MSAR WATERSHED TMDL TASK FORCE

MSAR Bacteria Synoptic Study

Final Draft Report

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CDM Smith

PRESENTATION OUTLINE

- Final Draft Report Overview
  - Key Additions/Changes
  - Key Issues
- Synoptic Study Findings
- Report Recommendations
- Finalization of Report – Next Steps

FINAL DRAFT REPORT

- Key Additions/Changes
- Comments Addressed

FINAL DRAFT REPORT OVERVIEW

- Final Draft Report based on:
  - Comments from discussion at November 19 Task Force Meeting
  - Written comments from Riverside County Flood Control & Water Conservation District
- Key Changes:
  - Revisions to
    - Section 1 - Background & Purpose
    - Section 3 - Synoptic Study Findings
  - Addition of
    - Section 2 - Watershed Information and Data Sources
    - Section 4 – Findings and Recommendation
    - Appendix A (Site Photographs) and Appendix B (Field and *E. coli* Data)
  - Appendix C (QA/QC Report) in preparation (same style as Regional Monitoring Program Annual Report)

RESOLUTION OF KEY ISSUES PREVIOUSLY DISCUSSED

- Reporting *Bacteroide*s Results
  - Draft Report – Reported all results even if below detection limit (10 gene copies/2 µL)
  - Various options considered
    A. Report quantified results only if above detection limit (10 gene copies/2 µL)
    B. Report results as high, medium or low (with defined terms)
    C. Report results using Presence/Absence
    D. Report results as previously done but clarify meaning and use of data
  - We selected a combination of Options C & D
    - Maximize use of data developed through approved method
    - If the amplified value was < 10 gene copies/2 µL, we treated it as present. We did not use the amplified value in any calculations. Only use was to support prioritization analysis
    - Added text regarding purpose/usage of *Bacteroides* data results – per EPA it is an informational tool; not a compliance analysis tool

RESOLUTION OF KEY ISSUES PREVIOUSLY DISCUSSED

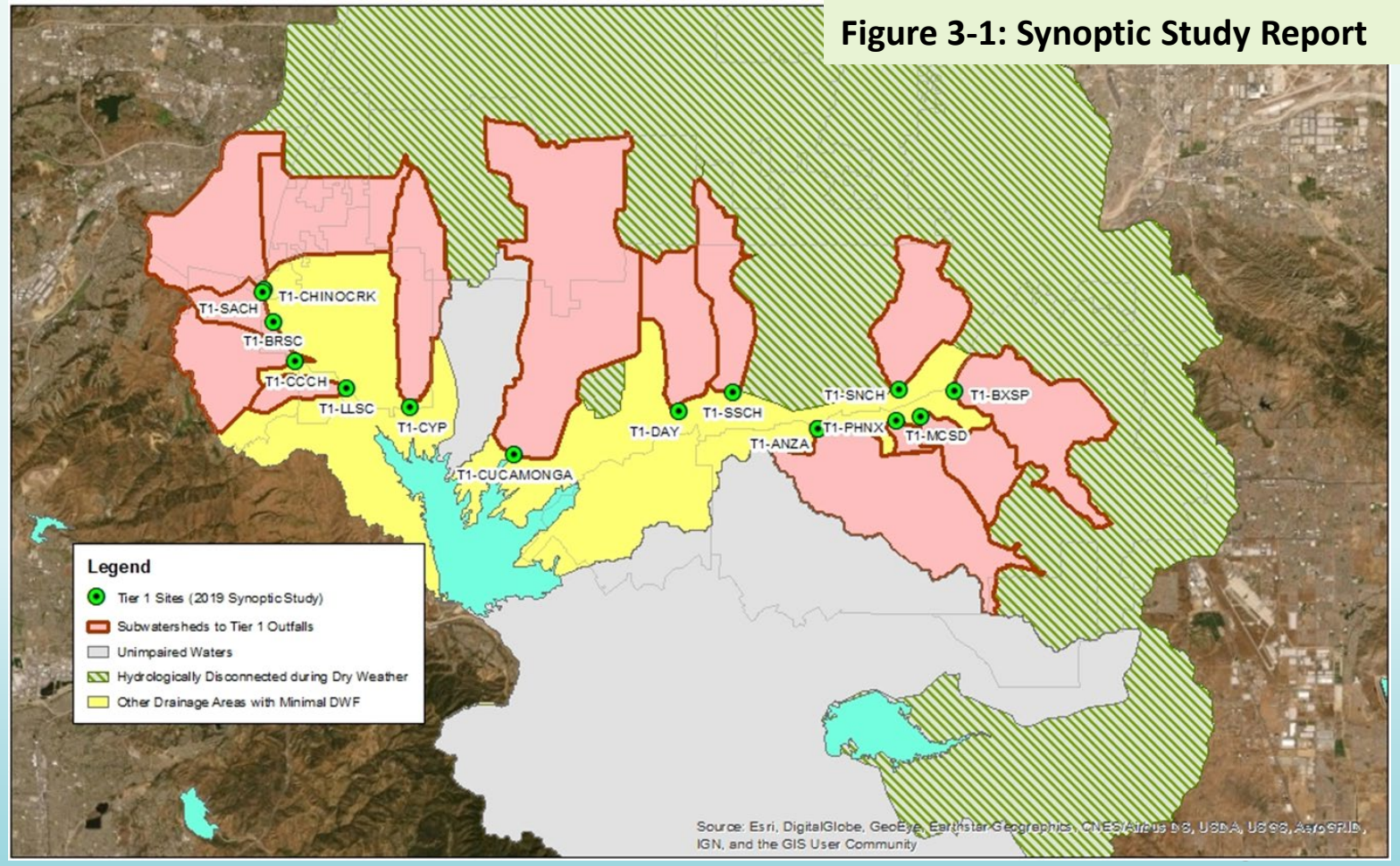
- Prioritization Method Discussion
  - Which criteria to use
  - How to calculate the prioritization score
  - How has site prioritization changed over time
- Final Draft Report
  - Compared methods to calculate score (previous vs. current) and results are very similar
  - Final Draft Report uses same calculation method and criteria as was in the Draft Report
    - Modified what is high, medium or low priority by dividing 0-100 range into thirds, EXCEPT opted to place ANZA in high – score is 66 – very close to 67 cutoff for high
  - Incorporated chart to show prioritization change over time

SYNOPTIC STUDY FINDINGS

FINDING 1: REDUCTION IN DRY WEATHER FLOWS FROM MS4S

- Finding: MS4 Programs met CBRP goals to significantly reduce dry weather flows (DWF) to impaired waters
  - 66% of upper watershed hydrologically disconnected
  - DWF from MS4 facilities substantially lower, continuing a downward trend observed since 2007
  - Claremont has effectively eliminated dry weather flow (2017 field study)

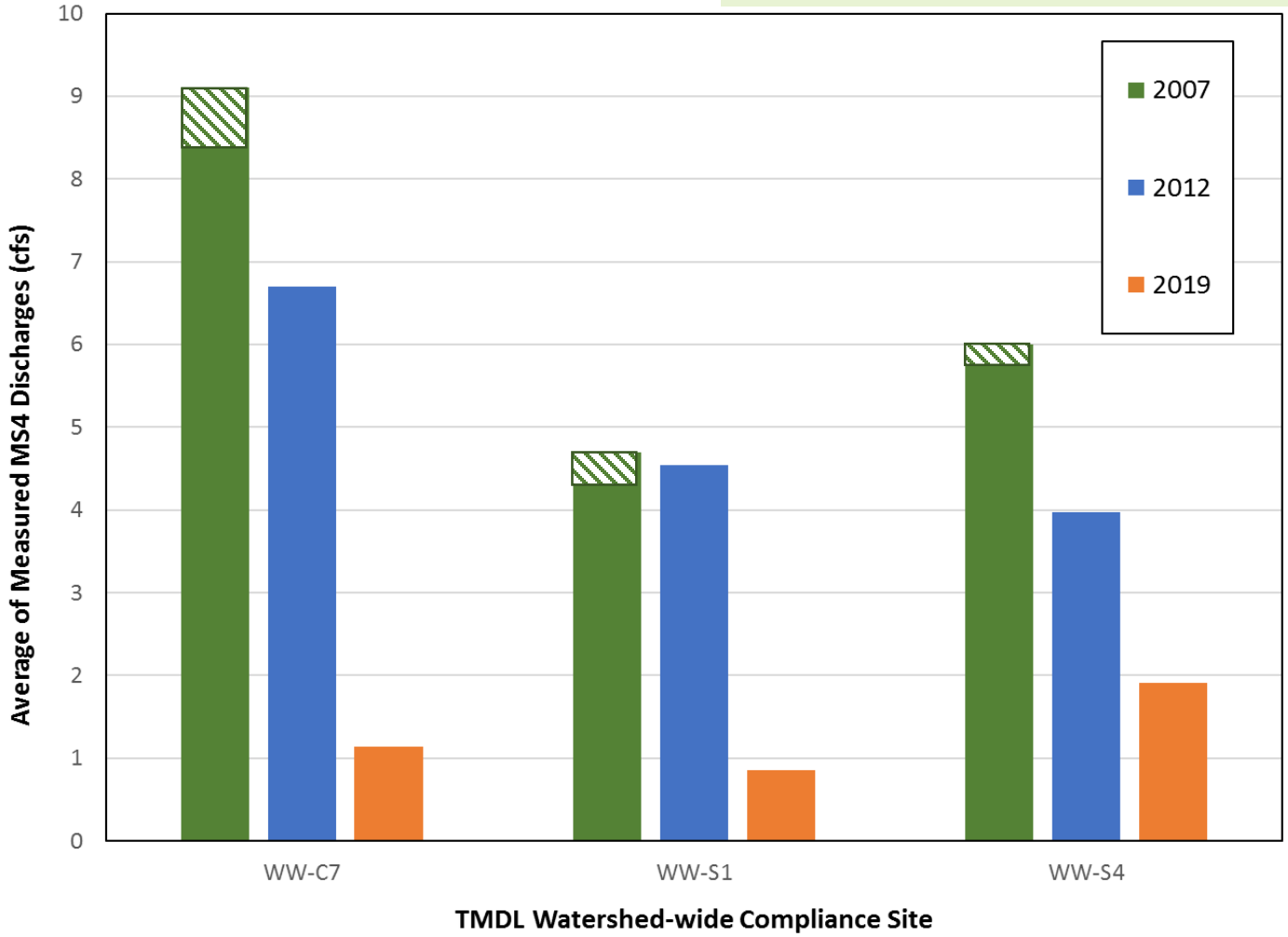
Figure 3-1: Synoptic Study Report



FINDING 1: REDUCTION IN DRY WEATHER FLOWS FROM MS4S

- Figure illustrates DWF reductions by subwatershed
- Long-term downward trend in DWF from 2007 – 2019
- MS4s have exceeded CBRP DWF reduction goals (hatched areas)

Figure 3-2: Synoptic Study Report



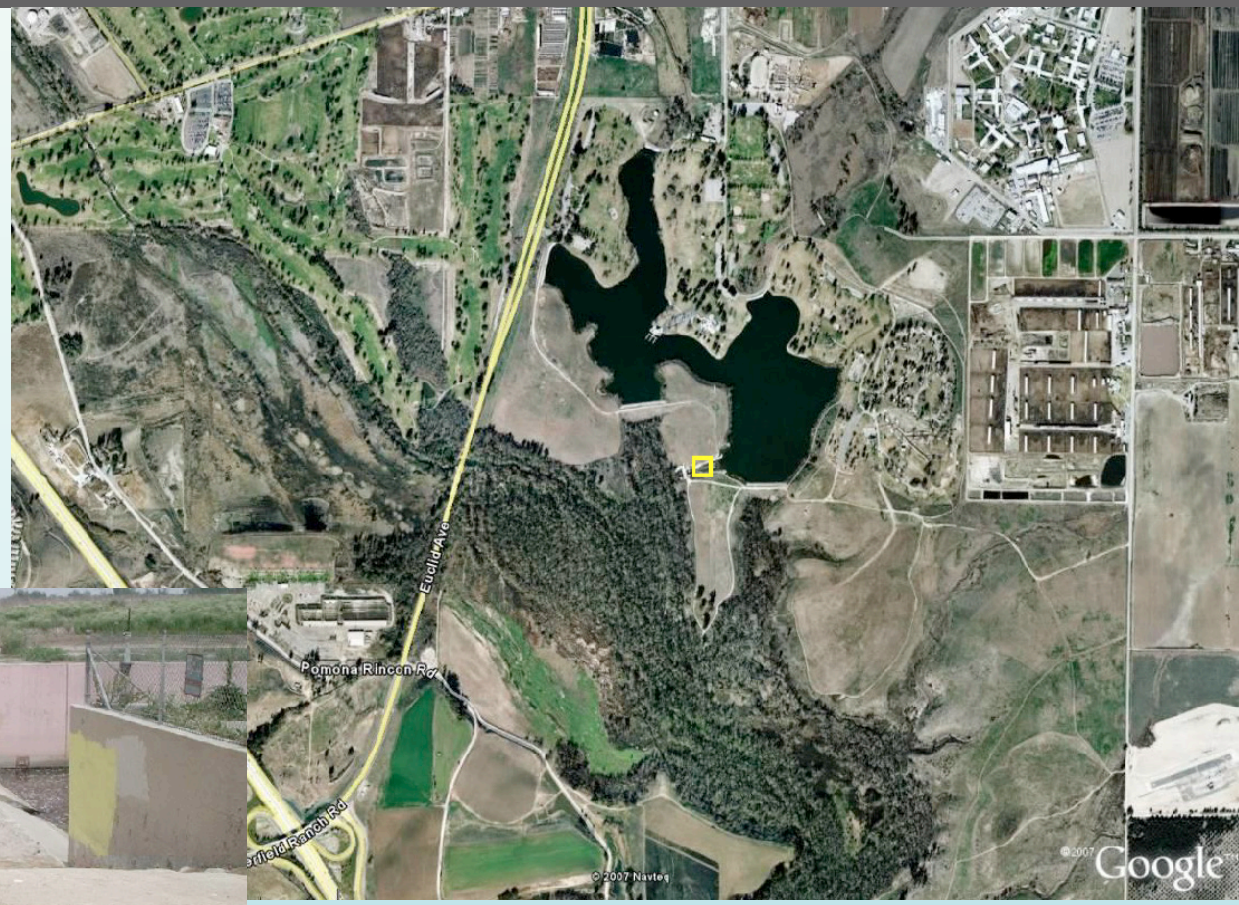
FINDING 2: REDUCTION IN BACTERIA LOADS FROM MS4S

- Findings: Status of CBRP bacteria load reduction goals:
  - Exceeded for Santa Ana River subwatersheds (hatched area)
  - Met 80% of the goal for the Chino Creek subwatershed (hatched area)

Figure 3-6: Synoptic Study Report

FINDING 3: STATUS OF PRADO PARK LAKE

- Finding: *E. coli* concentrations often meet TMDL targets; consider for de-listing when sufficient data available. If still listed impaired when revising TMDL, no dry weather WLA should be assigned to the MS4s because MS4s do not discharge to DWF to Prado Park Lake.



