

SANTA SUSANA FIELD LABORATORY



PUBLIC MEETING SITE-WIDE SUMMARY OF ACTIVITIES

August 11, 2020

SSFL Stormwater Expert Panel

With support from
Geosyntec
consultants

Meeting Orientation

2

Meeting Objectives

- Provide opportunity for the Stormwater Expert Panel to provide an update on stormwater sampling results and management activities at SSFL, and respond to questions raised in a recent public survey
- Provide interested members of the public an opportunity to ask additional questions of the Stormwater Expert Panel

Agenda

4:00 – 5:15 pm Panel Presentation

5:15 – 6:00 pm Respond to Questions

Meeting Orientation

3

Proposed Ground Rules

- Please submit your questions using the Q&A feature on Zoom
 - If unable to use Q&A feature please call 818-466-8800 to submit your questions for the expert panel
- We will answer your questions after the presentation
- Focus your questions on topics addressed by the Stormwater Expert Panel
- Please treat everyone in the meeting with kindness and respect

Outline

4

- Background and Panel Introduction
- Public Survey Responses
- SSFL Stormwater Overview
- Key Findings this Year
- Previously-Submitted Questions from the Public
- Summary

5

Background

Stormwater Expert Panel Introduction

6

- Dr. Bob Gearheart, PE, Humboldt State University
- Jon Jones, PE, Wright Water Engineers
- Dr. Michael Josselyn, WRA Consultants
- Dr. Bob Pitt, PE, University of Alabama
- Dr. Michael Stenstrom, PE, University of California, Los Angeles
- *Panel consultant: Geosyntec*



Panel's Ongoing Role and Scope

7

- Independent panel formed in response to the 2007 Cease and Desist Order from the RWQCB
 - *"...a panel to review site conditions, modeled flow, contaminants of concern, and evaluate the BMPs capable of providing the required treatment to meet the final effluent limits."*
- Ongoing Charge (2015 Permit)
 - Review NPDES compliance and BMP performance monitoring data
 - Investigate **site-wide** stormwater pollutant sources
 - Make recommendations for new BMPs or improvements to existing BMPs
 - Review Stormwater Human Health Risk Assessment (HHRA)
 - Public outreach



SSFL Overview

8

- Former rocket testing and energy research facility
- Industrial activities have ceased and facilities removal is underway
 - Nuclear energy research operations ceased in 1989
 - Rocket engine testing operations ended in 2006
- Current activities include environmental monitoring/sampling, remediation planning, and demolition
- Numerous stormwater Best Management Practices (BMPs) to treat stormwater from developed and undeveloped areas



NPDES Permit Overview

9

- Stormwater discharges at SSFL are regulated by the LARWQCB through an individual NPDES permit, which requires:
 - Composite sampling at 12 stormwater outfalls; and
 - Compliance with approximately 50 Numeric Effluent Limits (NELs) – protective of both human health and aquatic life
- NELs for a wide range of constituents, including:
 - Dioxins (TCDD TEQ): 0.0000000028 µg/L (ppb)
 - Total Iron: 300 µg/L (ppb)
 - Total Lead: 5.2 µg/L (ppb)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION
320 W. 4th Street, Suite 300, Los Angeles, California 90013
Phone (213) 575-3800 • Fax (213) 575-6640
http://www.arwdnet.org

ORDER NO. RA-2010-0090
NPDES NO. CA001309

WASTE DISCHARGE REQUIREMENTS FOR THE BOEING COMPANY,
SANTA SUSANA FIELD LABORATORY

The following Discharger is subject to waste discharge requirements as set forth in this Order.
Table 1 Discharger Information

Discharger	The Boeing Company
Name of Facility	Santa Susana Field Laboratory
Facility Address	5800 Woodley Canyon Road Canaan Park, CA 91304-1148
	Ventura County

The U.S. Environmental Protection Agency (USEPA) and the Regional Water Quality Control Board have classified this discharge as a minor discharge.

The discharge by the Owner from the discharge points identified below is subject to waste discharge requirements as set forth in this Order.

April 6, 2010
Revised: May 20, 2010
Revised: June 3, 2010

10

Public Survey Responses

Public Survey Responses:

Please rank your level of interest in the following stormwater-related subjects.

11

1. Stormwater pollutant source assessment of 2019/2020 rainy season NPDES exceedances
 - 5 of 12 respondents identified this as their #1 interest
2. Post-wildfire watershed recovery assessment (hydrologic and water quality recovery since the 2018 Woolsey Fire)
 - 4 of 12 respondents identified this as their #1 interest
3. 2019/2020 rainy season NPDES stormwater compliance monitoring results
 - 5 of 12 respondents identified this as their #2 interest
4. Treatment performance of stormwater control measures
5. Lifecycle and maintenance of stormwater control measures
6. Description of existing structural stormwater control measures and treatment systems

Public Survey Responses:

Please rank your level of interest in the following areas.

12

7. Southern buffer zone (Outfall 001 and 002 watersheds)
 - 8 of 12 respondents identified this as their #1 interest
8. Silvernale stormwater treatment system (Outfall 018)
9. Northern Drainage (Outfall 009 watershed)
10. Happy Valley (Outfall 008 watershed)

