

VENTURA COUNTY

WATERSHED MANAGEMENT PROGRAMS

for the CALLEGUAS CREEK, MALIBU CREEK, SANTA CLARA RIVER,
VENTURA RIVER, and VENTURA COUNTY COASTAL WATERSHEDS

SEPTEMBER 2023
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presented to the
LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD
by the
VENTURA COUNTY MS4 PERMITTEES



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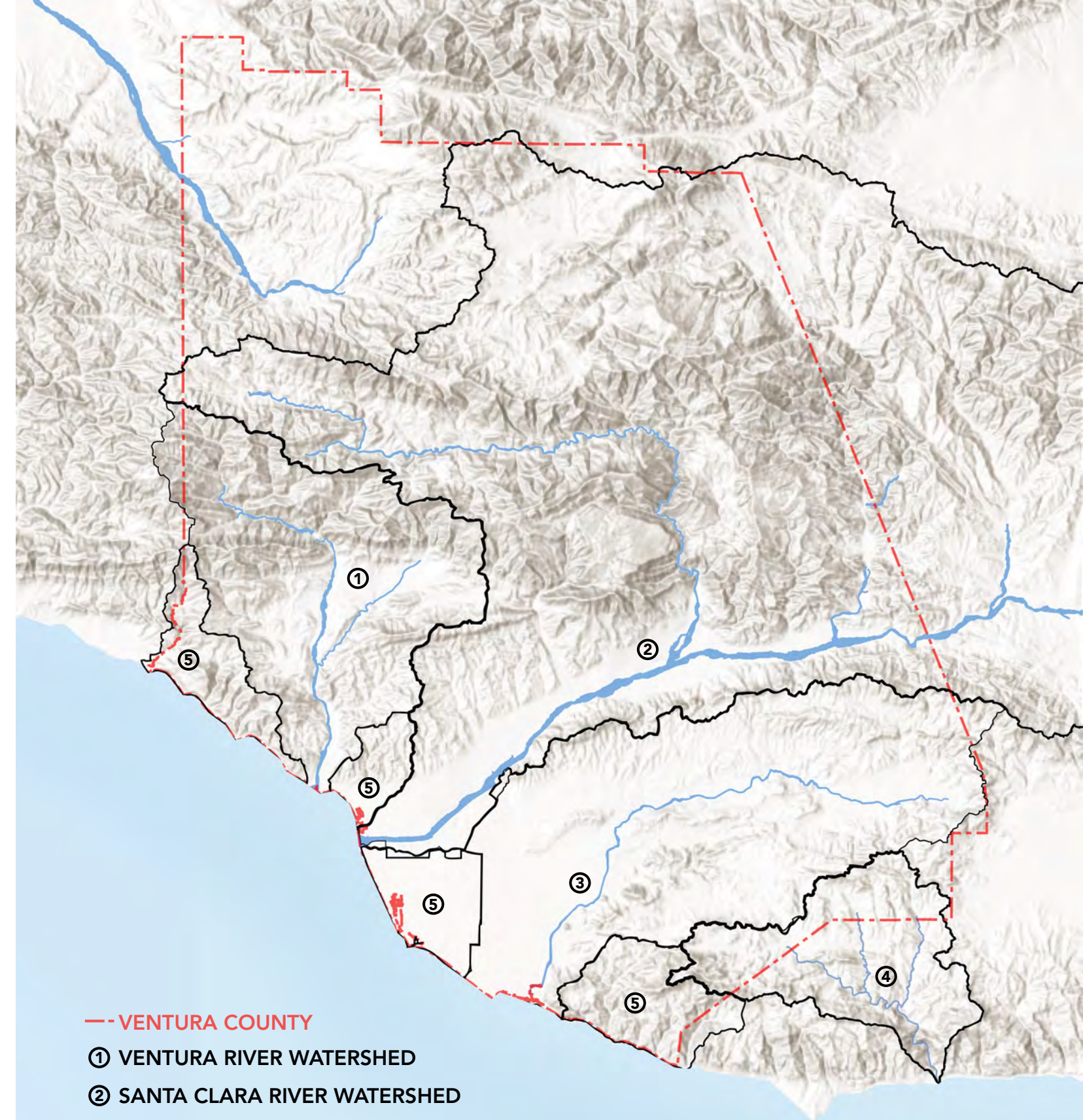
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--- VENTURA COUNTY

- ① VENTURA RIVER WATERSHED
- ② SANTA CLARA RIVER WATERSHED
- ③ CALLEGUAS CREEK WATERSHED
- ④ MALIBU CREEK WATERSHED
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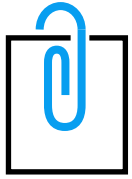
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ACRONYMS & ABBREVIATIONS

AOI	Area of Investigation
BMP	Best Management Practice
CIMP	Coordinated Integrated Monitoring Program
CTR	California Toxics Rule
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
FOG	Fats, Oils, and Grease
GIS	Geographic Information System
HWSI	Human Waste Source Investigation
HRU	Hydrologic Response Unit
IC/ID	Illicit Connection/Illicit Discharge
LID	Low-Impact Development
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OC	Organochlorine
Permit	Regional Phase I MS4 NPDES Permit (Order No. R4-2021-0105, NPDES Permit No. CAS004004)
PCBs	Polychlorinated Biphenyls
RAA	Reasonable Assurance Analysis
Regional Board	Los Angeles Regional Water Quality Control Board
RWLs	Receiving Water Limitations
SSO	Sanitary Sewer Overflow
SUSTAIN	System for Urban Stormwater Treatment and Analysis Integration
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
VCSQMP	Ventura Countywide Stormwater Quality Management Program
WBPC	Water Body Pollutant Combination
WLA	Waste Load Allocation
WMP	Watershed Management Program
WQBELs	Water Quality Based Effluent Limitations
WQO	Water Quality Objective

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DOCUMENT PURPOSE



The purpose of this document is to demonstrate—using the latest data, science, and technical approaches—how the **Municipal Separate Storm Sewer System (MS4) Permittees of Ventura County** can manage and reduce the discharge of pollutants from their MS4 systems to improve water quality and meet regulatory standards in their five major watersheds: *Calleguas Creek, Malibu Creek, Santa Clara River, Ventura River, and Ventura County Coastal*. The Watershed Management Programs are a combination of rigorous data analysis and modeling, technical engineering, and extensive stakeholder coordination to provide a clear pathway towards compliance with MS4 Permittees’ requirements for improved water quality and healthier waterways.

ACKNOWLEDGEMENTS

These Programs came together through engagement with the participating agencies, Los Angeles Regional Water Quality Control Board staff, and public feedback, including...

24 meetings with the **VENTURA STORMWATER MANAGEMENT COMMITTEE** 

3 meetings with each **WATERSHED SPECIFIC GROUP** = 15 TOTAL 

3 meetings with each **AGENCY** = 36 TOTAL 

6 meetings with the **REGIONAL BOARD** 

and 4 **PUBLIC OUTREACH** events 



WHO WE ARE

The Ventura Countywide Stormwater Quality Management Program (VCSQMP) includes the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, Simi Valley, Santa Paula, Thousand Oaks, Ventura, the County of Ventura, and the Ventura County Watershed Protection District. The VCSQMP, currently administered by the Ventura County Public Works Watershed Protection District, is the lead agency in development of the WMPs and historically has served as the liason between the Los Angeles Regional Water Quality Control Board and Ventura County MS4 Permittees.

Group History

The VCSQMP was formed in 1994, when the first stormwater permit for Ventura County was adopted. We formed out of collective interest of the agencies to work together to achieve our mission...

OUR MISSION

Preserve, protect, and enhance the surface water resources within Ventura County for the protection of human health and the continued enjoyment of their multiple beneficial uses.

DEEMED COMPLIANCE



The Group is dedicated to stormwater management, and developed a comprehensive watershed plan that addresses MS4-relevant water quality concerns across the five watersheds in Ventura County. However, for clarity, the Watershed Management Program presented herein focuses only on water quality conditions eligible for deemed compliance. In each watershed, tailored implementation approaches were strategically selected to effectively and efficiently address the associated water quality conditions, as detailed in the following tables.

CALLEGUAS CREEK WATERSHED

ASSESSMENT AREA	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
CALLEGUAS CREEK 1	PESTICIDES/ ORGANICS (CATEGORIES 1B, 3A)	March 2026	8,707 lbs sediment/ year	Projected Redevelopment LID (1.09 ac-ft) and Enhanced Street Sweeping (170.2 additional miles/ month)	33,864 lbs sediment/year
	INDICATOR BACTERIA (CATEGORY 2A)	September 2049	7.52E+15 MPN E. coli/day	6 Targeted Catchments (11,703 acres) for Source Control (Structural Project where Source Unidentified)	7.60E+15 MPN E. coli/day
	NON-POLLUTANTS (CATEGORY 2C)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	

DEEMED COMPLIANCE



ASSESSMENT AREA (continued)	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
CALLEGUAS CREEK 2	PESTICIDES/ ORGANICS (CATEGORIES 1B, 3A)	March 2026	3,826 lbs sediment/ year	Projected Redevelopment LID (0.99 ac-ft) and Enhanced Street Sweeping (216.9 additional miles/ month)	37,283 lbs sediment/year
	INDICATOR BACTERIA (CATEGORY 2A)	September 2049	9.30E+13 MPN E. coli/day	5 Targeted Catchments (10,996 acres) for Source Control (Structural Project where Source Unidentified)	9.81E+13 MPN E. coli/day
	NON-POLLUTANTS (CATEGORIES 2C, 3A)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	
CALLEGUAS CREEK 3	PESTICIDES/ ORGANICS (CATEGORIES 1B, 3A)	March 2026	5,363 lbs sediment/ year	Projected Redevelopment LID (0.66 ac-ft) and Enhanced Street Sweeping (222.8 additional miles/ month)	70,191 lbs sediment/year
	INDICATOR BACTERIA (CATEGORY 2A)	September 2049	4.70E+13 MPN E. coli/day	3 Targeted Catchments (5,982 acres) for Source Control (Structural Project where Source Unidentified)	5.12E+13 MPN E. coli/day
	NON-POLLUTANTS (CATEGORIES 2C, 3A)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	
CALLEGUAS CREEK 4	PESTICIDES/ ORGANICS (CATEGORIES 1B, 3A)	March 2026	20,794 lbs sediment/ year	Projected Redevelopment LID (5.33 ac-ft) and Enhanced Street Sweeping (813.3 additional miles/ month)	74,174 lbs sediment/year
	INDICATOR BACTERIA (CATEGORY 2A)	September 2049	8.62E+12 MPN E. coli/day	3 Targeted Catchments (5,417 acres) for Source Control (Structural Project where Source Unidentified)	8.76E+12 MPN E. coli/day
	NON-POLLUTANTS (CATEGORY 2C)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	



ASSESSMENT AREA (continued)	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
CALLEGUAS CREEK 5	PESTICIDES/ ORGANICS (CATEGORIES 1B, 2A, 3A)	March 2026	26,223 lbs sediment/ year	Projected Redevelopment LID (3.13 ac-ft) and Enhanced Street Sweeping (841.2 additional miles/month)	60,241 lbs sediment/year
	INDICATOR BACTERIA (CATEGORY 2A, 3A)	September 2049	2.81E+16 MPN E. coli/day	8 Targeted Catchments (22,866 acres) for Source Control (Structural Project where Source Unidentified)	2.84E+16 MPN E. coli/day
	NON-POLLUTANTS (CATEGORY 2C)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	
OUTSIDE ASSESSMENT AREA (OXNARD DRAIN #3) ¹	PESTICIDES/ ORGANICS (CATEGORIES 1D, 3A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION			

¹Based on the source assessment and defined MS4-responsible areas, no MS4 reductions are required to address pesticides within the Oxnard Drain #3 due to minimal MS4 contributions within the drainage area and pollutants of concern driven by outside sources.

MALIBU CREEK WATERSHED

ASSESSMENT AREA	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
MALIBU CREEK 1	INDICATOR BACTERIA (CATEGORY 1B)	July 2026	3.99E+11 MPN E. coli/day	3 Targeted Catchments (4,409 acres) for Source Control (Structural Project where Source Unidentified)	4.75E+11 MPN E. coli/day
	NUTRIENTS (CATEGORY 1B)	July 2026	642.9 lbs Nitrate-N + Nitrite-N/year	Projected Redevelopment LID (0.53 ac-ft) and Structural Project (10.71 ac-ft)	876.4 lbs Nitrate-N + Nitrite-N/year
	METALS (CATEGORY 2A)	NO RAA-IDENTIFIED POLLUTANT LOAD REDUCTIONS			
	NON-POLLUTANTS (CATEGORY 1B, 2B, 2C)	July 2026	N/A	Addressed Through Control Measures for Other Constituents	



SANTA CLARA RIVER WATERSHED

ASSESSMENT AREA	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
SANTA CLARA RIVER 1	INDICATOR BACTERIA (CATEGORY 1C)	March 2029	1.03E+11 MPN E. coli/day	4 Targeted Catchments (8,072 acres) for Source Control (Structural Project where Source Unidentified)	1.15E+11 MPN E. coli/day
	METALS (CATEGORY 3A)	NO RAA-IDENTIFIED POLLUTANT LOAD REDUCTIONS			
	SALTS (CATEGORY 3A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION			
	NON-POLLUTANTS (CATEGORY 2B)	March 2029	N/A	Addressed Through Control Measures for Other Constituents	
SANTA CLARA RIVER 2	INDICATOR BACTERIA (CATEGORY 1C)	March 2029	2.53E+11 MPN E. coli/day	2 Targeted Catchments (2,365 acres) for Source Control (Structural Project where Source Unidentified)	3.56E+11 MPN E. coli/day
	METALS (CATEGORY 2A)	NO RAA-IDENTIFIED POLLUTANT LOAD REDUCTIONS			
	SALTS (CATEGORIES 2A, 3A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION			
	NON-POLLUTANTS (CATEGORIES 2B, 3A)	March 2029	N/A	Addressed Through Control Measures for Other Constituents	
SANTA CLARA RIVER 3	INDICATOR BACTERIA (CATEGORY 1C)	March 2029	2.18E+11 MPN E. coli/day	1 Targeted Catchment (1,259 acres) for Source Control (Structural Project where Source Unidentified)	1.56E+12 MPN E. coli/day
	SALTS (CATEGORY 2A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION			



VENTURA RIVER WATERSHED

ASSESSMENT AREA	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
VENTURA RIVER 1	INDICATOR BACTERIA (CATEGORIES 2A, 3A)	September 2049	2.94E+12 MPN <i>E. coli</i> /day	6 Targeted Catchments (5,406 acres) for Source Control (Structural Project where Source Unidentified)	3.11E+12 MPN <i>E. coli</i> /day
	PESTICIDES/ ORGANICS (CATEGORY 3A)	September 2025	207 lbs sediment/year	Projected Redevelopment LID (0.26 ac-ft) and Enhanced Street Sweeping (78.4 additional miles/ month)	18,752 lbs sediment/year
	SALTS (CATEGORIES 2A, 3A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION)			
	NON-POLLUTANTS (CATEGORY 2B)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	
VENTURA RIVER 2	INDICATOR BACTERIA (CATEGORY 2A)	September 2049	2.95E+11 MPN <i>E. coli</i> /day	1 Targeted Catchments (1,022 acres) for Source Control (Structural Project where Source Unidentified)	5.26E+11 MPN <i>E. coli</i> /day
	SALTS (CATEGORIES 2A, 3A)	NO MS4-REQUIRED REDUCTIONS; SOURCE ASSESSMENT DEPRIORITIZATION			



VENTURA COUNTY COASTAL WATERSHED

ASSESSMENT AREA	POLLUTANT CATEGORY	FINAL DEADLINE	MS4 POLLUTANT LOAD REDUCTION TARGET	SELECTED CONTROL MEASURES	MODELED LOAD REDUCTION FROM CONTROL MEASURES
VENTURA COUNTY COASTAL 1	NO WBPCs WITH MS4-REQUIRED LOAD REDUCTION				
VENTURA COUNTY COASTAL 2	NO WBPCs WITH MS4-REQUIRED LOAD REDUCTION				
VENTURA COUNTY COASTAL 3	INDICATOR BACTERIA (CATEGORIES 2A, 3A)	September 2049	4.20E+10 MPN <i>Enterococcus</i> /day	1 Targeted Catchment (2,012 acres) for Source Control (Structural Project where Source Unidentified)	4.14E+11 MPN <i>Enterococcus</i> /day
	NON-POLLUTANTS (CATEGORIES 2B, 3A)	September 2049	N/A	Addressed Through Control Measures for Other Constituents	

MS4 PERMIT CROSSWALK

The agencies of the VCSQMP worked together to develop Watershed Management Programs for five watersheds in accordance with the current **Regional Phase I MS4 Permit** (Order No. R4-2021-0105). The following crosswalk is provided to assist Regulators in locating and evaluating permit requirements contained within this document and its associated appendices.

REPORTING ELEMENT	PERMIT REFERENCE	Location in Document
CONTROL MEASURES	IX.A	
	IX.A.4.b	§3, §4, Appendix C, D
	IX.A.4.d	§3, §4, Appendix C, D
	IX.A.4.g	§3, §4, Appendix C, D
	IX.A.4.h	§4, Appendix D
	IX.A.4.j	§3, §4, Appendix C, D
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FINANCIAL STRATEGY	IX.A.4.f	§4, Appendix D
	IX.A.4.i	§4, Appendix D
OUTREACH	IX.A.4.e	Approach, §4
ADMINISTRATIVE	IX.A.4.l	Approach

MS4 PERMIT CROSSWALK

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WATER BODY POLLUTANT COMBINATIONS	IX.B.3.a-c	§1, Appendix B
	IX.B.4	§2, §4, Appendix D
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SEQUENCING OF WATER QUALITY PRIORITIES	IX.B.4.b.i-ii	§2, §4, Appendix D
	IX.B.5	§3, §4, Appendix C, D
SELECTION OF WATERSHED CONTROL MEASURES	IX.B.5.a.i-iii	§3, §4, Appendix C, D
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	IX.B.5.c	Appendix C, F
	IX.B.6.a.i	§1, §3, Appendix C, E
STORMWATER MANAGEMENT PROGRAM MINIMUM CONTROL MEASURES	IX.B.6.a.ii	§1, §3, Appendix C
	IX.B.6.a.iii	§1, §3, Appendix C, E
	IX.B.6.iv	§1, §3, Appendix C, E
	IX.B.6.b	§3, Appendix C, D
NON-STORMWATER DISCHARGE MEASURES	IX.B.6.b	§3, Appendix C, D



WATERSHED
MANAGEMENT
PROGRAM
COMPONENTS

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- IX.B.7.a → Appendix F
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- IX.B.7.d → §3, §4, Appendix D
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- IX.B.8.a → §2, Appendix D
- IX.B.8.b → §2, §3, Appendix D
- IX.B.8.c → §2, §4, Appendix D
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- IX.B.8.e → §2, Appendix D
- IX.B.8.f → §2, Appendix D
- IX.B.8.f.i → §2, Appendix B, D
- IX.B.8.f.ii → §2, Appendix B, D
- IX.B.8.f.iii → §2, Appendix B, D
- IX.B.8.g → §2, Appendix D
- IX.B.8.h → §2, §3, §4, Appendix D
- IX.B.8.i → §4, Appendix D
- IX.B.8.j → §1, §4, Appendix D



COMPLIANCE
SCHEDULES

IX.B

- IX.B.9 → §4, Appendix D
- IX.B.9.a → §4, Appendix D
- IX.B.9.b → §4, Appendix D
- IX.B.c.i-ii → §4, Appendix D
- IX.B.c.iii → §4, Appendix D
- IX.B.c.iv → §4, Appendix D

ADAPTIVE
MANAGEMENT
PROCESS

IX.E

- IX.E.1 → §4, Appendix D
- IX.E.1.a → §4, Appendix D
- IX.E.1.b → §4, Appendix D
- IX.E.1.c → §4, Appendix D
- IX.E.1.d → §4, Appendix D
- IX.E.1.e → §4, Appendix D
- IX.E.1.f → §4, Appendix D
- IX.E.1.g → §4, Appendix D
- IX.E.1.h → §4, Appendix D
- IX.E.1.i → §4, Appendix D
- IX.E.2 → §4, Appendix D
- IX.E.3 → §4, Appendix D

APPROACH

The Ventura County MS4 Permittees worked collaboratively to develop **Watershed Management Programs (WMPs)** for five watersheds that meet the requirements of Section IX of the MS4 Permit. The technical foundation of the WMPs is the Reasonable Assurance Analysis (RAA), which uses quantitative analysis and modeling to identify pollutant load reductions necessary for MS4s to meet established water quality objectives, and evaluates the ability of various control measures to obtain those targets. At each step in the RAA, key assumptions and decisions were made based on the best available data and information. The sequence of decisions and assumptions balances conservative load reduction targets with realistic implementation pathways, producing an achievable and robust road map for MS4 Permittees to achieve compliance.

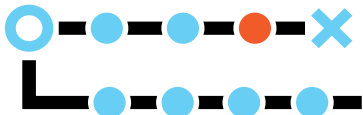
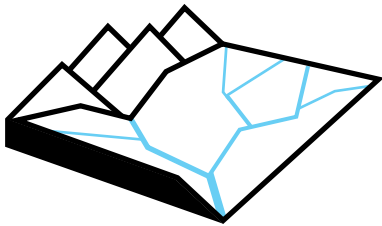
GUIDING PRINCIPLES

Use the latest...
WATERSHED SCIENCE & MODELING

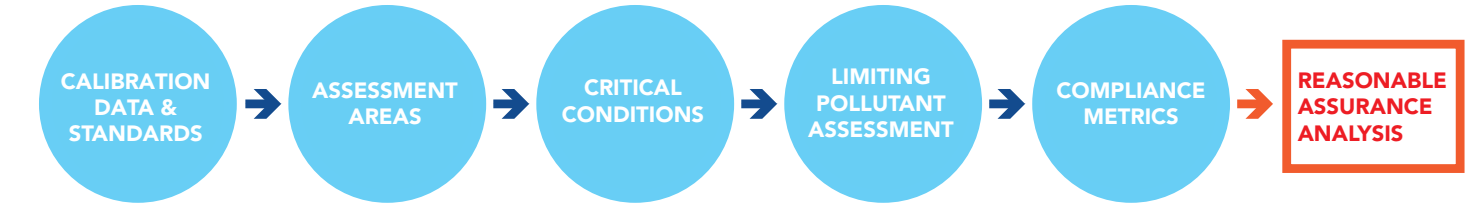
to meet...
MS4 REQUIRED REDUCTIONS

by leveraging...
EXISTING MINIMUM CONTROL MEASURES

and identifying...
PROJECT-LED PATHWAYS TO COMPLIANCE

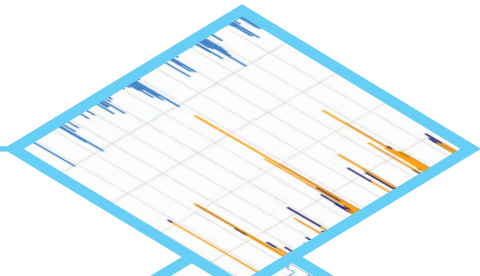


PROGRAM FRAMEWORK



MODEL CALIBRATION & DATA STANDARDS

The watershed model establishes baseline flow and water quality conditions in the five watersheds. Recognizing that the receiving waters in Ventura County can be largely impacted by facilities covered under separate NPDES permits, the baseline watershed model was calibrated using local MS4 outfall monitoring data to best characterize the pollutant loadings specific to MS4 areas.



ASSESSMENT AREAS

Where the MS4 pollutant reduction targets are assessed must balance a small enough scale to protect areas of interest, but large enough to enable collaboration and the development of control measures for improving downstream receiving water conditions.

CRITICAL CONDITIONS

When numeric targets for MS4 pollutant reductions are assessed must align with historical periods that capture critical storm dynamics and ensure protection of beneficial uses in receiving waters. The critical conditions selected for the RAA use a longer term, 90th percentile critical water year.



LIMITING POLLUTANT ASSESSMENT

What pollutants are evaluated is based on the water quality characterization and water quality priorities. Analysis of numeric targets and implementation actions are prioritized based on limiting pollutants requiring the highest reductions. Limiting pollutants were established by assessment area for groupings that can be addressed by similar control measures consistent with the MS4 Permit requirements.



COMPLIANCE METRICS

In determining a meaningful, measurable metric for evaluating compliance, the WMPs are based on **pollutant load reduction targets**.



The RAA metrics by which deemed compliance is established in the WMPs were developed using a locally calibrated watershed model to calculate MS4-specific pollutant load reductions required under a long-term 90th percentile condition. This methodology ensures that the assessment areas are meeting applicable water quality standards for the limiting pollutants.

SECTION 1:

EXISTING CONDITIONS



The agencies of the **Ventura Countywide Stormwater Quality Management Program (VCSQMP, the "Group")** are a vibrant quilt of communities at the urban-rural-undeveloped interface, with approximately 13% of watersheds urbanized countywide. Overall, the county watersheds experience relatively good water quality,¹ in part due to the diffuse urbanization of the county as well as successful management of non-structural stormwater programs, also known as "minimum control measures" (MCMs).

1.1 POLLUTANTS OF CONCERN

The pollutants of concern in Ventura County's receiving waters vary between dry and wet weather. Based on the water quality characterization conducted during the WMPs development process, the persistent pollutants of concern in dry weather include *indicator bacteria*, *salts*, and *nutrients*, while the persistent pollutants of concern during wet weather include *indicator bacteria*, *metals*, and *pesticides*.

