Storm Water Resource Plan

Stephen Carter, P.E.
Task Lead

Paradigm Environmental

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.
www.flowstobay.org

C/CAG Stormwater Committee
April 21, 2015

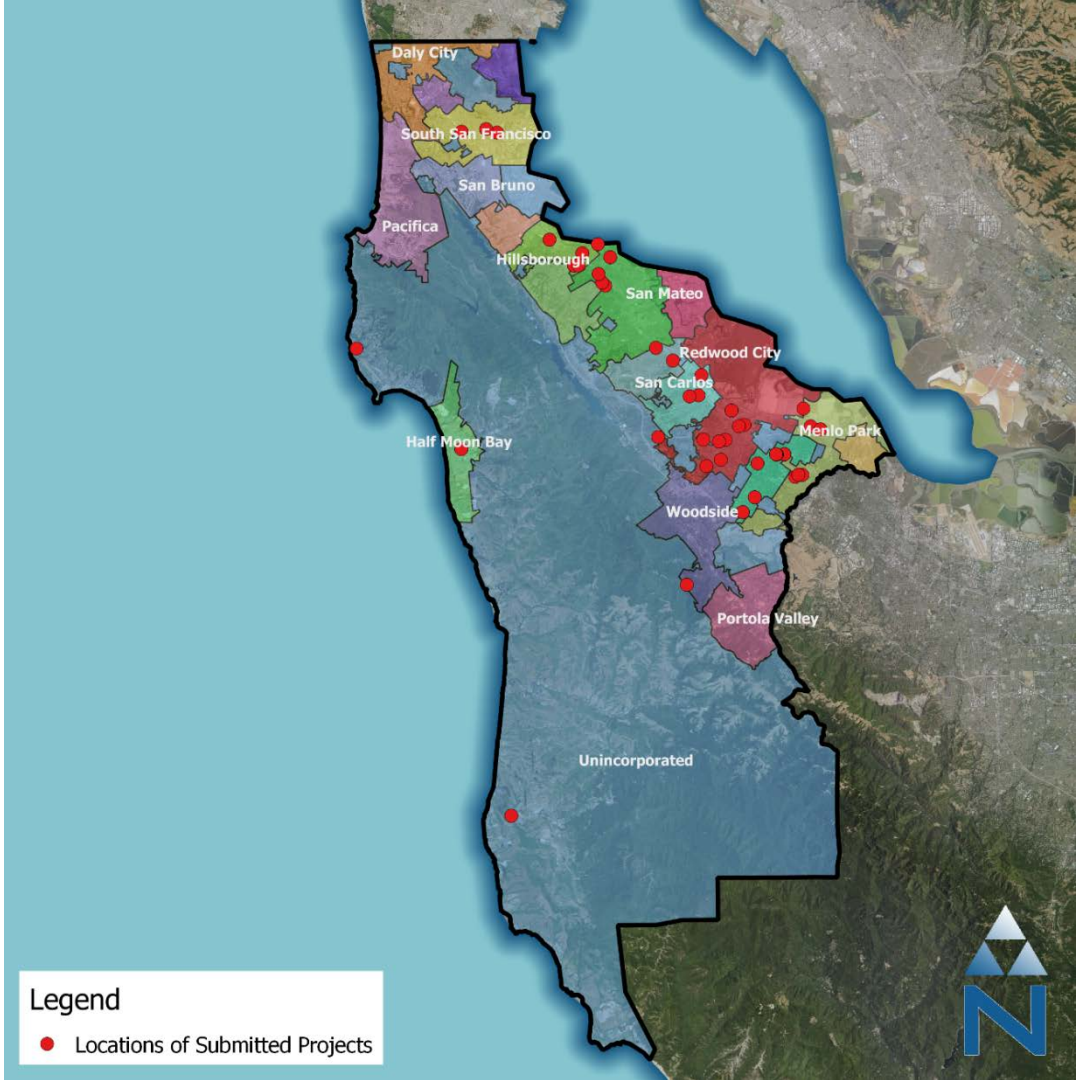
Stormwater Resource Planning

- June 2016 - Develop project concepts to support Prop 1 grant applications
- June 2016 - Prepare draft SRP that incorporates project concepts to meet grant application process
- Dec 2016 – Final SRP due to the State if grants are awarded

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

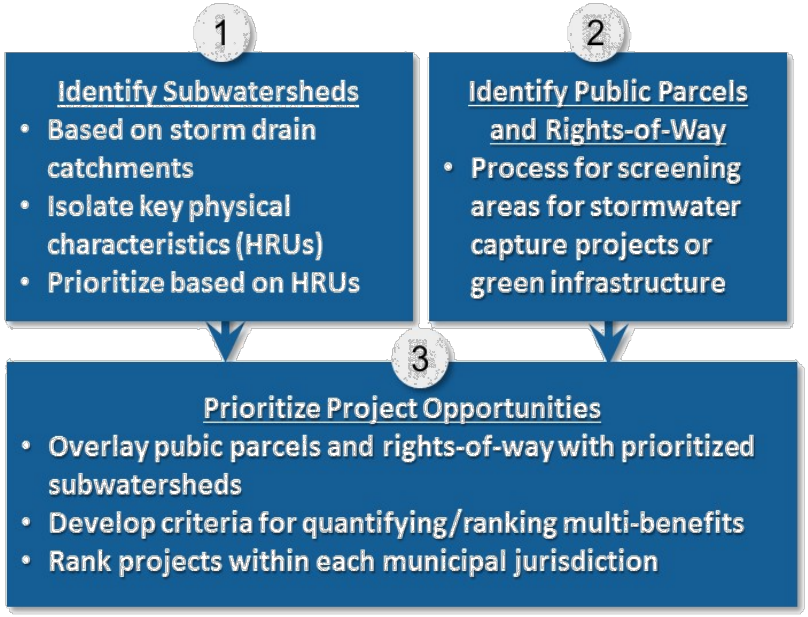
Data Compilation

- GIS data from cities/county
- Project information



Identify and Prioritize Stormwater and GI Projects

- Process tailored to C/CAG preferences
- GIS screening of public parcels and rights-of-way
- Prioritization based on:
  - Maximum effectiveness for stormwater control
  - Multiple benefits (groundwater recharge, reuse, enhancement of habitat or open space)

