King County
Lower Duwamish Waterway Source Control Implementation Plan

2019–2023

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2019–2023

Prepared for:

Washington State Department of Ecology
Northwest Regional Office

Submitted by:

King County
Department of Natural Resources and Parks
Department of Executive Services
Department of Local Services
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King County

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Acronyms and Abbreviations

BEHP	bis (2-ethylhexyl) phthalate
BBP	butyl benzyl phthalate
BMP	best management practice
Boeing	The Boeing Company
Cadman	Cadman Aggregate and Ready-Mix
COC	contaminants of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	cleanup screening level
CSO	combined sewer overflow
CSCS	Confirmed and Suspected Contaminated Site
DIG	Duwamish Inspectors Group
dw	dry weight
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESJ	equity and social justice
ESA	environmental site assessment
FMD	Facilities Management Division
GSI	green stormwater infrastructure
HPAH	high molecular weight polycyclic aromatic hydrocarbon
IC/IDDE	illicit connections and illicit discharges detection and elimination
ISGP	Industrial Stormwater General Permit
KCSWDM	King County Surface Water Design Manual
KCIA	King County International Airport
KCIW	King County Industrial Waste Program
kg	kilograms
LAET	low apparent effects threshold
2LAET	second lowest apparent effects threshold
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LPAH	low molecular weight polycyclic aromatic hydrocarbon
Manson	Manson Construction Company
Metro	Municipality of Metropolitan Seattle
mg	milligrams
mg/kg oc	milligrams per kilogram organic carbon
MS4	Municipal Separate Storm Sewer System
MTCA	Model Toxics Control Act
N/A	not available
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OSS	on-site sewage system
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl

Phase 1 MS4 Permit	Phase I Municipal NPDES Stormwater Permit
ppb	parts per billion
ppm	parts per million
PSAMP	Puget Sound Ambient Monitoring Program
Public Health	Public Health–Seattle & King County
RI/FS	remedial investigation/feasibility study
ROW	right-of-way
RSD	Roads Services Division
SAP	sampling and analysis plan
SCWG	Source Control Work Group
SDOT	Seattle Department of Transportation
SMS	Sediment Management Standards (Washington State)
SPS	South Pump Station
SPU	Seattle Public Utilities
sq ft	square foot
SQS	Sediment Quality Standards
SVOC	semi-volatile organic compound
SWD	Solid Waste Division
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
SWS	Stormwater Services Section
UST	underground storage tank
WAC	Washington Administrative Code
West Point	West Point Treatment Plant
WLRD	Water and Land Resources Division
WTD	King County Wastewater Treatment Division
YSC	Youth Services Center

EXECUTIVE SUMMARY

This document summarizes King County's Lower Duwamish Waterway (LDW) Source Control Implementation Plan (SCIP) for 2019 to 2023. This is the County's second 5-year plan. This plan and the previous 5-year plan outline the County's efforts to keep pollutants out of the LDW in support of the LDW Superfund Sediment Cleanup Plan.

The LDW Source Control Strategy is led by the Washington State Department of Ecology (Ecology). This strategy includes source control implementation plans from King County and the City of Seattle. The strategy is one of three components of the overall approach for addressing sediment contamination in the LDW. The other two components are the cleanup of five early action areas (which are now completed) and the U.S. Environmental Protection Agency's cleanup plan for the LDW Superfund site, as documented in the Record of Decision for the site. Two key goals of Ecology's strategy are to sufficiently control sources so that sediment cleanup can begin and to minimize recontamination of sediments after the LDW Superfund cleanup has occurred.

The County's SCIP builds upon significant clean water investments it has made in the LDW and its drainage basins for over 50 years. The plan includes a continued commitment to regulating and monitoring industrial dischargers within the LDW portion of the King County sanitary system; implementing planned combined sewer overflow (CSO) control projects; managing implementation of the County's Phase I Municipal National Pollutant Discharge Elimination System (NPDES) Stormwater Permit; providing technical and educational programs for businesses and residents on ways to prevent pollutants from entering the LDW; conducting scientific assessments, sampling and source tracing, and system mapping; and committing to full compliance with water and air quality permits and regulations at County-owned and operated facilities.

Most of the County's responsibility for LDW source control rests with four County divisions: Wastewater Treatment Division, Water and Land Resources Division, King County International Airport, and Roads Services Division. Other County divisions with activities that benefit source control for the LDW in the following: Facilities Management Division, Environmental Health Services Division of Public Health–Seattle & King County, and Permitting Division.

The plan outlines the County's commitment to activities that support source control efforts in the LDW basins during 2019 to 2023. The plan consists of the following:

- **Ongoing LDW source control actions and commitments.** CSO control projects, compliance with the Phase I Municipal NPDES Stormwater Permit, pretreatment program regulation of industrial dischargers, and other ongoing source control actions and commitments form the backbone of the County's source control efforts. Each County division describes the history and ongoing work of its division and a multi-jurisdictional program that, collectively, carry out efforts to control pollutants from entering the LDW.

- **Review of past 5-year actions.** A summary of the past actions taken per the 2014 to 2018 implementation plan.

- **Additional source control actions.** Wastewater Treatment Division, Water and Land Resources Division, King County International Airport, and Roads Services Division include additional actions that will expand and increase the benefits of the County's ongoing and planned source control work in the LDW. The actions, designed to improve sediment quality, include expanded sampling for source tracing, a water quality grant program, increased business inspections, and line cleaning within County jurisdiction of the LDW drainage basin. Per Ecology's direction, these specific actions are those that are above and beyond the County's existing LDW source control requirements and commitments.

- **Coordinated source control activities**. The County's commitment to continue to coordinate source control efforts among its agencies and with external partners.

1.0 INTRODUCTION

This document summarizes King County's Lower Duwamish Waterway (LDW) Source Control Implementation Plan (SCIP) for 2019 to 2023. This is the County's second 5-year plan. This plan and the previous 5-year plan outline the County's efforts to keep pollutants out of the LDW in support of the LDW Superfund Sediment Cleanup Plan (EPA 2014). This section demonstrates how the plan aligns with source control objectives for the LDW and ends with a description of the content and organization of the plan.

1.1 Background

In December 2012, as part of the U.S. Environmental Protection Agency's (EPA) proposed plan for the LDW Superfund site, the Washington State Department of Ecology (Ecology) updated its 2004 LDW Source Control Strategy (Ecology 2016).[1,2] In its updated strategy, Ecology asked King County, the City of Seattle, and EPA to provide agency-specific implementation plans that describe how each agency will conduct source control work.

Two key goals of Ecology's updated strategy are to sufficiently control sources so that sediment cleanup can begin and to minimize recontamination of sediments after the LDW Superfund cleanup has occurred. Although the majority of the contaminants of concern (COCs) in the sediments are from historical releases, ongoing releases are still occurring. The COCs that pose unacceptable risk to human health include polychlorinated biphenyls (PCBs), arsenic, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and dioxins/furans. The COCs that pose unacceptable risk to aquatic organisms include PCBs, metals, and other organic compounds such as polycyclic aromatic hydrocarbons (PAHs) and phthalates. Appendix A lists the COCs that are being looked at as part of the LDW Superfund cleanup and that are the target of source control efforts.

The LDW source control area is defined as drainage areas that discharge to the LDW Superfund site. The area includes both King County and Seattle Public Utilities (SPU) combined sewer overflow (CSO) basins and separated stormwater basins that are the responsibility of King County and the cities of Seattle, Tukwila, Burien, and SeaTac (Figure 1). This source control plan covers combined sewer basins associated with King County CSO outfalls, King County separated storm-sewer basins, and King County properties within the LDW source area.

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[1] "Superfund" refers to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

[2] The strategy is one of three components to the overall strategy for addressing contamination in the LDW (EPA 2014). The other two components are the cleanup of Early Action areas and the EPA cleanup plan for the LDW Superfund site, as documented in the Record of Decision for the site. Ecology's strategy document is available at http://www.ecy.wa.gov/programs/tcp/sites_brochure/lower_duwamish/lower_duwamish_hp.html.

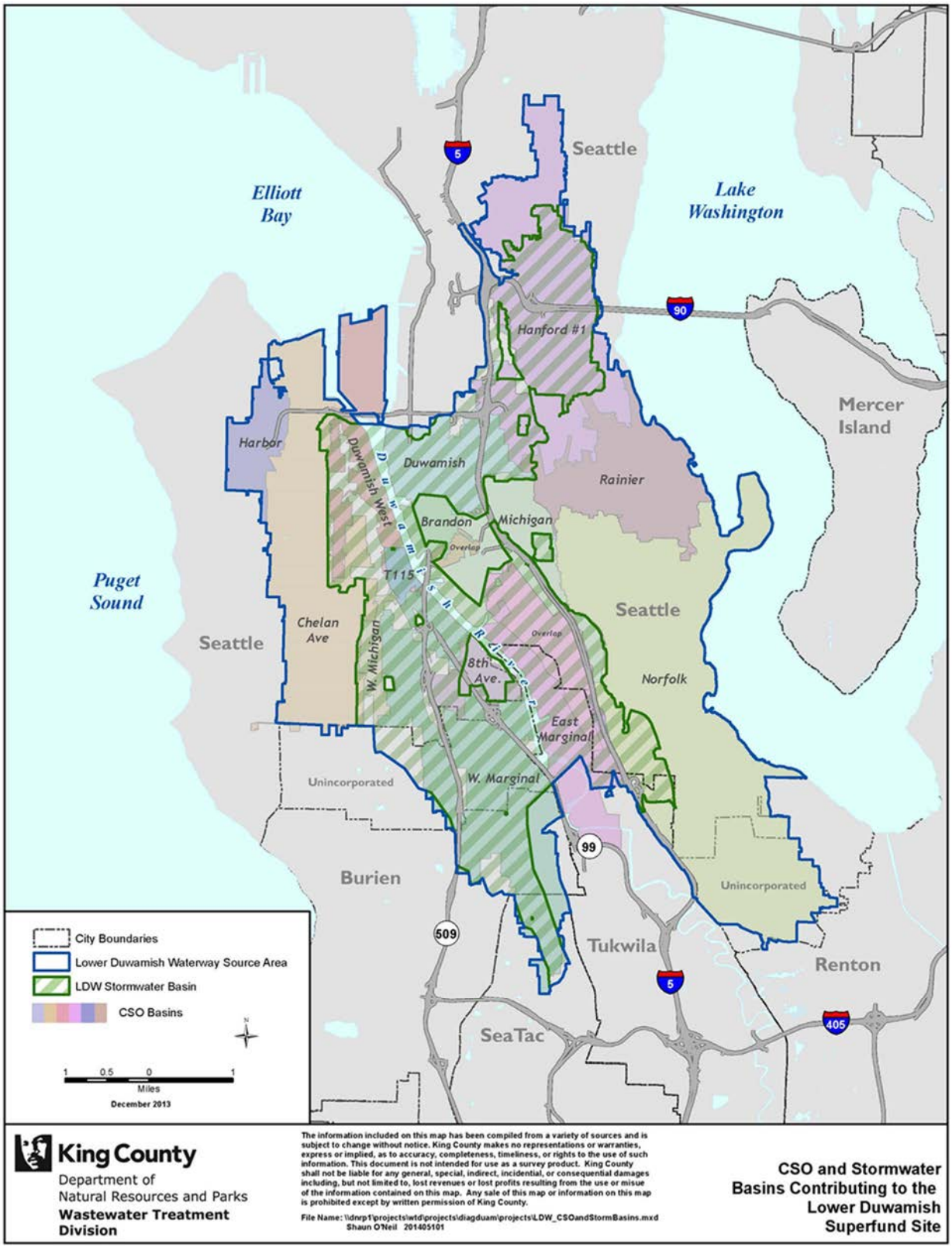

Figure 1. Stormwater and Combined Sewer Basins in the LDW Source Control Area

King County has been working to keep pollutants from entering the LDW since the 1960s. The formation of the Municipality of Metropolitan Seattle (Metro) in 1958 led to the elimination of untreated sewage and primary-treated effluent discharges into the LDW through the development of the regional wastewater treatment system. In 1994, King County assumed Metro's authority and its legal obligation for water pollution abatement.

Since the opening of West Point Treatment Plant (West Point) in 1966, untreated sewage that once flowed daily into the LDW has been conveyed to West Point for treatment and discharge into Puget Sound. In 1968, Metro established one of the first regulatory programs in the nation requiring industries to remove toxicants from their wastewater before discharge into the sewer system.

Since the opening of South Treatment Plant in 1965, untreated sewage and primary-treated effluent that flowed into the Green/Duwamish River has been treated and discharged as secondary-treated effluent. In 1986, a new effluent discharge pipeline and deep-water outfall in Puget Sound were completed to eliminate the secondary-treated effluent discharges from South Treatment Plant to the Green/Duwamish River. These source control efforts have reduced flows of industrial wastewater and raw or undertreated sewage into the LDW by 98 percent, or 27 billion gallons per year, and have significantly reduced contaminant concentrations in the remaining releases.

Preventing industrial wastewater and untreated sewage discharges from entering the LDW is just one of a number of actions Metro, and now King County, have carried out to improve water quality in the LDW. The County has also invested in restoration of more than 25 acres of habitat, numerous water quality studies, programs to improve water quality, CSO control, and sediment cleanup. These investments have successfully removed decades of contamination from some of the waterway's most contaminated areas.

King County is actively involved in many source control efforts in the basins draining to the LDW. The County's track record shows a strong commitment to source control that has yielded substantial results. Highlights of these efforts are listed below:

- **Multiple water quality studies and data collection efforts.** Metro began conducting water quality studies in the Green/Duwamish River in 1958 and, in 1964, began the first year of continuous data collection to characterize local water bodies and identify water quality needs.
- **Puget Sound Estuary Program Elliott Bay Action Plan.** This multi-agency program (EPA, Ecology, City of Seattle, Metro, King County, Port of Seattle, and others) and multi-year comprehensive plan were carried out in the 1980s and resulted in the identification and elimination of many industrial process discharges into the LDW.
- **Efforts to characterize and control pollution from stormwater**. King County became a leader in the movement to characterize and control pollution from stormwater. The County continues these efforts through its work to control the small remaining percentage of untreated stormwater being discharged from its CSO

outfalls, implementing stormwater management and spill prevention programs in separated basins under its jurisdiction, and remediating historical upland and aquatic contamination.

- **Stormwater management**. Multiple divisions in the County (Stormwater Services Section [SWS], Facilities Management Division [FMD], King County International Airport [KCIA] and Roads Services Department [RSD]) all implement various stormwater management actions through the County's Phase I Municipal National Pollutant Discharge Elimination System (NPDES) Stormwater Permit (herein referred to as the Phase 1 MS4 Permit). Regulatory requirements and associated actions pertaining to the permit include mapping, development standards, structural stormwater controls, source control assessments, illicit connections and illicit discharges detection and elimination (IC/IDDE), operation and maintenance, and property maintenance.
- **Elliott Bay/Duwamish Restoration Program.** As a partner in this program, the County implemented some of the first sediment remediation efforts and habitat improvements in the LDW at the Norfolk and Duwamish/Diagonal CSO/Storm Drain sediment cleanup sites and the Herring's House Park, Hamm Creek, Turning Basin, and Cecil B. Moses restoration sites. The program was the result of a 1991 legal settlement reached by the City of Seattle and King County (then Metro) with the National Oceanic and Atmospheric Administration (NOAA). The U.S. Fish and Wildlife Service, Ecology, Suquamish Tribe, Muckleshoot Indian Tribe, NOAA, City of Seattle, and King County administered the program.
- **Lower Duwamish Waterway Group.** The Lower Duwamish Waterway Group (LDWG) is made up of representatives from King County, the City of Seattle, the Port of Seattle, and The Boeing Company (Boeing). LDWG has been working with EPA and Ecology since 2001 to study contamination and determine the best and most effective alternatives to clean up the waterway. The LDW Remedial Investigation/Feasibility Study (RI/FS), Activated Carbon Pilot Study, and Pre-design Studies resulted from these efforts.[3] LDWG's investment of over $200 million (M) to conduct studies and early action sediment cleanups reduced the average concentration of PCBs in the sediment by over 50 percent. The early action cleanups included the Norfolk and Duwamish/Diagonal projects.
- **Source Control Work Group.** Since 2002, King County has been a member of the LDW Source Control Work Group (SCWG), which was formed by Ecology to bring together agencies with the regulatory authority to implement source control measures in the LDW. The purpose of the SCWG is to share information, discuss strategy, and share progress reports on LDW source control activities.

[3] The documents associated with the LDW Remedial Investigation/Feasibility Study are available at http://yosemite.epa.gov/R10/CLEANUP.NSF/LDW/Lower+Duwamish+Waterway+Superfund+Site+Technical+Documents.

The County's ongoing work to protect and enhance water quality in the LDW also aligns with the goals and principles of the King County Strategic Plan, which is based on the values and priorities of County residents. A core element of the strategic plan is environmental sustainability to safeguard and enhance the County's natural resources. A guiding principle of the strategic plan is to integrate equity and social justice (ESJ) into all of the County's work. As such, the County has been engaging the diverse communities that live, work, and fish in the LDW area to help guide decisions and priorities regarding actions. Community engagement in the LDW has influenced proposed cleanup strategies in the LDW Superfund site, decisions on plans and projects to control county CSOs, and development and implementation of education and outreach programs.

1.2 Alignment of this Plan with Ecology's Source Control Strategy

King County's LDW SCIP is responsive to Ecology's updated LDW Source Control Strategy. Controlling sources within drainage basins will protect river sediments near discharge points following cleanup actions and reduce the potential for sediment recontamination.

Ecology's strategy outlines a coordinated and committed long-term effort for managing source control in the LDW. Its primary near-term goal is to control existing sources of contaminants in the LDW sufficient to begin in-waterway cleanup. In the long term, after the sediment remedy is in place, the goal is to minimize the risk of recontaminating sediments to levels above the sediment cleanup standards established in EPA's Record of Decision for the LDW Superfund site. A secondary goal is to support habitat restoration opportunities. Ecology identified seven objectives for meeting these Source Control Strategy Goals.

In 2010, the County participated in the development of a preliminary needs assessment with its SCWG partners to assess current efforts to control sources in the LDW, identify any existing gaps, and determine supplemental efforts needed to address these gaps in the future. The needs assessment provided the framework for developing the approach to addressing Ecology's Source Control Strategy objectives. The County's LDW SCIP identifies actions within the County's authority that are needed to successfully implement source control in the LDW. Other data gaps were incorporated into Ecology actions, LDW studies, and other agency SCIPs. The goal for this second (as well as the first) 5-year plan is to focus on preventing recontamination above the remedial action levels presented in the LDW Record of Decision. The County's long-term goal is to facilitate the control of sources so that LDW sediments move closer to meeting the cleanup goals in the LDW Record of Decision.

Table 1 links each of Ecology's seven objectives to corresponding source control actions that King County will implement over the next 5 years. This cross reference demonstrates that the King County LDW SCIP thoroughly and completely addresses the guiding framework established by Ecology's source control goals and objectives.

1.3 Content and Organization of this Plan

Most of King County's responsibility for LDW source control rests with four county divisions: Wastewater Treatment Division (WTD), Water and Land Resources Division (WLRD), KCIA, and RSD. Other County divisions with activities that benefit source control for LDW are the following: FMD, Environmental Health Services Division of Public Health–Seattle & King County (Public Health), Permitting Division, and the Solid Waste Division (SWD).

King County's LDW SCIP consists of the following components organized by each County division listed above:

- **Ongoing LDW source control actions and commitments.** Three major CSO control projects, compliance with the Phase I Municipal NPDES Stormwater Permit, pretreatment program regulation of industrial dischargers, and other ongoing County source control actions and commitments form the backbone of the County's source control efforts. Each County division's section describes the history and ongoing work of it division and a multi-jurisdictional program that, collectively, carry out efforts to control pollutants from entering the LDW. More information is provided in Appendix B of County's first 5-year plan (King County 2016a).
- **Review of past 5-year actions.** Each division will include a summary of the past actions taken per the 2014 to 2018 plan.
- **Additional source control actions.** Three County divisions describe actions that will expand and increase the benefits of the County's ongoing and planned source control work in the LDW. The actions were developed in response to Ecology's updated LDW Source Control Strategy. They are designed to improve sediment quality. Per Ecology's direction, these specific actions are those above and beyond the County's existing LDW source control requirements and commitments.

This plan also summarizes the ongoing coordination among County divisions and with external agencies involved in LDW source control. Coordination is a key component in accomplishing effective source control and implementing adaptive management strategies, as needed. Coordination between WTD and SPU regarding management responsibilities and implementation of source control actions is particularly important.

By 2023, the County divisions involved in LDW source control work will develop the next 5-year LDW source control plan for implementation from 2024 to 2028.

Table 1. Cross-Reference of the Ecology Source Control Strategy and the King County 5-Year LDW SCIP

Objective to Meet Ecology Source Control Strategy Goals	King County Strategy	Action (Bolded action = additional action)	Outputs by 2023[a] (Bolded output = additional output)	Ecological and Human Health Outcomes
Identify and, to the extent possible, control ongoing sources of chemicals to LDW sediments with the potential to exceed cleanup levels.	Control releases from the combined sewer system.	• Implement Long-Term Control Plan – CSO Control Program. • Comply with NPDES permit for West Point (includes LDW) • Regulate industrial wastewater discharges to combined sewer system. • Monitor, maintain, and inspect wastewater facilities. • **Implement Waterworks Grants Program that includes LDW basin.** • **Conduct source tracing and identification.**	• Completed construction of the Rainier Valley Wet Weather Storage Project in 2018 controlling Hanford #1 CSO; report compliance in 2021. • Complete construction of Georgetown Wet Weather Treatment Station by 2022; continue to develop facility plan for West Michigan and Terminal 115 CSO control project. • Meet all West Point permit conditions that apply to the LDW. • Review all discharge authorizations for industrial users within the LDW basin; apply discharge authorizations to any new discharges. • Enforce food and water recreation facility wastewater disposal regulations. • Inspect all county lines on a 7-year cycle; inspect all outfall pipes on a 5-year cycle; maintain West Duwamish rock box annually; maintain facilities as needed. • **Award grants for water improvements in the Duwamish Valley.** • **Collect sediment traps and follow-up in-line grab samples in each uncontrolled sub-basin once every 5 years and controlled basins on a less frequent basis.**	• Keep sediment concentrations below marine sediment cleanup levels. • Reduce fish tissue concentrations. • Meet marine water quality criteria.
	Control releases from Municipal Separate Storm Sewer System (MS4) in unincorporated King County.	• Comply with the County Phase 1 MS4 Permit. • Conduct road service programs to reduce pollutant releases from County MS4 system. • **Conduct increased source control inspections.** • **Conduct source tracing and identification.** • **Clean structures and lines when necessary.[b]**	• Meet all County Phase 1 municipal NPDES stormwater permit conditions that apply to the LDW drainage area, including source control inspections, stormwater facility infrastructure inspections and maintenance activities, stormwater pollution prevention policies and procedures on County–owned or operated lands, water quality complaints, illicit discharge detection and elimination, and spill response. • Conduct catch basin inspections and cleaning as needed per the Phase 1 MS4 Permit and implement the Regional Road Maintenance Endangered Species Act Program Guidelines and the Snow and Ice Response Program. • **Complete source control business inspections at higher frequency in the South 96th Street Corridor.** • **Collect sediment trap samples and follow-up in-line solids grab samples.** • **Implement additional maintenance in support of source tracing activities and line-cleaning program in the basin in support of the Source Tracing and Elimination Program, contingent upon other funding sources.**	
	Control releases from county-owned property	• Comply with County Phase 1 MS4 Permit on County owned-properties and County Industrial Stormwater General Permit (ISGP) at King County International Airport (KCIA) • **Conduct source tracing and identification** • **Implement North Boeing Field/Georgetown Steam Plant state Model Toxics Control Act (MTCA) order**	• Complete source control inspections of all properties. • Meet all conditions of the ISGP for KCIA. • Meet all County Phase 1 MS4 permit conditions that apply to County properties. • Conduct site investigations and hazardous materials abatement during redevelopment. • Comply with dangerous waste disposal and reporting and UST requirements. • **Characterize and evaluate stormwater solids at KCIA in accordance with its source control program.** • **Conduct the remedial investigation for the North Boeing Field/Georgetown Steam Plant state MTCA order by 2019 and draft feasibility study.**	
	Control releases from other properties.	• Regulate safe handling of solid waste. • Implement the Moderate Risk Waste Plan.	• Review operation plans and inspect solid waste facilities. • Review and assess permit-exempt solid waste facilities. • Respond to illegal dumping. • Provide collection of household hazardous waste and small quantity generator waste.	
	Control releases from septic systems.	• Regulate on-site septic systems.	• Review all permit applications for new systems and current maintenance reports on home sales. • Respond to all complaints of septic failures.	
Apply administrative and legal authorities to accomplish corrective actions in areas contributing to contaminated sediments	Conduct corrective actions when necessary for inappropriate discharges to the sewer or County MS4	• Follow up on all identified industrial waste problems and referrals • Follow up on all identified stormwater problems and referrals • Work with Puget Sound Clean Air Agency on control of air emissions • **Conduct review of existing regulatory authorities**	• Resolve all identified industrial waste problems and referrals • Resolve all identified stormwater problems and referrals • Participate on Puget Sound Clean Air Agency board and advisory council • **Review implementation of combined basin pollution prevention program and appropriate Best Management Practices**	

Objective to Meet Ecology Source Control Strategy Goals	King County Strategy	Action (Bolded action = additional action)	Outputs by 2023[a] (Bolded output = additional output)	Ecological and Human Health Outcomes
Educate businesses, residents, and others who handle hazardous materials on ways to reduce pollution from their activities	Provide educational and outreach information that aids in source control activities	• Conduct education and outreach to businesses that discharge wastewater to sewers and stormwater to county MS4 and on King County properties • Conduct education and outreach for septic systems • Conduct education and outreach to property owners in areas eligible for Green Grants	• Provide de-icing/washing policy/training to KCIA tenants • Conduct spill response training to County tenants • Conduct Dirt Alert program on arsenic and lead exposure and yard cleanup • Provide technical assistance, including on-site visits, to small quantity waste generators • Conduct public education on household hazardous waste • Perform targeted outreach to business and communities on particular hazardous waste issues • Provide technical assistance to businesses on industrial wastewater discharges • Offer certification program for septic pumpers, installers, and maintainers • Conduct education and outreach for septic owners • Conduct outreach on Green Grants Program	
Monitor and evaluate source control efforts and revise plans accordingly	Assess source control program effectiveness and propose revisions	• **Assess source control program effectiveness and incorporate outcomes into long-term plan**	• **Complete next 5-year source control plan** • **Based on source tracing activities and available sediment data, evaluate County's source control program effectiveness over time in summary of 5-year plan actions**	
Establish milestones and reporting requirements for source control activities	Report findings to Ecology and the LDW Source Control Work Group	• **Report all findings to Ecology**	• **Submit yearly updates to the Ecology Source Control Status Report and prepare annual source control reports**	
Increase the degree of inter- and intra-agency coordination to address source control issues that cannot be adequately resolved by one agency, department, or program	Enhance regional and internal coordination and communication efforts to improve the effectiveness of source control efforts	• Actively collaborate with regional partners and governmental agencies • **Bi-annual SCIP Team meetings**	• Participate in the SCWG and Duwamish Inspections Group; train investigators to identify sources of contaminants • **Conduct bi-annual SCIP Team meetings within King County**	
Evaluate whether controls are at the point where a sediment cleanup can proceed with some assurance that recontamination potential has been (or is being) reduced	Provide Ecology with information needed to make timely determinations	• Inform the appropriate authority of any identified problems • Participate in SCWG and Duwamish Inspections Group • Provide all collected information in regular submittals	• Coordinate with Duwamish Inspectors Group • Participate regularly in both SCWG and Duwamish Inspections Groups • Submit updates to the Ecology's source control status report as requested	

[a] If no data are listed, outcome is completed by end of 5-year plan or is ongoing.
[b] With approval of funds from King County's Water and Land Resources Division and if other funding (e.g., grant) is available.

2.0 WASTEWATER TREATMENT DIVISION

WTD protects water quality and prevents water pollution by providing regional wastewater treatment to 17 cities and 17 local utilities. WTD serves about 1.5 million people in a 420-square-mile service area, including most urban areas of King County and parts of south Snohomish County and northeast Pierce County. The LDW is included in WTD's service area (Figure 2). WTD's treatment plants operate under and comply with NPDES permits that outline the conditions in which the plants can discharge treated wastewater. Today, on an annual average, over 85 percent of the stormwater in the system's combined sewer basins is captured and treated at West Point. The remaining flow released during CSOs, made up of approximately 90 percent stormwater and 10 percent wastewater, benefits from the source control actions discussed in this 5-year plan

2.1 Ongoing LDW Source Control Actions and Commitments

2.1.1 Actions that Protect Water and Sediment Quality

WTD protects water and sediment quality in the LDW through actions listed below:[4]

- **Clean Water Plan.** Over the next few decades, the region will spend billions of dollars on water quality protection. The Clean Water Plan seeks to ensure the region is on a path to direct public investments to the right actions at the right time for the best water quality outcomes. The plan will inform King County's future direction on issues like maintaining the 50-year old wastewater treatment system, meeting existing and future regulatory requirements, and how to finance water quality improvements. The planning process is in the early stages and is expected to be complete in 2022.
- **Implementing the CSO Control Program**. The cornerstones of King County's LDW SCIP are three CSO control projects that will cost approximately $334.4 M to implement. Construction and design for two of these projects is underway; construction was completed in 2018 on the third project. These investments will build on the significant clean water investments the County has made in the LDW for over 50 years. The subsection that follows describes the Protecting Our Waters Program in more detail.
- **Complying with NPDES permits.** The NPDES permit for West Point includes discharge, loading, reporting, and monitoring requirements for all the facilities and outfalls associated with West Point, including CSO outfalls that discharge to the Duwamish River. Many actions required under the permit contribute to source

[4] Additional information is available at http://www.kingcounty.gov/environment/wtd.aspx.

control, particularly pretreatment of industrial discharges and implementation of the nine minimum controls for CSOs. [5]

- **Managing the King County Industrial Waste Program (KCIW).** KCIW regulates industrial wastewater discharged into the County's wastewater system from industrial facilities. The program ensures that facilities either treat wastewater to reduce harmful substances or use best management practices (BMPs) before discharging wastewater to sanitary sewers. KCIW regulates approximately 150 facilities in basins draining to the LDW, representing approximately 20 percent of facilities regulated by the program. As part of the program, KCIW inspects industries regulated by KCIW. KCIW inspectors share findings with SPU, Ecology, and EPA and work collaboratively in cases that involve multiple jurisdictions. Beyond its mandates as a state and federally delegated pretreatment program, KCIW inspections follow up on referrals and provide referrals to SPU and Ecology, as needed, to support joint efforts to mitigate point sources.
- **Implementing the Sediment Management Program.** WTD carries out a Sediment Management Plan to remediate contaminated sediments near CSO outfalls identified on the state's Contaminated Site List. Sites in the LDW either have been addressed under the Elliott Bay Duwamish Restoration Program or are being addressed under the LDW Superfund cleanup. The County's efforts include past and ongoing work to identify and control the sources of pollution that may pose health or environmental problems if the pollutants accumulate in sediments. Source control efforts are also to prevent recontamination of cleanup areas in the LDW. To address gaps in knowledge of sources entering the system and the LDW, the County conducted several studies that will aid in future source control efforts (e.g., gaining a better understanding of contaminants in the air deposition pathway).
- **Monitoring, inspecting, and maintaining WTD facilities**. WTD monitors flow at approximately 30 locations in LDW combined sewer basins and inspects sewer lines using video equipment and other means on a 7-year cycle so that each sewer line is inspected at least once every 7 years. CSO outfall pipes are inspected about every 5 years.[6]
- **Offering educational and public outreach activities**. WTD offers educational information as part of its source control activities in the LDW. It maintains a website, performs community outreach, and provides wastewater education and tour programs in addition to industrial waste educational programs, materials, and workshops. WTD partners with other groups on education, such as participating in

[5] More information on WTD's NPDES permits is available at http://www.kingcounty.gov/environment/wtd/About/System/NPDES.aspx.
[6] More information is available at http://www.kingcounty.gov/environment/wtd/Construction/Assets.aspx and http://www.kingcounty.gov/environment/wastewater/CSI/FlowMonitoring.aspx.

the annual Duwamish River Festival and in Hazardous Waste Management Program activities.[7]

- **Participating in the RainWise Program.** In partnership with SPU, WTD has administered the RainWise Program since 2010. This program provides rebates to homeowners living in specific combined sewer areas for installing rain gardens and cisterns on their property. RainWise helps to slow, detain, or retain stormwater, which reduces both the volume and timing of combined sewer flows and reduces sources of pollution into the combined system. The County plans to offer this program through 2020.[8]

[7] More information is available at http://www.kingcounty.gov/environment/wtd/Education.aspx.
[8] Information on the program is available at http://www.700milliongallaons.org.

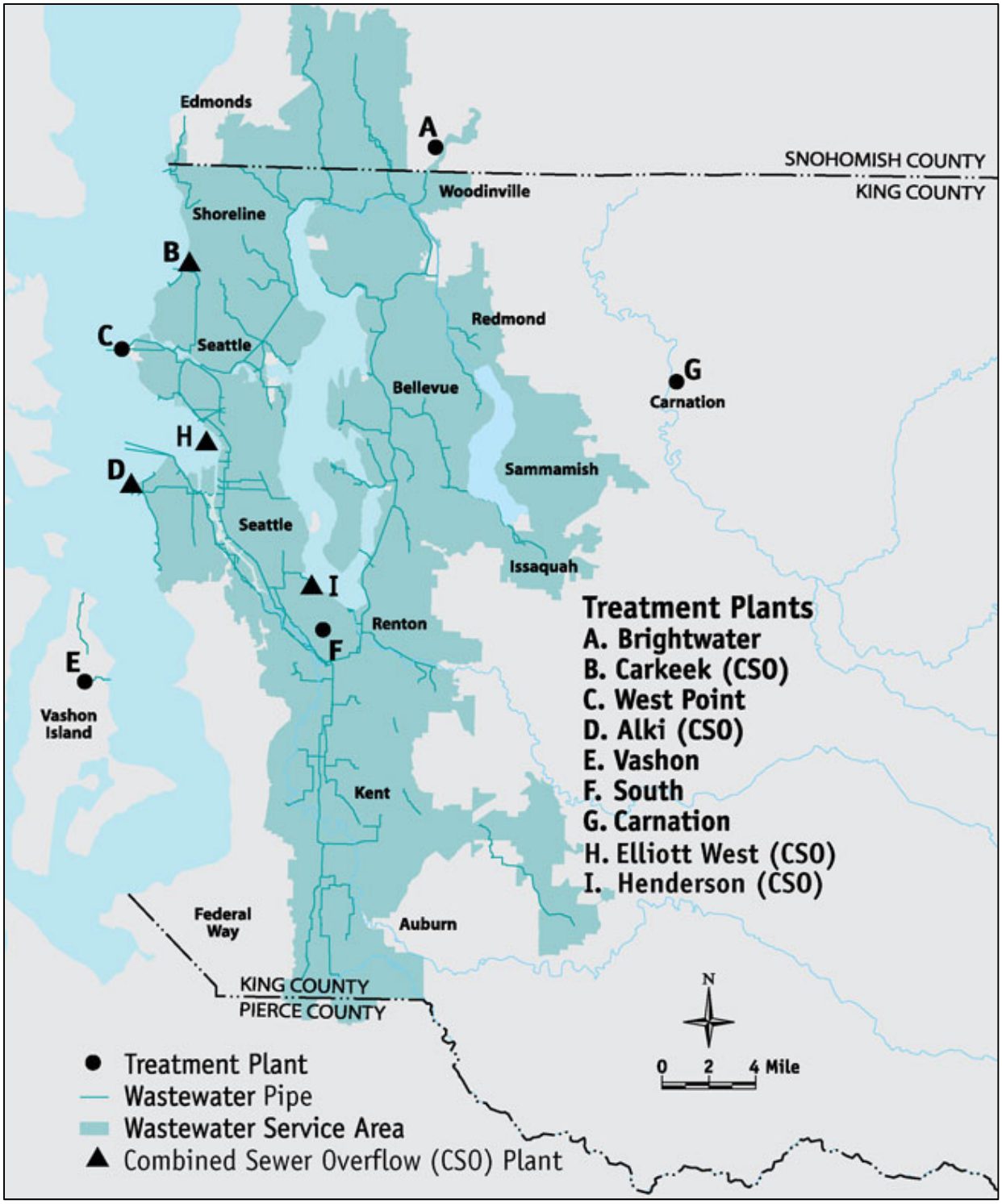

Figure 2. King County's Wastewater Service Area

2.1.2 WTD's CSO Control Program

The regional wastewater system includes CSO "relief points" in the combined sewer area of Seattle to prevent backups in homes and streets from extreme variations in stormwater volumes. These include 39 locations in the County system and 85 in the SPU system. WTD has been implementing the County's CSO Control Program, Protecting Our Waters, since the late 1970s. King County has spent $390 M on CSO control to date. Projects have been completed to control half of the County's 39 CSOs to the Washington State standard of no more than one untreated CSO discharge per year on a 20-year moving average.

In 2012, the King County Council approved an amendment to WTD's CSO long-term control plan that includes nine projects to control the remaining 14 uncontrolled CSOs by the end of 2030 at a total cost of $849 M (2018 dollars; predicted to potentially double by completion). This CSO long-term control plan prioritizes the control of LDW CSOs ahead of the others to support the Superfund cleanup efforts (Figure 3). The cost of LDW CSO control projects (all underway) is $334.4 M (2018 dollars).[9] LDW CSO control will further decrease untreated CSO volume by an average of 104 million gallons per year and will further reduce CSO pollutant loadings in the LDW (e.g., PCBs loading from CSO discharges is estimated to be reduced by approximately 60 percent) (Figure 4).[10] The Clean Water Plan referenced in Section 2.1.1 will inform the next CSO long-term control plan update.

In 2013, King County entered into a consent decree with the U.S. Department of Justice, EPA, and Ecology to ensure its CSO control plan is completed by 2030.

[9] The 2019 CSO Control Program Update was submitted to Ecology with the West Point Treatment Plant Application for NPDES Permit Renewal on January 31, 2019.
[10] See 2014–2019 SCIP, Appendix B, for details on how PCB loads shown in Figures 2 and 3 were calculated.

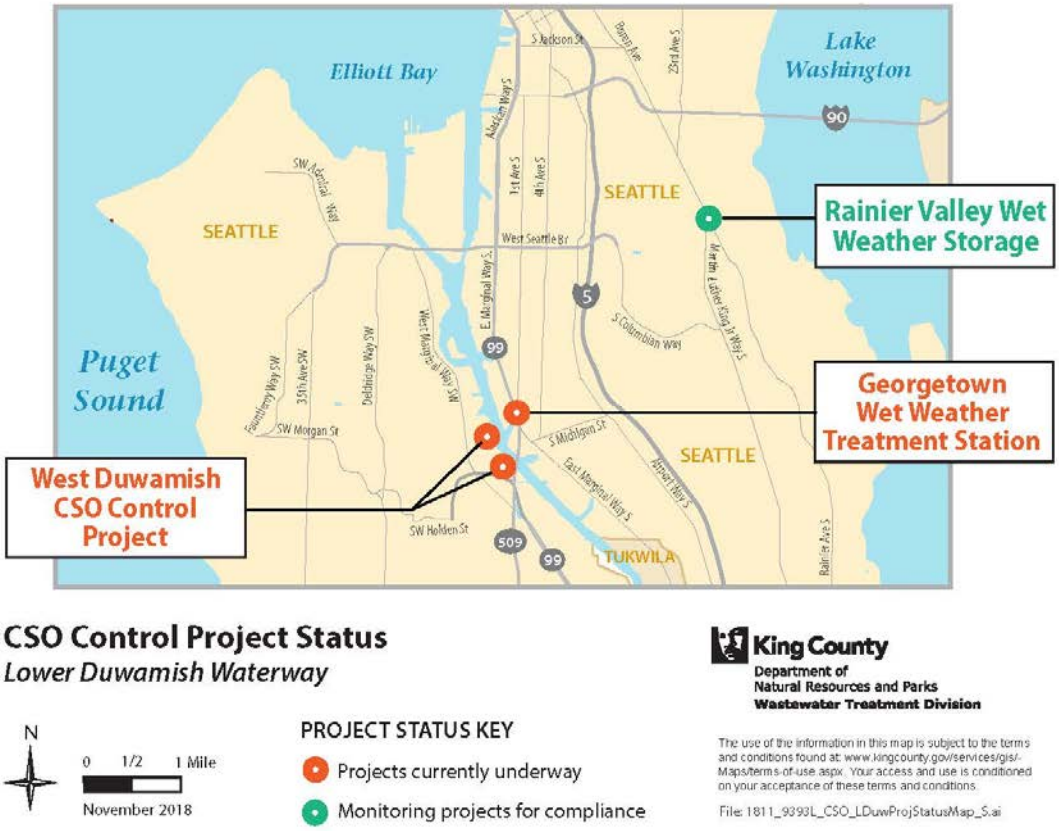

Figure 3. Projects in the LDW Included in the King County CSO Long-Term Control Plan

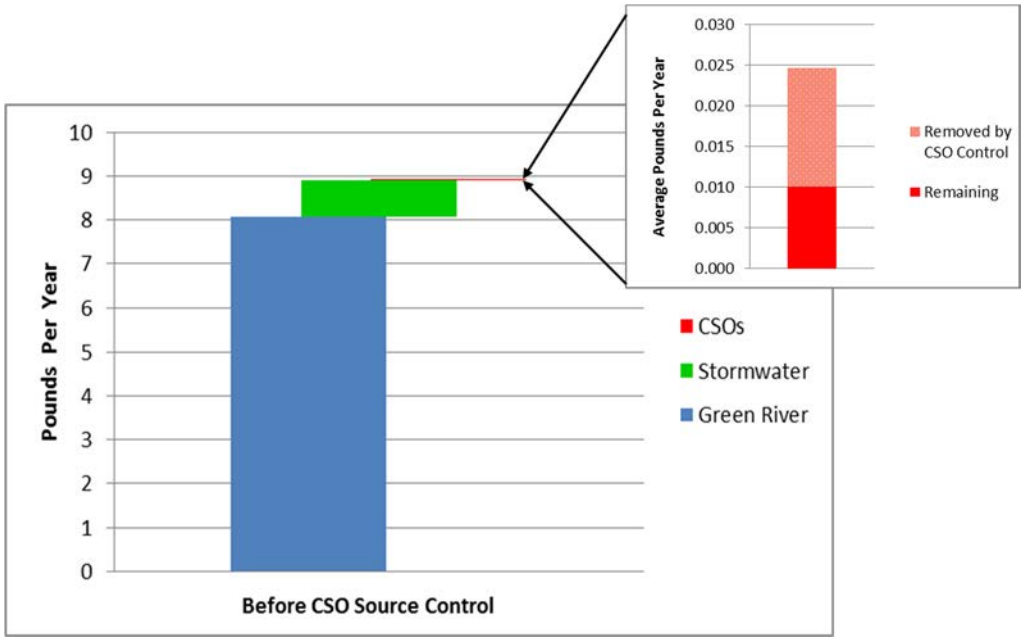

Figure 4. Estimated Relative PCB Inputs to the LDW Before and After CSO Control

The following activities and their costs (in 2018 dollars) are associated with the County's CSO long-term control plan in the 2019 to 2023 timeframe and are designed to further significantly reduce pollutant loadings from CSO discharges to the LDW:

- Georgetown Wet Weather Treatment Station (Brandon/South Michigan) CSO control project ($241 M) to remove 102 million gallons per year of untreated overflows; completed in 2022.
- West Michigan and Terminal 115 CSO control project ($57.4 M) to remove 1.5 million gallons per year; completed in 2025.
- Ongoing coordination with the City of Seattle on CSOs, integrated control plans, and stormwater in combined basins ($0.6 M for the LDW basins).

After a CSO control project is constructed, the County conducts post-construction monitoring (King County 2010). The purpose of the monitoring is to verify the effectiveness of CSO controls and demonstrate compliance with water and sediment quality standards and protection of designated uses and sensitive areas.

A 2018 CSO Control Program Update (Program Update) provides information on the current implementation status of King County's CSO Long-term Control Plan (LTCP). Ecology's CSO regulation (Washington Administrative Code [WAC] 173-245) requires that King County submit CSO LTCP updates to coincide with each NPDES permit renewal for West Point. The updates are intended to document progress made toward implementation of the County's CSO Control Program and identify program priorities for the next 5 years and beyond. The last updates submitted to Ecology were the 2012 CSO Long-term Control Plan (King County 2012), which recommended future capital projects for CSO control that are underway today, and the 2018 CSO Control Program Update (King County 2018a). The 2018 update did not propose any changes to the CSO Long-term Control Plan. The Program Update was submitted to Ecology with the West Point Application for NPDES Permit Renewal on January 31, 2019.[11]

2.2 Review of Past 5-Year Actions

This section presents a summary of completed actions listed in the King County LDW SCIP for 2014–2018.

2.2.1 CSO Control Program

The following are highlights of the CSO control actions completed during the 2014 to 2018 period of the County's SCIP:

[11] More information on the CSO Control Program is available at http://www.kingcounty.gov/environment/wastewater/CSO.aspx.

- Rainier Valley Wet Weather Storage (Hanford #1) CSO control project ($36 M) to remove 100,000 gallons per year of untreated overflows; completed in 2018.
- Improved treatment at King County's Henderson/Martin Luther King Jr. Wet Weather Treatment Station ($2.1 M); to be started spring 2019.
- Water Quality Assessment and Monitoring Study ($2 M for the Duwamish Green components of the study); completed in 2017. Water quality characterization studies for LDW ($1.5 M for Duwamish Green Component of studies); completed fall 2017.
- Completed CSO Control Program review ($1 M for reconsideration of LDW controls).

2.2.2 Industrial Waste Program

The following are highlights of KCIW source control actions during the 2014 to 2018 period of the County's SCIP:

- Continued implementation of pretreatment program requirements as stipulated in Ecology NPDES permits for WTD wastewater treatment plants, with periodic updates to Ecology provided in annual reports.
- KCIW attendance in the LDW Duwamish Inspectors Group (DIG) and SCWG.
- Technical support for WTD source control studies in the Brandon and Michigan CSO basins.
- Periodic trouble call responses within the LDW. These were primarily initiated through referrals from Ecology's Environmental Report Tracking System.
- Conducted oversight of an Ecology inspector to conduct stormwater assessments of drainage areas within the Brandon and Michigan CSO basins.

2.2.3 Monitoring, Inspecting, and Maintaining WTD Facilities

The following are highlights of source control actions of WTD facilities during the 2014 to 2018 period of the County's SCIP:

- WTD monitored flow at approximately 30 locations in LDW combined sewer basins.
- The West Duwamish Interceptor Rock Box was cleaned twice a year. The Rock Box captures in-line sediment (and debris) before it goes through the siphon.
- 2,000 linear feet of the Delridge Trunk (from MH WE*DELRGE.W14-601 to the Chelan Regulator Station) was cleaned in 2018. An estimated 450 yards of material were removed from the line. This trunk runs to the siphon.

Inspections of County WTD facilities in the LDW area are scheduled for 2019.

2.2.4 Educational and Public Outreach Activities

- The following are highlights of the educational and public outreach activities conducted during the 2014 to 2018 period of the County's SCIP:
- **CSO control planning, project design, and capital project construction outreach.** Informational materials related to CSOs are available in multiple languages. This provides an opportunity for communities to learn about WTD's CSO projects. Outreach efforts for the design and construction of the Georgetown Wet Weather Treatment Station, the Rainier Valley Wet Weather Storage Project, and the West Duwamish CSO Control Project have all contained information about source control.
- **RainWise program.** From 2014 to 2018, the King County RainWise South Park and Highland Park basins rebated projects at 61 properties, addressing over 111,500 square feet (sq ft) of roof runoff area. RainWise funds outreach to diverse and multicultural residents and allows for customer service and coaching for clients that need extra help navigating the process. Cultivating demonstration projects at places of worship and community gathering places is also a strategy for engaging specific communities. ECOSS is the key partner in this effort, with a staff that speaks over 16 languages. Last year, one-third of the customers that ECOSS helped with RainWise did not speak English as their first language.
- **Sponsored river tours.** WTD staff provide information on river tours sponsored by the Duwamish River Cleanup Coalition and the Port of Seattle.
- **Wastewater education and tours program.** WTD treatment plant tours, open houses, and educational programs provide information on the history of the need for sanitation and clean water, treatment processes, resource recovery programs, pollution prevention for homes and businesses, and Puget Sound and LDW health.[12]
- **Annual participation in and sponsorship of the Duwamish River Festival.** The festival offers opportunities for the public to learn more about continuing efforts to restore the Duwamish River. King County, in collaboration with LDWG partners (Boeing, the City of Seattle, and the Port of Seattle), funded and staffed a boat tour in both 2016 and 2018. The tours were attended by approximately 180 local residents; Spanish and Vietnamese interpreters were on board to translate the presentations.
- **KCIW educational programs and workshops.** KCIW produces a newsletter twice a year to inform industrial dischargers of regulations and procedural updates. The program posts links on its website with helpful information about local, regional, state, and federal resources industrial users can access to better manage their pretreatment systems. In January 2016, KCIW hosted a workshop for representatives of local sewer agencies. The agenda included updates on construction dewatering, a large business survey to identify industrial users, and updates to fees and communications. The program produces and distributes fact

[12] More information on WTD's educational and outreach activities is available at http://www.kingcounty.gov/environment/wtd/Education.aspx.

sheets to provide specific information on how the program implements its regulations. Additionally, the program presents annual compliance awards to facilities with no violations. These serve as an incentive for industrial facilities to strive to meet and maintain compliance with environmental regulations. Inspectors also provide a multilingual "spill poster" on what to do in case of a sewer spill and a poster on "do's and don'ts" to protect the LDW during inspection visits. Finally, businesses are sent a letter following each inspection with helpful tips on what they can do to improve their practices.

2.2.5 WaterWorks and Green Grants Program

Up until 2015, WTD funded community projects, environmental education, and community outreach efforts in the Duwamish River Valley through the Green Grants Program. The purpose of the program was to help improve air and water quality in the Duwamish Watershed, support the successful implementation of CSO control projects in the area, and meet regulatory obligations for clean air. Grants also promoted partnerships in the LDW area, with the goals of advancing source control for the LDW Superfund cleanup, developing local expertise in water and air quality protection, and enhancing small-scale environmental and economic opportunities in the community. The program targeted a community that has disproportionate human health outcomes and environmental burdens. It improved ESJ by supporting the community's vision for vibrant, healthy neighborhoods around the Duwamish River. From 2014 to 2015, $203,805 was awarded to eight projects.

The WaterWorks Grant Program was launched in 2015 with the purpose of improving water quality in the region, promoting community involvement and stewardship, and leveraging resources. Between 2015 and 2018, $7,677,211 was awarded to 105 projects across the County. Funds are awarded to organizations and agencies for projects that improve water quality in the WTD service area; project types include green stormwater infrastructure (GSI), stormwater treatment, research, monitoring, education, community engagement, and riparian restoration. Of the 105 projects funded, 34 projects (which received $2,860,004) took place entirely in the Green/Duwamish Watershed areas, which drain to the Duwamish River. An additional 19 projects (which received $1,733,362) took place in a wider area that included the Green/Duwamish Watershed. A list of these projects can be found in Table 2 below.

These projects support the success of King County's source control and CSO control projects by controlling new and ongoing sources of pollution that could harm the environment or recontaminate cleaned-up areas in the LDW, and by reducing volume and timing of combined sewer flows. Overall, grant-funded projects throughout the County have leveraged over $8 M in match funding (cash match and in-kind volunteer hours), representing a significant community investment in water quality improvements. Projects have collectively educated and engaged tens of thousands of community members through workshops, classroom visits, training programs, and other activities.