DRY WEATHER



BACTERIA



SALTS

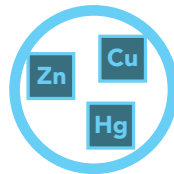


NUTRIENTS

WET WEATHER



BACTERIA



METALS



PESTICIDES



¹Based on Ventura County's Water Quality Index and Heal the Bay's 2021-2022 Beach Report Card

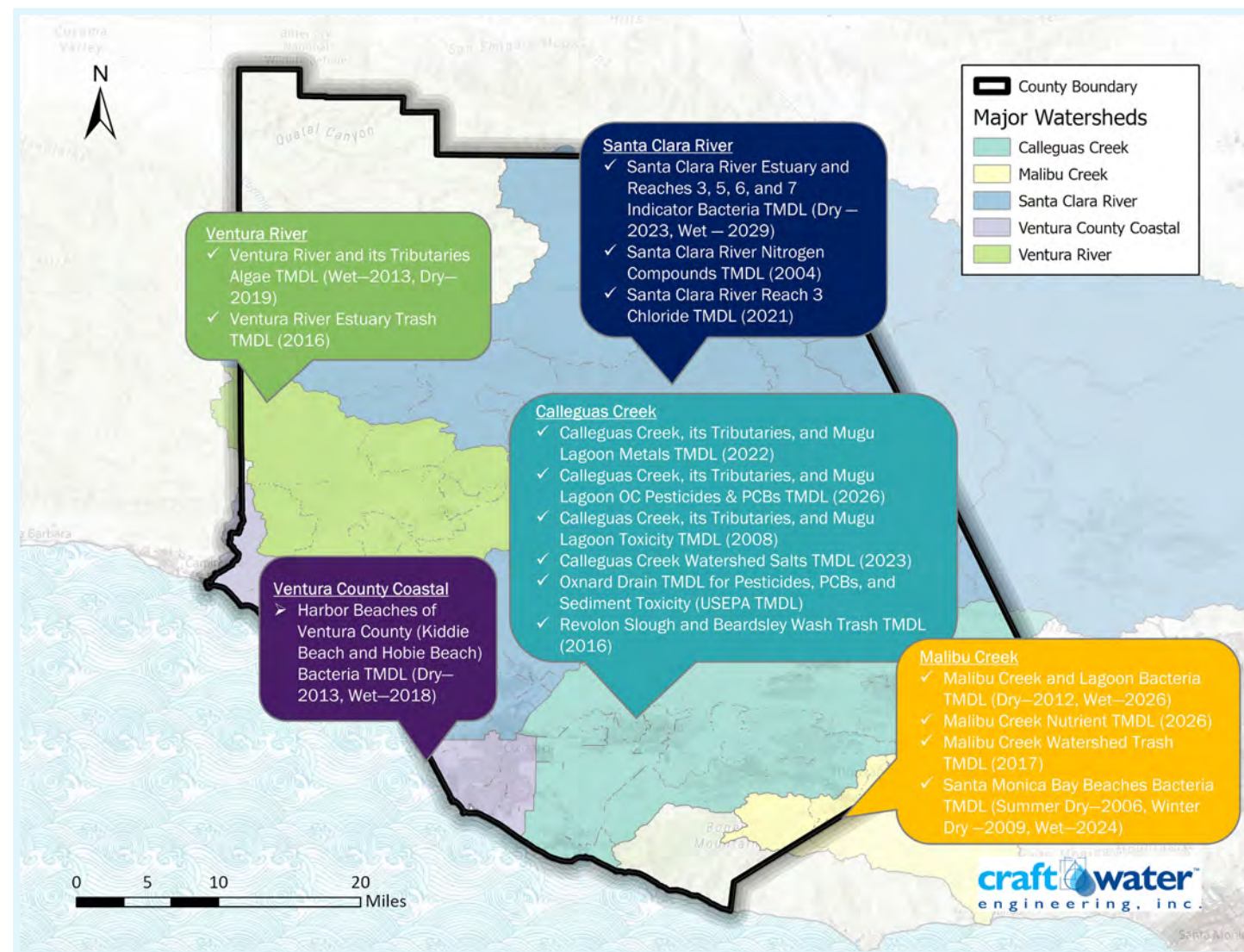


FIGURE 1-1: TMDLs and Final Deadlines by Watershed



A table of TMDLs by watershed is also provided in **Appendix B, Table 2-1.**

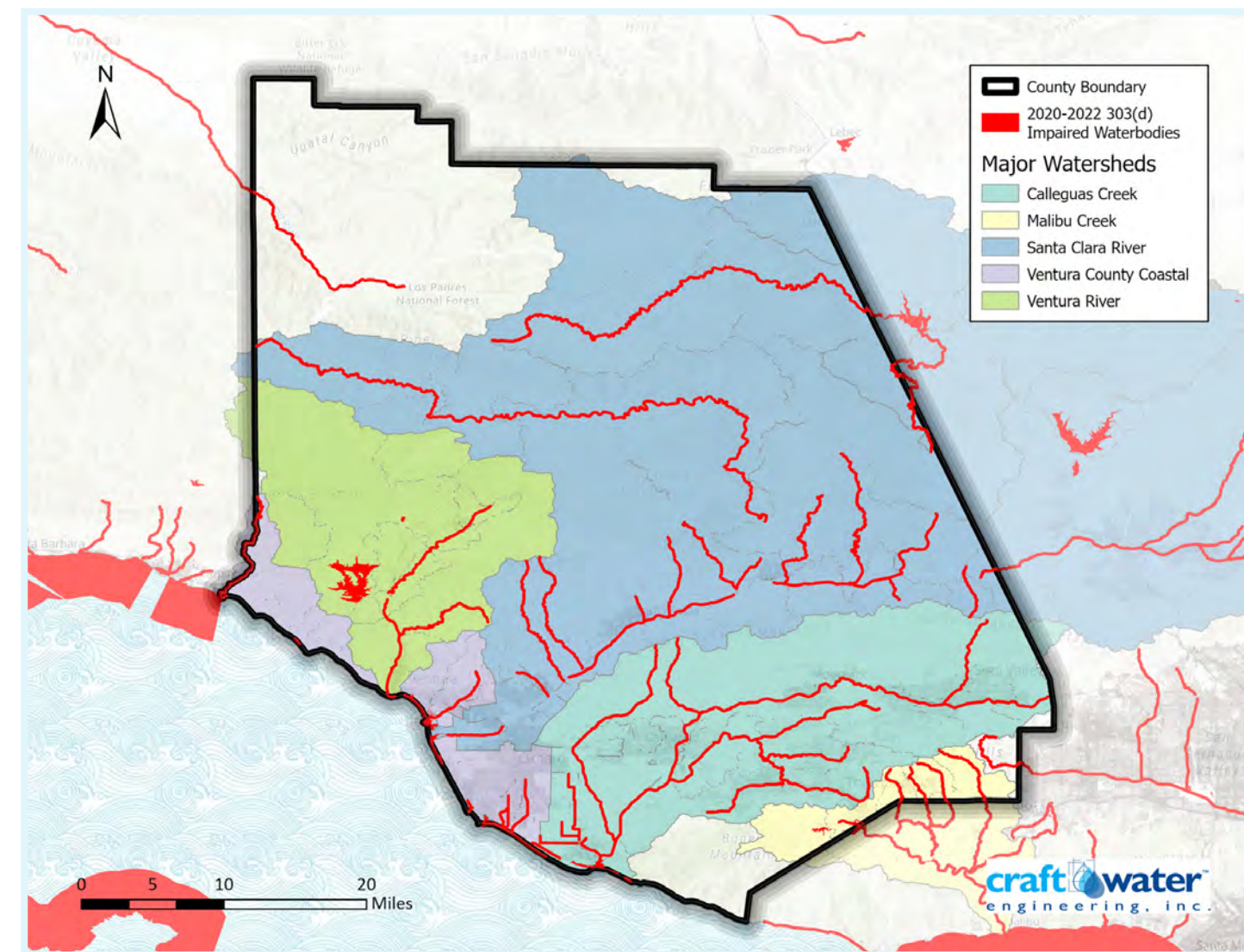


FIGURE 1-2: Impaired Waterbodies by Watershed on the 2020-2022 California 303(d) List



A table of 303(d) listed pollutants is also provided in **Appendix B, Tables 2-2 through 2-6.**



1.1.1 WATER QUALITY CHARACTERIZATION

To fully characterize the existing water quality conditions within the Ventura County watersheds, a comprehensive Countywide data review of monitoring programs and special studies was conducted.

Monitoring Program Datasets Used for Characterization

- Ventura County Stormwater Quality Monitoring Program
- Bioassessment Monitoring Program
- Calleguas Creek Watershed TMDL Monitoring Program
- Ocean Water Quality Monitoring Program
- Ventura River Algae TMDL Monitoring Program
- Channel Islands Harbor Water Quality Program
- Lower Santa Clara River Bacteria TMDL Monitoring Program
- Ventura County Agricultural Irrigated Lands Group (VCAILG) Monitoring Program
- Malibu Creek Bacteria TMDL Monitoring Program
- Santa Monica Bay Beaches Bacteria TMDL Monitoring Program

These datasets were used to identify and evaluate **water body-pollutant combinations (WBPCs)**, which inform the WMPs' water quality priorities and support pollutant source assessment.



A complete Water Quality Characterization, including Source Assessments, is provided in **Appendix B**.



Receiving Waters Prioritization

WBPCs were organized into three categories to help the Group determine priority pollutants...

CATEGORY

1

HIGHEST PRIORITY

Pollutants for which water quality based effluent limitations (WQBELs) or receiving water limitations (RWLs) are established to implement Total Maximum Daily Loads (TMDLs) (Figure 1-1).

CATEGORY

2

HIGH PRIORITY

Pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment (Figure 1-2).

CATEGORY

3

MEDIUM PRIORITY

Pollutants for which there are insufficient data to indicate water quality impairment in the receiving water according to the State's Listing Policy, but which exceed applicable receiving water limitations (RWLs) contained in the Permit and for which MS4 discharges may be causing or contributing to the exceedances within the last five years.

And the three WBPC categories were further subdivided to focus the WMPs on MS4-responsible pollutants...

- a** WBPCs for which the MS4 is responsible and are addressed in the WMPs
- b** WBPCs where it is unlikely MS4 discharges are causing or contributing based on the source assessment
- c** WBPCs that have no MS4 discharges into the receiving waters



A complete list of WBPCs subdivided by Permit category, subcategory, and watershed is provided in **Appendix B, Section 4**.

SECTION 1: EXISTING CONDITIONS

1.1 POLLUTANTS OF CONCERN

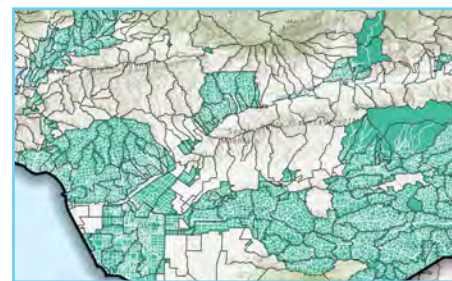
1.1.1 WATER QUALITY CHARACTERIZATION



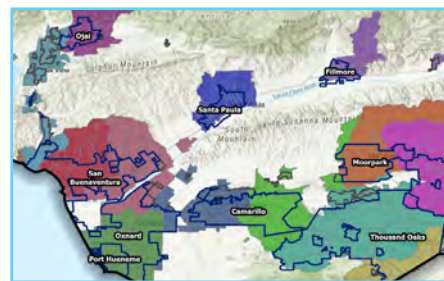
Delineation of Assessment Areas

Given the diffuse urbanization and potential co-mingling of MS4, agricultural, industrial, and undeveloped influences at MS4 outfalls, it was crucial to establish assessment areas that best represent MS4 permittees' discharges.

To spatially isolate the MS4-responsible areas and their relative impacts on receiving waters, assessment areas were delineated where MS4 Permittees are most likely to be accountable for pollutant contributions. Assessment area delineation considered the following...



SUBWATERSHEDS



MUNICIPALITIES



MS4 OUTFALLS

While the delineation of assessment areas focused on MS4-responsible areas as much as possible, it was not possible to perfectly isolate MS4 contributions to pollutant loads. For example, there are multiple agricultural and Industrial General Permit (IGP) facilities within the assessment areas that are covered under separate NPDES Permits. To account for this, the RAA pollutant load reduction targets were proportioned based on jurisdictional contributions.



For each assessment area, the Reasonable Assurance Analysis (RAA) establishes MS4 pollutant load reduction targets for the applicable WBPCs to be addressed in the WMP. The RAA also evaluates implementation pathways through non-structural and structural control measures to achieve these targets. [Appendix D](#) contains the complete Reasonable Assurance Analysis.

SECTION 1: EXISTING CONDITIONS

1.1 POLLUTANTS OF CONCERN

1.1.1 WATER QUALITY CHARACTERIZATION

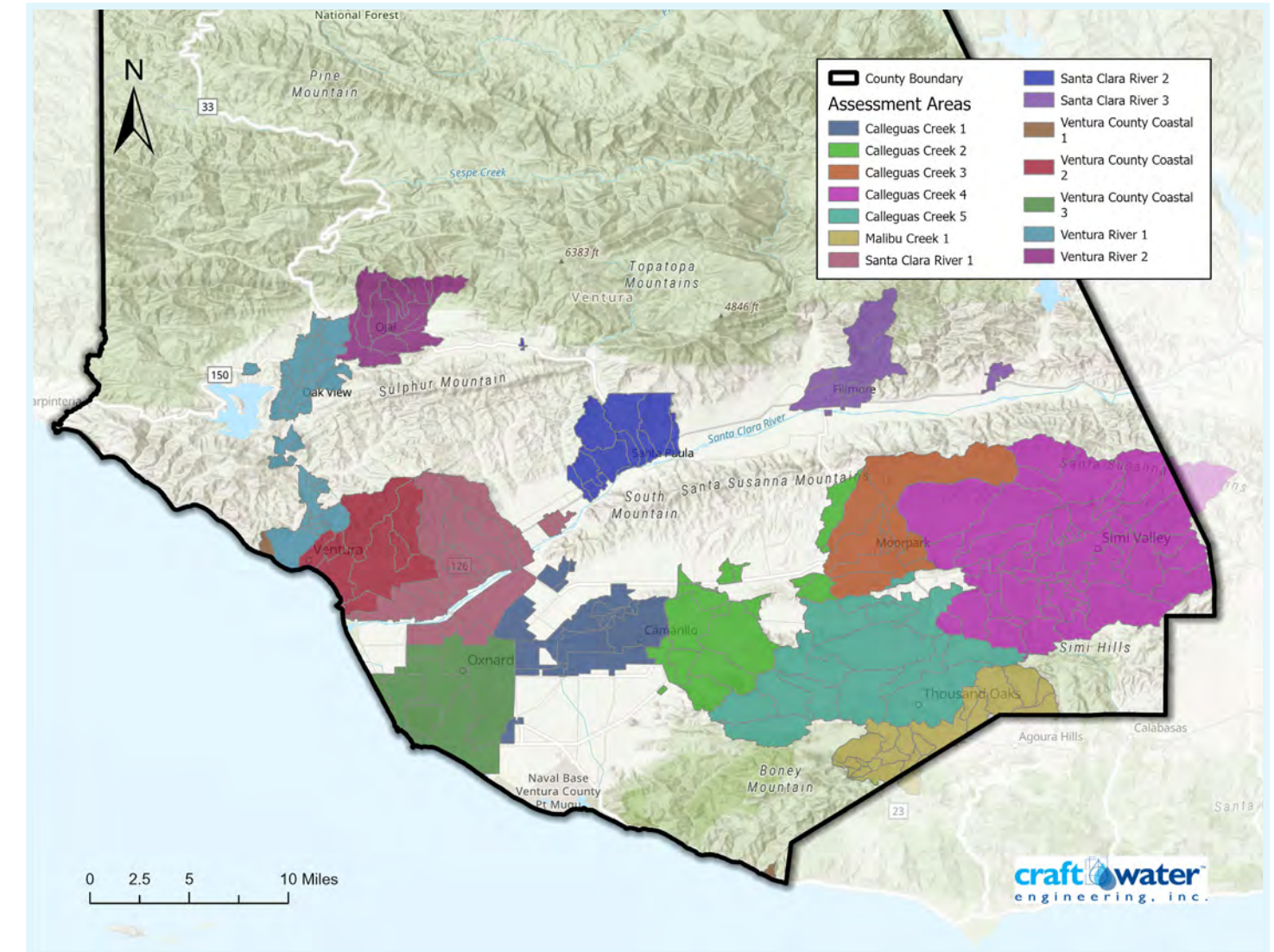


FIGURE 1-3: Assessment Areas

Assessment areas are the foundation for determining baseline runoff and pollutant loading, as well as allowable loadings based on established WQBELs or RWLs. Receiving waters and corresponding MS4-applicable pollutants from the WBPCs were assigned to the appropriate assessment area.



1.1.2 MS4-RESPONSIBLE POLLUTANTS

To determine whether further MS4 load reductions are needed to meet established water quality objectives, the following pollutants were evaluated via watershed modeling, statistical analyses, and additional source assessment. Both stormwater and non-stormwater discharges from the MS4 were evaluated. The results of the analysis are presented here by watershed, and further organized by assessment area.

1.1.2.1 CALLEGUAS CREEK WATERSHED

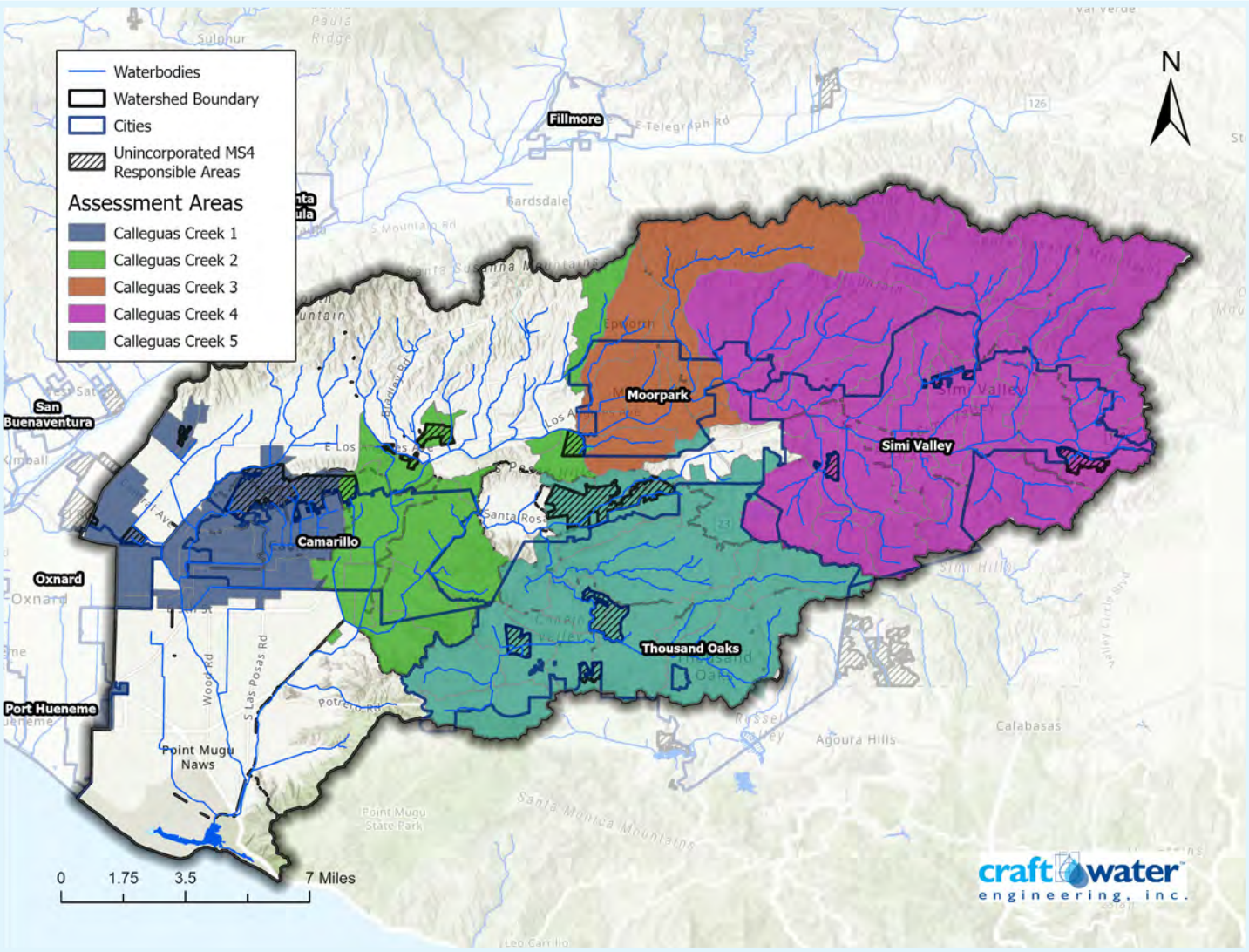


FIGURE 1-4: Calleguas Creek Watershed Assessment Areas



TABLE 1-1: Pollutants in the Calleguas Creek Watershed with Potential MS4 Contributions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT
CALLEGUAS CREEK 1	INDICATOR BACTERIA	Indicator Bacteria
	METALS	Copper, Mercury, Nickel, Selenium
	PESTICIDES/ORGANICS	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Bifenthrin, Chlorpyrifos, Cyfluthrin, Cypermethrin, Diazinon, Dieldrin, Malathion, Total Chlordane, Total PCBs, Toxaphene
	SALTS	Boron, Chloride, Sulfate, Total Dissolved Solids
	OTHER	Sedimentation, Toxicity
CALLEGUAS CREEK 2	INDICATOR BACTERIA	Indicator Bacteria
	METALS	Copper, Mercury, Nickel
	PESTICIDES/ORGANICS	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Bifenthrin, Chlorpyrifos, Cyfluthrin, Cypermethrin, Diazinon, Dieldrin, Malathion, Total Chlordane, Total PCBs, Toxaphene
	SALTS	Chloride, Sulfate, Total Dissolved Solids
	OTHER	pH, Sedimentation, Toxicity
CALLEGUAS CREEK 3	INDICATOR BACTERIA	Indicator Bacteria
	METALS	Copper, Mercury, Nickel
	PESTICIDES/ORGANICS	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Bifenthrin, Chlorpyrifos, Cyfluthrin, Cypermethrin, Diazinon, Dieldrin, Malathion, Total Chlordane, Total PCBs, Toxaphene
	SALTS	Boron, Chloride, Sulfate, Total Dissolved Solids
	OTHER	pH, Sedimentation, Toxicity
CALLEGUAS CREEK 4	INDICATOR BACTERIA	Indicator Bacteria
	METALS	Copper, Mercury, Nickel
	PESTICIDES/ORGANICS	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Bifenthrin, Chlorpyrifos, Cyfluthrin, Cypermethrin, Diazinon, Dieldrin, Malathion, Total Chlordane, Total PCBs, Toxaphene
	SALTS	Boron, Chloride, Sulfate, Total Dissolved Solids
	OTHER	Sedimentation, Toxicity
CALLEGUAS CREEK 5	INDICATOR BACTERIA	Indicator Bacteria
	METALS	Copper, Mercury, Nickel
	PESTICIDES/ORGANICS	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Bifenthrin, Bis(2-ethylhexyl) phthalate, Chlorpyrifos, Cyfluthrin, Cypermethrin, Diazinon, Dieldrin, Malathion, Total Chlordane, Total PCBs, Toxaphene
	SALTS	Chloride, Sulfate, Total Dissolved Solids
	OTHER	pH, Sedimentation, Toxicity

Highlighted pollutants are WBPCs with past-due final compliance deadlines; therefore, they are not eligible for deemed compliance coverage through the WMP.

SECTION 1: EXISTING CONDITIONS

1.1 POLLUTANTS OF CONCERN

1.1.2 MS4-RESPONSIBLE POLLUTANTS



1.1.2.2 MALIBU CREEK WATERSHED

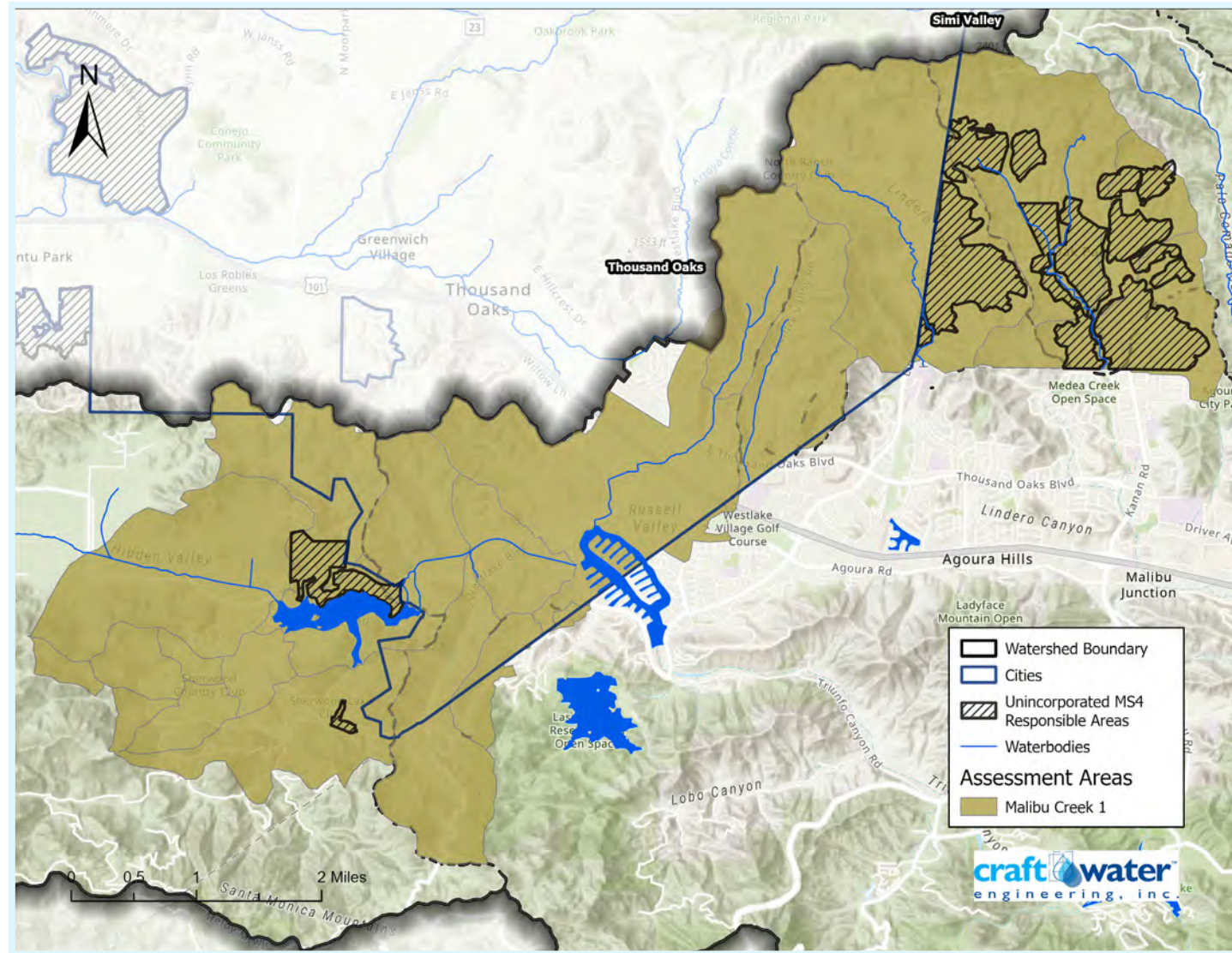


FIGURE 1-5: Malibu Creek Watershed Assessment Areas

SECTION 1: EXISTING CONDITIONS

1.1 POLLUTANTS OF CONCERN

1.1.2 MS4-RESPONSIBLE POLLUTANTS



TABLE 1-2: Pollutants in the Malibu Creek Watershed with Potential MS4 Contributions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT
MALIBU CREEK 1	INDICATOR BACTERIA	<i>E. coli</i> (dry/wet)
	METALS	Selenium
	NUTRIENTS	Ammonia-N, Nitrate-N + Nitrite-N, Total Phosphorus
	OTHER	Algae, Benthic Community Effects, Dissolved Oxygen, Invasive Species, Scum/Foam-unnatural, Sedimentation

Highlighted pollutants are WBPCs with past-due final compliance deadlines; therefore, they are not eligible for deemed compliance coverage through the WMP.

1.1.2.3 SANTA CLARA RIVER WATERSHED

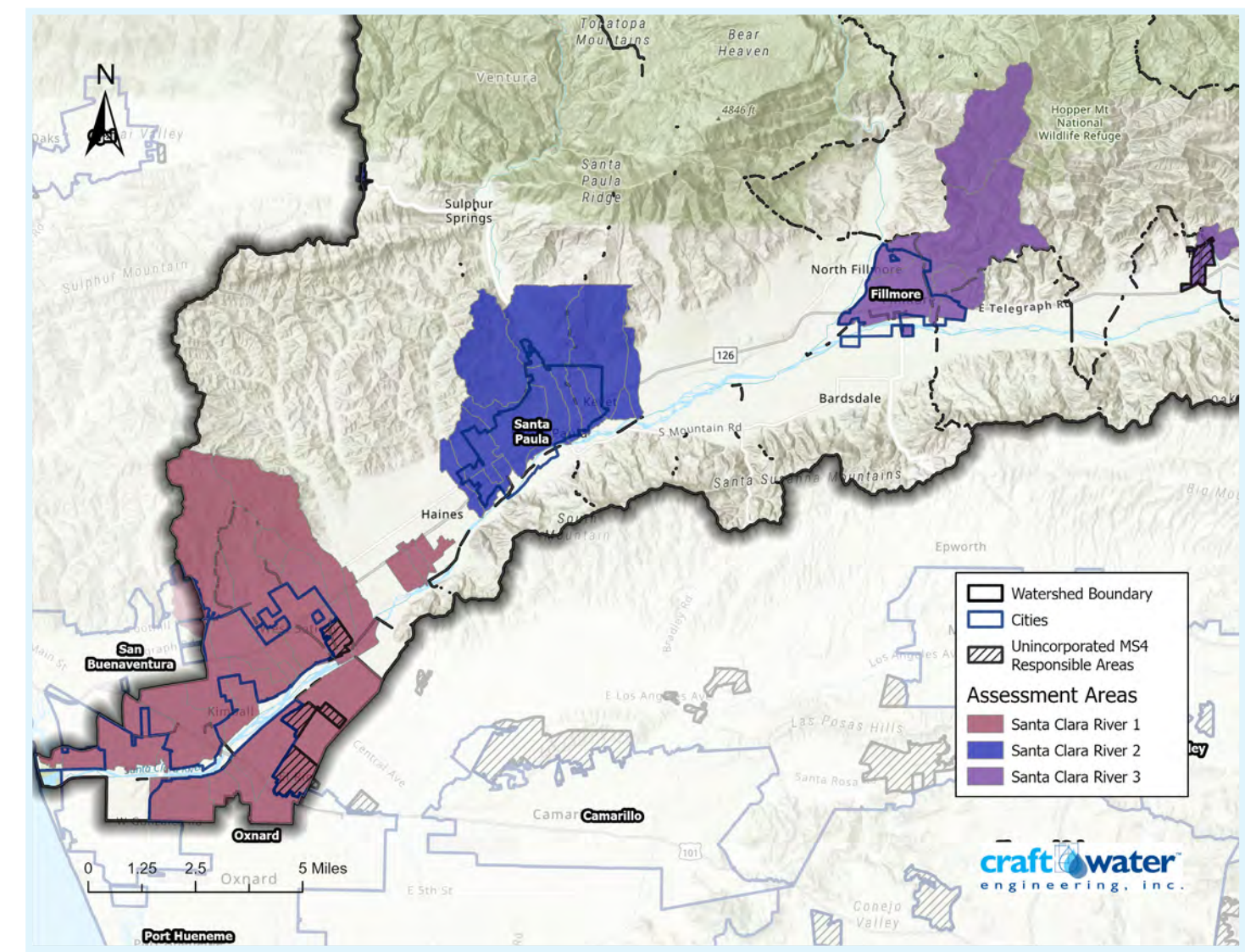


FIGURE 1-6: Santa Clara River Watershed Assessment Areas

TABLE 1-3: Pollutants in the Santa Clara River Watershed with Potential MS4 Contributions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT
SANTA CLARA RIVER 1	INDICATOR BACTERIA	Enterococcus, Fecal Coliform, Total Coliform (dry /wet)
	METALS	Selenium
	SALTS	Sulfate
	OTHER	Dissolved Oxygen, pH, Toxicity
SANTA CLARA RIVER 2	INDICATOR BACTERIA	<i>E. coli</i> (dry /wet)
	METALS	Selenium
	NUTRIENTS	Ammonia-N, Nitrate-N + Nitrite-N
	SALTS	Chloride , Sulfate, Total Dissolved Solids
SANTA CLARA RIVER 3	INDICATOR BACTERIA	<i>E. coli</i> (dry /wet)
	SALTS	Sulfate, Total Dissolved Solids

Highlighted pollutants are WBPCs with past-due final compliance deadlines; therefore, they are not eligible for deemed compliance coverage through the WMP.

