C/CAG

CITY/COUNTY ASSOCIATION OF GOVERNMENTS
OF SAN MATEO COUNTY

Atherton ■ Belmont ■ Brisbane ■ Burlingame ■ Colma ■ Daly City ■ East Palo Alto ■ Foster City ■ Half Moon Bay ■ Hillsborough ■ Menlo Park
Millbrae ■ Pacifica ■ Portola Valley ■ Redwood City ■ San Bruno ■ San Carlos ■ San Mateo ■ San Mateo County ■ South San Francisco ■ Woodside

STORMWATER (NPDES) COMMITTEE AGENDA
2:30 PM, Thursday, August 19, 2021

On March 17, 2020, the Governor issued Executive Order N-29-20 suspending certain provisions of the Ralph M. Brown Act in order to allow for local legislative bodies to conduct their meetings telephonically or by other electronic means. On June 11, 2021, the Governor issued Executive Order N-08-21 extending the suspension of these provisions to September 30, 2021. Thus, pursuant to Executive Order N-08-21, C/CAG Board meetings will be conducted via remote conferencing. Members of the public may observe or participate in the meeting remotely via one of the options below.

Join by Zoom:
https://us02web.zoom.us/j/84237030246?pwd=b1hNb0MxN0NPVVI4ZHdidUVYSjhiZz09
Join by Phone: +1 669 900 6833 Meeting ID: 842 3703 0246 Password: 685334

Persons who wish to address the C/CAG Stormwater Committee on an item to be considered at this meeting, or on items not on this agenda, are asked to submit written comments to rbogert@smcgov.org. Oral public comments will also be accepted during the meeting through Zoom. Please see instructions for written and spoken public comments at the end of this agenda.

1.	Call to Order, Roll Call, and brief overview of teleconference meeting procedures	Bogert	No materials
2.	Public comment on items not on the Agenda (presentations limited to three minutes)	Breault	No materials
3.	Stormwater Issues from August C/CAG Board meetings: • None – no C/CAG Board meeting in August		
4.	ACTION – Review and approve July 15, 2021 Stormwater Committee minutes	Breault	Pages 1-5
5.	INFORMATION – Announcements on stormwater issues • MRP 3.0 Update • Annual reporting schedule • Ad-hoc Funding and Financing Workgroup • Stormwater Program staffing transition • Other	Fabry	No materials
6.	INFORMATION – Receive update on regional stormwater capture projects currently underway in San Mateo County	Fabry	Page 6
7.	INFORMATION – Receive update and provide feedback on draft "Business Case" and preliminary prioritization of regional project opportunities for the *Advancing Regional-Scale Stormwater Management in San Mateo County project*	Fabry	Pages 7-69
8.	Discussion of recommendations and findings in Grand Jury report, "San Mateo County: California's Ground Zero for Sea Level Rise."	Fabry	Page 70-113
9.	Regional Board Report	Mumley	No Materials
10.	Executive Director's Report	Charpentier	No Materials
11.	Member Reports	All	No Materials
12.	Adjourn		

PUBLIC NOTICING: All notices of C/CAG regular Board meetings, standing committee meetings, and special meetings will be posted at the San Mateo County Transit District Office, 1250 San Carlos Ave., San Carlos, CA, and on C/CAG's website at: http://www.ccag.ca.gov.

PUBLIC RECORDS: Public records that relate to any item on the open session agenda for a regular Board meeting, standing committee meeting, or special meeting are available for public inspection. Those public records that are distributed less than 72 hours prior to a regular meeting are available for public inspection at the same time they are

distributed to all members, or a majority of the members, of the Committee. The Board has designated the City/County Association of Governments of San Mateo County (C/CAG), located at 555 County Center, 5th Floor, Redwood City, CA 94063, for the purpose of making public records available for inspection. Such public records are also available on C/CAG's website at: http://www.ccag.ca.gov. Please note that C/CAG's office is temporarily closed to the public; please contact Mima Guilles at (650) 599-1406 to arrange for inspection of public records.

PUBLIC PARTICIPATION DURING VIDEOCONFERENCE MEETINGS: Persons with disabilities who require auxiliary aids or services to participate in this meeting should contact Mima Guilles at (650) 599-1406, five working days prior to the meeting date.

Written comments should be emailed in advance of the meeting. Please read the following instructions carefully:

1. Your written comment should be emailed to rbogert@smcgov.org.
2. Your email should include the specific agenda item on which you are commenting or note that your comment concerns an item that is not on the agenda.
3. Members of the public are limited to one comment per agenda item.
4. The length of the emailed comment should be commensurate with the two minutes customarily allowed for verbal comments, which is approximately 250-300 words.
5. If your emailed comment is received at least 2 hours prior to the meeting, it will be provided to the C/CAG Committee members and made publicly available on the C/CAG website along with the agenda. We cannot guarantee that emails received less than 2 hours before the meeting will be able to be posted or provided to Committee members prior to the meeting, but such emails will be included in the administrative record of the meeting.

Oral comments will be accepted during the meeting through Zoom. Please read the following instructions carefully:

1. The Stormwater Committee meeting may be accessed through Zoom at the online location indicated at the top of this agenda.
2. You may download the Zoom client or connect to the meeting using an internet browser. If using your browser, make sure you are using a current, up-to-date browser: Chrome 30+, Firefox 27+, Microsoft Edge 12+, Safari 7+. Certain functionality may be disabled in older browsers including Internet Explorer.
3. You will be asked to enter an email address and name. We request that you identify yourself by your name as this will be visible online and will be used to notify you that it is your turn to speak.
4. When C/CAG Staff or the Committee Chair/Vice-Chair call for the item on which you wish to speak, click on "raise hand." C/CAG staff will activate and unmute speakers in turn. Speakers will be notified shortly before they are called on to speak.
5. When called, please limit your remarks to the time allotted.

If you have any questions about this agenda, please contact C/CAG staff:

Program Director: Matthew Fabry (mfabry@smcgov.org)
Administrative Assistant: Mima Guilles (mguilles@smcgov.org or (650) 599-1406)

C/CAG AGENDA REPORT

Date: August 19, 2021

To: Stormwater Committee

From: Matthew Fabry, Program Manager

Subject: Review and approve July 15, 2021 Stormwater Committee meeting minutes.

(For further information or questions contact Matthew Fabry at mfabry@smcgov.org)

RECOMMENDATION

That the Committee review and approve July 15, 2021 Stormwater Committee meeting minutes, as drafted.

DISCUSSION

N/A.

ATTACHMENTS

1. Draft July 15, 2021 Minutes

STORMWATER COMMITTEE
Regular Meeting
Thursday, July 15, 2021
2:30 p.m.

Draft Meeting Minutes

The Stormwater Committee met remotely via Zoom, per C/CAG's shelter-in-place policy and consistent with state and county directives to manage COVID-19. Attendance at the meeting is shown on the attached. In addition to the Committee members, also in attendance were Matt Fabry (C/CAG Program Manager), Reid Bogert (C/CAG staff), Sandy Wong (C/CAG Executive Director), Sean Charpentier (C/CAG staff), Batool Zaro (City of East Palo Alto), Elizabeth Wada (City of Belmont), Susan Wright and John Allan (County of San Mateo), Jennifer Lee (City of Burlingame), Ahmad Haya (City of Redwood City), Makena Wong and Len Materman (OneShoreline), Chris Sommers (EOA), Kelly Havens (Geosyntec), Merrill Taylor (Craftwater), and Caroline Koch (WaterNow Alliance). Vice Chair Ovadia called the meeting to order at 2:31 p.m.

1. Call to Order, Roll Call, and overview of teleconference meeting procedures.

2. Public comment: None

3. INFORMATION – Stormwater Issues from May C/CAG Board Meeting: Approved Task Orders for Eisenberg, Olivieri, and Associates, Larry Walker Associates, S. Groner Associates, and Urban Rain Design for technical support in FY 21-22; Approved amendment to Bay Area Water Supply and Conservation Agency agreement for rainwater harvesting and rain garden rebates and incentives for FY 21-22; Appointed Hae Won Ritchie (San Bruno) and Ann Stillman (San Mateo County) to the Stormwater Committee; Approved time extensions to Pacifica and East Palo Alto Safe Routes to School/Green Infrastructure Projects; Approved C/CAG Budget for FY 21-22; Approved Measure M Strategic and Implementation Plan for 2021/22-2025-26, including a 3% increase in countywide stormwater revenue allocation; Appointed new C/CAG Executive Director (Sean Charpentier), starting August 1, 2021.

4. ACTION – Approval of the draft minutes from the May 20, 2021, Stormwater Committee meeting, as drafted. Motion: Member Petersen; second: Member Nagaya. Approved (13:0:2). Chair Breault and Member Saber abstained.

5. INFORMATION – Received announcements on stormwater issues:

MRP 3.0 Reissuance – Matt Fabry provided a brief update on the MRP 3.0 reissuance process, including a new anticipated release date for the Draft Tentative Order in September, a two-day Water Board hearing/workshop in October and an adoption hearing in early 2022. The tentative effective date of the new permit remains July 1, 2022. Fabry noted ongoing discussions and negotiations regarding proposed requirements to address PCBs in old industrial areas. C/CAG will be convening a workgroup of the nine member agencies that have 94% of the old industrial land use areas in the county within these jurisdictions. C/CAG's consultants are conducting an analysis to evaluate what has been already accomplished with respect to old industrial areas and to propose what can reasonably done to achieve load reduction goal in remaining areas during the next permit term. Fabry also noted the ongoing dialogue with respect to proposed receiving water trash monitoring requirements, which may include

outfall and/or receiving water monitoring. There are significant cost implications with adding new monitoring provisions to the permit.

Annual Reporting – Fabry has distributed the schedule for Annual Reports for Fiscal Year 2021, noting that in the next week staff will circulate the SMCWPPP version of the Annual Report forms for member agency representatives to get started with the process. Fabry also noted the new electronic submittal process this year, via the SMARTS website, and the additional initial requirement to authorize a Legal Responsible Person (LRP) for each co-permittee prior to submitting the Annual Reports electronically via an e-Authorization Form.

Trash source control measure survey – Fabry announced a survey was distributed to the SMCWPPP NPDES Technical Advisory Committee to help quantify and demonstrate the benefits of source controls for trash reduction, the results of which will be used in MRP 3.0 negotiations. Survey responses are due July 16.

San Bruno Funding Initiative – Fabry announced that the City of San Bruno's proposed Prop 218 property owner-balloted stormwater fee recently failed to receive the simple majority support required for approval. C/CAG staff will be holding a meeting with San Bruno staff to identify lessons learned and recommendations for any funding initiatives.

C/CAG Delegation Meetings – C/CAG staff have convened meetings with a subset of the Legislative Committee, including the Board Chair and Vice Chair and the Chair and Vice Chair of the Committee, and representatives of the San Mateo County State Legislative Delegation, including a focus on stormwater funding and legislative issues. Staff will continue to engage the Legislators and their staff to advance funding for stormwater projects in San Mateo County.

Monsanto Settlement – Fabry provided a brief update on the process of receiving notifications regarding intent for municipalities to participate in the Monsanto PCBs settlement. County Council, John Beyers, is planning to engage with other municipal legal staff to help coordinate and provide the latest information. Fabry will also recirculate the document sent previously including the proposed settlement amounts for each jurisdiction and county.

6. ACTION – Approved update to C/CAG's 2018 trash full capture opportunity analysis.

C/CAG staff recently learned Caltrans staff has preliminarily allocated up to $38 million for potential cooperative agreements with San Mateo County jurisdictions for trash full capture devices that treat priority Caltrans rights-of-way (with $100,000/acre of Caltrans right-of-way treated). Caltrans has identified several cities, including South San Francisco, San Bruno and Daly City based on C/CAG's previous opportunities analysis for potential collaborative projects. In terms of timing for the new funding allocation, Caltrans needs concept scopes by December 2021 and funding agreements in place by July 2022. This funding would advance Caltrans' work towards achieving its treatment obligations under a Cease and Desist Order issued by the Regional Water Quality Control Board, with a deadline to achieve its trash control obligations by July 2026. C/CAG staff proposed updating its 2018 trash full capture opportunity analysis that focused on priority trash-generating areas not already controlled by small, inlet-based trash full capture devices, to now include areas currently treated by the small devices. The analysis would include an assessment of the potential benefits to the jurisdictions as well as the benefits received by Caltrans with respect to trash load reductions. This assessment would require additional work to better understand the connectivity of Caltrans right-of-way to municipal drainage

areas, as well as site specific sizing information and concept-level costs. This analysis will help leverage the current round of proposed Caltrans funding as well as future cycles of funding. Staff is working with EOA to develop a scope and budget, with preliminary estimates of approximately $85,000. Caltrans funds would only be available for design/construction. Members suggested leveraging opportunities to address other stormwater permit requirements (PCBs, monitoring, etc.). Unfortunately, the existing proposal for the San Bruno I-280/380 regional capture stormwater project is not downstream of high-priority Caltrans rights-of-way. Members also requested that costs for ongoing operations and maintenance of full trash capture devices be included in the analysis. Motion: Member Nagaya; second: Member Ovadia (14:0:0). Note – Member Rose did not respond with a vote on this item.

7. INFORMATION – Received update on Business Case Approach Memo as part of the Advancing Regional-scale Stormwater Management in San Mateo County project.

Matt Fabry summarized the overall multi-pronged project to advance regional collaboration on stormwater management in San Mateo County and introduced Kelly Havens with Geosyntec to provide an update on the Business Case Approach Memorandum. The Business Case Approach Memo compares a jurisdiction by jurisdiction vs. a regional collaborative approach to achieving the multi-benefit objectives for regional-scale stormwater management. Merrill Taylor with Craftwater Engineering summarized the regional-scale stormwater capture project opportunities analysis, focusing on site feasibility, stormwater performance, and categorical benefits. The initial outputs include map layers of the identified opportunities and an Excel spreadsheet of the 74 project opportunities ranked by key stormwater performance criteria. Next steps will be to identify the top ten highest prioritized opportunities, perform a modeling exercise for the potential water volume and pollutant removal potential of those sites, conduct site assessments in the field, and with recommendations from the member agencies and Technical Advisory Committee narrow the top ten down to five opportunities to recommend proceeding with for concept level designs. In parallel, Geosyntec is evaluating the potential for these additional opportunities to offset the remaining green infrastructure capacity to achieve the San Mateo County portion of the TMDL waste load reduction for PCBs by 2040 as detailed in the San Mateo County Green Infrastructure Reasonable Assurance Analysis as compared to a jurisdiction by jurisdiction approach. The associated cost-benefit analysis with respect to cost/grams of PCBs reduced under these scenarios, demonstrates significant benefits and cost efficiencies from a regional collaborative approach. Beyond the water quality benefits the Business Case Approach Memo will also characterize the cost-benefits of other drivers and objectives, including flood reduction benefits, water savings, groundwater recharge, and other community benefits. Havens reviewed the current project timeline, with details on the next TACs and development of the final White Paper on a regional collaboration framework.

9. Regional Board Report: None.

10. Executive Director's Report: Executive Director, Sandy Wong, provided a brief update and offered appreciation and thank you to the members and staff for their efforts over the years on the stormwater program. Sean Charpentier, the incumbent Executive Director, announced his appreciation for the work done by the Committee and his excitement to lead C/CAG as the new Executive Director.

11. Member Reports: None.

12. Chair Breault adjourned the meeting at 3:49 p.m.

2021-22 Stormwater Committee Attendance														
Agency	**Representative**	**Position**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**
Atherton	Robert Ovadia	Public Works Director	X											
Belmont	Peter Brown	Public Works Director	X											
Brisbane	Randy Breault	Public Works Director/City Engineer	X											
Burlingame	Syed Murtuza	Public Works Director	O											
Colma	Brad Donohue	Director of Public Works and Planning	X											
Daly City	Richard Chiu	Public Works Director												
East Palo Alto	Kamal Fallaha	City Engineer	O											
Foster City	Dante Hall	Acting Public Works Director												
Half Moon Bay	Maziar Bozorginia	City Engineer	X											
Hillsborough	Paul Willis	Public Works Director												
Menlo Park	Nikki Nagaya	Public Works Director	X											
Millbrae	Andrew Yang	Senior Engineer	X											
Pacifica	Lisa Petersen	Public Works Director/City Engineer	X											
Portola Valley	Howard Young	Public Works Director	X											
Redwood City	Saber Sarwary	Supervising Civil Engineer	X											
San Bruno	Jimmy Tan	Public Works Director	X											
San Carlos	Steven Machida	Public Works Director	X											
San Mateo	Azalea Mitch	Public Works Director	X											
South San Francisco	Eunejune Kim	Public Works Director	X											
Woodside	Sean Rose	Public Works Director	X											
San Mateo County	Jim Porter	Public Works Director	O											
Regional Water Quality Control Board	Tom Mumley	Assistant Executive Officer												

"X" - Committee Member Attended
"O" - Other Jurisdictional Representative Attended

C/CAG AGENDA REPORT

Date: August 19, 2021

To: Stormwater Committee

From: Matthew Fabry, Program Manager

Subject: Receive update on regional stormwater capture projects currently underway in San Mateo County.

(For further information or questions contact Matthew Fabry at mfabry@smcgov.org)

RECOMMENDATION

That the Committee receive an update on regional stormwater capture projects currently underway in San Mateo County.

BACKGROUND/DISCUSSION

There are four regional stormwater capture projects currently underway in the county, at varying levels of implementation:

- **Orange Memorial Park, South San Francisco**: This project is currently under construction, with design, environmental review, permitting, and construction funded via $15.5 M from Caltrans
- **Red Morton Park, Redwood City**: This project is currently in the design phase, with funding for design and environmental review via a $937k California Natural Resources Agency grant and a $200k Environmental Protection Agency grant from the County Office of Sustainability.
- **I-280/380 Interchange, San Bruno**: This project is on Caltrans property and the City has executed a project oversight cooperative agreement with Caltrans and is now in the pre-design phase, with funding for design and environmental review via a $937k California Natural Resources Agency grant and a $200k Environmental Protection Agency grant from the County Office of Sustainability.
- **Twin Pines Park, Belmont**: This project has funding for initial design and environmental review via a $937k California Natural Resources Agency grant. The project is being integrated with a $1M grant from the Department of Water Resources for restoration of Belmont Creek in Twin Pines Park. A Request for Proposals for design services for both projects is forthcoming from the City of Belmont.

Staff will provide a brief presentation providing additional detail on these projects for the Committee's information.

ATTACHMENTS

None

C/CAG AGENDA REPORT

Date: August 19, 2021

To: Stormwater Committee

From: Matthew Fabry, Program Manager

Subject: Receive update and provide feedback on draft "Business Case" and preliminary prioritization of regional project opportunities for the *Advancing Regional-Scale Stormwater Management in San Mateo County project*.

(For further information or questions contact Matthew Fabry at mfabry@smcgov.org)

RECOMMENDATION

That the Committee receive an update and provide feedback on the draft "Business Case" and preliminary prioritization of regional project opportunities for the *Advancing Regional-Scale Stormwater Management in San Mateo County project*.

BACKGROUND/DISCUSSION

C/CAG is engaged in a multi-pronged partnership project intended to advance implementation of regional-scale stormwater management in San Mateo County. Regional-scale stormwater management is defined to include large-scale regional retention facilities as well as programmatic implementation of smaller, distributed-scale stormwater facilities such as through the countywide rain barrel/cistern/rain garden rebate and incentive program. The four interrelated project components and associated consultants/partners are summarized below.

1. **Building the Business Case for Regional-Scale Stormwater Management** (Geosyntec Consultants)
    a. Drivers and Objectives: Establishes the "What" in terms of what can be achieved through regional-scale stormwater management through establishing key drivers and associated objectives. The Drivers and Objectives feed into the prioritization analysis in 2.a, below, establishing the goals prioritized opportunities will need to address. The Stormwater Committee approved the final Drivers and Objectives report at the May 2021 meeting.
    b. Business Case: Establishes the "Why" in terms of why C/CAG's member agencies would benefit from countywide collaboration on regional-scale stormwater management. The Business Case is informed by the prioritized opportunities determined in 2.a, below, including quantitative analyses of the potential benefits provided through those opportunities.
    c. Collaborative Framework: Establishes the "How" in terms of how C/CAG's member agencies can collaborate across jurisdictional lines on regional scale stormwater management.

2. **Prioritizing and Conceptualizing Regional-Scale Stormwater Management Opportunities** (Craftwater Engineering/County of San Mateo)
    a. Identify and Prioritize Opportunities: This will update analyses done for the Countywide Stormwater Resource Plan to find the best opportunities throughout the county for regional-scale stormwater management to address the Drivers and Objectives established in 1.a, above.
    b. Project Concepts: Five new project concepts will be developed, showcasing high-priority stormwater capture opportunities throughout the county that directly address the Drivers and Objectives from 1.a., above. The project concepts are being funded in partnership with San Mateo County through the Office of Sustainability and it's separate grant funding from the US Environmental Protection Agency.

3. **Credit Trading Marketplace Analysis** (American Rivers/Corona Environmental): This project will evaluate the potential for creating a stormwater credit trading marketplace in San Mateo County that would allow private developers or C/CAG member agencies to buy and sell stormwater management credits to increase rates of implementation and progress toward achieving the identified Drivers and Objectives, from 1.a., above.

4. **Innovative Funding and Financing Analysis** (WaterNow Alliance): This project will evaluate innovative funding and financing options for all scales of stormwater management, from large regional capture facilities to small-scale rainwater harvesting rebate and incentive programs, including key considerations when structuring potential funding initiatives to maximize flexibility for implementation on public and private properties.

Geosyntec Consultants finalized the draft Business Case (Attachment 1) and Craftwater Engineering has developed a preliminary project opportunity prioritization analysis (Attachments 2 and 3), per Items 1.b and 2.a, respectively. Staff provided a high-level overview of both at the July meeting and will now provide a deeper dive and detail the requested agency feedback. The draft materials were provided to city/county representatives on August 10, with comments requested by August 27. Staff now anticipates presentations on Items 3 and 4 (Credit Trading Marketplace and Innovative Funding/Financing analyses), at the September Stormwater Committee meeting.

ATTACHMENTS

1. Draft Business Case for Regional Collaboration
2. Preliminary Regional Project Opportunity Analysis Memo
3. Preliminary Regional Project Opportunity Prioritization (due to size and formatting issues, available online at https://ccag.ca.gov/committees/stormwater-committee/)

Geosyntec consultants

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REVISED DRAFT Memorandum

Date:	August 9, 2021
To:	Matt Fabry, P.E., and Reid Bogert, City/County Association of Governments of San Mateo County
From:	Kelly Havens, P.E., Senior Engineer, Lisa Austin, P.E., Principal, Lisa Welsh, Ph.D., Scientist, Troy Hunt, P.E., Senior Principal, and Yuecheng Liu, Senior Staff Engineer
Subject:	Advancing Regional Stormwater Capture Projects: Business Case for Regional Collaboration Geosyntec Project Number: CWR0650

1. INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) is assisting the City/County Association of Governments of San Mateo County (C/CAG) with a project focusing on advancing regional stormwater capture projects in San Mateo County (County) through a regionally collaborative approach (the Project). An overview of the Project objectives was provided in the *Advancing Regional Stormwater Capture Projects: Drivers and Objectives Report* (Drivers and Objectives Report) (C/CAG, 2021a). The Drivers and Objectives Report described what could be addressed and achieved through regional-scale stormwater management (i.e., key objectives associated with identified drivers).

This memorandum describes the Business Case for regional collaboration. The Business Case provides a planning level cost-benefit analysis and qualitative assessment to demonstrate why a regional-scale stormwater management approach may provide cost efficiencies and added benefits to jurisdictions collaborating regionally. This memorandum is organized as follows:

- Section 2 provides an overview of the approach used to conduct the Business Case.
- Section 3 describes the regional stormwater capture projects, including those previously identified in other efforts and additional potential opportunities, which are referenced in this comparative Business Case analysis.
- Section 4 presents the Business Case comparison by objective between a jurisdiction-by-jurisdiction approach and an optimized regional approach.
- Section 5 provides the Business Case summary.
- Section 6 discusses next steps for the Project.

2. BUSINESS CASE APPROACH

2.1 Drivers and Objectives

The Drivers and Objectives Report describes the key Project drivers, defined as the fundamental issues that provide impetus for managing stormwater on a regional scale, and objectives, defined as the desired outcomes from addressing the identified stormwater management drivers on a regional scale (C/CAG, 2021a). A summary of the identified drivers and objectives and how they interact is provided in Figure 1.

Figure 1: Drivers and Objectives

2.2 Analyses Methodology

Analyses have been conducted to compare metrics and other evaluation factors for two stormwater capture project implementation "scenarios:"

1. Scenario 1: Jurisdiction-by-Jurisdiction scenario under which stormwater management is addressed through jurisdiction-specific approaches.
2. Scenario 2: Collaborative Regional scenario under which regional-scale stormwater management is optimized to achieve identified drivers and objectives.

The Jurisdiction-by-Jurisdiction scenario is represented by existing studies and plans, including the *Countywide Reasonable Assurance Analysis* (Countywide RAA) (San Mateo County Water Pollution Prevention Program [SMCWPPP], 2020a) and the *Sustainable Streets Master Plan* (SSMP; C/CAG, 2021b), available *Storm Drain Master Plan* (SDMP) and *Green Infrastructure Plan* (GI Plan) information, and the Bay Area Water Supply and Conservation Agency (BAWSCA) *Long-Term Reliable Water Supply Strategy* (BAWSCA, 2015). The Collaborative Regional scenario is examined using outputs from analyses conducted for the Project by Craftwater Engineering (Craftwater), which has produced optimized opportunities for regional stormwater capture projects countywide.

2.3 Objective-Based Metrics and Evaluation Factors

The metrics or evaluation factors that have been used to compare the benefits associated with each scenario for the identified objectives are provided in Table 1. Given the retrospective nature of the use of prior analyses and plans, not all objectives under the "Jurisdiction-by-Jurisdiction" scenario have corresponding metrics to those developed through new modeling results for the Collaborative Regional scenario.

Table 1: Metrics Corresponding with Identified Project Objectives

Objective	Jurisdiction-by-Jurisdiction Scenario		Collaborative Regional Scenario
	Proposed Metrics/Evaluation Factors	**Source**	**Proposed Metrics/Evaluation Factors** (*all developed through the Project*)
More Efficiently Use **Limited Resources**	• Costs (Capital and O&M)	• Refer to Section 3.4 for cost discussion • Countywide RAA	• Costs (Capital and O&M)
Support Improvements to Alleviate Strain on **Existing Stormwater Infrastructure**	• SDMP upgrades needed to address localized flooding (and associated grey costs)	• C/CAG Member Agencies SDMPs	• Peak flow reduction and/or lag to peak on watershed scale • Volume retention by watershed
Cost Effectively Comply with **Water Quality** Regulatory Requirements	• PCBs load reduction • Acres "greened" or treated • Volume Managed	• Countywide RAA • GI Plans	• PCBs load reduction • Acres "greened" or treated • Volume managed
Supplement County **Water Supply** Portfolio with Stormwater, Where Feasible	• Estimated stormwater capture through rainwater harvesting programs (i.e., rain barrel rebates)	• BAWSCA Long-Term Reliable Water Supply Strategy	• Volume recharged (where usable aquifers), offset/onsite use, and reclaimed, by watershed • Stormwater supply offset (%)
Consider and, Where Appropriate, Design for Projected Future Impacts Resulting from **Climate Change**	• Green Infrastructure Climate Change Offset	• SSMP	• Regional Projects needed to achieve volume managed by green streets modeled for SSMP
Consider Local **Community Benefits** and Concerns in Project Implementation	• Qualitative evaluation	• --	• Parks and public facilities identified as potential regional project location
Site and Design Projects to **Equitably** Serve and Protect Communities	• Quantify proportion of above metrics/factors (as feasible given available plans) realized in DACs	• Analyzed geospatially through the project	• Quantify proportion of above metrics/factors realized in DACs
Maximize **Other Benefits**, Where Possible	• Qualitative Evaluation	• --	• Qualitative Evaluation

Notes: DACs = Disadvantaged Communities; O&M = operations and maintenance; PCBs = polychlorinated biphenyls

2.4 Greened Acres and Other Stormwater Quality Treatment

This Business Case examines the benefits of stormwater capture projects for a number of different metrics. One such metric is "greened acres". This Business Case defines greened acres as treatment of stormwater runoff through green stormwater infrastructure (GSI) sized per the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) requirements, or "GSI-equivalent" treatment. While there are many benefits associated with GSI and the greened acres treated, including but not limited to habitat, aesthetic benefits, and evapotranspirative cooling through vegetation and pollutant removal through soil media, other "non-GSI" treatment measures can provide substantial water quality benefits and are often less costly than GSI.