Table 2. WaterWorks Grants Awarded 2015–2018

Organization	Project Title	Award Amount	Green Duwamish Watershed?
City of Black Diamond	North Commercial and State Route 169 Stormwater Treatment Facility	$243,643	Yes
City of Covington	Timberlane Estates Drainage Project Sites 2, 3, & 4	$70,000	Yes
City of Kent	Downey Farmstead Contaminated Soil Removal	$125,000	Yes
City of Kent	Leber Homestead – Arsenic Remediation	$100,000	Yes
City of Kent	Green River Watershed Center, Design & Analysis	$50,000	Yes
City of Kent	Lake Fenwick Aerator Upgrade and Alum Treatment	$89,000	Yes
City of Maple Valley	216th Avenue SE Roadway Improvements	$45,000	Yes
City of Seattle	Envirostars Business Outreach and Technical Assistance Support for Water Quality Actions	$100,000	Partial
City of Seattle, Seattle Public Utilities	Bioretention to Underground Injection Control Well Water Quality Monitoring	$94,200	Partial
City of Seattle, Seattle Public Utilities	Implementing In-Stream Methodology for Detecting Sewage Flow into Receiving Waters	$320,000	Partial
City of Seattle, SPU	Protect Your Pipes: Flush Only Toilet Paper	$80,000	Partial
Delridge Neighborhoods Development Association	Delridge Wetlands Restoration and Stewardship Project	$50,000	Yes
Earth Corps	Duwamish River Stewards	$25,000	Yes
Earth Corps	Sharing Our Resources for the Duwamish	$30,000	Yes
EarthCorps	Puget Sound Stewards – Duwamish and Beyond	$50,000	Yes
ECOSS	Environmental Stewards 2	$60,000	Partial
ECOSS	Greening Community Spaces	$50,000	Partial
ECOSS	Puget Sound Spill Kit Incentive Program – Multicultural Outreach	$40,000	Partial
ECOSS	Environmental Stewards Program	$55,000	Yes
ECOSS	Greening Community Spaces 2	$50,000	Partial
Environmental Science Center	Salmon Heroes: Watershed Education and Water Quality Training for Underserved Students	$50,000	Partial
Forterra	Green Buffers to Clean the Green	$89,543	Yes

Organization	Project Title	Award Amount	Green Duwamish Watershed?
Futurewise	Stormwater Pollution Reduction Project for Algona	$81,565	Yes
IslandWood	Community Waters – Connecting Stormwater Curriculum to Local Watersheds	$200,000	Partial
King County WLRD	Duwamish Source Control and Community Engagement	$150,000	Yes
King County WTD (with Urban Systems Design)	Growing Green Infrastructure Careers through On-the-Job Training – Phase 2	$50,000	Yes
King County WLRD	Cooling the Green River	$250,000	Yes
King County WLRD	Soil Testing at Teuful Nursery	$18,000	Yes
Lake Sawyer Park Foundation	Lake Sawyer Regional Park Interpretive Trail	$12,500	Yes
Mountains to Sound Greenway Trust	Greenway Education Project	$25,000	Partial
Mountains to Sound Greenway Trust	Me-Kwa-Mooks Park Community Engagement and Restoration	$50,000	Yes
Nature Vision	Water Quality Education and Stewardship Project	$39,622	Yes
Nature Vision	Water Quality Education Project	$24,949	Yes
Northwest Center for Alternatives to Pesticides	Raindrops to Rivers King County	$24,962	Partial
Pacific Marine Research	Marine Science Afloat	$35,000	Partial
Puget Soundkeeper	Lost Urban Creeks Community Education and Revitalization Project	$67,500	Yes
Seattle 2030 District	Green Stormwater Management: Catalyzing the Private Sector to Protect Puget Sound	$175,000	Yes
Seattle Parks Foundation	Duwamish Valley Green Connections	$100,000	Yes
Seattle Parks Foundation	Water Quality Education at Gateway Park North, Georgetown	$65,000	Yes
Seattle Parks Foundation in partnership with Urban Systems Design LLC	Green Infrastructure Job Corps	$75,000	Yes
Seattle Parks Foundation (with Just Health Action)	Building Green Walls to Mitigate Water and Air Pollution in a Community with Environmental Equity Concerns	$56,500	Yes
Seattle Tilth Association	Improving Water Quality through Changes to Agriculture Practices	$50,000	Yes
Seattle Tilth Association	The Watershed Stewards Project	$50,000	Partial
Stewardship Partners	Green Stormwater Infrastructure Mini Grants, RainWise Access Grants, and Community Engagement Campaign	$75,000	Partial

Organization	Project Title	Award Amount	Green Duwamish Watershed?
Stewardship Partners	RainWise Access Grant Expanded Pilot	$60,000	Partial
Sustainability Ambassadors (Sustainable Seattle is fiscal sponsor)	Green/Duwamish Project Design Lab	$89,969	Yes
Tilth Alliance	Soil and Water Stewardship Training Program	$150,000	Partial
University of Washington (UW) (originally KC WLRD)	Duwamish Floating Wetlands	$154,986	Yes
UW Green Futures Research and Design Lab	The Sweetgrass Shoreline Restoration Project	$236,000	Partial
World Relief	Hillside Paradise Parking Plots Community Garden 2	$144,227	Yes
World Relief Seattle	Hillside Paradise Parking Plots Community Garden	$75,000	Yes
YMCA of Greater Seattle – Earth Service Corps	Youth in Action: Stewardship, Education & Leadership	$33,200	Partial
Zero Waste Washington	Plastic pollution youth-created videos, outreach, and education in the Duwamish Valley and beyond	$108,000	Yes

2.2.6 Municipal Stormwater Source Control in CSO Basins

By the end of 2017, WTD and SPU reviewed existing municipal stormwater source control program for combined basins. This included a review of regulations that address source control authority and identified where existing authorities could limit the ability to conduct and enforce source control. In reviewing the pollution prevention programs in combined basins described above, both WTD and SPU have determined that existing legal authorities are sufficient to effectively administer and implement these programs. WTD and SPU will continue to implement the pollution prevention program that is consistent with each agency's NPDES permits and that benefits each agency's combined sewer system. A description of a pollution prevention program, appropriate BMPs, and the legal authority and administrative procedures that will be used to ensure the pollution prevention program is being implemented in combined sewer basins were submitted to Ecology in the County's 2017 CSO Control Program Annual Report.

To meet NPDES permit obligations to implement a pollution prevention program for CSO basins, WTD additionally relies on SPU to implement pollution prevention actions (e.g., spill response, water quality complaint response, and street sweeping) in areas of Seattle served by WTD CSO facilities. SPU currently provides these pollution prevention actions, but is not responsible for WTD's NPDES permit compliance. SPU tracks and reports to WTD on the limited set of BMPs identified above. Implementation of this reporting started in 2017, and

only 2017 activities have been reported to date. In 2017, SPU tracked the following pollution prevention BMPs in areas served by King County CSOs:[13]

- Water quality complaints: SPU inspectors respond to complaints as they are received through the water quality hotline, web page, or agency referrals. A total of 186 water quality complaints were reported in these basins.
- Spill response: Spills are dispatched through the SPU Operations Response Center to on-call spill coordinators as they are received. SPU responded to 268 spills within these basins.
- Street sweeping*:* SPU coordinates with the Seattle Department of Transportation (SDOT) to conduct street sweeping on arterials in Seattle using high-efficiency regenerative-air street sweepers. SPU and SDOT swept 10,128 lane miles in these basins.

2.2.7 Sediment Management Program Studies

Sources of chemical contaminants to the LDW Superfund site include both historical and current sources. Current sources can be transported through various pathways to the LDW including inputs from the Green River, direct discharge of stormwater, CSOs, atmospheric deposition, spills and leaks of contaminated material, groundwater, and bank erosion or leaching of contaminants from materials. A number of source control related studies to characterize contaminants in some of these pathways were conducted between 2011 and 2017 in the Green/Duwamish River Watershed and within two combined sewer basins. These studies included an atmospheric deposition study in the greater Green/Duwamish Watershed; surface water, suspended solids, and stream sediment studies in the Green River Watershed; and CSO basin input studies in the Brandon and South Michigan combined sewer basins.[14]

WTD completed model development of a nearfield discharge model that predicts sediment deposition around a CSO discharge. Sediment samples collected around several CSOs were used to validate the model. A simple model was developed that compared well with output from the more complex modeling that allows quick screening of discharges with the potential to create sediment quality issues. The model can be used to evaluate recontamination potential following cleanup and help identify COCs for recontamination potential that can target source control efforts. The modeling done to date only suggests some potential of a few COCs exceeding the Washington State Sediment Management

[13] SPU does not report records separately for the LDW combined basins to WTD, although it maintains the details of all activities.
[14] The study reports can be found at https://www.kingcounty.gov/services/environment/wastewater/duwamish-waterway/preventing-pollution/pollution-sources.aspx.

Standard's (SMS) sediment cleanup objective within 100 feet of the largest CSOs—Brandon and Michigan (bis(2-ethylhexyl) phthalate [BEHP], PCBs, and mercury). The modeling indicates that only BEHP is predicted to exceed sediment cleanup objective at Brandon.[15]

2.2.8 Source Tracing

Since 2008, WTD has conducted sampling in combined sewer basins discharging to the Duwamish Estuary[16] to identify and control sources of COCs. The data helped characterize the chemistry of CSO basins (Table 3) and identified elevated levels of a few contaminants that were traced back to their sources. The information on sources was provided to the appropriate regulatory agencies.

Source tracing in-line solids grabs and sediment trap samples have been collected from the LDW combined sewer system since 2010. Uncontrolled basins were the primary target over most of the period (Table 3). Table 3 below presents a summary of major findings of combined sewer system source tracing samples; Figure 1 shows CSO basin locations. Source tracing screening levels for the combined sewer system are two times (2x) the second lowest low apparent effects threshold (2LAET)[17], and source tracing focuses on metals, PCBs, PAHs, and certain other semi-volatile organic compounds (see Appendix B for details). The data are presented in annual source control reports (King County 2016c; 2017b; and 2018b).

Table 3. Summary of Source Tracing Samples Collected from 2010–2018 in County CSO Basins that Drain to the LDW

Sample Type and Year	Uncontrolled CSO Basin					Controlled CSO Basin	
	South Michigan	Brandon	West Michigan	T115[a]	Hanford #1[b]	8th Ave S[c]	Norfolk
In-line Solids Grab[d]							
2010	2	3	--				
2011	3	--	1				
2012	1	2	--				
2013							
2014							
2015						1	
2016							
2017							
2018							
Sediment Traps							
2012	2	5	--				
2013	2	4	--				
2014		2					
2015	2	2					

[15] Details of this modeling can be found in the appendices of the Sediment Management Plan update at https://kingcounty.gov/services/environment/wastewater/sediment-management/plan.aspx.
[16] The Duwamish Estuary includes the LDW and the East and West Waterways.
[17] As noted in Appendix B, the 2LAET is the dry weight equivalent of the Cleanup Screening Level from the Washington State Sediment Management Standards (WAC-173-204-562).

Sample Type and Year	Uncontrolled CSO Basin					Controlled CSO Basin	
	South Michigan	Brandon	West Michigan	T115[a]	Hanford #1[b]	8th Ave S[c]	Norfolk
2016						2	
2017	2					1	
2018	2			1	2		

N/A = not available

[a] T115 is controlled by an overflow weir, not a regulator station. No access could be obtained prior to this weir. SPU collects and analyzes solids from a sediment trap near the outfall that includes both separated stormwater and combined sewer overflows for this basin. Sample collected from West Marginal Pump Station in 2018 is used to represent potential discharges from T115 CSO.

[b] Hanford #1 CSO control project was completed in June 2018 through the Rainier Valley Storage Project.

[c] Source tracing samples from 8th Ave S basin may also help characterize flows from T115 CSO because flows from the 8th Ave S regulator are directed to West Interceptor, which is the source of T115 overflows, when they occur.

[d] Reconnaissance in South Michigan, Brandon, West Michigan, Hanford #1, and 8th Ave South often found no solids in pipes to collect or limited access to look for solids in the pipe to collect.

2.2.8.1 West Michigan CSO

In-line solids grab samples collected in 2011 had concentrations of BEHP and 1,4-dichlorobenzene above combined sewer system screening levels and concentrations of butyl benzyl phthalate (BBP) above 2LAET. Sediment samples collected near the outfall had Washington State SMS benthic cleanup screening level (CSL) exceedances of BEHP and benzyl alcohol and sediment quality standard (SQS) exceedances of BBP and 1,4-dichorlorbenzene (SAIC 2011). A sediment sample collected slightly north and south of the outfall had no exceedances of SQS or benthic CSL (AECOM 2012; SAIC 2011).

2.2.8.2 South Michigan CSO

Source tracing samples were collected in the South Michigan CSO basin multiple times over a 9-year period. Samples have often had concentrations of BEHP and PAHs above the combined sewer screening levels. This has occurred less frequently for mercury, and only once for PCBs, 1,4-dichlorobenzene, pentachlorophenol, phenol, and silver. Chemicals observed above 2LAET at times include PAHs, BBP, and mercury. Sediments near the South Michigan CSO outfall have exceedances of either SQS or benthic CSL for total PCBs, the SQS for butyl benzyl phthalate (BBP), and benthic CSL for BEHP (AECOM 2012; King County 2017a). Sediments farther from the outfall also have SQS exceedances for total PCBs, and one sample south of the outfall near the 1st Avenue South Bridge has an SQS exceedance for mercury.

In 2015, KCIW began an investigation to source trace the PAHs, which are believed to be related to fuel that was intermittently discharged to the combined sewer system. Based on the investigation, one permitted facility, Marine Vacuum, was identified as a potential discharger in the South Michigan CSO basin associated with fuel discharges. During 2016, and under orders from KCIW, Marine Vacuum implemented changes to its pretreatment process in addition to making other site modifications; the company

continues to work on additional changes that will eliminate the potential of future incidents.

2.2.8.3 Brandon CSO

Source tracing samples were collected in Brandon CSO basin over a 6-year period. Samples often had concentrations of BEHP followed by BBP above the combined sewer screening levels. Other chemicals observed above 2LAET infrequently during this period include PAHs, phenol, di-n-octyl phthalate, and metals such as mercury. One sediment trap sample collected from a lateral line had concentrations of multiple PAHs, BEHP, BBP, and three metals (cadmium, copper and silver) above the screening levels in 2012. Only concentrations of BEHP, BBP, and another phthalate remained above the screening levels during the 2013 sample period. Business inspections by Ecology and a review by KCIW did not identify any likely source of these chemicals. Sediments near the CSO outfall have shown an exceedance of the benthic CSL for mercury at one station (AECOM 2012). Sediment data collected in 2016 showed a benthic CSL exceedance of BEHP and several PAHs at one station and a SQS exceedance of BBP at three stations (King County 2018c).

2.2.8.4 T115 CSO

The T115 CSO was characterized using a sediment trap sample collected in 2018 near the West Marginal Pump Station. Concentrations of BEHP were above screening levels and mercury concentrations were above the 2LAET. Samples collected within the 8th Avenue South CSO basin may also be useful for characterizing possible discharges from T115 CSO. This is because this CSO is an overflow weir from the West Interceptor, to which the 8th Avenue South regulator station directs flows. Sediments near the T115 CSO/storm drain outfall only had an exceedance of the Washington State SMS's SQS for BBP at one station; the other two closest sediment stations did not have any exceedances of SQS (AECOM 2012; SAIC 2011).

2.2.8.5 Hanford #1 CSO

Samples were collected in 2018 at two locations within the combined sewer system that can have flows discharge via the Hanford #1 CSO. There were no chemicals with concentrations above the combined sewer system screening levels, but BEHP and mercury were each above the 2LAET once at each location. Sediments near the Duwamish CSO outfall only had an exceedance of the Washington State SMS's SQS for phenol at one station in 2012; the other two closest sediment stations did not have any exceedances of SQS (King County 2016b). Samples collected from these same locations in 2010 and 2011 showed exceedances of benthic CSL for BEHP in both years, the SQS for BBP in both years, and the SQS for PCBs and some PAHs in 2011 (King County 2016b; EBDRP 2015).

2.2.8.6 8th Avenue South CSO

The in-line solids grab sample collected in 2015 had concentrations of mercury and BEHP above combined sewer system screening levels and concentrations of chromium

and zinc above the 2LAET. The sediment trap samples collected over a 2-year period periodically had concentrations of mercury above either the combined sewer system screening level or the 2LAET. The most recent sampling data collected in 2017 as well as past duplicate samples for mercury were not above the 2LAET, indicating the mercury levels fluctuate in the system. BEHP concentrations were always above the screening level. Di-N-butyl-phthalate was above 2LAET during one collection period. Sediments near the 8th Avenue South CSO outfall only had an exceedance of the Washington State SMS's SQS for total PCBs at one station and benzyl alcohol at another station; a third station nearby had no exceedances of the SQS (AECOM 2012; SAIC 2011).

2.3 Additional Source Control Actions for 2019–2023

WTD intends to continue to supplement its ongoing LDW source control efforts and commitments in 2019 to 2023 by (1) continuing coordination of business inspections, (2) collecting source tracing samples and following up on any identified issues, (3) continuing to award grants that benefit water quality in the LDW, and (4) reviewing source control regulations to identify issues that need resolution. These actions are described below, followed by a summary in Table 4.

2.3.1 Business Inspection Coordination

King County, SPU, and Ecology conduct ongoing business inspections in the LDW. Business inspections are an important component in controlling COCs. They help identify potential sources of contaminants from on-site activities, appropriate BMPs to minimize or prevent stormwater contamination, and pretreatment actions required for any releases to the sewer. The inspections also consider the conveyance system and possible illicit connections. Inspection coordination between KCIW, SWS, Ecology, and SPU is expected to continue through participation in DIG and through ongoing communication. In addition, continuing to share source control activities and information through the LDW SCWG is an important component of this effort. County inspectors share findings with SPU, Ecology, and EPA and work collaboratively in cases that involve multiple jurisdictions. The County will take regulatory or legal action, when necessary, where it has jurisdiction and authority.

2.3.2 Source Identification and Tracing

WTD identifies possible sources of COCs through sampling and will trace sources through ongoing business and industrial waste inspections and additional targeted sampling. Additional tracing of chemicals of concern that enter the County's combined sewers will help protect treatment efficiency at the West Point Treatment Plant, ensure proper performance of future CSO treatment facilities in the LDW, and minimize pollutants in the remaining flow from the combined sewer system released to the LDW. Once likely sources are identified, appropriate authorities are informed to mitigate the release. Depending on the type of source, agencies that could have the regulatory authority to address the

problem include KCIW, City of Seattle, City of Tukwila, Ecology, and EPA. If a source is found to come from a business or industry that operates under a KCIW discharge permit, KCIW works with that business or agency to control the source or takes appropriate enforcement action.

WTD will continue to collect chemistry samples (in-line grabs and sediment traps) at key locations in the combined sewer system in the LDW drainage area. Sampling data (1) may identify potential sources, (2) characterizes source concentrations, (3) identify elevated levels of chemicals of concern that can potentially be traced back to their source, and (4) provide the dataset to track long-term trends in overall source concentrations. (See Appendix B for details on the types of samples collected for chemistry analysis and the assessment methodology to determine if any follow-up source tracing actions are needed.)

Uncontrolled CSO basins within the LDW have been characterized by at least one round of sampling to date. Where possible, targeted elevated levels of COCs are traced, to the extent practicable, to their source and controlled. Routine screening will be needed over time to provide data for ongoing source tracing and long-term trend analysis to help assess program effectiveness.

A variety of factors can lead to new or increased releases to the combined sewer system. A City of Seattle study of properties in the Duwamish/Diagonal drainage basin documented a high rate of property turnover during the 5 years since the original round of joint City–County inspections. As it is likely there will be changes in staff, businesses, and on-site activities over time, periodic screening will be needed to identify and trace potential new releases that are at levels of concern in the combined system. As CSOs are controlled, WTD will modify source tracing in the newly controlled basins accordingly. In addition, areas identified for source tracing can require additional sampling up the pipe to narrow down and identify specific sources of chemicals of concern.

During 2019 to 2023, WTD intends to conduct the following sampling with a general focus of one CSO basin per year:

- Collect in-line samples (in-line solids grab samples and sediment traps) in uncontrolled CSO basins in the LDW (Brandon, South Michigan, West Michigan, and Terminal-115). Sampling is expected to occur in West Michigan and T115 in 2019. Brandon and South Michigan will occur in following years.
- Do periodic screening in controlled basins (Norfolk, Eighth Avenue, Hanford #1, and Diagonal siphon[18]) if concerns are identified through ongoing business inspections, spill reports, or other triggers.

[18] Access and feasibility for obtaining samples for Diagonal siphon has not been determined yet.

- Generally characterize, if needed, combined sewer basins that contribute to relief points farther downpipe of regulator stations (e.g., the interceptor line west of the LDW was characterized in the 2014 to 2018 period).
- Collect samples following WTD cleaning of facilities in the system once enough solids have accumulated.

Once a likely source has been identified, WTD takes action and works with the appropriate regulatory agency and with the property owner to control the release. Control could require implementation of stormwater BMPs, treatment, industrial waste pretreatment, or site cleanup. Extra effort will be required in the basins draining to the LDW because of the lower goals for recontamination than for other receiving bodies. The County will coordinate with various authorities, as needed, during the process to track the progress of source control actions.

When no specific sources are identified and historical contamination of in-line solids is the likely source, line cleaning may be needed. The County will work with local line owners regarding the cleaning of their affected line segments and will clean its own trunk lines. Additional sampling following cleaning would be conducted to determine if the problem is resolved or if ongoing sources keep the solids concentrations elevated and require additional source tracing.

By collecting and tracking source data over time, WTD will be able to identify long-term trends in concentrations of contaminants in the combined sewer system. The trend analyses can be used to assess changes in source concentrations over time, to track the effectiveness of the overall source control program, and to adaptively manage the source control program, including revisiting target levels, tracing priorities, and sampling efforts.

Based on source tracing data collected to date in the combined sewer system, the following chemicals of concern can frequently be above screening levels compared to other chemicals: BEHPs, BBPs, PAHs, and mercury. Of these, BEHP is the most common chemical with concentrations above the screening levels. Further up-pipe source tracing is not being pursued for BEHP because the concentrations are typically observed at levels commonly found in source tracing datasets. These levels have been characterized as ubiquitous in the samples and thus are not readily traceable to a particular source. Mercury tends to be heterogeneous in the combined sewer basins based on data collected to date (including field and laboratory duplicate sample data). Therefore, it is unlikely to be readily traceable to a source. BBP is found at fluctuating concentrations within the combined sewer system solids data and BBP is not consistently observed above screening levels. PAHs have been most frequently observed above screening levels in South Michigan CSO basin. A likely source was identified and KCIW worked with the business to control the releases. In addition, the Georgetown Wet Weather Treatment Station being constructed to control South Michigan CSO discharges is expected to greatly reduce solids discharged from the CSO, and thus address chemicals of concern within the discharge.

WTD will continue to incorporate results learned about potential sources of COCs that tend to originate from sewer, stormwater, or inflow and infiltration inputs. Depending on the

likeliest source, WTD will coordinate source tracing efforts with the appropriate staff (KCIW or SPU). These efforts, along with studies on CSO basin inputs, atmospheric deposition, Green River inputs, and nearfield discharge monitoring, will help target further source tracing efforts and coordination with appropriate enforcement agencies.

2.3.3 WaterWorks Grant Program

In 2019 to 2023, WTD plans to continue the WaterWorks Grant Program, pending budget and Council approval for each biennium. WaterWorks funding is expected to continue at the level of approximately $4 M every 2 years, and was funded in the 2019/2020 budget. Although funding is for projects throughout the WTD service area, a portion of those funds is expected to be awarded to projects in the Green/Duwamish Watershed, continuing control of new or ongoing sources of pollution by engaging other agencies and diverse community partners.

WaterWorks delivers water quality benefits and improves ESJ in the areas surrounding the Duwamish River. Although the program covers all of WTD's service area, it includes projects in the LDW area and those targeting communities that have disproportionate human health outcomes and environmental burdens. Implementation of the projects funded by the program will help support WTD's overall source control efforts in the LDW.[19]

2.3.4 Municipal Stormwater Source Control in CSO Basins

Following the regulatory review of the authority to regulate the release of contaminants to receiving waters, authority was clarified for releases through stormwater to combined sewer basins. WTD is working with SPU to implement appropriate pollution prevention BMPs in combined sewer basins. SPU will track and annually report to the Department of Natural Resources and Parks on the set of BMPs implemented in combined basins. WTD will monitor effectiveness of this arrangement and decide if further discussions with SPU over implementation are needed.

[19] More information on currently available grants can be found at http://www.kingcounty.gov/services/environment/grants-and-awards/waterworks.aspx.

Table 4. Summary of WTD Additional Actions in 2019–2023

Additional Action	Completion Date
Source Identification and Tracing **Expanded Sampling:**	
1. Develop annual targeted sampling plan for a specific CSO basin based on previous in-line trap data, data and information provided by other agencies, and other factors such as previous line cleaning and follow-up sampling.	• Annually
• Deploy one to four in-line sediment traps in areas of focus and/or collect in-line solids grab samples.	• Rotating uncontrolled basins or identified problems in controlled basins annually
• Sample in each uncontrolled basin and in controlled basins where a problem is identified.	• Complete a rotation of basins in 5 years
• Conduct studies as needed and publish a PCB synthesis report.	• By the end of 2019
Business Inspections: • Summarize site visits and actions needed.	• Annually
Grants Program • Obtain funding for WaterWorks Grant Program for 2019 and beyond.	• Include in 2021-2022 county budget and pursue funding for 2023-2024 budget
• Provide Ecology with a summary from previous year's activities for Ecology's LDW Source Control Status Report.	• Annually
Municipal Stormwater Source Control in CSO Basins • Review implementation of combined sewer basin pollution prevention program and appropriate BMPs.	• Annually
Reporting: • Summarize previous year's activities for inclusion in Ecology's LDW Source Control Status Report.	• Annually
• Provide Ecology with previous year's collected data and activities.	• Annually
• Report to Ecology on long-term trends.	• By the end of 2023

3.0 WATER AND LAND RESOURCES DIVISION

WLRD helps protect the County's water and lands so that its residents can enjoy them safely today and for generations to come. The division provides diverse services, such as water quality studies and analyses, river and floodplain management, watershed basin stewardship, rural and agricultural services, and implementation of and compliance with the County's Phase I Municipal NPDES Stormwater Permit (Phase 1 MS4 Permit), which authorizes stormwater runoff discharges from County's Municipal Separate Storm Sewer System (MS4).[20]

3.1 Ongoing LDW Source Control Actions and Commitments

WLRD sections that work to control pollutants to the LDW are the SWS and the Local Hazardous Waste Management Program (currently doing business as Hazardous Waste Management Program or Haz Waste Program) within the Rural and Regional Services section. Each of these are discussed below. Other sections (or programs) within WLRD also help to control pollutants from the environment but are not the focus of this SCIP.

3.1.1 Stormwater Services – Ongoing Actions

WLRD's Stormwater Management Program (SWMP) includes a number of programs that address pollutant prevention and reduction in stormwater discharges to the LDW and other receiving waters in King County. Descriptions of these actions and their associated agencies can be found in the 2013 SWMP document.[21] WLRD also coordinates the actions of other King County agencies that have responsibilities under the Phase 1 MS4 Permit. These programs are countywide in unincorporated areas.

The following programs that WLRD implements have the most relevance to the LDW:

- The Source Control Program provides technical assistance, education, and code compliance activities to business and property owners. The goal of these activities is to reduce and eliminate existing or potential pollutant discharges to the MS4 and

[20] Information on the County's Phase 1 MS4 Permit is available at https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits/Municipal-Stormwater-Phase-I-Permit.

[21] Information on the SWMP is available at https://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/stormwater-services-section/stormwater-program.aspx.

surface waters in unincorporated King County, a small portion (2.8 percent) of which are in the basins that drain to the LDW. Compliance is achieved using a progressive enforcement path starting with education/technical assistance; corrective action letters; follow-up inspections; and, eventually, notices of violations and penalties.

- In accordance with the Phase 1 MS4 Permit (S5.C.2, Municipal Separate Storm Sewer System Mapping and Documentation), King County is required to map and document MS4 on the properties it owns or operates, including the County right-of-way (ROW), and connections from properties that discharge to the MS4. SWS has mapped MS4 in the lower Duwamish footprint, and further mapping actions will consist of investigating unresolved connections and capturing additions to the MS4. SWS will track and map changes to the MS4 resulting from capital and/or maintenance projects by King County agencies. SWS will also investigate and map any new connections or systems found during King County operations or reported to the County stormwater mapping team by County agencies, other jurisdictions, or the public. Parts of the County's MS4 are located in incorporated areas where the County owns or operates properties in the LDW drainage basin (Figure 5).
- The Facility Inspection Program ensures that stormwater flow control and water quality treatment facilities are properly functioning and appropriately maintained. Thirteen public and 40 private stormwater flow control/treatment facilities are in unincorporated King County areas that drain to the LDW.
- The IC/IDDE Program addresses potential sources of stormwater pollution by conducting investigations, inspections, and follow-up actions to ensure compliance with King County's Water Quality Code; identifying illicit connections and discharges; and removing them.
- WLRD is responsible for mapping and documenting the MS4 in the County's jurisdiction, on the properties it owns or operates, and on properties that are discharging to the County's MS4.[22]

[22] More information on WLRD's programs is available at http://www.kingcounty.gov/environment/wlr.aspx.

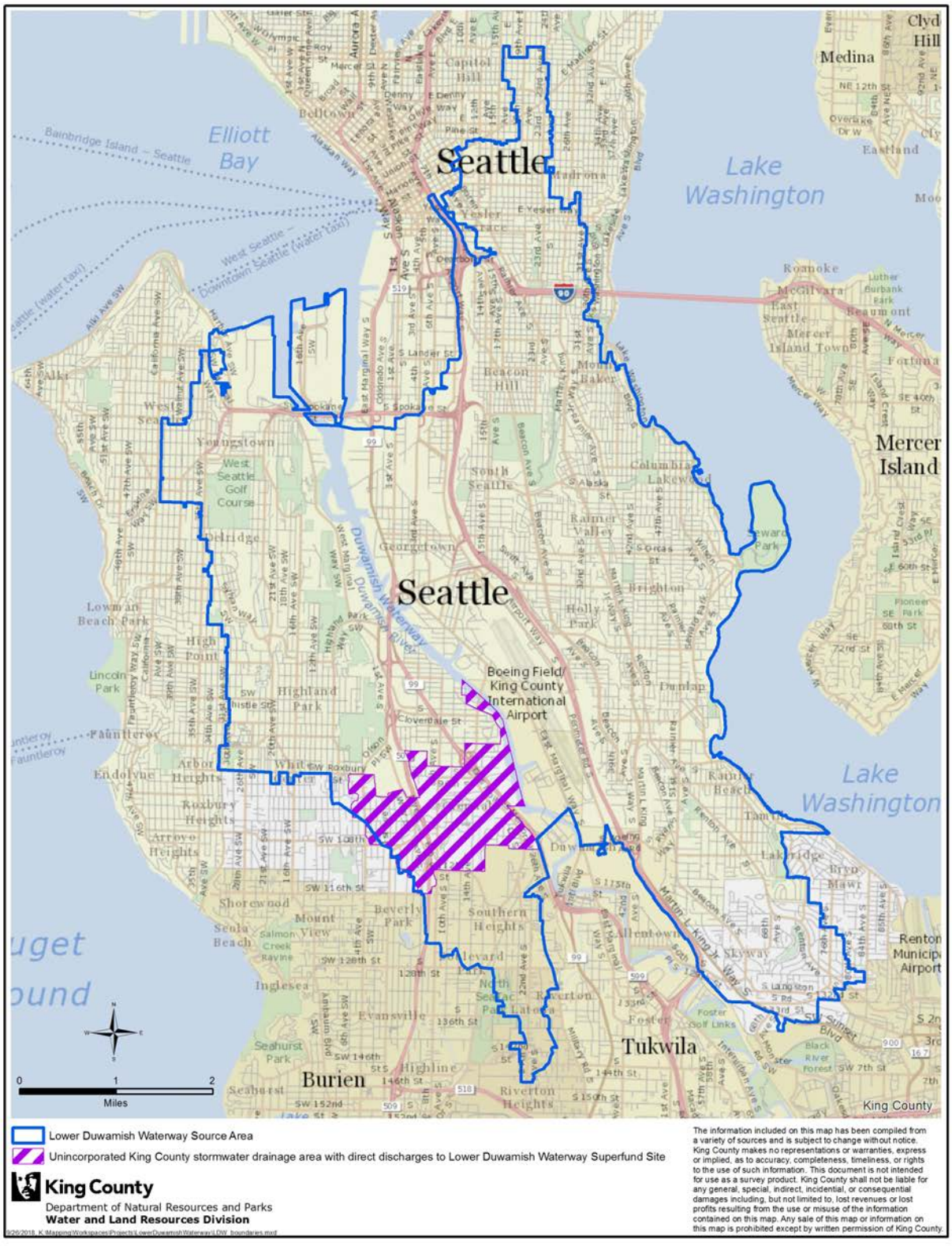

Figure 5. King County MS4 Area with Drainage to LDW

3.1.2 Local Hazardous Waste Management Program – Ongoing Actions

The Hazardous Waste Management Program is a multi-agency program that covers all incorporated cities and unincorporated areas in King County. Last year the Local Hazardous Waste Management Program completed a brand refresh which included a change in its operational name. It is currently known as the Hazardous Waste Management Program (also referred to as Haz Waste Program). Participating agencies include King County Solid Waste Division and Water Land Resources Division, Seattle-King County Public Health, Seattle Public Utilities, and the Sound Cities Association. The program implements the moderate-risk waste plan required by Chapter 70.105 Revised Code of Washington, updated most recently in 2010 and approved by the Department of Ecology. The program also addresses hazardous wastes generated by residents and those generated in small quantities by businesses.

Program services include household hazardous waste collection, public education, small quantity generator technical assistance, small quantity generator waste collection, and targeted outreach to communities and businesses. These efforts help keep pollutants out of surface waters, including the LDW, and the environment.[23]

The Hazardous Waste Management Program is committed to creating and implementing programs, services, and policies that embed racial equity across all lines of business. Examples of projects that are informed by the experiences and needs of our ratepayers are:

- Provide customized drainage maps and spill plans, cleanup kits, and training to businesses. This work is done in partnership with ECOSS.
- The Hazardous Waste Management Program is focusing on safer alternatives across all industries and offers a limited number of grants to reduce hazardous exposures to the environment and the public.
- Assist dry cleaners in shifting away from perchloroethylene and other chlorinated solvent spot cleaners. The program is providing grants to dry cleaning businesses, many of which are owned by Koreans and staffed by Latinx, to switch to safer alternatives.
- Work with the janitorial/custodial service industry, which employ a large contingent of Latinx staff, to promote the safe use of cleaning products. The program is providing grants to these businesses to switch to safer alternatives.
- Work with Autobody shops to assist them to switch to using waterborne paints including providing grants.

[23] More information on Hazardous Waste Management Program's services is available at http://www.lhwmp.org/home/.

3.2 Review of Past 5-Year Actions

3.2.1 Stormwater Services – Past Actions

3.2.1.1 Mapping

SWS completed its mapping of the County's MS4 conveyance system in the basins draining to the LDW by June 30, 2015. This action was completed sooner than required by the County's Phase 1 MS4 Permit. SWS increased the frequency of source control inspections and collected source tracing samples in the South 96th Street Corridor, which is home to a number of industrial activities in the LDW drainage basin.

3.2.1.2 Source Control Program for MS4

SWS conducted source control inspections throughout unincorporated King County as required by the Phase 1 MS4 Permit. In addition, SWS responds to water quality complaints and concerns and conducts investigations of suspected illicit connections. There were no illicit connections discovered during this time period in the South 96th Street Corridor.

The source control inspections occur on about a 5-year cycle. As part of the previous SCIP, a system was developed to create an inspection schedule for the businesses in the South 96th Street corridor that was based on business type and compliance history. This resulted in an increased inspection frequency for several businesses starting in 2016. Although it is too soon to evaluate the effectiveness of the schedule, several businesses that would not have otherwise been inspected until 2021 were found to be lacking the required BMPs. Technical assistance and follow-up was provided to bring them into compliance.

The other benefit of increased inspection frequency has been the ability to partner with inspectors from Ecology's Hazardous Waste and Water Quality groups and to have an increased presence in the area. This coordination is done through DIG. The core group contains source control inspectors from SWS, KCIW, Ecology, the City of Seattle, and, on occasion, inspectors from Puget Sound Clean Air and EPA.

Section 6.0 contains details other inspections conducted on behalf of FMD.

3.2.1.3 Source Tracing

Source tracing samples were collected over the period within the South Fork of Hamm Creek and the South 95th Street drainage basin[24] as well as one time for three small drainage basins. Table 5 presents a summary of the source tracing samples collected by type and year; Appendix C shows the sample locations. An overall summary of the findings of source tracing samples are presented below. To assist in this assessment, key

[24] SWS took over the sediment trap sampling and analysis in 2016 at four locations: HC-ST1, 96-ST1, 96-ST2, and 96-ST3.

parameters of interest were graphed to look at changes over time for four sediment trap sample locations with multiple years of data (Appendix C).

Table 5. Summary of Source Tracing Solids Samples Collected from 2008–2018 in County Stormwater System that Drains to the LDW

Sample Type and Year	Sample Location										
	96-ST1	96-ST2	96-ST3	LDW-SG1	LDW-SG2	LDW-SG3	LDW-SG-96ST1A	LDW-SG-96ST1B	LDW-SG-96ST1C	LDW-SG-96ST1D	HC-ST1
In-line Solids Grab											
2009	1	1	1								
2010	1	1	1								1
2012	1	1	1								
2013	1	1	1								1
2014	1	1	1								1
2015											
2016				1	1	1					
2017											
2018							1	1	1	1	
Sediment Traps											
2009	1	1	1								1
2010	1	1	1								1
2012	1	1	1								1
2013	1	1	1								1
2014	1	1	1								1
2015	1	1	1								1
2016	1	1	1								1
2017	1	1	1								
2018	1	1	1								

Note: Samples from 2009–2014 were collected and analyzed by SPU with Ecology grant funding. Samples from 2015 were collected and analyzed by Ecology. Samples from 2016–2018 were collected and analyzed by King County.

South Fork Hamm Creek

Since 2009, sediment traps have been deployed over multiple years at HC-ST1. The data showed continued contaminant concentrations below source control screening levels. Because of the continued pattern of low concentrations for all parameters at HC-ST1, source tracing at this site was not conducted in 2017 or 2018.

South 96th Street Corridor Basin

Since 2009, sediment traps have been deployed over multiple years at three locations in South 96th Street Basin: 96-ST1, 96-ST2, and 96-ST3. Sampling location 96-ST3 captures stormwater runoff from Hwy 509 and is located upgradient of sampling locations 96-ST2 and 96-ST1. All stormwater from these locations flows to the North Fork of Hamm Creek and then to the LDW.

Ten parameters were evaluated for general trends over time in the basin. These were arsenic, copper, lead, mercury, zinc, PCBs, high molecular weight polycyclic aromatic hydrocarbons (HPAHs), low molecular weight polycyclic aromatic hydrocarbons (LPAHs), BEHPs, and BBPs. These parameters were selected because they are either key contaminants of LDW or can be associated with stormwater runoff. Over the years sampled, copper, lead, mercury, PCBs, and LPAHs always were found at concentrations below source control screening levels[25]. Arsenic was also always below the screening level, with the exception of one year at 96-ST1 when it was above the low apparent effects threshold (LAET) screening level. HPAHs were always below the LAET at 96-ST2 and 96-ST3; however, on three occasions HPAH was above LAET at 96-ST3. BEHP showed multiple years with concentrations above the 2LAET screening level at 96-ST1 and 96-ST2, and one year for 96-ST3. BBP concentrations were above LAET multiple years when detected (more so at 96-ST2, followed by 96-ST3).

Additionally, data for these three locations over the 2016–2018 period indicate a few individual PAHs compounds as well as one additional phthalate compound sometimes had concentrations above screening levels. In 2016, dioxin/furans were also analyzed. While no screening levels have been established for dioxin/furans, the dioxin/furan concentrations in the source tracing sample were above the LDW Record of Decision remedial action levels; however, LDW sediments at discharge locations and nearby areas are not above remedial action levels for dioxin/furans (AECOM 2012; Windward 2019). In addition, the concentrations of dioxin/furans are similar to other storm drain solids data, indicating these levels would not likely be traceable to a particular source based on ubiquitous nature of these compounds in storm drain systems.

BEHP and BBP are generally found at levels often seen in source tracing storm drain solid samples and there are no BEHP or BBP SMS marine benthic exceedances in available nearby receiving sediment samples (AECOM 2012; SAIC 2011; Windward 2019). These two phthalate compounds would not likely be traceable to a particular source based on ubiquitous nature of these compounds in storm drain systems.

Two sources of zinc to the stormwater conveyance system were identified up-pipe of 96-ST2. The two sources of zinc are Ace Galvanizing, which is a primary source, and Security Contractor Services, which is a secondary source. King County has been working with Ecology to control zinc from these sources.

Further source tracing for zinc and PAHs was conducted in 2018 up-pipe of 96-ST1. Four stormwater catch basins contributing to ("up-pipe of") 96-ST1 were sampled in March 2018 (LDW_SG_96ST1A, -B, -C and -D). Site -C was above LAET for zinc, while the other three sites were below LAET. Regarding HPAHs, while none of the sites were above HPAH LAETs, Site -A had the highest levels for 13 PAHs from the 17 individual PAHs measured.

[25] PCBs and mercury were not analyzed in 2017 and 2018 because of the number of years these parameters were found to be below screening levels. Other parameters that also were below screening levels continued to be analyzed because they were included in analytical methods being analyzed for another parameter.

Site -A is located below the state Highway 99 and captures runoff from it, which may explain the higher HPAH levels than the other three grab locations that are situated west of the highway and do not receive runoff from it.

Other Basins

Three other storm drain basins were sampled in 2016: LDW-SG1, LDW-SG2, and LDW-SG3. At LDW-SG1, zinc was above LAET and BEHP was above 2LAET and, at LDW-SG3, BBP was above LAET and chromium and BEPH were above 2LAET. No parameters were above screening levels at LDW-SG2. Zinc, BEHP, and BBP were at levels often seen in source tracing storm drain solid samples and, therefore, would be difficult to source trace; there are no SMS marine benthic exceedances in available nearby receiving sediment samples (AECOM 2012; SAIC 2011).

Additional sample aliquots were re-analyzed for chromium and laboratory results indicate much lower levels (101, 58, and 37 mg/kg dry weight compared to the original result of 731 mg/kg dry weight) in the sample; these results and the metal shavings observed in the sample indicate chromium is not consistently found at higher concentrations throughout the catch basin solids. The catch basin where this sample was collected receives stormwater runoff from a portion of the new South Park Bridge. The drainage system for the bridge has "as-builts" stamped in October 2015. As a source control action, the County cleaned the catch basin and drainage lines associated with this catch basin in 2017. The catch basin will be resampled once sufficient solids accumulate following the cleaning.

3.2.2 Hazardous Waste Management Program Past Actions

Of particular importance to LDW source control efforts are the Hazardous Waste Management Program's on-site technical assistance visits to small businesses. Hazardous Waste Management Program investigators provide consultation services throughout the County. During 2014–2017, they conducted over 500 site visits in the LDW drainage area. Table 6 summarizes the number of site visits by investigators in the LDW drainage area in 2014–2017.

Table 6. Hazardous Waste Management Program Visits in the LDW Drainage Area during 2014–2017

Zip Code	2014–2017
98106	30
98108	188
98134	216
98168	106
Total	540

Note: Site visits for 2018 were not conducted in LDW drainage basin.

The most common corrections made by businesses included storage of hazardous materials and wastes such as labeling and covering containers, providing secondary containment when appropriate, and disposing of accumulated hazardous wastes. Vouchers redeemed by businesses were used to improve catch basin maintenance and proper

disposal of hazardous waste and to purchase containment and safety equipment. The Hazardous Waste Management Program intends to continue to provide these services to businesses in the LDW going forward in coordination with other agencies.

3.3 Additional Source Control Actions for 2019–2023

WLRD intends to supplement its ongoing LDW source control efforts and commitments by (1) conducting more frequent source control inspections in the basin that serves South 96th Street Corridor, (2) continuing to participate in DIG, and (3) collecting in-line solids source tracing samples to implement enhanced source tracing and identification in unincorporated areas with stormwater directly discharging to the LDW drainage basin. These actions are described below.

3.3.1 Business Inspections in the South 96th Street Corridor

Business inspections are an important component of controlling COCs. They help identify potential sources of contaminants from on-site activities and appropriate BMPs to minimize or prevent stormwater contamination. As part of the Phase 1 MS4 Permit, the County maintains an inventory of potential pollutant-generating sites and must inspect 20 percent of those annually. The majority of the potential pollutant-generating sites in unincorporated King County that are in the LDW Superfund site drainage boundary are located between State Route 509 and the Duwamish River and north of South 100th Street to the City of Seattle border. This area is commonly referred to as the "South 96th Street Corridor" and is zoned for industrial and commercial uses (Figure 5). The areas south of South 100th Street and west of State Route 509 are zoned for residential development.

The South 96th Street Corridor has long been home to a number of industrial activities. While King County's Source Control Program has an inspection rate of approximately once every 5 years, increasing the frequency of inspections of businesses that have a higher potential to pollute presents the opportunity to more readily identify and control sources of pollutants and prevent new sources that could lead to stormwater and sediment recontamination.

Under the previous implementation plan, SWS developed a system for determining the frequency of business inspections based on the nature of the business and its potential to pollute. Properties were assigned scores based on its primary use and compliance history (Table 7); the scores were combined to determine inspection frequency (Table 8). Additional inspections are also conducted in response to complaints or referrals from field staff.

Table 7. Compliance History Scores for Properties in the South 96th Street Corridor

Compliance History	Score
No problems found or immediately corrected minor problems	0
Compliance achieved after corrective action letter or follow-up contact	1
Trouble achieving and/or maintaining compliance	3

Table 8. Inspection Frequency Based on Scores for Properties in the South 96th Street Corridor

Total Score	Inspection Frequency	Category
1–2	Every 5 years	Low
4–3	Every 3 years	Medium
5–6	Annually	High

Over the next 5 years, SWS intends to continue this inspection frequency program. With the implementation of a new data management system in 2019, the program has been expanded to the County's entire source control program, not just in the Lower Duwamish.

The increase in inspections relies on continued coordination with the City of Seattle and Ecology for properties that drain to the City's drainage system or operate under an Ecology NPDES permit. Inspection coordination with Ecology and the City of Seattle is expected to continue through participation in DIG and through ongoing communication. Additionally, continuing to share source control activities and information through the LDW SCWG is an important component of this effort.

3.3.2 Source Tracing and Control in Unincorporated Areas in the LDW Drainage Basin

From 2019 to 2023, the following is planned for source tracing sampling in LDW drainage basin within unincorporated King County:

S. 96th Street Corridor Basin

- Sediment trap sampling (deployment in 2018 and retrieval in 2019) to occur at 96-ST1 as follow up to PAHs and zinc observed above screening levels in past samples. Further sampling may occur depending on data results. Thus far existing data suggests source of PAHs is from highway runoff.
- Sampling using sediment traps will be conducted at three locations (96-ST1, 96-ST2 and 96-ST3) at least once in the years 2020 and 2023. The priority analytes will be zinc and HPAHs based on previous data.
- Additional sampling at other sites within the basin, in the form of solids/sediment grab sampling, may also take place if data collected in 2020 suggests this is necessary.

16th Avenue South Bridge Basin

- A solids grab sample will be collected at LDW-SG3 once sufficient solids accumulate. The purpose of this sample is to re-check chromium level in the structure to confirm the chromium concentrations were associated with bridge construction and not ongoing sources. Future sampling will be driven by sampling results.
- The other location (LDW-SG1) requires no further sampling based on existing data and the receiving sediment conditions.

LDW-SG2 Basin

- This small basin requires no further sampling based on existing data and the receiving sediment conditions.

South Fork Hamm Creek Basin

- No further sampling is planned at HC-ST1 or any other location within basin based on existing data and the receiving sediment conditions.

The sampling plan for South 96th Street Corridor is based on previous years' sampling results and the fact that there are no SMS marine standard exceedances in sediments near the outlet of the North Fork of Hamm Creek (see Section 3.2.1; AECOM 2012; SAIC 2011; Windward 2019). Source tracing to date has identified potential sources for zinc and PAHs. A slip-lining project is expected to be completed in 2019 (see Section 5.3) that includes line cleaning. Therefore, sampling will be deferred to 2020. If samples continue to show concentrations below screening levels or if some parameters, such as phthalates, are at ubiquitous levels, the next sampling will occur in 2023. The decision to conduct additional source tracing will be discussed in the County's source control annual report for 2020 activities.

Appendix B describes the types of samples for chemistry analysis and the assessment methodology to determine if any follow-up source tracing actions are needed. These protocols and guidance will direct any future source tracing actions. If Source Control Program business inspections find an area of concern, source tracing samples would be collected.

4.0 KING COUNTY INTERNATIONAL AIRPORT

KCIA is housed within the Department of Executive Services, which operates and maintains the airport, also known as Boeing Field. KCIA is one of the busiest primary non-hub airports in the nation. Located just 5 miles south of downtown Seattle, at 7277 Perimeter Road South, it averages more than 200,000 operations (takeoffs and landings) each year, serving small commercial passenger airlines, cargo carriers, private aircraft owners, helicopters, corporate jets, and military and other aircraft. It is also home to Boeing's 737 aircraft flight-test program and other Boeing operations.

KCIA, which is owned by King County, consists of 615 ac. The majority of this area (435 ac) is impervious surface covered by buildings and paved areas; the remaining 180 ac consist of grass and landscaped areas.

There are approximately 15 miles of stormwater drainage pipe in the KCIA storm drainage system. Four stormwater outfalls discharge into the LDW: one to Slip 4 (Outfall ID #2049), one to former Slip 5 (Outfall ID #2062), one to Slip 6 (Outfall ID #2080); and one to the Norfolk storm drain/CSO (Outfall ID #2095) (Figure 6). Two pump stations lift the water and pump it to two of the outfalls (Slip 4 and former Slip 5) that drain the north and central basins of the airport, respectively. Two gravity lines drain the south central basin to Slip 6 and south basin to Norfolk storm drain/CSO.

Several off-site stormwater sources discharge into the airport drainage system:

- Public stormwater systems discharge stormwater into the drainage system at the airport; these include Airport Way drainages to Slip 4, former Slip 5 and Slip 6 basins, and East Marginal Way drainages to former Slip 5 and Slip 6 basin outfalls.
- Private stormwater systems, such as the Museum of Flight property, Woodland Meadows property, and the International Auto Auction, Inc., property, connect to the airport stormwater system for discharge to the LDW as well; these locations are within the City of Tukwila municipal jurisdiction and all drain to the Slip 6 Basin outfall.

Airport activities are generally divided into airport and tenant activities. Air transportation activities, such as aircraft testing and painting, aircraft maintenance/storage, aircraft fueling, and aircraft de-icing and washing, are primarily performed by the tenants. Because of applicable industrial activities, each of the six larger tenants at the airport has been issued an Industrial Stormwater General Permit (ISGP) administered by Ecology; KCIA tracks their compliance through tenant inspections. Remaining tenants adhere to the requirements of KCIA's ISGP; King County's Phase 1 MS4 Permit; and all applicable local, state, and federal laws required in lease agreements.

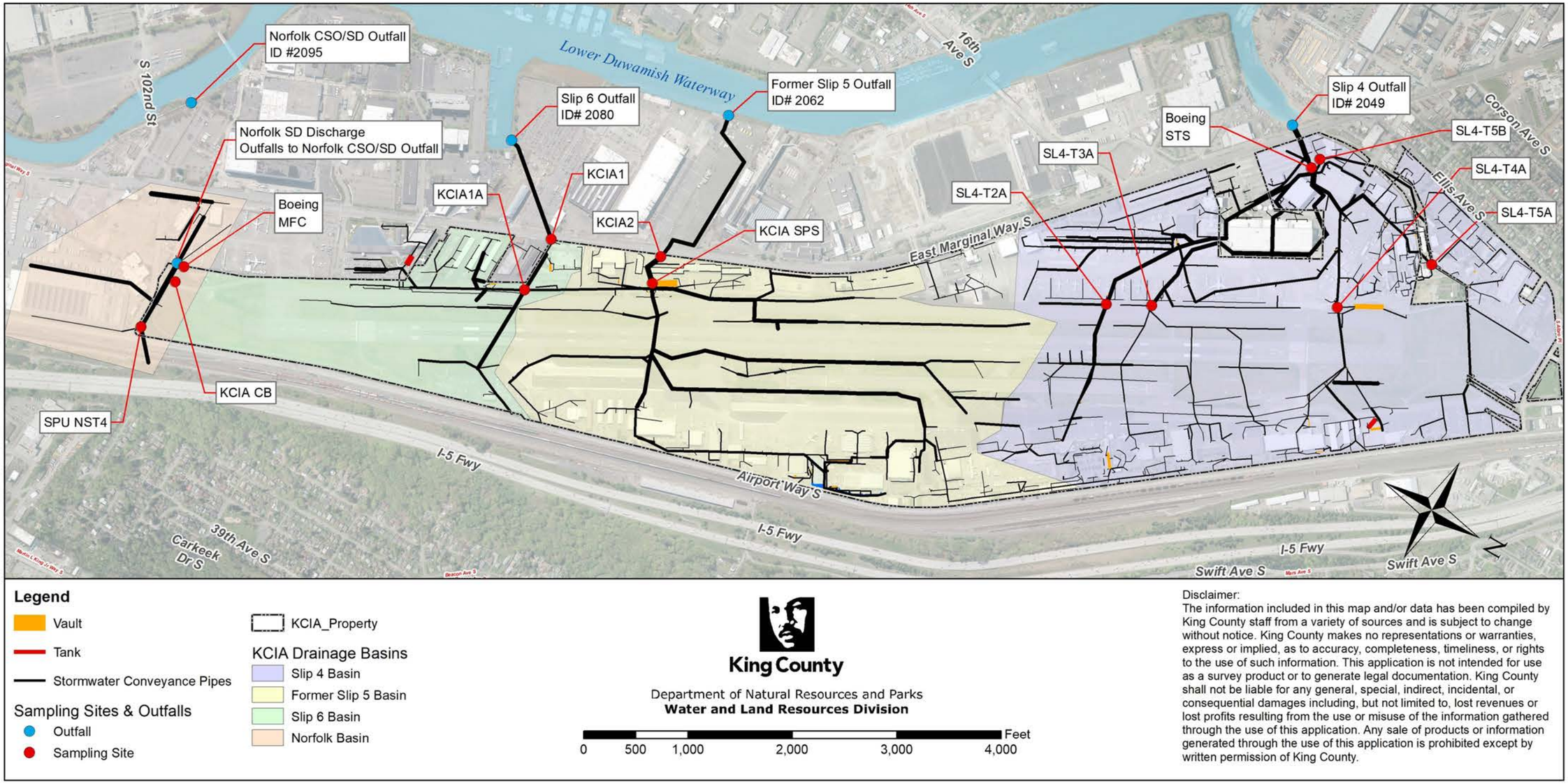

Figure 6. KCIA Stormwater Basins and Source Tracing Sampling Locations

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Airport and tenant activities have the potential to introduce pollutants into the stormwater system, such as fuels, oil, greases, de-icing/anti-icing agents, suspended sediments, and other chemical contaminants. Corrective actions, as indicated by source investigation, are implemented by either KCIA or responsible tenants.