Photos: Regional Bacteria Monitoring Program Monitoring Plan (CDM Smith 2019)

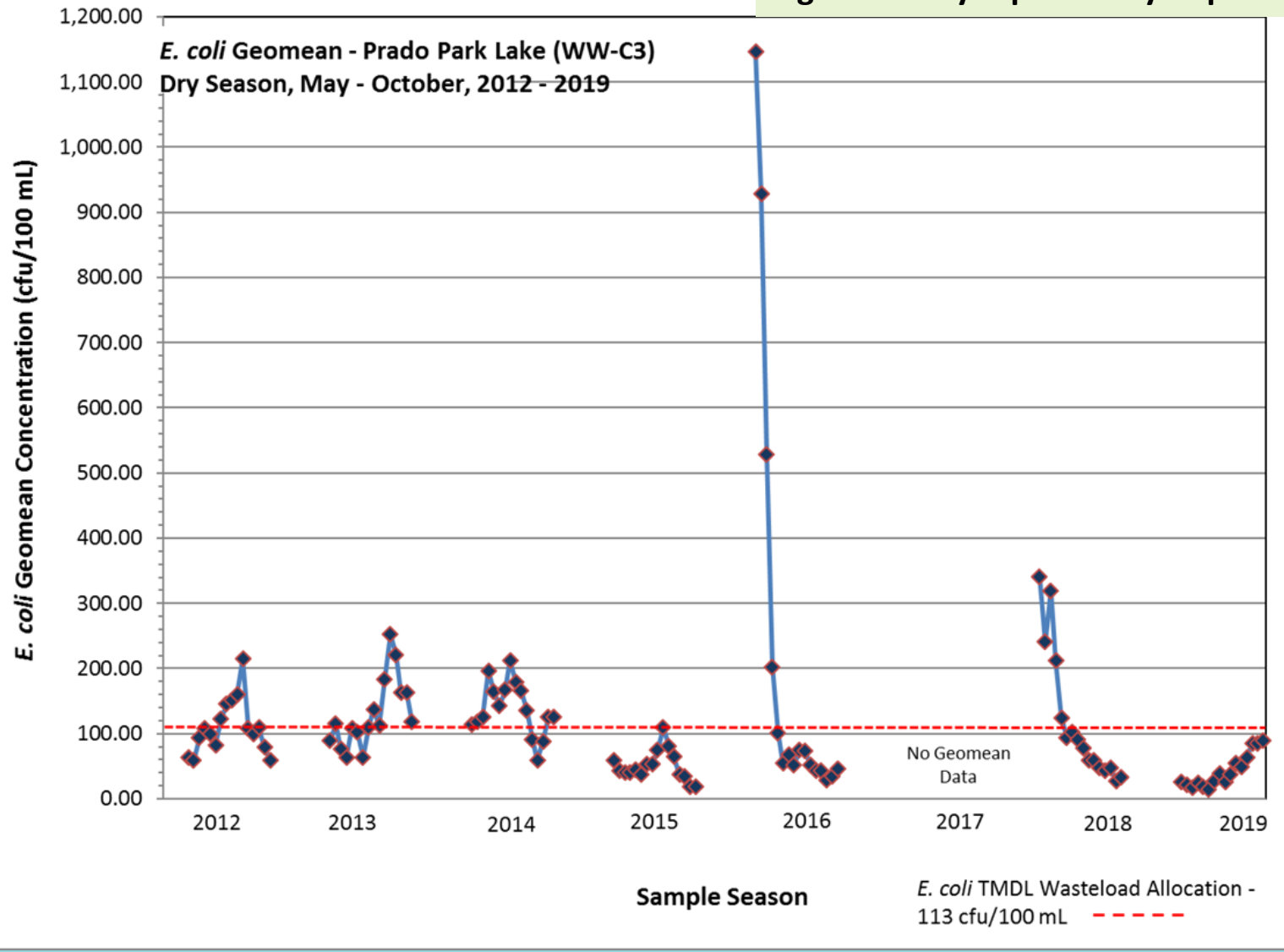
FINDING 3: STATUS OF PRADO PARK LAKE

- Prado Park Lake was drained in spring 2017 to repair pipe:
  - Storm sewer pipe was built under Prado Park Lake to divert stormwater under the lake
  - Diversion pipe did not function as designed for many years
- In dry weather lake is kept full from recycled water from IEUA RP-1

FINDING 3: STATUS OF PRADO PARK LAKE

- Prado Park Lake – 2012 to 2019 *E. coli* geomean results
- No geomean data for 2017 because of lake pipeline rehabilitation project

Figure 2-5: Synoptic Study Report



FINDING 4: NON-MS4 SOURCES OF *E. COLI* ARE MAJORITY IN SANTA ANA RIVER

- Finding: Unidentified non-MS4, non-POTW sources account for the majority (77%) of the total bacteria load in the Santa Ana River. Santa Ana River would be in compliance with the TMDL targets w/o this source.

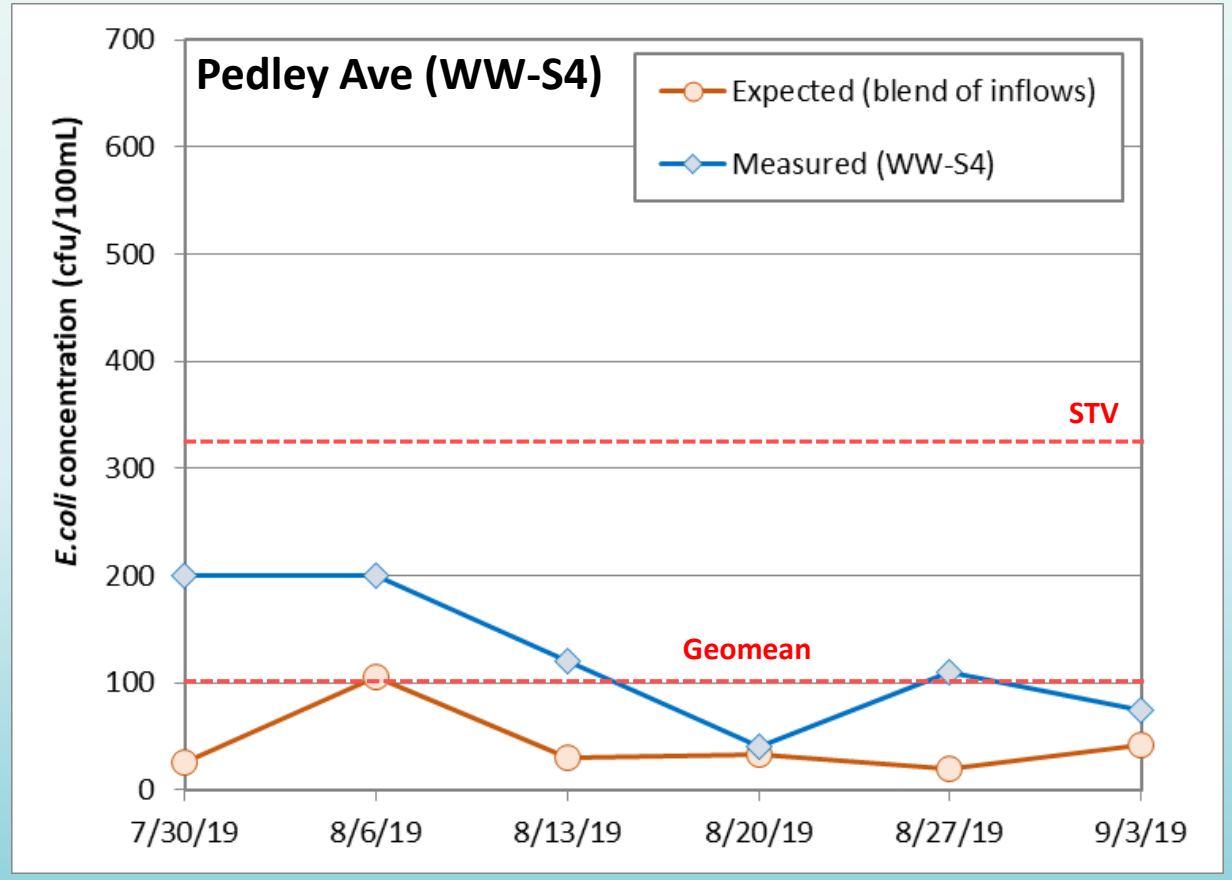
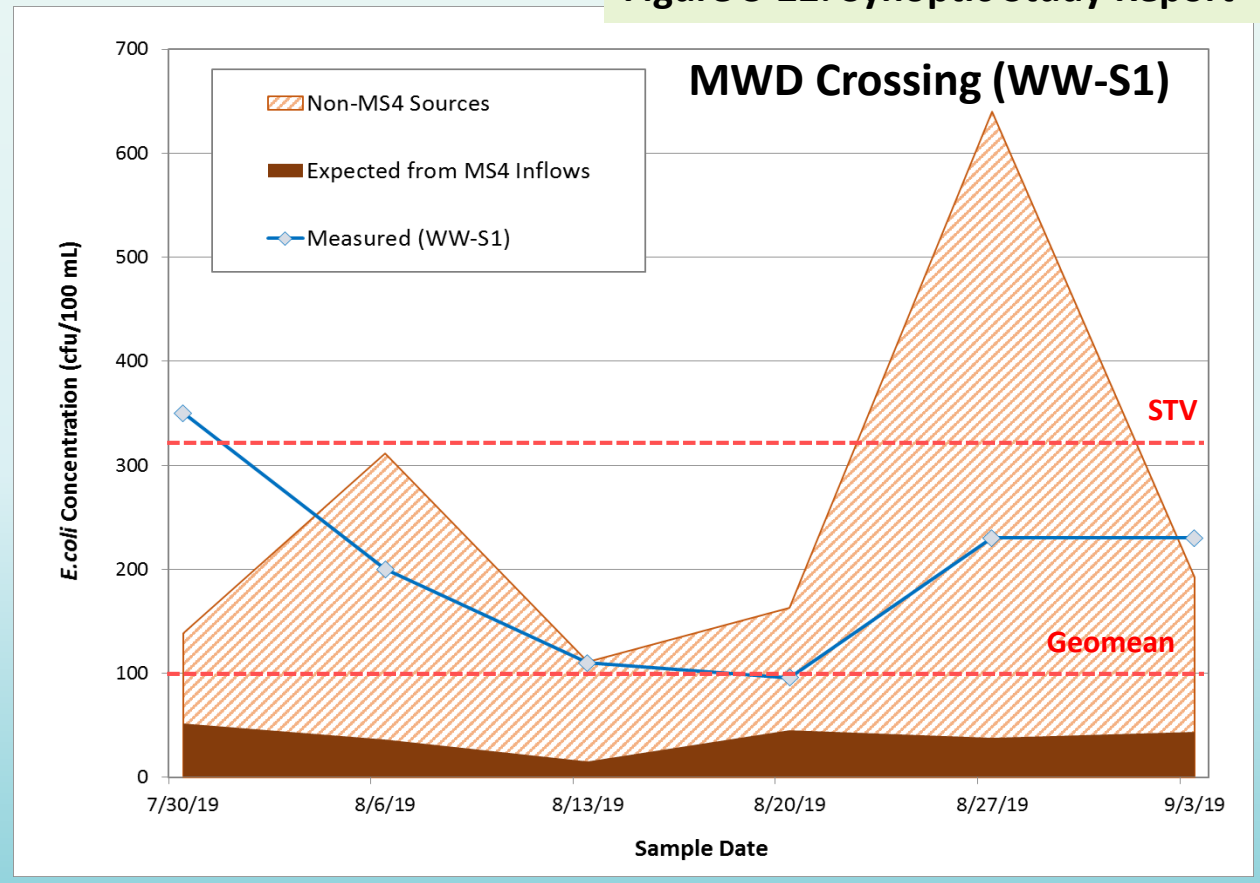