2.4.1 GSI and Greened Acres

GSI has been specifically defined by the SFBRWQCB Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP; Order R2-2015-0049) and subsequent documents released by the SFBRWQCB. Permittees were required by MRP Provision C.3.j to develop a Green Infrastructure Plan to identify how GSI would be implemented in permittee jurisdictions through Regulated Projects and retrofits. The Green Infrastructure Plan was required to include a "Requirement(s) that projects be designed to meet the treatment and hydromodification sizing requirements in Provisions C.3.c. and C.3.d."

Provision C.3.c requires low impact development (LID) standards be met through projects. MRP Provision C.3.d requires LID/GSI measures be designed to meet the Volume Hydraulic Design Basis (i.e., "the volume of annual runoff required to achieve 80 percent or more capture" or equivalent) or the Flow Hydraulic Design Basis. Facilities that are space constrained (i.e., street projects) may use the Bay Area Stormwater Management Agencies Association (BASMAA) *Guidance for Sizing Green Infrastructure Facilities in Street Projects with companion analysis: Green Infrastructure Facility Sizing for Non-Regulated Street Projects* (BASMAA, 2019) to size facilities slightly smaller than the Volume Hydraulic Design Basis.

GSI retrofit requirements are expected to be included in the MRP reissuance and will likely require consistency with Provisions C.3.c and C.3.d, including the specific facility types and sizing requirements. For this Business Case memorandum, "GSI-equivalent" treatment that provides greened acres includes infiltration, capture and use, biofiltration/biotreatment (through a non-proprietary biofilter), and diversion to sanitary sewer, per the current MRP and other documents from the SFBRWQCB.

2.4.2 Other Stormwater Quality Treatment

Other stormwater quality treatment measures that are not considered to be GSI treatment are not considered to produce "greened acres" per this Business Case; however, these facilities provide substantial other water quality benefits, including reduction of trash, sediment, and other pollutants. There are Total Maximum Daily Loads (TMDLs) for PCBs and mercury for the San Francisco Bay that require these pollutants to be reduced, and non-GSI may be used to achieve TMDL pollutant load reductions.

For this Business Case, large detention facilities that do not infiltrate, non-vegetated media filters, and full trash capture devices are not considered GSI-equivalent. Standard proprietary tree-box-type biofilters are also not considered to be GSI treatment (BASMAA, 2016). One example of a tree-box-type proprietary biofilter that is considered non-GSI is the BioClean Wetland Modular System (SFBRWQCB, 2019). Notably, some locations in California allow for proprietary biofilters to be considered GSI; for example, the Los Angeles Regional Water Quality Control Board has issued approvals of proprietary biofilters under their Alternative Biofiltration Specification (LARWQCB, 2021).

2.5 Optimized Regional Stormwater Capture Projects

Craftwater conducted a regional stormwater facility identification and optimization exercise to identify facilities that could provide benefits in line with the objectives. As a result of their analysis, 74 potential regional facility locations and the associated proposed facility types were identified. This optimized suite of potential facilities was modeled by Craftwater to estimate for each facility:

1. A cost-optimized storage volume.
2. Resulting average annual volume managed (i.e., captured).
3. Total PCBs load reduced annually.
4. "Acres greened," calculated as the percent of the average annual runoff volume captured by the facility, multiplied by the impervious area within the facility drainage area.[1]
5. Peak flow reduction and volume capture for the 10-year, 24-hour event.
6. Potential water supply benefit, based on infiltration feasibility (100% of captured volume assumed to be available as water supply) or potential to divert to the sanitary sewer upstream of a publicly owned treatment works (POTW) recycled water facility (33% of captured volume assumed to be available as water supply).
7. Planning level cost estimates.
8. Potential aggregate area of medium, high, or very high trash generation areas in project drainage area and aggregate area of Caltrans area in project drainage area.

Additional details regarding Craftwater's methods and results are provided in the County of San Mateo Advancing Regional Stormwater Capture Projects Project Opportunities Analysis Memo (Craftwater, 2021b, currently DRAFT). The results of Craftwater's analysis were transmitted to

[1] For this memorandum, this calculation is how "acres greened," or acres treated equivalently to the MRP-defined Volume Hydraulic Design Basis or Flow Hydraulic Design Basis through GSI-equivalent measures, are assumed for facilities achieving less than 80% capture. For individual facilities, the calculation of "greened acres" may require further discussion with the SFBRWQCB and/or additional hydrologic and water quality modeling in later stages of design to demonstrate equivalency.

Geosyntec through delivery of spreadsheets and other data (Craftwater, 2021a) and are referenced in section 4 as the "optimized regional projects" results. These results were used to define the Collaborative Regional scenario for the Business Case. These results are considered generally representative of the Collaborative Regional scenario but are still preliminary. Further refinement of the identified regional project opportunities is ongoing, and additional, more detailed modeling will be conducted for those projects that are ultimately constructed.

2.6 Regional Stormwater Capture Project Case Studies

Three regional stormwater capture projects were identified in the San Mateo County *Stormwater Resource Plan* (SRP; SMCWPPP, 2017). Of these, Orange Memorial Park in South San Francisco is moving forward to construction and is summarized herein. The other two regional projects are not included in this Business Case. One opportunity (Holbrook-Palmer Park in Atherton) has since been determined not to be feasible, and the concept for the other project (Twin Pines Park, Belmont) has changed substantially from the SRP. Since the SRP, two additional regional stormwater capture project concepts were identified and are also moving forward into design and construction phases; these two projects are included in this Business Case. The three projects summarized include:

- **Orange Memorial Park, South San Francisco** – This project, currently under construction, will divert flow from Colma Creek for treatment, beneficial reuse, and local flood reduction. The project includes a large grit/trash removal chamber, a cistern accompanied by an advanced filtration and disinfection system, and infiltration gallery (City of South San Francisco and Lotus Water, 2021).
- **Red Morton Park, Redwood City** – The project, currently in design, would divert runoff from the existing channel to a subsurface storage facility. The project is proposed to include some non-potable reuse and flow-through water quality treatment (City of Redwood City, 2021).
- **Caltrans Right-of-Way at I-280 and I-380 Interchange** – The project, currently in preliminary design, is proposed to include a subsurface infiltration gallery (SMCWPPP, 2020a).

A summary of the three regional projects is provided in Table 2, including: the total tributary drainage area and impervious portion of the drainage area; the storage volume; the facility cost; and the source of information for the facility. A summary of the potential benefits achieved through the projects, as provided in existing reports and documents, is included in Table 3. Table 3 includes: the facility volume managed; the percent capture; the "equivalent" drainage area (i.e., portion of the total drainage area multiplied by the facility percent capture) and equivalent impervious drainage area; the estimated annual PCBs load reduced; the "acres greened" (i.e., portion of drainage area assumed treated by GSI-equivalent treatment); and the annual water supply provided.

Similar to the optimized regional projects, when capture is less than 80% average annual runoff volume, equivalent "greened acres" were calculated as the percent capture of the average annual runoff volume times the impervious area within the drainage catchment for the treatment that is GSI-equivalent (i.e., infiltration, capture and use, biofiltration, and diversion to sanitary sewer). The current design for the Red Morton Park includes detention, some capture and use, and treatment through a proprietary biofilter or cartridge media filter prior to returning treated flows to the adjacent channel.

Table 2: Summary of Previously Identified Regional Projects at Varying Stages of Implementation in San Mateo County

Regional Project	Implementation Stage	Total Tributary Drainage Area (acres)	Total Impervious Tributary Drainage Area (acres)	Total Tributary Average Annual Runoff (ac-ft/yr)	Design Alternative	Storage Volume (ac-ft)	Estimated Capital Cost	Estimated O&M Cost	Source
Orange Memorial Park, South San Francisco	Under Construction	6,577	2,565	4,000	n/a	0.6 (cistern) 4.9 (infiltration gallery)	$15.5 million	$500,000 for first year[1]	City of South San Francisco and Lotus Water (2021)
Red Morton Park, Redwood City[2]	Preliminary Design Alternatives	1,682	409	529	Project Alternative 1 - 85th Percentile Alternative	9.5	$12.2 to $14.9 million[3]	$151,670 per year	City of Redwood City (2021)
					Project Alternative 2 - Single Field Maximization	23.5	$28.2 to $31.5 million[3]		
Caltrans I-280 @ I-380, San Bruno	Concept Design	942	254	n/a	n/a	21	$19.6 million	n/a	SMCWPPP (2020a)

[1] Obtained per e-mail communication with South San Francisco (2021).
[2] A third option is being considered that would include 30 acre-feet of storage and cost $35.6 to $38.9 million. This option entails a two-phase approach that would extend the project footprint of Project Alternative 1 or 2 to include another facility under an adjacent field.
[3] Cost estimate range for gravity diversion and pump diversion, respectively.
ac-ft/yr = acre-feet per year
ac-ft = acre-feet

Table 3: Identified San Mateo County Regional Projects – Benefits Estimated

Regional Project	Design Alternative	Volume Managed (GSI and non-GSI) (ac-ft/yr)	Equivalent Impervious Tributary Drainage Area (GSI and non-GSI) (acres)	Estimated PCBs Load Reduction (g/year)	Percent Average Annual Runoff Captured Through GSI Equivalent Treatment	Acres Greened (acres)	Water Supply (ac-ft/yr)	Source
Orange Memorial Park, South San Francisco	n/a	640	969	10	7%	424[1]	240 (groundwater recharge) + 40 (irrigation)	City of South San Francisco and Lotus Water (2021)
Red Morton Park, Redwood City	Project Alternative 1 - 85th Percentile Alternative	310	240	6.2	2%	9[2]	11.6	City of Redwood City (2021)
	Project Alternative 2 - Single Field Maximization	374	289	7.8	2%	9[2]	11.6	
Caltrans I-280 @ I-380, San Bruno[2]	n/a	226	254	8	100%	254	Potential to irrigate adjacent parks and cemetery. Infiltration feasibility to be determined.	SMCWPPP (2020a)

[1] Acres greened calculated for Orange Memorial Park was based on assumption that 44% of the equivalent impervious tributary drainage (969 acres, provided by City of South San Francisco and Lotus Water, 2021) was treated with GSI-equivalent facilities (i.e., 16% watershed runoff diverted in total, 7% of watershed runoff treated through GSI-equivalent treatment).
[2] Acres greened calculated based on percent of average annual runoff treated through GSI-equivalent treatment, i.e., capture and use.
[2] The Caltrans I-280 @ I-380 project was assumed to provide 80% capture (i.e., capture of the 85th percentile, 24-hour storm event) through infiltration.
g/year = grams per year

3. BUSINESS CASE COMPARISON BY OBJECTIVE

This section provides the details of the Business Case. Metrics corresponding with objectives are compared for the Jurisdiction-by-Jurisdiction scenario and the Collaborative Regional scenario. The input for the Jurisdiction-by-Jurisdiction scenario has been compiled from various existing reports and resources, cited herein. The information for the Collaborative Regional scenario has been compiled from the identified San Mateo County regional projects (Table 2 and Table 3) and the results from the optimized regional projects modeling conducted by Craftwater.

3.1 More Efficiently Use Limited Resources

A key challenge for C/CAG member agencies is limited resources, specifically dedicated funding, for storm drain infrastructure and stormwater quality needs. Efficient use of limited resources can make the dollars that are available go farther. One way to use resources efficiently is to construct facilities that achieve multiple objectives and cost less than other options. To examine this, costs used for this Business Case analysis have been compiled from existing and new sources. These include cost estimates included in the *PCBs and Mercury Total Maximum Daily Load (TMDL) Control Measure Implementation Plan and RAA for San Mateo County* (TMDL Control Measure Plan; SMCWPPP, 2020b); statistical analyses of available GSI cost data conducted by Geosyntec in 2018 to examine costs of GSI at varying scales and additional data points from Southern California (Geosyntec, 2018); estimated costs for identified San Mateo County regional projects at varying stages of implementation (Table 2); San Mateo County Integrated Safe Routes to School and Green Infrastructure Project costs (C/CAG, 2021c); and the optimized regional project planning level cost output (Craftwater, 2021a). A summary of the costs from each of these sources is provided in Attachment A. The capital and operations and maintenance (O&M) cost estimates used in this Business Case are summarized in the following sections.

3.1.1 Capital Costs Used in Analysis

The costs used in the analysis and the justification for using these costs are provided in Table 4 and discussed below.

Table 4: Unit Capital Costs Assumed for Business Case

Facility Type	Cost or Range	Unit	Sources
Parcel-based or "Other GSI"	$165,000	Cost per impervious acre treated[1]	TMDL Control Measure Plan, escalated to 2021 dollars
Green Streets	$230,000 - $301,000	Cost per impervious acre treated[1]	TMDL Control Measure Plan, escalated to 2021 dollars, San Mateo County Integrating Safe Routes to School, and Green Infrastructure Project costs
Regional Projects	Varies	Varies depending on metric examined	Most Recent San Mateo County Regional Project Information
	Average $69,000	Cost per greened acre	Craftwater Analysis

[1] Assumed treated per the MRP Volume Hydraulic Design Basis or Flow Hydraulic Design Basis and therefore equivalent to "cost per greened acre" for the purposes of this business case.

- **Parcel-based or "Other GSI"** – when parcel-based or "Other GSI" costs are identified, the parcel-based average cost per treated acre identified in the TMDL Control Measure Plan, escalated to 2021 dollars, is used for consistency with that Plan (see Attachment A). While this is presented in the statistical summary as "cost per acre treated", it has been applied as "cost per impervious acre treated" in this analysis. This assumption is considered reasonable given the typically highly impervious nature of the drainage areas in parcel-based projects.
- **Green Streets** – Local San Mateo County Integrated Safe Routes to School and Green Infrastructure Project cost data (average of $301,000 per impervious acre treated) is reflective of current implementation costs (a summary of this data is provided in Attachment A). However, a cost range is provided to allow for the potential for cost efficiencies over time and for consistency with the cost identified in the TMDL Control Measure Plan, escalated to 2021 dollars (see Attachment A). The TMDL Control Measure Plan unit cost is presented as "cost per acre treated," but this is applied as "cost per impervious acre treated", which is reasonable given the highly impervious nature of green streets projects.
- **Regional Projects** – Regional project costs used in the Business Case are those estimated by the optimized regional project analysis where those potential facilities are referenced; or the estimated costs of San Mateo County regional projects, where those identified facilities are referenced, scaled based on the benefit provided. See Attachment A for a statistical summary of Craftwater model-estimated optimized regional project costs; the average cost per greened acre is provided in Table 4 for reference. Estimated costs associated with San Mateo Regional Projects moving forward in design and construction are summarized in Table 2.

Comparing the optimized regional project cost (an average of $69,000 per greened acre) to costs associated with parcel-based facilities and green streets projects, regional projects are generally

significantly less expensive to implement on a per acre treated basis. As shown in Table 4, the cost per greened acre for regional projects is approximately 40% of the cost of parcel-based facilities and approximately 25% to 30% of the unit cost of green street projects.

3.1.2 Operations and Maintenance Costs

In addition to capital costs savings, O&M cost savings should also be realized through the use of regional projects. O&M costs used in this Business Case are summarized in Table 5. Estimated O&M costs for the identified San Mateo County regional projects are included in Table 2. Although regional projects can have greater facility-specific O&M costs, cumulative O&M costs on a countywide scale should be less because fewer projects would be implemented for the same overall benefit. Regional collaboration approaches would allow for pooling of maintenance funds for regional facilities to allow for additional efficiencies and consistency (also see Section 5.1).

TMDL Control Measure Plan Costs

The TMDL Control Measure Plan referenced Geosyntec's 2018 suggested O&M cost of approximately 4% of the capital cost of these facilities (SMCWPPP, 2017). The resulting annual O&M costs used in the TMDL Control Measure Plan are summarized in Table 5 and have been escalated to 2021 costs where applicable.

Table 5: TMDL Control Measure Referenced O&M Costs

Control Measure	Unit of Implementation	2018 Dollars	2021 Dollars	Units	Source
GI - Private/Parcel-based Redevelopment	Acres treated	$6,120	$6,610	$ per acre treated per year	Geosyntec 2018
GI - Public Right of Way Retrofits (Green Streets)	Acres treated	$8,520	$9,200	$ per acre treated per year	Geosyntec 2018
GI - Regional Projects	Acres treated	$4,040	$4,360	$ per acre treated per year	Geosyntec 2018

The 4% of capital costs value assumption for O&M is consistent with the assumed O&M for the Orange Memorial Park project, which is estimated to have a first year O&M cost of $500,000 (City of South San Francisco, 2021) or a little more than 3% of capital costs. The Red Morton Park Preliminary Design Report indicates an O&M cost of $151,670 per year, which is approximately 1% or less of the capital costs, depending on design alternative (City of Redwood City. 2021).

3.2 Support Improvements to Alleviate Strain on Existing Stormwater Infrastructure

As summarized in the Drivers and Objectives Report, storm drain infrastructure improvements costing hundreds of millions of dollars have been identified as needed to alleviate flooding and capacity issues with existing storm drains. The following table summarizes the costs identified in available plans for necessary infrastructure improvements, broken down by high, medium, and low priority projects, where available, along with dedicated stormwater fee revenue, if any[2].

Table 6: Summary of Storm Drain Master Plan Costs and Dedicated Revenue

	Date of Study	Storm Drain Master Plan Cost (total) [1]	High Priority Projects[1]	Med Priority Projects[1]	Low Priority Projects[1]	Dedicated Annual Revenue[1]
Atherton	2015	$45	$18	$24	$3	$0.000
Belmont	2009	$57	$13	$13	$31	$0.300
Brisbane	2003	$20	$15	$3	$2	$0.055
East Palo Alto	2014	$39	$31	$5	$3	$0.125
Hillsborough	2015	$58	$26	$14	$18	$0.030
Menlo Park	2003	$39	$23	$16		$0.335
Millbrae	2018	$42	$3	$30	$9	$0.240
Pacifica	2012	$11	$9	$2		$0.178
San Bruno	2014	$26	$19		$7	$0.575
San Carlos	2017	$56	$43	$13		$0.435
San Mateo (City)	2004	$57	$33	$16	$8	$0.000
South San Francisco	2016	$54	$23	$27	$4	$0.425
Total		**$504**	**$256**	**$163**	**$85**	**$3**

[1] All values in $ millions.

Multi-benefit regional stormwater capture projects can be designed to capture portions of smaller flood events, including the peak flow if capacity is available. When these regional projects are upstream of needed storm drain improvements, such as those identified in SDMPs across the County, they may be able to reduce the investment needed for downstream infrastructure improvements. Some of the optimized regional projects are estimated to provide peak flow reduction and volume capture for the 10-year, 24-hour flood event (Craftwater, 2021a).

[2] Many of these master plans were completed five or more years ago, and listed costs are not escalated to current dollars. In addition, many member agencies do not have storm drain master plans, or they were not available for review for the purposes of this report.

All 74 optimized regional projects are estimated to manage runoff during the 10-year, 24-hour storm event. The regional projects are estimated to manage between 3% and 100% of the 10-year, 24-hour storm event. In addition, 39 of the optimized regional projects are estimated to reduce 10-year, 24-hour peak flows, with reductions ranging from 0.03 to 58.5 cubic feet per second (cfs), managing <1% to 68% of the peak flow.[3] Facilities that can manage a significant portion of 10-year, 24-hour peak flow could alleviate some downstream flooding during these storm events.

The cost offset of this benefit cannot be quantified for the optimized regional projects, as the flood management benefits would be modeled more accurately at a later design stage, and the resulting avoidance of downstream storm drain improvements identified at that time. However, this benefit could be considered an additional cost offset on top of the other benefits achieved through the cost of the facility (i.e., pollutant load reduction, acres greened, and water supply). As described in the following section, the estimated benefits of the Regional Stormwater Capture Project at I-280/I-380 demonstrate how these cost offsets could be realized.

3.2.1 Regional Project Case Study

One example of an identified San Mateo regional project that is anticipated to provide SDMP cost offset is the Regional Stormwater Capture Project at I-280/I-380, located in the City of San Bruno. In the San Bruno SDMP (City of San Bruno, 2014), the City of San Bruno identified two potential improvements to alleviate flooding along 7th Avenue: a detention basin in Crestmoor Canyon costing an estimated $2.9 million or approximately one mile of storm drain improvements downstream of Crestmoor Canyon in the vicinity of I-380 between I-280 and CA-82 (El Camino Real), entailing upgrades of undersized pipes in the area. The estimated cost of the storm drain improvements was $10.9 million in 2014 dollars (City of San Bruno, 2014). Preliminarily, it is thought that the regional stormwater capture project, just downstream of Crestmoor Canyon, in addition to providing other water quality and possible water supply benefits, could provide some upstream detention to reduce some of the downstream impacts.

3.3 Cost Effectively Comply with Water Quality Regulatory Requirements

As described in the Drivers and Objectives Report, C/CAG member agencies are subject to the MRP as well as TMDLs for PCBs and mercury for the San Francisco Bay (Bay), for Bay-draining jurisdictions; and sediment and bacteria for certain Pacific Ocean-draining creeks and adjacent lagoons and beaches. There is also a Diazinon and Pesticide-Related Toxicity TMDL for San Francisco Bay Urban Creeks, however, this is primarily addressed through outreach and source control. PCBs TMDL load reduction goals, greened acres, and trash reductions are discussed in this section.

[3] In some cases, the regional projects treat (i.e., manage) runoff for the 10-year, 24-hour event, but discharge the runoff relatively quickly, hence the peak flow is not managed. This is why the volume managed may look much higher than the peak flow reduction.

3.3.1 PCBs TMDL

Bay-draining portions of San Mateo County are subject to the San Francisco Bay PCBs TMDL. A total PCBs load reduction of 1.5 kilograms per year (kg/year) is required to be achieved in urban stormwater discharges from Bay-draining San Mateo County permittees by 2030, per the TMDL Control Measure Plan. The MRP (Provisions C.11 and C.12) required Permittees to develop an RAA that quantitatively demonstrates that proposed control measures will result in sufficient load reductions of PCBs and mercury to meet the municipal stormwater wasteload allocations (WLAs) for the San Francisco Bay PCBs and mercury TMDLs, as well as reduce a certain portion of PCBs load by 2040 through GSI. Actions required to achieve the PCBs TMDL WLAs were analyzed and summarized in the TMDL Control Measure Plan (SMCWPPP, 2020b).

PCBs Load Reduction Through GSI by 2040 Goal

A portion of the overall load reduction required to achieve the PCBs WLA should be addressed through GSI. For San Mateo County, 230 g/year should be reduced through GSI by 2040, as described in the TMDL Control Measure Plan. After accounting for existing projects and future redevelopment, an estimated additional 96 g/year of PCBs should be reduced through GSI by 2040 at a minimum in San Mateo County. Some portion of this will be reduced through regional stormwater capture projects that are already moving forward in the County (summarized in Section 3.2). The amount estimated to be reduced through regional projects in the RAA included the Holbrook-Palmer Park in Atherton project assumed in that report, which ultimately is not moving forward.

Per the RAA, the remaining approximately 25-30 g/year (assumed to be 30 g/year for this Business Case to be conservative) that should be reduced through GSI by 2040 (i.e., remaining load reduction needed after assuming concept-level load reductions for the five regional projects assumed in the RAA) were suggested to be addressed through green streets projects (SMCWPPP, 2020b; Figure 4-1). The RAA looked at cohesive sediment reduction to estimate GSI treatment needs and calculated the needed capacity of green streets and other GSI projects for two implementation scenarios to achieve the PCBs load reduction through GSI by 2040 goal: (1) a proportional jurisdiction-based approach and a countywide approach. The required capacities estimated by the RAA are summarized in Table 7 below. Also estimated in Table 7 is the extrapolated impervious acres treated, based on the average acres treated per acre feet GSI capacity provided in Table 9-1 of the RAA (SMCWPPP, 2020a), along with the total estimated cost of the GSI facilities.

Table 7: Estimated Cost of Additional Green Streets and Other GSI Required to Achieve PCBs Load Reduction Through GSI by 2040 Goal

RAA Scenario Modeled	Green Streets Capacity Required (ac-ft)	Additional GSI Capacity Required (ac-ft)	Impervious Acres Treated per acre-feet capacity (acres/ac-ft)	Total Equivalent Impervious Acres Treated[1] (acres)	Total Estimated Cost of Required GSI[2] ($)
Jurisdiction-Based	112.1	11.8	9.1	1,122	$251 million – $324 million
Countywide	93.9	4.3	9.4	927	$209 million – $272 million

[1] Calculated based on the total treated impervious acres and the total GSI facility capacity provided in Table 9-1 of the RAA.
[2] Calculated using the range of average cost per impervious acre treated provided in Table 4.

For comparative purposes, this analysis will focus on the 30 g/year identified as required to be achieved through GSI by the TMDL Control Plan. The optimized regional projects modeling results demonstrate that approximately 30 g/year could be achieved with far fewer regional facilities and at a considerably lower cost. Of the top 12 Bay-side prioritized regional projects from the 74 identified, 10 are estimated to achieve more than 11 g/year of PCBs load reduction each (Craftwater, 2021a). If three of these top prioritized facilities were ultimately implemented, they would likely provide sufficient pollutant capture to meet the 30 g/year PCBs load reduction needed. A summary of the costs to achieve the 30 g/year through the Jurisdiction-Based RAA Scenario versus the Optimized Regional Scenario is provided in Table 8.

Table 8: Cost per gram of PCBs Reduced by Scenario

RAA Scenario Modeled	Total Estimated Cost to Achieve 30 g/year PCBs load Reduction[1]		Cost per gram PCBs reduced[1]	
	Low	High	Low	High
Jurisdiction-Based through GSI by 2040 in RAA	$251 million	$324 million	$8.4 million	$10.8 million
Optimized Regional	$5.4 million	$59.1 million	$121,000[2]	$2.0 million

[1] Per cost range analyzed, see Table 4.
[2] Cost per gram removed based on most efficient modeled regional project, a single project which is estimated to remove 45 grams per PCBs per year at a cost of $5.4 million.

Implementation of the optimized regional project approach is estimated to cost 75% to 95% less than the jurisdiction-based approach to achieve the same load reduction. The cost per gram per year calculations account only for the water quality associated benefits and does not account for the value of other benefits being achieved through these regional facilities.

TMDL Wasteload Allocation

Beyond the MRP required PCBs load reduction through GSI by 2040 goal, the TMDL WLA must also be achieved. San Mateo County has a WLA of 0.2 kg/year and an estimated required load reduction of 1.5 kg/year. The TMDL Control Measure Plan estimated the total PCBs load reductions achieved through source control measures, full trash capture systems, and GSI planned to be implemented as part of new and redevelopment projects. Based on the estimates included in the TMDL Control Measure Plan, some additional load reduction would be required beyond these measures to achieve the WLA. The remaining load reduction needed requires additional measures to address. The estimated load reduction achieved through source controls and development projects, along with the proposed control measures to achieve the remaining "gap," is shown in Figure 4-2 from the TMDL Control Measure Plan.

