

# SANTA SUSANA FIELD LABORATORY



## PUBLIC MEETING SITE-WIDE SUMMARY OF ACTIVITIES

July 25, 2018

SSFL Stormwater Expert Panel

With support from  
**Geosyntec**  
consultants

# Outline

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- Stormwater Expert Panel introduction
- NPDES Permit overview
- Questions of interest:
  1. What has recent water quality been like?
  2. What is SSFL doing to improve water quality?
  3. How are the BMPs working?
  4. How are the BMPs being maintained?
  5. What did the Human Health Risk Assessment conclude?
- Tour overview

# Stormwater Expert Panel Introduction

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- Dr. Bob Gearheart, Humboldt State University
- Jon Jones, Wright Water Engineers
- Dr. Michael Josselyn, WRA Consultants
- Dr. Bob Pitt, University of Alabama
- Dr. Michael Stenstrom, Univ. California, Los Angeles
- *Panel consultant: Geosyntec (Brandon Steets, Megan Otto)*



# Panel's On-Going Role and Scope

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- 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



# 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 outfalls during storms, and
  - Compliance with Numeric Effluent Limits (NELs) – protective of both human health and aquatic life
- NELs for a wide range of constituents, including:
  - Dioxins (TCDD TEQ): 0.000000028 µg/L (ppb)
  - Total Copper: 14 µg/L (ppb)
  - Total Lead: 5.2 µg/L (ppb)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
LOS ANGELES REGION  
200 W. 4<sup>th</sup> Street, Suite 500, Los Angeles, California 90012  
Phone: 213.379.4600 • Fax: 213.379.4640  
http://www.cwrqcb.org

ORDER NO. RA-2010-0090  
NPDES NO. CA6001329

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**

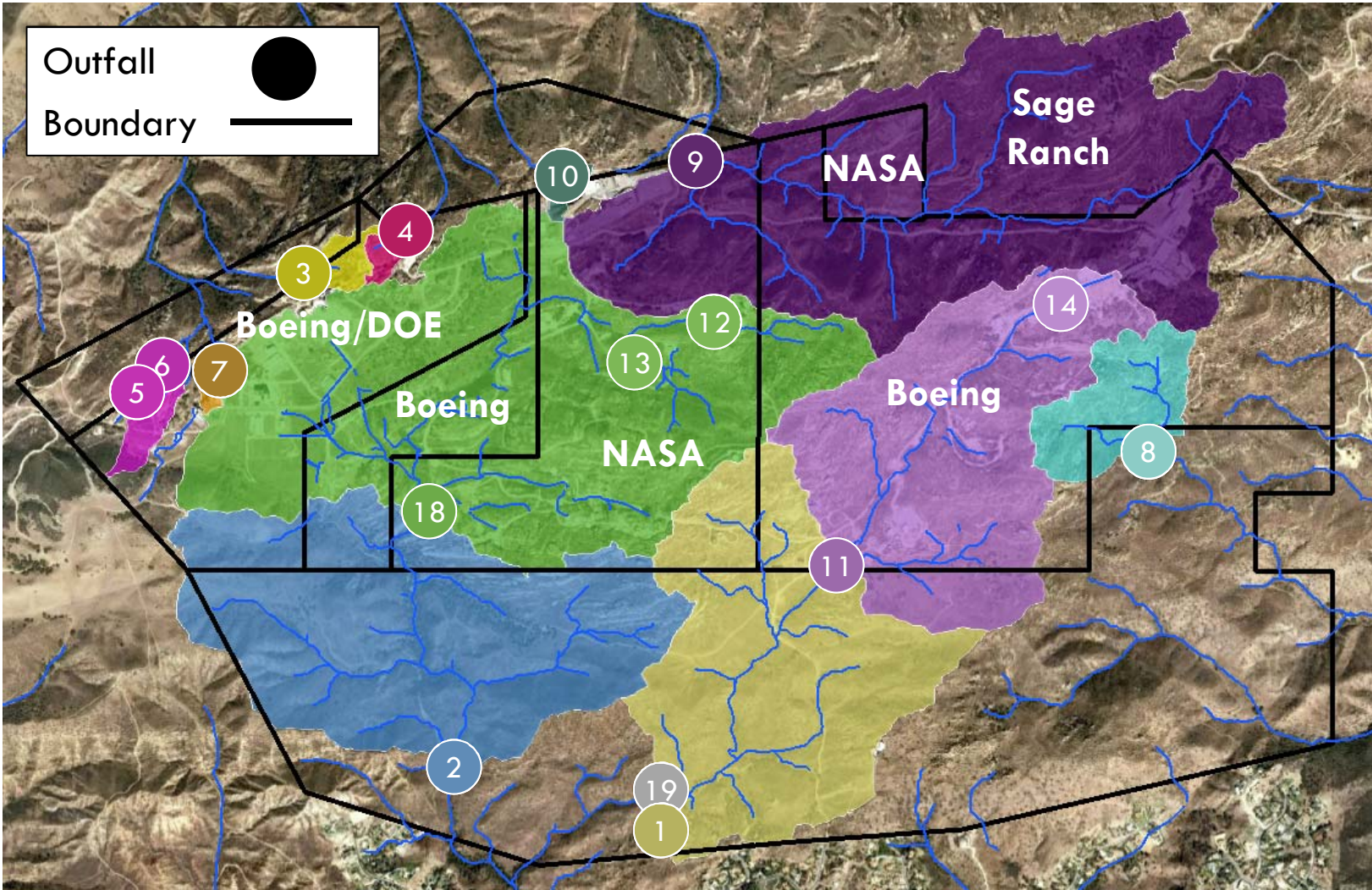
Discharger	The Boeing Company
Name of Facility	Santa Susana Field Laboratory
Facility Address	5500 Woolsey Canyon Road Canoga Park, CA 91304-1143
	Ventura County

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

# SSFL NPDES Outfalls



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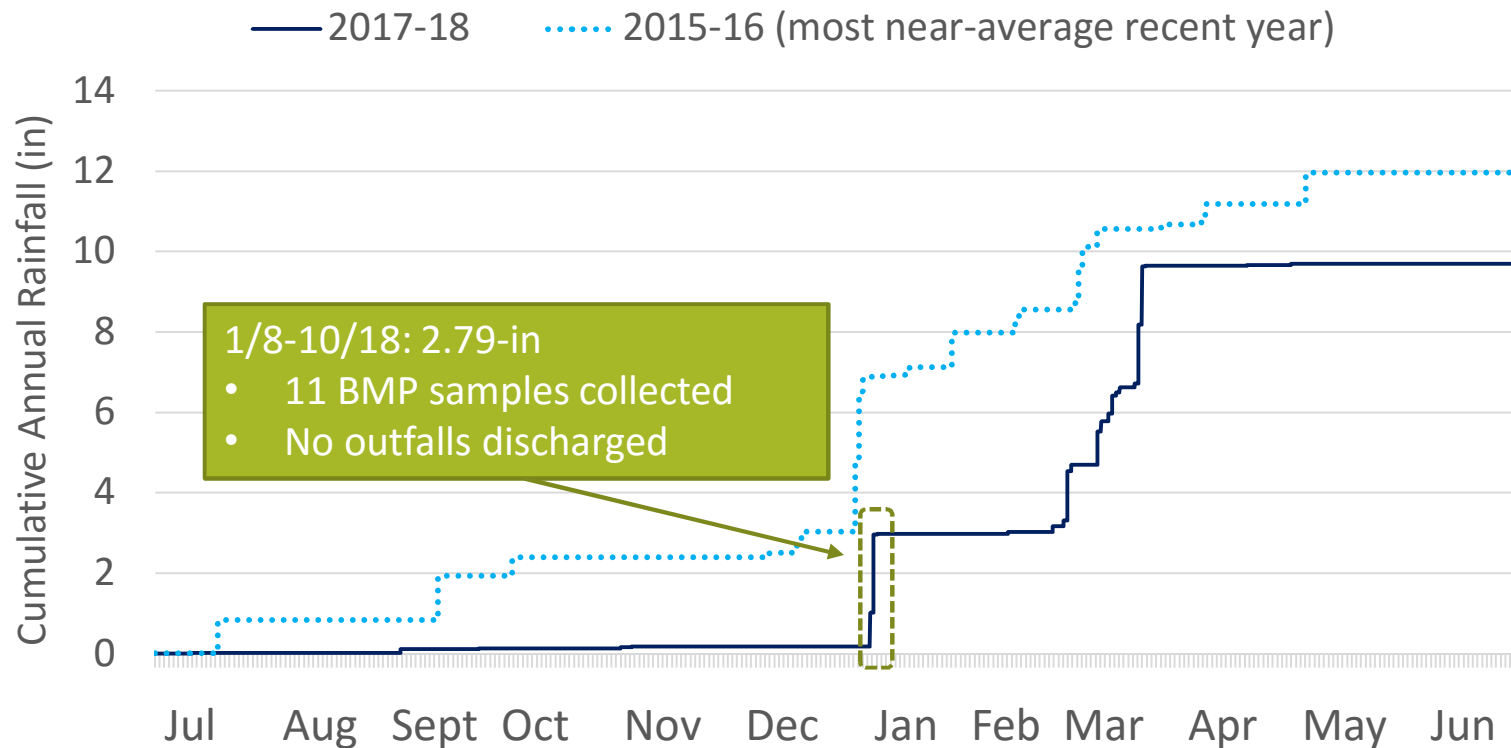
## What has recent water quality been like?

- **32-44** parameters are analyzed at **every** surface water outfall during **every** storm that produces runoff.
- Over **250** parameters are analyzed at **every** outfall at least **once** annually.

# 2017-18 Rainfall Summary

8

- Four qualifying rain events (>0.10-in in 24-hrs)
- Total annual rainfall 9.75-in (vs. 16.8-in average)