Figure 3-22: Synoptic Study Report



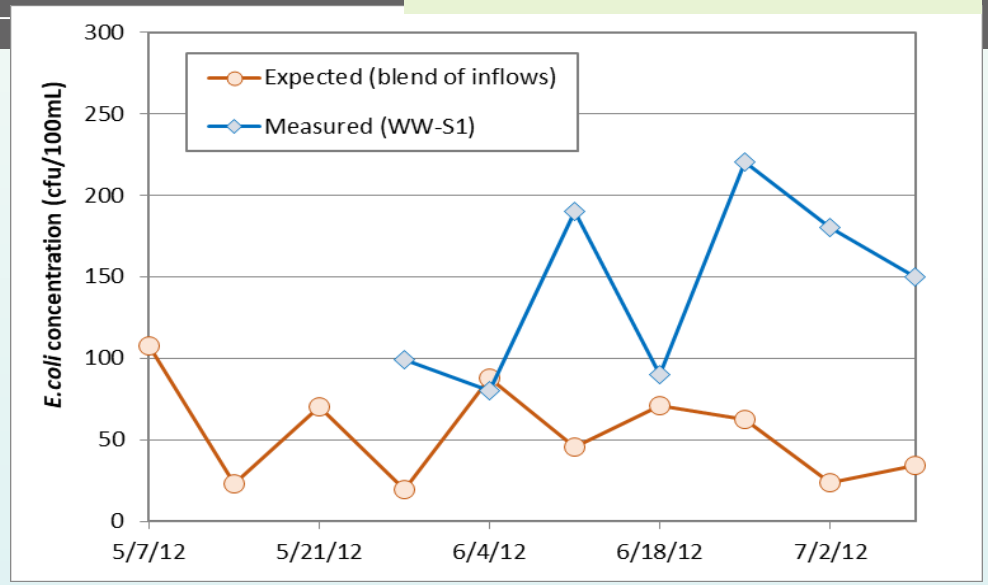
FINDING 4: NON-MS4 SOURCES OF *E. COLI* ARE MAJORITY IN SANTA ANA RIVER

- Unaccounted for sources of *E. coli* load was apparent in the CBRP analysis and 2013 Triennial Report findings

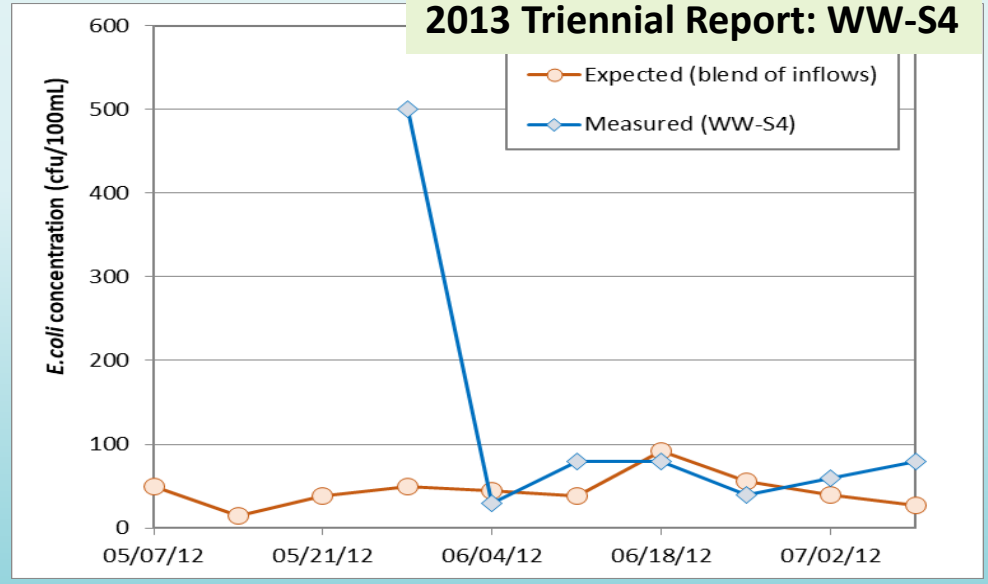
Site	1 Hydrologically Connected Acres	2 Dry Weather Flow (cfs)	3 Total Dry Weather Flow Generation (gal/acre/day)	4 Dry Weather Geometric Mean of *E. coli* (cfu/100 mL)	5 Dry Weather *E. coli* (cfu/day)
SAR at MWD Crossing	10,727	73.2		149	267
POTW Influent	n/a	68.7	n/a	2	4
Sunnyslope Channel	2,104	2.0	623	183	9
Box Springs Channel	4,193	1.8	279	1,686	75
Other MS4 Areas	4,430	0.9	100	600 [3]	10
			Unaccounted-for Sources		170
SAR at Pedley Avenue	17,921	54.8		149	200
POTW Influent	n/a	49.4	n/a	2	3
Anza Drain	6,335	2.6	263	492	31
Day Creek	2,759	0.5	122	577	7
San Sevaine Channel	2,489	1.3	338	320	10
Other MS4 Areas	6,338	1.0	100	600 [3]	14
			Unaccounted-for Sources		135

Table 3-2: CBRP Compliance Analysis

2013 Triennial Report: WW-S1



2013 Triennial Report: WW-S4



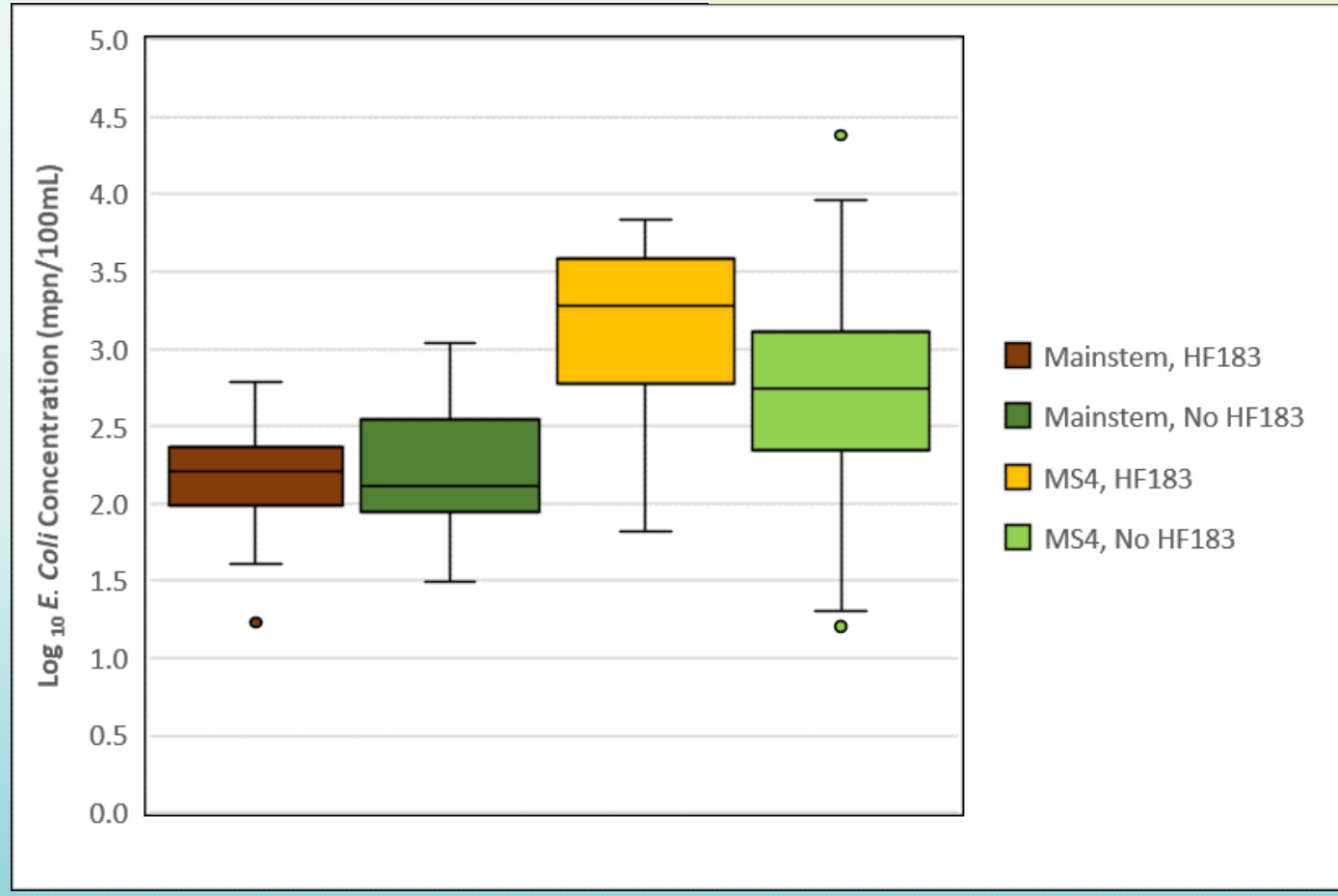
FINDING 4: NON-MS4 SOURCES OF *E. COLI* ARE MAJORITY IN SANTA ANA RIVER

- *E. coli* loads within the Santa An River are not dominated by human sources

Table 3-14: Synoptic Study Report

Mainstem Samples Only	N	E. coli Geomean (MPN/100 mL)	P-Value
HF183 Amplified	23	142	0.932
HF183 Not Amplified	19	157	

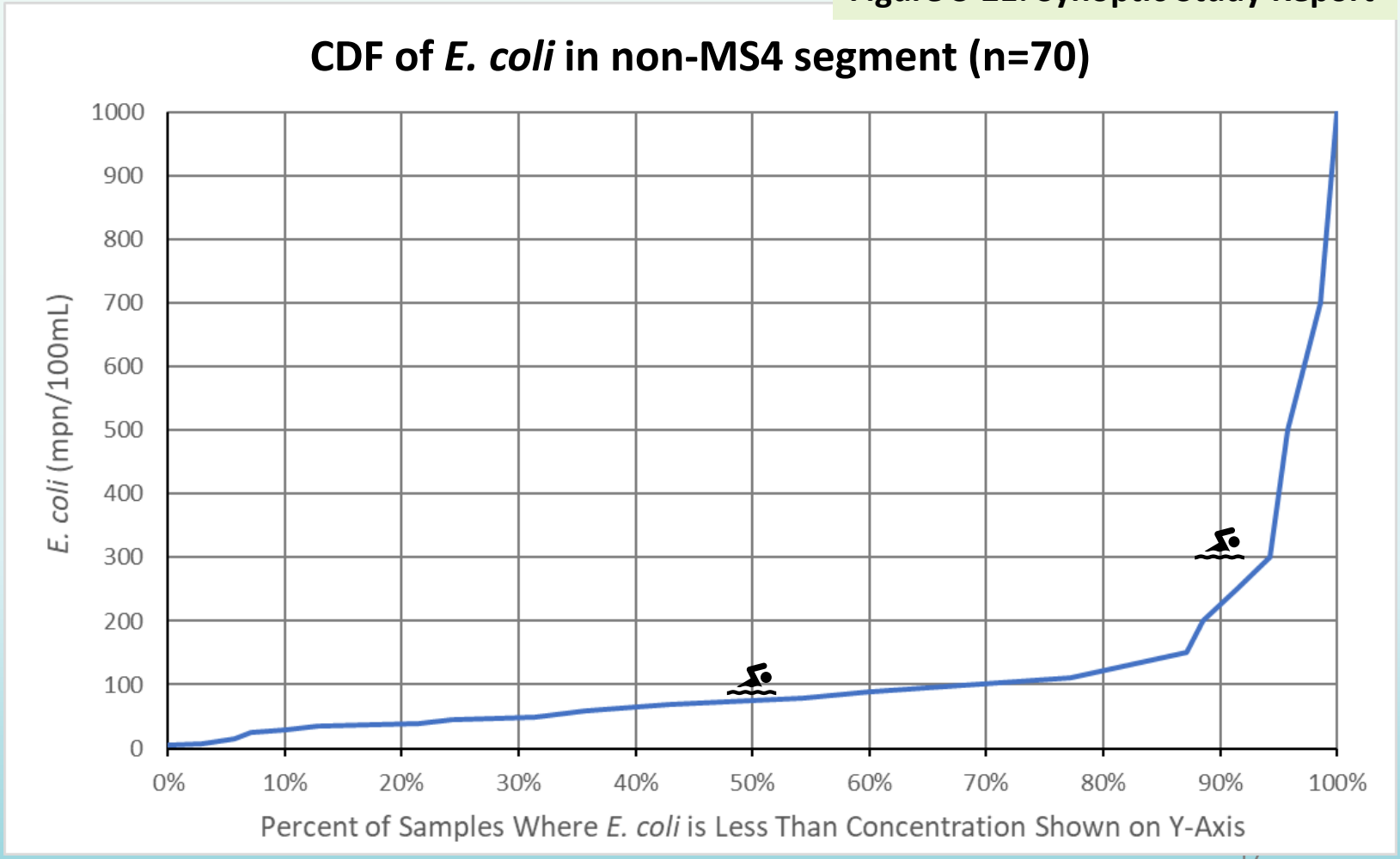
Figure 3-28: Synoptic Study Report



FINDING 5: NON-MS4 SOURCES CONTRIBUTE TO NON-ATTAINMENT

- Finding: *E. coli* loads from non-MS4/non-POTW sources contribute about 300 billion MPN/day - enough to consume nearly 100% of the total allowable load for *E. coli.* The 2019 Study measured what was previously known, but unaccounted for