1.1.2.4 VENTURA RIVER WATERSHED

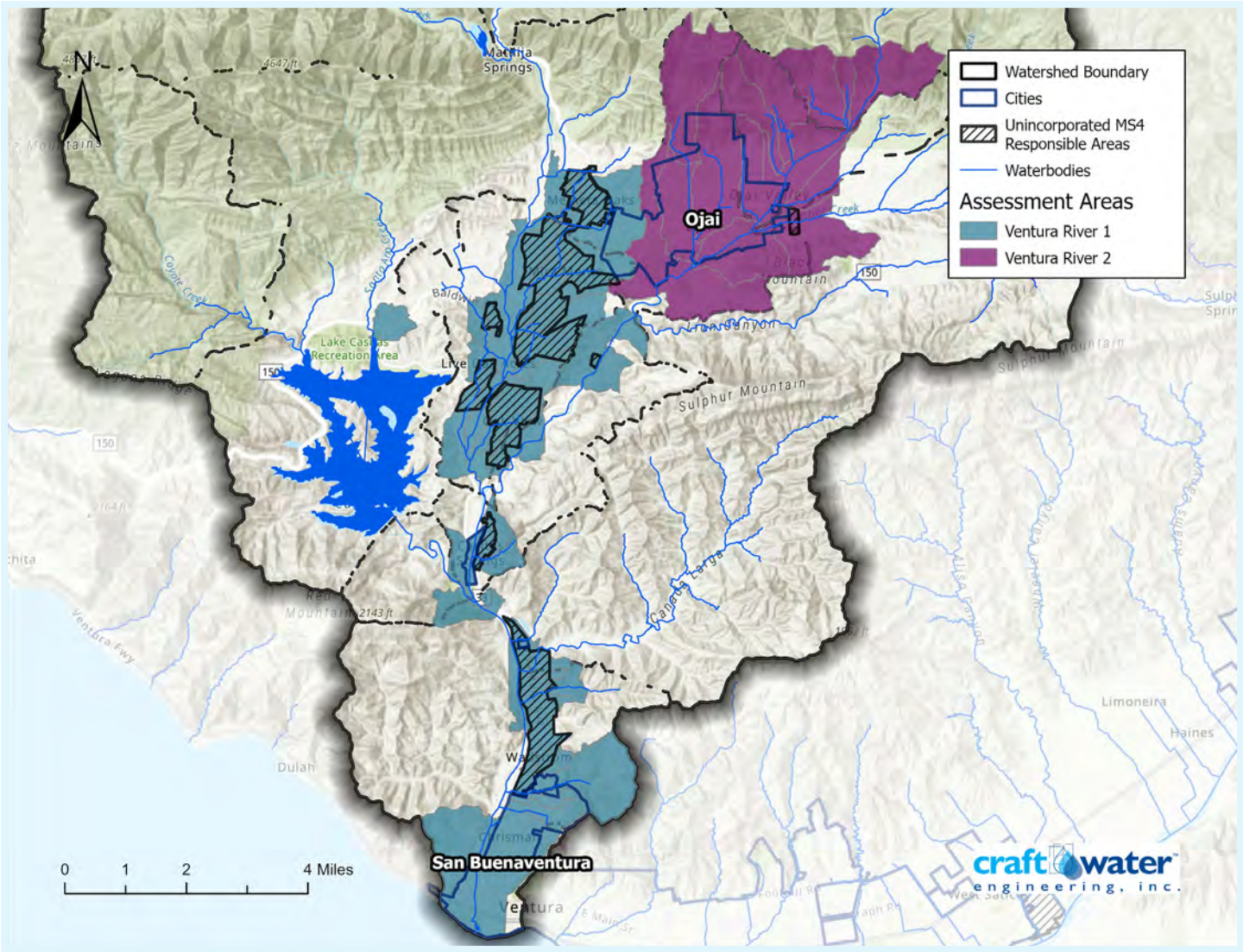


FIGURE 1-7: Ventura River Watershed Assessment Areas

TABLE 1-4: Pollutants in the Ventura River Watershed with Potential MS4 Contributions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT
VENTURA RIVER 1	INDICATOR BACTERIA	Indicator Bacteria
	NUTRIENTS	Nitrate-N + Nitrite-N, Total Nitrogen, Total Phosphorus
	PESTICIDES/ORGANICS	Chlorpyrifos
	SALTS	Chloride, Sulfate, Total Dissolved Solids
	OTHER	Algae, Benthic Community Effects, Dissolved Oxygen, Toxicity
VENTURA RIVER 2	INDICATOR BACTERIA	Indicator Bacteria
	NUTRIENTS	Nitrate-N + Nitrite-N, Total Nitrogen, Total Phosphorus
	SALTS	Chloride, Sulfate, Total Dissolved Solids

Highlighted pollutants are WBPCs with past-due final compliance deadlines; therefore, they are not eligible for deemed compliance coverage through the WMP.

1.1.2.5 VENTURA COUNTY COASTAL WATERSHED

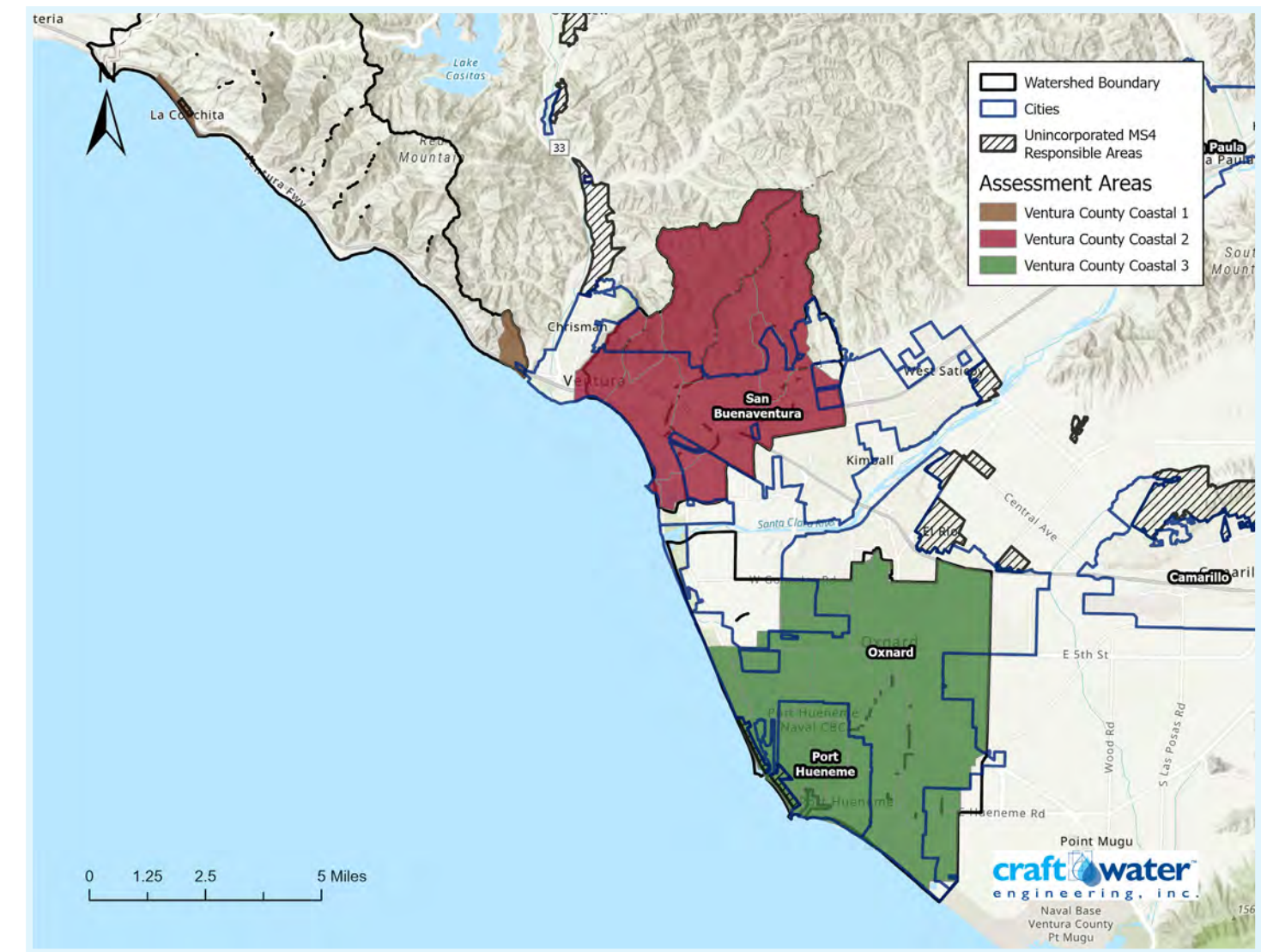


FIGURE 1-8: Ventura County Coastal Watershed Assessment Areas

TABLE 1-5: Pollutants in the Ventura County Coastal Watershed with Potential MS4 Contributions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT
VENTURA COUNTY COASTAL 2	INDICATOR BACTERIA	Enterococcus, Fecal Coliform, Total Coliform
VENTURA COUNTY COASTAL 3	INDICATOR BACTERIA	Enterococcus, Fecal Coliform, Total Coliform, Enterococcus, Fecal Coliform, Total Coliform
	OTHER	Dissolved Oxygen, pH

Highlighted pollutants are WBPCs with past-due final compliance deadlines; therefore, they are not eligible for deemed compliance coverage through the WMP.

Ventura County Coastal 3 assessment area includes Kiddie Beach and Hobie Beach, which are part of a past-due TMDL for indicator bacteria, not eligible for deemed compliance. There are additional Category 2 and Category 3 WBPCs with 303(d) listings or other observed exceedances in the past 5 years for indicator bacteria within the Ventura County Coastal 3 assessment area. The actions and milestones in the following sections associated with addressing indicator bacteria in the Ventura County Coastal 3 assessment area are focused on addressing the Category 2 and Category 3 WBPCs.



Justification for Deprioritization of Salts

The Group acknowledges that while exceedances of salts may sometimes be observed in some MS4 outfalls, the MS4 itself is not the primary source of salts in the applicable watersheds, which are mostly contributed by natural occurrence in local groundwater or imported water. Therefore, salts were not determined as priority pollutants for the WMPs to address.



For a more detailed discussion of salts in Ventura County watersheds, please refer to [Appendix B, Section 3.4](#)



Areas Outside MS4 Responsibility

The Assessment Areas excluded portions of watersheds with no MS4 contributions. Outside areas are heavily influenced by agriculture and open spaces that significantly contribute to the receiving water quality. The WMPs are focused on addressing MS4-controllable sources of pollutants contributing to water quality issues. Of note, the Calleguas Creek assessment areas do not include Oxnard Drain 3 as associated with the USEPA Toxics TMDL. Drainage from the County of Ventura and City of Oxnard MS4 system is minimal to this area. Specifically, the County of Ventura jurisdiction only includes a small section of road, with no MS4 system (e.g., pipes or catch basins). The pollutants in the Oxnard Drain 3 TMDL are focused on pesticides and toxics that are prevalent from agricultural uses. The combination of the very limited MS4 system in this area, and the pollutants that are dominantly influenced by agricultural lands, deprioritizes any further actions necessary from the MS4 Permittees in the WMP.



1.2 PROGRAMS & PROJECTS

The Group has already made significant progress improving regional water quality through its implementation of control measures. These control measures include ongoing non-structural programs (i.e. MCMs), low impact development (LID), green streets, targeted bacteria reduction strategies, trash capture devices, and regional projects.

Existing Programs

- Public Information and Participation Program
- Industrial/Commercial Facilities Program
- Planning and Land Development Program
- Construction Program
- Public Agency Activities Program
- Illicit Discharge Detection and Elimination Program

Minimum Control Measures (MCMs)

MCMs are the first line of defense against stormwater and non-stormwater flows discharging to waterways, as these measures prevent pollutants from being generated in the first place (source control) or remove build-up of pollutants before they are washed into downstream receiving waterbodies (operational control measures).

MS4 The Group is proposing modifications to the following MCMs:
Development Construction Program [VIII.G.5]
Public Agency Activities Program [VIII.H.9]

Please refer to [Appendix E](#) for a description of the proposed modifications.

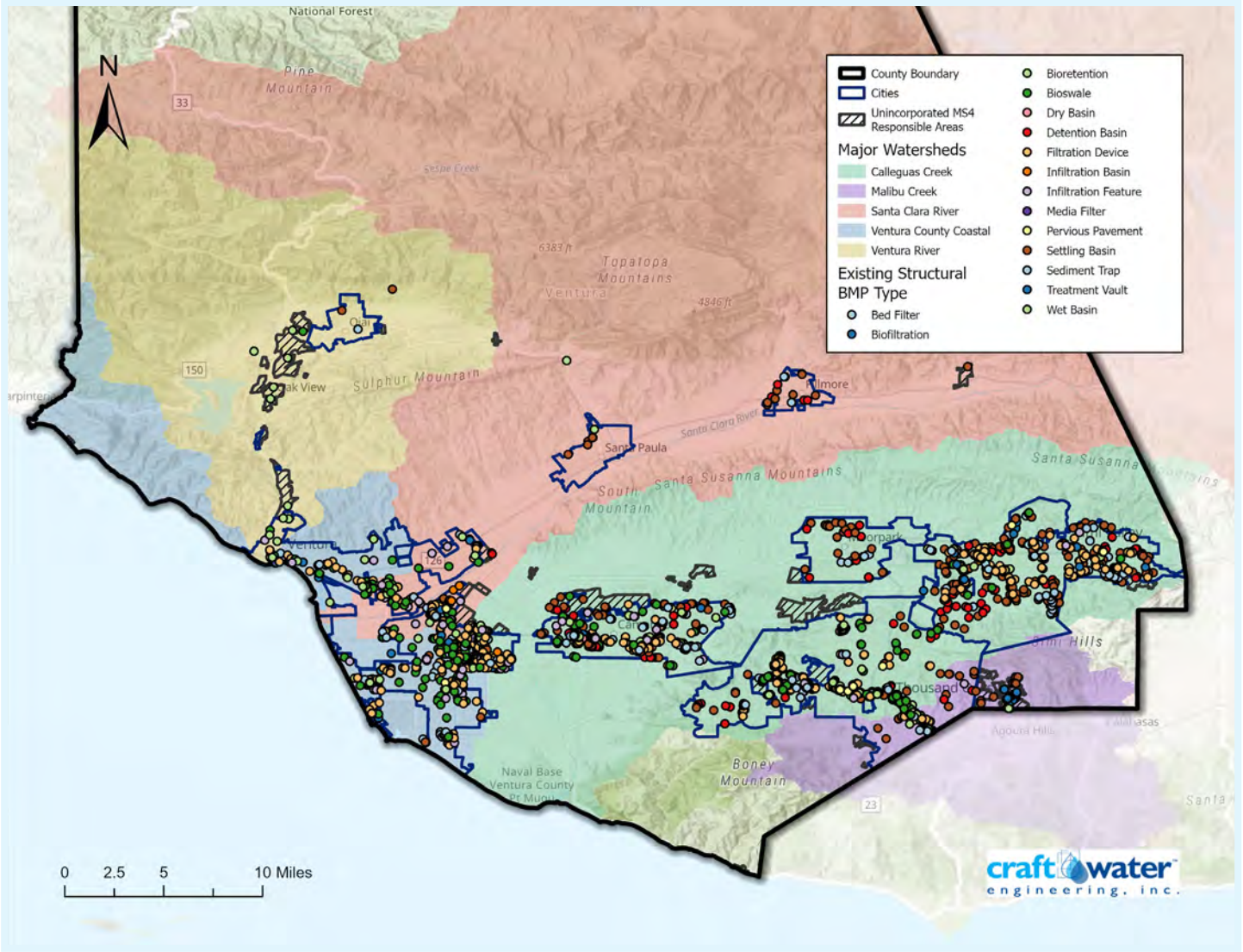


FIGURE 1-9: Existing Structural Control Measures

Over 2,100 existing structural control measures have been catalogued in Ventura County. These structural control measures primarily consist of LID and trash capture devices that prevent certain pollutants from entering the storm drain system.

SECTION 2:

PRIORITIES



After identifying and categorizing pollutants of concern through the water quality characterization process, pollutant reduction needs were quantified based on compliance targets. Load reduction targets were established for each watershed and used to inform where control measure enhancements were needed most.

2.1 WATERSHED MODEL

The foundation of the pollutant prioritization process was a new watershed model for Ventura County, developed using the USEPA’s **Loading Simulation Program in C++ (LSPC)** to...

- > Estimate baseline runoff and sources of sediment¹, nutrients², metals³, and other pollutant loads⁴ in the watershed, with a focus on MS4 areas.
- > Calculate the timing and amount of pollutant loads delivered from the upstream watershed (again focusing on MS4 contributing areas) to the receiving waters.
- > Support development of the RAA pollutant load reduction targets.
- > Input baseline conditions to estimate performance of new or enhanced control measures to achieve the pollutant load reduction targets.



TECHNICAL
NOTE

What about bacteria? The fate and transport of fecal indicator bacteria are complex and highly variable in the environment. A traditional watershed modeling system was deemed inappropriate for the modeling of bacteria, and instead, a **Monte Carlo Model** was employed. In addition, these WMPs integrate a risk-based approach to identify, prioritize, and target potential sources of human waste, which are more likely to carry pathogens that could make humans sick. The Monte Carlo statistical analysis and risk-based approach are discussed in more detail in **Appendix D, Section 4**.

¹Sediment is utilized as a proxy for pesticide and organic pollutants.

²Nitrogen and phosphorus

³Total selenium, copper, mercury, nickel, and zinc

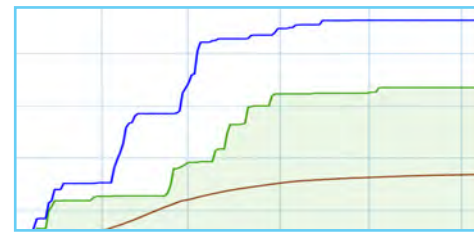
⁴WBPCs identified within the “Other” pollutant category are addressed via their associated pollutants of concern.



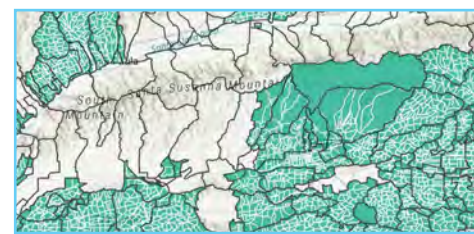


Watershed Model Inputs

The LSPC watershed model was based on the best available watershed data...



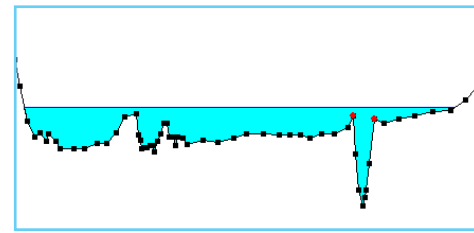
METEOROLOGICAL DATA
Hourly precipitation and evapotranspiration timeseries form the boundary conditions used to executing the hydrology and water quality modules.



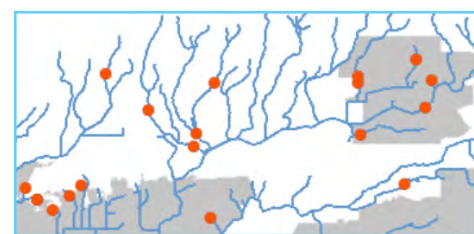
SUBWATERSHEDS
These hydrologic units delineate the landscape and are the basis of the model architecture linking the landscape to the receiving waters.



HYDROLOGIC RESPONSE UNITS (HRUs)
HRUs are the core hydrologic modeling land units representing areas of similar physical characteristics based on land use and land cover. The standard HRU-defining approach associates all similar land uses, soils, and slopes within a subwatershed based upon user-defined thresholds. The effective impervious area was used to disaggregate disconnected, pervious areas within impervious land uses.



REACH CHARACTERISTICS
Stream cross-sections drive the relationship between flow and water depth and affect travel times across the watershed. Accurate channel cross-section areas and roughness characteristics are especially important for simulating velocities throughout the network, which strongly influence pollutant fate and transport modeling.



POINT SOURCES
Point sources were added to the model to represent any external sources that may affect the hydrology and water quality loading in the watersheds aside from natural watershed inputs.

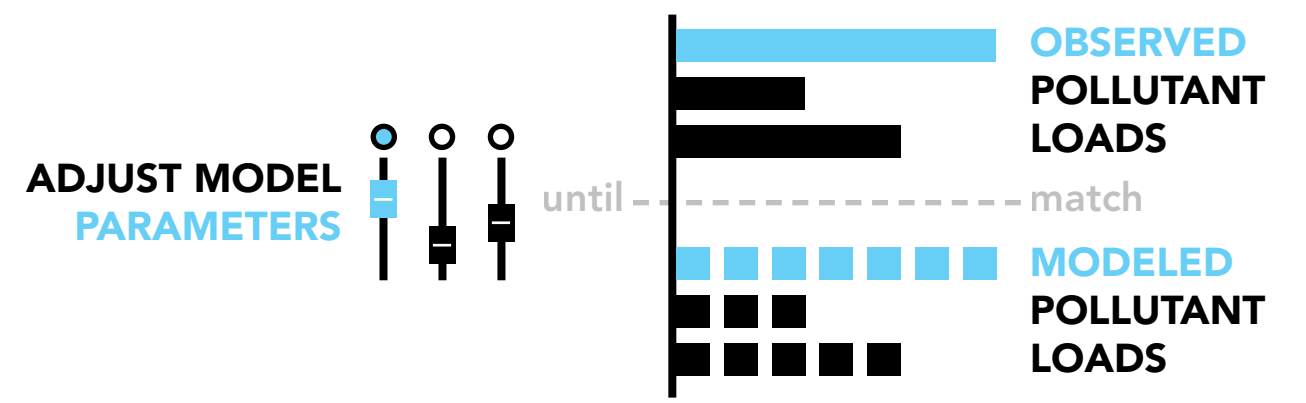
For a more complete discussion of watershed model inputs, please refer to **Appendix D, Section 1.2**



Watershed Model Calibration

To reflect conditions from the most recent ten years, the watershed model was calibrated with local flow and water quality monitoring data from MS4 outfalls between Water Years 2012 and 2021.¹

The calibration process consisted of adjusting appropriate model parameters to better match observed conditions from the set calibration period. Because the overall calibration was focused on comparing modeled to observed loads, hydrology calibration was conducted first to dial in the flows, followed by sediment calibration, and finally, water quality calibration.



TECHNICAL NOTE The Los Angeles Regional Board's 2014 **Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program** specify model calibration tolerances for different levels of agreement or accuracy. These tolerance standards were rigorously applied to the RAA model calibration.

Timeseries and pairwise comparison graphs were used to support assessment of model calibration in addition to the statistical guidelines. These graphs are included in **Appendix D, Section 1.4**

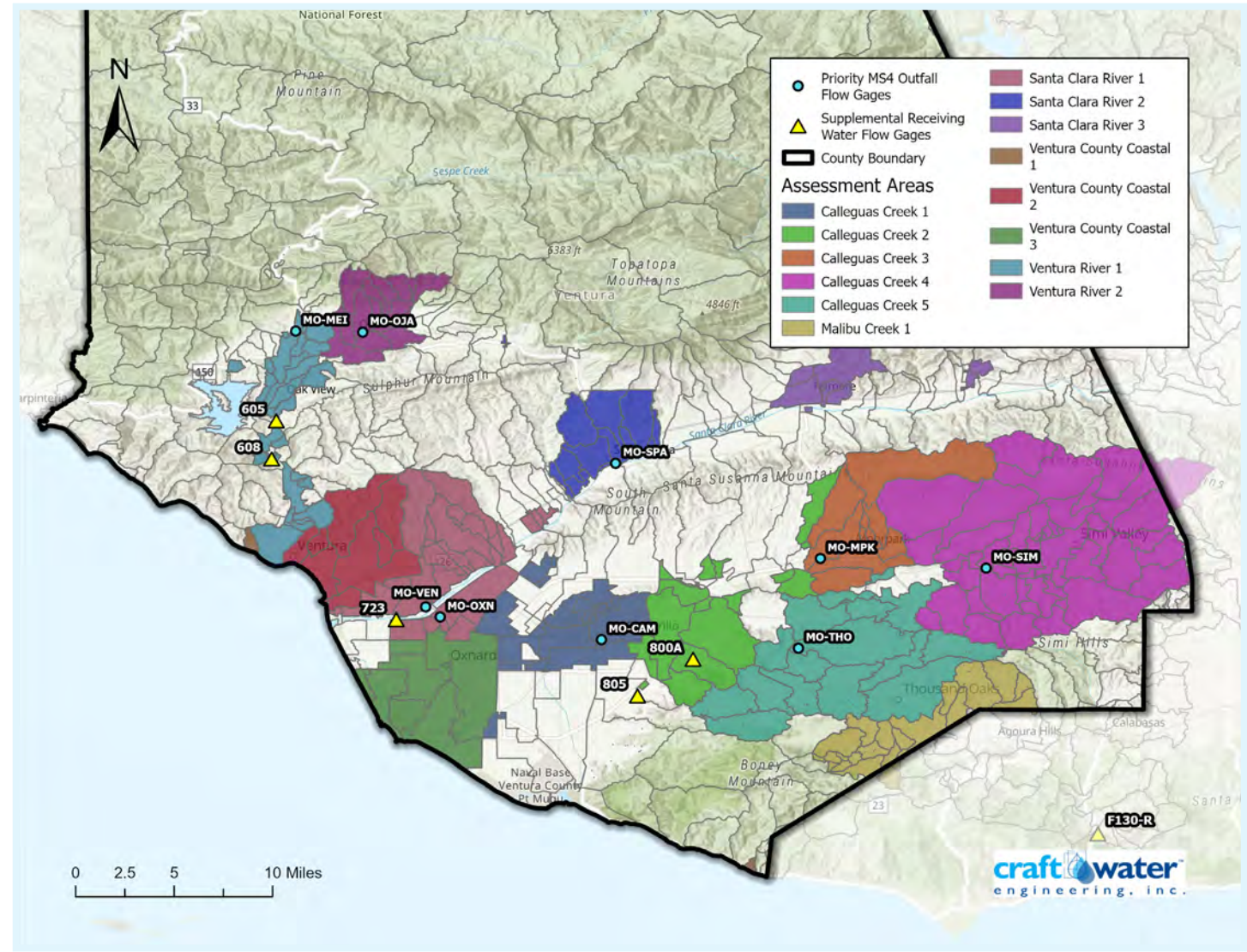


FIGURE 2-1: Flow Calibration Locations

Calibration was performed at the local scale to ensure representative outfall monitoring stations within the watersheds (Calleguas Creek, Santa Clara River, and Ventura River) met applicable guidelines.

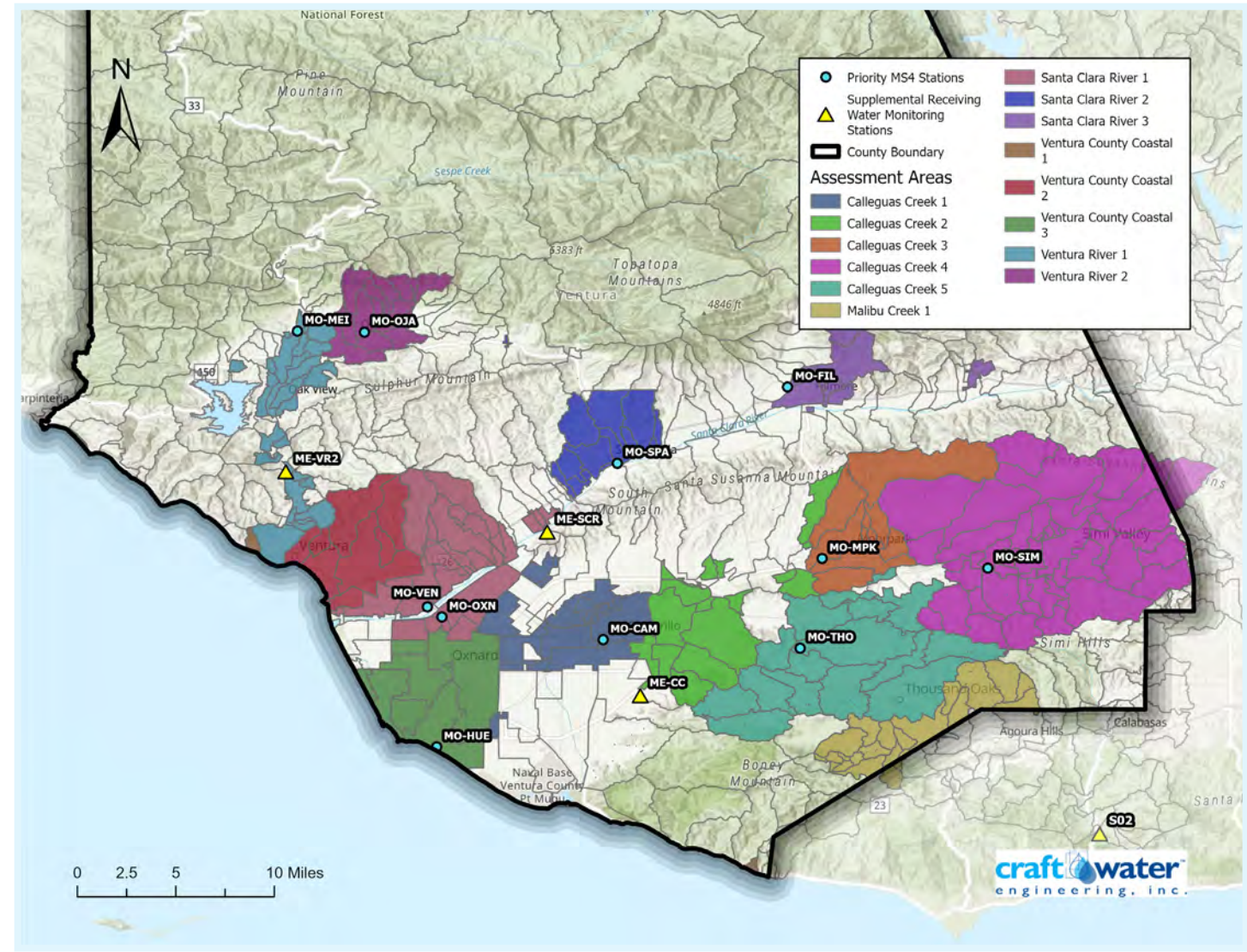


FIGURE 2-2: Water Quality Calibration Locations

Sediment calibration and water quality calibration were conducted based on available local data. Model calibration focused on the following constituents: *total suspended solids, total nitrogen, total phosphorus, total selenium, total copper, total mercury, total nickel, and total zinc*. Other pollutants of concern were represented based on their sediment-association.



