

SANTA SUSANA FIELD LABORATORY



PUBLIC MEETING SITE-WIDE SUMMARY OF ACTIVITIES

July 17, 2019

SSFL Stormwater Expert Panel

With support from
Geosyntec
consultants

Meeting Orientation

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Meeting Objectives

- Provide opportunity for the Stormwater Expert Panel to provide an update on post-fire 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

6:30 – 7:45 pm Panel Presentation

7:45 – 8:30 pm Respond to questions

Meeting Orientation

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Proposed Ground Rules

- Please hold your questions until after the presentation
- Take turns asking questions and focus your questions on topics addressed by the Stormwater Expert Panel
- Please treat everyone present tonight with kindness and respect

Santa Susana Field Laboratory

DTSC protects Californians and their environment from exposure to hazardous wastes by enforcing hazardous waste laws and regulations

July 19, 2019

Calabasas, CA



Department of Toxic Substances Control



Cal/EPA

DTSC's Regulating Authority at SSFL

- The Los Angeles Regional Water Quality Control Board regulates surface water leaving the Santa Susana Field Laboratory (SSFL) site through an industrial discharge permit
- All other media are regulated by DTSC under its Resource Conservation and Recovery Act (RCRA) authority
 - Several sites at SSFL operated under RCRA permits to store and treat hazardous waste
 - RCRA provides the framework for corrective action (cleanup) at permitted sites where hazardous waste has been released to the environment

DTSC Community Involvement for SSFL

- View DTSC's SSFL website:
https://dtsc.ca.gov/sitecleanup/santa_susana_field_lab/
- Subscribe to the SSFL E-list
- Review the Monthly SSFL Progress Report via the SSFL E-list
- Request for Notification of document uploading

*For questions regarding SSFL and Community Involvement contact:
Michelle Banks-Ordone, DTSC Public Participation Specialist at
(818) 717-6573 or Michelle.Banks-Ordone@dtsc.ca.gov*

Outline

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- Stormwater Expert Panel introduction
- Background
- SSFL Stormwater Overview
- HHRA Summary
- Key Questions this Year
- Conclusions

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Background

Stormwater Expert Panel Introduction

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- 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

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- 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

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- 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

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- 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 200, Los Angeles, California 90013
Phone (213) 275-3800 • Fax (213) 275-6640
http://www.arwqcb.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	5500 Woolsey Canyon Road Canaña 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 8, 2010
Revised: May 20, 2010
Revised: June 3, 2010