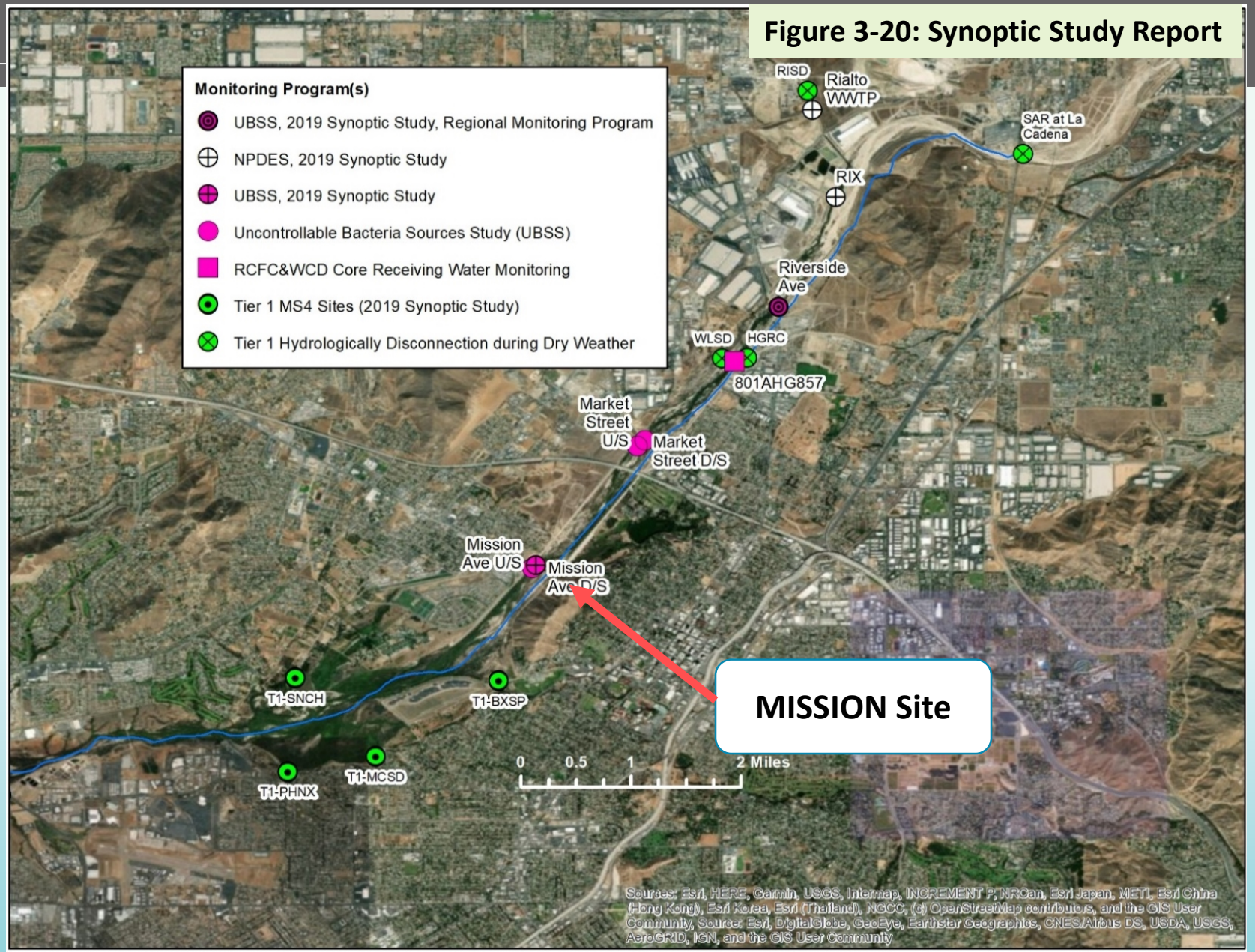
Figure 3-21: Synoptic Study Report



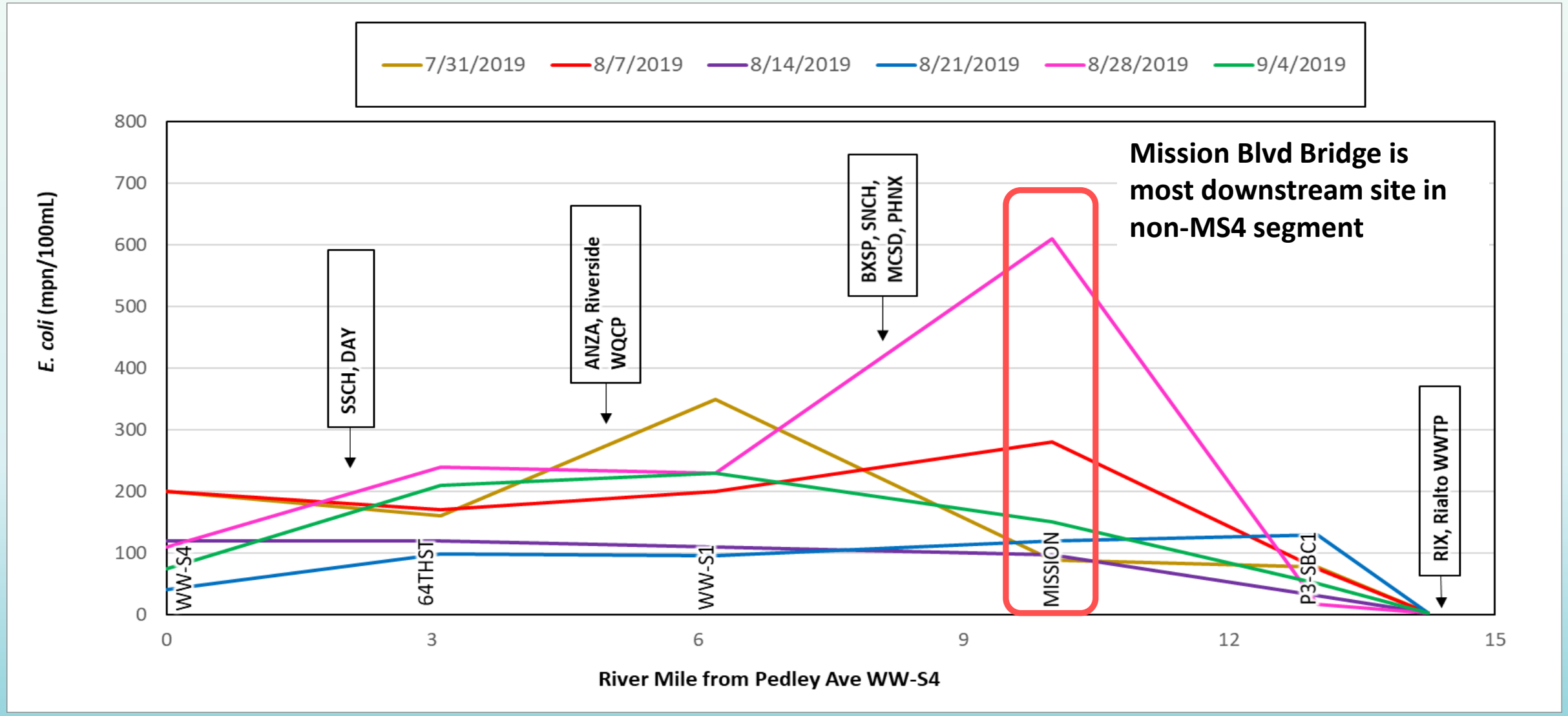
FINDING 5: NON-MS4 SOURCES CONTRIBUTE TO NON-ATTAINMENT

- MISSION: This site is upstream of all MS4 outfalls in the watershed; *E. coli* loads at this site arise from sources other than MS4 or POTWs

Figure 3-20: Synoptic Study Report



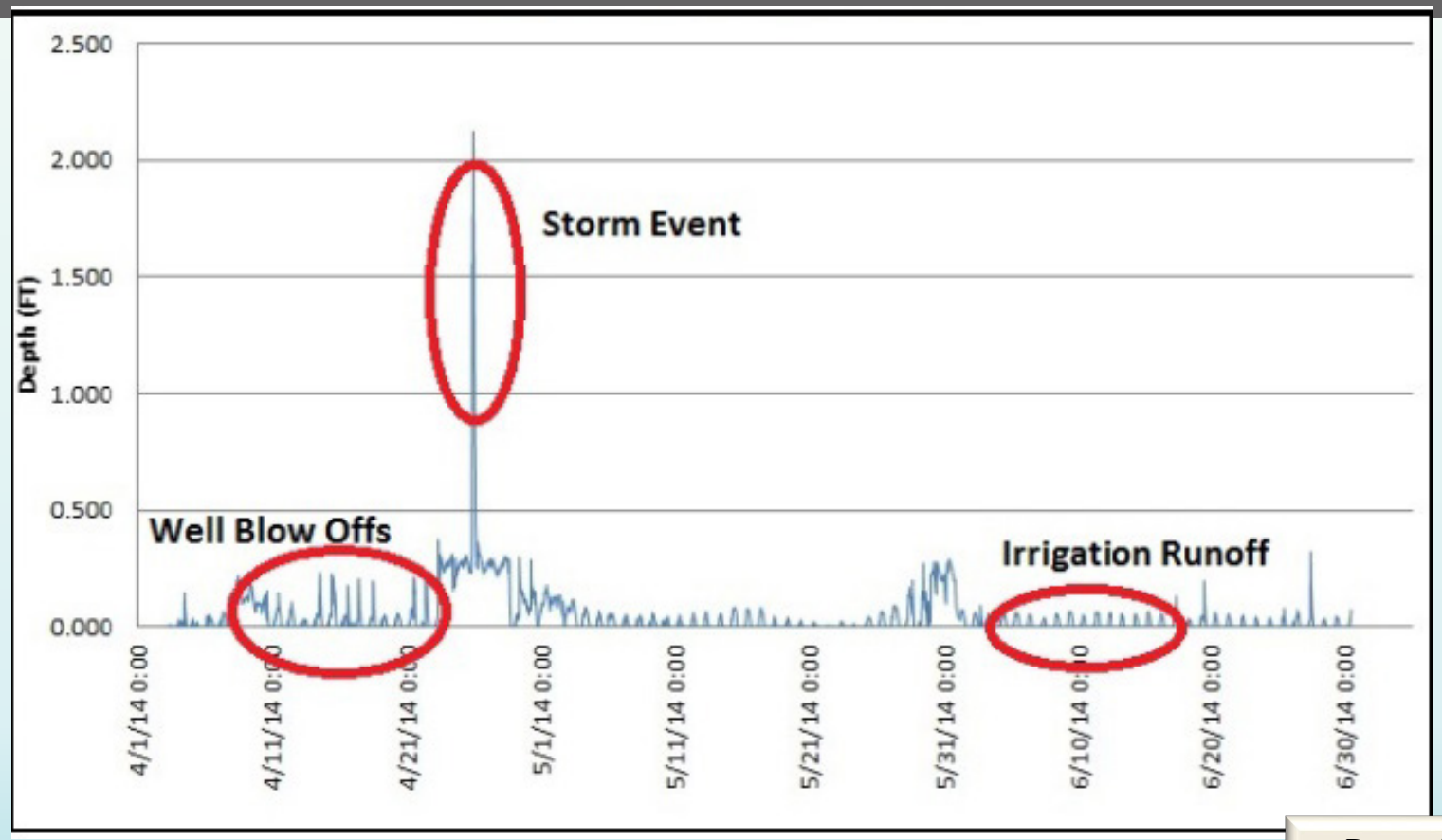
FINDING 5: NON-MS4 SOURCES CONTRIBUTE TO NON-ATTAINMENT



FINDING 6: ROLE OF DE MINIMIS DISCHARGES

- Finding: De minimis discharges continue to be a source of flow in MS4 facilities. During Synoptic Study, we observed evidence of these discharges at two locations (San Antonio Channel and Anza Drain). Report notes the following sources:
  - Turnouts of imported water by the Metropolitan Water District;
  - Well blow-offs;
  - Water transfers;
  - Inputs from rising groundwater;
  - Urban water waste from excess irrigation and other outdoor water uses;
  - Other authorized discharges (as defined by the MS4 or Santa Ana Region General Waste Discharge Requirements for de minimis discharges (R8-2015-0004); and
  - Non-permitted, prohibited discharges.