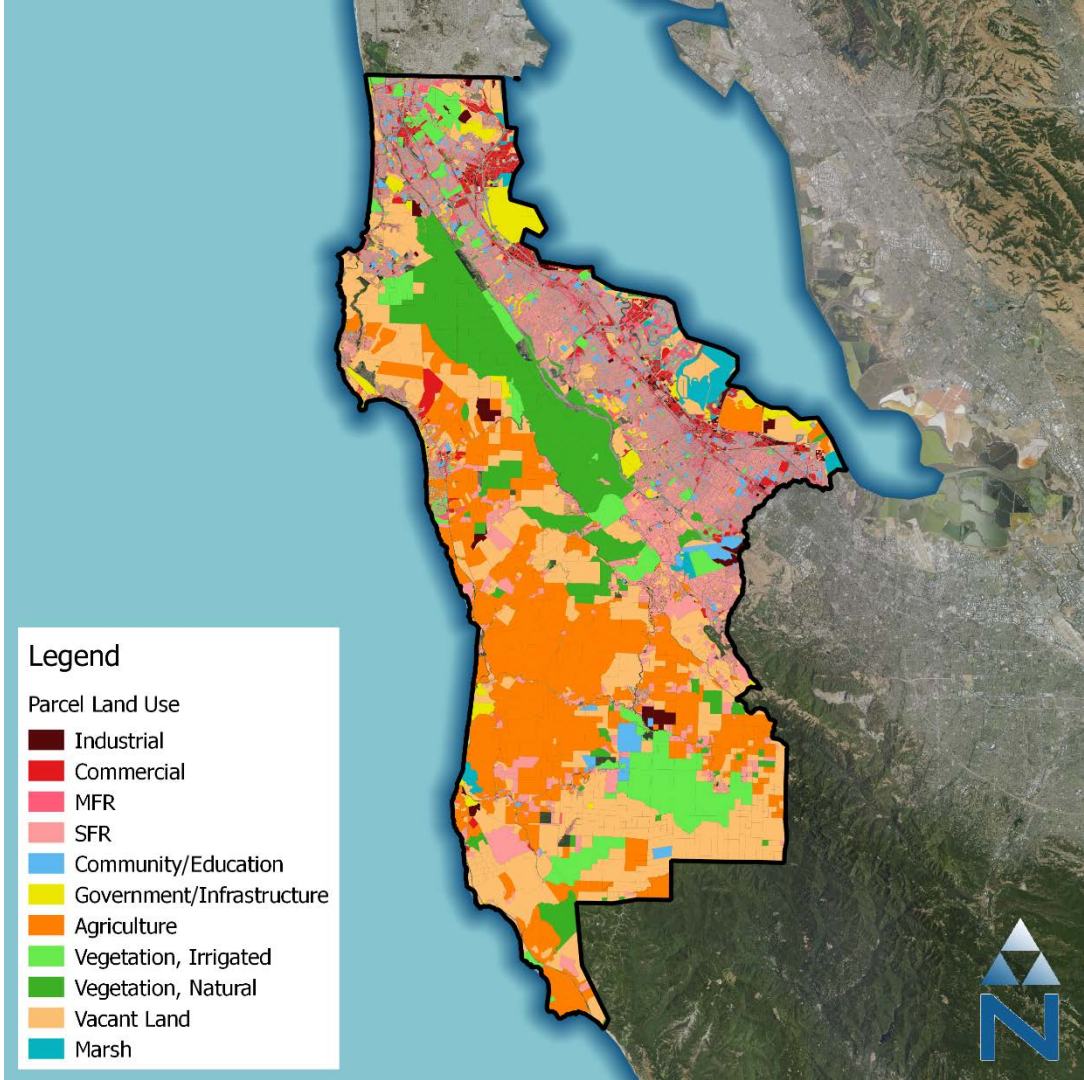


SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Physical Characteristics

Parcel land use

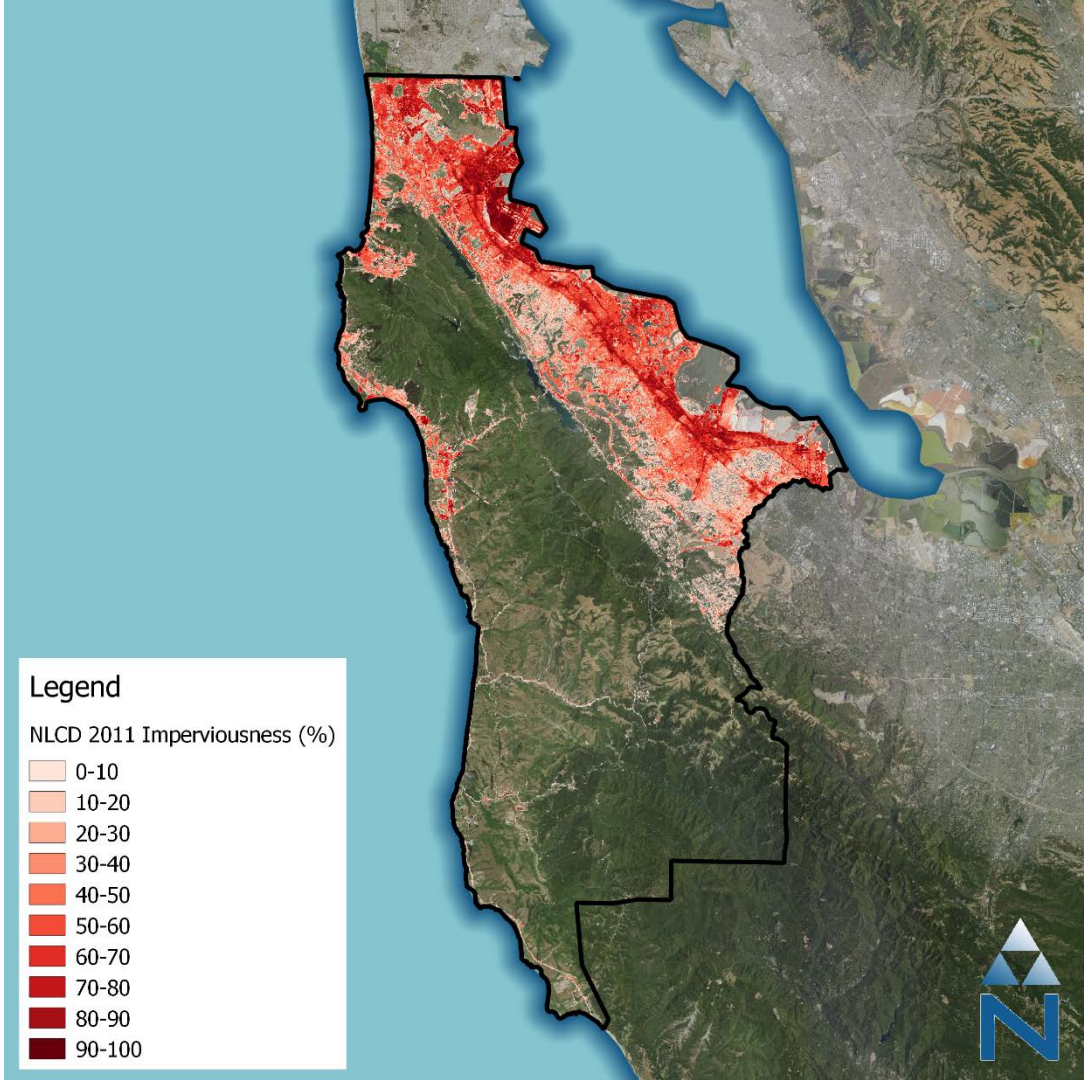
- screen public parcels
- prioritize land uses suitable for each project type



Physical Characteristics

Impervious area

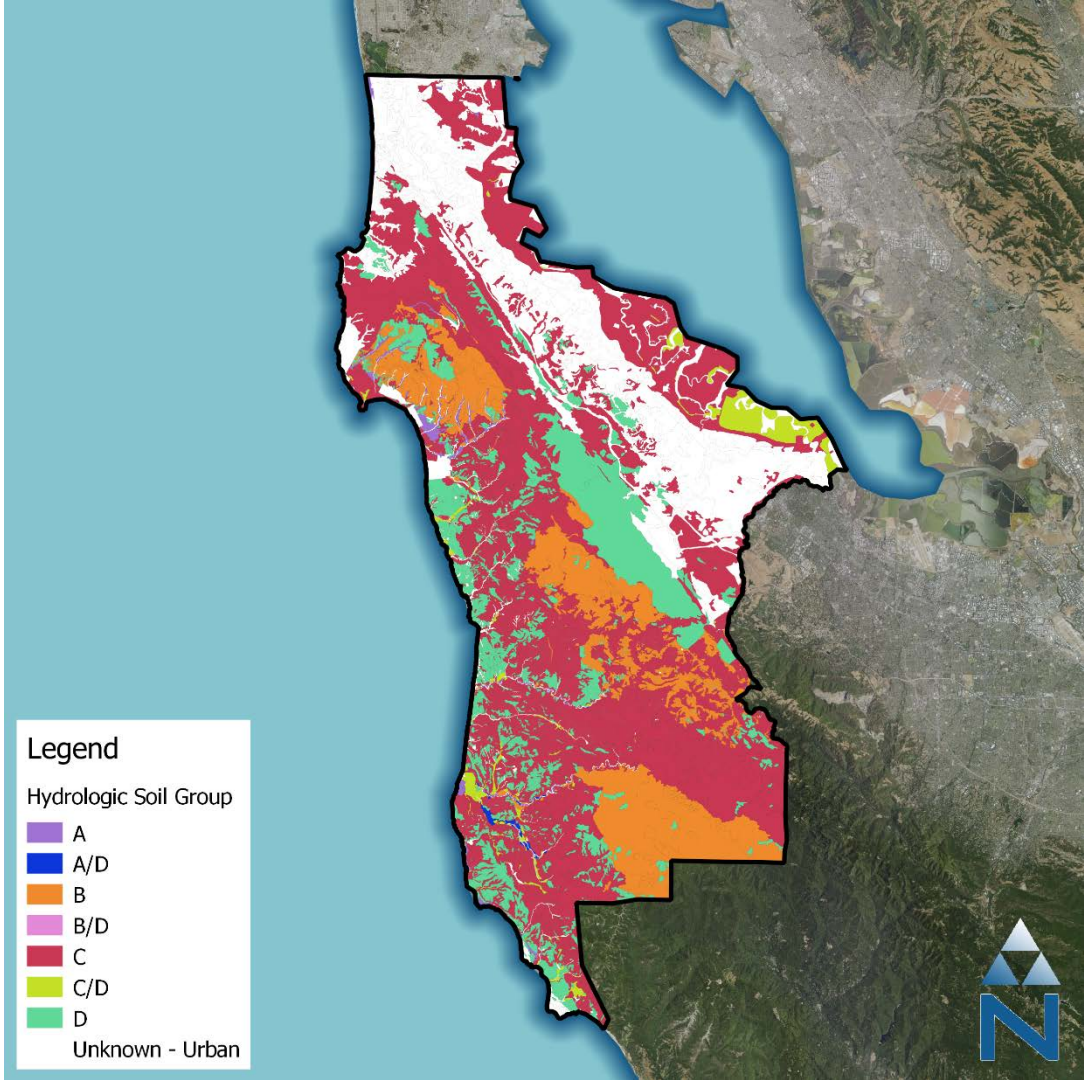
- high impervious area is correlated to large runoff potential
- Priority given to sites with high imperviousness