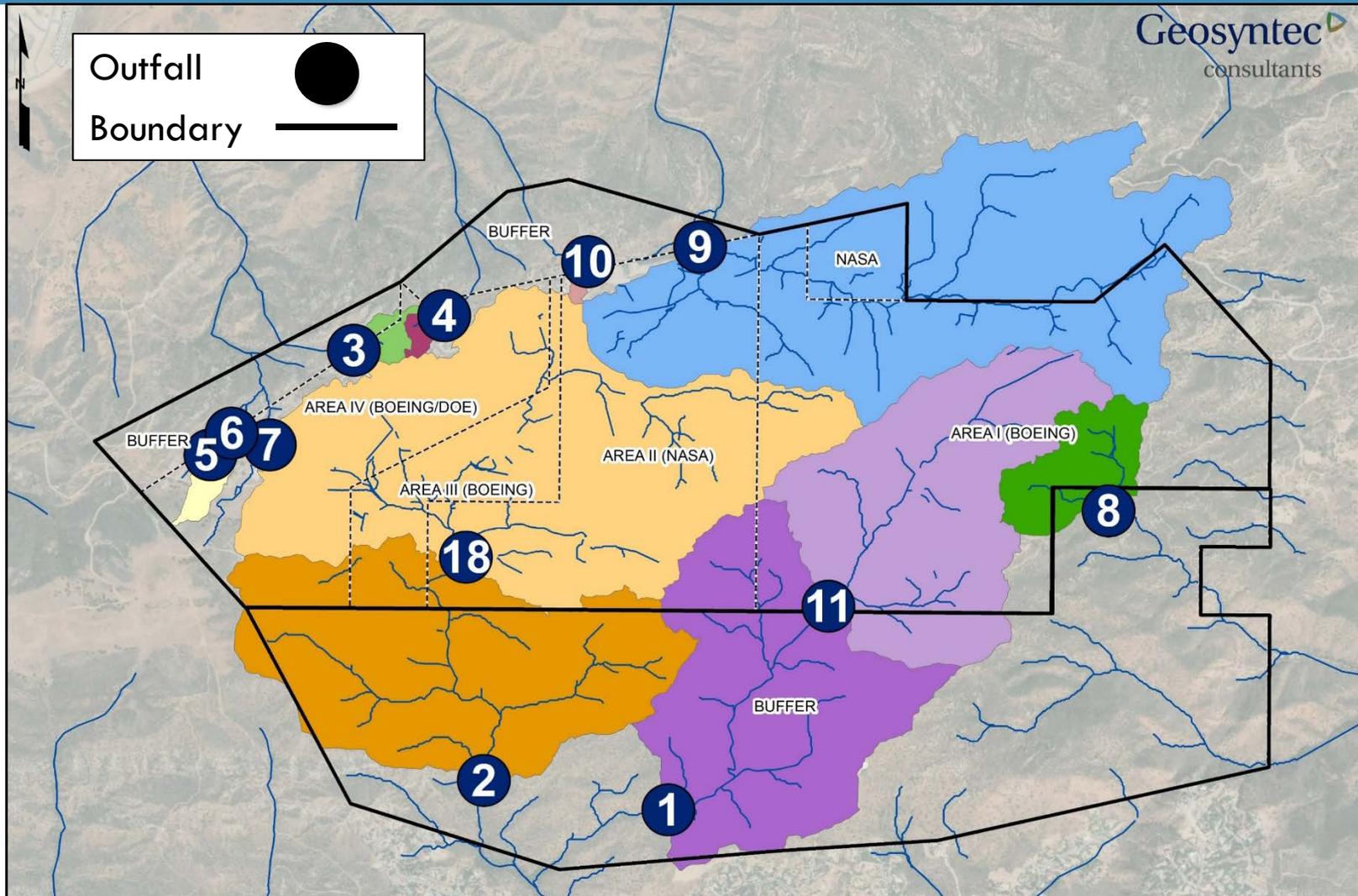
13

SSFL Stormwater Overview

SSFL NPDES Outfalls

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Simi Valley

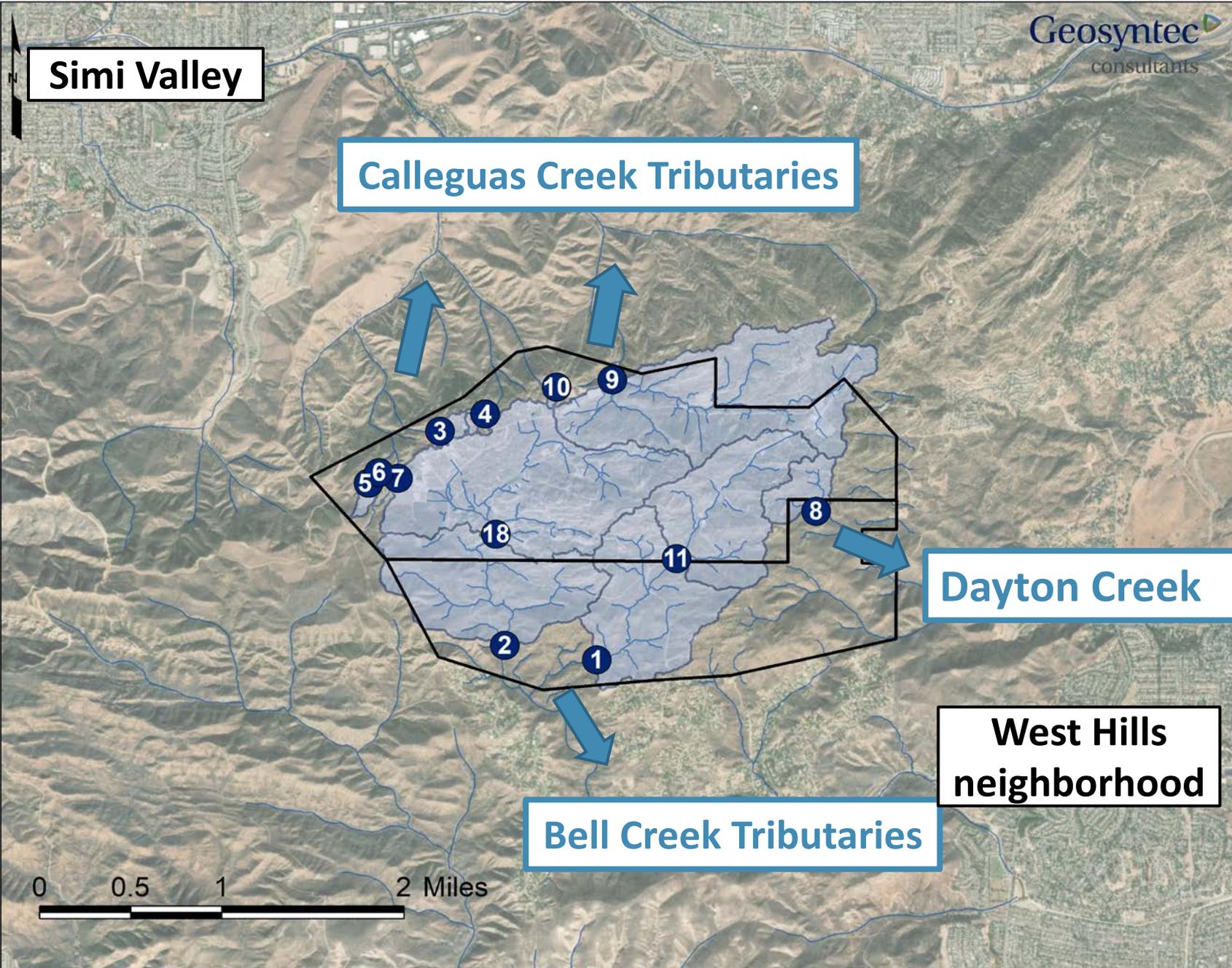
Calleguas Creek Tributaries

Dayton Creek

**West Hills
neighborhood**

Bell Creek Tributaries

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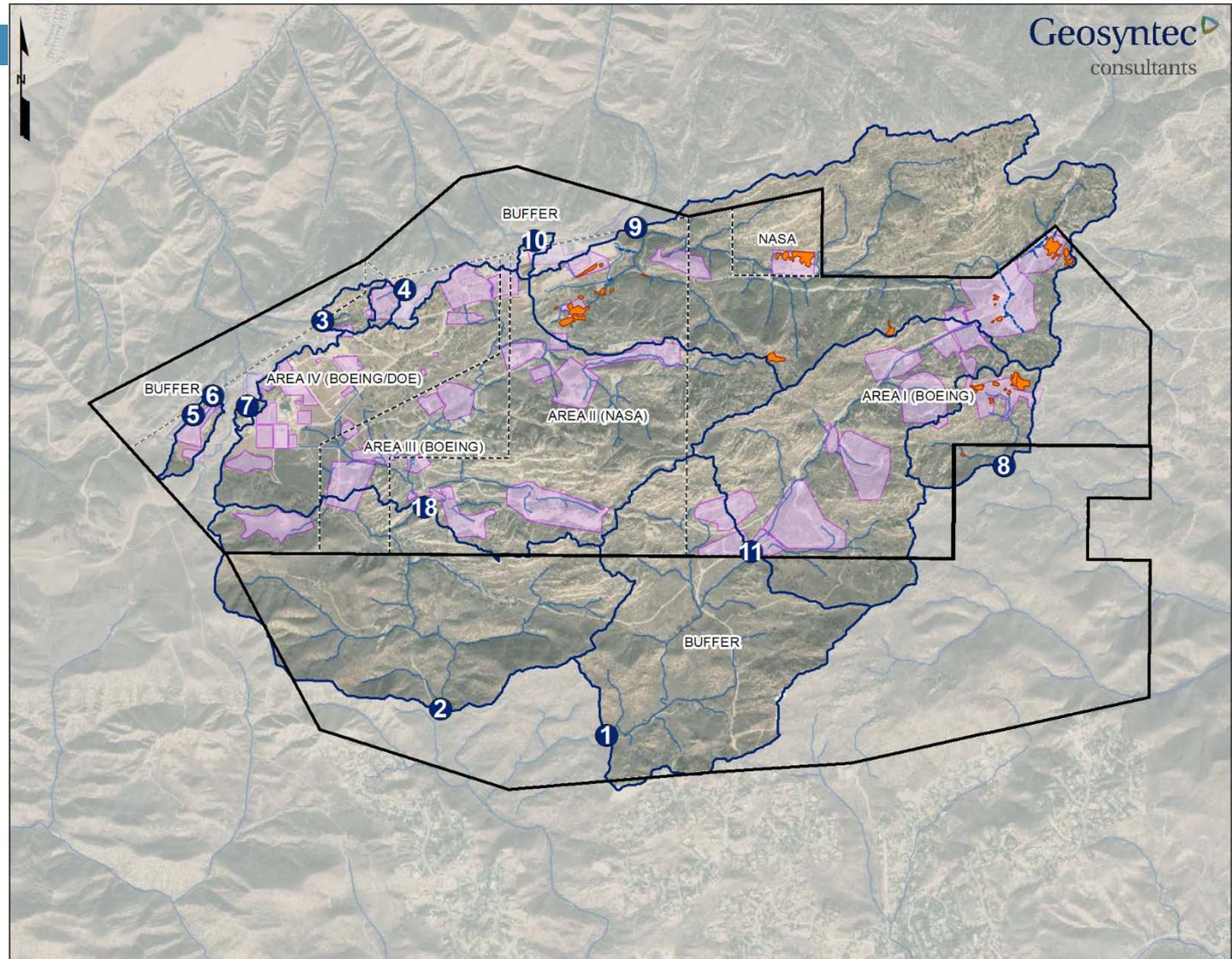


RCRA Facility Investigation (RFI)

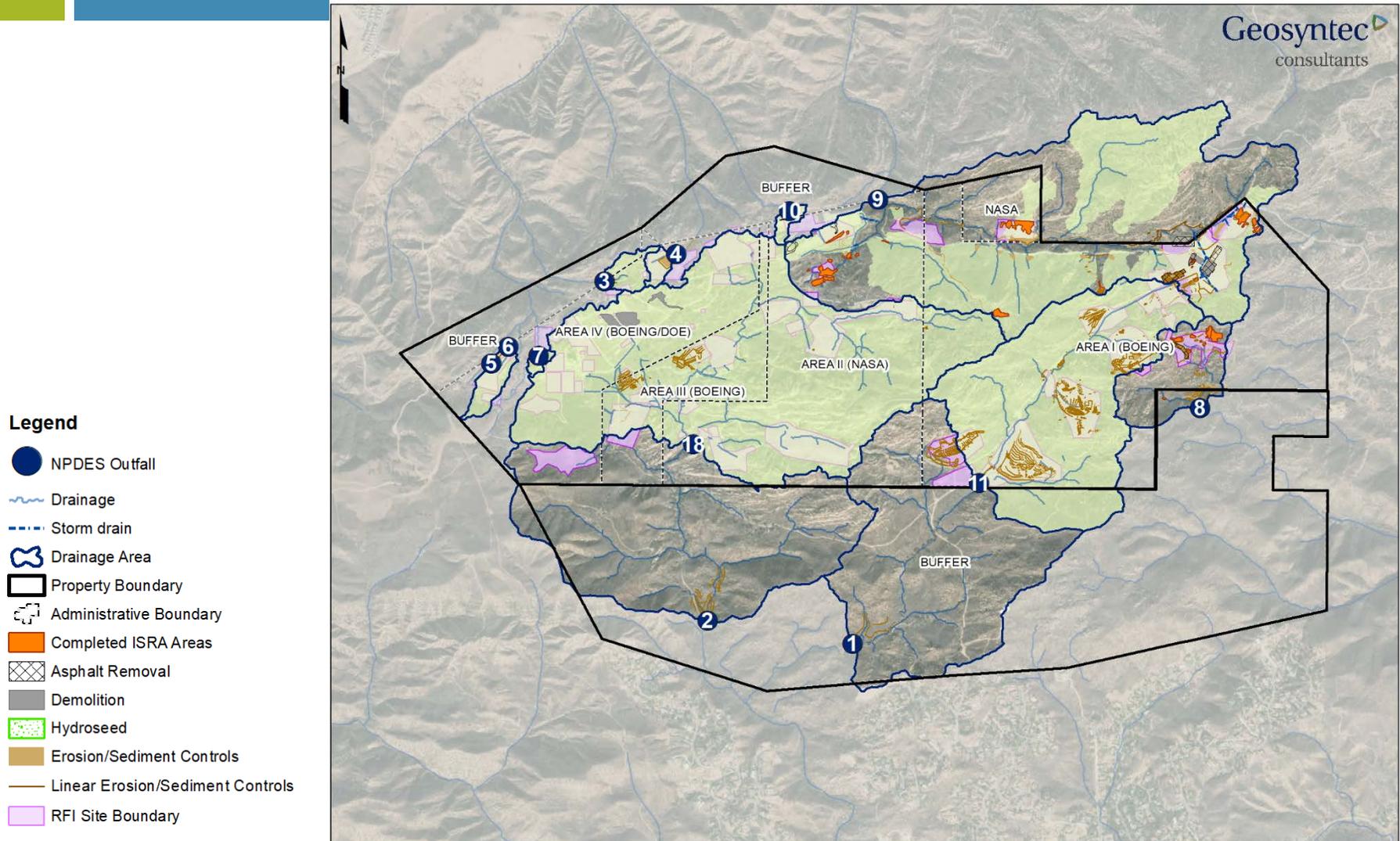
Geosyntec
consultants

Legend

- NPDES Outfall
- ~ Drainage
- - - Storm drain
- ⊕ Drainage Area
- ▭ Property Boundary
- ⊞ Administrative Boundary
- Completed ISRA Areas
- RFI Site Boundary



Structural treatment controls target RFI Areas



Multi-Pronged Approach

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- **Source Controls**
 - ISRA soil removal
 - Pavement and building removal
- **Erosion/Sediment Controls and Restoration**
 - Hydroseed/mulch, plantings, etc.
 - Dirt road controls
 - Channel stabilization controls
- **Treatment Controls**
 - Advanced stormwater treatment systems (011, 018)
 - Flow-through media filters
 - Culvert modifications
 - Media filters (B1, upper lot)
 - Sedimentation basin and biofilter
 - ELV treatment system
 - Admin area filters
 - Detention bioswales
 - Temporary sedimentation areas (LOX, helipad)

Outfall 018 Stormwater Treatment System

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Outfall 018 Stormwater Treatment System

Stormwater not treated by Silvernale treatment system flows through media filters before leaving northern outfalls

