by Jurisdiction

Top 90th Percentile Green Street Project Opportunities by Jurisdiction		
Jurisdiction	**Number of Projects**	
Campbell	138	3.0%
Cupertino	152	3.3%
Los Altos	118	2.6%
Los Altos Hills	12	0.3%
Los Gatos	87	1.9%
Milpitas	154	3.4%
Monte Sereno	12	0.3%
Morgan Hill	42	0.9%
Mountain View	193	4.2%
Palo Alto	252	5.5%
San Jose	2,404	52.4%
Santa Clara	308	6.7%
Santa Clara County	171	3.7%
Saratoga	130	2.8%
Sunnyvale	413	9.0%
TOTAL	**4,586**	100%

Co-Located Projects

Co-located projects are projects submitted by the SCVURPPP agencies and stakeholders that fit one of two definitions:

1. Planned stormwater capture projects in the pre-design or design phase that agencies consider to be candidates for grant funding.
2. Potential or planned capital improvement projects (street resurfacing, pedestrian improvements, pipeline trenching, etc.) that could integrate or be coordinated with a stormwater capture project within the same or nearby area.

Potential or planned projects that fit either definition were included in the prioritization process. Potential project opportunities that were co-located with either category of submitted projects were given higher prioritization scores.

Planned stormwater projects were assumed to be further along in the process of acquiring stakeholder buy-in and funding and, therefore, were the most likely opportunities to be implemented. Capital projects, while not stormwater-related, may present opportunities for stormwater capture to be incorporated, since ground will already be broken and construction schedules can be synchronized. The addition of stormwater capture elements may open additional funding avenues, such as grants that emphasize multi-benefit projects.

The lists, submitted by SCVURPPP agencies, of potential or planned capital improvement projects with potential to be co-located with a stormwater capture project are shown in Appendix 5-2. The potential projects submitted by stakeholders are shown in Appendix 5-3. Locations of all projects submitted are shown on Figure 5-13.

Stakeholders that submitted projects included the Open Space Authority, the Santa Clara Valley Transportation Authority (VTA), and the Master Gardeners.

