

# MEMO

TO: City/County Association of Governments of San Mateo County (C/CAG)

CC: San Mateo County Office of Sustainability; OneShoreline

FROM: Craftwater Engineering, Inc

SUBJECT: Regional Project Study Memo

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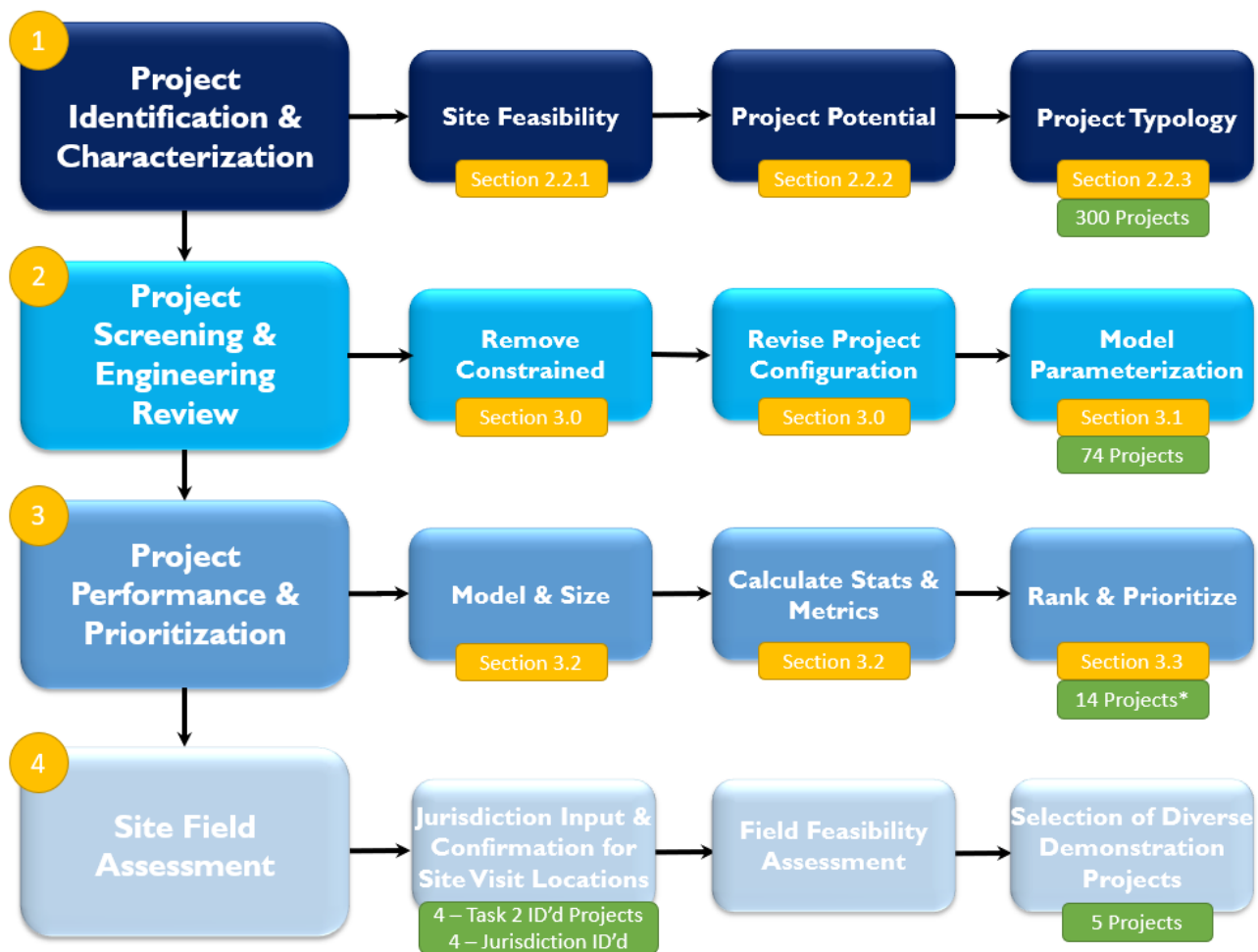
As part of the “County of San Mateo Advancing Regional Stormwater Capture Projects Project Opportunities Analysis Memo” (C/CAG 2022), the County of San Mateo was fully assessed for regional stormwater capture opportunities to provide a better understanding of the where these types of projects might be viable county-wide and which might be higher priority for further development according to a range of project aims and impacts. This memo summarizes the methods behind that effort as well as the results of subsequent investigation and discussion leading to the selection of final regional project concepts to pursue. Additionally, this memo summarizes key statistics for the identified regional opportunities.

The overall aim of this memo is to provide a concise and consolidated foundation for further discussion around the value, applicability, feasibility, and comparability of regional stormwater capture projects as a strategy for advancement in San Mateo County in comparison to more local scale distributed green infrastructure practices and in relation to water quality, water supply, and climate change considerations. The result of this study overall as summarized in this memo point to multiple key regional concepts that can be pursued by C/CAG immediately as well as a roster of additional opportunities to be considered in future project pursuits.



# I.0 PROJECT DATABASE METHODS RECAP

The overall approach to exhaustively assess regional BMP opportunities across San Mateo County was carried out as depicted in **Figure 1**. This process entailed geospatial analysis to identify and characterize individual project opportunity sites (**Section 1.1**), an extensive engineering screening and review process to give projects further context with engineering details and to eliminate those deemed infeasible (**Section 1.2**), and project modeling and a performance assessment to help prioritize project opportunities across a wide range of multi-benefit metrics (**Section 1.3**). Summarized details of the methods and assumptions used in each of these parts of the process are summarized in the following sections and detailed in full in the “County of San Mateo Advancing Regional Stormwater Capture Projects Project Opportunities Analysis Memo” (C/CAG 2022) (Attachment A). **Section 2.0** follows detailing the process and findings of the site field assessment. **Section 3.0** highlight assumptions used to narrow the field of developed concepts down to the top 5 projects. **Section 4.0** presents a focused selection of the performance assessment statistics for the Top Priority Concepts as well as all other opportunities identified.



**Figure 1.** Overall schematic used in county-wide assessment for regional project identification and prioritization.

## 1.1 Project ID & Characterization

Project opportunities were identified using extensive geospatial analysis with the most recent datasets available, provided by C/CAG and member agencies. The following definitions, considerations, and assumptions were used to define the initial roster of potential regional opportunities across San Mateo County.

### 1.1.1 Site Feasibility

Site feasibility analysis answers the question whether a project could be built in any given location. This analysis eliminated site constraints where regional stormwater projects would not be feasible. Namely avoiding the following areas:

- **Building footprints + 20' setback**
- **Existing slope > 15%**
- **Utility conflicts + 4' buffer**
- **Known fault hazards**

For purposes of this project, this analysis went a step further to limit potential project opportunities to:

- **Parcels with Land Use generally characterized as Public**  
*Note: No definitive designation by APN has been made for San Mateo County parcels pertaining to public/private ownership; previous analysis of Land Use designations was adopted for this study*
- **ROW areas within 1000' of major storm drains**

### 1.1.2 Project Potential

Project potential was assessed to narrow the field of all potential opportunities identified through Site Feasibility analysis to focus on the sites with the most potential for impactful stormwater capture performance. This analysis used the following key criteria to produce an initial rank of all project opportunities:

- **Developable parcel space for a stormwater capture project**
- **Stormwater runoff capture potential based on drainage analysis**

These two criteria were assessed and ranked for all feasible sites, with a balanced ranking between the two providing a roster of the top opportunities county-wide that were then assessed individually by engineers. Equal consideration of these two foundational parameters was used in considering base level project potential for large-scale regional capture projects to focus analysis on the most impactful opportunities from the outset. Subsequent analysis evaluated these opportunities based on the full suite of multi-benefit performance criteria determined in the Drivers and Objectives Report (C/CAG 2022).

### 1.1.3 Project Typology

A host of additional geospatial data was used to provide initial recommendations of project typology at each candidate site. Examples of these typology recommendations are as follows:

- **Sites with high amounts of pervious area that did not appear to be in active uses (ie, organized recreational space) were designated for Surface BMP types**
- **Sites with favorable soil types (Hydrologic Soil Group A or B) or proximity to water supply aquifers or high priority recharge zones were designated for Infiltrative BMP types**
- **Sites not fitting the above categories but within 200' of sanitary sewer lines were designated as Subsurface BMP types with Sewer Discharge for treatment**
- **Remaining opportunities were designated as Subsurface BMP types with Filtration as treatment**

BMP Typologies are solely initial recommendations based on remote-sensing data. These must be vetted further as project details progress in design for all opportunities.

## 1.2 Project Screening & Engineering Review

All the information developed in the prior step was used to rapidly evaluate individual opportunities with a more stringent engineering feasibility analysis to further screen out infeasible or unfavorable opportunities and provide greater detail to project configurations that would work best at each site. Geospatial datasets and desktop GIS assessments were used to investigate potential project sites, infrastructure surrounding these locations, and the general urban setting as it relates to adding potential regional BMPs. Particular attention was paid to identify any constraints at a given location that would make a project difficult, infeasible, or very costly. The main outcomes of this part of the process were:

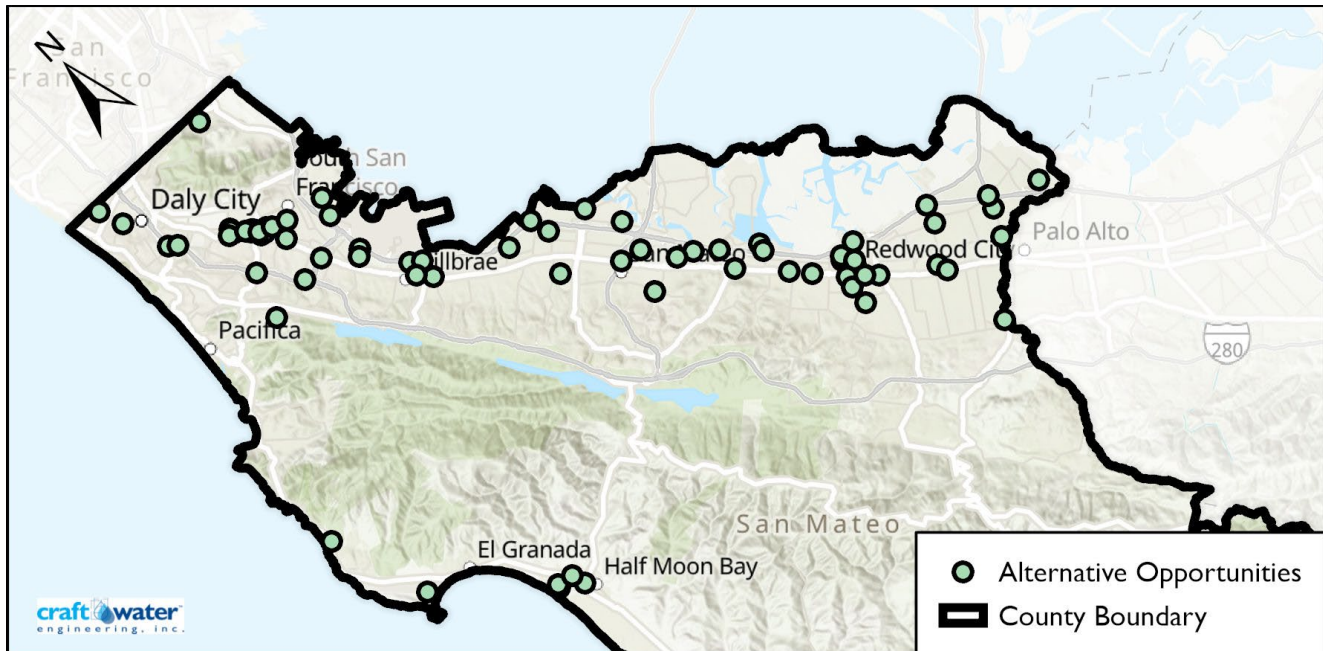
- **Infeasible options eliminated from consideration**
- **Collocated, feasible parcel opportunities combined to eliminate redundancy and optimize site potential**
- **Top three hundred regional opportunities narrowed to approximately 80 top candidates**

## 1.3 Project Performance & Prioritization

Top candidates from the engineering review were parameterized and modeled to provide cost-effective size estimates at each location and expected performance metrics. Key modeling assumptions/approach were:

- **10-year hydrologic and water quality timeseries were evaluated for individual project drainage areas using the San Mateo County RAA model used to plan stormwater projects to meet waste load allocations of PCBs and mercury to the San Francisco Bay (SMCWPPP 2020)**
- **Long-term timeseries routed to regional BMPs using custom SUSTAIN BMP model to evaluate project opportunities across range of feasible diversion rates and storage volumes to identify the right-size at each location and develop associated performance metrics.**

Projects were evaluated across a range of performance metrics pertaining to local BMP emphases, and the performance of each pertaining to these metrics was ranked to enable the selection of the top multi-benefit opportunities across the community and metrics that would help advance C/CAG goals for regional BMPs. These goals and metrics were agreed upon by the project Technical Advisory Committee and are intended to focus on integrated watershed outcomes. Further details of this selection process are detailed in **Section 2.0** and key performance metrics for the 78 regional opportunities assessed are presented in **Section 4.0**. A full discussion on the opportunity assessment can be found in Attachment A of this memo.



**Figure 2.** Candidate project opportunities modeled for the study.

## 2.0 FIELD ASSESSMENT RESULTS

With input from C/CAG's jurisdictions and other project opportunity stakeholders, the eight sites (**Figure 2-1**) selected for field assessments were chosen to advance **high performing opportunities across the multi-benefit performance criteria** and to account for additional consideration of:

1. **broad geographic distribution,**
2. **sensitivity to the performance of existing planned/implemented projects, and**
3. **providing a range of best management practice (BMP) types to optimize the overall regional scale stormwater management portfolio in the County.**

Field assessment efforts focused on the general feasibility of the site for implementation of a regional stormwater capture project. The assessment looked at the slopes, available space, existing utilities, nearby vegetation, possible diversion points, and present site use. Experience with regional stormwater capture projects has shown that these are the primary features that drive the technical components of site feasibility and a site assessment level of analysis provide the necessary level of detail to advance to a conceptual design. Additional evaluation, including assessment of local support, is required for full 100% design. A brief summary of each site is found in **Table 2-1**. More detailed site evaluations for each of the eight sites visited are described in Attachment B.

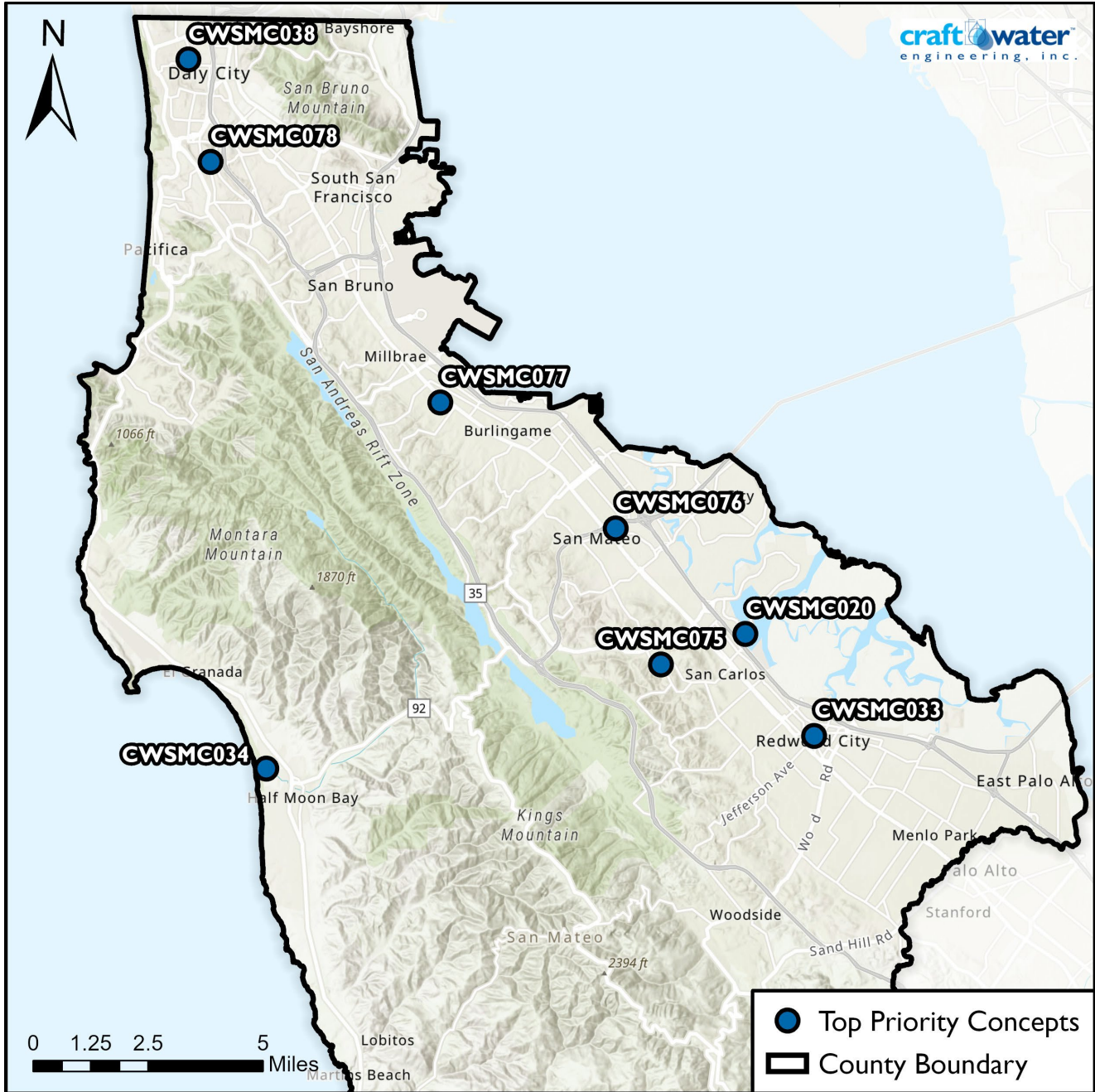
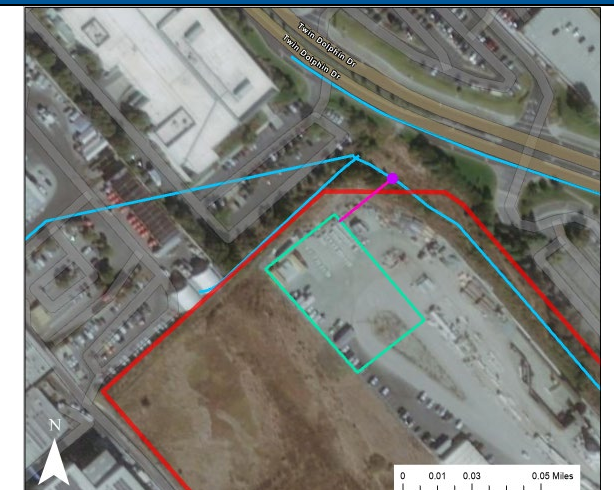


Figure 3. Field visited opportunities for regional BMPs in San Mateo County.

Table 2-1. Summary of field assessment.

Half Moon Bay Parcel						
<b>Half Moon Bay Parcel</b>	Project Type	Wetland	Slopes	Moderate	PCB Removal	3.82 g/yr
<b>Project ID: CWSMC034</b>	Drainage Area	17,808 ac	Current Use	Open Space	High Trash Removal	--
<b>Location: Half Moon Bay, CA</b>	Impervious Drainage Area	765 ac	Utilities	None observed	Potential Acres Greened	297 ac
<b>Jurisdiction: City of Half Moon Bay</b>	Drain Type	Natural Channel	Other Notes	Existing basin. Investigate diversion to treatment plan.	Flood Control	✓
Location: <a href="https://goo.gl/maps/QGSjPUwpFt7NYKmh9">https://goo.gl/maps/QGSjPUwpFt7NYKmh9</a>						
San Carlos Airport Parcel						
<b>San Carlos Airport Parcel</b>	Project Type	Wetland or Vault	Slopes	Mild	PCB Removal	44.62 g/yr
<b>Project ID: CWSMC020</b>	Drainage Area	563 ac	Current Use	Open Space/ Staging	High Trash Removal	✓
<b>Location: San Carlos, CA</b>	Impervious Drainage Area	361 ac	Utilities	OH Electric Sewer (deep)	Potential Acres Greened	262 ac
<b>Jurisdiction: County of San Mateo Airports</b>	Drain Type	Natural Channel	Other Notes	Coordinate with future development	Flood Control	✓
Location: <a href="https://goo.gl/maps/z8GgnvtTRYqEaxUz9">https://goo.gl/maps/z8GgnvtTRYqEaxUz9</a>						



### Redwood City City Hall Parking Lot

<b>Redwood City City Hall Parking Lot</b>  <b>Project ID:</b> CWSMC033  <b>Location:</b> Redwood City, CA  <b>Jurisdiction:</b> Redwood City	<b>Project Type</b>	Vault	<b>Slopes</b>	Mild	<b>PCB Removal</b>	15.72 g/yr	
	<b>Drainage Area</b>	5,952 ac	<b>Current Use</b>	Parking Lot	<b>High Trash Removal</b>	✓	
	<b>Impervious Drainage Area</b>	2,114 ac	<b>Utilities</b>	Electric Sewer	<b>Potential Acres Greened</b>	499 ac	
	<b>Drain Type</b>	Reinforced Concrete Box Culvert	<b>Other Notes</b>	Busy lot. Downstream of Red Morton Park.	<b>Flood Control</b>	--	

Location: <https://goo.gl/maps/xhS63xP66NMdWdKn6>

### Tierra Linda Middle School & Mariposa Upper Elementary School

<b>Tierra Linda Middle School &amp; Mariposa Elementary</b>  <b>Project ID:</b> CWSMC075  <b>Location:</b> San Carlos, CA  <b>Jurisdiction:</b> City of San Carlos	<b>Project Type</b>	Vault	<b>Slopes</b>	Moderate	<b>PCB Removal</b>	2.7 g/yr	
	<b>Drainage Area</b>	226 ac	<b>Current Use</b>	Sports Field	<b>High Trash Removal</b>		
	<b>Impervious Drainage Area</b>	85 ac	<b>Utilities</b>	Irrigation Water Sewer	<b>Potential Acres Greened</b>	92 ac	
	<b>Drain Type</b>	Reinforced Concrete Pipe	<b>Other Notes</b>	School state building codes. Street grade below field.	<b>Flood Control</b>	✓	

Location: <https://goo.gl/maps/gGHXs297GNNRYxMW6>



San Mateo Public Works Department Parking Lot						
<b>San Mateo Public Works Department Parking Lot</b>  <b>Project ID:</b> CWSMC076  <b>Location:</b> San Mateo, CA  <b>Jurisdiction:</b> City of San Mateo	<b>Project Type</b>	Vault	<b>Slopes</b>	Mild	<b>PCB Removal</b>	7.7 g/yr
	<b>Drainage Area</b>	692 ac	<b>Current Use</b>	Parking Lot	<b>High Trash Removal</b>	✓
	<b>Impervious Drainage Area</b>	281 ac	<b>Utilities</b>	Water Sewer Fiber Optic	<b>Potential Acres Greened</b>	257 ac
	<b>Drain Type</b>	Trapezoid Concrete Channel	<b>Other Notes</b>	Caltrain coordination for diversion. Existing concept. Lot damage.	<b>Flood Control</b>	
Location: <a href="https://goo.gl/maps/FnmAEbTupkn3iofX8">https://goo.gl/maps/FnmAEbTupkn3iofX8</a>						
Ray Park						
<b>Ray Park</b>  <b>Project ID:</b> CWSMC077  <b>Location:</b> Burlingame, CA  <b>Jurisdiction:</b> City of Burlingame	<b>Project Type</b>	Vault	<b>Slopes</b>	Mild	<b>PCB Removal</b>	13.5 g/yr
	<b>Drainage Area</b>	596 ac	<b>Current Use</b>	Sports Field	<b>High Trash Removal</b>	
	<b>Impervious Drainage Area</b>	301 ac	<b>Utilities</b>	Water Sewer Irrigation	<b>Potential Acres Greened</b>	225 ac
	<b>Drain Type</b>	Reinforced Concrete Box Culvert	<b>Other Notes</b>	Residential drainage. City provided.	<b>Flood Control</b>	
Location: <a href="https://goo.gl/maps/TxLkHcCC93csxCgv6">https://goo.gl/maps/TxLkHcCC93csxCgv6</a>						



## Gellert Park

<b>Gellert Park</b>  <b>Project ID:</b> <b>CWSMC078</b>  <b>Location:</b> <b>Daly City, CA</b>  <b>Jurisdiction:</b> <b>Daly City</b>	<b>Project Type</b>	Vault	<b>Slopes</b>	Steep	<b>PCB Removal</b>	0.8 g/yr
	<b>Drainage Area</b>	87 ac	<b>Use</b>	Sports Field & Parking Lot	<b>High Trash Removal</b>	
	<b>Impervious Drainage Area</b>	48 ac	<b>Utilities</b>	Water Electrical Fiber Optic	<b>Potential Acres Greened</b>	22 ac
	<b>Drain Type</b>	Reinforced Concrete Pipe	<b>Other Notes</b>	Existing on-site GI. Two diversions & storage needed.	<b>Flood Control</b>	



Location: <https://goo.gl/maps/buFVXa3h3SVrTeAV8>

## Benjamin Franklin Intermediate School

<b>Benjamin Franklin Intermediate School</b>  <b>Project ID:</b> <b>CWSMC038</b>  <b>Location:</b> <b>Daly City, CA</b>  <b>Jurisdiction:</b> <b>County of San Mateo</b>	<b>Project Type</b>	Vault	<b>Slopes</b>	Moderate	<b>PCB Removal</b>	11.65 g/yr
	<b>Drainage Area</b>	759 ac	<b>Use</b>	Sports Field	<b>High Trash Removal</b>	✓
	<b>Impervious Drainage Area</b>	472 ac	<b>Utilities</b>	Water Irrigation	<b>Potential Acres Greened</b>	303 ac
	<b>Drain Type</b>	Reinforced Concrete Pipe	<b>Other Notes</b>	Active on-site flooding. Field needs refreshing. School state standards.	<b>Flood Control</b>	✓



Location: <https://goo.gl/maps/hRnbDwbWP7t1LPyG8>

## 3.0 PROJECT CONCEPT SELECTION

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This section summarizes the final selection process for the five (5) Project Concepts identified and recommended to the County of San Mateo, C/CAG, and its member agencies/jurisdictions. These projects represent regional stormwater capture opportunities that will help meet the drivers and objectives for the region in an impactful and cost-effective way and will also work best given current infrastructure initiatives, needs, and desires of the agencies. Full preliminary concepts will be further developed under a separate effort.

Quantitative project evaluation is often only a starting point for discussions surrounding such large capital investments as regional stormwater BMPs. These objective assessment approaches can only truly and effectively encapsulate a portion of all of the deciding factors that go into final site selection for infrastructure of this size. By ranking projects across multiple metrics, rapid evaluation of tradeoffs is possible, and this more flexible approach to project opportunity evaluation provided excellent input for the discussions had between agencies to narrow the field down to the top priority concepts.