PCBs and Mercury TMDL Control Measure Implementation Plan and RAA for San Mateo County

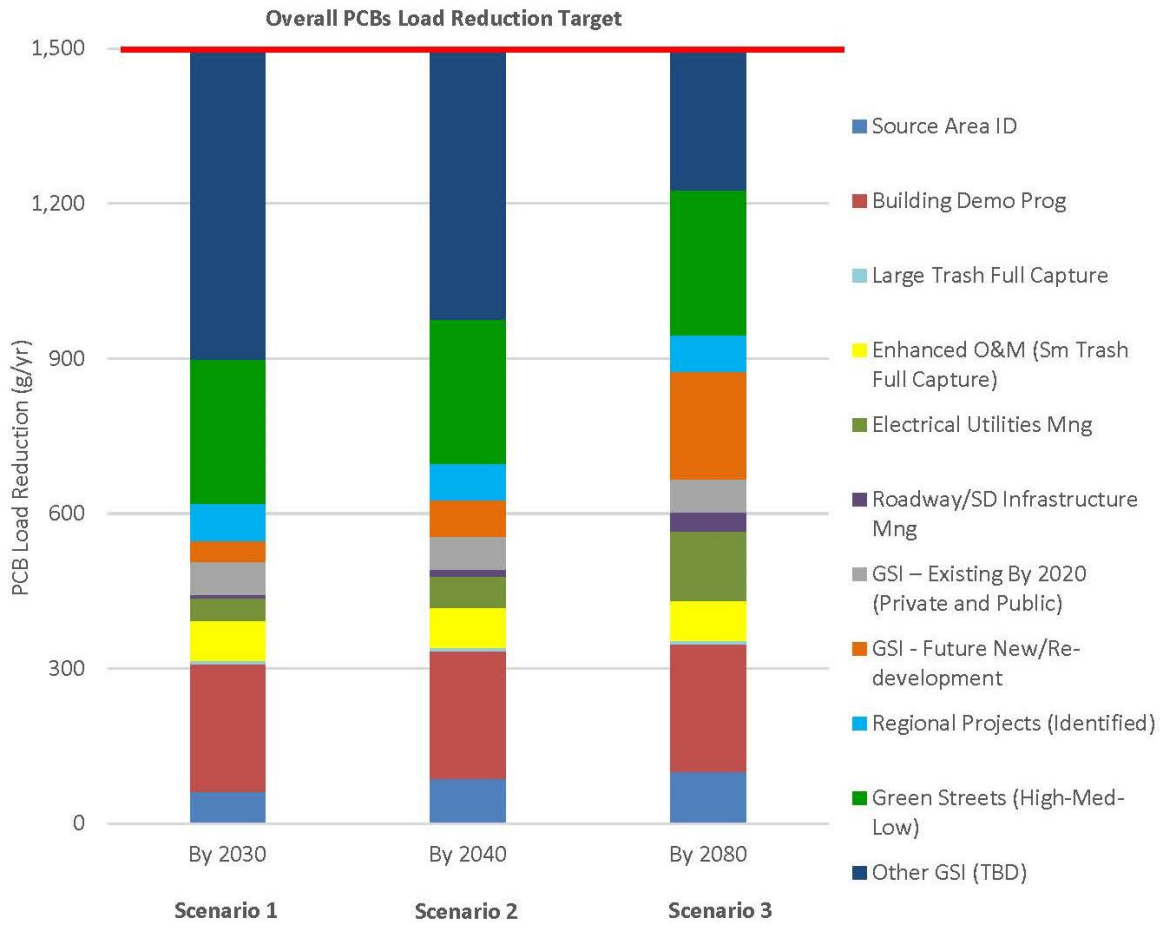

Figure 4-2. Scenarios for combinations of control measures projected to achieve San Mateo County PCBs TMDL load reduction target (i.e., 1.5 kg/yr) by 2030, 2040 and 2080.

Figure 1: Scenarios for PCBs Reducing Control Measures from SMCWPPP (2020b)

The load reduction proposed to be achieved by identified regional projects, green streets, and other GSI (to be determined) is inclusive of the PCBs load reduction through GSI by 2040 goal. In the control measure plan, the additional public GSI required to achieve the load reduction by 2030, 2040, and 2080, along with the costs, was estimated. A summary of the TMDL Control Plan findings is provided in Table 9.

Table 9: Estimated TMDL GSI Implementation Needs from TMDL Control Plan (SMCWPPP, 2020b)

Year	Area Treated (acres)	PCBs Loads Reduced (g/year)	Capital Cost	Cost per Gram	Ongoing O&M Cost
2030	8,341	0.95	$1.14 billion	$1.2 million	$46 million
2040	7,930	0.87	$1.1 billion	$1.3 million	$44 million
2080	4563	0.62	$760 million	$1.2 million	$30 million

The PCBs load reduction efficiency must be very high to achieve these targets, in both PCBs reduced per acre treated as well as cost per gram of PCBs removed. A number of the optimized regional projects identified could provide this level of PCBs removal efficiency.

3.3.2 Acres Greened

The RAA output identified projects with a total of 385 ac-ft capacity in 196 subwatersheds within 20-member agency jurisdictions to achieve the required PCBs load reduction through GSI by 2040 goal. These 385 ac-ft capacity projects will manage (capture) 4,493 ac-ft of stormwater runoff per year on average. Of that, 124 ac-ft is required in green streets and other GSI, or a total of 1,122 greened acres.

To achieve equivalent to 1,122 greened acres, approximately three to five of the 74 optimized regional projects would be needed. When examining the top 14 prioritized projects identified, the average greened acres per facility is 320 acres (assuming that GSI-equivalent treatment is provided) (Craftwater, 2021a). In addition to providing equivalent capture of stormwater runoff in many fewer facilities (allowing for cost efficiencies for capital and O&M costs), these optimized facilities provide additional benefits.

Regional Project Case Study
The Orange Memorial Park project is proposed to provide trash and sediment capture and treatment to an equivalent impervious treatment area of 969 acres and GSI-equivalent treatment to 424 acres of those impervious acres via capture and non-potable reuse or infiltration. With a total project cost of $15.5 million, the cost per greened acre is estimated to be $37,000. This calculation does not isolate the costs associated with the portion of runoff just receiving sediment and trash capture; the true cost per greened acre is likely lower when considering the costs associated with that treatment separately.

3.3.3 Trash Capture

Trash management is a requirement per Provision C.10 of the MRP, which requires substantial trash load reductions. Where visual inspections demonstrate that full trash management systems must be installed, these facilities must meet requirements for screening (i.e., trapping of particles retained by a 5-millimeter mesh screen) and design sizing (i.e., the 1-year, 1-hour storm event

peak flow rate). GSI facilities, including bioretention, capture and use systems, and infiltration facilities, are considered certified multi-benefit trash treatment systems by the State Water Resources Control Board (2019). This means that most to all of the GSI implemented in San Mateo County would be considered full trash capture. However, regional projects could provide additional trash reduction benefits through less expensive non-GSI portions of the treatment train. The optimized regional scenario examined the medium, high, and very high trash-generating areas in the project watersheds, and additionally examined the area owned by Caltrans in each project watershed. As Caltrans has programs for partnerships with local municipalities to reduce trash from Caltrans-owned area, these projects could provide a funding pathway. A summary of the trash-generating area and Caltrans area within projects identified as the most-downstream in the analysis is provided in Table 10.

Table 10: Potential Acreage of Trash Benefit through Optimized Regional Projects

Project Drainage Areas	Number of Optimized Regional Projects with Identified Area in Drainage Area[1]	Average Area in Project Drainage Area (acres)
Medium, High, and Very High Trash-Generating Area	24	95
Caltrans-Owned Area	44	172

[1] Represents most-downstream identified project opportunities only to avoid bias of averages from double counting.

Regional Project Case Study

The Orange Memorial Park project is proposed to provide sediment and debris capture and treatment to an equivalent impervious treatment area of 969 acres (the equivalent 1-year, 1-hour trash capture design storm is not fully captured by the project). Additionally, Caltrans is receiving 68 acres of full trash capture credit toward trash reduction compliance for the project.

3.4 Supplement County Water Supply Portfolio with Stormwater, Where Feasible

The BAWSCA Long-Term Reliable Water Supply Strategy identified that up to 680 ac-ft of supply could be achieved through rainwater harvesting (BAWSCA, 2015). The rainwater harvesting program represents an important incentive program that also acts as public education. The costs of the water supply achieved through the rainwater harvesting program are estimated by BAWSCA to range from $2,900/ac-ft to $4,800/ac-ft using an equipment life of 15 years and other assumptions.

Alternative water supply from stormwater could potentially be achieved more cheaply and at greater volumes through regional stormwater capture projects. Two pathways to supply—infiltration and sanitary diversion—were modeled through the optimized regional analysis. Because stormwater capture for direct use requires demand calculations, which take place at later stages of design, stormwater capture and use water supply benefits were not modeled.

Of the 74 optimized regional projects, a total of 46 were identified as having potential water supply benefits through infiltration or sanitary diversions. The average water supply provided through the most-downstream optimized regional facilities for each of these supply pathways (i.e., considering that some optimized regional project opportunities overlap) is provided in Table 14. As these facilities are primarily constructed to provide water quality benefits and often water supply infrastructure is a small additional cost, monetization of water supply provided could be considered cost savings realized through implementing these facilities.

Potential economic benefit is estimated for this Business Case by examining the water purchase cost of a water transfer, included as a potential water supply source in BAWSCA's *Bay Area Water Supply and Conservation Agency Long-Term Reliable Water Supply Strategy, Phase II*, costs $50 - $350 per ac-ft in 2015 dollars (BAWSCA, 2015). The water supply provided through the regional facilities could avoid or offset a water transfer and therefore the avoided cost is considered a monetary benefit of the facility. The cost of a water transfer per BAWSCA (2015) also includes East Bay Municipal Utilities District (EBMUD) wheeling costs, pump station and other operation costs, transmission pipeline fee, and San Francisco Public Utilities Commission (SFPUC) Wholesale Revenue Requirement, which are not incorporated into the cost savings estimated in this Business Case. This allows that there would likely be pumping, conveyance, and treatment costs associated with the stormwater alternative supply that may not fully offset the full cost of a water transfer, estimated at $935 - $1725 per ac-ft in 2015 dollars (BAWSCA, 2015). However, if some of these additional costs could be offset by capturing alternative supply locally, the water supply cost savings realized could be higher per ac-ft.

Table 11: Estimated Potential Water Supply Provided by Optimized Regional Projects

Water Supply Pathway	Number of Facilities Identified	Average Water Captured for Supply (average) (ac-ft/year)	Average Facility Water Supply Annual Cost Savings Based on Avoidance of Water Transfer[1]	
			Low (Avoids Water Purchase at $50/ac-ft)	High (Avoids Water Purchase at $350/ac-ft
Infiltration	11	118	$6,000	$41,000
Sanitary Diversion	35	297	$15,000	$104,000

[1] Cost savings includes offset of water purchase only. Cost offset could be higher if treatment and pumping/conveyance costs are lower than other cost aspects of water transfer. Cost kept in 2015 dollars for calculation in table. Cost rounded to nearest $1,000.

The ability to provide sanitary diversion for these projects will require additional coordination with local POTWs with recycled water operations (see Drivers and Objectives Report for additional information on these POTWs). Currently, many of the potential facilities are sited in areas with high underlying groundwater, hence the limited number of facilities that could provide infiltration benefit. However, if the local groundwater elevation was lowered due to increased use of groundwater, there could potentially be adequate separation to the groundwater table to allow for safe infiltration through these facilities.

As described, the modeling does not easily capture the potential for capture and use of stormwater, which is possible as another supply pathway for all of the projects summarized in Table 11, as well as for the other 28 optimized regional projects if non-potable demand is present. This additional potential water supply could be used for irrigation and other non-potable local uses and provide additional water supply cost offset.

3.4.1 Regional Project Case Studies

Water reuse is an important component of the Orange Memorial Park project, where approximately 15 million gallons (46 ac-ft) of potable water will be offset each year, resulting in an estimated savings of $140,000 annually. The reused water will be used to irrigate Orange Memorial Park, including the recreation fields, picnic area, and sculpture garden, as well as the adjacent Centennial Way Trail and Sister Cities Park.

In addition to irrigation benefits, the project overlies the Westside Groundwater Basin and an estimated 240 ac-ft of groundwater will be recharged annually. Since the Westside Basin is a water supply source for the California Water Service and SFPUC, the project has the potential to reduce the need and use of imported water. There is the potential for monetization of groundwater recharge.

Multi-benefits from the Red Morton Park project in Redwood City also include water reuse. The project concept includes the capture and use of stormwater for on-site irrigation as well as for toilet flushing in the park bathrooms. In addition, a fountain and surface recirculation has been proposed to provide aesthetic, habitat, and educational benefits as well as a means to keep water moving through the subsurface storage unit and prevent public health issues with standing water.

Groundwater infiltration at Red Morton Park was initially thought to be possible, but further investigation has shown that it is currently is infeasible largely due to the high underlying groundwater (currently at 10 feet below ground surface [ENGEO, 2021]). Prior to the use of imported water from the Hetch Hetchy Reservoir in the 1960s, the underlying groundwater basin (San Mateo Plain) was used for water supply (EKI, 2018). At the time of use, it is possible that water supplies were drawn down below sustainable levels (i.e., up to 90 feet in some places [EKI, 2018]). It is possible a managed aquifer recharge program with groundwater extraction for local potable or non-potable use could balance the depth of the aquifer and allow for safe infiltration of stormwater to the basin, providing that geotechnical conditions support infiltration. Based on the geotechnical examination of the site, Red Morton Park is underlain by expansive clay, so infiltration may not be feasible even with lower groundwater elevations (ENGEO, 2021).

Irrigation of neighboring parks (e.g., Commodore Park) and the Golden Gate National Cemetery is also being considered as part of the Regional Stormwater Capture Project at I-280/I-380 in San Bruno.

3.5 Consider and, Where Appropriate, Design for Projected Future Impacts Resulting from Climate Change

As part of the SSMP, Green Streets projects identified for the PCBs load reduced through GSI by 2040 RAA scenario (proportional by jurisdiction scenario) were modeled for 6-hour storm events corresponding to specific return frequencies. Historical 6-hour storm events and predicted larger 6-hour storm events (adjusted to account for climate change[4]) were modeled. Based on the analyses conducted for the RAA and the SSMP, an estimated depth of 0.015 inches can be captured by the identified green streets projects for the 2040 green streets implementation scenario at a countywide scale (C/CAG, 2021b; SMCWPPP, 2020a).

Craftwater conducted an analysis to examine a suite of identified optimized regional projects in the Bayside communities that could achieve equivalent volume capture to the green streets identified for the RAA scenario. The analysis assumed that capture and management of equivalent volume within the Bayside communities by regional projects could provide equivalent offset of increased precipitation to that demonstrated in the Sustainable Streets Master Plan (Craftwater, 2021a). This assumption would also require that the runoff be adequately conveyed to the regional facilities (i.e., capacity constraints in the storm drain network upstream of a regional facility could impact the ability of the facility to capture the increased volume).

The results of this analysis demonstrated that equivalent volume could be managed in a smaller total combined storage capacity and for lower cost. A summary of the comparison is provided in Table 12.

Table 12: Comparison of Estimated Facility Capacity Required for Equivalent Climate Change Offset to Green Streets Analyzed by SSMP

Scenario Modeled	Capacity Required (acre-feet)	Impervious Acres Treated (acres)	Total Estimated Cost of Required GSI ($)
Jurisdiction-Based through GSI by 2040 from RAA[1]	112.1	1,122	$251 million – $324 million
Optimized Regional	79.4	4,594	$95.2 million

[1] See Table 7.

In addition to providing offset for increases in larger return frequency storm events, the regional facilities provide other multiple benefits related to mitigation of climate change impacts. These include some management of larger flood events, including the 10-year, 24-hour storm peak flow, and water supply resiliency.

[4] Climate change scenarios modeled included a Representative Concentration Pathway (RCP) 8.5 scenario to year 2070.

3.6 Consider Local Community Benefits and Concerns in Project Implementation

Jurisdiction-by-jurisdiction implementation of green streets and other distributed GSI can provide benefits to adjacent communities, including heat island cooling and habitat through facility plant palettes, safety features, and public education. Green streets distributed throughout the County could provide wide coverage of such benefits.

Regional projects could also provide enhanced amenities for certain locations. Existing park locations or undeveloped parcels present opportunities to provide community amenities through park improvements as part of planning and installation. Six of the optimized regional projects opportunities are at existing parks, and 11 of them are proposed to be located in undeveloped parcels with the potential to be converted to a park.

3.6.1 Regional Project Case Studies

The regional projects moving forward at Orange Memorial Park and Red Morton Park provide examples of the community amenities that can be provided through these projects when implemented at a park location. At Orange Memorial Park, associated improvements include new artificial turf fields, scoreboards, and other features. At Red Morton Park, a recirculation stream feature is also proposed.

3.7 Site and Design Projects to Equitably Serve and Protect Communities

As described in the previous section, jurisdiction-by-jurisdiction implementation of green streets and other distributed GSI can provide benefits to adjacent communities. Implementation of GSI facilities in vulnerable communities and disadvantaged communities can sometimes face specific challenges, including but not limited to: lack of adequate public outreach, which can be especially true in multilingual communities; limited ability to site projects on the street due to community transportation and parking needs; and challenges with obtaining grant funds that require match (even when reduced match is allowable).

Regional projects implemented through a regional collaboration program could provide solutions to some of these concerns, including the ability for a larger, more focused public outreach budget, siting of facilities on parcels where they do not take up community parking spots, and fiscal benefits (also see Section 5.1).

The optimized regional facilities identified are also located within or near a number of the vulnerable communities identified as part of the SSMP (C/CAG, 2021b). Three of the vulnerable community datasets sited in the SSMP were investigated as part of the optimized regional projects modeling. Of the 74 projects, 43 of them would be located within ½ mile of a Metropolitan Transportation Commission (MTC) Community of Concern; 17 would be located within ½ mile of an American Community Survey Disadvantaged Community (DAC); and 71 would be located within ½ mile of a San Francisco Bay Restoration Authority (SFBRA)

Economic DAC. Sixteen projects would be located within ½ mile of communities identified by all three datasets.

Table 13: Optimized Regional Projects Located within ½ Mile of San Mateo County Vulnerable Communities

Vulnerable Community Dataset	Number of Identified Optimized Regional Projects within ½ Mile of Communities
MTC Communities of Concern	43
American Community Survey DACs	17
SFBRA Economic DACs	71
Located within ½ mile of DAC identified by all three datasets	16

Many of the MTC Communities of Concern, as well as vulnerable communities identified in the other datasets, are directly adjacent to flood-prone streams or located within the 100-year Federal Emergency Management Act Flood Plain. Twenty-three of the optimized regional facilities located within ½ mile of an MTC Community of Concern could provide some mitigation of the 10-year, 24-hour storm peak flow tributary to the facility, and nine could provide peak flow reductions greater than 25%, based on modeling results. These estimated peak flow reductions could provide some alleviation of flooding in these vulnerable communities.

Additional benefits to vulnerable communities provided by these facilities include coincident amenities, such as park, playfield, parking lot, and other infrastructure upgrades made as part of the implementation of regional projects, water supply benefits, including offset of nearby potable demand, and, for certain facility types, evapotranspiration-caused cooling effects due to installed vegetation.

3.8 Maximize Other Benefits, Where Possible

In addition to the benefits described in the previous sections, additional benefits are provided through these facilities. Regional projects that capture and retain or detain a portion of larger stormwater flows can also alleviate erosive flows in channels where this is a concern. Another example is sediment management, which has been the primary focus of the Orange Memorial Park project, for example. The regional project case studies are predicted to remove a considerable amount of sediment from the drainage area (e.g., approximately 100 tons/year at Orange Memorial Park and 112 tons/year at Red Morton Park, for the single field project alternative). Removal of sediment provides removal of entrained pollutants from downstream receiving water bodies, hence water quality benefits, and it can also provide added benefits due to the removal of the sediment itself. For example, the Orange Memorial Park project captures sediment that would have otherwise been discharged to San Francisco Bay via Colma Creek. Ongoing maintenance of Colma Creek includes dredging at multiple locations (SMCFSLRRD, 2021). The capture of this sediment could potentially reduce downstream dredging costs.

Beneficial reuse of this captured sediment is a possibility, though the sediment would require robust quality checks of physical and chemical characteristics[5] and the process is complicated regulatorily. Additional sediment is critically needed to protect Bay Area baylands and increase their resiliency. SFEI published *Sediment for Survival: A Strategy for the Resiliency of Bay Wetlands in the Lower San Francisco Estuary* in 2021, which estimates that many hundreds of million metric tons of sediment are needed to maintain tidal marshes and tidal flats in the Bay, which protect property and infrastructure and provide crucial habitat (Dusterhoff et al, 2021). A significant portion of this sediment is needed before the year 2050.

4. SUMMARY OF BUSINESS CASE

In general, the optimized regional projects implemented through the Collaborative Regional approach would cost less as compared to the Jurisdiction-by-Jurisdiction approach to achieve similar benefits. The cost savings achieved through the optimized regional projects are estimated to range from 60% to 90+% of the capital cost, and could provide additional cost offsets (e.g., monetization of water supply), depending on the specific objective. These regional facilities also provide increased opportunity for multiple benefits to be achieved by the same project, such as water supply and/or flood reduction benefits in addition to water quality and climate resiliency benefits.

Additional savings may be achieved through the Collaborative Regional approach by enabling streamlining of procurement, environmental review and outreach processes, construction, inspection, and operations and maintenance. The ability to leverage stormwater investment region-wide can also allow for programmatic approaches that can incorporate additional feature such as local workforce training and development.

A summary of the Business Case for all of the objectives is provided in Table 14 below. Project delivery considerations are described in section 4.1.

[5] Including examination of pollutant concentrations on sediment, which must be lower than regulatory thresholds.

Table 14: Summary of Business Case

Objective		Jurisdiction-by-Jurisdiction Scenario	Collaborative Regional Scenario
More Efficiently Use **Limited Resources**		Distributed GSI facilities cost about $165,000 per greened acre for parcel-based facilities and $230,000 to $302,000 per greened acre for green streets. O&M costs are estimated to scale with capital costs (e.g., 4% of capital costs estimated in Geosyntec, 2018).	Optimized regional projects are estimated to cost approximately $69,000 per greened acre, on average, a savings of approximately 60% - 75%. While individual regional facility O&M costs may be quite high, the O&M costs for these projects are expected to be lower on a per acre treated basis.
Support Improvements to Alleviate Strain on **Existing Stormwater Infrastructure**		Substantial grey storm drain infrastructure upgrades are needed to alleviate flooding concerns throughout member agency jurisdictions.	Regional projects may be able to provide some alleviation of flooding through retention and detention of smaller flood peak flows, potentially allowing for avoidance of some major infrastructure upgrades.
Cost Effectively Comply with **Water Quality** Regulatory Requirements	PCBs	Investment in green streets to achieve 30 grams of PCBs load reduction, for an average cost per gram removed of $8.4 million to $10.8 million.	Cost to achieve 30 grams of PCBs removal ranging from $120,000 per gram to $1.9 million per gram with an average of $1.0 million per gram for top 12 prioritized bay-side optimized regional projects (i.e., 75% to 95+% cost savings).
	Acres greened	A total of 1,122 greened acres would be required to meet the PCBs load reduction through GSI by 2040 goal. This would require 385 ac-ft capacity in 196 subwatersheds within 20-member agency jurisdictions.	Approximately 3-5 of the 74 optimized regional stormwater projects could be implemented to achieve 1,122 greened acres providing that GSI-equivalent treatment is included.
	Trash	Distributed GSI typically provides full trash capture.	Regional projects may be able to provide trash management for a larger drainage area than that treated through GSI-equivalent treatment.
Supplement County **Water Supply** Portfolio with Stormwater, Where Feasible		Stormwater capture could be achieved through rainwater harvesting programs at a cost of $2,900 to $4,800 per ac-ft.	Water supply can be provided as an additional benefit for most of these projects (i.e., with little add-on cost to the cost per greened acre), and provide potable water offset or avoidance of other water supply requirements at a cost offset of $50 to $350 per ac-ft.
Consider and, Where Appropriate, Design for Projected Future Impacts Resulting from **Climate Change**		Green Streets required to achieve the PCBs load reduction through GSI by 2040 goal could achieve offset of climate impacts for smaller return storms (see SSMP, C/CAG, 2021b).	Equivalent Climate Change Impact Offset to jurisdiction-by-jurisdiction green streets in approximately 70% of the capacity and 30 to 40% of the costs (cost savings of 60% to 70%).

Objective	Jurisdiction-by-Jurisdiction Scenario	Collaborative Regional Scenario
Consider Local **Community Benefits** and Concerns in Project Implementation	Distributed facilities can provide community benefits including heat island cooling and habitat through facility plant palettes, safety features, and public education.	In addition to providing many of the benefits that distributed facilities can, regional facilities could provide enhanced amenities in park locations. Six of the optimized regional projects identified are proposed to be located in an existing park, and eleven of them are proposed to be located in undeveloped parcel with the potential to be converted to a park.
Site and Design Projects to **Equitably** Serve and Protect Communities	See above.	Many of the optimized regional projects are located within ½ mile of an identified vulnerable community. Regional projects implemented through a regional collaboration program may be able to provide enhanced implementation of GSI in vulnerable communities.
Maximize **Other Benefits**, Where Possible	See above.	These facilities can provide other benefits including but not limited to sediment management and reduction of erosive flows.

4.1 Other Cost Efficiencies and Benefits of Regional Collaboration

Stormwater facilities, specifically GSI, are by their nature small, varied, and geographically dispersed, which has traditionally caused them to be planned, designed, and constructed individually. This is true in San Mateo County where multiple jurisdictions are individually planning, designing, and constructing their own GSI projects often within a shared watershed. Implementing small GSI on a project-by-project basis makes these projects even less cost effective because of the amount of overhead required to procure and manage multiple engineering and construction firms for project implementation and permitting. This project-by-project mentality has constricted innovation within the stormwater industry and has promoted the inefficiencies inherent in a piecemealed delivery approach.

The logical approach to lowering the cost and increasing the speed of GSI implementation is to consolidate the projects into fewer, larger, regional facilities located in the best geographic locations regardless of jurisdiction and to consolidate and streamline the procurement and management of the work. Much of this document focuses on the technical and environmental advantages of consolidating the projects into fewer, larger regional projects and the reduction of costs associated with this approach. However, incorporating different programmatic delivery models will provide additional benefits, including a reduction in overall GSI project costs, increased speed and efficiency in the implementation of the projects, and an opportunity to obtain additional socioeconomic and community-based benefits as a byproduct.

The most efficient way to implement GSI is to combine as many efficient practices as possible together, including locating projects in the areas that will provide the most environmental benefit, configuring the projects as large as possible, an using a delivery model that reduces overhead burden by streamlining procurement and management.

4.1.1 Alternative Delivery

Several alternative delivery models are available, and each provides advantages worth considering. Design build and its variations relieve some of the overhead burdens by providing a single point of responsibility for the implementation of a single project. This contributes to a more efficient delivery, but as mentioned previously GSI is best suited to a full programmatic delivery model that manages the implementation of GSI in a holistic way. This approach aggregates piecemealed projects into a performance-based, investable solution that achieves broader community and economic value. It achieves goals faster, in part, by stacking the efficiencies gained through private sector flexibility in project selection and aggregation, contractor procurement, economies of scale, and other similar tactics. The relatively small, individual efficiencies, when combined, create substantial time and cost savings.

These alternative delivery models include public private partnerships (P3s); design, build, maintain (DBM); and similar pay-for-performance models. Using these methods, the project owner contracts with a single entity that is accountable for all aspects of the project throughout the lifecycle, which reduces risk for the project owner. A unique P3 model developed specifically for stormwater implementation is called a Community-Based Public Private

Partnership (CBP3). It was developed by the United States Environmental Protection Agency and has been quite effective in reducing the cost and delivery time of GSI while providing other benefits to the local community, like increased local participation of small and disadvantaged businesses, increased participation of local resident workforce, mentor protégé programs to train and build up small and disadvantaged businesses, and the equitable distribution of program benefits to all sectors of the community.

5. NEXT STEPS

The next step for this project is to develop an approach for Regional Collaboration. Potential approaches to Regional Collaboration will be presented to the Project Technical Advisory Committee (TAC) for input. A potential framework for regional collaboration will be developed in a flow chart format using the input from the TAC. This Regional Collaboration Approach will be discussed along with this Business Case in a final White Paper completed for the Project.