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Outfall 003 Media Filter



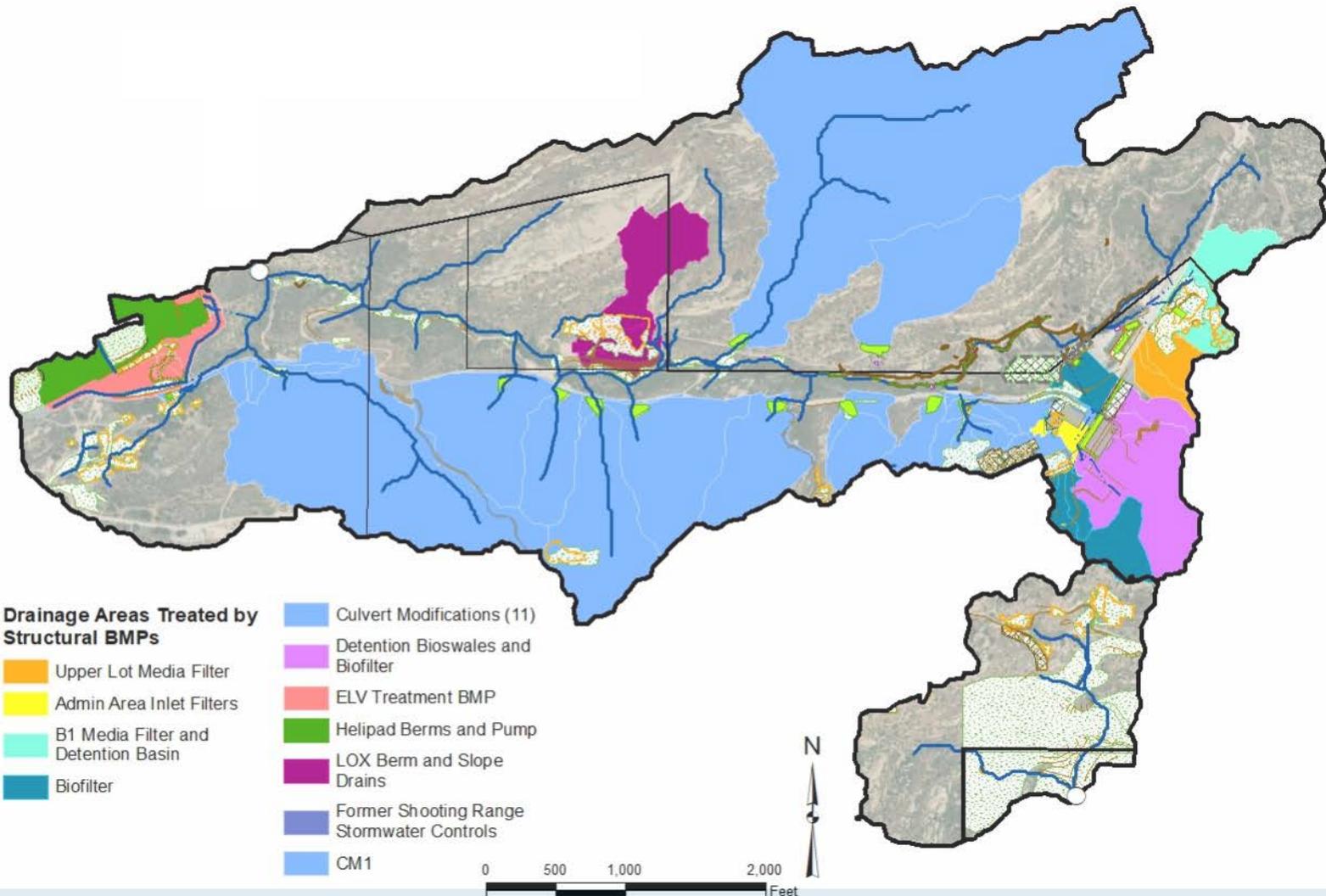
Outfall 006 Media Filter



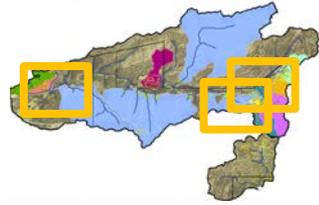
BMP Strategy for 008/009 Watersheds



008/009 Distributed Approach



Example 009 BMPs



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12 Culvert Modifications



Sedimentation Basin and Biofilter



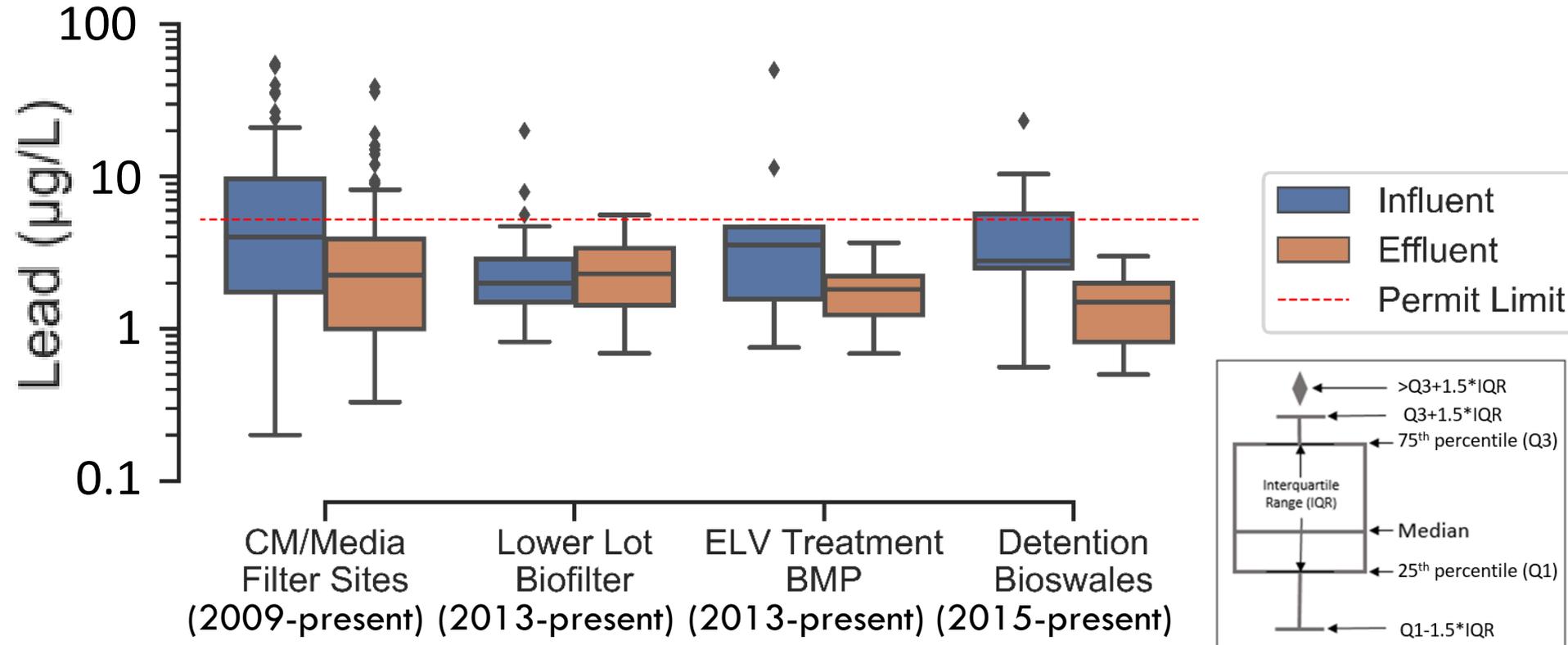
Expendable Launch Vehicle (ELV) Treatment BMP



BMP Performance: Lead

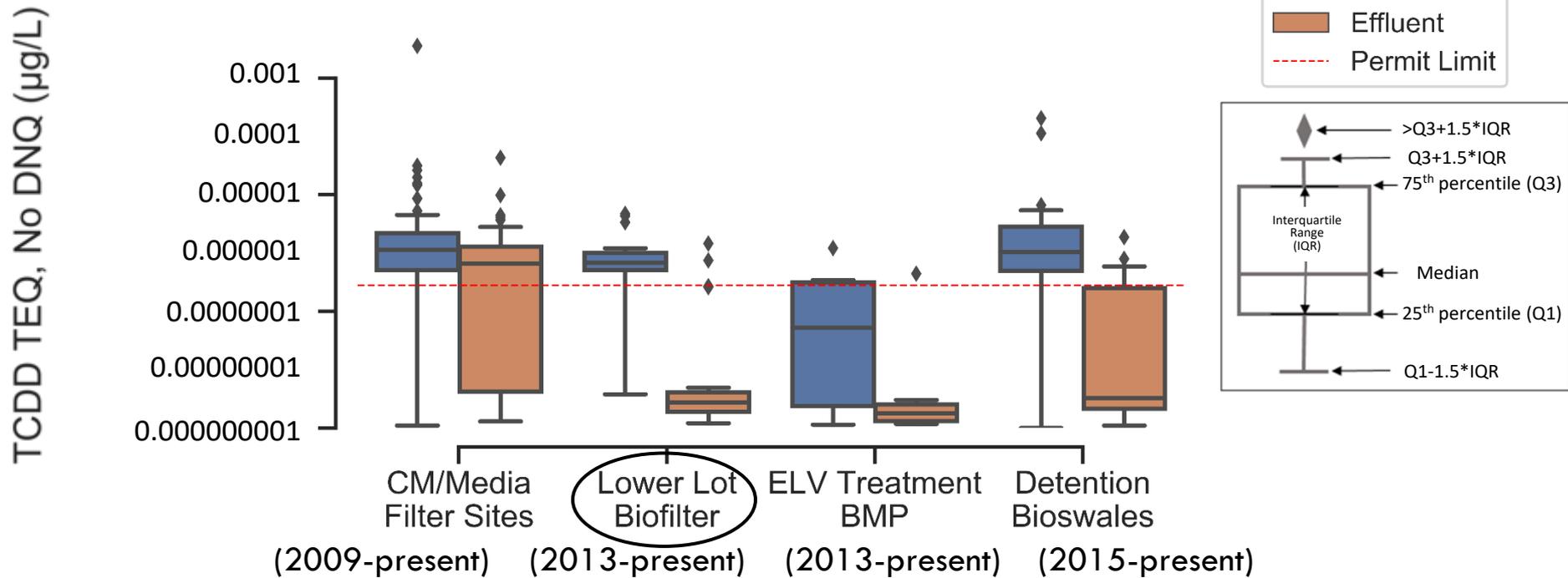
25

Lead concentrations are significantly reduced for most BMP types



BMP Performance: Dioxin

Dioxin concentrations are significantly reduced for all BMP types



55% of the storms less than 1-inch are contained in the lower lot biofilter and not discharged to the Northern Drainage.

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HHRA Summary

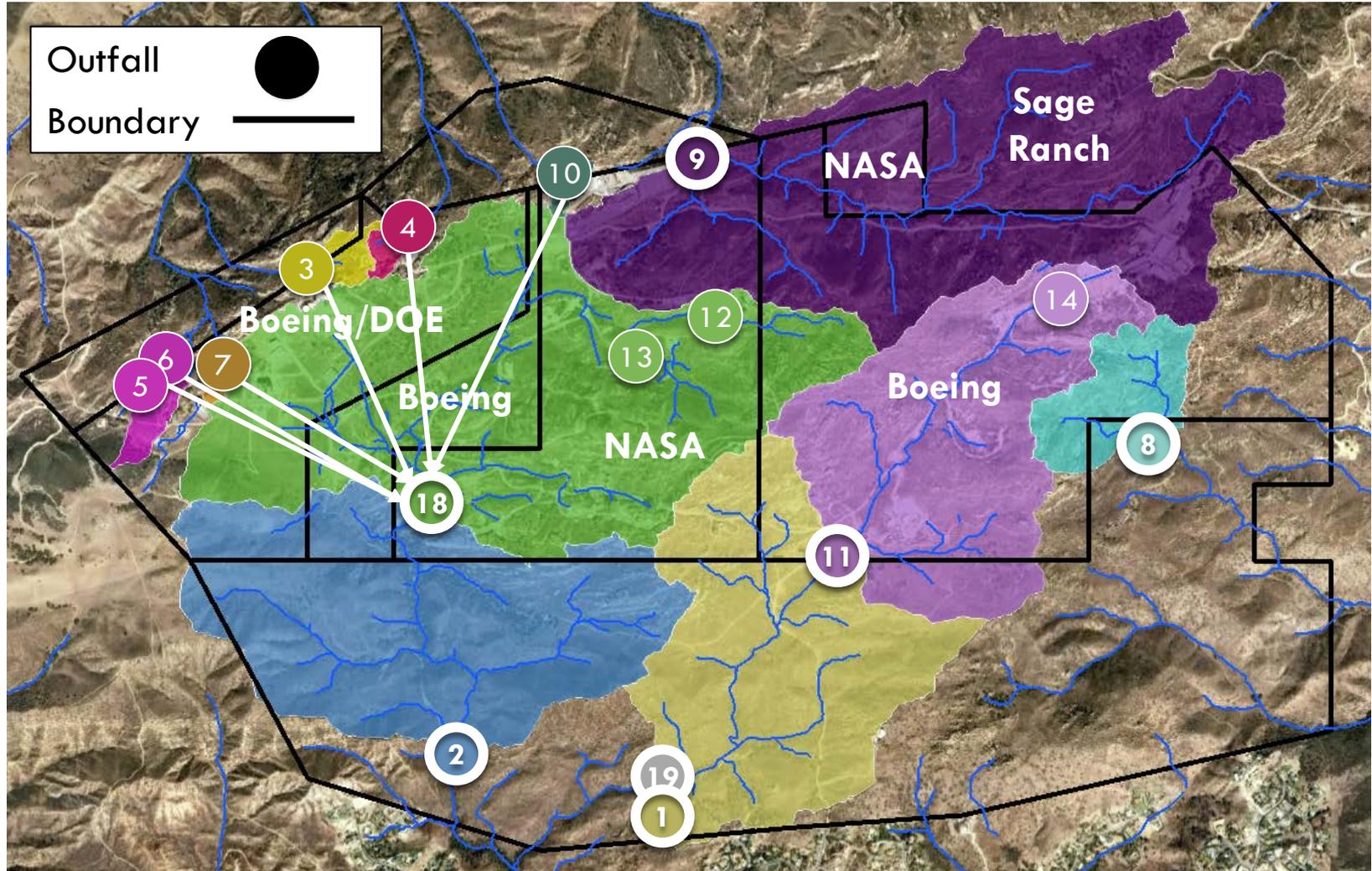
HHRA Scope

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- Regional Board issued Order to Boeing to conduct stormwater HHRA in response to public comment
- Quantitative assessment of potential risks and hazards associated with human contact with stormwater and treated groundwater discharges from the SSFL
 - Other media (e.g., soil, sediment, groundwater, soil vapor emissions) are addressed through separate risk assessments
- Evaluated potential conceptual exposure scenarios representative of realistic (but conservative) exposures immediately downstream of the SSFL property boundary over the long-term
- Analysis covers Outfalls 001, 002, 008, 009, 011, 018, and 019