### 3.1 Selection of Diverse Demonstration Projects

Upon completion of the field assessment, results were summarized in the *Site Assessment Analysis Report* (Attachment B) and presented to the County and C/CAG for initial review. Upon review, the results were presented to the C/CAG Stormwater Committee for their consideration and final thoughts prior to the selection of the final five locations. In the course of discussion and review, a strong desire for projects that demonstrate meaningful progress towards the anticipated requirements under the reissued Municipal Regional Stormwater Permit (MRP “3.0”) compliance was relayed. To add to this consideration additional sites from the 74 potential locations were reevaluated for possible inclusion in the concept design phase that had been excluded from field visits due to low rankings against the overall goals and objectives, or complexities in coordination with outside agencies that would cause longer project schedules. The coordination is not an excluding factor and is simply an additional consideration in determining the constructability of a project and the necessary timeline for implementation. This reevaluation included additional Caltrans identified right-of-way areas that had not been previously discussed with them and nested projects that are located along the same drainage course as an existing regional project or a top-ranking site within this effort. The Benjamin Franklin Intermediate School and Doelger Senior Center are an example of this nested scenario where the latter was removed from initial consideration because of the possibility of a project at the school.

C/CAG staff will continue coordinating with its member agencies, the County Office of Sustainability and OneShoreline on the final recommended list of five sites for advancing through conceptual designs. These concepts will serve as standalone documents that can support future funding opportunities led by C/CAG and/or its member agencies and external partners.

## 4.0 REGIONAL PROJECT SUMMARY STATISTICS

The below table summarizes key statistics for the regional project opportunities assessed in the study. For full details of these projects, see the “County of San Mateo Advancing Regional Stormwater Capture Projects Project Opportunities Analysis Memo” (C/CAG 2022). Note that these statistics are not strictly additive as many opportunities assessed divert stormwater from similar drainages in different locations. They do however represent the full potential capture for each individual project to be used in prioritization assessments. An updated database that includes the sites identified by the jurisdictions is found in Attachment C.

<b>TOP PRIORITY REGIONAL PROJECT OPPORTUNITIES</b>					
<i>BMP ID</i>	<i>Drainage Area (ac)</i>	<i>Impervious Drainage Area (ac)</i>	<i>Avg. Annual Runoff Treated (ac-ft/yr)</i>	<i>Avg. Annual PCB Reduction (g/yr)</i>	<i>Greened Acres (Imp. Drainage Treated; ac)</i>
CWSMC020	563	361	217	44.6	262
CWSMC033	5,952	2,114	522	15.7	499
CWSMC034	17,808	765	1,841	3.8	279
CWSMC038	759	472	355	11.7	303
CWSMC075	226	109	67	2.7	92
CWSMC076	692	402	192	7.7	257
CWSMC077	596	301	187	13.5	225
CWSMC078	57	23	38	0.8	22
<b>SECONDARY REGIONAL PROJECT OPPORTUNITIES</b>					
<i>BMP ID</i>	<i>Drainage Area (ac)</i>	<i>Impervious Drainage Area (ac)</i>	<i>Avg. Annual Runoff Treated (ac-ft/yr)</i>	<i>Avg. Annual PCB Reduction (g/yr)</i>	<i>Greened Acres (Imp. Drainage Treated; ac)</i>
CWSMC001	322	144	184	10.1	82
CWSMC002	1,154	437	364	15.2	138
CWSMC003	4,579	1,717	501	15.2	188
CWSMC004	424	165	217	5.1	84
CWSMC005	4,682	1,785	1,101	18.9	420
CWSMC006	5,111	1,953	1,119	17.6	428
CWSMC007	6,711	2,729	456	9.3	186
CWSMC008	1,450	678	409	12.2	191
CWSMC009	1,590	553	374	7.8	130
CWSMC010	1,452	679	405	12.2	189
CWSMC011	1,723	408	188	3.5	44
CWSMC012	89	79	59	3.0	52
CWSMC013	32	28	20	1.0	17
CWSMC014	704	376	270	9.7	144

CWSMC015	788	412	298	10.8	156
CWSMC016	475	190	232	17.3	92
CWSMC017	178	101	64	2.4	36
CWSMC018	159	31	22	0.1	4
CWSMC019	585	204	208	8.9	73
CWSMC021	776	283	222	16.1	81
CWSMC022	245	138	83	2.5	47
CWSMC023	4,507	1,054	226	15.4	53
CWSMC024	3,839	838	194	13.3	42
CWSMC025	1,278	476	304	9.9	113
CWSMC026	17,352	648	1,820	3.9	68
CWSMC027	268	86	61	4.1	20
CWSMC028	2,980	697	400	28.2	94
CWSMC029	2,892	651	204	15.6	46
CWSMC030	243	87	100	1.6	36
CWSMC031	246	158	96	3.9	62
CWSMC032	35	17	10	0.3	5
CWSMC035	394	48	95	0.1	12
CWSMC036	1,464	864	555	18.2	327
CWSMC037	194	82	103	6.3	44
CWSMC039	481	244	365	9.1	185
CWSMC040	764	389	522	12.3	266
CWSMC041	398	58	104	2.3	15
CWSMC042	4,576	1,716	537	16.7	201
CWSMC043	30	16	21	0.4	11
CWSMC044	4,640	1,756	1,158	21.6	438
CWSMC045	5,145	1,977	1,002	12.5	385
CWSMC046	6,802	2,781	1,410	22.2	576
CWSMC047	7,177	3,003	1,295	51.1	542
CWSMC048	611	277	258	7.8	117
CWSMC049	533	210	196	7.8	77
CWSMC050	992	342	320	13.1	110
CWSMC051	264	66	107	4.2	27
CWSMC052	530	209	195	7.8	77
CWSMC053	435	199	178	6.2	81
CWSMC054	520	271	195	7.6	102
CWSMC055	345	185	53	2.6	28

CWSMC056	73	46	39	1.7	25
CWSMC057	298	53	153	0.4	27
CWSMC058	1,676	554	162	6.0	54
CWSMC059	1,428	405	132	4.9	37
CWSMC060	94	51	26	0.8	14
CWSMC061	1,832	549	377	17.4	113
CWSMC062	448	275	193	38.7	118
CWSMC063	532	122	251	14.4	57
CWSMC064	2,174	422	167	9.5	32
CWSMC065	115	89	39	1.1	30
CWSMC066	281	166	92	2.8	55
CWSMC067	20	16	8	0.2	7
CWSMC068	200	100	16	0.6	8
CWSMC069	2,077	772	243	10.1	90
CWSMC070	3,473	1,091	535	18.2	168
CWSMC071	259	47	71	0.1	13
CWSMC072	654	242	143	9.6	53
CWSMC073	39	28	16	0.3	12
CWSMC074	264	126	80	1.3	38

## 5.0 REFERENCES

City/County Association of Governments of San Mateo County (C/CAG). 2022. "County of San Mateo Advancing Regional Stormwater Capture Projects Project Opportunities Analysis Memo." January 2022.

San Mateo County Wide Watershed Pollution Protection Program. 2020. "San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report." September 2020.

San Mateo County Wide Water Pollution Prevention Program. 2022. "Advancing Regional-Scale Stormwater Management in San Mateo County: Regional Collaborative Program Framework White Paper." January 2022.

## ATTACHMENT A: PROJECT OPPORTUNITY ANALYSIS REPORT

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# County of San Mateo

## Advancing Regional Stormwater Capture Projects

### Project Opportunities Analysis Memo FINAL

26 January 2022

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**PRESENTED TO**

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## ACRONYMS/ABBREVIATIONS

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Acronyms/Abbreviations	Definition
ac-ft	acre-feet
ABAG	Association of Bay Area Governments
BMP	Best Management Practice
C/CAG	City/County Association of Governments of San Mateo County
cfs	cubic feet per second
DEM	Digital elevation model
ft	feet
hr	hour
HSG	Hydrologic soil group
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
PCB	Polychlorinated biphenyls
POC	Pollutant of Concern
RAA	Reasonable Assurance Analysis
ROW	Right-of-Way
SMC	San Mateo County
SRP	Stormwater Resource Plan
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Loads

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## 1.0 BACKGROUND & CONTEXT

The following provides introduction to the Project and rationale for the need to advance the best opportunities for regional stormwater capture across San Mateo County.

### 1.1 OVERVIEW

To address the requirements of the Municipal Regional Permit (MRP), the City/County Association of Governments of San Mateo County (C/CAG) and member agencies are collaborating to determine the most impactful and effective ways possible to capture stormwater and improve water quality across managed watersheds across their jurisdictional boundaries. The MRP, a Phase I municipal stormwater permit, was issued by the San Francisco Regional Water Quality Control Board and includes compliance requirements by Permittees to address regional TMDLs (Total Maximum Daily Loads) for mercury and PCBs (polychlorinated biphenyls) as part of the San Francisco Bay Basin Plan. To provide required pollutant reductions and contribute to other regional watershed management goals (flood management, green infrastructure, water reuse, etc.), C/CAG has taken a progressive approach to achieve compliance with the MRP in a cost-efficient manner, while promoting multi-benefit projects with a heavy focus on leveraging collaboration and funding sources. The approach has undertaken several large-scale planning efforts to date with the goals of modeling watersheds, planning strategies, and quantifying needs to provide a sound determination of how member agencies can collectively work together to develop solutions that will both meet regulatory compliance requirements and provide multi-benefit infrastructure solutions in a cost-effective manner. The approach is a multi-scaled approach that provides site development guidance, green street instruction, and regional scale opportunities identification. The focus of this analysis is on regional-scale stormwater capture projects and identifying opportunities/watershed areas that can support regional-scale programmatic implementation of green infrastructure at a distributed scale. Previous planning efforts have begun to identify how this might be carried out, but there is a need to further advance this analysis to determine the best potential opportunities across San Mateo County where these program ideals can be realized.

### 1.2 ADVANCING REGIONAL STORMWATER CAPTURE PROJECTS

Highly distributed green infrastructure has been shown to be an effective stormwater management practice in many instances, and while it is an important component of new development, it can be difficult and expensive to fully implement in previously developed areas which require extensive retrofits. Because of this and increasingly stringent water quality requirements, regional stormwater capture projects have been shown to be a more cost-effective alternative in highly developed areas, with more focused and centralized capture and treatment of stormwater at strategic locations. Furthermore, the areas where PCBs have historically accumulated (i.e. old industrial land use areas) tend to not be the most effective and efficient locations for implementing distributed green infrastructure. The Stormwater Resources Plan watershed-based opportunities analysis began to identify feasible locations for regional stormwater capture projects, but there is a need to identify more potential opportunities, provide further detail for project potential, and develop a more focused feasibility and prioritization assessment of these opportunities so that C/CAG can ensure that County-wide efforts are pursuing the most cost-effective and impactful projects moving forward. Additionally, it is necessary for potential project identification to incorporate an assessment of technical feasibility and multi-benefit evaluation that will provide C/CAG assurance that identified opportunities can be effectively engineered and that they will contribute to a broad range of watershed goals in addition to the water quality benefits that they can impart. The result of this analysis contained herein will provide a strong list of the best regional stormwater capture projects across the County, vetted through focused engineering feasibility and project potential metrics, that will provide the best options for C/CAG to further pursue for refined engineering feasibility and design studies moving forward.

## 1.3 REGIONAL-SCALE FRAMEWORK

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The identification and conceptualization of the regional stormwater capture projects is one part of the multi-pronged approach to manage stormwater within San Mateo County. The larger effort's goal is to catalyze countywide collaboration on regional-scale stormwater management to address key drivers, create a framework under which that collaboration can take place, prioritize and conceptualize opportunities for regional-scale stormwater management, and explore innovative funding and financing approaches. The effort is broken into four interrelated project components:

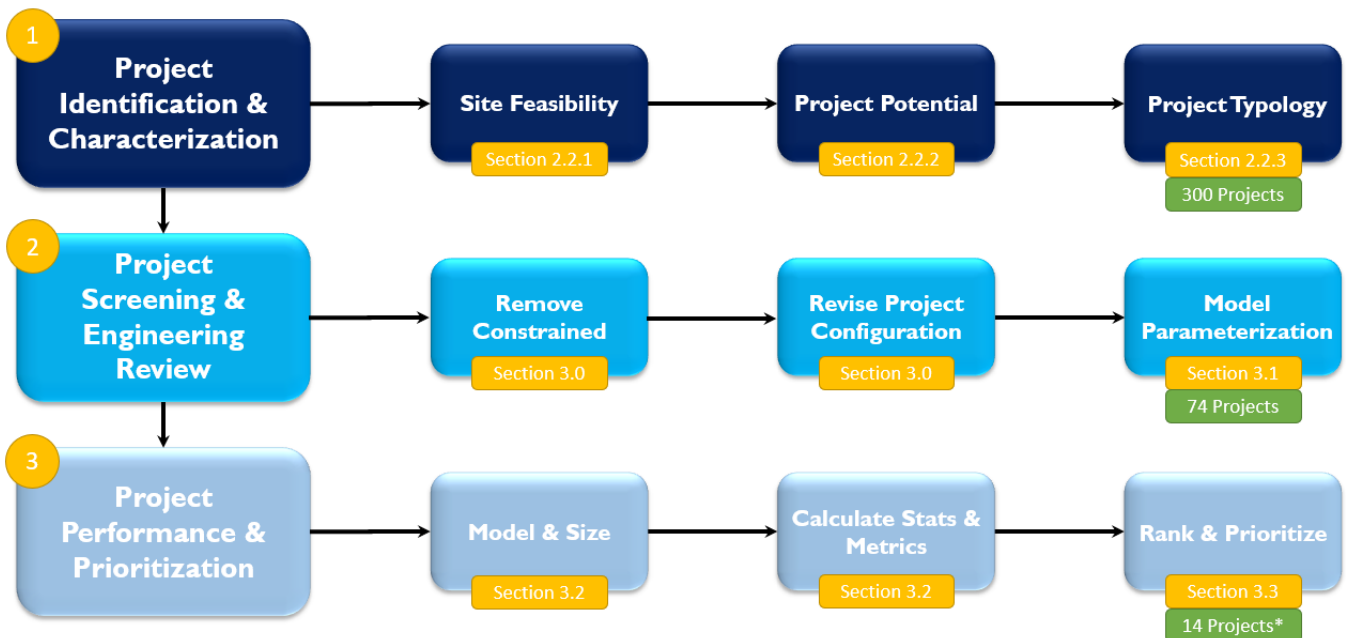
- 1) Building the business case for regional-scale stormwater management
  - a. Establishes the 'What, Why, and How' regional-scale management should be performed. Includes development of drivers and objectives, benefits realized by collaborating, and how collaboration could function across jurisdictional boundaries.
- 2) Prioritizing and conceptualizing regional-scale stormwater management opportunities
  - a. Creates an identification and prioritization framework to find and rank the best regional opportunities. Concept designs for the top identified locations serve to move towards finding funding opportunities.
- 3) Credit trading marketplace analysis
  - a. Evaluates the opportunity to allow private developers or member agencies to buy and sell stormwater management credits to increase overall stormwater management project implementation per the drivers and objectives established.
- 4) Innovative funding and financing analysis – a
  - a. Pursues innovative funding and financing options for various scales of stormwater management.

This technical report focuses on the identification and prioritization frameworks to help find the top project concepts that will be field evaluated and conceptualized in a future task. Ultimately, these projects will be incorporated into the Stormwater Resources Plan to provide a comprehensive plan for the region.

## 2.0 PROJECT IDENTIFICATION & FEASIBILITY EVALUATION

The following section summarizes the methodology and datasets used to identify potential regional stormwater capture project opportunities and characterize them to focus further feasibility assessment and engineering evaluation to determine a narrowed roster of the top opportunities for full modeling evaluation.

All parcels within the County were considered as possible candidate sites and entered the site feasibility analysis. Initial screening narrowed the potential list to approximately 300 parcels where a project could reasonable be completed. The 300 projects were reviewed by a design engineer who performed aerial imagery and street view analysis of the sites to provide an initial thought on project complexity and provided an assessment of not feasible, significant constraints, and minimal constraints. The projects identified as having minimal constraints equated to 74 project sites that were then parameterized for prioritization. The priority modeling provided a ranking of each project relative to the drivers and objectives (see the Drivers and Objectives memorandum) where the highest-ranking ones across multiple objectives were selected for further evaluation. **Figure 2-1** provides a brief overview of the identification and prioritization process followed.



**Figure 2-1.** Regional project identification and prioritization process flow chart. \*14 projects evaluated by the jurisdictions. Ten (10) projects will be ultimately selected for field visits and five (5) for project concepts.

### 2.1 PROJECT IDENTIFICATION AND CHARACTERIZATION

In the first step of project identification, the goal is to evaluate the applicability of feasible regional scale stormwater capture projects based on the site feasibility, project potential, and project typology. High-resolution geospatial analysis was used to identify regional stormwater capture project opportunities across San Mateo County and characterize these opportunities to serve as a basis for further engineering analysis, project performance quantification, and prioritization that will narrow the list of potential opportunities to a short list of the most impactful and cost-effective projects that C/CAG can pursue. A variety of spatial datasets were provided by C/CAG and member agencies for these purposes, and this data was integrated with engineering feasibility assessment analysis to develop the most realistic determination of project potential possible at a County-wide

scale. The methodology used in this analysis is detailed below across three key project assessment criteria, and specific datasets utilized for these purposes are summarized in **Table 2-1**.

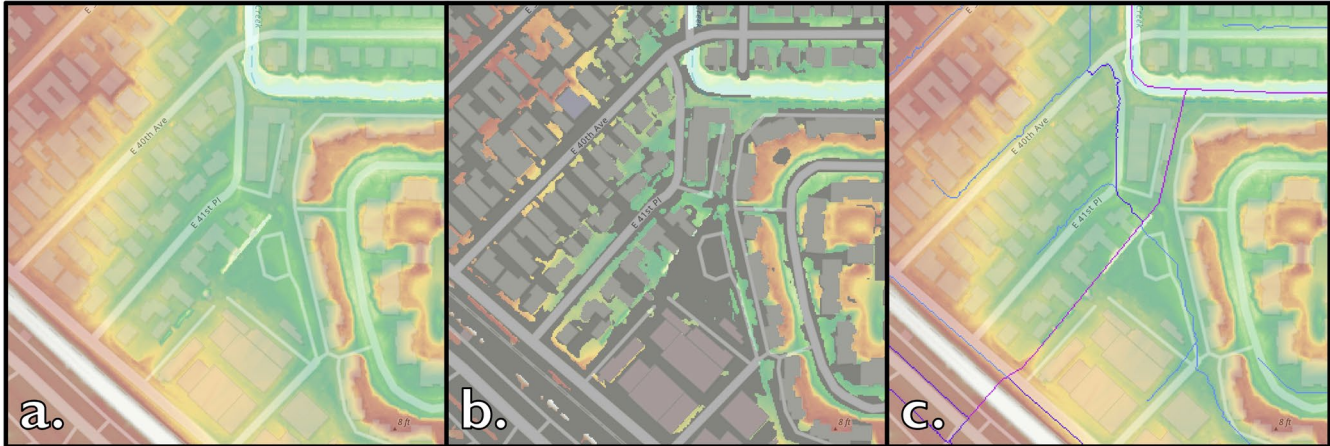
Project opportunities were identified across San Mateo County and characterized along the following three assessment criteria to provide context to focus the efforts of engineering feasibility analysis on the projects with the greatest chance of success.

### ***Project Site Feasibility***

A regional stormwater capture project can be engineered and built almost anywhere using brute force and human ingenuity given sufficient funding, but the most cost-effective projects capitalize on locations that are the most amenable to construction and the incorporation of stormwater projects within current site conditions. Preliminary feasibility screening was performed to identify potential project sites that avoid building footprints, existing utility infrastructure, and fault zones and that each site has constructable areas with a moderate ground slope that can be readily built upon. Provided datasets were used to screen out areas where these conditions would not be amenable to project implementation (see **Table 2-1** for greater screening detail). The results of this analysis (feasible project area) were summarized at the County parcel level. Because publicly owned parcels offer much fewer barriers to project implementation than do private parcels, these have been prioritized in this analysis for advancing the best options found. However, the full project characterization analysis has been carried out for all parcels countywide (public or private) to (1) assist in the credit market feasibility analysis to identify optimal locations for implementing projects on public/private sites to determine future demand/supply for credit trading and (2) possible future public-private partnerships for top project opportunities on these lands in the future. In addition to the defined public parcels, key areas of right-of-way (ROW) have been assessed for potential project opportunities as well because of their public nature and potential to incorporate stormwater capture with other maintenance and construction activities. These have been identified where major roadway corridors are crossed by existing storm drains to assess the ROW locations with the greatest potential for stormwater capture.

### ***Project Capture Potential***

With nearly 4,500 public parcels identified in San Mateo County, it is not possible to provide an in-depth engineering analysis for project opportunities at each of these individual sites. Ranking these sites based on their potential to capture stormwater provides a preliminary list of project opportunities that can be assessed in order of rank to narrow the list of projects to a manageable number for more in-depth modeling assessment. The potential for a project opportunity to capture stormwater is rooted in (1) available space to construct the project and (2) access to an appreciable amount of stormwater runoff via diversion from existing storm drains. The former



**Figure 2-2.** Combining DEM-based drainage patterns (a) with impervious surface data (b) and storm drain lines (c) to be used to assess project potential.

has been assessed based on the results of the Project Site Feasibility Analysis. The latter has been assessed using high-resolution drainage mapping and elevation analysis.

The drainage mapping analysis integrates digital elevation models (DEMs; **Figure 2-2a**), storm drain inventories, automated drainage area delineation, and proximity analysis to identify feasible diversion points for runoff from the storm drain network to each potential project location and the associated drainage area that would be treated by capturing this runoff. Once the drainage area for each project is identified using the DEM and storm drain network in conjunction, it is further assessed to quantify the magnitude of impervious surfaces within the drainage to gauge potential project performance (**Figure 2-2b** shows how elevation and impervious surfaces interact to forge runoff accumulation paths in **Figure 2-2c**). While overall drainage area is a good indicator of potential runoff to a site, the impervious drainage area provides an even better indicator of not only runoff magnitude but also potential pollutant loading. Impervious surfaces are often associated with higher runoff volumes and pollutant loads because runoff transmitted across them is mostly concentrated and carries with it all accumulated pollutants that result from land use, human activity, and the collective ambient conditions of pollutant deposition. The results of these two project opportunity metrics (feasible space and treatable impervious area) were combined in a balanced ranking (geometric mean) to focus the engineering analysis wherein the top potential opportunities are individually screened using “engineering eyes” and accompanying project characterization data to provide a more refined feasibility assessment to determine which projects move on to the modeling and prioritization analysis.

### **Project Typology Evaluation**

A variety of categorical evaluative factors are useful in the engineering analysis to determine the potential options that may or may not be viable at any given location and the potential for success of any given project opportunity. These factors are typically categorical in nature and/or binary measures of project specific conditions (yes/no; presence/absence). These types of data may not apply to all potential BMP types, but they can be used to select among multiple BMP types at a given site or exclude certain options that may not be feasible. Because of this, these data do not necessarily define the potential performance of a project opportunity at any given site. Rather, these evaluative factors help focus the engineering analysis of potential options at a given site (e.g. open field versus parking lot, a deep versus shallow water table, relatively constrained footprint versus larger footprint) and provide guidance as to what might be the best BMP type to pursue once detailed site analysis is performed. Details of the evaluative factors that were used in the full analysis are found in **Table 2-1**, and maps of how these factors vary across the County are provided in Section 2.2.3. These factors have been used in the engineering analysis as



well as further project opportunity evaluation for the top projects to select among a variety of desired BMP types for the County.

## 2.2 MULTI-DRIVERS SCREENING CRITERIA DATA & METHODS

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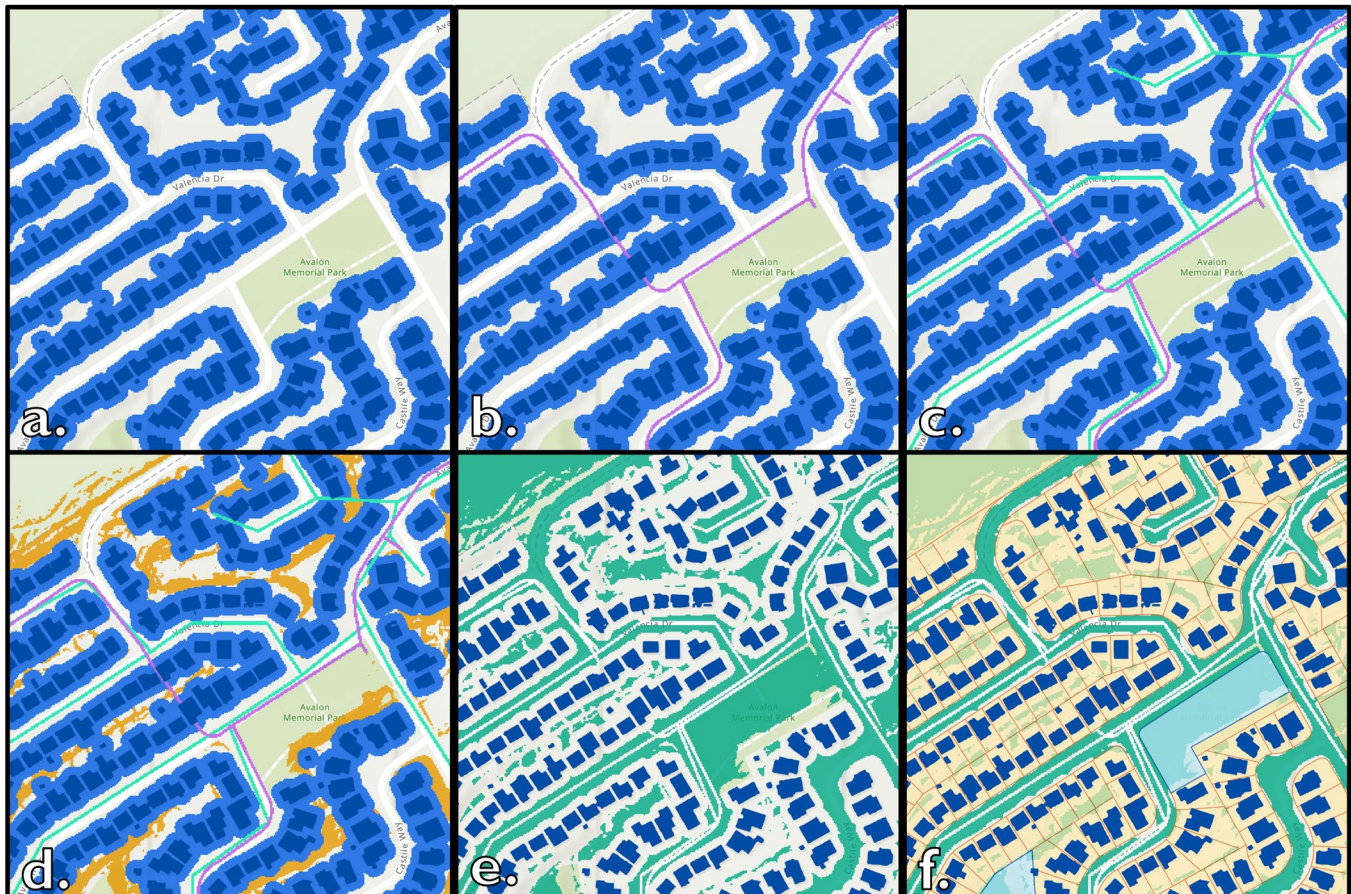
The second step in the identification process is the screening using readily available datasets from countywide sources and previous studies. The goal of the screening is to further refine the list of regional project opportunities from several thousand to a number that can reasonable be evaluated by engineering eyes in an aerial evaluation and to further evaluate the opportunities based on the full set of objectives in the Drivers and Objectives Report. The following approach and data were used to conduct the geospatial analysis of opportunities that help maximize the benefit of these projects. The table below summarizes metrics, datasets, and classification details used to identify, screen, rank, and evaluate the full roster of County-wide project opportunities and narrow this list down to a focused group of the best opportunities to undergo full modeling analysis for prioritization. Key maps follow to demonstrate how these criteria varied across the County, and all final characterization will be included in the geospatial project database.