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ATTACHMENT A: COST DATA AND INPUTS

1. CAPITAL COSTS

Capital cost data examined to develop this Business Case is summarized in the following sections. The assumed cost per acre greened and/or treated applied to the Business Case is described therein.

1.1 GSI Statistical Cost Analysis Conducted by Geosyntec

Geosyntec conducted a comprehensive statistical cost analysis in 2018 using available GSI implementation cost data throughout the state. The results of that analysis, escalated to 2021 dollars, are provided in Table 4.

Table 15: Statistical Summary of Unit Capital Cost for GSI Project Categories (Geosyntec, 2018) Escalated to 2021 Dollars

Project Category	No. of Projects (n)	Unit Capital Cost ($/acre treated) in 2021 Dollars[1]					
		Minimum	25th-percentile	Median	75th-percentile	Maximum	Mean
Green Street	19	$27,000	$76,000	$148,000	$288,000	$1,393,000	$230,000
Distributed (i.e., Parcel-Based) GSI	21	$17,000	$97,000	$131,000	$190,000	$449,000	$165,000
Regional Stormwater Control	11	$16,000	$27,000	$66,000	$137,000	$461,000	$109,000

[1] Units have been rounded to the nearest $1,000. Cost data includes design and construction costs.

The escalated cost statistics provided in Table 4 are used as a benchmark for the other cost estimates referenced throughout the Business Case.

1.2 TMDL Control Measure Plan Costs

The TMDL Control Measure Plan referenced Geosyntec's 2018 cost statistics as well as other cost analyses conducted as part of the accompanying RAA and the San Mateo County Stormwater Resource Plan (SMCWPPP, 2017). The costs used in the TMDL Control Measure Plan are summarized in Table 5 and have been escalated to 2021 costs where applicable.

Table 16: TMDL Control Measure Referenced Costs

Control Measure	Unit of Implementation	2018 Dollars	2021 Dollars	Units	Source
GI - Private/Parcel-based Redevelopment	Acres treated	$153,000	$165,000	$/acre	Average value for parcel-based (distributed GI) from Geosyntec, 2018
GI - Public Right of Way Retrofits (Green Streets)	Acres treated	$213,000	$230,000	$/acre	Geosyntec, 2018
GI - Regional Projects	Acres treated	$101,000	$109,000	$/acre	Geosyntec, 2018

1.3 San Mateo County Regional Projects

The costs associated with the San Mateo County regional projects, currently at varying phases of implementation, are provided in Table 6 below, for comparison.

Table 17: Summary of Cost per Greened Acre for Identified San Mateo County Regional Projects

Regional Project	Design Alternative	Total Cost	Greened Acres (acre)	Cost per Greened Acre ($/acre)
Orange Memorial Park, South San Francisco	n/a	$15.5 million	421	$37,000
Red Morton Park, Redwood City	Project Alternative 1 - 85th Percentile Alternative	$14.9 million	9	--
	Project Alternative 2 - Single Field Maximization	$31.5 million	9	--
Caltrans I-280 @ I-380, San Bruno	n/a	$19.6 million	254	$77,000
Twin Pines Park, Belmont	n/a	$778,000	8	$97,000

The Red Morton Park project unit cost would be approximately $62,000 per treated acre for Design Alternative #1 and $109,000 per treated acre for Design Alternative #2 if the detention and flow through treatment train was considered GSI-equivalent by the SFBRWQCB, in line with other regional stormwater capture project costs presented.

1.4 Optimized Regional Projects

Planning-level costs were developed for the regional stormwater capture projects identified as part of the optimized regional project analysis. These proposed regional projects were modeled to optimize the water quality and other benefits given the facility location, drainage area, and other factors (Craftwater, 2021a). As such, many of these projects do not capture 80% of average

annual runoff (i.e., the Volume Hydraulic Design Basis as defined in MRP Provision C.3.d) if the site is either too space constrained or it would be uneconomical to do so.

Using the greened acre calculation for these optimized regional projects, the cost per greened acre was calculated for the 74 optimized projects. As described in section 2.4, greened acres also require treatment through LID/GSI measures; the GSI equivalency of the optimized regional project facility types is currently unknown as treatment measures are typically selected during pre-concept or concept design stages. For the unit costs provided in Table 7, it was assumed that optimized regional facilities use GSI-equivalent treatment measures.

Table 18: Statistical Summary of Craftwater Planning-Level Costs for Regional Projects

Project Category	No. of Modeled Projects (n)	Unit Capital Cost ($/greened acre), Planning Estimates					
		Minimum	25th percentile	Median	75th percentile	Maximum	Mean
Optimized Regional Projects	74	$13,000	$36,000	$59,000	$79,000	$328,000	$69,000

[1] Units have been rounded to the nearest $1,000. Cost data includes planning level costs.

The statistical spread varies somewhat from the updated empirically derived regional stormwater cost statistics (Table 4), especially in the higher cost range, but overall the costs are very similar to the empirically based costs findings. The lower costs for the 75th percentile, maximum, and mean unit costs as compared to the actual cost data statistics are likely due to the "optimized" nature of these modeled facilities. This unit cost check allows for confidence in using these planning level optimized regional project cost values for the Business Case analysis.

1.5 San Mateo County Integrated Safe Routes to School Green Infrastructure Project Costs

C/CAG compiled GSI costs for eight Integrated Safe Routes to School and Green Infrastructure projects completed to date (of ten total projects). The green streets GSI typically consisted of bulbouts or linear planters in the street and were constructed within eight member agency jurisdictions in the County. A statistical summary of the unit cost (cost per acre treated) is provided in Table 8.

Table 19: Unit Cost statistics for San Mateo County Safe Routes to School Projects GSI

Project Category	No. of Modeled Projects (n)	Unit Capital Cost ($/acre), Planning Estimates					
		Minimum	25th percentile	Median	75th percentile	Maximum	Mean
GI - Public Right of Way Retrofits (Green Streets)	8	$85,000	$124,000	$189,000	$487,000	$632,000	$301,000

When compared to the green streets statistics compiled by Geosyntec (Table 4), these facilities are more expensive to implement – with both the median and mean unit costs approximately 30% higher than the statistical results (escalated to 2021 dollars). This increased cost of green streets implementation in the San Francisco Bay Area is consistent with green streets costs compiled in other counties. This is a relatively small data set, but provides recent local implementation costs, so will be used as a cost input for this Business Case.

County of San Mateo
Advancing Regional Stormwater Capture Projects
Project Opportunities Analysis Memo DRAFT

2 August 2021

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ACRONYMS/ABBREVIATIONS

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

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 within 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 also contribute to other regional watershed management goals (flood management, green infrastructure, water reuse, etc.), C/CAG 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 they can collectively work together to develop solutions that will both meet regulatory compliance requirements and provide member agencies with multi-benefit infrastructure solutions in a cost-effective manner. 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. Previous planning efforts by C/CAG have begun 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 provisioning 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.

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.

2.1 PROJECT IDENTIFICATION AND CHARACTERIZATION

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. 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 (public or private) in case public-private partnerships are sought 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

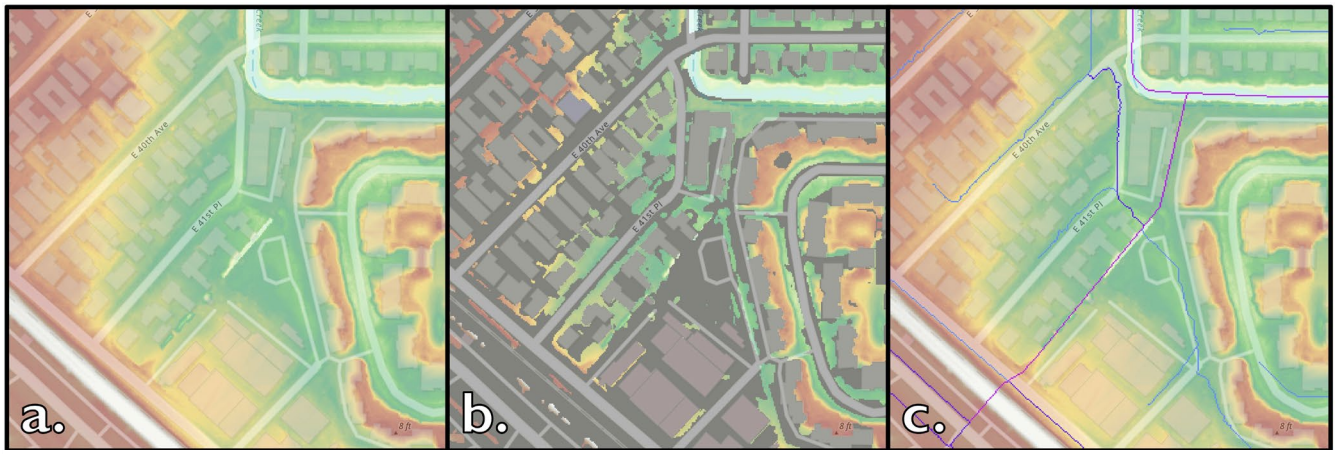

Figure 2-1. Combining DEM-based drainage patterns with impervious surface data to assess project potential.

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

The drainage mapping analysis integrates digital elevation models (DEMs; **Figure 2.1a**), 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, it is further refined to assess the magnitude of impervious surfaces within the drainage to gauge potential project performance (**Figure 2.1b** shows how elevation and impervious surfaces interact to forge runoff accumulation paths in **Figure 2.1c**). 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 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 conceptualization for the top projects to select among a variety of desired BMP types for the County.

2.2 PROJECT SCREENING CRITERIA DATA & METHODS

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
Site Feasibility	Building Footprints	C/CAG Impervious Surface Data	Footprint + 20' buffer	Building offsets for BMP construction
	Utility Conflicts	C/CAG and Member Agency Utility Data	Asset + 4' buffer	Utility avoidance keeps costs lower and minimizes delays
	Constructable Slope	C/CAG 2017 1m DEM	15% Grade Breakpoint	Grades less than 15% more easy to construct upon
	Fault Hazards	ABAG Fault Hazards	Presence/Absence	Higher probability of failure
Potential Performance	Drainage Patterns	DEM Analysis	DEM-based Flowpath Analysis	Indicate runoff pathways
	Storm Drain Diversions	C/CAG and Member Agency Utility Data	Drains ≥ 24 in. Diameter	Identify points of potential diversion from storm drains to BMP
	Impervious Drainage Area	DEM Analysis	DEM-based Flowpath Analysis	Tied to diversion point; indicate greater runoff volume with heavier pollutant loading
Categorical Evaluative Factors	Hydrologic Soil Group	SSURGO Soils Data	A = 1, B = 2, C = 3, D = 4	High (HSG A) to Low (HSG D) infiltration potential
	Soil Liquefaction Potential	C/CAG SRC Datasets	Presence/Absence	May raise costs for infiltrative BMPs
	Aquifer Recharge Potential	C/CAG SRC 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
	Water Quality Concerns	C/CAG SRC Datasets	Within TMDL watershed (Yes/No)	Water quality treatment of higher priority
	Flooding Risk	C/CAG SRC Datasets	Within Floodprone Watershed (Yes/No)	Flood management contributions of higher priority
	Community Benefits	CalEnviroScreeen 4.0	Overall Scoring Percentile Class (by 10s)	Community benefit contributions of higher priority
	SMC 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	Drainage areas to potential CALTRANS Full Trash Capture Opportunities	Upstream drainage area coinciding with CALTRANS opportunity drainage areas	Projects 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. 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 2.2a**). Subsequently, utility conflicts were eliminated as well where data was available, buffered to 4' for storm drains (**Figure 2.2b**) and sanitary sewer lines (**Figure 2.2c**). Ground slope was considered, eliminating areas where the local slope exceeded a 15% grade (**Figure 2.2d**). 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 2.2e** (green areas) and is displayed for the full County in **Figure 2.3**. 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 2.2f** (light blue overlay) and county-wide in **Figure 2.4**.

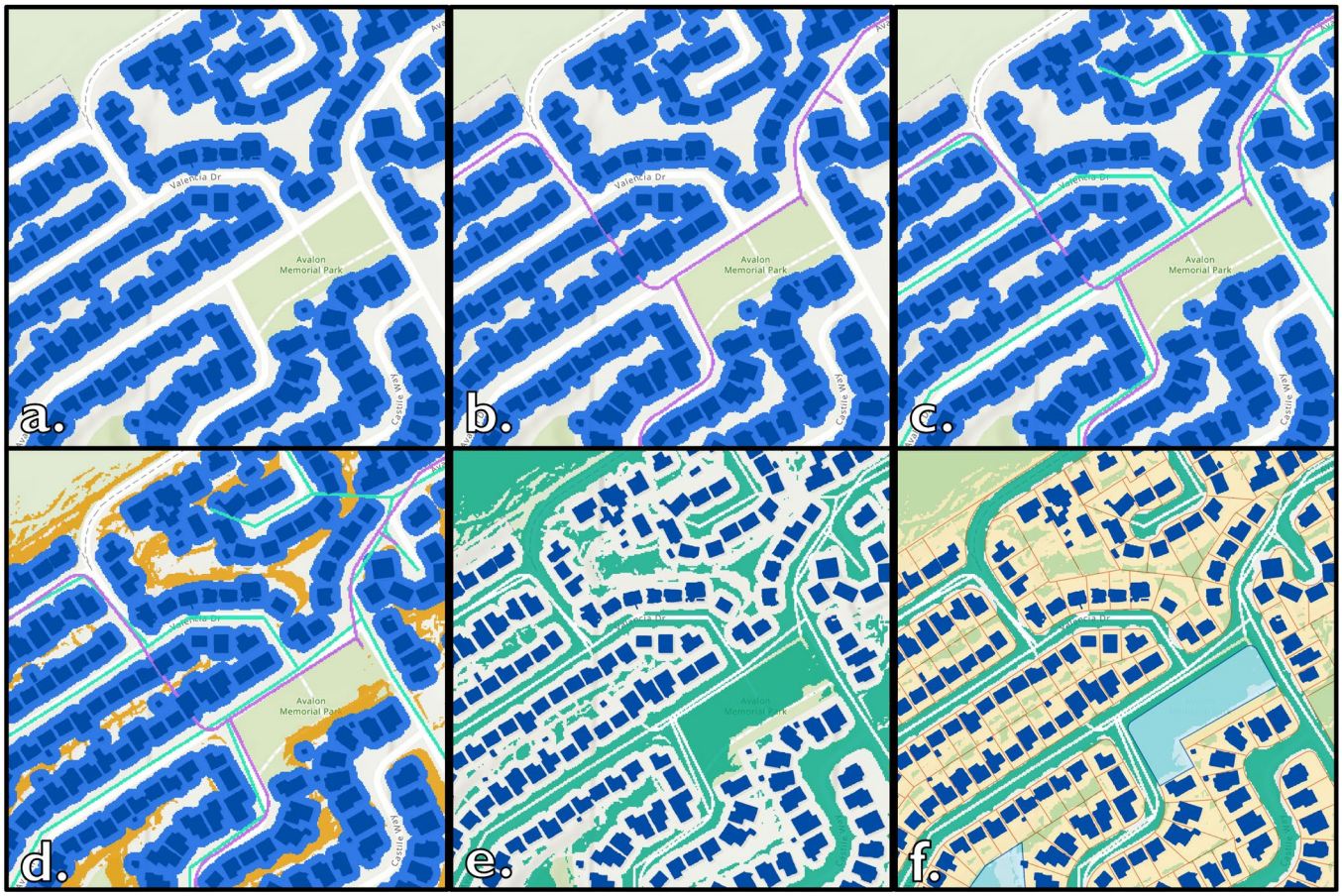

Figure 2-2. Progression of feasibility assessment used to determine potential space where a regional stormwater capture project could be readily built.

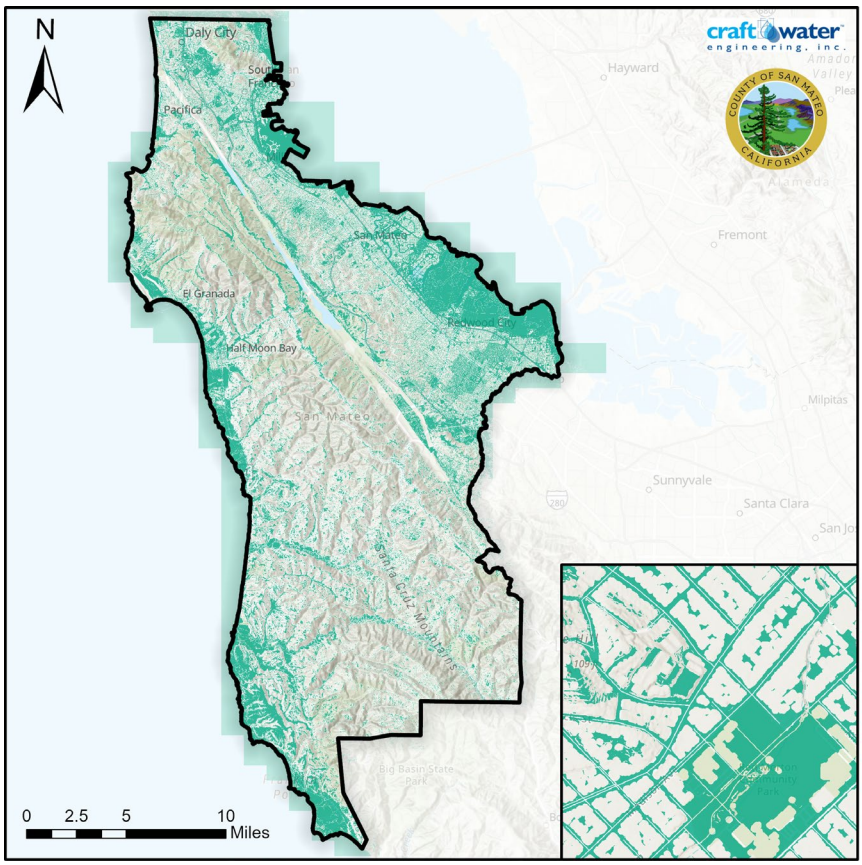

Figure 2-3. Feasible BMP project space across San Mateo County.

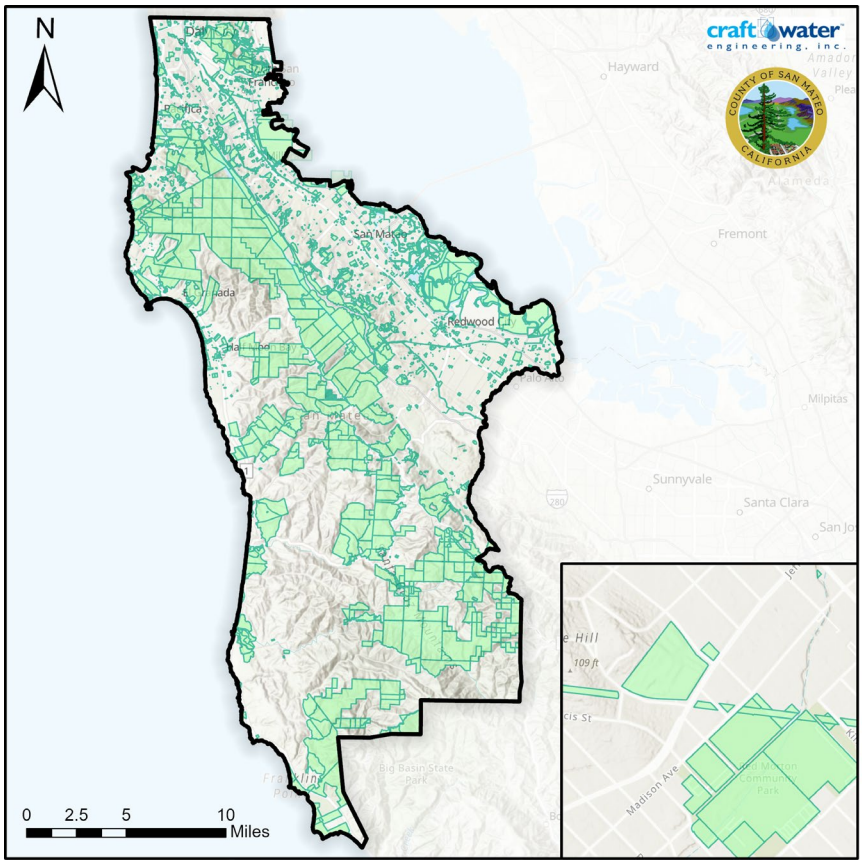

Figure 2-4. Public parcels across San Mateo County.

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 2.5**.

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.

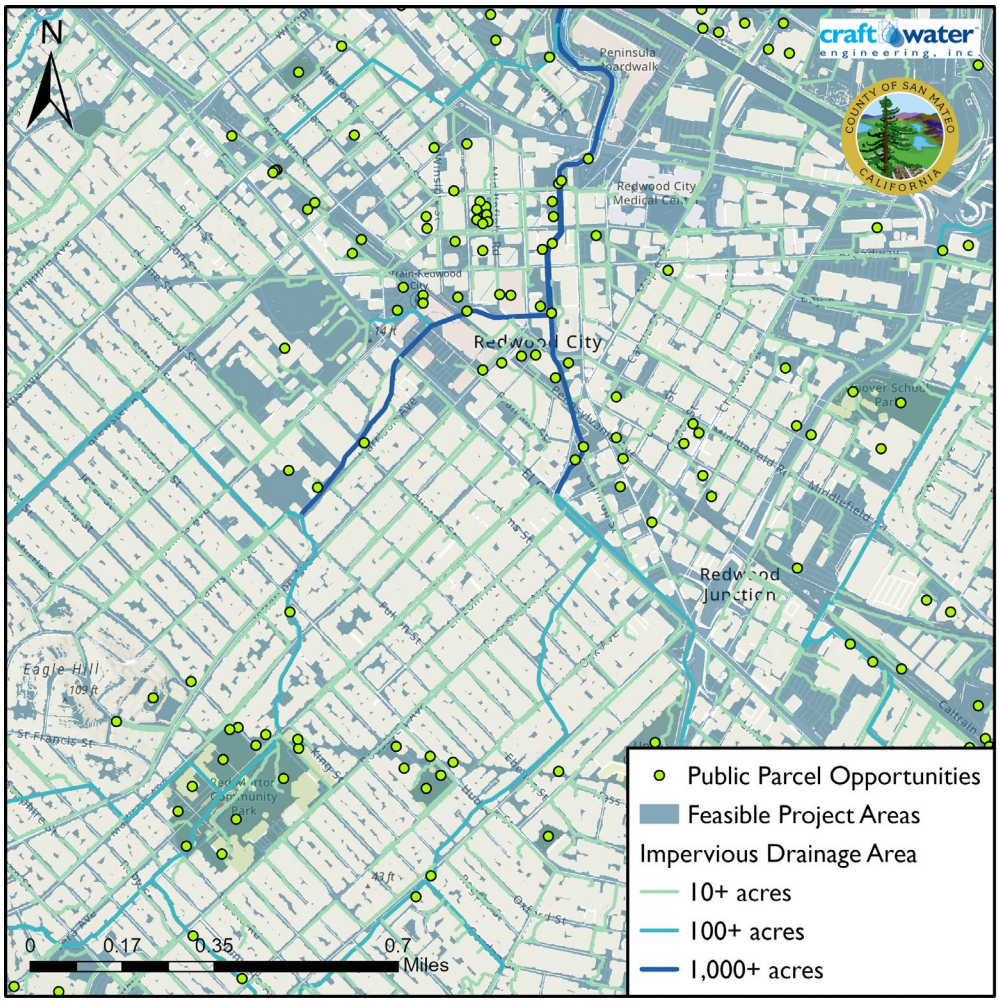

Figure 2-5. Estimating project potential with feasible space and upstream impervious drainage area.

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.

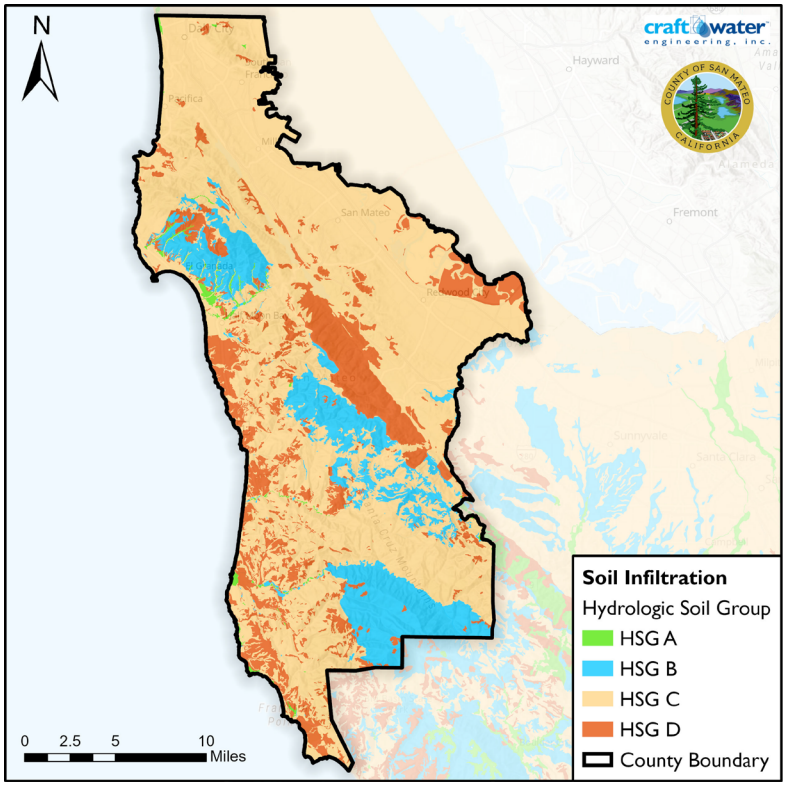

Figure 2-6. Soil hydrologic soil groups.

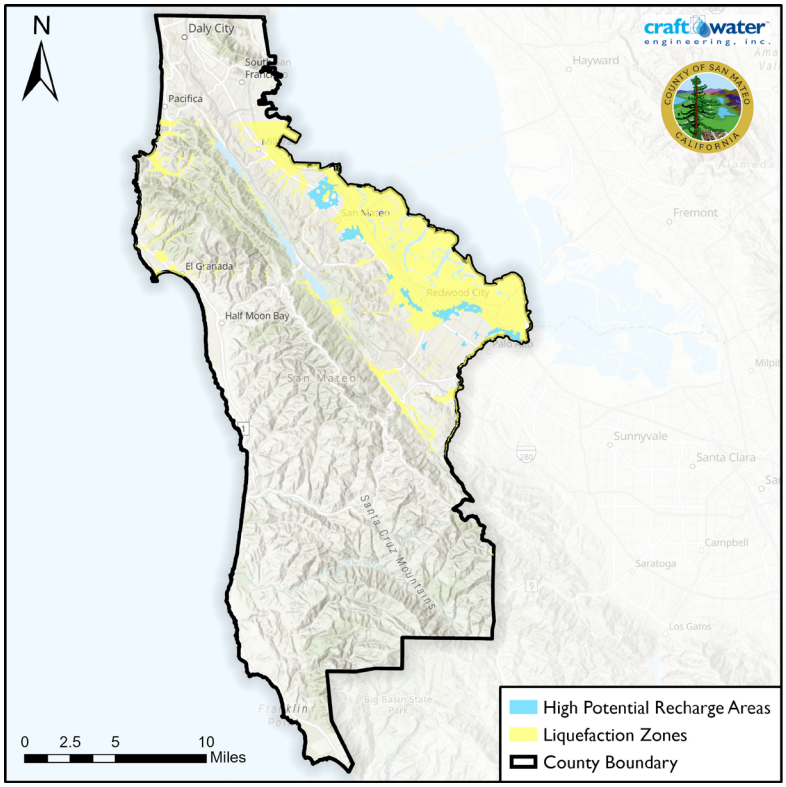

Figure 2-7. High potential recharge areas and liquefaction zones.