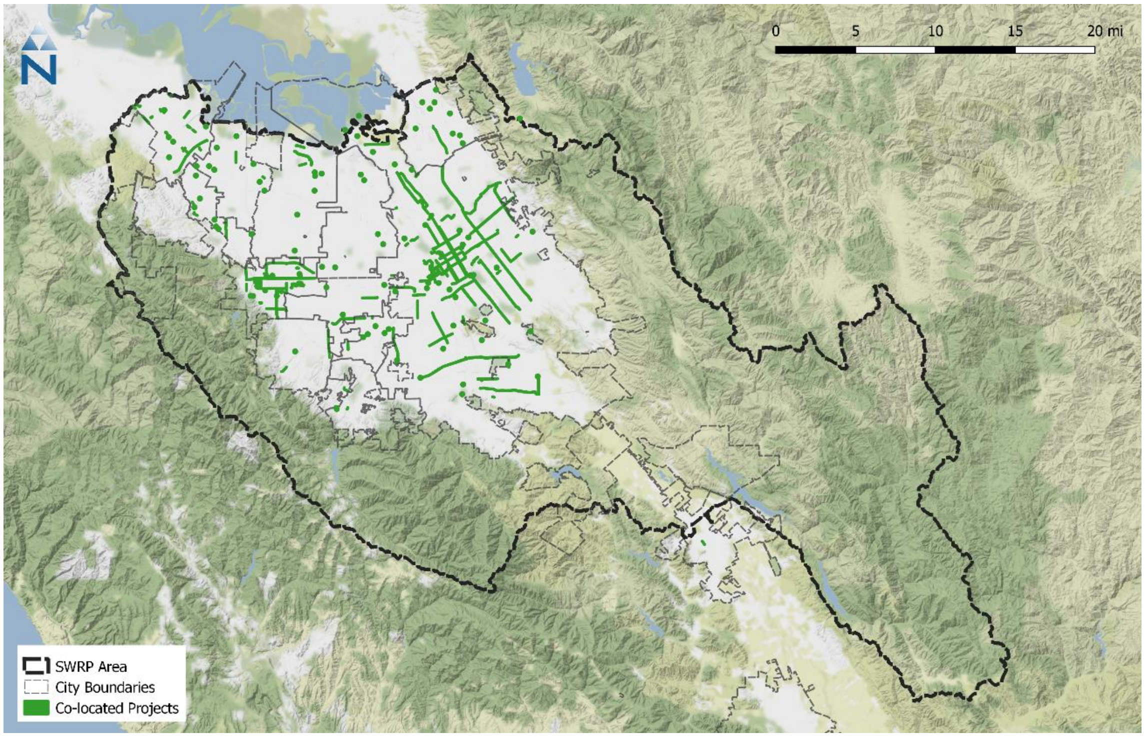

Figure 5-13. Locations of Co-Located Projects Submitted by SCVURPPP Agencies and Stakeholders

5.3.3 Quantitative Analysis of Stormwater Capture Volumes and Pollutant Load Reductions

A quantitative analysis of stormwater capture volumes and pollutant load reductions was performed for a subset of high priority projects from the countywide prioritized list of project opportunities. The methods are described in the sections below.

Selection of High Priority Projects

Several tools were made available to assist the agencies in selecting high priority projects. The results of the metrics-based prioritization were provided to each of the agencies as a spreadsheet (see Appendix 5-4) and in the form of an online map viewer. The map viewer in conjunction with the spreadsheet allowed the agencies to review project rankings, sort by the individual scores in each metric category, and develop a spatial reference for the site. In this way, agencies were able to compare scores of project opportunities, better visualize the site, and produce lists of projects that ranked highly while aligning with agency priorities. A screen shot from the online map viewer is shown in Figure 5-14.