4.1 Ongoing LDW Source Control Actions

KCIA's primary pathway to the LDW is stormwater discharged through its drainage basin outfalls. KCIA complies with stormwater regulations related to Ecology's NPDES permits, which include industrial, municipal, and construction stormwater general permits, and with Ecology's regulations under the toxics cleanup, underground storage tank, and dangerous waste programs:

- **ISGP.** Ecology issued an ISGP for KCIA that covers industrial activities involving airport transportation. Ecology also issued ISGPs for seven KCIA tenants. All other tenants are covered under the KCIA ISGP and must comply with its specific requirements. Regulatory requirements pertaining to the permit include Stormwater Pollution Prevention Plan (SWPPP) development, monthly site inspections, quarterly stormwater monitoring and reporting, corrective actions, and annual reporting. Additional actions include line cleaning.
- **Municipal Stormwater Permit**. As a custodial agency and County property, for those areas not regulated by the ISGP, KCIA adheres to the County's Phase 1 MS4 Permit. The permit regulates the discharges from MS4s owned or operated by King County. WLRD is the lead agency managing permit compliance for the County. Regulatory requirements and associated actions pertaining to the permit include mapping, development standards, structural stormwater controls, source control assessments, IC/IDDE, operation and maintenance, and property maintenance.
- **King County Code.** Development and construction at KCIA are performed in accordance with King County Code, Chapter 9.04, Surface Water Runoff Policy. Small construction projects, such as minor maintenance projects, must also comply with KCIA's ISGP and Phase 1 MS4 Permit requirements. Airport and tenant projects that trigger County grading permits (excavating > 500 cubic feet of material) and state construction stormwater general permits (>1 ac of area) are subject to their requirements. Airport lease agreements require tenants to comply with all federal, state, and local laws. Other requirements include airport policies such as the KCIA Spill Response Policy. For construction projects greater than 1 ac, KCIA and its tenants are also required to apply for coverage under Ecology's Construction Stormwater General Permit, as applicable. The County's Permitting Division also conducts inspections for building, commercial site development, demolition, and grading permits.
- **North Boeing Field/Georgetown Steam Plant Site Model Toxics Control Act (MTCA)** Agreed Order. In accordance with MTCA, Ecology signed Agreed Order DE 5685 with Boeing, KCIA, and the City of Seattle to facilitate remedial action at the North Boeing Field/Georgetown Steam Plant Site. Boeing, KCIA, and the City are

potentially liable parties to the site. Under the Agreed Order, which became effective August 14, 2008, Ecology is conducting a RI/FS and performing interim actions, as needed. KCIA conducts site investigations in support of the RI/FS.

- **Cleanup of Contaminated Sites**. As part of redevelopment activities, KCIA performs site investigations, feasibility studies, and site cleanups in accordance with Ecology's Toxic Cleanup Program and MTCA requirements.
- **Management of Underground Storage Tanks (USTs).** As a term of their leases, KCIA requires tenants to comply with Ecology's UST Program. KCIA maintains a UST inventory operated by the airport and its tenants.
- **Dangerous Waste Disposal and Reporting.** KCIA, as a waste generator, complies with Ecology's Dangerous Waste Regulations and the Resource Conservation and Recovery Act to ensure hazardous wastes are properly disposed of and recorded. KCIA submits annual reports to Ecology that account for hazardous wastes that are disposed of.
- **Hazardous Materials Abatement.** For demolition of building structures at KCIA, hazardous material surveys are performed in accordance with federal, state, and local regulations. The surveys identify hazardous materials that require abatement and proper disposal prior to demolition. Asbestos-related activities are coordinated with the Permitting Division and Puget Sound Clean Air Agency.
- **De-icing and Washing Policy and Facilities**. To maximize stormwater protection, KCIA constructed de-icing and washing pads for aircraft. The pads include oil-water separators before discharge to the sanitary sewer system. An aircraft de-icing and washing policy was established to ensure that tenants and operators are knowledgeable of approved de-icing locations and procedural requirements. KCIA submits reports to KCIW on its deicing and treatment system discharges.
- **Capital Improvement Program.** KCIA has updated its infrastructure to support source control and remediation, including rehabilitating runways and taxiways, refurbishing stormwater pump stations, repairing/replacing damaged stormwater pipes, and updating aging ground vehicles. In addition, the program allows for redevelopment activities such as environmental investigations, hazardous materials abatement, building demolition, feasibility studies, and environmental cleanups.
- **Tenant Outreach and Education.** KCIA participates in outreach activities to educate tenants and operators on how to control discharges of pollutants into the KCIA stormwater system. Some of these activities include spill response and de-icing policy training and maintenance of the KCIA website that informs readers on environmental accomplishments including green roofs, sound insulation, and stormwater protection. KCIA tenants are also reminded of the airport's ongoing compliance with environmental regulations during annual tenant assessments.

Appendix B of the LDW SCIP for 2014–2018 describes ongoing source control activities in more detail. This includes tenant inspections, assessments, and corrective actions; BMP implementation; and reporting.[26]

4.2 Review of Past 5-Year Actions

This section presents a summary of the completed actions listed in the LDW SCIP for 2014–2018.

4.2.1 General Compliance Activities

KCIA continued its compliance activities as described in Section 4.1. The following are the specific actions performed:

- **ISGP.** KCIA continued to adhere to Ecology's requirements under the ISGP. Monthly inspections, quarterly stormwater monitoring, and reporting were performed each year. Annual reports were submitted for 2014 through 2018. Corrective actions were performed in accordance with permit requirements.

  From 2015 to 2017, KCIA performed line cleaning at its stormwater system in accordance with permit requirements. An administrative order was issued by Ecology to conduct line cleaning annually with its catch basin maintenance schedule.
- **Stormwater Line Cleaning and Repairs.** In 2015, KCIA began a 3-year effort to clean its stormwater lines and conduct video inspections. The effort concluded in 2017 with approximately 15 miles of stormwater lines cleaned and video-inspected. The project resulted in removing legacy contaminated stormwater solids from stormwater lines. Catch basins and oil-water separators designed to hold contaminated stormwater solids were also cleaned.

  The video inspections also allowed KCIA to obtain data to compile a list of damaged and disjointed stormwater pipes. The list resulted in the first phase of stormwater pipe repairs in 2018 in accordance with the KCIA Capital Improvement Program.
- **Municipal Stormwater Permit.** As a custodial agency and County property, KCIA conducted annual IC/IDDE inspections that resulted in no obvious illicit discharges from its property. Annual stormwater system facility checks were performed to log depth of sediments in the oil-water separators and to schedule cleanings. Oil-water separators were cleaned in 2017. Annual tenant assessments were performed to update current data, discuss stormwater protection status, and review current airport policies for spill response and deicing activities.
- **King County Code.** Two tenant developments were performed in 2014 to 2018. The developments were permitted through the County's Permitting Division (formally known as the Department of Permitting and Environmental Review). New

[26] More information on KCIA's programs is available at http://www.kingcounty.gov/transportation/kcdot/Airport.aspx.

stormwater treatment and conveyance systems were approved by the Permitting Division for the two sites.

- **North Boeing Field/Georgetown Steam Plant Site MTCA Agreed Order.** From 2014 to 2018, the Agreed Order was in its remedial investigation phase. A remedial investigation report is currently being finalized. KCIA performed the following investigations during this period:
    - 2014 Slip 4 Basin Source Tracing
    - 2016–2017 Washington Army National Guard TCE Investigation
    - 2018 Slip 4 Source Control Plan
- **Cleanup of Contaminated Sites.** Three independent cleanup projects were completed at KCIA between 2013 and 2015. For these cleanups, KCIA notified Ecology of contaminant release, investigation status, and planned remediation activities. The projects were the former Standard Gas Station, former Standard Oil Station, and former Hangar 5 sites. Ecology has conducted Site Hazard Assessments for these sites and all have been ranked as 4, indicating they are lower priority. The following are highlights of the cleanup activities from 2014 to 2018:
    - In 2015, performance monitoring was performed for the Standard Oil and Hangar 5 sites, concluding their cleanup activities. Any follow-up actions for these and other listed sites at KCIA are detailed in the 2018 KCIA Listed Sites Plan.
    - The 2018 KCIA Listed Sites Plan that presents follow up actions for KCIAs current State listed sites was completed. This plan will program activities and budget for the next several years.
    - In 2015, Boeing removed PCB-contaminated soils adjacent to the Boeing Military Delivery Center.
    - Boeing continues to remediate groundwater contamination of chlorinated solvents at its Electrical Manufacturing Facility using enhanced reductive dechlorinization. This is being performed semi-annually.
    - As part of future development of KCIA's Snow Removal Facility and Large Aircraft Parking projects, KCIA performed Phase II environmental site assessments (ESAs) in 2018. Additional investigations and cleanup actions are expected in the next SCIP period.
- **Management of USTs.** KCIA currently maintains its UST and Aboveground Storage Tank inventories, keeping a log of current and decommissioned USTs. In 2018, a new tank system was added to the list. No compliance issues were reported from current tank owners.
- **Dangerous Waste Disposal and Reporting.** During the 2014 to 2018 period, annual reports were submitted to Ecology. No hazardous materials were disposed off-site as part of construction activities.
- **Hazardous Materials Abatement.** A Hazardous Materials Survey for four buildings was conducted in 2017. The survey resulted in the discovery of asbestos and lead. The survey led to the development of cost estimates for future hazardous materials

abatement. Additional work was performed to develop specifications. There are plans to remove these materials during the next SCIP period as part of site development.

- **Deicing and Washing Policy and Facilities.** KCIA's Deicing Policy remained unchanged through the 2014 to 2018 period. KCIA's permit with KCIW is in good standing with no non-compliance issues within the period. Boeing deicing pads at the North Boeing Field lease area were reconfigured in 2017 to discharge to its stormwater system rather than to sanitary sewer. It is expected that stormwater in this area will be incorporated in Boeing's ISGP. An additional deicing stall was developed at Boeing's north entrance in 2018.
- **Capital Improvement Program.** In 2017, KCIA installed a backflow preventer in drainage pipe at the downstream end of the central basin at KCIA's property boundary to the west. The purpose of installing this in-line backflow preventer was to prevent off-site stormwater from entering the KCIA property through KCIA's pipe from the East Marginal Way stormwater drainage system and LDW surface water. KCIA intends to install another backflow preventer at its former Slip 5 outfall (Outfall ID #2062) during 2018 and 2019.

  In 2018, KCIA performed stormwater pipe repairs at the central basin (former Slip 5 outfall). The goal of the effort was to initiate repairs to an aging system and to reduce groundwater intrusion into the drainage system resulting in pipe fouling from anaerobic bacteria.
- **Tenant Outreach and Education.** Annual tenant meetings on snow and deicing activities were performed in the fall of each year to inform tenants of snow removal, deicing, and spill response requirements. ISGP tenant assessments were conducted annually to discuss environmental requirements, tenant stormwater protection status, and any known issues.

4.2.2 Source Tracing Program

KCIA's source tracing program focuses on three major drainage basins in its facility (Slip 4, former Slip 5, and Slip 6) that are governed by several federal, state, and local environmental laws and code requirements. KCIA conducted annual sampling and source tracing in its drainage system during the 2014 to 2018 SCIP period. In-line sediment trap and grab data were collected for each sample location. Trap data were weighed more than grab data in making conclusions for future source control activities. Grab data were used in absence of trap data. The figures in Appendix D present graphical comparisons of a select group of contaminants compared to source control screening levels. The following subsections highlight source tracing results for the 2014 to 2018 period; data are presented in annual source control reports (King County 2016c; 2017b; and 2018b).

4.2.2.1 Slip 4 Basin

To evaluate the potential of recontamination of Slip 4 prior to early action sediment cleanup, stormwater solids sampling was initiated at North Boeing Field and KCIA in 2004 in four lateral lines (North, North Central, South Central and South). The samples at these

locations were initially collected by SPU during this time. The 2008 North Boeing Field/Georgetown Steam Plant Site MTCA Agreed Order resulted from the solids sampling data as well as other information. The data collected were also used for NPDES ISGP obligations. SPU continued sampling until 2011 when Boeing or KCIA started collecting the samples, depending on the location. The following are high-level summaries of the data over the 2014 to 2018 sampling period compared to source tracing screening levels (LAET and 2LAET).

North Boeing Field/Georgetown Steam Plant Site MTCA Activities

KCIA conducted additional source tracing activities in 2014 to focus on the four major laterals discharging to Slip 4. The laterals investigated were up-gradient of the North Boeing Field/Georgetown Steam Plant Site MTCA site. The outcome of this sampling was reported to Ecology in 2016 and incorporated into the North Boeing Field/Georgetown Steam Plant Site MTCA site remedial investigation report. Ecology, the City of Seattle, Boeing, and KCIA continue to finalize a draft remedial investigation report. A feasibility study is to be developed in 2019.

North Lateral

Based on 2014 to 2017 stormwater solids data (SL4-T5B) provided by Boeing at the SL4-T5A/B sample location[27], contaminants above screening levels continue to be observed from KCIA 's north lateral basin. The following is a summary of the data comparisons:

- Zinc was above LAET, but below 2LAET in 3 of 4 years.
- Total PCBs were above LAET, but below 2LAET in 4 of 4 years.
- Phenanthrene was above 2LAET in 3 of 4 years, but showed a decreasing trend.
- Total HPAH was above 2LAET in 3 of 4 years, but showed a decreasing trend.
- BEPH was above 2LAET in 4 of 4 years.
- BBP was above 2LAET in 2 of 4 years.
- DEPH was above LAET, but below 2LAET in 1 of 4 years.
- DMPH was above 2LAET in 1 of 4 years.
- Heavy oil was above MTCA A standards 3 of 4 years.

North Central Lateral

Based on 2014 to 2017 stormwater solids data provided by Boeing at the SL4-T4A sample location[28], contaminants above screening levels continue to be observed from KCIA's north central lateral basin. The following provides a summary of the data comparisons:

- Zinc was above 2LAET in 3 of 4 years.

[27] Starting in 2018, Boeing is no longer sampling this location.
[28] Starting in 2018, Boeing is no longer sampling this location.

- Copper was above 2LAET in 1 of 4 years.
- Lead was above LAET, but below 2LAET in 1 of 4 years.
- Total PCBs were above LAET, but below 2LAET in 4 of 4 years.
- Phenanthrene was above 2LAET in 4 of 4 years.
- Total LPAH was above 2LAET in 1 of 4 years.
- Total HPAH was above 2LAET in 3 of 4 years, but showed a decreasing trend.
- BEPH was above 2LAET in 4 of 4 years.
- BBP was above LAET, but below 2LAET in 1 of 4 years and above 2LAET in 1 of 4 years.
- DEPH was above LAET, but below 2LAET in 1 of 4 years.
- DMPH was above 2LAET in 1 of 4 years.
- DBPH was above LAET, but below 2LAET in 1 of 4 years and above 2LAET in 1 of 4 years.
- DNPH was above 2LAET in 4 of 4 years.
- Heavy oil was above MTCA A standards 1 of 4 years.

South Central Lateral

Based on 2014 to 2018 stormwater solids data collected by KCIA at the SL4-T3A sample location, contaminants above screening levels continue to be observed from KCIA 's south central lateral basin. The following is a summary of the data comparisons:

- Arsenic, copper, lead, mercury, and zinc were below LAET in all 5 years.
- Total PCBs were below the LAET in all 5 years.
- Phenanthrene was above 2LAET in 4 of 5 years.
- Total LPAH was above 2LAET in 1 of 5 years.
- Total HPAH was above 2LAET in 4 of 5 years, but showed a decreasing trend.
- BEPH was above 2LAET in 2 of 5 years.
- BBP was above LAET, but below 2LAET in 1 of 5 years and above 2LAET in 1 of 5 years.

South Lateral

Based on 2014 to 2018 stormwater solids data collected by KCIA at the SL4-T2A sample location, contaminants above screening levels continue to be observed from KCIA's south lateral basin. The following is a summary of the data comparisons:

- Zinc was above 2LAET in 3 of 5 years.
- Mercury was above 2LAET in 1 of 5 years.
- Arsenic was above LAET, but below 2LAET in 1 of 5 years.

- Total PCBs were above LAET, but below 2LAET in 4 of 5 years and above 2LAET in 1 of 5 years.
- Phenanthrene was above 2LAET in 3 of 5 years.
- Total LPAH was above LAET, but below 2LAET in 1 of 5 years.
- Total HPAH was above 2LAET in 3 of 5 years, but showed a decreasing trend.
- BEPH was above LAET, but below 2LAET in 1 of 5 years and above 2LAET in 1 of 5 years.
- Heavy oil was above MTCA A standards 1 of 5 years

4.2.2.2 Former Slip 5 Basin

Stormwater solids sampling at the former Slip 5 basin was initiated in 2008 to collect data for source tracing. The samples in this basin were initially collected by SPU and then by KCIA starting in 2012. KCIA added a second monitoring location in 2012 at the South Pump Station (SPS) to allow characterization of solids above the influence of backflow from the LDW because of tides. Based on 2014 to 2018 stormwater solids data at the KCIA2 sample location, contaminants were not observed leaving KCIA 's former Slip 5 Basin above the LAET screening level. On occasion, some contaminants are observed above the LAET at SPS location. However, because these contaminants were not above the LAET in KCIA2 samples, it appears they remained in the KCIA SPS or Water Quality Vault. Being contained in the vault allows the solids cleaned in the next round of maintenance. Sediment samples collected near the outfall had Washington State SMS's benthic CSL exceedances of PAHs and BEHP and SQS exceedances of PAHs and BBP (AECOM 2012).

4.2.2.3 Slip 6 Basin

Based on 2014 to 2018 stormwater solids data (KCIA1) collected by KCIA at the KCIA1/1A sample location, contaminants above screening levels continue to be observed from KCIA's Slip 6 basin, as follows:

- Zinc was above LAET, but below 2LAET in 3 of 5 years and above 2LAET in 1 of 5 years.
- Total HPAH was above 2LAET in 1 of 5 years.

Based on these data, additional source tracing sampling occurred in 2016 in three lateral lines in this basin. Two of the lateral line samples had PAHs above 2LAET screening levels and zinc just above the LAET screening level. The line cleaning completed in 2017 and other BMPs applied at KCIA may have controlled the PAHs or it is possible that the concentrations above screening levels observed from the 2016 source tracing samples are not leaving the airport drainage system. This is likely attributable to the on-site treatment system that includes a wet vault downstream of the West Lateral sample location and an OWS downstream of all the laterals. The zinc levels were in the range typically observed in LDW stormdrain solids.

As a further source tracing action, KCIA collected stormwater solids samples in 2018 from the east side of Slip 6 basin within KCIA drainage lines just down-gradient of where City of Seattle stormwater enters the KCIA drainage area. The stormwater from the City's system is collected from approximately 113 ac of area east of the airport, conveyed and treated through an oil-water separator within the airport's Slip 6 Basin, and eventually discharged to Slip 6 through the airport's outfall. Stormwater solids data collected from this location showed concentrations of zinc, phenanthrene, LPAHs, and HPAHs above the 2LAET screening level. These data indicate off-site inputs of these contaminants to the KCIA drainage basin. Thus, these stormwater solids are likely contributing to concentrations observed above screening levels at the KCIA1A sampling location (see Section 4.3 for future actions related to these findings).

Sediment samples collected near the outfall had Washington State SMS's benthic CSL exceedances of dimethyl phthalate and benzyl alcohol in one sample (SAIC 2011) and no SQS exceedances in three samples (AECOM 2012). Sediment samples collected farther from the outfall had a benthic CSL exceedance for phenol and SQS exceedances for BEHP and a few PAH compounds (AECOM 2012).

4.2.2.4 Norfolk Basin

Stormwater solids sampling within the Norfolk basin occurred in three locations in 2012 by SPU, Ecology, and EPA. Based on findings of an EPA sample collected in a swale receiving drainage from Boeing's Military Development Center[29], Boeing collected additional data in 2013. These data were an order of magnitude or more above the 2LAET for PCBs and indicated the source was originating from Boeing's Military Development Center and not from KCIA operations. Sediment samples collected near the outfall had Washington State SMS's benthic CSL exceedances of PCBs (AECOM 2012).

In 2015, Boeing remediated contaminated soils in adjacent KCIA property in its Toxic Substances Control Act/MTCA efforts to remove sources of PCBs at its property at Boeing Military Development Center. From 2016 to 2018, Boeing continued to communicate with Ecology to develop an engineering plan for its property in accordance with Ecology Industrial General Permit (NPDES) requirements. The plan includes separating facility stormwater from the KCIA property and constructing a filter system for PCB treatment.

4.2.2.5 Additional Source Control Actions

Slip 4 Source Tracing Plan. In 2018, KCIA developed a Slip 4 Source Control Plan (Hart Crowser 2018a) to assist with planning source control efforts for each of the four laterals (north, north central, south central, and south) in the 2019 to 2023 SCIP period. These plans are discussed in Section 4.3.

KCIA-Listed Sites Plan. In 2018, KCIA developed a State Listed Sites Plan (Hart Crowser 2018b) to assist with planning sampling efforts for seven KCIA sites. The plan developed

[29] This locations was previously called Boeing Military Flight Center.

work plans and cost estimates for these sites. The plan is set to be implemented in the 2019 to 2023 SCIP period.

4.3 Additional Source Control Actions for 2019–2023

KCIA will supplement its ongoing LDW source control efforts and commitments in 2019 to 2023 through annual sampling and source tracing in its drainage system. KCIA intends to continue sampling stormwater solids through collection of in-line-sediment trap samples, in-line solids grabs, and sump samples at three basins: Slip 4, former Slip 5, and Slip 6.

KCIA is not conducting source tracing at Norfolk basin because this part of airport property drains mainly to grassland. No industrial facilities are located in this drainage basin. The source control measure affecting stormwater to Norfolk outfall is the Boeing Military Development Center, which is a separate and adjacent property that Ecology is currently working on with Boeing. Stormwater from this property affected KCIA Norfolk drainages.

The source tracing samples will be used to evaluate (1) the effectiveness of source control activities and BMPs, (2) changes from airport/tenant industrial activities, and (3) pollutant contribution trends. In-line sediment trap monitoring will assist in source tracing, identification, and control activities at the airport. KCIA will work with the appropriate regulatory authorities to resolve any issues resulting from this work.

A prioritization for source control activities is planned based on the weight of evidence outlined in Appendix B. When additional actions are warranted, the following source control activities will be occur:

- Sample up-gradient laterals for parameters exceeding 2LAET.
- Review other data including stormwater data.
- Review status of stormwater maintenance records for compliance with standards.
- Review inspection reports of current year, including illicit discharges and spill response reports.

KCIA may also collect samples from other media including surface debris, soil, and anthropogenic materials such as road material and paint.

Appendix B includes details on the types of samples for chemistry analysis and the methodology to determine if any follow-up source tracing actions are needed.

4.3.1 Slip 4 Basin

North Boeing Field/Georgetown Steam Plant Site MTCA Order Activities

A remedial investigation report is planned to be completed in 2019. A feasibility study will be prepared thereafter.

North Lateral

In 2018, Boeing decided to discontinue future sampling at the SL4-T5B location. There is no data at this sampling location for 2018. KCIA will include this sampling location in its annual stormwater solids monitoring program. A grab sample will be taken at this sampling location or an up-gradient location starting in 2019.

Based on the results from the last period, annual stormwater solids sampling will continue for all parameters/groups. KCIA will plan up-gradient sampling for 2019 for the Priority 1 and 2 parameter groups below.

Priority 1 is:

- PAHs
- Phthalates
- TPH-heavy oil

Priority 2 is:

- Zinc
- Total PCBs

A full SMS list will be sampled in year 2021 to assess conditions still below the levels of concern.

KCIA will review pertinent data including stormwater data, maintenance records, and inspection records for spills and illicit discharges. Based on results of up-gradient sampling, KCIA will perform additional sampling or source removal before the SCIP ends.

North Central Lateral

KCIA will include this sampling location in its annual stormwater solids monitoring program since Boeing has discontinued sampling in 2018. A grab sample will be taken at this or an up-gradient location starting in 2019, assuming sufficient solids are present to collect a sample.

Based on the results from the last period, annual stormwater solids sampling will continue for all parameters/groups. KCIA will plan up-gradient sampling for 2019 for the Priority 1 and 2 parameter groups below.

Priority 1 is:

- Zinc
- PAHs
- Phthalates

Priority 2 is:

- Total PCBs
- Copper

A full SMS list will be sampled in year 2021 to assess conditions still below the levels of concern.

KCIA will review pertinent data including stormwater data, maintenance records, and inspection records for spills and illicit discharges. KCIA will perform additional sampling or source removal before the SCIP period ends.

South Central Lateral

Based on the results from the last period, annual stormwater solids sampling will continue for PAHs and phthalates. KCIA will plan up-gradient sampling for 2019 for the Priority 1 and 2 parameter groups below.

Priority 1 is:

- PAHs
- Mercury

Priority 2 is:

- Phthalates

A full SMS list will be sampled in year 2021 to assess conditions still below the levels of concern.

KCIA will review pertinent data including stormwater data, maintenance records, and inspection records for spills and illicit discharges. KCIA will perform additional sampling or source removal before the SCIP period ends.

South Lateral

Based on the results from the last period, annual stormwater solids sampling will continue for metals, PAHs, phthalates, and PCBs. KCIA will plan up-gradient sampling for 2019 for the Priority 1 and 2 parameter groups below.

Priority 1 is:

- Zinc
- PAHs
- Phthalates

Priority 2 is:

- Total PCBs

A full SMS list will be sampled in year 2021 to assess conditions still below the levels of concern.

KCIA will review pertinent data including stormwater data, maintenance records, and inspection records for spills and illicit discharges. KCIA will perform additional sampling or source removal before the SCIP period ends.

4.3.2 Former Slip 5 Basin

Based on the results from the last period, stormwater solids sampling will continue in 2021 to assess if conditions remain below the levels of concern for this basin. A full SMS list will be sampled at that time.

4.3.3 Slip 6 Basin

Based on the results from the last period, annual stormwater solids sampling will continue for metals and PAHs. A full SMS list will be sampled in year 2021 to assess conditions still below the levels of concern.

To further investigate off-site inputs, KCIA plans to sample solids in 2019 within KCIA drainage on the east side of the basin near where off-site inputs enter the KCIA lines. Samples will be analyzed for metals and PAHs as well as the priority 2 parameter group: phthalates. In addition, KCIA plans to work with the City of Seattle regarding off-site inputs entering the KCIA Slip 6 drainage basin; this may include stormwater solids sampling from the City's drainage lines.

KCIA will review pertinent data including stormwater data, maintenance records, and inspection records for spills and illicit discharges. KCIA will perform additional sampling or source removal before the SCIP period ends.

4.3.4 Norfolk Basin

In 2015, Boeing remediated contaminated soils in adjacent KCIA property in its Toxic Substances Control Act/MTCA efforts to remove sources of PCBs at its property at Boeing Military Development Center. From 2016 to 2018, Boeing continued to communicate with Ecology to develop an engineering plan for its property in accordance with Ecology Industrial General Permit (NPDES) requirements. The plan includes separating facility stormwater from the KCIA property and constructing a filter system for PCB treatment.

5.0 ROADS SERVICES DIVISION

RSD, housed within the Department of Local Services, designs, builds, operates, and maintains roads, bridges, and other features in the ROW in unincorporated areas of King County, including part of the LDW drainage basin. The RSD service area, which, including roadways and bridges with stormwater drainage directly to LDW, composes about 5.3 percent of the overall LDW drainage basin area.

5.1 Ongoing LDW Source Control Actions

RSD is responsible for the operation and maintenance of the County's MS4 system located in King County's ROW. These actions include sweeping streets, vactoring drainage systems, and other standard maintenance activities. They also include repairing and cleaning stormwater flow control and water quality treatment facilities, catch basins, and conveyance systems (pipes and ditches). Under King County's Phase 1 MS4 Permit, RSD performs annual inspection of the catch basins within the LDW drainage basin as well as clean catch basins that have accumulated sediment that is more than 50 percent of the sump depth. These efforts help prevent sediments and associated contaminants, such as petroleum hydrocarbons, PAHs, and metals, from entering local waterways.

Other relevant RSD programs are as follows:

- **Regional Road Maintenance Endangered Species Act Program.** King County is part of a consortium of 36 agencies throughout Washington state that implement the Regional Road Maintenance Endangered Species Act Program Guidelines. This program specifically defines routine road maintenance activities and includes 10 program elements, including BMP's designed to minimize the impacts of road maintenance activities on the associated environment. Staff are trained to properly implement erosion and sediment control products and practices along with following regulatory requirements when completing road maintenance work. BMPs can include both physical and managerial practices. Physical BMPs within a highly urbanized watershed can include, but are not limited to, sweeping streets and vactoring drainage systems, which, in turn, will reduce sediment and other pollutants such as heavy metals from entering the waterway. A biological review of the program concluded that the identified routine road maintenance activities conducted throughout Washington state under the Regional Road Maintenance Program will not impair properly functioning habitat, nor appreciably reduce the functioning of already impaired habitat, nor retard the long-term progress of impaired habitat toward properly functioning conditions. By issuing a 4(d) approval, NOAA Fisheries concluded that implementation of the Regional Road Maintenance Program guideline will adequately conserve the listed species.[30]

[30] More information is available at http://www.kingcounty.gov/depts/transportation/roads/endangered-species-act-reports.aspx and http://www.wsdot.wa.gov/Maintenance/Roadside/esa.

- Snow and Ice Response Program. This program applies sand, salt, and anti-icer to roads in unincorporated King County during inclement weather. Improved traction reduces the likelihood and severity of vehicle accidents, which, in turn, limits and minimizes spills of automotive fluids. The sand is recovered through sweeping and catch basin cleaning to reduce the amount of sediment transported downstream to receiving water bodies.
- Routine Road Maintenance. The Maintenance Section of RSD maintains road ROW and associated stormwater conveyance systems throughout unincorporated King County. This comprises 50.5 miles of roadway and 50 miles of linear distance of MS4 ditches and pipes in the LDW source area. Activities include cleanup of automotive fluid spills, removal of illegally dumped solid waste, removal of landslide material, snow and ice response, stabilization of eroding soils, street sweeping, removal of litter, shoulder grading, removal of creosote-treated timbers, and removal of sediment from catch basins, pipes, ditches, and stormwater ponds. Problems with contamination and recontamination are referred to WLRD for assistance in identifying and eliminating the source.[31]

5.2 Review of Past 5-Year Actions

RSD conducted catch basin inspection and cleaning per the County's Phase 1 MS4 Permit as well as additional catch basin cleaning in support of source tracing activities conducted by SWS. Over the reporting period from 2014 to 2017, following catch basin inspections, 143 catch basins were cleaned or underwent sediment removal by a vacuum truck. An additional 41 basins were cleaned through maintenance service requests. In addition, additional maintenance activities such as sweeping streets, vactoring drainage systems, patching potholes, and vegetation management activities were performed along the South 96th Street corridor.

5.3 Additional Source Control Actions for 2019–2023

RSD will conduct additional maintenance in support of source control activities in King County's ROW in unincorporated areas of the LDW drainage basin. In addition, two projects have been identified to line clean segments of drainage pipe before slip lining the pipes along the South 96th Street Corridor:

- North side of the South 96th Street Corridor between 4th Avenue South and 8th Avenue South

[31] More information on RSD activities is available at http://www.kingcounty.gov/transportation/kcdot/Roads.aspx.

- South side of the South 96th Street Corridor between 8th Avenue South and 10th Avenue South

To the extent that grant funding is available, RDS intends to address legacy loads by cleaning stormwater lines in the County's ROW in unincorporated areas of the LDW drainage basin. Because legacy contaminants may adhere to the stormwater lines, cleaning the lines may prove to be effective in helping prevent pollutants from entering the LDW. Line cleaning would be done in conjunction with WLRD's source tracing and elimination program to ensure removal of contaminated solids in the conveyance system after a source has been identified and controlled. RSD has faced significant funding challenges in recent years, and, therefore, the line cleaning is contingent upon obtaining other funds for this work.

RSD also intends to initiate additional sampling in the ROW in the LDW drainage area when excavating soil for a project. The sidewalls and soils below the excavation depth will be sampled for general characterization. If the County becomes aware of additional soil contamination in the ROW during the course of construction, normal maintenance, or other activities in the ROW, the County will continue to comply with MTCA reporting requirements. The County will also continue to appropriately manage and dispose of any contamination disturbed during construction or maintenance activities.

6.0 FACILITIES MANAGEMENT DIVISION

FMD operates and manages the County's General Fund capital assets by developing and maintaining cost-conscious, sustainable, high-quality facilities and environments. FMD ensures that developed and vacant sites with stormwater facilities are inspected annually for stormwater and water quality compliance.

6.1 Ongoing LDW Source Control Actions

FMD is the custodial agent for seven parcels (comprising nine individual tax lots) located along the LDW, referred to as the "Harbor Bond Triangle properties," and for five developed parcels and 152 vacant parcels in the basins that drain to the LDW (Figure 7). Appendix E lists these parcels (as of September 2018). The following information is included in the appendix for each parcel: parcel identification number, description, acreage, current tenant, SWPPP requirement, sewer service, inclusion on the Confirmed & Suspected Contaminated Sites (CSCS) list, and most recent King County inspection dates. The Harbor Bond Triangle properties have been leased to a variety of tenants for almost a century for industrial and commercial purposes that benefit from both rail and water access. A number of programs, permits, and activities serve to reduce the possibility of recontamination from these parcels.

If the County becomes aware of soil, groundwater, or surface water contamination on County-owned property during the course of construction, normal maintenance, or other activities on the property, the County will continue to comply with MTCA reporting requirements. The County will also continue to appropriately manage and dispose of any contamination disturbed during construction or maintenance activities. FMD properties in the LDW area are described below.[32]

6.1.1 Harbor Bond Triangle Properties

The Harbor Bond Triangle properties occupy the right bank of the LDW from river mile 1.0 to 1.4.[33] These parcels include most of the underwater portion of Slip 1 and extend south to include the current operations of lessees Manson Construction Company (Manson), Cadman Aggregate and Ready-Mix (Cadman), United Western Supply, J.A. Jack & Sons, Inc., and Ardagh (formerly Saint-Gobain Containers). FMD contracts with WLRD to perform water quality compliance inspections at these properties every 5 years in accordance with the County's Phase 1 MS4 Permit. Inspections ensure the stormwater collection systems are maintained and operated according to approved designs and stormwater pollution prevention plans. Inspections also confirm that water quality BMPs are in place.

[32] More information on FMD's programs is available at http://www.kingcounty.gov/operations/FacilitiesManagement.aspx.
[33] River Mile 0.0 is at the southern tip of Harbor Island.

As the custodial agent for King County, FMD administers leases with tenants of these properties and ensures the leases, as they are renewed, contain specific and comprehensive language requiring conformance with the most current applicable environmental regulations, including those for stormwater.

The business operations, stormwater management systems, and regulatory permits vary considerably:

- Manson leases the Slip 1 parcel and the ground and dock area to the south for storage and repair of marine construction vessels, equipment, and supplies. Stormwater from the ground lease area is captured and directed to an on-site infiltration system with no direct discharge to the LDW. The company holds an industrial discharge permit for limited discharges to the sanitary sewer. Ecology has determined that Manson is not required to operate under an ISGP.
- Cadman imports, stores, and sells cement and aggregate, and also operates a large ready-mix batch plant. Stormwater is directed to an on-site cistern where it is stored for later use in the ready-mix product. Although there is a discharge pipe to the LDW, the company has not reported a discharge for several years on their quarterly discharge reports to Ecology. The cistern has been sized, according to company reports, for the 100-year storm event. The company operates under a Sand and Gravel General Permit administered by Ecology. It also holds an industrial waste discharge permit for limited discharges of process water to the sanitary sewer.
- United Western Supply operates a large warehouse and trans-shipment business. Most materials are stored indoors with very limited outdoor storage and off-loading from rail cars. No storm drains serve the property, which is mostly roofed, and discharges infiltrate and are not treated. Ecology does not require an ISGP.
- J.A. Jack & Sons, Inc., imports limestone spall and processes and sells industrial and agricultural limestone in bags and bulk. The facility treats stormwater with an oil-water separator and stores stormwater in a vault for infiltration. Any overflow that formerly entered the LDW at Outfall 2007 has now been rerouted to discharge from Outfall 2010. J.A. Jack & Sons operates under a Sand and Gravel General Permit.
- Ardagh operates a large facility along the LDW. Stormwater runoff from the County-owned property is restricted to large warehouse roof areas (one storm outfall) and mixed-roof and paved areas for vehicular traffic (three separate outfalls). No stormwater exposed to industrial processes discharges from the property. The entire facility operates under an Ecology-administered ISGP. Although outfall 2011 is located on this site, it conveys no runoff that originates from this parcel.

6.1.2 Other Properties

The County manages five other developed parcels in the LDW source control area:

- The Orcas Street fleet maintenance facility contains paved parking for approximately 110 vehicles and a large warehouse structure enclosing all vehicle maintenance functions.
- The Barclay Dean facility on Seventh Avenue South houses County Sheriff's offices, indoor storage, and paved parking for about 20 vehicles.
- The Records and Elections Warehouse on East Fir Street includes three warehouse buildings and paved parking for about three dozen vehicles.
- The Youth Services Center (YSC) is a major facility occupying two tax parcels on 12th Avenue South occupying more than four city blocks and includes courtrooms, offices, a major youth detention facility, and paved parking for more than 400 vehicles.

These developed parcels are inspected annually under contract with WLRD for stormwater facility compliance and every 5 years for water quality compliance.

The remaining 152 parcels are scattered throughout the rest of the area (see Appendix E). Most are small vacant parcels that have come to the County as a result of their owners' failure to pay property taxes ("tax title" properties) or as a result of open space dedications through formal platting processes. These parcels have recently been folded into WLRD's stormwater inspection program:

- If constructed drainage facilties are discovered on a property, the parcel becomes part of the annual inspection and compliance program.
- If no drainage improvements are found, the parcel is inspected for potential sources of water pollution (typically illegal dumping of polluting wastes). The water quality inspection occurs on a 5-year rotation. Discovered drainage deficiencies or polluting situations are corrected by Roads Maintenance crews, private contractors, or the Solid Waste Community Litter Program.
- The 114 parcels that are less than a tenth of an acre are managed on a complaint-only basis.

6.1.3 Properties on Confirmed and Suspected Contaminated Sites List

A comparison of the complete list of current FMD properties in the LDW drainage basins was compared to Ecology's list of CSCS list. Only three of the FMD sites in the LDW are on Ecology's CSCS list; of these:

- The Orcas Fleet Maintenance Warehouse, located at 5815 Padilla Place South, is occupied by King County Fleet Administration. Vehicles are repaired inside a large warehouse structure. The remainder of the parcel is paved. During preparations in 2013 to repave the south parking area and upgrade the stormwater system, subsurface contamination was discovered below the existing asphalt. Extensive testing done before construction disclosed the presence, in limited areas, of lead and

mercury in fill soil in concentrations that exceeded MTCA Method A cleanup levels. During construction, the site was carefully managed to contain any contaminants. Any contaminated soils found during construction were excavated to native soils. Approximately 1,300 tons of soil were removed and disposed of at the Roosevelt Regional Landfill in Klickitat County. All excavated areas were repaved. Subsequent tests indicated minor amounts of oil, lead, mercury, and cPAHs in isolated areas. The site remains on the state's CSCS list with a risk score of 5, the lowest priority score. No further action is planned by FMD at this time.

- The second site is the southernmost parcel of the Harbor Bond Triangle Properties; however, the listing of this County property on the CSCS list is in error. The site is ranked as a 4 on the Washington Ranking Model (1 through 5, with 5 the lowest risk), and the status of the site is "Cleanup Started." Ardagh Ltd. currently leases the site. Ecology records, filed under a previous lessee (Ball Incon), indicate the discovery in 1989 of a UST that was leaking petroleum products. Further research into historical documents produced by Ball Incon and St. Gobain Containers, a lessee of this property after Ball Incon and before Ardagh, indicates that nine USTs were remediated in 1989. Several of them were leaking. Five USTs were removed and four were filled in place. A large quantity of contaminated soils was removed from the site and disposed of appropriately. Importantly, Figure 2 in a 1995 Phase I Environmental Assessment prepared for Ball Incon shows that none of the nine tanks was located on the County parcel. Rather, they were located on the parcel east of Ohio Avenue SE, which is owned and operated by various glass manufacturing companies.
- The third site, YSC, is located on 12th Avenue in Seattle. The YSC occupies two parcels on four city blocks and includes courtrooms, offices, a major youth detention facility, and paved parking for more than 400 vehicles. The site was reported to Ecology in 2010 as part of a perchloroethylene plume discovered near 12th Avenue and East Alder Street. The source has been preliminarily identified as a former dry cleaning facility off-site from the County parcel. This site has been remediated and given a No Further Action determination by Ecology after verification by Ecology staff.
- A second reporting for this facility, in 2012, concerned the discovery of a hydraulic fluid leak in an elevator shaft in the central part of the building footprint. Hydraulic fluid may have been released to the soil underneath the building.

  The County is in the process of implementing a complete replacement of this facility; the project, which is currently under construction, conforms with Seattle's GSI techniques. These techniques manage stormwater runoff from the new facility that discharges to the combined sewer system. In addition, a Contaminated Soil Handling and Management Plan was adopted for this site in 2016. Any perchloroethylene-contaminated soil or groundwater removed for construction will be disposed of according to current MTCA standards. Similarly, any soils contaminated with hydraulic fluid or other pollutants removed for construction will be disposed of in compliance with MTCA standards. The project is scheduled for completion and occupancy in 2020.

6.2 Review of Past 5-Year Actions

6.2.1 Harbor Bond Triangle Properties

With WLRD's help, FMD participated in an expanded program of source control sampling in catch basins upstream of the outfalls on the Harbor Bond Triangle properties relying on a coordinated effort with the current tenants on those parcels to obtain and analyze the samples. Inspection and maintenance activities during the 2014 to 2018 period include:

- Manson: Inspections and resultant cleaning of four catch basins over the reporting period.
- Cadman: Repair and/or cleaning of 13 CBs or control structures, two conveyance lines, the storage cistern, and the treatment vault (in response to corrections notices over the reporting period).
- Ardagh: An extensive sampling program performed on this parcel in 2016 yielded no areas of concern. Independently, Ardagh Glass conducted a round of catch basin sediment sampling on September 22, 2016, pursuant to their renewed ISGP. In addition to the three locations sampled by King County, Ardagh Glass also sampled a catch basin upstream of the outfall 2008, a catch basin sampled by the County, and also combined samples from two catch basins that are a tributary to outfall 2011. Results of this sampling effort can be found in Ecology's PARIS database. Maintenance activities since 2014 have consisted of a redesign, installation, and/or replacement of catch basins and associated conveyance and repair and/or cleaning of seven catch basins.

6.2.2 Other Properties

Below is a summary of source control actions taken at the five other developed parcels managed by the County in the LDW source control area:

- Orcas: Catch basin cleanings as identified during inspections.
- Barclay Dean: SPU testing in 2014 revealed elevated PAH levels in both catch basins on this site. WLRD determined from additional inspection and sampling that the source was most likely an aging layer of asphalt sealant covering portions of the parking area. In 2015, contractors removed the sealant and repaved with new asphalt. An April 2017 inspection determined that both catch basins needed sediment removal; this work was performed in October 2017. Tests performed by a City of Seattle contractor before that cleaning identified somewhat elevated levels of PAHs in sediments in the north catch basin. Subsequent testing after the October cleaning was inconclusive because of insufficient sediment in the structures owing to the lack of precipitation that might have conveyed additional pollutants to the structures. King County and the City of Seattle will continue to monitor this location in 2018.

- Records and Elections Warehouse: Only minor catch basin vactoring and re-stenciling were required at this site since 2014.
- YSC: This parcel was under construction in 2018 and the stormwater system is being updated.

6.2.3 Tax Titles and Other Vacant Parcels

Although 2018 inspections are still underway at the time of this writing, water quality inspections have so far been conducted on a total of 29 parcels (including Duwamish Waterway Park and Comet Lodge Cemetery) during the reporting period. One parcel was cleared of debris that had a potential to impact water quality; one catch basin has required occasional cleaning.

6.3 Additional Source Control Actions for 2019–2023

In addition to ongoing implementation of existing inspection and maintenance activities, the only currently proposed outstanding future action is additional cleanup and possible source control at Barclay Dean if future testing indicates a need.

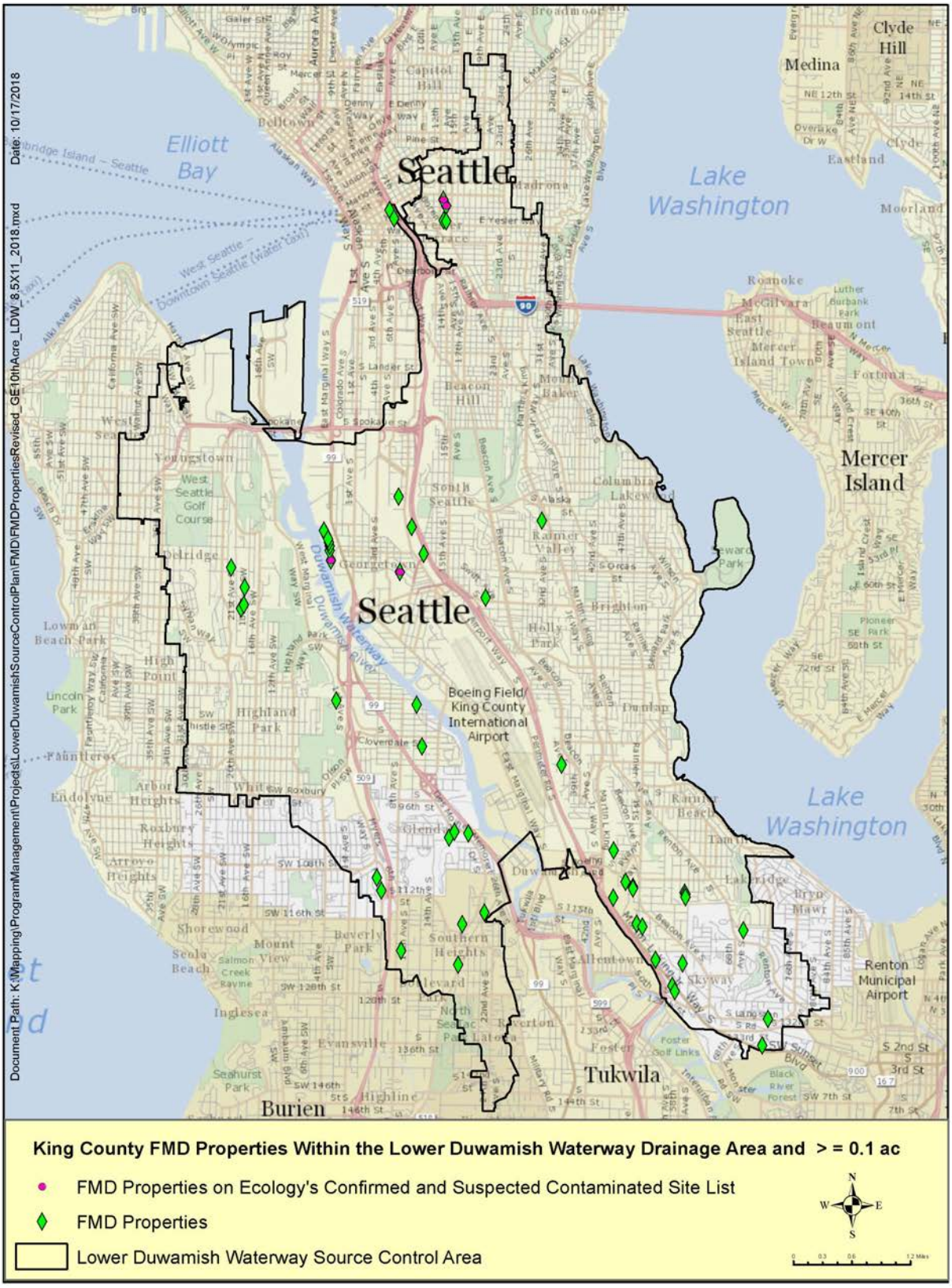

Figure 7. King County FMD Properties in the LDW Drainage Area

7.0 ENVIRONMENTAL HEALTH SERVICES DIVISION

The Environmental Health Services Division is part of Public Health. The mission of Public Health is to identify and promote the conditions under which all people can live in healthy communities and achieve optimum health.

7.1 Ongoing LDW Source Control Actions

Public Health's Environmental Health Services Division supports efforts to control point sources that can potentially contribute to sediment contamination load in the LDW. This is accomplished through regulatory and oversight activities that do the following:

- Minimize potential human and environmental exposures to sewage and chemicals released from properties that have on-site sewage systems (OSSs) in the LDW drainage basin. There are 1,413 properties with known OSSs in the basin.
- Administer and enforce state and local regulations governing the safe handling of solid waste. There are 12 permitted solid waste facilities and 42 solid waste facilities exempt from permits that discharge into the LDW drainage basin.[34] For the 12 permitted solid waste facilities, Public Health conducts inspections and provides regulatory oversight to ensure compliance with state and local environmental regulations, and prepares inspection reports based on a checklist for each type of solid waste facility: Moderate Risk Waste facilities; Solid Waste Storage Piles; or Transfer Stations, Material Recovery Facilities, and Exempt Material Recovery Facilities.
- Continue other regulatory activities related to the release of wastes from plumbing structures, food facilities, and water recreation facilities into public sanitary sewer systems.
- Help prevent pollutants from entering the LDW through non-regulatory activities such as educational and outreach programs and materials.[35]

7.2 Review of Past 5-Year Actions

The Solid Waste Program within Public Health's Environmental Health Services Division continues to increase permit compliance in the LDW through inspection efficiency of solid waste permitting activities. Twelve facilities are inspected at least twice a year and as much as monthly depending on the complexity of the solid waste handling at the facilities. Public Health's Solid Waste Program attends community meetings in South Park and

[34] Information on the number of solid waste facilities is current as of August 2015.
[35] More information on Public Health's programs is available at http://www.kingcounty.gov/healthservices/health.aspx.

Georgetown upon request to address community concerns of facilities and drive improvements, when possible, through the inspections.

OSS staff worked to identify systems that exist but were previously unknown in the LDW, and have identified 1,413 parcels that are served by OSS in the basin. They have permitted 14 new or replacement OSSs and overseen repairs to 33 over the last 5 years. Three OSSs were abandoned and connected to the sewer.

8.0 PERMITTING DIVISION

The Permitting Division[36] within the Department of Local Services is the permitting agency for unincorporated King County and KCIA, with the exception of ROW construction and special use permits administered by the Department of Executive Services. The Permitting Division provides the following two primary services aimed at controlling the release of contaminants from development sites: (1) reviews and issues development and use permits and (2) inspects projects for compliance with plans and conditions of permit approval. The types of projects that could potentially introduce or mobilize hazardous substances include those that involve filling, excavation, construction of new structures, reconstruction or expansion of existing structures, demolition, and tank installation or removal. Projects can range from construction of a deck for an existing single-family residence to construction of a 40,000-sq-ft hangar at KCIA.

8.1 Ongoing LDW Source Control Actions

Permitting Division and King County Code policies and requirements are applied uniformly throughout unincorporated King County and KCIA. Compliance with the State Environmental Policy Act, the 2009 King County Surface Water Design Manual (KCSWDM), and the County's Phase 1 MS4 Permit are the primary permitting tools the Permitting Division uses to control the release of contaminants from development sites in the LDW drainage area.

Development at KCIA is regulated under the KCSWDM in a manner similar to other areas under King County jurisdiction. Developments that create new or altered impervious surfaces of over 2,000 sq ft are subject to the KCSWDM and undergo drainage review and inspection to ensure compliance with the KCSWDM and the Phase 1 MS4 Permit.

The process recognizes a few KCIA distinctions, including the following:

- KCIA has its own Surface Water Management Plan and Program, NPDES permit, and facilities. KCIA routinely inspects and maintains facilities and monitors their discharges.
- KCIA has a Spill Prevention and Response Plan.

The Permitting Division coordinates site development permit reviews with KCIA and individual tenant projects to ensure both regulatory and operational compliance with the KCSWDM and with KCIA's source control implementation measures.