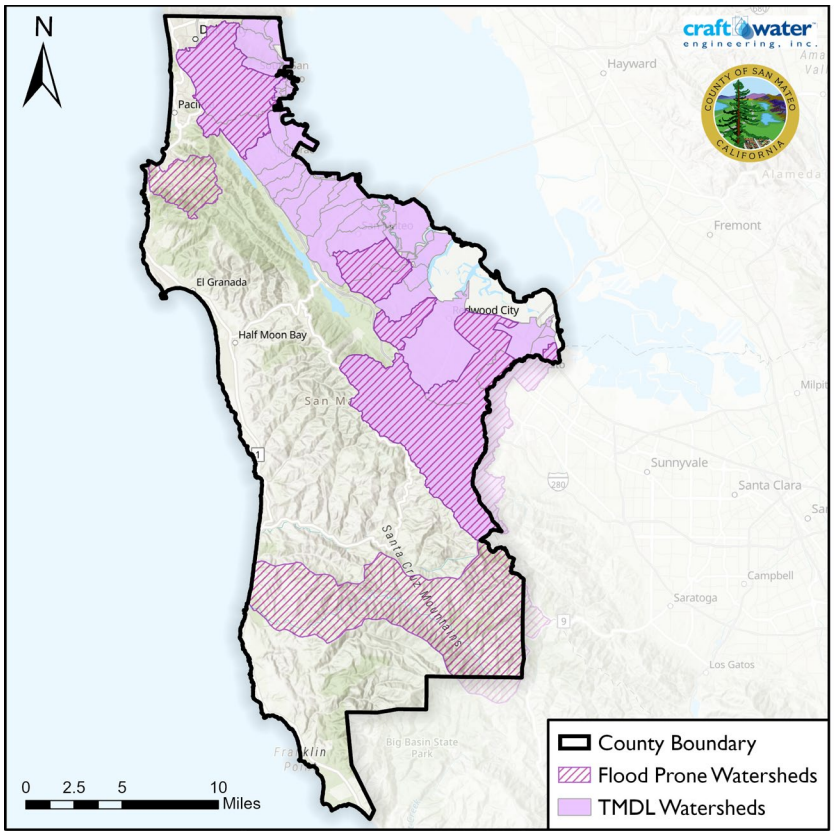

Figure 2-8. Watersheds with existing TMDLs and with known flooding issues.

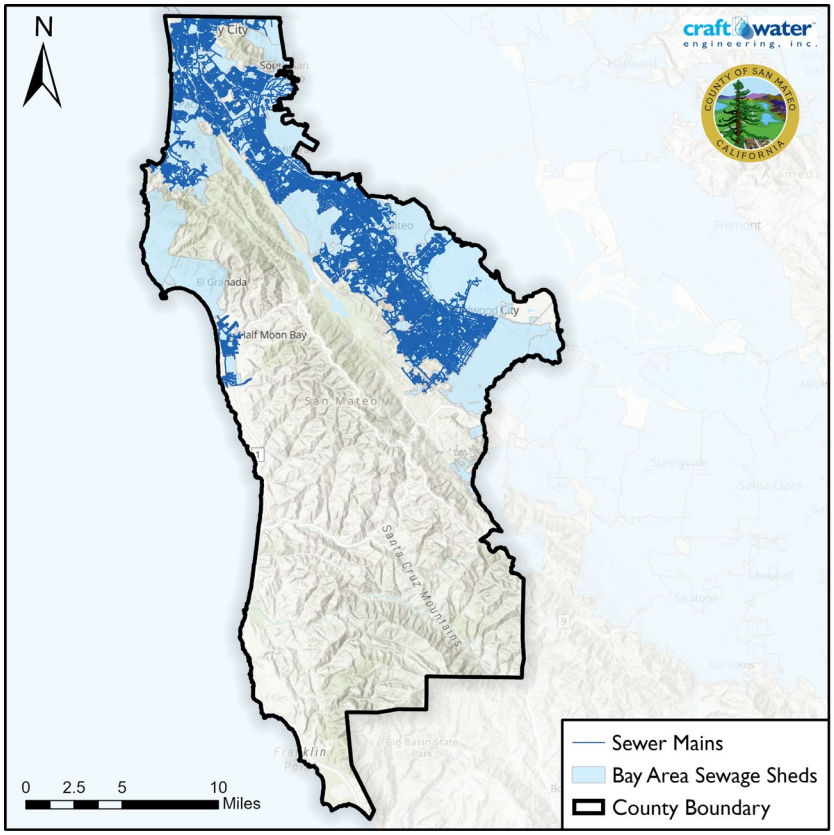

Figure 2-9. Locations of known sewer mains.

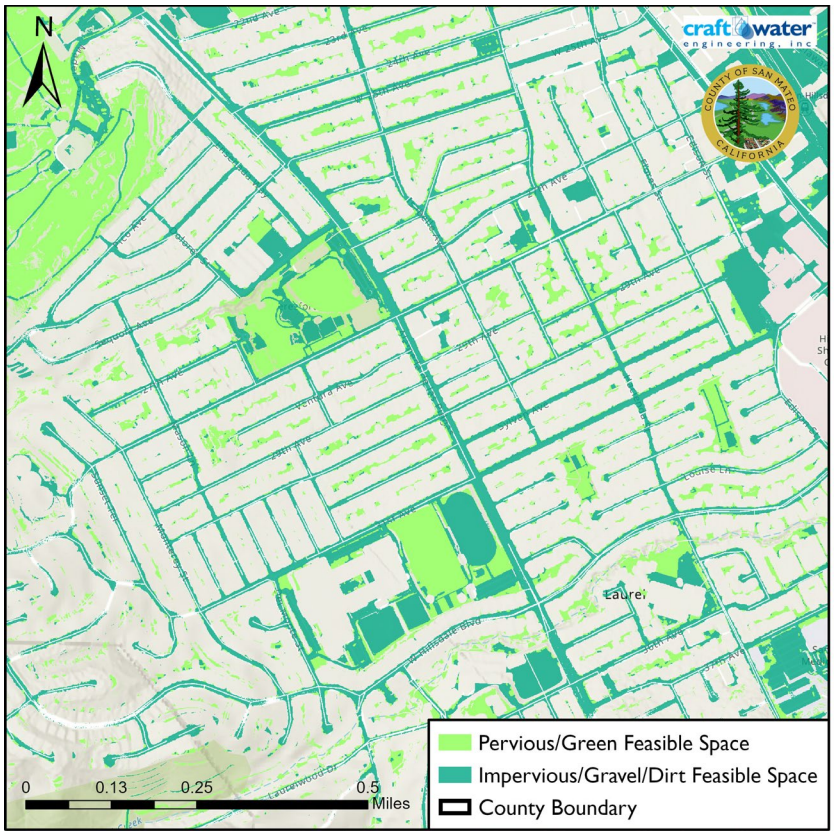

Figure 2-10. Pervious vs impervious area.

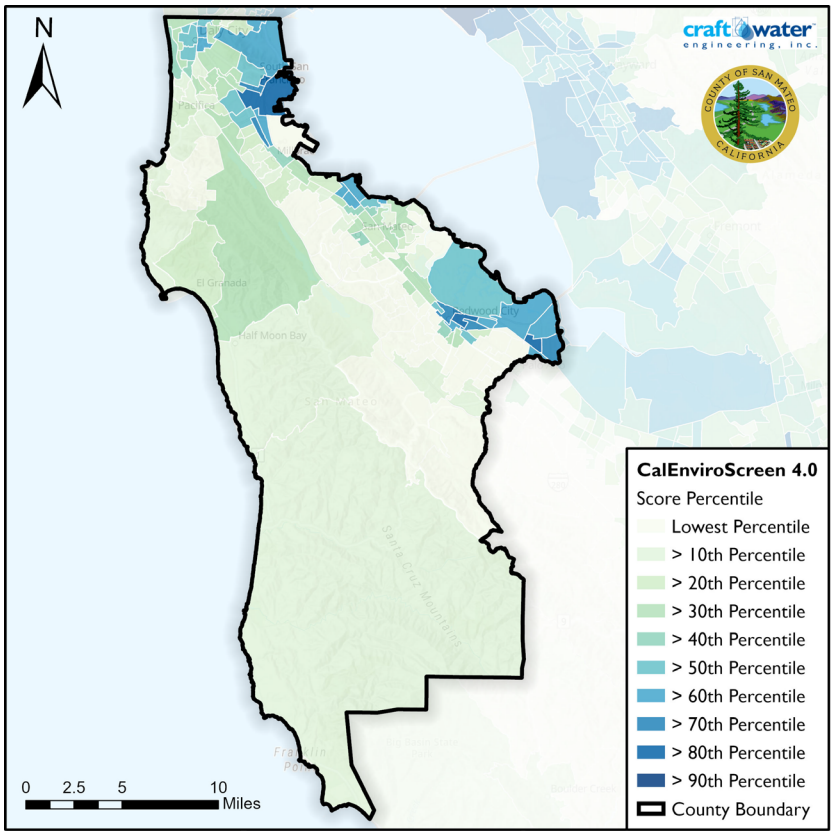

Figure 2-11. CalEnviroScreen 4.0 percentiles.

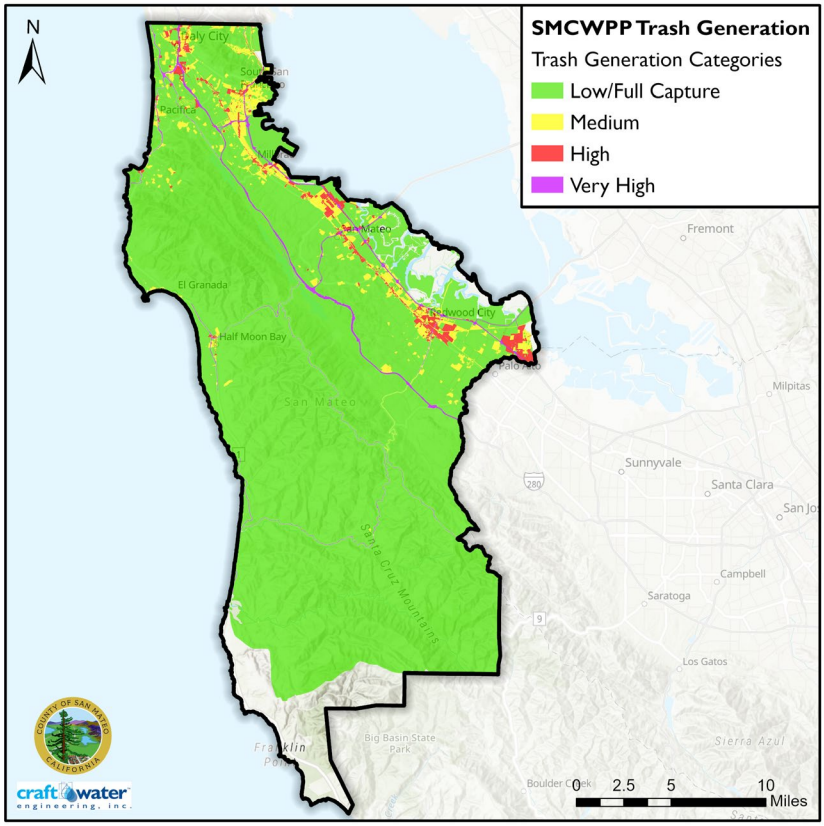

Figure 2-12. SMC WPP Trash Generation dataset.

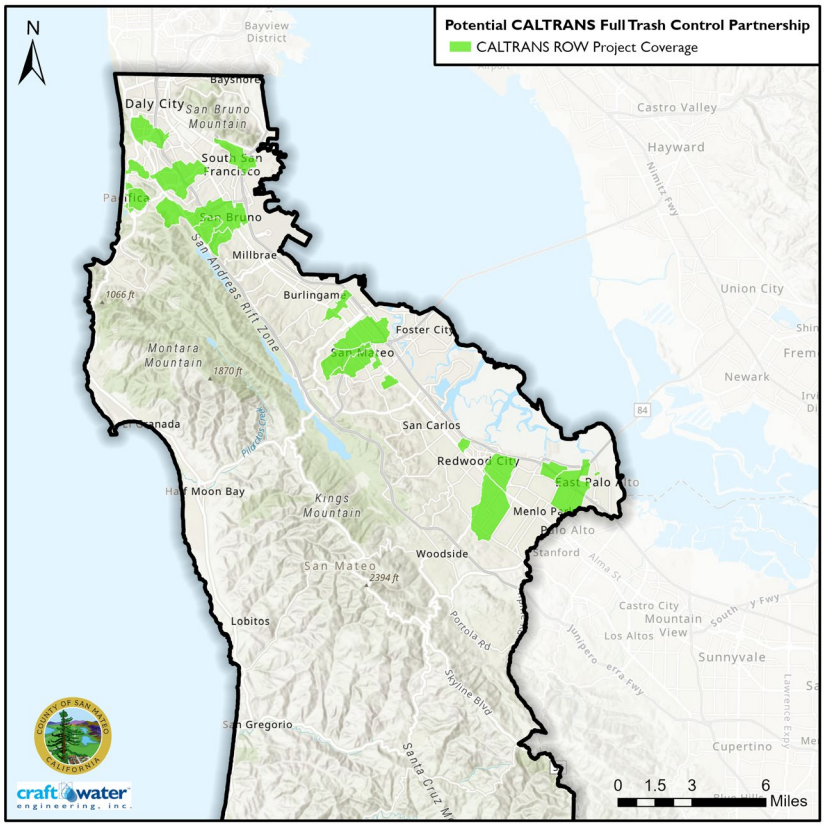

Figure 2-13. CALTRANS Full Trash Capture opportunity drainages.

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.

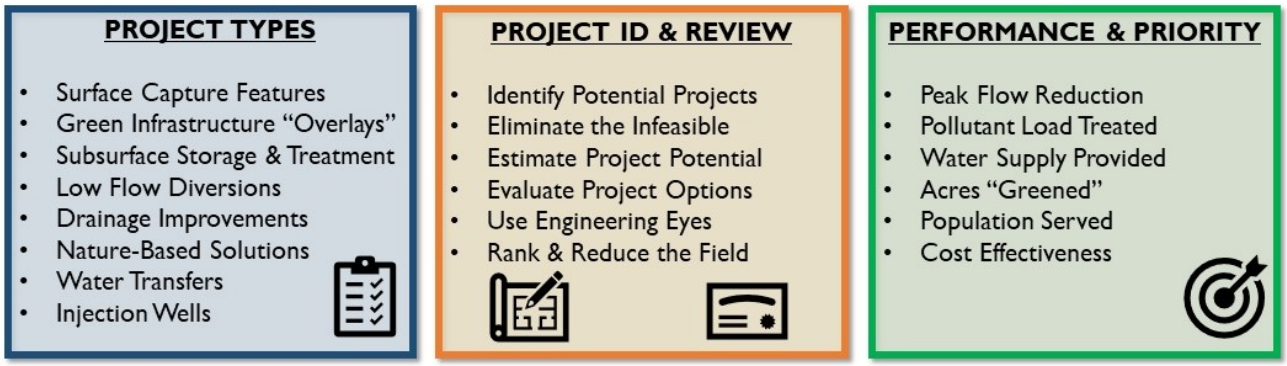

Figure 3-1. Summary of screening approach and performance metrics to be used in project opportunity prioritization.

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

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. 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 fixed system setpoint, so any change in system-defining variables 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 a number of 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

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. These metrics (**Table 3-1**) were assessed for all 74 candidate opportunities, and each was ranked to show how each project performed for each metric compared to other project opportunities. This allowed for comparisons to be made amongst metrics and in relation to other potential projects as opposed to assigning a final score 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, 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 via other capture initiatives	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

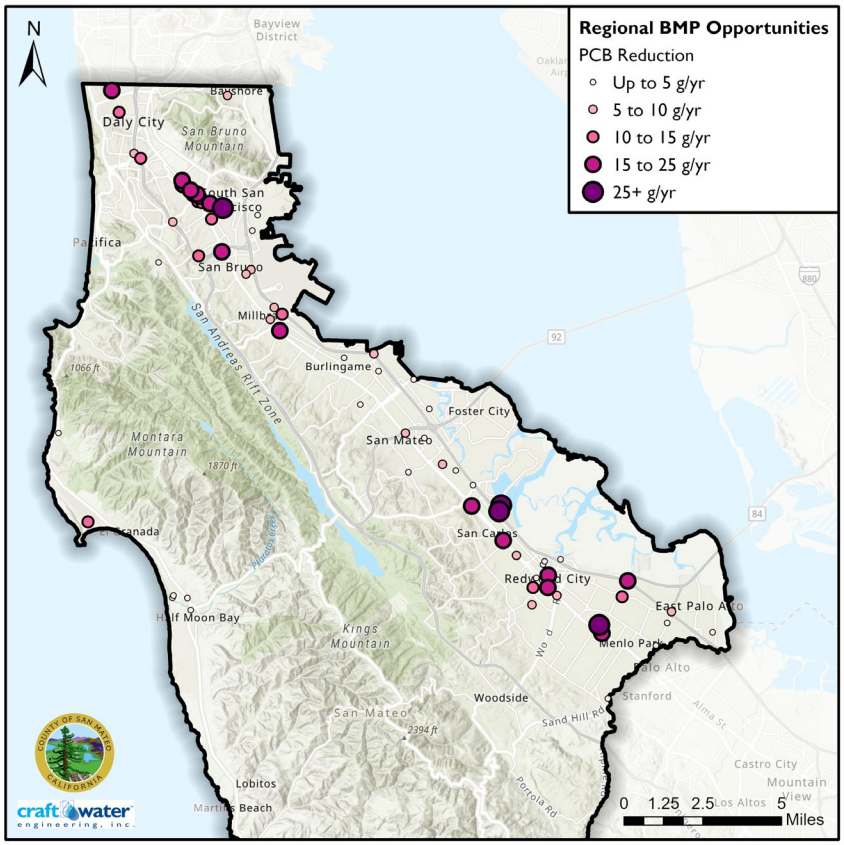

Figure 3-4. PCB Reduction across candidate opportunities.

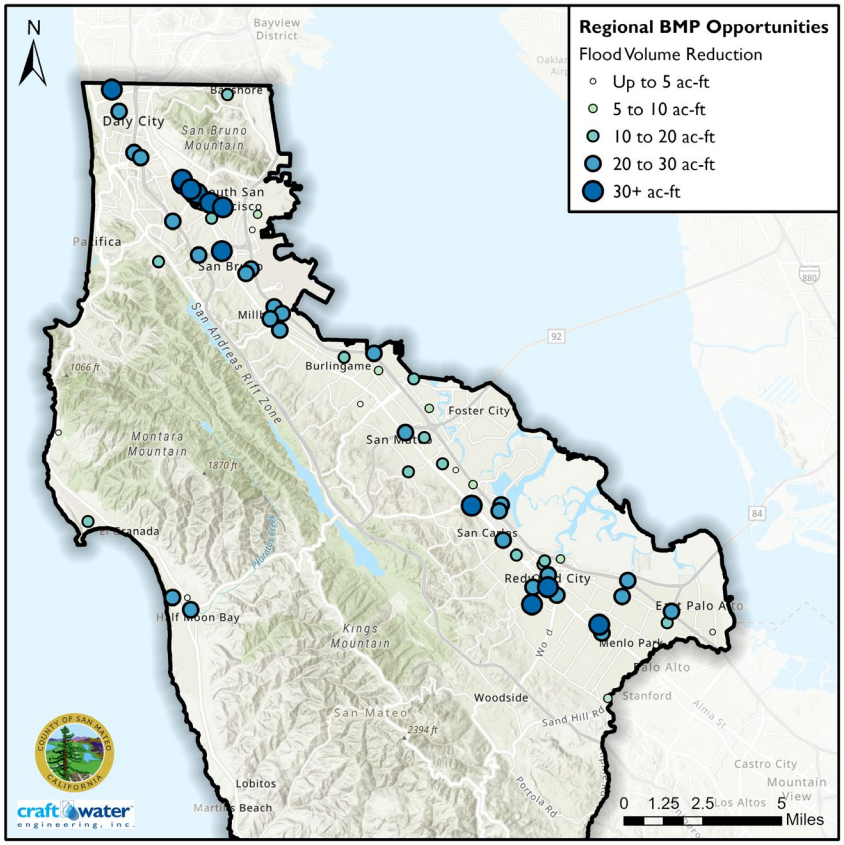

Figure 3-5. Flood volume managed by candidate opportunities.

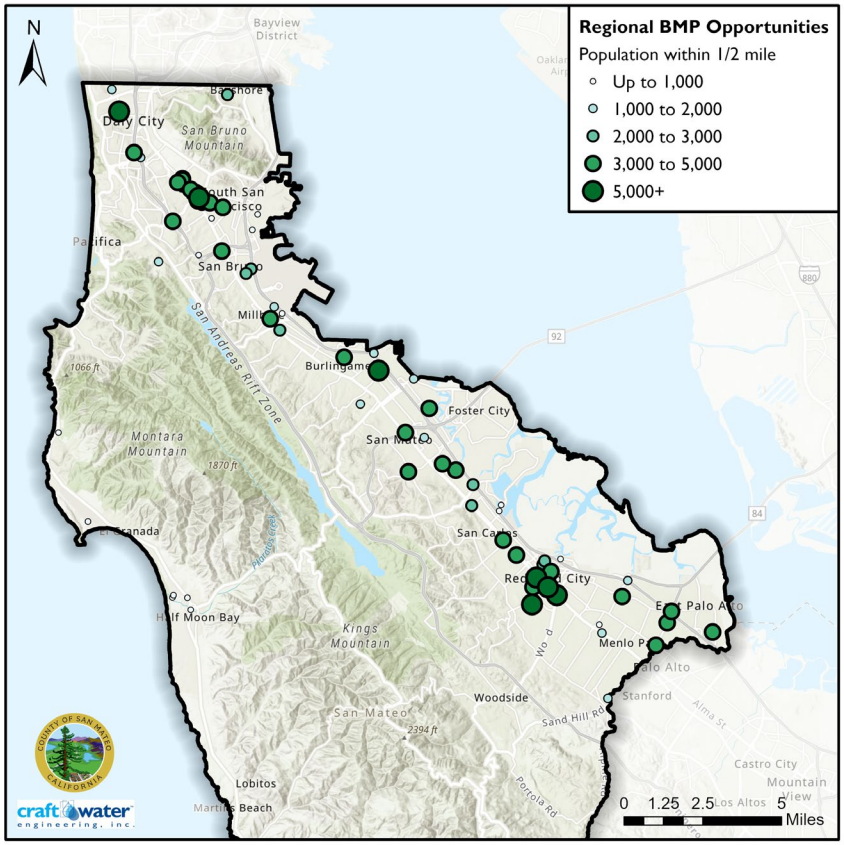

Figure 3-6. Population benefited by candidate opportunities.

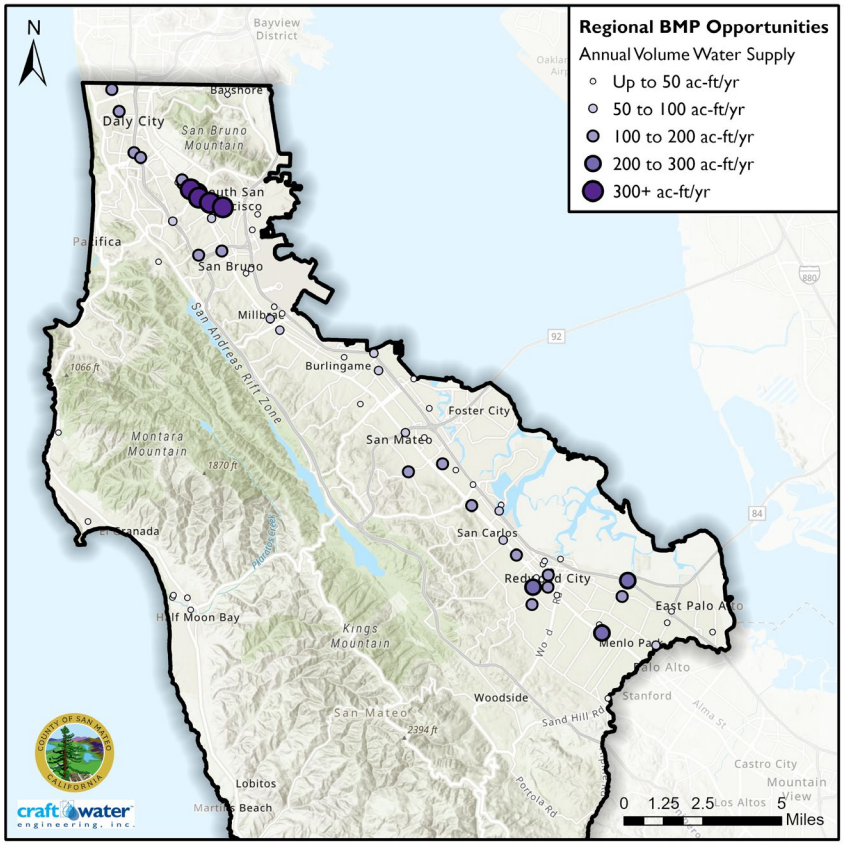

Figure 3-7. Potential water supply for candidate opportunities.

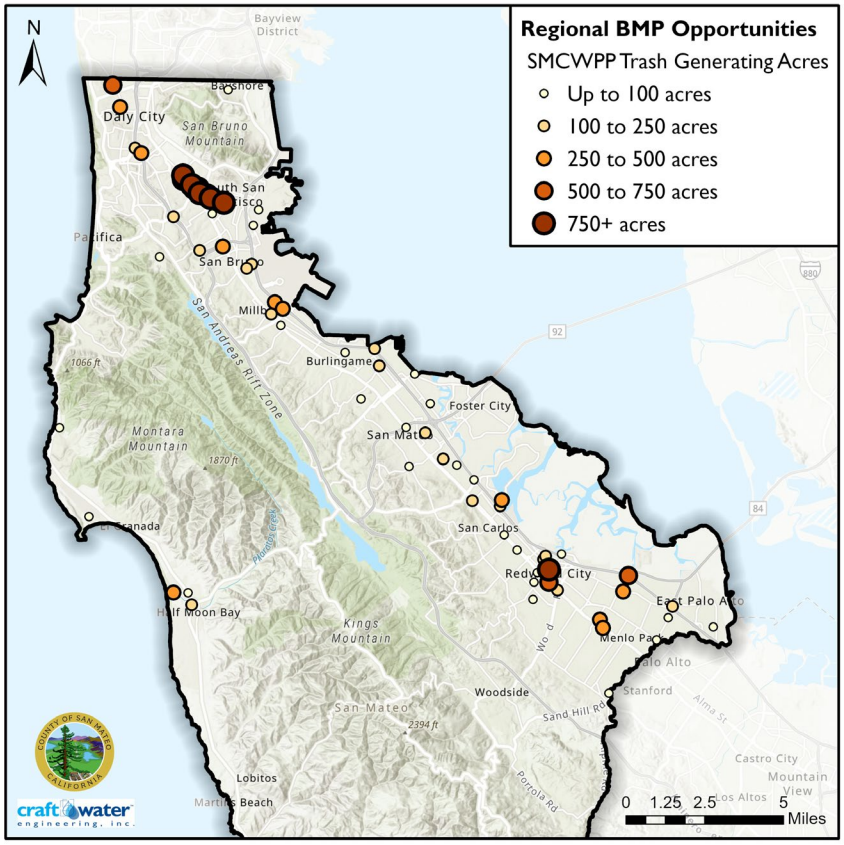

Figure 3-8. Potential trash capture for candidate opportunities.

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 County will follow and will determine which of the top opportunities will be advanced to more detailed concepts following review of this report.