HHRA Analyzed NPDES Outfalls

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HHRA Approach

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- Recreators (child/adult) were evaluated
- Exposure was assumed to occur at each outfall separately
- Exposure frequency – days per year of exposure connected to the flow days (1-2 days per week)
- Exposure pathways
 - Incidental ingestion and dermal contact evaluated as primary pathways consistent with USEPA guidance
 - Inhalation pathway evaluated separately for Outfall 002 (only outfall where TCE was detected)
 - Edible aquatic plant and fish consumption pathway evaluated

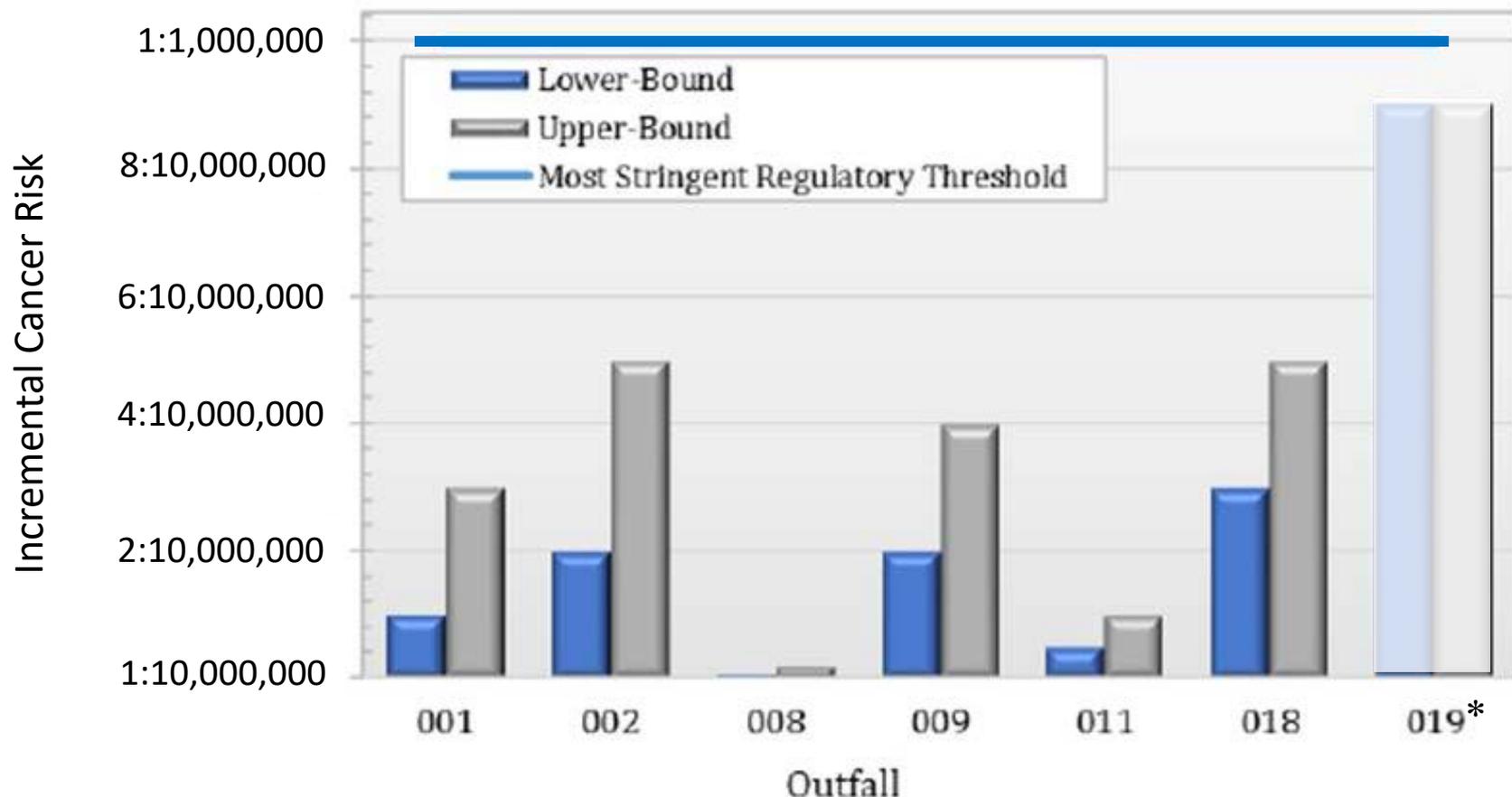
HHRA Findings

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- Potential recreational exposure via incidental ingestion and dermal contact in surface water runoff exiting the SSFL via Outfalls 001, 002, 008, 009, 011, 018, and 019 **are below levels of concern as established by CalEPA and USEPA** (see chart on next slide).
- Volatilization/inhalation risk is insignificant
- Edible aquatic plant risk is insignificant
- Fish consumption does not occur onsite and SSFL flow contributions to nearest downstream fishing locations are insignificant

Comparison of Lower and Upperbound Cumulative Incremental Cancer Risk Estimates by Outfall

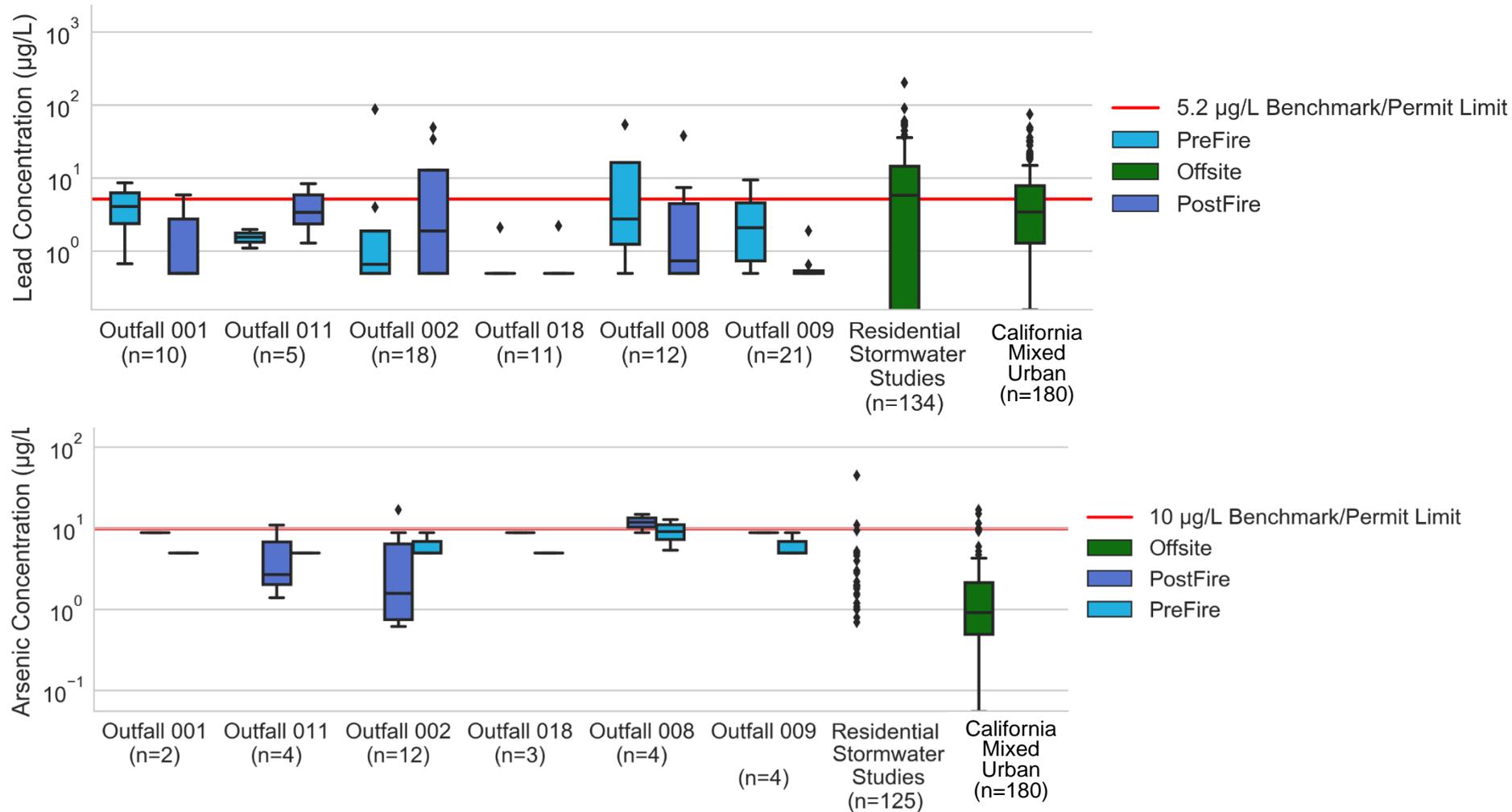
32



*Outfall 019 is not planned to be used for surface water discharge

Comparison of SSFL Stormwater with Urban Residential Stormwater

33



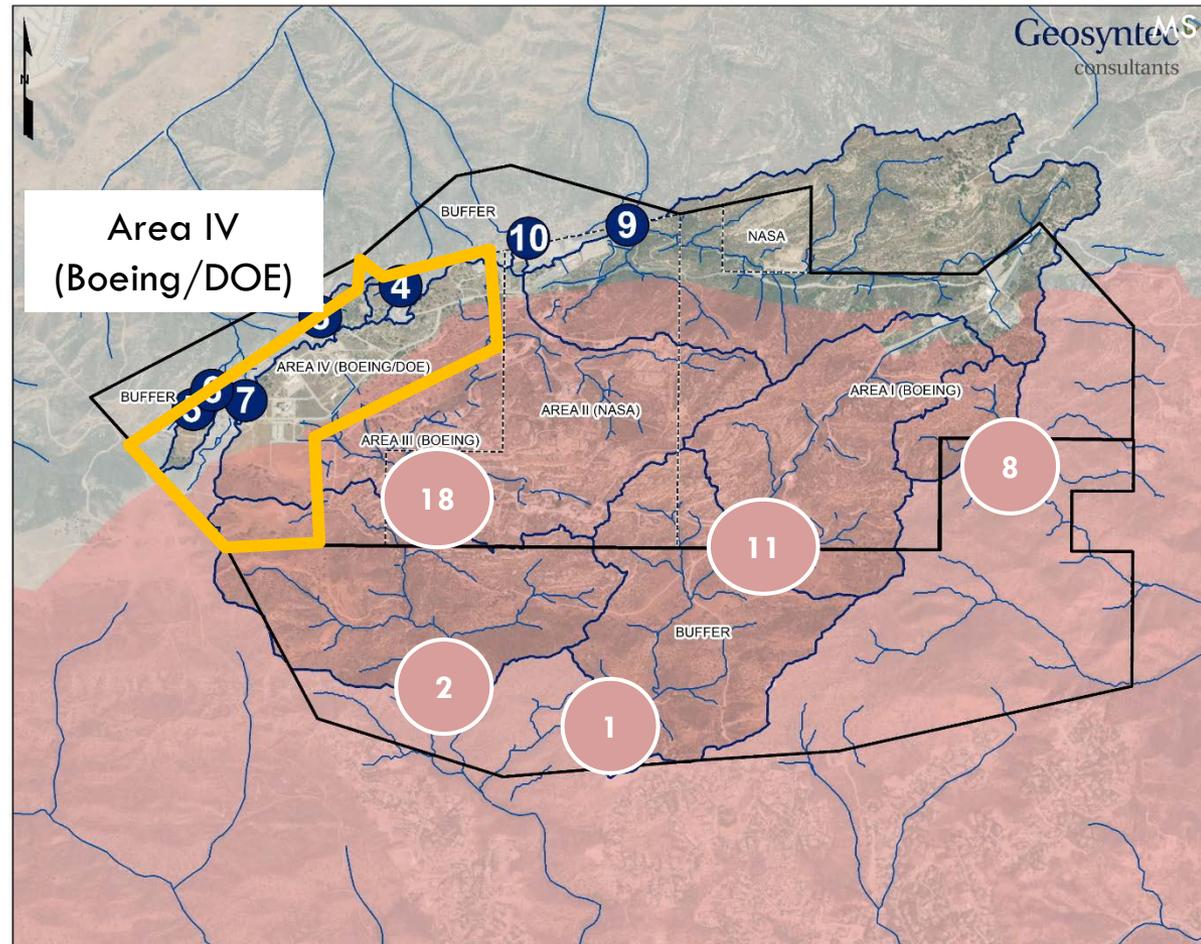
Key Questions This Year

How did the Woolsey Wildfire impact the site and how has Boeing responded?