Between the early 1980s and 2011, the Permitting Division (formally called Department of Permitting and Environmental Review) processed permits for approximately 700 projects in the LDW Superfund site drainage area that had the potential to introduce or mobilize

[36] The Permitting Division was formally called Department of Permitting and Environmental Review in the County's LDW SCIP 2014–2018.

hazardous substances. In the past 3 years, permitting activity in this area has averaged about 15 projects per year. About one-third of these projects were located at KCIA and the balance was generally evenly split between small residential and small-to-moderate commercial/industrial projects located in the unincorporated areas in the LDW drainage area. Permitting services in this area are expected to drop significantly over the next 5 years because of city annexations. Once all unincorporated areas are annexed, permitting activity by County Permitting Division in the LDW drainage area will be limited to redevelopment projects at KCIA.

8.1.1 Permit Review

The Permitting Division receives applications for development permits and reviews all required stormwater site plans for projects that meet the thresholds in the NPDES permit. In addition, implementation of temporary erosion and sediment control BMPs is required for all site development that is below the thresholds for drainage review. The review process includes assessing the site for elements such as erosion hazard critical areas and proximity to steep slopes, creeks, and wetlands, and assessing the project for temporary erosion and sediment control elements. Project plans are reviewed for compliance with the relevant provisions of the KCSWDM, the site development and soil retention standards in King County Code Title 16, the critical area standards in King County Code Title 21A, and other relevant regulations.

For redevelopment of sites that are suspected of containing hazardous materials or other contaminants, the Permitting Division requires that a baseline ESA be prepared to document the presence and levels of potential contamination. In cases where hazardous materials or other contaminants are found, the applicant is required to prepare a remedial action plan to demonstrate how Ecology and MTCA cleanup standards will be achieved and how the contaminants will be controlled and kept from mobilizing during cleanup. The remedial action plans generally require the following:

- Soils/geotechnical report describing contaminants, groundwater, areas of cleanup, depths, and other relevant information
- Defined work area – temporary erosion and sediment control, isolation, fencing, construction ingress/egress, traffic control, stockpile area, and containment
- Cleanup procedures including excavation, groundwater extraction, disposal sites, soils testing, handling, and safety
- Site restoration – clean soils, compaction reports, surface restoration

This plan is incorporated into the approved permit along with any required mitigation and/or special inspections and the plans and conditions implementing the stormwater management and temporary erosion and sediment control measures required by KCSWDM and the Phase 1 MS4 Permit.

8.1.2 Permit Inspection

For larger developments requiring permanent stormwater facilities and/or site remediation because of the presence of hazardous materials or other contaminants, the Permitting Division's site inspection program is responsible for ensuring that applicants adhere to approved development plans and conditions of permit approval. Inspection staff conduct three primary source control (erosion and sediment control) inspection activities:

- Discuss erosion control measures and documentation required at a pre-construction meeting with the applicant and contractors
- Inspect the installed erosion control facilities at the start of construction, communicate any noted deficiencies to the applicant, and conduct follow-up inspections if necessary
- Inspect the site at end of construction to ensure that site stabilization and permanent drainage facilities are completed and in operation

Inspection staff also conduct erosion control facility checks when doing normal construction inspection site visits and immediately after severe weather events. If at any time the erosion control facilities are determined to be inadequate or in need of repair, the inspector will take appropriate notification and/or permit enforcement actions. For sites with an approved remedial action plan, special provisions in the permit ensure that contaminants are fully contained on-site and that all contaminated materials removed from the site are properly disposed of. These provisions are tailored to the site and are an added responsibility of the developer. Provisions typically include water quality monitoring during excavation work, contingency planning, and full-time supervision by qualified environmental monitors.

Depending on the extent of contamination, daily monitoring reports of all on- and off-site activities associated with the cleanup activities may also be required. Permitting Division inspection staff review these reports weekly and at project completion to ensure compliance with the remedial action plan. Follow-up inspections are performed, as necessary, to ensure that any required corrective actions are completed and maintained. Documentation related to the inspections and corrective actions are recorded in the Permitting Division's permit tracking system (ACCELA).

For small projects reviewed under the Small Project Manual (Appendix C of the KCSWDM) (limited to single-family residential and agricultural projects), the Permitting Division building inspectors inspect the site for compliance with erosion and sediment control measures in conjunction with their other scheduled inspections and input the documentation to ACCELA.

8.1.3 Reporting

For all development proposals in unincorporated King County that are subject to drainage review under the KCSWDM, the Phase 1 MS4 Permit requires that the Permitting Division track certain aspects of its development permitting program and report on this information

annually. In 2009, the Permitting Division revised its review procedures and processes to accommodate this reporting requirement. The annual report includes the following information:

- Number of stormwater site plans that were reviewed
- Number of development sites that were inspected before construction
- Number of development sites that have a high potential for sediment transport
- Number of development sites that were inspected to verify proper installation and maintenance of erosion control facilities
- Number of development sites that were inspected before final approval or occupancy to verify proper installation of permanent stormwater facilities
- Number of enforcement actions taken for non-compliance with approved stormwater plans

ACCELA is not able to identify sites with approved remedial action plans.

8.2 Review of Past 5-Year Actions

The Permitting Division provides two primary services for unincorporated King County and KCIA that are directly aimed at controlling the release of contaminants from development sites. The Permitting Division reviews and issues development and use permits and inspects the permits for compliance with plans and conditions of permit approval. Table 9 shows the number of permits and final construction approvals in 2014 to 2017 for projects that could potentially introduce or mobilize contaminants. The County's source control annual reports contain more details on these projects.

Table 9. Permitting Division Activity During 2014–2017

Construction Type	Number of Permits Approved	Number of Final Construction Approvals
Residential	**22**	**14**
Business/Commercial	**3**	**2**
Industrial – KCIA	**4**	**2**
Industrial – Other	**1**	**2**
Total	**30**	**20**

Note: The data for 2018 were not available during the drafting of this plan; they will be reported in the annual report for 2018 activities.

Projects approved in 2017 were as follows:

- Residential. Three tank removal projects, eight new single-family residences, nine additions, one demolition project, and one retaining wall project.
- Business/commercial. One demolition project, one condominium addition, and one school addition.
- Industrial development outside of KCIA. One manufacturing building permit.

- Redevelopment at KCIA. Two building additions, one demolition project, and one site grading project.

Final construction was completed for six of the permits approved in 2017. Fourteen projects achieving final construction in 2017 were approved prior to 2017.

9.0 SOLID WASTE DIVISION

King County's SWD provides solid waste transfer and disposal and recycling services for residents and businesses in King County, except for those in the cities of Seattle and Milton.

SWD activities in the LDW drainage basin have involved the work of the King County Brownfields Program. The Brownfields Program is no longer in operation; therefore, SWD no longer has an active role in the County's plan. A summary of the Brownfields Program, including activities during the 2014 to 2018 plan period, is provided below.

The Brownfields Program provided technical and financial assistance to qualified private individuals and businesses, nonprofit organizations, and municipalities in King County to assess and clean up contaminated sites, called brownfields. The program was funded with grants from EPA to conduct ESAs on properties with confirmed or suspected contamination.

Between 1998 and 2017, the Brownfields Program conducted 12 Phase I and 27 Phase II ESAs, many of which resulted in successful cleanup and redevelopment projects countywide, including the development of affordable housing. Between 2008 and 2017, one project in the LDW drainage basin received extensive assistance from the Brownfields Program and EPA. The site, located in the Georgetown neighborhood of the City of Seattle, was formerly a gas station. Seattle-based artist collective SuttonBeresCuller formed a 501(c)(3) nonprofit organization to purchase the property, which they did in 2013 with the aim of transforming it into a pocket park and arts-oriented community center called the Mini Mart City Park. Contaminants analyzed by the ESA site included gasoline (TPH-G), diesel (TPH-D), heavy oil (TPH-O), and BETX compounds (benzene, ethylbenzene, toluene, xylene); the Mini Mart City Park building will include a vapor barrier and mitigation/treatment system to address confirmed soil and groundwater contamination.

10.0 REPORTING AND CONTINUING COORDINATION

Achievements in source control have been, and continue to be, the result of collaboration among King County divisions, the City of Seattle, Ecology, and other agencies involved in the LDWG and the LDW SCWG. This section summarizes the types of reporting the County will use for its source control related actions and the development of the next 5-year plan. In addition, a summary of external and internal LDW source control coordination the County will continue during 2019 to 2023 is presented.

10.1 Reporting

In addition to established reporting requirements through permits, agreements, or other mechanisms between Ecology and King County, the County will submit the following reports to Ecology:

- Ongoing progress reports on the County's implementation of planned source control actions in 2019 to 2023 will be submitted through Ecology's annual LDW Source Control Status Report. [37]
- Annual reports will document the previous year's collected data and activities. For those programs already with reporting requirements under another authority, the previous year is defined as that reporting period ending in the previous calendar year. Therefore, reporting periods will vary in the annual report.

The County divisions responsible for implementing additional source control actions will summarize overall findings and outcomes in the next 5-year plan. County annual reports and SCIPs will be made available to the public through the County's Duwamish Waterway source control website.[38]

10.2 External Coordination

Over the next 5 years and beyond, the County intends to continue to collaborate with regional partners and governmental agencies. Examples of existing efforts anticipated to continue are as follows:

- Conducting joint inspections, referrals, and investigations with the City of Seattle, Ecology, and EPA

[37] Ecology's annual Source Control Status Reports are available at https://fortress.wa.gov/ecy/gsp/CleanupSiteDocuments.aspx?csid=1643

[38] The County's Duwamish Waterway source control website is available at https://www.kingcounty.gov/services/environment/wastewater/duwamish-waterway/preventing-pollution/pollution-sources.aspx.

- Coordinating with Ecology and LDWG partners on LDW Source Control Strategy and Action Plans
- Coordinating with Ecology, EPA, and LDWG partners on source control efficiency determinations
- Participating in the LDW SCWG
- Coordinating with the City of Seattle on source tracing in combined sewer areas
- Coordinating source control inspections in the LDW with Ecology and municipalities
- Fielding reports from the City of Seattle on what it is implementing in combined basins each year
- Working with the City of Seattle on developing any needed revisions to the Joint Operations and System Optimization Plan to improve the functioning of the combined sewer system every 3 years
- Working with cities including Seattle, Tukwila, Kent, and Auburn on implementation of the Phase I & Phase II Municipal NPDES Stormwater permits
- Facilitating regional discussions on operations and maintenance issues regarding stormwater infrastructure as part of the Regional Operations and Maintenance Program
- Working with Central Sound Phase I and Phase II Permit Coordinators Groups for NPDES Municipal Stormwater Permit holders
- Participating in regional and national forums that promote product stewardship
- Coordinating Interagency Resource for Achieving Cooperation and Interagency Compliance Team activities focused on regional issues
- Participating in the Management Coordination Committee to improve hazardous waste programs
- Participating on the Puget Sound Clean Air Agency Advisory Council
- Coordinating activities with the City of Seattle, Port of Seattle, Boeing, and other potentially responsible parties through existing agreements
- Implementing the Regional Roads Maintenance Endangered Species Act Program with 34 other jurisdictions in Washington state
- Continue development of the Our Green/Duwamish Stormwater Management Program at a Watershed Scale in Partnership with the City of Seattle and in close collaboration with the Washington State Department of Ecology. The program is to develop a regional partnerships with stormwater management entities located in the upper watershed.

10.3 Internal Coordination

The County will work on enhancing internal coordination and communication over the next 5 years. During the past 5 years, a team of representatives from the four primary County divisions involved in source control (WTD, WLRD, KCIA, and RSD) and from FMD, SWD, Public Health, and the Permitting Division will continue to meet regularly to coordinate this 2019 to 2024 LDW SCIP. The County intends to continue to employ a cross-divisional team to coordinate source control efforts and enhance communication. The team meets biannually to discuss activities related to source control, ensure follow-up actions assigned to other departments are progressing, and coordinate any needed interdepartmental actions. In addition, SWS coordinates stormwater-related actions for KCIA, RSD, and FMD. The coordinator of the County's plan also provides technical assistance to County team members and serves as the communications lead across the team members.

10.4 Development of 2024–2028 Source Control Implementation Plan

In 2023, County divisions involved in LDW source control work will develop the next 5-year LDW source control plan for implementation in 2024 to 2028. The County expects to submit its next 5-year plan to Ecology in December 2023.

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Appendix A:

LDW COCs

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Table 14. Summary of COPCs and Rationale for Selection as COCs for Human Health Exposure Scenarios

COPC	COC?	Maximum RME Risk Estimate	Rationale for Selection or Exclusion as COC
Seafood Consumption Scenarios			
PCBs	Yes	2×10^{-3}	Risk magnitude, high percent contribution to the cumulative excess cancer risk (58%), and high detection frequency in tissue samples (97%).
Inorganic arsenic	Yes	2×10^{-3}	Risk magnitude, percent contribution to the cumulative excess cancer risk (29%), and high detection frequency in tissue samples (100%).
cPAHs	Yes	8×10^{-5}	Risk magnitude and high detection frequency in tissue samples (72%).
Dioxins/furans	Yes	nd	No dioxin/furan tissue data were available. However, because excess cancer risks were assumed to be unacceptably high, dioxins/furans were identified as a COC.
Bis(2-ethylhexyl) phthalate	No	6×10^{-6}	Low percent contribution to the cumulative excess cancer risk (less than or equal to 3%) and rarely detected in tissue samples (particularly when samples were re-analyzed to evaluate the effect on RLs of analytical dilutions in the initial analysis).
Pentachlorophenol	No	9×10^{-5}	
Tributyltin	No	HQ = 3	HQs for these metals were only slightly greater than 1 and were driven by the child tribal RME seafood consumption scenario, for which Ingestion rates are uncertain.
Vanadium	No	HQ = 2	
Aldrin	No	5×10^{-5}	All organochlorine pesticides were low contributors to the cumulative excess cancer risk (less than or equal to 3% of the cumulative risk). In addition, because of analytical interference of these contaminants with PCBs, much of the tissue data for these contaminants were qualified JN, which indicates the presence of an analyte that has been 'tentatively identified,' and the associated numerical value represents its approximate concentration. The JN-qualified organochlorine pesticide results are highly uncertain and likely biased high.
alpha-BHC	No	2×10^{-5}	
beta-BHC	No	6×10^{-6}	
Carbazole	No	4×10^{-5}	
Total Chlordane	No	6×10^{-6}	
Total DDTs	No	2×10^{-5}	
Dieldrin	No	1×10^{-4}	
gamma-BHC	No	5×10^{-6}	
Heptachlor	No	1×10^{-5}	
Heptachlor epoxide	No	3×10^{-5}	
Hexachlorobenzene	No	1×10^{-5}	
Direct Sediment Exposure Scenarios			
PCBs	Yes	8×10^{-6}	Lower risk magnitude and percent contribution to cumulative excess cancer risk than the other sediment risk drivers, but selected because of importance in the seafood consumption scenarios.
Inorganic arsenic	Yes	2×10^{-5}	Risk magnitude, percent contribution to cumulative excess cancer risk (14 to 19%), and high detection frequency in surface sediment samples (92%).
cPAHs	Yes	4×10^{-5}	Risk magnitude, percent contribution to cumulative excess cancer risk (3 to 85%), and high detection frequency in surface sediment samples (94%).
Dioxins/furans	Yes	1×10^{-4}	Risk magnitude, percent contribution to cumulative excess cancer risk (35 to 72%), and high detection frequency in surface sediment samples (100%).
Toxaphene	No	6×10^{-6}	Low percent contribution to cumulative excess cancer risk (6% or less) and low detection frequency in surface sediment samples (1%).

Notes:
BHC = benzene hexachloride.

Except for TBT and Vanadium, the maximum RME risk estimates shown are excess cancer risks for the adult Tribal RME seafood consumption based upon Tulalip tribal data. Only RME scenarios were used to designate COCs. The highest risk estimate for any of the RME scenarios is shown in this table (adult tribal RME based on Tulalip data for seafood consumption, and various scenarios for direct contact). Note that the estimates reported here differ slightly from those reported in Appendix B (the HHRA) and Section 6 of the RI (LDWG 2010), based on a 2009 erratum (LDWG 2009) that adjusted the proportion of crabs and clams consumed by the Tulalip Tribe.

Table 18. Rationale for Selection of Contaminants as COCs for Ecological Risk

COPC	ROC	Maximum NOAEL-Based HQ	Maximum LOAEL-Based HQ	Additional Considerations	COC?
Total PCBs	crabs	10	1.0	Uncertainty in exposure data: whole-body concentrations were estimated Uncertainty in effects data: LOAEL-based HQ was based on a study with Aroclor 1016 and grass shrimp, and NOAEL was estimated using an uncertainty factor; selection of next higher TRV would result in LOAEL-based HQ < 1.0	no
	river otter	5.8	2.9	Uncertainty in exposure data: low uncertainty in diet assumptions and home range Uncertainty in effects data: low uncertainty in TRV (growth endpoint in kits)	yes
	English sole	4.9 – 25[a]	0.98 – 5.0[a]	Uncertainty in exposure data: low uncertainty in tissue concentrations Uncertainty in effects data: high uncertainty in lowest LOAEL TRV because of uncertain statistical significance of the fecundity endpoint for the low dose, a lack of dose-response in the fecundity endpoint, uncertain number of fish used in the experiment, and uncertainties associated with fish handling and maintenance protocols	no
	Pacific staghorn sculpin	3.8 – 19[a]	0.76 - 3.8[a]	Same considerations as listed above for English sole	no
PCB TEQ[b]	spotted sandpiper –Area 2 (high-quality foraging habitat)	15	1.5	Uncertainty in exposure data: low uncertainty in diet assumptions and home range Uncertainty in effects data: high uncertainty in TRV, which was based on study of reproduction with weekly IP injection; high uncertainty in TEFs; effects data for total PCBs are less uncertain than for PCB TEQs and the LOAEL-based HQ for total PCBs was < 1.0	no
Cadmium	juvenile chinook salmon	5.0	1.0	Uncertainty in exposure data: LOAEL-based HQ < 1.0 if empirical juvenile chinook salmon stomach contents data from the LDW are used to estimate exposure, instead of estimating exposure based on ingestion of benthic invertebrates Uncertainty in effects data: high uncertainty in the lowest TRV because selection of next higher TRV would result in LOAEL-based HQ < 1.0, all salmonid-specific studies for cadmium with NOAELs result in NOAEL-based HQs less than 0.01	no
	English sole	6.1	1.2	Uncertainty in exposure data: low uncertainty (LDW-collected benthic invertebrate tissue samples) Uncertainty in effects data: high uncertainty in the lowest TRV because selection of next higher TRV would result in LOAEL-based HQ < 1.0; all other NOAELs and LOAELs were orders of magnitude higher than the selected LOAEL	no
	Pacific staghorn sculpin	5.2	1.0	Uncertainty in exposure data: low uncertainty (LDW-collected shiner surfperch and benthic invertebrate tissue samples) Uncertainty in effects data: high uncertainty in the lowest TRV because selection of next higher TRV would result in LOAEL-based HQ < 1.0; all other NOAELs and LOAELs were orders of magnitude higher than the selected LOAEL	no
Chromium	spotted sandpiper –Area 2 (high- and poor-quality foraging habitat)	8.8	1.8	Uncertainty in exposure data: high uncertainty because LOAEL-based HQ would be less than 1.0 if the single anomalously high benthic invertebrate tissue sample from RM 3.0 west was excluded; chromium concentrations in sediment were low in this area Uncertainty in effects data: high uncertainty; only one study with reported effects, and study was unpublished and could not be obtained for review	no

COPC	ROC	Maximum NOAEL-Based HQ	Maximum LOAEL-Based HQ	Additional Considerations	COC?
Copper	spotted sandpiper –Area 3 (high- and poor-quality foraging habitat)	1.5	1.1	Uncertainty in exposure data: low uncertainty Comparison to natural background: concentration in sediment (Surface Weighted Average Concentration of 57 mg/kg dw) from Area 3 (high- and poor-quality foraging habitat) similar to PSAMP rural Puget Sound concentrations (50 mg/kg dw [90th percentile]) Residual risk: following planned sediment remediation within early action areas, LOAEL-based HQ would be < 1.0	no
Lead	spotted sandpiper –Area 2 (high- and poor-quality foraging habitat)	19	5.5	Uncertainty in exposure data: high uncertainty because LOAEL-based HQ would be less than 1.0 if the single anomalously high benthic invertebrate tissue sample from RM 3.0 west was excluded; lead concentrations in sediment were low in this area Uncertainty in effects data: low uncertainty (reproductive endpoint)	no
	spotted sandpiper –Area 3 (high- and poor-quality foraging habitat)	5.0	1.5	Uncertainty in exposure data: low uncertainty Uncertainty in effects data: low uncertainty (reproductive endpoint) Residual risk: following planned sediment remediation within early action area, LOAEL-based HQ would be < 1.0	
Mercury	spotted sandpiper –Area 3 (high-quality foraging habitat)	5.3	1.0	Uncertainty in exposure data: low uncertainty Uncertainty in effects data: low uncertainty (TRV was based on a growth endpoint) Residual risk: following planned sediment remediation within early action area, LOAEL-based HQ would be < 1.0	no
Vanadium	English sole	5.9	1.2	Uncertainty in exposure data: low uncertainty Uncertainty in effects data: high uncertainty in TRV because only one study was available Comparison to natural background: exposure concentration in LDW sediment (SWAC of 58 mg/kg dw) was less than PSAMP rural Puget Sound concentration (64 mg/kg dw [90th percentile])	no
	Pacific staghorn sculpin	3.2 – 5.9	0.65 – 1.2	Same considerations as listed for English sole above	no
	spotted sandpiper – all exposure areas	2.0 – 2.7	1.0 – 1.4	Uncertainty in exposure data: low uncertainty Uncertainty in effects data: TRV was based on a 4-week growth endpoint, with uncertainty (two available studies: one with reduced body weight in chickens after 4 weeks and the other with no effect on body weight in mallards after 10 weeks) Comparison to natural background: mean exposure concentrations in sandpiper exposure areas ranged from 49 to 57 mg/kg dw, compared to Puget Sound Ambient Monitoring Program rural Puget Sound background concentration of 64 mg/kg dw (90th percentile)	no
41 SMS contami-nants[c]	benthic invertebrates	range of values	range of values	Each of these 41 contaminants had at least one detected exceedance of benthic SCO in baseline surface sediment dataset	yes

COPC	ROC	Maximum NOAEL-Based HQ	Maximum LOAEL-Based HQ	Additional Considerations	COC?
Nickel	benthic invertebrates	6.6	2.5	Uncertainty in exposure data: low uncertainty Uncertainty in effects data: medium uncertainty in the TRV (i.e., the ML) because only no-effects data (amphipod mortality and community abundance Apparent Effects Thresholds) were available; no information was available regarding concentrations associated with adverse effects Residual risk: ML was exceeded at four locations in LDW – all within early action areas with planned sediment remediation	no
Total DDTs	benthic invertebrates	5.1	2.7	Uncertainty in exposure data: medium uncertainty (i.e., likely interference in pesticide analyses from PCBs) Uncertainty in effects data: medium uncertainty; based on a single study with spiked sediment Residual risk: LOAEL was exceeded at only one location in LDW, location is within early action area with planned sediment remediation	no
Total chlordane	benthic invertebrates	82	48	Uncertainty in exposure data: highly uncertain because all total chlordane concentrations in samples from Phase 2 locations were JN-qualified as a result of probable PCB interference; except one location at RM 2.2, all locations with detected total chlordane concentrations co-occurred with elevated PCB concentrations Uncertainty in effects data: TRV is highly uncertain because it was based on a general Canadian sediment guideline (PEL); this guideline is based mainly on field-collected data with complex mixtures of contaminants Residual risk: LOAEL was exceeded at 14 locations in LDW; all but one of these locations are associated with an early action area with planned sediment remediation	no

Note: HQs for fish are the highest HQs in cases where more than one approach was used.

a. LOAEL-based HQs were calculated from a range of effects concentrations reported in Hugla and Thome (1999) because of uncertainty in the LOAEL. The NOAEL TRV range was estimated by dividing the LOAEL TRV range by an uncertainty factor of 5. Ranges reported for Pacific staghorn sculpin also included the range in exposure estimates for areas smaller than the entire LDW.

b. Risk estimates based on TEQs were calculated using only tissue data for dioxin-like PCB congeners because dioxin and furan tissue data were not available. Thus, risks associated with exposure to all dioxin-like contaminants were likely underestimated; the degree of underestimation is uncertain.

c. Arsenic, cadmium, chromium, copper, lead, mercury, silver, zinc, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo (a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3,-c,d)pyrene, naphthalene, phenanthrene, pyrene, total benzofluoranthenes, HPAH, LPAH, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, dimethyl phthalate, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, 2-methylnaphthalene, 4-methylphenol, 2,4-dimethylphenol, benzoic acid, benzyl alcohol, dibenzofuran, hexachlorobenzene, n-nitrosodiphenylamine, pentachlorophenol, phenol, total PCBs.

NOTE: arsenic and total PCBs are also human health contaminants of concern.

Appendix B:

Approach to Source Tracing in Support of LDW Source Control Actions

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This appendix describes how King County will set and update source tracing threshold levels and prioritize tracing efforts. It also specifies sample types, parameters to be analyzed, and when results from source characterization efforts will trigger source tracing up-basin. The general approach is presented first, followed by variations from the general approach where appropriate. The guidelines for frequency of sampling in storm drain solids is also presented.

Source Tracing Thresholds

Because there are no regulatory standards for inline solids, sediment trap, catch basin solids, or sump samples collected in combined sewer or stormwater sewer systems, four lines of evidence will be considered before tracing "up pipe" is triggered. A "weight of evidence" approach is used to set target levels that trigger source tracing activities.

First-Line of Evidence

Results are typically compared to Washington State Sediment Management Standards (SMS) and Model Toxics Control Act (MTCA) Method A cleanup standards as the first line of evidence.[39] Although these standards do not apply to these types of solids samples, members of the LDW Source Control Work Group (SCWG) commonly use the SMS as screening levels to provide a rough indication of solids quality. The SMS establish marine sediment quality standards and cleanup standards. The following screening levels are considered in source tracing:

Sediment Quality Standards (SQS)[40]: establish sediment quality that will result in no adverse effects, including no acute or chronic adverse effects on biological resources

Cleanup Screening Level (CSL)[41]: establishes minor adverse effects to benthic organisms as the maximum chemical contaminant concentration

Because these samples typically contain fairly high concentrations of total organic carbon (TOC), the dry-weight equivalent SMS values (low apparent effects threshold [LAET] and second lowest LAET [2LAET]) are used for the organic compounds where SQS/CSL values are based on TOC-normalized concentrations. The LAET and 2LAET are those presented in Table 8-1 of Ecology's Sediment Cleanup User's Manual (Ecology 2017).

Second-Line of Evidence

The second line of evidence is the magnitude of elevation above the range of concentrations typically seen in the drain type (combined sewer or stormwater sewer). Tracing works best when contaminants associated with a site are significantly elevated or all the subsequent tracing samples look similar.

[39] MTCA Method A cleanup standards are used only to evaluate contaminants such as total petroleum hydrocarbons for which there are no Sediment Management Standards.
[40] WAC 173-204-320. The SQS is equivalent to benthic SCO (WAC 173-204-562).
[41] WAC 173-204-562

Third-Line of Evidence

The third line of evidence is the accumulation of the elevated chemical above LDW remedial action levels at the discharge location (if this information is available). Regardless of the in-line concentrations, the source will not warrant tracing if no evidence of accumulation above concern exists at the discharge location.

Forth-Line of Evidence

The fourth line of evidence considered is the volume of the discharge. Because any sediment discharged disperses in the receiving environment and because of a general background sedimentation rate, the volume of the discharge is proportional to the resulting sediment concentration.

Consideration of Other Factors

King County uses the CSL/2LAET to screen for source tracing activities in storm drains. The other lines of evidence are weighed on a site-specific basis to determine when tracing is triggered. As the general concentrations in the drains are reduced over time, the SQS/LAET screening levels are used. The same principles will apply and the target levels will still need to be significantly elevated over the general concentrations in the drains for tracing efforts to be successful. It is expected that the SCWG will be involved in these discussions.

For combined sewer lines, higher screening levels (i.e., two times the CSL/2LAET) will be used because the majority of the flows are treated before being discharged from a wastewater treatment plant or, for some basins, a CSO treatment station. In addition, higher concentrations of chemicals are routinely found in the sewer system because many chemicals are discharged for treatment and thus can be found at higher concentrations in the system. Some chemicals are not typically screened because they can degrade in the environment or can form in the system based on chemical/physical/biological processes occurring in the system; examples include 1,4-dichlorophenol and 4-methylphenol.

The other lines of evidence are also weighed on a site-specific basis to determine when tracing is triggered. Completion of the County's CSO control plan in accordance with the consent decree will be the most effective source control actions for CSO discharges.

Prioritizing Tracing Efforts

To date, the County has focused on looking for sources of metals, PAHs, and PCBs because they exceed the screening levels more often than other chemicals.[42] Source tracing screening levels are used to focus activities on areas where the highest levels of contaminants are present. Coordination and discussions with the City of Seattle indicate that these levels have been effective in informing actions. Screening levels for storm drain solids will change over time to reflect overall improvements in source concentrations and/or regulatory requirements.

[42] The one exception is BEHP, which is frequently above the 2LAET in in-line solids samples in both storm drains and combined sewers.

In certain instances, lower priorities will be considered. Some contaminants with ongoing signatures such as phthalates, benzyl alcohol, and phenolic compounds have frequent transitory SQS exceedances in LDW sediments and occur in localized areas near large outfalls. Other contaminants, such as benzoic acid and some phenolic compounds (2,4-dimethylphenol and 4-methylphenol), can form naturally from biotic activity and degradation of natural products. For these urban-related non-point source chemicals, mixed results (some increasing concentrations and some decreasing concentrations) over time are generally observed. It appears that a state of equilibrium is reached when the concentrations tend to go up or down in equal measure. These compounds can cause recontamination of LDW sediments; however, their transient or ubiquitous nature does not often lend itself to useful source tracing. The six transient or ubiquitous chemicals (benzyl alcohol, benzoic acid, BEHP, phenol, 2,4-dimethylphenol, and 4-methylphenol) are not considered priorities unless a significantly elevated sample is found that would warrant source control. In addition, depending on the type of discharge being sampled, specific factors will be weighed as described below.

Stormwater Runoff Solids

Comparison of storm drain sediment collected from catch basins, maintenance holes, and sediment traps to SMS is considered conservative in regard to the average concentration entering the receiving water. If storm drain solids samples are below the SQS, there is little, if any chance, of stormwater recontaminating sediment offshore of the outfalls above these levels. Even if a concentration is above the SQS, it does not necessarily indicate that the sediment offshore of the outfall will exceed standards because sediment discharged from storm drains disperses in the receiving environment and mixes with sediment from other sources before depositing.

Combined Sewer Overflows

Comparison of combined sewer sediment collected from catch basins, maintenance holes, and sediment traps to CSL/2LAET is considered conservative in regard to the average concentration entering the receiving water. If combined sewer solids samples are below the SQS/LAET, there is little chance of CSO discharges recontaminating sediment offshore of the outfalls above these levels. Even though releases can occur over the course of a year, their volumes (and mass of solids discharged) are often smaller than volumes from relatively small storm drains.

Some businesses discharge process wastewater to the combined sewers under the Industrial Pretreatment Program and solids in the system may have much higher concentrations of certain COCs than the CS/2LAETL, particularly near the process source. However, the discharged solids would not recontaminate a site because most of the solids are conveyed to the wastewater treatment plant, a large dilution process takes place during CSO events, and the CSOs disperse in the receiving environment and mix with sediment from other sources before depositing. Therefore, tracing is typically not triggered in the combined sewer system until data is much higher than the CSL/2LAET. All data is assessed on a sample-by-sample basis to determine when tracing is appropriate.

Source Tracing Sample Types

A variety of sampling methods can be used for source tracing. It is generally understood that no single method is most effective in tracing sources and each has its limitations. The most common types of samples used by the County to trace sources are as follows:

- **In-line solids grab samples**. The County has established sampling and analysis plans (SAPs) specific to the collection and analysis of in-line solids grab samples from stormwater and combined sewer lines (Figure E-1). The City of Seattle uses the same or equivalent sampling procedure. Using standardized procedures helps in comparing data across basins, over time, and between jurisdictions. In-line solid grab samples can be collected at various access points in the system (if there are enough solids in the lines to collect) to help narrow the area of interest affected by a source. The samples tend to represent the heavier materials such as sand and gravel-size particles that accumulate over time at the bottom of the pipe and can often include historical material.
- **In-line sediment traps.** The County has established SAPs specific to the collection and analysis of in-line sediment trap samples from stormwater and combined sewer lines (Figure E-1). Traps are designed to collect suspended solids from stormwater flows or combined sewage and stormwater flows during moderate-to-high flows and provide useful information about possible ongoing sources. Sediment traps are typically deployed over a period of time (for example, six to twelve months) to allow for the accumulation of sufficient material to conduct a larger suite of analyses. Similar to in-line solids grab samples, data from sediment traps enables the County to narrow the areas of interest. However, sediment traps cannot be installed in all locations.

  Sediment traps compared to solids grab samples provide different information for a number of reasons, including the following:

  - Sediment traps collect more of the suspended material, which has finer-sized particles or lighter material, where contaminants are typically found in higher concentrations. The data provides the County with another line of evidence to identify sources of COCs.
  - They provide an estimate of the average particulate chemical concentrations passing through the system over time.
  - They can be more representative of current ongoing sources compared to accumulated sediments in the lines, which can often include historical contamination.

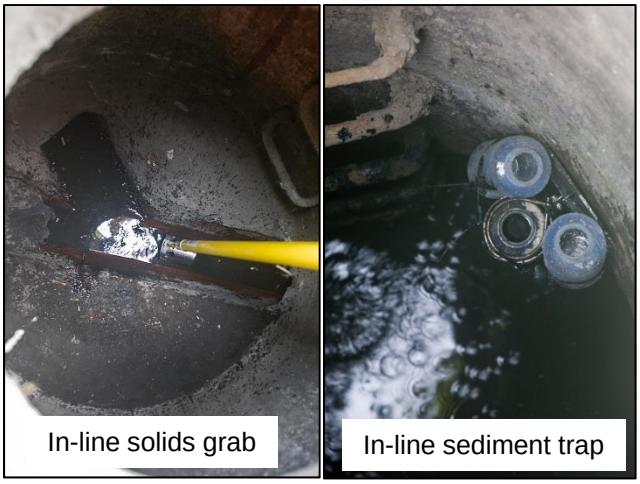

Figure E-1. Example of In-line Solids Grab Samples and In-line Sediment Traps

- **Catch basin grab samples.** Catch basin grab samples are used for characterizing stormwater-associated solids that have accumulated in the catch basins on or near a specific property or right of way, as opposed to the bottom of a stormwater or combined sewer line that typically collects inputs from many properties. Catch basin samples are collected to provide information about the quality of stormwater runoff and, in some cases, could provide useful information about the contribution of a particular chemical from a narrow drainage area or a specific property.
- **Sump samples** (vaults, oil /water separators, etc): grab samples from structures that are designed to collect sediments/solids from drainage systems. These samples are similar to catch basin samples described above but are collected typically from vaults or oil/water separators.

General Parameters Analyzed in Source Tracing Samples

Source samples are routinely analyzed for the following parameters:

Total solids

TOC

Metals (arsenic, copper, lead, mercury, and zinc)

PCBs by Aroclor

Semi-volatile organic compounds

Grain size

Additional analyses for parameters such as other metals, dioxins/furans, petroleum hydrocarbons, diesel, and heavy oil, may be performed if warranted from observations made during sampling or information obtained during a business inspection, or for support of LDW sediment evaluations.

Sampling and analysis will be conducted in accordance with SAPs developed to date (Cardno 2014a; b; King County 2016d and 2019).

Guidelines for LDW Source Control Source Tracing Sampling Frequency for Storm Drain Solids[43]

This section presents guidelines for sampling frequency in storm drain solids based on past source tracing sampling data at a particular location or outfall drainage basin. The sample frequency generally applies to samples collected at KCIA and within the unincorporated King County MS4 system and will be reviewed once 3-4 years of data exists for a basin.

If a parameter remains below the SQS/LAET over time, then only sample for that parameter at a 3-year frequency. This will confirm the parameter remains below levels of concern during the design and construction cleanup phase. Parameters below the SQS/LAET should not contribute to recontamination of sediment above the ROD remedial action levels. Other considerations for sampling frequency are presented below:

1. If parameter is above either SQS/LAET or CSL/2LAET source control screening level once or twice over multiple years of sampling, it is unlikely this parameter can be traced to a particular source. However, if sediment data near the outfall discharge location exceed benthic cleanup levels in ROD for these same chemicals, continued source tracing sampling is likely needed. If they do not exceed benthic cleanup levels in nearby sediments, then sample frequency could be reduced to once every three years for those parameters.
2. If concentrations of metals, PCBs or PAHs greater than CSL/2LAET in stormwater solids multiple times and exceed benthic cleanup levels in nearby sediments, these would be continued to be analyzed on annual basis. If the nearby outfall sediments are below benthic cleanup levels, the frequency of sampling may be reduced depending on the other lines of evidence discussed above.
3. If source tracing data have concentrations of metals, PCBs or PAHs above SQS/LAET over multiple sampling events, the lines of evidence discussed above will be considered to determine if the sampling frequency (e.g. annually or once every three years).
4. Phthalates need to be greater than what is typically observed in LDW storm drain solids to have ability to successfully trace these compounds to a source (as discussed above). If phthalates are above CSL/2LAET or SQS/LAET screening levels in storm drain solids multiple times and the sediments near the outfall also exceed benthic cleanup level, continued sampling on annual basis would occur. If the nearby sediments do not exceed benthic cleanup levels, the frequency of sampling for phthalates could be reduced to less than annually.
5. Some semi-volatile organic compound (SVOCs) like benzoic acid, benzyl alcohol and phenolic compounds are not persistent and/or have natural sources. The frequency

[43] Source tracing sampling frequency in combined sewer system is dependent on CSO control status and sediment conditions near the outfall discharge point. See section 2.3.2.

of sampling for these other SVOCs will depend on lines of evidence but they will generally follow the guidelines for phthalates.

In addition, when some individual PAH compounds are below screening levels but other PAH compounds are above CSL/2LAET screening level, then all PAHs will continue to be analyzed in source tracing samples because the analytical method will generate data for all. In addition, total lower molecular weight and high molecular weight PAHs may still need to be tracked if individual PAH compounds are above screening levels. Similarly, when analyzing samples for total PCBs, all Aroclors (1016, 1221, 1232, 1242, 1248, 1256, and 1260) will continue to be included.

Other considerations

If source control actions such as line cleaning or control of known sources has occurred, follow-up source tracing samples will be taken to confirm if the source was historic and not on-going, or to confirm source control action was effective in reducing inputs to the system. If samples collected post-action are below screening levels, then it is likely the action was effective and the frequency of sampling can be reduced to once every 3 years.

If determine the source of chemical is a non-county source (not regulated by the County's MS4 permit), then sample frequency could be reduced to once every 3-years. In addition, the County will work with appropriate source control jurisdiction or agency (e.g., Seattle, Tukwila, WSDOT, Ecology) to reduce or control the source inputs to County's stormwater system.

As noted above, all guidelines for reduced sampling frequency is considering sediment conditions in LDW near the outfall discharge location and the volume of discharge. If chemical is not exceeding benthic cleanup level in nearby sediments, then unlikely drainage system is a source of concern. Following design and construction cleanup near outfall discharge point, source tracing sampling may be discontinued if recontamination of sediments is not observed. PCBs, arsenic and dioxin/furans, all of which have low site-wide cleanup levels in LDW, may require further sampling depending on level in drainage system and sediments near the outfall.

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Appendix C:

SWS Source Tracing Data Summary

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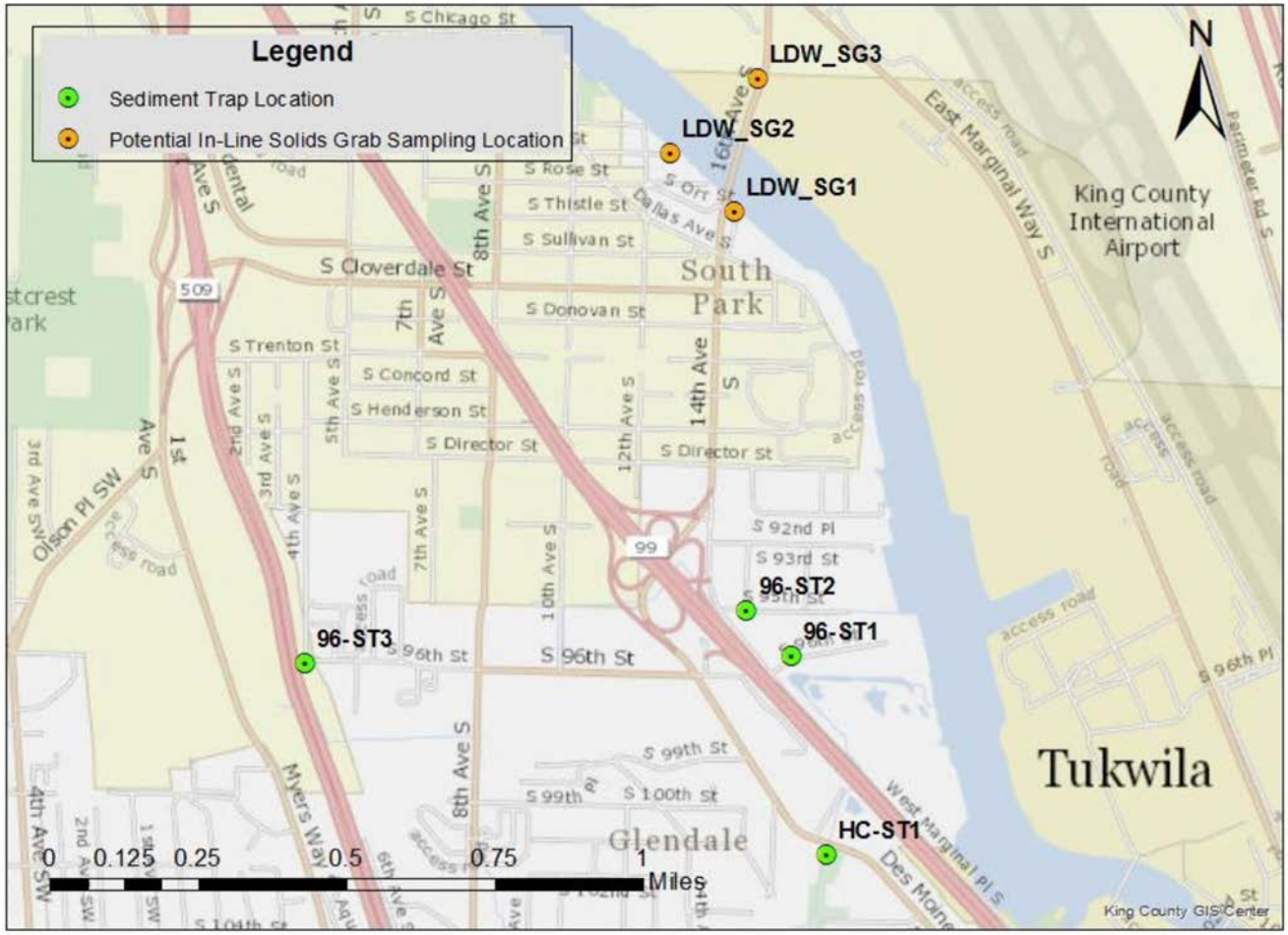

Figure C-1. SWS Source Tracing Storm Solids Sampling Locations

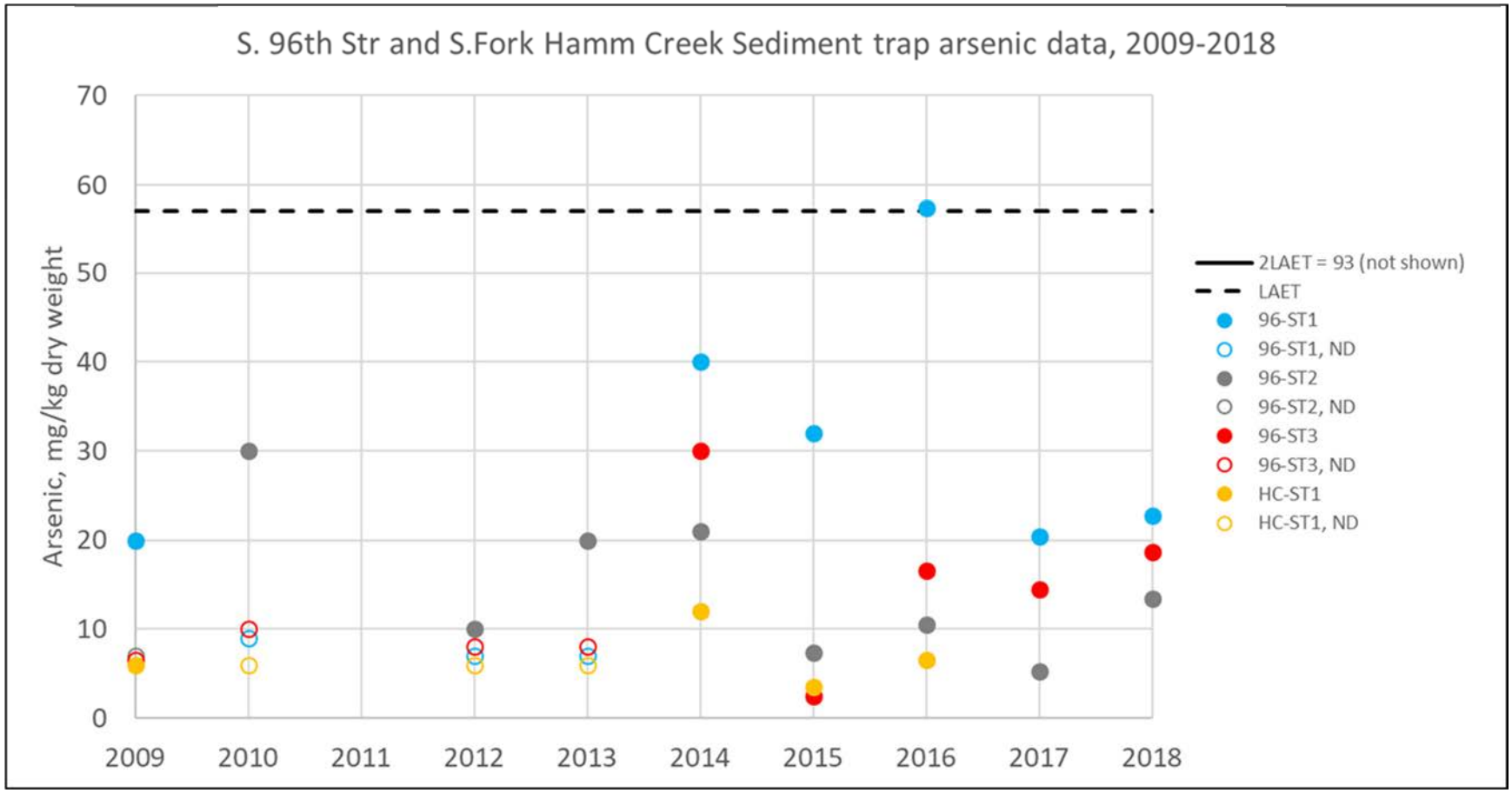

Figure C-2. SWS Source Tracing Storm Solids Sampling Results for Arsenic.

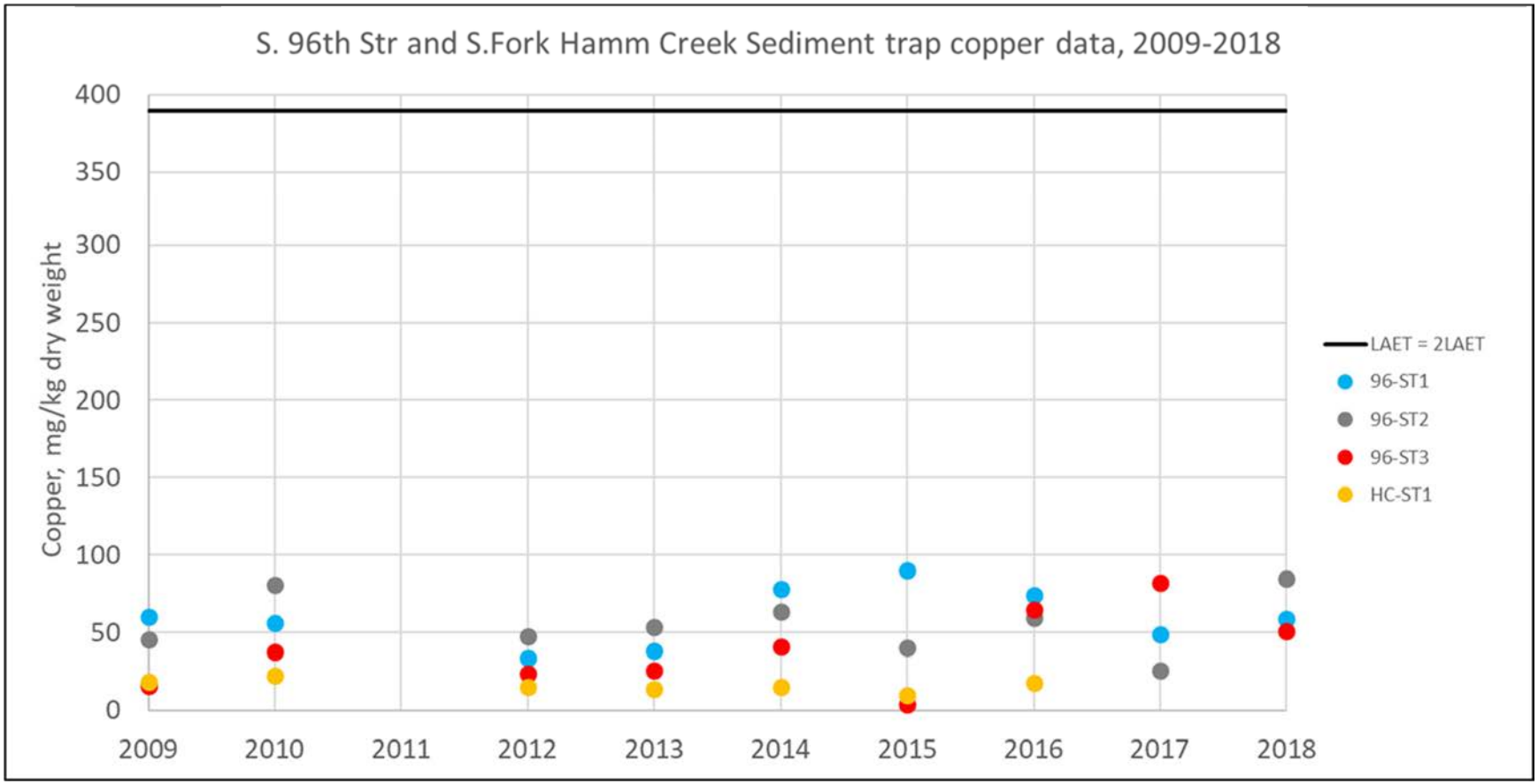

Figure C-3. SWS Source Tracing Storm Solids Sampling Results for Copper.

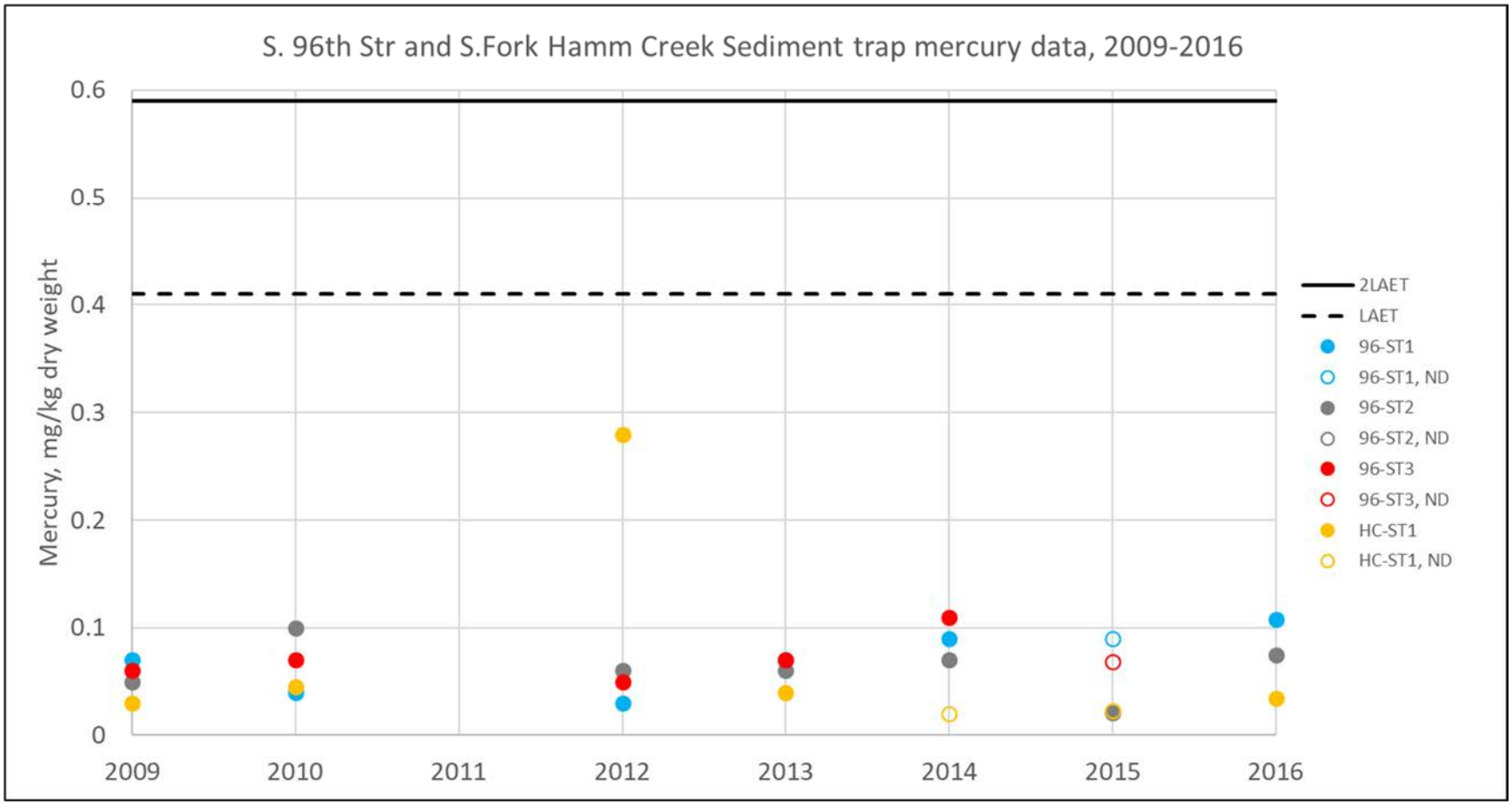

Figure C-4. SWS Source Tracing Storm Solids Sampling Results for Mercury.