Physical Characteristics

Hydrologic Soil Group

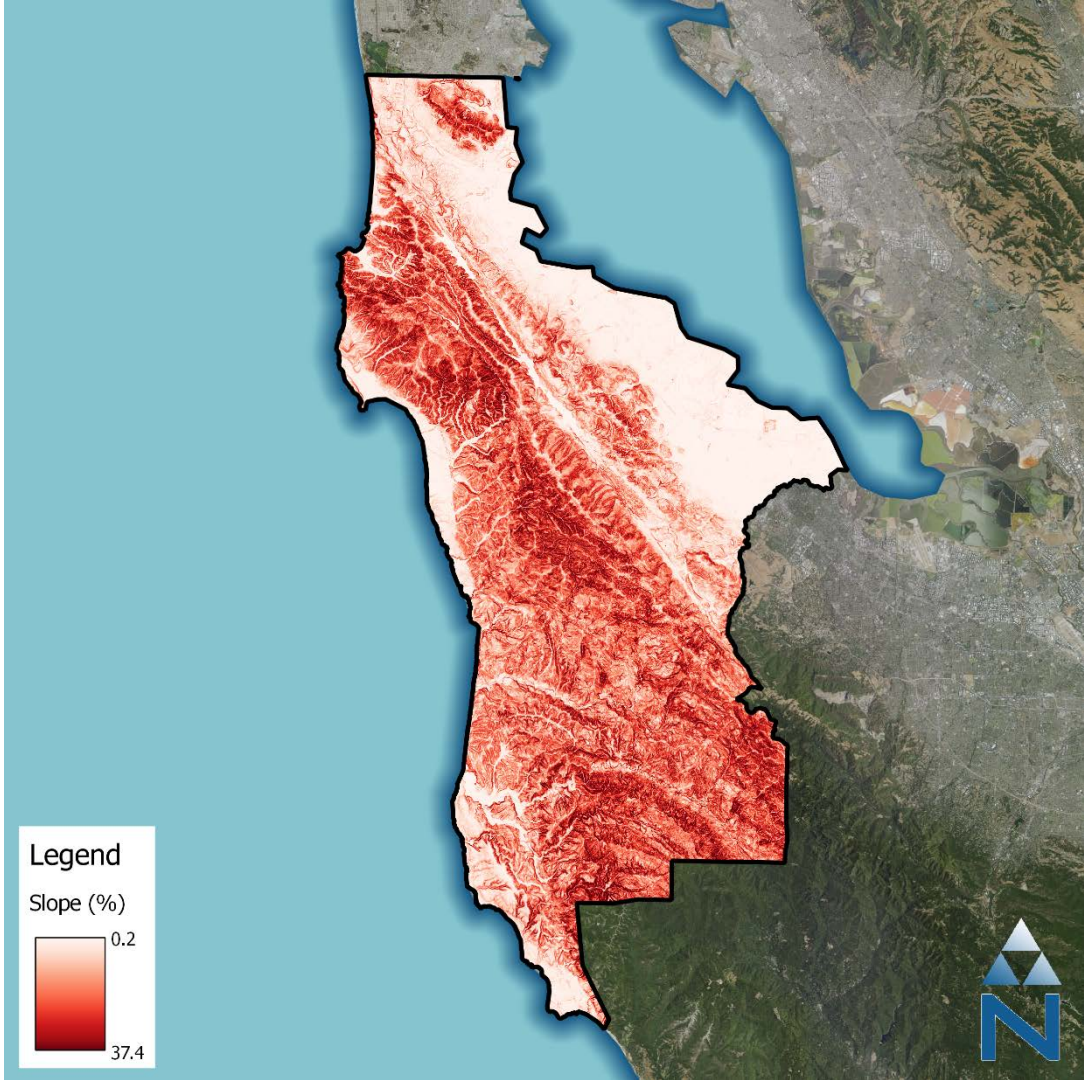
- grouped based on drainage characteristics of soils
- **Group A** represents *well*-drained soils
- **Group D** represents *poorly*-drained soils.



Physical Characteristics

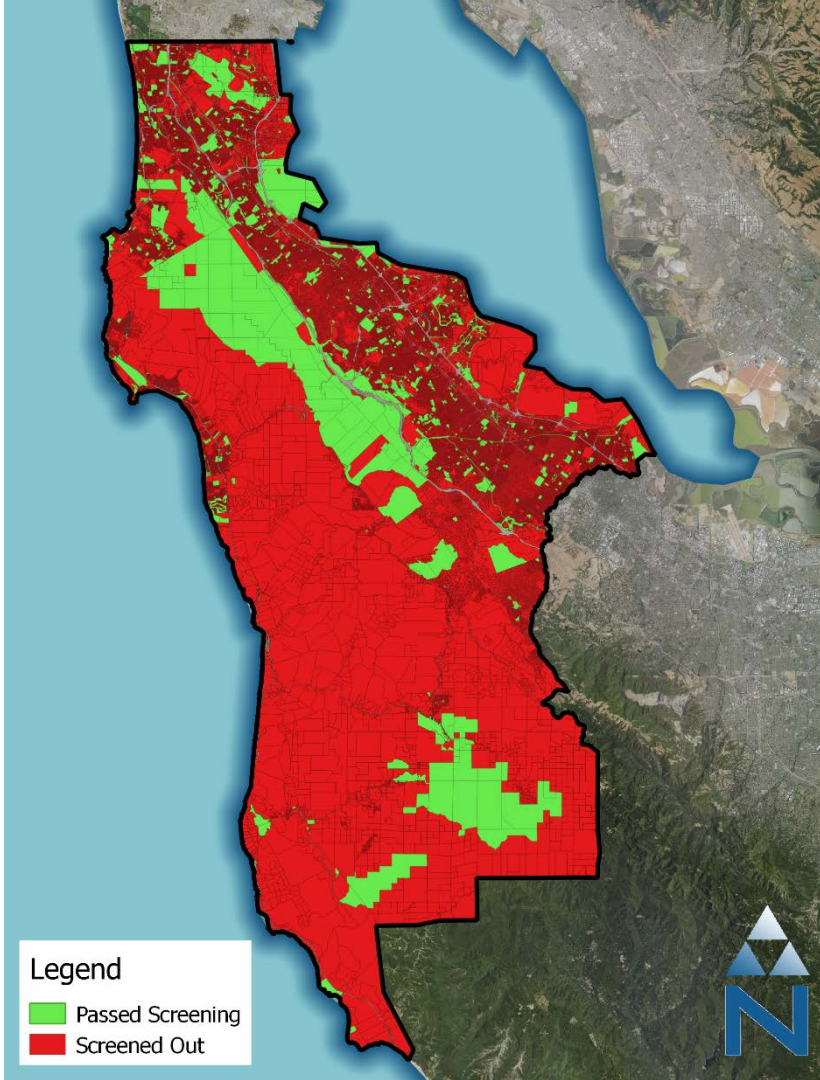
Slope

- mild slopes are more feasible for stormwater capture
- steep slopes present difficulties with implementation and performance



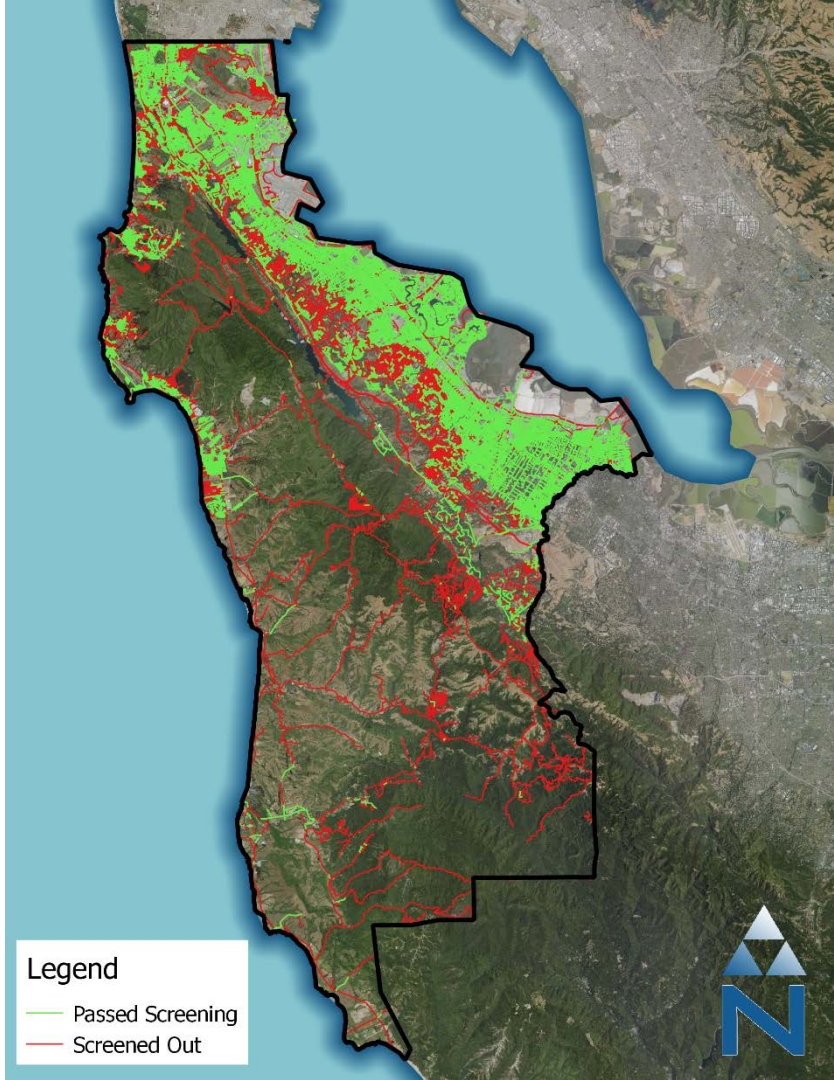
Screening of Sites for Onsite LID/Regional Projects

Screening Factor	Parcel Characteristic	Criteria	Reason
Public Parcels	Ownership	City, County or Town	Identify all public parcels for regional storm and dry weather runoff capture projects or onsite LID retrofits
	Land Use	Park, School, Other (e.g., Golf Course)	
Suitability	Parcel Size	>0.25 acres	Adequate space for regional stormwater and dry weather runoff capture project
		All	Opportunity for onsite green infrastructure retrofit
	Site Slope	< 10 %	Steeper grades present additional design challenges