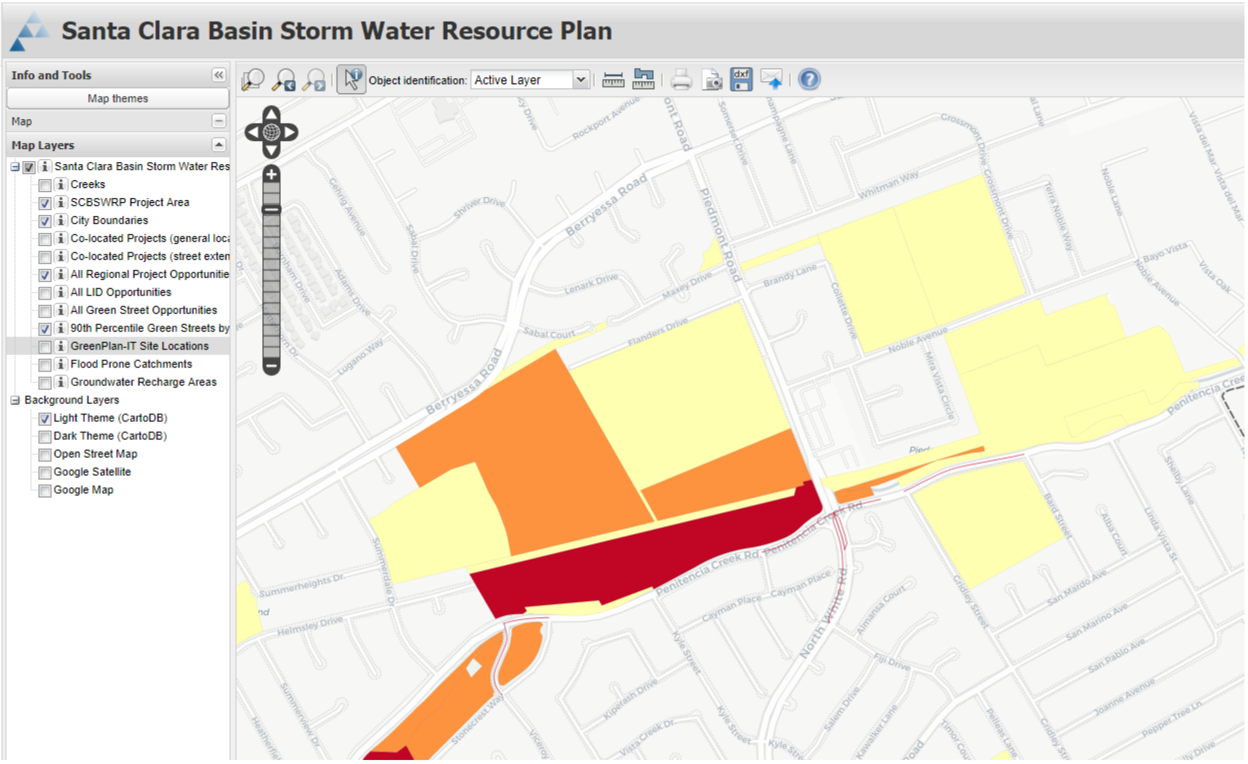

Figure 5-14. Online Map Viewer for Visualizing Results of Prioritization. Example screenshot shows high (red), medium (orange) and low (yellow) priority regional project opportunities.

Another tool to aid in selection of high priority projects was SFEI's GreenPlan-IT Site Locator tool. The Site Locator tool utilizes a mostly-automated process to represent street parking/curb bulbout opportunities within the right-of-way, public parcels, and parks. A countywide analysis using the Site Locator tool was performed to validate results from the prioritization and provide the agencies with another tool in selecting high priority projects. Many of the same regional datasets used in the prioritization process were used in the GreenPlan-IT analysis. The results showed ranked opportunities for bioretention in the medians of street segments. While the prioritization process resulted in general locations of high opportunity project sites (parcel and street block-level resolution), the Site Locator identifies potential footprints of GSI improvements at those sites. Output from the Site Locator tool was included as a layer in the online map viewer that the agencies could use with the prioritization results to better evaluate projects for the high priority list and is shown in Figure 5-15. More information about GreenPlan-IT is provided in Appendix 5-1.