Woolsey Wildfire Extent

35

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



Woolsey Wildfire Extent



Wildfire perimeter

Effects of Wildfire

JJ

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- Lost vegetative cover
- Lost plant litter
- Increased soil hydrophobicity (water repellent)
- Burned material including plastic sampler housing, metal platforms, batteries, HDPE pipelines, PVC fixtures, utility poles, etc.
- Temporarily damaged stormwater controls (e.g., Storm Water Treatment Systems, conveyance pipes, etc.)



JJ

Hydrologic and Water Quality Response

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- Increased runoff (frequency and volume)
- New pollutant sources (burned materials)
- Increased soil exposure and associated constituent mobilization

With time these effects are diminished with vegetative regrowth and as soil infiltration characteristics return to pre-wildfire conditions.

Example SSFL Response, Repairs, and Controls

JJ

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- Hydromulch applied and fiber rolls installed
- Burned HDPE pipelines replaced to direct runoff to storm water treatment system (SWTS)
- Debris removed and ash vacuumed from burned areas
- Repair and maintenance of stormwater BMPs, including SWTS, and sampling stations
- Majority of repairs completed prior to first runoff producing storm (4 weeks after wildfire)



JJ

Example Sediment Capture: CM-4

JJ

40



Post-Wildfire sediment accumulation looking downstream toward weir boards.



Today

JJ

41

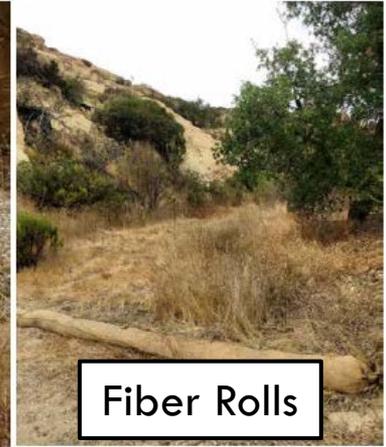
Key Questions This Year

Did lead from the shooting range impact water quality at Outfall 009?

Outfall 009 Shooting Range BMPs

43

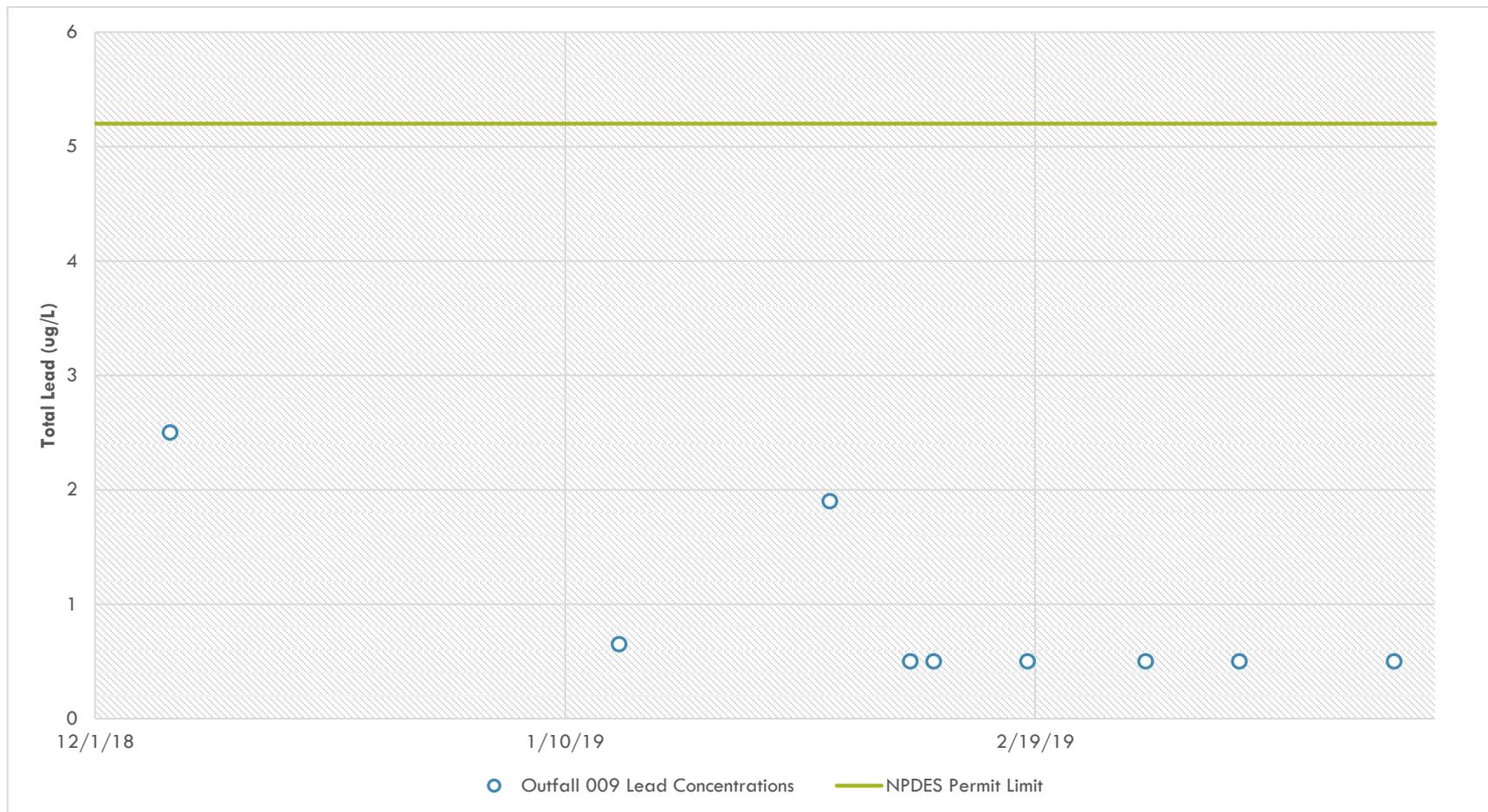
BMPs implemented to capture sediment and particulate-bound lead from the shooting range



No Lead Exceedances at Outfall 009

This year the lead is being contained on the site

44

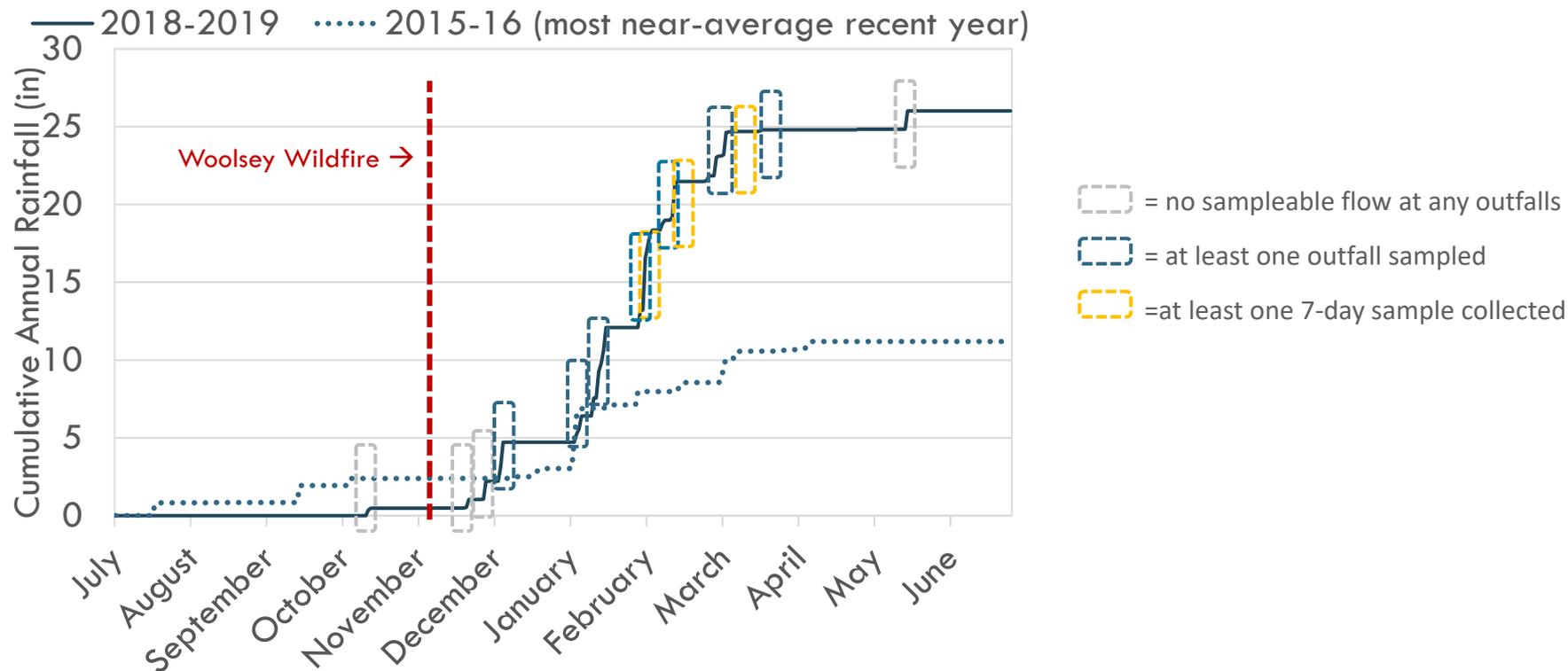


Key Questions This Year

What was the water quality of stormwater discharged this year and how does it compare to drinking water and human health-based standards?