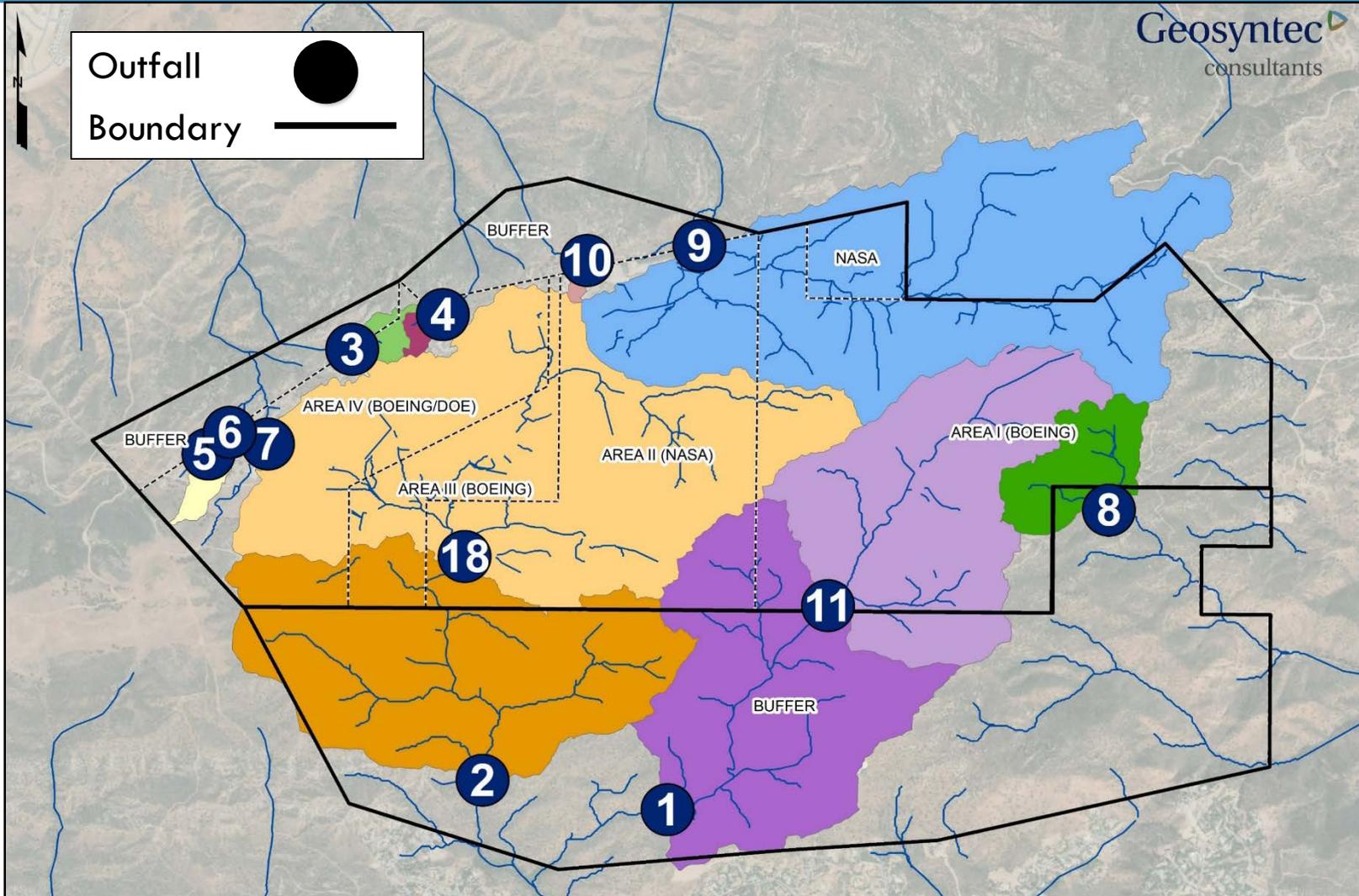
13

SSFL Stormwater Overview

SSFL NPDES Outfalls

14

Geosyntec
consultants



Simi Valley

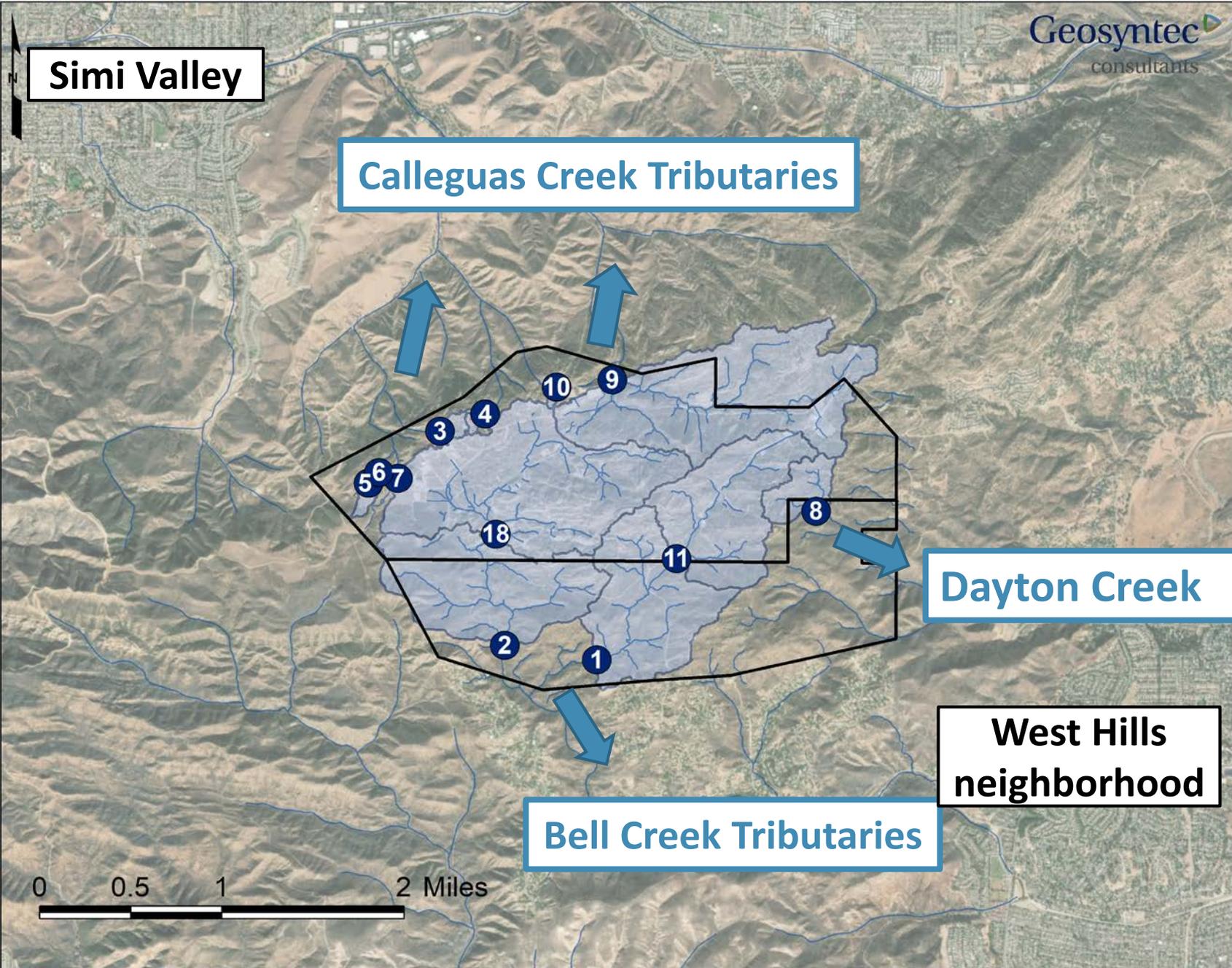
Calleguas Creek Tributaries

Dayton Creek

**West Hills
neighborhood**

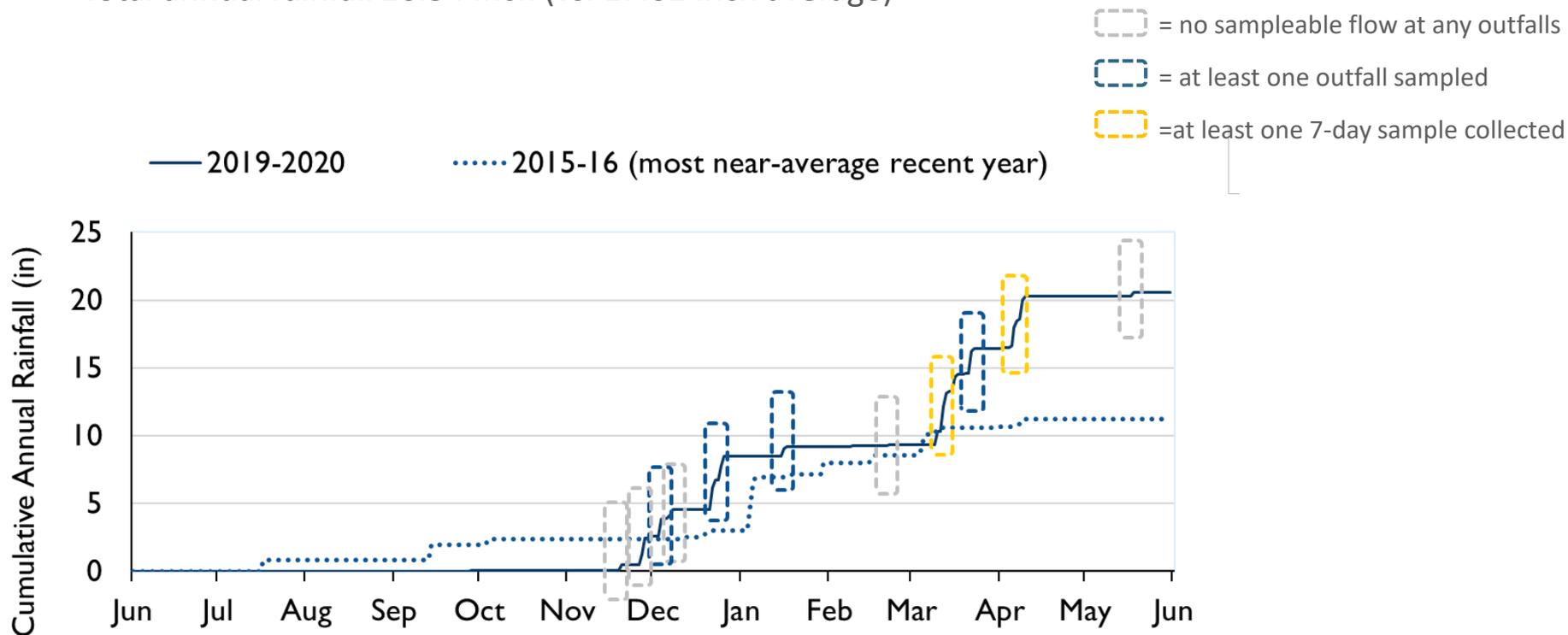
Bell Creek Tributaries

15



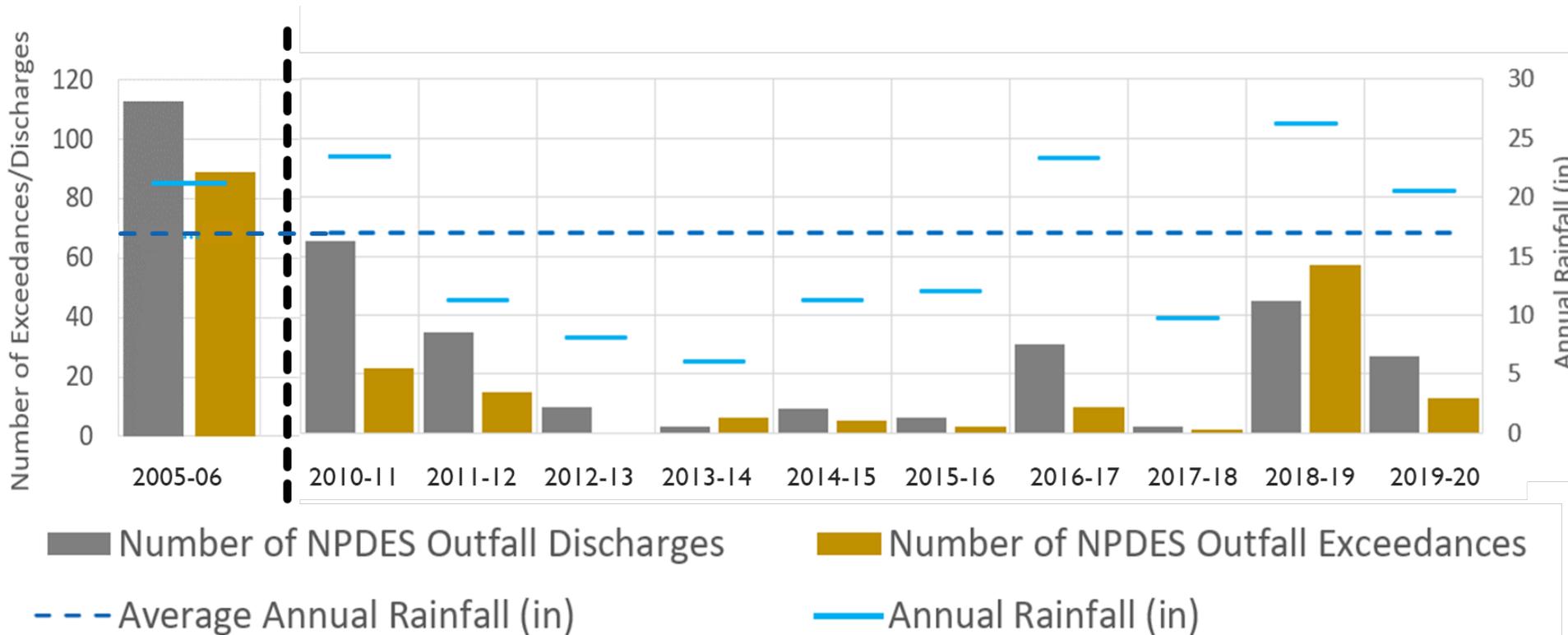
2019-2020 was a wetter than average year

- Nine qualifying rain events (>0.10 inch in 24-hrs)
 - 21 discharge samples and 5 seven-day follow up samples
 - Only one storm was larger than the 24-hr 1-year recurrence interval storm (2.5-in) and had a 24-hr storm depth of 2.65 inches (1-yr event)
- Total annual rainfall 20.54 inch (vs. 17.02 inch average)