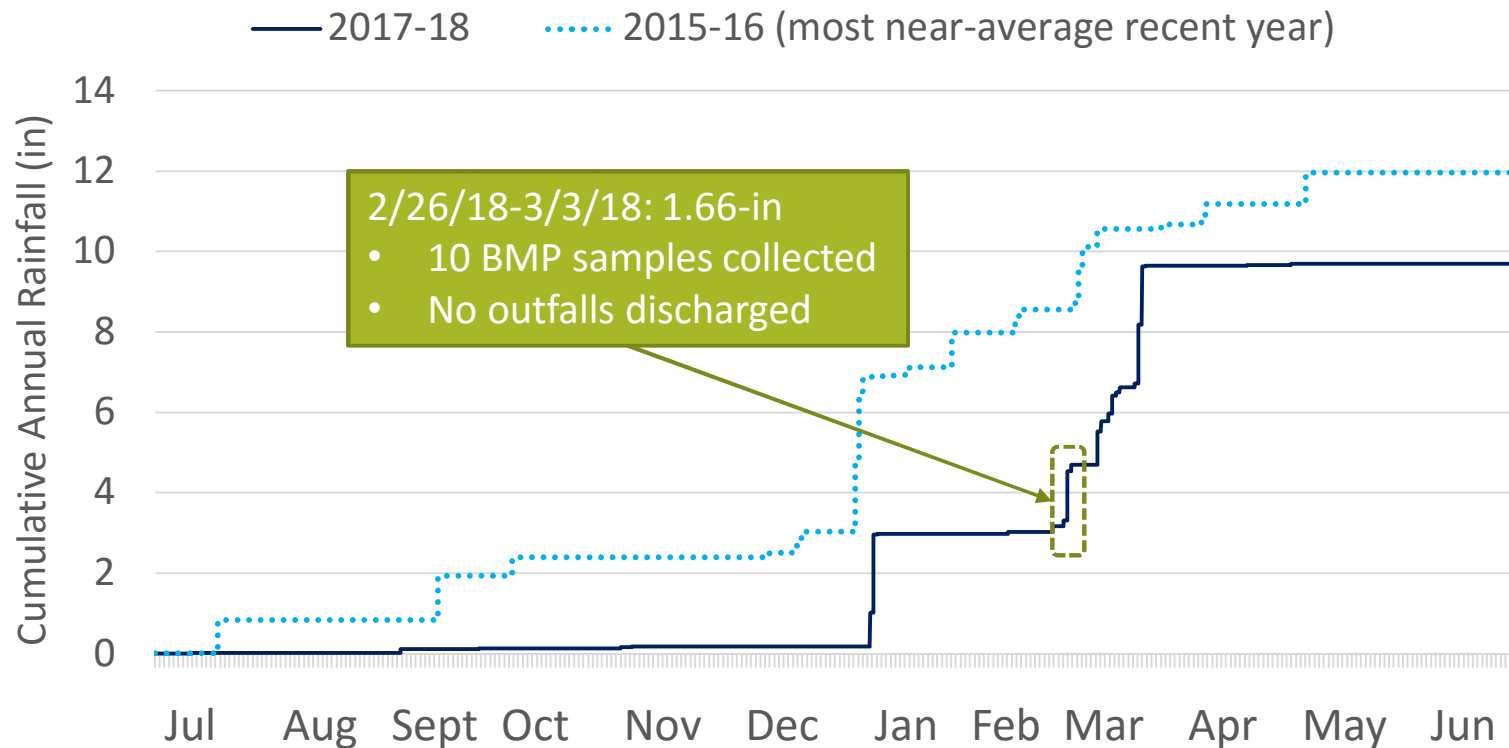




# 2017-18 Rainfall Summary

9

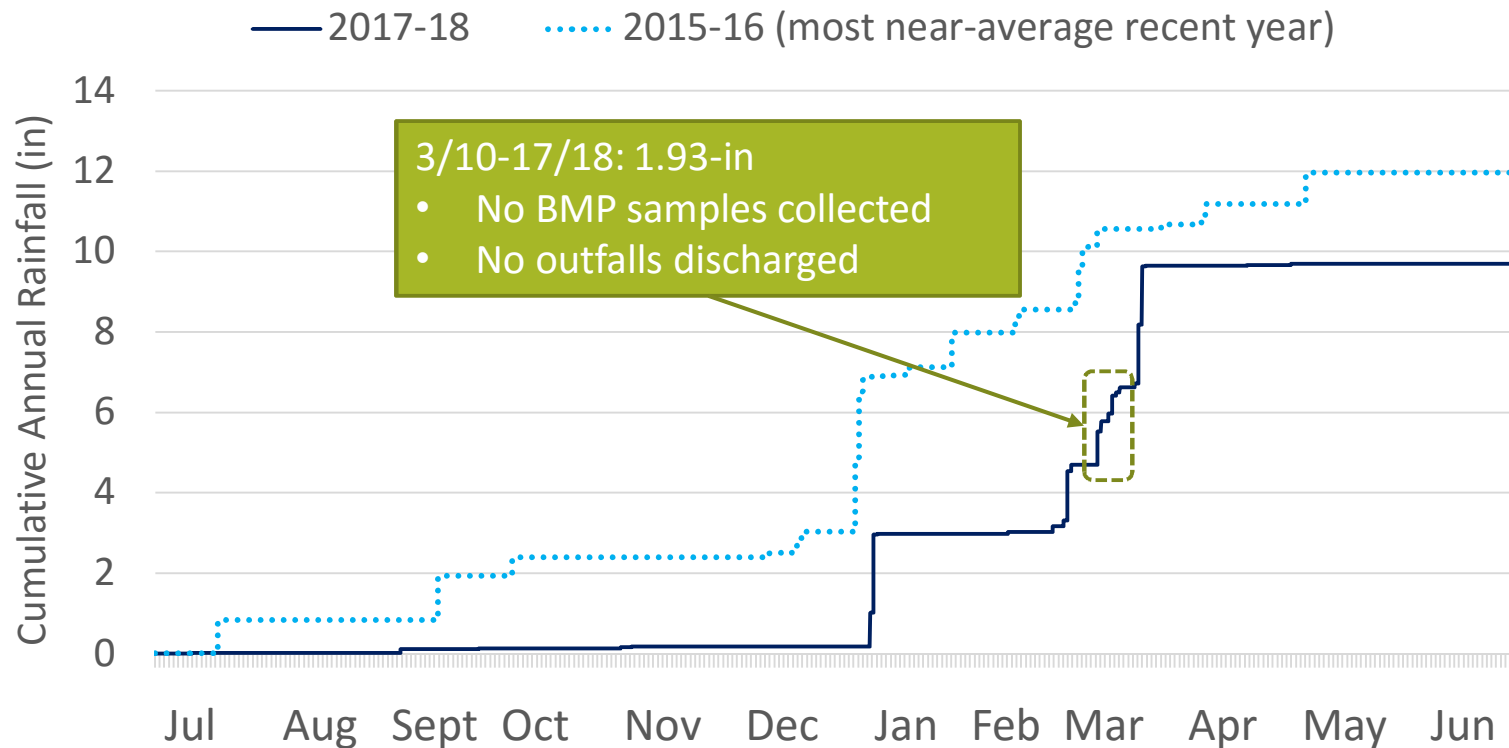
- Four qualifying rain events
- Total annual rainfall 9.75-in (vs. 16.8-in average)



# 2017-18 Rainfall Summary

10

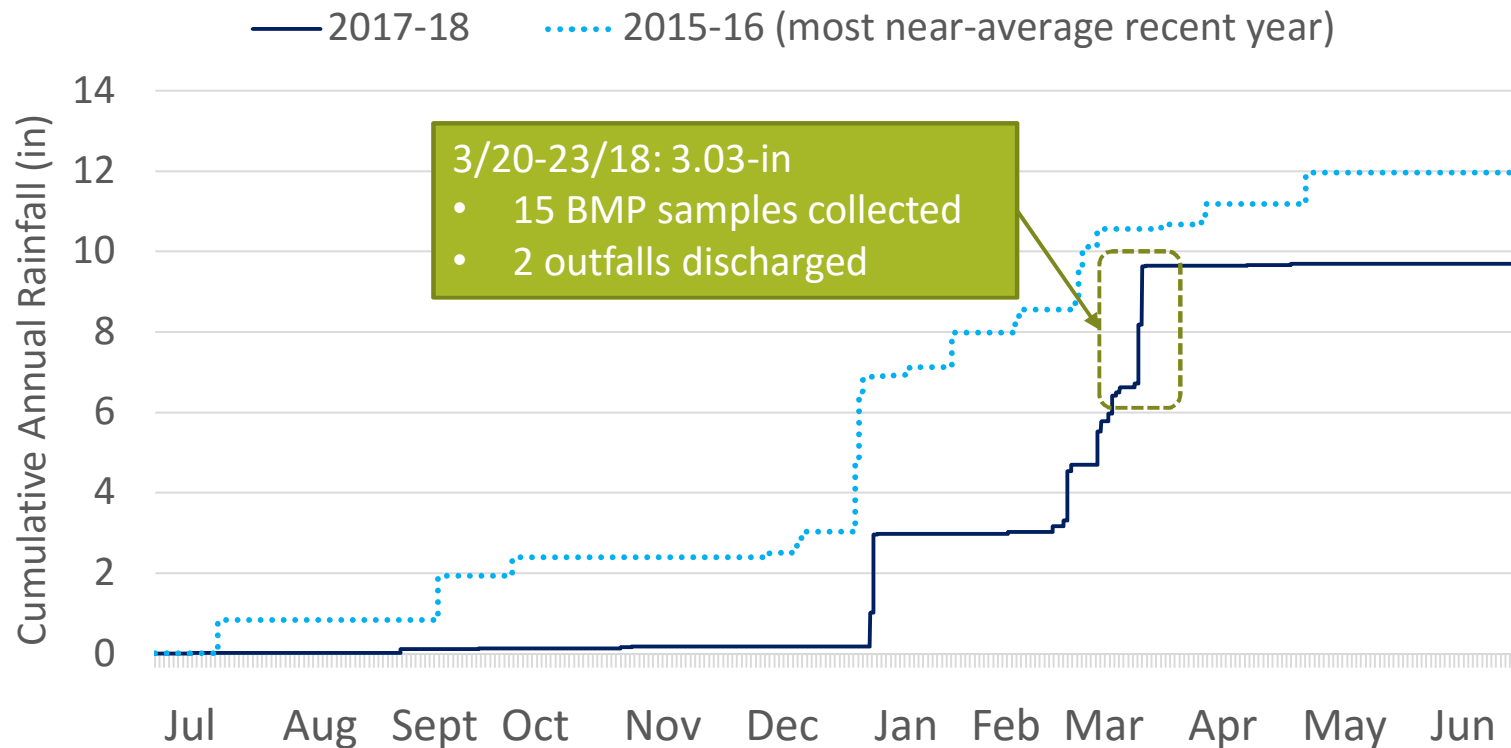
- Four qualifying rain events
- Total annual rainfall 9.75-in (vs. 16.8-in average)



# 2017-18 Rainfall Summary

11

- Four qualifying rain events
- Total annual rainfall 9.75-in (vs. 16.8-in average)



# 2017-18 Monitoring Summary

12

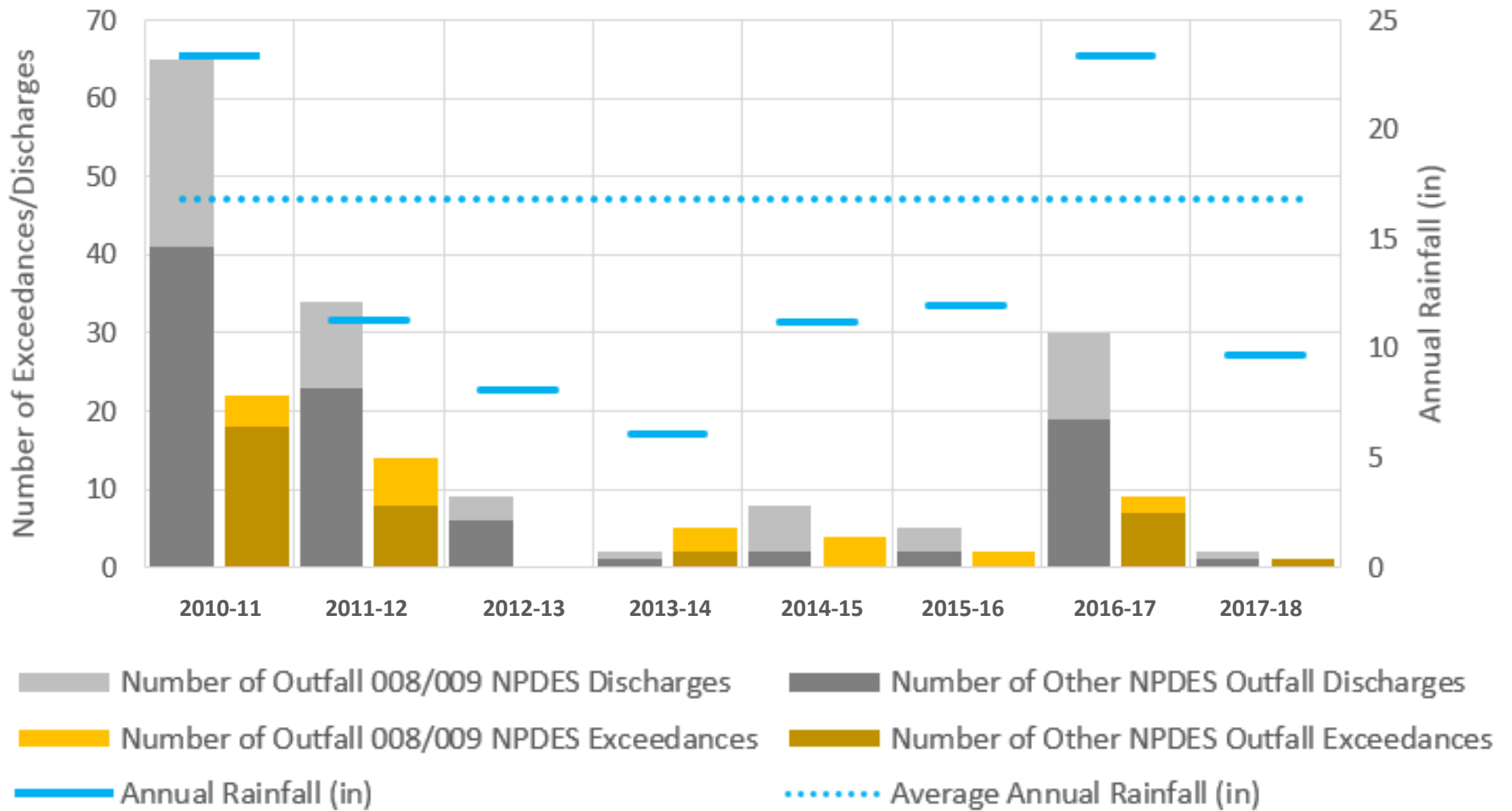
- Outfalls 009 and 002 discharged only during the last event
- No exceedances at Outfall 009
- One exceedance at Outfall 002
  - Iron result = 2.1 mg/L
  - Benchmark limit = 0.3 mg/L
  - Potential sources may include:
    - Background soils
    - Metal structures