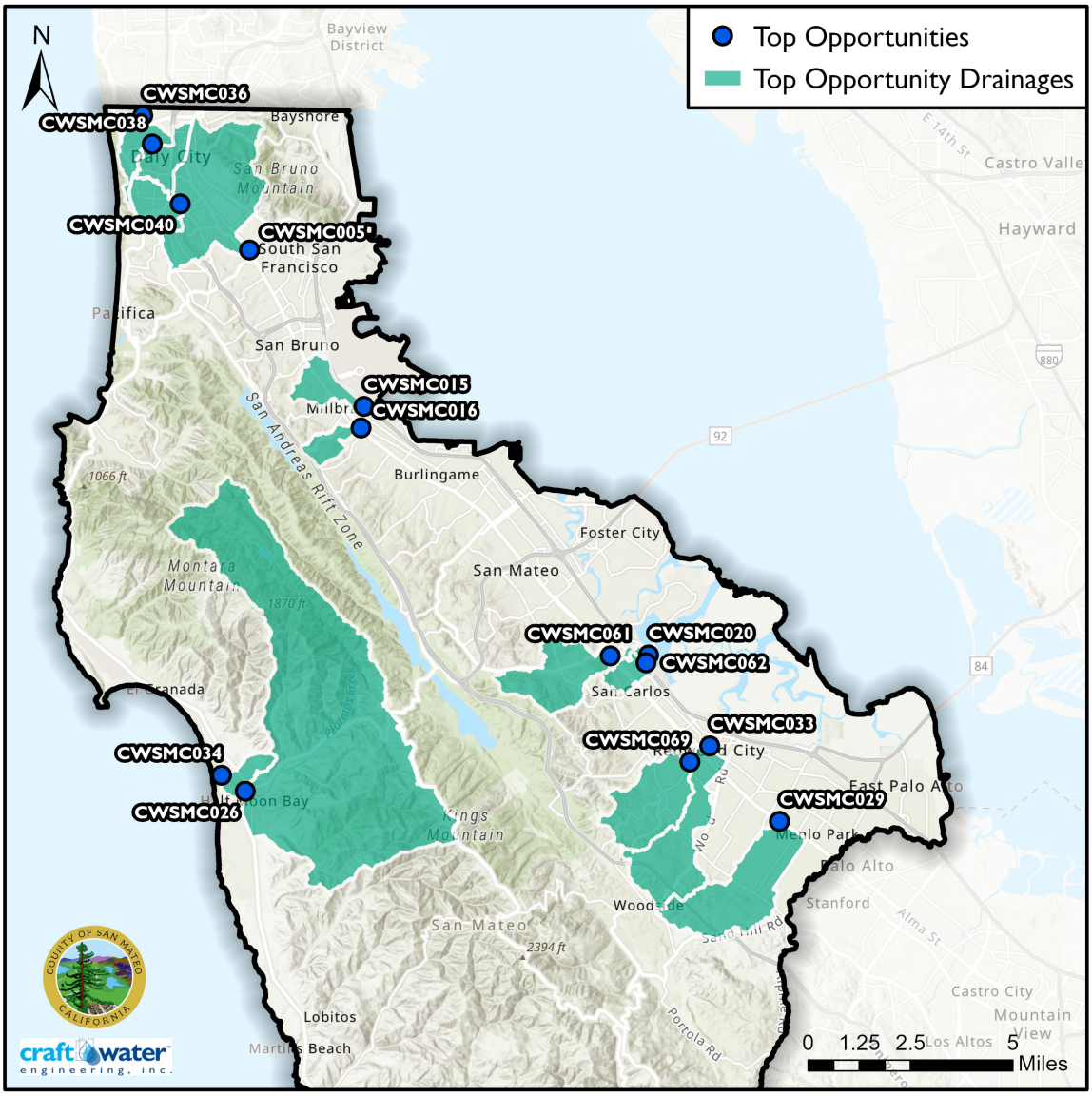

Figure 4-1. Top priority opportunities for regional BMPs in San Mateo County.

5.0 REFERENCES

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

C/CAG AGENDA REPORT

Date: August 19, 2021

To: Stormwater Committee

From: Matthew Fabry, Program Manager

Subject: Discussion of recommendations and findings in Grand Jury report, "San Mateo County: California's Ground Zero for Sea Level Rise."

(For further information or questions contact Matthew Fabry at mfabry@smcgov.org)

RECOMMENDATION

That the Committee discuss the recommendations and findings in the Grand Jury report, "San Mateo County: California's Ground Zero for Sea Level Rise."

BACKGROUND/DISCUSSION

The San Mateo County Grand Jury recently released the attached report entitled, "San Mateo County: California's Ground Zero for Sea Level Rise." The issue under review:

> "*The San Mateo County Flood and Sea Level Rise Resiliency District ("OneShoreline") began operating in 2020. It was designed to coordinate countywide efforts to combat the harms of sea level rise caused by climate change. Is OneShoreline on course to adequately address the sea level rise challenge that has been assigned to it, and does it have the support it needs?*"

C/CAG member agencies are required to respond to all 13 Findings in the report, as well as three of the four Recommendations (R1, R2, and R4).

The Grand Jury analysis is focused exclusively on sea level rise; however, OneShoreline's overall mission, as originally proposed to C/CAG's member agencies and as indicated on Page 11 of the report, includes addressing "sea level rise, flooding, coastal erosion, and large-scale storm water infrastructure improvements through integrated regional planning, design, permitting, project implementation and long-term operations and maintenance." The report's first recommendation states that each C/CAG member agency should take at least one concrete action at a public meeting toward establishing a continuing funding source for OneShoreline and potentially adopt a resolution expressing support for a parcel or property tax by June 30, 2022. Recognizing C/CAG member agency efforts to advance regional-scale stormwater capture projects to help build climate resilience while cost-effectively meeting water quality mandates, the Stormwater Committee's ad-hoc Funding and Financing Workgroup met with OneShoreline's Chair and CEO in July to discuss the importance of including regional stormwater in any potential funding initiative, consistent with OneShoreline's mission. Staff recommends Committee members discuss how to continue highlighting the importance of including regional stormwater in OneShoreline's ongoing efforts and any funding initiatives when preparing their agency-specific responses.

ATTACHMENTS

1. Grand Jury Report, "San Mateo County: California's Ground Zero for Sea Level Rise."

SAN MATEO COUNTY:
CALIFORNIA'S GROUND ZERO FOR SEA LEVEL RISE

Issue | Summary | Glossary | Background | Discussion | Best Practices | Findings
Recommendations | Request for Responses | Methodology | Bibliography | Appendices | Responses

ISSUE

The San Mateo County Flood and Sea Level Rise Resiliency District ("OneShoreline") began operating in 2020. It was designed to coordinate countywide efforts to combat the harms of sea level rise caused by climate change. Is OneShoreline on course to adequately address the sea level rise challenge that has been assigned to it, and does it have the support it needs?

SUMMARY

San Mateo County has been declared the California County most at risk from sea level rise (SLR). ***Its Bayside communities have billions of dollars of residential and commercial property at risk.*** Its five wastewater facilities and three airports, including San Francisco International, are all at risk for flooding from the rising sea. Transportation systems, schools, medical facilities, homes, and parks are all at risk. The Pacific coast communities are also vulnerable to flooding and erosion from higher seas.[1]

Sea level rise is a complex problem with an uncertain timetable that demands ongoing long-term solutions. It requires people to think differently and to truly collaborate. While solutions are still being developed, they will require planning, funding, and collaboration between affected cities, the County, and private entities.

OneShoreline was created from the County Flood Control District, has countywide jurisdiction, and focuses on SLR in addition to flooding from creeks. The official name for OneShoreline is the "San Mateo County Flood and Sea Level Rise Resiliency District."

OneShoreline provides expertise in the complex process of designing and building SLR and flood mitigation projects, including guidance through the complex maze of federal and state funding for projects. Major SLR projects can take five to ten years to plan, engineer, permit, and construct. Each SLR project will require regulatory permitting by regional, state, and federal agencies. OneShoreline could also guide County officials and regional legislators as they lobby Congress and state and federal agencies for funding and regulatory reform to address this serious problem.

[1] Hillary Papendick, Jasneet Sharma, Carolyn Raider, Avana Andrade, Emi Hashizume, Montserrat Plascencia, Sally Prowitt, et al. 2018, March, "County of San Mateo, Sea Level Rise Vulnerability Assessment" Final Report, Redwood City: County of San Mateo, https://seachangesmc.org/wp-content/uploads/2018/03/2018-03-12_SLR_VA_Report_2.2018_WEB_FINAL.pdf

To effectively implement SLR projects, OneShoreline must earn the confidence of San Mateo County (SMC) residents. Some people may not see the need for the expensive SLR projects and will need convincing that the expense cannot be avoided. Others will prefer to simply delay projects, causing costs to increase dramatically. OneShoreline has an agreement with the San Mateo County Office of Sustainability, and others, to educate the public to ensure that the residents understand that SLR is a real threat and that waiting until flooding is imminent is not a viable choice. Powerfully effective public engagement campaigns about SLR will be necessary to meet such challenges.

Currently, OneShoreline's operational funding comes primarily from contributions by the County and its twenty cities and towns. It needs a stable source of funding, one that will not be vulnerable to competing concerns of the communities it serves. Obtaining funds for projects to reduce the damage caused by sea level rise is a major challenge. Such projects are very expensive and are often funded by a combination of federal, state, and local funds. Obtaining required funding can be a complicated, slow, and somewhat costly process.

This Grand Jury recommends that:

- the County and its cities and towns support steady, reliable funding for OneShoreline's basic operations;
- OneShoreline consider establishing and administering a low interest revolving loan fund to enable jurisdictions to prepare the initial engineering and planning necessary to obtain federal and state financial support for SLR projects; and
- the County, its cities, and OneShoreline, along with other Bay Area counties and cities, lobby the federal and state governments for regulatory changes to enable SLR projects to proceed more easily.

Additionally, this Grand Jury urges all residents of San Mateo County to keep themselves informed as to the risks of SLR, and the need to stay ahead of SLR in order to minimize the damage it could cause in San Mateo County. *The glaciers are melting, and the clock is ticking.*

GLOSSARY - TERMS

King Tide – a non-scientific term for exceptionally high tides.

MOU – Memorandum of Understanding; defines a relationship among the parties that outlines terms and details of an agreement, without the terms of a legally enforceable contract.

Reaches – stretches of land bordered by water, often used in flooding projects as a way to divide the project into segments defined by the nature of the land and water.

RFP – Request for Proposal; announces a project, describes it, and solicits bids from qualified contractors to complete it.

SLR – sea level rise.

Storm Surge – the temporary rise in sea level caused by a strong storm's wind and waves.

GLOSSARY – AGENCIES

Army Corps – United States Army Corps of Engineers – For SLR and flooding, the Army Corps is the primary agency for levees.

BCDC – San Francisco Bay Conservation and Development Commission was founded in the mid-1960s; and became a state agency in 2008 with the passage of AB 2094. It is the State agency responsible for leading the Bay Area's preparedness for, and resilience to, rising sea level, tides, and storm surge due to climate change.

FEMA – the Federal Emergency Management Agency. For SLR & flooding, FEMA administers the national flood insurance program and manages mitigation efforts involving berms, dikes, and other efforts.

LAO – the California Legislative Analyst's Office, the California Legislature's nonpartisan fiscal and policy advisor.

NFIP – National Flood Insurance Program, overseen by FEMA.

OneShoreline – the short name for the San Mateo County Flood & Sea Level Rise Resiliency District; it is the successor to the San Mateo County Flood Control District.

Office of Sustainability – a department of the County of San Mateo that "strives to improve the sustainability of the County's operations and the greater community."[2]

Resource Conservation District of San Mateo County – a special district that helps "meet the need for voluntary resource conservation."[3]

SFCJPA – San Francisquito Creek Joint Powers Authority – leads projects that mitigate the risk of flooding along San Francisquito Creek and the San Francisco Bay. The cities of East Palo Alto, Palo Alto, and Menlo Park, along with OneShoreline and the Santa Clara Valley Water District, are members of the JPA.

USFWS – United States Fish and Wildlife Service.

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[2] Contact Us – SMC Office of Sustainability (smcsustainability.org), https://www.smcsustainability.org/contact-us/

[3] About the RCD | San Mateo RCD, http://www.sanmateorcd.org/about/

BACKGROUND – SEA LEVEL RISE AND THE THREAT TO SAN MATEO COUNTY

How Big Is the Problem?

> Global sea level has been rising over the past century, and the rate has increased in recent decades. In 2014, global sea level was 2.6 inches above the 1993 average – the highest annual average in the satellite record (1993-present). Sea level continues to rise at a rate of about one-eighth of an inch per year.
>
> Higher sea levels mean that deadly and destructive storm surges push farther inland than they once did, which means more frequent nuisance flooding. Disruptive and expensive, nuisance flooding is estimated to be from 300% to 900% more frequent within U.S. coastal communities than it was just fifty years ago.[4]

San Mateo County (SMC) covers 455 square miles with a 2019 population of 766,573. The County consists of twenty incorporated cities, twenty-three school districts, 78,000 acres of natural land (including 8,381 acres of wetlands), twenty County parks (over 17,000 acres), 190 miles of County and local trails, 12.9 miles of beaches, 21,528 businesses, and an employed workforce of 416,263.[5]

San Mateo County faces several complications from SLR. "Sea level rise has a clear and direct impact on any coastal or bayside community, any people or businesses within inundation zones, and any ecosystem subject to erosion and flooding. Sea level rise causes direct physical damage to property and habitats, and it can have huge economic repercussions for both individuals and communities."[6] In addition to flooding, "waves crashing further up the shore will erode … coastal cliff walls," and "higher ocean water levels could force up the water levels underneath the ground as well, leading to flooding, saltwater intrusion into fresh groundwater supplies, and toxic contamination by carrying hazardous materials to the surface."[7]

"Sea level rise (SLR) is one of the most serious consequences of climate change and it will have a significant effect on San Mateo County, which has more people and property value at risk from the rising sea than any other county in the state."[8] Future flooding and coastal erosion could pose considerable risks to life, safety, critical infrastructure, the economy, and the County's natural and recreational assets. Flood damage could exceed $1 billion and assessed values of parcels exposed to erosion and flooding in the long term totals roughly $39.1 billion. More than 30,000 residential parcels and 3,000 commercial parcels could be vulnerable in the long term.

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[4] Is sea level rising? (noaa.gov), https://oceanservice.noaa.gov/facts/sealevel.html

[5] U.S. Census Bureau QuickFacts: San Mateo County, California (2019), https://www.census.gov/quickfacts/sanmateocountycalifornia

[6] Papendick, et al., *Vulnerability Assessment*, 2018

[7] Ehlers, Rachel. *What Threat Does Sea-Level Rise Pose to California*, 2020, LAO Publication, Sacramento: Legislative Analyst's Office, p. 4, https://lao.ca.gov/reports/2020/4261/sea-level-rise-081020.pdf

[8] C/CAG, Flood and Sea Level Rise Resiliency Agency Proposal, Dec. 21, 2018, https://ccag.ca.gov/wp-content/uploads/2019/01/6.3_A3-Water-Agency-Proposal_122118.pdf

Vulnerable infrastructure includes wastewater treatment plants, schools, and essential transportation: BART, Caltrain, Highway 101, and Highway 1.[9] Electrical distribution facilities, and facilities related to the San Francisco International Airport (SFO), located in SMC, are also at risk.

In addition to the monetary losses, SLR may impact "affordable" housing disproportionately. "Already half of East Palo Alto sits within a federally designated flood zone. According to projections, in 10 years or so up to two-thirds of the land within city limits may regularly experience flooding."[10] Redwood City, Pacifica, and unincorporated areas of the County also have areas of affordable housing subject to flooding.[11]

Flooding in a bayside mobile home park in south San Mateo County. (Photo from OneShoreline website)

Additionally, SMC residents who do not live near a shoreline may think SLR is not their problem. This is incorrect. All residents, including inland residents, need: access to highway 101,

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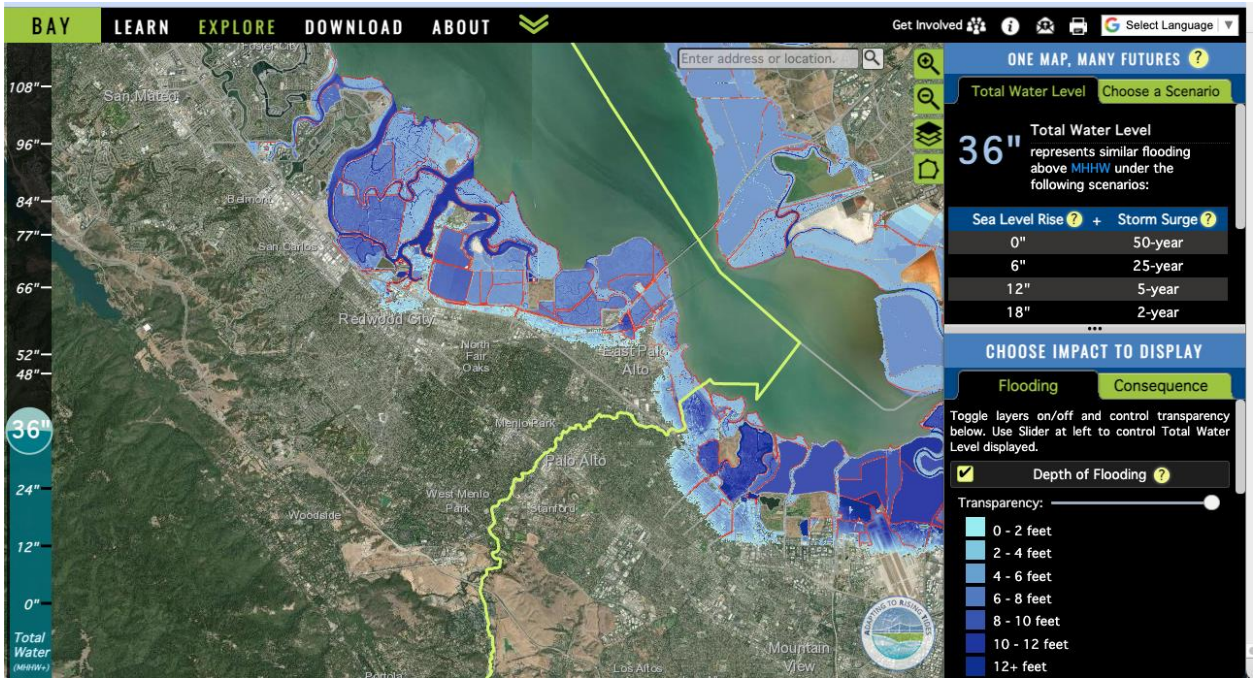
[9] Papendick, et al., *Vulnerability Assessment*, 2018.

[10] What Can the Bay Area Do About Rising Seas? East Palo Alto Has a Few Great Answers | KQED, https://www.kqed.org/science/1973805/climate-solutions-in-east-palo-alto; see also the 2015 Preliminary FEMA, NFIP map for East Palo Alto and portions of Menlo Park, https://www.cityofepa.org/sites/default/files/fileattachments/community_amp_economic_development/page/2531/fema_maps_2015_201509011239377956.pdf

[11] Grand Jury interview.

to take Caltrain, or to use SFO. All key wastewater treatment plants are located at the shoreline, and everyone needs "toilets that flush."[12]

An interactive map showing the effect of SLR and storm surges is available at https://explorer.adaptingtorisingtides.org/explorer. Below is an example showing the flooding from a 36-inch increase in water level along the Bay at the southern end of the County. As shown in the graphic below, a 36-inch increase can be experienced from no sea level rise and a "50-year" storm, six inches of sea level rise and a "25-year" storm, and other combinations.



Options for Responding to Sea Level Rise

There are only few options for dealing with the threat of SLR. They are:

- ***Protect*** the land and structures by berms, levees, sea walls, pumping stations and other structures, and raise mudflats and bay marshes to prevent erosion or flooding.
- ***Modify*** assets to withstand periodic flooding.
- ***Relocate*** the facilities to higher land.
- ***Abandon*** land and structures that will be flooded.[13]

[12] Grand Jury interviews.

[13] Grand Jury interviews.

Sea Level Rise is a Present Threat: Reports since 2016

In 2015 the San Mateo County Grand Jury issued a report titled: "Flooding Ahead: Planning for Sea Level Rise."[14] That report called for the creation of a countywide agency to address the problems brought on by SLR. Since then, numerous other reports examined SLR in California, the Bay Area, and San Mateo County. New significant reports from governmental and non-governmental agencies appear several times a year. Some of the recent and more significant reports include:

In March 2018, the County Office of Sustainability issued: *County of San Mateo Sea Level Rise Vulnerability Assessment*.[15] This report focused on understanding sea level rise risk, the level of risk is in each area, how people are affected, and our adaptive capacity.[16] **The report cited San Mateo County as the county with the highest risk of damage in the Bay Area, and one of the hot spots in the nation.** At least 32% of the population live in vulnerable areas. (See Appendix A - Selected Demographics). San Mateo County's three airports, San Francisco International, San Carlos, and Half Moon Bay, are all threatened by SLR. In addition, environmentally sensitive areas – closed landfills, former industrial sites, underground storage tanks and other contamination sites – may be damaged by SLR and contaminate the area. The County has 29 known sites classified as containing hazardous materials or cleanup sites that are vulnerable to flooding in the near term. Up to 665 sites are at risk in the long term.

Also in March 2018, Stanford Public Policy Program issued *Adaptation Planning for Sea Level Rise in San Mateo County - An Examination of 11 Bayside Cities*, a report prepared for the County Office of Sustainability.[17] It found that San Mateo County was "ground zero" for SLR vulnerability. That report noted that a mid-level projected sea level rise of 3.3 feet would impact 22,000 acres of land, 30,600 residential parcels, and five wastewater facilities. The Stanford study encouraged the cities and County to share up to date SLR information with the public.

In December 2019, the California Legislative Analyst Office (LAO) issued a report titled *Preparing for Rising Seas*,[18] which noted that SLR will impact California's coastlines in extensive and expensive ways. It posits that most of the responsibility for SLR preparation will lie with local governments and private property owners – none of whom have faced anything like this before – and observes that delaying preparations will only increase the cost dramatically. The LAO's report makes recommendations for the support of local adaptation efforts, and emphasizes the benefit of taking action early, as shown in the graphic below.

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[14] Flooding Ahead: Planning for Sea Level Rise (sanmateocourt.org), http://www.sanmateocourt.org/documents/grand_jury/2014/sea_level_rise.pdf

[15] Papendick, et al., *Vulnerability Assessment.*

[16] Ibid.

[17] Enrique, Alex, Isabelle Foster, and Will La Dow, *Adaptation Planning for Sea Level Rise in San Mateo County - An Examination of 11 Bayside Cities*, March 2018, Consulting Stanford, California: Stanford Public Policy.

[18] Ehlers, Rachel, *Preparing for Rising Seas: How the State Can Help Support Local Coastal Adaptation Efforts*, December 2019, LAO Publication, Sacramento: Legislative Analyst's Office.

Benefits of Taking Action Early to Prepare for Sea-Level Rise (SLR)

- ✓ ***Planning Ahead Means Adaptation Actions Can Be Strategic and Phased.*** Early planning can allow coastal communities to adopt a phased approach that undertakes escalating actions when certain predetermined conditions or "triggers" are reached.
- ✓ ***Undertaking Near-Term Actions Can "Buy Time" Before More Intensive Responses are Needed.*** Putting certain adaptation projects and strategies in place now can help postpone and extend the period before which subsequent, more difficult-to-implement actions are needed.
- ✓ ***Early Implementation Provides the Opportunity to Test Approaches and Learn What Works Best.*** Acting to implement adaptation strategies in the near term will provide the opportunity to monitor, evaluate, and revise them in the coming years before SLR threats become more pressing.
- ✓ ***Taking Action Earlier May Make Overall Adaptation Efforts More Affordable.*** Undertaking a multiyear, multistep strategic plan for coastal adaptation can allow local governments to spread costs over a longer period of time.
- ✓ ***Coming Decade Is Key Window for SLR Preparation.*** Some adaptation strategies—such as fortifying certain tidal marshes—may not be effective against SLR unless they are implemented before sea levels rise to higher levels.

In March 2020, The San Francisco Bay Conservation and Development Commission (BCDC), and the Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG), issued: *Adapting to Rising Tides Bay Area: Regional Sea Level Rise Vulnerability and Adaptation Study*.[19] The report, available both in a long form (205 pages) and in a summary form (36 pages), focuses on "consequences the Bay Area may face as sea levels rise in the absence of coordinated, prioritized adaptation."[20] The Adapting to Rising Tides "ART Portfolio" website contains tools and information tested and refined by BCDC. It offers key sector impact data, maps, sample projects, and guidance for cities seeking to develop adaptation strategies against sea level rise.[21]

In August 2020, the LAO issued another SLR report, titled: *What Threat Does SLR Pose to California?*[22] This report describes available research on how rising seas threaten California's coast in seven categories of impacts: public infrastructure, private property, vulnerable

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[19] Adapting to Rising Tides 2020. Adapting to Rising Tides Bay Area: Regional Sea Level Rise Vulnerability and Adaptation Study. San Francisco Bay Conservation and Development Commission (BCDC) and Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG), March 2020, San Francisco, CA., http://www.adaptingtorisingtides.org/wp-content/uploads/2020/03/ARTBayArea_Main_Report_Final_March2020_ADA.pdf

[20] Adapting to Rising Tides 2020. *Adapting to Rising Tides Bay Area: Short Report Summary of Regional Sea Level Rise Vulnerability and Adaptation Study.* San Francisco Bay Conservation and Development Commission (BCDC) and Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG), March 2020, San Francisco CA. at p. 5., http://www.adaptingtorisingtides.org/wp-content/uploads/2020/07/ARTBayArea_Short_Report_Final_March2020_ADA.pdf

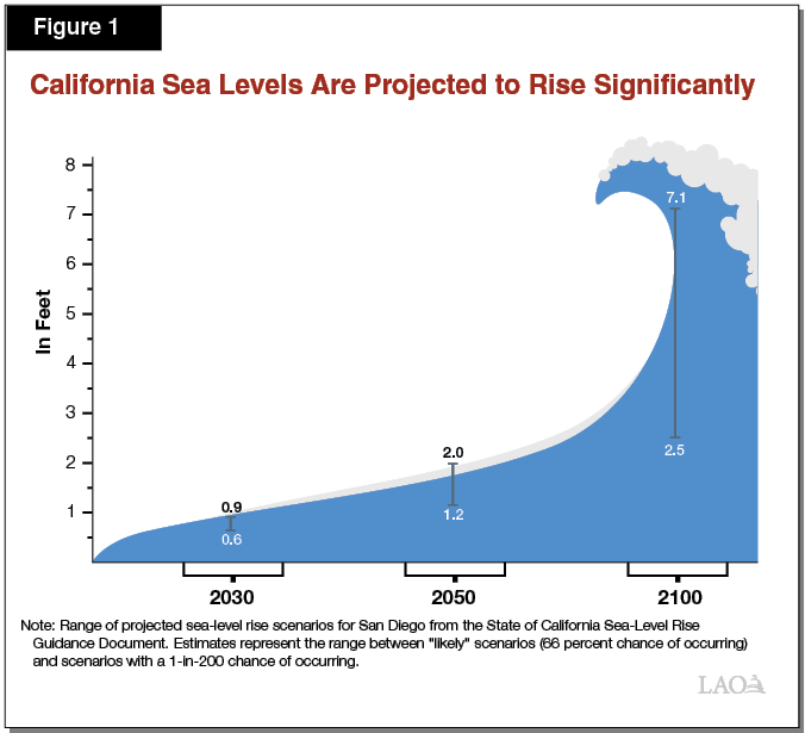
[21] Adapting to Rising Tides, https://www.adaptingtorisingtides.org

[22] Ehlers, Rachel. *What Threat Does Sea-Level Rise Pose, supra.*

communities, natural resources, drinking and agricultural water supplies, toxic contamination, and economic disruption.

In April 2021, the San Francisco Estuary Institute issued: *Sediment for Survival: A Strategy for the Resilience of Bay Wetlands in the Lower San Francisco Estuary*,[23] which proposes using sediment that is dredged from the Bay's shipping channels (and currently barged out to sea or to deep parts of the bay) to restore wetlands and mudflats in such a way that they could help in adapting to sea level rise. It estimates this approach could offer cost savings, in some locations, over building seawalls to protect homes, businesses, highways and airports. These reports offer a wealth of information on sea level rise in California, and the Bay Area in particular.