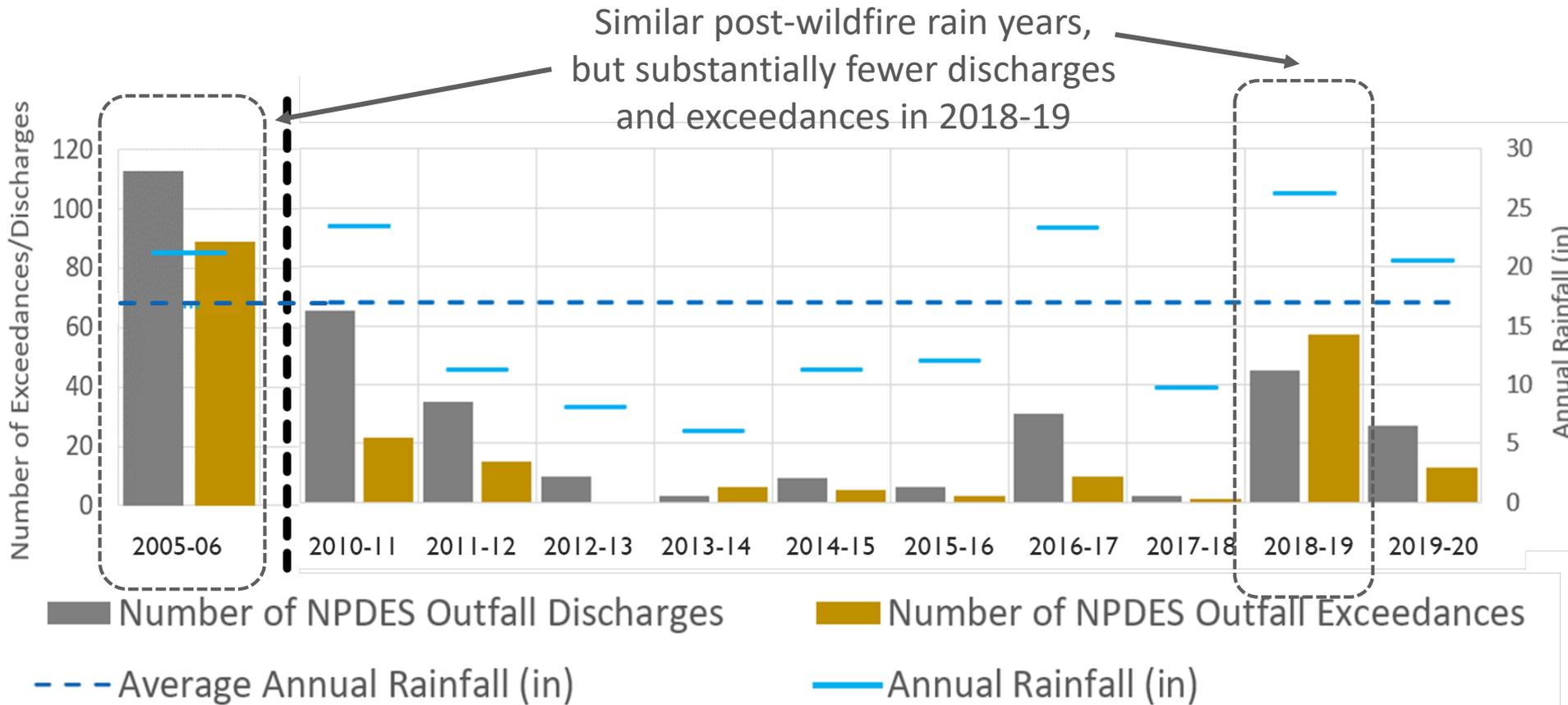


Historical Overview – NPDES Sampling All SSFL Outfalls

17

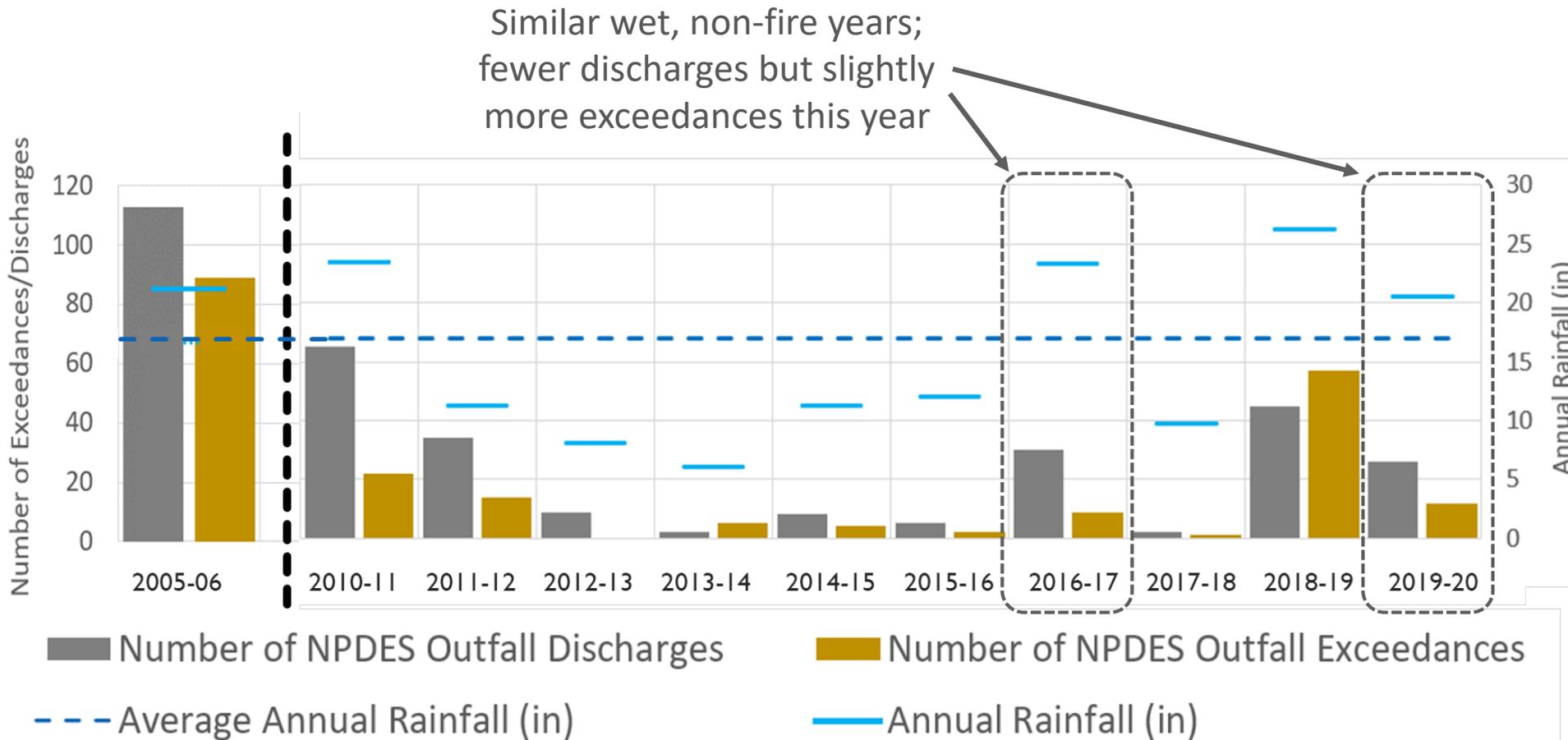


Historical Overview – NPDES Sampling All SSFL Outfalls



Historical Overview – NPDES Sampling

All SSFL Outfalls



2019/2020 NPDES Benchmark Exceedances (No Limit Exceedances)

20

Parameter	Outfall 001	Outfall 002	Outfall 008	Outfall 009	Outfall 018	Total
Gross Alpha	1*	0	0	0	0	1
Iron	3	3	NR	NR	0	6
Lead	1	0	0	0	0	1
Manganese	1	0	NR	NR	0	1
TCDD TEQ (no DNQ)	2	1	0	0	0	3
Total Exceedances	8	4	0	0	0	12
Total Sampling Events	3	9	5	5	4	26

NR = this parameter does not have a regulated permit effluent limit at this outfall.

* Quarterly Monitoring Report reported one exceedance for gross alpha (14.1 +/- 3.6 pCi/L), but noted this result was indeterminate compared to the daily max benchmark (15 pCi/L) and that OF001 annual average (3.65 +/- 0.64 pCi/L) was below, therefore concluding gross alpha at OF001 was in compliance for the reporting year.

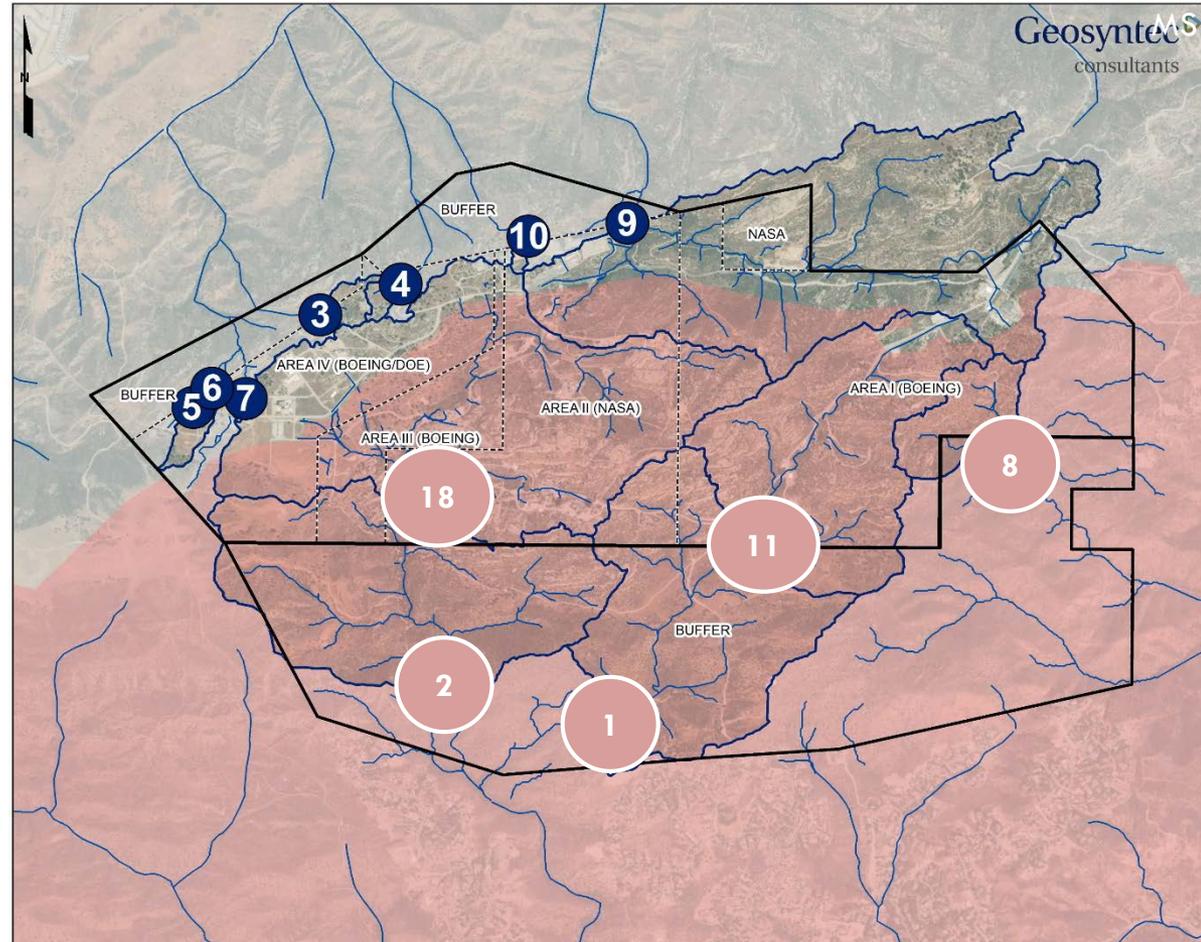
Key Findings This Year

#1: Exceedance counts and concentrations have fallen markedly since last year's post-fire conditions, and we're now back to near normal (pre-fire) water quality conditions