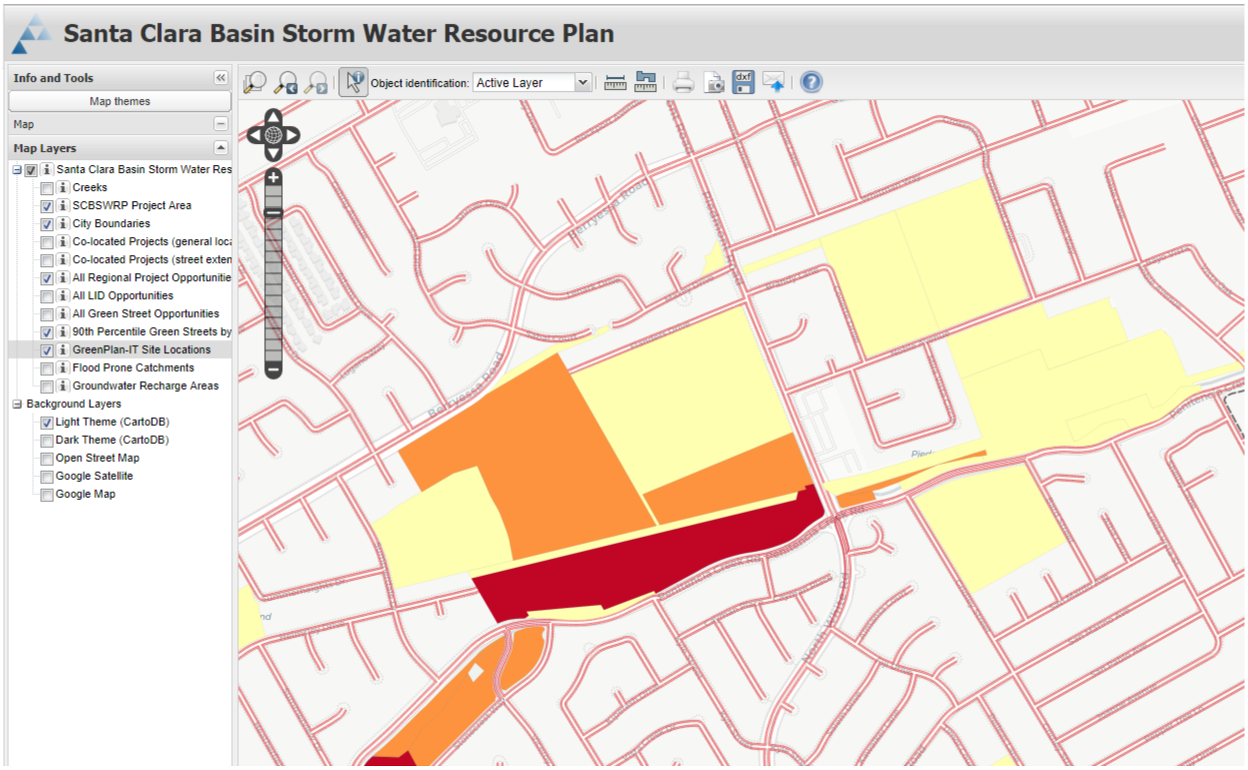

Figure 5-15. GreenPlan-IT Site Locator Overlay in Online Map Viewer

The agencies provided project opportunities from their lists that had potential to become effective stormwater capture projects, were consistent with local priorities, and had a higher likelihood of implementation. The resulting list of 21 project opportunities is presented in Table 5-11 and was used to determine which opportunities would ultimately move forward to development of project concepts.

Results of the Quantitative Analysis

The quantitative analysis was performed by developing a model using the System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN). Because several projects did not have concept details to use in the quantitative analysis, typical green infrastructure configurations were assumed for the projects without detailed concepts. LID and green street projects were configured as bioretention cells and regional projects were configured as infiltration detention basins. Table 5-10 shows the assumptions used in the SUSTAIN model to estimate performance for project opportunities without detailed concepts.

Table 5-10. Default Profile Assumptions of GSI Used in SUSTAIN Model

Layer	Item Description	Value	Units	Source
LID/Green Street Project (Bioretention)				
Surface	Drainage Area	*Preliminary estimate via GIS analysis*		
	Footprint	*4% of impervious area in drainage area*		[1] Section 6.1
	Ponding Depth	6	in	[1] Section 6.1
Media	Depth	1.5	ft	[1] Section 6.1
	Soil Porosity	0.25	-	
	Soil Infiltration Rate	5	in/hr	[1] Section 6.1
Aggregate/ Underdrain	Depth	1	ft	[1] Section 6.1
	Media Porosity	0.35	-	[1] Section 6.4
	Background Infiltration	*Average infiltration rate of surrounding soils*		SSURGO Database
Regional Project (Infiltration Detention Basin)				
Surface	Design Drainage Area	*Preliminary estimate via GIS analysis*		
	Project Footprint	*Preliminary estimate via GIS analysis*		
	Ponding Depth	5	ft	[1] Section 6.8

[1] SCVURPPP, 2016. C.3 Stormwater Handbook

Stormwater capture volumes and pollutant load reductions were quantified using GIS estimates of total and impervious drainage area for each project. Baseline pollutant loads are sensitive to the type of impervious land use assumed for the project drainage area. Because a baseline hydrology and pollutant loading model had not been developed for the SWRP planning area, runoff and pollutant load time series were represented using regionally-consistent modeling assumptions from the San Mateo County SWRP (SMCWPPP, 2017). The assumptions for pollutant generation rates were developed from land use categories derived for the Regional Watershed Spreadsheet Model (RWSM) by the San Francisco Estuary Institute (SFEI) using Association of Bay Area Governments (ABAG) GIS coverages for PCB source areas (Wu et al. 2017). For the purposes of the SWRP, preliminary performance was estimated by averaging the pollutant load reductions associated with “New Urban” and “Old Urban” SFEI ABAG land use categories. These categories represent the low and high range of pollutant generation rates, respectively.

The estimated stormwater capture volumes and pollutant load reductions for the 21 high priority project opportunities are reported in Table 5-11. The estimates are an annual average from Water Years 2007 to 2015.