Figure 1, below, showing the variability in SLR projections, is from the August 2020, LAO report, *What Threat Does SLR Pose to California*, mentioned above.



San Mateo County – Office of Sustainability

"Formed in July 2014, as a part of the County Manager's Office, the Office of Sustainability strives to improve the sustainability of the County's operations and the greater community through work in areas of renewable energy and energy efficiency; resource conservation;

[23] Dusterhoff, Scott, Katie McKnight, Letitia Grenier, and Nate Kauffman, *Sediment for Survival: A Strategy for the Resilience of Bay Wetlands in the Lower San Francisco Estuary*, April 2021, https://www.sfei.org/sites/default/files/biblio_files/Sediment%20for%20Survival%20042121%20med%20res.pdf

alternative transportation; and greenhouse gas emission reductions."[24] An important part of its work is climate change, including SLR. In 2015, the Office of Sustainability launched a program called "Sea Change San Mateo County" which led to the San Mateo County Sea Level Rise Vulnerability Assessment, discussed above.

It also functions as a "communications department" for public engagement on sea level rise in the County. The Office of Sustainability provides curricula for schools on sea level change as well as managing a Youth Climate Ambassadors Leadership Program for 9th to 11th grade students from across the County. This program empowers youth to take climate action into their own hands by having them develop projects designed to drive change within the County.[25]

The Office of Sustainability's description of SLR states: "San Mateo County is actively preparing for sea level rise. While the changing climate and rising sea pose many risks to the people and places in San Mateo County, together we can plan ahead to protect our people and manage our valuable resources responsibly."[26]

Origin of OneShoreline

In 2015, the San Mateo County Civil Grand Jury issued a report titled "Flooding Ahead: Planning for Sea Level Rise." As a result of that report and efforts by members of the Board of Supervisors, State and Federal legislators, and others, San Mateo County and its twenty cities and towns agreed to convert the County's Flood Control District to a new District called the "San Mateo County Flood and Sea Level Rise Resiliency District," also known as "OneShoreline." OneShoreline is perhaps the only countywide agency dedicated solely to sea level rise and flooding west of the Mississippi. A table comparing the basics of the old district to the new, is in Appendix D.

DISCUSSION

San Mateo County Flood and Sea Level Rise Resiliency District – OneShoreline

In 2019, state legislation created OneShoreline, which began operation on January 1, 2020. Its geographic boundaries and spheres of influence include addressing SLR in the entire County, not just flooding in the three creek flood zones.[27] Its seven-member board is made up of five city council members from different regions in the County, and two members of the County Board of

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[24] May 19, 2020 - New Director of Sustainability: San Mateo County on "Front Lines" of Regional Challenges | County Manager's Office (smcgov.org), https://cmo.smcgov.org/press-release/may-19-2020-new-director-sustainability-san-mateo-county-%E2%80%9Cfront-lines%E2%80%9D-regional

[25] Youth Climate Ambassador – SMC Office of Sustainability (smcsustainability.org), https://www.smcsustainability.org/climate-change/youth-climate-ambassador/

[26] Office of Sustainability, Sea Change San Mateo County, https://seachangesmc.org/

[27] Our History – OneShoreline, https://oneshoreline.org/our-history/ , see also Assembly Bill 825 (2019, Mullin) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB825

Supervisors.[28] The board hired the former director of the San Francisquito Creek Joint Powers Authority (SFCJPA) as the CEO of OneShoreline. Initial funding came from the County and the 20 cities, with contribution amounts varying by city population.

OneShoreline's mission is to address SLR, flooding, coastal erosion and large-scale storm water infrastructure improvements through integrated regional planning, design, permitting, project implementation and long-term operations and maintenance.[29]

OneShoreline was created to look at the SLR problem holistically, emphasizing collaboration among all affected by a SLR project. SLR is a complex issue that requires cities to work together. The old approach of designing a project with just enough protection to escape a requirement that property owners obtain flood insurance is inadequate. A rising sea level means that flood insurance maps will be revised more frequently, requiring expensive flood insurance or a new project to provide protection.[30]

OneShoreline monitors proposed development on the shoreline to urge cities to consider SLR in the planning, design, and engineering of projects built in vulnerable areas. Cities must be aware of the long-term risks posed by development projects that are inadequately designed and planned. SLR should not be ignored no matter the short-term benefits that a development project promises to the developer or the locality in the short term.[31] If development projects, whether commercial and residential neighborhoods, roadways, or infrastructure, are rushed through without fully contemplating the long-term effects of SLR, the inevitable result will be future problems that are much harder to fix.

OneShoreline's current operational funding is $1.5 million per year for its first three years, plus portions of flood zone taxes when those areas have active projects. As more projects get underway, the OneShoreline staff of four will likely need to expand. Long-term, stable funding is critical to the success of this organization but does not currently exist. Many avenues of secure revenue streams for funding OneShoreline operations have been considered; currently OneShoreline is evaluating the support for a countywide parcel tax that would support both SLR and wildfire mitigation efforts[32]

Outreach and public engagement are essential for OneShoreline's success. To effectively implement SLR projects, OneShoreline must ensure public support from County residents. Some may not see the need for the expensive SLR projects and will require convincing that the expense cannot be avoided. OneShoreline will need to work with the County Office of Sustainability, and

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[28] AB 825, (2019, Mullin) San Mateo County Flood and Sea Level Rise Resiliency District, (2019), Section 4.5(a) prescribes the Board of Directors membership.

[29] OneShoreline, *FY2021 Audited Financial Statements*, https://oneshoreline.org/wp-content/uploads/2020/12/FSLRRD-FY20_Financial_Statement.pdf

[30] Grand Jury interviews.

[31] Grand Jury interviews and Papendick, et al., *Vulnerability Assessment.*

[32] Grand Jury interviews.

others, to ensure that residents understand that SLR is real, and that waiting until flooding is imminent is not a reasonable choice. It is partnering with the League of Women Voters and other officials to provide six public forums on SLR in 2021.[33] OneShoreline representatives are also meeting with city and town managers, and councils. Educating city elected officials and staff about the hazards of SLR and mitigation strategies is essential, since turnover of city council members is high, and SLR projects can take many years to plan and build.

OneShoreline was envisioned as the hub connecting multiple interested parties in combating SLR as seen in this diagram.[34]

[33] The last two forums are on September 2 and October 14, 2021. South San Mateo County | MyLO (lwv.org)South San Mateo County | MyLO (lwv.org), https://my.lwv.org/california/south-san-mateo-county

[34] Graphic from https://resilientsanmateo.org/wp-content/uploads/2019/04/Brochure_ExecutiveSummaryProposal_122118_PRINT-11x17-1.pdf, on April 29, 2021, (website not accessible on June 7, 2021). Similar diagram in C/CAG, *Flood and Sea Level Rise Resiliency Agency Proposal*, Dec. 21, 2018, at p. 11.

OneShoreline's First Year (2020)

In its first year of operations, OneShoreline set up its board of directors and commenced operations. The board is composed of elected representatives from different regions of the County. An executive director supervises a staff of four with expertise in flood prevention in San Mateo County. It maintains an informative website containing up-to-date documents on its projects, financing, and outreach efforts. By publishing a digital newsletter, OneShoreline has reached out to the city and town councils in the County. Importantly, the OneShoreline management and board are aware that its most pressing need is to secure a reliable source of funding for its operations.[35]

OneShoreline currently operates through a master services agreement with the County, under which it coordinates with the Office of Sustainability on outreach to keep the residents informed of SLR needs.

OneShoreline's current activities include:[36]

- obtaining long-term support, along with its constituent cities, to address funding of projects identified as necessary to mitigate hazards caused or exacerbated by sea level rise;
- addressing projects inherited from the San Mateo County Flood Control District;
- overseeing the Bayfront Canal project, with construction starting in 2021;
- offering to assist communities with other SLR and flooding projects;
- consulting with cities and towns about new projects; and
- managing multi-jurisdictional projects.

OneShoreline is most interested in working on projects: where meaningful objectives are achievable and enjoy local support; where OneShoreline can add value (such as projects involving multiple jurisdictions); and where the project makes fiscal sense.

In its interviews, the Grand Jury identified the following potential roles for OneShoreline:[37]

- *Work with the County and neighboring counties* to lobby state and federal governments for regulatory change for SLR projects;
- *Share expertise* for SLR and flooding projects;
- *Set standards* for determining the amount of SLR that cities and towns, the County, and private property owners must plan for;
- *Set guidelines* for the kinds of projects OneShoreline will prioritize;

[35] Grand Jury interviews and OneShoreline website.

[36] Grand Jury interviews and OneShoreline website.

[37] Grand Jury interviews.

- *Assist in obtaining federal and state funding* for SLR and flooding projects, by providing a unified voice when communicating with governmental agencies;
- *Work with congressional representatives* for authorizations and appropriations for initial project studies; and
- *Reach out to the San Francisco District of the Army Corps* to identify problems and discuss possible projects for the County.[38]
- *Facilitate and coordinate between interested parties* and the various state and federal regulators for projects;
- *Assist the cities* in obtaining permits for projects;
- *Keep local governments and the County informed* – regarding its operation and SLR risks; and
- *Coordinate with the County Office of Sustainability* on SLR and flooding outreach programs for the schools and community organizations.

OneShoreline Projects

OneShoreline's website contains a current list of its projects at https://onshoreline.org/projects; brief descriptions of some of those projects are available in Appendix C. One project currently under construction is the Bayfront Canal & Atherton Channel Flood Protection and Ecosystem Restoration Project[39] which, among its several goals, will protect mobile home parks near the bayfront from flooding.

Funding OneShoreline Operations

OneShoreline is working to build a strong reputation before its initial operational funding runs out in 2023. Many interviewees informed the Grand Jury that OneShoreline required secure funding commitments in order perform its functions beyond the initial three-year funding period.

Recently, the Strategic Planning Committee for OneShoreline's Board of Directors examined various potential sources of long-term stable funds for OneShoreline operations, as well as project support. The only funding option identified that would provide long-term, stable yet flexible funding for projects and for operations was a countywide parcel tax. "Polling is

[38] Grand Jury interviews.

[39] Bayfront Canal & Atherton Channel Flood Protection and Ecosystem Restoration Project – OneShoreline – at https://oneshoreline.org/projects/bayfront-atherton-flood-protection/

beginning … to test a few of these scenarios and public perceptions of this issue so that we may solidify potential ballot language."[40]

If such a tax is not feasible, OneShoreline may have to continue relying on contributions from cities and the County, renewed in multi-year commitments. OneShoreline has successfully obtained grants from the state for specific work (California Department of Water Resources $1 million grant from the Urban Streams Restoration Program, and funds for the flood warning system). While private funding is an alternative source that OneShoreline has considered, interviewees expressed their concern that such funding sources are unlikely to be reliable as long-term funding.

Funding SLR Projects

Levees, sea walls, raising marshes and mudflats, and similar capital projects are *expensive*. For example, Levee Improvement Bond Measure P passed by Foster City voters in 2018,[41] authorized Foster City to issue $90 million in general obligation bonds to fund critical levee improvements. The property tax levy to repay this borrowing will continue for 30 years. The first-year rate was approximately $36 per $100,000 of assessed property value. Subsequently, the rate will be an estimated $33 annually, with continuing decreases assuming assessed property valuations continue to rise.[42]

Foster City Levee upgrade, March 26, 2021 (Grand Jury photo)

[40] OneShoreline Board of Directors presentation April 26, 2021. Available at: https://oneshoreline.org/wp-content/uploads/2021/04/FSLRRD-Board-mtg.-4.26.2021-presentation.pdf

[41] Measure P | Foster City California, https://www.fostercity.org/cityclerk/page/measure-p

[42] Frequently Asked Questions | Foster City Levee Project, https://fostercitylevee.org/faqs/

OneShoreline inherited funding that is limited for earmarked use in the flood areas in the County for established projects. Projects directly connected with one of the three creek flood zones (Colma, San Bruno, San Francisquito) may be funded from dedicated property taxes for the specific flood zone.[43]

State funding may be available if a proposed Bond Act is passed by the voters. This measure would raise approximately $7 billion to fund climate change and sea level rise projects statewide.[44]

The Army Corps of Engineers and FEMA also provide funding for some SLR projects, but each agency has a complex set of requirements for such funding. For example, federal funding requires that a preliminary engineering and design study must be prepared prior to application for the funds. OneShoreline will serve as a valuable resource to guide projects through the study, engineering, and funding application phases. To receive federal funds, the community must contribute funds for the project. As a result of such complexities communities and agencies similar to OneShoreline typically hire consultants to guide a proposal through the federal process.[45]

OneShoreline could operate a revolving loan fund, or a portion of a regional loan fund, "capitalized by a federal investment, like the Clean Water State Revolving Fund, and offer below-market rates. Savings on insurance premiums from improved ratings under FEMA Community Rating Systems, among other sources, could repay the funds."[46] The loan fund could be used to pay for the preliminary engineering and design studies required to apply for federal funding.

Delays in adapting to SLR can result in flood remediation costs of up to six times greater than the cost of planned adaptations. A "FEMA-sponsored study by the National Institute of Building Sciences found that for every $1 the federal government invested in various types of pre-disaster mitigation activities in recent years, it avoided public and private losses totaling $6."[47]

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[43] FSLRRD-FY2020-21-Operations-and-Flood-Zones-Budgets-Approved-June-8-2020.pdf (oneshoreline.org), https://oneshoreline.org/wp-content/uploads/2020/06/FSLRRD-FY2020-21-Operations-and-Flood-Zones-Budgets-Approved-June-8-2020.pdf

[44] Bill Text - AB-1500 Safe Drinking Water, Wildfire Prevention, Drought Preparation, Flood Protection, Extreme Heat Mitigation, and Workforce Development Bond Act of 2022. (ca.gov), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB1500

[45] Grand Jury interview.

[46] Grand Jury interview and Four Key Actions to Solve for Coastal Flooding and Sea Level Rise in the Bay Area: a Governance Proposal | SPUR, https://www.spur.org/news/2020-02-20/four-key-actions-solve-coastal-flooding-and-sea-level-rise-bay-area-governance; https://www.epa.gov/cwsrf . See also: Fact Sheet | How Can Revolving Loan Funds Make Our Coasts More Resilient? | White Papers | EESI at https://www.eesi.org/papers/view/fact-sheet-how-can-revolving-loan-funds-make-our-coasts-more-resilient

[47] Ehlers, Rachel, LAO 2019, *Preparing for Rising Seas*, *supra*, at p.7.

Will Regulatory Complexities Delay SLR Projects?

In addition to financial hurdles, sea level rise projects face serious regulatory delays. The "lengthy process for attaining approvals from state and federal agencies to implement adaptation projects is a significant barrier to getting more projects underway."[48] It has been suggested that regulatory reform at both the federal and state level is needed to allow SLR projects to be proposed, designed, and constructed with less delay and cost. It would be beneficial if OneShoreline, along with the Board of Supervisors, the cities and towns, and neighboring counties, worked together to lobby state and federal governments for appropriate reform.[49]

Multiple regulatory agencies must evaluate, and issue permits for a single project. Large SLR projects (i.e., via the Army Corps of Engineers) can require a decade to design, approve, and build. Whether it is the San Francisco Bay Conservation and Development Commission or the California Coastal Commission, regulatory systems were not designed for the threat of SLR.

Regulatory complexity may be reduced by lobbying the federal and state governments for reform, or by forming interagency teams to streamline the permit application process under existing law and regulations. One example of the later approach is the SF Bay Restoration Regulatory Integration Team (BRITT),[50] which expedites and simplifies the permitting process across nine Bay Area counties for Measure AA projects ("multi-benefit wetland restoration projects and associated flood management and public access infrastructure" projects).[51] BRITT coordinates permit reviews across all the applicable state and federal agencies for those projects.

The complexity of even a relatively simple current project is illustrated below, where the project required five funding sources, land easements among multiple parties, and permits from six agencies.[52]

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[48] https://lao.ca.gov/reports/2019/4121/coastal-adaptation-121019.pdf **at** p. 26.

[49] Grand Jury Interviews; see also W. Chabot and others. April 28, 2021, during "Conversation With Kevin : Collaborating to Address Climate Change" hosted by Speaker Pro Tempore Kevin Mullin, video available at Conversation With Kevin Collaborating to Address Climate Change (facebook.com) https://www.facebook.com/102284836614761/videos/789035602040576/?__so__=channel_tab&__rv__=all_videos_card.

[50] California State Coastal Conservancy, San Francisco Bay Restoration Authority, "San Francisco Bay Restoration Regulatory Integration Team (BRRIT)", https://www.sfbayrestore.org/san-francisco-bay-restoration-regulatory-integration-team-brrit

[51] Combined Permitting overview, agreements, performance measures May 11 2018 (00409201-5).DOCX (sfbayrestore.org)' https://www.sfbayrestore.org/sites/default/files/2021-03/Permitting_agreements_and_performance_measures.pdf

[52] 4.26.2021 presentation (oneshoreline.org); https://oneshoreline.org/wp-content/uploads/2021/04/FSLRRD-Board-mtg.-4.26.2021-presentation.pdf

The US Army Corps of Engineers – Expertise, Funding, and Regulation of SLR Projects

The US Army Corps of Engineers (Army Corps) has decades of experience in protecting against flooding, especially with the use of levees. It serves a regulatory function in issuing permits, can be a source of funds, and can provide engineering expertise. Involving the Army Corps for federal funding is complex, involves Congressional action, and can take many years.[53]

An Army Corps project requires a local sponsor to provide initial funding for the design of the SLR protection. During planning and development, the local sponsor provides approximately 70% of the money and Army Corps provides the balance. During construction this reverses – the local sponsor provides approximately 30% and Army Corps provides the balance.

The Army Corps works best for big projects. Few communities can afford capital costs in the tens or hundreds of millions of dollars, or more. An article published by the Yale School of the Environment discussing the costs nationwide noted that, "In San Francisco, voters approved a $425 million bond to pay a quarter of the costs of fortifying a sea wall."[54] A simplified outline of the Army Corps process, as the Grand Jury understands it, is included in Appendix F.

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[53]To get an idea of the complexity of applying for a permit see: San Francisco District > Missions > Regulatory > How to Apply for a Permit (army.mil), https://www.spn.usace.army.mil/Missions/Regulatory/How-to-Apply-for-a-Permit

[54] Who Will Pay for the Huge Costs of Holding Back Rising Seas? - Yale E360 https://e360.yale.edu/features/who-will-pay-for-the-huge-costs-of-holding-back-rising-seas. See also SF's Embarcadero seawall measure wins easily

The Water Resources Development Act (WRDA) of 2020 changed how the Army Corps evaluates projects. New regulations are expected later in 2021 and will require the evaluation to be based on "best available, peer-reviewed science and data."[55] The WRDA also requires an evaluation of the projected benefits of a project for a *50-year period* after the expected completion date.

The Army Corps evaluates socio-economic and environmental justice effects of a proposed plan during the study phase, and solicits public involvement, to understand the views and values of the community. The Army Corps is required to consider low-cost alternatives. One non-structural measure that might be considered is a managed retreat (relocation). The Army Corps considers the fair market value of vulnerable low-cost housing. If the cost to protect the housing is more expensive than replacing the housing elsewhere, then the Army Corps may prefer the relocation alternative. If a local sponsor wants to protect areas that the Army Corps does not consider economical, the cost difference will be borne by the local sponsor.[56]

FEMA – Flood Zone Maps, Mitigation, and Prevention

The Federal Emergency Management Agency (FEMA), in addition to providing aid after a disaster, also provides flood hazard and risk data to help guide mitigation actions. Flood mapping is an important part of the National Flood Insurance Program (NFIP). Flood maps are the basis for the NFIP regulations and flood insurance[57] requirements. FEMA's flood mapping program is called Risk Mapping, Assessment, and Planning, or Risk MAP.[58] FEMA maintains and updates data through flood maps and risk assessments.[59] FEMA redraws its maps as new SLR data is collected, so that NFIP requirements will increase over time.

Designating an area as a flood zone can impact property owners financially, because the consequence is that properties in the flood zone are required to carry flood insurance, which is expensive. In the Foster City example discussed above, residents chose to raise their property taxes to fund levee improvements, because doing so protected mortgage-holding residents from having their property designated as within a flood zone, and therefore requiring that they pay high flood insurance premiums.

(sfchronicle.com); https://www.sfchronicle.com/politics/article/SF-s-Embarcadero-seawall-measure-on-track-to-13369575.php

[55] Section 113, Water Resources Development Act (WRDA) of 2020. Water Resources Development Act of 2020 (congress.gov), https://crsreports.congress.gov/product/pdf/IF/IF11700

[56] Grand Jury interviews.

[57] Flood Insurance | FEMA.gov, https://www.fema.gov/flood-insurance

[58] Risk Mapping, Assessment and Planning (Risk MAP) | FEMA.gov, https://www.fema.gov/flood-maps/tools-resources/risk-map#

[59] Flood Maps | FEMA.gov, https://www.fema.gov/flood-maps

States, communities, and private levee owners are responsible for maintaining and operating the levees they own according to specific design criteria.[60] While FEMA maps flood hazards impacted by levee systems, it does not build, own, or certify levees. Instead, other parties (such as the Army Corps) build, inspect, and maintain the levees they own.

FEMA can provide funds for flood mitigation projects (such as SLR projects) through a competitive application process. FEMA will become deeply involved with permitting for any project occurring in a floodplain.

Other Regulatory Agencies

The **U.S. Fish and Wildlife Service** (USFWS) regulates projects that affect fish and wildlife.[61] A new USFWS online planning tool is available to streamline the USFWS environmental review.[62]

National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NOAA Fisheries) is involved on the ocean-side of SMC. Under the Marine Mammal Protection Act and the Endangered Species Act, NOAA Fisheries, through its scientific support and permitting, protects ocean species while a construction project is ongoing.[63]

The **San Francisco Regional Water Quality Control Board** (Water Board) regulates discharges into the waters and requires cleanups of unplanned or illegal discharges. Regulating discharges is done through a variety of permits, including those that control erosion and storm water runoff during construction, as well as National Pollution Discharge Elimination System permits, and stream and vegetation permits. Under the federal Clean Water Act, either dredging or wetland fill activities require permits from the Army Corps. The Water Board must certify that those federal permits meet State water quality standards and that the projects minimize impacts on water quality. Most permits are adopted by the Water Board in public hearings after opportunities for public comment, which can increase delays.[64]

The **California Department of Fish & Wildlife** (CDFW) provides environmental review and permits in two key programs: the California Environmental Quality Act (CEQA) Review[65] and

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[60] FEMA, Cooperating Technical Partners and Engineers, accessed May 2021, https://www.fema.gov/flood-maps/living-levees/technical-partners-engineers

[61] U.S. Fish and Wildlife Service: An Overview - EveryCRSReport.com, https://www.everycrsreport.com/reports/R45265.html#_Toc519853442

[62] The tool is called IPac – Information for Planning and Consultation. IPaC: Home (fws.gov), https://ecos.fws.gov/ipac/

[63] Welcome to NOAA | NOAA Fisheries, https://www.fisheries.noaa.gov

[64] Permits We Issue | San Francisco Bay Regional Water Quality Control Board (ca.gov), https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/permits.html

[65] California Environmental Quality Act (CEQA) Review, https://wildlife.ca.gov/Conservation/Environmental-Review/CEQA

the Lake and Streambed Alteration (LSA) Program.[66] Both programs have separate regulations and permits.

The **California Coastal Commission** (CCC) "is an independent, quasi-judicial state agency." "In partnership with coastal cities and counties, [it] plans and regulates the use of land and water in the coastal zone. Development activities, which are broadly defined by the Coastal Act to include (among others) construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal permit from either the Coastal Commission or the local government."[67] The CCC has a dedicated section on its website on Sea Level Rise Planning and Permitting.[68] A chart illustrating the CCC regulatory process is shown in Appendix E. The CCC does not regulate the land and water in San Francisco Bay. That area is under the jurisdiction of the BCDC.

Since 2008, the **San Francisco Bay Conservation and Development Commission (BCDC)** "has been the State agency responsible for leading the Bay Area's preparedness for rising sea level, tides, and storm surge due to climate change."[69] BCDC oversees the adaptation strategy to be used by the Bay Area's regional agencies. All levels of government will need to collaborate with public and private property owners who are affected by rising sea level.[70] BCDC issues permits for work in the Bay or within 100 feet of the shoreline, including filling, dredging, dredged sediment disposal, shoreline development and other work. "A public hearing is mandatory for a major permit application[71] and the application may be reviewed by the Commission's Design Review Board and/or the Engineering Criteria Review Board." BCDC's permitting process also includes an emphasis on environmental justice.

City Awareness of Sea Level Rise

The 2014-15 Grand Jury SLR report "*Flooding Ahead: Planning for Sea Level Rise*",[72] made recommendations that contributed to the formation of OneShoreline. That report also made recommendations that SMC cities and towns include the threat of SLR in their General Plans.[73] The current Grand Jury looked at the General Plans of South San Francisco, Pacifica, Redwood City, Woodside, Menlo Park, and East Palo Alto, and found that all, except South San Francisco, had SLR in their General Plans. Not all of the General Plans covered SLR protection of transportation and utility infrastructure, schools, public safety facilities and hazardous material

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[66] Lake and Streambed Alteration Program (ca.gov), https://wildlife.ca.gov/Conservation/Environmental-Review/LSA

[67] California Coastal Commission, https://www.coastal.ca.gov/whoweare.html

[68] Planning & Permitting (ca.gov), https://www.coastal.ca.gov/climate/slr/planning-permitting/

[69] BCDC - about us (ca.gov), https://www.bcdc.ca.gov/aboutus/

[70] Ibid.

[71] BCDC PERMIT APPLICATION FORM, https://www.bcdc.ca.gov/forms/appform.pdf

[72] Flooding Ahead: Planning for Sea Level Rise (sanmateocourt.org), http://www.sanmateocourt.org/documents/grand_jury/2014/sea_level_rise.pdf

[73] Recommendation 6 of *Flooding Ahea*d, at pg. 18

sites. South San Francisco, which has active SLR projects, is in the process of amending its General Plan to include SLR.[74] For more information on the cities, see Appendix B.

This investigation also sought to determine whether city and town councils were aware of the nature of the SLR problem – its long-term impact and significant costs. Interviews with city employees revealed that, in general, the city and town councils, staff, and residents seem more aware of the impact of SLR now than they did six years ago. City representatives interviewed by this Grand Jury acknowledged the need to regularly update new council members on the SLR projects due to the prolonged time it takes for a SLR project to be designed, approved, funded, and built.[75]

OneShoreline – SMC's Future for Responding to Sea Level Rise

San Mateo County remains at risk from sea level rise and will continue to be for many generations. OneShoreline is the County's special district with the mission to protect the County from SLR and flooding, and to work with cities, towns, and the County. Although it is just a year old, OneShoreline appears to be heading in the right direction. OneShoreline must be sustainably funded in order to do the work needed to protect San Mateo County from the unavoidable problems caused by sea level rise.

BEST PRACTICES

- Cities and towns can respond to SLR by looking beyond the immediate FEMA-based flood insurance criteria and require project designs for new developments take into account long-term SLR. A project should not be viewed in isolation; consideration must be given to how it might affect nearby structures.[76]

- To build critical public support for sea level rise mitigation projects, public officials should demonstrate current and future sea level rise impacts to the community, emphasize the financial benefits of timely projects, and solicit community input in the choice of solutions to address the sea level rise problem.[77]

FINDINGS

F1. Sea level rise will seriously damage critical San Mateo County infrastructure and assets unless the County and its cities and towns prepare now.

F2. Sea level rise infrastructure projects can take more than a decade to plan, fund and build.

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[74] South San Francisco, Request for Proposals, General Plan 2040, January 11, 2019, p. 4, https://www.ssf.net/Home/ShowDocument?id=14571

[75] Grand Jury interviews.

[76] Grand Jury interviews.