Green Street Screening

Screening Factor	Street Section Characteristic	Criteria	Reason
Selection	Functional Class	S1400 S1730 S1780	Local neighborhood road, rural road, city street, alley, parking lot roads
Suitability	Ownership	Private	Potential projects are focused on public and right-of-way opportunities
	Road Slope	< 5%	Steep grades present additional design challenges; reduce capture opportunity due to increased runoff velocity



Regional Projects Matrix

	Points						Weight Factor
	0	1	2	3	4	5	
Parcel Land Use	--	--	Schools/Golf Courses	Public Buildings	Parking Lot	Park / Open Space	--
Impervious Area	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Parcel Size (acres)	0.25 ≤ X < 0.5	0.5 ≤ X < 1	1 ≤ X < 2	2 ≤ X < 3	3 ≤ X < 4	4 ≤ X	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	5 < X ≤ 10	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	Potential High Interest	--	High Interest	--	--	--
Currently planned by City or co-located with other City project	No					Yes	2
Drains to TMDL waters	No					Yes	--
Above groundwater aquifer	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

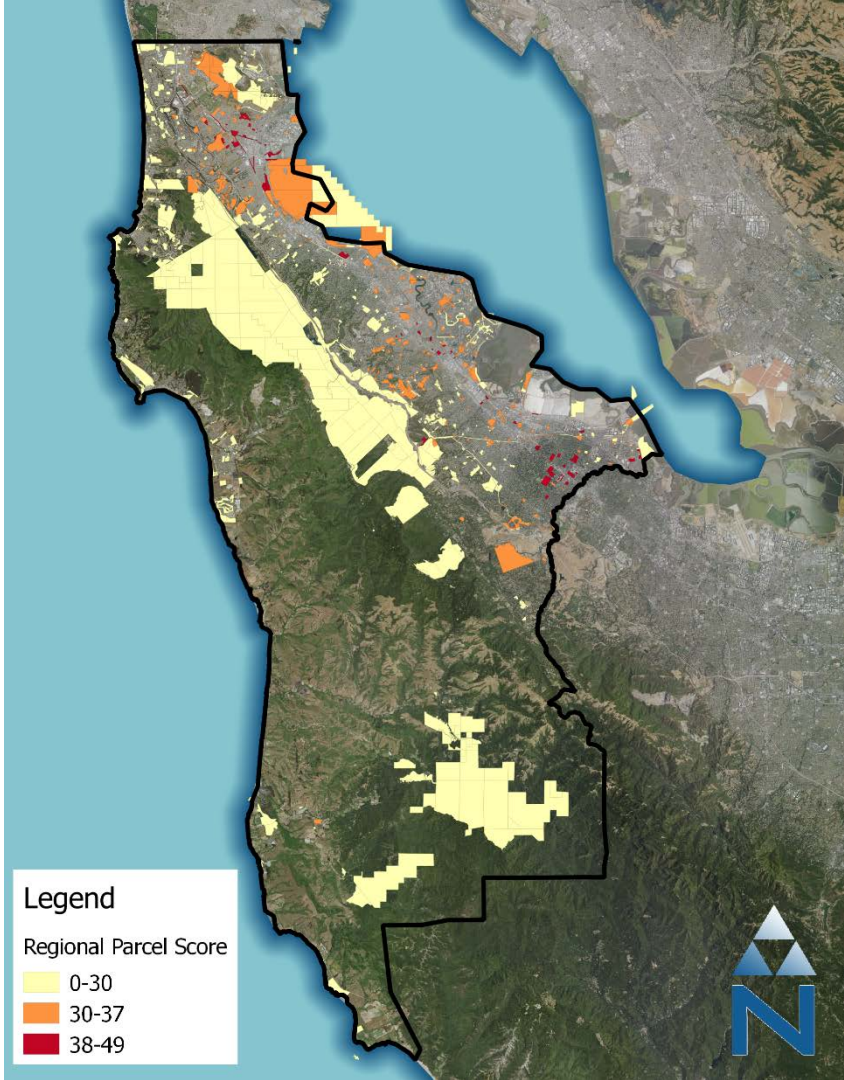
COUNTYWIDE
Pollution
n Program
Clean Water. Healthy Community.

Regional Projects

Total # of Screened Parcels: 1,841

Low score: 1,091
Medium score: 670
High score: 80

Rank	Score	Jurisdiction	APN	Co-located Project
1	49	Menlo Park	071102400	Parking Plaza 7 Renovation
2	49	Menlo Park	071281160	Parking Plaza 7 Renovation
3	49	Menlo Park	071285160	Parking Plaza 7 Renovation
4	48	Menlo Park	071283140	Parking Plaza 7 Renovation
5	48	Menlo Park	071094180	Parking Plaza 7 Renovation
6	48	Menlo Park	071284100	Parking Plaza 7 Renovation
7	48	Menlo Park	071092290	Parking Plaza 7 Renovation
8	46	Menlo Park	071273160	Parking Plaza 7 Renovation
9	45	South San Francisco	015180180	
10	45	South San Francisco	015180170	
…	…	…	…	

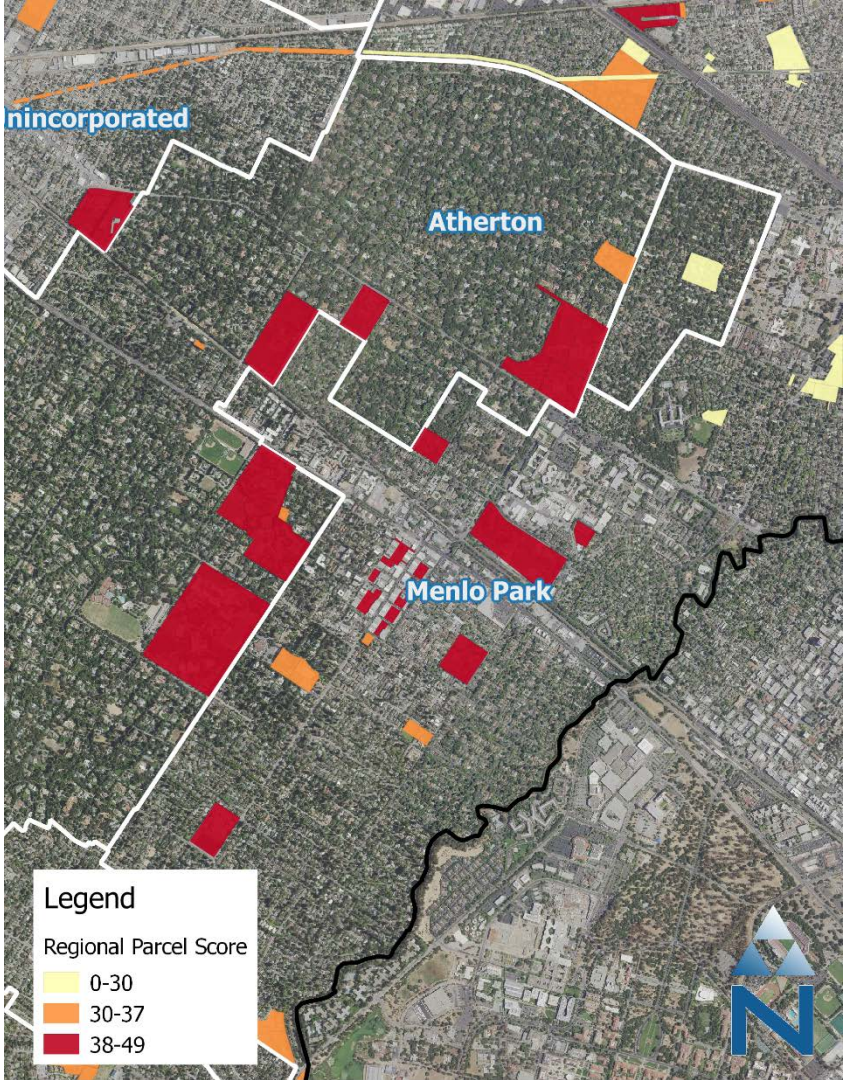


Regional Projects

Total # of Screened Parcels: 1,841

Low score: 1,091
Medium score: 670
High score: 80

Rank	Score	Jurisdiction	APN	Co-located Project
1	49	Menlo Park	071102400	Parking Plaza 7 Renovation
2	49	Menlo Park	071281160	Parking Plaza 7 Renovation
3	49	Menlo Park	071285160	Parking Plaza 7 Renovation
4	48	Menlo Park	071283140	Parking Plaza 7 Renovation
5	48	Menlo Park	071094180	Parking Plaza 7 Renovation
6	48	Menlo Park	071284100	Parking Plaza 7 Renovation
7	48	Menlo Park	071092290	Parking Plaza 7 Renovation
8	46	Menlo Park	071273160	Parking Plaza 7 Renovation
9	45	South San Francisco	015180180	
10	45	South San Francisco	015180170	
…	…	…	…	



LID Projects Matrix

	Points						Weight Factor
	0	1	2	3	4	5	
Parcel Land Use	--	--	Schools/Golf Courses	Park / Open Space	Parking Lot	Public Buildings	--
Impervious Area	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	5 < X ≤ 10	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	Potential High Interest	--	High Interest	--	--	--
Currently planned by City or co-located with other City project	No					Yes	2
Drains to TMDL waters	No					Yes	--
Above groundwater aquifer	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