Table 5-11. Annual Average (WY 2007-2015) Volume Capture and Pollutant Load Reduction for High Priority Project Opportunities

Project ID	Agency	Project Name	Volume Captured (ac-ft/yr)	Mercury Load Reduced (mg/yr)	PCBs Load Reduced (mg/yr)
R-4	San Jose	Kelley Park	240	15,000	8,900
R-7	Palo Alto	Greer Park	180	11,000	6,600
R-2	San Jose	Overfelt Gardens Park	120	7,100	4,400
R-6	San Jose	River Oaks Pump Station	120	6,900	4,200
R-3	San Jose	Bellevue Park	59	3,600	2,200
R-11	Santa Clara	Fuller Park	56	3,500	2,100
R-1	SCVWD	Upper Penitencia Creek	48	3,000	1,800
R-10	Santa Clara	Agnew Park	32	1,900	1,200
R-5	San Jose	Vinci Park	22	1,300	820
R-9	Santa Clara	Maywood Park	8.6	520	320
G-1	Cupertino	Mary Ave Renovation and Park	6.6	390	240
G-4	Palo Alto	East Charleston Rd and Industrial Ave	4.3	260	160
G-5	Sunnyvale	SNAIL Active Transportation Improvements	3.9	230	140
R-12	Santa Clara	Westwood Oaks	2.5	150	94
G-3	Mtn. View	Space Park Way Drainage Improvements	1.6	94	58
L-2	Los Altos	Los Altos Community Center	1.0	62	38
G-2	Campbell	Dell Ave Green Street Pilot	0.70	39	24
L-5	Milpitas	Fire Station 3 Replacement	0.50	29	18
L-1	Los Altos	MSC Parking Lot Resurfacing	0.28	17	10
L-4	Milpitas	Fire Station 2 Replacement	0.050	3.0	1.8

Project ID	Agency	Project Name	Volume Captured (ac-ft/yr)	Mercury Load Reduced (mg/yr)	PCBs Load Reduced (mg/yr)
L-3	Milpitas	Sports Center Skate Park	0.040	2.2	1.3
Concept-only Total			**500**	**30,544** *(31 g/yr)*	**18,338** *(18 g/yr)*
TOTAL			**907**	**55,096** *(55 g/yr)*	**33,325** *(33 g/yr)*

Note: Green highlighted rows indicate project opportunities ultimately selected for development of project concepts. Table is organized from highest to lowest volume capture.

5.3.4 Selection of Project Opportunities for Concept Development

The rows highlighted in green in Table 5-11 indicate the 11 project opportunities that were ultimately selected for development of project concepts. The concepts allowed for drainage areas, facility footprints, and diversion options to be more accurately represented in the SUSTAIN model and for volume capture and pollutant load reduction estimates to be refined using additional insight gained through site investigations. This final concept list was selected through discussions between SCVURPPP and the major stakeholders based on, but not limited to, factors such as:

- A project's stormwater capture and pollutant reduction potential, based on the estimates in Table 5-11;
- Whether projects were deemed likely to move forward by stakeholders (agency buy-in, existing support for other improvements at the site);
- Field visits to evaluate feasibility of GSI implementation; and
- The goal to provide concepts for a variety of regional, LID, and green street projects to highlight the benefits of many types of GSI and to serve as examples for future projects identified through the SWRP.

The resulting list is a collection of diverse projects that showcase the multitude of benefits that can be achieved by different types of GSI. The development of project concepts is described in greater detail in Chapter 6.

5.3.5 Future Quantitative Analysis

The quantitative analysis is an ongoing effort that will be refined as project concept details are fleshed out and project designs are developed. In addition, SCVURPPP is developing a watershed model to simulate rainfall, runoff and pollutant loading to support a Reasonable Assurance Analysis (RAA) for compliance implementation with the MRP. Pollutant loading estimates from this model, once developed, can be used to update the SUSTAIN model and refine performance estimates. The results of the RAA will be incorporated into a future update of the SWRP.