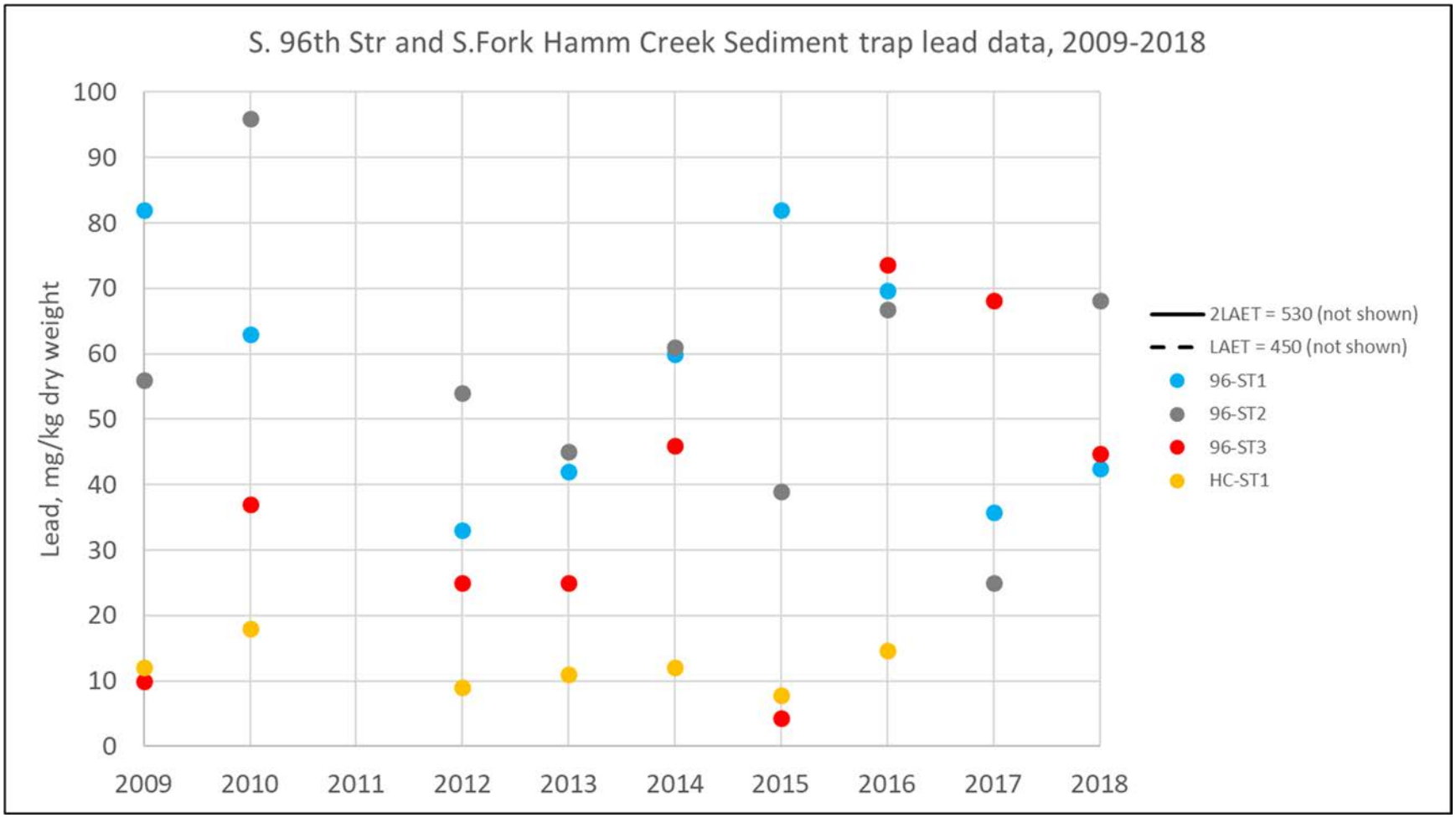

Figure C-5. SWS Source Tracing Storm Solids Sampling Results for Lead.

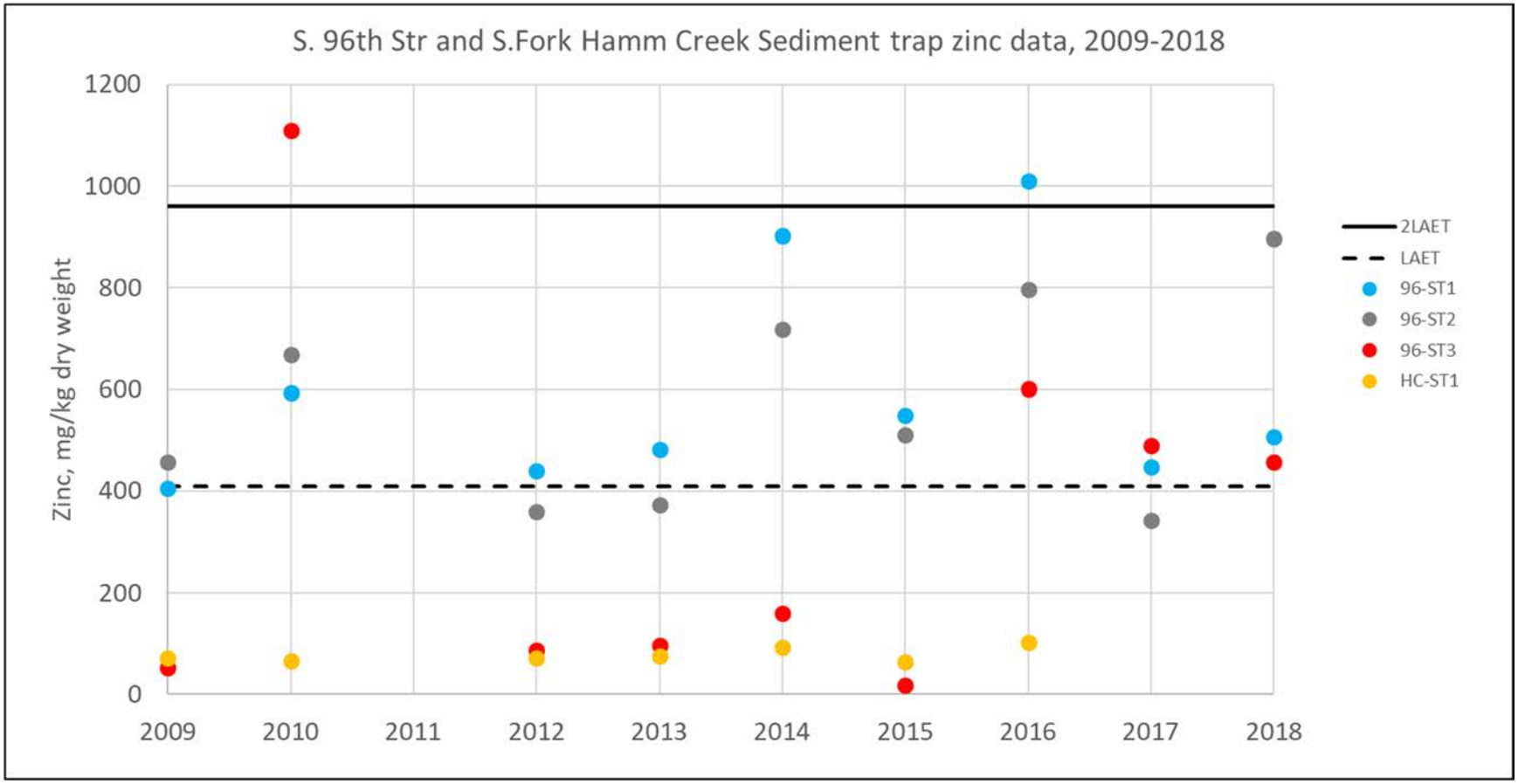

Figure C-6. SWS Source Tracing Storm Solids Sampling Results for Zinc.

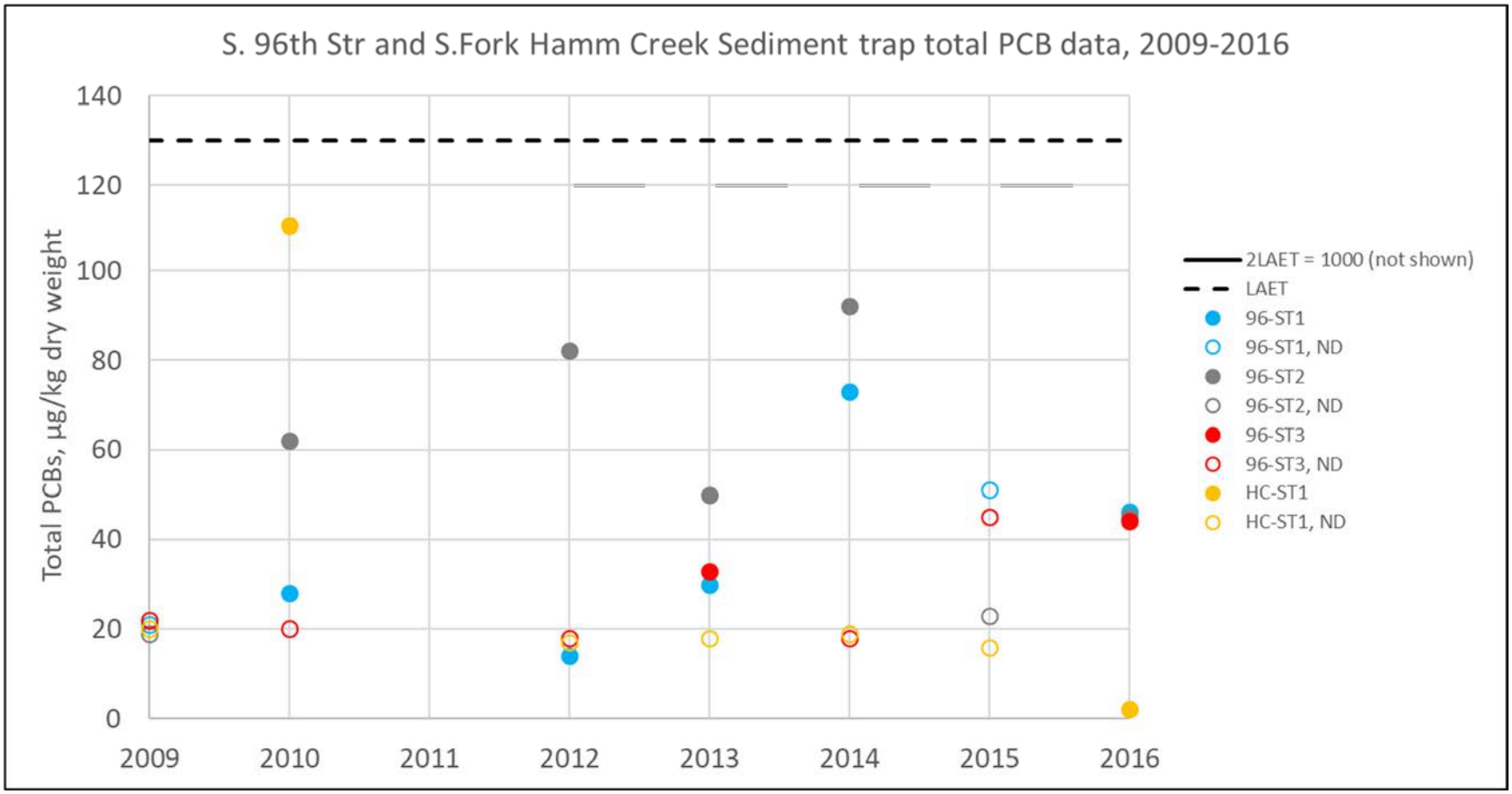

Figure C-7. SWS Source Tracing Storm Solids Sampling Results for PCB.

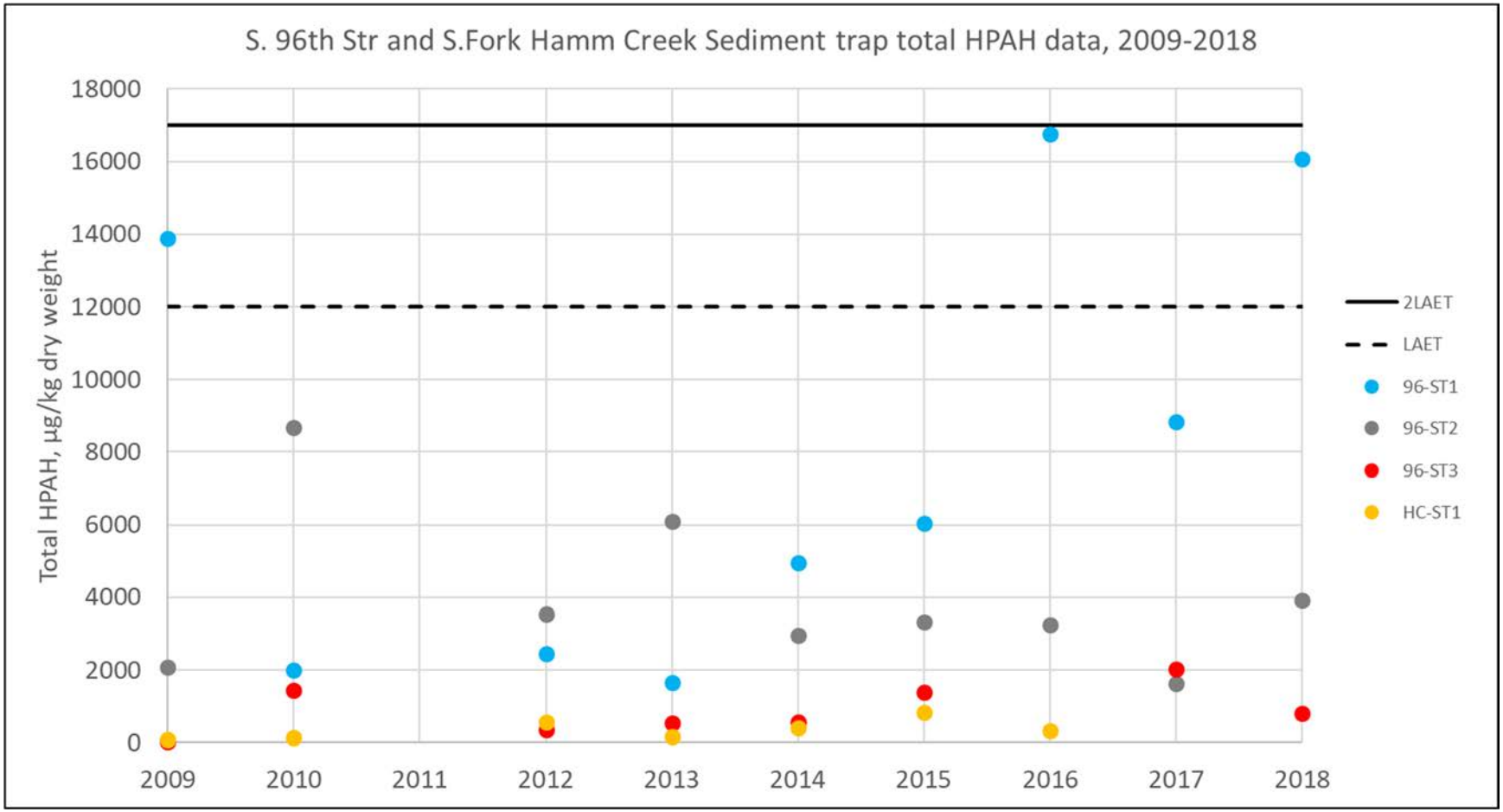

Figure C-8. SWS Source Tracing Storm Solids Sampling Results for HPAH.

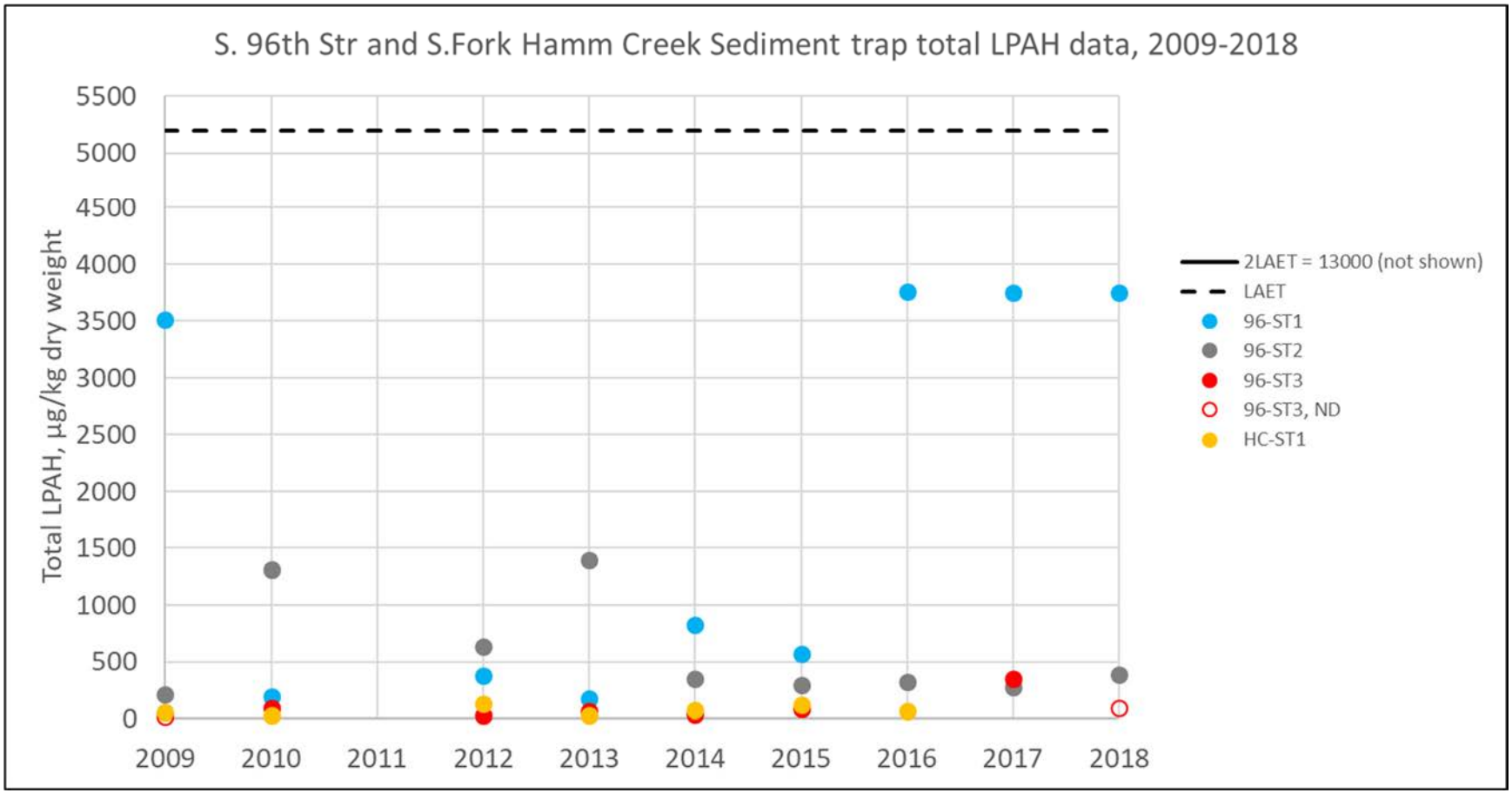

Figure C-9. SWS Source Tracing Storm Solids Sampling Results for LPAH.

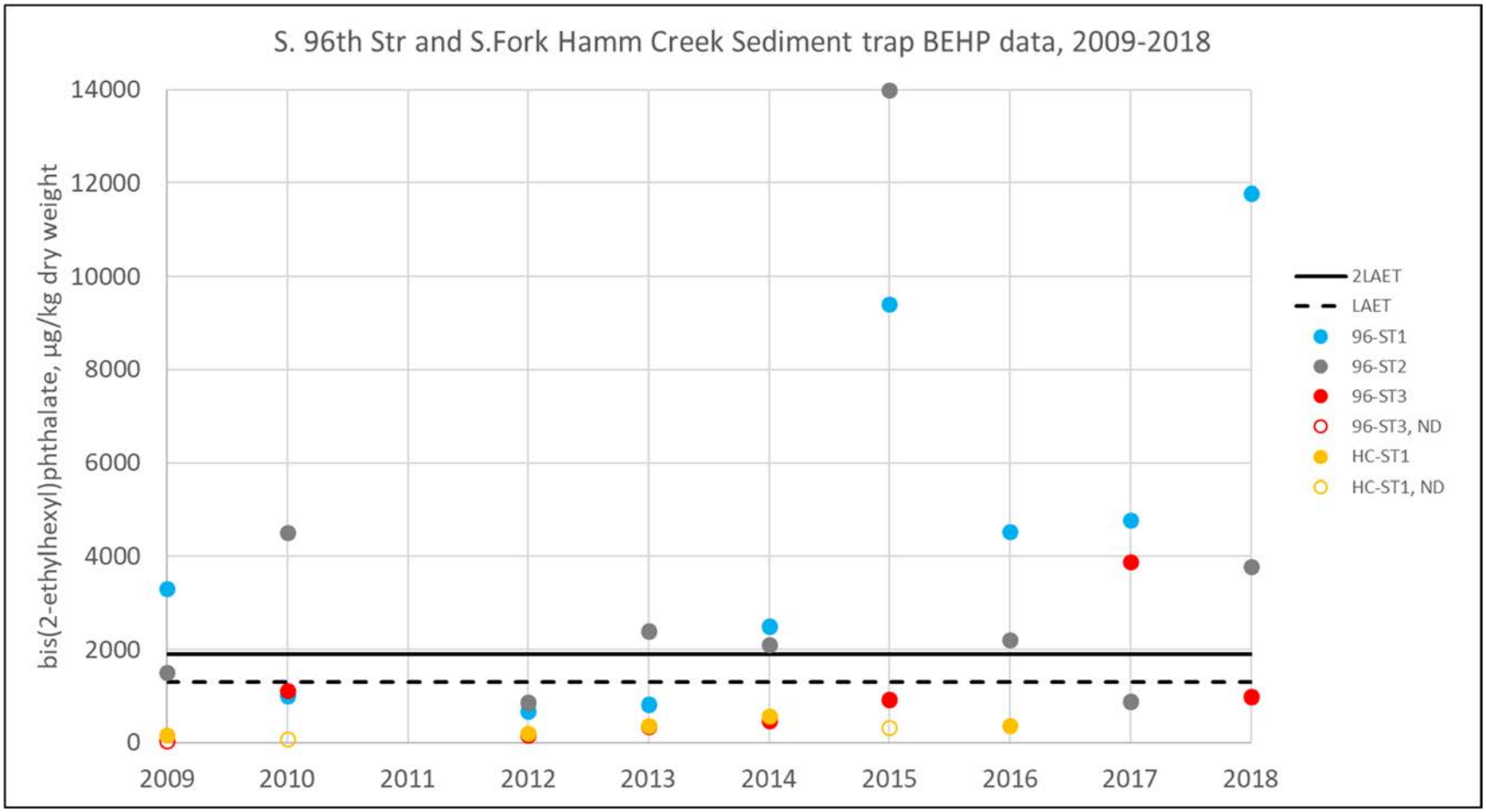

Figure C-10. SWS Source Tracing Storm Solids Sampling Results for BEHP.

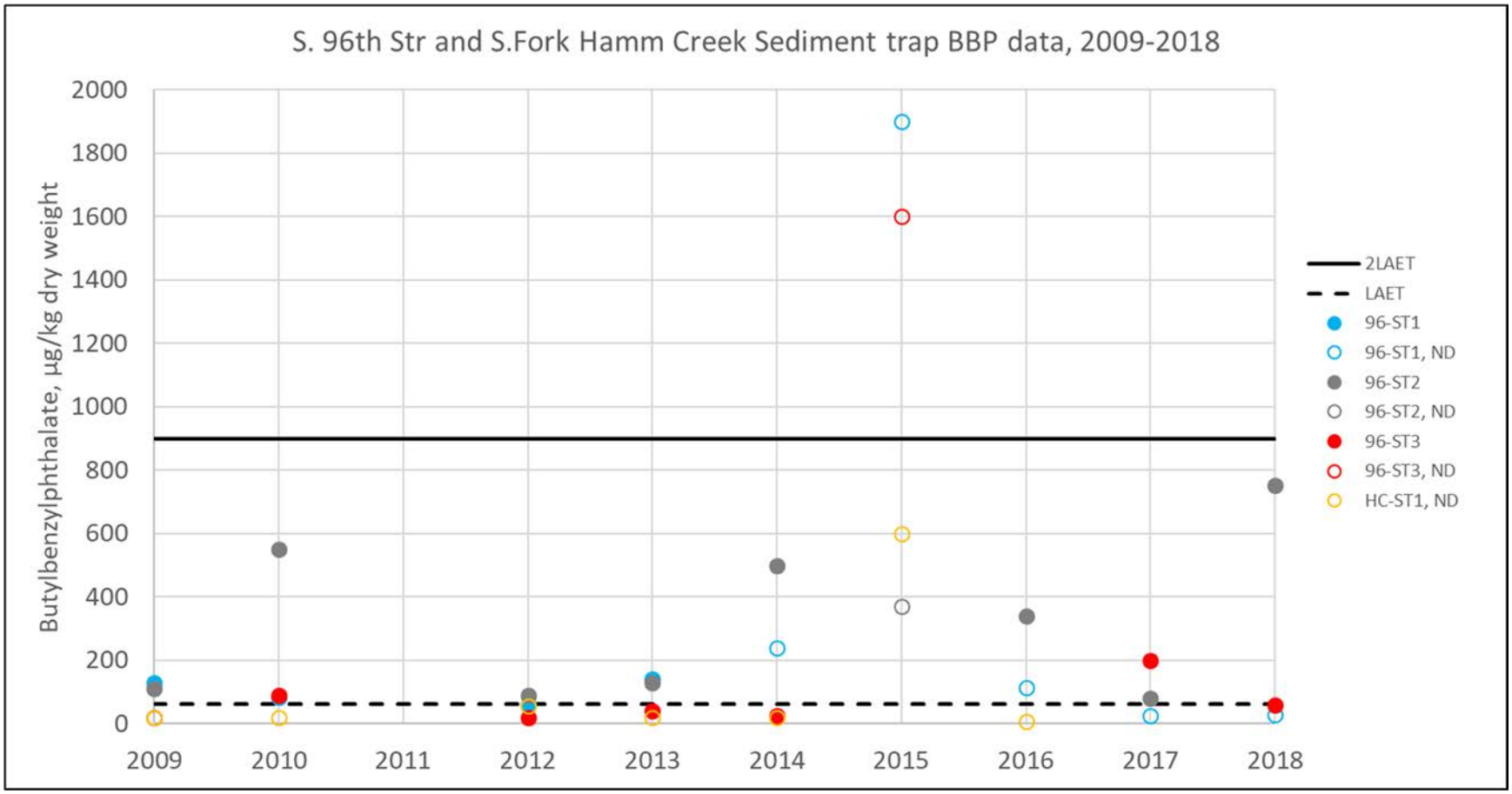

Figure C-11. SWS Source Tracing Storm Solids Sampling Results for BBP.

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Appendix D:

KCIA Source Tracing Data Summary

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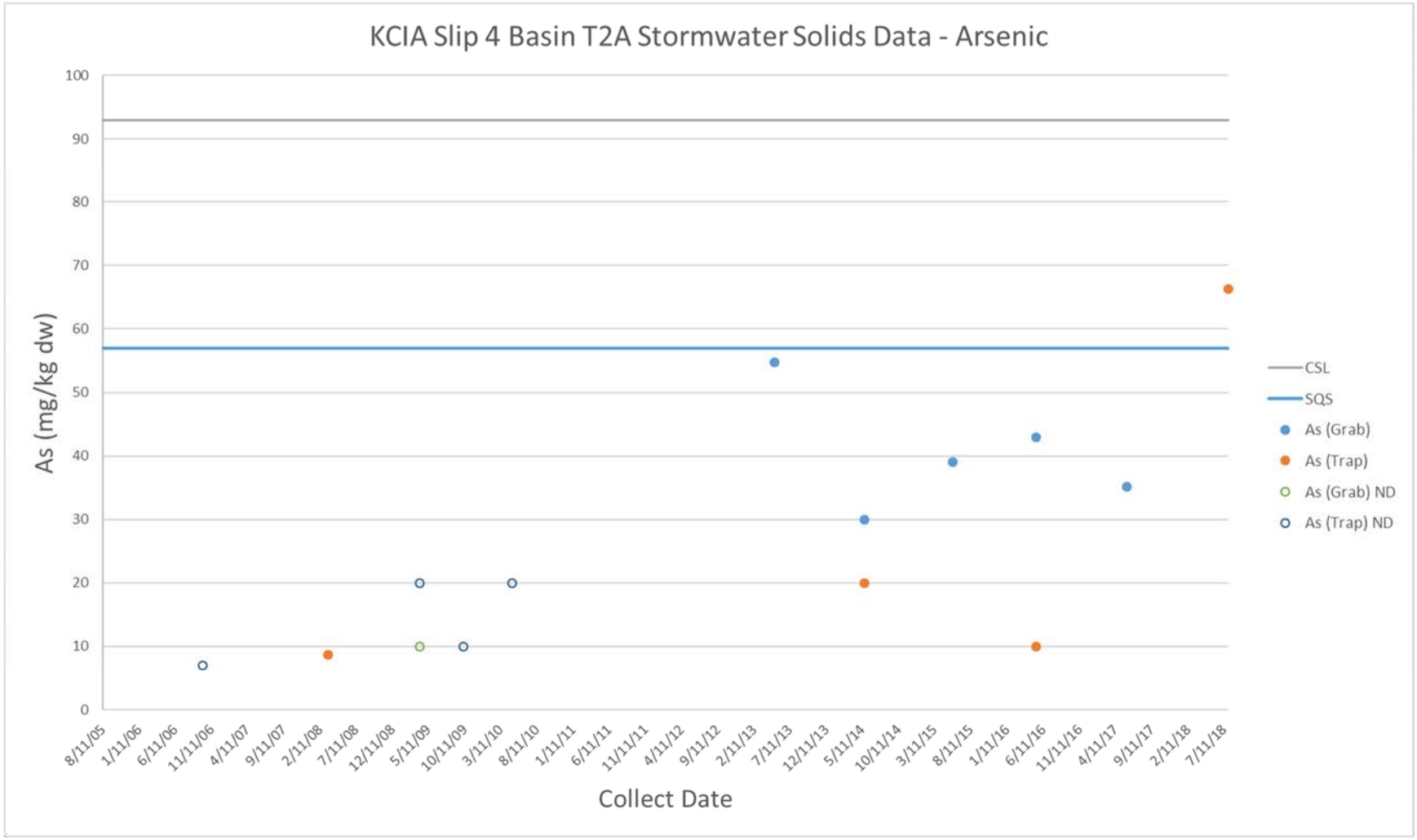

Figure D-1. KCIA Source Tracing Storm Solids Sampling for Arsenic Slip 4 T2A

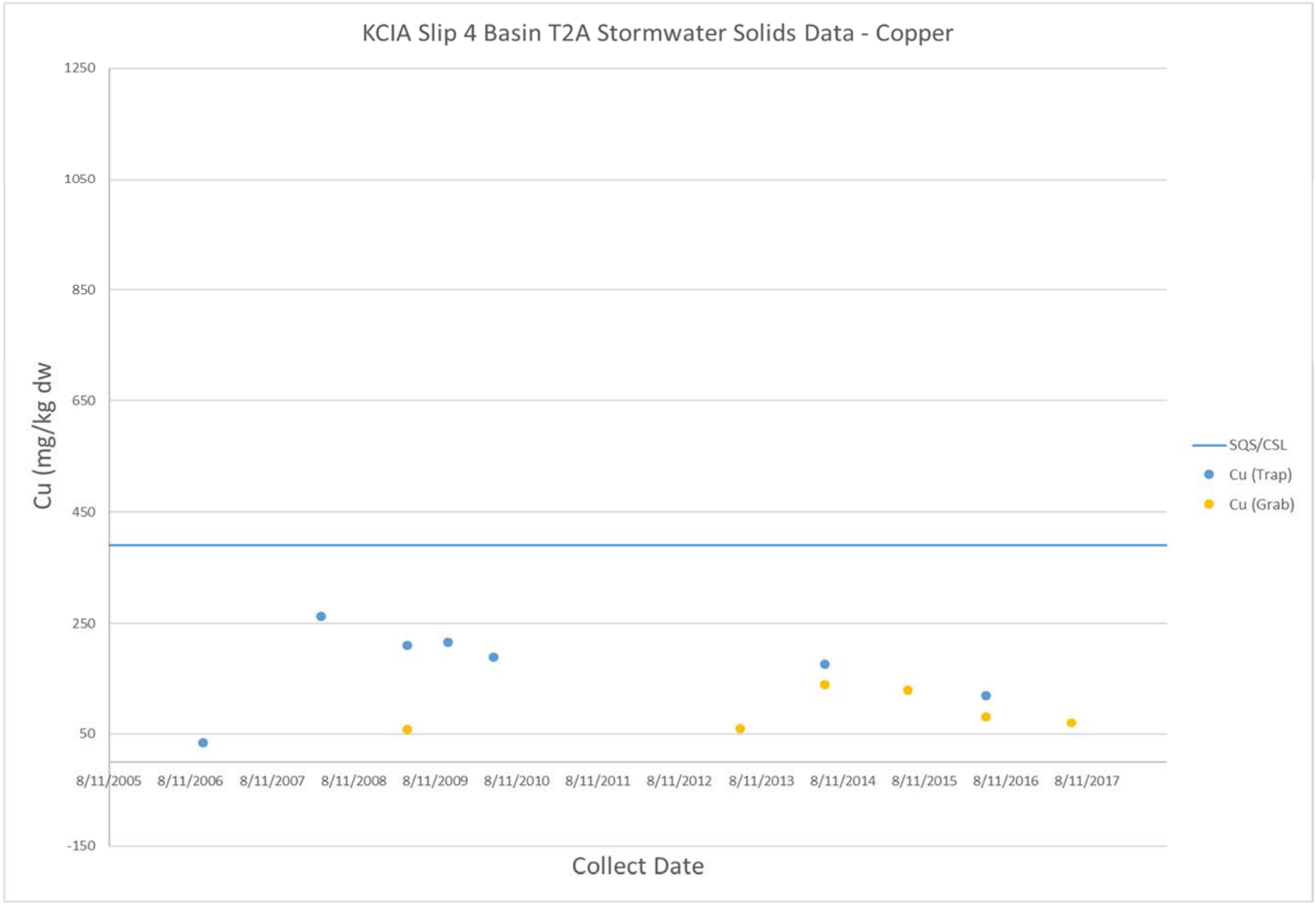

Figure D-2. KCIA Source Tracing Storm Solids Sampling for Copper Slip 4 T2A.

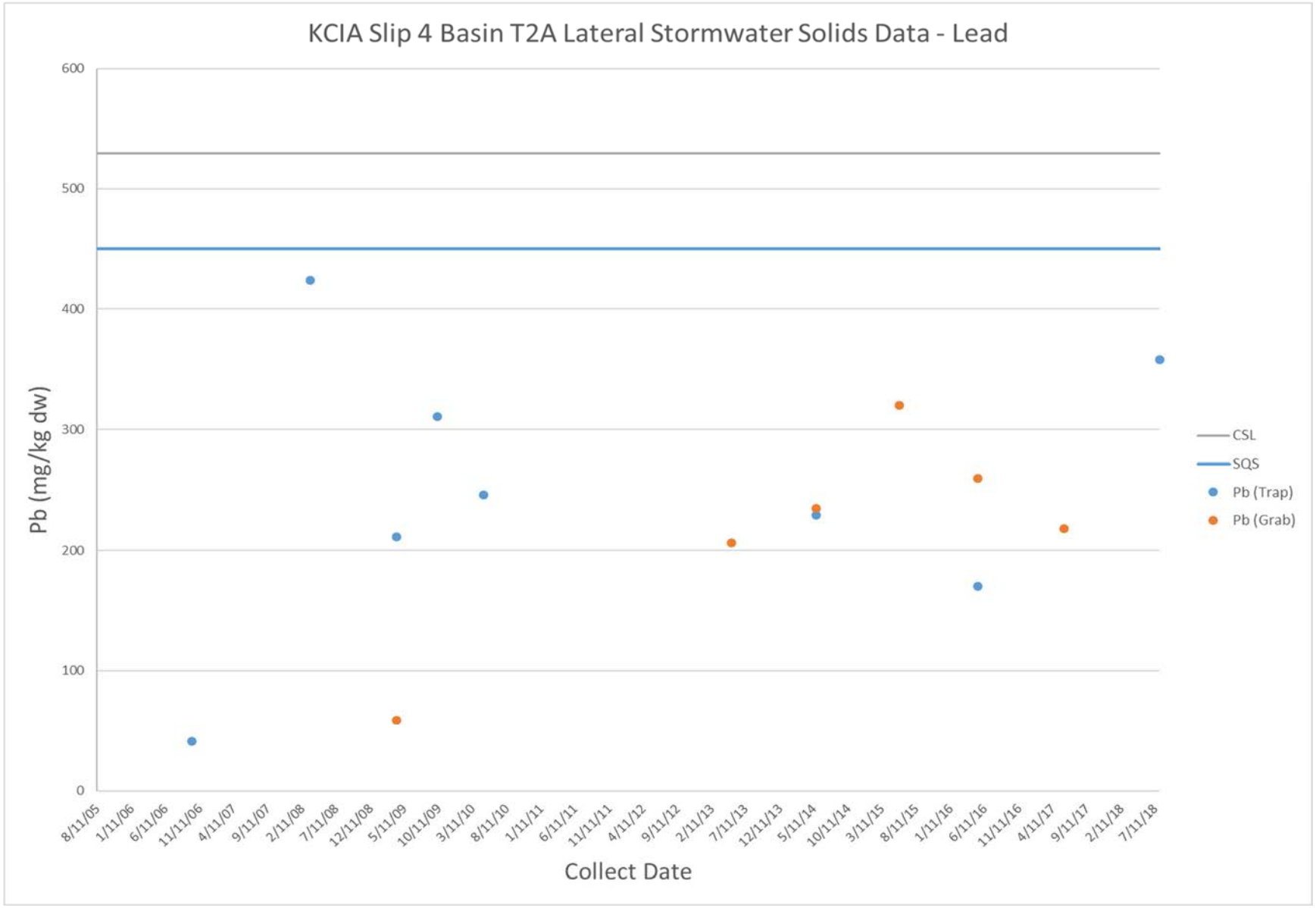

Figure D-3. KCIA Source Tracing Storm Solids Sampling for Lead Slip 4 T2A.

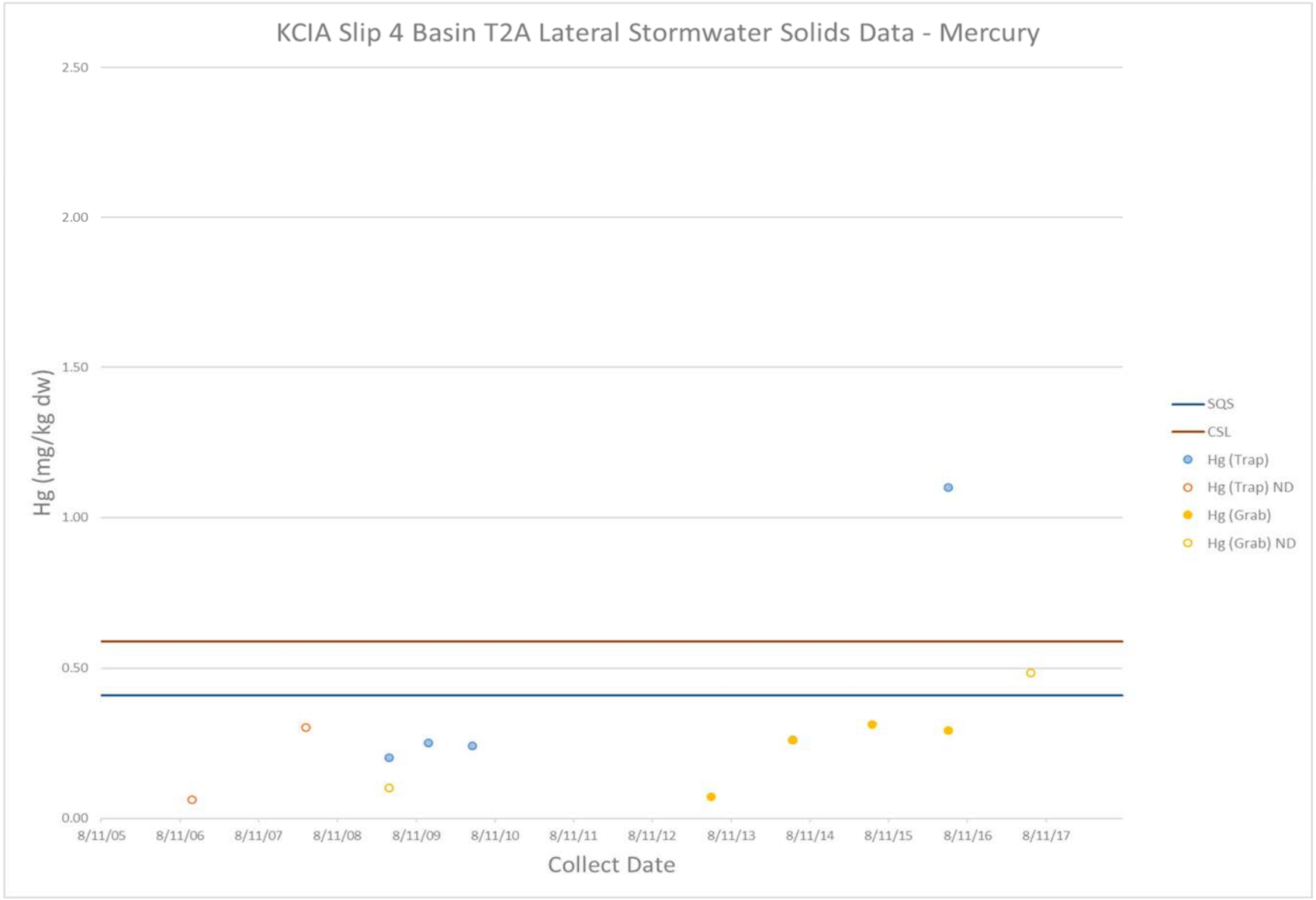

Figure D-4. KCIA Source Tracing Storm Solids Sampling for Mercury Slip 4 T2A.

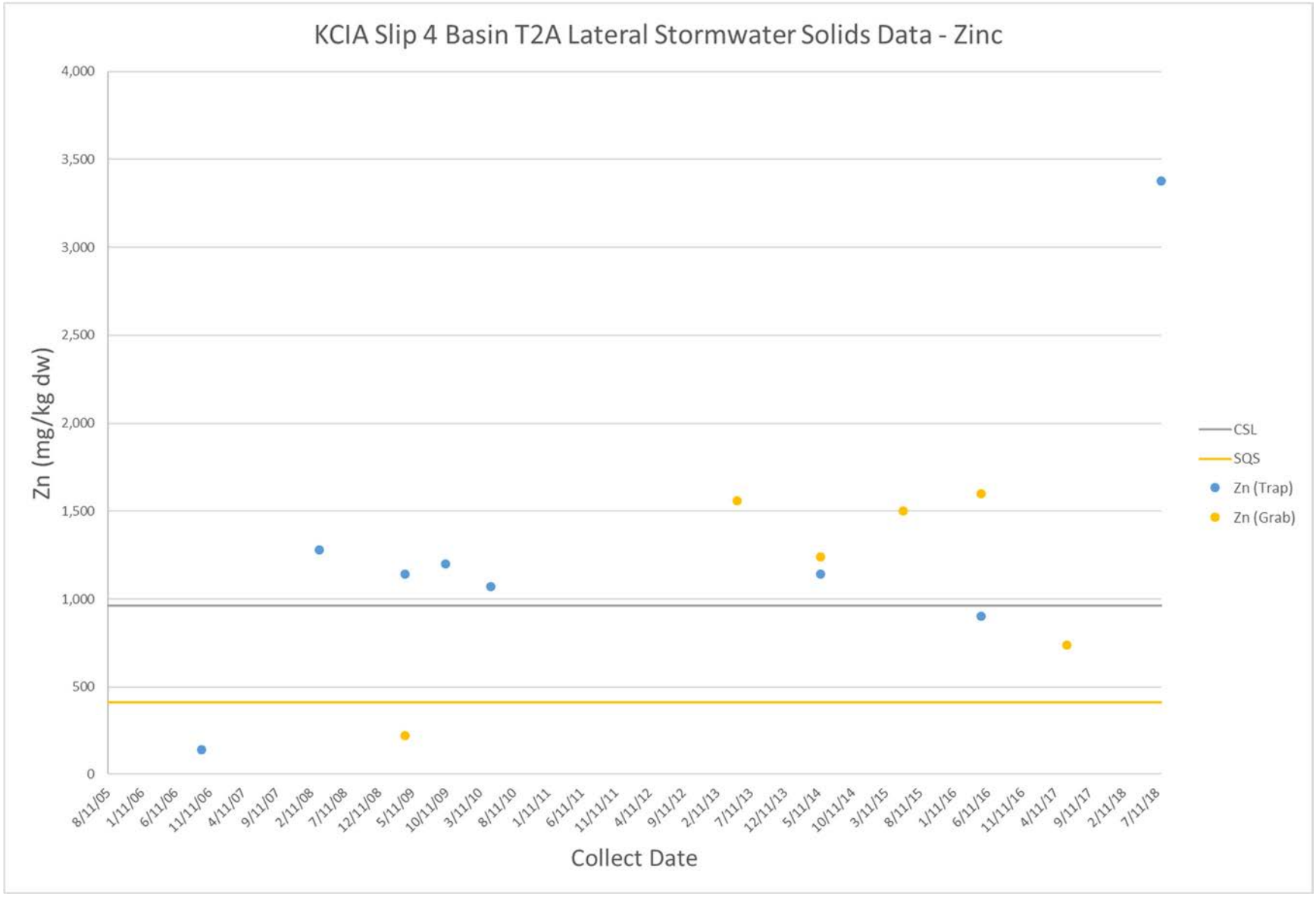

Figure D-5. KCIA Source Tracing Storm Solids Sampling for Zinc Slip 4 T2A.

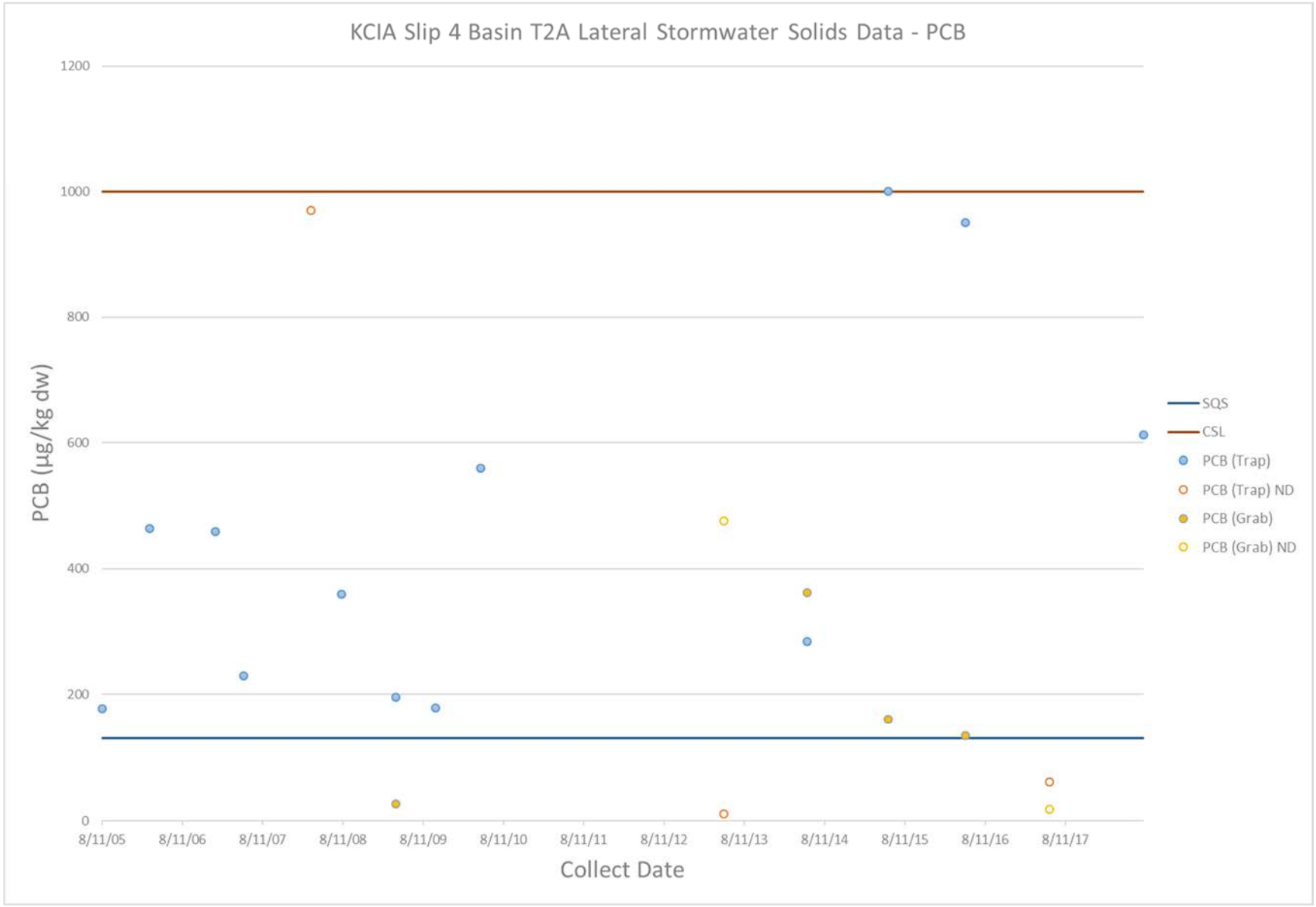

Figure D-6. KCIA Source Tracing Storm Solids Sampling for PCB Slip 4 T2A.