2.2 POLLUTANT LOAD REDUCTION TARGETS

Utilizing the baseline watershed model and delineated MS4-responsible assessment areas, pollutant load reduction targets were calculated under applicable TMDL-defined critical conditions (e.g. dry weather vs. wet weather, specific seasons, or over an annual average timescale) for each pollutant of concern for various water years within the last ten years. **Table 2-1** presents a list of WBPCs that were determined by the RAA *not* to require further pollutant load reductions, while the RAA-identified pollutant load reduction targets required in each watershed are summarized in **Tables 2-2** through **2-6**.

MS4 Progress with WMPs implementation and associated deemed compliance status will be evaluated based on these **assessment-area-scale or jurisdiction-scale pollutant load reduction targets**.

MS4 Based on the incorporation of WQBELs in the Permit, any given Permittee's compliance for past-due TMDLs is established at monitoring stations that represent either individual MS4 discharges or receiving waters. The emphasis on individual compliance presents challenges to the development of collaborative watershed management programs. **The Group hopes that future iterations of the Permit will include metrics that incentivize watershed scale collaboration to more effectively and efficiently achieve beneficial use protection.**

Critical Condition: 90th Percentile Rainfall Water Year

After reviewing various critical water years, the RAA was established around a 90th Percentile Rainfall critical water year (defined for each assessment area based on the local historic rainfall.)



For a more complete discussion of the critical conditions chosen for modeling, please refer to **Appendix D, Section 1.3**



TABLE 2-1: WBPCs for which the RAA Identified No Required Pollutant Load Reductions

ASSESSMENT AREA	POLLUTANT TYPE	POLLUTANT WITH NO RAA-IDENTIFIED LOAD REDUCTIONS
CALLEGUAS CREEK 1	PESTICIDES/ORGANICS	2,4'-DDD, 2,4'-DDT, Cyfluthrin, Cyhalothrin lambda, Cypermethrin, Dieldrin, Total PCBs
CALLEGUAS CREEK 2	PESTICIDES/ORGANICS	Bifenthrin, Cyfluthrin, Cypermethrin, Dieldrin, Total PCBs
CALLEGUAS CREEK 3	PESTICIDES/ORGANICS	Cyfluthrin, Cypermethrin, Dieldrin, Total PCBs
CALLEGUAS CREEK 4	PESTICIDES/ORGANICS	Cyfluthrin, Cypermethrin, Dieldrin, Total PCBs
CALLEGUAS CREEK 5	PESTICIDES/ORGANICS	Cypermethrin, Dieldrin, Total Chlordane, Total PCBs
MALIBU CREEK 1	METALS	Selenium
SANTA CLARA RIVER 1	METALS	Selenium
	SALTS	Sulfate
SANTA CLARA RIVER 2	METALS	Selenium
	SALTS	Sulfate, Total Dissolved Solids
SANTA CLARA RIVER 3	SALTS	Sulfate, Total Dissolved Solids
VENTURA RIVER 1	SALTS	Chloride, Sulfate, Total Dissolved Solids
VENTURA RIVER 2	SALTS	Chloride, Sulfate, Total Dissolved Solids
VENTURA COUNTY COASTAL 1	N/A	No applicable WBPCs
VENTURA COUNTY COASTAL 2	BACTERIA	Enterococcus
VENTURA COUNTY COASTAL 3	N/A	None

The RAA model identified no required reductions for the WBPCs listed in **Table 2-1**. It should be acknowledged that it is still possible for future isolated events to result in observed exceedances of these WBPCS, particularly given the variable nature of stormwater. However, the RAA is based on robust data and modeling of the most representative critical conditions in these watersheds to be protective of the beneficial uses. In addition, although no required reductions are identified through the RAA model for the WBPCs listed in **Table 2-1**, the control measures committed to in this WMP in each assessment area will help address any rare possible exceedances of these pollutants.



2.2.1 CALLEGUAS CREEK WATERSHED

TABLE 2-2: RAA-Identified Pollutant Load Reductions Required in Calleguas Creek Watershed

ASSESSMENT AREA	JURISDICTION	RAA-IDENTIFIED POLLUTANT REDUCTIONS		
		Sediment-Pesticides Proxy (Annual) (lb/year)	Indicator Bacteria ¹ (Dry) (MPN/day)	Indicator Bacteria ¹ (Wet) (MPN/day)
CALLEGUAS CREEK 1	CAMARILLO	6,294	5.10E+08	4.77E+15
	OXNARD	1,145	1.83E+08	1.71E+15
	UNINCORPORATED COUNTY	1,268	1.12E+08	1.04E+15
	TOTAL	8,707	8.04E+08	7.52E+15
CALLEGUAS CREEK 2	CAMARILLO	3,487	2.39E+07	8.80E+13
	UNINCORPORATED COUNTY	339	1.36E+06	5.01E+12
	TOTAL ²	3,826	2.53E+07	9.30E+13
CALLEGUAS CREEK 3	MOORPARK	5,363	2.13E+04	4.70E+13
	TOTAL ³	5,363	2.13E+04	4.70E+13
CALLEGUAS CREEK 4	SIMI VALLEY	19,965	1.81E+09	8.27E+12
	MOORPARK	468	4.38E+07	2.00E+11
	UNINCORPORATED COUNTY	361	3.22E+07	1.47E+11
	TOTAL ⁴	20,794	1.89E+09	8.62E+12
CALLEGUAS CREEK 5	THOUSAND OAKS	23,685	2.80E+05	2.55E+16
	UNINCORPORATED COUNTY	2,538	2.89E+04	2.63E+15
	TOTAL ⁵	26,223	3.09E+05	2.81E+16

N/A indicates no required load reductions are needed for the indicated pollutant(s) during the critical water year evaluated for that assessment area.

¹E. coli was used as the representative indicator bacteria to evaluate pollutant load reduction targets.

²Moorpark, Simi Valley, and Thousand Oaks are responsible for less than 1% of the required pollutant load reductions, therefore no specific required reductions were assumed as this will be managed by excess load reductions by other agencies within the assessment area.

³Simi Valley and Unincorporated County is responsible for less than 1% of the required pollutant load reductions, therefore no specific required reductions were assumed as this will be managed by excess load reductions by other agencies within the assessment area.

⁴Thousand Oaks is responsible for less than 1% of the required pollutant load reductions, therefore no specific required reductions were assumed as this will be managed by excess load reductions by other agencies within the assessment area.

⁵Simi Valley is responsible for less than 1% of the required pollutant load reductions, therefore no specific required reductions were assumed as this will be managed by excess load reductions by other agencies within the assessment area.

2.2.2 MALIBU CREEK WATERSHED

TABLE 2-3: RAA-Identified Pollutant Load Reductions Required in Malibu Creek Watershed

ASSESSMENT AREA	JURISDICTION	RAA-IDENTIFIED POLLUTANT REDUCTIONS		
		Nitrate-N + Nitrite-N (Summer & Winter) (lb/year)	Total Phosphorus (Summer) (lb/year)	Indicator Bacteria ¹ (Wet) (MPN/day)
MALIBU CREEK 1	THOUSAND OAKS	414.7	7.43	2.59E+11
	UNINCORPORATED COUNTY	228.2	4.04	1.40E+11
	TOTAL	642.9	11.47	3.99E+11

2.2.3 SANTA CLARA RIVER WATERSHED

TABLE 2-4: RAA-Identified Pollutant Load Reductions Required in Santa Clara River Watershed

ASSESSMENT AREA	JURISDICTION	RAA-IDENTIFIED POLLUTANT REDUCTIONS
		Indicator Bacteria ² (Wet) (MPN/day)
SANTA CLARA RIVER 1	VENTURA	6.46E+10
	OXNARD	2.69E+10
	UNINCORPORATED COUNTY	1.12E+10
	TOTAL	1.03E+11
SANTA CLARA RIVER 2	SANTA PAULA	2.52E+11
	TOTAL ³	2.53E+11
SANTA CLARA RIVER 3	FILLMORE	2.05E+11
	UNINCORPORATED COUNTY	1.34E+10
	TOTAL	2.18E+11

N/A indicates no required load reductions are needed for the indicated pollutant(s) during the critical water year evaluated for that assessment area.

¹E. coli was used as the representative indicator bacteria to evaluate pollutant load reduction targets.

²Enterococcus was used as the representative indicator bacteria for the Santa Clara River 1 assessment area while E. coli was used as the representative indicator bacteria for the Santa Clara River 2 and Santa Clara River 3 assessment areas to evaluate pollutant load reduction targets.

³Fillmore and Unincorporated County is responsible for less than 1% of the required pollutant load reductions, therefore no specific required reductions were assumed as this will be managed by excess load reductions by other agencies within the assessment area.



2.2.4 VENTURA RIVER WATERSHED

TABLE 2-5: RAA-Identified Pollutant Load Reductions Required in Ventura River Watershed

ASSESSMENT AREA	JURISDICTION	RAA-IDENTIFIED POLLUTANT REDUCTIONS		
		Sediment-Pesticides Proxy (Annual) (lb/year)	Indicator Bacteria ¹ (Dry) (MPN/day)	Indicator Bacteria ¹ (Wet) (MPN/day)
VENTURA RIVER 1	UNINCORPORATED COUNTY	116	1.31E+02	1.70E+12
	VENTURA	82	8.76E+01	1.13E+12
	OJAI	9	8.14E+00	1.05E+11
	TOTAL	207	2.27E+02	2.94E+12
VENTURA RIVER 2	OJAI	N/A	9.33E+01	2.91E+11
	UNINCORPORATED COUNTY	N/A	1.23E+00	3.84E+09
	TOTAL	N/A	9.45E+01	2.95E+11

N/A indicates no required load reductions are needed for the indicated pollutant(s) during the critical water year evaluated for that assessment area.
¹E. coli was used as the representative indicator bacteria to evaluate pollutant load reduction targets.

2.2.5 VENTURA COUNTY COASTAL WATERSHED

TABLE 2-6: RAA-Identified Pollutant Load Reductions Required in Ventura County Coastal Watershed

ASSESSMENT AREA	JURISDICTION	RAA-IDENTIFIED POLLUTANT REDUCTIONS	
		Indicator Bacteria ¹ for Recreational Beneficial Use (Dry) (MPN/day)	Indicator Bacteria ¹ for Recreational Beneficial Use (Wet) (MPN/day)
VENTURA COUNTY COASTAL 2	VENTURA	N/A	N/A
	TOTAL	N/A	N/A
VENTURA COUNTY COASTAL 3	OXNARD	1.92E+05	3.36E+10
	PORT HUENEME	4.48E+04	7.82E+09
	UNINCORPORATED COUNTY	3.36E+03	5.87E+08
	TOTAL	2.41E+05	4.20E+10

N/A indicates no required load reductions are needed for the indicated pollutant(s) during the critical water year evaluated for that assessment area.
¹Enterococcus was used as the representative indicator bacteria to evaluate pollutant load reduction targets to protect the recreational beneficial use.

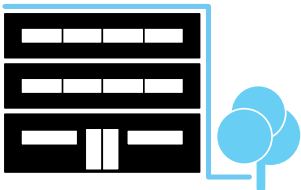
SECTION 3: ENHANCEMENTS



This section summarizes the collection of control measures analyzed in the RAA that can be employed to address the RAA-established pollutant load reductions detailed in **Section 2.2**.

3.1 OPPORTUNITY TOOLKIT

The opportunity toolkit is a collection of recommended implementation activities that have proven effective in addressing the pollutants of concern—and in particular—stormwater and non-stormwater discharges from the MS4 for pollutants requiring load reductions. Their effectiveness is based on an alignment between their treatment mechanisms and the known fate and transport of the targeted pollutants (as established during the Water Quality Characterization.) The opportunity toolkit includes *redevelopment LID*, *enhancements to street sweeping*, *new structural projects*, and *human waste source investigations (HWSIs) and abatement activities*.



LOW IMPACT
DEVELOPMENT
(LID)



ENHANCED
STREET
SWEEPING



NEW
STRUCTURAL
PROJECTS



HUMAN
WASTE SOURCE
INVESTIGATIONS
AND ABATEMENT





3.1.1 Redevelopment LID

As communities evolve and expand they undergo redevelopment, changing the existing urban environment to develop something new. Such redevelopment projects are required to implement LID, intended to minimize stormwater runoff from the site, reducing pollutant loading that otherwise would have been contributed from the area.

THE IMPACT OF REDEVELOPMENT LID

Redevelopment LID projects are existing management actions which have projected future impacts on associated pollutant load reductions. All capital and maintenance costs are assumed to be borne by private developers; therefore, agencies do not need to take on any additional financial burden. However, the agencies are responsible for approving design plans and performing inspection during construction of redevelopment projects, consistent with current activities. As the implementation of LID will provide pollutant load reduction benefits, where this is employed as an element of the implementation strategy, the Group is committed to tracking redevelopment rates and LID capacities, beyond the baseline Permit requirements, to verify projected reductions and adapt if necessary.



Redevelopment projects are defined as projects that create and/or replace **5,000 square feet or more** of impervious surface (collectively over the entire project site) per Section VIII.F.1.a.ii-iv of the Permit.



Per the *Planning and Land Development Program* included in the Permit, redevelopment projects are required to retain on-site the **Storm Water Quality Design Volume (SWQDV)**, which is the greater of the runoff from the **0.75-inch, 24-hour rain event** or the runoff from the **85th percentile, 24-hour rain event**.



For a more complete discussion of redevelopment LID, please refer to **Appendix C**



3.1.2 Enhanced Operational MCMs (Street Sweeping)

Street sweeping helps to remove trash, debris, and pollutants that build up along the side of roadways. Street sweepers are outfitted with water sprayers, rotating brushes and a vacuum, which work together to remove pollutants before they can be washed off into the MS4 system and eventually, to downstream receiving waters.



THE IMPACT OF STREET SWEEPING

Street sweeping can be an effective means of reducing the accumulation of street debris, especially along curbs, and is an existing MCM activity (Section VIII.H of the Permit). It is a non-structural way to control the quality of roadway or parking lot runoff that drains to the MS4 system, because it removes constituents before they become entrained in runoff. Street sweeping is often performed using street sweepers, which can be either mechanical broom, vacuum, or regenerative air. Recognizing the cost-effectiveness of street sweeping, the Group investigated potential enhancements to their existing programs, including additional routes, increased sweeping events, upgrading technologies, and parking restrictions. For select pollutants, the Group is committing to enhanced street sweeping, beyond the baseline Permit requirements, by increasing monthly curb miles swept for additional pollutant load reduction benefits.



Spatial data of sweeping routes and frequencies was compiled from agencies to understand the extent of their existing street programs and to model the incremental load reductions from enhancements.



For a more complete discussion of enhanced operational MCMs, please refer to **Section 3.2.2** and **Appendix C**



3.1.3 New Structural Projects



Structural projects help capture and treat runoff from larger drainage areas, up to hundreds or even thousands of acres. These downstream regional stormwater capture projects would be the last line of defense for achieving pollutant load reductions.

IDENTIFYING POTENTIAL STRUCTURAL PROJECTS

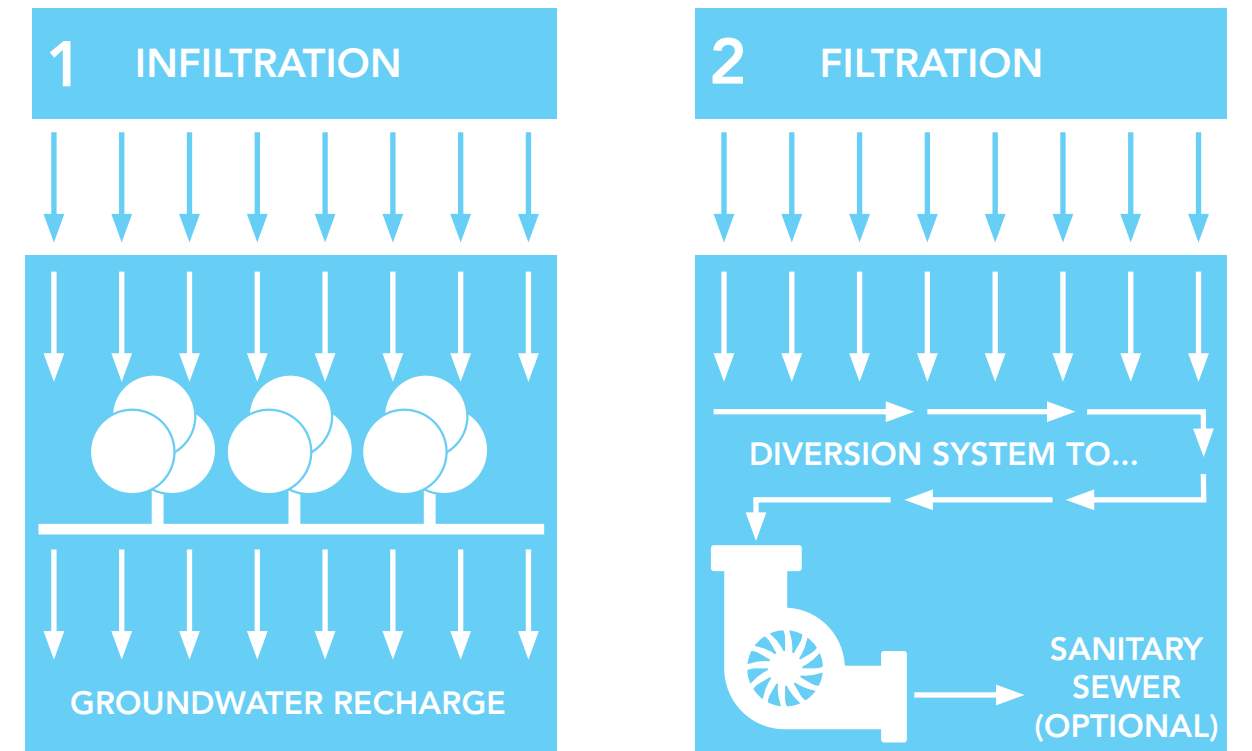
Potential structural projects identified by previous planning efforts, including the [Municipal Stormwater Resources Plan](#), [TMDL Implementation Plans](#), and [Five-Year Capital Improvement Plans](#), were evaluated first. From there, additional project opportunities were identified using high-resolution GIS datasets and preliminary desktop analyses to determine where most likely constructable regional stormwater projects could go, and what the upper limits for their size might be given site-specific conditions and constraints. These opportunities were then screened by design engineers based on a desktop analysis to select projects for further consideration. The screening process generated three "tiers" of structural projects. Top tier structural projects are presented in **Figure 3-1**.



For a more detailed discussion of Structural Project Identification, please refer to [Appendix C, Section 4](#).



Two major regional project treatment types were considered:



Infiltration-based stormwater capture projects are nature-based solutions that provide multiple benefits, including groundwater recharge, recreational usage, and/or habitat restoration.

Filtration-based stormwater capture projects were only considered if infiltration was not feasible, existing planned projects specifically indicated this treatment type, or discharge to the sanitary sewer was necessary to control flowrates out of the project.



Projects that divert to the sanitary sewer system address stormwater runoff and can help with regional local water supply goals by providing an additional source of water to water reclamation plants. These types of projects require coordination with the governing water / wastewater agency.

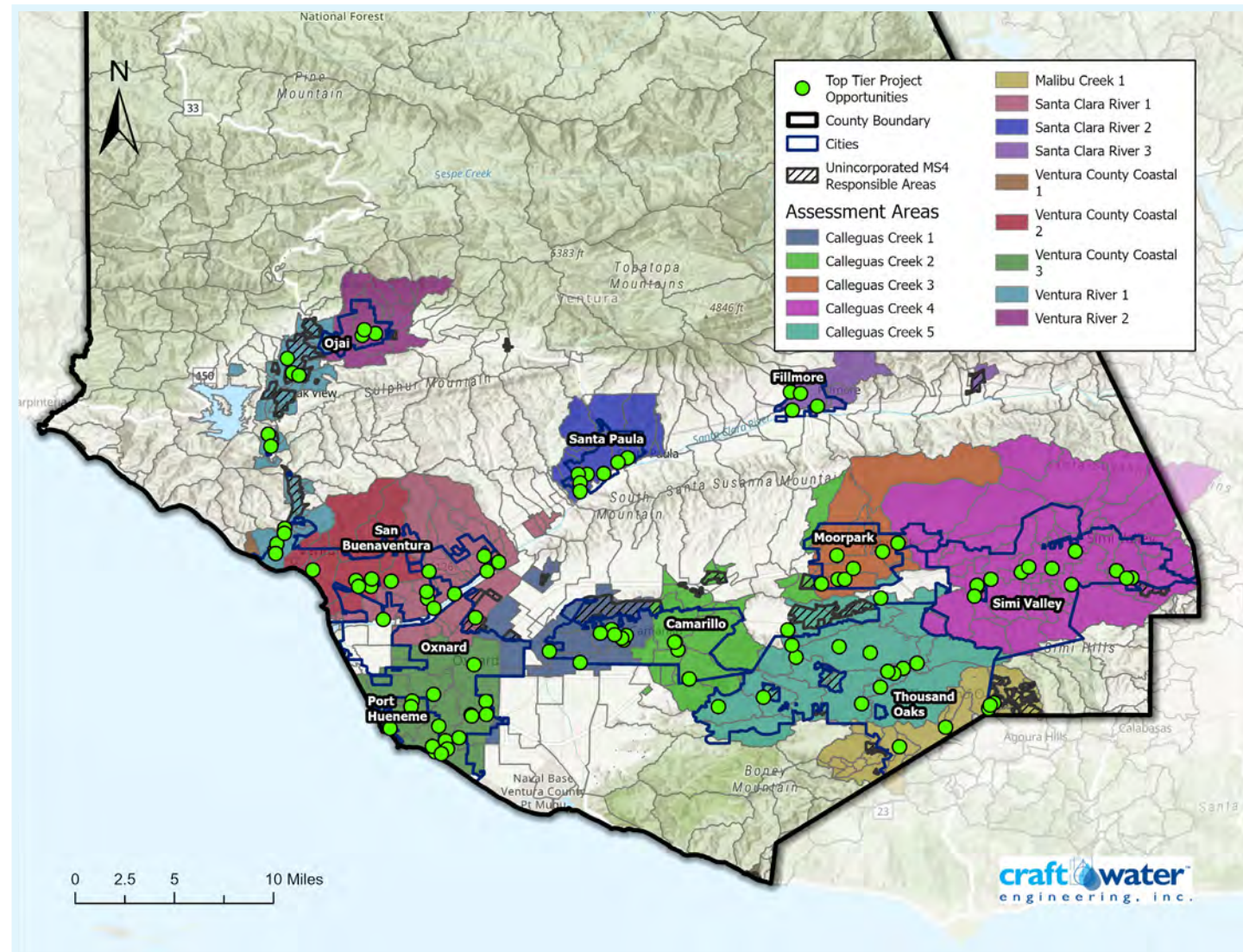


FIGURE 3-1: Top Tier Structural Projects Identified by Screening Process



For a tabulated count of screened projects organized by jurisdiction, please refer to [Appendix C, Section 4](#).



3.1.4 Human Waste Source Investigations & Abatement

Of all the sources of indicator bacteria, bacteria of human origin poses the greatest risk to public health. In recent years, the science and tools used to identify bacteria, trace their sources within a watershed, and target their abatement have expanded. Integrating a modern framework with risk-based prioritization helps focus limited resources on the most immediate areas of concern, enabling the Group to effectively address bacteria load reductions according to the latest fecal indicator bacteria standards.



HUMAN WASTE SOURCE ABATEMENT

Bacteria objectives in receiving waters primarily protect recreational activities. The most cost-effective management activities reduce the risk of illness through abatement of human waste sources. With this in mind, the WMPs integrate a risk-based approach that prioritizes high-risk catchments for human waste source investigations, followed by abatement activities (non-structural and/or structural). Human waste source investigations follows an efficient and systematic approach consistent with the steps outlined in the [California Microbial Source Identification Manual](#) written by the *Southern California Coastal Water Research Project* (SCCWRP, 2013).

Figure 3-2 presents a broader overview of the risk-based approach to addressing bacteria. The framework allows a targeted catchment to tailor implementation actions based on the findings of source investigations, which will be most effective at reducing bacteria in the watersheds. If a source is unidentified, or if there are other limitations on the source investigation, structural projects will be implemented to address the target catchment area and achieve the necessary load reduction.



For a more detailed discussion of Human Waste Source Investigation and Abatement, please refer to [Appendix D, Section 4](#).



RISK-BASED CATCHMENT PRIORITIZATION

As part of the WMPs development process, the Group compiled a GIS database of potential human waste sources within each catchment. This GIS database enables a risk-based approach to prioritization; when paired with water quality objective exceedance data, the GIS database helps guide decisions regarding which catchments to target first.

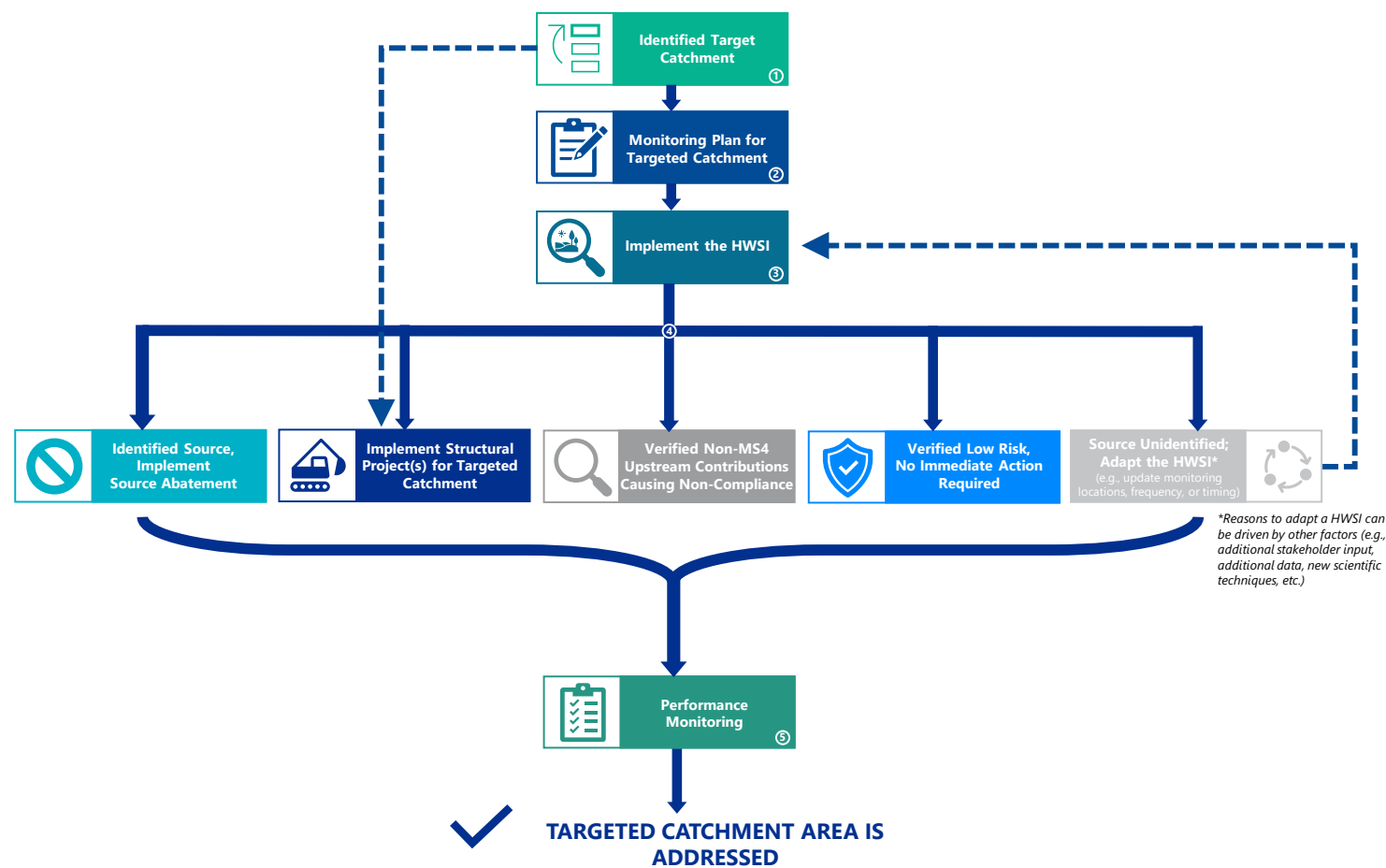
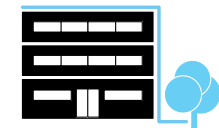


FIGURE 3-2: Framework for Addressing Bacteria through Risk-Based Approach



3.2 MINIMUM CONTROL MEASURES MODEL



3.2.1 Redevelopment LID

Projected average annual redevelopment rates for the five watersheds were compiled from agencies' general plans where possible, and proxy values from comparable agencies where data was limited. **Table 3-1** displays the annual redevelopment rates used for each watershed. For each pollutant and within each assessment area, projected redevelopment was represented in the LSPC model, characterizing the impact up until the pollutant's final compliance deadline. Modeled pollutant load reductions from projected redevelopment and associated implementation of LID are presented in Section 4's implementation strategies.