2018-19 was a wetter than average year

- Eleven qualifying rain events (>0.10 inch in 24-hrs)
 - Three 7-day samples
- Total annual rainfall 26.05 inch (vs. 16.8 inch average)

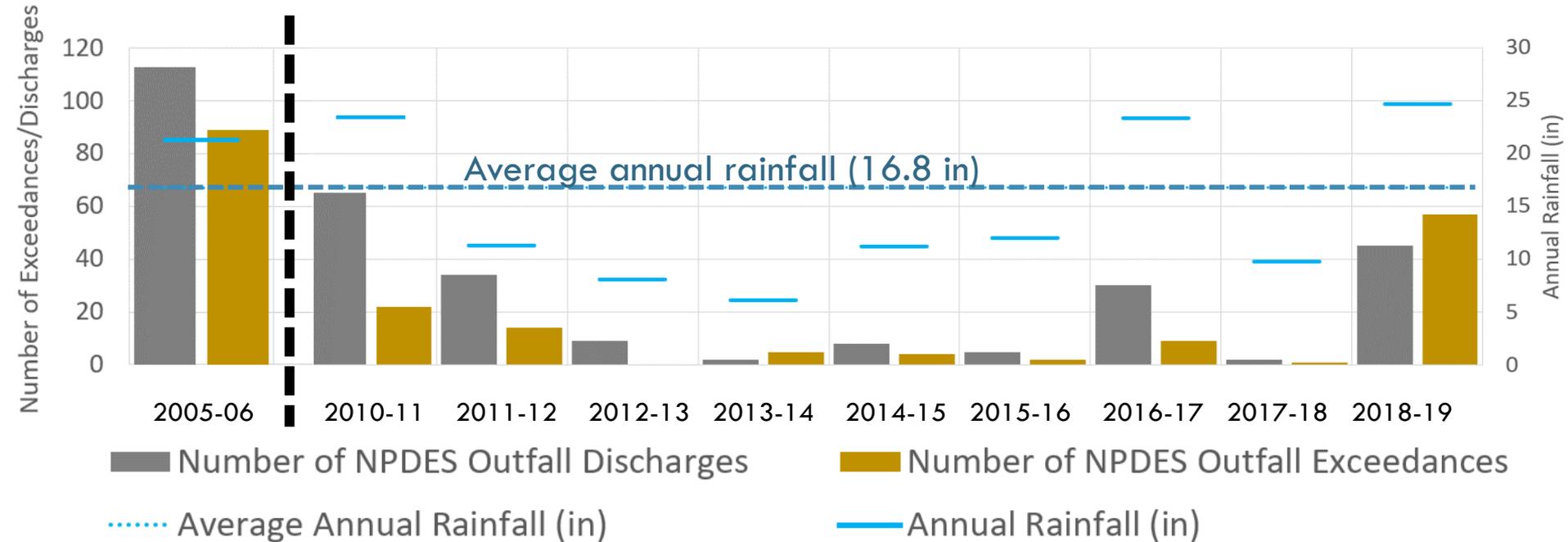


Constituents that Exceeded Human Health Based Thresholds

48

- 57 NPDES Exceedances
 - Iron (12)
 - Lead (9)
 - Manganese (8)
 - Dioxin (6)
 - Copper (5)
 - Zinc (3)
 - Gross Alpha (3)
 - Arsenic (2)
 - Nitrate + Nitrite as Nitrogen (2)
 - Nitrate as Nitrogen (2)
 - Cyanide (1)
 - Nickel (1)
 - pH (1)
 - Selenium (1)
 - Sulfate (1)
- Drinking water standard exceedances
 - Gross Alpha (3)
 - Arsenic (2)
 - Nickel (1)
- Fish consumption standard exceedances
 - Dioxins (6)
- Drinking water standards based on 2 liters (0.53 gal) consumed daily for lifetime

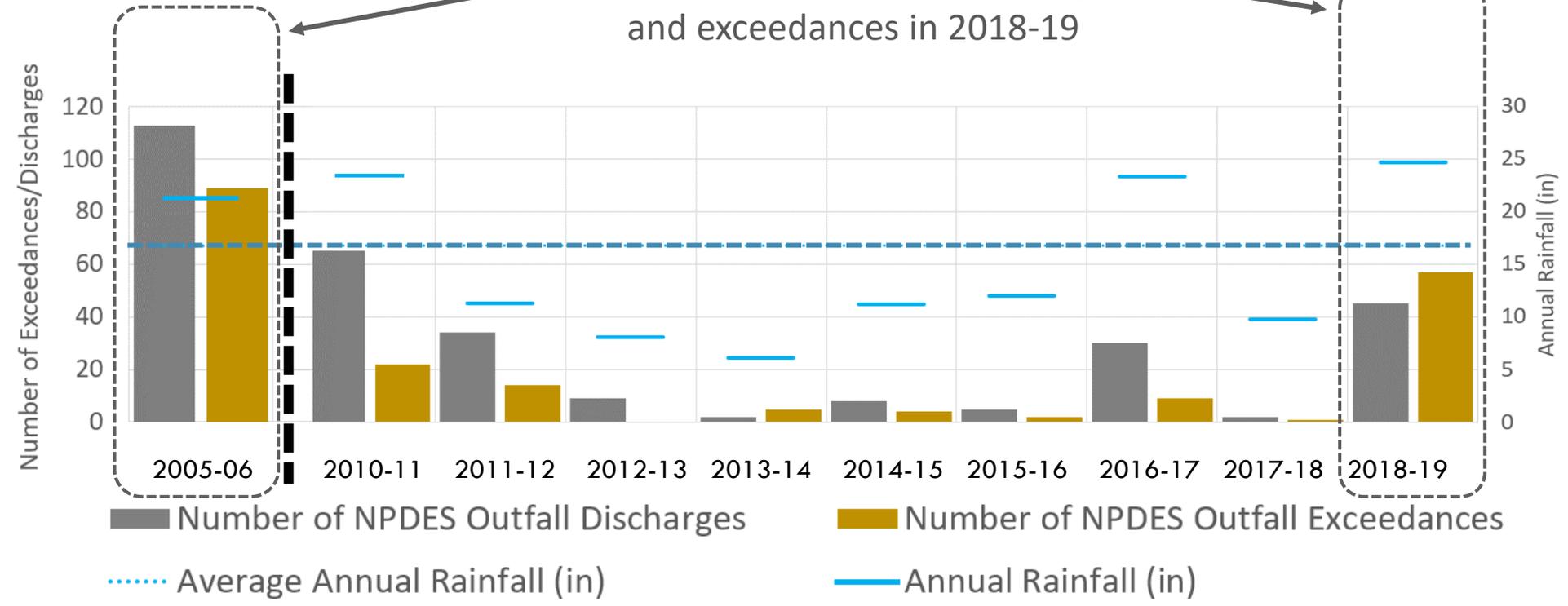
Historical Overview – NPDES Sampling All SSFL Outfalls



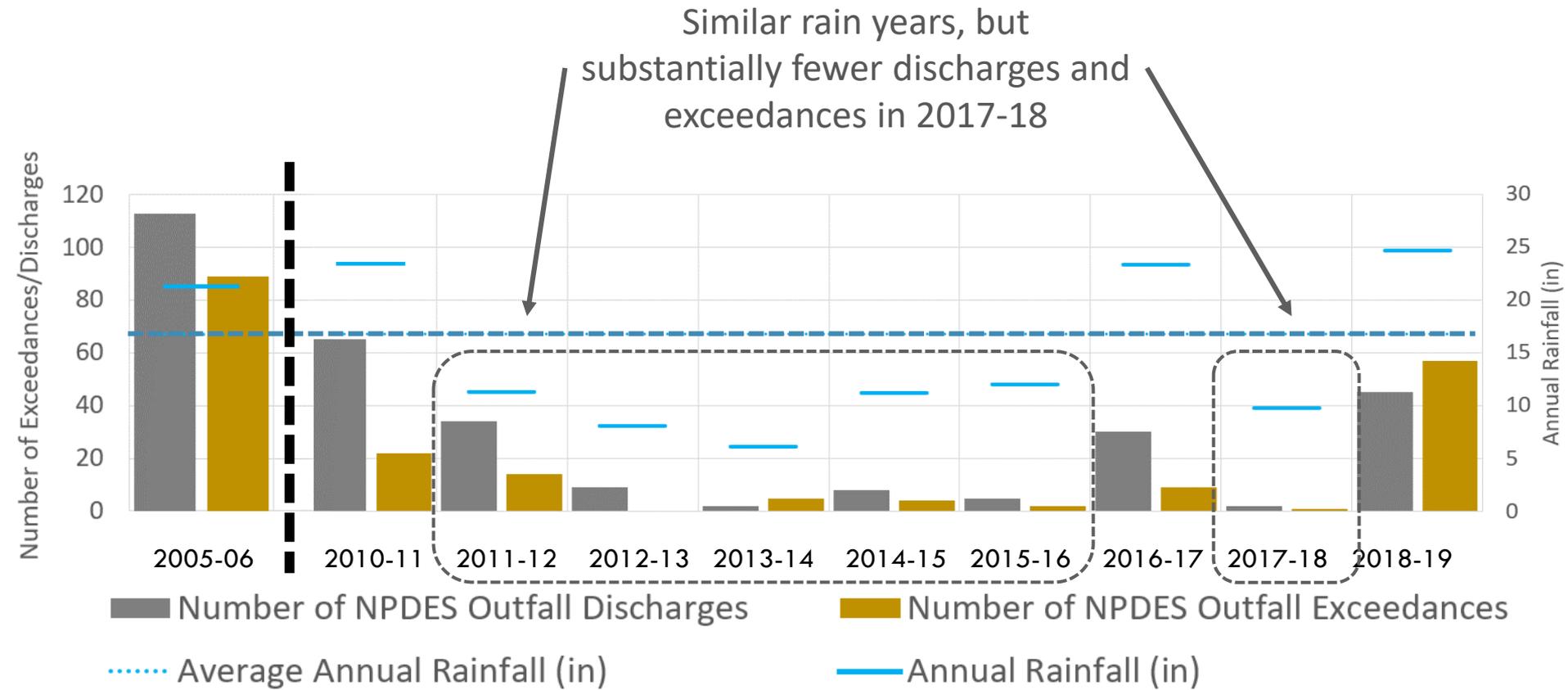
Historical Overview – NPDES Sampling All SSFL Outfalls



Similar post-wildfire rain years,
but substantially fewer discharges
and exceedances in 2018-19