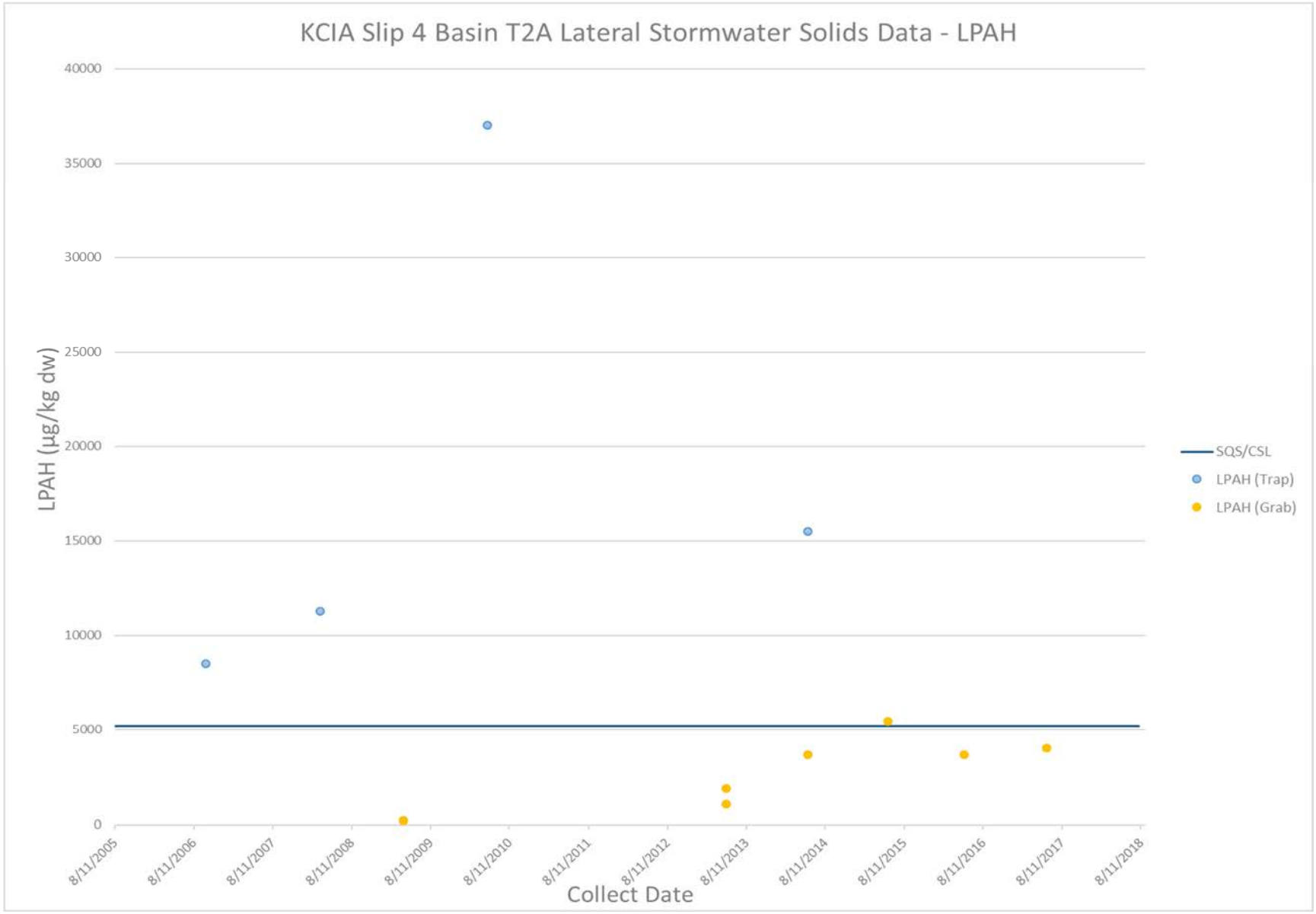

Figure D-7. KCIA Source Tracing Storm Solids Sampling for LPAH Slip 4 T2A.

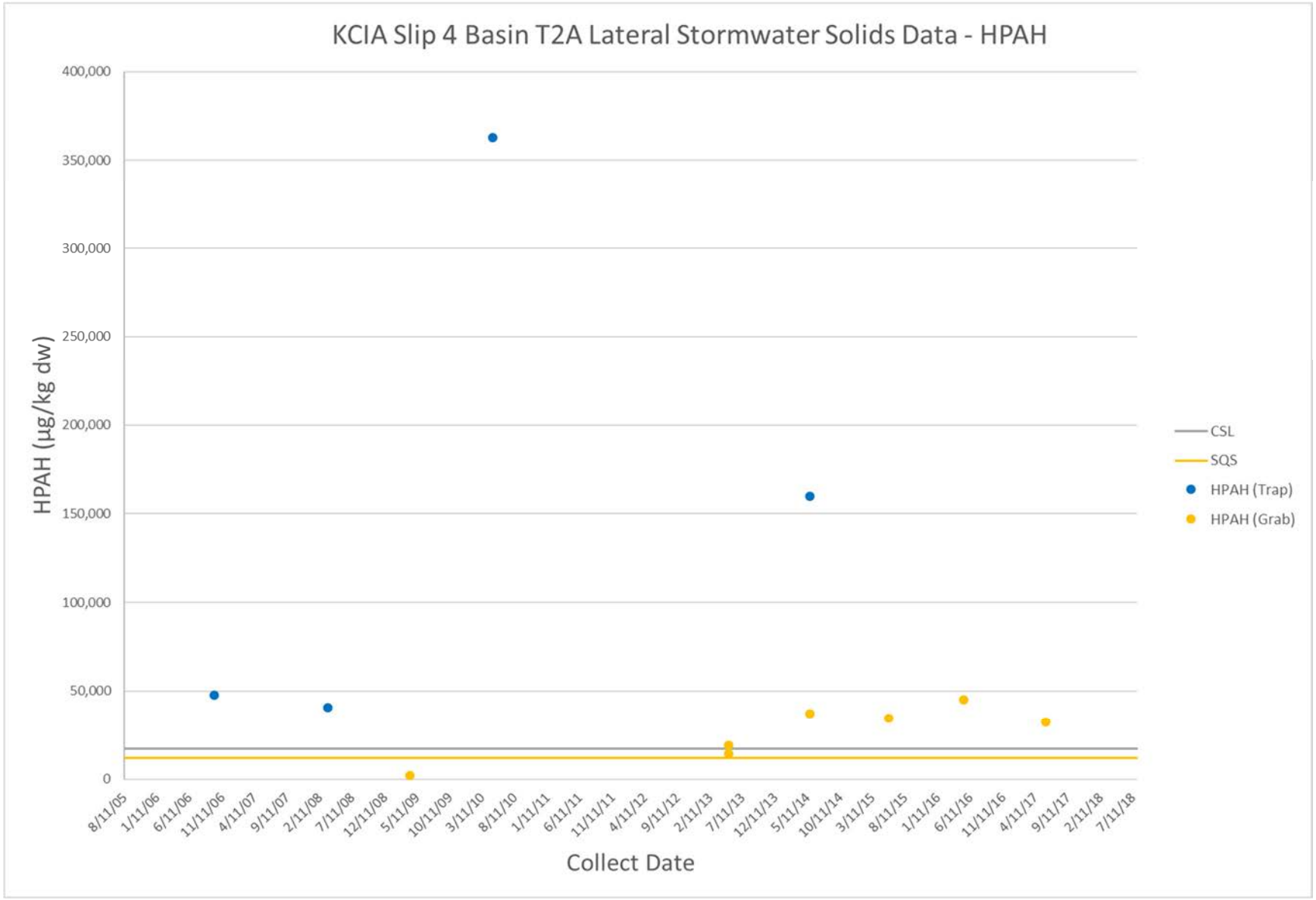

Figure D-8. KCIA Source Tracing Storm Solids Sampling for HPAH Slip 4 T2A.

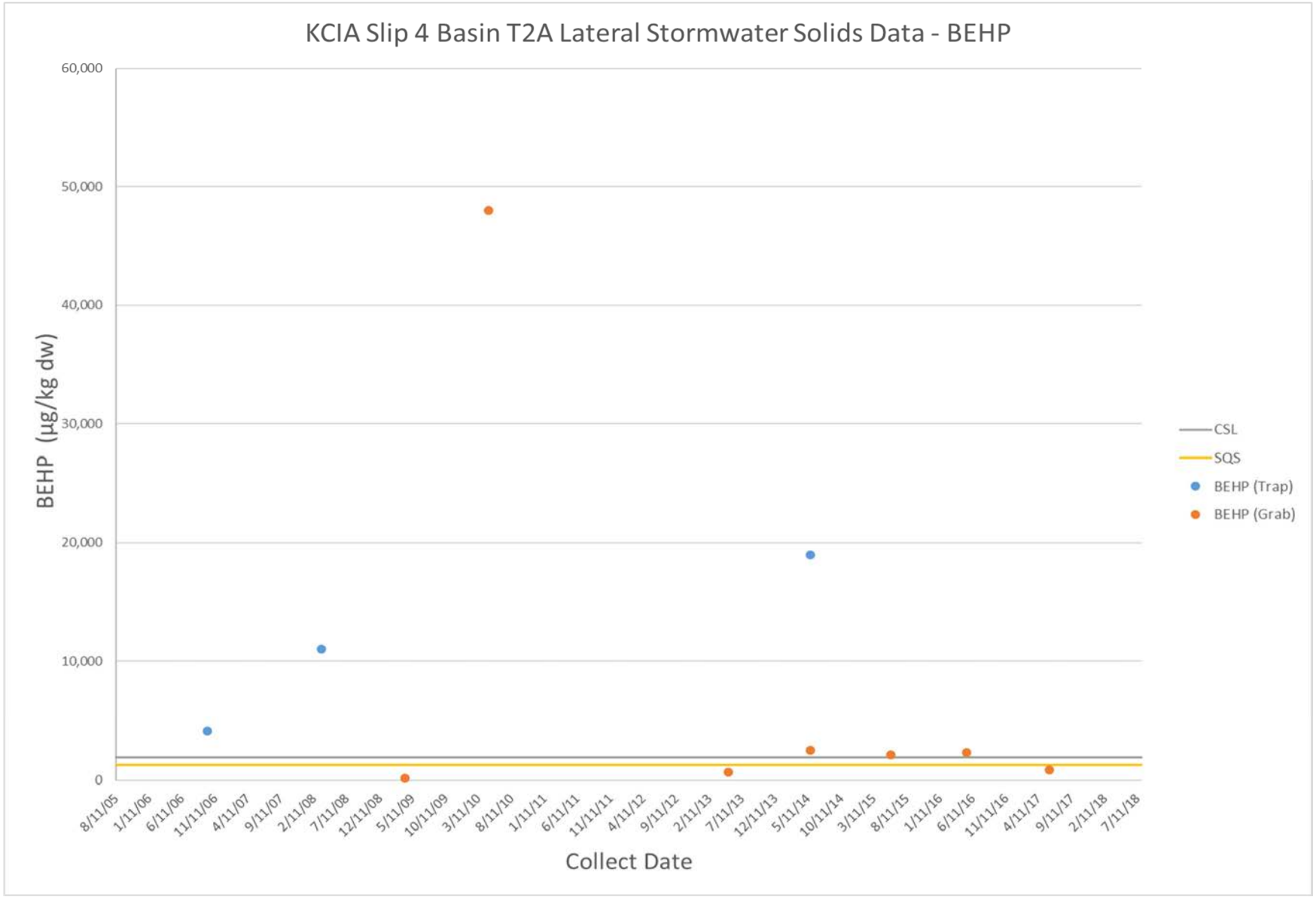

Figure D-9. KCIA Source Tracing Storm Solids Sampling for BEHP Slip 4 T2A.

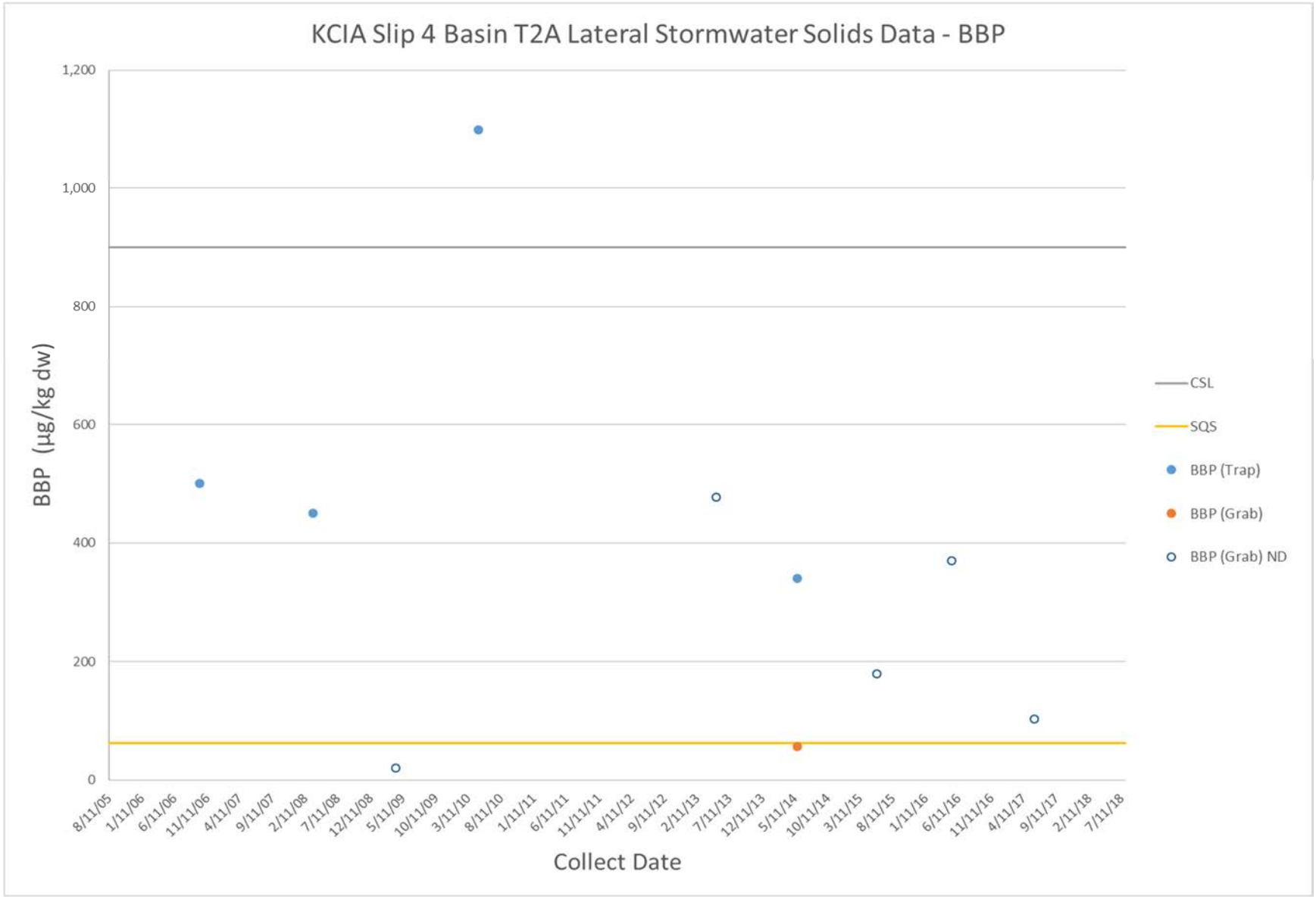

Figure D-10. KCIA Source Tracing Storm Solids Sampling for BBP Slip 4 T2A.

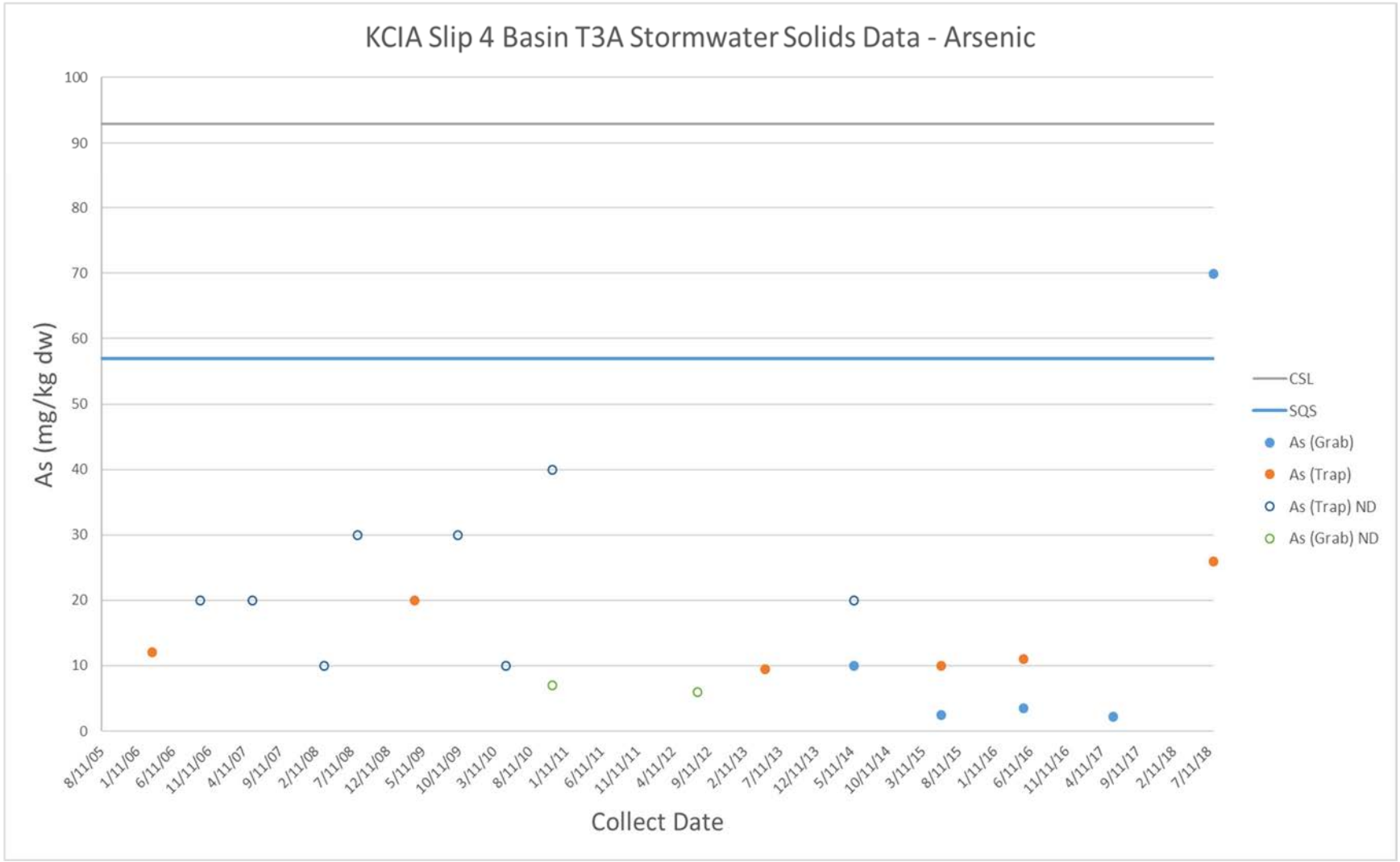

Figure D-11. KCIA Source Tracing Storm Solids Sampling for Arsenic Slip 4 T3A.

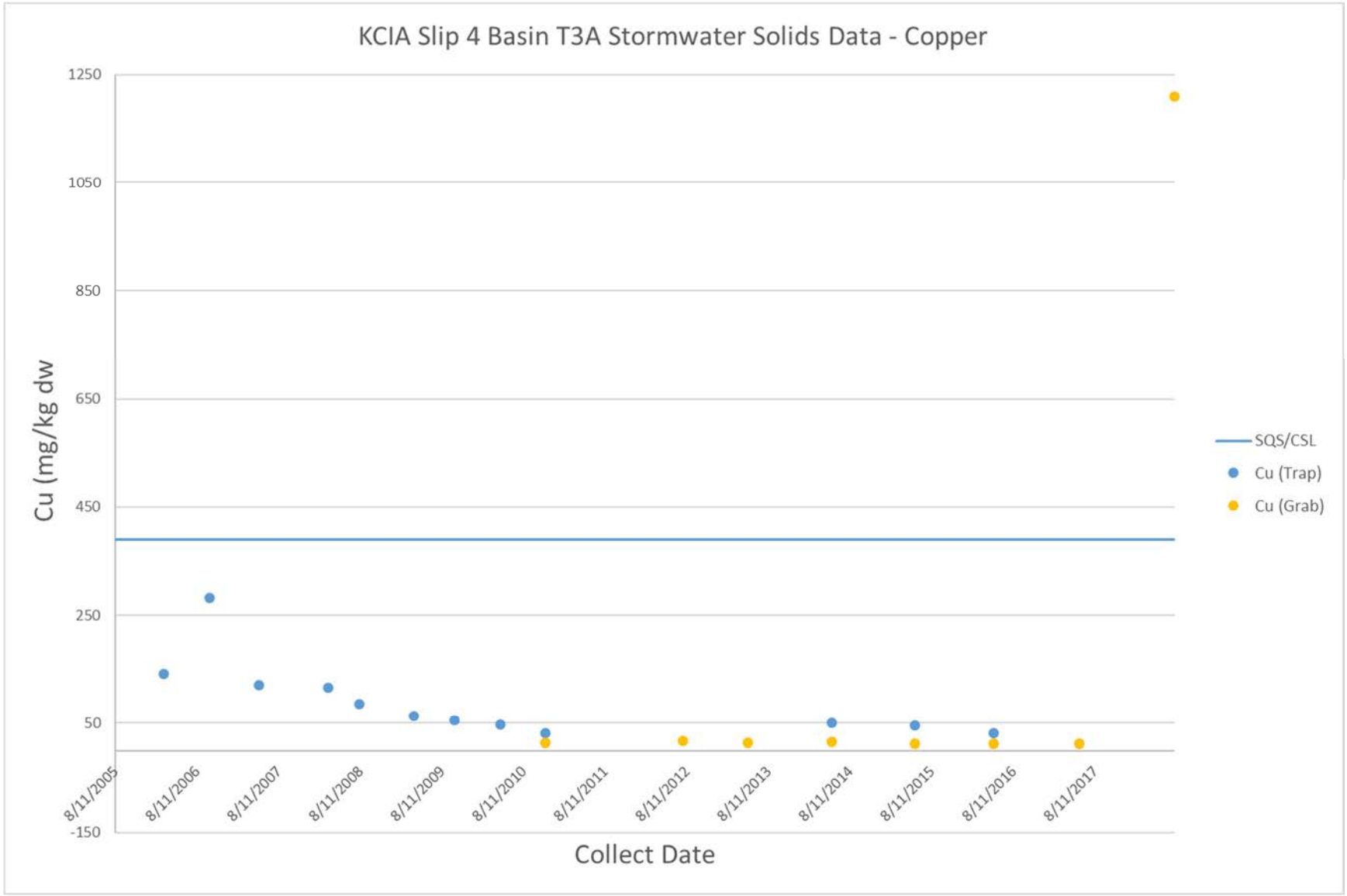

Figure D-12. KCIA Source Tracing Storm Solids Sampling for Copper Slip 4 T3A.

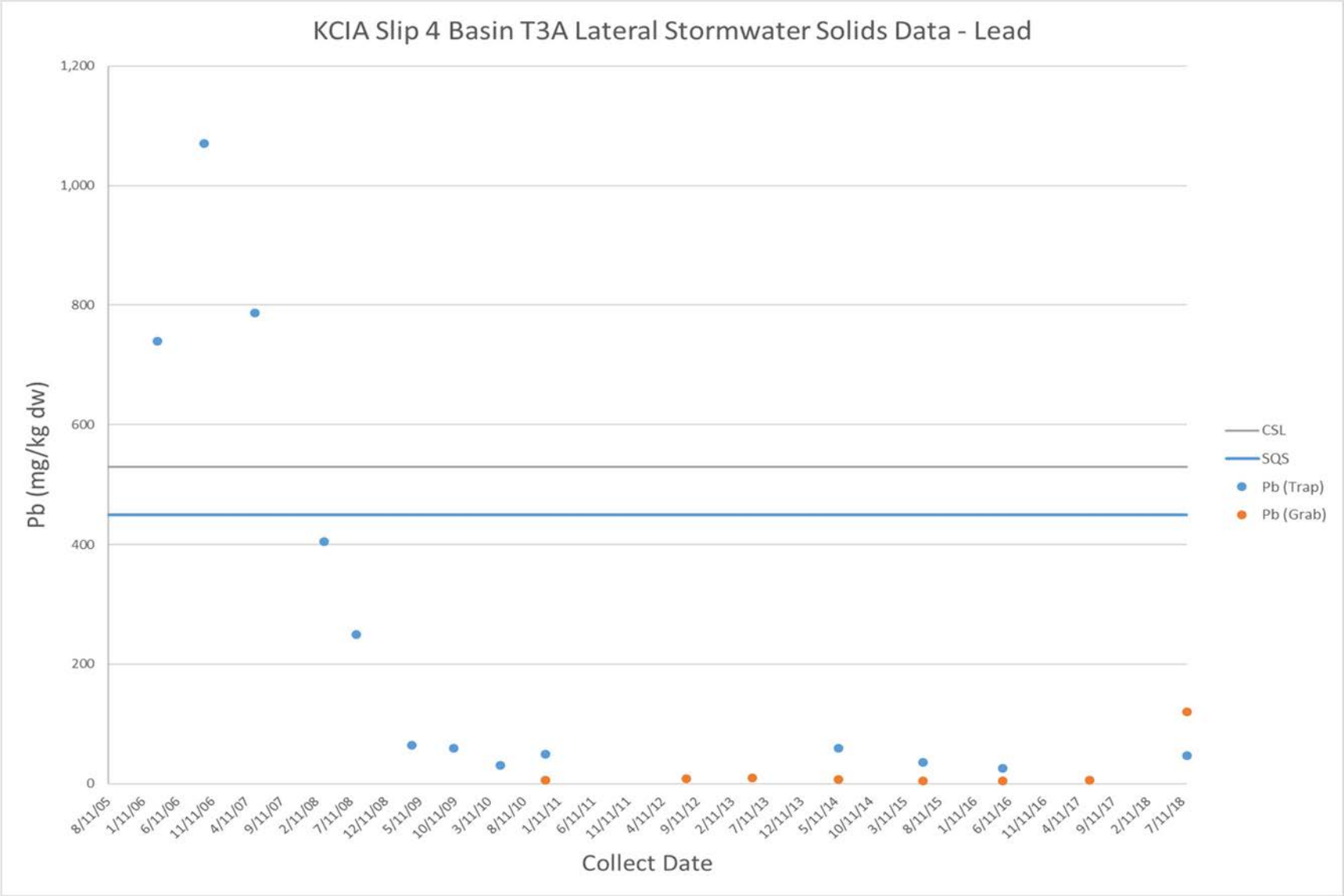

Figure D-13. KCIA Source Tracing Storm Solids Sampling for Lead Slip 4 T3A.

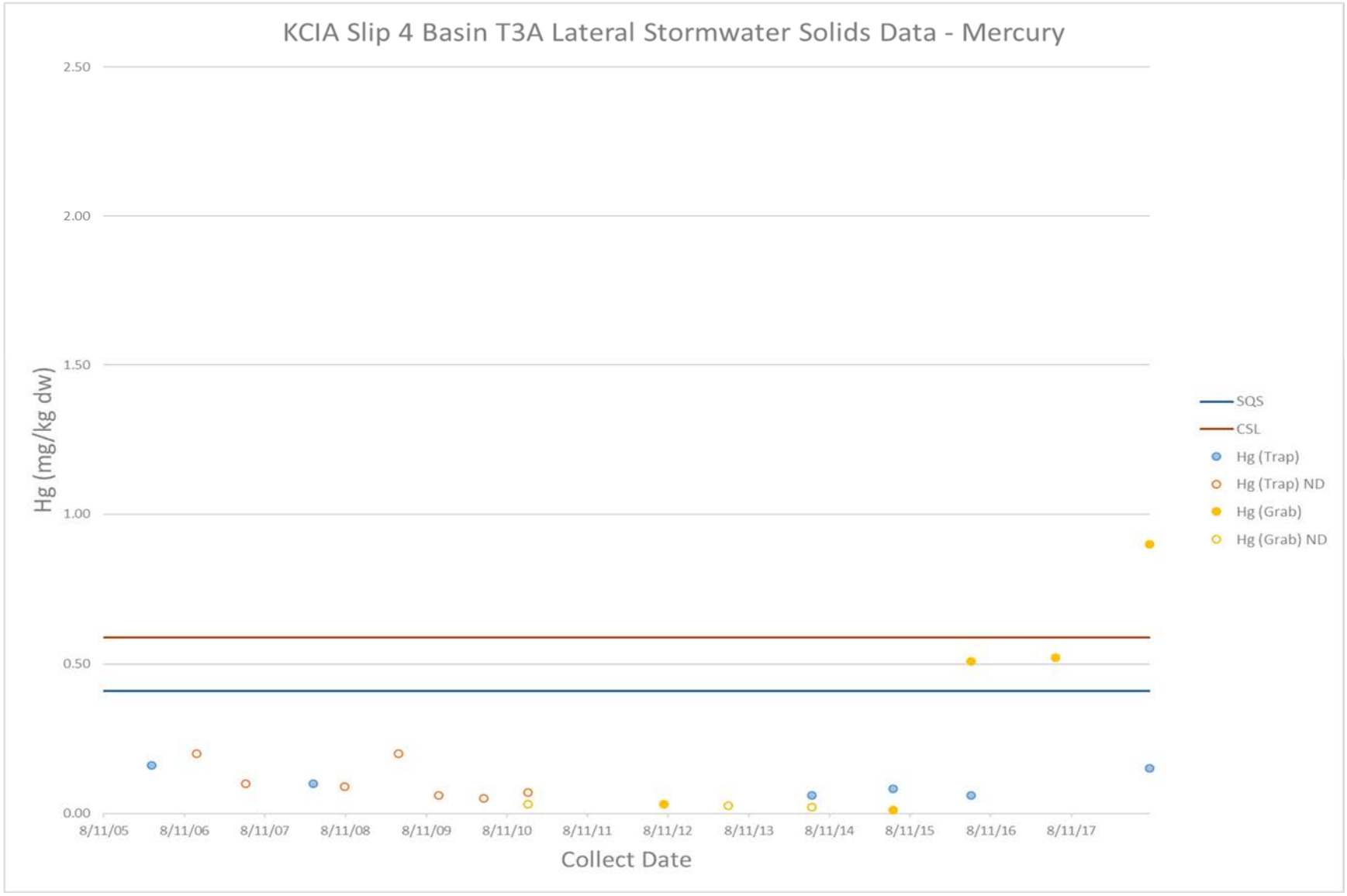

Figure D-14. KCIA Source Tracing Storm Solids Sampling for Mercury Slip 4 T3A.

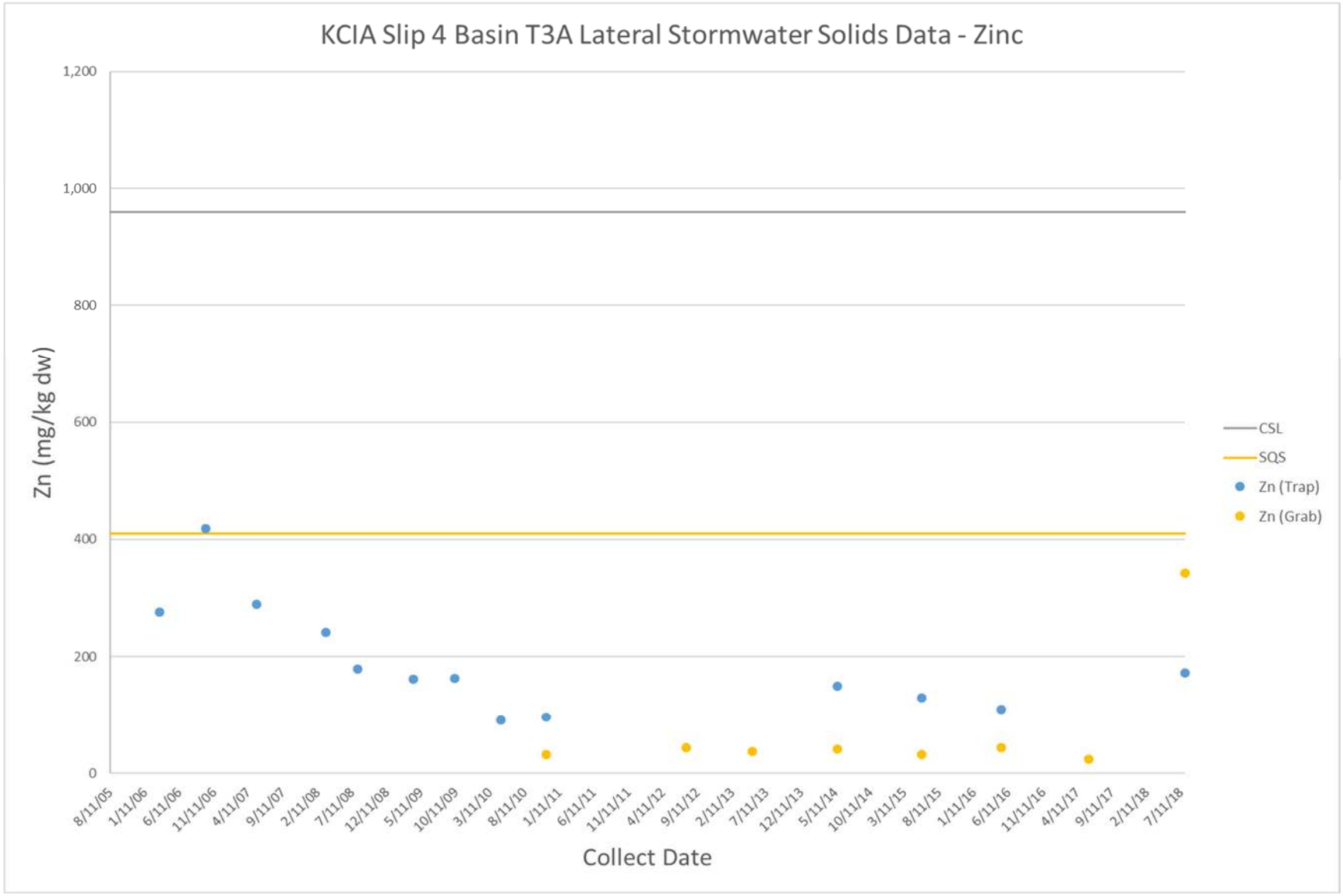

Figure D-15. KCIA Source Tracing Storm Solids Sampling for Zinc Slip 4 T3A.

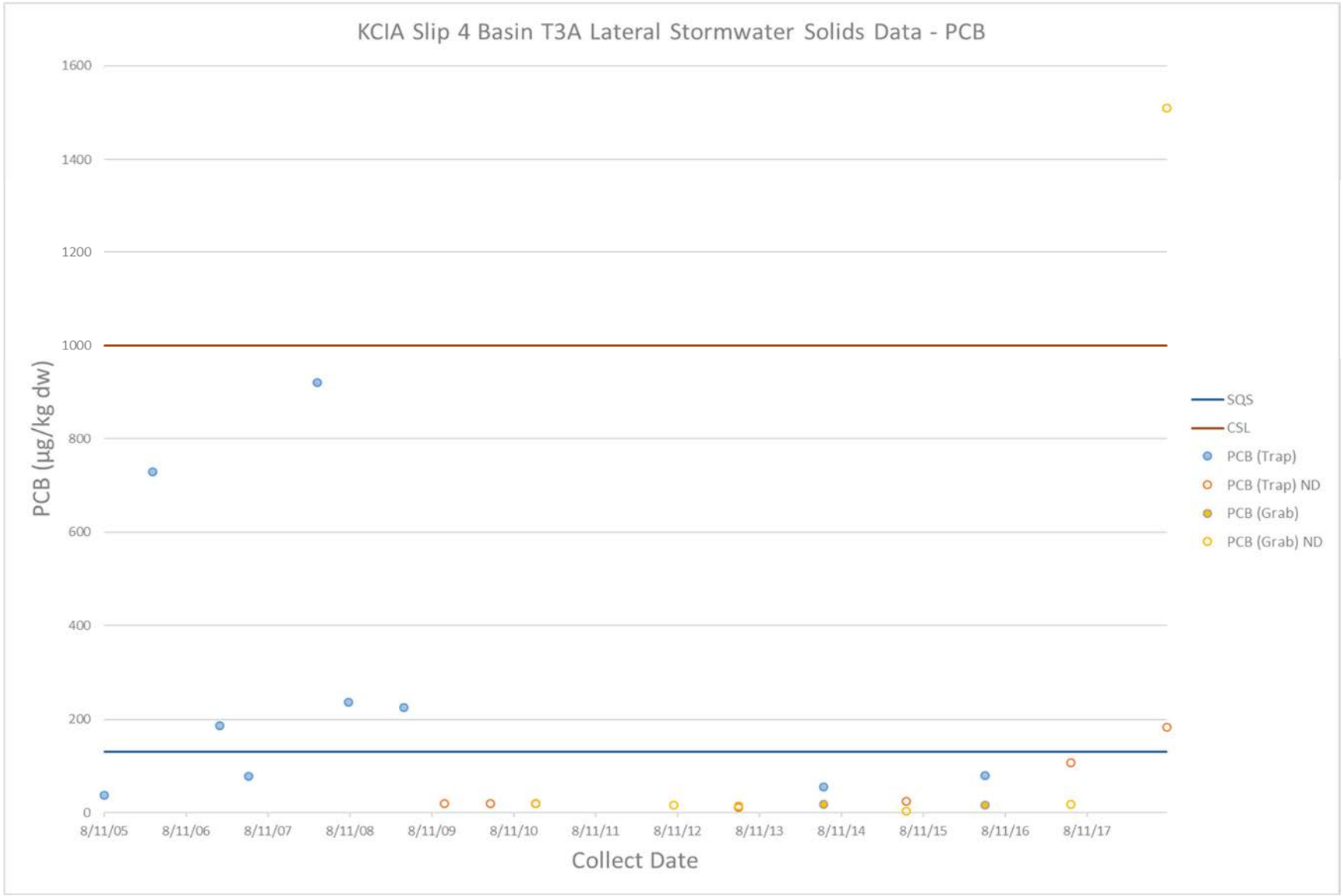

Figure D-16. KCIA Source Tracing Storm Solids Sampling for PCB Slip 4 T3A.

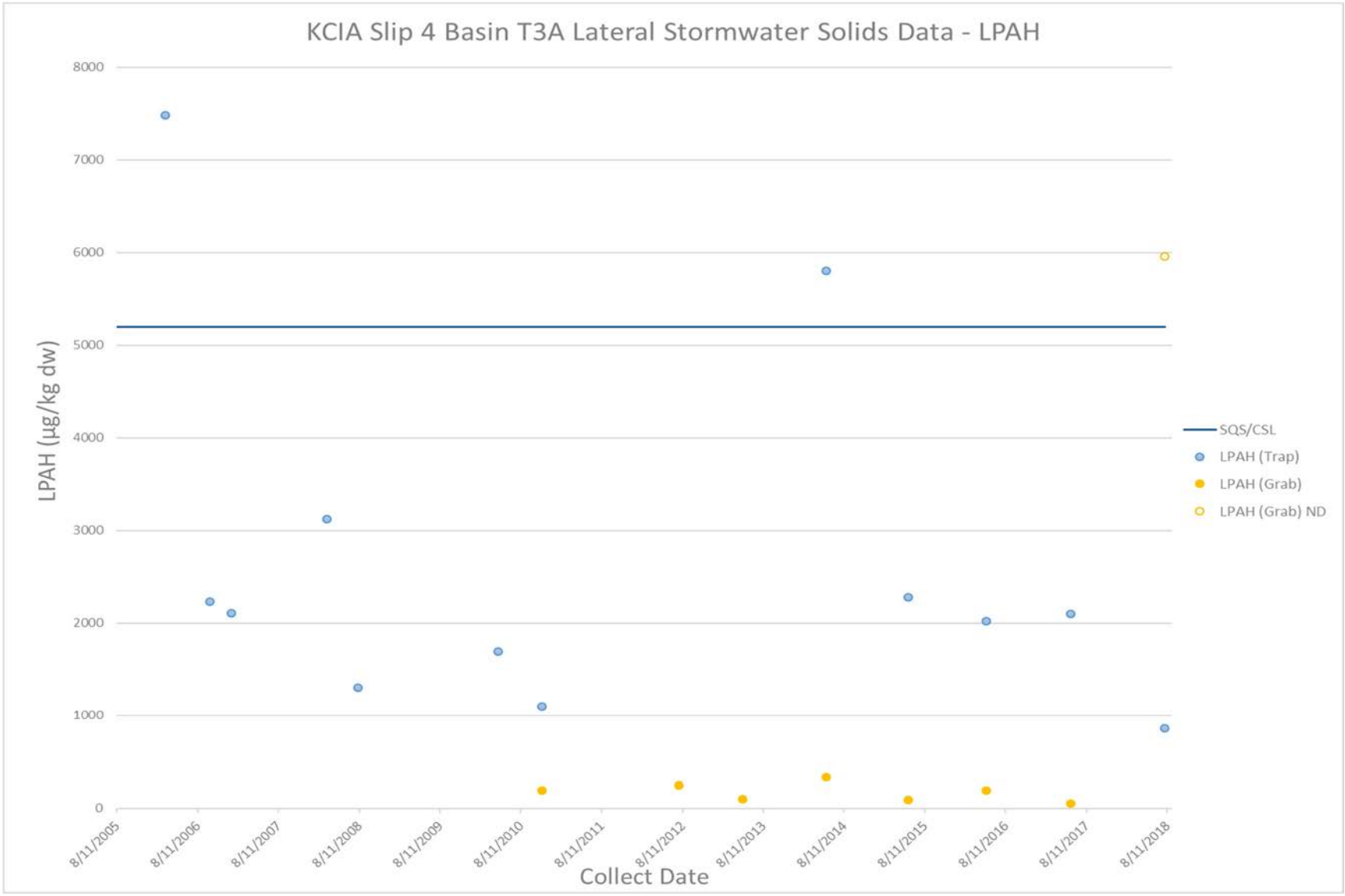

Figure D-17. KCIA Source Tracing Storm Solids Sampling for LPAH Slip 4 T3A.

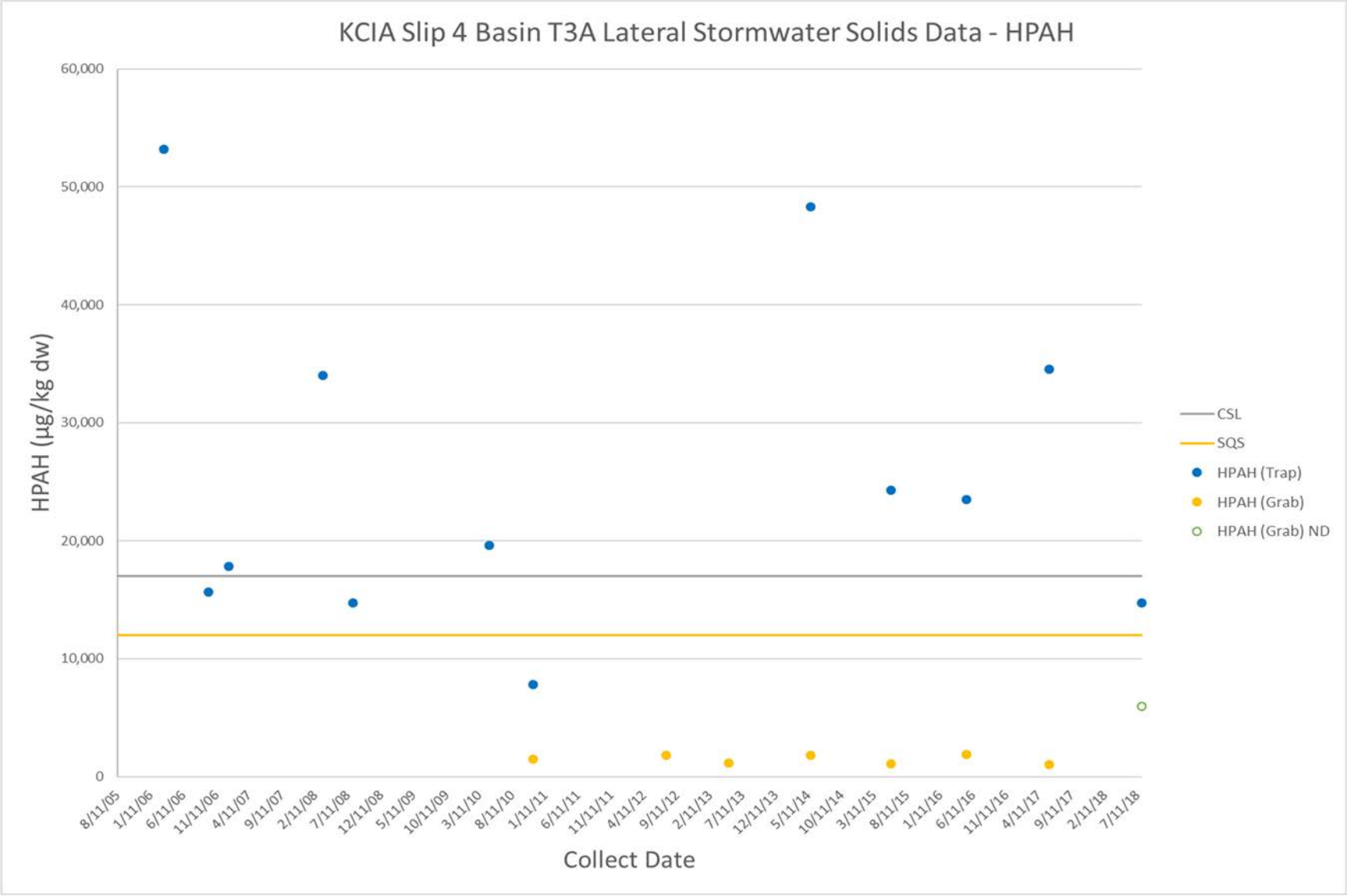

Figure D-18. KCIA Source Tracing Storm Solids Sampling for HPAH Slip 4 T3A.

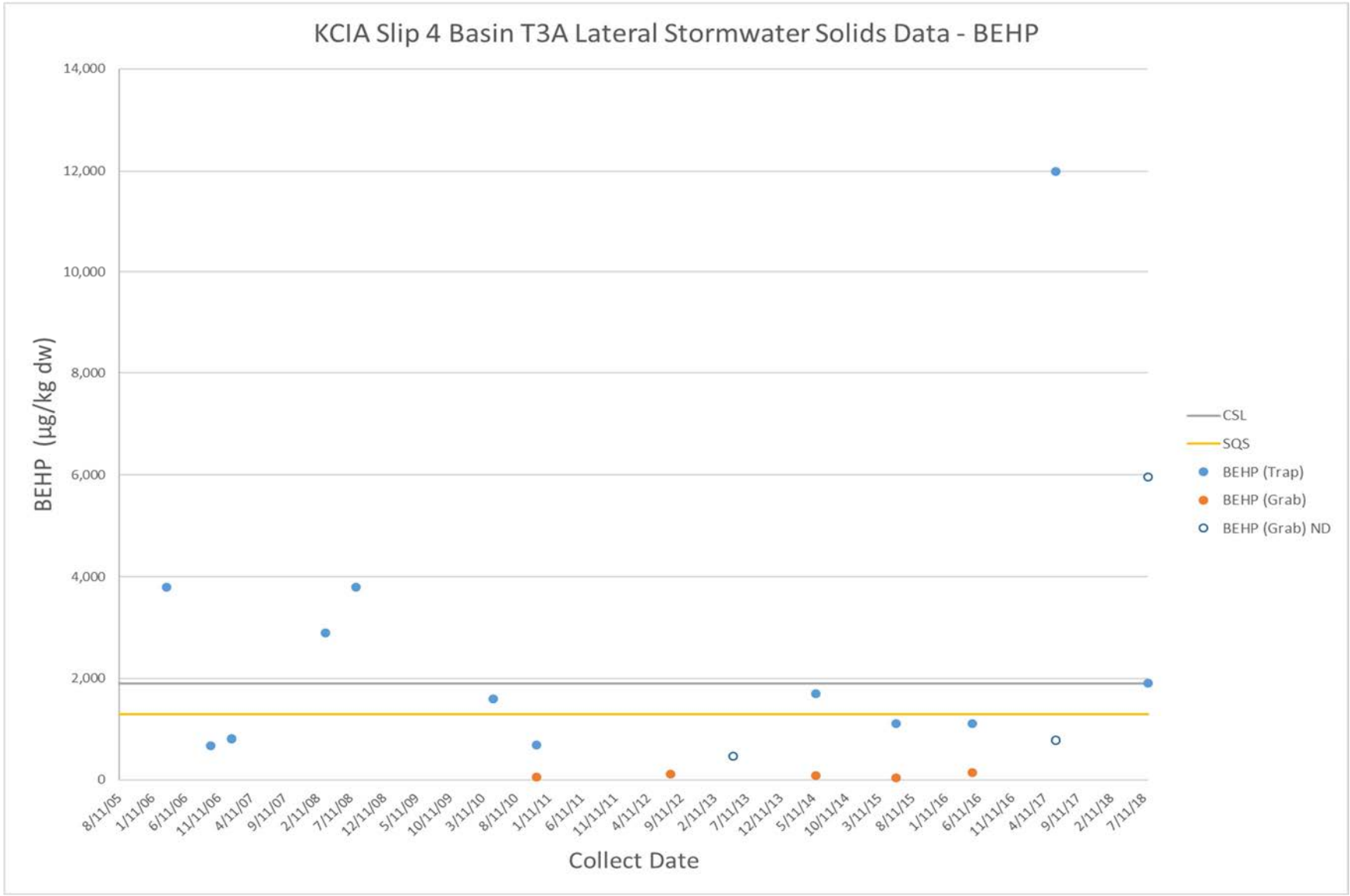

Figure D-19. KCIA Source Tracing Storm Solids Sampling for BEHP Slip 4 T3A.

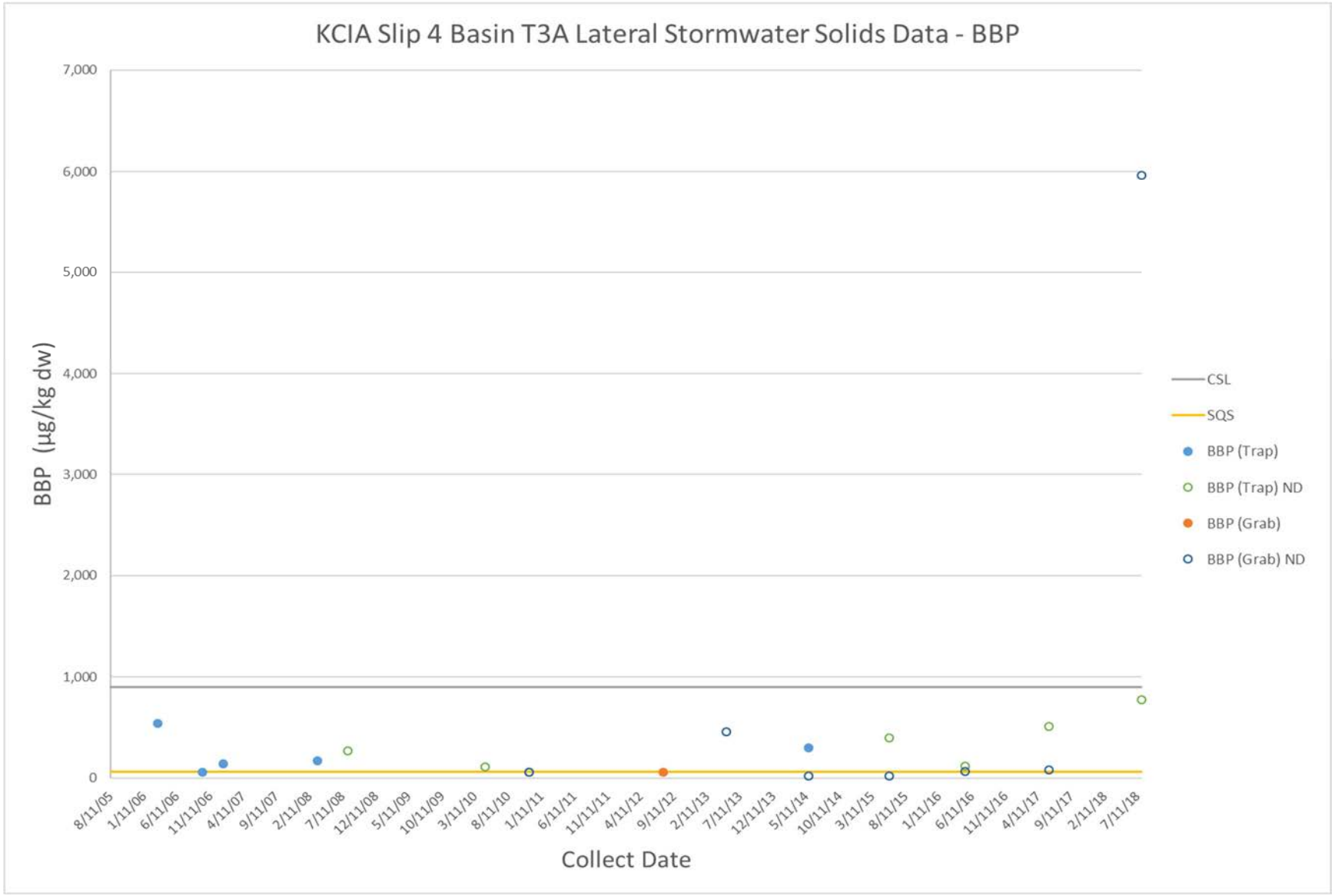

Figure D-20. KCIA Source Tracing Storm Solids Sampling for BBP Slip 4 T3A.