TABLE 3-1: Redevelopment Rates in Ventura County Watersheds

WATERSHED ¹	ANNUAL RESIDENTIAL REDEVELOPMENT RATE	ANNUAL COMMERCIAL REDEVELOPMENT RATE	ANNUAL INDUSTRIAL REDEVELOPMENT RATE
CALLEGUAS CREEK	0.93%	1.06%	1.21%
MALIBU CREEK	0.93%	1.06%	1.21%
VENTURA RIVER	0.50%	0.27%	0.27%
SANTA CLARA RIVER	0.70%	0.13%	2.33%
VENTURA COUNTY COASTAL	0.70%	0.13%	2.33%



Redevelopment LID projects are expected to capture the greater of the **0.75 inches** or **85th percentile rainfall** and retain its event volume on the parcel. To account for the pollutant load reductions resulting from redevelopment LID, a percentage of the impervious area being redeveloped was changed to a pervious land use in the watershed model. The percent area changed was determined based on the redevelopment rates in **Table 3-1**, adjusted by the equivalent reduction in runoff volume necessary to capture the 85th percentile rainfall.

¹The following representative agencies' general plans were referenced for each watershed: Calleguas Creek (Camarillo), Malibu Creek (Thousand Oaks), Santa Clara River (Oxnard/Ventura), Ventura River (Ventura), Ventura County Coastal (Oxnard/Ventura).



3.2.2 Enhanced Operational MCMs (Street Sweeping)

The Street Sweeping Module within LSPC was used to model enhancements to street sweeping practices. This enhanced MCM was modeled to specifically evaluate pollutant load reductions from additional street sweeping beyond the current baseline program. Different components of an agency's street sweeping program can be adjusted to impact performance, such as adding new roadway routes, increasing the frequency of sweeping along the current routes, upgrading the sweeper technology, and increasing the sweeper's access to curbs where many pollutants congregate. These different scenarios were modeled and ultimately, **the Group opted to add one additional sweeping event per month to all routes within selected assessment areas.** This approach will have a relatively high load reduction per unit cost and requires minimal program adjustments.



For a more detailed discussion of the Minimum Control Measures model, please refer to [Appendix D, Section 2.](#)



3.3 STRUCTURAL CONTROL MEASURES MODEL

Once structural control measure opportunities were identified per the methodology in **Section 3.1.3**, the USEPA's **System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN)** model was used to evaluate the performance of the regional stormwater capture project opportunities, both in terms of pollutant reductions and implementation costs.



For a more detailed discussion of the Structural Control Measures Model, please refer to [Appendix D, Section 3.1](#)



PRIORITIZATION OF STRUCTURAL CONTROL MEASURES

Each project opportunity was ranked for impact (pollutant reduction magnitude) and for cost-effectiveness (dollars spent per pound of pollutant reduction), and a balanced ranking (geometric mean) of these two components was used to set the prioritization order for projects identified across the County. This method values both impact and cost-effectiveness equally so that the prioritized projects maximize pollutant reduction goals while achieving the most cost-effectiveness sizing.

Beyond cost-effectiveness and pollutant reduction, prioritization of projects was informed by agency-specific feedback. Certain projects might be preferred (or more readily implementable) in a given jurisdiction based on a variety of institutional and community factors. With agency feedback, final rankings of projects within each assessment area were generated. The recommended structural projects listed in [Section 4](#) represent structural control measures with the greatest chance of implementation and benefits for watershed impact.



3.4 BACTERIA MODEL

Bacteria are evaluated utilizing the **Monte Carlo Model**, which is a statistical analysis based on monitoring data to quantify baseline loading contributions and associated reductions achieved by addressing targeted areas.



For a more detailed discussion of the Monte Carlo Model, please refer to **Appendix D, Section 4.1**



PRIORITIZATION OF TARGETED CATCHMENTS

The Monte Carlo Model calculates the bacteria loading for an assessment area, which can be attributed to each individual catchment. Catchments were ranked based on their relative contribution. This ranking was overlaid with the GIS database of potential human waste sources to layer in the potential risk of pathogen presence. The top ranking catchments were then iteratively identified to reduce the bacteria load until the target bacteria load reduction is achieved. The targeted catchments are presented in **Section 4**.

SECTION 4: PATHWAY TO IMPLEMENTATION



Equipped with an understanding of the fate and transport of the pollutants of concern, models of the watershed and existing control measures, and a toolkit of implementation strategies, the Group assembled implementation plans that will meet the RAA-established pollutant load reductions with upcoming deadlines.

CONNECTING THE DOTS...

Different control measures have different treatment mechanisms to remove pollutants. To tailor the implementation plan for each watershed, the Group developed a crosswalk of control measures to address the pollutants of concern as shown in **Table 4-1**.

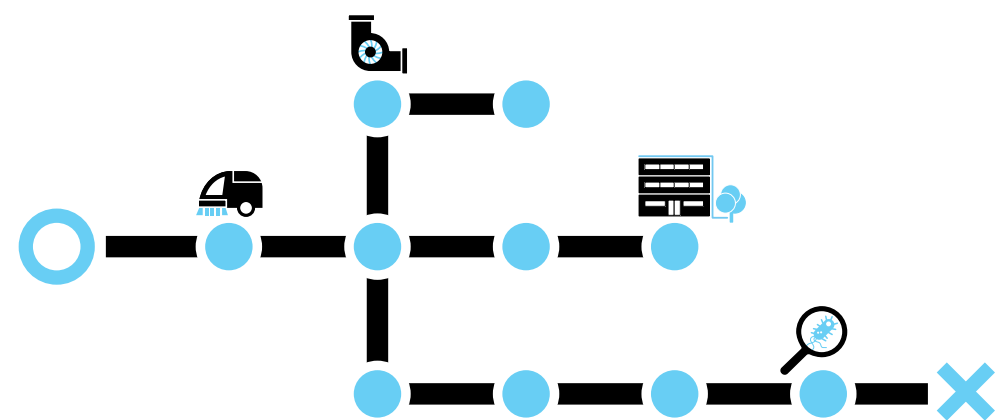




TABLE 4-1: Potential Control Measures to Address Pollutants of Concern

POLLUTANT GROUP	POTENTIAL CONTROL MEASURES
METALS PESTICIDES/ ORGANICS (SEDIMENT PROXY)	Enhanced minimum control measures (i.e., street sweeping) can remove the accumulation of debris and pollutants such as metals, organics, nutrients, and particulate matter from roadways. Structural control measures (i.e., redevelopment LID, regional projects) that include <u>pre-treatment</u> followed by infiltration and/or filtration have been demonstrated to show reasonable assurance of removing sediment-bound pollutants with which metals, pesticides, and organic compounds are associated.
NUTRIENTS	Enhanced minimum control measures (i.e., street sweeping) can remove the accumulation of debris and pollutants such as metals, organics, nutrients, and particulate matter from roadways. Structural control measures (e.g., redevelopment LID, regional projects) that incorporate <u>biological communities</u> , such as vegetation and bacteria, can be conducive to nutrient removal. Vegetation can uptake nutrients for plant growth through nutrient assimilation. Other biological processes, such as nitrifying and denitrifying bacteria used in conjunction, can remove ammonia and nitrate/nitrite, respectively.
BACTERIA	The removal of bacteria using structural control measures remains highly variable and unreliable, as referenced in monitoring data from the International Stormwater BMP Database¹ . Therefore, the Group is emphasizing addressing bacteria initially using source investigations and abatement where possible. The human waste source investigation program includes additional activities that go beyond the baseline Permit requirements, such as microbial source tracking and both proactive and reactive source abatement, as described in Appendix D–Attachment B . Microbial source tracking tools can be employed to track potential sources of human waste, which contain the highest concentration of pathogens and pose the most risk to human health. Expansion of minimum control measures detailed in Section VIII of the Permit, including the illicit connections and illicit discharges elimination program, the public agency activities program, the industrial/commercial facilities program, progressive enforcement, and public information and participation program, as well as the Statewide Waste Discharge Requirements General Order for Sanitary Sewer Systems , all are key tools to control sources prior to entering receiving waters and provide valuable targeted human waste source abatement. Where sources are not identified or not controllable following the human waste source investigation, structural control measures (e.g., sanitary sewer diversions, regional capture projects) will be employed to achieve load reduction targets for targeted catchments.

¹Clary, J., Steets, B., Jones, J., Strecker, E., Leisenring, M. 2012. Fecal Indicator Bacteria Reduction in Urban Runoff. Stormwater Solutions. October 2012.



IMPLEMENTATION STRATEGY

The Group’s strategy focuses on implementing the most cost-effective projects first (e.g., redevelopment LID, enhanced street sweeping, and source control) to achieve the most rapid progress towards water quality improvement, while also realizing valuable co-benefits. After implementation of the most cost-effective strategies, if further reductions are required, structural projects have been identified to fill in the remaining pollutant load reductions, where necessary.

ESTABLISHING LIMITING POLLUTANTS

To streamline the analysis of implementation actions needed to meet pollutant load reduction targets across each watershed, the limiting pollutant with the highest required reduction within each pollutant grouping was identified. These pollutant groupings were established for pollutants of concern that have RAA-established load reductions for MS4s according to the watershed model or statistical analysis. Limiting pollutants were established by assessment area for groupings that can be addressed via similar control measures consistent with the MS4 Permit requirements.

MS4 The identified control measures in each watershed are presented in respective subsections of **Section 4.1** below as implementation strategies to be utilized by the Group to meet the RAA-established pollutant load reduction targets. Compliance with implementation of the WMPs shall be based on either 1) the pollutant load reductions by assessment area or jurisdiction or 2) implementation of control measures by assessment area or jurisdiction, as tracked by the equivalent metrics presented. Therefore, **the Group may determine to adjust or swap in and out different control measures in the future implementation of these Programs through adaptive management**, while ensuring that the RAA-established pollutant load reduction targets for MS4s are still met.



4.1 IMPLEMENTATION STRATEGIES

The following subsections present the limiting pollutants and associated compliance schedules in each of the five watersheds. The subsections also identify implementation strategies that address the required load reductions for each limiting pollutant. Finally, the subsections provide cost estimates for the implementation strategies.

4.1.1 CALLEGUAS CREEK WATERSHED

POLLUTANTS OF CONCERN



BACTERIA



PESTICIDES

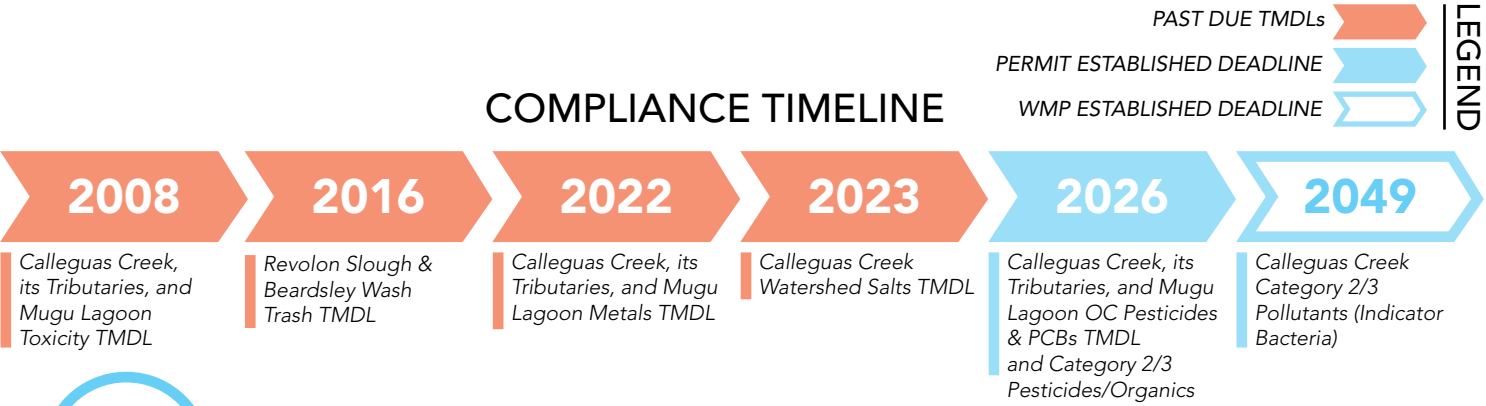
TABLE 4-2: Limiting Pollutants in the Calleguas Creek Watershed

ASSESSMENT AREA	LIMITING POLLUTANT GROUPS	
	BACTERIA	PESTICIDES
CALLEGUAS CREEK 1	<i>E. coli</i>	Malathion
CALLEGUAS CREEK 2	<i>E. coli</i>	4,4'-DDT
CALLEGUAS CREEK 3	<i>E. coli</i>	4,4'-DDT
CALLEGUAS CREEK 4	<i>E. coli</i>	4,4'-DDT
CALLEGUAS CREEK 5	<i>E. coli</i>	4,4'-DDT



4.1 IMPLEMENTATION STRATEGIES

4.1.1 CALLEGUAS CREEK WATERSHED



ADDRESSING PESTICIDES IN CALLEGUAS CREEK WATERSHED



Redevelopment LID Capacity, ac-ft



Additional monthly curb miles swept

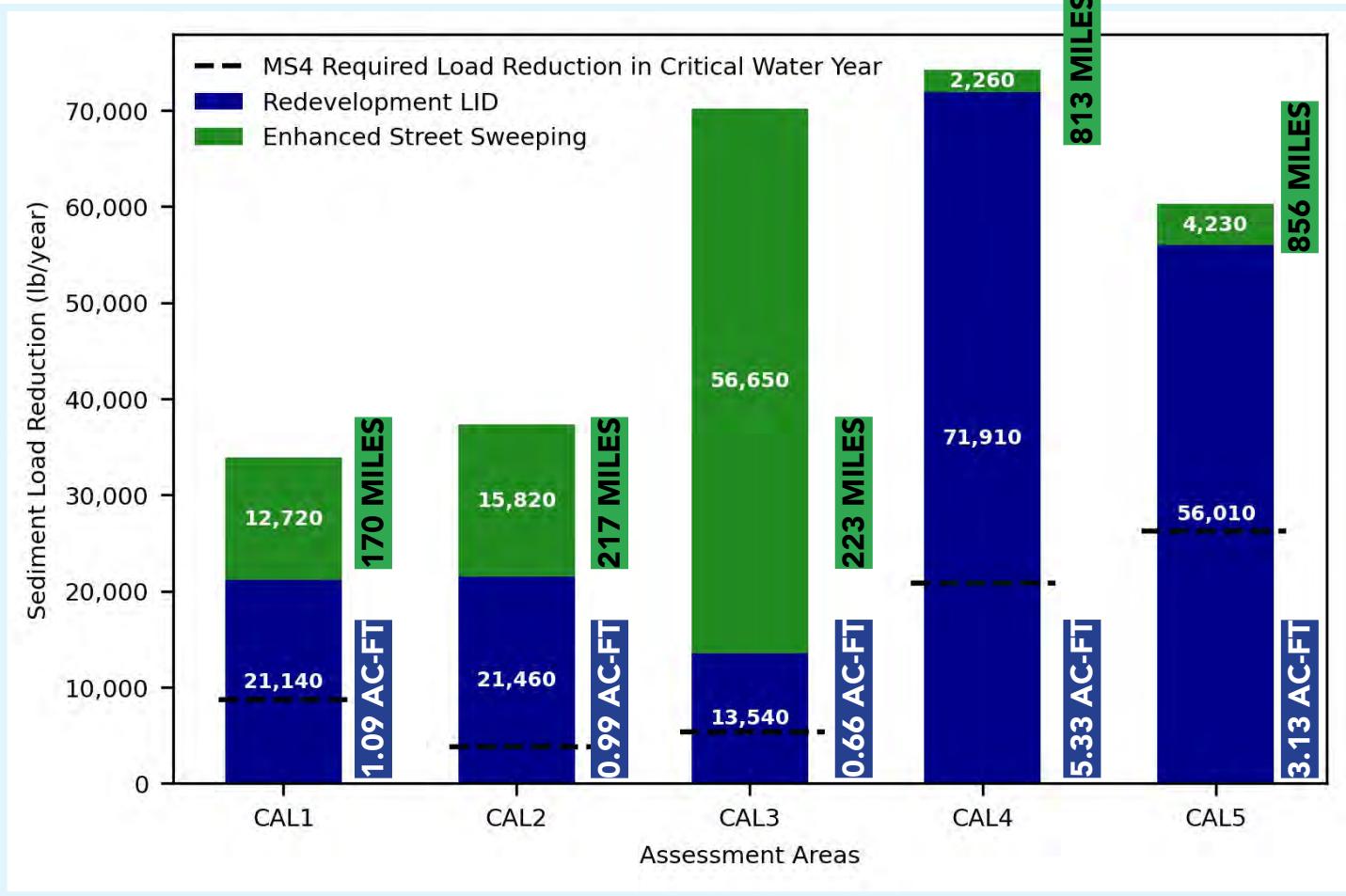


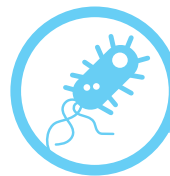
FIGURE 4-1: Implementation Strategies to Meet Load Reductions for Pesticides (Sediment Proxy) in Calleguas Creek Watershed

Model based on the 2026 final deadline for the Calleguas Creek OC Pesticides TMDL.

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.1 CALLEGUAS CREEK WATERSHED



ADDRESSING BACTERIA IN CALLEGUAS CREEK WATERSHED

The general framework for addressing bacteria in the Calleguas Creek Watershed is outlined in **Figure 3-2**. Human waste source investigations and source abatement are the first phase of the implementation strategy as they are the most effective control measures to reduce bacteria in the targeted areas. In the case that investigations do not result in identifiable or controllable sources of bacteria in the targeted catchments, each assessment area has structural control measure opportunities that have been identified (**Appendix D, Section 7.2.4**) to achieve the required bacteria load reductions. The approach is also outlined below, and the current implementation status for each phase in the framework is described.

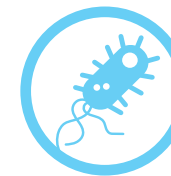
IMPLEMENTATION PHASE	STATUS	DESCRIPTION
 Identified Target Catchment ①		Target catchments have been identified through the Monte Carlo analysis and risk-based approach (presence of potential human waste sources).
 Monitoring Plan for Targeted Catchment ②		Paired FIB/HF183 data collected through previous studies conducted in 2014, 2015, 2021, and 2022 can be leveraged to prioritize catchments to start investigations by comparing results relative to regulatory and/or risk-based thresholds.
LEGEND  PHASE COMPLETED  PHASE IN PROGRESS		
 For a more detailed description of bacteria reduction implementation activities in the Calleguas Creek Watershed, please refer to Appendix D, Section 7.2.4.1		



SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.1 CALLEGUAS CREEK WATERSHED



TARGETED CATCHMENTS IN CALLEGUAS CREEK WATERSHED

The implementation strategy for bacteria in the Calleguas Creek Watershed is based on addressing the targeted catchments displayed in **Figure 4-2** and **Figure 4-3** during dry and wet weather, respectively, to meet the RAA-established load reductions for MS4s. The number of potential human waste sources identified from compiled data are overlaid for reference.

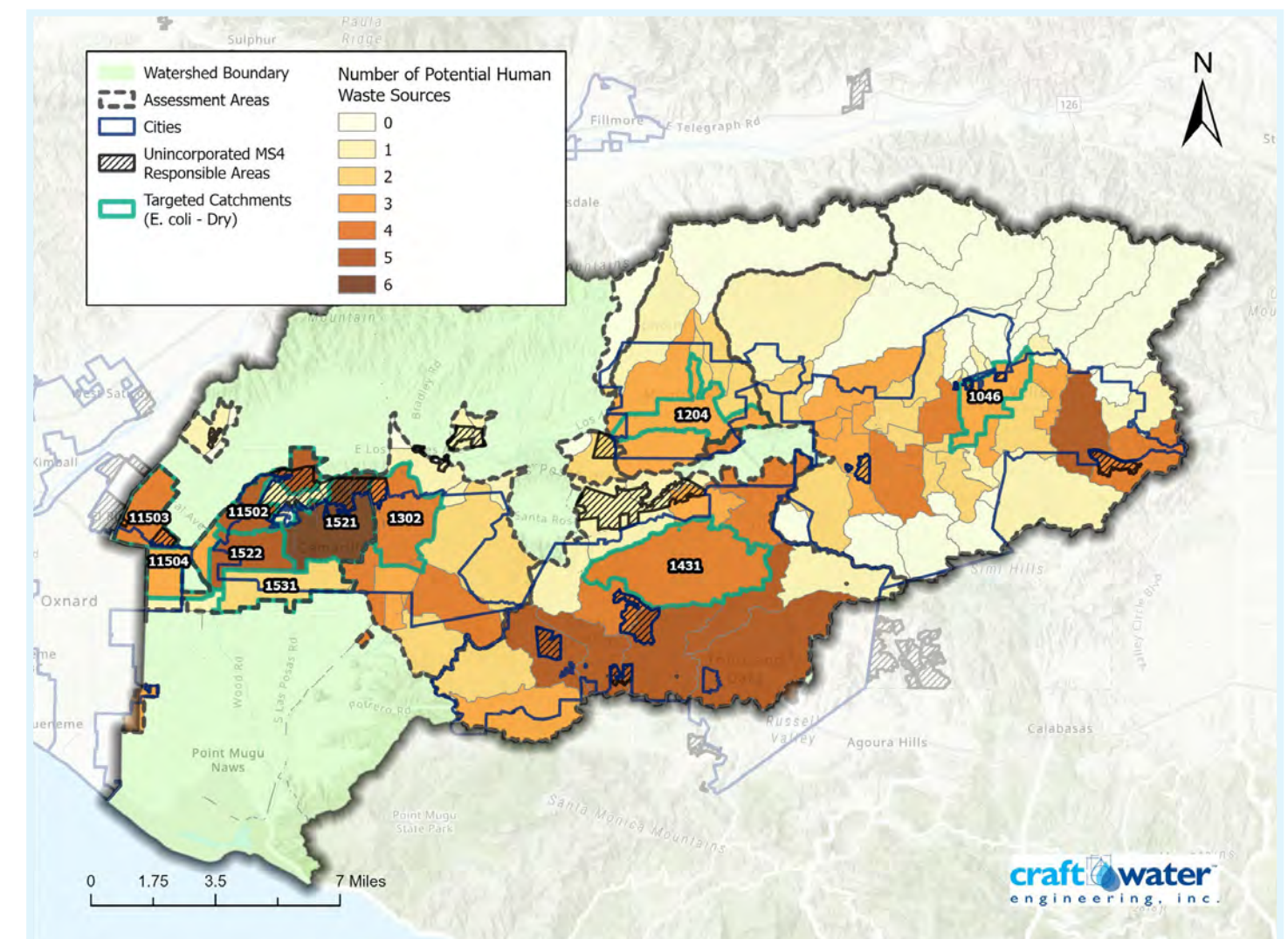


FIGURE 4-2: Targeted Catchments to Address *E. coli* in Calleguas Creek Watershed During Dry Weather by 2049



SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.1 CALLEGUAS CREEK WATERSHED

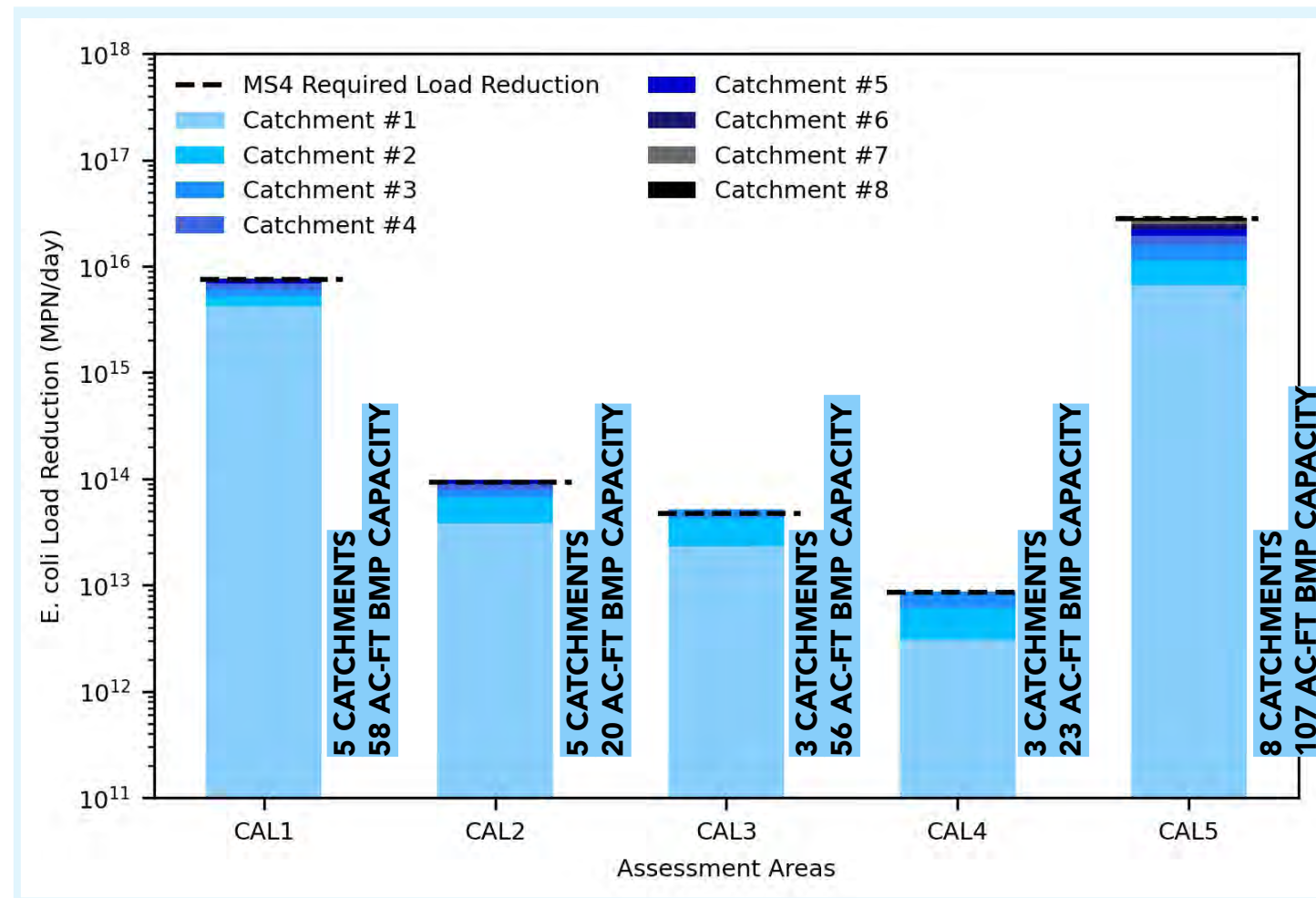


FIGURE 4-5: Implementation Strategies to Meet Load Reductions for *E. coli* During Wet Weather in Calleguas Creek Watershed

The milestones for meeting load reductions for *E. coli* in **Figure 4-4** and **Figure 4-5** by reducing loads from targeted catchments prioritize source abatement where identified through investigations and structural projects for areas where the source is unidentified. The list of structural projects in targeted catchments aligned with the BMP capacity presented is detailed in [Appendix D, Section 7.2.4.2](#).

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.1 CALLEGUAS CREEK WATERSHED

IMPLEMENTATION COSTS IN CALLEGUAS CREEK WATERSHED

The estimated costs of implementing this particular implementation pathway are provided in **Table 4-3**. The Group plans to collaborate on strategies that are impactful at the assessment area scale, **so costs are initially prorated based on loading from each jurisdiction**. The cost sharing identified across jurisdictions is preliminary and will be further discussed/negotiated as implementation progresses, including the potential for cost sharing with dischargers outside of the agencies represented in this WMP.