**Table 2-1.** Summary of geospatial datasets used in project opportunity characterization.

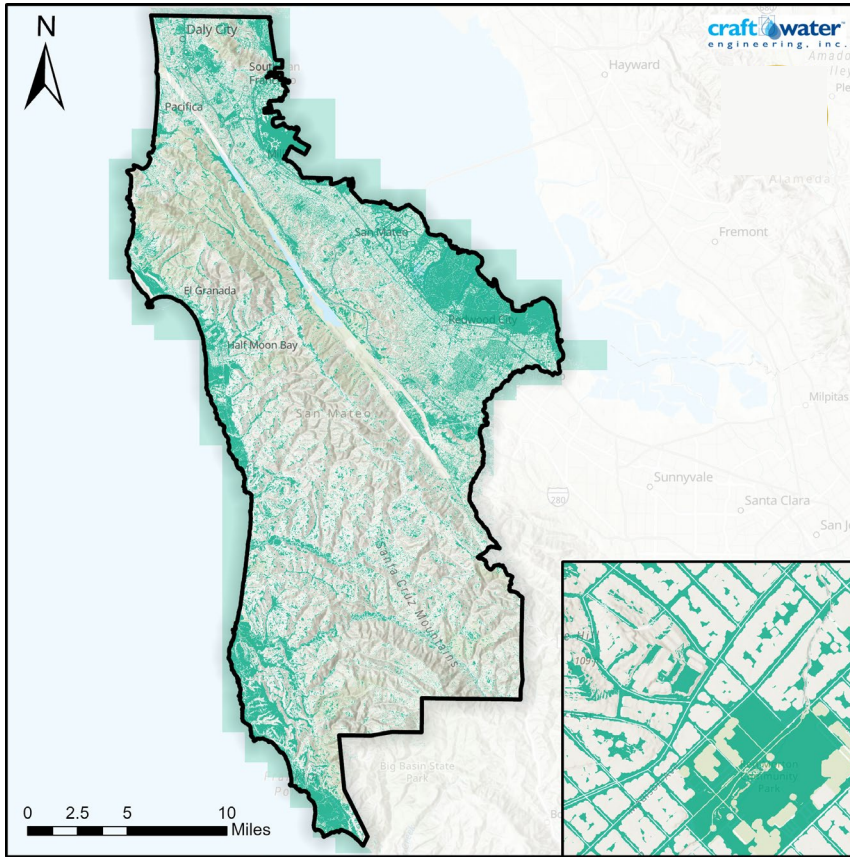
Assessment Criteria	Metric/Constraint	Data Source	Classification	Notes
<b>Site Feasibility</b>	Building Footprints	C/CAG Impervious Surface Data	Footprint + 20' buffer	Building footprint plus offsets screened out for BMP feasibility
	Utility Conflicts	C/CAG and Member Agency Utility Data	Asset + 4' buffer	Utility avoidance keeps costs lower and minimizes delays; screened out for BMP feasibility
	Constructable Slope	C/CAG 2017 1m DEM	15% Grade Breakpoint	Slopes ≤ 15% more easy to construct upon; any areas with higher slopes screened out for BMP feasibility
	Fault Hazards	ABAG Fault Hazards	Presence/Absence	Higher probability of failure; areas screened out for BMP feasibility
<b>Potential Stormwater / Hydrology Performance</b>	Drainage Patterns	DEM Analysis	DEM-based Flowpath	Indicate surface runoff pathways
	Storm Drain Diversions	C/CAG and Member Agency Utility Data	Drains ≥ 24 in. Diameter	Identify potential project drainage area from storm drain diversion point to BMP via GIS analysis of subsurface runoff pathways forming drainage areas in conjunction with surface runoff pathways
	Impervious Drainage Area	DEM Analysis	DEM-based Flowpath	Assessed at project diversion points; indicate greater runoff volume with heavier pollutant loading
<b>Project Typology Evaluative Factors</b>	Hydrologic Soil Group	Soil Survey Geographic Database (SSURGO)	A = 1, B = 2, C = 3, D = 4	High (HSG A) to Low (HSG D) infiltration potential
	Soil Liquefaction Potential	C/CAG Stormwater Resource Plan (SRP) Datasets	Presence/Absence	May raise costs for infiltrative BMPs
	Aquifer Recharge Potential	C/CAG SRP Datasets	Presence/Absence	Areas where infiltration has been prioritized
	Sewer Discharge Potential	C/CAG and Member Agency Utility Data	Within 200' of Sanitary Sewer for potential discharge	Full water quality treatment and water supply provisioning
	Pervious Footprint Area	C/CAG Impervious Surface Data	Portion of Feasible Space designated Pervious	Lower cost to construct BMP in existing pervious areas
	Flooding Risk	C/CAG SRP Datasets	Within Floodprone Watershed (Yes/No)	Flood management contributions of higher priority
	SMC Water Pollution Prevention (WPP) Trash Generation Capture Potential	SMC WPP Trash Generation Designation Dataset	Upstream area with Medium/High/Very High Trash Generation designation	Centralized projects can provide significant capture of upstream trash
	Potential CALTRANS Trash Capture Opportunities	Catchment areas with substantial CALTRANS ROW coverage.	Upstream drainage area coinciding with CALTRANS ROW areas	Projects in these catchments can offer multi-benefits and collaborative potential

## 2.2.1 Project Site Feasibility Screening

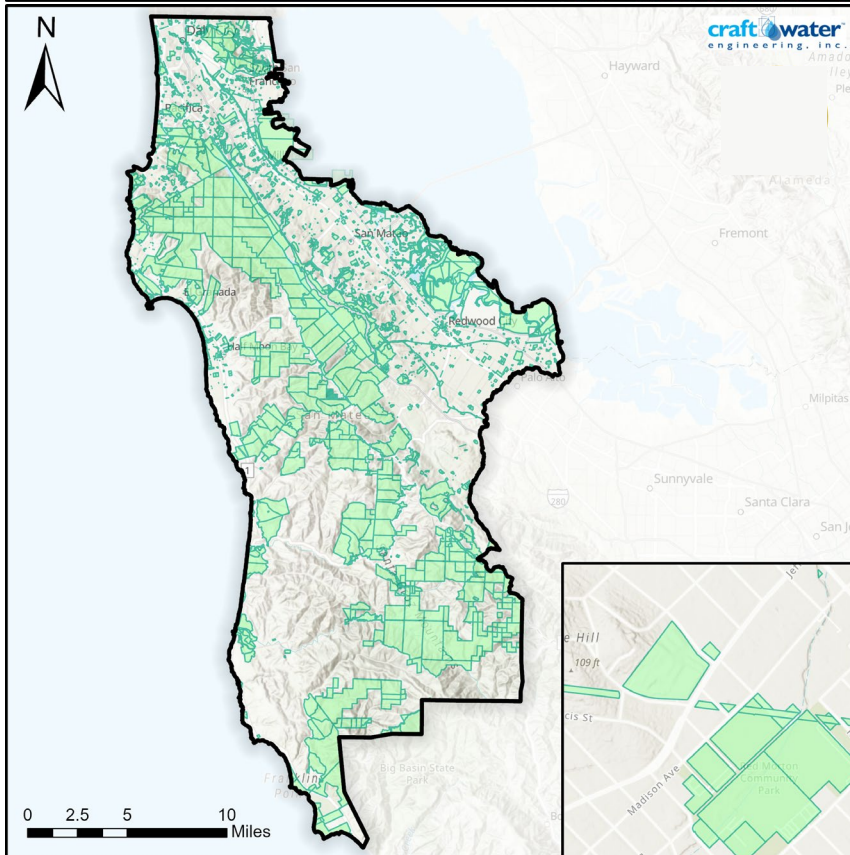
The goal of the project opportunity feasibility screening was to both identify parcels in San Mateo County where regional stormwater capture projects could be implemented and provide an upper estimate of the potential footprint for a BMP at these sites. This screening involved elimination of areas with discernible conditions that would make construction of a BMP difficult, costly, or infeasible. Note that potential opportunities identified as feasible at this stage are only vetted based on this analysis and any opportunity identified herein could become infeasible as more detailed site assessment is conducted. The screening process used is displayed in **Figure 2-2**, demonstrating the key screening criteria used to define the County-wide feasible project space to be further evaluated for project potential and suitability. This process started by eliminating building footprints, buffered to 20' to allow adequate setback for construction (**Figure 2-3a**). Subsequently, utility conflicts were eliminated as well where data was available, buffered to 4' for storm drains (**Figure 2-3b**) and sanitary sewer lines (**Figure 2-3c**). Ground slope was considered, eliminating areas where the local slope exceeded a 15% grade (**Figure 2-3d**). Finally, fault hazard areas were eliminated from consideration for BMPs due to the higher risk of failure for infrastructure in these areas of the County (not shown in the figure). The result of these screening criteria is shown in the focus area in **Figure 2-3e** (green areas) and is displayed for the full County in **Figure 2-4**. Parcel ownership was also accounted for in the feasibility screening, separating parcels by ownership based on tax status and known public owner agencies. These are highlighted in both **Figure 2-3f** (light blue overlay) and county-wide in **Figure 2-4**.



**Figure 2-3.** Progression of feasibility assessment used to determine potential space where a regional stormwater capture project could be readily built. (a) Buildings are buffered, (b) storm drains are embedded, (c) sewer lines and other utilities mapped, (d) slopes are overlaid, (e) remote sensing of open areas, and (f) possible areas for implementation shown in blue.



**Figure 2-4.** Feasible BMP project space across San Mateo County. Identifies parcels and parkway spaces.



**Figure 2-5.** Public parcels across San Mateo County.

## 2.2.2 Project Capture Potential Analysis

As mentioned before, the potential for a given project opportunity to capture stormwater is related to a balance between the available space to construct a BMP and access to runoff from a large drainage area via diversion from the storm drain network to the BMP. Because water quality benefits are such an integral component of stormwater capture success, BMPs that capture runoff from a large area of impervious surfaces typically capture the greatest runoff volumes carrying the highest pollutant loads. These two ideals (feasible space and impervious drainage area) form the basis of estimating the potential performance at identified project sites. These data were assessed County-wide and cross-referenced with project opportunities to provide a ranked list of potential projects and focus more in-depth engineering analysis to identify the top projects across San Mateo County. A subset of this data is highlighted in **Figure 2-6**.

Drainage area assessment and proximity analysis were combined with potential project locations to identify the maximum divertible impervious drainage area to the project site, constrained by feasible diversion line lengths of approximately 1000 feet. This metric was combined with feasible project space at each site to form a balanced ranking which provided a roadmap for further engineering analysis to focus on the locations with the greatest stormwater capture potential across the County.

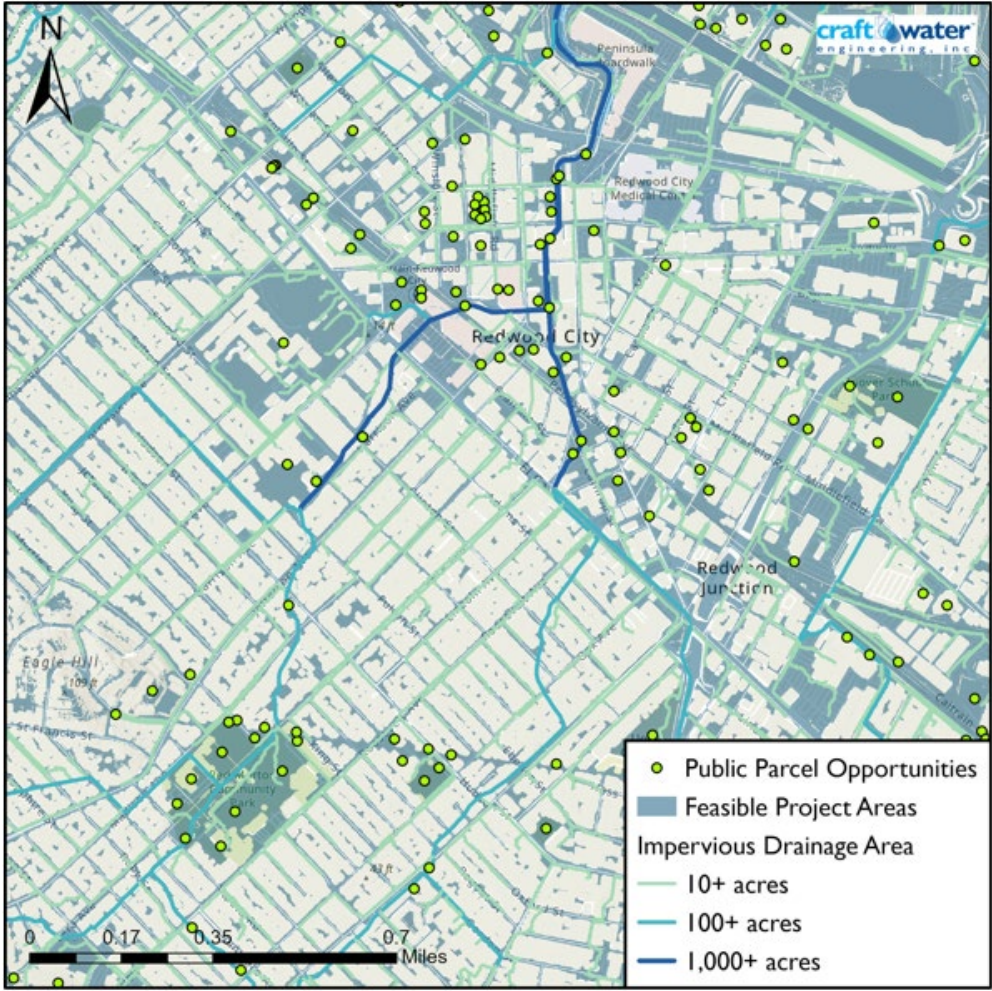
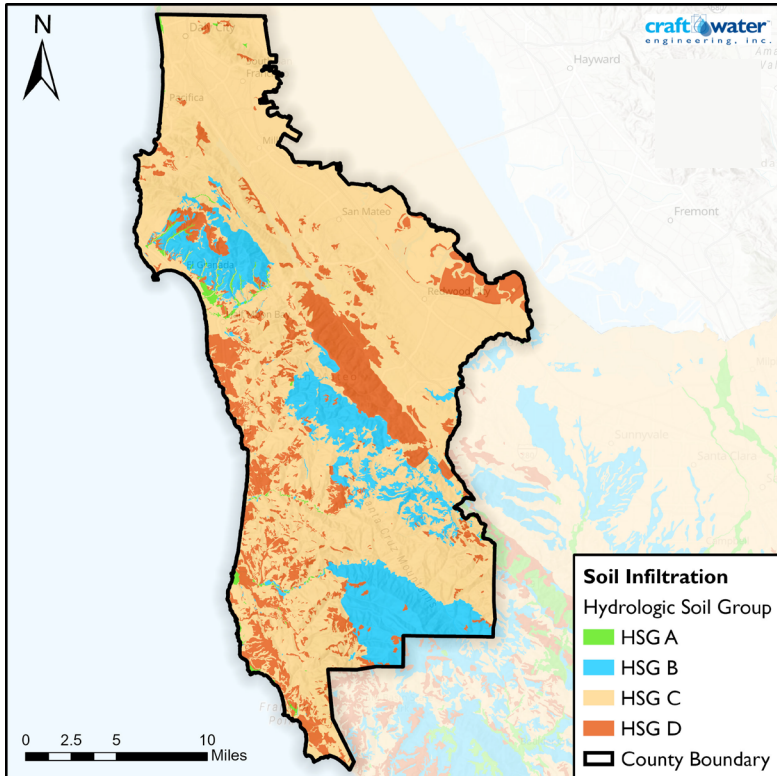


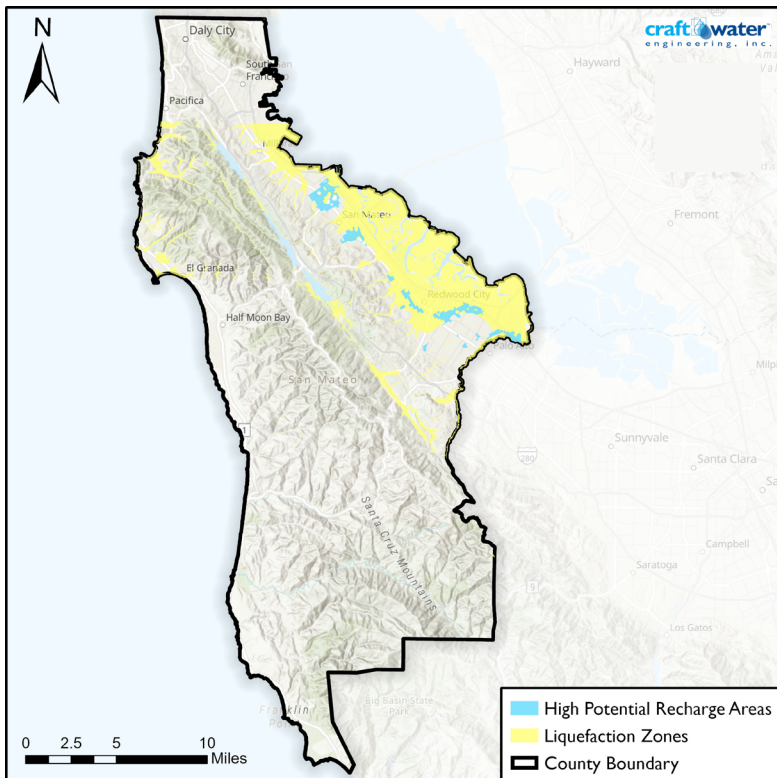
Figure 2-6. Estimating project potential with feasible space and upstream impervious drainage area.

### 2.2.3 Project Typology Evaluation

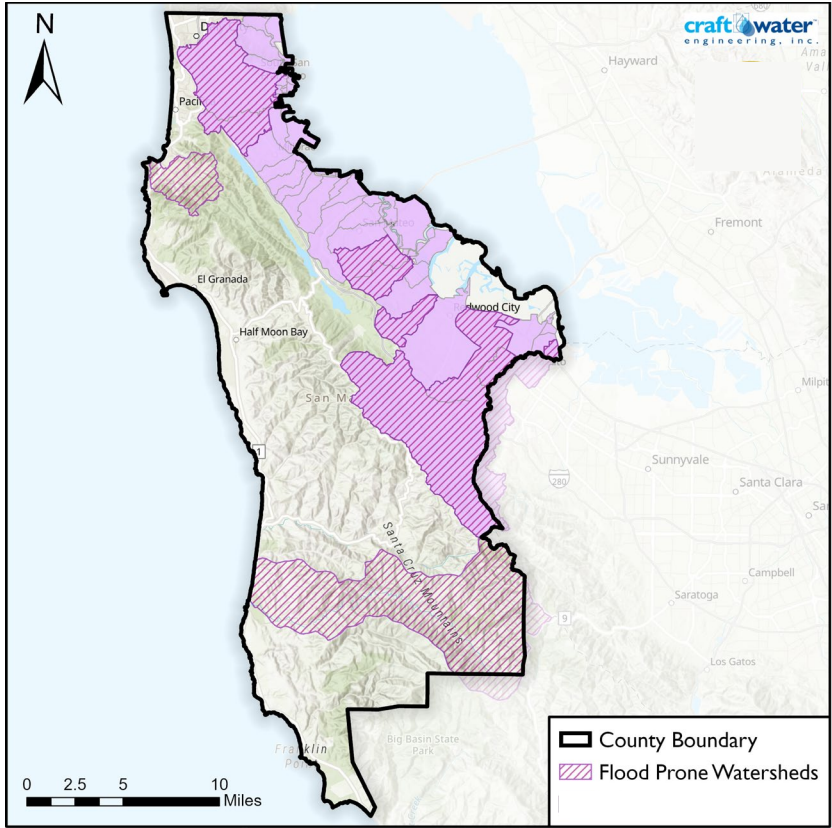
The following figures highlight datasets used to provide evaluative criteria to aid in project opportunity engineering analyses and assist in optimal BMP typology and options definitions for potential sites.



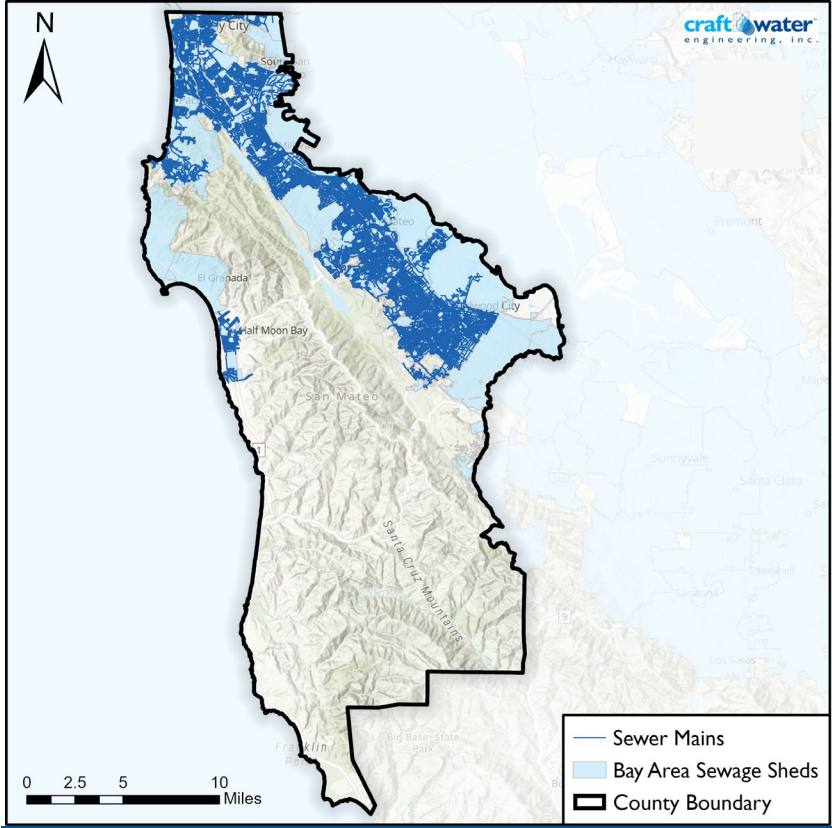
**Figure 2-7.** Soil hydrologic soil groups per SSURGO. Indicative of infiltration potential.



**Figure 2-8.** High potential recharge areas and liquefaction zones.



**Figure 2-9.** Watersheds with known flooding issues per the SRP.



**Figure 2-10.** Locations of known sewer mains.



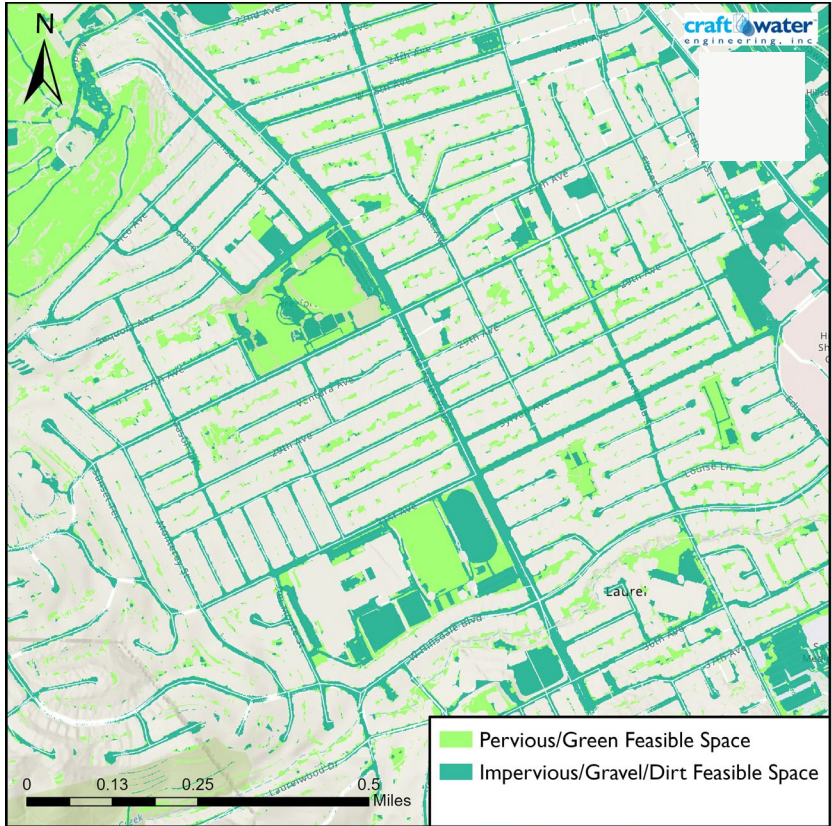


Figure 2-11. Pervious vs impervious area.