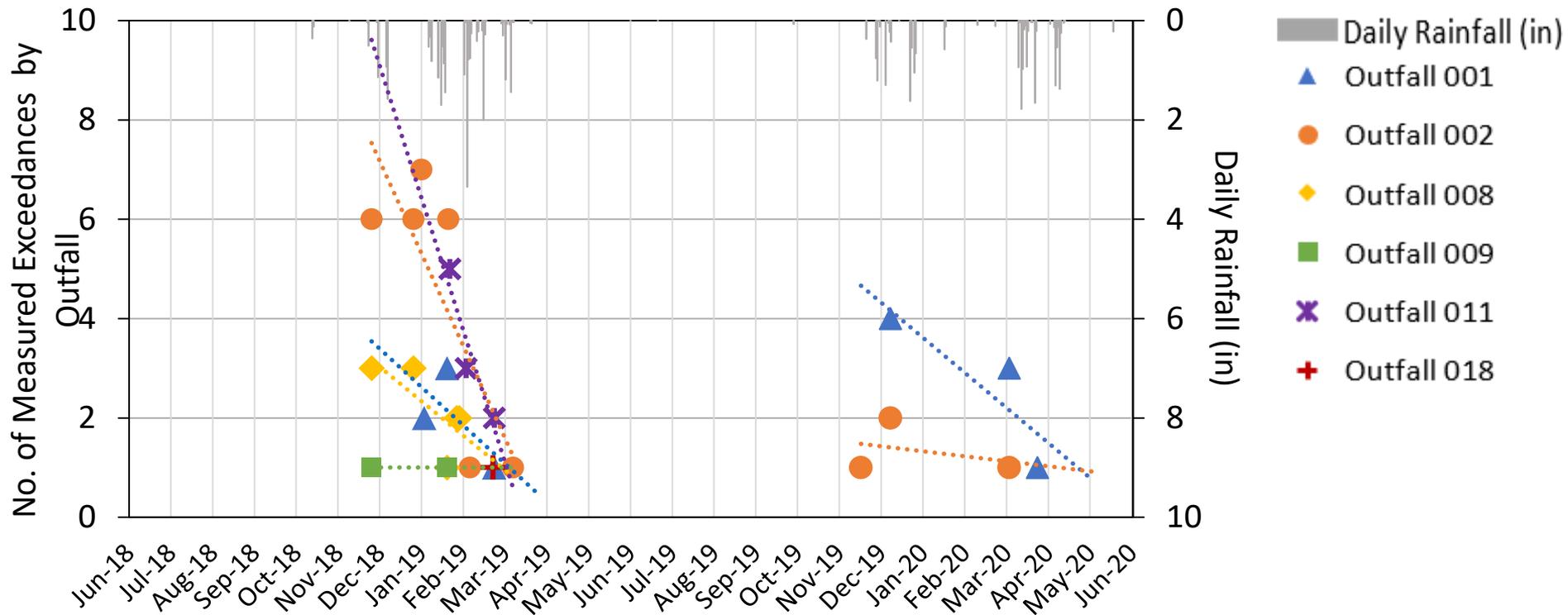
Woolsey Wildfire Extent

22

- 79% of site burned in November 2018
- Outfall watersheds most impacted:
 - Outfall 011/001
 - Outfall 018/002
 - Outfall 008
- Last wildfire was in 2005 (Topanga)

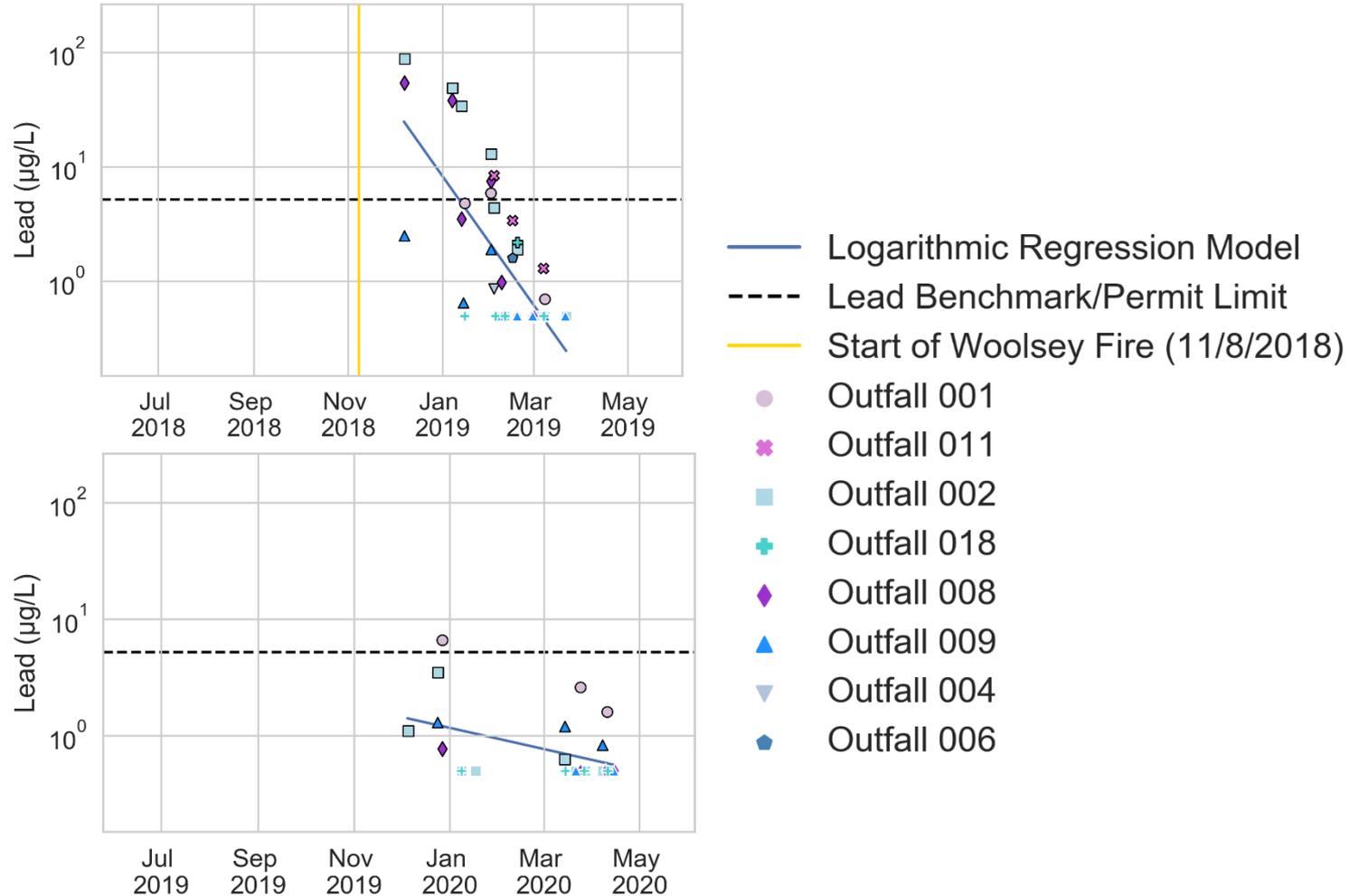


Number of Permit Limit and Benchmark Exceedances are Decreasing with Time



Concentrations are Decreasing With Time (Lead Example)