[77] Vulnerability Study, *supra*, at p. 201

F3. Complex federal and state regulations and procedures delay and increase the costs of already expensive sea level rise mitigation projects. They need to be revised.

F4. Delaying sea level rise projects will increase costs.

F5. To remain effective, OneShoreline needs steady, long-term, operational funding.

F6. Coordination between neighboring jurisdictions is important to reduce costs and improve the effectiveness of a SLR project.

F7. Competing budget priorities among the entities in a sea level rise project make the projects difficult to fund and manage, leading to risk of delays and missed deadlines.

F8. Numerous hazardous material sites in the County must be protected from sea level rise flooding.

F9. Storm surge and sea level rise threaten the County's wastewater treatment plants affecting everyone in the County – even inland County residents.

F10. OneShoreline is uniquely positioned to augment San Mateo County's ability to combat sea level rise by its planning, funding, permitting expertise, and guidance.

F11. Destruction of low-cost housing on the Bay and coast by flooding and erosion due to sea level rise will further increase inequities in communities such as Belle Haven (Menlo Park), East Palo Alto, Redwood City, and Pacifica.

F12. OneShoreline effectively collaborates with the Office of Sustainability and others on public engagement campaigns to educate individuals on how sea level rise will affect San Mateo County.

F13. A loan program to provide cities and towns funds for the required preliminary engineering necessary to obtain partial state or federal funding for SLR projects would be beneficial.

RECOMMENDATIONS

The Grand Jury recommends:

R1. At a public meeting, each city and town council, or board of supervisors should take at least one concrete action toward establishing a continuing funding source for OneShoreline, identify that action in response to this report, and potentially adopt a resolution expressing support for a parcel tax or property tax by June 30, 2022.

R2. A coordinated lobbying strategy with participation by the County, by San Mateo County cities and towns, by OneShoreline, and by other interested Bay Area cities and counties for federal and state regulatory simplification by January 31, 2022.

R3. OneShoreline consider establishing and administering a low interest revolving loan fund to enable jurisdictions to prepare the initial engineering and planning necessary to obtain federal and state funding for SLR projects, establishing such program by December 31, 2021.

R4. The County Board of Supervisors and each city and town council, should ensure that their general plans regarding SLR protection include transportation and utility infrastructure, schools, public safety facilities, and hazardous material sites by March 31, 2022.

REQUEST FOR RESPONSES

Pursuant to Penal Code Section 933.05, the Grand Jury requests responses as follows from the indicated government entities.

Responses to the Findings:

OneShoreline's board of directors should respond to Findings:

F1 through F13.

The County Board of Supervisors should respond to Findings:

F1 through F13.

The City and Town Councils (or Governing Bodies) should respond to Findings:

F1 through F13.

Per Government Code Section 933.05(a), "as to each grand jury **finding**, the responding person or entity shall indicate one of the following:

1) The respondent agrees with the finding.
2) The respondent disagrees wholly or partially with the finding, in which case the response shall specify the portion of the finding that is disputed and shall include an explanation of the reasons therfor."

Responses to the Recommendations

OneShoreline's board of directors should respond to Recommendations:

R2 and R3.

The County Board of Supervisors should respond to Recommendations:

R1, R2 and R4.

The City and Town Councils should respond to Recommendations:

R1, R2 and R4.

Per Government Code Section 933.05(b), "as to each grand jury **recommendation**, the responding person or entity shall report one of the following actions:

1) The recommendation has been implemented, **with a summary regarding the implemented action.**
2) The recommendation has not yet been implemented, but will be implemented in the future, **with a timeframe for implementation.**
3) The recommendation requires further analysis, **with an explanation and the scope and parameters of an analysis or study, and a timeframe** for the matter to be prepared for discussion by the officer or head of the agency or department being investigated or reviewed, including the governing body of the public agency when applicable. **This timeframe shall not exceed six months from the date of publication of the grand jury report.**
4) The recommendation will not be implemented because it is not warranted or is not reasonable, **with an explanation therefor."**

The governing bodies indicated above should be aware that the comment or response of the governing body must be conducted subject to the notice, agenda, and open meeting requirements of the Brown Act.

METHODOLOGY

Documents

Numerous reports, news articles, and webpages were consulted in preparation of this report, from the cities and towns, the County, OneShoreline, as well as the California Legislative Analyst's Office and other organizations. For a complete list see the Bibliography below.

Interviews

Reports issued by the Civil Grand Jury do not identify individuals interviewed. Penal Code Section 929 requires that reports of the Grand Jury not contain the name of any person or facts leading to the identity of any person who provides information to the Civil Grand Jury.

All interviews were conducted via videoconference using Zoom or Google Meets, or via written questions. For this report the Grand Jury interviewed:

- City or Town managers or members of city or town councils.
- At least one County Supervisor.
- At least one member of the Board of the San Mateo County Flood and Sea Level Rise Resiliency District, aka OneShoreline.
- At least one member of the staff of OneShoreline.
- At least one officer of an Environmental Organization.
- At least one consultant with knowledge of FEMA and the Army Corps.

- Elected Legislators at the State and Federal Level or their designated staff.
- A representative of the Army Corps of Engineers.

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Appendix A: Selected Demographics for the County and Certain Cities[78]

Appendix A: Selected Demographics for the County and certain Cities							
CITY	**POPULATION** (2019 est.)	**DENSITY** (per square mile)	**ELEVATION** (in feet)	**Housing Units**	**Owner-occupied housing (%)**	**Housing Density** (per square mile)	**Median Household Income ($)**
East Palo Alto	29,593	11,596	20	7,819	42.8	2,993	44,006
Foster City	33,997	8,138	7	12,458	57.9	3,317	135,470
Menlo Park	34,138	3,271	72	13,085	56.1	1,337	82,609
Pacifica	38,984	2,941	82	14,523	68.3	1,147	31,737
Redwood City	85,784	3,956	20	29,167	50.6	1,502	69,679
South SF	67,408	6,624	16	21,814	60.2	2,386	60,764
Woodside	5,542	451	387	2,157	87.1	184	212,917
SM County	767,423	2,753	n/a	284,471	Not available	789	69,306

[78] US Census Bureau, 2019, https://www.census.gov/quickfacts/sanmateocountycalifornia and other sources.

Appendix B – Examination of Selected Cities & SFO

This Grand Jury looked at certain cities and towns selected to represent the risks faced by the County as a whole. The cities are: South San Francisco, Pacifica, Redwood City, Woodside, Menlo Park, and East Palo Alto. This report added Foster City and the San Francisco International Airport, given their unique relevance to SLR today.

South San Francisco has levees, floodwalls, two wastewater treatment plants, a sealed hazardous waste area, parks and trails, a quarter of all outpatient health care facilities, acres of wetlands, Caltrain tracks and Highway 101, and a large biotech industrial district right on the SF Bay. All are at risk of SLR or flooding. Colma Creek frequently floods and has an established flood zone with a connected property tax.

SSF's General Plan, amended in 2018, does not mention SLR. In a recent presentation by OneShoreline, it was mentioned that OneShoreline was working with SSF to update its general plan regrading SLR and flooding.[79]

South San Francisco takes several approaches to sea level rise:

- Development planning and zoning for the future, utilizing SLR predictive models.
- Community awareness of the problems and recognizing the likelihood of needing resident's financial support for sea level rise mitigation projects in the future.
- Using consultants to work with federal agencies (e.g., the Army Corps of Engineers) in order to receive funding and expertise for project planning, design, and construction.
- Remediation of bay water seepage into existing landfills as the result of sea level rise.

Many parts of South San Francisco are in FEMA flood zones. South San Francisco has been proactive in seeking solutions to its own sea level rise challenges and hired consultants to work with the Army Corps of Engineers on a project to protect a $1billion water treatment plant located on the shoreline which cannot be moved. The funding, when working with the Army Corps, breaks down as follows: for design and development – SSF pays 70% and Army Corps 30%; for construction – SSF pays 30% and Army Corps 70%.

South San Francisco expects to collaborate with OneShoreline on projects such as the reconstruction of Colma Creek, which is funded via an existing property tax. SSF is also planning a water reclamation project and will look to OneShoreline for both funding and construction assistance.[80]

Pacifica is susceptible to significant impacts due to SLR. High tides and severe storms result in shoreline erosion, especially in northern Pacifica. The high cliffs are particularly susceptible to erosion and required the city to condemn and remove apartment houses and infrastructure (e.g.,

[79] Presentation by the League of Women Voters, OneShoreline, and others, April 8, 2021.

[80] Grand Jury interviews & city documents.

wastewater, telecom). Permanent fixes are complicated and expensive. Pacifica must also be prepared for tsunamis.

Properties along Esplanade Ave can be seen perched on the edge of an eroding cliff Dec. 23, 2015, in Pacifica, Calif. The center property is vacant.
(Leah Millis/San Francisco Chronicle)

Pacifica adopted a Sea Level Rise Adaptation Plan because of the 2018 Sea Level Vulnerability Assessment. The city of Pacifica is looking to implement coastal resiliency strategies and policies that are consistent with Pacifica General Plan and Local Coastal Programs.

Pacifica's General Plan recognizes the importance of global climate change and its impact on SLR. The plan describes how SLR affects coastal neighborhoods and habitats and acknowledges that "coastline-altering structures [may] be needed in the future to protect new development." It recommends periodically conducting studies of the expected rate of coastal flooding and erosion.[81] Pacifica has popular beaches, canyons, creeks and "mini-watersheds" that contribute to

[81] City of Pacifica, CA - -- General Plan Documents, https://www.cityofpacifica.org/depts/planning/general_plan_update/default.asp

flooding from the inland areas. It constructed an Equalization Basin to handle wastewater overflow to prevent sewage from entering the ocean.

Pacifica must work closely with the California Coastal Commission, which regulates any development near the coast, causing delays when evaluating new projects. It has a Local Coastal Land Use Plan which specifies the land uses and an Implementation Program containing zoning and other elements.

Storm surges frequently cover the Pacifica Pier, a present-day reality of SLR, as shown in the photograph below.

Huge waves batter the coast on Beach Boulevard in Pacifica Jan. 23, 2016. The city of Pacifica has declared a local emergency due to El Nino storm damage.[82]

Foster City, built entirely on bay fill, is protected by levees and is currently raising those levees to avoid being mapped as a flood zone requiring flood insurance. The $85 million project is being funded by a 2018 voter passed property tax.

[82] Pacifica declares local emergency after damage to sea wall – Orange County Register (ocregister.com), https://www.ocregister.com/2016/01/23/pacifica-declares-local-emergency-after-damage-to-sea-wall/

Foster City's General Plan discusses SLR and describes other contributors to coastal flooding: tides, storm surge, wind-driven waves, El Nino events, and fresh-water flooding. The Plan recognizes secondary environmental conditions (rainfall, soil conditions, etc.); the impact of human mitigation measures (levees, control channels, and other flood-control features); and addresses specific hazards, studies, past mitigation efforts, as well as an "evaluation of future sea level rise."[83]

Woodside is not at *direct* risk from SLR and has minimal flooding risk. Woodside's General Plan does not consider SLR to be much of a threat to the town, local infrastructure, or residents.[84] However, the plan acknowledges it has a vested interest in SLR mitigation given that its sole wastewater treatment facility is the Silicon Valley Clean Water Regional Wastewater Treatment Plant located in Redwood City, a facility extremely vulnerable to SLR. "Everyone needs to flush their toilets."[85]

Woodside would also be impacted by flooding of Highway/U.S. 101, other transportation resources, the loss of County industry and employers, and other infrastructure such as local airports, hospitals, and County government facilities.

Redwood City is currently working on several SLR projects namely, the Bayfront Canal and Atherton Channel Flood Improvement project with Menlo Park, Atherton, the County and OneShoreline. Improvements to the levees around Redwood Shores are being planned, with $500,000 initially budgeted for preliminary design. Also in progress is a salt pond restoration project next to Redwood Shores which will help reduce flooding during storms and high tides and protect the mouth of Redwood Creek. The City is working with property owners in the Seaport Centre and Seaport Plaza areas to raise those levees to 14 feet (at the highest point), to meet FEMA standards. Property owners are covering design and construction costs of approximately $13.5 million, while the City will be responsible for operation and maintenance.

The Redwood City General Plan cites specific SLR hazards posed to the Port of Redwood City, and the extensive development of residential, industrial, critical infrastructure, and coastal ecosystems on both sides of U.S. 101. The plan discusses:

- discouragement of development on land where SLR cannot be adequately addressed;
- consideration and mitigation of SLR in the planning process;
- supporting research and preparing adaptation plans for the effects of climate change;
- intent to consult with public agencies responsible for flood control; and
- preparing public awareness campaigns about climate change and how residents might become actively involved in solutions.

Redwood City plans to institute several SLR programs:

- Sea Level Rise Response Strategy;

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[83] General Plan | Foster City California, https://www.fostercity.org/commdev/page/general-plan

[84] General Plan 2012 | Town of Woodside California (woodsidetown.org), https://www.woodsidetown.org/planning/general-plan-2012-0

[85] Grand Jury interview.

- Climate Change Consultation and Flooding Consultation;
- Upgrade levees to FEMA standards; and
- Improvements in the city's abilities to contain and process stormwater.[86]

Redwood City looks to OneShoreline to help on regional efforts and projects that span multiple jurisdictions and require the coordination of various agencies (FEMA, Army Corps, CA Environmental Protection Agency, Bay Conservation and Development Commission, etc.), as well as establishing uniform sea level rise standards throughout the County. Of special importance is the need for Redwood City to update the Redwood Shores levee, which, if not accomplished within a certain timeframe, will result in a large residential area being re-mapped by FEMA into a special flood hazard area, requiring homeowners carry expensive flood insurance.

Menlo Park understands that it must work cooperatively with its neighbors to solve the shared threat of SLR. "Water is fungible – it moves around."[87]

It is working with OneShoreline and the San Francisquito Joint Powers Authority (SFJPA) to address SLR and flooding. OneShoreline is currently leading project development pursuant to Memorandum of Understanding (MOU) for Bayfront Canal with Redwood City, Atherton, Menlo Park and the County. Menlo Park is also involved with OneShoreline and the San Francisquito Creek Joint Powers Authority to address concerns over flooding from the creek and the Bay in Menlo Park.

Menlo Park's General Plan recognizes the need to "prepare the community for potential adverse impacts related to climate change, such as sea level rise…," and includes a discussion of funding options. It acknowledges concerns of mortgage holders in the FEMA 100-year floodplain over the cost of mandatory flood insurance. Long-term planning for construction in SLR-vulnerable areas must be regulated to consider how development may be affected by SLR.

The Belle Haven area, located between the Bay and Highway 101, is particularly vulnerable to flooding from sea level rise. Menlo Park is working with OneShoreline, Redwood City, East Palo Alto, Atherton, PG&E and Facebook, to secure grants and other funding needed for levees to protect bayfront areas, including a PG&E substation – toward which PG&E has offered to contribute $10 million.

East Palo Alto is laser-focused on finding solutions to its flooding threats. "The City of East Palo Alto has 335 acres of land at risk in the baseline scenario, 714 acres in the mid-level scenario, and 992 acres in the high-end scenario. A significant portion of East Palo Alto's population (nearly 60%) is vulnerable to sea level rise in the mid-level scenario."[88] It is directly

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[86] Redwood City General Plan.

[87] Grand Jury interview.

[88] Papendick, Hilary, Jasneet Sharma, Carolyn Raider, Avana Andrade, Emi Hashizume, Montserrat Plascencia, Sally Prowitt, et al. 2018, March. *County of San Mateo, Sea Level Rise Vulnerability Assessment.* Final Report, Redwood City: County of San Mateo, at p. 130.

impacted both by SLR and freshwater flooding from the San Francisquito Creek. It has a history of involvement, with the SFCJPA, to address creek flooding and has SLR projects in the early stages of development.

East Palo Alto's General Plan discusses educating its residents to take personal steps to combat climate change as a basic approach to mitigating SLR. The plan addresses the history of flooding and future hazards posed by the proximity of several neighborhoods to San Francisquito Creek. East Palo Alto considers the inevitability of SLR in its general assessment and mitigation planning for all flooding.

East Palo Alto has already been hit hard by flooding, especially around "the Village." Many of its neighborhoods are in FEMA flood zones, obliging homeowners to purchase costly flood insurance. As the city seeks to approve new development, it requires builders to "build higher" to ensure that new construction is not compromised by flooding threats.

East Palo Alto has recently been awarded a grant for sea wall construction. The City, with the assistance of OneShoreline, is working on a project with three "reaches":

Reach 1: Protect the Garden area of East Palo Alto – this project is complete.

Reach 2: Replace bridges, including the Pope / Chaucer Bridge. OneShoreline is providing design assistance along with the Army Corps of Engineers. This reach is currently looking for funding.

Reach 3: Exploring options about the ongoing upstream protection of Stanford University.

San Francisco International Airport (SFO)

San Francisco International Airport, while owned by the City and County of San Francisco, is in San Mateo County. This is the single most valuable asset in all the County. "In FY 2018, SFO directly accounted for almost $11 billion in business revenues, which supported more than 46,000 jobs at the Airport. Off-Airport businesses that depend directly on air service at SFO … raise the direct Airport contribution to the Bay Area economy to $42.5 billion in business sales, with more than 188,000 jobs."[89]

SFO borders two cites and the County. The Airport is in the planning stage of a $500 million project to increase the height of its levees. SFO has its own source of funding for SLR protection via airline ticket fees and other fees. SFO plans to work with OneShoreline to coordinate its SLR protection with its neighbors.

[89] SFO_Economic_Impact_Report_2019.pdf (flysfo.com), at p. 1, https://www.flysfo.com/sites/default/files/SFO_Economic_Impact_Report_2019.pdf

Appendix C – Some of OneShoreline's Current Projects

OneShoreline is involved in several flooding and sea level rise projects, many already in progress in various stages when the district was formed. Some of the currently active projects are summarized below. (For more details on any of these projects, check the OneShoreline website.[90]

Bay Shoreline Project: Burlingame, Millbrae, and San Francisco International Airport

The long-term objective is to raise shoreline and creek bank elevations along 1.6 miles of Bay shoreline and 1.5 miles of creeks. The project will remove properties from the current FEMA 100-year floodplain and protect them from an additional roughly six feet of sea level rise – a water level approximately 10 feet above current daily high tide. SFO has a revenue stream and will protect the airport. OneShoreline's role is, in part, to coordinate with SFO and the neighboring cities, as well as to help the cities design and finance their projects.

Bay Shoreline Project: Redwood Shores and San Carlos

Redwood Shores, built upon marshes of San Francisco Bay, is protected by a system of levees. In 2010, Redwood City raised the height of over three miles of levee surrounding Redwood Shores. In April 2020, FEMA notified Redwood City that the levees had to be raised again, or a certain residential area would be designated as a Special Flood Hazard Area requiring approximately 4,700 households to purchase flood insurance.

Bayfront Canal & Atherton Channel Flood Protection and Ecosystem Restoration Project

The Atherton Channel converges with the Bayfront Canal at the border of Redwood City and Menlo Park and empties into San Francisco Bay through a tide control structure. High tides keep the Canal and Channel from draining to the Bay. Even minor rainfall resulted in flooding of nearby mobile home parks and businesses 40 times over the past 70 years, most recently in 2017.

In 2017, Redwood City, Menlo Park, Atherton, and the County signed an MOU to establish funding for the design, environmental documentation, and land access agreements. This project consists of an underground culvert to divert excess flow from the Atherton Channel and the Bayfront Canal into managed ponds within the Ravenswood Complex of the South Bay Salt Ponds Restoration Project (SBSPRP). In 2020, OneShoreline assumed the lead role to complete the project working with the cites and the County.

Colma Creek, San Bruno Creek, Navigable Slough, and nearby areas of the shoreline

Colma Creek, San Bruno Creek, and Navigable Slough are connected waterways within the cities of South San Francisco and San Bruno that are prone to flooding, especially during high tide levels in the San Francisco Bay. Colma Creek and San Bruno Creek comprise two of the three long-standing active flood zones that OneShoreline inherited from the former flood control

[90] https://oneshoreline.org/projects/

district. OneShoreline has conducted a survey of these studies and potential projects to establish potential priorities for upcoming projects.

Countywide Flood Early Warning System and Flood Emergency Action Plans

OneShoreline is managing a coordinated, countywide flood emergency preparedness and response program in collaboration with the Sheriff's Office and the County Office of Emergency Services. The program upgrades and expands the region's flood warning system (measurement and alarms) for emergency responders and the general public. The program includes extensive public outreach and emergency response personnel training, and the creation of a publicly accessible flood monitoring webpage.

OneShoreline is also leading the creation of site-specific Flood Emergency Action Plans (EAPs) to better define and coordinate emergency responsibilities before, during, and after flood events that cross jurisdictional boundaries for the following areas: Bayfront Canal and Atherton Channel; Belmont Creek; and Navigable Slough, Colma Creek, and San Bruno Creek.

Appendix D – Comparing the Old District to OneShoreline

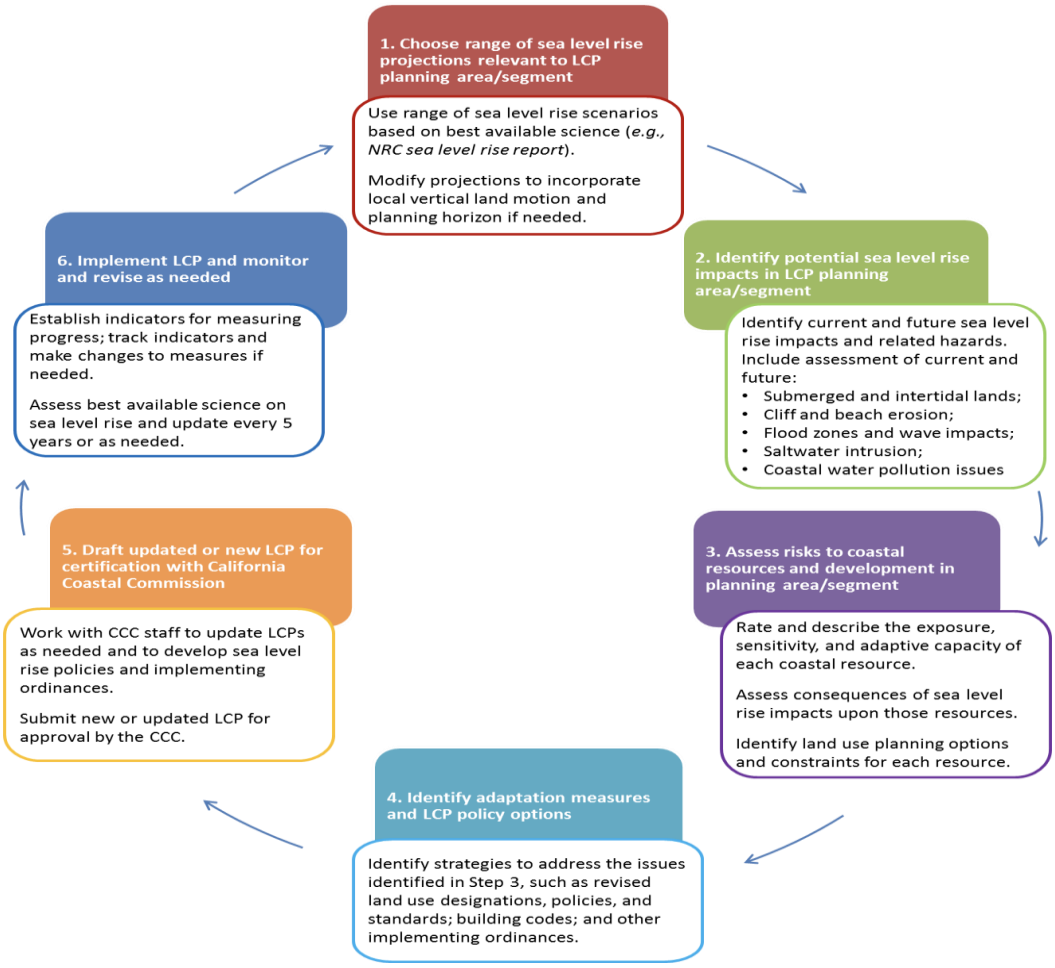
Comparing the Old Flood Control District to OneShoreline		
	Flood Control District	OneShoreline
Formal name	San Mateo County Flood Control District	San Mateo County Flood and Sea Level Rise Resiliency District
Year Established	1959	2019
Governance	Board of Supervisors of the County	Independent seven-member Board of Directors appointed from elected County and City officials[91]
Staffing	None; borrowed from County and consultants	As of May 2021, full time staff of four professionals, and consultants
Area of operation	3 Areas near creeks[92]	Entire County
Focus	Flooding – 3 creeks	SLR and Flooding
Operating budget	No "operating" budget	$1.5 million per year (2020-2022)
Funding	Property taxes from 3 flood zones by creeks	Operational: County & cities for approximately 3 years (with 2-year optional extension) Property taxes from three creek-side neighborhoods
Project Budgets	Flood zone property taxes, with some grants and matching	Flood zone property taxes, with some grants and matching, other agreements, and other assessments approved by voters

[91] Section 4.5(a) of the San Mateo County Flood Control Act, as amended.

[92] The three creeks are Colma, San Bruno, and San Francisquito.

Appendix E – California Coastal Commission Regulatory Diagrams

As an illustration of the complexity of the regulatory process, a chart from the "CALIFORNIA COASTAL COMMISSION SEA LEVEL RISE POLICY GUIDANCE - Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits"[93] is shown below.[94] While this only deals specifically with the Coastal Commission, a similarly complex iterative regulatory process will also be encountered with the BCDC, the Army Corps, and other agencies.



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[93] California Coastal Commission, ""CALIFORNIA COASTAL COMMISSION SEA LEVEL RISE POLICY GUIDANCE - Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits," updated Nov. 7, 2018. Available at https://documents.coastal.ca.gov/assets/slr/guidance/2018/0_Full_2018AdoptedSLRGuidanceUpdate.pdf

[94] Ibid, p. 95.

APPENDIX F – The Army Corps of Engineers Procedures – "Simplified"[95]

The sequential steps that are involved in an Army Corps flood control project include:

1. Non-federal sponsor identifies problem and requests feasibility study. The non-federal sponsor, typically a city, county, or state, has the legal and financial capability to provide its share of the project cost.
2. Congressional authorization to study required, and local sponsor submits letter of intent.
3. Funds appropriated and study authorized - funds can be requested by Army Corps from President's budget, or Congress can appropriate funds.
4. Study process involves identifying problems, opportunities, objectives, and constraints, potential alternative plans, and identifies the:
    a. National Economic Development (NED) based on maximizing net benefits relative to costs. Benefits are primarily avoiding economic damages from flooding. The costs are those of constructing and maintaining the project.
    b. National Ecosystem Restoration (NER) alternative.
    c. Local sponsors may identify plans beyond the NED or NER and can include those at their own cost; a levee built higher than what the NED plan included, for example
5. Draft integrated feasibility report which includes a draft environmental compliance plan.
6. Review of the draft by:
    a. the public;
    b. resource agencies;
    c. stakeholders; and
    d. Army Corps internal legal, policy and technical.
7. Recommended Plan includes greater level of design, economic, engineering, environmental, and other technical details.
8. Final Feasibility Study Report, including environmental.
    a. Recommends project authorization.
9. Congressional Authorization and construction funding required.

The Army Corps in addition to looking primarily to avoid economic damages from flooding also evaluates based on:

- National Economic Benefit;
- Environmental Quality;
- Regional Economic Development;
- Other Social Effects;
- Views of the public;
- Federal regulatory agencies;
- State regulatory agencies; and
- Stakeholders.

[95] Grand Jury interview.

Civil works studies and projects compete nationally for congressional appropriations. The Army Corps also has a set of nine existing authorities under the Continuing Authority Program (CAP) to plan, design, and construct water resources projects of limited scope and complexity. CAP studies and projects do not require project-specific authorization from Congress. Potentially applicable CAP authorities applicable to coastal and fluvial water resources problems include Section 103 (Beach erosion and storm risk reduction); Section 204 (Beneficial Reuse of Dredge Material); Section 205 (Flood risk management); and possibly others.