# Addressing Metal Structures

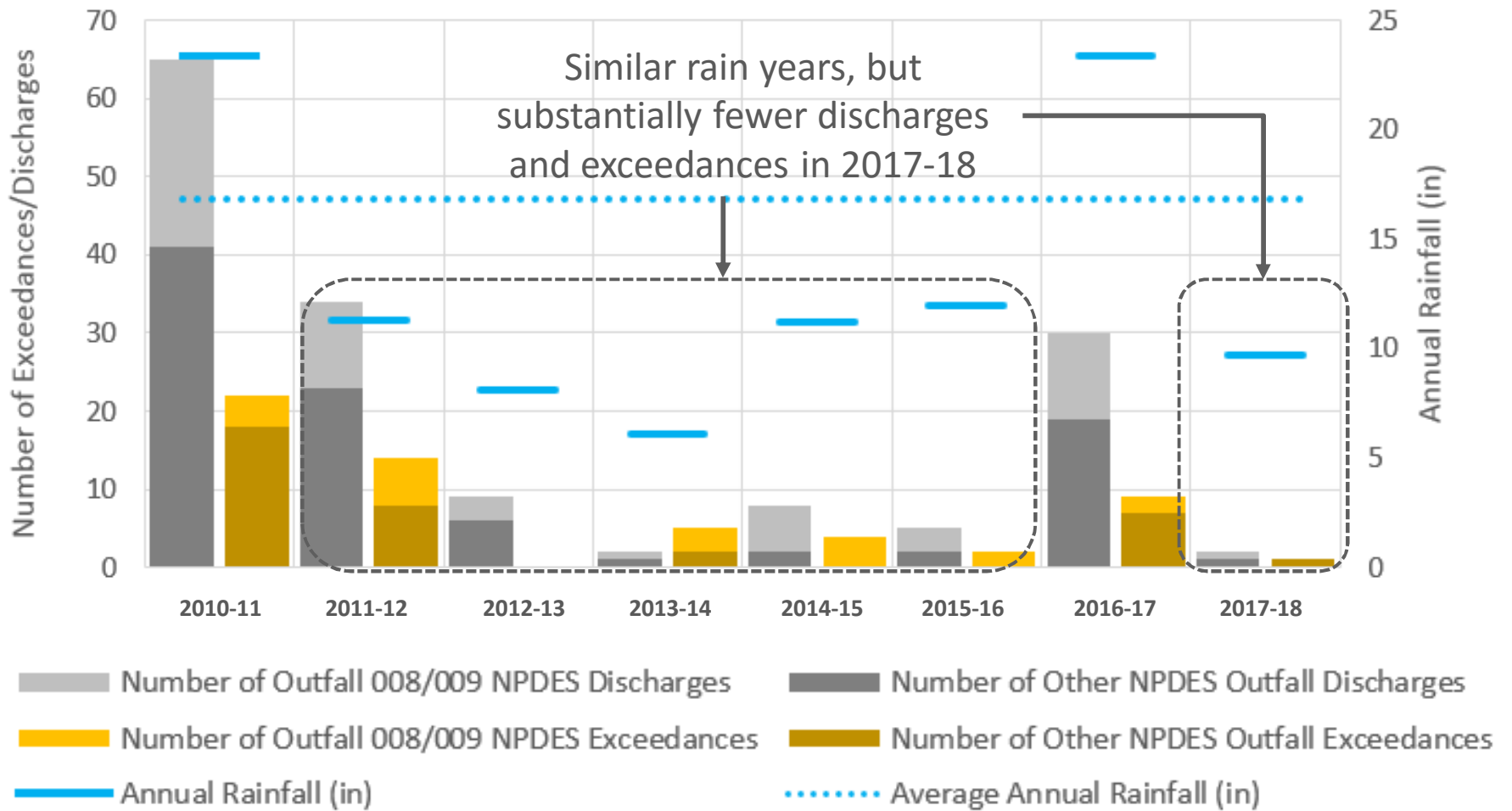
Iron structures in the upstream areas have been painted.



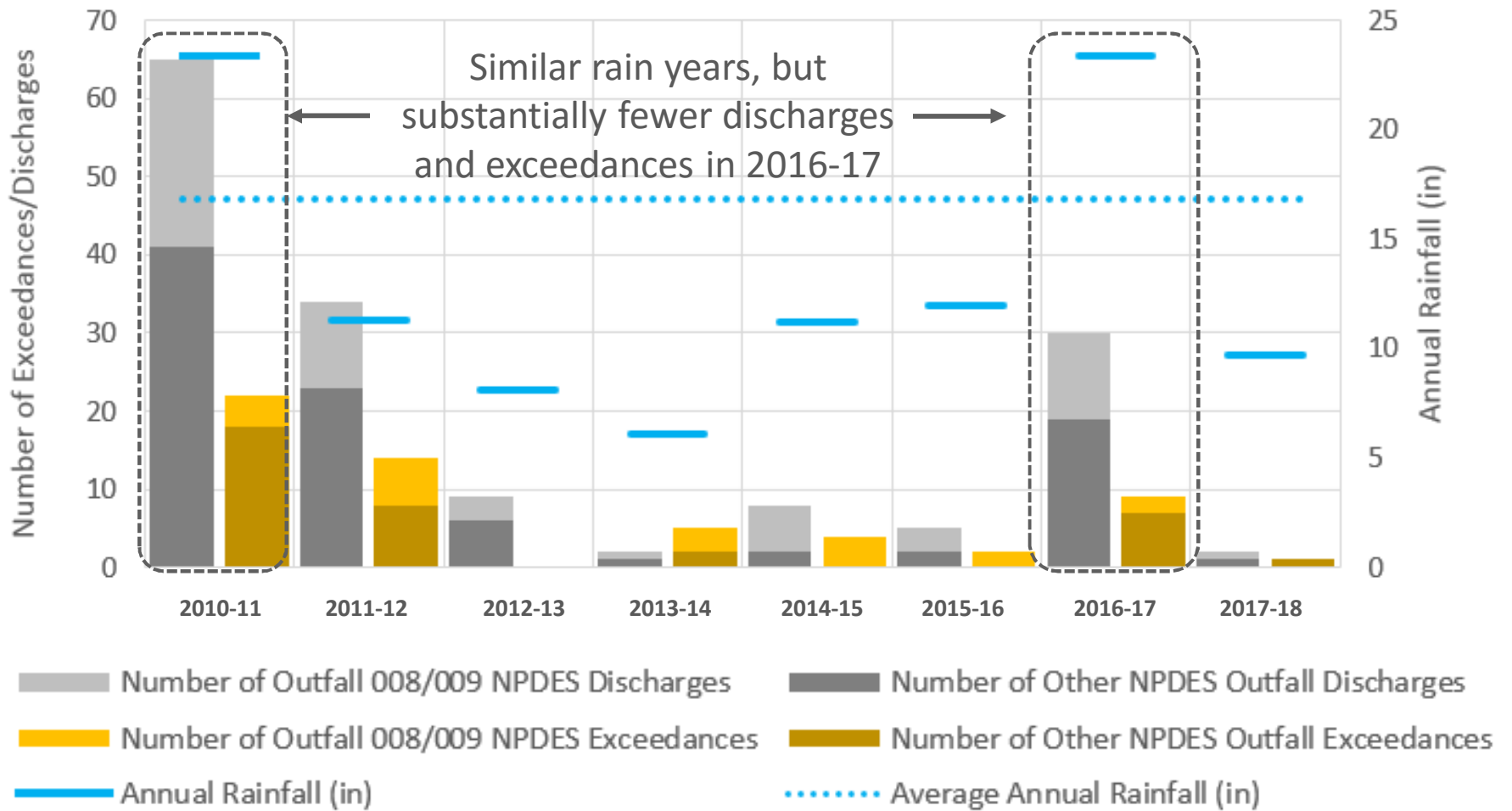
# Historical Overview – NPDES Sampling All SSFL Outfalls



# Historical Overview – NPDES Sampling All SSFL Outfalls



# Historical Overview – NPDES Sampling All SSFL Outfalls





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What is being done to improve water quality?

# BMP Strategy for 008/009 Watersheds

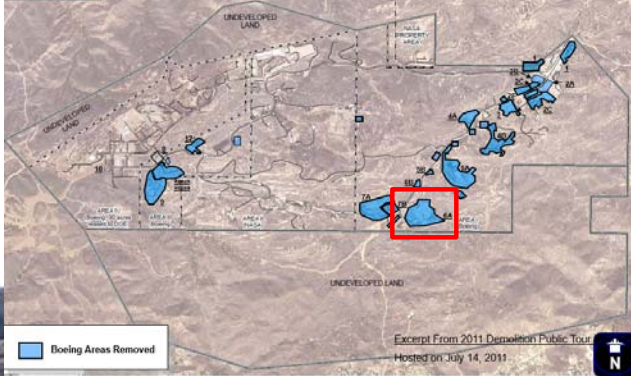


# 008/009 Multi-Pronged Approach

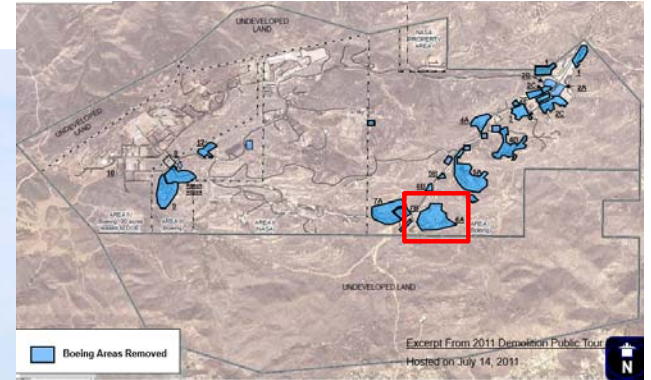
19

- **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**
  - Flow-through media filters
    - Culvert modifications
    - B1, upper lot media filters
    - Sedimentation basin and biofilter
    - ELV treatment BMP
    - Admin area filters
  - Detention bioswales
  - Temporary sedimentation areas (LOX, helipad)