24

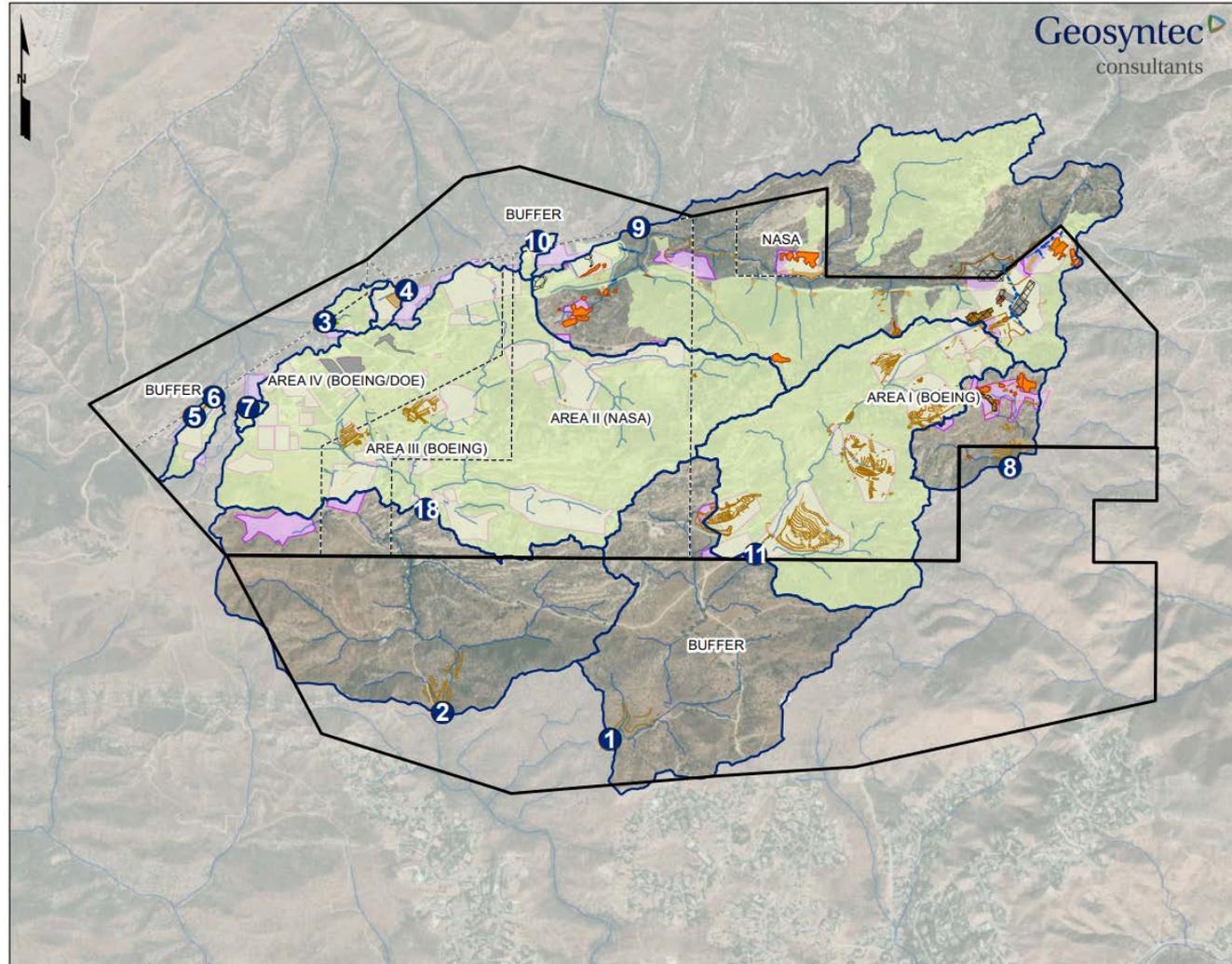


Note: Markers with a black border signify detected results.
 Markers without a border signify non-detected result and are shown at the method detection limit.

Key Findings This Year

#2: The BMPs and Storm Water Treatment Systems (SWTS) generally continue to be very effective

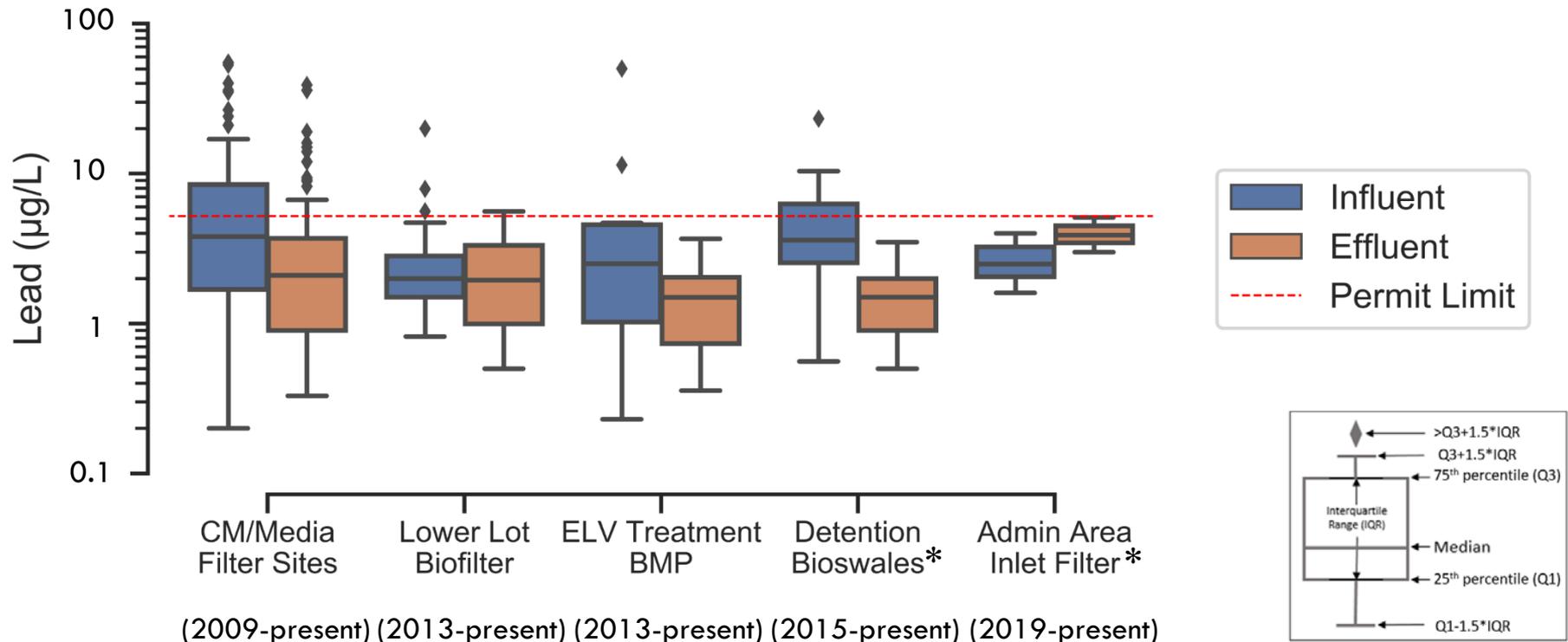
Structural treatment controls target RFI and other critical source areas



009 Watershed BMP Performance Results (Lead Example)

27

Lead concentrations are significantly reduced for most BMP types with performance monitoring

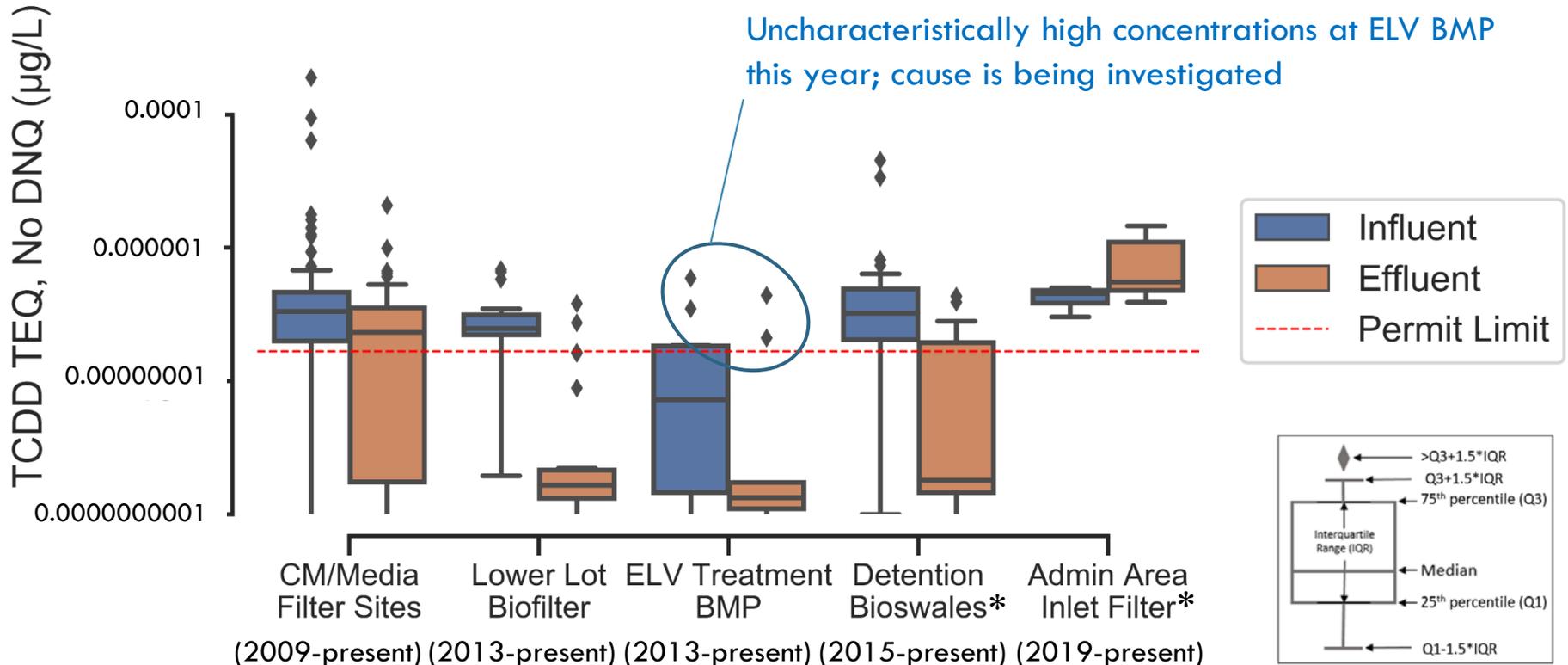


Most of the storms less than 1-inch are contained in the lower lot biofilter and not discharged to the Northern Drainage.

* Effluent flows to Lower Lot Biofilter as part of BMP treatment train

009 Watershed BMP Performance Results (Dioxins Example)

28



* Effluent flows to Lower Lot Biofilter as part of BMP treatment train

Key Findings This Year

#3: Boeing and NASA continue to implement expert panel recommendations

Review of 2019 BMP Recommendations

30

Watershed	Recommendation	Status
001 & 002	New subarea monitoring in buffer zone to evaluate sources of recent exceedances	✓
008	Condition assessment of post-fire erosion and sediment controls and vegetation reestablishment, and repairing or supplementing where needed	✓
009	Add rock check structure for pretreatment upstream of CM-3, and replace clogged filter media	✓
009	Monitor CM-9 for signs of clogging	✓
009	Add generator as back-up power for biofilter cistern pump	✓

Review of 2019 BMP Recommendations

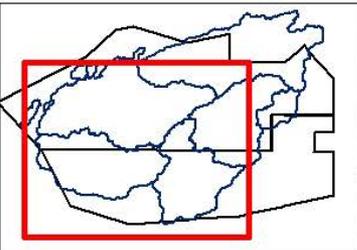
31

Watershed	Recommendation	Status
011	Make Stormwater Treatment System (SWTS) operational (including repair of fire-damaged electrical system)	
018	Assess feasibility of increasing pond capacity to allow more stormwater to be treated by SWTS	Permitting feasibility being evaluated
018	Assess feasibility of reconstructing Outfall 018 media filter (for treatment of occasional SWTS overflows)	
Buffer Zone	Add filter socks and wattles around treated wood utility poles	
Sitewide	Stockpile erosion control materials as feasible to minimize emergency response time	
Sitewide	Test variety of hydromulch products for NPDES pollutant content	

Key Findings This Year

#4: Expert panel continues to evaluate stormwater runoff from potentially impacted areas and recommends treatment as appropriate