TABLE 4-3: Estimated Planning-Level Costs of Implementation Strategies in Calleguas Creek Watershed

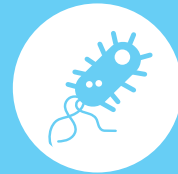
		IMPLEMENTATION STRATEGIES			
ASSESSMENT AREA	JURISDICTION	Enhanced Street Sweeping (Annual Cost)	Human Waste Source Investigations (Total Cost of Investigations) ¹	Structural Projects (Capital Cost) ²	Structural Projects (Annual O&M Cost) ²
CALLEGUAS CREEK 1	CAMARILLO	\$19,000–\$75,000	\$571,000–\$1,142,000	\$50,387,000	\$3,527,000
	OXNARD	\$1,000–\$2,000	\$205,000–\$409,000	\$18,063,000	\$1,264,000
	UNINCORPORATED COUNTY	\$1,500–\$5,000	\$124,000–\$249,000	\$10,986,000	\$769,000
	TOTAL	\$21,500–\$82,000	\$900,000–\$1,800,000	\$79,436,000	\$5,561,000
CALLEGUAS CREEK 2	CAMARILLO	\$26,000–\$103,000	\$710,000–\$1,419,000	\$22,931,000	\$1,605,000
	UNINCORPORATED COUNTY	\$500–\$1,100	\$40,000–\$81,000	\$1,305,000	\$91,000
	TOTAL	\$26,500–\$104,100	\$750,000–\$1,500,000	\$24,236,000	\$1,696,000
CALLEGUAS CREEK 3	MOORPARK	\$27,000–\$107,000	\$450,000–\$900,000	\$71,583,000	\$5,011,000
	TOTAL	\$27,000–\$107,000	\$450,000–\$900,000	\$71,583,000	\$5,011,000
CALLEGUAS CREEK 4	SIMI VALLEY	\$95,300–\$381,100	\$432,000–\$864,000	N/A	N/A
	MOORPARK	\$2,300–\$9,100	\$10,000–\$21,000	N/A	N/A
	UNINCORPORATED COUNTY	\$0–\$100	\$8,000–\$15,000	N/A	N/A
	TOTAL	\$97,600–\$390,300	\$450,000–\$900,000	N/A	N/A
CALLEGUAS CREEK 5	THOUSAND OAKS	\$95,800–\$383,000	\$1,088,000–\$2,176,000	\$117,457,000	\$8,222,000
	UNINCORPORATED COUNTY	\$5,200–\$20,800	\$112,000–\$224,000	\$12,112,000	\$848,000
	TOTAL	\$101,000–\$403,800	\$1,200,000–\$2,400,000	\$129,569,000	\$9,070,000
TOTAL		\$273,600–\$1,087,200	\$3,750,000–\$7,500,000	\$304,824,000	\$21,338,000

¹Source abatement costs to be determined pending the findings of source investigations for each targeted catchment.
²Structural project costs are based on a conservative expectation that at least 50% of targeted catchments will be addressed via source abatement, with the remainder if the source is unidentified or uncontrollable to be addressed via structural projects identified. High-level planning costs for structural projects in targeted catchments can be found in Appendix D, Section 7.2.4.2.



4.1.2 MALIBU CREEK WATERSHED

POLLUTANTS OF CONCERN



BACTERIA

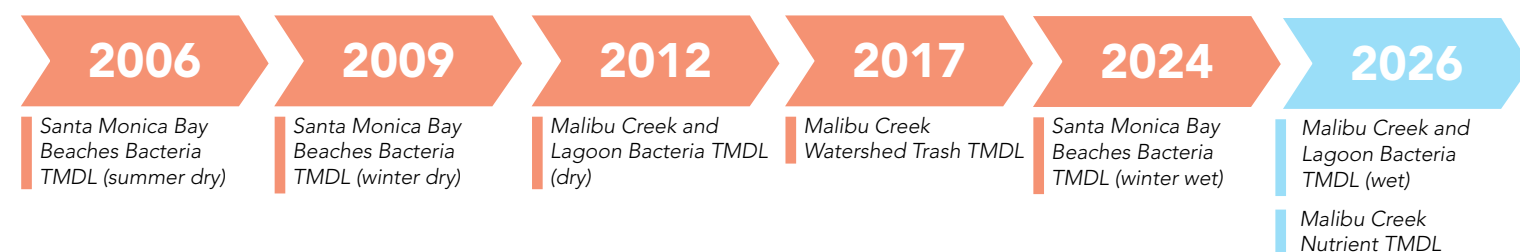


NUTRIENTS

TABLE 4-4: Limiting Pollutants in the Malibu Creek Watershed

ASSESSMENT AREA	LIMITING POLLUTANT GROUPS	
	BACTERIA	NUTRIENTS
MALIBU CREEK 1	<i>E. coli</i> (wet)	Nitrate-N + Nitrite-N

COMPLIANCE TIMELINE



ADDRESSING NUTRIENTS IN MALIBU CREEK WATERSHED

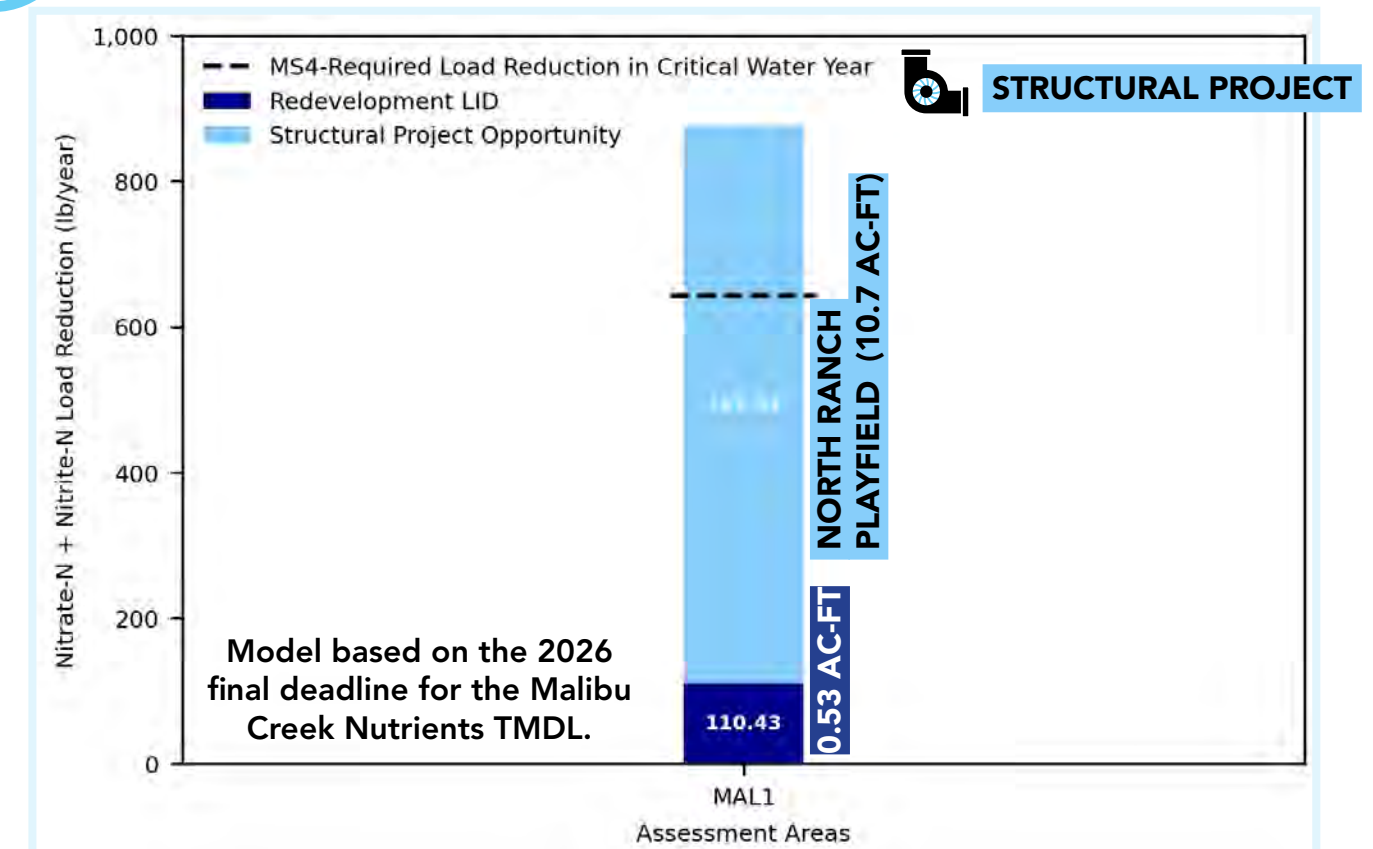


FIGURE 4-6: Implementation Strategies to Meet Load Reductions for Nitrate-N + Nitrite-N in Malibu Creek Watershed

TABLE 4-5: Structural Project Included in Malibu Creek Watershed Implementation Strategies

ASSESSMENT AREA	PROJECT NAME	DRAINAGE AREA (acres)	BMP CAPACITY (acre-feet)	LIMITING POLLUTANT REDUCTION (lb Nitrate-N + Nitrite-N / year)
MALIBU CREEK 1	North Ranch Playfield	1,078	10.7	765.92



The structural project in **Table 4-5** represent the recommended strategy for addressing limiting pollutants in the Malibu Creek Watershed. Alternative structural projects were also identified and are listed in **Appendix D, Section 8.2.4.2**.

ADDRESSING BACTERIA IN MALIBU CREEK WATERSHED

The general framework for addressing bacteria in the Malibu Creek Watershed is outlined in **Figure 3-2**. Human waste source investigations and source abatement are the first phase of the implementation strategy as they are the most effective control measures to reduce bacteria in the targeted areas. In the case that investigations do not result in identifiable or controllable sources of bacteria in the targeted catchments, each assessment area has structural control measure opportunities that have been identified (**Appendix D, Section 8.2.5**) to achieve the required bacteria load reductions. The approach is also outlined below, and the current implementation status for each phase in the framework is described.

IMPLEMENTATION PHASE	STATUS	DESCRIPTION
Identified Target Catchment ①		Target catchments have been identified through the Monte Carlo analysis and risk-based approach (presence of potential human waste sources).
Monitoring Plan for Targeted Catchment ②		Completed several catchment-level monitoring plans for the Upper Medea and Upper Lindero drainage areas during dry weather (13025, 13026, 3027) in 2014 and 2015.
Implement the HWSI ③		Source investigations have been conducted for the Upper Medea and Upper Lindero drainage areas during dry weather with potential sources including reclaimed water, wildlife, bird, and other non-MS4 sources.
Implement Structural Project(s) for Targeted Catchment		The City of Thousand Oaks and County of Ventura are pursuing feasibility studies for dry and/or wet-weather diversion to sanitary sewers.

- LEGEND

PHASE COMPLETED

PHASE IN PROGRESS

For a more detailed description of bacteria reduction implementation activities in the Malibu Creek Watershed, please refer to **Appendix D, Section 8.2.5.1**

TARGETED CATCHMENTS IN MALIBU CREEK WATERSHED

The implementation strategy for bacteria in the Malibu Creek Watershed is based on addressing the targeted catchments displayed in **Figure 4-7** during wet weather to meet the RAA-established load reductions for MS4s. The number of potential human waste sources identified from compiled data are overlaid for reference.

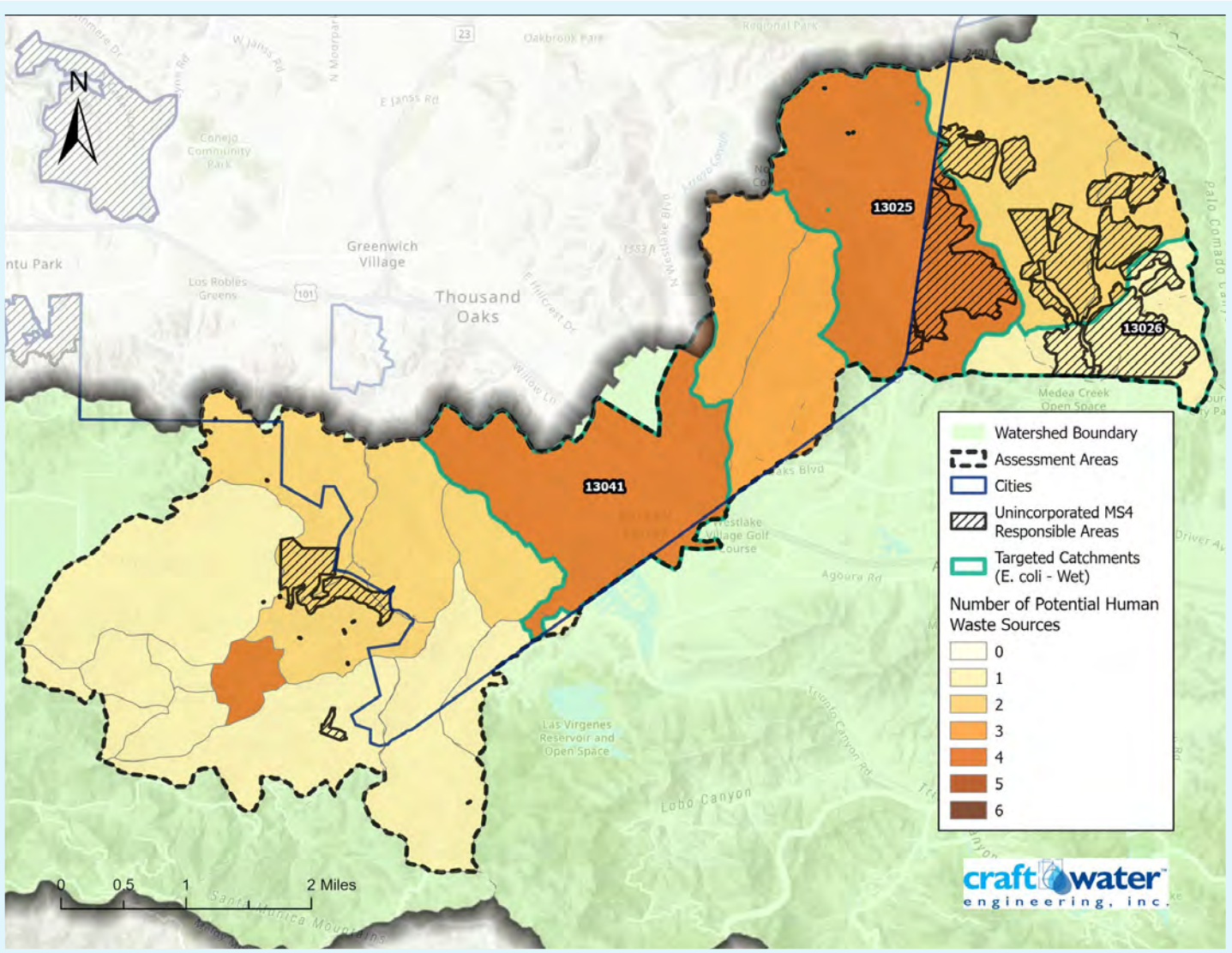


FIGURE 4-7: Targeted Catchments to Address *E. coli* in Malibu Creek Watershed During Wet Weather by 2026



For a more detailed list of targeted catchments in the Malibu Creek Watershed, please refer to [Appendix D, Section 8.2.5](#)

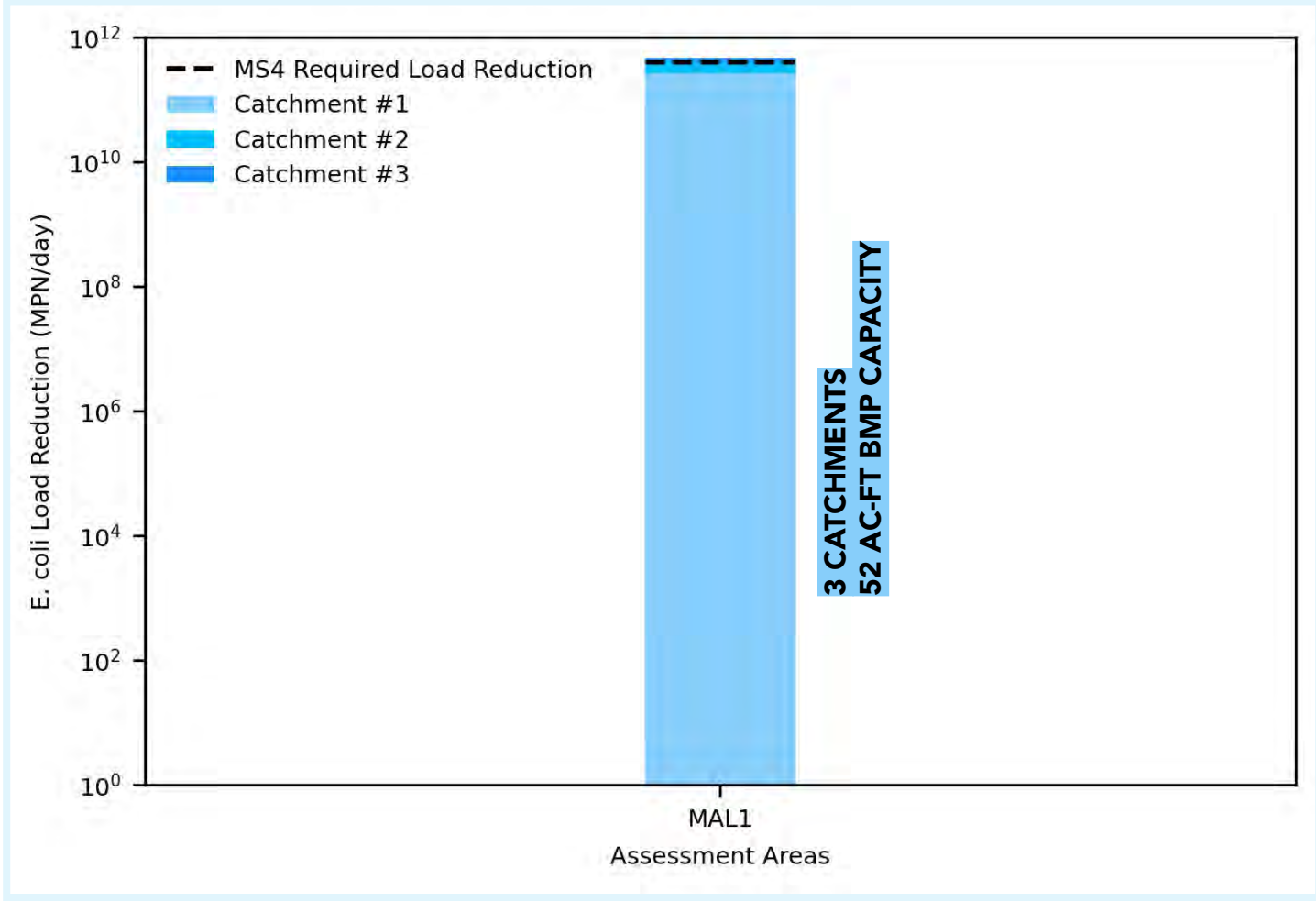


FIGURE 4-8: Implementation Strategies to Meet Load Reductions for *E. coli* During Wet Weather in Malibu Creek Watershed



The milestones for meeting load reductions for *E. coli* in **Figure 4-8** by reducing loads from targeted catchments prioritize source abatement where identified through investigations and structural projects for areas where the source is unidentified. The list of structural projects aligned with the BMP capacity presented in targeted catchments is detailed in [Appendix D, Section 8.2.5.2](#).



IMPLEMENTATION COSTS IN MALIBU CREEK WATERSHED

The estimated costs of implementing this particular implementation pathway are provided in **Table 4-6**. The Group plans to collaborate on strategies that are impactful at the assessment area scale, **so costs are initially prorated based on loading from each jurisdiction**. The cost sharing identified across jurisdictions is preliminary and will be further discussed/negotiated as implementation progresses, including the potential for cost sharing with dischargers outside of the agencies represented in this WMP.

TABLE 4-6: Estimated Planning-Level Costs of Implementation Strategies in Malibu Creek Watershed

ASSESSMENT AREA	JURISDICTION	IMPLEMENTATION STRATEGIES				
		Human Waste Source Investigations (Total Cost of Investigations) ¹	Structural Projects to Address Nutrients (Capital Cost)	Structural Projects to Address Nutrients (Annual O&M Cost)	Additional Structural Projects to Address Bacteria (Capital Cost) ²	Additional Structural Projects to Address Bacteria (Annual O&M Cost) ²
MALIBU CREEK 1	THOUSAND OAKS	\$292,000–\$584,000	\$7,137,000	\$247,000	\$35,986,000	\$2,772,000
	UNINCORPORATED COUNTY	\$158,000–\$316,000	\$3,927,000	\$136,000	\$19,378,000	\$1,495,000
	TOTAL	\$450,000–\$900,000	\$11,065,000	\$383,000	\$55,363,000	\$4,267,000

¹Source abatement costs to be determined pending the findings of source investigations for each targeted catchment.
²Structural project costs are based on a conservative expectation that at least 50% of targeted catchments will be addressed via source abatement, with the remainder if the source is unidentified or uncontrollable to be addressed via structural projects identified. High-level planning costs for structural projects in targeted catchments can be found in Appendix D, Section 8.2.5.2.



4.1.3 SANTA CLARA RIVER WATERSHED

POLLUTANTS OF CONCERN



BACTERIA

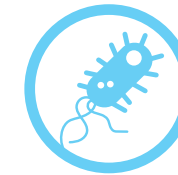
TABLE 4-7: Limiting Pollutants in the Santa Clara River Watershed

ASSESSMENT AREA	LIMITING POLLUTANT GROUPS
	BACTERIA
SANTA CLARA RIVER 1	Enterococcus (wet)
SANTA CLARA RIVER 2	<i>E. coli</i> (wet)
SANTA CLARA RIVER 3	<i>E. coli</i> (wet)

COMPLIANCE TIMELINE

PAST DUE TMDLs
PERMIT ESTABLISHED DEADLINE
WMP ESTABLISHED DEADLINE

LEGEND



ADDRESSING BACTERIA IN SANTA CLARA RIVER WATERSHED

The general framework for addressing bacteria in the Santa Clara River Watershed is outlined in **Figure 3-2**. Human waste source investigations and source abatement are the first phase of the implementation strategy as they are the most effective control measures to reduce bacteria in the targeted areas. In the case that investigations do not result in identifiable or controllable sources of bacteria in the targeted catchments, each assessment area has structural control measure opportunities that have been identified (**Appendix D, Section 9.2.3**) to achieve the required bacteria load reductions. The approach is also outlined below, and the current implementation status for each phase in the framework is described.

IMPLEMENTATION PHASE	STATUS	DESCRIPTION
 Identified Target Catchment ①		Target catchments have been identified through the Monte Carlo analysis and risk-based approach (presence of potential human waste sources).
 Monitoring Plan for Targeted Catchment ②		Paired FIB/HF183 data collected through previous studies conducted in 2014 and 2015 can be leveraged to prioritize catchments to start investigations by comparing results relative to regulatory and/or risk-based thresholds.

LEGEND

-  PHASE COMPLETED
-  PHASE IN PROGRESS

For a more detailed description of bacteria reduction implementation activities in the Santa Clara River Watershed, please refer to **Appendix D, Section 9.2.3.1**

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.3 SANTA CLARA RIVER WATERSHED



TARGETED CATCHMENTS IN SANTA CLARA RIVER WATERSHED

The implementation strategy for bacteria in the Santa Clara River Watershed is based on addressing the targeted catchments displayed in **Figure 4-9** during wet weather to meet the RAA-established load reductions for MS4s. The number of potential human waste sources identified from compiled data are overlaid for reference.

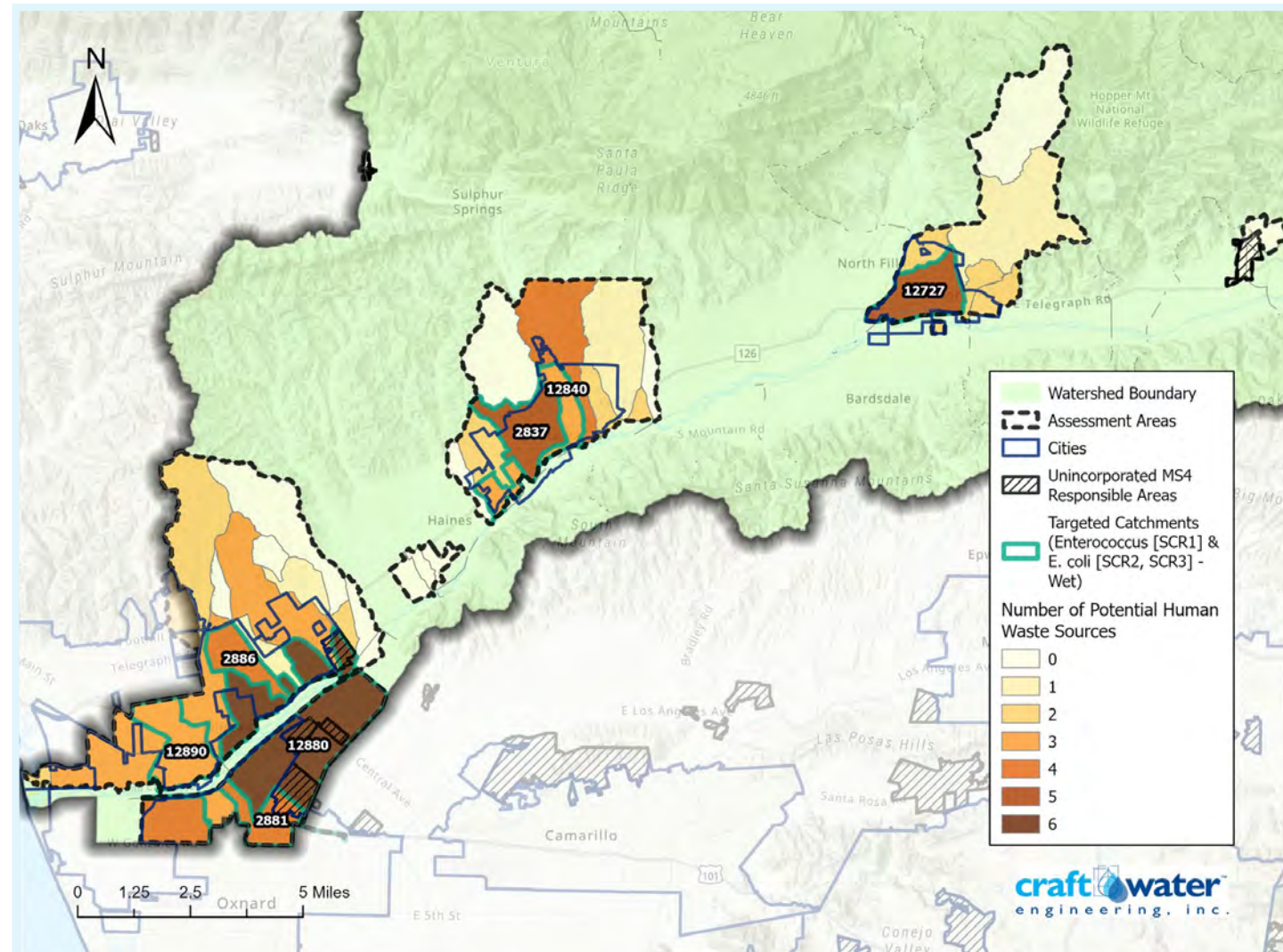


FIGURE 4-9: Targeted Catchments to Address *E. coli* in Santa Clara Watershed During Wet Weather by 2029

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.3 SANTA CLARA RIVER WATERSHED



For a more detailed list of targeted catchments in the Santa Clara River Watershed, please refer to **Appendix D, Section 9.2.3**

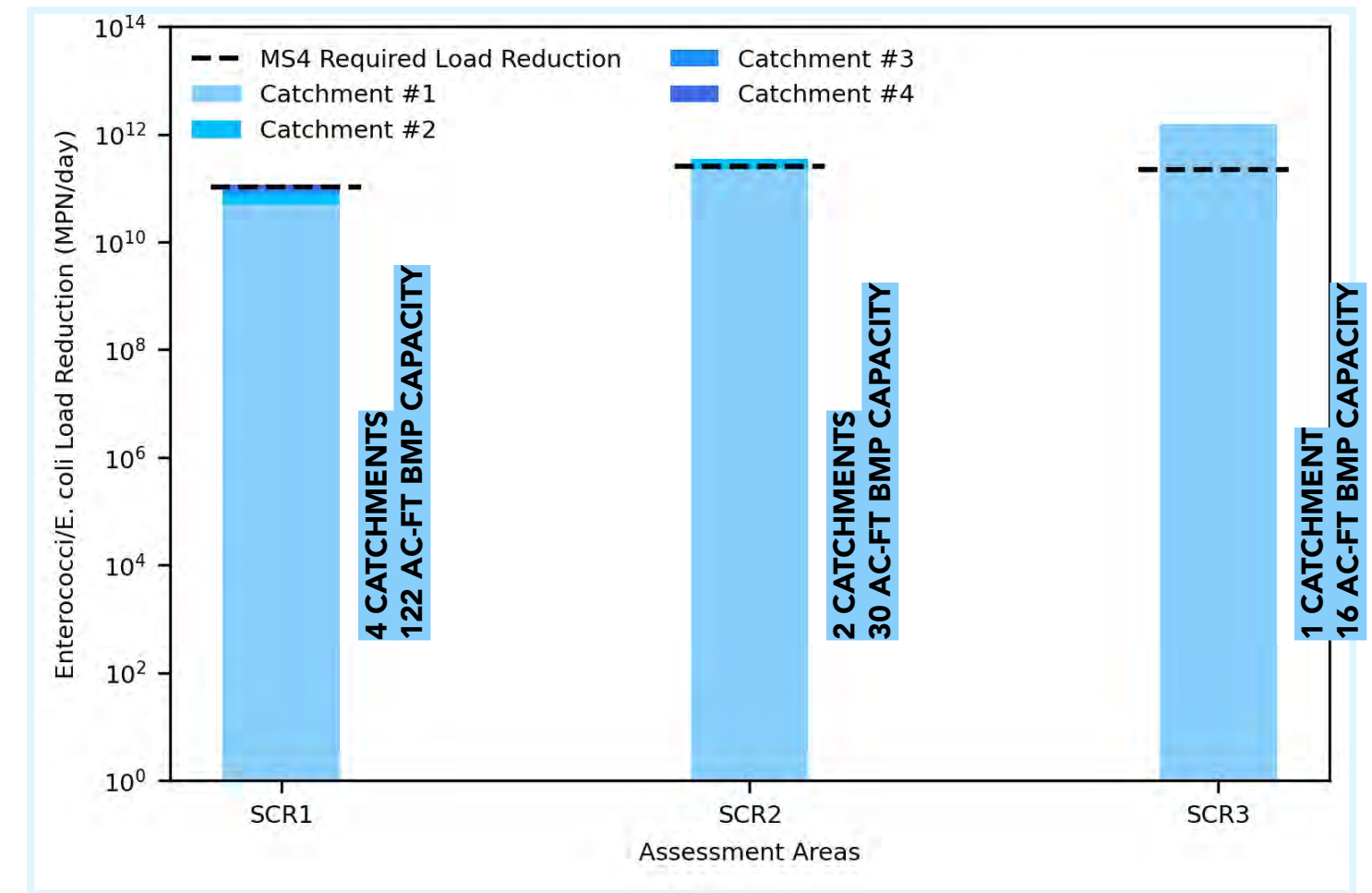


FIGURE 4-10: Implementation Strategies to Meet Load Reductions for *Enterococci* (SCR1) or *E. coli* (SCR2 & SCR3) in Santa Clara Watershed During Wet Weather by 2029



The milestones for meeting load reductions for *Enterococci* and *E. coli* in **Figure 4-10** by reducing loads from targeted catchments prioritize source abatement where identified through investigations and structural projects for areas where the source is unidentified. The list of structural projects aligned with the BMP capacity presented in targeted catchments is detailed in **Appendix D, Section 9.2.3.3.**



IMPLEMENTATION COSTS IN SANTA CLARA RIVER WATERSHED

The estimated costs of implementing this particular implementation pathway are provided in **Table 4-8**. The Group plans to collaborate on strategies that are impactful at the assessment area scale, **so costs are initially prorated based on loading from each jurisdiction**. The cost sharing identified across jurisdictions is preliminary and will be further discussed/negotiated as implementation progresses, including the potential for cost sharing with dischargers outside of the agencies represented in this WMP.