FINDING 6: ROLE OF DE MINIMIS DISCHARGES



RCFC&WCD installed water level loggers to document variability in dry weather flows due to other sources, including “de minimus” discharges (Figure from 2014-2015 Annual Report)

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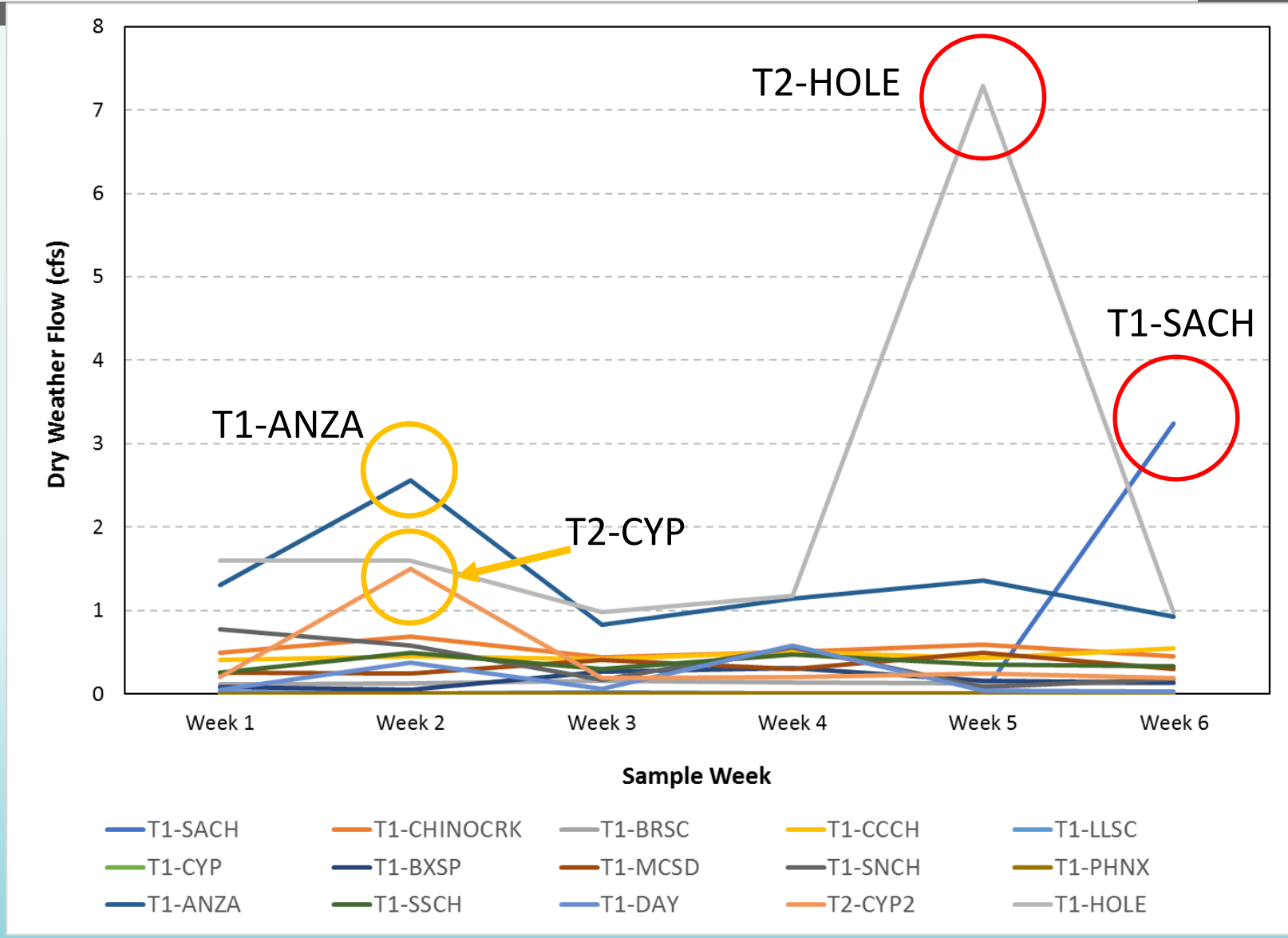
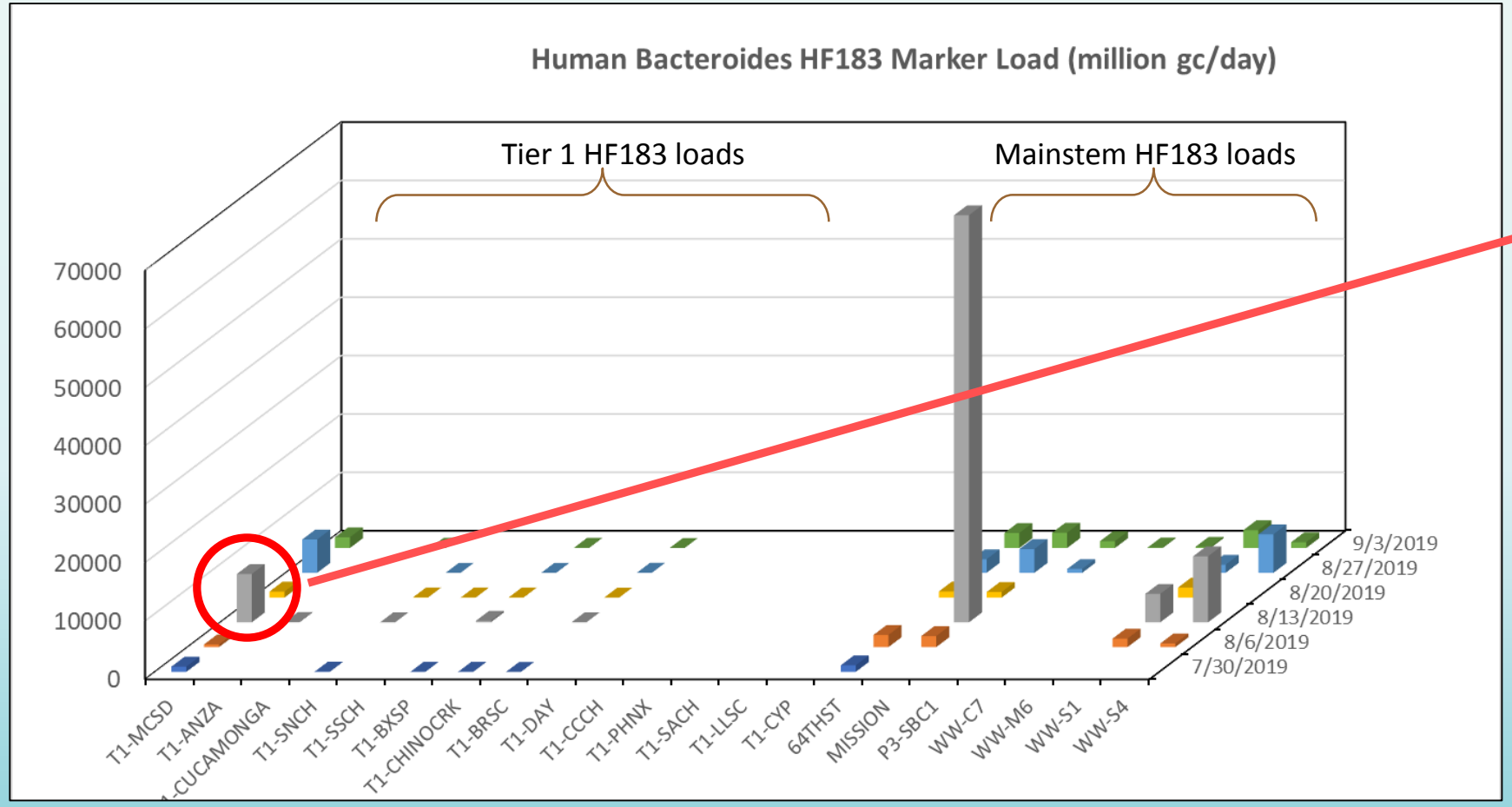
FINDING 6: ROLE OF DE MINIMIS DISCHARGES

- Two clear DWF anomalies observed (red) (Table B-1):
  - Week 5 - Hole Lake in Anza Drain (T2-HOLE) – cause unknown
  - Week 6 - San Antonio Channel (T1-SACH): Valve to capture DWF for groundwater recharge malfunctioned
- Two possible anomalies (yellow)
  - Week 2 – T1-ANZA
  - Week 2 – T2-CYP



FINDING 7: HF183 LOADS TRANSLATED TO FECAL CONTAMINATION

- Finding: Source tracking and elimination of isolated cases of human fecal contamination can be highly effective in improving water quality at MS4 outfalls in the MSAR watershed



Finding and eliminating relatively small upstream source(s) can be highly impactful at the outfall

FINDING 7: HF183 LOADS TRANSLATED TO FECAL CONTAMINATION

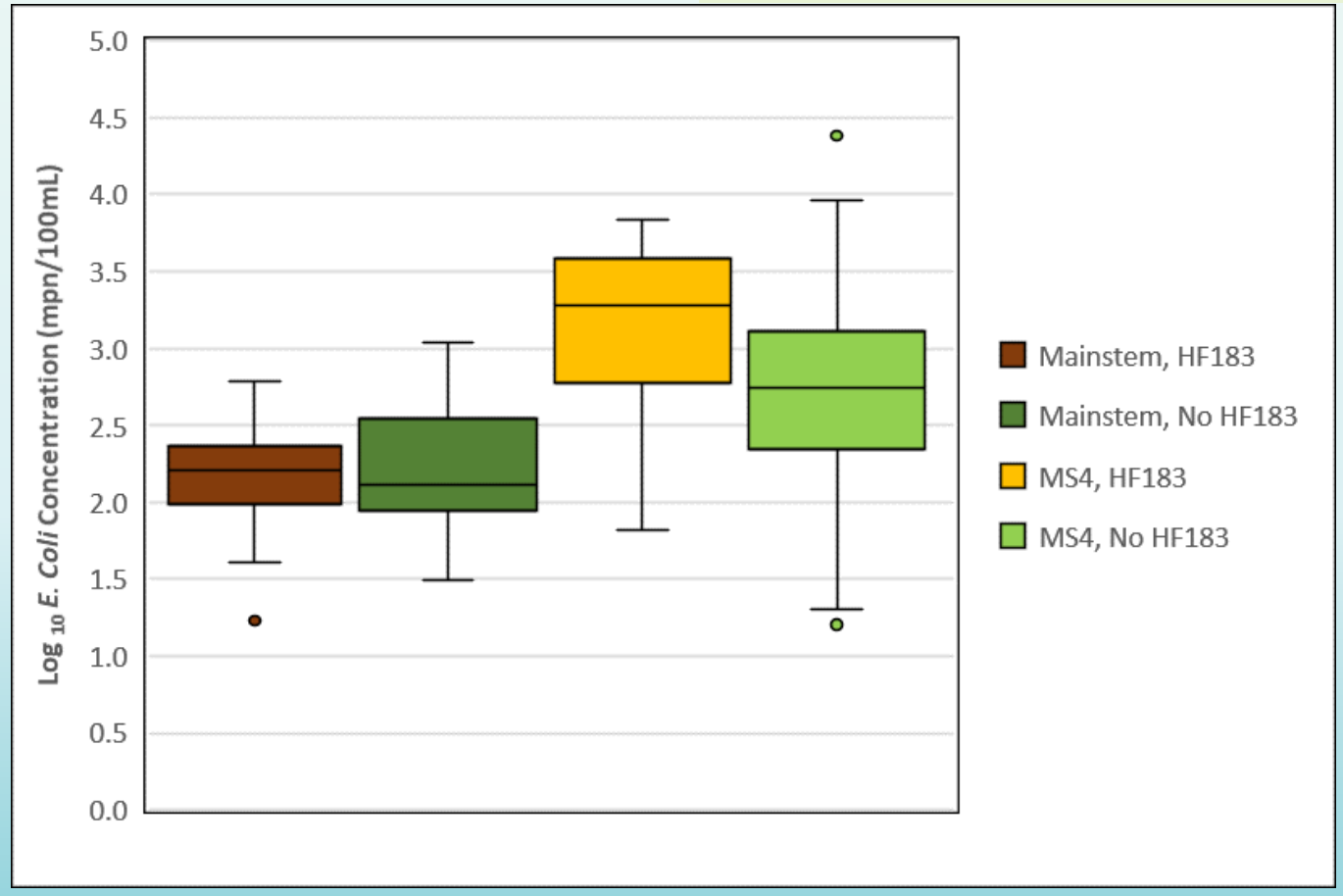
- Eliminating isolated human sources may also serve to reduce *E. coli* concentrations at the outfall

Table 3-13: Synoptic Study Report

MS4 Samples Only	N	E. coli Geomean (MPN/100 mL)	P-Value
HF183 Amplified	25	1,270	0.008*
HF183 Not Amplified	61	509	