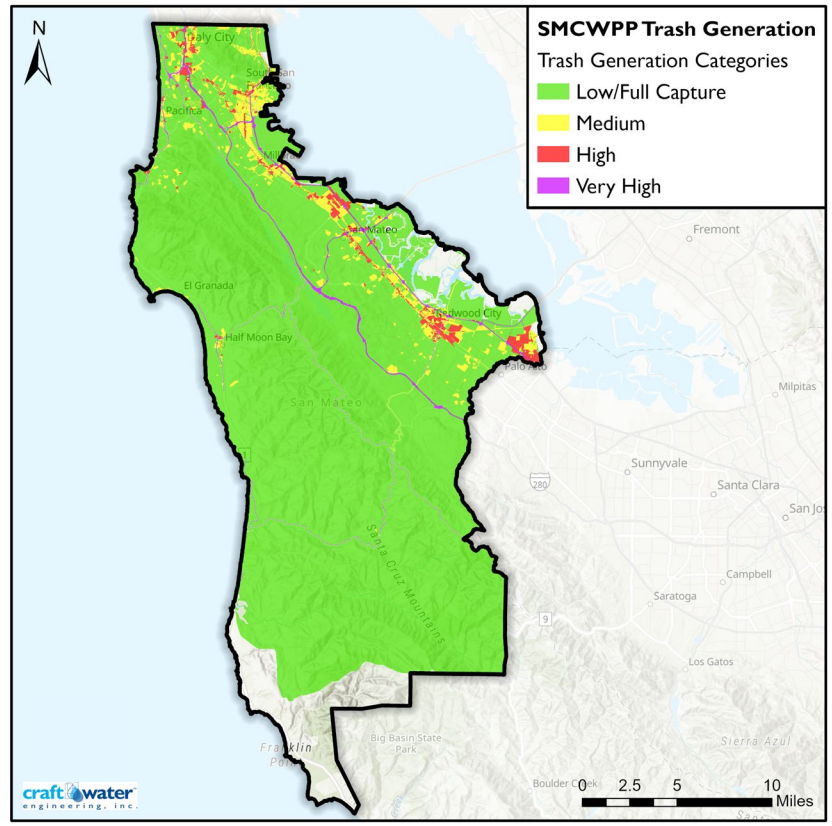
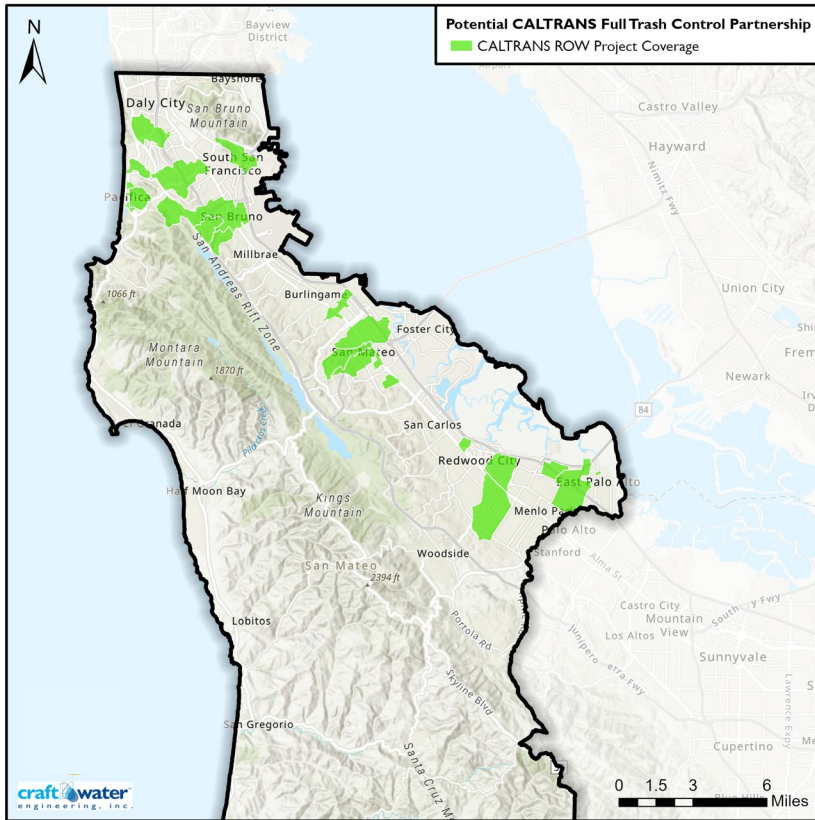


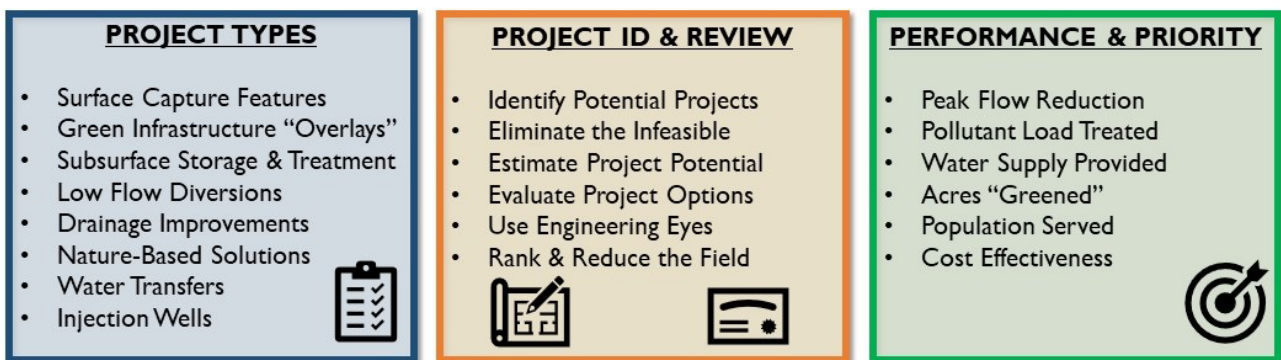
Figure 2-12. SMC WPP Trash Generation dataset. Category descriptions available within the SMC WPP Trash Generation Report



**Figure 2-13.** CALTRANS Full Trash Capture opportunity drainages. Areas highlighted are of highest priority to Caltrans and illustrates where they desire to have a project area treat.

## 3.0 PROJECT PERFORMANCE & PRIORITIZATION

Detailed engineering analysis was conducted for approximately 300 of the top opportunities resulting from the previous analysis. These opportunities were narrowed to a field of 74 feasible regional projects that passed the engineering analysis as viable project opportunities. With the potential opportunities for regional stormwater capture projects narrowed through the project identification and evaluation analyses, more detailed quantification of potential project performance of these 74 opportunities was performed. For each of the project opportunities in the narrowed list, drainage areas were delineated to provide an even more detailed assessment of project performance focusing on the BMP menu and performance metrics developed between the Project Team and C/CAG (see **Figure 3-1**). To accurately quantify these metrics, an integrated assessment using long-term hydrology and water quality modeling, BMP sizing and configuration optimization, and balanced project prioritization was utilized. Details for this methodology are summarized below.



**Figure 3-1.** Summary of screening approach and performance metrics to be used in project opportunity prioritization.

### 3.1 PROJECT TYPES

Characterizing the type of practice that is suitable for each of the identified potential project areas is the first step in determining the potential project performance and subsequent prioritization. For purposes of this study, the regional projects are first divided into two categories: surface and subsurface. Both surface and subsurface projects can utilize infiltration or filtration methodologies for treatment pending geotechnical investigations for infiltration rates, depth to groundwater, and soil contamination. As a part of this analysis, the infiltrative practices were only assigned to areas identified as potential groundwater recharge regions. Below describes typical surface and subsurface practices considered in the performance modeling. The project type can be changed or updated based on site-specific conditions observed during more in-depth evaluations.

#### 3.1.1 Subsurface Practices

Subsurface galleries are underground storage reservoirs that temporarily store and then infiltrate and/or filter stormwater runoff. The subsurface units allow for siting water quality/water supply projects where surface space is limited or where alternate surface uses are desired (i.e. athletic fields and/or parking). Infiltrative practices percolate captured runoff through openings along the bottom of the unit and into the subgrade and subsoils. If site conditions do not allow for infiltration, water is filtered through a media or cartridge system and directed back to the stormwater conveyance system. Alternatively, captured runoff can be directed to local sanitary sewer systems for treatment pending capacity and feasible proximity. For purposes of this analysis, any already

developed parcels that identified as a possible opportunity were assigned a subsurface facility and potential discharge method (infiltration/filtration/sewer discharge) were assigned where feasible. Since filtration is feasible anywhere for subsurface practices, it was assigned lowest priority in designation. Infiltration was assigned highest priority given its nature-mimicking hydrologic benefits.

Subsurface systems can be precast concrete structures or poured-in-place solutions depending on the desires of the municipality. Precast units typically have shorter install times and allow for modular installation while poured-in-place can reduce overall project costs and generally results in lower construction traffic. There are multiple modular precast concrete systems available including the following example systems; StormPrism by Precon, StormTrap, StormCapture by Oldcastle, and Jensen StormVault. All subsurface systems are designed to maximize storage space while meeting or exceeding HS-20 traffic loading thus providing sufficient strength to support covering soils and resist buoyancy. An example subsurface system is shown in **Figure 3-2**.



**Figure 3-2.** Example subsurface regional practices.

### 3.1.2 Surface Practices

Surface treatment facilities are basins that store and then infiltrate and/or filter stormwater runoff. These practices can contain a permanent pool of water (i.e. treatment wetland) or only contain water during wet-weather events (i.e. extended detention ponds). Both systems can be designed as an infiltration or filtration facility depending on the geotechnical conditions. Surface practices require open space and for purposes of this analysis, only areas that are currently undeveloped were considered for surface practices. An example surface system is shown in **Figure 3-3**.



**Figure 3-3.** Example surface regional practices.

## 3.2 PROJECT PERFORMANCE MODELING

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Initial estimates for potential project performance were assessed using long-term baseline hydrology and water quality modeling from the C/CAG's previous Reasonable Assurance Analysis (RAA) conducted to determine overall County needs for BMP implementation to meet the requirements of the TMDLs (C/CAG 2020). This model provided a drainage-specific 10-year timeseries (WY2006-2015) to be used in BMP modeling and optimization at each site. With this timeseries at each location, a range of BMP options, sizes, and configurations were modeled across engineering-feasible and site-specific ranges to assess the potential performance at the site by quantifying expected PCB load reductions. Planning level cost functions were applied to encapsulate differences in each of these modeled options with relative differences in overall project cost, and these were paired with BMP performance results to identify the optimal BMP size and configuration to deliver cost-effective benefits at any given location.

BMP performance for each opportunity was assessed in isolation as if each opportunity would manage stormwater on its own. However, it is known that BMPs in overlapping drainages can be impacted when additional BMPs are placed upstream. Full evaluation of BMPs in so-called "nested" drainage areas is complex and can be highly variable depending on the mix of BMPs, their sizes, placement, and other factors. Final performance of BMPs with nested drainages is dependent upon a defined system of projects due to their interdependent capture and treatment, so any change in system-defining variables (# of BMPs, size of BMPs, specific BMPs included) will shift the overall performance of the system of BMPs. Because BMP selection is often guided by decisions concerning a variety of other factors external to BMP capture potential alone, it is best to focus on defining the most impactful BMP opportunities available and selecting them across several different non-nested drainage areas wherein regional treatment can be distributed over the County's many isolated drainages to maximize capture with the most impactful projects over the greatest area of need.

## 3.3 FINAL PROJECT PRIORITIZATION AND RANKING

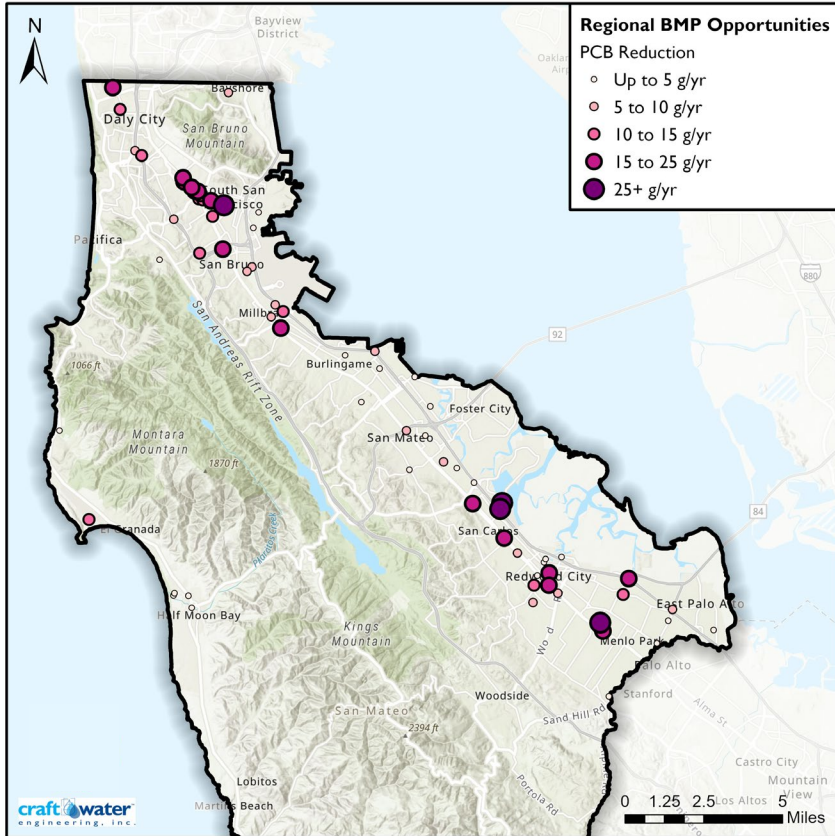
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The final step in the identification and prioritization is relating the performance to the Drivers and Objectives Memo that outlines the categories and metrics of interest. Modeling results provided values for metrics that were utilized to make an initial prioritization of project opportunities and present the County with a solid list of the top candidates from the field of 74 that would offer the most well-rounded impact to their current stormwater program. Regional BMPs that have already advanced in conceptualization and design throughout the County were included in the analysis to provide a point of comparison for any new opportunities selected. However, these BMPs were not included in the prioritization selection, and any opportunities located close to these existing concepts were deemphasized. Tabulated metrics (**Table 3-1**) were assessed for all 74 candidate opportunities, and each was ranked to show how each project performed for each compared to other project opportunities.

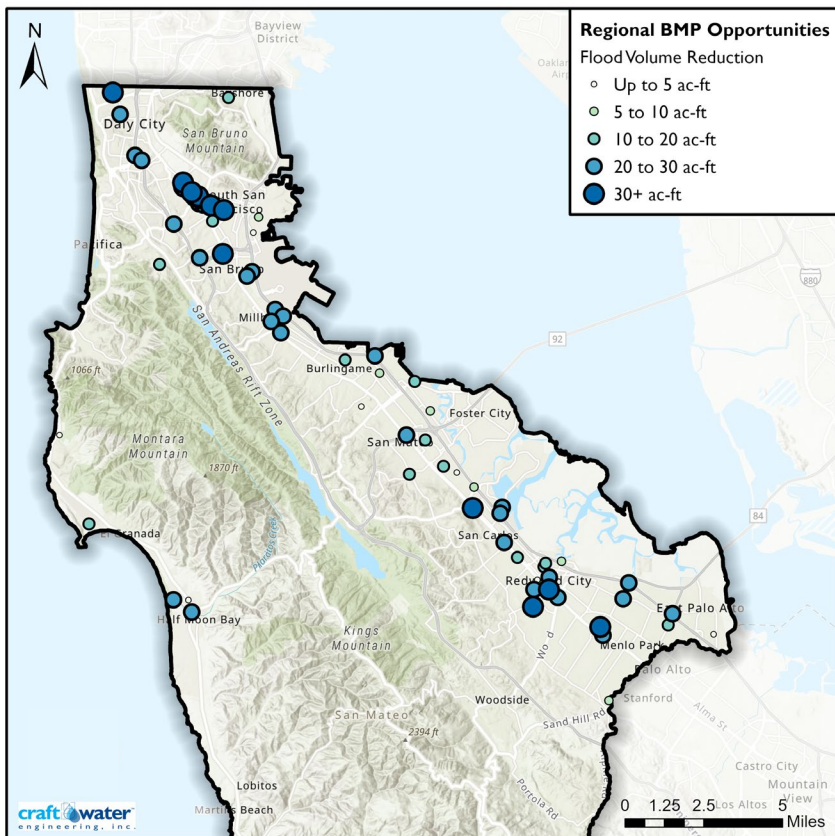
Rankings for each metric were used to select several top tier opportunities to potentially advance to further conceptualization. To identify these top candidates, water quality rankings were first assessed. Moving down the list of the best performers, projects were included or not based on the balance of their water quality ranking in comparison to their other multi-benefits that might be provided. Additionally, projects were selected in a way to distribute top opportunities geographically across the County, among distinct watersheds to provide treatment of different drainages, as well as among BMP typologies to provide C/CAG a variety of concepts to explore their options in regional capture with. Using rankings allowed for flexible, engineering-focused comparisons to be made amongst metrics and in relation to other potential projects as opposed to assigning a final score with arbitrary weighting to each project opportunity. This approach provides flexibility to the decision-making process, a basis for comparison among project alternatives across different sets of criteria and allows the County to revisit project opportunities in the future and compare these metrics for further decision-making down the line as more projects become implemented and the next crop of options is being sought. Following **Table 3-1** are several maps that highlight the rankings for key values to demonstrate how they vary among projects and across the County.

**Table 3-1.** Summary of BMP project opportunity performance metrics.

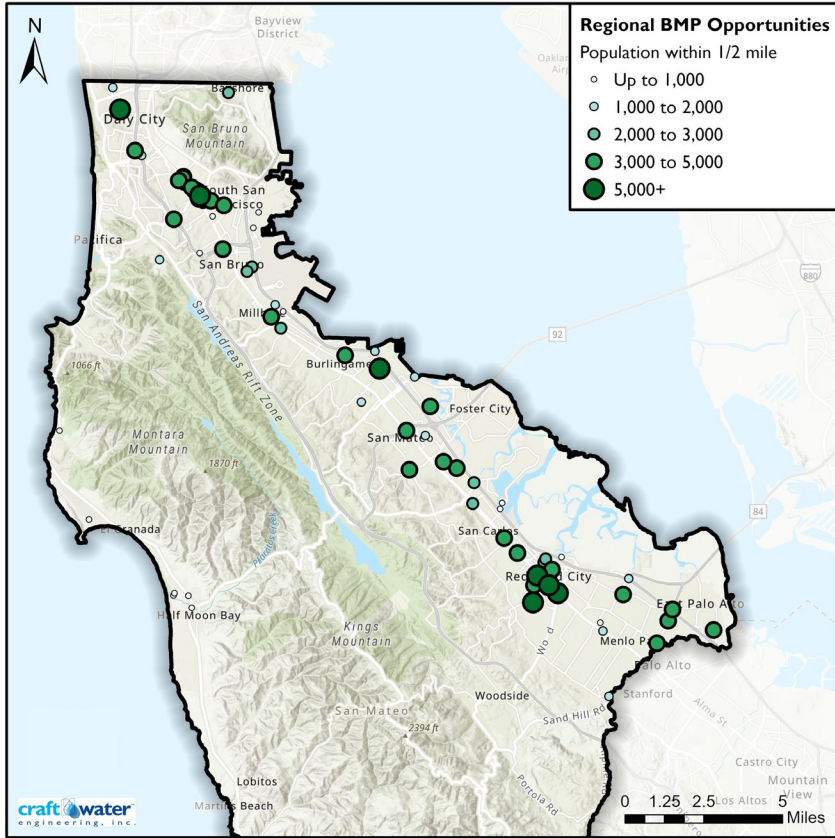
CATEGORY	METRIC	DESCRIPTION	UNITS
Community Benefits	Walkable Population	Estimated 2010 population within ½ mile walkable radius to project	people
	Project Community Benefit	Designates project is on Park or School parcel; "NEW" indicates undeveloped parcel with potential to convert to Park; "NO" indicates limited community benefit from site	na
Flood Management	Peak Flow Reduction	Reduction in peak flow for 10 Year, 24 Hour storm event	cfs
	Flood Volume Reduction	Volume captured for 10 Year, 24 Hour storm event	ac-ft/yr
Water Quality	Water Quality Reduction	Average annual reduction in PCBs for the drainage area	g/yr
	"Greened" Acres	Proxy of impervious area "treated" from drainage area by the project	acres
	Volume Managed	Average annual runoff volume captured by project for treatment	ac-ft/yr
Water Supply	Volume Used	Average annual water volume utilized/supplied; assumed full for infiltration, 33% for sewer discharge (which is typically limited to discharge in off-peak hours of ~ 10pm – 6am, or 1/3 of the day), and 0 for other options which return water to drains	ac-ft/yr
	Demand Offset	Demand of regional offset; based on 680 ac-ft/yr demand for stormwater harvesting projected for regional projects supply (BAWSCA 2015)	percentage
Trash Capture	SMCWPP Trash Capture	Potential area treated with Medium/High/Very High trash generation designation from the SMCWPP baseline	acres
	CALTRANS Opportunity Full Capture	Potential area treated coinciding with CALTRANS Full Capture opportunity drainage areas.	acres



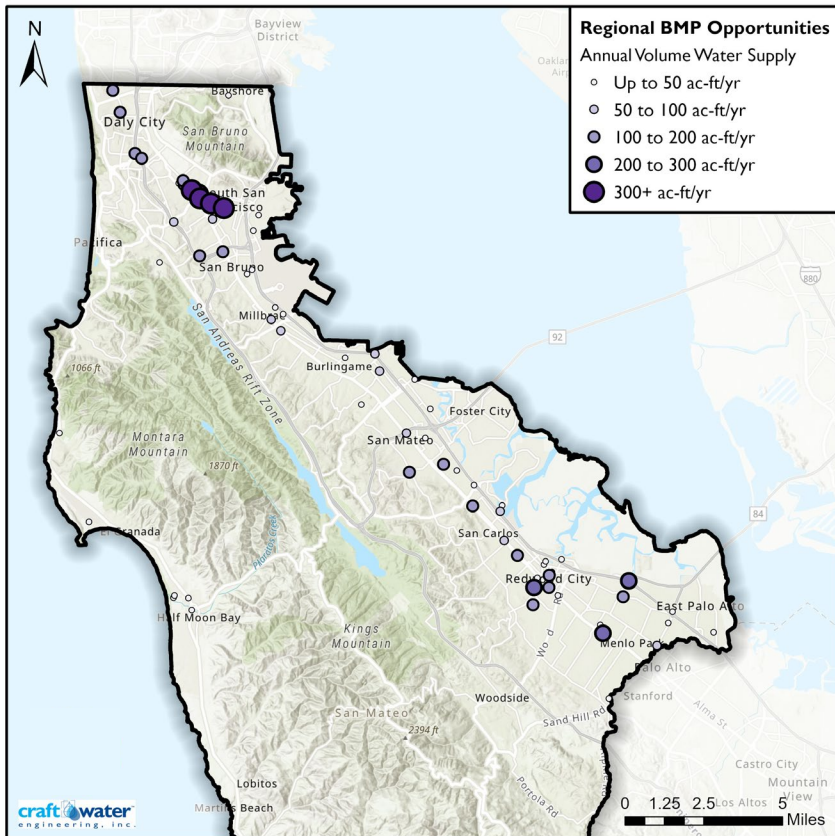
**Figure 3-4.** PCB Reduction across candidate opportunities.



**Figure 3-5.** Flood volume managed by candidate opportunities.

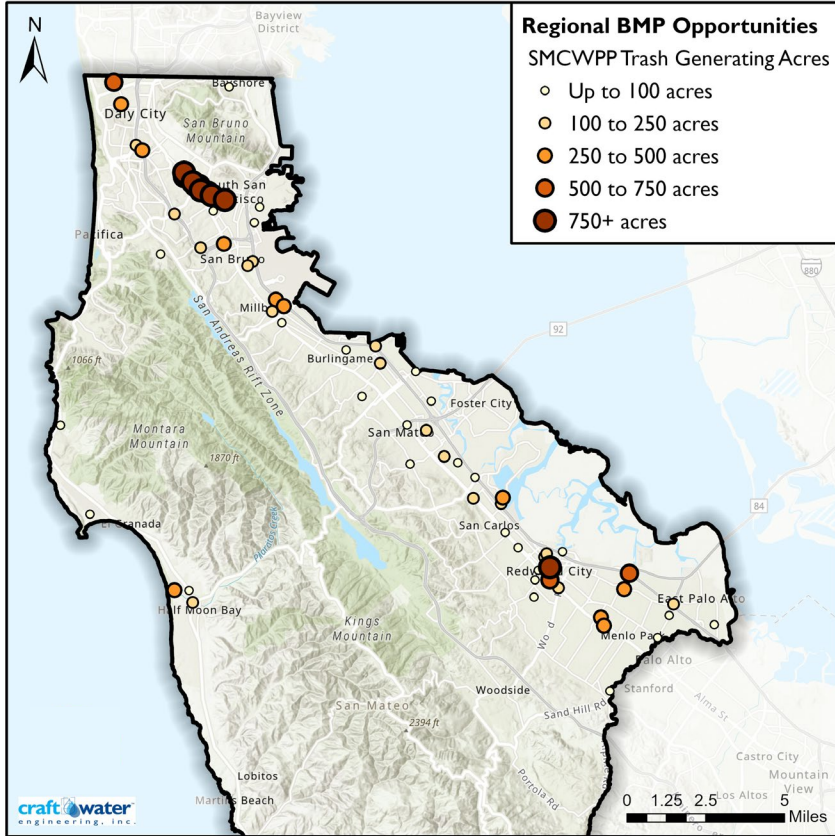


**Figure 3-6.** Population benefited by candidate opportunities.



**Figure 3-7.** Potential water supply for candidate opportunities.





**Figure 3-8.** Potential trash capture for candidate opportunities drainage areas.

## 4.0 TOP PROJECT OPPORTUNITIES

The analysis of candidate opportunity metrics and performance focused the BMP opportunity list to a group of 14 top tier projects (**Figure 4-1**) that will provide the most impactful and cost-effective options for the County to pursue further in study and design. These different projects were chosen with a focus on performance metrics but also with an eye on (1) distributing projects among diverse drainage areas to provide options across County watersheds, (2) sensitivity to protecting the performance of previously planned projects currently in construction or design, and (3) providing a range of BMP types to develop a range of options for the County to utilize in building out their stormwater management portfolio. Discussion with the C/CAG member agencies and project TAC will follow and will determine which of the top opportunities will be advanced to more detailed concepts following review of this report.

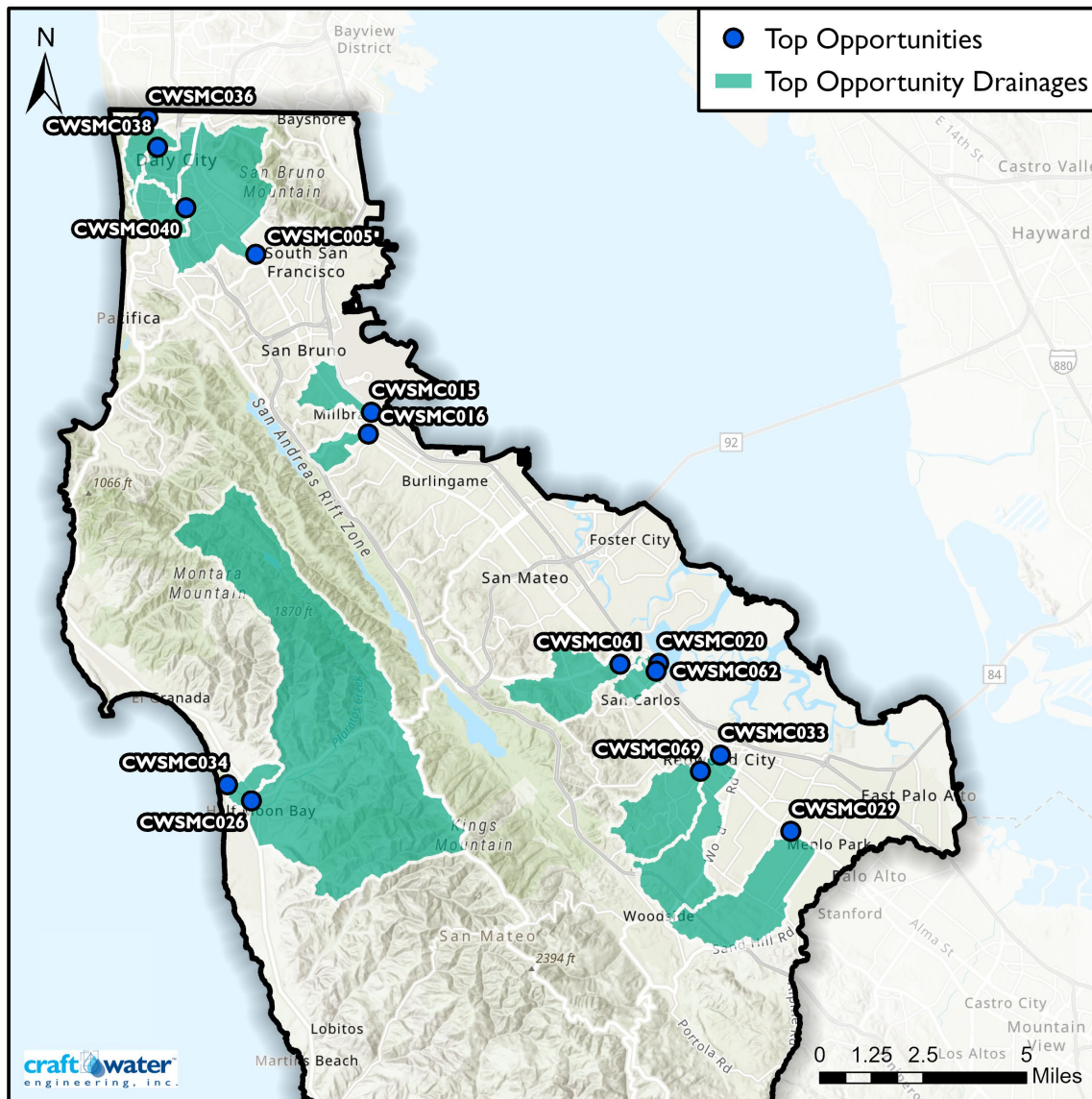


Figure 4-1. Top priority opportunities for regional BMPs in San Mateo County.