Southern Buffer Zone Subarea Monitoring Study



Legend

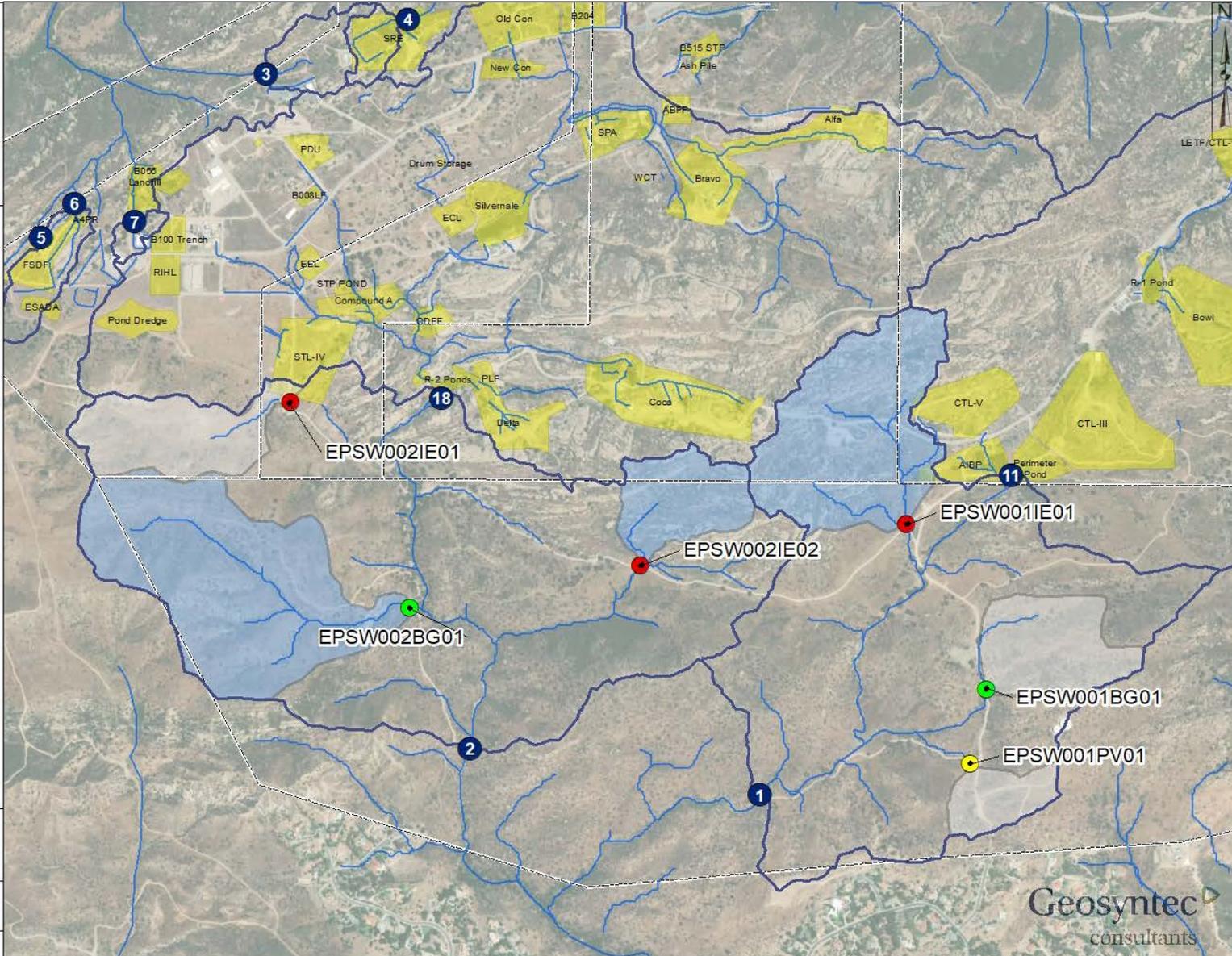
- NPDES Outfall
- Subarea Monitoring Location
- Potentially Impacted Soils
- Background (with paved areas)
- Background (natural unimpacted areas)
- Drainage
- NPDES Drainage Areas
- Drainage Subarea Sampled
- Drainage Subarea Not Sampled
- Administrative Boundary
- RFI Site Boundary

0 500 1,000 2,000 Feet

2019-2020 RFI Areas and Outfall 001 and 002 Subarea Monitoring Locations

Santa Susana Field Laboratory
Ventura County, CA

August 2020



Geosyntec
consultants

Southern Buffer Zone Sources and Conditions

34



Utility Poles (dioxin source)
Wattles later added



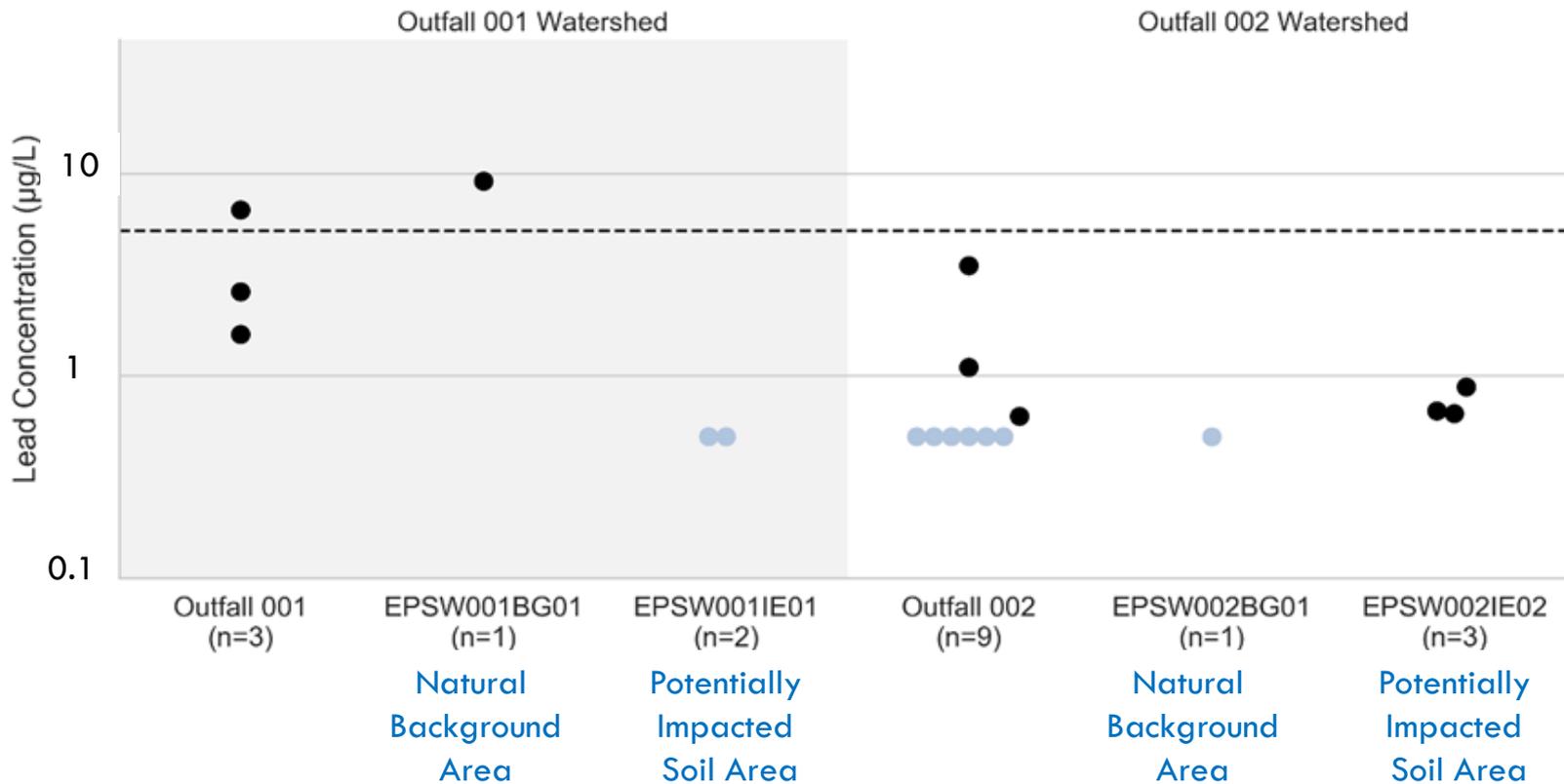
Metal Stakes (iron source)



Vegetation Recovery Looking Southeast toward OF001
(taken ~20 months post-fire)

BUFFER ZONE SUBAREA SAMPLING RESULTS: Lead Example (2019/2020 Season)

Potentially impacted soils do not appear to be contributing to exceedance at downstream outfall (001).