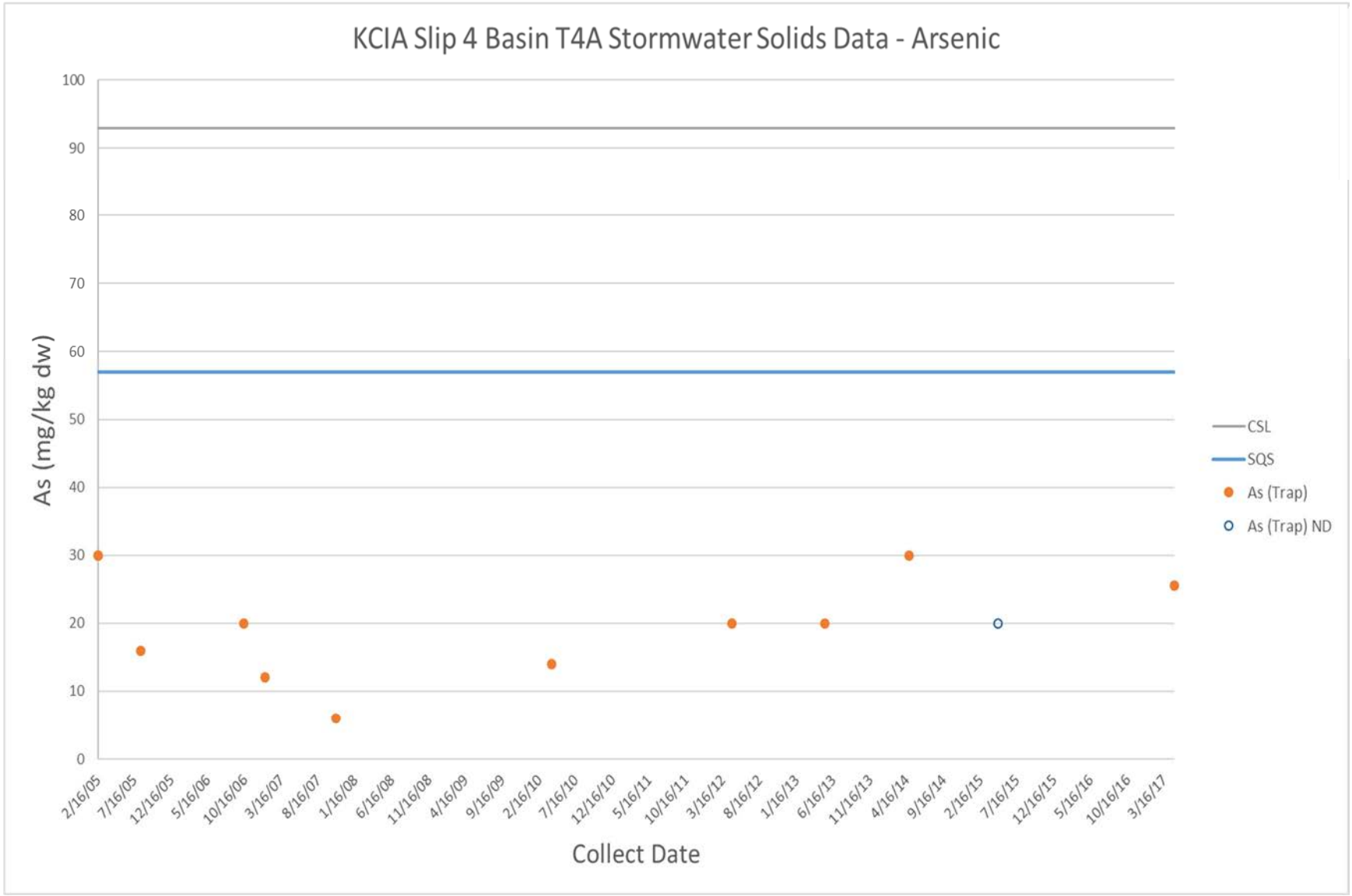

Figure D-21. KCIA Source Tracing Storm Solids Sampling for Arsenic Slip 4 T4A.

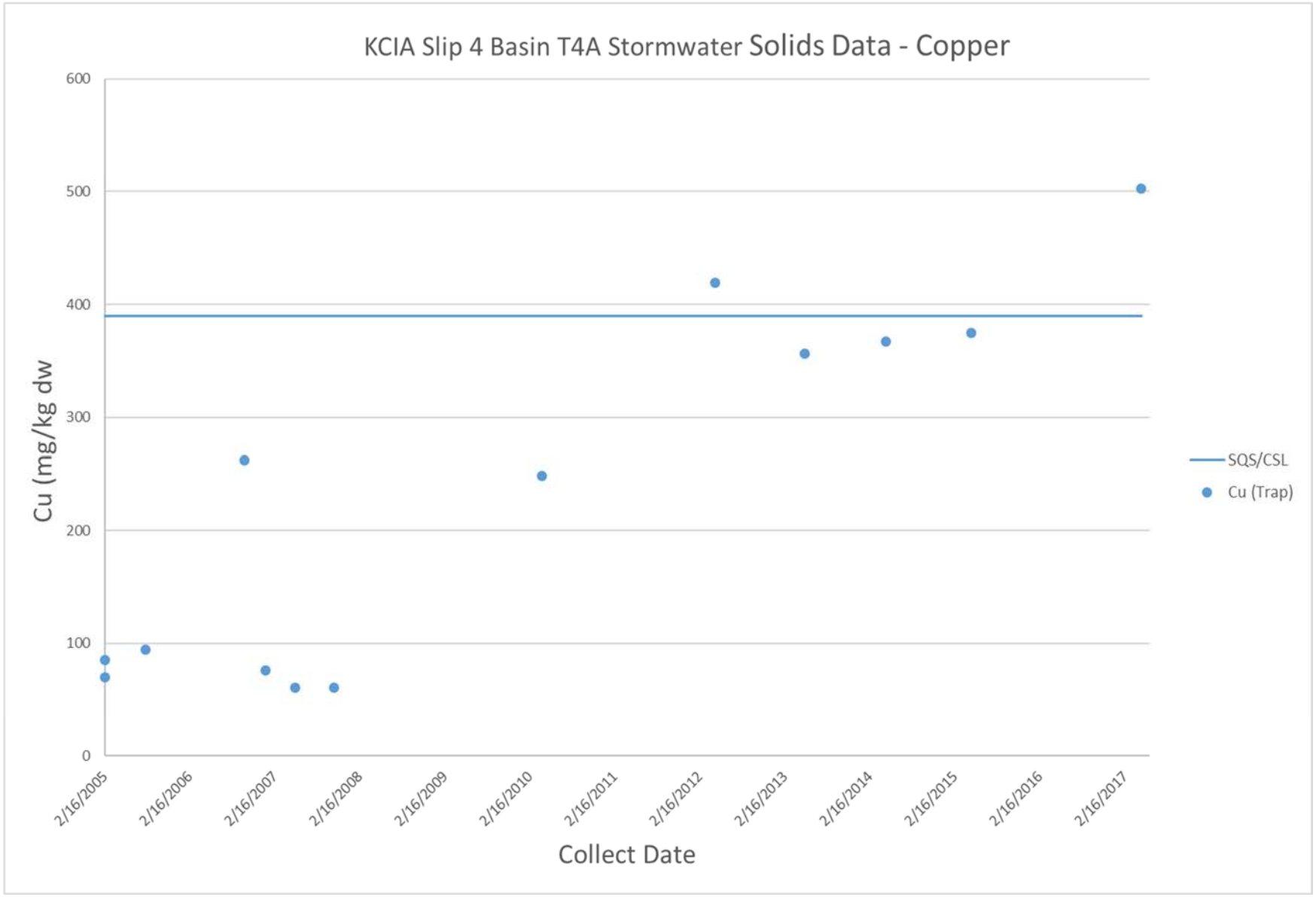

Figure D-22. KCIA Source Tracing Storm Solids Sampling for Copper Slip 4 T4A.

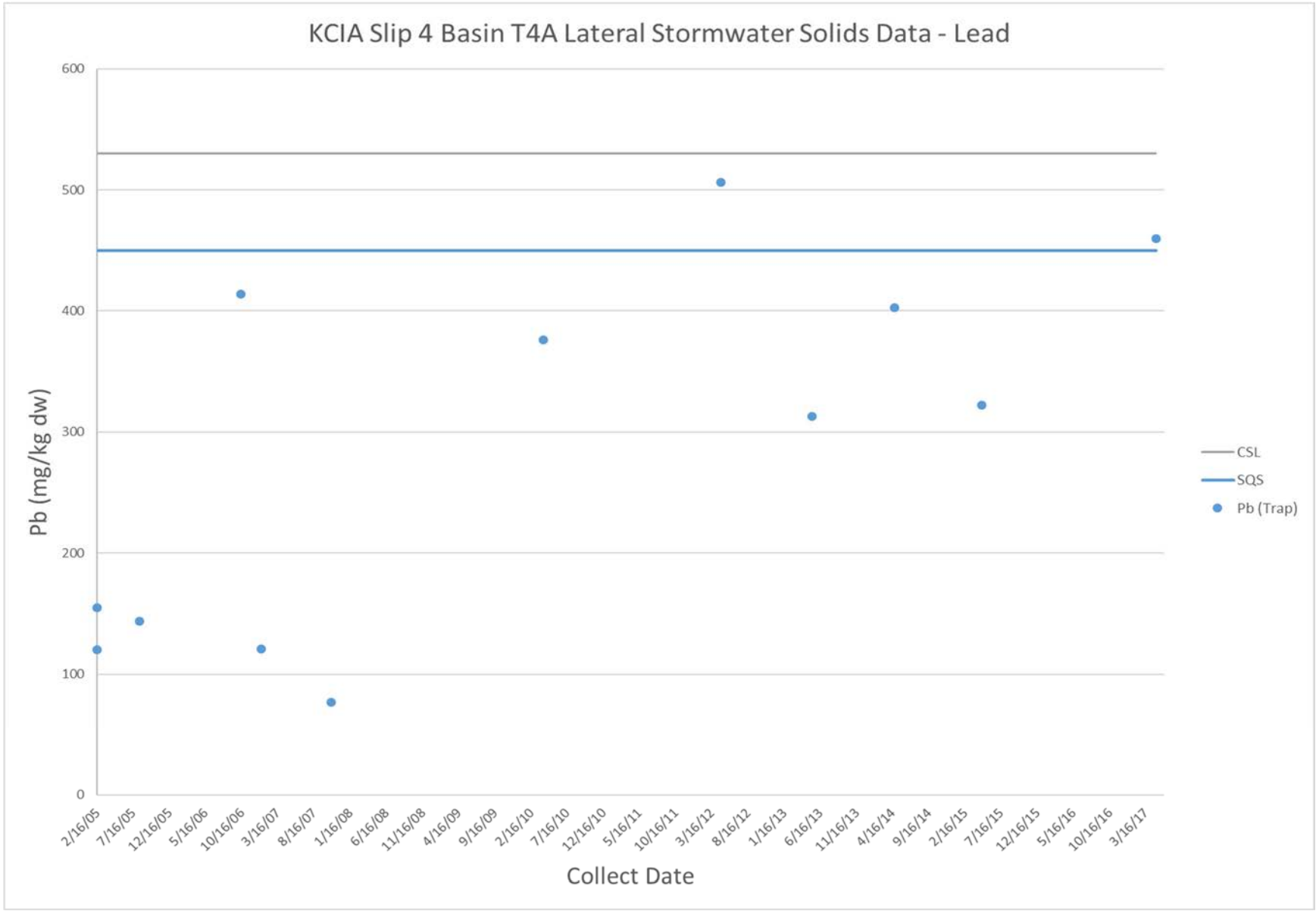

Figure D-23. KCIA Source Tracing Storm Solids Sampling for Lead Slip 4 T4A.

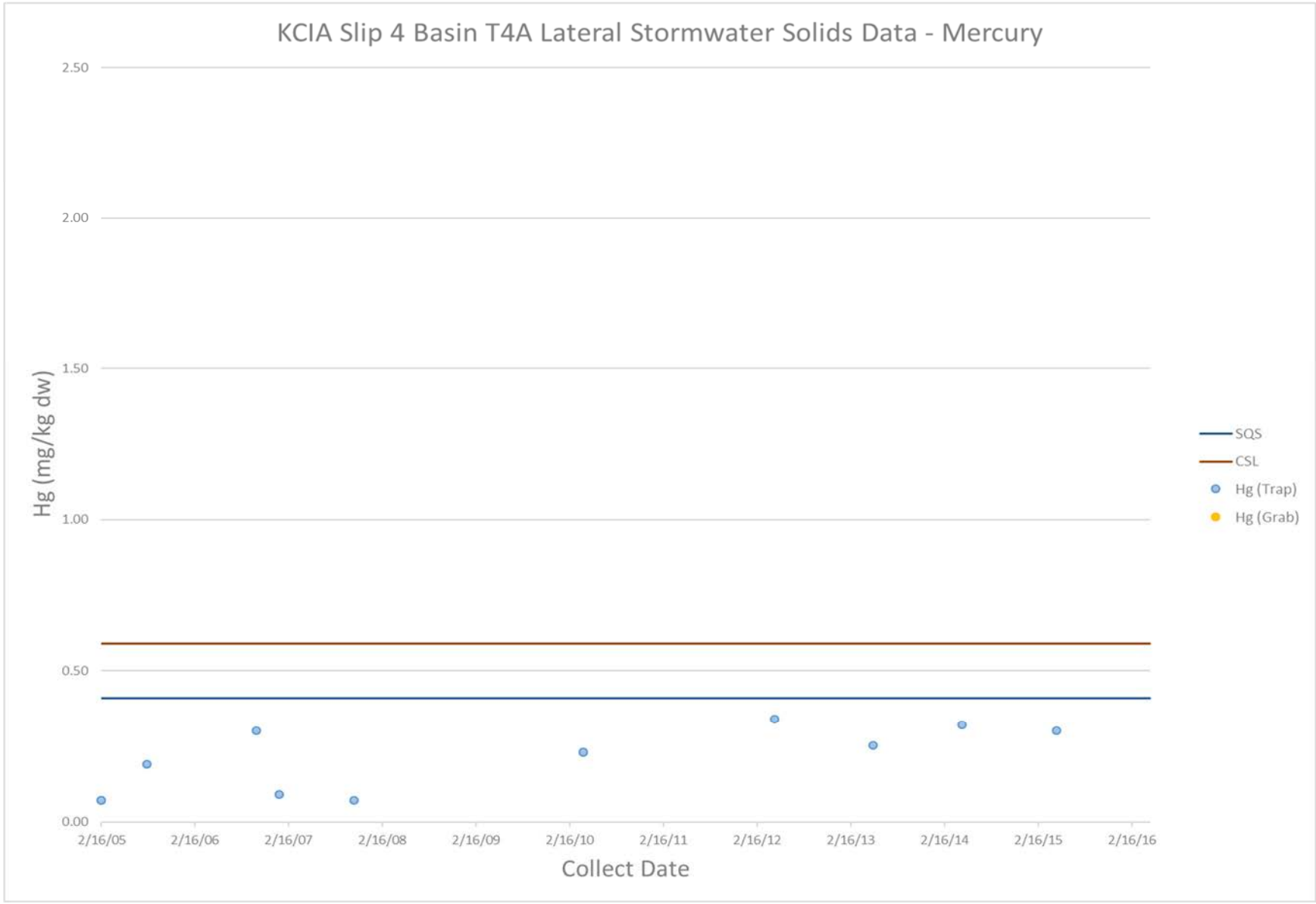

Figure D-24. KCIA Source Tracing Storm Solids Sampling for Mercury Slip 4 T4A.

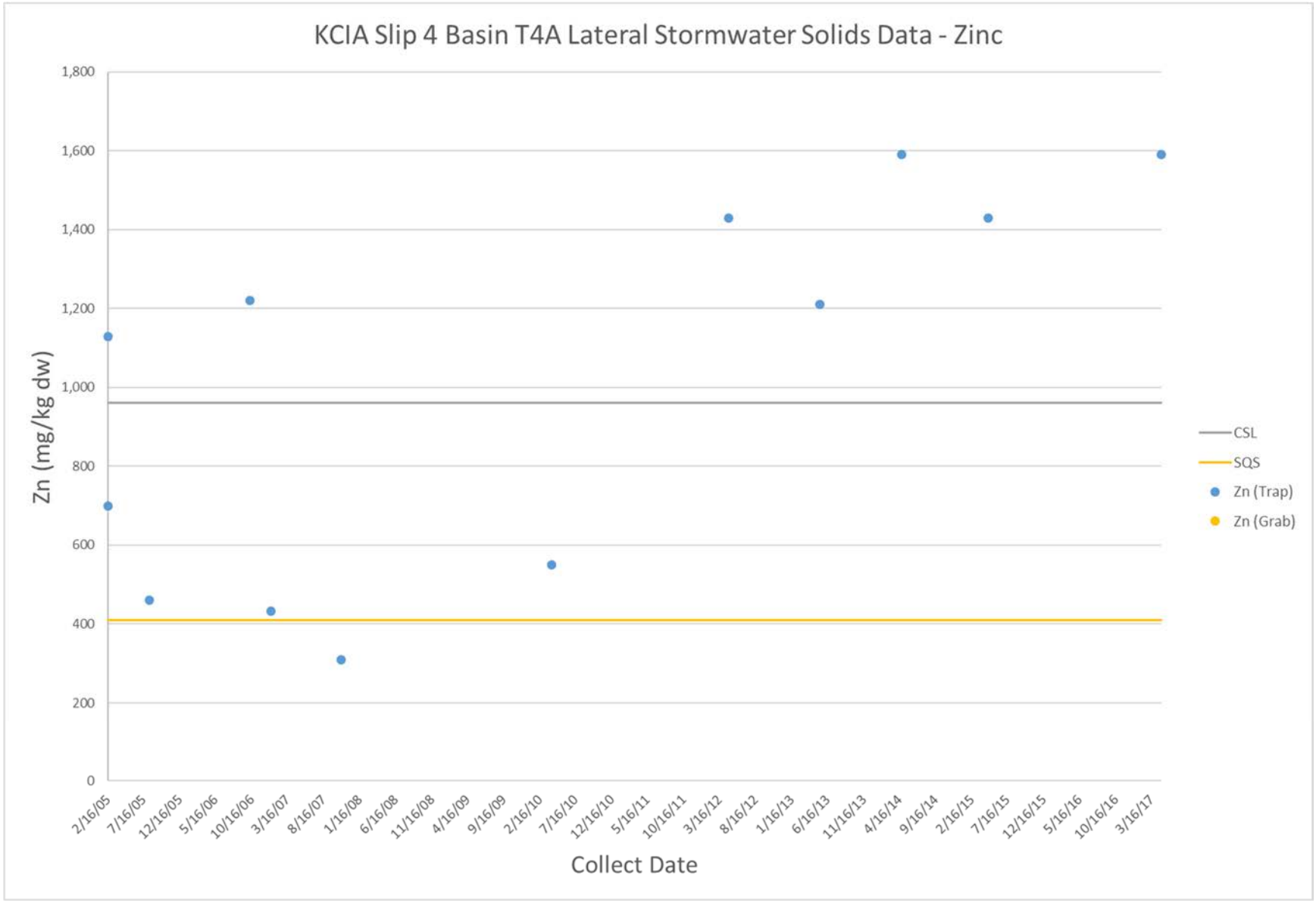

Figure D-25. KCIA Source Tracing Storm Solids Sampling for Zinc Slip 4 T4A.

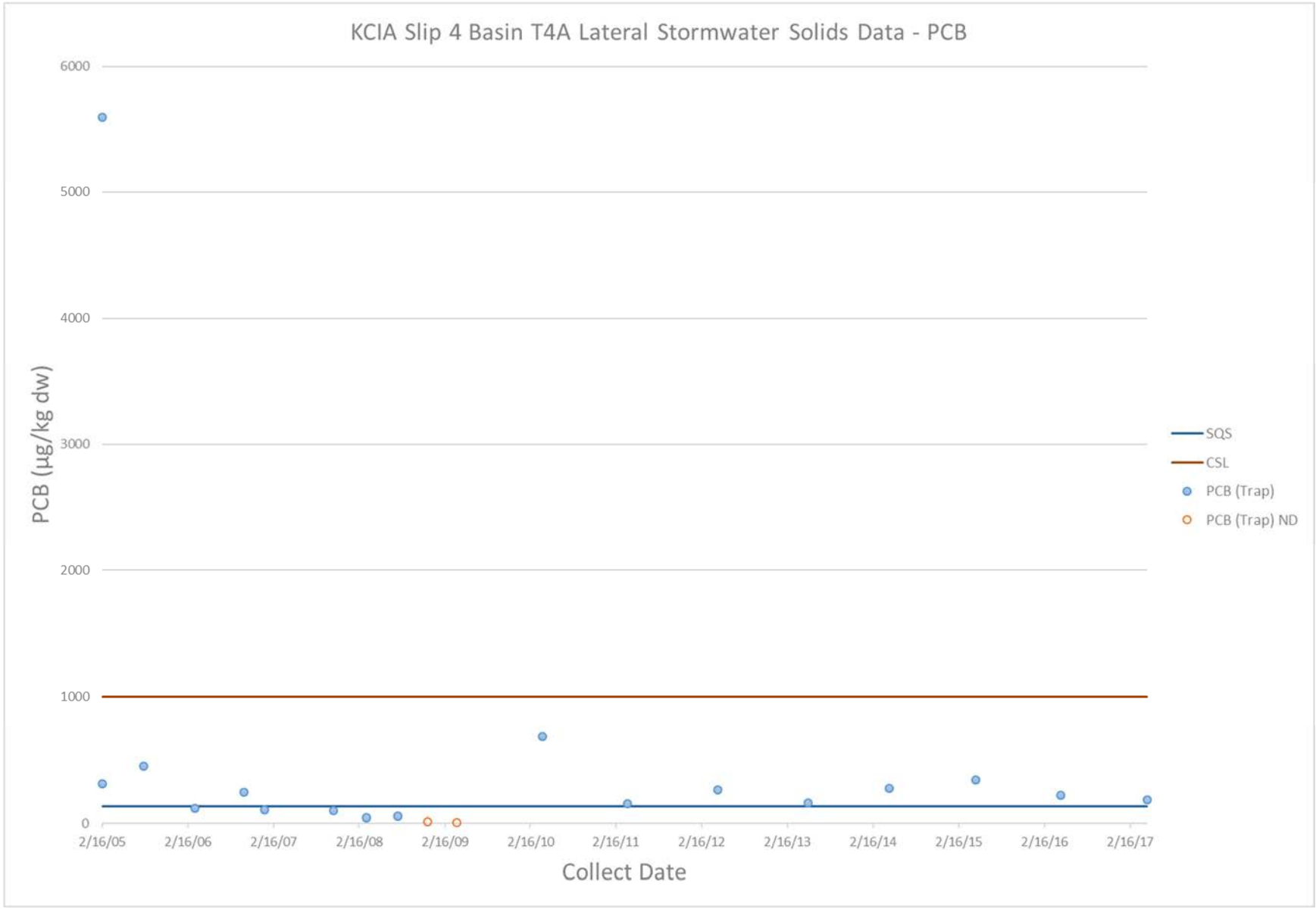

Figure D-26. KCIA Source Tracing Storm Solids Sampling for PCB Slip 4 T4A.

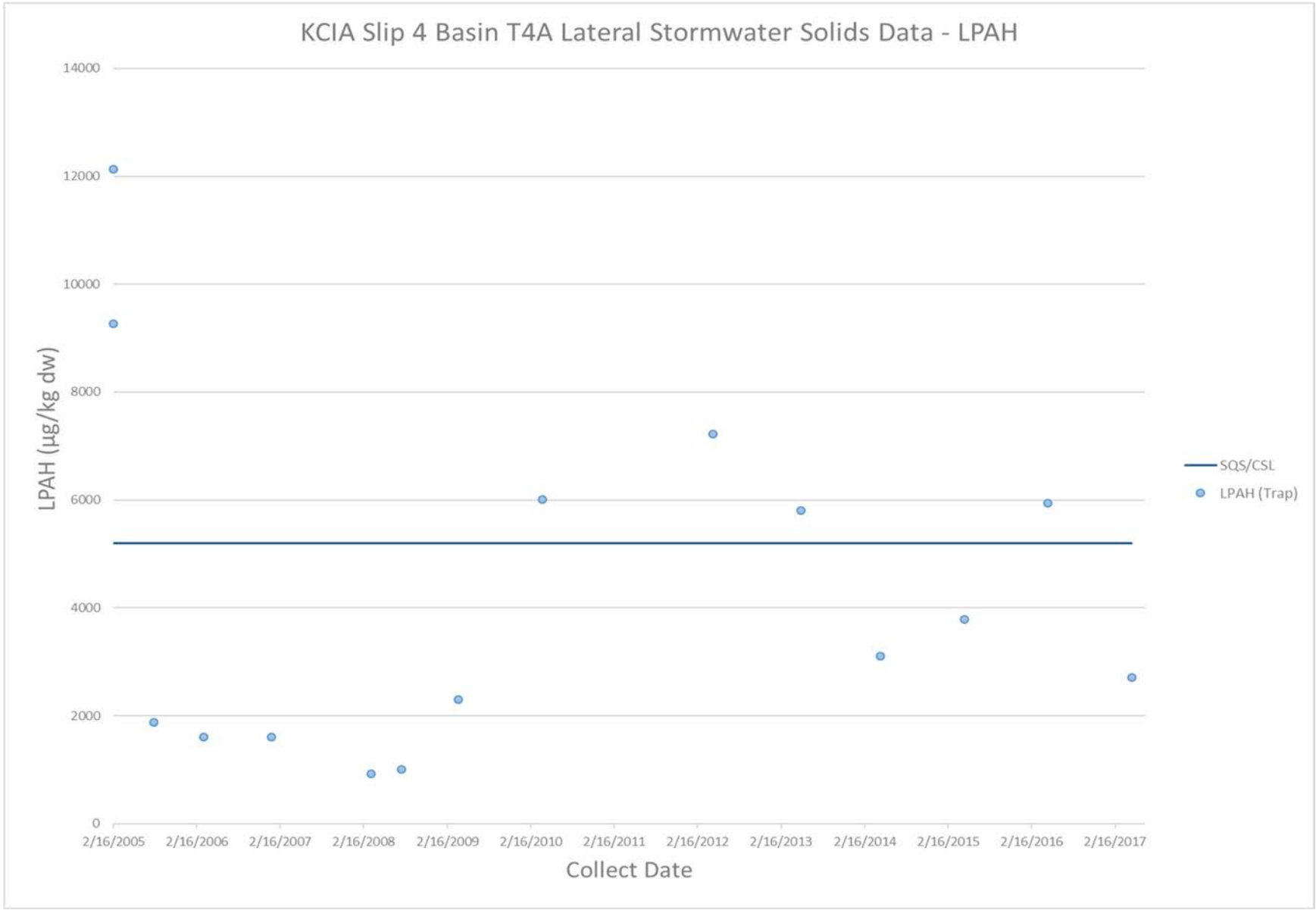

Figure D-27. KCIA Source Tracing Storm Solids Sampling for LPAH Slip 4 T4A.

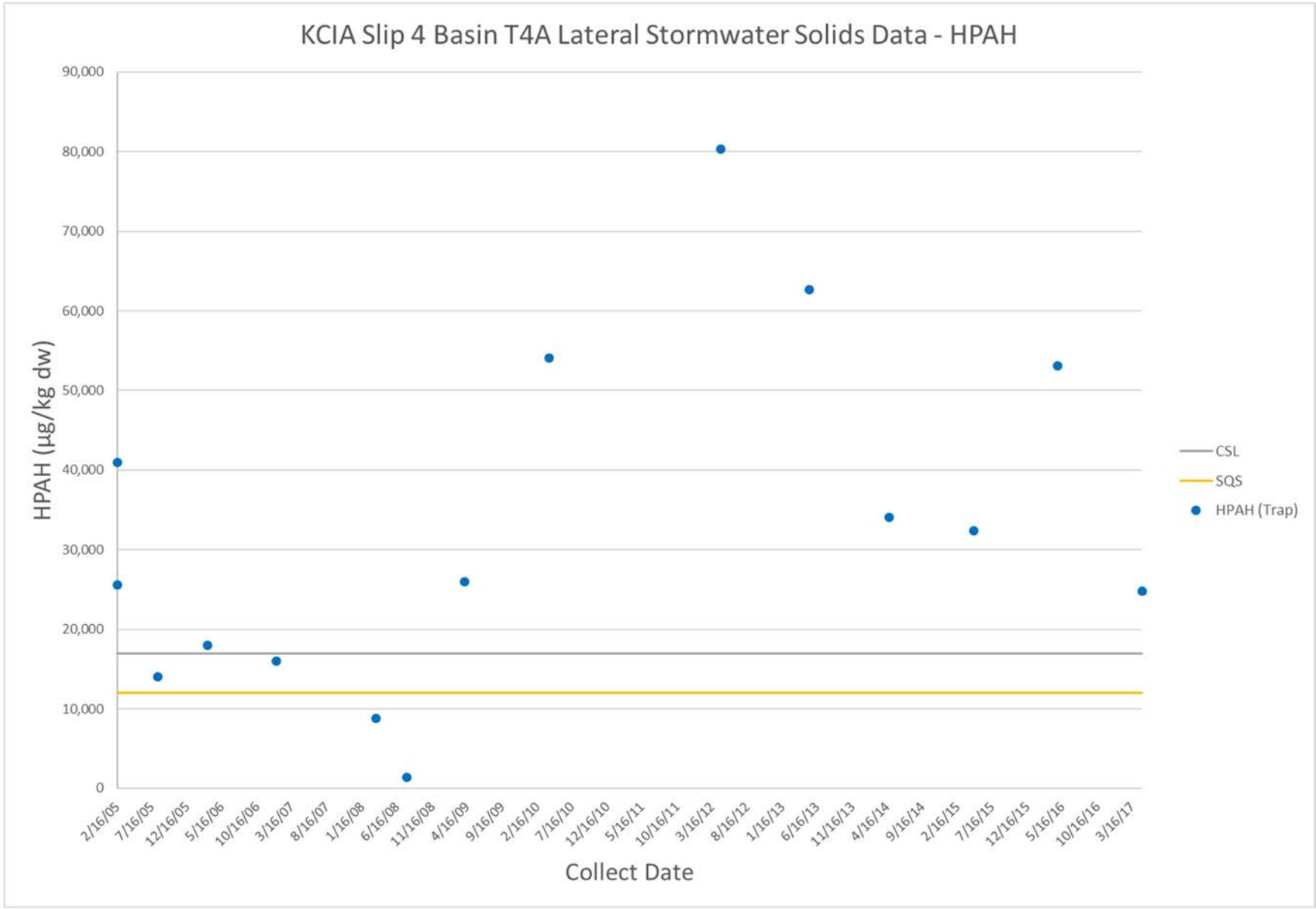

Figure D-28. KCIA Source Tracing Storm Solids Sampling for HPAH Slip 4 T4A.

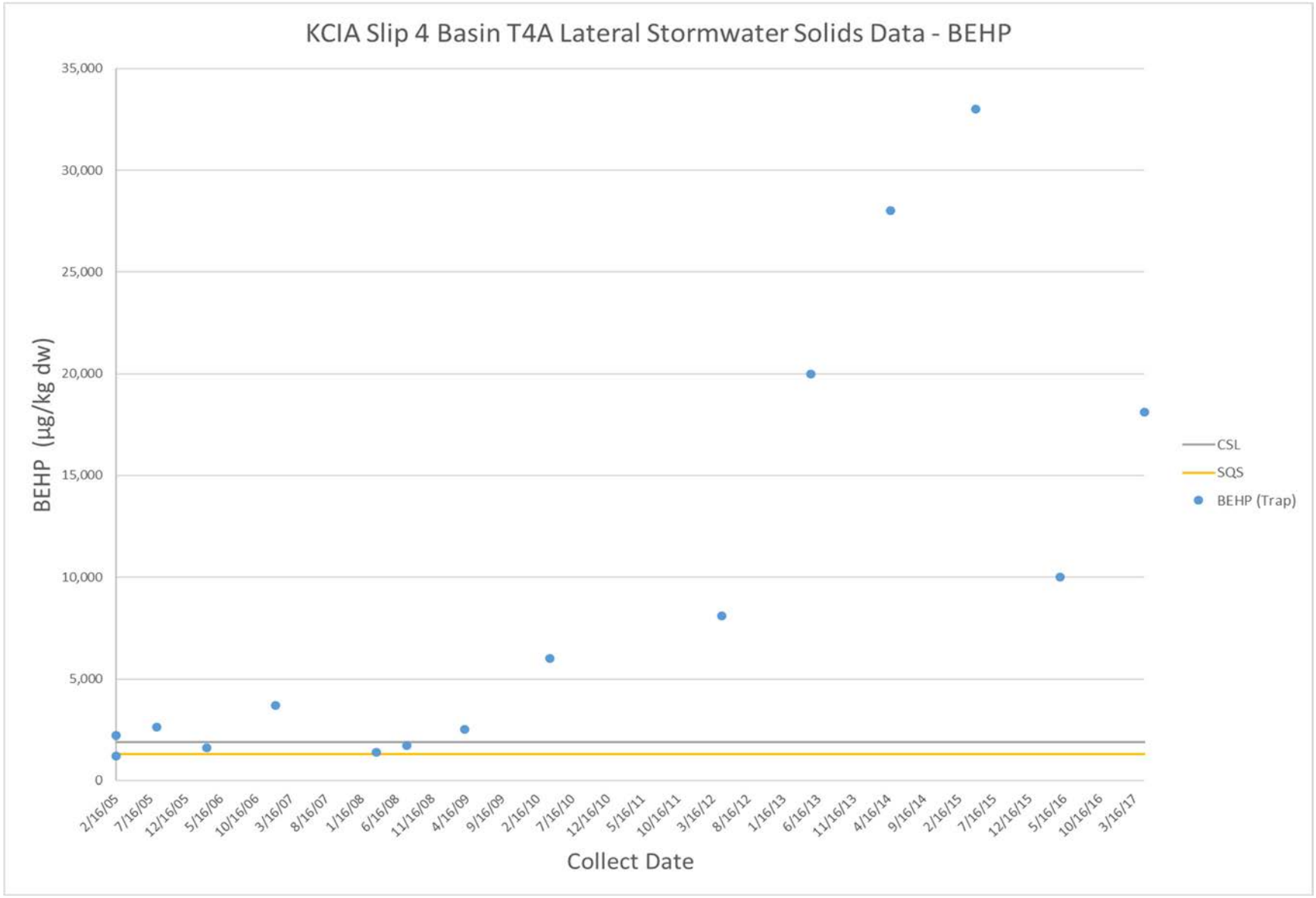

Figure D-29. KCIA Source Tracing Storm Solids Sampling for BEHP Slip 4 T4A.

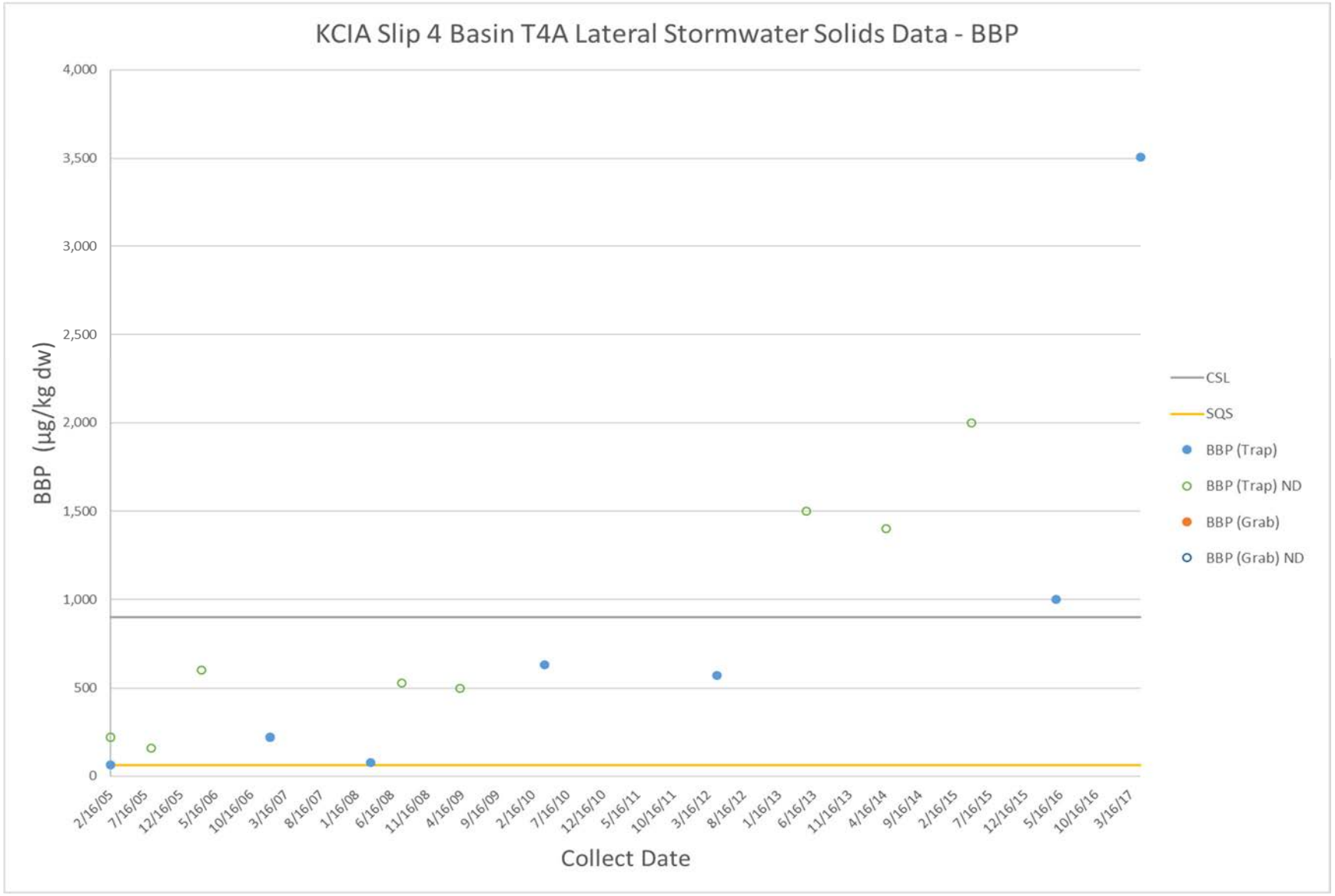

Figure D-30. KCIA Source Tracing Storm Solids Sampling for BBP Slip 4 T4A.

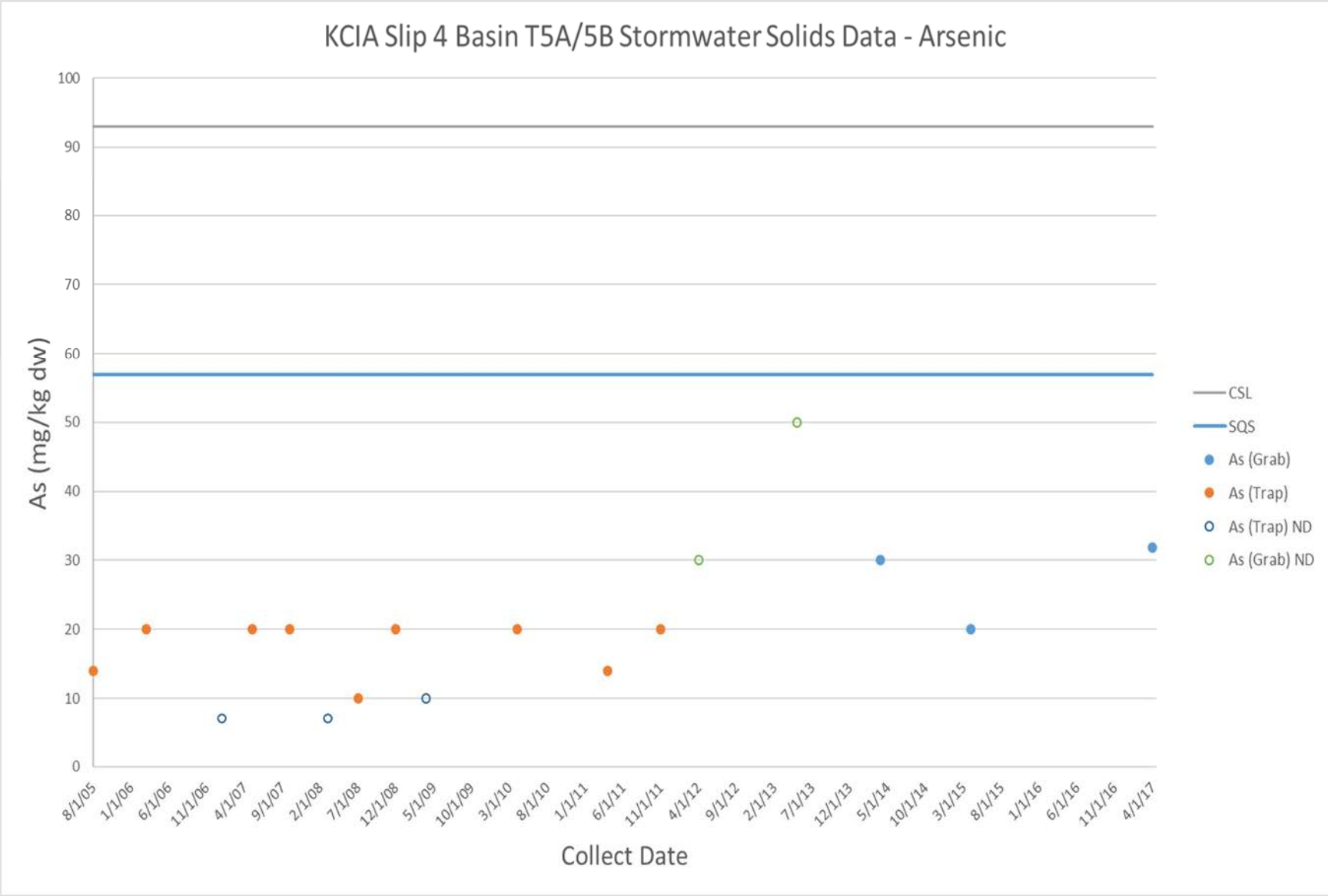

Figure D-31. KCIA Source Tracing Storm Solids Sampling for Arsenic Slip 4 T5A/B.

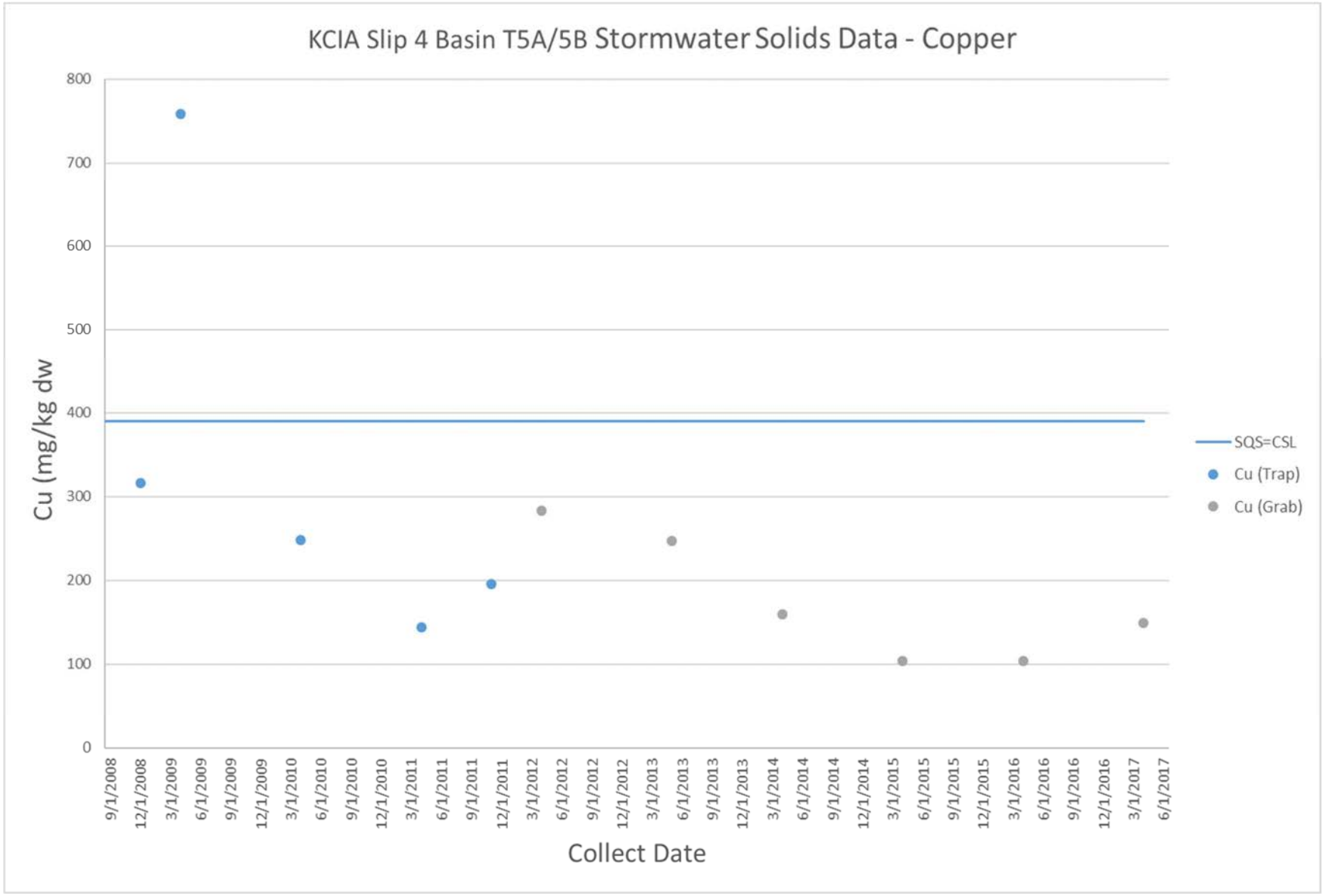

Figure D-32. KCIA Source Tracing Storm Solids Sampling for Copper Slip 4 T5A/B.

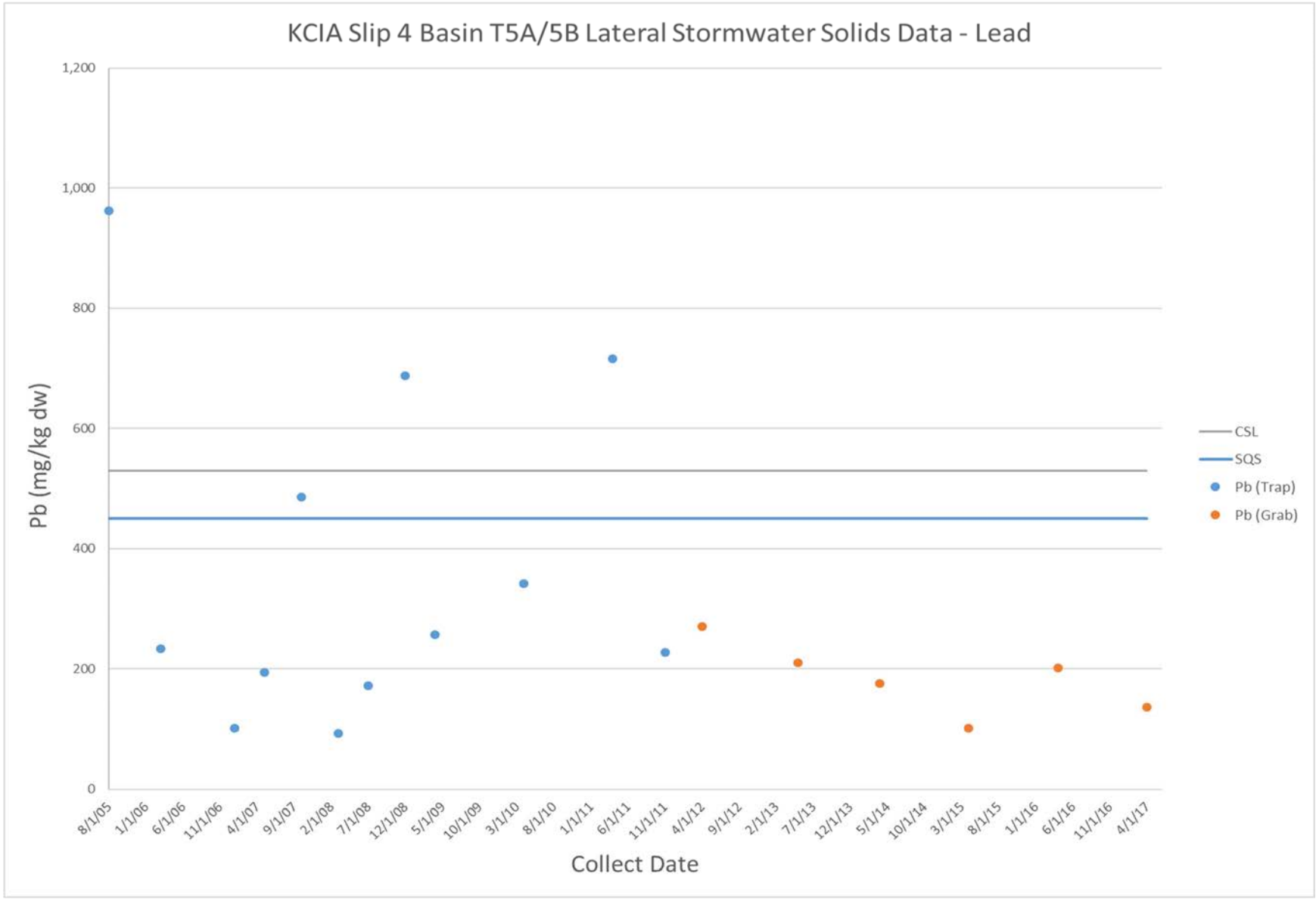

Figure D-33. KCIA Source Tracing Storm Solids Sampling for Lead Slip 4 T5A/B.

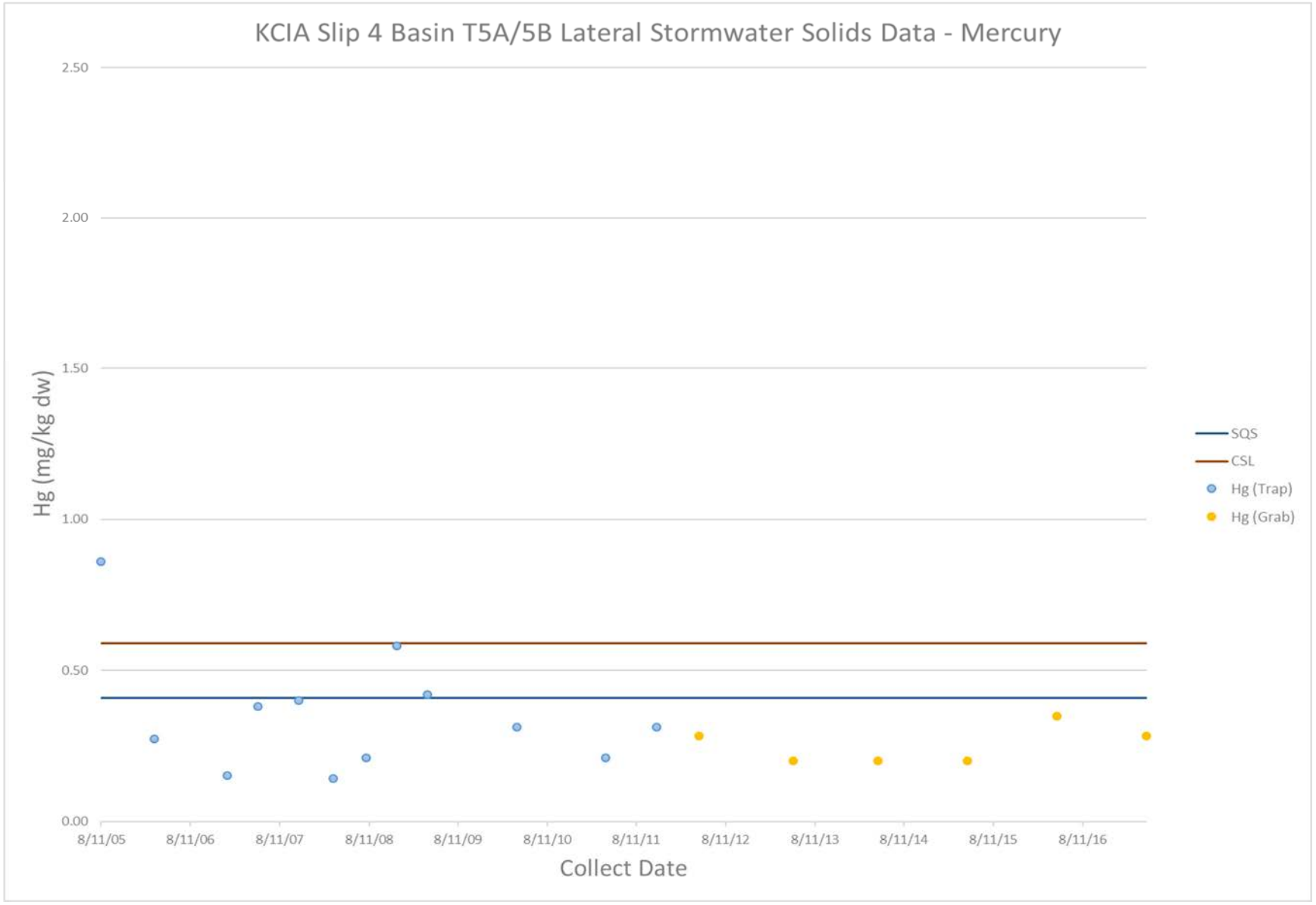

Figure D-34. KCIA Source Tracing Storm Solids Sampling for Mercury Slip 4 T5A/B.