# CTL3 - Before and After

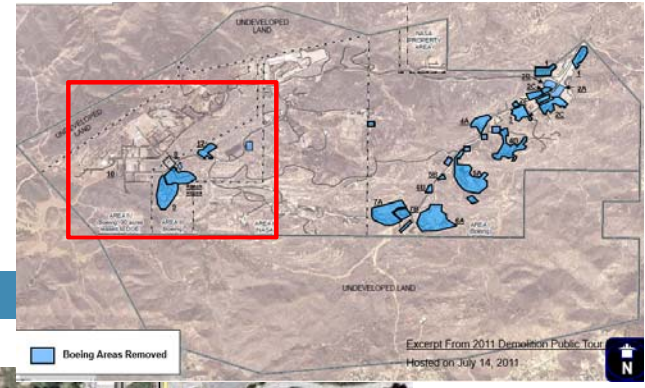


# CTL3 - March 2017



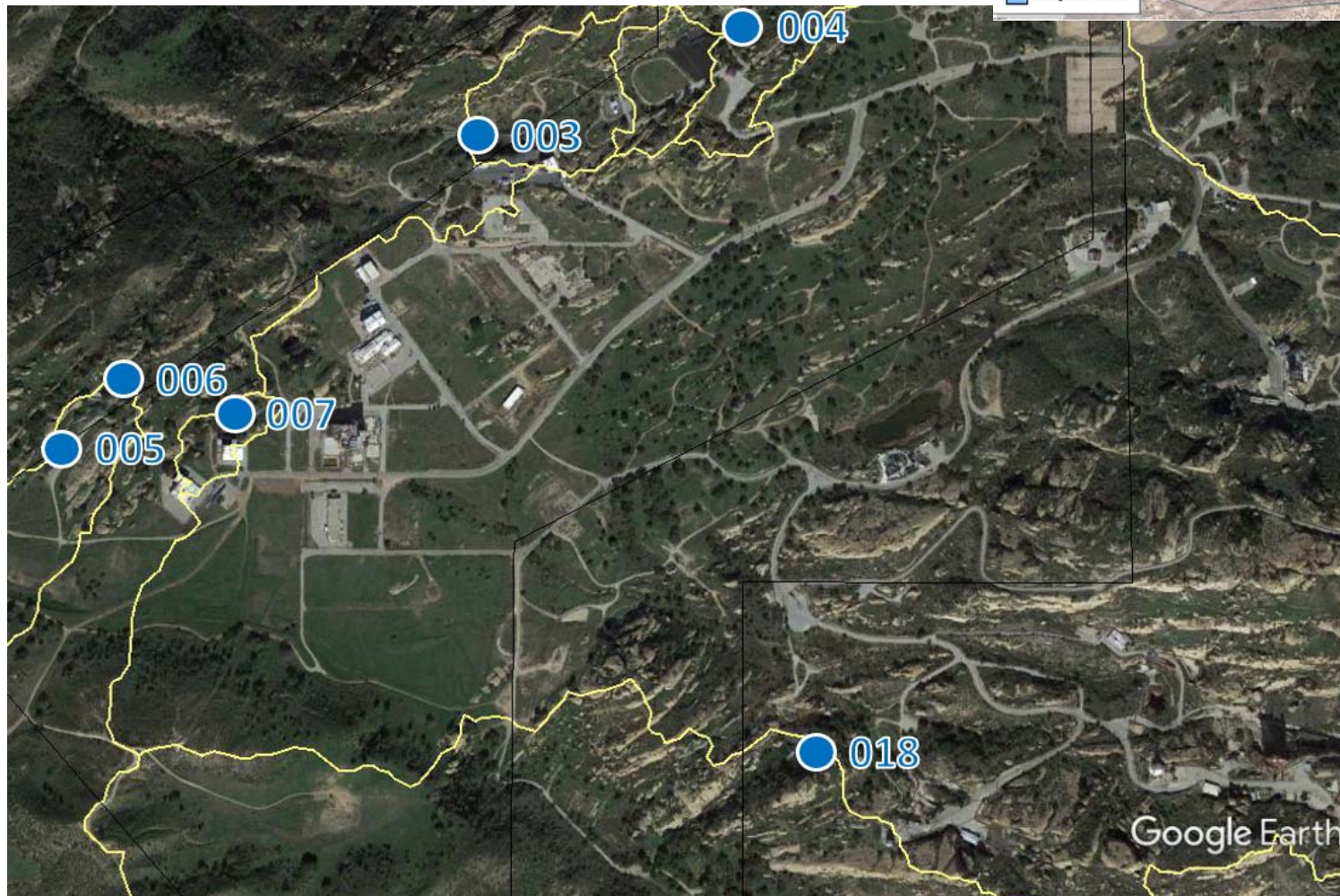
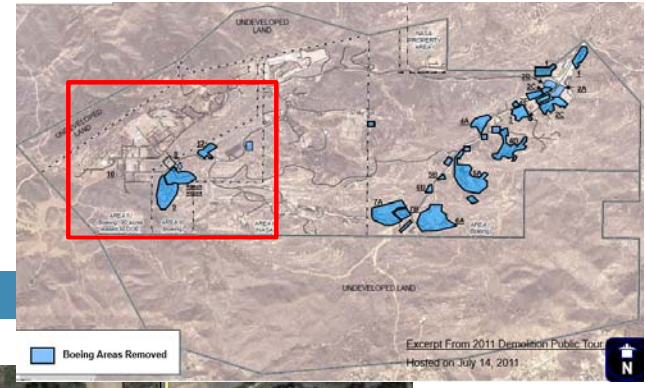
# Area IV Pre-Demolition, 2003

22

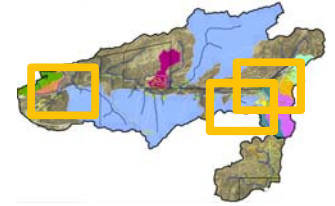


# Area IV Post Demolition, 2016

23



# Example 009 BMPs



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12 Culvert Modifications



Sedimentation Basin and Biofilter

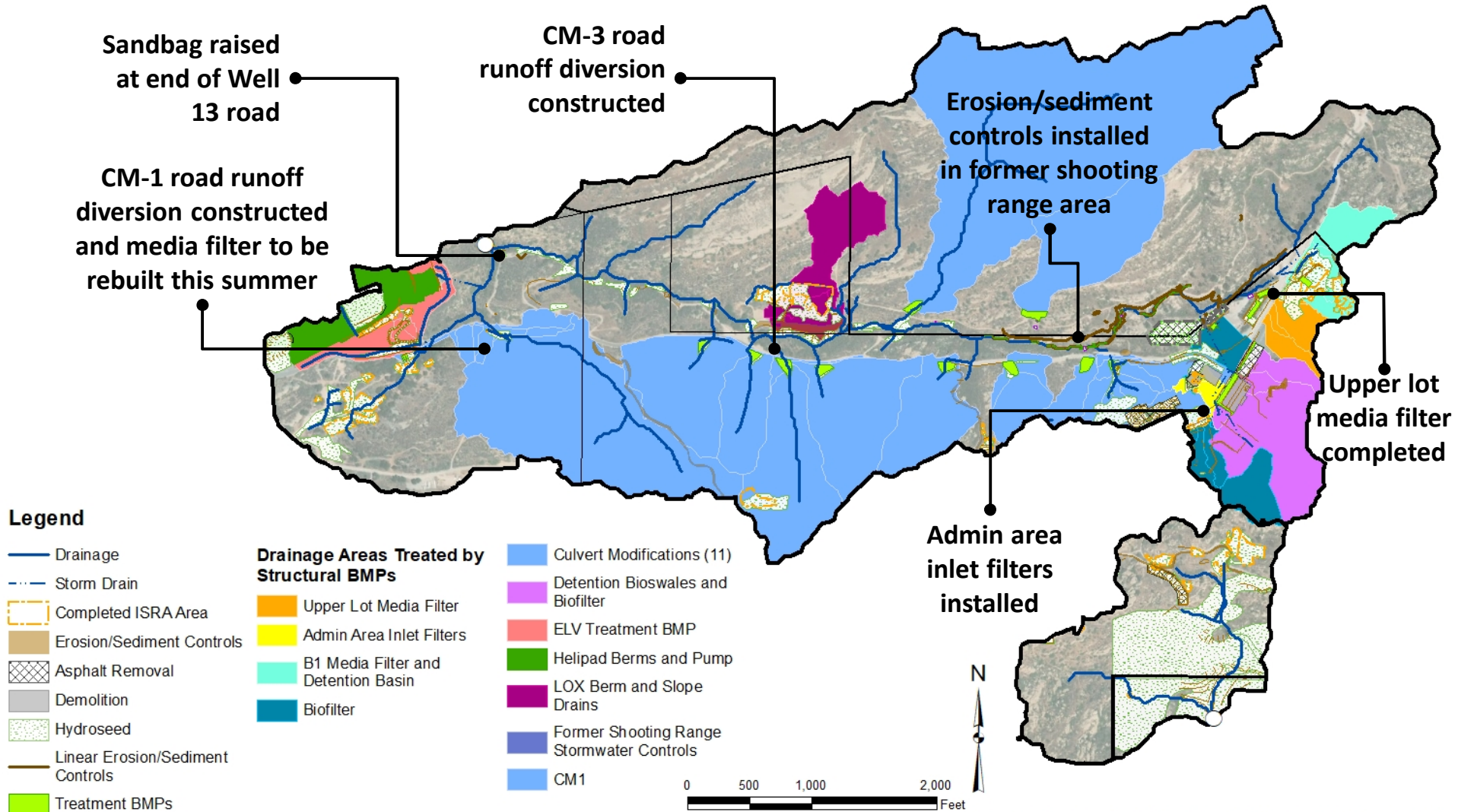


Expendable Launch Vehicle (ELV) Treatment BMP

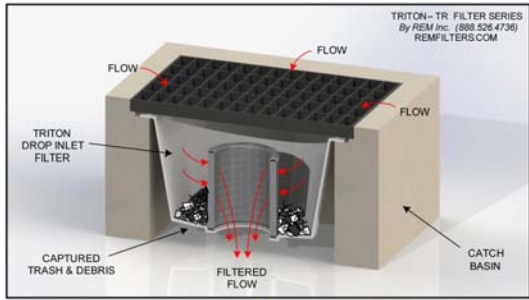
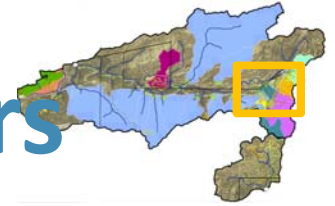




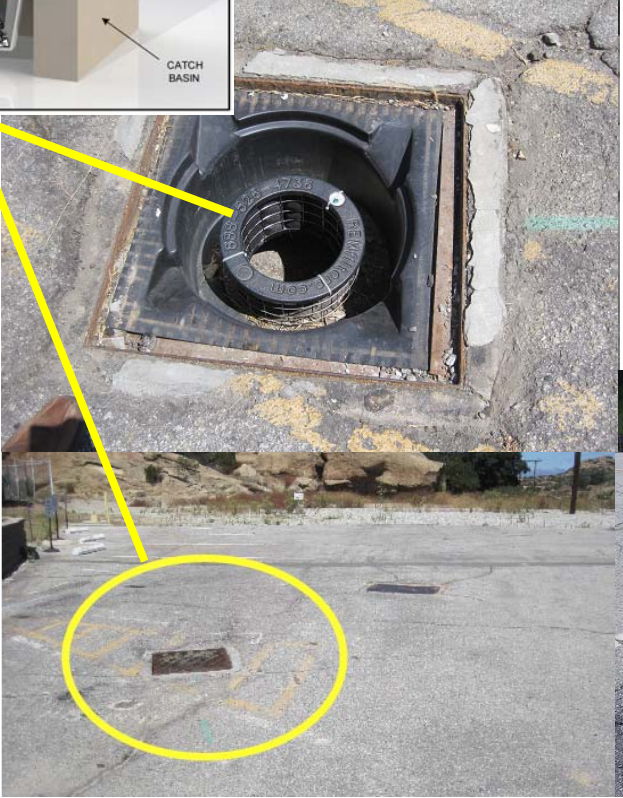
# Most Recently Installed BMPs



# Administration Area Inlet Filters



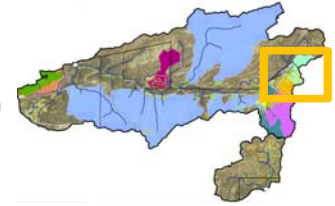
Drop Inlet Filters filled with Site Media (Sand, GAC, Zeolite)



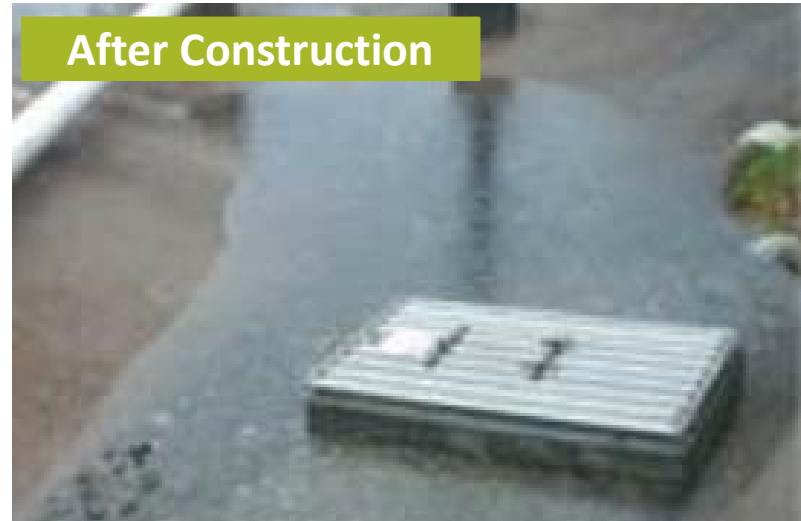
Weighted Wattle filled with media (Perlite, GAC, Zeolite)