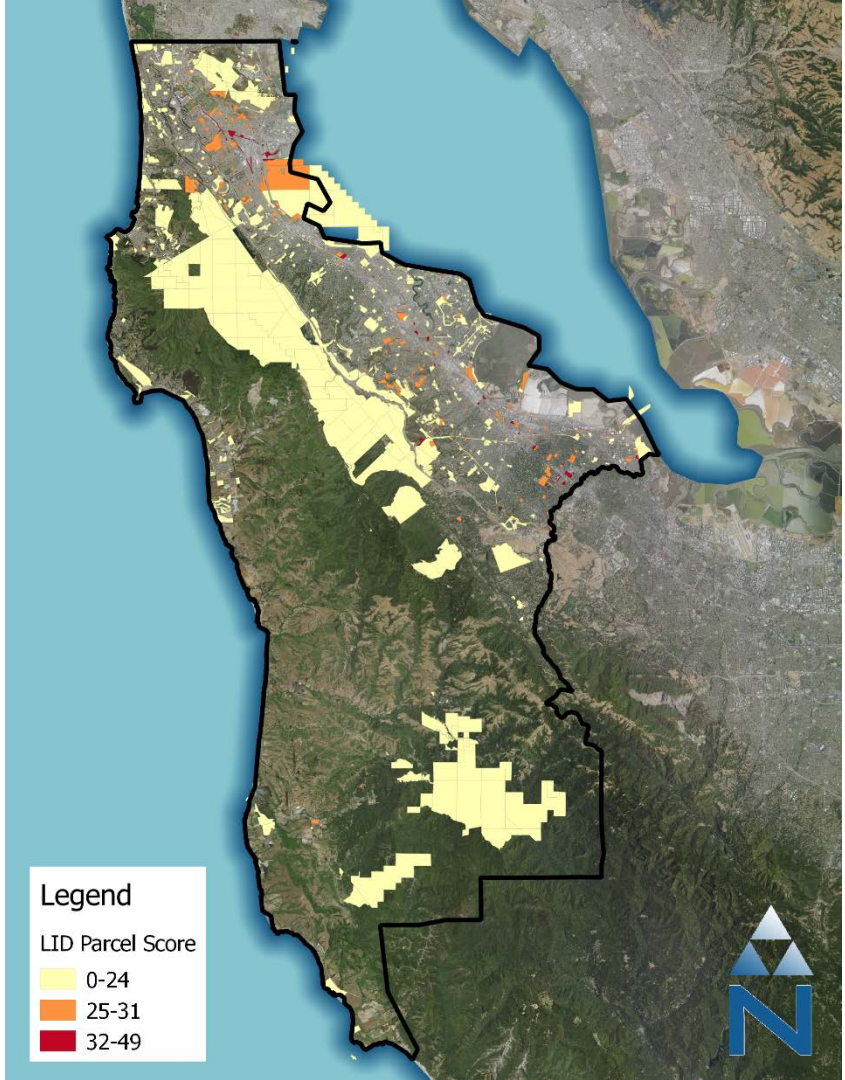
WIDE
tion
ogram
Clean Water. Healthy Community.

LID Projects

Total # of Screened Parcels: 2,688

Low score: 1,888
Medium score: 738
High score: 62

Rank	Score	Jurisdiction	APN	Co-located Project
1	47	Menlo Park	71283140	Parking Plaza 7 Renovation
2	47	Menlo Park	71273160	Parking Plaza 7 Renovation
3	47	Menlo Park	71102400	Parking Plaza 7 Renovation
4	47	Menlo Park	71284100	Parking Plaza 7 Renovation
5	47	Menlo Park	71281160	Parking Plaza 7 Renovation
6	47	Menlo Park	71285160	Parking Plaza 7 Renovation
7	46	Menlo Park	71094180	Parking Plaza 7 Renovation
8	46	Menlo Park	71092290	Parking Plaza 7 Renovation
9	39	South San Francisco	15135210	
10	38	San Bruno	14283070	
…	…	…	…	

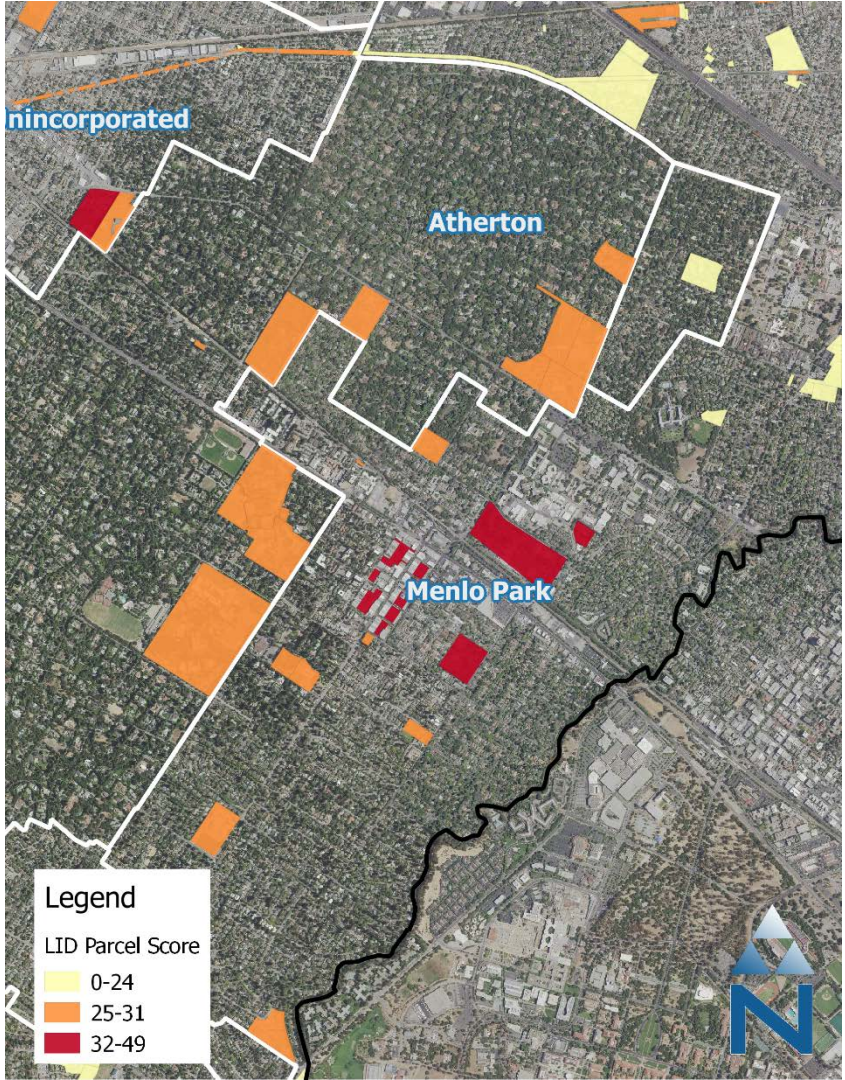


LID Projects

Total # of Screened Parcels: 2,688

Low score: 1,888
Medium score: 738
High score: 62

Rank	Score	Jurisdiction	APN	Co-located Project
1	47	Menlo Park	71283140	Parking Plaza 7 Renovation
2	47	Menlo Park	71273160	Parking Plaza 7 Renovation
3	47	Menlo Park	71102400	Parking Plaza 7 Renovation
4	47	Menlo Park	71284100	Parking Plaza 7 Renovation
5	47	Menlo Park	71281160	Parking Plaza 7 Renovation
6	47	Menlo Park	71285160	Parking Plaza 7 Renovation
7	46	Menlo Park	71094180	Parking Plaza 7 Renovation
8	46	Menlo Park	71092290	Parking Plaza 7 Renovation
9	39	South San Francisco	15135210	
10	38	San Bruno	14283070	
…	…	…	…	



Green Streets Matrix

	Points						Weight Factor
	0	1	2	3	4	5	
Street Type	Highway	--	Arterial	Collector	Alley	Local	--
Imperviousness (%)	X < 40	40 ≤ X < 50	50 ≤ X < 60	60 ≤ X < 70	60 ≤ X < 80	80 ≤ X < 100	--
Hydrologic Soil Group	--	D	Unknown	C	B	A	--
Slope (%)	--	4 < X ≤ 5	3 < X ≤ 4	2 < X ≤ 3	1 < X ≤ 2	0 < X ≤ 1	--
Proximity to Flood-prone Channels (miles)	Not in sub-basin	3 < X	--	1 < X ≤ 3	--	X ≤ 1	2
Contains PCB Risk Areas	None	Potential High Interest	--	High Interest	--	--	--
Currently planned by City or co-located with other City project	No					Yes	2
"Safe Routes to School" program	No					Yes	2
Drains to TMDL waters	No					Yes	--
Above groundwater aquifer	No		Yes				--
Augments water supply	No	Yes					--
Water quality source control	No	Yes					--
Reestablishes natural hydrology	No	Yes					--
Creates or enhances habitat	No	Yes					--
Community enhancement	No	Yes					--