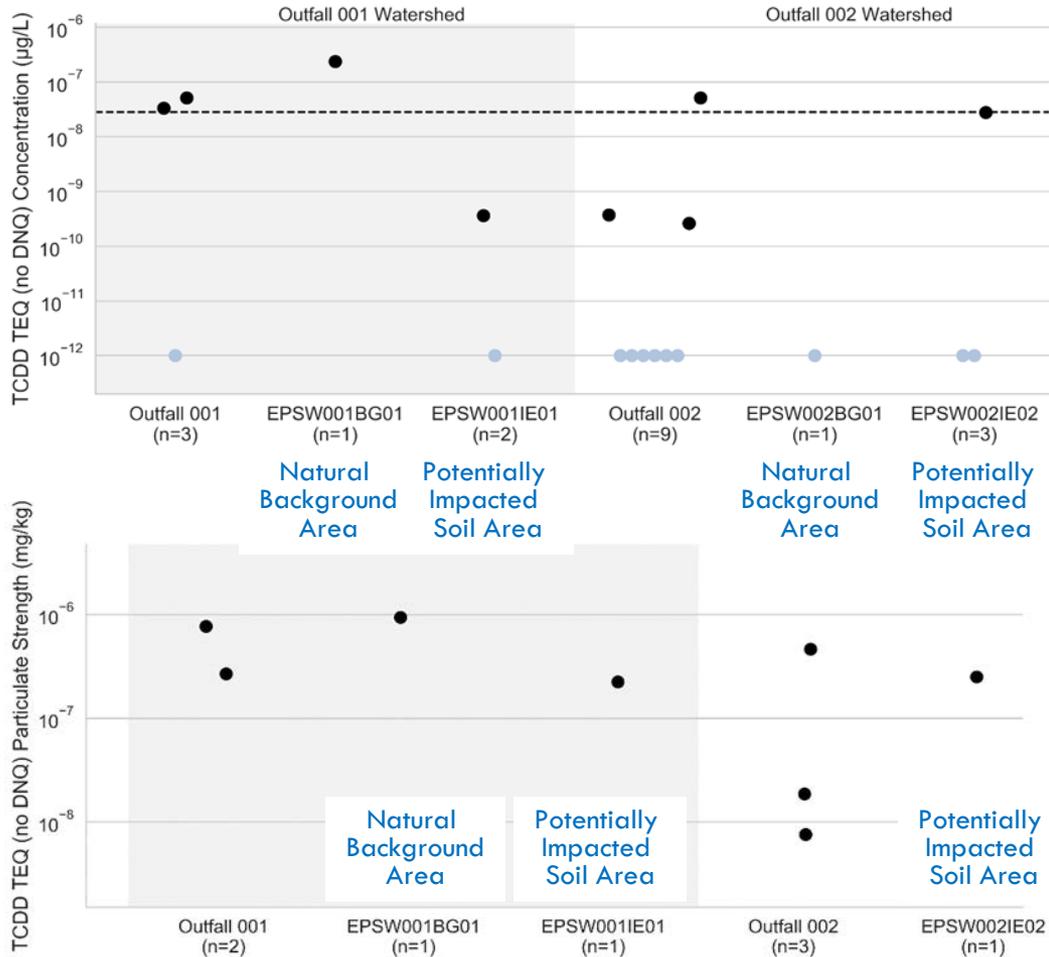
---- Lead Benchmark/Effluent Limit

Note: Black markers signify detected results.

Light gray markers signify non-detected results and are shown at the method detection limit.

BUFFER ZONE SUBAREA SAMPLING RESULTS: Dioxin Example (2019/2020 Season)

36



----- TCDD TEQ (no DNQ) Benchmark/Effluent Limit
 Note: Black markers signify detected results.
 Light gray markers signify non-detected results and are shown at the method detection limit.

Potentially impacted soils do not appear to be contributing to exceedance at downstream outfalls (001, 002). Highest concentration and particulate strength seen at background subarea.

Note: Black markers signify detected results. Gray markers signify estimated particulate strengths calculated using the method detection limit for the non-detected dissolved fraction results. Particulate strengths are not shown for samples where the total concentrations were not detected.

Treated Wood Pole BMPs

37

Wattles added to approximately 115 Poles



Cleared bases at 88 Poles



Key Findings This Year

#5: The recent benchmark exceedances are believed to be due to background soil, soil near treated wood, atmospheric deposition, pavement solids, metal pipe supports, and potentially impacted soils

Constituent Source Evaluation

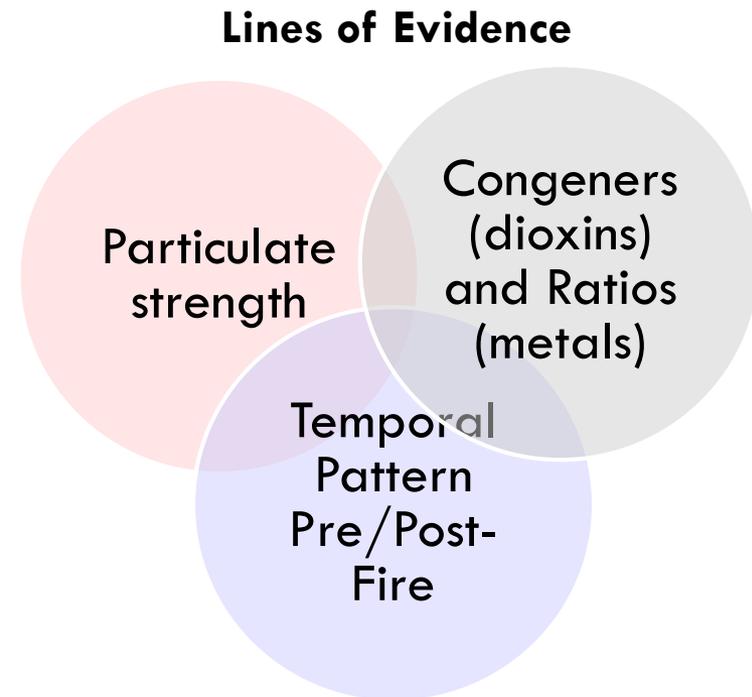
39

- Potential Sources Evaluated

- Soils from former operational and contaminated areas
- Pavement solids
- Treated wood and adjacent soils
- Atmospheric deposition
- Natural background soils

- Lines of Evidence

- Particulate strength
- Spatial patterns
- Temporal patterns
- Fingerprinting (congeners for dioxins and ratios for metals)



Key Findings:

Preliminary Constituent Source Analysis

40

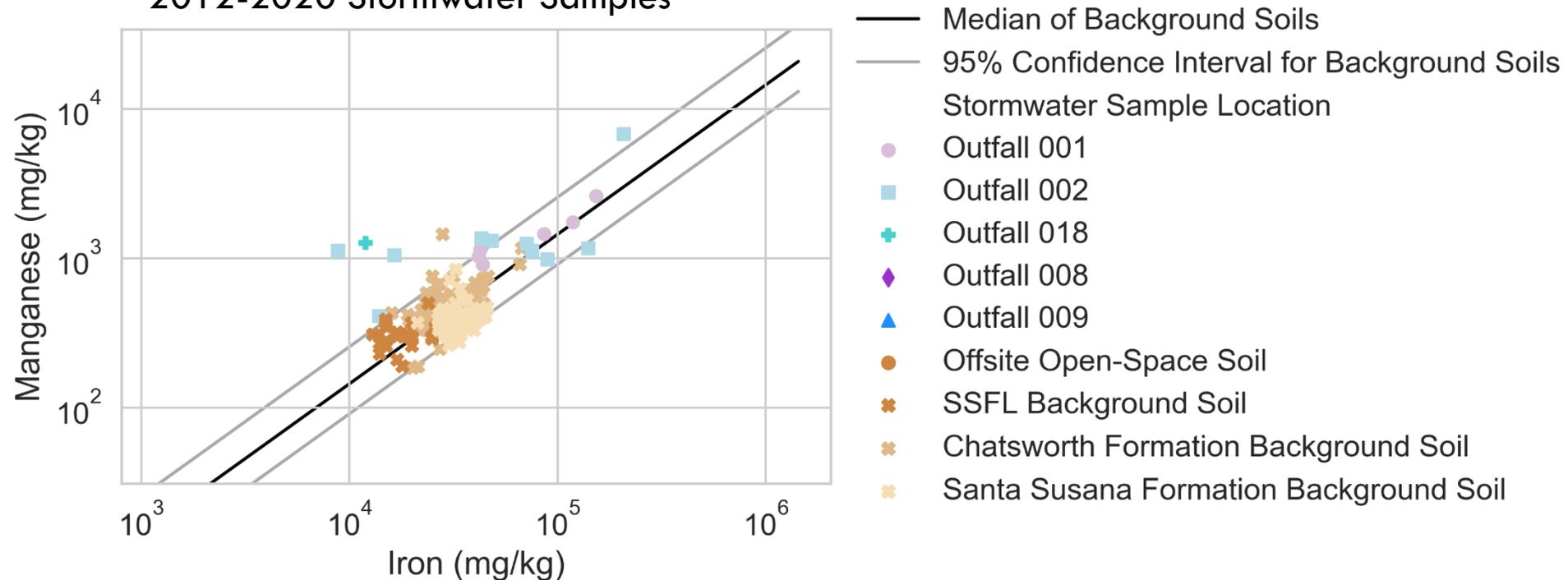
Exceeding Constituent (Outfall Exceeding in 2019/2020)	Potential Sources Determined Through Forensic Evaluation
Iron (OF001 and OF002)	Natural background soils, metal pipe supports (001)
Lead (OF001)	Natural background soils, pavement solids, atmospheric deposition
Manganese (OF001)	Natural background soils
Dioxins (OF001 and OF002)	Pavement solids (OF001), soils near treated wood, natural background soils, and potentially impacted soils
Gross Alpha* (OF001)	Natural background soils (only naturally occurring radionuclides detected)

*One exceedance for gross alpha counted here (14.1 +/- 3.6 pCi/L) was indeterminate when compared to the daily max benchmark of 15 pCi/L but the annual average for OF001 (3.65 +/- 0.64 pCi/L) was below so gross alpha at OF002 was in compliance for 2019, as reported in the DMR.