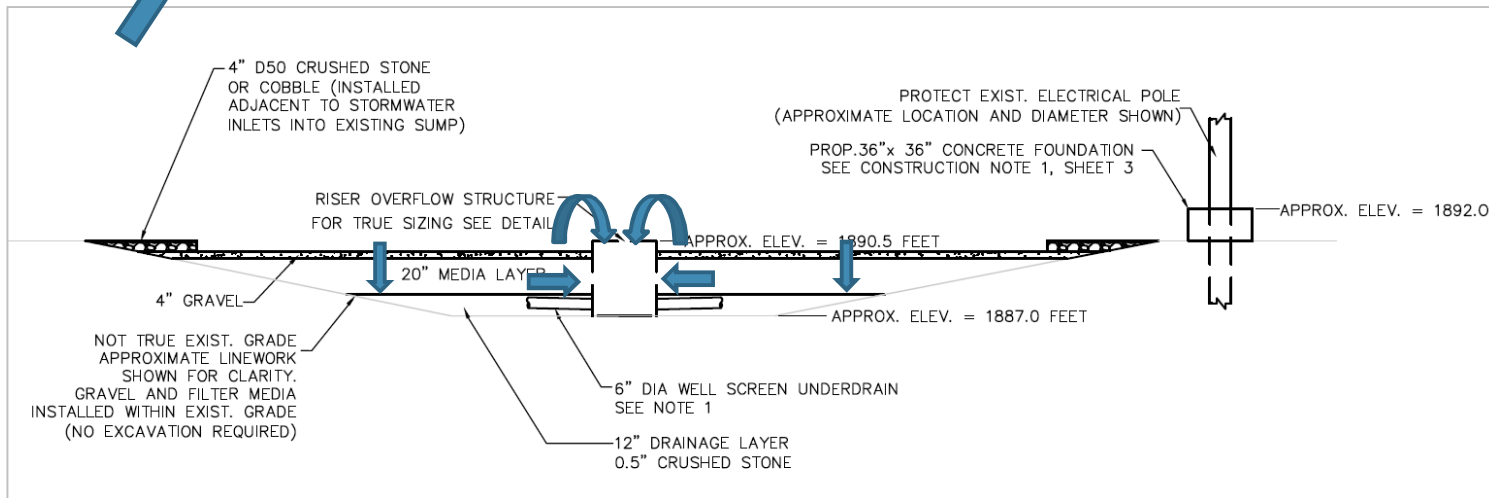
# Upper Parking Lot Media Filter



During Construction



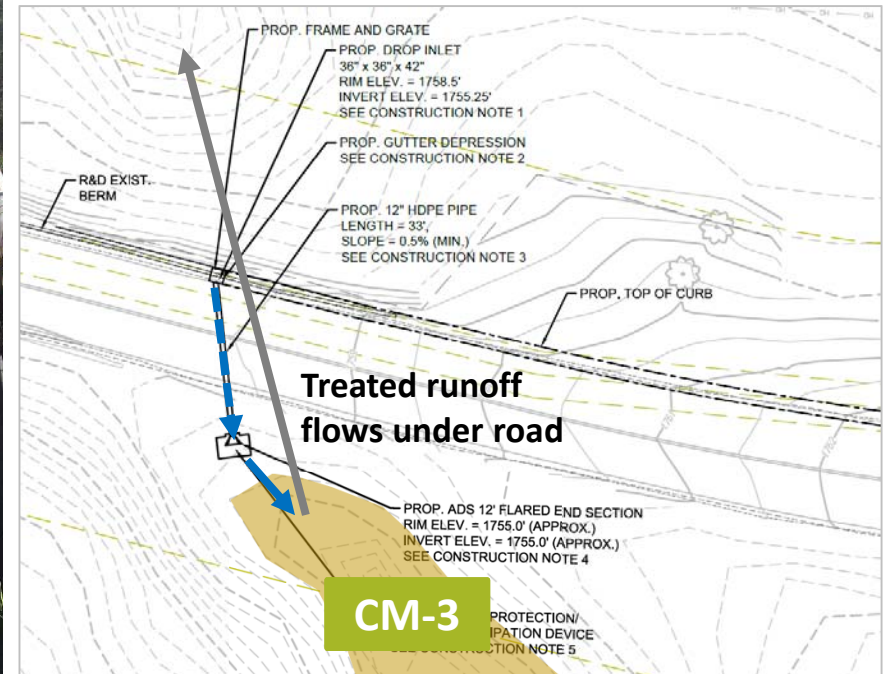
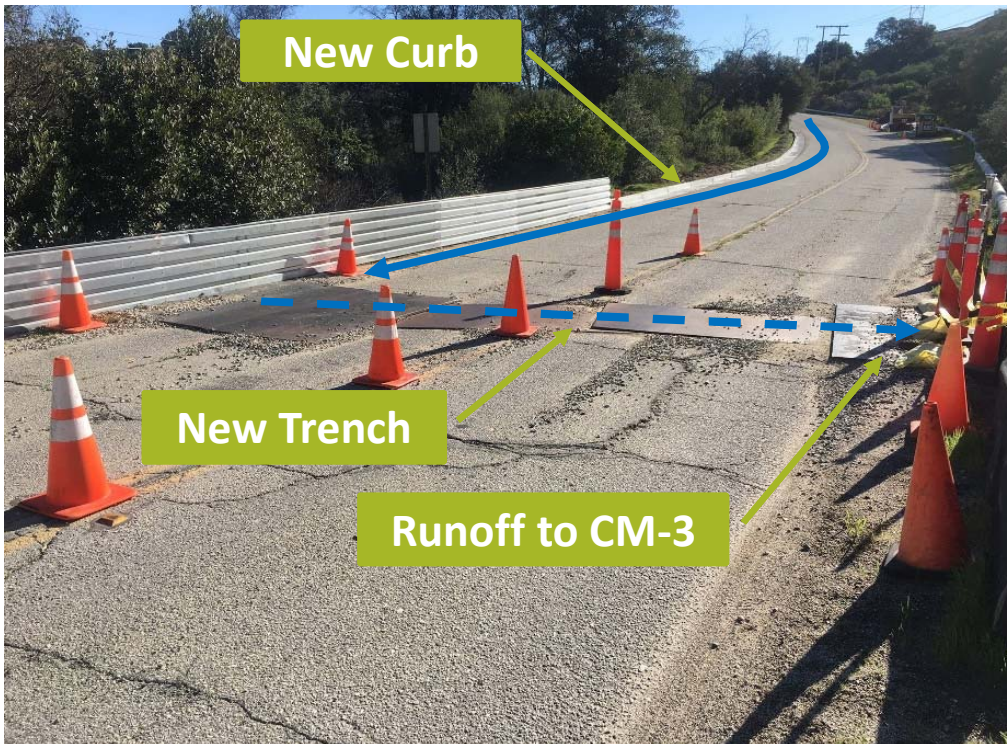
After Construction



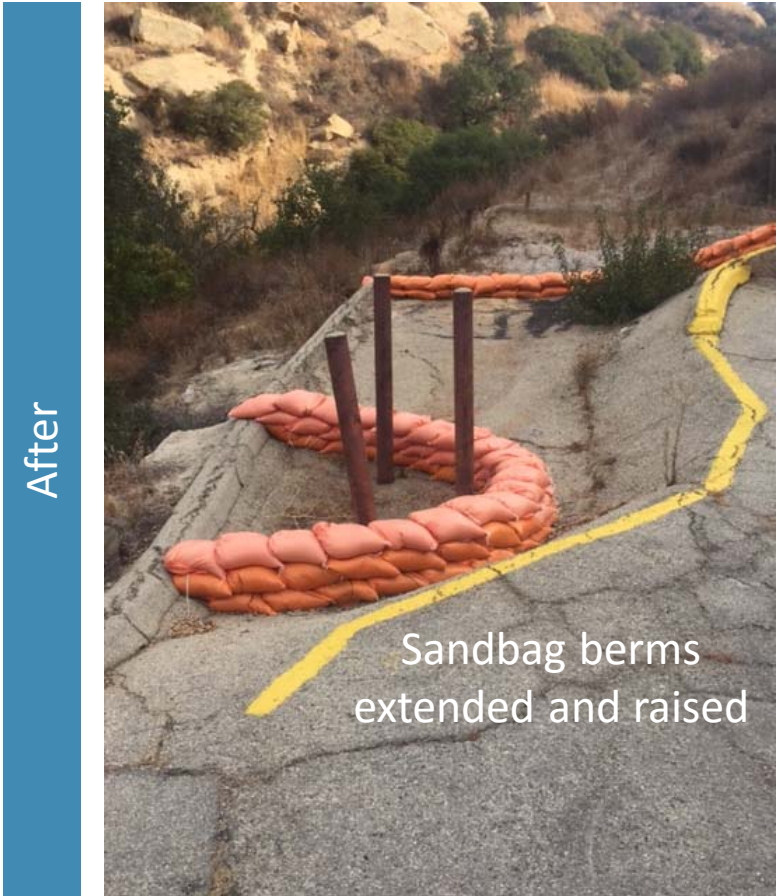
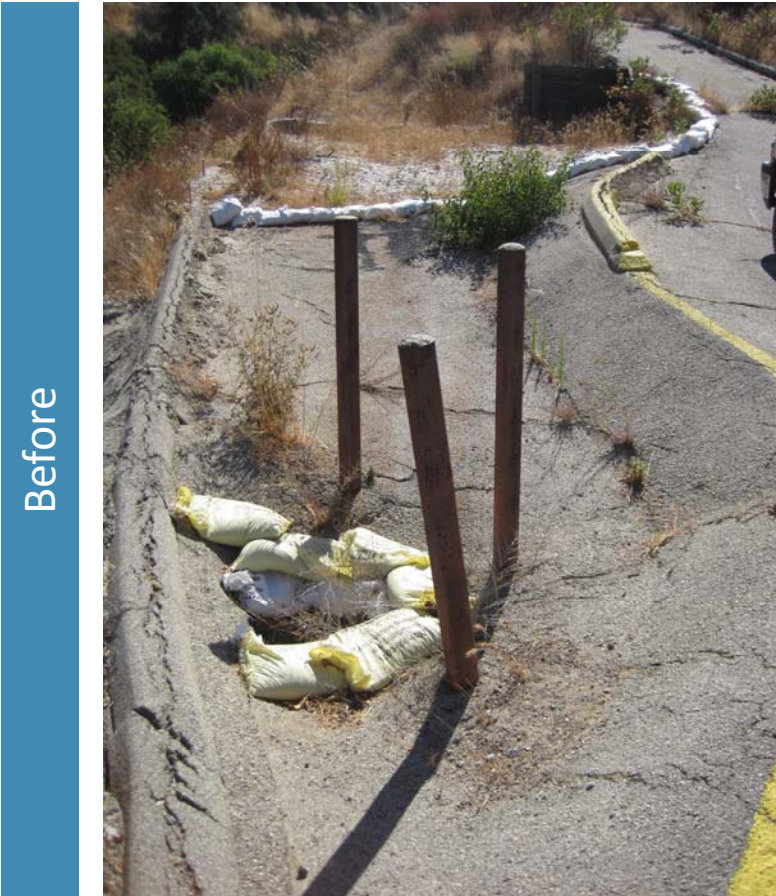
# New Road Runoff Inlets to CM-3 and CM-1



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# Well 13 Road BMPs



# Former Shooting Range BMPs

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Fiber rolls



Sandbag berms



Bank stabilization



Silt fencing



# Special Study Preliminary Results

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- Study Objectives
  - Where (spatially) are dioxins and lead in stormwater predominantly coming from within 009 watershed?
  - What are the predominant pollutant sources to the paved subareas?
- Initial results indicate potential contributors to past OF009 stormwater exceedances:
  - Dioxins
    - Soils near treated wood
    - Fine solids from all pavement types
  - Lead
    - Atmospheric deposition
    - Fine solids from higher traffic roads
    - Shooting range soils not a significant current contributor to the Northern Drainage, and ISRA addressed other surface soils in watershed
- Sampling is ongoing



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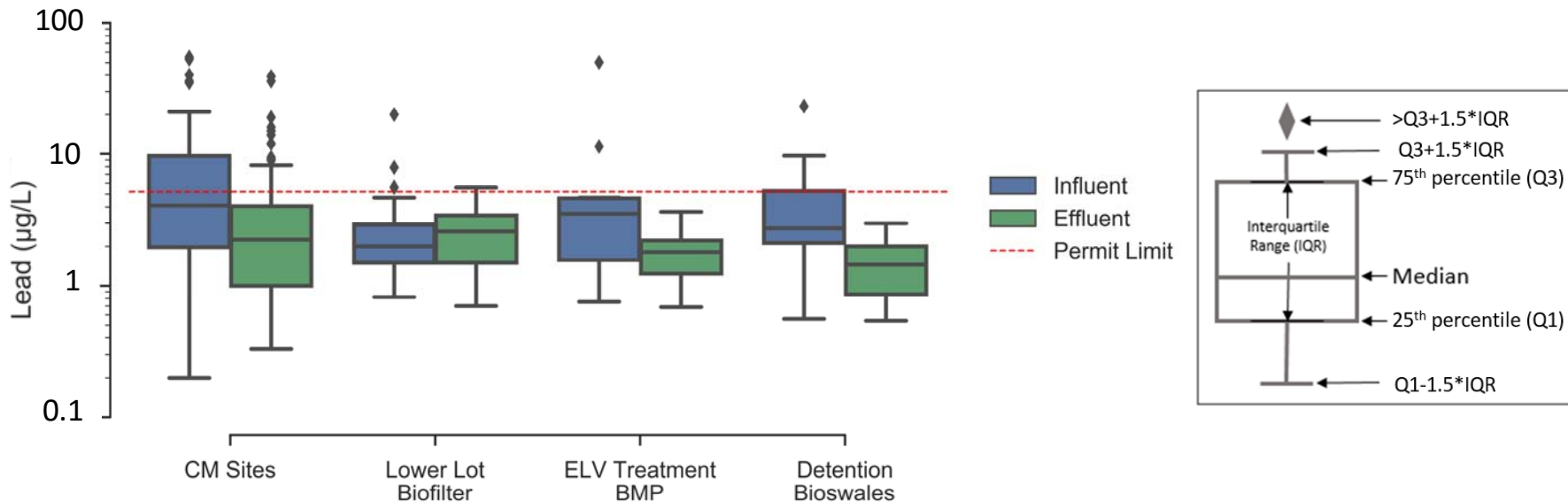
# How are the BMPs Working?