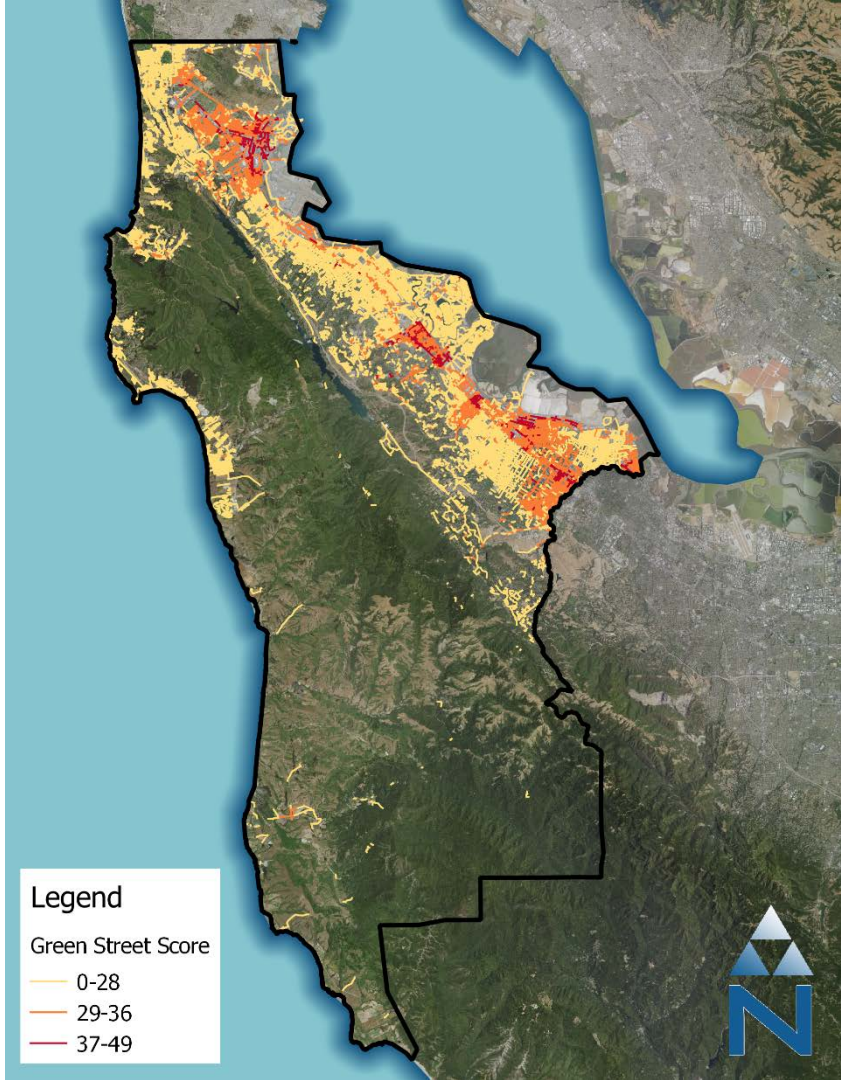
WIDE
tion
Prevention Program
Clean Water. Healthy Community.

Green Streets

Total # of Screened ROW segments: 16,366
Median Segment Length: 320 ft

Low score: 11,086
Medium score: 4,547
High score: 733

Rank	Score	Street Name	TIGER Census Roads ID (STNA_ID)	Length (ft)
1	49	Airport Blvd	322632	374
2	49	Santa Cruz Ave	1717	225
3	48	Grand Ave	269532	235
4	48	Airport Blvd	322632	370
5	48	Chestnut St	284618	145
6	47	Alma St	235064	798
7	47	E Grand Ave	327309	228
8	47	Meadow Ct	3011441	135
9	47	San Miguel Way	3010534	303
10	47	San Miguel Way	3010534	419
…	…	…	…	…

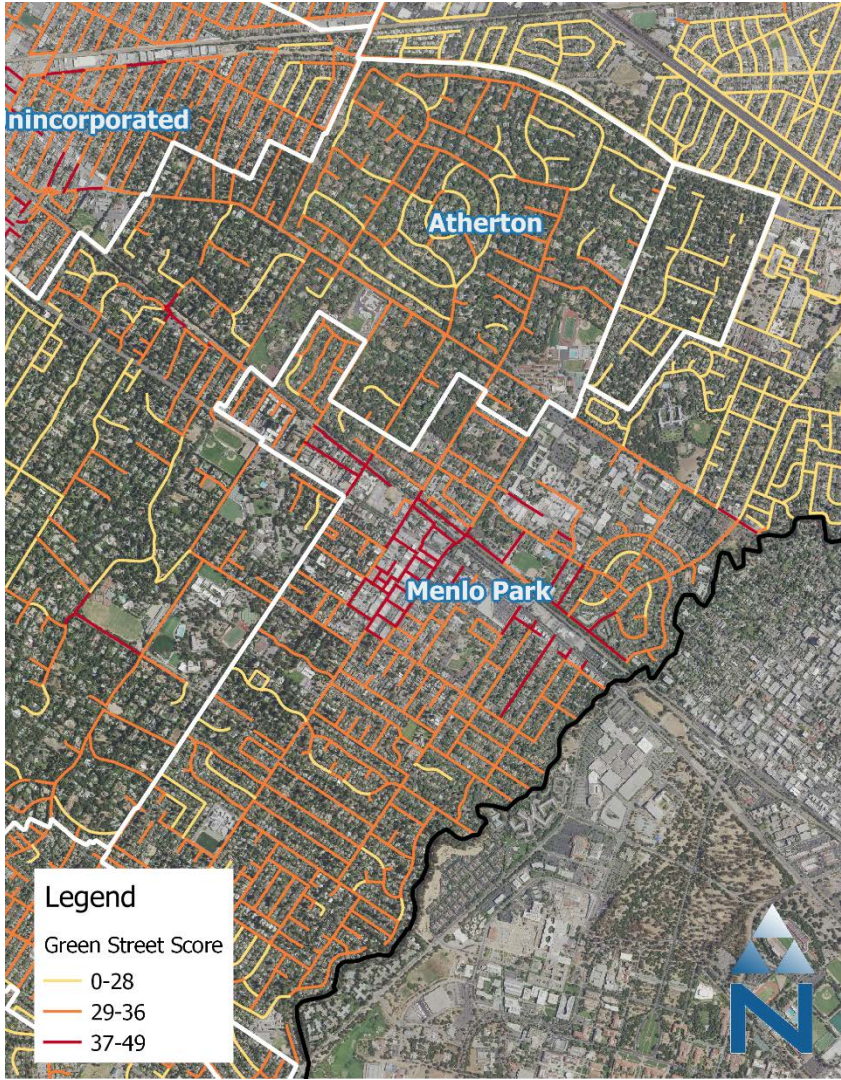


Green Streets

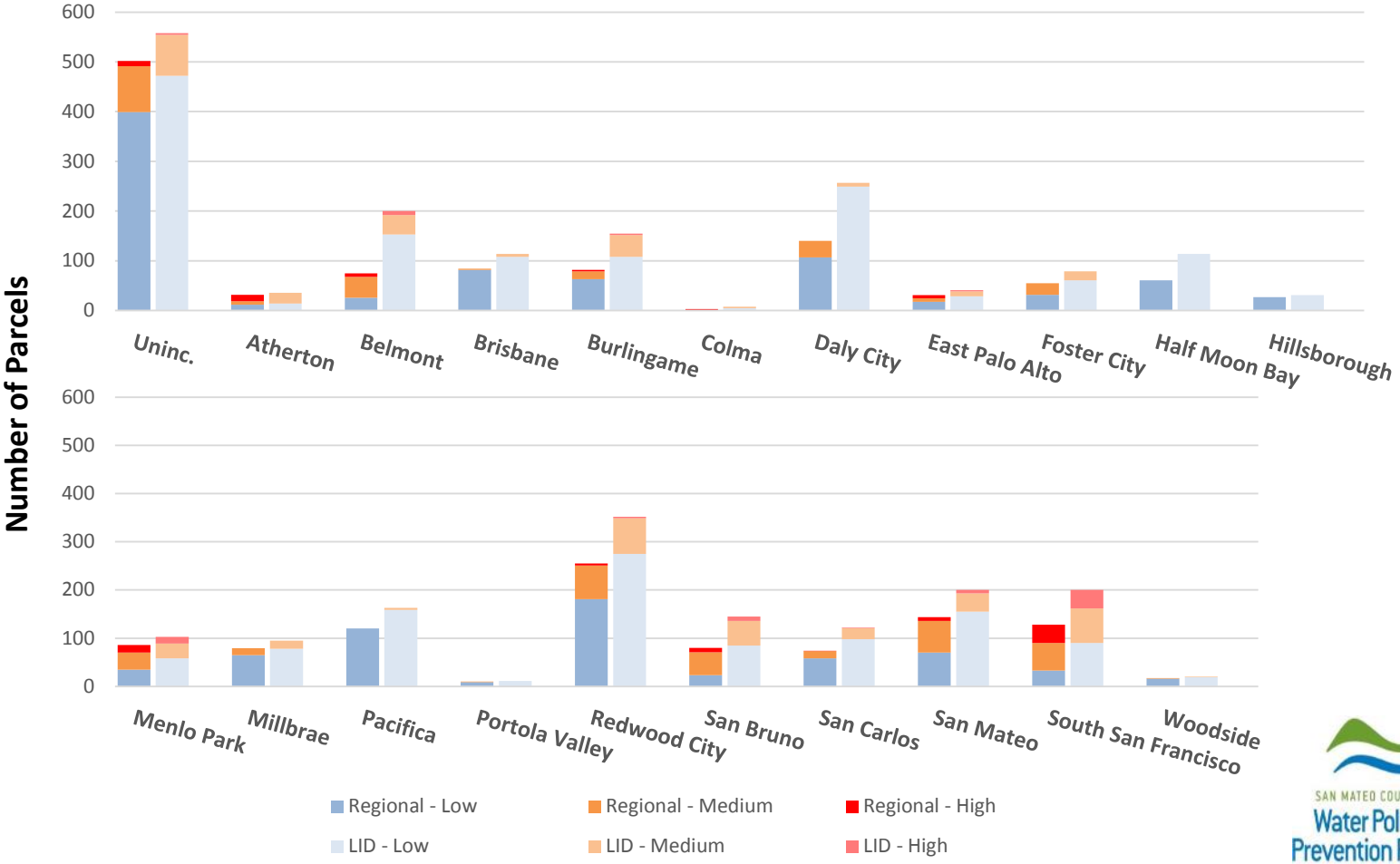
Total # of Screened ROW segments: 16,366
Median Segment Length: 320 ft