## 5.0 REFERENCES

Bay Area Water Supply & Conservation Agency (BAWSCA), 2015. *Long-Term Reliable Water Supply Strategy Strategy Phase II Final Report*. February 2015.

C/CAG, 2020. *San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report*. September 2020.

C/CAG, 2017. *San Mateo County Stormwater Resource Plan*. February 2017.

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Geosyntec Consultants, 2021. *Advancing Regional Stormwater Capture Projects: Business Case for Regional Collaboration – DRAFT MEMORANDUM*. August 2021.

## APPENDIX A: PROJECT OPPORTUNITY DATABASE

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CATEGORY	ATTRIBUTE	DESCRIPTION and NOTES	UNITS
Project Baseline	<b>CWID</b>	Craftwater Project ID	na
	<b>FULLDA_AC</b>	Full Upstream Drainage Area to project diversion point	acres
	<b>IMPDA_AC</b>	Impervious Area in project drainage area	acres
	<b>IMPDA_PCT</b>	Percentage of drainage area impervious	percentage
	<b>BASE_RUN_af</b>	Baseline Runoff to project diversion point	ac-ft/yr
	<b>BASE_PCB_g</b>	Baseline PCBs to project diversion point	g/yr
	<b>10YR_PEAK_cfs</b>	Peak Flowrate for 10 Year, 24 Hour storm event to project diversion point	cfs
	<b>10YR_VOL_af</b>	Runoff Volume for 10 Year, 24 Hour storm event to project diversion point	ac-ft/yr
Project Attributes	<b>DIV_CFS</b>	Preliminary Project Diversion Rate	cfs
	<b>STOR_ACFT</b>	Preliminary Project Storage Volume	ac-ft/yr
	<b>BMPTYPE</b>	Type of BMP	na
	<b>TREATMENT</b>	Type of BMP treatment recommended	na
	<b>PLANCOST</b>	Planning Level Cost Estimate	\$ dollars
Community Benefits	<b>WLKBL_POP</b>	Estimated 2010 population within 1/2 mile walkable radius to project	people
	<b>PARKS_REC</b>	Designates project is on Park or School parcel; "NEW" indicates undeveloped parcel with potential to convert to Park; "NO" indicates limited community benefit from site	na
Flood Management	<b>PEAK_RDX</b>	Reduction in peak flow for 10 Year, 24 Hour storm event	cfs
	<b>VOL_RDX</b>	Volume captured for 10 Year, 24 Hour storm event	ac-ft/yr
Water Quality Benefit	<b>PCB_RDX</b>	Average annual reduction in PCBs for the drainage area	g/yr
	<b>GREEN_ACRES</b>	Proxy of impervious area "treated" from drainage area by the project	acres
	<b>VOL_MAN</b>	Average annual runoff volume captured by project for treatment	ac-ft/yr
Water Supply	<b>VOL_USE</b>	Average annual water volume utilized/supplied; assumed full for infiltration, 33% for sewer discharge, and 0 for other options which return water to drains	ac-ft/yr
	<b>DEM_OFFSET</b>	Demand of regional offset; based on 680 ac-ft/yr demand for stormwater harvesting via other capture initiatives	percentage
Trash Capture	<b>SMCWPP_TRASH</b>	Aggregate area of Medium/High/Very High trash generation areas in project drainage area from the SMCWPP Trash Generation designations	acres
	<b>CALOPPS_TRASH</b>	Aggregate of drainage covered by potential CALTRANS trash capture opportunities	acres

CWID	DA_AC	IMPDA_AC	IMPDA_PCT	BASE_RUN_af	BASE_PCB_g	10YR_PEAK_cfs	10YR_VOL_af	DIV_CFS	STOR_ACFT	BMPTYPE	TREATMENT	PLANCOST
CWSMC001	322.23	144.35	44.80%	212.02	10.64	94	35.77	50	6.2	Subsurface Vault	Infiltration	\$8,900,000
CWSMC002	1154.17	436.74	37.84%	519.46	19.36	307	99.78	80	16.5	Subsurface Vault	Infiltration	\$21,400,000
CWSMC003	4578.7	1717.13	37.50%	1327.71	28.40	543	163.16	80	18	Subsurface Vault	Filtration/Sewer	\$23,200,000
CWSMC004	423.97	164.57	38.82%	255.99	5.60	110	37.16	50	6.6	Subsurface Vault	Filtration/Sewer	\$9,300,000
CWSMC005	4682.47	1784.88	38.12%	2824.00	61.80	1209	409.94	80	20	Wetland/Detention	Wetland/Filtration	\$25,600,000
CWSMC006	5111.42	1952.77	38.20%	3084.05	67.49	1320	447.69	70	17.5	Subsurface Vault	Filtration/Sewer	\$22,500,000
CWSMC007	6711.06	2728.64	40.66%	3708.36	103.77	2353	707.27	50	8	Wetland/Detention	Wetland/Filtration	\$4,300,000
CWSMC008	1449.81	677.78	46.75%	801.50	22.43	508	152.86	70	14	Subsurface Vault	Filtration/Sewer	\$18,300,000
CWSMC009	1589.68	553.23	34.80%	528.66	9.70	321	119.26	60	23.5	Subsurface Vault	Filtration/Sewer	\$31,600,000
CWSMC010	1452.26	679.49	46.79%	802.26	22.45	509	153.01	80	13	Wetland/Detention	Wetland/Filtration	\$6,500,000
CWSMC011	1723.04	408.43	23.70%	605.37	15.01	242	78.51	20	0.7	Modular Wetland	Filtration	\$1,700,000
CWSMC012	89.44	79.29	88.65%	59.63	2.99	26	10.06	30	2.3	Subsurface Vault	Filtration/Sewer	\$4,100,000
CWSMC013	32.4	27.51	84.91%	19.88	1.00	9	3.35	20	0.7	Modular Wetland	Filtration	\$1,700,000
CWSMC014	703.52	376.3	53.49%	342.04	11.26	161	65.64	80	11.5	Wetland/Detention	Wetland/Filtration	\$5,800,000
CWSMC015	787.92	411.79	52.26%	383.47	12.62	181	73.59	80	13.2	Wetland/Detention	Wetland/Filtration	\$6,500,000
CWSMC016	475.37	189.83	39.93%	284.89	19.13	176	54.72	60	10.6	Subsurface Vault	Filtration/Sewer	\$14,200,000
CWSMC017	177.72	101	56.83%	70.60	2.62	59	17.52	20	1.6	Subsurface Vault	Filtration/Sewer	\$3,200,000
CWSMC018	159.46	30.92	19.39%	137.51	1.40	17	7.60	20	0.6	Subsurface Vault	Infiltration	\$1,000,000
CWSMC019	584.89	204.44	34.95%	253.04	9.82	165	56.47	80	9.6	Subsurface Vault	Filtration/Sewer	\$13,100,000
CWSMC020	563.08	360.92	64.10%	299.17	56.15	254	89.58	70	10.6	Wetland/Detention	Wetland/Filtration	\$5,400,000
CWSMC021	776.05	283.42	36.52%	322.16	20.15	185	60.00	60	9	Subsurface Vault	Filtration/Sewer	\$12,300,000
CWSMC022	245.05	137.71	56.20%	90.33	2.62	49	18.26	40	4.8	Subsurface Vault	Filtration/Sewer	\$7,100,000
CWSMC023	4506.59	1054.12	23.39%	1060.00	68.69	796	301.62	70	21.5	Subsurface Vault	Infiltration	\$26,300,000
CWSMC024	3838.55	838.01	21.83%	902.81	58.50	678	256.89	60	18.5	Subsurface Vault	Infiltration	\$22,700,000
CWSMC025	1278.46	476.2	37.25%	474.23	13.76	258	95.86	50	14.2	Wetland/Detention	Wetland/Filtration	\$7,000,000
CWSMC026	17352.11	648.21	3.74%	4918.27	7.53	269	112.73	50	9.4	Wetland/Detention	Wetland/Filtration	\$4,900,000
CWSMC027	267.6	85.58	31.98%	69.35	4.48	67	19.20	40	3.2	Subsurface Vault	Filtration	\$5,200,000
CWSMC028	2979.77	697.01	23.39%	701.29	45.44	527	199.55	60	21.5	Subsurface Vault	Filtration	\$27,300,000
CWSMC029	2891.96	650.96	22.51%	679.80	44.05	511	193.43	60	21.5	Subsurface Vault	Infiltration	\$26,300,000
CWSMC030	242.87	86.5	35.62%	101.17	1.63	18	9.38	20	4.2	Subsurface Vault	Filtration	\$6,300,000
CWSMC031	246.14	157.65	64.05%	106.36	4.13	69	23.73	40	3.7	Subsurface Vault	Filtration/Sewer	\$5,800,000
CWSMC032	34.71	17.42	50.19%	10.21	0.32	8	2.85	20	0.4	Bioretention	Filtration	\$1,300,000
CWSMC033	5951.65	2113.52	35.51%	2210.23	64.14	1201	446.79	60	14.6	Subsurface Vault	Filtration/Sewer	\$19,000,000
CWSMC034	17807.65	765.47	4.30%	5048.39	7.73	276	115.71	50	8	Wetland/Detention	Wetland/Filtration	\$4,300,000
CWSMC035	393.51	48.2	12.25%	109.29	0.17	6	2.51	20	0.7	Wetland/Detention	Wetland/Filtration	\$1,200,000
CWSMC036	1463.63	863.55	59.00%	1064.78	31.04	624	184.50	90	26	Subsurface Vault	Filtration/Sewer	\$32,800,000
CWSMC037	193.54	82.18	42.46%	114.70	6.62	77	23.10	40	4	Subsurface Vault	Filtration/Sewer	\$6,200,000
CWSMC038	759.12	471.56	62.12%	551.43	16.07	323	95.55	70	13.5	Subsurface Vault	Infiltration	\$17,700,000
CWSMC039	481.19	244.43	50.80%	421.40	10.22	181	56.49	50	9.2	Subsurface Vault	Infiltration	\$12,500,000
CWSMC040	764.24	389.32	50.94%	668.70	16.21	287	89.65	60	11	Subsurface Vault	Infiltration	\$14,700,000
CWSMC041	397.55	57.51	14.47%	115.38	2.47	47	14.18	40	13	Subsurface Vault	Filtration/Sewer	\$17,000,000
CWSMC042	4576.48	1715.52	37.49%	1327.03	28.39	542	163.08	90	22.5	Subsurface Vault	Filtration/Sewer	\$28,600,000
CWSMC043	29.57	15.63	52.86%	21.52	0.43	8	2.77	20	0.6	Modular Wetland	Filtration	\$1,600,000
CWSMC044	4639.95	1756.28	37.85%	2799.62	61.26	1198	406.40	90	26	Subsurface Vault	Infiltration	\$32,800,000
CWSMC045	5145	1976.6	38.42%	3104.36	67.93	1329	450.64	50	9.4	Subsurface Vault	Filtration/Sewer	\$12,700,000
CWSMC046	6802.07	2780.93	40.88%	4103.94	89.81	1756	595.74	90	26	Subsurface Vault	Infiltration	\$32,800,000
CWSMC047	7177.41	3002.5	41.83%	4757.10	238.76	2112	802.69	80	28.8	Subsurface Vault	Infiltration	\$36,100,000
CWSMC048	610.99	276.8	45.30%	337.95	9.46	214	64.46	60	11	Subsurface Vault	Filtration/Sewer	\$14,700,000

CWSMC049	532.94	209.58	39.33%	239.34	8.92	141	45.98	40	8.5	Wetland/Detention	Wetland/Filtration	\$4,500,000
CWSMC050	991.53	341.56	34.45%	445.81	16.62	263	85.64	60	14.2	Subsurface Vault	Infiltration	\$18,500,000
CWSMC051	263.56	66.36	25.18%	118.36	4.41	70	22.74	30	4.4	Wetland/Detention	Wetland/Filtration	\$2,700,000
CWSMC052	530.41	208.95	39.39%	238.03	8.87	141	45.72	40	8.4	Wetland/Detention	Wetland/Filtration	\$4,500,000
CWSMC053	434.64	198.53	45.68%	211.57	6.96	100	40.60	30	7.2	Subsurface Vault	Filtration/Sewer	\$9,900,000
CWSMC054	520.32	271.16	52.11%	248.22	9.07	211	62.42	50	8.4	Subsurface Vault	Filtration/Sewer	\$11,500,000
CWSMC055	344.6	185.19	53.74%	136.73	5.07	115	33.94	30	5.2	Subsurface Vault	Infiltration	\$6,500,000
CWSMC056	73.01	46.2	63.28%	40.37	1.72	25	9.20	20	0.8	Modular Wetland	Filtration	\$1,800,000
CWSMC057	298.4	52.55	17.61%	158.14	0.45	9	3.44	50	16.5	Wetland/Detention	Wetland/Filtration	\$8,000,000
CWSMC058	1676.15	553.83	33.04%	493.64	15.43	382	137.63	60	17.2	Subsurface Vault	Infiltration	\$21,100,000
CWSMC059	1427.66	404.52	28.33%	420.44	13.15	326	117.22	50	13.8	Subsurface Vault	Infiltration	\$17,000,000
CWSMC060	93.66	51.42	54.90%	27.24	0.85	21	7.59	20	0.6	Modular Wetland	Filtration	\$1,600,000
CWSMC061	1831.69	548.64	29.95%	648.29	25.54	323	115.20	60	18	Subsurface Vault	Filtration/Sewer	\$23,100,000
CWSMC062	447.91	274.67	61.32%	237.99	44.66	202	71.26	50	12.8	Subsurface Vault	Filtration/Sewer	\$16,800,000
CWSMC063	531.78	121.79	22.90%	273.69	17.69	70	22.02	40	6	Subsurface Vault	Filtration	\$8,600,000
CWSMC064	2173.94	422.31	19.43%	823.65	25.16	222	86.45	50	14.4	Subsurface Vault	Infiltration	\$17,700,000
CWSMC065	115.37	88.99	77.13%	42.34	1.23	23	8.56	20	0.8	Modular Wetland	Filtration	\$1,800,000
CWSMC066	281.08	166.22	59.14%	104.44	3.03	57	21.11	30	4.5	Subsurface Vault	Filtration/Sewer	\$6,700,000
CWSMC067	20.04	15.94	79.54%	8.47	0.25	5	1.71	10	0.5	Modular Wetland	Filtration	\$1,500,000
CWSMC068	199.68	100.15	50.16%	73.39	2.13	40	14.84	20	1.5	Subsurface Vault	Infiltration	\$2,000,000
CWSMC069	2077.36	771.66	37.15%	770.62	22.36	419	155.78	70	25	Subsurface Vault	Infiltration	\$30,500,000
CWSMC070	3472.76	1091.24	31.42%	1290.01	37.43	701	260.77	80	23	Subsurface Vault	Filtration/Sewer	\$29,200,000
CWSMC071	258.63	46.93	18.15%	72.86	0.11	4	1.67	30	5.5	Subsurface Vault	Filtration/Sewer	\$7,900,000
CWSMC072	653.71	242.32	37.07%	169.23	10.93	162	46.85	70	12.2	Subsurface Vault	Filtration	\$16,200,000
CWSMC073	39.15	28.31	72.31%	16.47	0.27	3	1.53	10	0.5	Modular Wetland	Filtration	\$1,500,000
CWSMC074	264.42	125.78	47.57%	110.58	1.78	20	10.25	30	4.2	Subsurface Vault	Infiltration	\$5,300,000

CWID	WLKBL_POP	PARKS_REC	PEAK_RDX	VOL_RDX	PCB_RDX	GREEN_ACRES	VOL_MAN	VOL_USE	DEM_OFFSET	SMCWPP_TRASH	CALOPPS_TRASH
CWSMC001	528	SCHOOL	29.7	19.78	10.06	82.33	183.78	183.78	27.0%	59.83	4.2
CWSMC002	3259	NO	0	30.46	15.17	137.74	364.00	364.00	53.5%	257.82	1061.38
CWSMC003	4813	NO	0	32.25	15.18	188.00	501.29	167.10	24.6%	1223.4	801.62
CWSMC004	4344	NO	27.86	20.38	5.06	84.27	217.10	72.37	10.6%	55.63	3.64
CWSMC005	4161	NEW	0	34.27	18.95	419.67	1100.96	0.00	0.0%	1243.09	814.9
CWSMC006	4867	NO	0	31.77	17.57	427.58	1119.19	373.06	54.9%	1299.96	818.54
CWSMC007	2274	NEW	0	22.25	9.31	185.52	456.28	0.00	0.0%	1592.37	2049
CWSMC008	4659	NO	0	28.25	12.16	191.42	409.45	136.48	20.1%	258.88	1228.31
CWSMC009	6353	PARK	50.56	37.29	7.79	130.13	373.93	124.64	18.3%	37.64	0
CWSMC010	4177	NEW	0	27.25	12.21	189.27	404.52	0.00	0.0%	260.42	1229
CWSMC011	3086	SCHOOL	0	14.55	3.52	44.50	187.73	0.00	0.0%	97.72	0
CWSMC012	357	NO	10.29	9.19	2.96	51.93	58.58	19.53	2.9%	69.19	8.14
CWSMC013	311	NO	0.63	3.32	1.00	16.86	19.85	0.00	0.0%	29.07	0
CWSMC014	1013	PARK	30.96	25.21	9.74	144.42	270.00	0.00	0.0%	327.72	31.35
CWSMC015	636	PARK	32.72	26.92	10.83	155.83	298.17	0.00	0.0%	336.38	31.35
CWSMC016	2892	NO	25.1	24.41	17.25	92.45	231.52	77.17	11.3%	74.23	0
CWSMC017	1972	PARK	4.38	11.83	2.40	36.19	63.68	21.23	3.1%	75.17	0
CWSMC018	1353	SCHOOL	0.03	0.66	0.12	4.19	21.63	21.63	3.2%	0	6.69
CWSMC019	3656	NO	11.33	23.35	8.92	72.76	208.18	69.39	10.2%	60.4	577.6
CWSMC020	837	NEW	0	24.34	44.62	139.36	217.42	0.00	0.0%	278.65	0
CWSMC021	3207	NO	0	22.76	16.10	81.19	222.32	74.11	10.9%	24.41	0
CWSMC022	2867	NEW	30.25	15.24	2.47	46.56	82.86	27.62	4.1%	102.62	36.53
CWSMC023	1675	NO	1.09	23.49	15.43	52.91	226.19	226.19	33.3%	606.46	79.49
CWSMC024	3151	NO	0.93	20.21	13.27	42.39	194.18	194.18	28.6%	407.15	9.81
CWSMC025	7006	NO	0	27.96	9.94	113.27	304.10	0.00	0.0%	174.44	1203.86
CWSMC026	35	NEW	0	23.74	3.89	67.98	1819.86	0.00	0.0%	240.02	0
CWSMC027	3515	NO	22.05	14.03	4.05	19.61	61.30	0.00	0.0%	23.33	256.3
CWSMC028	859	NO	0	35.37	28.19	93.67	400.46	0.00	0.0%	340.56	9.28
CWSMC029	1084	NO	1.08	23.48	15.61	45.87	203.78	203.78	30.0%	312.06	9.28
CWSMC030	1976	SCHOOL	10.21	9.38	1.61	35.75	100.38	0.00	0.0%	33.65	0
CWSMC031	1428	NO	22.68	16.04	3.94	61.61	96.19	32.06	4.7%	101.22	2.11
CWSMC032	4625	PARK	0	2.59	0.32	5.11	10.17	0.00	0.0%	0	0
CWSMC033	4783	NO	0	28.88	15.72	185.46	522.24	174.08	25.6%	874.14	1263.29
CWSMC034	11	NEW	0	22.35	3.82	79.16	1841.47	0.00	0.0%	284.33	0
CWSMC035	31	NEW	0	2.51	0.14	11.69	95.44	0.00	0.0%	6.16	0
CWSMC036	1810	NO	0	40.25	18.21	327.45	554.99	185.00	27.2%	570.16	19.45
CWSMC037	2059	NO	25.5	16.3	6.34	43.64	102.77	34.26	5.0%	47.63	0
CWSMC038	7301	NEW	0	27.6	11.65	220.37	354.75	354.75	52.2%	395.87	19.27
CWSMC039	3409	NO	3.38	23.36	9.11	185.38	364.94	364.94	53.7%	189.44	460.17
CWSMC040	1108	NO	0	25.26	12.27	265.91	521.99	521.99	76.8%	401.6	657.47
CWSMC041	4162	SCHOOL	32.16	13.59	2.29	15.04	103.95	34.65	5.1%	28.71	0
CWSMC042	4434	NO	0	36.75	16.71	201.32	537.05	179.02	26.3%	1221.18	801.62
CWSMC043	4110	NO	0	2.68	0.43	11.31	21.40	0.00	0.0%	10.64	0
CWSMC044	4058	NO	0	40.27	21.57	438.25	1157.82	1157.82	170.3%	1236.83	801.62
CWSMC045	5119	NO	0	23.67	12.50	384.91	1001.89	333.96	49.1%	1318.71	819.56
CWSMC046	4340	PARK	0	40.28	22.22	576.36	1409.75	1409.75	207.3%	1600.83	2050.63



CWSMC047	3405	NO	0	43.07	51.11	541.62	1294.73	1294.73	190.4%	1774.47	2060.32
CWSMC048	3261	NO	0	25.25	7.81	116.92	258.08	86.03	12.7%	121.95	458.77
CWSMC049	2296	NO	25.88	22.27	7.81	76.92	195.59	0.00	0.0%	116.29	460.31
CWSMC050	443	NO	0	28.11	13.05	110.34	320.30	320.30	47.1%	181.1	898.74
CWSMC051	1012	NO	22.16	16.43	4.18	26.86	106.67	0.00	0.0%	28.19	260.43
CWSMC052	2781	NEW	25.35	22.17	7.77	76.63	194.53	0.00	0.0%	116.29	457.78
CWSMC053	3995	NO	22.16	20.64	6.24	81.34	178.08	59.36	8.7%	107.99	0
CWSMC054	1786	NO	0	22.32	7.58	101.81	195.37	65.12	9.6%	180.04	30.21
CWSMC055	6381	SCHOOL	0.26	5.68	2.63	28.44	52.92	52.92	7.8%	232.43	222.05
CWSMC056	3294	SCHOOL	1.84	7.18	1.68	24.77	39.15	0.00	0.0%	6.98	47.03
CWSMC057	134	NEW	0.69	3.44	0.37	26.86	152.51	0.00	0.0%	0.03	0
CWSMC058	4684	SCHOOL	0.86	18.79	6.01	53.66	162.40	162.40	23.9%	142.76	18.39
CWSMC059	3566	SCHOOL	0.69	15.07	4.86	37.47	132.24	132.24	19.4%	67.1	13.16
CWSMC060	2072	NO	0	5.98	0.82	14.30	26.05	0.00	0.0%	24.32	0
CWSMC061	2595	NO	0	31.82	17.37	112.78	376.52	125.51	18.5%	191.38	0.44
CWSMC062	593	NO	14.02	26.51	38.69	118.42	193.12	64.37	9.5%	196.51	0
CWSMC063	167	NO	32.16	18.47	14.37	57.45	250.84	0.00	0.0%	0.05	0
CWSMC064	3302	NO	0.73	15.74	9.49	32.42	166.91	166.91	24.5%	78.94	0.62
CWSMC065	736	NO	1.84	6.82	1.14	30.10	39.03	0.00	0.0%	78.84	7.36
CWSMC066	2036	NO	22.16	15.95	2.79	54.63	92.37	30.79	4.5%	137.8	38.55
CWSMC067	4142	NO	0	1.71	0.25	6.73	8.46	0.00	0.0%	20.04	0
CWSMC068	5017	SCHOOL	0.08	1.64	0.60	8.25	16.45	16.45	2.4%	72.81	0
CWSMC069	3920	SCHOOL	1.26	27.3	10.12	90.09	242.54	242.54	35.7%	60.97	0
CWSMC070	7550	NO	0	37.02	18.22	168.13	535.05	178.35	26.2%	546.3	1224.7
CWSMC071	51	NO	0	1.67	0.10	12.87	70.94	23.65	3.5%	22.79	0
CWSMC072	3324	NO	58.45	25.81	9.55	53.08	143.19	0.00	0.0%	193.48	633.54
CWSMC073	4054	SCHOOL	0	1.53	0.27	11.91	16.47	0.00	0.0%	39.15	0
CWSMC074	3901	NO	7.29	4.58	1.28	37.98	79.84	79.84	11.7%	0.22	0.36

CWID	PEAKRD_X_RANK	VOLRD_X_RANK	PCBRD_X_RANK	GRNAC_RANK	VOLMAN_RANK	VOLUSE_RANK	DEMOFF_RANK	SMCWPP_RANK	CALOPPS_RANK
CWSMC001	8	44	30	33	44	16	16	53	44
CWSMC002	40	13	19	21	22	7	7	25	9
CWSMC003	40	10	18	13	14	20	20	8	14
CWSMC004	9	42	46	32	35	31	31	54	45
CWSMC005	40	9	7	5	7	47	47	6	13
CWSMC006	40	12	10	4	6	5	5	5	12
CWSMC007	40	39	35	14	15	47	47	3	3
CWSMC008	40	15	26	11	16	23	23	24	6
CWSMC009	2	5	40	22	20	26	26	57	50
CWSMC010	40	20	25	12	17	47	47	23	5
CWSMC011	40	54	53	50	43	47	47	43	50
CWSMC012	21	59	54	47	63	45	45	49	41
CWSMC013	36	66	64	64	70	47	47	59	50
CWSMC014	6	26	32	19	27	47	47	19	31
CWSMC015	3	21	28	18	26	47	47	18	31
CWSMC016	13	27	12	30	31	29	29	47	50
CWSMC017	24	57	58	55	61	44	44	46	50
CWSMC018	39	74	73	74	68	43	43	73	43
CWSMC019	20	34	37	39	36	32	32	52	19
CWSMC020	40	28	2	20	34	47	47	22	50
CWSMC021	40	35	14	35	33	30	30	62	50
CWSMC022	7	52	57	48	58	41	41	41	30
CWSMC023	29	31	17	46	32	12	12	11	27
CWSMC024	31	43	21	52	41	14	14	14	38
CWSMC025	40	17	31	25	25	47	47	34	8
CWSMC026	40	29	51	40	2	47	47	26	50
CWSMC027	18	55	49	63	62	47	47	64	25
CWSMC028	40	8	4	29	18	47	47	17	39
CWSMC029	30	32	16	49	37	13	13	20	39
CWSMC030	22	58	61	56	54	47	47	58	50
CWSMC031	14	49	50	41	55	39	39	42	46
CWSMC032	40	68	69	73	73	47	47	73	50
CWSMC033	40	14	15	15	12	19	19	10	4
CWSMC034	40	36	52	36	1	47	47	21	50
CWSMC035	40	69	72	69	56	47	47	69	50
CWSMC036	40	4	9	7	9	15	15	12	34
CWSMC037	11	48	43	51	53	38	38	55	50
CWSMC038	40	18	27	9	23	8	8	16	35
CWSMC039	25	33	36	16	21	6	6	31	21
CWSMC040	40	24	24	8	13	4	4	15	17
CWSMC041	4	56	59	65	52	37	37	60	50
CWSMC042	40	7	13	10	10	17	17	9	14
CWSMC043	40	67	67	70	69	47	47	67	50
CWSMC044	40	3	6	3	5	3	3	7	14
CWSMC045	40	30	23	6	8	9	9	4	11
CWSMC046	40	2	5	1	3	1	1	2	2