TABLE 4-8: Estimated Planning-Level Costs of Implementation Strategies in Santa Clara River Watershed

ASSESSMENT AREA	JURISDICTION	IMPLEMENTATION STRATEGIES		
		Human Waste Source Investigations (Total Cost of Investigations) ¹	Structural Projects (Capital Cost) ²	Structural Projects (Annual O&M Cost) ²
SANTA CLARA RIVER 1	VENTURA	\$377,000–\$755,000	\$95,780,000	\$6,705,000
	OXNARD	\$158,000–\$314,000	\$39,905,000	\$2,793,000
	UNINCORPORATED COUNTY	\$65,000–\$131,000	\$16,654,000	\$1,166,000
	TOTAL	\$600,000–\$1,200,000	\$152,340,000	\$10,664,000
SANTA CLARA RIVER 2	SANTA PAULA	\$300,000–\$600,000	\$38,169,000	\$2,672,000
	TOTAL	\$300,000–\$600,000	\$38,169,000	\$2,672,000
SANTA CLARA RIVER 3	FILLMORE	\$141,000–\$282,000	\$20,834,000	\$1,458,000
	UNINCORPORATED COUNTY	\$9,000–\$18,000	\$1,362,000	\$95,000
	TOTAL	\$150,000–\$300,000	\$22,196,000	\$1,554,000
TOTAL		\$1,050,000–\$2,100,000	\$212,705,000	\$14,890,000

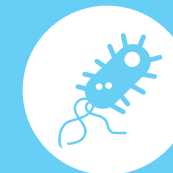
¹Source abatement costs to be determined pending the findings of source investigations for each targeted catchment.

²Structural project costs are based on a conservative expectation that at least 50% of targeted catchments will be addressed via source abatement, with the remainder if the source is unidentified or uncontrollable to be addressed via structural projects identified. High-level planning costs for structural projects in targeted catchments can be found in Appendix D, Section 9.1.3.3.

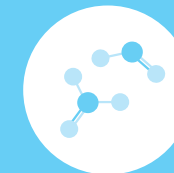


4.1.4 VENTURA RIVER WATERSHED

POLLUTANTS OF CONCERN



BACTERIA



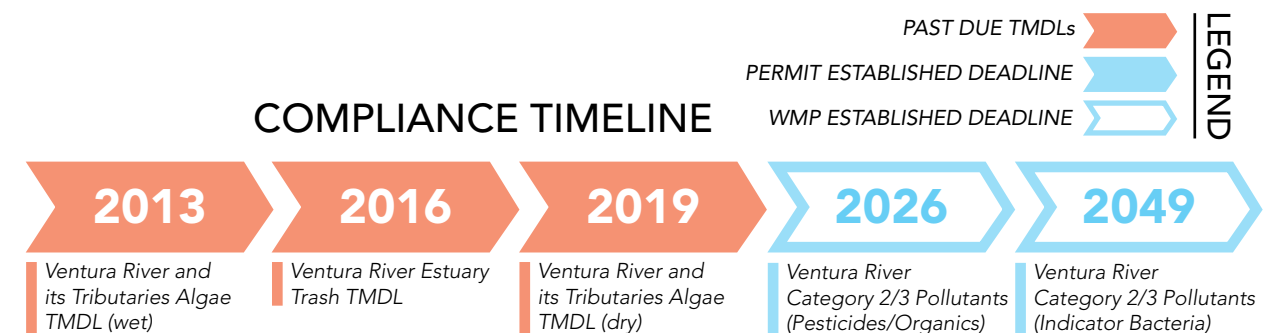
NUTRIENTS



PESTICIDES

TABLE 4-9: Limiting Pollutants in the Ventura River Watershed

ASSESSMENT AREA	LIMITING POLLUTANT GROUPS	
	BACTERIA	PESTICIDES
VENTURA RIVER 1	<i>E. coli</i>	Chlorpyrifos
VENTURA RIVER 2	<i>E. coli</i>	N/A



SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.4 VENTURA RIVER WATERSHED



ADDRESSING PESTICIDES IN VENTURA RIVER WATERSHED



Redevelopment LID Capacity, ac-ft



Additional monthly curb miles swept

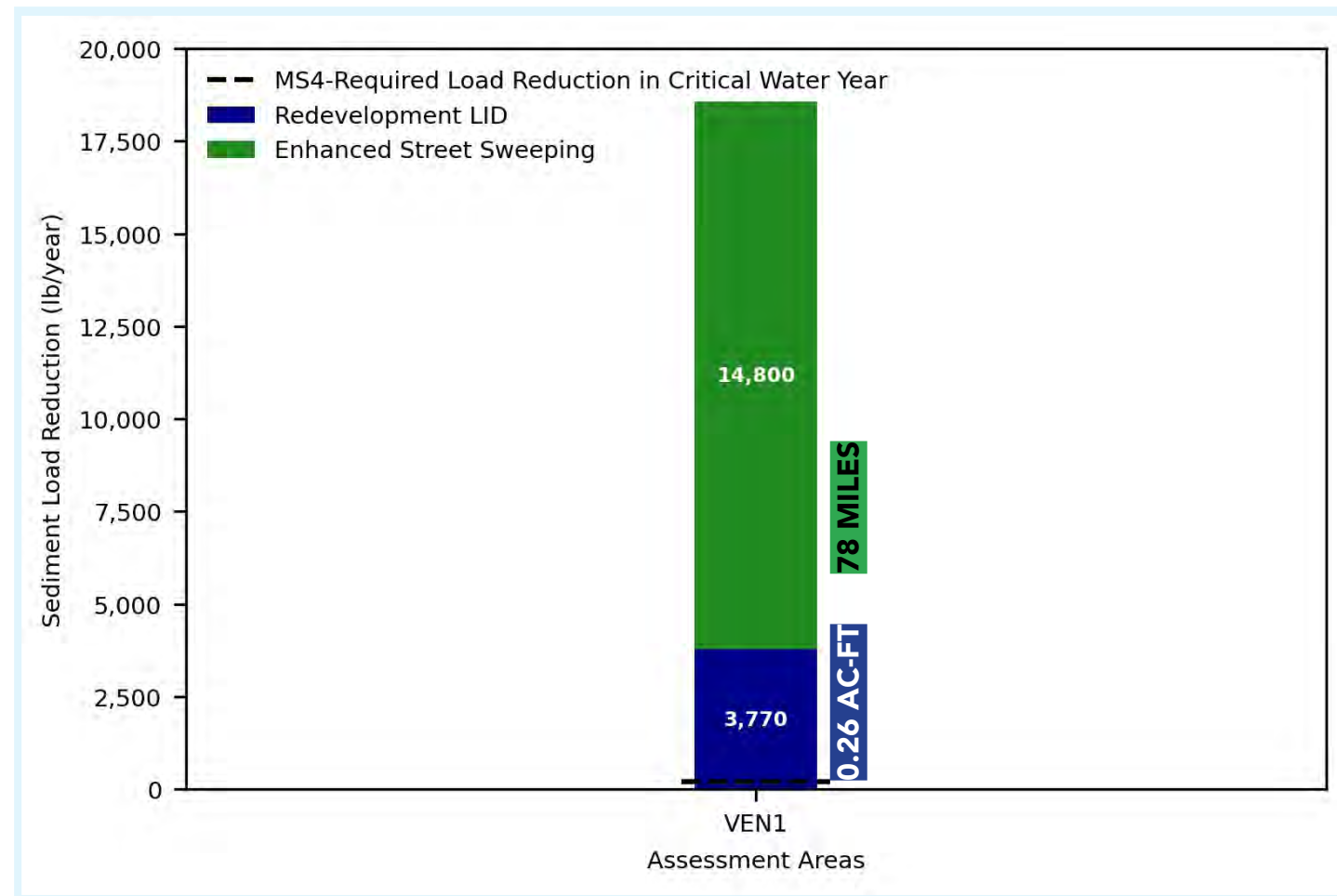


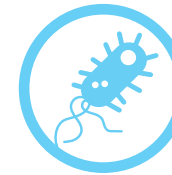
FIGURE 4-11: Implementation Strategies to Meet Load Reductions for Pesticides (Sediment Proxy) in Ventura River Watershed

Model based on the 2026 WMP deadline for chlorpyrifos.

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.4 VENTURA RIVER WATERSHED



ADDRESSING BACTERIA IN VENTURA RIVER WATERSHED

The general framework for addressing bacteria in the Ventura River Watershed is outlined in **Figure 3-2**. Human waste source investigations and source abatement are the first phase of the implementation strategy as they are the most effective control measures to reduce bacteria in the targeted areas. In the case that investigations do not result in identifiable or controllable sources of bacteria in the targeted catchments, each assessment area has structural control measure opportunities that have been identified (**Appendix D, Section 10.2.4**) to achieve the required bacteria load reductions. The approach is also outlined below, and the current implementation status for each phase in the framework is described.

IMPLEMENTATION PHASE	STATUS	DESCRIPTION
 Identified Target Catchment ①		Target catchments have been identified through the Monte Carlo analysis and risk-based approach (presence of potential human waste sources).
 Monitoring Plan for Targeted Catchment ②		Paired FIB/HF183 data collected through previous studies conducted in 2014 and 2015 can be leveraged to prioritize catchments to start investigations by comparing results relative to regulatory and/or risk-based thresholds.
LEGEND		
	PHASE COMPLETED	
	PHASE IN PROGRESS	



For a more detailed description of bacteria reduction implementation activities in the Ventura River Watershed, please refer to [Appendix D, Section 10.2.4.1](#)

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.4 VENTURA RIVER WATERSHED



TARGETED CATCHMENTS IN VENTURA RIVER WATERSHED

The implementation strategy for bacteria in the Ventura River Watershed is based on addressing the targeted catchments displayed in **Figure 4-12** and **Figure 4-11** during dry and wet weather, respectively, to meet the RAA-established load reductions for MS4s. The number of potential human waste sources as well as catchment areas identified from compiled data are overlaid for reference.

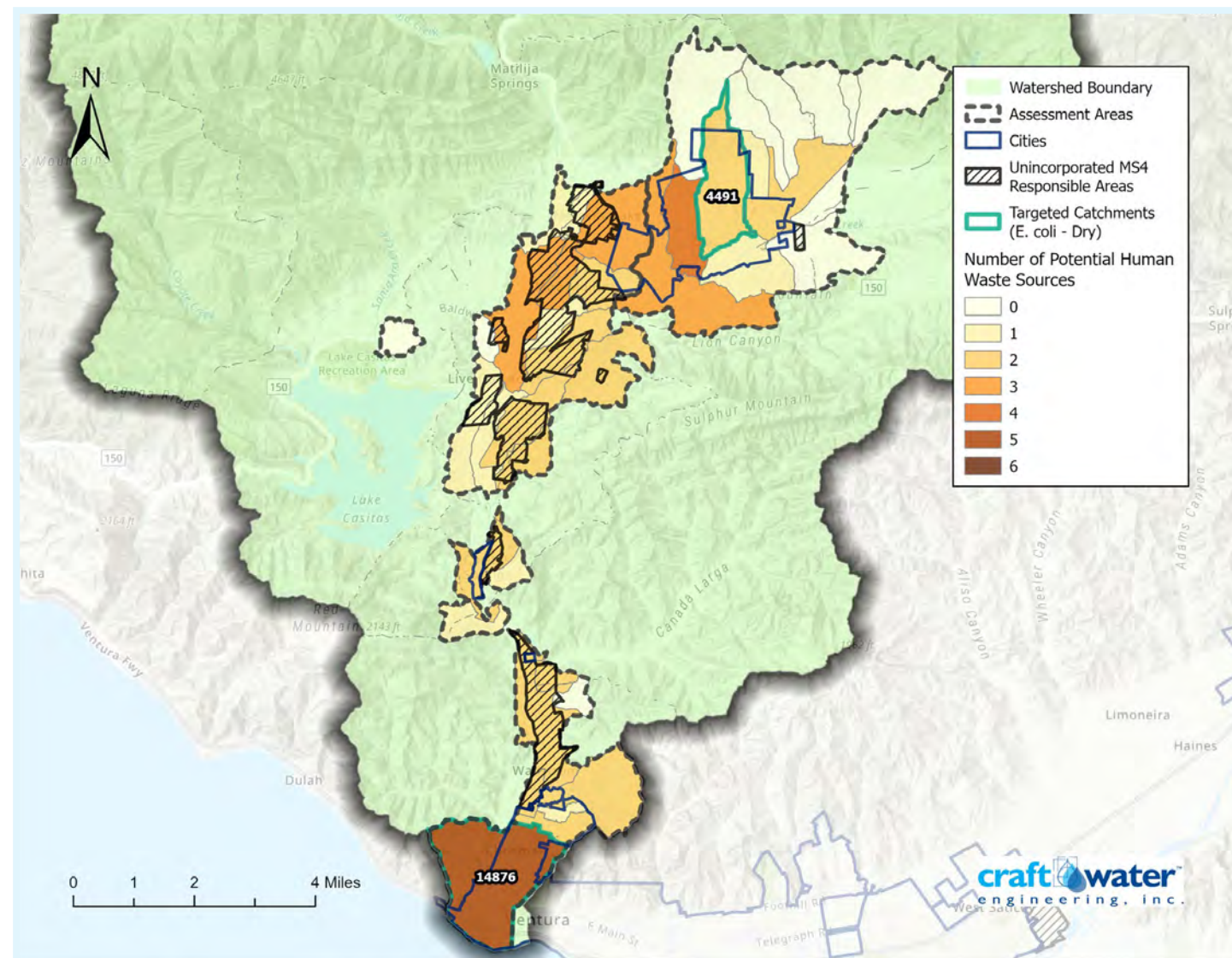


FIGURE 4-12: Targeted Catchments to Address *E. coli* in Ventura River Watershed During Dry Weather by 2049

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.4 VENTURA RIVER WATERSHED

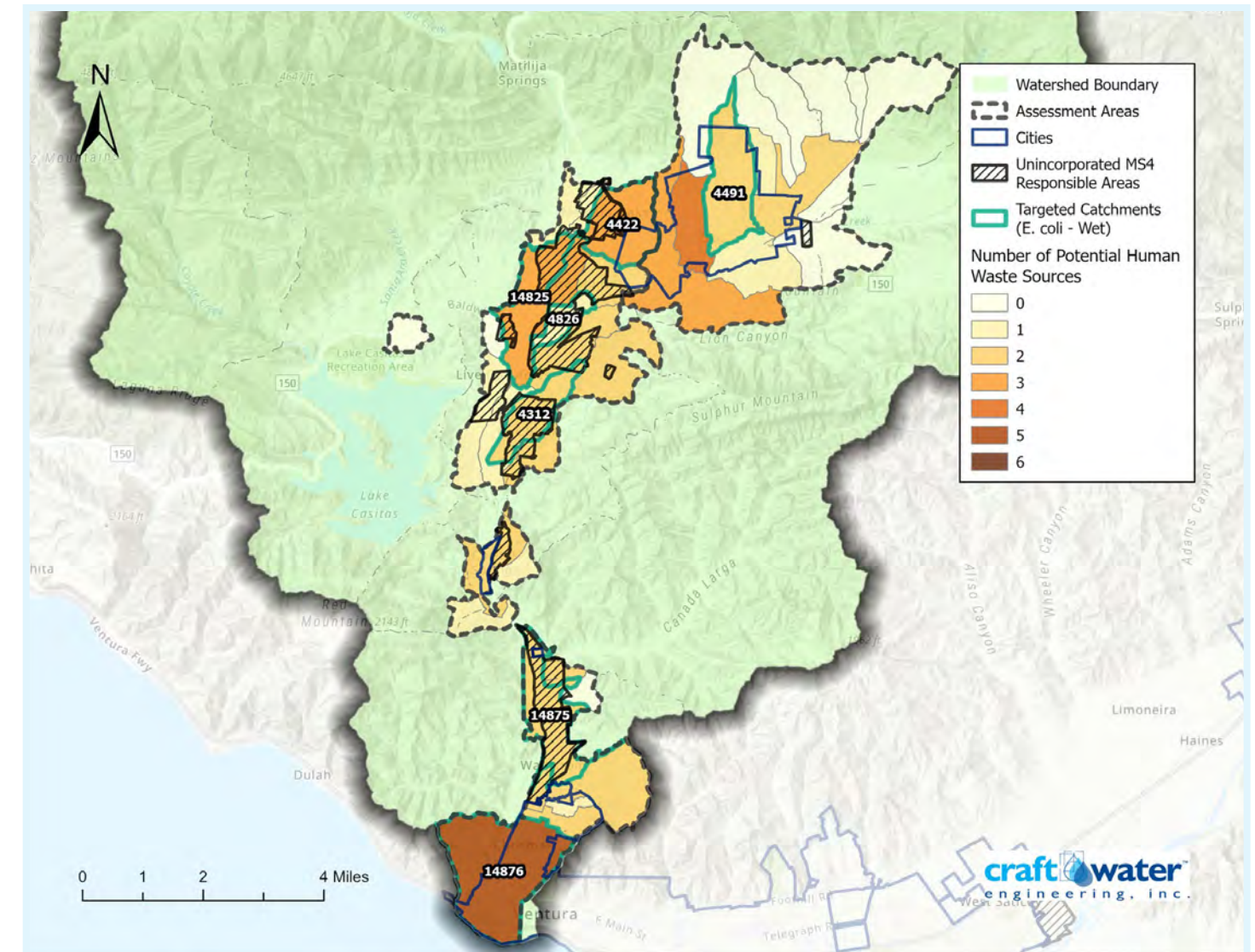


FIGURE 4-13: Targeted Catchments to Address *E. coli* in Ventura River Watershed During Wet Weather by 2049



For a more detailed list of targeted catchments in the Ventura River Watershed, please refer to [Appendix D, Section 10.2.4](#)

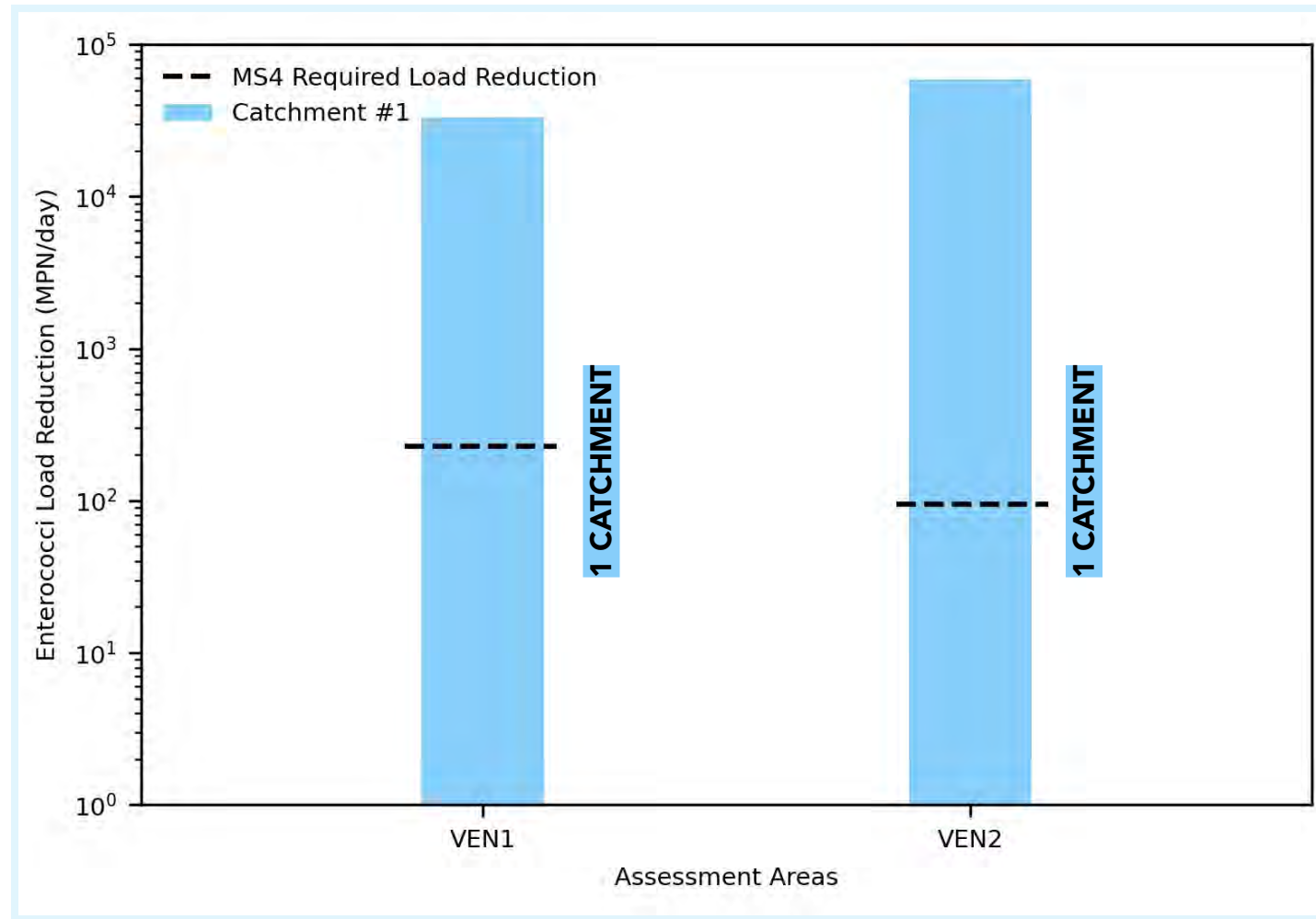


FIGURE 4-14: Implementation Strategies to Meet Load Reductions for *E. coli* During Dry Weather in Ventura River Watershed

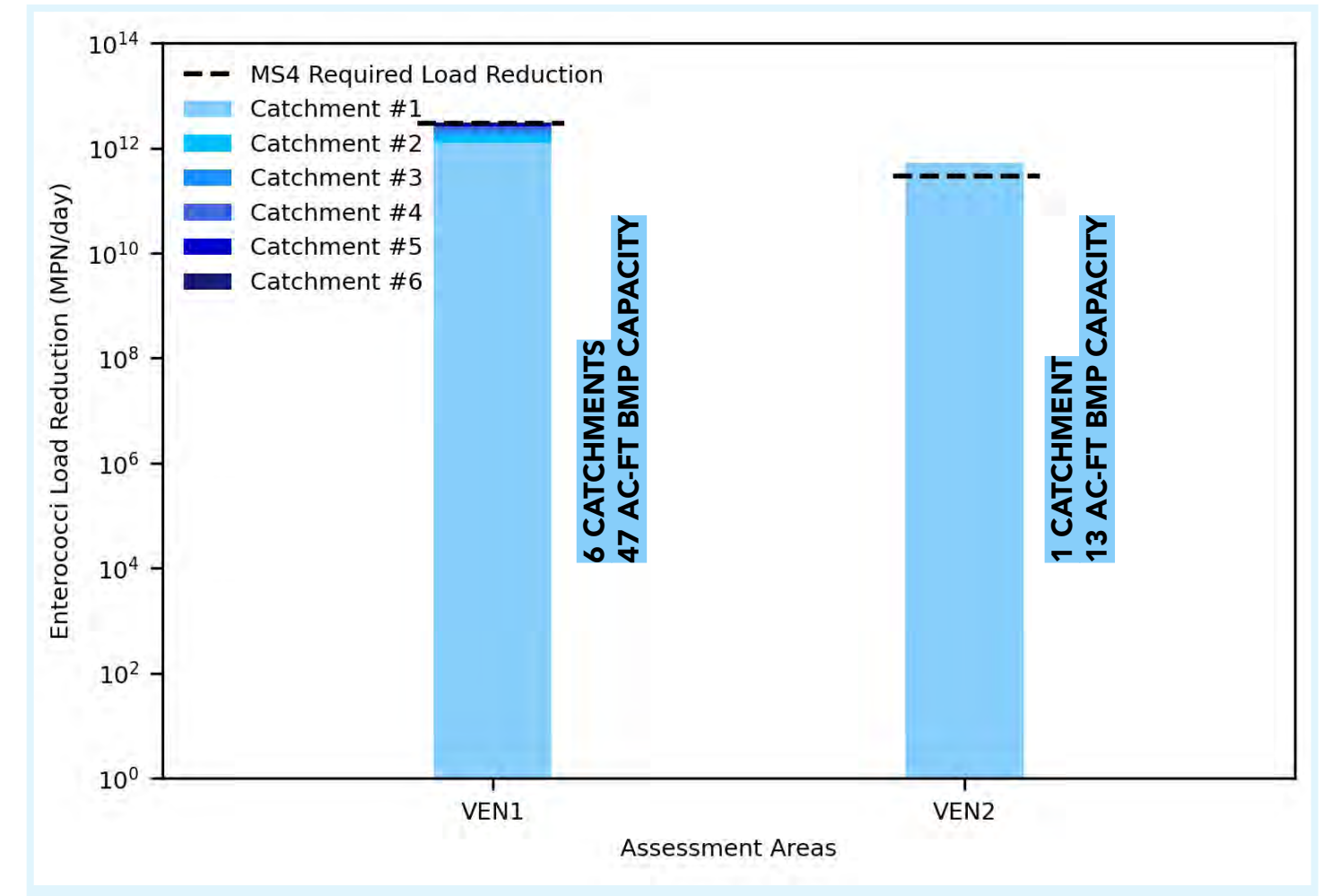


FIGURE 4-15: Implementation Strategies to Meet Load Reductions for *E. coli* During Wet Weather in Ventura River Watershed

The milestones for meeting load reductions for *E. coli* in **Figure 4-14** and **Figure 4-15** by reducing loads from targeted catchments prioritize source abatement where identified through investigations and structural projects for areas where the source is unidentified. The list of structural projects aligned with the BMP capacity presented in targeted catchments is detailed in [Appendix D, Section 10.2.4.2](#).



IMPLEMENTATION COSTS IN VENTURA RIVER WATERSHED

The estimated costs of implementing this particular implementation pathway are provided in **Table 4-10**. The Group plans to collaborate on strategies that are impactful at the assessment area scale, **so costs are initially prorated based on loading from each jurisdiction**. The cost sharing identified across jurisdictions is preliminary and will be further discussed/negotiated as implementation progresses, including the potential for cost sharing with dischargers outside of the agencies represented in this WMP.

TABLE 4-10: Estimated Planning-Level Costs of Implementation Strategies in Ventura River Watershed

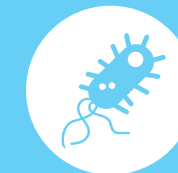
ASSESSMENT AREA	JURISDICTION	IMPLEMENTATION STRATEGIES			
		Enhanced Street Sweeping (Annual Cost)	Human Waste Source Investigations (Total Cost of Investigations) ¹	Structural Projects (Capital Cost) ²	Structural Projects (Annual O&M Cost) ²
VENTURA RIVER 1	UNINCORPORATED COUNTY	\$1,200–\$4,800	\$521,000–\$1,040,000	\$33,574,000	\$2,350,000
	VENTURA	\$7,400–\$29,700	\$347,000–\$695,000	\$22,414,000	\$1,569,000
	OJAI	\$800–\$3,100	\$32,000–\$65,000	\$2,081,000	\$146,000
	TOTAL	\$9,400–\$37,600	\$900,000–\$1,800,000	\$58,069,000	\$4,065,000
VENTURA RIVER 2	OJAI	N/A	\$148,000–\$296,000	\$15,654,000	\$1,096,000
	UNINCORPORATED COUNTY	N/A	\$2,000–\$4,000	\$207,000	\$14,000
	TOTAL	N/A	\$150,000–\$300,000	\$15,861,000	\$1,110,000
TOTAL		\$9,400–\$37,600	\$1,050,000–\$2,100,000	\$73,930,000	\$5,175,000

¹Source abatement costs to be determined pending the findings of source investigations for each targeted catchment.
²Structural project costs are based on a conservative expectation that at least 50% of targeted catchments will be addressed via source abatement, with the remainder if the source is unidentified or uncontrollable to be addressed via structural projects identified. High-level planning costs for structural projects in targeted catchments can be found in Appendix D, Section 10.2.4.2.