# Historical BMP Performance: Lead

33

Historically, lead concentrations are being significantly reduced for most BMP types



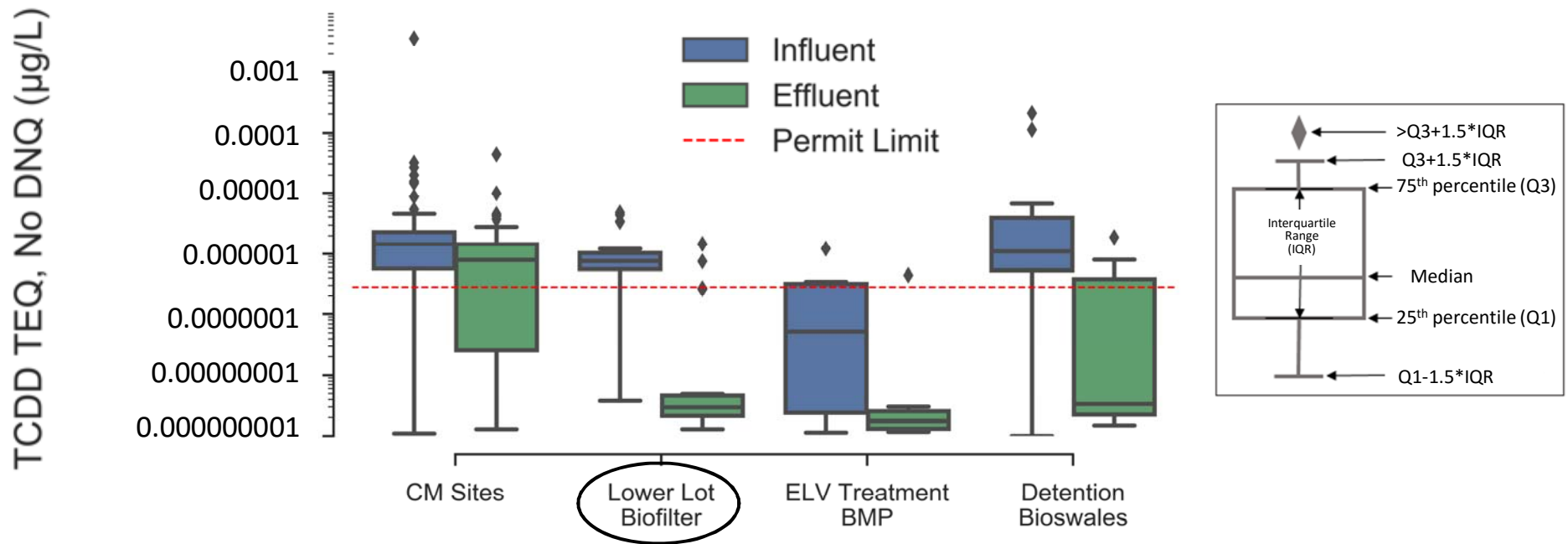
The figure above summarizes all available data, but in the most recent dataset (2017-18):

- Nearly all BMP influent results were below the lead Permit limit
- No measured BMP effluent results were higher than the lead Permit limit
- No lead exceedances were measured at Outfall 009 (during the only discharge event)

# Historical BMP Performance: Dioxin

34

Dioxin concentrations are being significantly reduced for all BMP types



Half 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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How are the BMPs being maintained?

# BMP Maintenance Summary

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BMPs Implemented	Quantity Implemented	Routine Maintenance	Repair/ Upgrade
Mechanical/Chemical Treatment Systems	2	After major storm events	Annually as needed
Structural BMPs	5	After major storm events	Annually as needed
Structural BMPs with Advanced Media	16	After major storm events	Annually as needed
Fiber Rolls and Silt Fencing	~19 Linear Miles	Annually as needed	Annually as needed
Rolling Dips and Water Gravel Bars	~1400 Linear Feet	Annually as needed	Annually as needed
Check Dams	~1000 Linear Feet	Annually as needed	Annually as needed
Erosion Control, Hydroseed, and Jute Straw Mat	~760 Acres	Annually as needed	Annually as needed

# Northern Drainage Inspections

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- Inspection conducted May 30, 2018
- 1 recommendation for repairs and 2 watch areas



# Media Filter Maintenance Needs

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- Expected years to needed media replacement (based on total suspended solids loading) is evaluated annually for each media filter
- Inspections are also conducted 72-hours after each rain event to make note of extended ponding
- CM-1 media replacement is currently recommended per the TSS loading estimate and ponding observations; CM-1 to be reconstructed later this summer
- Other media filters are estimated to have 2 to 30+ years of useful media life remaining

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## What did the Human Health Risk Assessment Evaluate and Conclude?

# HHRA Scope

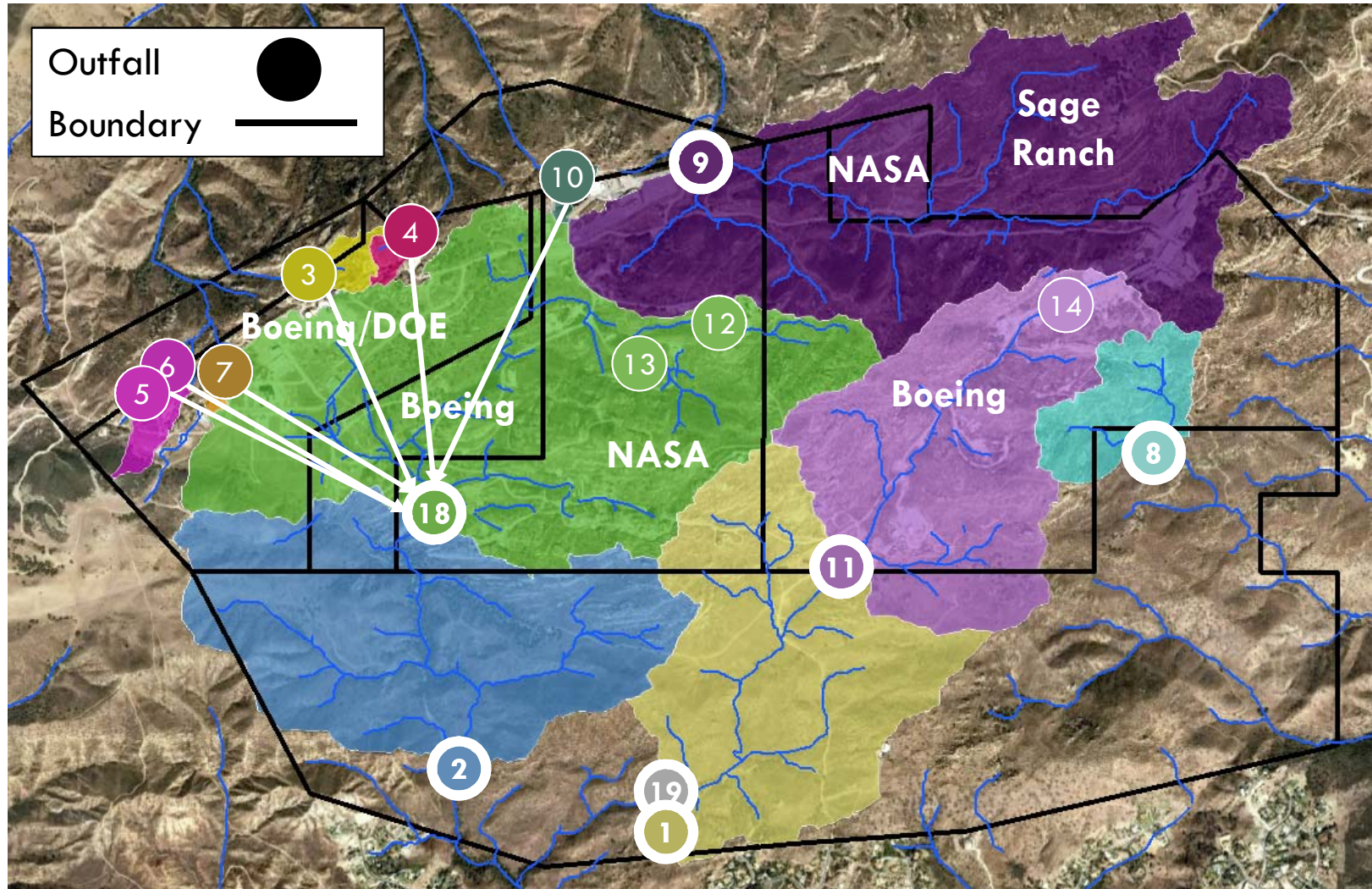
40

- 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) will be addressed through other future site 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 Timeline Review

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2015

- Order issued to perform HHRA
- Draft Work Plan submitted for RWQCB and Office of Environmental Health Hazard Assessment (OEHHA) review

2016

- Revised Draft Work Plan submitted and released for public comment
- Public comments received
- Work Plan revised and approved

2017

- Draft HHRA submitted for RWQCB and OEHHA review
- Final HHRA revised and completed

# HHRA Approach

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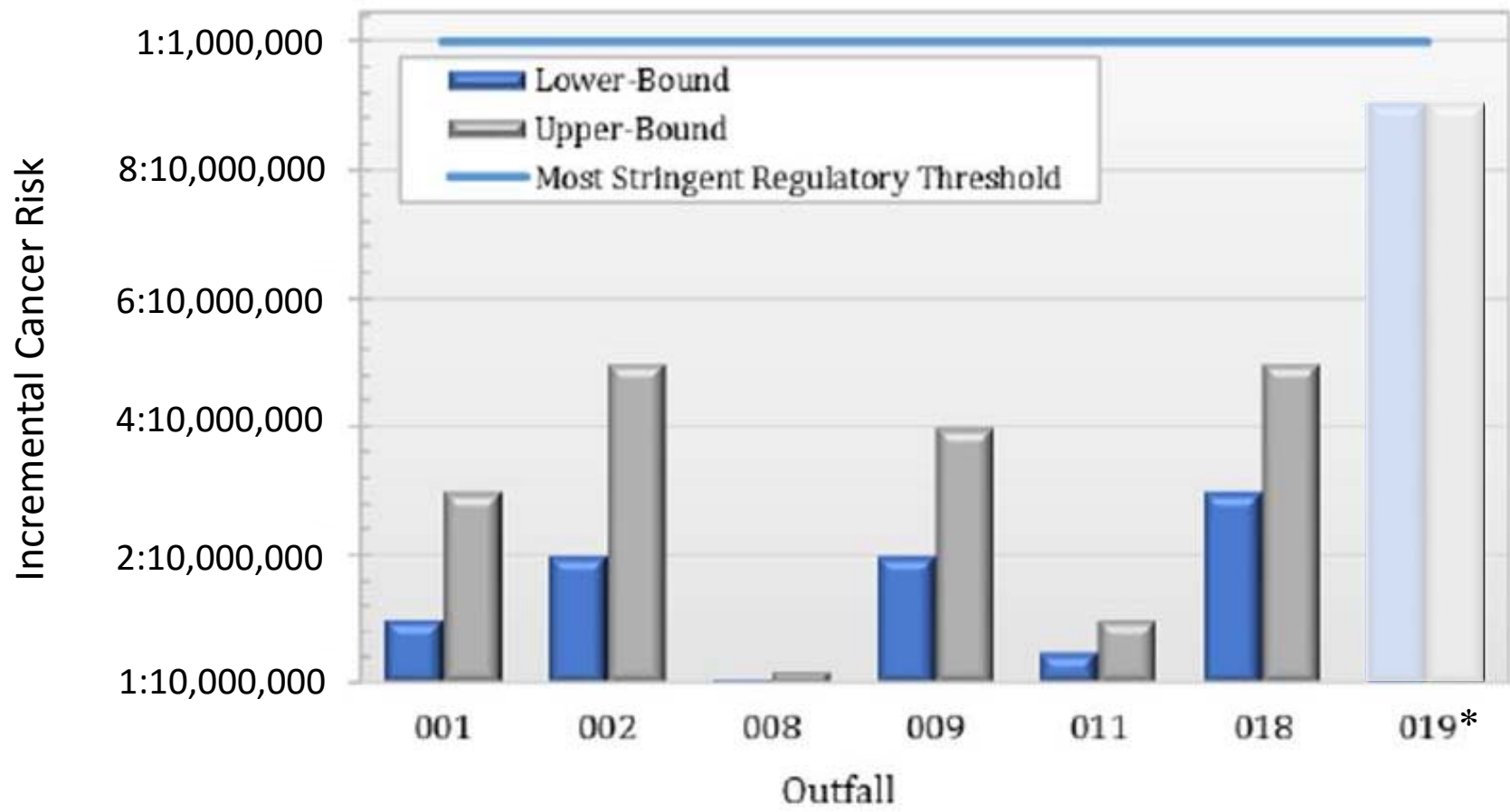
- Recreators (child/adult) were evaluated
- Exposure was assumed to occur at each outfall separately
- Exposure frequency – days per year of exposure connected to the flow days (1-2 days per week)
- Exposure pathways
  - Incidental ingestion and dermal contact evaluated as primary pathways consistent 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