CWSMC047	40	1	1	2	4	2	2	1	1
CWSMC048	40	25	39	24	28	27	27	37	22
CWSMC049	10	38	38	37	38	47	47	38	20
CWSMC050	40	16	22	27	24	10	10	32	10
CWSMC051	15	47	48	61	51	47	47	61	24
CWSMC052	12	40	41	38	40	47	47	38	23
CWSMC053	16	41	44	34	45	35	35	40	50
CWSMC054	40	37	42	28	39	33	33	33	33
CWSMC055	37	63	56	59	64	36	36	27	26
CWSMC056	26	60	60	62	65	47	47	68	28
CWSMC057	34	65	68	60	48	47	47	72	50
CWSMC058	32	45	45	44	47	22	22	35	36
CWSMC059	35	53	47	54	50	24	24	50	37
CWSMC060	40	62	65	66	67	47	47	63	50
CWSMC061	40	11	11	26	19	25	25	30	48
CWSMC062	19	22	3	23	42	34	34	28	50
CWSMC063	4	46	20	42	29	47	47	71	50
CWSMC064	33	51	34	57	46	21	21	44	47
CWSMC065	26	61	63	58	66	47	47	45	42
CWSMC066	16	50	55	43	57	40	40	36	29
CWSMC067	40	70	71	72	74	47	47	66	50
CWSMC068	38	72	66	71	72	46	46	48	50
CWSMC069	28	19	29	31	30	11	11	51	50
CWSMC070	40	6	8	17	11	18	18	13	7
CWSMC071	40	71	74	67	60	42	42	65	50
CWSMC072	1	23	33	45	49	47	47	29	18
CWSMC073	40	73	70	68	71	47	47	56	50
CWSMC074	23	64	62	53	59	28	28	70	49

## ATTACHMENT B: SITE ASSESSMENT ANALYSIS REPORT

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# County of San Mateo

## Advancing Regional Stormwater Capture Projects Site Assessment Analysis Report

14 January 2022

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### PRESENTED TO

**San Mateo County Office of Sustainability  
(OOS)**

455 County Center, 4<sup>th</sup> Floor  
Redwood City, CA 94063

---

### PRESENTED BY

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San Diego | Los Angeles  
Tel 805.729.0943

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**Cc:**

**City/County Association of Governments of San Mateo County (C/CAG)**

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San Mateo, CA 94402

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## ACRONYMS/ABBREVIATIONS

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Acronyms/Abbreviations	Definition
ac-ft	acre-feet
ABAG	Association of Bay Area Governments
BMP	best management practice
C/CAG	City/County Association of Governments of San Mateo County
cfs	cubic feet per second
DEM	digital elevation model
ft	feet
hr	hour
HSG	hydrologic soil group
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
PCB	polychlorinated biphenyls
POC	Pollutant of Concern
RAA	Reasonable Assurance Analysis
ROW	right-of-way
SMC	San Mateo County
SRP	Stormwater Resource Plan
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Loads

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## 1.0 BACKGROUND & CONTEXT

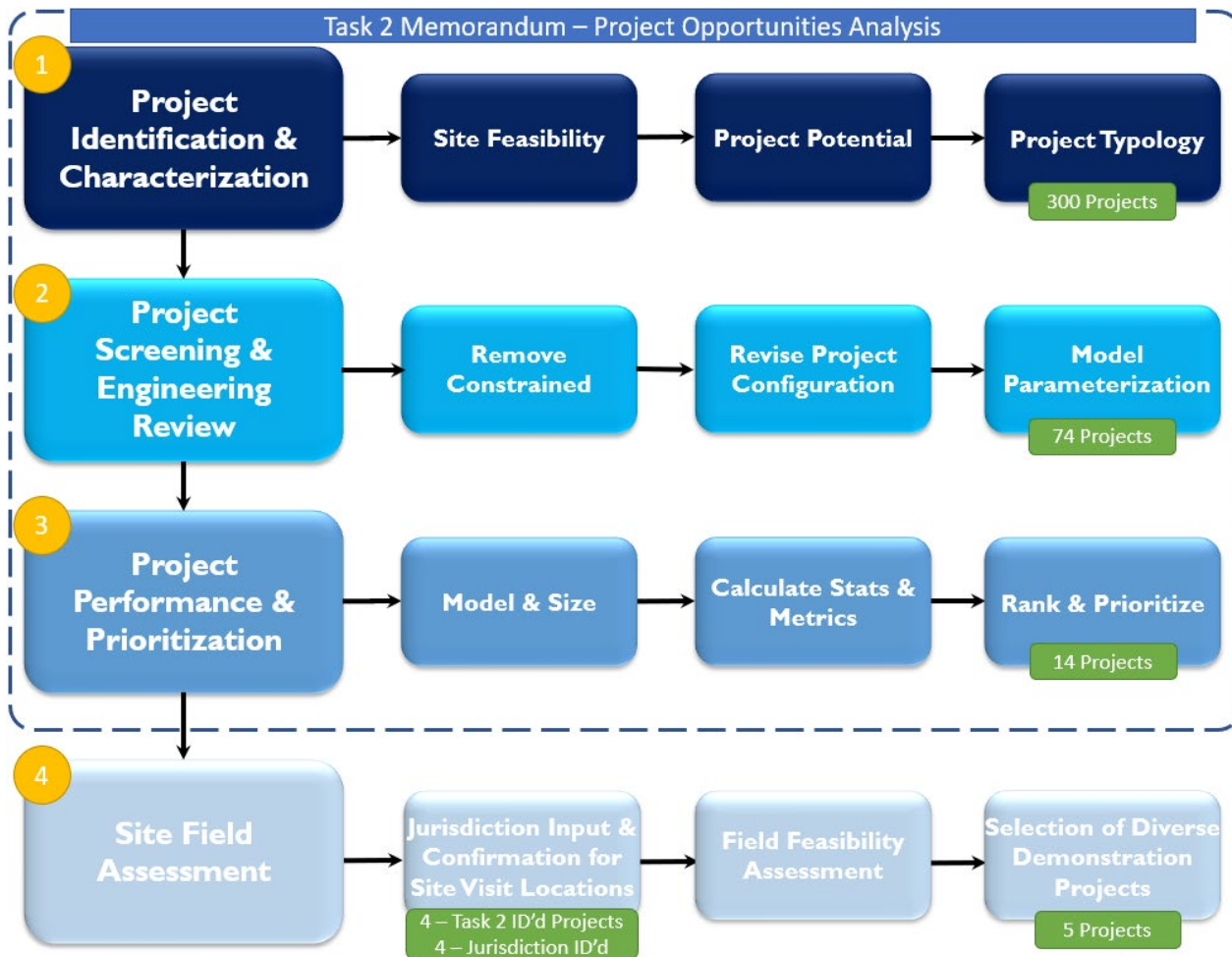
The following provides background to the Project and rationale for the need to advance high-impact, high-certainty, and diverse opportunities for regional stormwater capture across San Mateo County.

### 1.1 OVERVIEW

To address the requirements of the Municipal Regional Permit (MRP), the City/County Association of Governments of San Mateo County (C/CAG), San Mateo County Office of Sustainability, and other member agencies are collaborating to determine the most impactful and effective ways to capture stormwater and improve water quality across managed watersheds and jurisdictional boundaries. The MRP, a Regional Phase I municipal stormwater permit, issued by the San Francisco Regional Water Quality Control Board and includes compliance requirements by Permittees (including all 21 cities, towns, and the County of San Mateo, as well as OneShoreline as the County Flood Control District) to address regional TMDLs (Total Maximum Daily Loads) for mercury and PCBs (polychlorinated biphenyls) as part of the San Francisco Bay Basin Plan. To help with MRP compliance (acres greened, trash reduction, and pollutant load reduction) and to contribute towards other regional watershed management goals (climate change resiliency, flood management, green infrastructure, water supply augmentation, etc.), C/CAG has taken a progressive approach to achieve compliance with the MRP in a cost-efficient manner, while promoting multi-benefit projects with a heavy focus on leveraging collaboration and funding sources. This approach builds on several large-scale planning efforts to date with the goals of modeling watersheds, developing countywide planning strategies for different scales of green stormwater infrastructure, planning strategies, evaluating precipitation based climate change impacts, and quantifying needs to provide a sound determination of how agencies can collectively work together to develop solutions that will both meet regulatory compliance requirements and provide multi-benefit infrastructure solutions in a cost-effective manner. This is a multi-scaled and multi-stakeholder approach that advances progressive planning, policies, and technical guidance for implementing green stormwater infrastructure at the parcel, street, and regional scale. The focus of this analysis is on regional-scale stormwater capture projects and identifying opportunities/watershed areas that can support regional-scale programmatic implementation of green infrastructure at a distributed scale.

The Project Opportunities Analysis Technical Memorandum (Task 2) within the *Advancing Regional-Scale Stormwater Management in San Mateo County* project described the process, assumptions, and data used to generate a list of over 300 potential regional stormwater capture projects across the County. The candidate sites were vetted through focused engineering feasibility, spatial variability, potential project types, and multi-benefit performance metrics. Of the 74 highest performing sites, 14 were prioritized based on a holistic evaluation of the individual criteria rankings and the intent to advance concepts in a variety of watershed conditions and communities throughout the County, including the coastsides. The municipalities recommended an additional 4 project opportunities on top of the initial list of 14 sites generated during Task 2 for a total of 18 potential sites to assess during field visits. Following further evaluation and coordination with the relevant municipalities and school districts, the C/CAG Stormwater Committee and project Technical Advisory Committee agreed to narrow the field visit assessments down to 8 potential sites. The project team conducted these eight site visits for additional engineering feasibility and provided recommendation of the five opportunities for which to develop concept designs.

This technical memorandum summarizes the site assessment results and provides recommendations for consideration by the County for the top five (5) locations to be developed into concept designs. Final selection of the five (5) sites will be provided by the County of San Mateo through correspondence with the local Technical Advisory Committee. **Figure 1-1** outlines the project to the present point including Task 2 project elements that modeled, ranked, and prioritized the possible sites.



**Figure 1-1.** Regional project identification, prioritization, and site field assessment process flow chart.

## 2.0 FIELD ASSESSMENT OVERVIEW

The eight sites (Figure 2-1) selected for field assessments were chosen to advance the **highest performing opportunities across the multi-benefit performance criteria** and also to account for additional consideration of:

1. **broad geographic distribution,**
2. **sensitivity to the performance of existing planned/implemented projects, and**
3. **providing a range of best management practice (BMP) types to optimize the overall regional scale stormwater management portfolio in the County.**

Field assessment efforts focused on the general feasibility of the site for implementation of a regional stormwater capture project. The assessment looked at the slopes, available space, existing utilities, nearby vegetation, possible diversion points, and present site use. Experience with regional stormwater capture projects has shown that these are the primary features that drive the technical components of site feasibility and a site assessment level of analysis provide the necessary level of detail to advance to a conceptual design. Additional evaluation, including assessment of local support, is required for full 100% design. Full site evaluations for each of the eight sites visited are described in detail below.

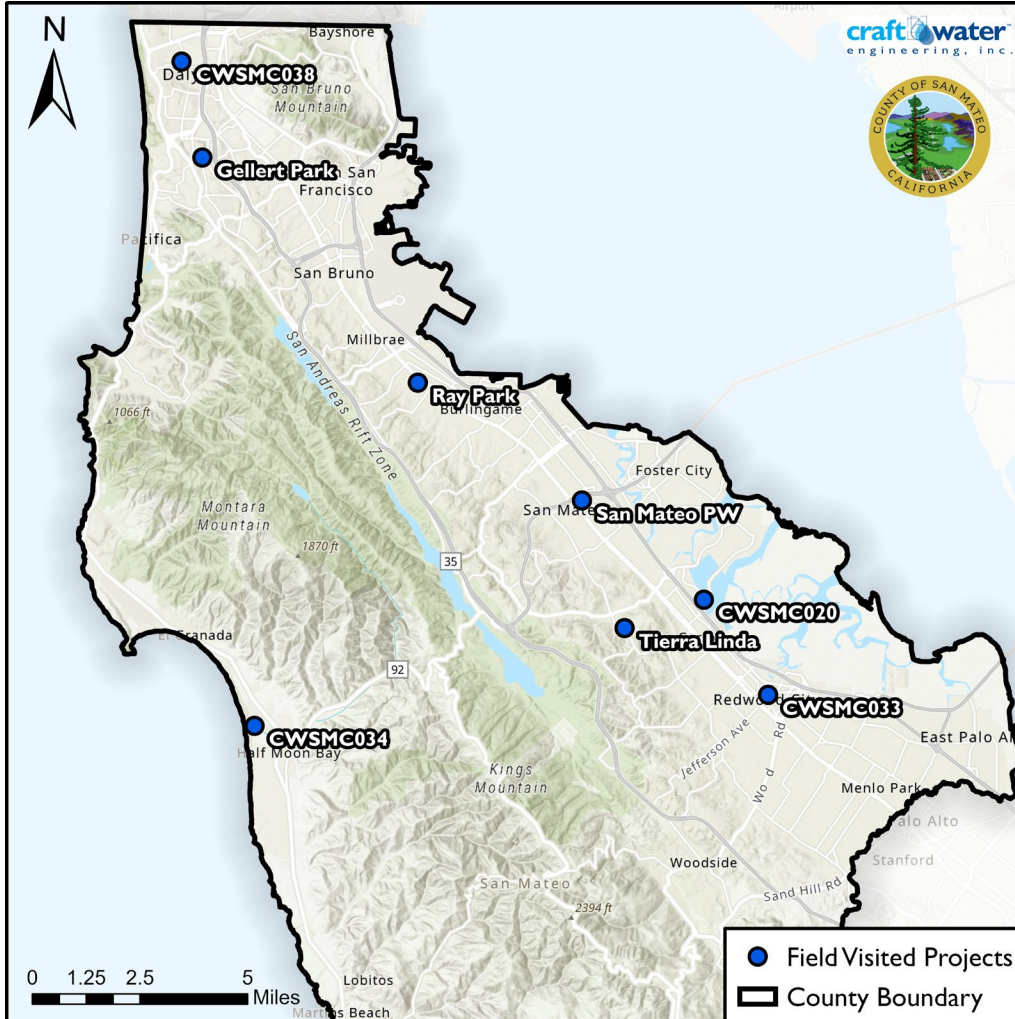


Figure 2-1. Field visited opportunities for regional BMPs in San Mateo County.

### 3.0 PROJECT OPPORTUNITIES

The following provides a summary of the field assessment performed at each potential site. The summaries are focused on the field evaluation and include only an abridged list of parameters related to potential project performance; for a complete summary of potential project statistics, please refer to the *Project Opportunities Analysis Technical Memorandum* (Task 2). Note that PCB reduction and volume managed were not yet estimated for the four sites recommended by municipalities after the completion of Task 2, but will be analyzed during conceptual design if those sites are selected to advance.

The projects are presented in the order they were visited and do not reflect the order of priority or preference.

### 3.1 HALF MOON BAY PARCEL (PROJECT ID# CWSMC034)

**Site Address:** Bev Cunha’s Country Road, Half Moon Bay

**Present Use:** Open Space/High Flow Detention

**Location:** <https://goo.gl/maps/QGSjPUwpFt7NYKmh9>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
17,808	765	3.82	1,841

**Proposed Project Description:**

The Pilarcitos Creek flows adjacent to the open space parcel controlled by the City of Half Moon Bay that presently serves as a high flow mitigation site for a historic Caltrans project. Discussions with individuals at the site indicate that the Caltrans project was constructed nearly 20 years ago and was limited in size leaving space for possible future expansions. Additional area is available to the south where the basin could be expanded to take additional flows from Pilarcitos Creek providing additional detention and water treatment prior to discharging back into the creek. The proposed project is a surface wetland/basin feature serves as a flood plain to the existing stream to maintain flows and prevent stagnation. An additional possibility exists in detaining the flows for later discharge into the existing treatment plant facility

**Site Access:**

The site is accessed from a dirt path off Bev Cunha’s Country Road. There have been historic issues of encampments within the area and signs are placed to restrict access to the location, but no physical barrier exists to block entry. Potential construction equipment would come through the Road and require a new access roadway.

Figure 3-1. Half Moon Bay Parcel Location Map



**Slopes:**

Overall, the slopes within the parcel are mild. The south end is elevated, and a berm exists on the east side of the parcel to contain flooding events (**Figure 3-2**). The low point of the parcel is the northwest corner. The present basin is in a sump condition and only overflows back to the stream during high flow events (**Figure 3-3**). The creek has a berm on the east bank which restricts entry of flows from the parcel (**Figure 3-4**).

**Ground Cover:**

The area is heavily vegetated with shrubs and grasses. Alder trees line the creek and were placed as a part of the Caltrans restoration efforts. Some invasive species have moved into the area but are actively managed by local volunteers to try to keep the area native (**Figure 3-5**).

**Utilities:**

The location did not appear to have any visible utilities within the area with no overhead lines and no ground markings, manholes, or cleanouts. Immediately to the north is the Sewer Authority Mid-Coastline wastewater treatment plant but no visible sewer lines were observed within the parcel.

**Other Constraints:**

The natural state of the parcel and the adjacency to the creek would present significant environmental permitting requirements. The site was previously used as mitigation by Caltrans and there is space available to expand upon the initial efforts of the basin, but the vegetation, wildlife, and other water quality impacts would need to be weighed and articulated through the CEQA effort.

**Recommendations:**

The project site is well suited for a regional stormwater project retrofit with ample opportunity to expand upon the existing practice and capture greater volumes of runoff. The site allows for demonstration of a surface wetland element which can be replicated for other open spaces throughout the County. Finally, the project is located on the Pacific Ocean side of the County where few opportunities for regional projects have been identified. Though not focused on providing PCBs TMDL benefits, the project would provide meaningful water quality benefits for other pollutants, like sediment, trash, and bacteria, and could provide an opportunity for diverting flow to the SAM facility during dry periods for stormwater treatment and/or to support future recycled water demand if non-potable reuse is pursued in the area.

**Select Site Photos:**



**Figure 3-2.** Eastern bank of the site looking south towards the parcel.



**Figure 3-3.** Existing overflow pond. Water from recent rain event.



**Figure 3-4.** Pilarcito Creek on the west end of the parcel.



**Figure 3-5.** Southern undeveloped portion of the basin. Area proposed for wetland expansion.



**Figure 3-6.** Creek bank and overflow channel. Diversion will need to cross trees and creek bank (on right).

### 3.2 SAN CARLOS AIRPORT PARCEL (PROJECT ID #CWSMC020)

<b>Site Address:</b>	395 Shoreway Rd, San Carlos
<b>Present Use:</b>	Open Space/Construction Staging
<b>Location:</b>	<a href="https://goo.gl/maps/z8GgnvtTRYqEaxUz9">https://goo.gl/maps/z8GgnvtTRYqEaxUz9</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
563	361	44.62	217

**Proposed Project Description:**

The site is on Unincorporated County land in San Carlos managed by the County’s San Carlos Airport. The property is encircled by various surface drainage features including an open channel on the north and east sides of the parcel. The project proposes to divert runoff from this open channel into storage features within the parcel site (Figure 3-8). The parcel is presently undeveloped but future plans have identified the area as a possible site for development and incorporation of stormwater treatment measures into that plan are the objective of the proposed project. Due to the desired future development, the proposed stormwater storage is located within the subsurface to allow for development to occur on the surface. During the site design, the storage should be located below parking or other flatwork areas and not beneath buildings or other structures.

**Site Access:**

An existing driveway is located on Shoreway Road which provided access to the whole site. The other three sides of the site are surrounded by channels or depressed open space.

Due to active construction staging, the site access is restricted but upon construction completion, the site will be looked at for future site development and access will need to be reassessed at that time.

**Slopes:**

The whole site is flat but elevated relative to the desired channel diversion. The east end of the property is supported by retaining walls to keep it flat relative to the channel. The flat nature of the site makes project implementation easy, but the elevated nature requires evaluation of a gravity versus pumping solution at the site. The groundwater table were encountered by recent deep excavation construction efforts and noted as shallow. They would likely be encountered during any subsurface storage work. Exact groundwater depths were not identified and further geotechnical investigation would be required prior to design and construction.

Figure 3-7. San Carlos Airport Location Map





**Ground Cover:**

The site is an open space and undeveloped parcel. As a construction staging area, it is unvegetated with a drivable base course presently laid. A small bioretention cell sit in the northwest portion of the lot and an additional bioretention cell is found at the far north end of the site (**Figure 3-9** and **Figure 3-10**).

**Utilities:**

Some overhead electric utilities were observed at the project site and provide power to the construction efforts. The lines will likely remain during construction and will be buried during any future site development. The far southeast portion of the site has a newly installed 12-ft diameter sewer. The invert depths are significantly deep and are located along the perimeters of the site, therefore they should not introduce any interference (**Figure 3-11**). No other utility cleanouts or manholes were observed on-site, and an evaluation of the other buried utilities would be required during further site design.

**Other Constraints:**

The property sits in a prime real estate location and provides the County Airport authorities possible profitable uses for the location. Future plans are looking to develop the site and a close coordination between this regional stormwater capture effort and possible future development would need to be closely performed. The site will be subject to FAA restrictions that will need to be considered in conjunction with the development. Incentives or other concessions with developers might be made to allow for the joint use and/or easement needs.

**Recommendations:**

As the site moves forward towards development, incorporation of a regional stormwater capture project introduces a great synergistic opportunity. The storage can be located beneath parking or open space areas providing on-site treatment and regional benefit with consideration of airport land use restrictions. While the exact location of the storage is not known at this time, identification of the target storage and diversion will provide a benchmark for the future developer.

**Select Site Photos:**



**Figure 3-8.** Channel to be diverted and treated.



**Figure 3-9.** Existing site bioretention area. Demonstration of possible implementation area.



**Figure 3-10.** Existing site bioretention area. Proposed diversion location at the north end of the parcel.



**Figure 3-11.** Present construction activities for sewer line.



**Figure 3-12.** Staging area near channel. Overhead utilities are observed.

### 3.3 REDWOOD CITY CITY HALL (PROJECT ID #CWSMC033)

<b>Site Address:</b>	1017 Middlefield Rd, Redwood City
<b>Present Use:</b>	Parking Lot
<b>Location:</b>	<a href="https://goo.gl/maps/xhS63xP66NMdWdKn6">https://goo.gl/maps/xhS63xP66NMdWdKn6</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
5,952	2,114	15.72	522

**Proposed Project Description:**

Two underground portions of the Redwood Creek storm drain meet at the parking lot immediately north of the Redwood City City Hall. The parking lot provides an opportunity to intercept the two lines and create an underground treatment facility below the existing parking lanes.

**Site Access:**

The parking lot has entrances on multiple sides with access driveways from Jefferson Ave, Main Street, and Broadway. The lot serves City Hall, the United States Postal Service branch, and multiple local downtown businesses (Figure 3-14).

**Slopes:**

The project site is flat with multiple raised medians that are protected by curbs. There were no noticeable retaining walls or other indications of significant slope changes within the parking lot vicinity (Figure 3-15).

**Ground Cover:**

The location presently serves as a parking lot. The pavement is in fair condition with no noticeable potholes or other deformities. Some vegetation is visible within the joints of the curb and pavement interface.

**Utilities:**

Various utilities were observed throughout the parking lot. There is a storm drain line that passes through the western portion of the parking lot and will serve as the desired point of diversion. Large hatches were located where the storm drain line is anticipated to be, but the hatches were unable to be opened for verification. Various electrical elements (light poles and parking meter stands) are installed throughout the parking lot. No visible indications of sewer, gas, or fiber optic lines were observed but a full utility inquiry will determine other possible lines (Figure 3-16 and Figure 3-17).

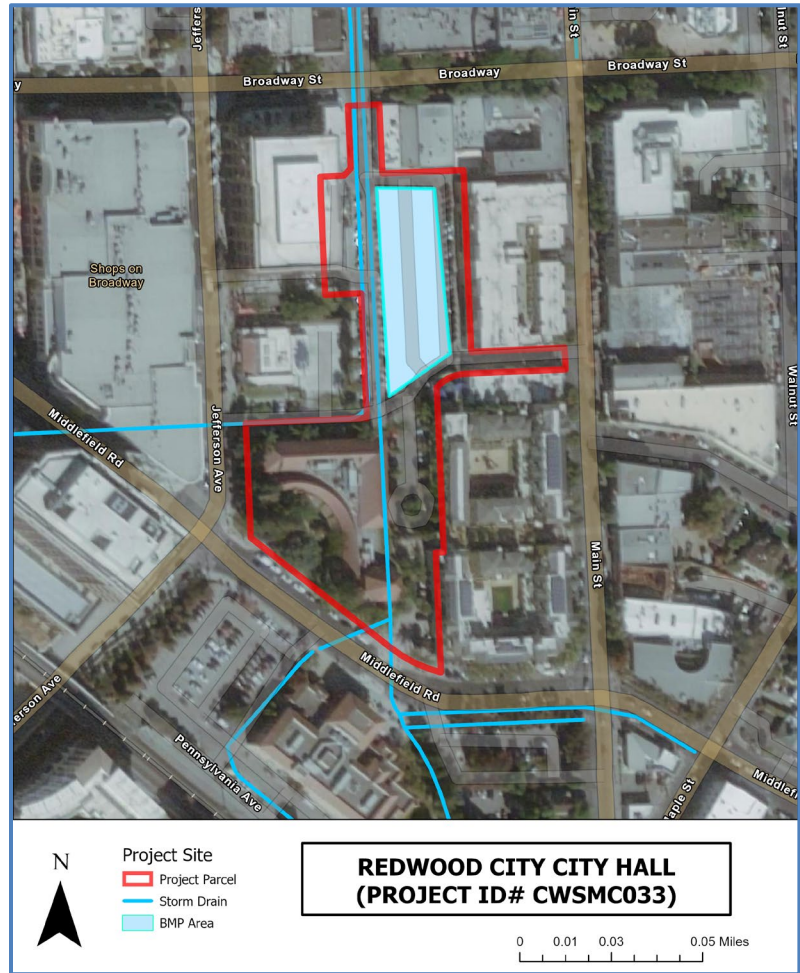
**Other Constraints:**

The location serves as a primary parking location for the Redwood City downtown district and was heavily trafficked during the visit. Many of the parking spots were occupied, including City vehicles, indicating that alternative parking locations would be needed during construction of the project.

**Recommendations:**

A good candidate site for demonstration under a parking area. Drainage area size is quite large for the space.

Figure 3-13. Redwood City Location Map



**Select Site Photos:**



**Figure 3-14.** Existing site access and storm drain merge location. Diversion within this vicinity.



**Figure 3-15.** Existing parking lot area (looking north).



**Figure 3-16.** Existing parking lot medians. Opportunity for green infrastructure on the surface.



**Figure 3-17.** Pipe alignment and assumed access hatch (looking north).

### 3.4 TIERRA LINDA MIDDLE SCHOOL & MARIPOSA UPPER ELEMENTARY SCHOOL (PROJECT ID #CWSMC075)

<b>Site Address:</b>	<b>750 Dartmouth Ave, San Carlos</b>
<b>Present Use:</b>	<b>Baseball/Softball Fields</b>
<b>Location:</b>	<a href="https://goo.gl/maps/gGHXs297GNRNYxMW6">https://goo.gl/maps/gGHXs297GNRNYxMW6</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
226	85	NA	NA

**Proposed Project Description:**

The Tierra Linda Middle School and Mariposa Upper Elementary School and surrounding neighborhood drain into a network of pipes that converge into a single line in Alameda De Las Pulgas at the southwest corner of the school property. This junction of pipes aligns with the nearby sports fields for the school providing ample space and opportunity to implement a subsurface storage structure. The runoff would be diverted from the 36-inch storm drain, stored, and then treated. While slightly smaller in overall drainage area size, the project can work in conjunction with the Alameda De Las Pulgas/San Carlos Avenue Mobility Corridor Plan and the school greening project planned at the site. This synergy of projects can provide an overall project savings while providing greater overall watershed improvements to water quality.