Example Source Analysis Technique: Iron Ratios

41

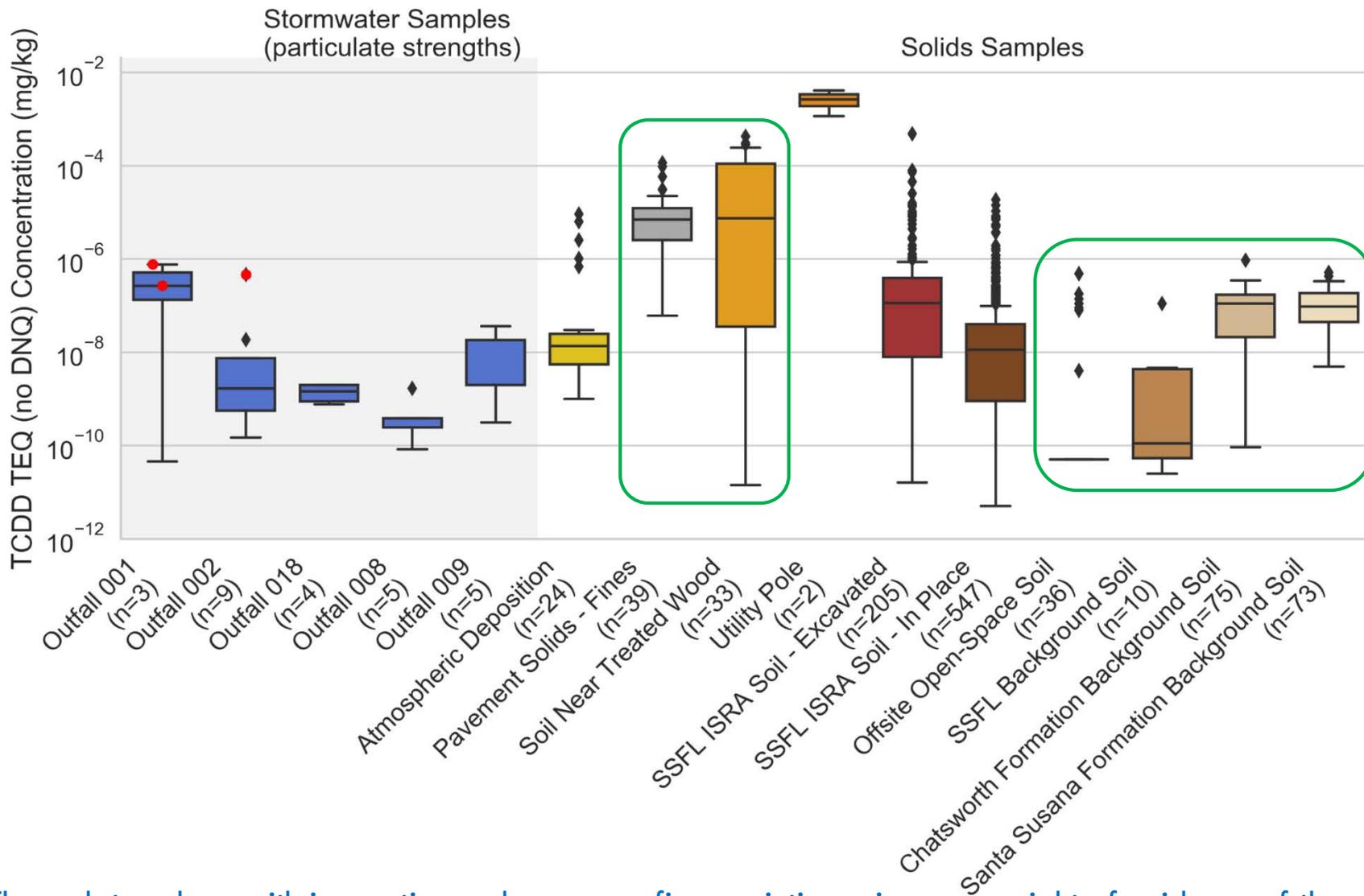
Iron Ratios Analysis of
2012-2020 Stormwater Samples



Linear background soil data show soils have a consistent Mn:Fe ratio, thereby supporting the basis of using other constituent ratios to Mn or Fe as a tool to assess whether background soils are a primary source

Example Source Analysis: Dioxins

42

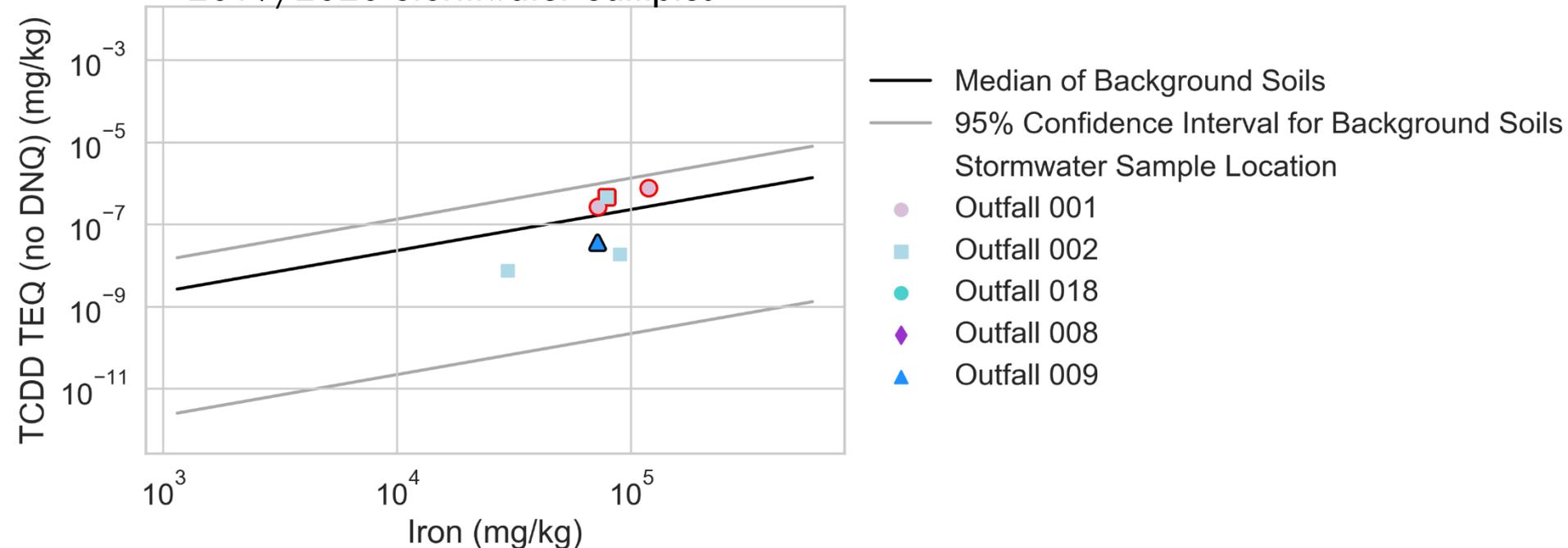


These data, along with iron ratios and congener fingerprinting, give us a weight of evidence of the sources

Example Source Analysis: Dioxins

43

Iron Ratios Analysis of
2019/2020 Stormwater Samples



Dioxin:Iron ratios confirm background soils as primary source of recent exceedances at OF001, 002

Red marker border = exceedance, Black marker border = detected

Key Findings This Year

#6: The Annual Report will again make new BMP and monitoring recommendations

Preliminary Recommendations (Examples)

45

- Evaluate removal of pipe support stakes (iron source)
- Add wattles around additional treated wood poles (dioxin source)
- Continue to evaluate subarea sample results from Southern Buffer Zone (to further hone in on sources)
- Continue to monitor CM-9 clogging potential as it nears the end of its useful life before needing media replacement
- Continue to evaluate areas for erosion risk and add erosion controls as necessary

46

Questions from the Public

Questions from Public

47

- Relationship between "exceedances" and any human or ecological health impacts. For example, are current permit standard levels unnecessarily low or not low enough (possibly compared with natural waters) to protect both?
 - EP Response: All permit limits and benchmarks are based on the protection of human health or aquatic life, although iron and manganese benchmarks are based on secondary aesthetic limits for drinking water. Exceedances may indicate a risk to human health or aquatic life. However, a recent stormwater HHRA found no elevated risks to human health and was accepted by the Regional Board and the State Office of Environmental Health Hazard Assessment, two agencies under CalEPA.
- What is the impact of SSFL storm water on the L. A. River at various reaches? Is it detectable? Same question re: Arroyo Simi.
 - EP Response: A small amount of stormwater comes from SSFL relative to LA River and Arroyo Simi watersheds. SSFL runoff makes up 2.1% of LA River at the Sepulveda Basin and 2.8% Arroyo Simi at Meier Canyon, and the rest of these watersheds are highly urbanized with limited BMPs (so constituent concentrations will be different).
- What native plant restoration efforts would serve best to mitigate run-off issues.
 - EP Response: Coastal sage scrub are adapted to recovering naturally to about 95% of cover within two years of a fire based on a study done in the Santa Monica mountains. Two years of above-average rainfall at SSFL helped support regrowth of herbaceous vegetation.
- What proactive measures have been considered and/or recommended to minimize risk of recurrent wildfire damage including damage to the water handling and treatment systems (such as relocating pipes underground to protect them, pre stationing of fire fighting equipment at SSFL to improve time & effectiveness of response, etc).
 - EP Response: DOE proactively started removal of buildings in Area IV in 2020 to prevent spread of contaminants. Boeing has set up an effective procurement process to get erosion control supplies promptly when needed. Generators were added as an alternative power source for stormwater BMPs in the event of power outages.

Questions from Public

48

- Stormwater quality in Coca Drainage and performance of outfall 18
 - EP Response: Stormwater runoff from Coca flows to the Silvernale SWTS which has the highest level of treatment onsite. OF018 had three treated stormwater discharges this year from the SWTS and had no exceedances.
- Likely part of the plan - what is the timing expected so this can be determined to be satisfactorily controlled and cleaned for water quality purposes? How will the water treatment be affected by the various cleanup options? Can you compare the expected effect on water remediation, of the "Conservation of Natural Resources" Soil Remediation proposal compared to the alternative "AOC LUT Values"? Please include proposed time to have the remediation completed for each alternative in your response.
 - EP Response: The stormwater expert panel has no involvement in remedial scenario selection or timing. As examples of the panel's involvement during remediation planning, lower lot BMPs were implemented in anticipation of increased traffic and staging necessary for future cleanup operations and the panel reviews SWPPPs for demolition areas.
- I would like to know why we are no longer getting Annual Summaries of the Storm Water Reports with Executive Summaries, so that we do not have to go to each quarterly report to try to look at the exceedances. I have not been able to review the reports since the Storm Water Panel's meeting last year. I think it is important to point out when some exceedances are likely from Background such as minerals that we know are naturally highly occurring due to the Background Studies done by DTSC and the EPA. Also, it is important to note when bacteria is most likely from wildlife, and when gross alpha is most likely from naturally occurring radionuclides if that is the likely case. Thank you.
 - EP Response: Boeing's quarterly reports include what was previously included in the annual summaries and these are publicly available online on the Boeing website. The expert panel also prepares an annual report each year to summarize exceedances, causes of exceedances, and recommendations. The causes of exceedances are investigated using SSFL background soil data and other data sources documented in the annual report. These are available online on the Boeing website as well.

Summary

49

1. Exceedance counts and concentrations have fallen markedly since last year's post-fire conditions, and we're now back to near normal (pre-fire) water quality conditions
 - o No permit limit exceedances, only benchmark exceedances (OF001 and OF002 only)
2. The BMPs and SWTS generally continue to be very effective
 - o Optimization continues
3. Boeing and NASA continue to implement expert panel BMP recommendations
4. Expert panel continues to evaluate stormwater runoff from potentially impacted areas and recommends treatment as appropriate
5. The benchmark exceedances are believed to be due to background soil, soil near treated wood, atmospheric deposition, pavement solids, metal pipe supports, and potentially impacted soils
6. This year's Annual Report will again include new BMP and monitoring recommendations

Questions

50

THANK YOU

Additional Information (e.g., Annual Report, Panel Presentations, NPDES Permit, and Technical Reports):
www.boeing.com/principles/environment/santa-susana