4.1.5 VENTURA COUNTY COASTAL WATERSHED

POLLUTANTS OF CONCERN



BACTERIA

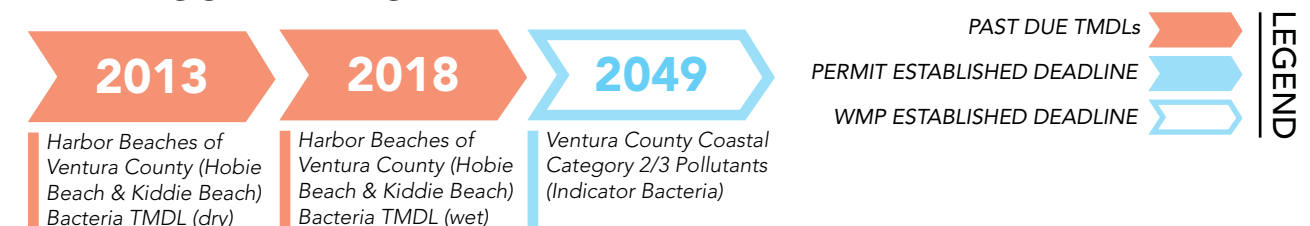
TABLE 4-11: Limiting Pollutants in the Ventura County Coastal Watershed

ASSESSMENT AREA	LIMITING POLLUTANT GROUPS
	BACTERIA
VENTURA COUNTY COASTAL 3	Enterococcus

There are no required reductions for the Ventura County Coastal 1 and Ventura County Coastal 2 assessment areas as demonstrated by the RAA; therefore, the agencies within these areas are not currently pursuing any actions. The agencies within the Ventura County Coastal 2 assessment area will continue to track the monitoring data and revisit updates to the RAA through adaptive management if conditions change. The anticipated 303(d) delisting of bacteria in the Ventura Harbor Keys shows that water quality conditions are improving in the Ventura County Coastal 2 assessment area. However, if loadings were to increase in the future, the agencies would prioritize implementation efforts in targeted catchment 5010.

The actions and milestones associated with addressing indicator bacteria in the Ventura County Coastal 3 assessment area are focused on addressing the Category 2 and Category 3 WBPCs (i.e., excluding the Kiddie Beach and Hobie Beach areas which are being addressed separately under the TMDL).

COMPLIANCE TIMELINE



SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.5 VENTURA COUNTY COASTAL WATERSHED



ADDRESSING BACTERIA IN VENTURA COUNTY COASTAL WATERSHED

The general framework for addressing bacteria in the Ventura County Coastal Watershed is outlined in **Figure 3-2**. Human waste source investigations and source abatement are the first phase of the implementation strategy as they are the most effective control measures to reduce bacteria in the targeted areas. In the case that investigations do not result in identifiable or controllable sources of bacteria in the targeted catchments, each assessment area has structural control measure opportunities that have been identified (**Appendix D, Section 11.2.3**) to achieve the required bacteria load reductions. The approach is also outlined below, and the current implementation status for each phase in the framework is described.

IMPLEMENTATION PHASE	STATUS	DESCRIPTION
Identified Target Catchment ①		Target catchments have been identified through the Monte Carlo analysis and risk-based approach (presence of potential human waste sources).
Monitoring Plan for Targeted Catchment ②		Completed several catchment-level monitoring plans for Hobie and Kiddie Beaches within the Ventura County Coastal 3 assessment area (5022/5024).
Implement the HWSI ③		Many catchment-level source investigations have been conducted for Hobie and Kiddie Beach to look at various potential sources from the beach (e.g., stormwater) or harbor-wide (e.g., groundwater) during wet weather.
Implement Structural Project(s) for Targeted Catchment		For dry weather, the San Nicholas Pump Station diverts dry weather flows to the sanitary sewer.
Performance Monitoring ⑤		During dry weather, there are no MS4 discharges to Kiddie Beach due to the low flow diversion.

LEGEND

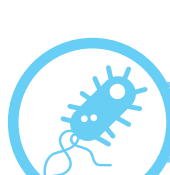
- PHASE COMPLETED
- PHASE IN PROGRESS

For a more detailed description of bacteria reduction implementation activities in the Ventura County Coastal Watersheds, please refer to **Appendix D, Section 11.2.3.1**

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.5 VENTURA COUNTY COASTAL WATERSHED



TARGETED CATCHMENTS IN VENTURA COUNTY COASTAL WATERSHED

The implementation strategy for bacteria in the Ventura County Coastal Watershed is based on addressing the targeted catchments displayed in **Figure 4-16** and **Figure 4-17** during dry and wet weather, respectively, to meet the RAA-established load reductions for MS4s. The number of potential human waste sources as well as catchment areas identified from compiled data are overlaid for reference.

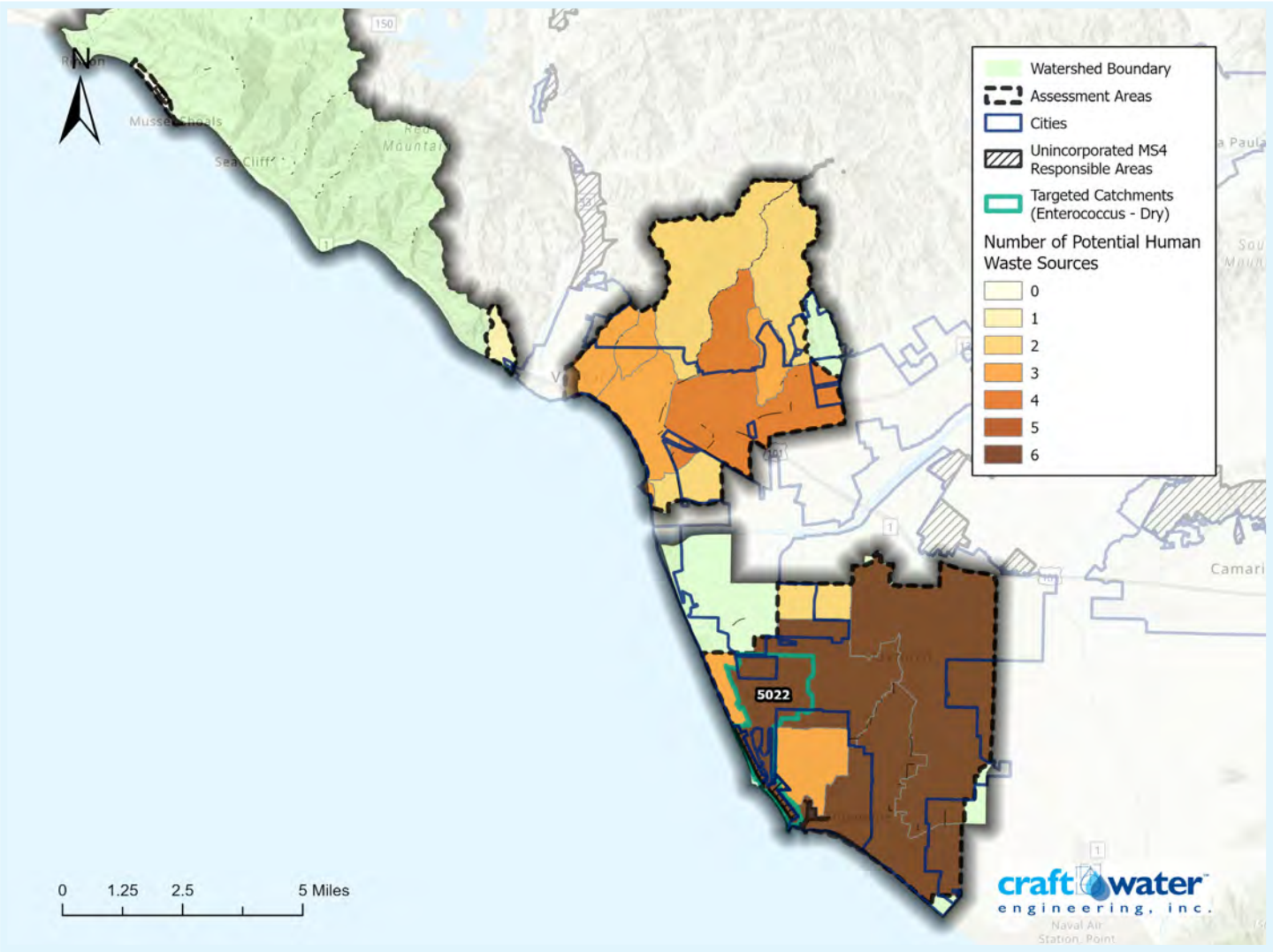


FIGURE 4-16: Targeted Catchments to Address Enterococcus in Ventura County Coastal Watershed During Dry Weather by 2049.

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.5 VENTURA COUNTY COASTAL WATERSHED

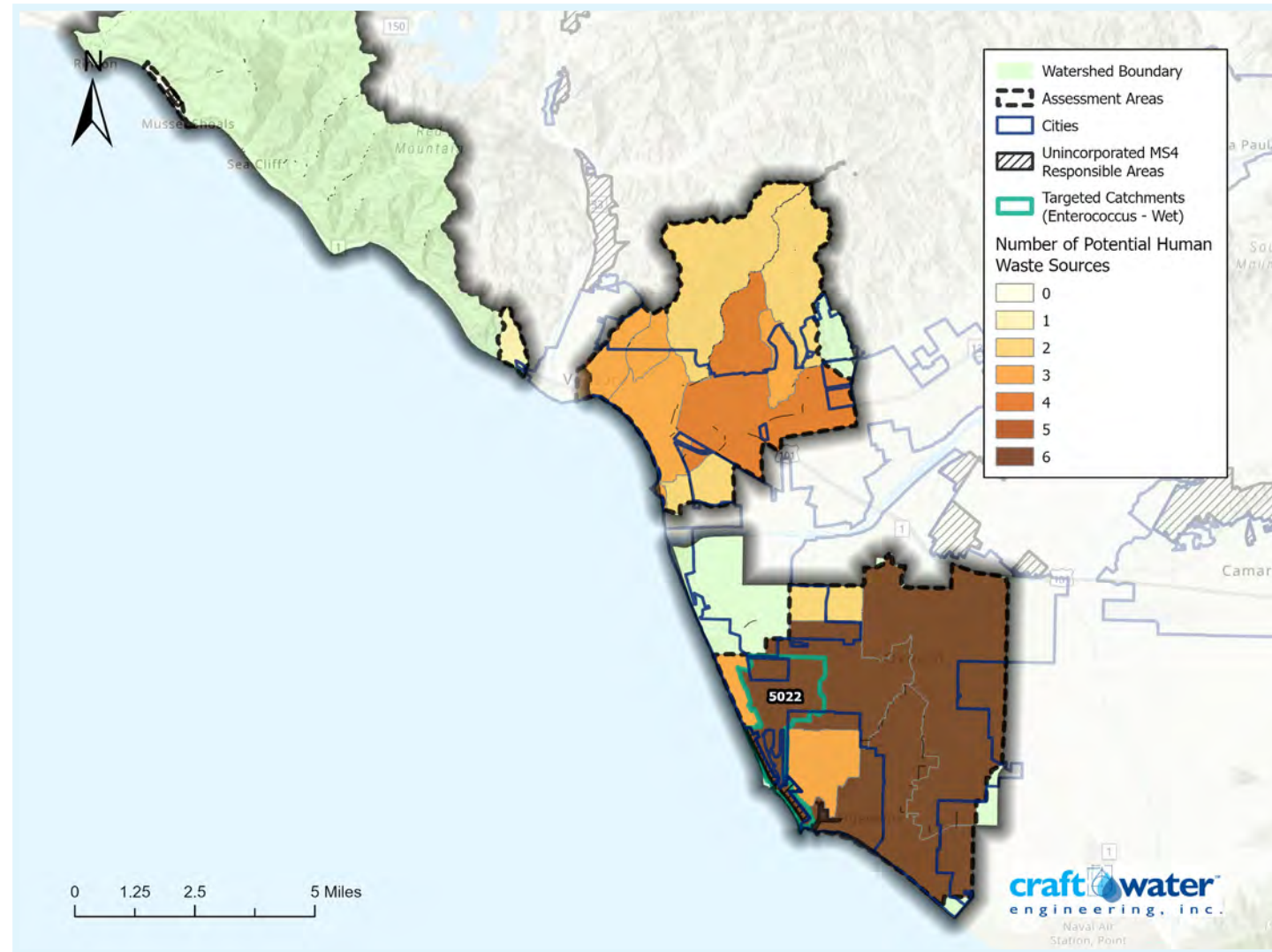


FIGURE 4-17: Targeted Catchments to Address Enterococcus in Ventura County Coastal Watershed During Wet Weather by 2049.



For a more detailed list of targeted catchments in the Ventura County Coastal Watershed, please refer to [Appendix D, Section 11.2.3](#)

SECTION 4: PATHWAY TO IMPLEMENTATION

4.1 IMPLEMENTATION STRATEGIES

4.1.5 VENTURA COUNTY COASTAL WATERSHED

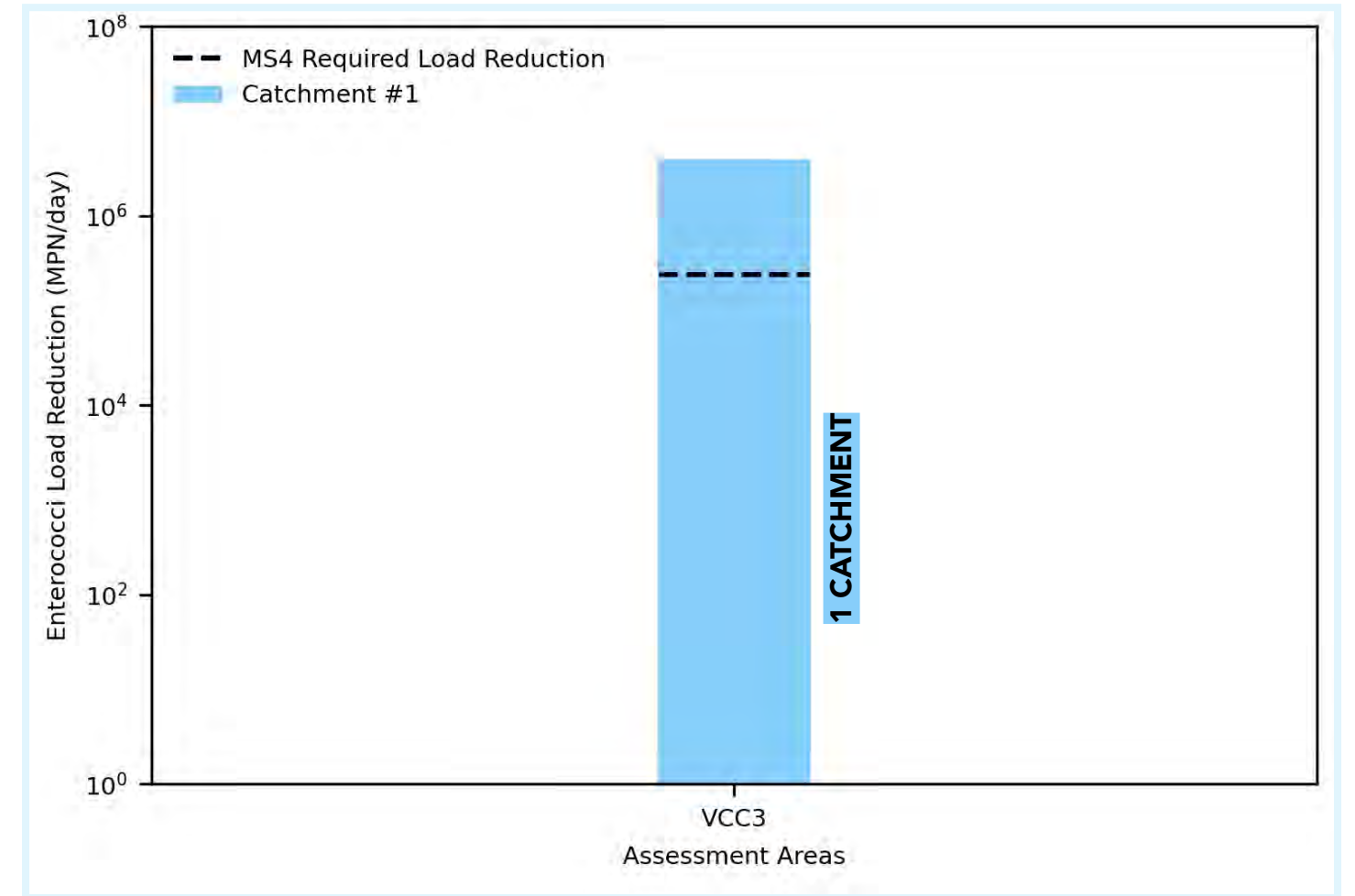


FIGURE 4-18: Implementation Strategies to Meet Load Reductions for Enterococcus During Dry Weather in Ventura County Coastal Watershed

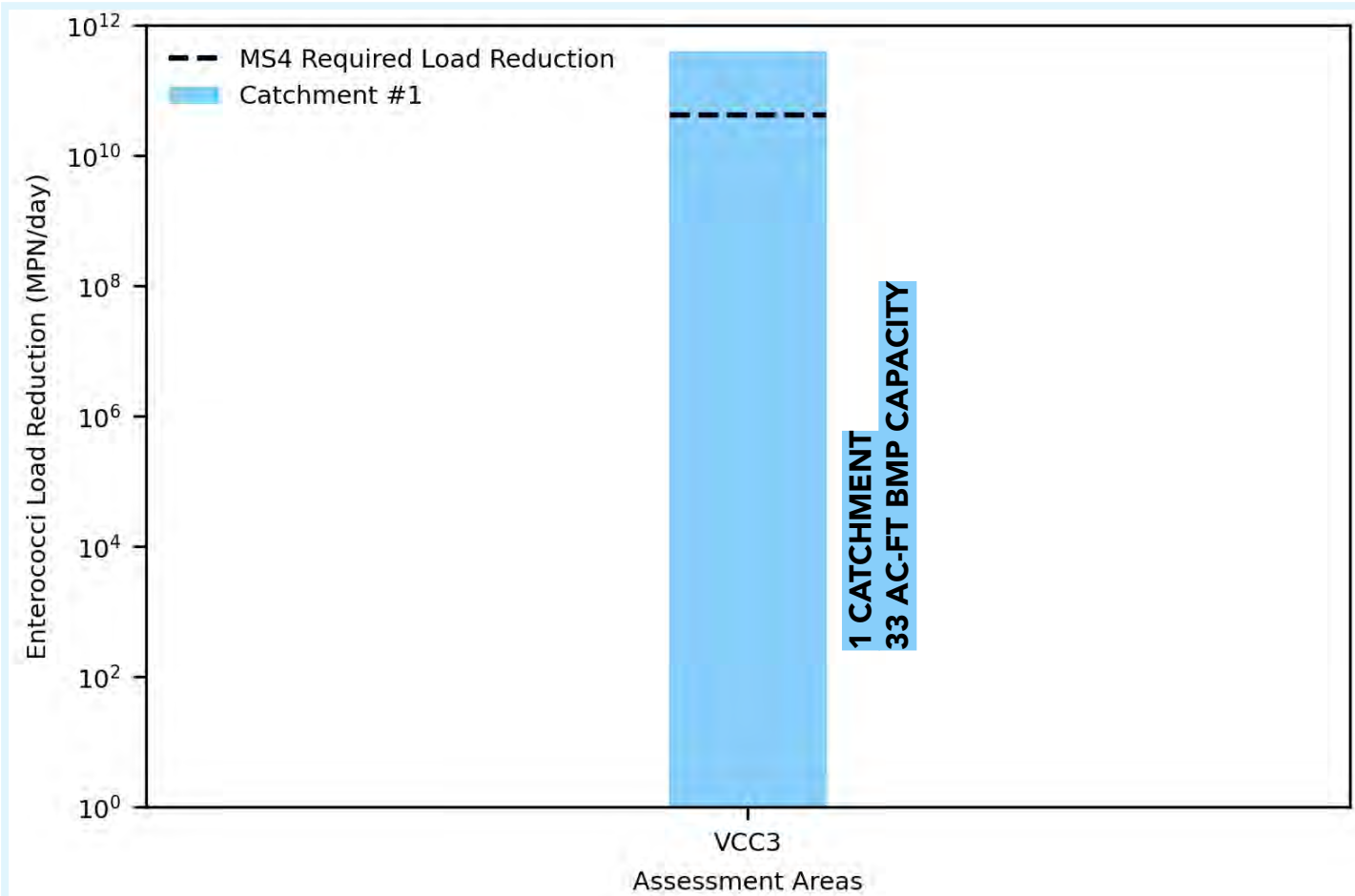


FIGURE 4-19: Implementation Strategies to Meet Load Reductions for *Enterococcus* During Wet Weather in Ventura County Coastal Watershed

The milestones for meeting load reductions for *E. coli* in **Figure 4-18** and **Figure 4-19** by reducing loads from targeted catchments prioritize source abatement where identified through investigations and structural projects for areas where the source is unidentified. The list of structural projects aligned with the BMP capacity presented in targeted catchments is detailed in **Appendix D, Section 11.2.3.3.**



IMPLEMENTATION COSTS IN VENTURA COUNTY COASTAL WATERSHED

The estimated costs of implementing this particular implementation pathway are provided in **Table 4-12**. The Group plans to collaborate on strategies that are impactful at the assessment area scale, **so costs are initially prorated based on loading from each jurisdiction**. The cost sharing identified across jurisdictions is preliminary and will be further discussed/negotiated as implementation progresses, including the potential for cost sharing with dischargers outside of the agencies represented in this WMP.

TABLE 4-12: Estimated Planning-Level Costs of Implementation Strategies in Ventura County Coastal Watershed

		IMPLEMENTATION STRATEGIES		
ASSESSMENT AREA	JURISDICTION	Human Waste Source Investigations (Total Cost of Investigations) ¹	Structural Projects (Capital Cost) ²	Structural Projects (Annual O&M Cost) ²
VENTURA COUNTY COASTAL 3	OXNARD	\$120,000–\$240,000	\$6,800,000	\$476,000
	PORT HUENEME	\$28,000–\$56,000	\$1,583,000	\$111,000
	UNINCORPORATED COUNTY	\$2,000–\$4,000	\$119,000	\$8,000
	TOTAL	\$150,000–\$300,000	\$8,502,000	\$595,000

¹Source abatement costs to be determined pending the findings of source investigations for each targeted catchment.
²Structural project costs are based on a conservative expectation that at least 50% of targeted catchments will be addressed via source abatement, with the remainder if the source is unidentified or uncontrollable to be addressed via structural projects identified. High-level planning costs for structural projects in targeted catchments can be found in Appendix D, Section 11.1.3.3.



4.2 FINANCIAL STRATEGY

While the implementation strategies prioritize cost-effective control measures for addressing pollutants, it is important to recognize that the implementation costs are still high. Unlike Los Angeles County, Ventura County does not have a dedicated funding source for stormwater, thus the Permittees will continue to evaluate creative strategies to cover the costs necessary to implement the WMPs.

EXISTING FUNDING SOURCES

The existing funding sources used by the Group include the **Watershed Protection District's Benefit Assessment Program, General Fund, Utility Tax, Separate Tax, Gas Tax, Special District Fund**, and others (Developer Fees, Business Inspection Fees, Sanitation Fees, Fleet Maintenance, Community Services District, Water Fund, Grants, and Used Oil Recycling Grants).

POTENTIAL FUNDING SOURCES

For operational activities and projects requiring implementation within this Permit term that go beyond the budget of existing programs, low-interest loans and grants offer near-term potential sources of funding. Long-term funding opportunities include pursuing property-related fees specific to stormwater, water quality trading, regional sales tax measures, and environmental impact fees.



For a more detailed discussion of the Group's financial strategy, please refer to **Appendix D, Section 12.**



4.3 COLLABORATION AND PARTNERSHIPS

Transparency and collaboration were the foundation of the WMPs process. Often the hardest part of watershed planning is getting—and keeping—the right voices engaged in the conversation. Recognizing the common goal of improved water quality across parties that may have vastly different approaches, the Group is committed to continued engagement with stakeholders, regulators, advocates, and potential partners. Engagement activities so far include...

24 meetings with the **VENTURA STORMWATER MANAGEMENT COMMITTEE** 

3 meetings with each **WATERSHED SPECIFIC GROUP** = 15 TOTAL 

3 meetings with each **AGENCY** = 36 TOTAL 

6 meetings with the **REGIONAL BOARD** 

and 4 **PUBLIC OUTREACH** events 

IDENTIFIED PARTNERS

The Group plans to continue engaging with the Regional Water Quality Control Board staff annually (at a minimum) and to develop collaborative relationships with environmental stakeholders, community groups, and the general public. The Group will also continue its active participation in professional development groups, such as the **California Stormwater Quality Association (CASQA)** and others, to advance sustainable stormwater legislation, policies, and programs in California.

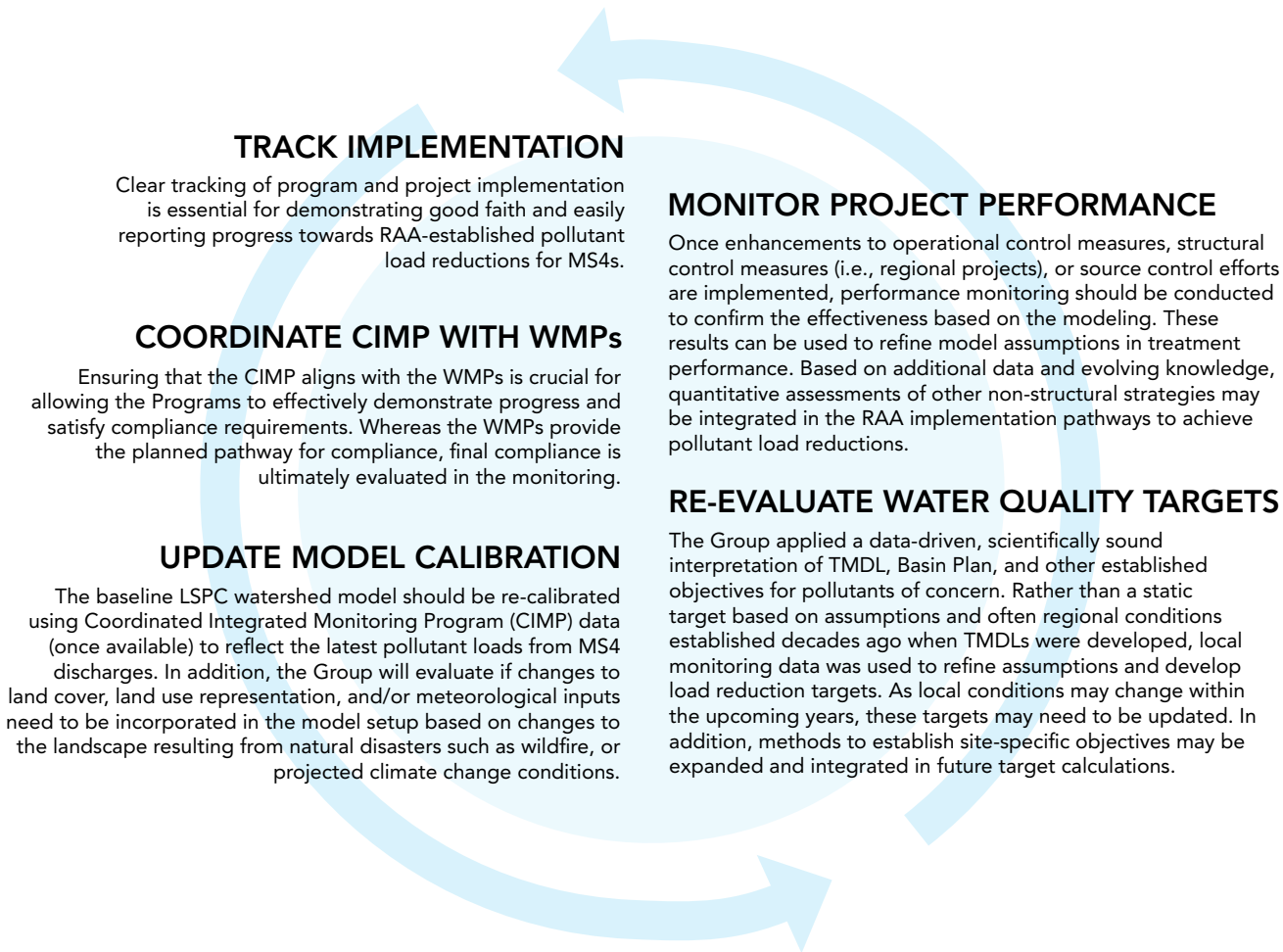


4.4 ADAPTIVE MANAGEMENT

Understanding that the state of watershed science is constantly evolving, the adaptive management process outlined below will allow the Group to periodically re-evaluate and update their Programs based on the latest monitoring data and scientific progress.

ADAPTIVE MANAGEMENT CYCLE

The following recommendations will be crucial in aiding with the adaptive management process...



CONCLUSION



The collective voices of the Group brought fresh, innovative ideas to the WMPs development process. This fostered a collaborative, transparent environment to discuss how real, meaningful water quality improvement using the latest sound science could continue for future generations to come. These WMPs are not meant to be static—this is intended to be a dynamic living document with feedback loops incorporated to tie monitoring realities with modeled outcomes to inform the effectiveness of pursued strategies. The Group will continue to pursue decision making tools to help track program implementation, adapt strategies over time, and report progress with ease.

Our WMP approach is based on **technical rigor** and **collaboration**.

Our work continues beyond this document.
Let's talk.