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

# Documents Available Online

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## Revised HHRA Work Plan

[http://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Revised\\_Human\\_Health\\_Assessment\\_Work\\_Plan\\_SSFL.pdf](http://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Revised_Human_Health_Assessment_Work_Plan_SSFL.pdf)

## Final HHRA Submitted to RWQCB

[https://www.waterboards.ca.gov/losangeles/public\\_notices/Boeing/2017/16.FinalHHRAforSurfaceWaterRunoffExitingSSFLviathetheSouthernOutfalls-October30,20017.pdf](https://www.waterboards.ca.gov/losangeles/public_notices/Boeing/2017/16.FinalHHRAforSurfaceWaterRunoffExitingSSFLviathetheSouthernOutfalls-October30,20017.pdf)

## Regional Board acknowledgement of HHRA completion

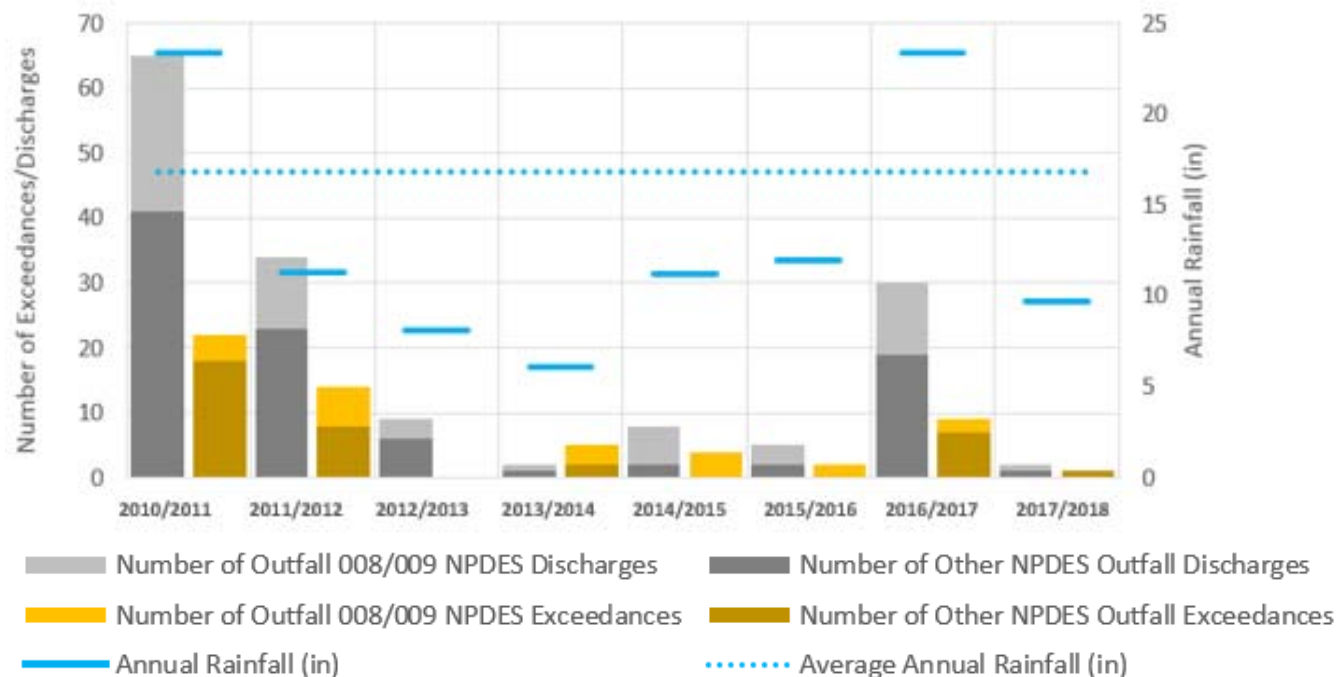
[https://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Final\\_HHRA\\_Cover\\_Letter.pdf](https://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Final_HHRA_Cover_Letter.pdf)

# Summary

47

## Q1: What has recent water quality been like?

**A:** There were no Permit Limit exceedances at any NPDES Outfalls this season. There was one benchmark limit exceedance at Outfall 002, for iron. Additionally, both discharges and exceedances have been reduced over time.



# Summary (cont'd)

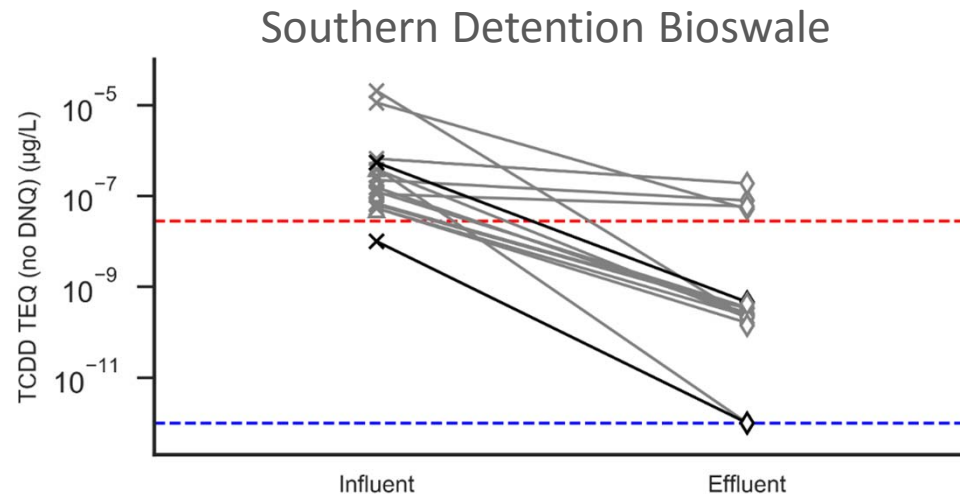
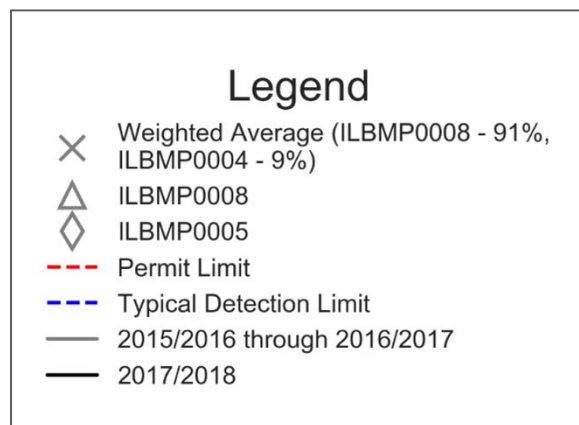
48

## Q2: What is SSFL doing to improve water quality?

**A:** Recent BMP efforts, rooted in monitoring data, have been significant and reflect the best available technology. Special studies to identify potential sources of historical exceedances are also ongoing.

## Q3: How are the BMPs working?

**A:** Significant performance data have been collected (nearly 150 influent/effluent pairs) and demonstrate that all BMPs are highly effective at reducing their targeted pollutants.





# Summary (cont'd)

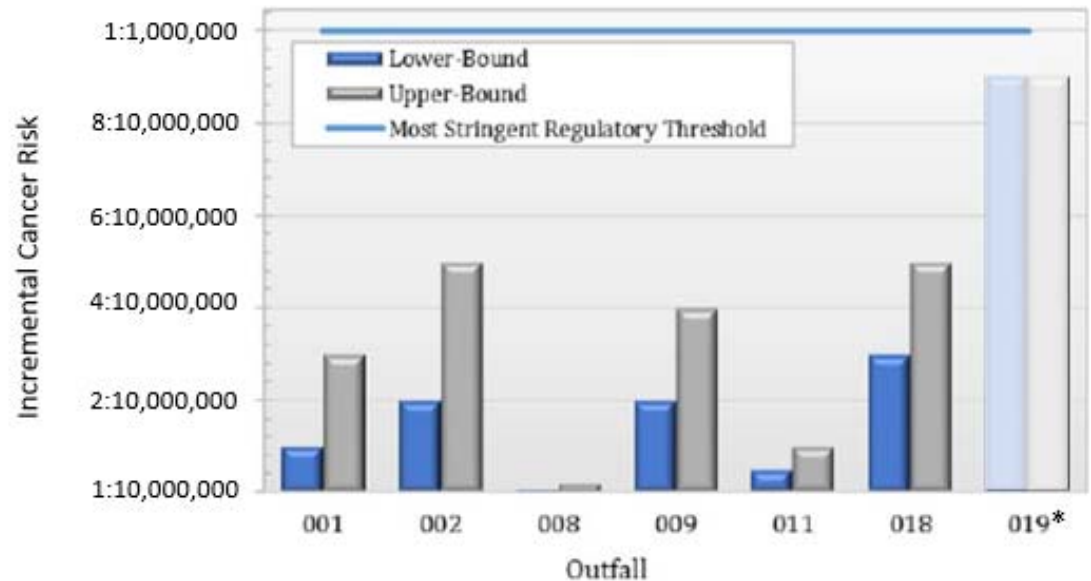
49

## Q4: How are the BMPs being maintained?

**A:** Maintenance needs are reviewed after each storm event and on an annual basis, with repairs made as needed.

## Q5: What did the HHRA conclude?

**A:** Potential recreational exposure via incidental ingestion and dermal contact in surface water runoff exiting the SSFL are below levels of concern established by CalEPA and USEPA.



# Questions

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## THANK YOU

Additional Information (e.g., NPDES Permit, Panel Presentations, and Technical Reports):

[www.boeing.com/principles/environment/santa\\_susana](http://www.boeing.com/principles/environment/santa_susana)

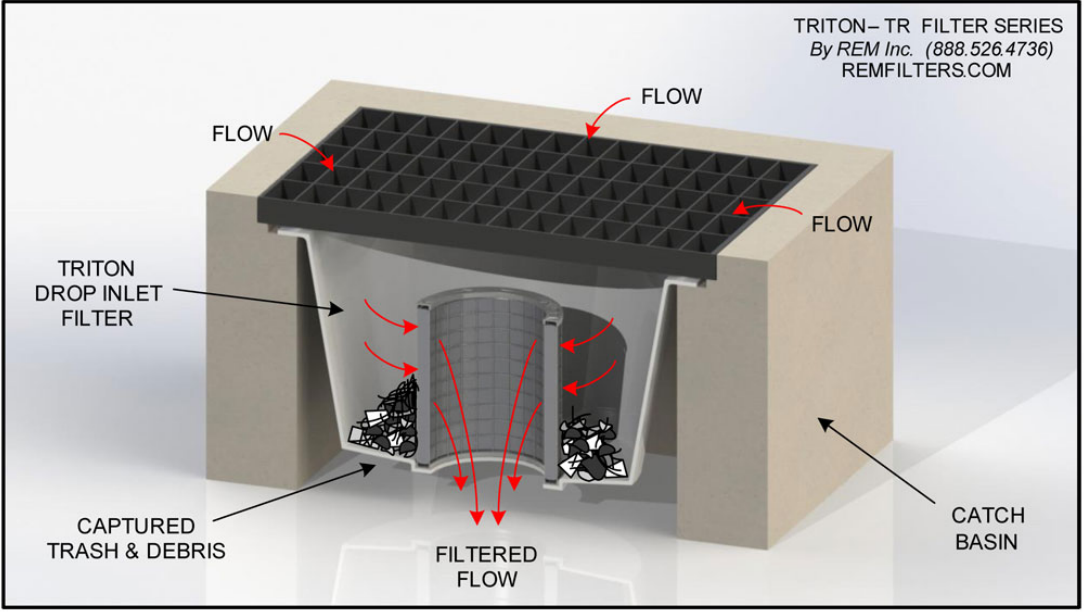
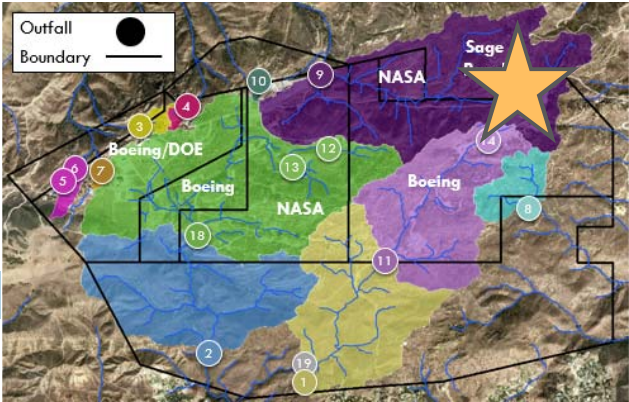
51