Low score: 11,086
Medium score: 4,547
High score: 733

Rank	Score	Street Name	TIGER Census Roads ID (STNA_ID)	Length (ft)
1	49	Airport Blvd	322632	374
2	49	Santa Cruz Ave	1717	225
3	48	Grand Ave	269532	235
4	48	Airport Blvd	322632	370
5	48	Chestnut St	284618	145
6	47	Alma St	235064	798
7	47	E Grand Ave	327309	228
8	47	Meadow Ct	3011441	135
9	47	San Miguel Way	3010534	303
10	47	San Miguel Way	3010534	419
…	…	…	…	…

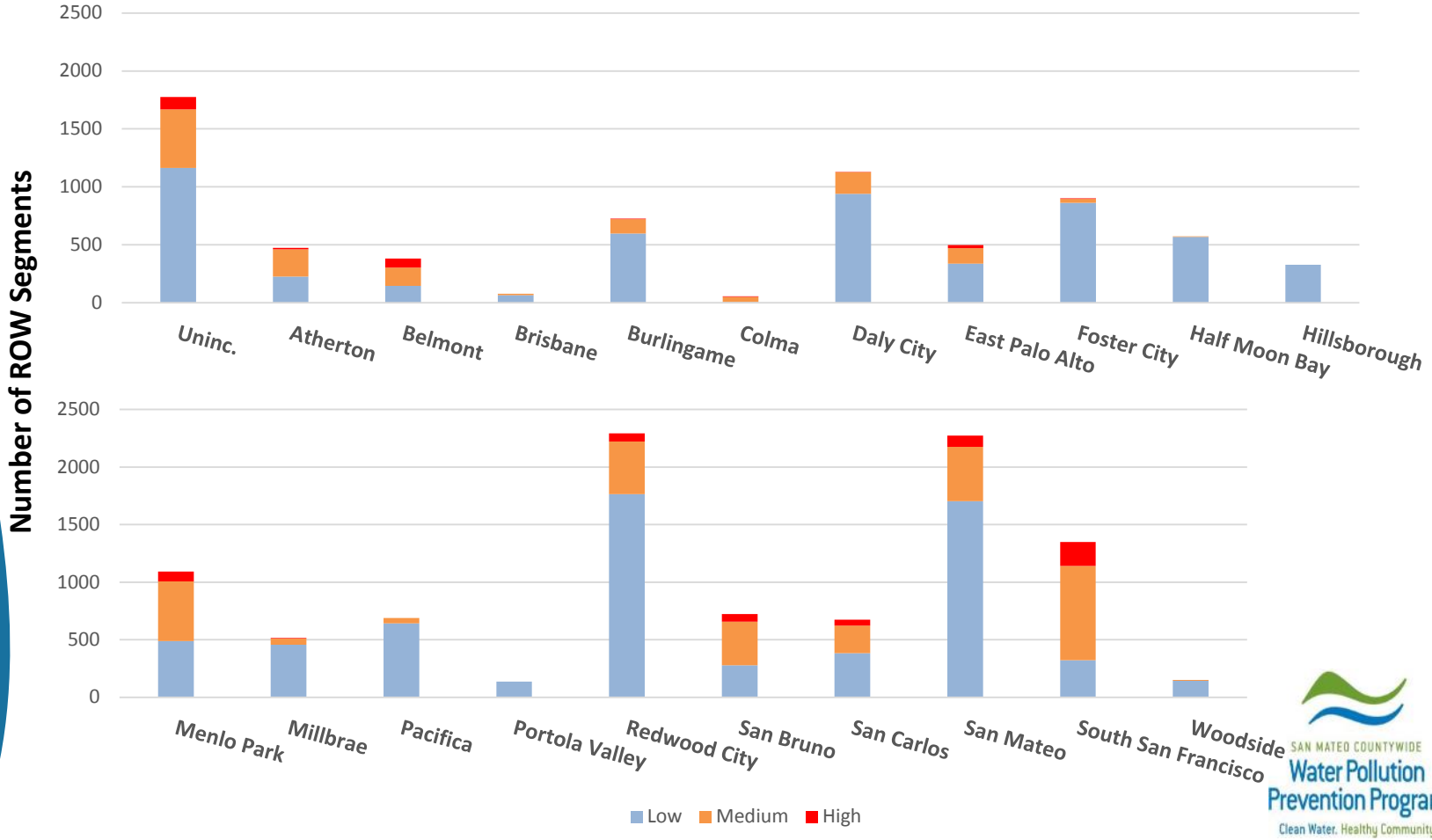


Onsite LID/Regional Project Prioritization



SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Green Street Prioritization



SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program
Clean Water. Healthy Community.

Concept Reports

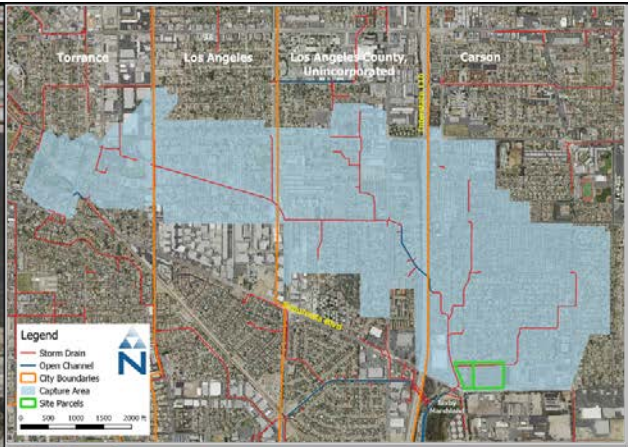
Guidance sought from the Committee on:

- Selection of projects for development of concepts
- Number and detail of concepts needed to support grant applications

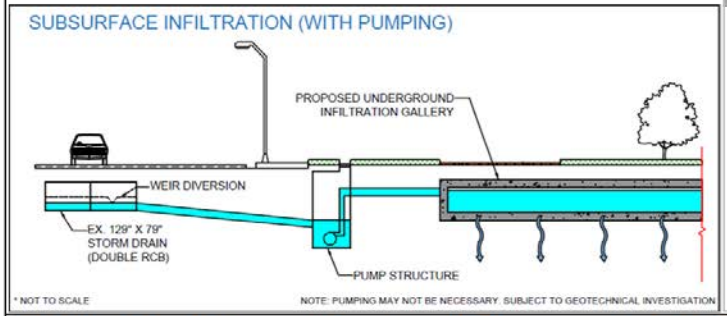
Example Concept Report Templates

Simple

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program
Clean Water. Healthy Community.



BMP Characteristics	
BMP Type	Subsurface Infiltration Chamber
BMP Footprint (acres)	6
Design Volume (ac-ft)	46.7
Required BMP Height (ft)	8
Total Cost	$46,091,014.00



Site Information	
Land Owner	City of Carson
Street Address	23800 Figueroa St, Carson, CA 90745
Latitude/Longitude	33° 48' 32.2" N / 118° 17' 5.1" W
Assessor's Identification Number (AIN)	7330007905, 7330007906
Capture Area (acres)	1,118
Impervious Area (%)	69
Dominant Land Use	Residential
Receiving Water	Wilmington Drain / Machado Lake

Project Description:

Carriage Crest Park was identified as a high opportunity site for a regional stormwater capture project. The site is owned by the City of Carson. The City intends to acquire or lease a portion of the neighboring parcel, location of the Color Spot Nurseries, to expand the park. A preliminary sizing analysis concluded the park expansion would provide adequate space for a structural BMP capable of treating the 85th percentile, 24-hour runoff event from a total of 1,118 acres. This configuration would maximize the urban area that benefits from the BMP and would also promote collaboration with neighboring jurisdictions.

The proposed project consists of an offline infiltration chamber below the ballfield of Carriage Crest Park and extended into the adjacent parcel. Stormwater would be diverted from the existing double box drain under South Figueroa Street to treat the design runoff volume. A diversion structure will be required to convey runoff from the box drain to the proposed structure. The invert of the existing storm drain is approximately 9 feet below ground surface and pumping may be required to lift the water to the BMP. If a geotechnical investigation finds that groundwater levels are sufficiently low in this area, then pumping may not be required and stormwater could be directed to the structure via gravity flow.