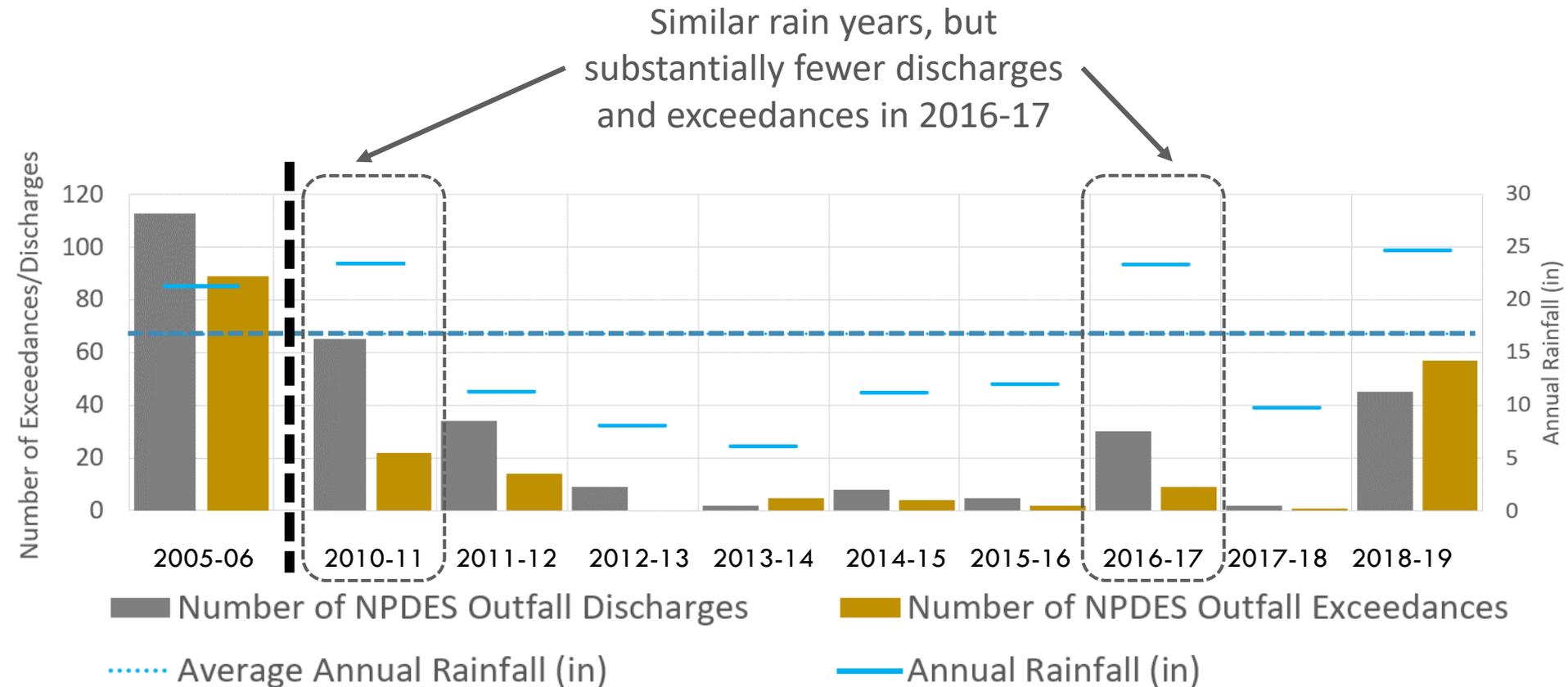


Historical Overview – NPDES Sampling All SSFL Outfalls



Historical Overview – NPDES Sampling

All SSFL Outfalls



Key Questions This Year

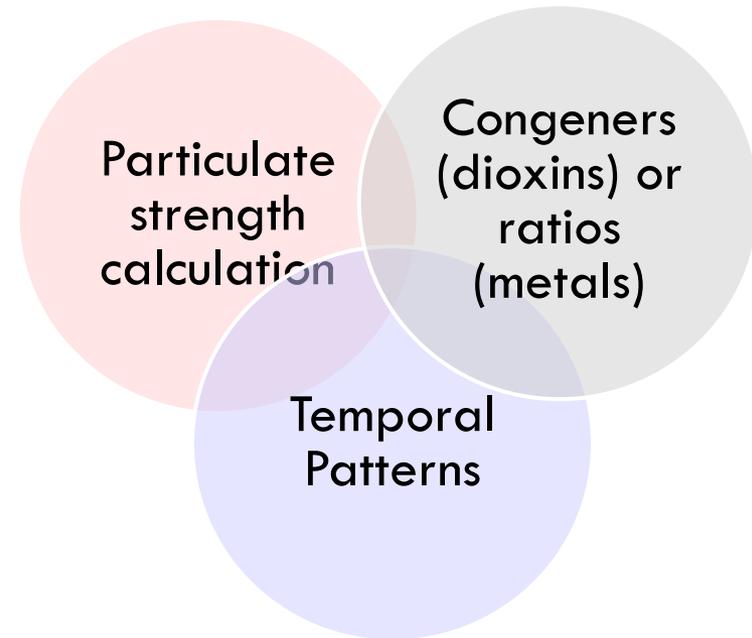
What were the sources of this year's NPDES permit limit/benchmark exceedances?

Post-Wildfire Source Evaluation

54

- Potential Sources Evaluated
 - Soils from former operational and contaminated areas
 - Ash and burnt material
 - Hydromulch
 - Pavement solids
 - Treated wood and adjacent soils
 - Atmospheric deposition
 - Natural background soils
- Lines of Evidence
 - Particulate strength
 - Spatial patterns
 - Temporal patterns
 - Experience from other wildfires
 - Fingerprinting (congeners for dioxins and ratios for metals)

Lines of Evidence



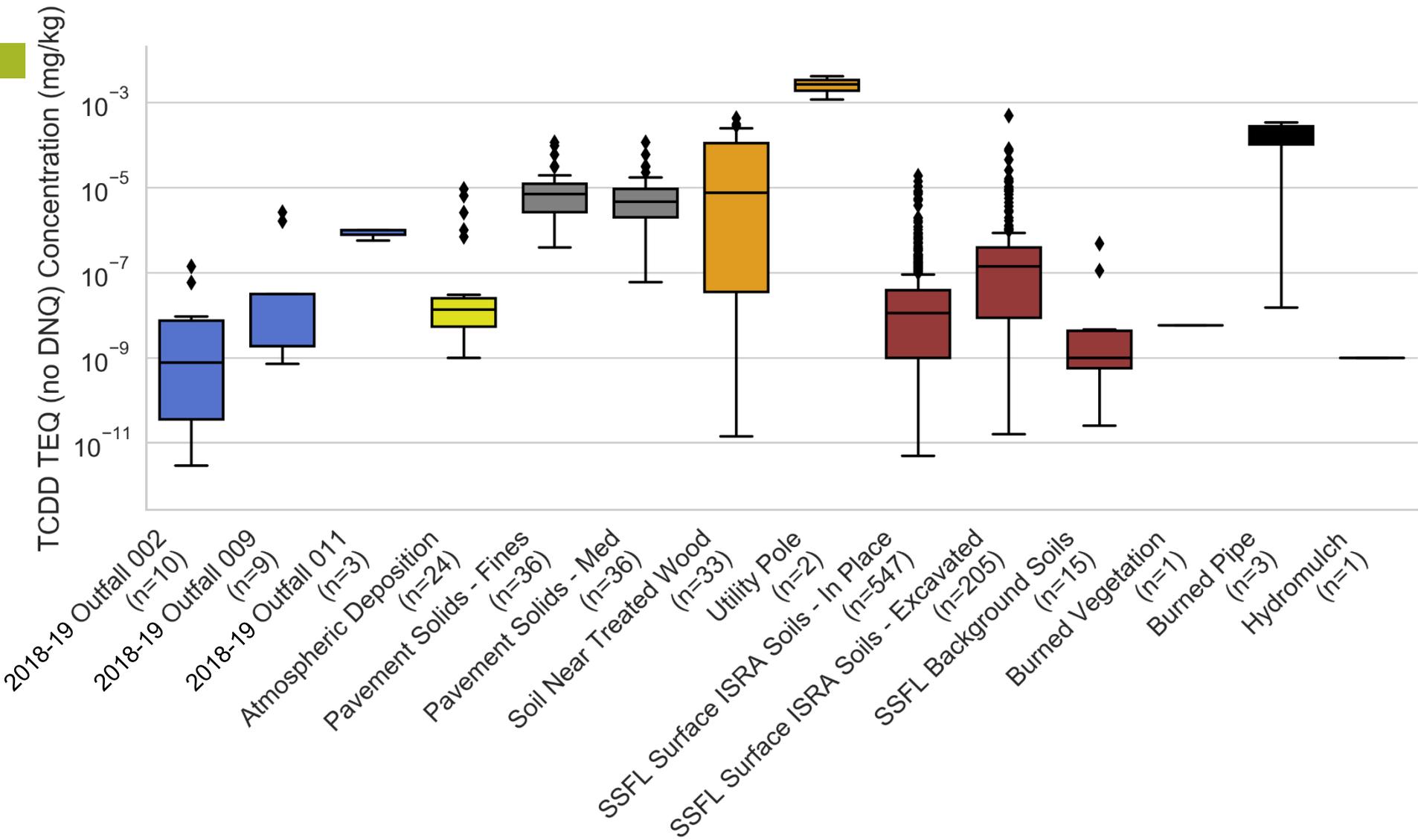
Previous studies of water quality following wildfires in mostly undeveloped areas show an increase in many constituents

55

	Constituent	Multiplicative Increase Pre- to Post-Fire Conc.	References
Metals	Arsenic*	7	Burton et al., 2016 [2006 Station Fire, CA]
	Copper*	8-36	Burton et al., 2016 [2006 Station Fire, CA]; Stein et al., 2012 [Multiple Fires, CA]
	Nickel*	50	Burton et al., 2016 [2006 Station Fire, CA]
	Mercury	13	Burton et al., 2016 [2006 Station Fire, CA]
	Lead*	800	Burton et al., 2016 [2006 Station Fire, CA]
	Selenium*	7	Burton et al., 2016 [2006 Station Fire, CA]
	Zinc*	15-60	Burton et al., 2016 [2006 Station Fire, CA]; Stein et al., 2012 [Multiple Fires, CA]
Nutrients	Nitrate+Nitrite*	292	Stein et al., 2012 [Multiple Fires, CA]
	Total Phosphorus	100	Stein et al., 2012 [Multiple Fires, CA]
	Total Suspended Solids	2-1000	Stein et al., 2012 [Multiple Fires, CA], Burke et al., 2013 and Burton et al., 2016 [2006 Station Fire, CA], 2007 Phase 1 SSFL Post-Fire Watershed Response Study
Organic Pollutants	Polycyclic Aromatic Hydrocarbons	3.6-4	Stein et al., 2012 [Multiple Fires, CA]; Chen et al., 2018 [2013 Rim Fire, CA]