# Tour Overview

# Stop 1 (on foot)

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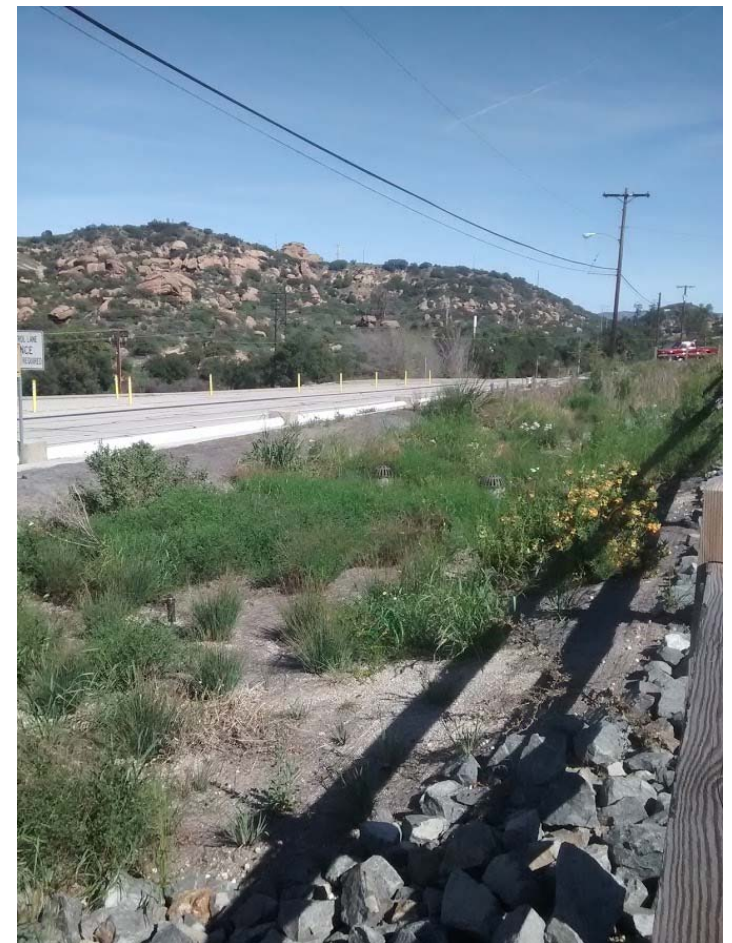
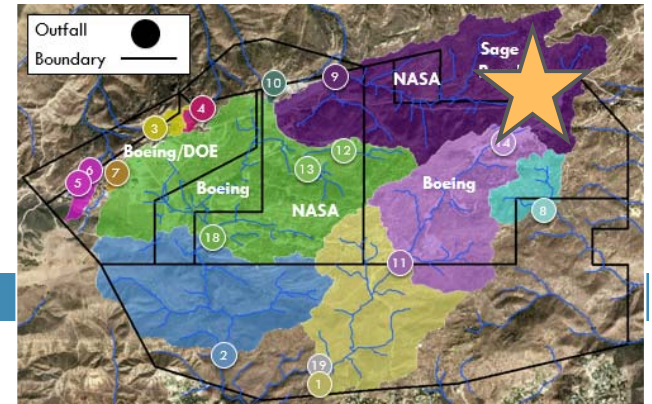
- Administration area inlet filters
- Detention bioswales



# Stop 1 (on foot)

53

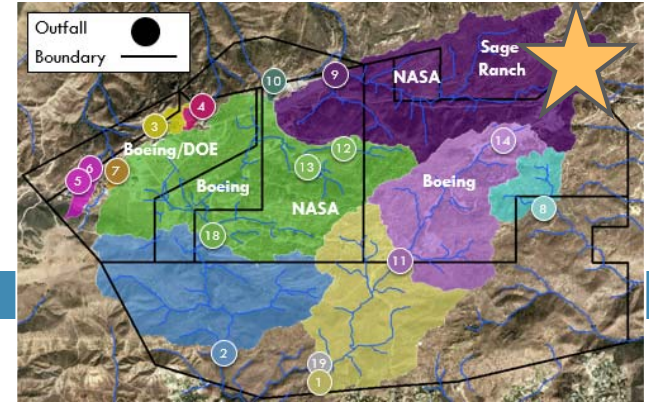
- Administration area inlet filters
- **Detention bioswales**



# Stop 2 (from bus)

54

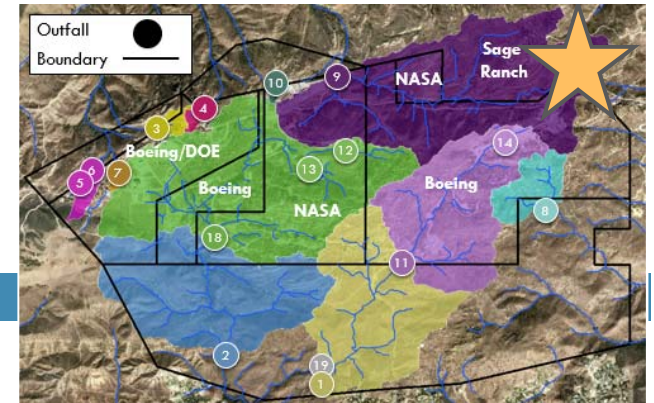
- Upper lot media filter
- Lower lot sedimentation basin and biofilter



# Stop 2 (from bus)

55

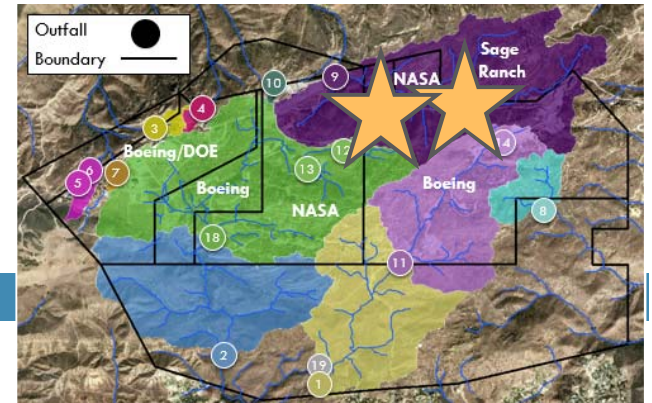
- Upper lot media filter
- Lower lot sedimentation basin and biofilter



# Stop 3 (exit bus)

56

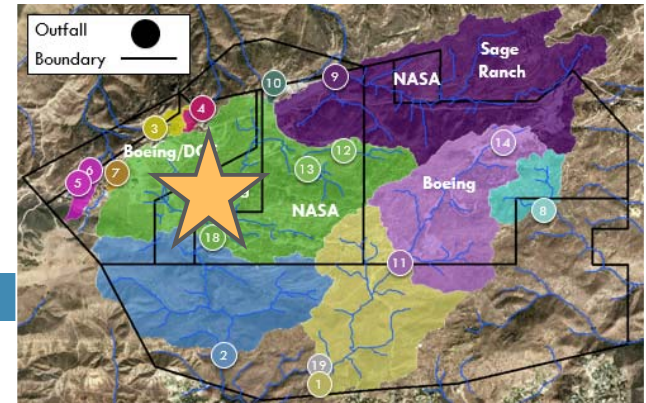
- CM-3 storm drain diversion
- CM-1 storm drain diversion





# Stop 4 (exit bus)

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- **Outfall 018 stormwater treatment system**



# Handouts for each tour stop

### Santa Susana Field Laboratory BMP Factsheet

**Year Constructed**  
2014

**Target Constituents**  
Lead, dioxins, and total suspended solids (TSS)

**Drainage Area**  
18.2 acres

**Treatment Processes**  
Detention, settling, filtration, and biofiltration

**PROCESS**

• Runoff is conveyed to the detention bioswales by a speed bump and rock swale or drains directly to the bioswale

• Stormwater is ponded on the surface to promote settling of pollutants

• Plants prevent scour, reduce maintenance, and filter and collect particulate-bound pollutants in the soil

• Captured runoff is stored in chambers below to detain flows and increase water treated by the biofilter

• Treated water is either diverted to the biofilter or flows to the Northern Drainage and ultimately to Outfall 009

**LOCATION**

The Outfall 009 watershed covers 535 acres

• The BMP (location starred) treats runoff before it reaches Outfall 009

• The treated drainage area (shaded) includes both paved and unpaved surfaces

**PERFORMANCE**

19 paired samples have been collected to date. The number of samples exceeding the OF009 Permit Limit decreases from influent to effluent, or is generally unchanged when concentrations are already low.

Constituent	Above Permit Limit		Below Permit Limit	
	Influent	Effluent	Influent	Effluent
Dioxins	100%	32%	0%	68%
Lead	53%	0%	47%	100%

**SNAPSHOT**

2015

### Santa Susana Field Laboratory BMP Factsheet

**Year Constructed**  
2017

**Target Constituents**  
Lead, dioxins, and total suspended solids (TSS)

**Drainage Area**  
5.1 acres

**Treatment Processes**  
Settling, sorption, ion exchange, and filtration

**PROCESS**

Runoff from adjacent parking lot, roadway, and hillside are conveyed by existing gutters and culverts

Similar design compared to other SSFL media filters (e.g., B1, CM3, etc.)

**Pretreatment Forebay**

- Large particles settle out to reduce clogging of media filter and extend its lifetime
- Water flows by gravity through the gravel berms into the media filter

**Media Filter**

- Optimized engineered media blend removes pollutants through sorption, ion exchange, and filtration

Treated water flows to the Northern Drainage and ultimately to Outfall 009

**LOCATION**

The Outfall 009 watershed covers 535 acres

• The BMP (location starred) treats runoff before it reaches Outfall 009

• The treated drainage area (shaded) includes both paved and unpaved surfaces

**PERFORMANCE**

This is a new installation so only 2 paired samples have been collected to date. The number of samples exceeding the OF009 Permit Limit decreases from influent to effluent, or is generally unchanged when concentrations are already low.

Constituent	Above Permit Limit		Below Permit Limit	
	Influent	Effluent	Influent	Effluent
Dioxins	100%	50%	0%	50%
Lead	0%	0%	100%	100%

**SNAPSHOT**

### Santa Susana Field Laboratory BMP Factsheet

**Year Constructed**  
2017

**Target Constituents**  
Lead, dioxins, and total suspended solids (TSS)

**Drainage Area**  
17 acres

**Treatment Processes**  
Settling, sorption, ion exchange, and filtration

**PROCESS**

Runoff from adjacent parking lot, roadway, and hillside are conveyed by existing gutters and culverts

Similar design compared to other SSFL media filters (e.g., B1, CM3, etc.)

**Pretreatment Forebay**

- Large particles settle out to reduce clogging of media filter and extend its lifetime
- Water flows by gravity through the gravel berms into the media filter

**Media Filter**

- Optimized engineered media blend removes pollutants through sorption, ion exchange, and filtration

Treated water flows to the Northern Drainage and ultimately to Outfall 009

**LOCATION**

The Outfall 009 watershed covers 535 acres

• The BMP (location starred) treats runoff before it reaches Outfall 009

• The treated drainage area (shaded) includes both paved and unpaved surfaces

**PERFORMANCE**

This is a new installation so only 2 paired samples have been collected to date. The number of samples exceeding the OF009 Permit Limit decreases from influent to effluent, or is generally unchanged when concentrations are already low.

Constituent	Above Permit Limit		Below Permit Limit	
	Influent	Effluent	Influent	Effluent
Dioxins	100%	50%	0%	50%
Lead	0%	0%	100%	100%

**SNAPSHOT**