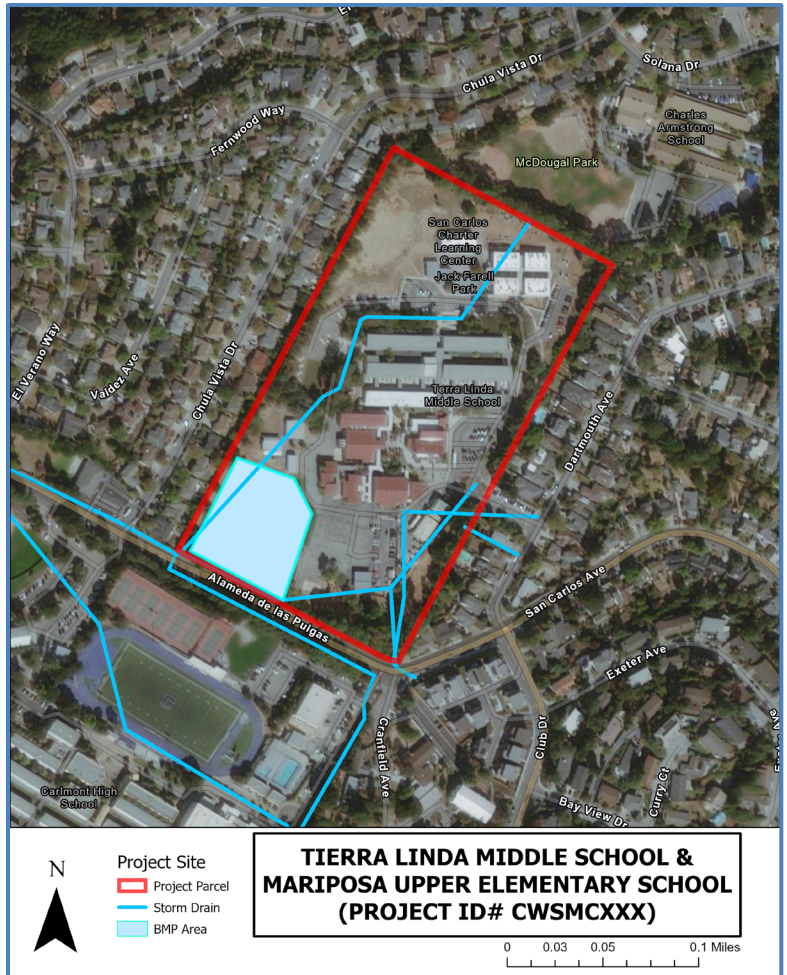
**Site Access:**

The site requires access from the campus side on Dartmouth Avenue as thick, mature trees line the school site on the south and west sides with no access driveway. There is sufficient space to place a diversion pipe and outlet pipe between the existing trees but moving equipment through the same gap could prove difficult (Figure 3-19). Close coordination with the school, their needs and schedule, and student safety will be required prior to any possible site construction.

**Slopes:**

The project site is flat with a slight slant towards the northwest corner of the field. The site is elevated relative to the Alameda De Las Pulgas surface with a slope that drops and is stabilized by mature trees. Alameda De Las Pulgas, where the diversion will be located, slopes downward as it travels west, thus possibly requiring the diversion pipe to travel counter to the grade and making it deep relative to the finished site surface (Figure 3-20 and Figure 3-21).

Figure 3-18. Tierra Linda MS Location Map



**Ground Cover:**

In the location of the proposed subsurface structure, the field is a turf grass with dirt infields. The outer edges of the parcel are mature trees with limited ground cover.

**Utilities:**

The site was only viewed from the street but the only assumed utilities within the field are irrigation lines. At the diversion location on Alameda De Las Pulgas, a fire hydrant was observed with the water main appearing to the west of the storm drain line. A sewer line appeared to be within the middle of the street while evidence of other utilities was not observed.

**Other Constraints:**

Current improvements plans are in development for the surrounding streets and the school site. Close coordination with these efforts and the school administration will be required to include the possible stormwater capture projects.

**Recommendations:**

The site is situated in a great location to treat runoff from the surrounding neighborhood. The pipe configuration requires confirmation as the alignments are currently assumed from County GIS data. The slopes and elevation difference do present a slight challenge as the diversion pipe would be required to flow counter to existing grade. The project is also located upstream of Belmont Creek which has historic flooding issues and this project could provide some peak flow reduction.

**Select Site Photos:**



**Figure 3-19.** Possible diversion alignment looking towards fields.





Figure 3-20. Diversion location and pipe confluence (looking north).



Figure 3-21. Alameda De Las Pulgas right-of-way at diversion point (looking south).

### 3.5 SAN MATEO PUBLIC WORKS DEPARTMENT PARKING LOT (PROJECT ID #CWSMC076)

**Site Address:** 1949 Pacific Blvd, San Mateo  
**Present Use:** Parking Lot  
**Location:** <https://goo.gl/maps/FnmAEbTupkn3iofX8>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
692	281	NA	NA

**Proposed Project Description:**

A trapezoidal channel that runs parallel to the City of San Mateo Public Works Department parking lot before discharge to Borel Creek (Figure 3-24). The project will target this channel for treatment by diverting flows to a subsurface structure to treat runoff. Upon installation of the subsurface storage, the surface would be restored back to a parking lot to maintain the existing site use (Figure 3-23).

**Site Access:**

Multiple driveways from Pacific Boulevard provide access to the parking lot. No gate or other restriction to the proposed project site presently exists. There are a couple of trees along the west end of the parking lot but these can easily be avoided and protected in place. The buildings on the east side of the parking lot will require protection from construction work but the buildings appear to have access from the side opposite of the parking lot (Figure 3-25 and Figure 3-27).

**Slopes:**

The proposed project site is flat with minor slopes aimed towards the center of the parking lot drive aisles and the entrance driveway. There appear to be low spots where water presently ponds during rain events in the middle of the west travel lane between the parked vehicles.

**Ground Cover:**

The site presently serves as a parking lot for the City Public Works facility. The pavement is in fair to poor condition as low points of water accumulation appear to exist thus degrading the pavement in select sections (Figure 3-26). The on-site drainage is in need of correction to encourage positive flow towards to existing drainage infrastructure. The proposed project intends to maintain the parking lot use but refresh the pavement condition and on-site drainage.

Figure 3-22. San Mateo Public Works Location Map to the Caltrain



**Utilities:**

Various utilities exist between the point of diversion and the parking lot. Underground water and sewer lines were observed in Pacific Boulevard in addition to overhead electrical lines. A telecommunication line was being repaired by local crews and appears to run along the eastern edge of the right-of-way. Care will need to be taken when crossing each of these utilities. The exact invert depths will need to be determined during the design phase of the proposed project.

**Other Constraints:**

The project will require coordination with the City of San Mateo to ensure minimal impacts to the Public Works operations and coordination with Caltrain as the channel appears to be contained within their right-of-way. The project can be phased to ensure that a portion of the parking lot remains operational during construction. The lot was nearly full during the field observation and each of these vehicles would require alternative parking locations during construction.

**Recommendations:**

The project provides an opportunity to demonstrate a subsurface regional practice below an active parking lot. The coordination with Caltrain will be a little cumbersome but not insurmountable and can provide benefit to all parties. The project is recommended as the impacts to nearby facilities that depend upon the parking lot are limited to the City facilities and phasing can ensure continued use.

**Select Site Photos:**



**Figure 3-23.** Existing parking lot and proposed storage location (looking south).



Figure 3-24. Trapezoidal channel to be diverted to storage.



Figure 3-25. Parking lot access point and possible diversion alignment (looking north).



**Figure 3-26.** Pavement condition of parking lot and drainage pathway.



**Figure 3-27.** Access and diversion alignment looking towards channel and Caltrain tracks.

### 3.6 RAY PARK (PROJECT ID #CWSMC077)

<b>Site Address:</b>	<b>1525 Balboa Way, Burlingame</b>
<b>Present Use:</b>	<b>Baseball/Softball Fields</b>
<b>Location:</b>	<a href="https://goo.gl/maps/TxLkHcCC93csxCgv6">https://goo.gl/maps/TxLkHcCC93csxCgv6</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
596	301	NA	NA

**Proposed Project Description:**

The open channel goes underground at the border of the park and crosses through the south end of the park property (Figure 3-29). The diversion is proposed along the underground portion of the drain within the tree clearing of the park that then travels down the sidewalk that lines the basketball court and eventually into the underground reservoir within the sports fields. There is ample space within the play fields to construct the underground storage and treatment. An additional alternative can be explored to pull flows from the drain that travels down Balboa Way but the drainage area is minimal relative to the channel drainage area. An evaluation of the costs relative to the benefit will need to be performed to weigh the options.

**Site Access:**

Driveway access is provided from Balboa Way into both the parking lot and the asphalt driveway into the proposed diversion location. The existing fences surrounding the fields would require temporary removal for access of equipment. There are existing curbs that are installed towards the north end of the lot and access from the south end of the lot will be preferred. Access to the diversion area may be possible through Cortez Avenue with the removal of the fence but the space is very limited between an existing tree and the channel headwall.

**Slopes:**

The whole project site is flat with limited slopes. The headwall indicates that the channel is several feet below ground but the slope of the channel is assumed to be minimal as the site has limited relief.

**Ground Cover:**

The site serves as a baseball/softball field with natural turf grasses and a dirt infield (Figure 3-32 and Figure 3-33). The proposed diversion is within a mulched area surrounded by trees. There is a small clearing in the trees at the diversion location and the trees should be able to be protected in place during construction activities. The trees are primarily eucalyptus trees, and the project can coordinate with the City on any desire to remove them (Figure 3-30 and Figure 3-31).

Figure 3-28. Ray Park Location Map



**Utilities:**

Within the project vicinity, a possible water line was observed but the specific orientation of the line will need to be confirmed. The field is anticipated to contain irrigation lines that will require replacement upon project completion. No field lights were observed and electrical is anticipated to be minor. A restroom is located along the proposed diversion line and the sewer lateral is assumed to be in the vicinity, but as-built plans will be required to identify the sewer configuration.

**Other Constraints:**

Access to the site and the diversion location while allowing for portions of the park, specifically the play structures, to remain operational will be a challenge. The play structures are located on the south side of the access road and culvert while the remaining portions of the park are to the north. The play structures had a significant gathering of children and parents and appears to be a popular spot within the community. The surrounding streets are not very wide and getting construction equipment and hauling trucks within the area will require careful route planning to minimize traffic disruptions. The site abuts Lincoln Elementary School which will have significant pedestrian and vehicular traffic during the school year. Construction activities should account for the school schedule and aim to minimize the impacts on school operations.

**Recommendations:**

The project is a good opportunity for incorporation of a regional stormwater capture project in a park environment. Diversion from the underground culvert would be easier than from a natural channel and would have lower environmental impacts. While the park is a popular gathering place for families, care in staging can be taken to allow for continued use during construction activities. The site treats a significant developed drainage area.

**Select Site Photos:**



**Figure 3-29.** Channel upstream of headwall to culvert.



**Figure 3-30.** Diversion location looking along pipe alignment to the east. Note the crowd at the play structure.



**Figure 3-31.** Possible diversion alignment (looking south).





**Figure 3-32.** Proposed storage location and existing field conditions (looking north).



**Figure 3-33.** Proposed storage location and existing field conditions (looking west).

### 3.7 GELLERT PARK (PROJECT ID #CWSMC078)

<b>Site Address:</b>	<b>40 Wembley Dr, Daly City</b>
<b>Present Use:</b>	<b>Parking Lot/Sports Fields</b>
<b>Locations:</b>	<a href="https://goo.gl/maps/buFVXa3h3SVrTeAV8">https://goo.gl/maps/buFVXa3h3SVrTeAV8</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
87	48	NA	NA

**Proposed Project Description:**

There are two 30-inch storm drains within the park vicinity that are targeted as a part of this proposed regional facility. The first line travels from west to east down Hickey Boulevard where it would be diverted into a facility beneath the open field turf grass. The second line travels from west to east down Wembley Drive and would be diverted to a separate storage facility underneath the parking lot. Due to the distance between the two lines, the creation of a combined system would prove difficult and cost prohibitive. The project site is a prior GI pilot project funded by C/CAG demonstrating rain gardens and pervious paving.

**Site Access:**

The park is only accessible from the parking lot on Wembley Drive (Figure 3-35). The slopes and trees on the remaining sides make access very difficult from any alternative location. To gain access to the fields, equipment must navigate between the play structure and the racquetball courts.

**Slopes:**

The area surrounding the park contains significant slopes specifically in the locations of the possible diversion points. Both Hickey Boulevard (to the north) and Wembley Drive (to the south) have elevations that start above the park surface elevation and as it travels east ends at an elevation below the park surface. The project site itself is flat with the only slopes being around the edges of the park (Figure 3-36, Figure 3-37, and Figure 3-38).

**Ground Cover:**

The project will require two facilities with the first facility located within the natural turf grass area that serves as the outfield grass to the sports fields (Figure 3-39). There are multiple mature trees lining the north end where the diversion would be sited. The second location is within the existing parking lot. The pavement appears to be in a good to fair condition with good drainage.

Figure 3-34. Gellert Park Location Map



**Utilities:**

At the Hickey location, a water line was observed but no other visible utilities were seen. A full utility investigation would be required to confirm the lines that would be crossed as the diversion is directed to the park. The field contains lighting and irrigation which would require replacement. At the Wembley drain, electrical and telecommunication junction boxes were observed but the specific layout of the lines is unknown. While no water or sewer lines were visible, given the residential nature of the street and the lack of alley ways, these utilities are assumed to be within the street (a fire hydrant was observed).

**Other Constraints:**

The park was observed to be heavily used by the local community. The parking lot contains electronic vehicle charging stations which will need to be considered during construction of the facility under the parking area.

**Recommendations:**

The project presents some significant challenges and site constraints. Based on the significant slopes, requirement for two separate facilities, location within the watershed and the limited drainage areas, the project is not recommended to move forward for concept design at this time.

**Select Site Photos:**



**Figure 3-35.** Proposed storage location from diversion point on Dewey



**Figure 3-36.** Proposed diversion point on Dewey. Note the steep slopes.



**Figure 3-37.** Proposed diversion point on Hickey



**Figure 3-38.** Slopes and trees on the north end near Hickey.



**Figure 3-39.** Proposed storage location near Hickey.

### 3.8 BENJAMIN FRANKLIN INTERMEDIATE SCHOOL (PROJECT ID #CWSMC038)

<b>Site Address:</b>	700 Stewart Ave, Daly City
<b>Present Use:</b>	Sports Fields
<b>Location:</b>	<a href="https://goo.gl/maps/hRnbDwbWP7t1LPyG8">https://goo.gl/maps/hRnbDwbWP7t1LPyG8</a>

Total Drainage Area (acres)	Impervious Drainage Area (acres)	PCB Reduction (g/yr)	Volume Managed (ac-ft/yr)
759	472	11.65	355

**Proposed Project Description:**

The Benjamin Franklin Intermediate School experiences localized flooding near S Park Plaza Drive during significant rain events as a low point within the area. A pump station currently exists within the southwest corner of the property to lift flows from the sump conditions in the area. The proposed project will divert flows from the 60-inch storm drain that crosses the northeast corner of the play field to create a detention and treatment facility and minimize the localized flooding experienced on site. The storage reservoir will be located beneath the existing sports fields to allow for continued use of the field by the school. The project can serve as an infiltration project as it presently overlays an active groundwater basin managed by Cal Water. Due to the location within a school property, close coordination with the school district and their associated construction requirements would need to be followed. There is Caltrans right-of-way within the drainage area presenting the opportunity for additional project partners.

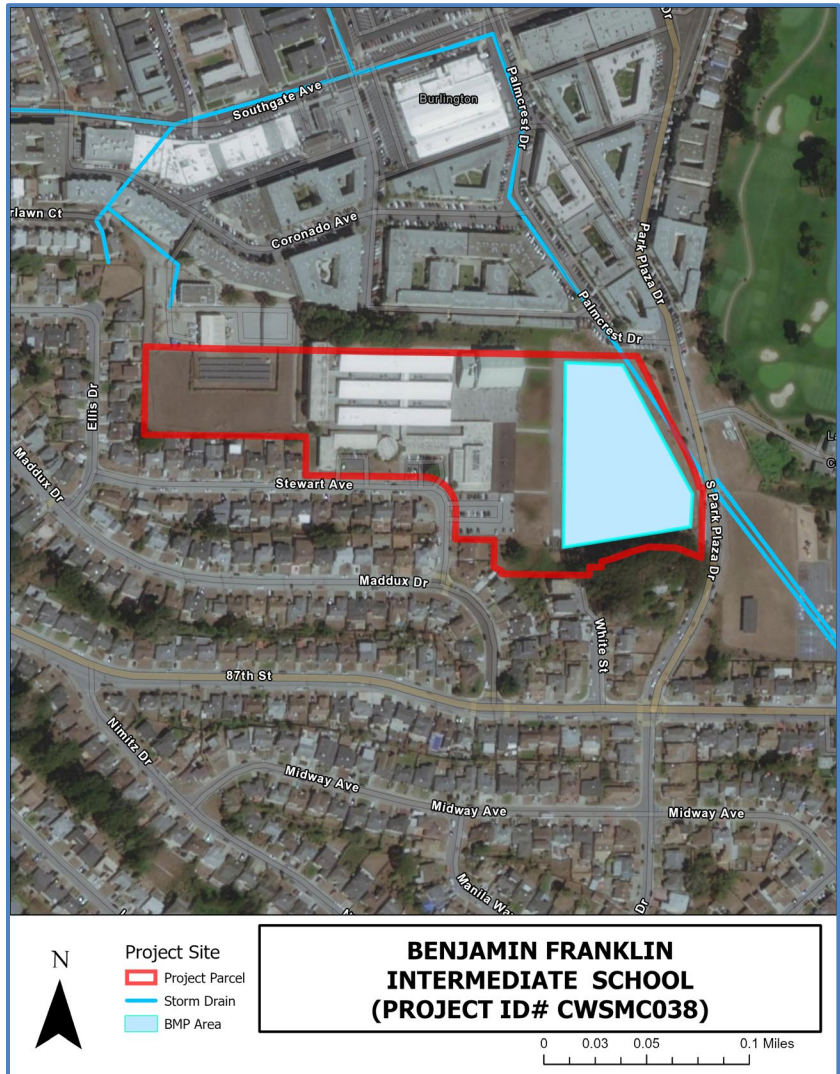
**Site Access:**

The site is accessed through a gate at the southeast corner of the field (Figure 3-41). The remaining sides of the field are surrounded by slopes and a fence placing the field in a bowl condition and the low point within the area. The driveway provides access to the existing pump station and the field for maintenance activities (Figure 3-42).

**Slopes:**

The project site is located within a depressed bowl with elevated slopes on all sides. The slopes on the west, north, and south are steep while the slope on the east is the mildest. The project location itself is flat and serves as the sports field for the school (Figure 3-43 and Figure 3-44).

Figure 3-40. Benjamin Franklin IS Location Map



**Ground Cover:**

The sport field is covered with a turf grass with a dirt walking path surrounding the outside edges and an asphalt strip on the west side for track activities. The south end of the site is protected by trees while the remaining edges are limited in vegetation with some simple grasses and weeds (Figure 3-45).

**Utilities:**

Because the storm drain passes through the sports field, there are minimal utilities anticipated to be encountered. There are water lines and irrigation located throughout the field that will require careful planning. No other utilities are anticipated to be within the project vicinity, however a thorough utility investigation will be required during design development. Coordination with Cal Water and their on-site pump station would be required to investigate the infiltration potential to recharge the aquifer.

**Other Constraints:**

The project is a low point and experiences localized flooding creating a possible necessity to increase the storage size to accommodate larger events. The area should have available space to increase the size, but a careful analysis of the desired protection should be performed. The project is overlapping with the drainage to the Vista Grande Canal project, which treats the watershed for trash, but does not provide pollutant removal or water supply benefits. Additionally, the project will be subject to state construction requirements set forth by the Division of State Architect that all school projects are required to follow. The coordination between the County, school district, state, Cal Water, and C/CAG would be significant at this location.

**Recommendations:**

The site sits in a prime position to capture stormwater to improve water quality and reduce the localized flooding. The field appears to need some refurbishment and the school is willing to collaborate on the project. Because the site is a school, state construction standards would be required to be followed adding another layer of review and collaboration. The flooding within the area drives the recommendation of pursuing this project.

**Select Site Photos:**



**Figure 3-41.** Proposed access point to the proposed storage location.



**Figure 3-42.** Access driveway and the existing pump station.



**Figure 3-43.** Proposed storage location from diversion point.





**Figure 3-44.** Proposed storage location showing surrounding slope conditions.



**Figure 3-45.** Proposed storage location from estimated pipe alignment.

## 4.0 FINAL RECOMMENDATIONS

Findings of the site visits suggest that all project sites may be feasible and high-impact opportunities for regional stormwater projects, although some present more challenges than others. A brief summary table of the sites with some of the key project differentiators are highlighted in **Table 4-1** and **Table 4-2**, along with recommendations for conceptual design based on the criteria outlined in **Section 2.0**. These tables are intended to help the County of San Mateo select the five projects to be further developed into a concept design.

Table 4-1. Summary of field assessment and project potential.

Project Site Name	Jurisdiction	Project Type	Drainage Area (acres)	Impervious Drainage Area (acres)	High PCB Removal	High Trash Removal	Potential Greened Acres	Flood Control	Partnership Opportunities	Recommend for Concept
Half Moon Bay Parcel	Half Moon Bay	Wetland	17,808	765			279	✓		✓
San Carlos Airport Parcel	San Mateo County	Wetland OR Vault	563	361	✓ (44.62g/yr)	✓	262	✓	✓ (Developer)	✓
Redwood City City Hall	Redwood City	Vault	5,952	2,114	✓ (15.72g/yr)	✓	499			
Tierra Linda Middle Sch. & Mariposa Upper Elem. Sch.	San Carlos	Vault	226	85	NA*	NA*	NA*		✓ (School)	
San Mateo Public Works Parking Lot	City of San Mateo	Vault	692	281	NA*	NA*	NA*			✓
Ray Park	Burlingame	Vault	596	301	NA*	NA*	NA*			✓
Gellert Park	Daly City	Vault	87	48	NA*	NA*	NA*			
Benjamin Franklin Intermediate Sch.	San Mateo County	Vault	759	472	✓ (11.65g/yr)	✓	303	✓	✓ (School)	✓

\*Sites provided by the jurisdictions following completion of Task 2 were not included in regional modeling. Values will be calculated for those recommended for concept design.

Table 4-2. Summary of field assessment notes.

Project Site Name	Additional Site Notes	Recommend for Concept
<b>Half Moon Bay Parcel</b>	1) Drains to Pacific (only project ID'd) 2) Surface wetland system 3) Existing capture system with expansion possibility	✓
<b>San Carlos Airport Parcel</b>	1) Regional BMP can be incorporated into future development plans 2) Can be surface and/or subsurface, depending on development 3) High PCB removal potential	✓
<b>Redwood City City Hall</b>	1) Downstream of the Red Morton Park project 2) Busy parking lot in downtown 3) Significant drainage area size. Only small treatment possible 4) Better parking lot demonstration opportunity at San Mateo County Public Works with a lower construction impact. 5) Good possible future site	
<b>Tierra Linda Middle Sch. &amp; Mariposa Upper Elem. Sch.</b>	1) School opportunity with possible collaboration 2) Slopes will be challenging as the street drops below the site. Pipe will have to direct counter slope 3) Better school demonstration collaboration and impacts at Benjamin Franklin Intermediate School	
<b>San Mateo Public Works Parking Lot</b>	1) Active parking lot demonstration potential 2) Possible coordination with Caltrain for the diversion system 3) Ideas have been previously generated at the site and recommended by the City 4) Pavement in need of refreshing and appears to have drainage issues	✓
<b>Ray Park</b>	1) Initial screening thought it was a natural channel. Site investigation confirmed it is a box culvert. 2) Good demonstration for active park installation and refreshing of turf fields 3) Significant drainage area and treatment potential 4) Recommended by the City	✓
<b>Gellert Park</b>	1) Significant slopes around the project area and limited drainage areas 2) Will require two diversions to make it worth it and then the site expense will require two separate tanks 3) Better park opportunities exist at Ray Park	
<b>Benjamin Franklin Intermediate Sch.</b>	1) Active flooding issues known at the site. Observed to be a low point in the system 2) Field is in need of refurbishment 3) Good partnership opportunity with schools. Will introduce some additional review and collaboration but doable 4) Opportunity at the north end of the County	✓

## ATTACHMENT C: PROJECT OPPORTUNITY DATABASE (UPDATED)

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CATEGORY	ATTRIBUTE	DESCRIPTION and NOTES	UNITS
Project Baseline	<b>CWID</b>	Craftwater Project ID	na
	<b>FULLDA_AC</b>	Full Upstream Drainage Area to project diversion point	acres
	<b>IMPDA_AC</b>	Impervious Area in project drainage area	acres
	<b>IMPDA_PCT</b>	Percentage of drainage area impervious	percentage
	<b>BASE_RUN_af</b>	Baseline Runoff to project diversion point	ac-ft/yr
	<b>BASE_PCB_g</b>	Baseline PCBs to project diversion point	g/yr
	<b>10YR_PEAK_cfs</b>	Peak Flowrate for 10 Year, 24 Hour storm event to project diversion point	cfs
	<b>10YR_VOL_af</b>	Runoff Volume for 10 Year, 24 Hour storm event to project diversion point	ac-ft/yr
Project Attributes	<b>DIV_CFS</b>	Preliminary Project Diversion Rate	cfs
	<b>STOR_ACFT</b>	Preliminary Project Storage Volume	ac-ft/yr
	<b>BMPTYPE</b>	Type of BMP	na
	<b>TREATMENT</b>	Type of BMP treatment recommended	na
	<b>PLANCOST</b>	Planning Level Cost Estimate	\$ dollars
Community Benefits	<b>WLKBL_POP</b>	Estimated 2010 population within 1/2 mile walkable radius to project	people
	<b>PARKS_REC</b>	Designates project is on Park or School parcel; "NEW" indicates undeveloped parcel with potential to convert to Park; "NO" indicates limited community benefit from site	na
Flood Management	<b>PEAK_RDX</b>	Reduction in peak flow for 10 Year, 24 Hour storm event	cfs
	<b>VOL_RDX</b>	Volume captured for 10 Year, 24 Hour storm event	ac-ft/yr
Water Quality Benefit	<b>PCB_RDX</b>	Average annual reduction in PCBs for the drainage area	g/yr
	<b>GREEN_ACRES</b>	Proxy of impervious area "treated" from drainage area by the project	acres
	<b>VOL_MAN</b>	Average annual runoff volume captured by project for treatment	ac-ft/yr
Water Supply	<b>VOL_USE</b>	Average annual water volume utilized/supplied; assumed full for infiltration, 33% for sewer discharge, and 0 for other options which return water to drains	ac-ft/yr
	<b>DEM_OFFSET</b>	Demand of regional offset; based on 680 ac-ft/yr demand for stormwater harvesting via other capture initiatives	percentage
Trash Capture	<b>SMCWPP_TRASH</b>	Aggregate area of Medium/High/Very High trash generation areas in project drainage area from the SMCWPP Trash Generation designations	acres
	<b>CALOPPS_TRASH</b>	Aggregate of drainage covered by potential CALTRANS trash capture opportunities	acres