***Parameters exceeding SSFL NPDES limits in 2018-19 samples**

Potential Dioxin Sources



Summary of Exceedance Sources

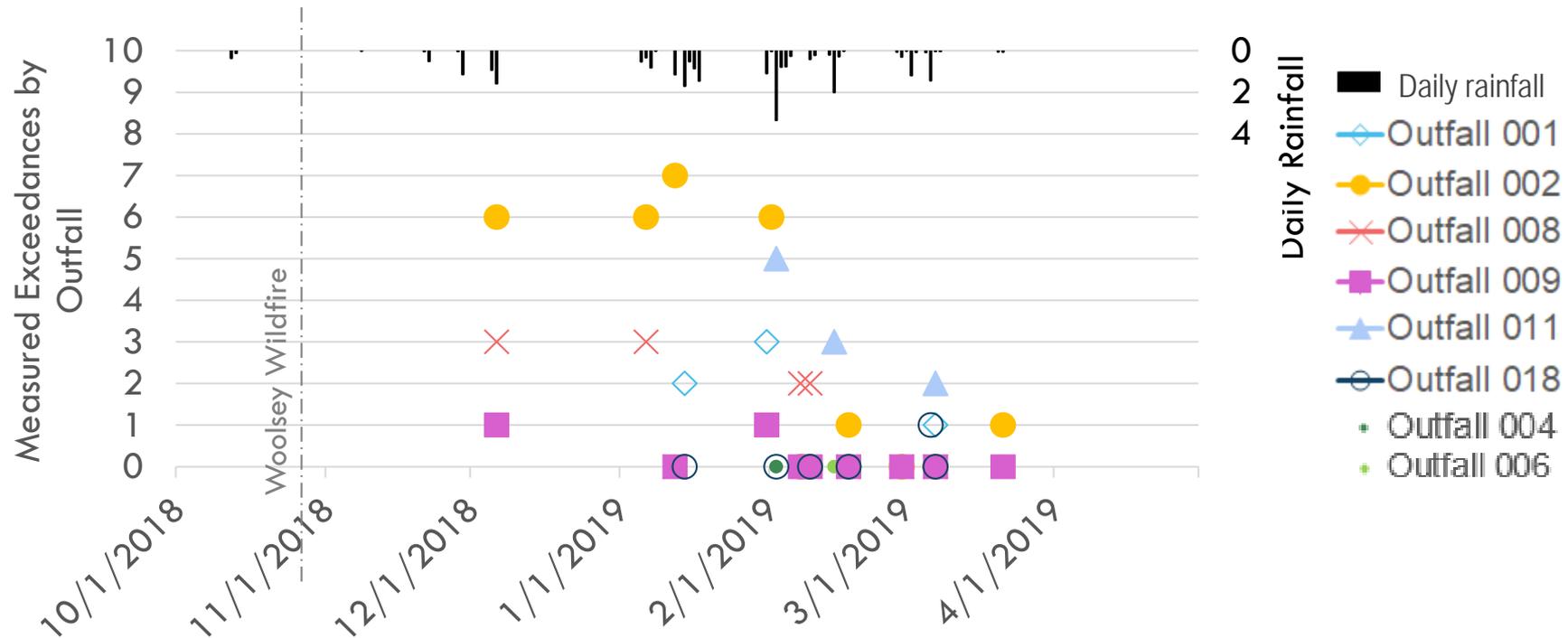
57

Exceedance	Potential Source
Most metals	Natural background soils, pavement solids
Dioxins	Pavement solids, soils near treated wood, soils from former operational areas, and burned treated wood and pipes
Gross Alpha	Only naturally occurring radionuclides detected
Nitrates	Vegetation ash, groundwater, former operational areas
Sulfates	Treatment system (alum)
Cyanide	Possibly burned sampling equipment
pH	Treatment system

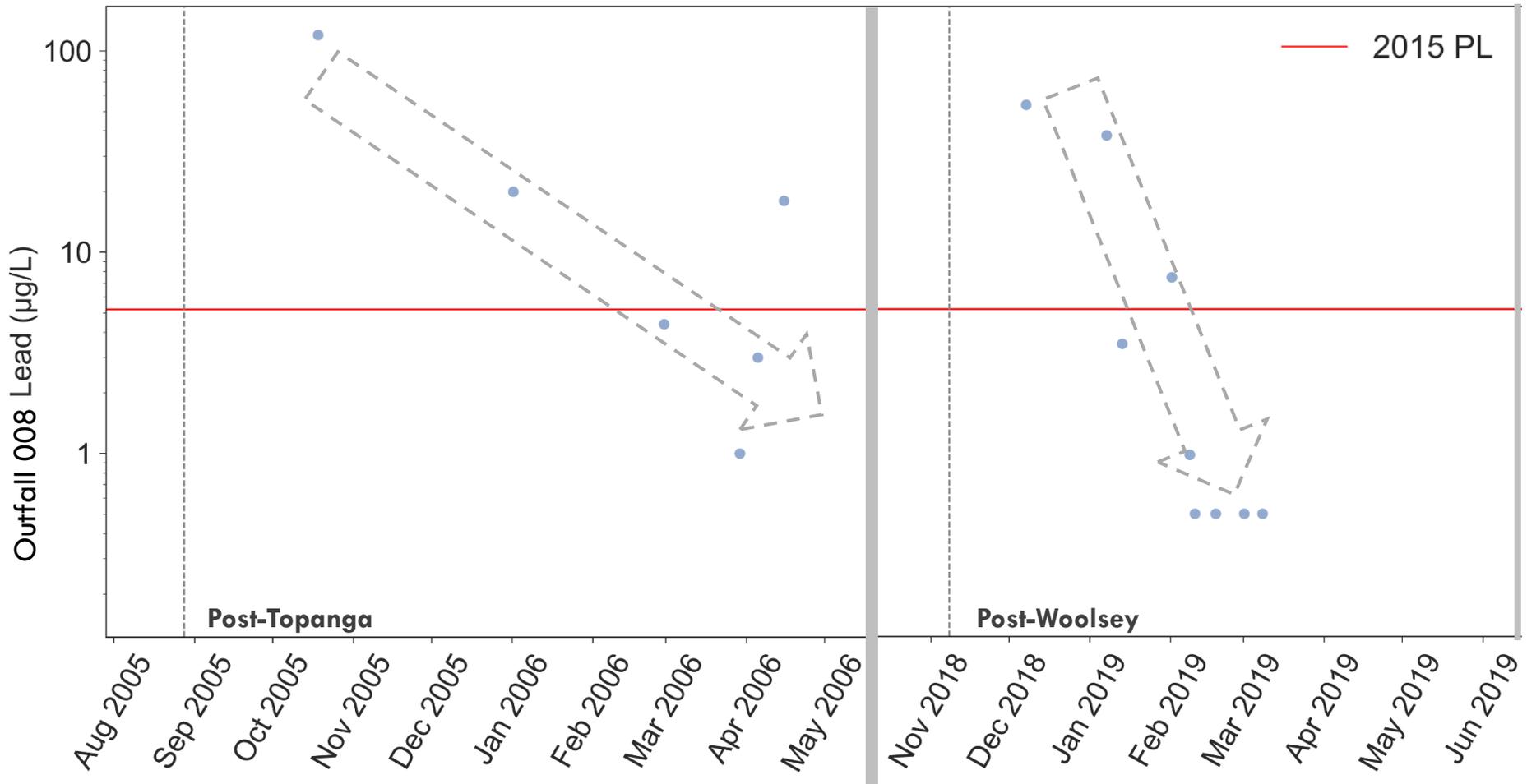
Key Questions This Year

Are there any lasting effects from the wildfire and what about the future?

Number of Permit Limit and Benchmark Exceedances are Decreasing with Time



Stormwater Concentrations Returning to Typical Levels



Stormwater Exceedances Expected to Decrease

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- Based on observed trend post-wildfires (Topanga and Woolsey), concentrations expected to decrease
- Future storm discharge water quality will be closely monitored to determine if the trend of decreasing concentrations continues

Future Wildfires

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- Boeing and the SWEP are developing recommendations to prepare for future wildfires
- These recommendations may reduce the response time for BMP deployment and operation



Key Questions This Year

What BMP and monitoring recommendations are being considered for this year's Annual Report?

Preliminary BMP and Monitoring Recommendations

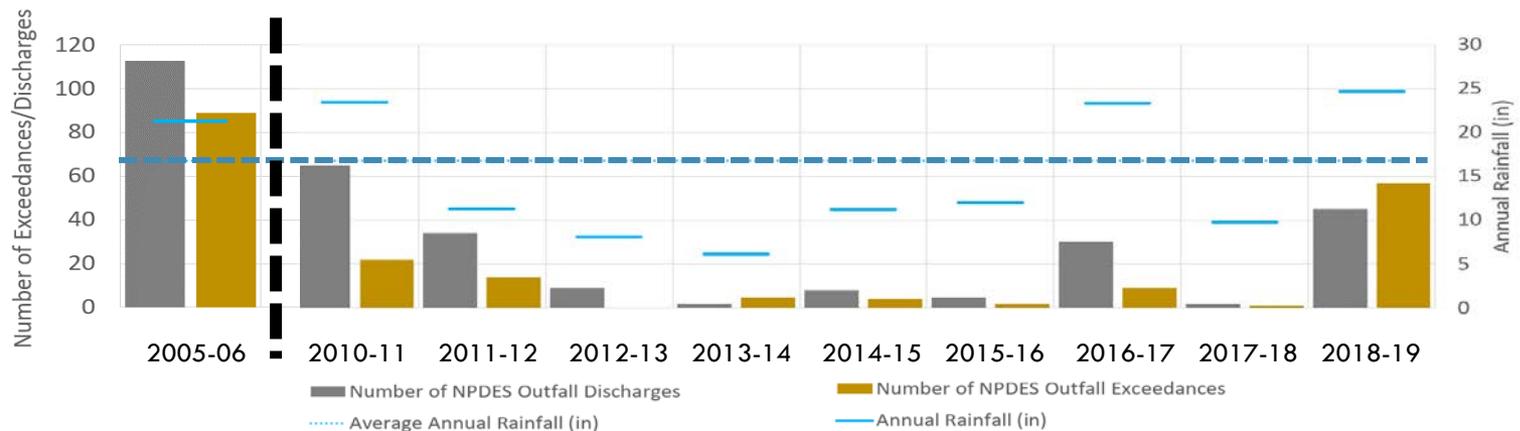
64

- BMP Recommendations
 - Stockpiling erosion controls for emergency response
 - Install BMPs around more treated wood poles
 - Repair OF011 treatment system and ready for operation
 - Assess feasibility of increasing pond storage and/or reconstructing OF018 media filter
 - Add generator at ELV treatment system (in OF009 watershed)
 - Reassess condition of erosion controls in OF008 watershed
- Monitoring Recommendations
 - OF009 Watershed: end subarea stormwater monitoring but retain BMP performance monitoring
 - Buffer Zone Watersheds (OF001, OF002): sample stormwater from subareas
 - Investigate surface soils in 008 watershed for new exceeding parameters that weren't covered in ISRA

Conclusion

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- The Woolsey wildfire occurred in early November, prior to much of the wet season
- There was higher than usual rainfall recorded this year; this, combined with the wildfire's affects on soils and vegetation, caused higher than usual number of stormwater runoff events at SSFL
- There were many more Permit limit and benchmark exceedances this year than in recent years



Conclusion

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- Existing stormwater treatment controls have been implemented (and repaired) to capture stormwater from contaminated areas at the site
- These controls have been effective at reducing site stormwater concentrations for the constituents of concern during normal operations
- NPDES permit limit/benchmark exceedances this year only occurred from burned watersheds
- Of the parameters that exceeded NPDES permit limits and benchmarks, most were also elevated in other California post-wildfire studies of mostly undeveloped watersheds, suggesting the SSFL results are not unusual for a burned area

Conclusion

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- Most of the exceedances occurred downstream of “buffer areas” with minimal or no historic operations (i.e., 001 and 002) or areas with a previously completed Interim Source Removal Action that addressed impacted surface soils (i.e., 008 and 009), limiting the area where the wildfire could have exposed soils where historic operations occurred (i.e., 011)

Conclusion

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- Most measured concentrations decreased throughout the year showing that the water quality effects of the wildfire are diminishing within a relatively short timeframe consistent with trends seen after the 2005 Topanga Wildfire
- The Panel is making new BMP and monitoring recommendations that will be described in the Annual Report, to be released in October 2019

Questions

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THANK YOU

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

HHRA Documents Available Online

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Revised HHRA Work Plan

www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Revised_Human_Health_Assessment_Work_Plan_SSF_L.pdf

Final HHRA Submitted to RWQCB

www.waterboards.ca.gov/losangeles/public_notices/Boeing/2017/16.FinalHHRAforSurfaceWaterRunoffExitingSSFLviaTheSouthernOutfalls-October30,2017.pdf

Regional Board acknowledgement of HHRA completion

www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Final_HHRA_Cover_Letter.pdf