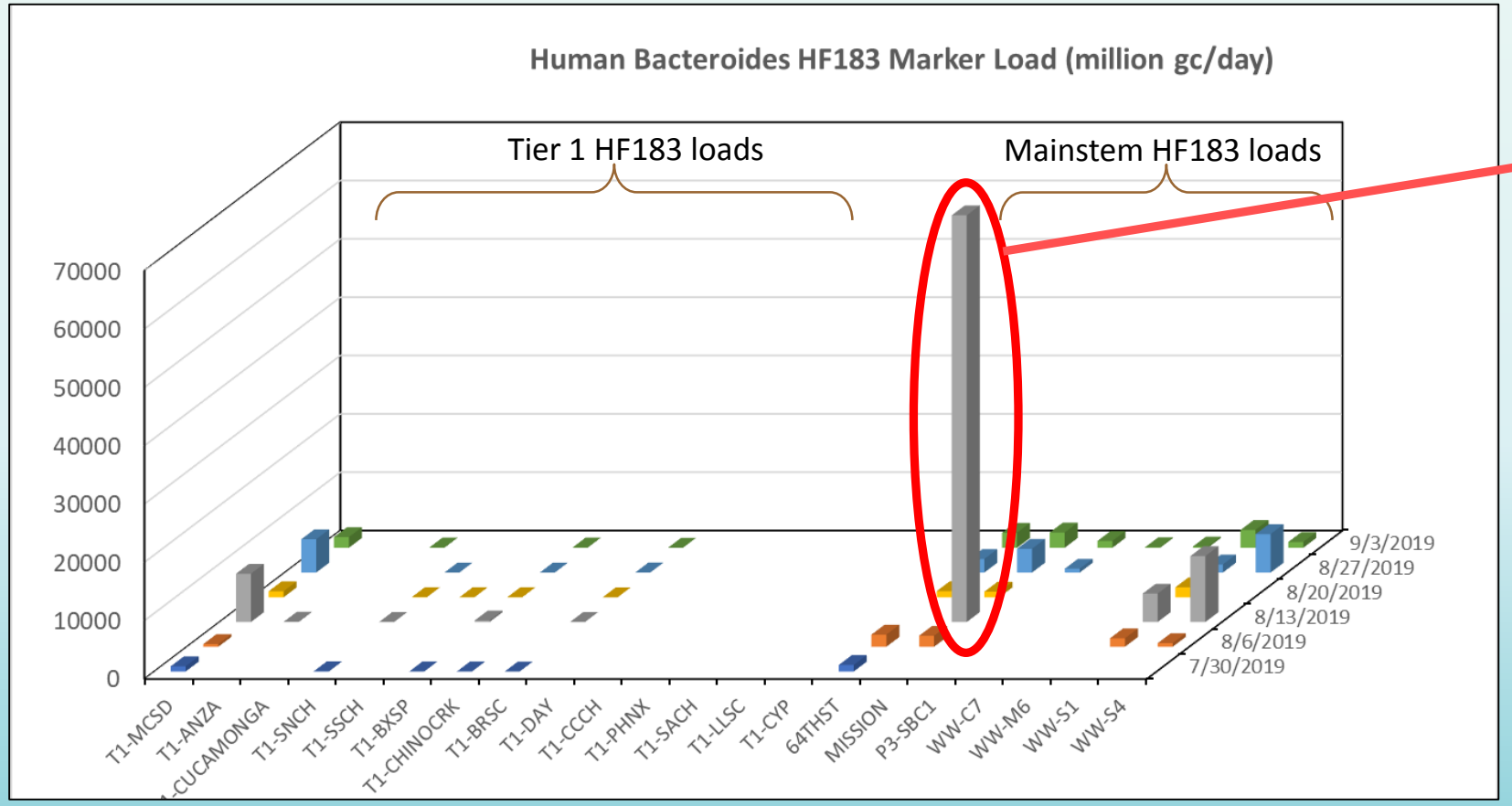
* - Significant at 0.05

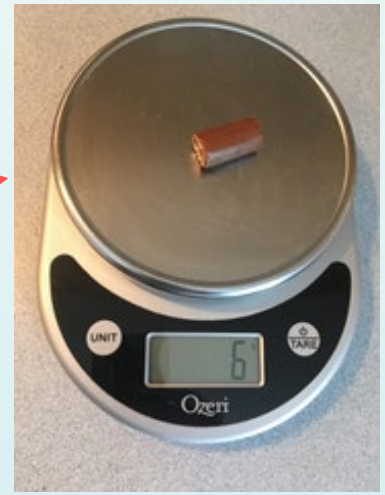
Figure 3-28: Synoptic Study Report



FINDING 8: HF183 LOADS ARE LARGER WITHIN SANTA ANA RIVER THAN FROM MS4

- Finding: Mitigating sources of *E. coli* bacteria within MS4 jurisdictions alone will not be enough to attain the *E. coli* water quality objectives at downstream watershed-wide compliance sites





In-stream sources of human fecal contamination existing outside of MS4 jurisdictions are evident

FINDING 9: HUMAN VERSUS NATURAL BACKGROUND SOURCES OF *E. COLI*

- Finding: Human bacteria signal has declined since 2012; receiving water *E. coli* more likely coming from natural background sources (sediment, biofilms, wildlife) than from homeless encampments, water recreation activities, or other controllable anthropogenic sources.

Figure 3-31: Synoptic Study Report

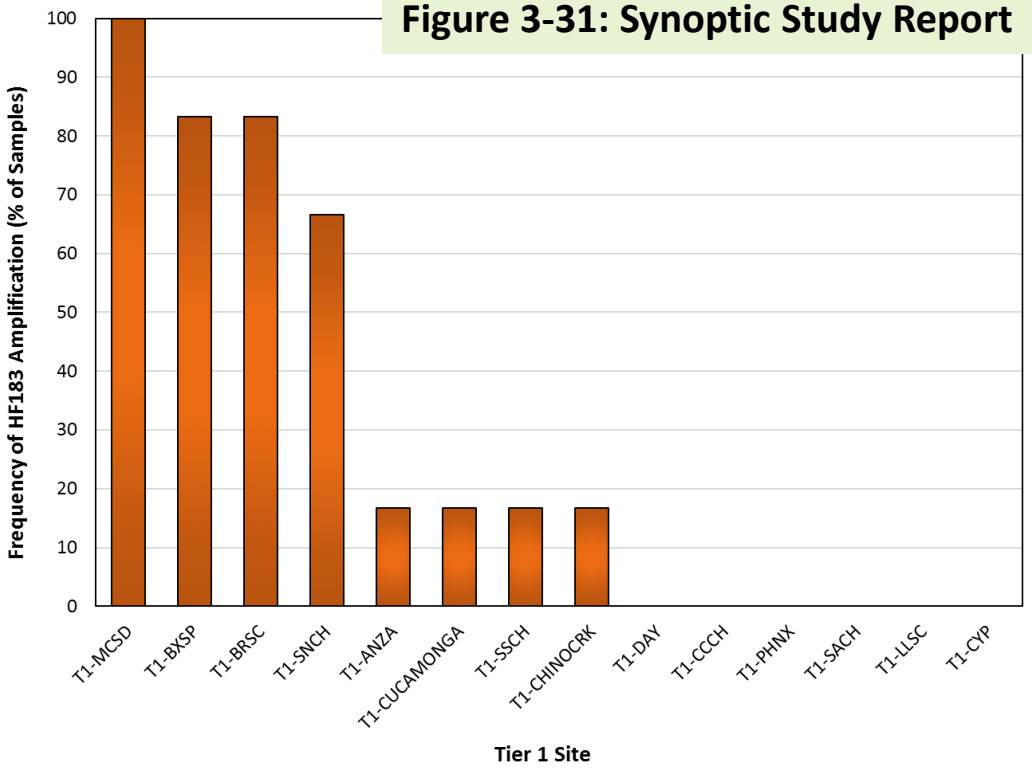
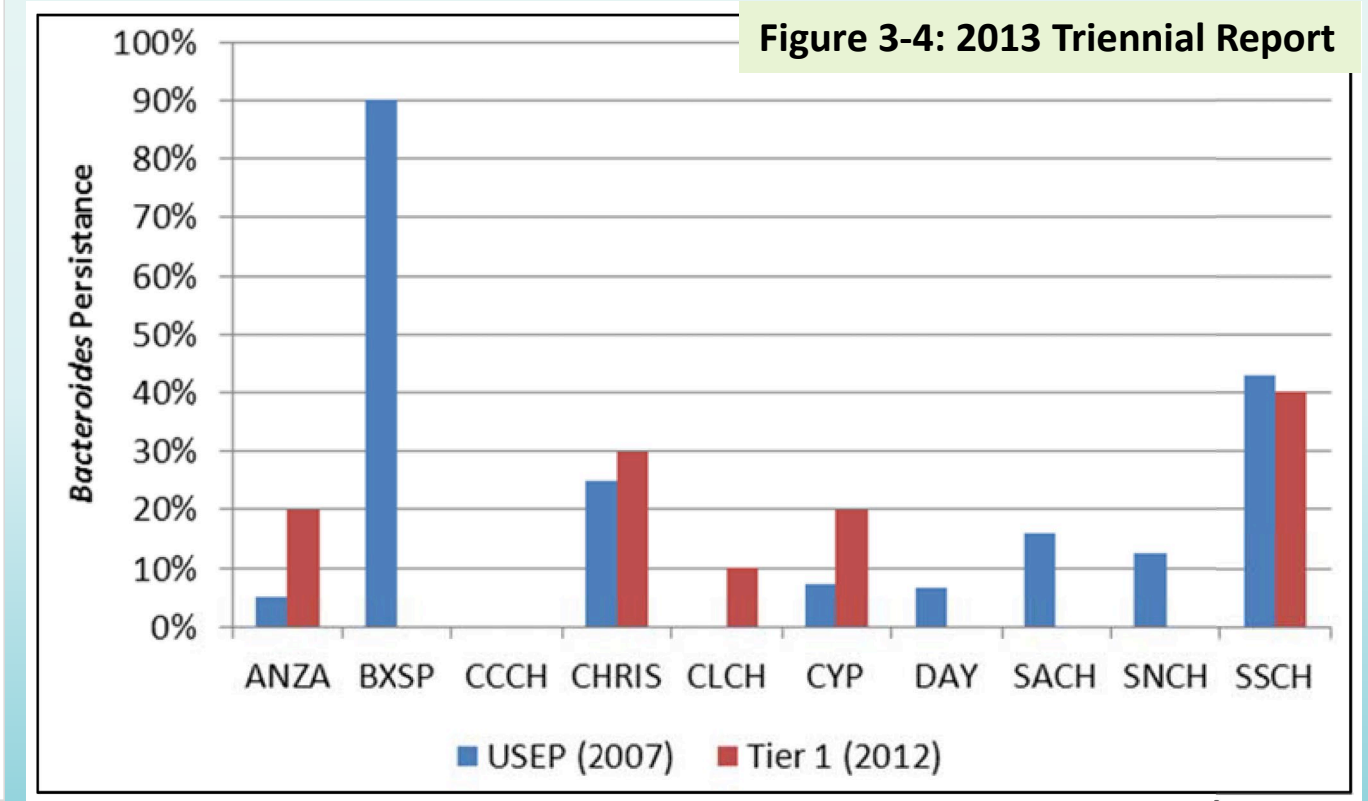


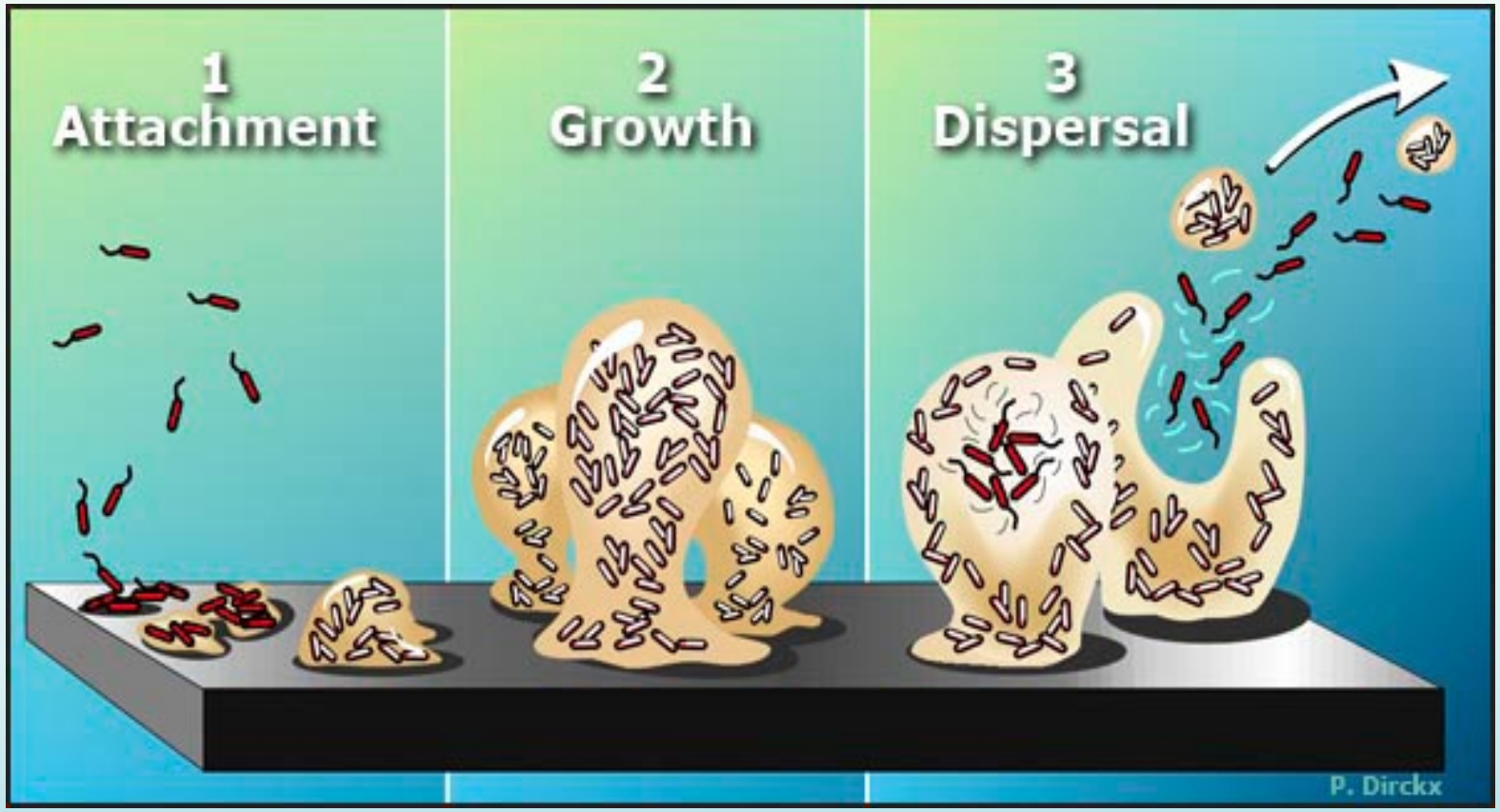
Figure 3-4: 2013 Triennial Report



REPORT RECOMMENDATIONS

RECOMMENDATION 1a: SPECIAL STUDY TO EVALUATE NATURALIZED *E. COLI* IN SANTA ANA RIVER BOTTOM

- General loading of indicator bacteria in mainstem Santa Ana River is hypothesized to be significantly influenced by releases from naturalized colonies