CWID	DA_AC	IMPDA_AC	IMPDA_PCT	BASE_RUN_af	BASE_PCB_g	10YR_PEAK_cfs	10YR_VOL_af	DIV_CFS	STOR_ACFT	BMPTYPE	TREATMENT	PLANCOST
CWSMC001	322.23	144.35	44.80%	212.02	10.64	94	35.77	50	6.2	Subsurface Vault	Infiltration	\$8,900,000
CWSMC002	1154.17	436.74	37.84%	519.46	19.36	307	99.78	80	16.5	Subsurface Vault	Infiltration	\$21,400,000
CWSMC003	4578.7	1717.13	37.50%	1327.71	28.40	543	163.16	80	18	Subsurface Vault	Filtration/Sewer	\$23,200,000
CWSMC004	423.97	164.57	38.82%	255.99	5.60	110	37.16	50	6.6	Subsurface Vault	Filtration/Sewer	\$9,300,000
CWSMC005	4682.47	1784.88	38.12%	2824.00	61.80	1209	409.94	80	20	Wetland/Detention	Wetland/Filtration	\$25,600,000
CWSMC006	5111.42	1952.77	38.20%	3084.05	67.49	1320	447.69	70	17.5	Subsurface Vault	Filtration/Sewer	\$22,500,000
CWSMC007	6711.06	2728.64	40.66%	3708.36	103.77	2353	707.27	50	8	Wetland/Detention	Wetland/Filtration	\$4,300,000
CWSMC008	1449.81	677.78	46.75%	801.50	22.43	508	152.86	70	14	Subsurface Vault	Filtration/Sewer	\$18,300,000
CWSMC009	1589.68	553.23	34.80%	528.66	9.70	321	119.26	60	23.5	Subsurface Vault	Filtration/Sewer	\$31,600,000
CWSMC010	1452.26	679.49	46.79%	802.26	22.45	509	153.01	80	13	Wetland/Detention	Wetland/Filtration	\$6,500,000
CWSMC011	1723.04	408.43	23.70%	605.37	15.01	242	78.51	20	0.7	Modular Wetland	Filtration	\$1,700,000
CWSMC012	89.44	79.29	88.65%	59.63	2.99	26	10.06	30	2.3	Subsurface Vault	Filtration/Sewer	\$4,100,000
CWSMC013	32.4	27.51	84.91%	19.88	1.00	9	3.35	20	0.7	Modular Wetland	Filtration	\$1,700,000
CWSMC014	703.52	376.3	53.49%	342.04	11.26	161	65.64	80	11.5	Wetland/Detention	Wetland/Filtration	\$5,800,000
CWSMC015	787.92	411.79	52.26%	383.47	12.62	181	73.59	80	13.2	Wetland/Detention	Wetland/Filtration	\$6,500,000
CWSMC016	475.37	189.83	39.93%	284.89	19.13	176	54.72	60	10.6	Subsurface Vault	Filtration/Sewer	\$14,200,000
CWSMC017	177.72	101	56.83%	70.60	2.62	59	17.52	20	1.6	Subsurface Vault	Filtration/Sewer	\$3,200,000
CWSMC018	159.46	30.92	19.39%	137.51	1.40	17	7.60	20	0.6	Subsurface Vault	Infiltration	\$1,000,000
CWSMC019	584.89	204.44	34.95%	253.04	9.82	165	56.47	80	9.6	Subsurface Vault	Filtration/Sewer	\$13,100,000
CWSMC020	563.08	360.92	64.10%	299.17	56.15	254	89.58	70	10.6	Wetland/Detention	Wetland/Filtration	\$5,400,000
CWSMC021	776.05	283.42	36.52%	322.16	20.15	185	60.00	60	9	Subsurface Vault	Filtration/Sewer	\$12,300,000
CWSMC022	245.05	137.71	56.20%	90.33	2.62	49	18.26	40	4.8	Subsurface Vault	Filtration/Sewer	\$7,100,000
CWSMC023	4506.59	1054.12	23.39%	1060.00	68.69	796	301.62	70	21.5	Subsurface Vault	Infiltration	\$26,300,000
CWSMC024	3838.55	838.01	21.83%	902.81	58.50	678	256.89	60	18.5	Subsurface Vault	Infiltration	\$22,700,000
CWSMC025	1278.46	476.2	37.25%	474.23	13.76	258	95.86	50	14.2	Wetland/Detention	Wetland/Filtration	\$7,000,000
CWSMC026	17352.11	648.21	3.74%	4918.27	7.53	269	112.73	50	9.4	Wetland/Detention	Wetland/Filtration	\$4,900,000
CWSMC027	267.6	85.58	31.98%	69.35	4.48	67	19.20	40	3.2	Subsurface Vault	Filtration	\$5,200,000
CWSMC028	2979.77	697.01	23.39%	701.29	45.44	527	199.55	60	21.5	Subsurface Vault	Filtration	\$27,300,000
CWSMC029	2891.96	650.96	22.51%	679.80	44.05	511	193.43	60	21.5	Subsurface Vault	Infiltration	\$26,300,000
CWSMC030	242.87	86.5	35.62%	101.17	1.63	18	9.38	20	4.2	Subsurface Vault	Filtration	\$6,300,000
CWSMC031	246.14	157.65	64.05%	106.36	4.13	69	23.73	40	3.7	Subsurface Vault	Filtration/Sewer	\$5,800,000
CWSMC032	34.71	17.42	50.19%	10.21	0.32	8	2.85	20	0.4	Bioretention	Filtration	\$1,300,000
CWSMC033	5951.65	2113.52	35.51%	2210.23	64.14	1201	446.79	60	14.6	Subsurface Vault	Filtration/Sewer	\$19,000,000
CWSMC034	17807.65	765.47	4.30%	5048.39	7.73	276	115.71	50	8	Wetland/Detention	Wetland/Filtration	\$4,300,000
CWSMC035	393.51	48.2	12.25%	109.29	0.17	6	2.51	20	0.7	Wetland/Detention	Wetland/Filtration	\$1,200,000
CWSMC036	1463.63	863.55	59.00%	1064.78	31.04	624	184.50	90	26	Subsurface Vault	Filtration/Sewer	\$32,800,000
CWSMC037	193.54	82.18	42.46%	114.70	6.62	77	23.10	40	4	Subsurface Vault	Filtration/Sewer	\$6,200,000
CWSMC038	759.12	471.56	62.12%	551.43	16.07	323	95.55	70	13.5	Subsurface Vault	Infiltration	\$17,700,000
CWSMC039	481.19	244.43	50.80%	421.40	10.22	181	56.49	50	9.2	Subsurface Vault	Infiltration	\$12,500,000
CWSMC040	764.24	389.32	50.94%	668.70	16.21	287	89.65	60	11	Subsurface Vault	Infiltration	\$14,700,000
CWSMC041	397.55	57.51	14.47%	115.38	2.47	47	14.18	40	13	Subsurface Vault	Filtration/Sewer	\$17,000,000
CWSMC042	4576.48	1715.52	37.49%	1327.03	28.39	542	163.08	90	22.5	Subsurface Vault	Filtration/Sewer	\$28,600,000
CWSMC043	29.57	15.63	52.86%	21.52	0.43	8	2.77	20	0.6	Modular Wetland	Filtration	\$1,600,000
CWSMC044	4639.95	1756.28	37.85%	2799.62	61.26	1198	406.40	90	26	Subsurface Vault	Infiltration	\$32,800,000
CWSMC045	5145	1976.6	38.42%	3104.36	67.93	1329	450.64	50	9.4	Subsurface Vault	Filtration/Sewer	\$12,700,000
CWSMC046	6802.07	2780.93	40.88%	4103.94	89.81	1756	595.74	90	26	Subsurface Vault	Infiltration	\$32,800,000
CWSMC047	7177.41	3002.5	41.83%	4757.10	238.76	2112	802.69	80	28.8	Subsurface Vault	Infiltration	\$36,100,000
CWSMC048	610.99	276.8	45.30%	337.95	9.46	214	64.46	60	11	Subsurface Vault	Filtration/Sewer	\$14,700,000

CWSMC049	532.94	209.58	39.33%	239.34	8.92	141	45.98	40	8.5	Wetland/Detention	Wetland/Filtration	\$4,500,000
CWSMC050	991.53	341.56	34.45%	445.81	16.62	263	85.64	60	14.2	Subsurface Vault	Infiltration	\$18,500,000
CWSMC051	263.56	66.36	25.18%	118.36	4.41	70	22.74	30	4.4	Wetland/Detention	Wetland/Filtration	\$2,700,000
CWSMC052	530.41	208.95	39.39%	238.03	8.87	141	45.72	40	8.4	Wetland/Detention	Wetland/Filtration	\$4,500,000
CWSMC053	434.64	198.53	45.68%	211.57	6.96	100	40.60	30	7.2	Subsurface Vault	Filtration/Sewer	\$9,900,000
CWSMC054	520.32	271.16	52.11%	248.22	9.07	211	62.42	50	8.4	Subsurface Vault	Filtration/Sewer	\$11,500,000
CWSMC055	344.6	185.19	53.74%	136.73	5.07	115	33.94	30	5.2	Subsurface Vault	Infiltration	\$6,500,000
CWSMC056	73.01	46.2	63.28%	40.37	1.72	25	9.20	20	0.8	Modular Wetland	Filtration	\$1,800,000
CWSMC057	298.4	52.55	17.61%	158.14	0.45	9	3.44	50	16.5	Wetland/Detention	Wetland/Filtration	\$8,000,000
CWSMC058	1676.15	553.83	33.04%	493.64	15.43	382	137.63	60	17.2	Subsurface Vault	Infiltration	\$21,100,000
CWSMC059	1427.66	404.52	28.33%	420.44	13.15	326	117.22	50	13.8	Subsurface Vault	Infiltration	\$17,000,000
CWSMC060	93.66	51.42	54.90%	27.24	0.85	21	7.59	20	0.6	Modular Wetland	Filtration	\$1,600,000
CWSMC061	1831.69	548.64	29.95%	648.29	25.54	323	115.20	60	18	Subsurface Vault	Filtration/Sewer	\$23,100,000
CWSMC062	447.91	274.67	61.32%	237.99	44.66	202	71.26	50	12.8	Subsurface Vault	Filtration/Sewer	\$16,800,000
CWSMC063	531.78	121.79	22.90%	273.69	17.69	70	22.02	40	6	Subsurface Vault	Filtration	\$8,600,000
CWSMC064	2173.94	422.31	19.43%	823.65	25.16	222	86.45	50	14.4	Subsurface Vault	Infiltration	\$17,700,000
CWSMC065	115.37	88.99	77.13%	42.34	1.23	23	8.56	20	0.8	Modular Wetland	Filtration	\$1,800,000
CWSMC066	281.08	166.22	59.14%	104.44	3.03	57	21.11	30	4.5	Subsurface Vault	Filtration/Sewer	\$6,700,000
CWSMC067	20.04	15.94	79.54%	8.47	0.25	5	1.71	10	0.5	Modular Wetland	Filtration	\$1,500,000
CWSMC068	199.68	100.15	50.16%	73.39	2.13	40	14.84	20	1.5	Subsurface Vault	Infiltration	\$2,000,000
CWSMC069	2077.36	771.66	37.15%	770.62	22.36	419	155.78	70	25	Subsurface Vault	Infiltration	\$30,500,000
CWSMC070	3472.76	1091.24	31.42%	1290.01	37.43	701	260.77	80	23	Subsurface Vault	Filtration/Sewer	\$29,200,000
CWSMC071	258.63	46.93	18.15%	72.86	0.11	4	1.67	30	5.5	Subsurface Vault	Filtration/Sewer	\$7,900,000
CWSMC072	653.71	242.32	37.07%	169.23	10.93	162	46.85	70	12.2	Subsurface Vault	Filtration	\$16,200,000
CWSMC073	39.15	28.31	72.31%	16.47	0.27	3	1.53	10	0.5	Modular Wetland	Filtration	\$1,500,000
CWSMC074	264.42	125.78	47.57%	110.58	1.78	20	10.25	30	4.2	Subsurface Vault	Infiltration	\$5,300,000
CWSMC075	225.749	108.86	48.22%	79.88	3.15	40	14.19	20	1.7	Subsurface Vault	Filtration/Sewer	\$3,300,000
CWSMC076	691.545	401.84	58.11%	299.43	11.62	195	66.82	30	4.2	Subsurface Vault	Filtration/Sewer	\$6,300,000
CWSMC077	595.733	301.15	50.55%	249.83	16.45	155	52.08	40	5.5	Subsurface Vault	Filtration/Sewer	\$8,000,000
CWSMC078	57.019	23.18	40.65%	39.19	0.79	15	5.04	10	0.5	Subsurface Vault	Filtration/Sewer	\$1,800,000

CWID	WLKBL_POP	PARKS_REC	PEAK_RDX	VOL_RDX	PCB_RDX	GREEN_ACRES	VOL_MAN	VOL_USE	DEM_OFFSET	SMCWPP_TRASH	CALOPPS_TRASH
CWSMC001	528	SCHOOL	29.7	19.78	10.06	125.13	183.78	183.78	27.0%	59.83	4.2
CWSMC002	3259	NO	0	30.46	15.17	306.04	364.00	364.00	53.5%	257.82	1061.38
CWSMC003	4813	NO	0	32.25	15.18	648.32	501.29	167.10	24.6%	1223.4	801.62
CWSMC004	4344	NO	27.86	20.38	5.06	139.57	217.10	72.37	10.6%	55.63	3.64
CWSMC005	4161	NEW	0	34.27	18.95	695.85	1100.96	0.00	0.0%	1243.09	814.9
CWSMC006	4867	NO	0	31.77	17.57	708.65	1119.19	373.06	54.9%	1299.96	818.54
CWSMC007	2274	NEW	0	22.25	9.31	335.73	456.28	0.00	0.0%	1592.37	2049
CWSMC008	4659	NO	0	28.25	12.16	346.25	409.45	136.48	20.1%	258.88	1228.31
CWSMC009	6353	PARK	50.56	37.29	7.79	391.30	373.93	124.64	18.3%	37.64	0
CWSMC010	4177	NEW	0	27.25	12.21	342.61	404.52	0.00	0.0%	260.42	1229
CWSMC011	3086	SCHOOL	0	14.55	3.52	126.66	187.73	0.00	0.0%	97.72	0
CWSMC012	357	NO	10.29	9.19	2.96	77.89	58.58	19.53	2.9%	69.19	8.14
CWSMC013	311	NO	0.63	3.32	1.00	27.47	19.85	0.00	0.0%	29.07	0
CWSMC014	1013	PARK	30.96	25.21	9.74	297.05	270.00	0.00	0.0%	327.72	31.35
CWSMC015	636	PARK	32.72	26.92	10.83	320.19	298.17	0.00	0.0%	336.38	31.35
CWSMC016	2892	NO	25.1	24.41	17.25	154.27	231.52	77.17	11.3%	74.23	0
CWSMC017	1972	PARK	4.38	11.83	2.40	91.10	63.68	21.23	3.1%	75.17	0
CWSMC018	1353	SCHOOL	0.03	0.66	0.12	4.86	21.63	21.63	3.2%	0	6.69
CWSMC019	3656	NO	11.33	23.35	8.92	168.19	208.18	69.39	10.2%	60.4	577.6
CWSMC020	837	NEW	0	24.34	44.62	262.30	217.42	0.00	0.0%	278.65	0
CWSMC021	3207	NO	0	22.76	16.10	195.58	222.32	74.11	10.9%	24.41	0
CWSMC022	2867	NEW	30.25	15.24	2.47	126.32	82.86	27.62	4.1%	102.62	36.53
CWSMC023	1675	NO	1.09	23.49	15.43	224.94	226.19	226.19	33.3%	606.46	79.49
CWSMC024	3151	NO	0.93	20.21	13.27	180.24	194.18	194.18	28.6%	407.15	9.81
CWSMC025	7006	NO	0	27.96	9.94	305.37	304.10	0.00	0.0%	174.44	1203.86
CWSMC026	35	NEW	0	23.74	3.89	239.85	1819.86	0.00	0.0%	240.02	0
CWSMC027	3515	NO	22.05	14.03	4.05	75.65	61.30	0.00	0.0%	23.33	256.3
CWSMC028	859	NO	0	35.37	28.19	398.02	400.46	0.00	0.0%	340.56	9.28
CWSMC029	1084	NO	1.08	23.48	15.61	195.13	203.78	203.78	30.0%	312.06	9.28
CWSMC030	1976	SCHOOL	10.21	9.38	1.61	85.82	100.38	0.00	0.0%	33.65	0
CWSMC031	1428	NO	22.68	16.04	3.94	142.57	96.19	32.06	4.7%	101.22	2.11
CWSMC032	4625	PARK	0	2.59	0.32	17.35	10.17	0.00	0.0%	0	0
CWSMC033	4783	NO	0	28.88	15.72	499.39	522.24	174.08	25.6%	874.14	1263.29
CWSMC034	11	NEW	0	22.35	3.82	279.22	1841.47	0.00	0.0%	284.33	0
CWSMC035	31	NEW	0	2.51	0.14	42.09	95.44	0.00	0.0%	6.16	0
CWSMC036	1810	NO	0	40.25	18.21	450.10	554.99	185.00	27.2%	570.16	19.45
CWSMC037	2059	NO	25.5	16.3	6.34	73.64	102.77	34.26	5.0%	47.63	0
CWSMC038	7301	NEW	0	27.6	11.65	303.37	354.75	354.75	52.2%	395.87	19.27
CWSMC039	3409	NO	3.38	23.36	9.11	211.68	364.94	364.94	53.7%	189.44	460.17
CWSMC040	1108	NO	0	25.26	12.27	303.91	521.99	521.99	76.8%	401.6	657.47
CWSMC041	4162	SCHOOL	32.16	13.59	2.29	51.81	103.95	34.65	5.1%	28.71	0
CWSMC042	4434	NO	0	36.75	16.71	694.28	537.05	179.02	26.3%	1221.18	801.62
CWSMC043	4110	NO	0	2.68	0.43	15.54	21.40	0.00	0.0%	10.64	0
CWSMC044	4058	NO	0	40.27	21.57	726.33	1157.82	1157.82	170.3%	1236.83	801.62
CWSMC045	5119	NO	0	23.67	12.50	637.92	1001.89	333.96	49.1%	1318.71	819.56
CWSMC046	4340	PARK	0	40.28	22.22	955.28	1409.75	1409.75	207.3%	1600.83	2050.63



CWSMC047	3405	NO	0	43.07	51.11	817.18	1294.73	1294.73	190.4%	1774.47	2060.32
CWSMC048	3261	NO	0	25.25	7.81	211.38	258.08	86.03	12.7%	121.95	458.77
CWSMC049	2296	NO	25.88	22.27	7.81	171.27	195.59	0.00	0.0%	116.29	460.31
CWSMC050	443	NO	0	28.11	13.05	245.40	320.30	320.30	47.1%	181.1	898.74
CWSMC051	1012	NO	22.16	16.43	4.18	59.81	106.67	0.00	0.0%	28.19	260.43
CWSMC052	2781	NEW	25.35	22.17	7.77	170.77	194.53	0.00	0.0%	116.29	457.78
CWSMC053	3995	NO	22.16	20.64	6.24	167.11	178.08	59.36	8.7%	107.99	0
CWSMC054	1786	NO	0	22.32	7.58	213.42	195.37	65.12	9.6%	180.04	30.21
CWSMC055	6381	SCHOOL	0.26	5.68	2.63	71.67	52.92	52.92	7.8%	232.43	222.05
CWSMC056	3294	SCHOOL	1.84	7.18	1.68	44.80	39.15	0.00	0.0%	6.98	47.03
CWSMC057	134	NEW	0.69	3.44	0.37	50.68	152.51	0.00	0.0%	0.03	0
CWSMC058	4684	SCHOOL	0.86	18.79	6.01	182.20	162.40	162.40	23.9%	142.76	18.39
CWSMC059	3566	SCHOOL	0.69	15.07	4.86	127.24	132.24	132.24	19.4%	67.1	13.16
CWSMC060	2072	NO	0	5.98	0.82	49.18	26.05	0.00	0.0%	24.32	0
CWSMC061	2595	NO	0	31.82	17.37	318.65	376.52	125.51	18.5%	191.38	0.44
CWSMC062	593	NO	14.02	26.51	38.69	222.88	193.12	64.37	9.5%	196.51	0
CWSMC063	167	NO	32.16	18.47	14.37	111.62	250.84	0.00	0.0%	0.05	0
CWSMC064	3302	NO	0.73	15.74	9.49	85.58	166.91	166.91	24.5%	78.94	0.62
CWSMC065	736	NO	1.84	6.82	1.14	82.02	39.03	0.00	0.0%	78.84	7.36
CWSMC066	2036	NO	22.16	15.95	2.79	147.01	92.37	30.79	4.5%	137.8	38.55
CWSMC067	4142	NO	0	1.71	0.25	15.93	8.46	0.00	0.0%	20.04	0
CWSMC068	5017	SCHOOL	0.08	1.64	0.60	22.45	16.45	16.45	2.4%	72.81	0
CWSMC069	3920	SCHOOL	1.26	27.3	10.12	242.87	242.54	242.54	35.7%	60.97	0
CWSMC070	7550	NO	0	37.02	18.22	452.61	535.05	178.35	26.2%	546.3	1224.7
CWSMC071	51	NO	0	1.67	0.10	45.69	70.94	23.65	3.5%	22.79	0
CWSMC072	3324	NO	58.45	25.81	9.55	205.03	143.19	0.00	0.0%	193.48	633.54
CWSMC073	4054	SCHOOL	0	1.53	0.27	28.31	16.47	0.00	0.0%	39.15	0
CWSMC074	3901	NO	7.29	4.58	1.28	90.82	79.84	79.84	11.7%	0.22	0.36
CWSMC075	4829	SCHOOL	10.6	10.53	2.74	91.58	67.20	22.40	3.3%	27.82	0.00
CWSMC076	3636	NO	0	17.98	7.73	257.25	191.69	63.90	9.4%	78.70	677.66
CWSMC077	7603	PARK	0	19.23	13.49	225.37	186.96	62.32	9.2%	4.37	0.00
CWSMC078	2510	PARK	0	4.15	0.75	22.26	37.64	12.55	1.8%	2.92	0.00

CWID	PEAKRD_X_RANK	VOLRD_X_RANK	PCBRD_X_RANK	GRNAC_RANK	VOLMAN_RANK	VOLUSE_RANK	DEMOFF_RANK	SMCWPP_RANK	CALOPPS_RANK
CWSMC001	8	44	31	52	46	16	16	54	45
CWSMC002	41	13	19	19	22	7	7	25	9
CWSMC003	41	10	18	7	14	20	20	8	14
CWSMC004	9	42	48	48	35	31	31	55	46
CWSMC005	41	9	7	5	7	51	51	6	13
CWSMC006	41	12	10	4	6	5	5	5	12
CWSMC007	41	39	36	16	15	51	51	3	3
CWSMC008	41	15	27	14	16	23	23	24	6
CWSMC009	2	5	41	13	20	26	26	58	51
CWSMC010	41	20	26	15	17	51	51	23	5
CWSMC011	41	56	55	50	44	51	51	43	51
CWSMC012	22	62	56	60	66	48	48	50	42
CWSMC013	37	70	67	72	74	51	51	60	51
CWSMC014	6	26	33	23	27	51	51	19	32
CWSMC015	3	21	29	17	26	51	51	18	32
CWSMC016	13	27	12	45	31	29	29	48	51
CWSMC017	25	59	61	55	64	47	47	47	51
CWSMC018	40	78	77	78	72	46	46	77	44
CWSMC019	20	34	38	43	36	32	32	53	20
CWSMC020	41	28	2	25	34	51	51	22	51
CWSMC021	41	35	14	37	33	30	30	64	51
CWSMC022	7	54	60	51	60	43	43	41	31
CWSMC023	30	31	17	31	32	12	12	11	28
CWSMC024	32	43	22	40	41	14	14	14	39
CWSMC025	41	17	32	20	25	51	51	34	8
CWSMC026	41	29	53	29	2	51	51	26	51
CWSMC027	18	57	51	61	65	51	51	66	26
CWSMC028	41	8	4	12	18	51	51	17	40
CWSMC029	31	32	16	38	37	13	13	20	40
CWSMC030	23	61	64	57	56	51	51	59	51
CWSMC031	14	51	52	47	57	41	41	42	47
CWSMC032	41	72	73	75	77	51	51	77	51
CWSMC033	41	14	15	9	12	19	19	10	4
CWSMC034	41	36	54	24	1	51	51	21	51
CWSMC035	41	73	76	70	58	51	51	71	51
CWSMC036	41	4	9	11	9	15	15	12	35
CWSMC037	11	50	45	62	55	40	40	56	51
CWSMC038	41	18	28	22	23	8	8	16	36
CWSMC039	26	33	37	34	21	6	6	31	22
CWSMC040	41	24	25	21	13	4	4	15	18
CWSMC041	4	58	62	65	54	39	39	61	51
CWSMC042	41	7	13	6	10	17	17	9	14
CWSMC043	41	71	71	77	73	51	51	69	51
CWSMC044	41	3	6	3	5	3	3	7	14
CWSMC045	41	30	24	8	8	9	9	4	11
CWSMC046	41	2	5	1	3	1	1	2	2

CWSMC047	41	1	1	2	4	2	2	1	1
CWSMC048	41	25	40	35	28	27	27	37	23
CWSMC049	10	38	39	41	38	51	51	38	21
CWSMC050	41	16	23	27	24	10	10	32	10
CWSMC051	15	49	50	64	53	51	51	62	25
CWSMC052	12	40	42	42	40	51	51	38	24
CWSMC053	16	41	46	44	47	37	37	40	51
CWSMC054	41	37	44	33	39	33	33	33	34
CWSMC055	38	66	59	63	67	38	38	27	27
CWSMC056	27	63	63	69	68	51	51	70	29
CWSMC057	35	69	72	66	50	51	51	76	51
CWSMC058	33	46	47	39	49	22	22	35	37
CWSMC059	36	55	49	49	52	24	24	51	38
CWSMC060	41	65	68	67	71	51	51	65	51
CWSMC061	41	11	11	18	19	25	25	30	49
CWSMC062	19	22	3	32	42	34	34	28	51
CWSMC063	4	47	20	53	29	51	51	75	51
CWSMC064	34	53	35	58	48	21	21	44	48
CWSMC065	27	64	66	59	69	51	51	45	43
CWSMC066	16	52	57	46	59	42	42	36	30
CWSMC067	41	74	75	76	78	51	51	68	51
CWSMC068	39	76	70	73	76	49	49	49	51
CWSMC069	29	19	30	28	30	11	11	52	51
CWSMC070	41	6	8	10	11	18	18	13	7
CWSMC071	41	75	78	68	62	44	44	67	51
CWSMC072	1	23	34	36	51	51	51	29	19
CWSMC073	41	77	74	71	75	51	51	57	51
CWSMC074	24	67	65	56	61	28	28	74	50
CWSMC075	21	60	58	54	63	45	45	63	51
CWSMC076	41	48	43	26	43	35	35	46	17
CWSMC077	41	45	21	30	45	36	36	72	51
CWSMC078	41	68	69	74	70	50	50	73	51