Multi-Jurisdictional Regional Stormwater BMP

Carriage Crest Park (City of Carson)

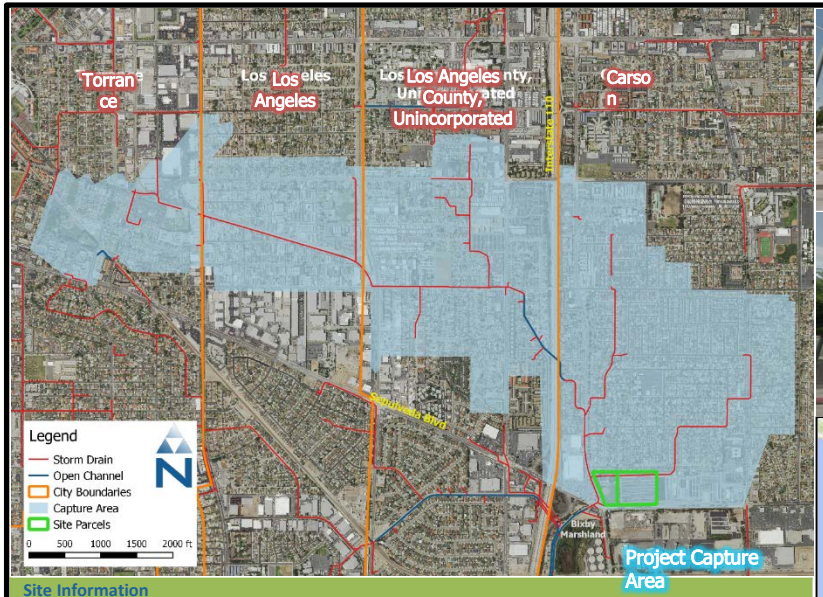
PARADIGM ENVIRONMENTAL

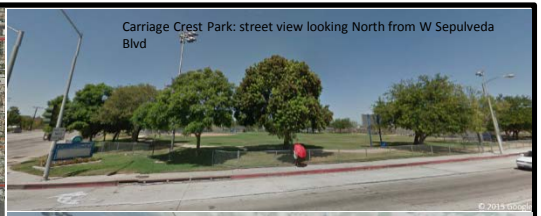
SAN MATEO COUNTYWIDE Water Pollution Prevention Program
Clean Water. Healthy Community.

Example Concept Report Templates

Detailed

SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program
Clean Water. Healthy Community.





Site Information

Land Owner	City of Carson
Street Address	23800 Figueroa St, Carson, CA 90745
Latitude/Longitude	33° 48' 32.2" N / 118° 17' 5.1" W
Parcel ID	CC_16
Assessor's Identification Number (AIN)	7330007905, 7330007906
Watershed Management Area	Dominguez Channel Watershed

Site Description:

Carriage Crest Park was identified as a high opportunity site for a regional stormwater capture project due to its proximity to two large storm drains (and thus large treatment area) and potential for multi-jurisdictional partnership. The park is owned and operated by the City of Carson. The City intends to acquire or lease a portion of the neighboring parcel, location of the Color Spot Nurseries, to expand the park. A preliminary sizing analysis concluded the park expansion would provide adequate space for a structural BMP capable of treating the 85th percentile, 24-hour runoff event from the project capture area, a total of 1,118 acres. The project would intercept runoff that is typically received by Wilmington Drain and Machado Lake. This configuration would maximize the urban area that benefits from the BMP and would also promote collaboration with neighboring jurisdictions (Unincorporated Los Angeles County and the cities of Los Angeles and Torrance).

Drainage Characteristics

Capture Area (acres)	1,118
Impervious Area (%)	69
Dominant Land Use	Residential

Capture Area by Jurisdiction

Jurisdiction	Torrance	Los Angeles	LA County	Carson
Area (acres)	133	175	339	471
% Area	12%	16%	30%	42%

Multi-Jurisdictional Regional Stormwater BMP

Carriage Crest Park (City of Carson)

PARADIGM ENVIRONMENTAL

SAN MATEO COUNTYWIDE Water Pollution Prevention Program
Clean Water. Healthy Community.

DESIGN CONSIDERATIONS FOR REGIONAL STORMWATER CAPTURE

BMP Concept Description:

The proposed concept for the Carriage Crest regional BMP consists of an offline infiltration gallery below the ballfield of Carriage Crest Park and extended into the adjacent parcel. The gallery would have a storage volume of 46.7 acre-feet and be constructed as either a concrete chamber or series of pipes. Stormwater would be diverted from the existing double 129" x 79" concrete box drain under South Figueroa Street to treat the 85th percentile, 24-hour runoff volume. A diversion structure will be required to convey runoff from the box drain to the proposed BMP. The diversion will be sized to accommodate the peak flow rate of 62 cubic feet per second. The invert of the existing storm drain is approximately 9 feet below ground surface and pumping may be required to lift the water to the BMP. If a geotechnical investigation finds that groundwater levels are sufficiently low in this area, then pumping may not be required and stormwater could be directed to the BMP via gravity flow. With pumping, excavation would only be necessary down to 10 feet below ground level. If gravity flow is used, excavation would be required down to 19 feet below the surface.

DISCLAIMER: All elements of this conceptual design are planning-level, based on desktop analysis. All assumptions and design parameters must be re-evaluated during the detailed design process.

Multiple Benefits:	Considerations:
Flood control, groundwater recharge, pollutant load reductions, park enhancements	Existing ball diamond, tree removal/ relocation, existing utilities

Design Criteria	
Sizing Criteria	85th percentile, 24 hour storm event
85th percentile, 24-hr precipitation (in)	0.89
Infiltration Rate (in/hr)	0.58
85th percentile, 24-hr runoff volume (ac-ft)[1]	53.7
Volume infiltrated during 24-hr storm (ac-ft)	7
Peak Discharge, 85th percentile 24-hr storm (cfs)	62

BMP Characteristics	
BMP Type	Underground Infiltration Gallery
BMP Footprint (acres)	6
Design Volume (ac-ft)[2]	46.7
Required BMP Height (ft)	8 (concrete chamber) / 10 (pipe)
Depth of Excavation (ft)	19 (no pumping) / 10 (with pumping)
Diversion Structure	Required
Pump Structure	Subject to geotechnical investigation

1. Runoff volume was estimated using HydroCalc 0.3.1, which uses the Modified Rational Method (MODRAT) developed by LA County. Due to the large drainage area, a detailed subwatershed analysis should be used during actual design.

2. Design volume takes into account the 85th percentile, 24-hour runoff volume and infiltration

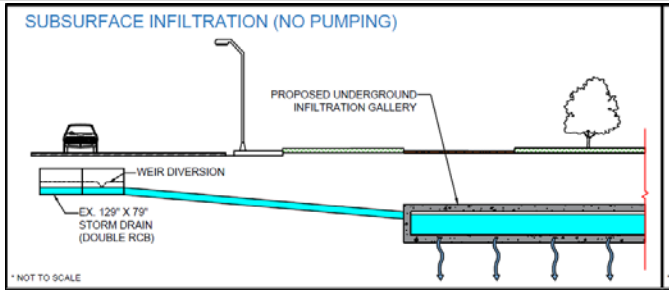
Multi-Jurisdictional Regional Stormwater BMP

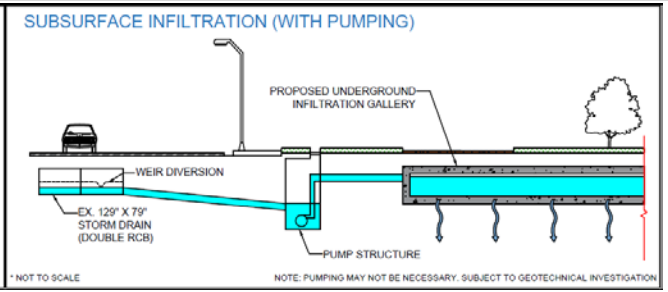
Carriage Crest Park (City of Carson)

PARADIGM ENVIRONMENTAL

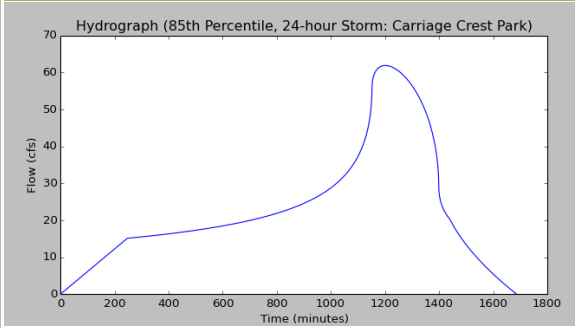
SAN MATEO COUNTYWIDE Water Pollution Prevention Program
Clean Water. Healthy Community.

DESIGN CONSIDERATIONS FOR REGIONAL STORMWATER CAPTURE





Hydrograph from Modified Rational Method (MODRAT, HydroCalc 0.3.1)



Cost Estimate for Infiltration Gallery Concept

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Removal (10 ft depth)	96,800	CY	$50.00	$4,840,000.000
Diversion				
Pump Structure (62 cfs/40 MGD)	1	EA	$2,000,000.00	$2,000,000.00
Diversion Structure	1	EA	$1,000,000.00	$1,000,000.00
Diversion Pipe (24" RCP)	350	LF	$200.00	$70,000.00
Subsurface Infiltration Structure	75,350	CY	$300.00	$22,605,000.00
Restoration (Landscaping/Ballpark)	261,360	SF	$2.00	$522,720.00
			CONSTRUCTION SUBTOTAL	$31,037,720.00
Mobilization (10% construction)				$3,103,772.00
Contingency (25% construction)				$7,759,430.00
Design (10% total)				$4,190,092.00
			TOTAL COST	**$46,091,014.00**

Color Spot Nurseries: Street view looking Northwest from W Sepulveda Blvd

Example corrugated metal pipe configuration

Example concrete chamber configuration

Multi-Jurisdictional Regional Stormwater BMP

Carriage Crest Park (City of Carson)

PARADIGM ENVIRONMENTAL

SAN MATEO COUNTYWIDE Water Pollution Prevention Program
Clean Water. Healthy Community.

Next Steps

- Receive input from C/CAG members on projects selected for concept development
- Continue development of stormwater capture model
- Prepare project concepts

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.