Free-floating bacteria attach to surface (EPS)

Bacteria colonize surface, produce complex three-dimensional structure that develops within hours

Bacteria can detach as small/large clumps/individual cells to propagate downstream

RECOMMENDATION 1a: SPECIAL STUDY TO EVALUATE NATURALIZED *E. COLI* IN SANTA ANA RIVER BOTTOM

- Grant et al 2007 study – Rise in load upstream to downstream not from growth within water – hypothesized that releases from naturalized colonies in sediment are a key source in the Santa Ana River
- As much as 2 trillion MPN of naturalized *E. coli* could potentially exist in Santa Ana River upstream from Mission Avenue (based on sediment samples from tributaries, reported in 2015 Uncontrollable Bacteria Sources Study)
- The 2019 dry season in-stream load at the MISSION site of 300 billion MPN/day could be explained by sloughing of ~15 percent per day
  - Recommendation for a site specific study into this uncontrollable source within non-MS4 segment to support scientific basis for planned TMDL revision

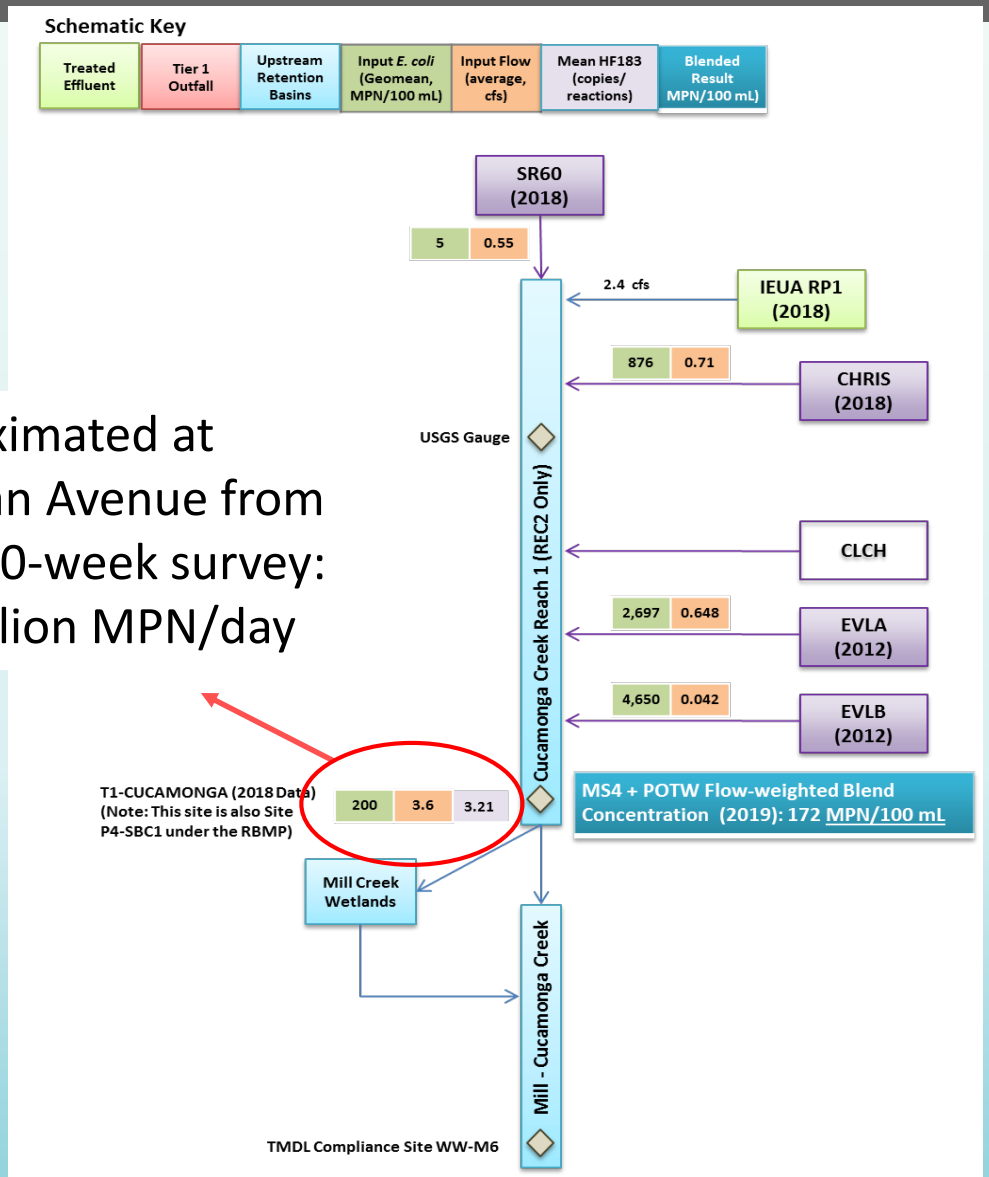
RECOMMENDATION 1a: SPECIAL STUDY TO EVALUATE NATURALIZED *E. COLI* IN SANTA ANA RIVER BOTTOM

- Collect site-specific data to assess the extent to which naturalized *E. coli* exists in the bottom sediments or biofilms of the Santa Ana River
  - Sediment samples over different seasons
  - Multiple sites within focus reach
  - Coupled with overlying water samples
- Quantification of key factors influencing colony formation, growth, and releases to overlying water (e.g., nutrients, dissolved organic carbon, and temperature, flowrate)
  - Releases occurring under turbulent (wet weather or large deminimus flows) and quiescent (typical dry weather) flow conditions
- Cost efficiency by coordination with routine Regional Bacteria Monitoring Program field efforts

RECOMMENDATION 1b: SPECIAL STUDY FOR MILL CREEK WETLANDS

- Objective – Evaluate Mill Creek Wetlands (MCW) effectiveness
- Approach - Compute *E. coli* load reduction achieved with MCW project, determine remaining load reduction needed to remove controllable loads from MS4 inflows

Approximated at Hellman Avenue from 2018 10-week survey: ~18 billion MPN/day



RECOMMENDATION 1b: SPECIAL STUDY FOR MILL CREEK WETLANDS

- Leverage ongoing *E. coli* sampling in Cucamonga Creek at Hellman antidegradation site (T1-CUCAMONGA), existing flow metering at diversion to Mill Creek Wetlands
- Coordinate water quality sampling with Tier 2 investigation in Eastvale
- Evaluate load reduction for a variety of effluent rates from RP1 to Cucamonga Creek

RECOMMENDATION 2: TIER 2 SOURCE INVESTIGATIONS IN MSAR SUBWATERSHEDS

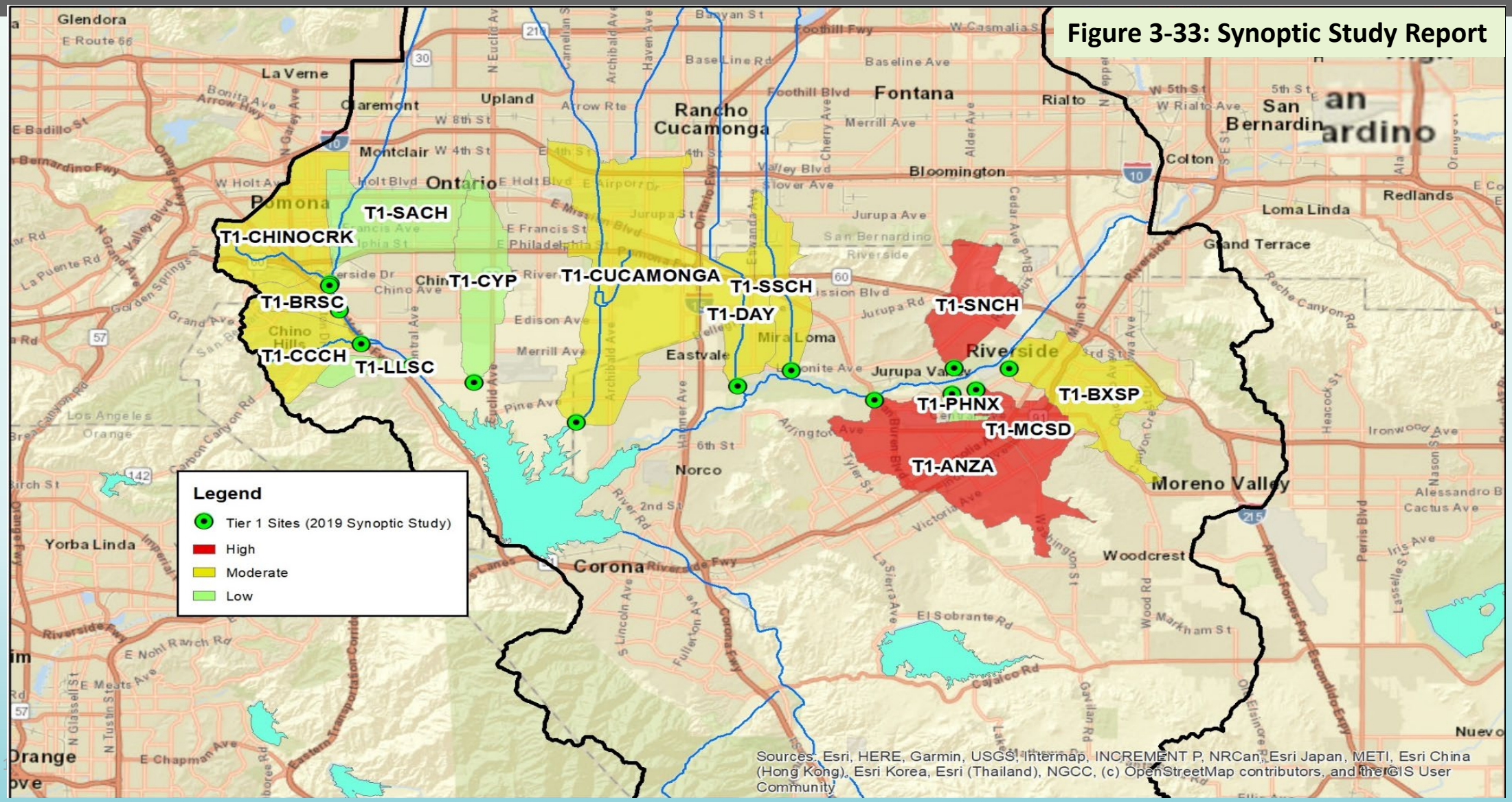


Figure 3-33: Synoptic Study Report

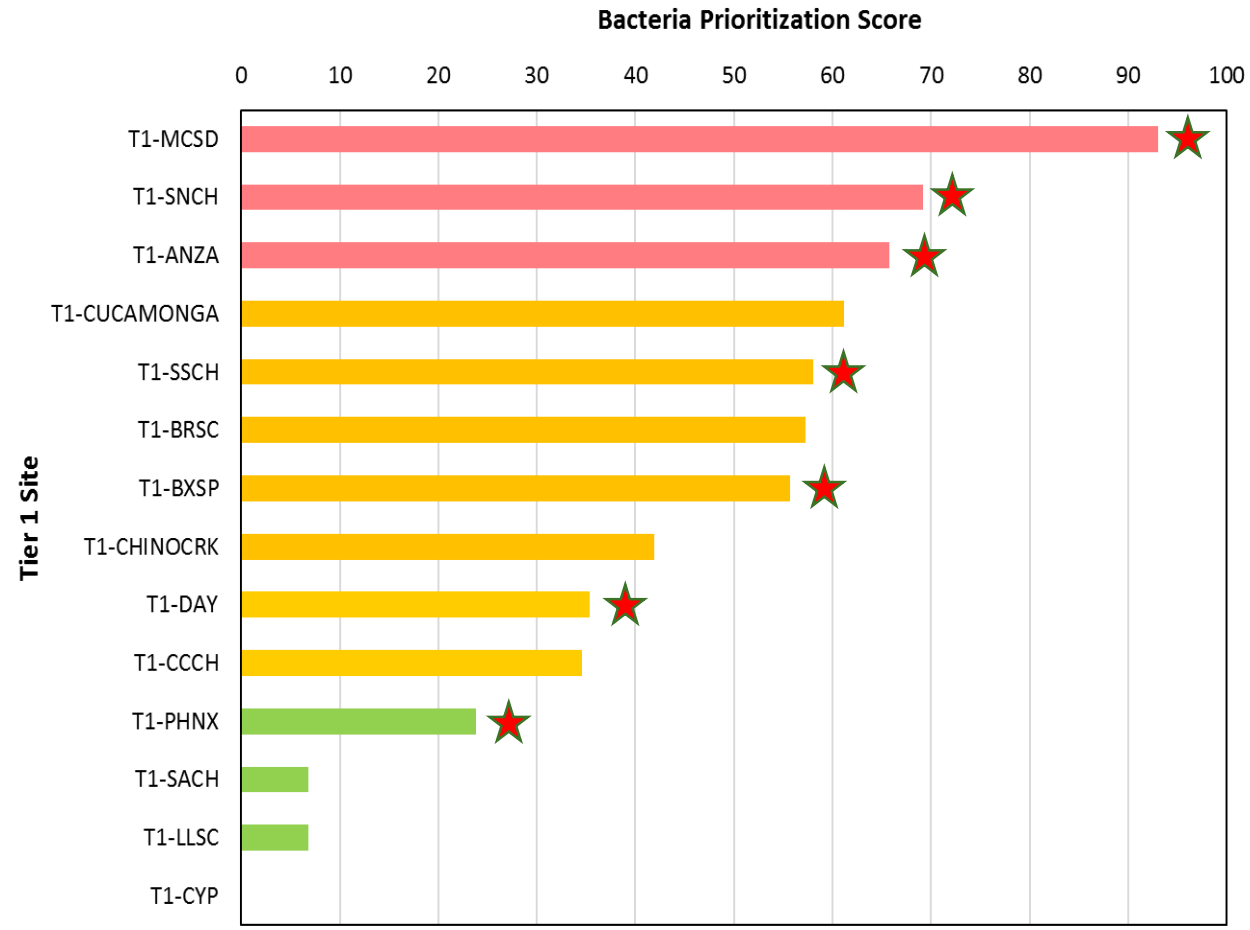
RECOMMENDATION 2a: TIER 2 SOURCE INVESTIGATIONS IN SANTA ANA RIVER REACH 3 SUBWATERSHED

- Of all Tier 1 sites investigated, the top three priorities are in the Santa Ana River subwatershed:
  - Magnolia Center Storm Drain (T1-MCSD);
  - Sunnyslope Channel (T1-SNCH); and
  - ANZA Drain (T1-ANZA)

Tier 1 Site	Relative Rank for Prioritization Criteria				BPS
	DWF	*E. coli* Loading	*Bacteroides* Frequency	Exposure Risk	
MCSD	92	85	100	100	93
SNCH	69	62	67	100	69
ANZA	100	69	17	100	66
SSCH	77	100	17	0	58
BXSP	31	38	83	100	56
DAY	38	46	0	100	35
PHXN	23	23	0	100	24

From Table 3-15: Synoptic Study Report

From Figure 3-32: Synoptic Study Report



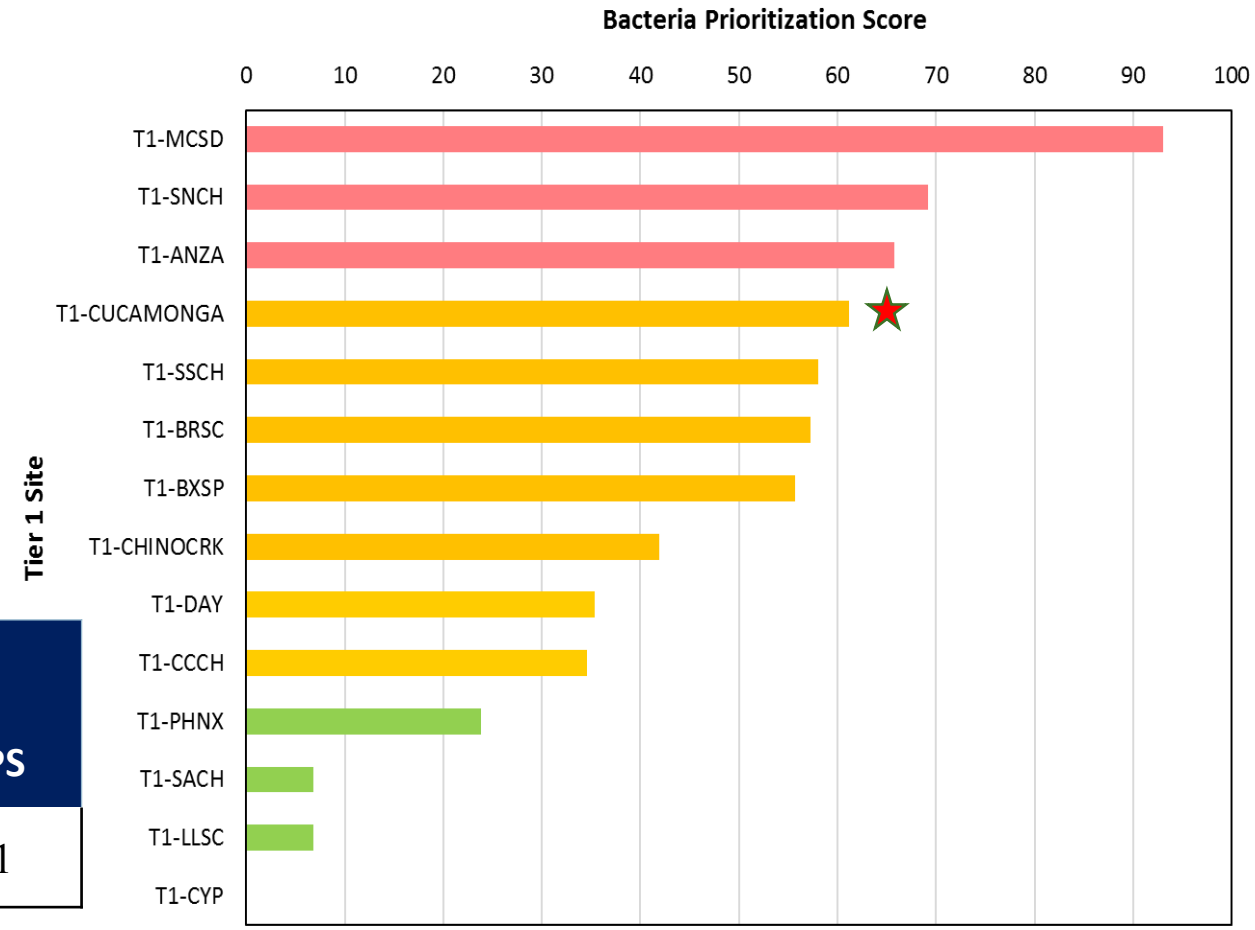
RECOMMENDATION 2b: TIER 2 SOURCE INVESTIGATIONS IN CUCAMONGA CREEK SUBWATERSHED

- T1-CUCAMONGA is only Tier 1 site in subwatershed
  - Complete Chris Basin retrofit;
  - Evaluate water quality at Tier 1 site after Chris Basin Project completed;
  - Re-evaluate T1-EVLA/T1-EVLB; and
  - Coordinate with Mill Creek Wetlands Study, if authorized

Tier 1 Site	Relative Rank for Prioritization Criteria				BPS
	DWF	*E. coli* Loading	*Bacteroides* Frequency	Exposure Risk	
CUCAMONGA	62	92	17	100	61

From Table 3-15: Synoptic Study Report

From Figure 3-32: Synoptic Study Report



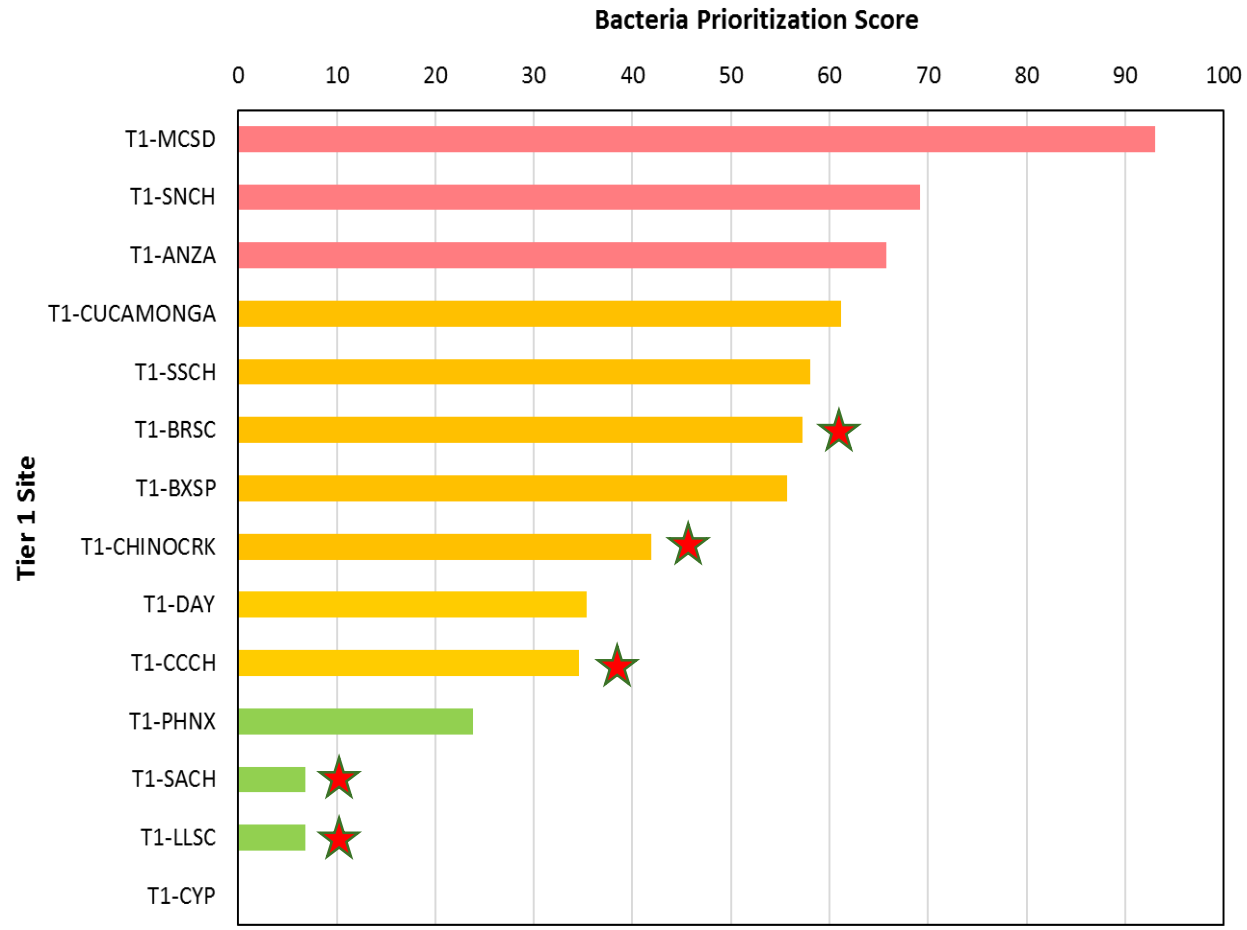
RECOMMENDATION 2c: TIER 2 SOURCE INVESTIGATIONS IN CHINO CREEK SUBWATERSHED

- Tier 2 investigations recommended to further identify sources of bacteria and DWF in the MS4 and options to mitigate those sources

Tier 1 Site	Relative Rank for Prioritization Criteria				BPS
	DWF	*E. coli* Loading	*Bacteroides* Frequency	Exposure Risk	
BRSC	54	54	83	0	57
CHINOCRK	46	77	17	0	42
CCCH	85	31	0	0	35
SACH	8	15	0	0	7
LLSC	15	8	0	0	7

From Table 3-15: Synoptic Study Report

From Figure 3-32: Synoptic Study Report



RECOMMENDATION 3: WATER QUALITY PROGRAM ENHANCEMENTS

- Add the Santa Ana River MISSION site to the RBMP as part of the TMDL compliance monitoring program.
- Regular sample collection from this location will provide data to support the upcoming revision of the TMDL by providing information on bacteria loads in the river that are not derived from an MS4 source.

RECOMMENDATION 4: PREPARATION FOR TMDL REVISION

- Begin work on a strategy for TMDL revision, including, but not necessarily limited to:
  - Developing the approach to revise the WLAs and LAs;
  - Identify the components that should be revised, e.g., dry/wet seasons vs. dry/wet weather;
  - Identify any additional data needs to effectively revise the TMDL;
  - Approach for addressing the wet weather component of the TMDL given the allowable high flow suspension in the Basin Plan.

NEXT STEPS

NEXT STEPS – PREPARATION OF FINAL REPORT (TRIENNIAL REPORT)

- Written comments on current draft by Close of Business January 27, 2020
- Prepare Final Synoptic Study Report, aka Triennial Report, based on comments received
- Submit to SAWPA by February 10 for submittal to Santa Ana Water Board by February 15, 2020