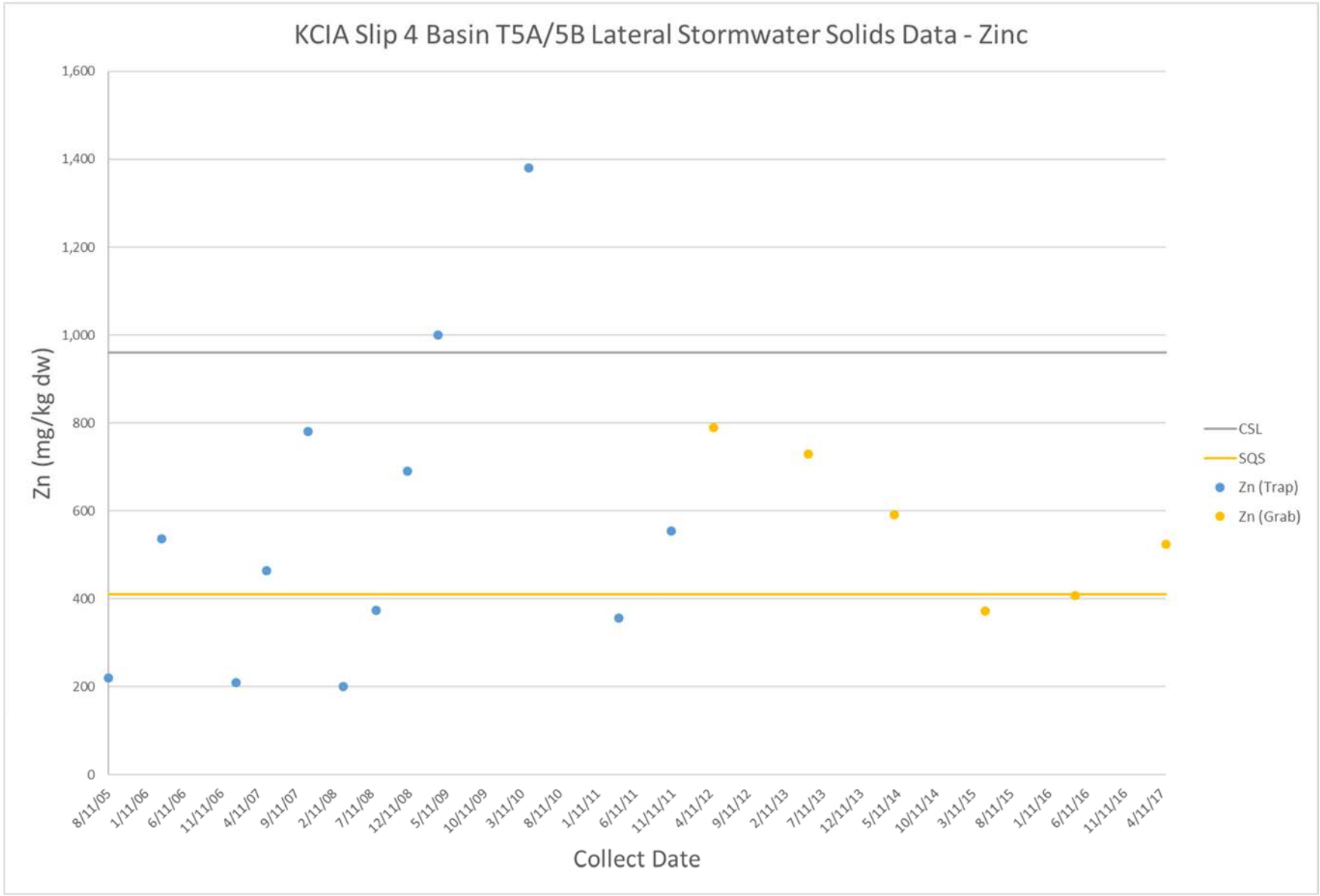

Figure D-35. KCIA Source Tracing Storm Solids Sampling for Zinc Slip 4 T5A/B.

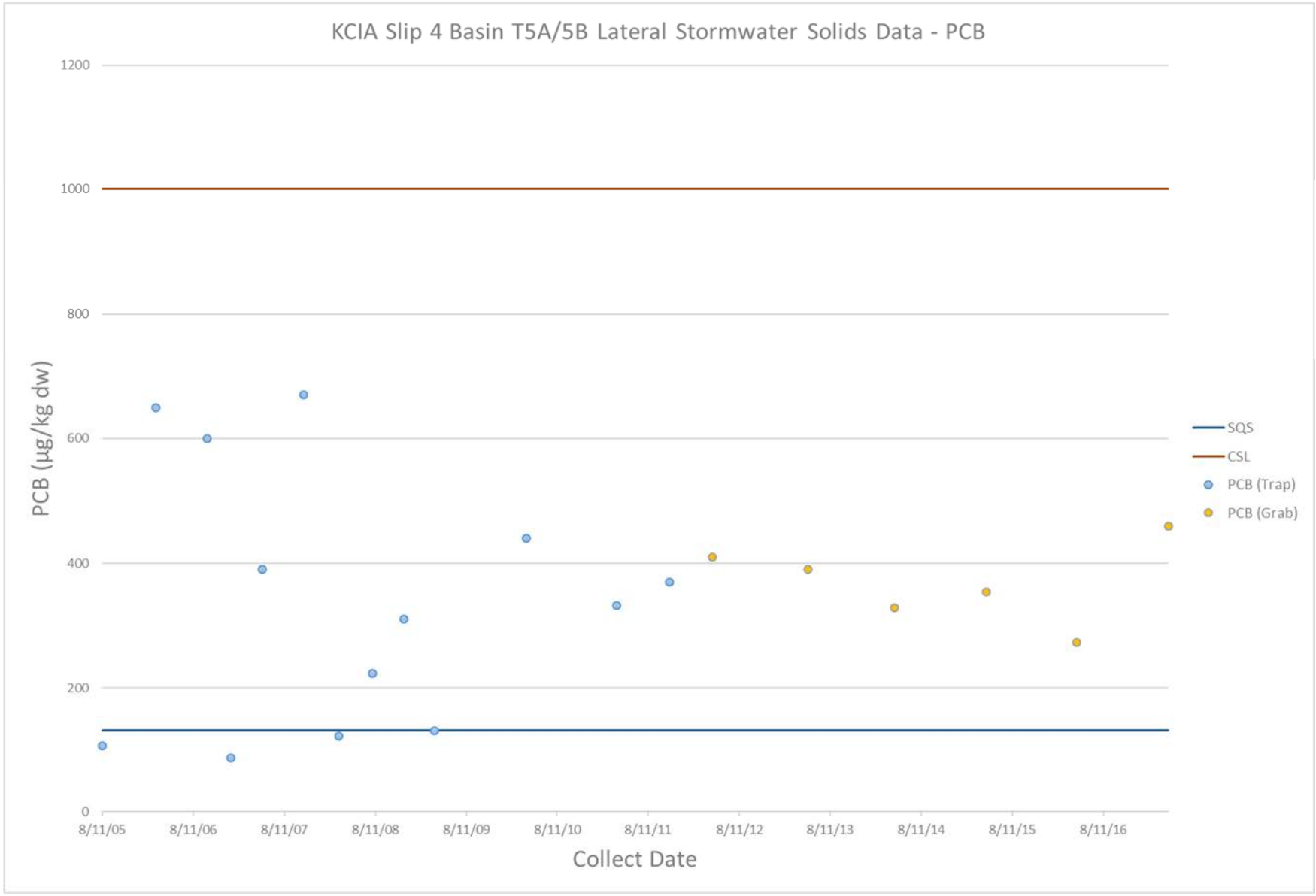

Figure D-36. KCIA Source Tracing Storm Solids Sampling for PCB Slip 4 T5A/B.

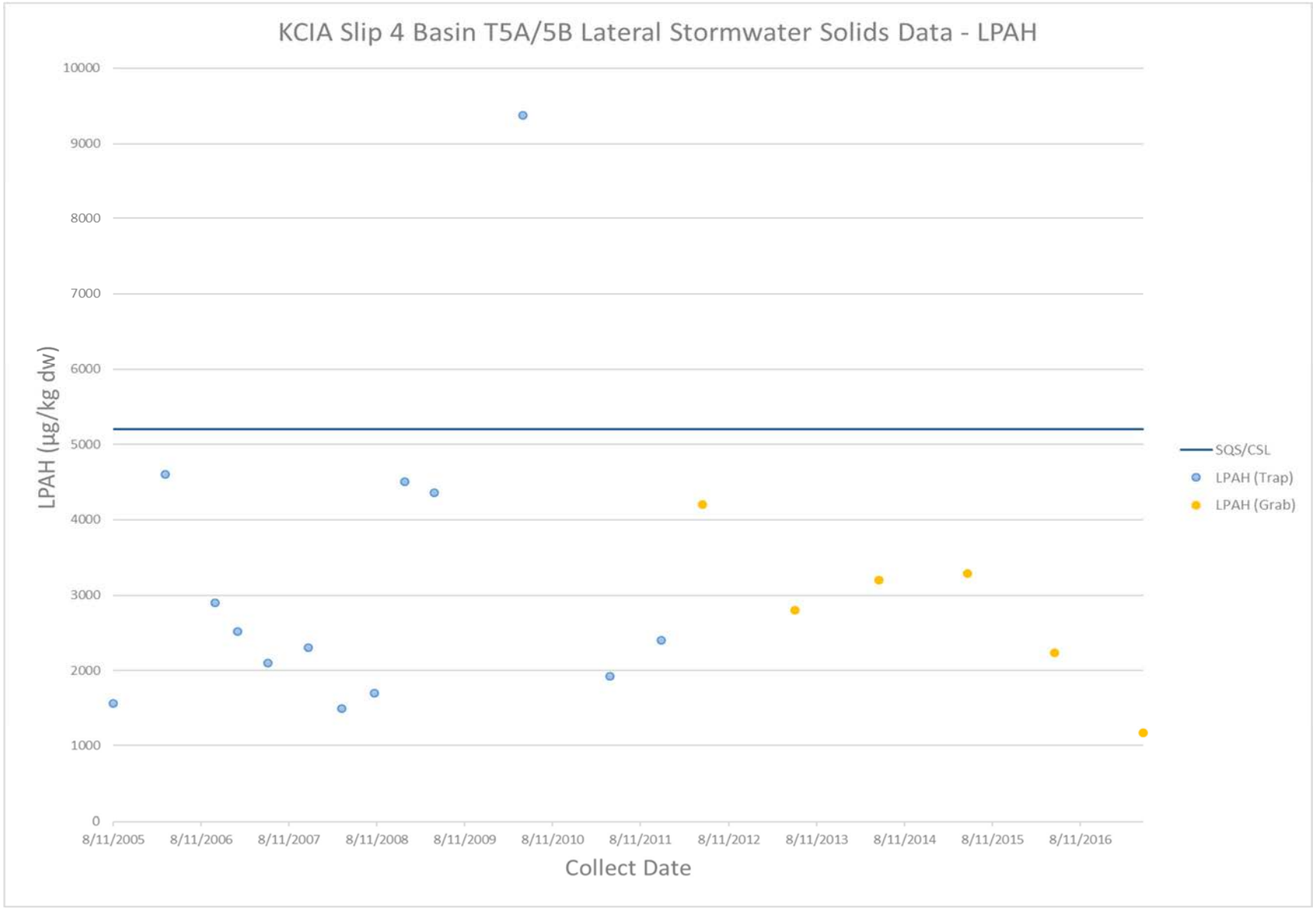

Figure D-37. KCIA Source Tracing Storm Solids Sampling for LPAH Slip 4 T5A/B.

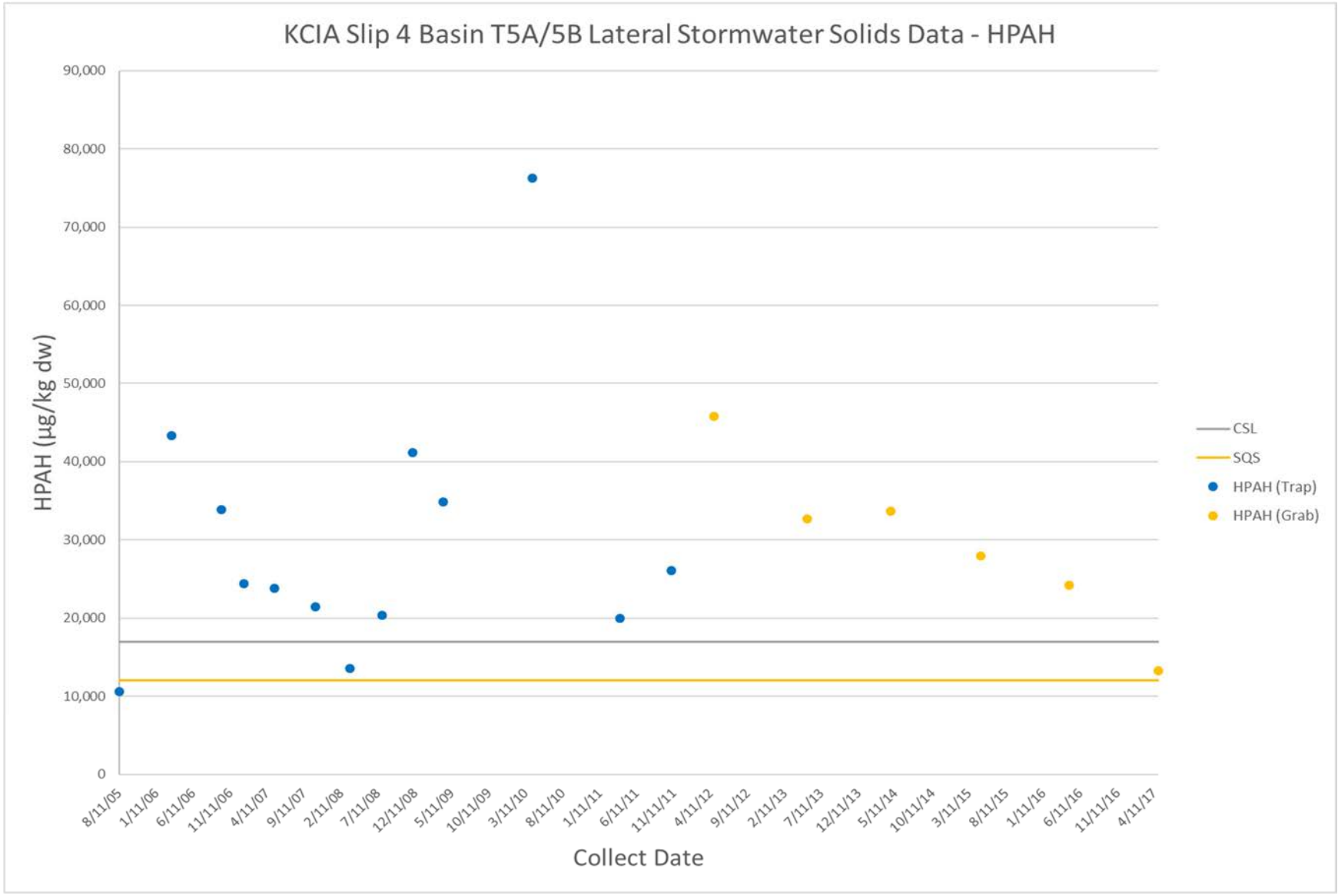

Figure D-38. KCIA Source Tracing Storm Solids Sampling for HPAH Slip 4 T5A/B.

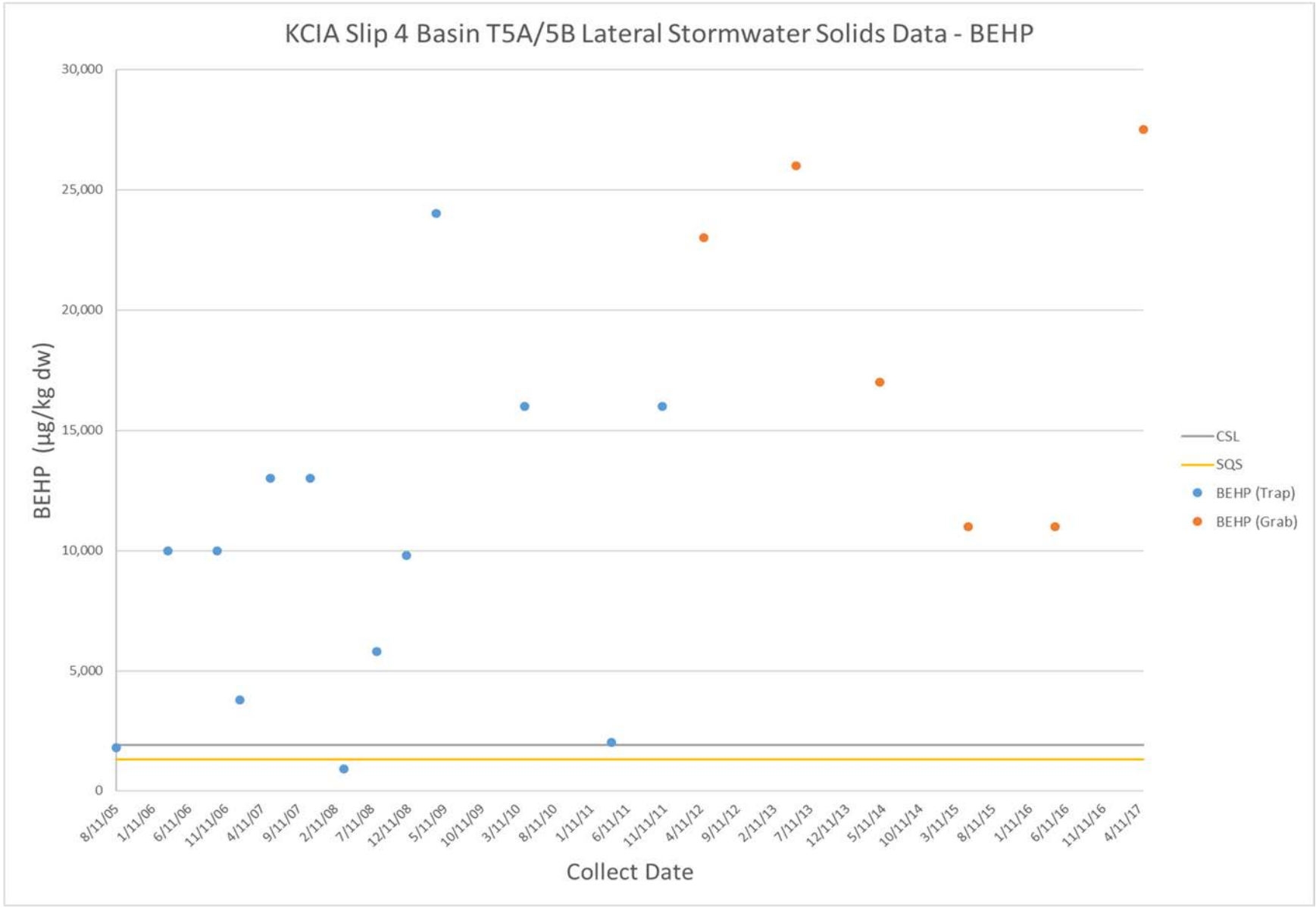

Figure D-39. KCIA Source Tracing Storm Solids Sampling for BEHP Slip 4 T5A/B.

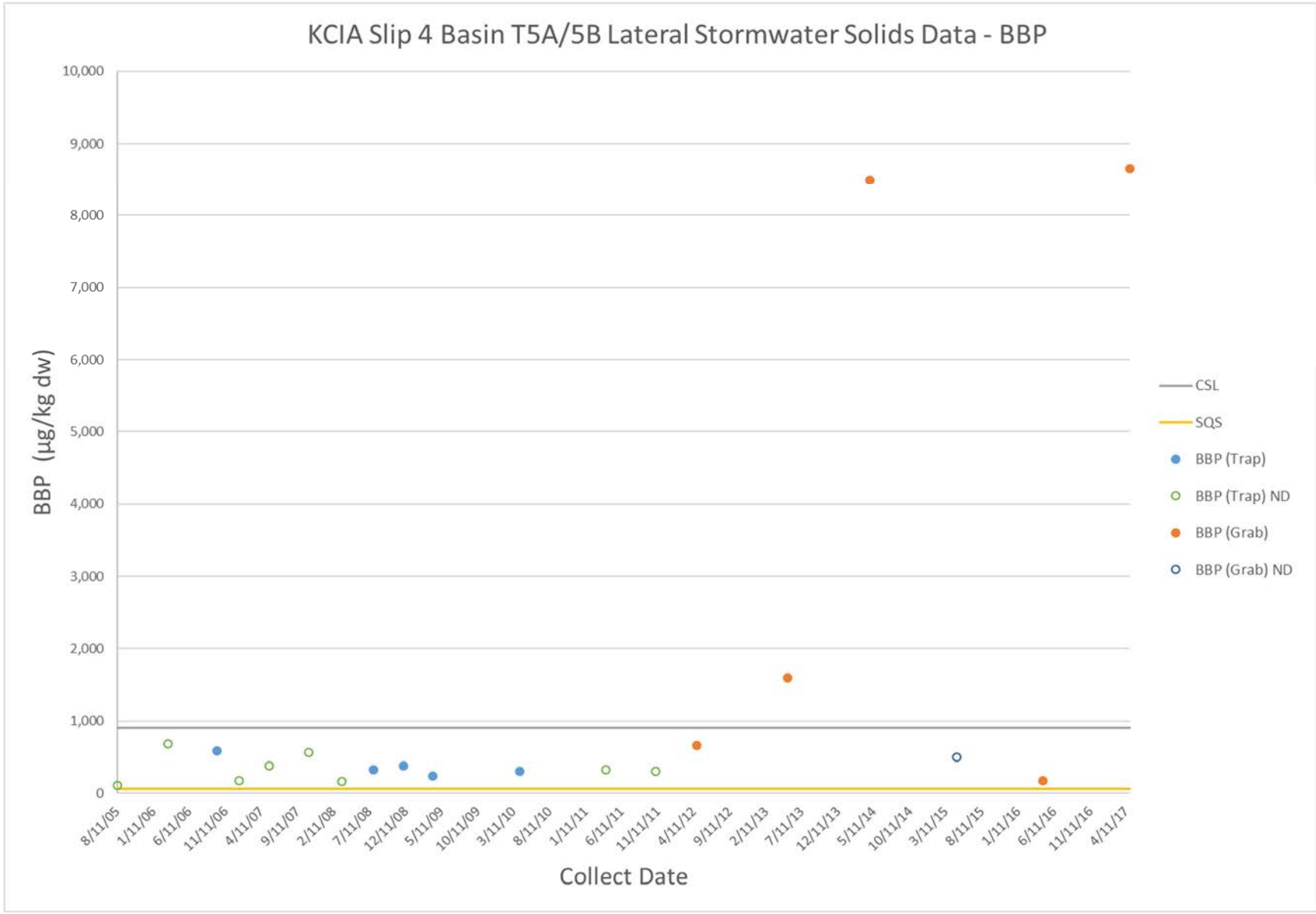

Figure D-40. KCIA Source Tracing Storm Solids Sampling for BBP Slip 4 T5A/B.

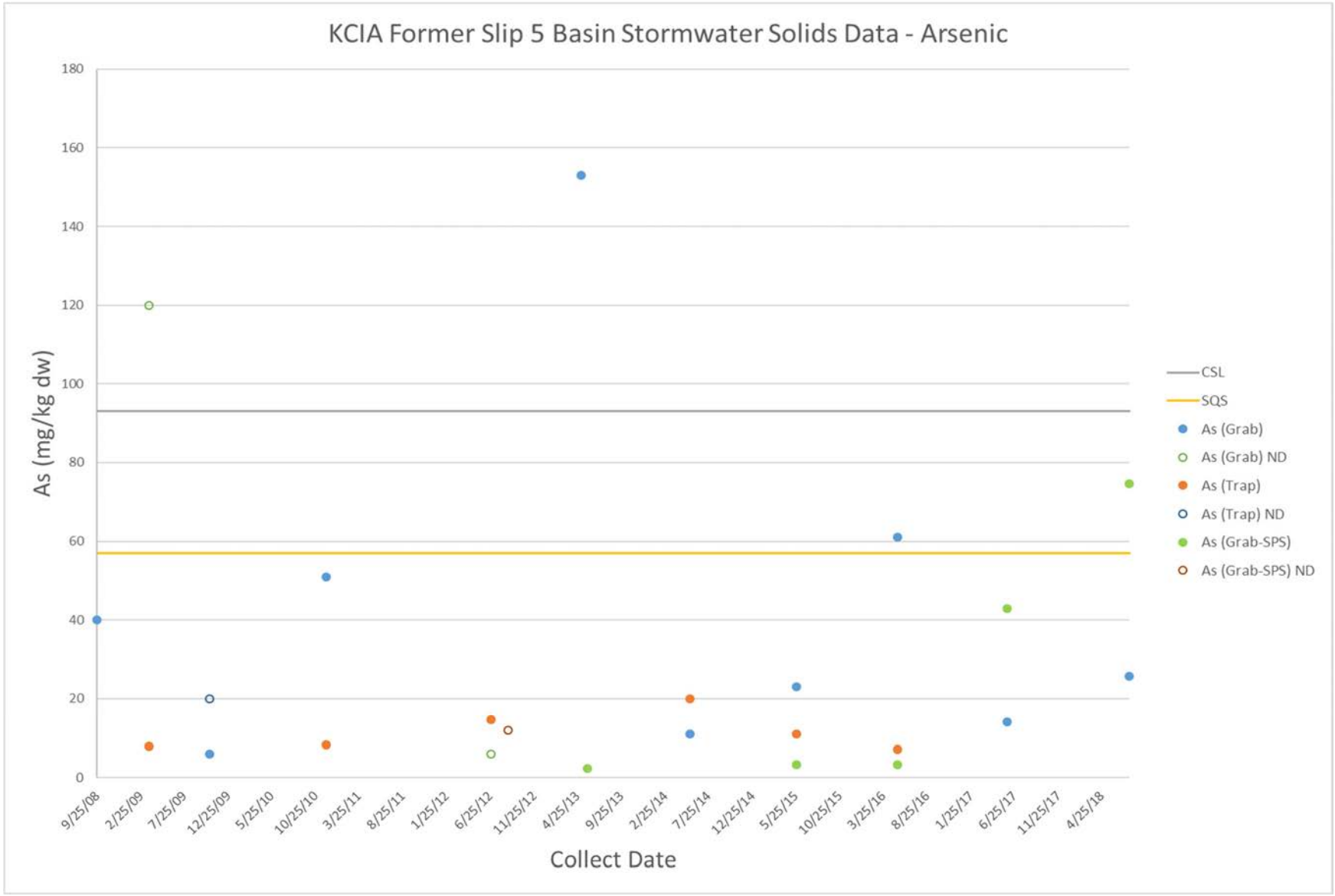

Figure D-41. KCIA Source Tracing Storm Solids Sampling for Arsenic Former Slip 5.

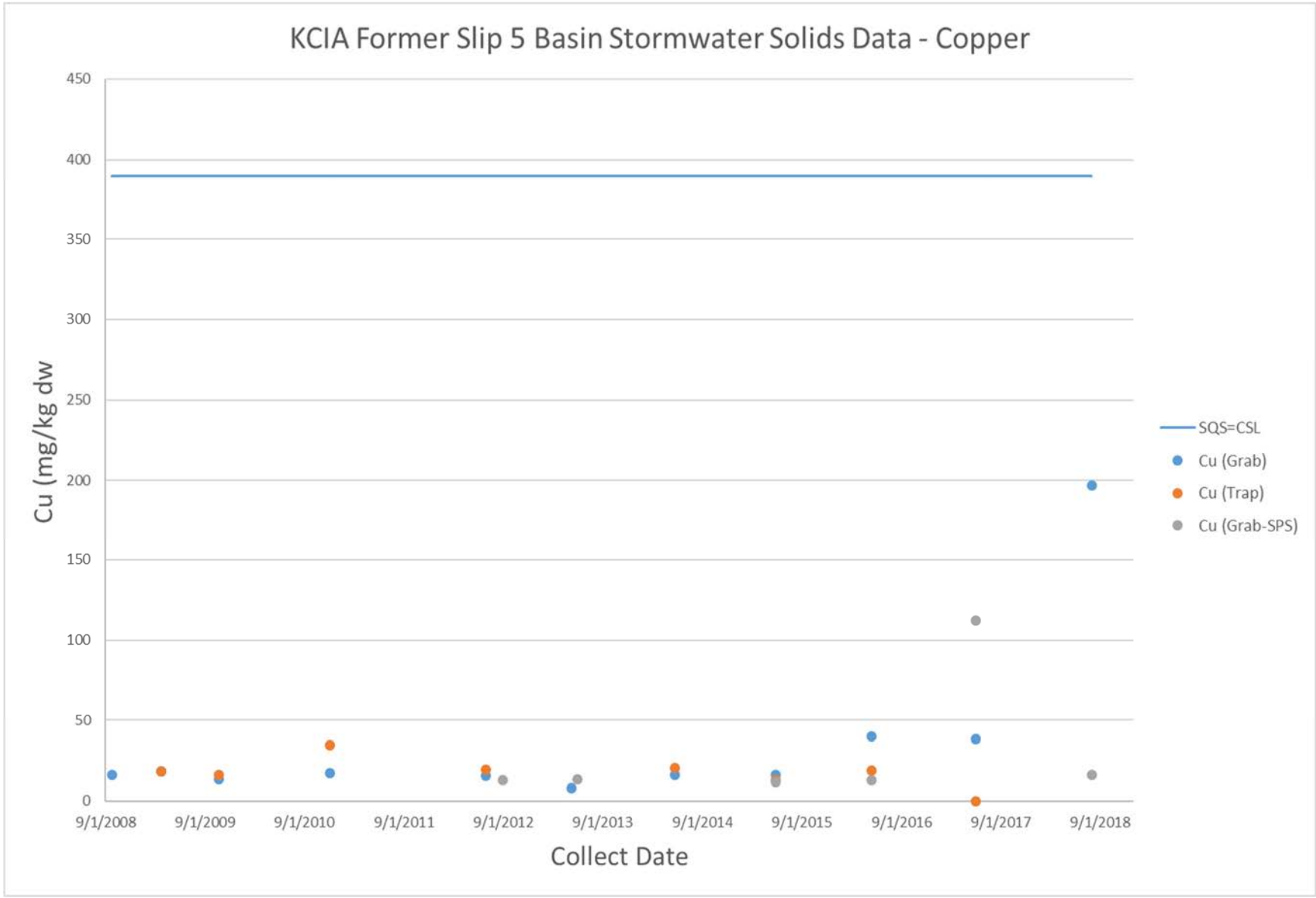

Figure D-42. KCIA Source Tracing Storm Solids Sampling for Copper Former Slip 5.

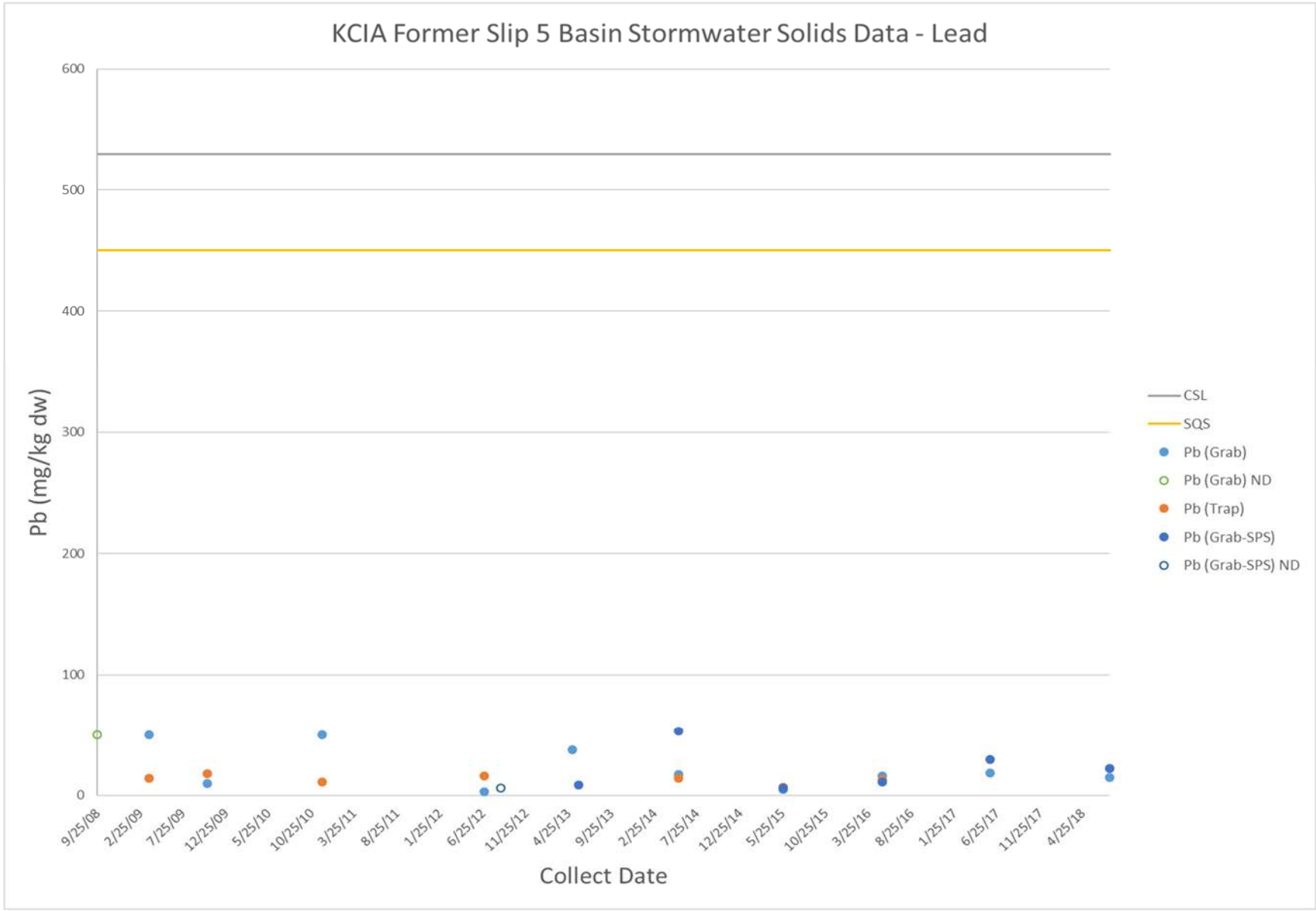

Figure D-43. KCIA Source Tracing Storm Solids Sampling for Lead Former Slip 5.

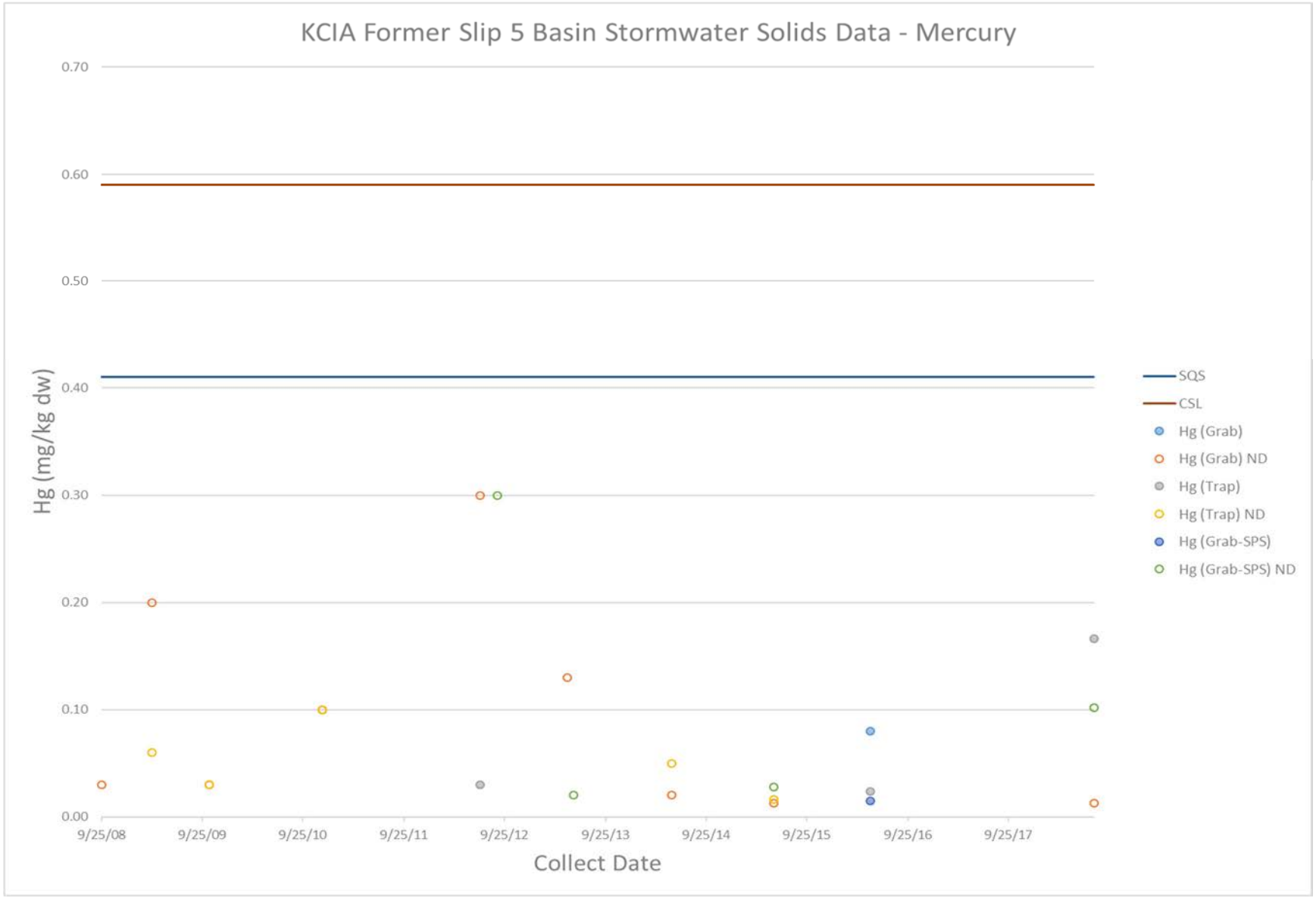

Figure D-44. KCIA Source Tracing Storm Solids Sampling for Mercury Former Slip 5.

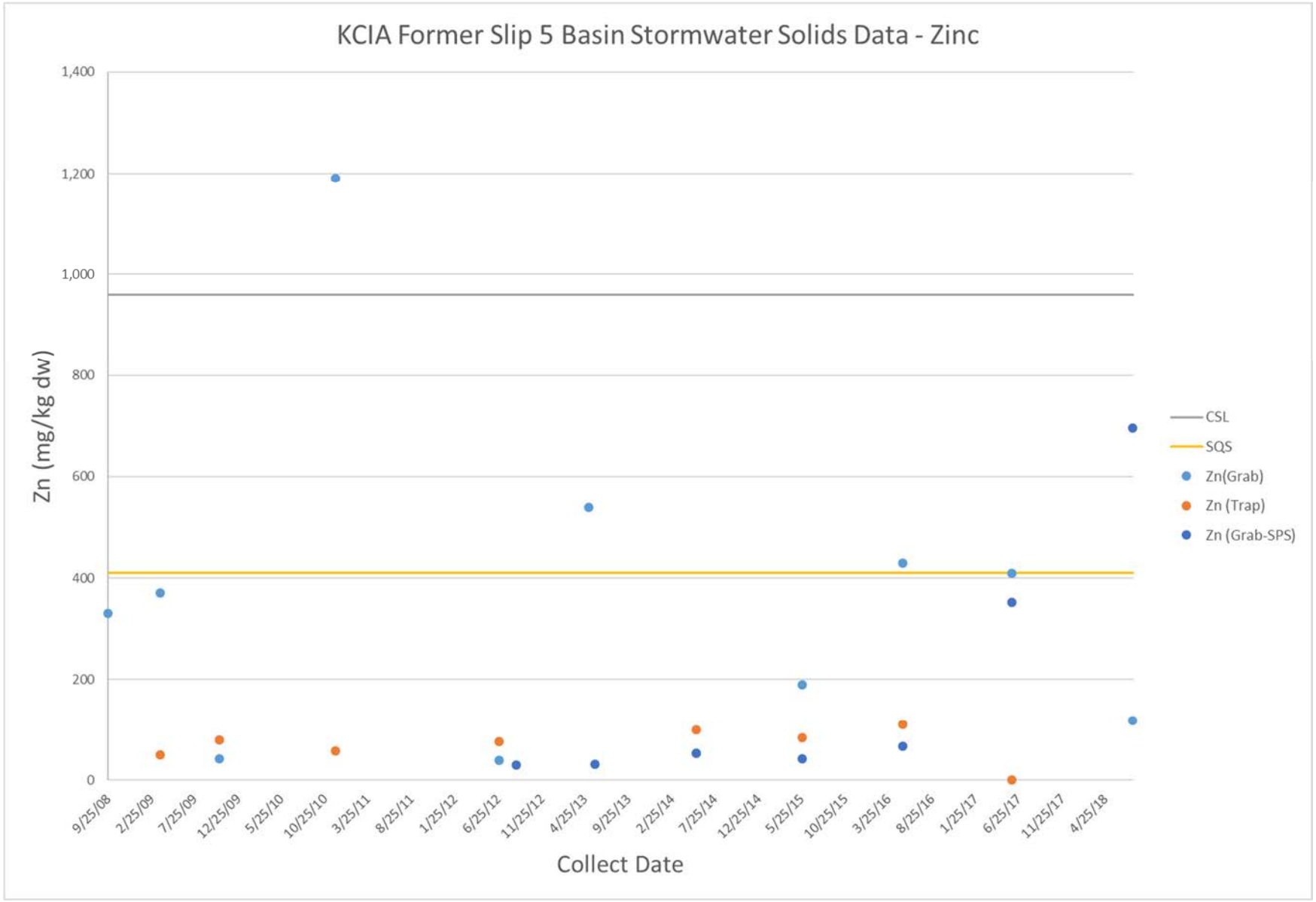

Figure D-45. KCIA Source Tracing Storm Solids Sampling for Zinc Former Slip 5.

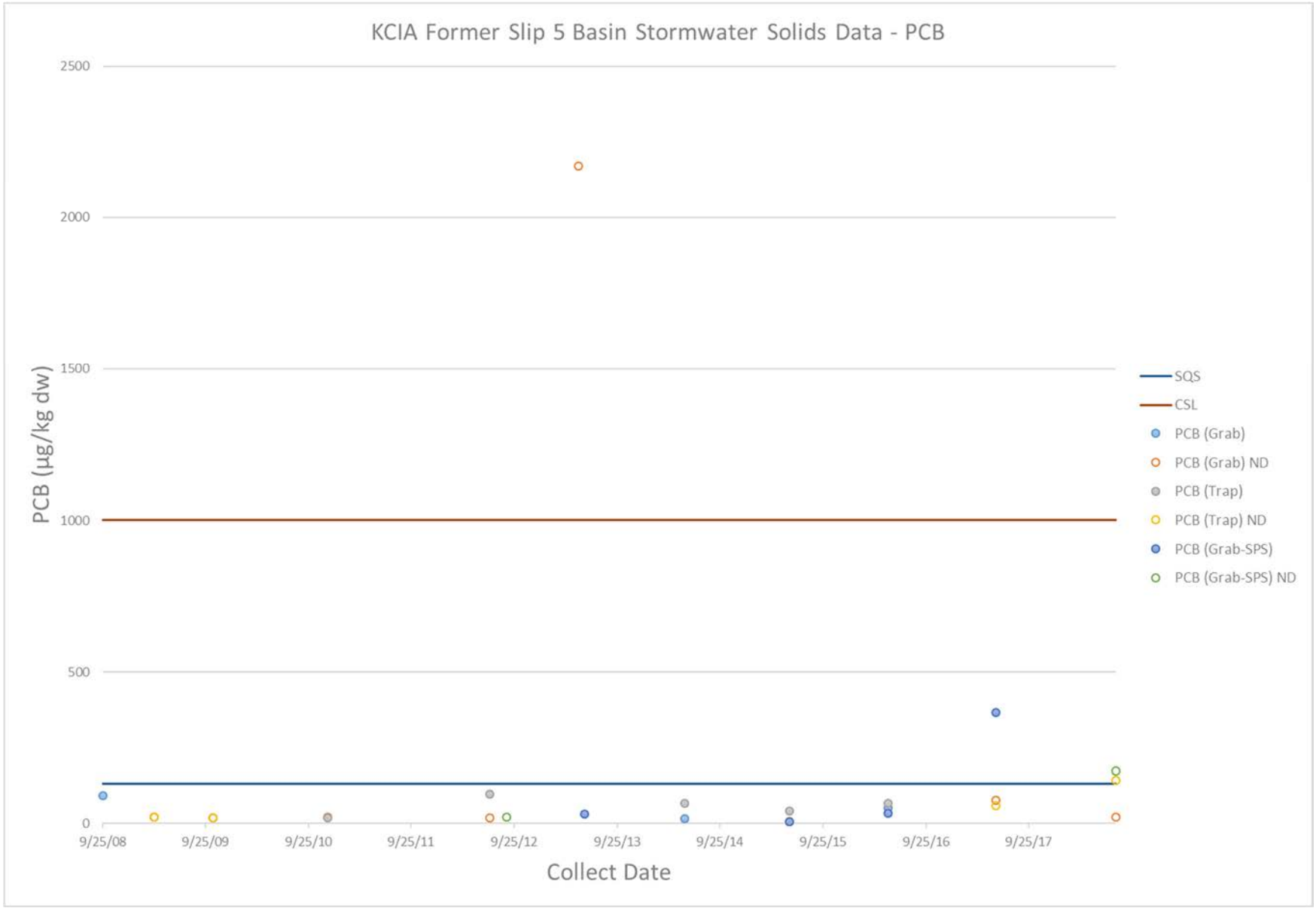

Figure D-46. KCIA Source Tracing Storm Solids Sampling for PCB Former Slip 5.

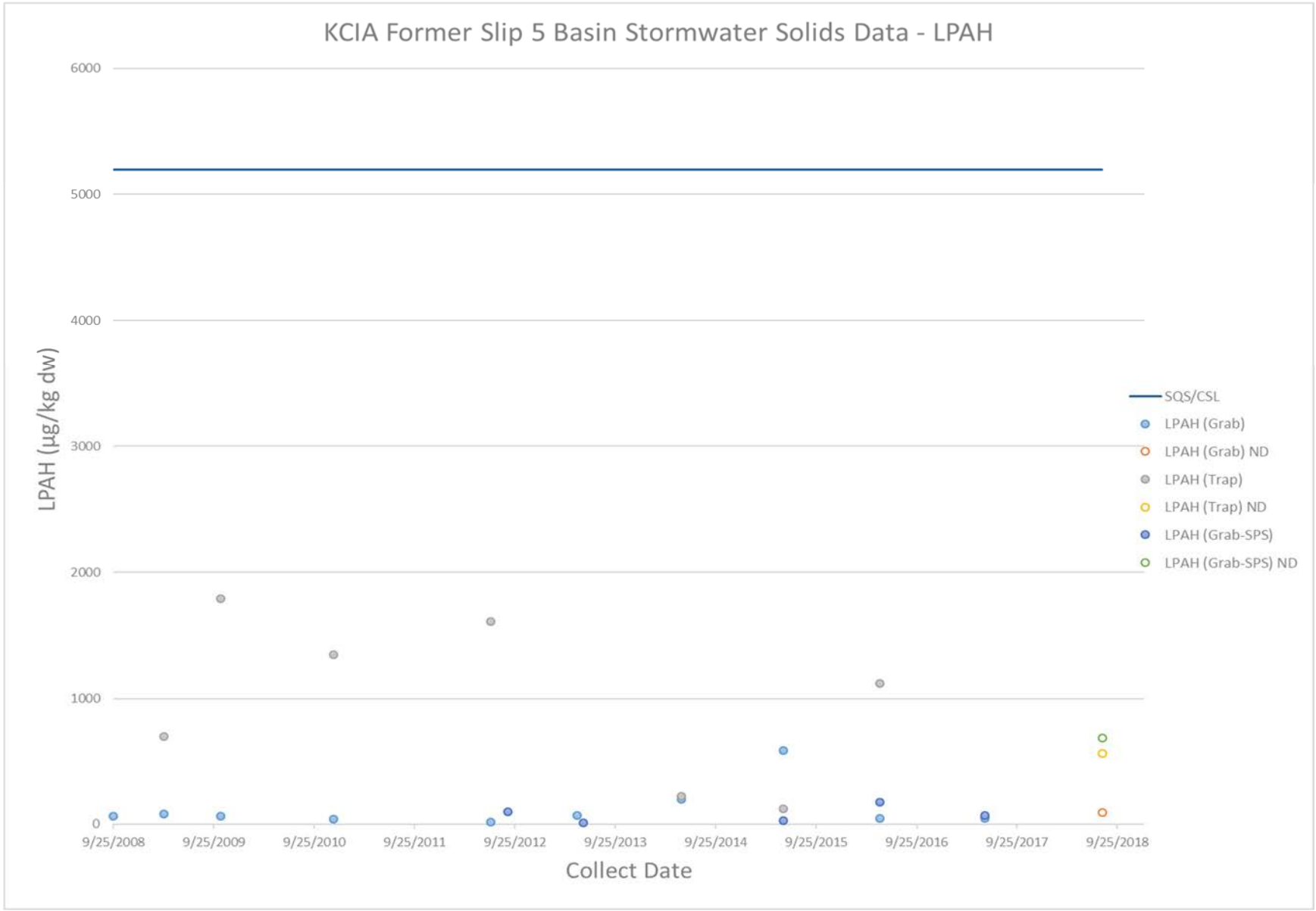

Figure D-47. KCIA Source Tracing Storm Solids Sampling for LPAH Former Slip 5.

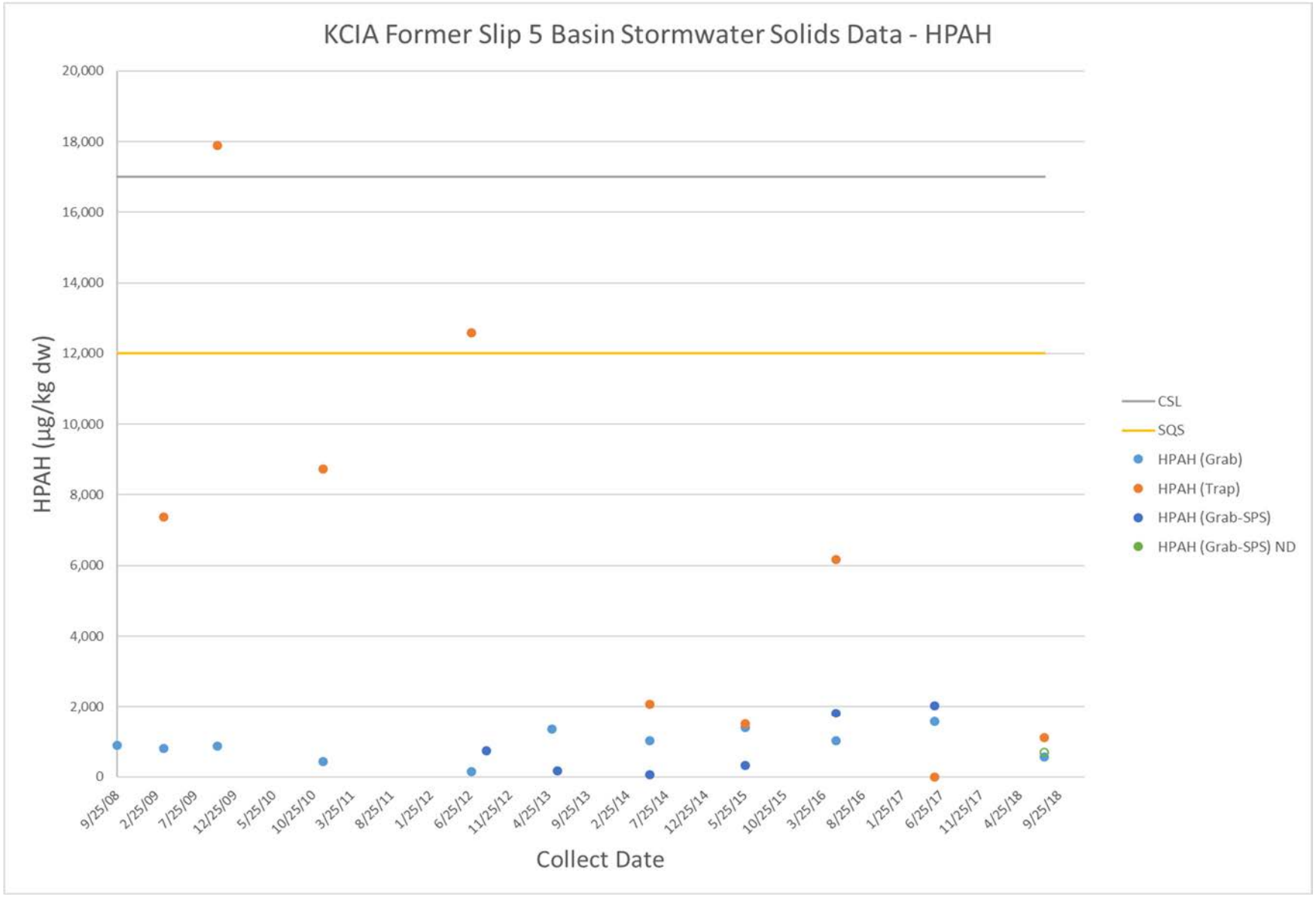

Figure D-48. KCIA Source Tracing Storm Solids Sampling for HPAH Former Slip 5.

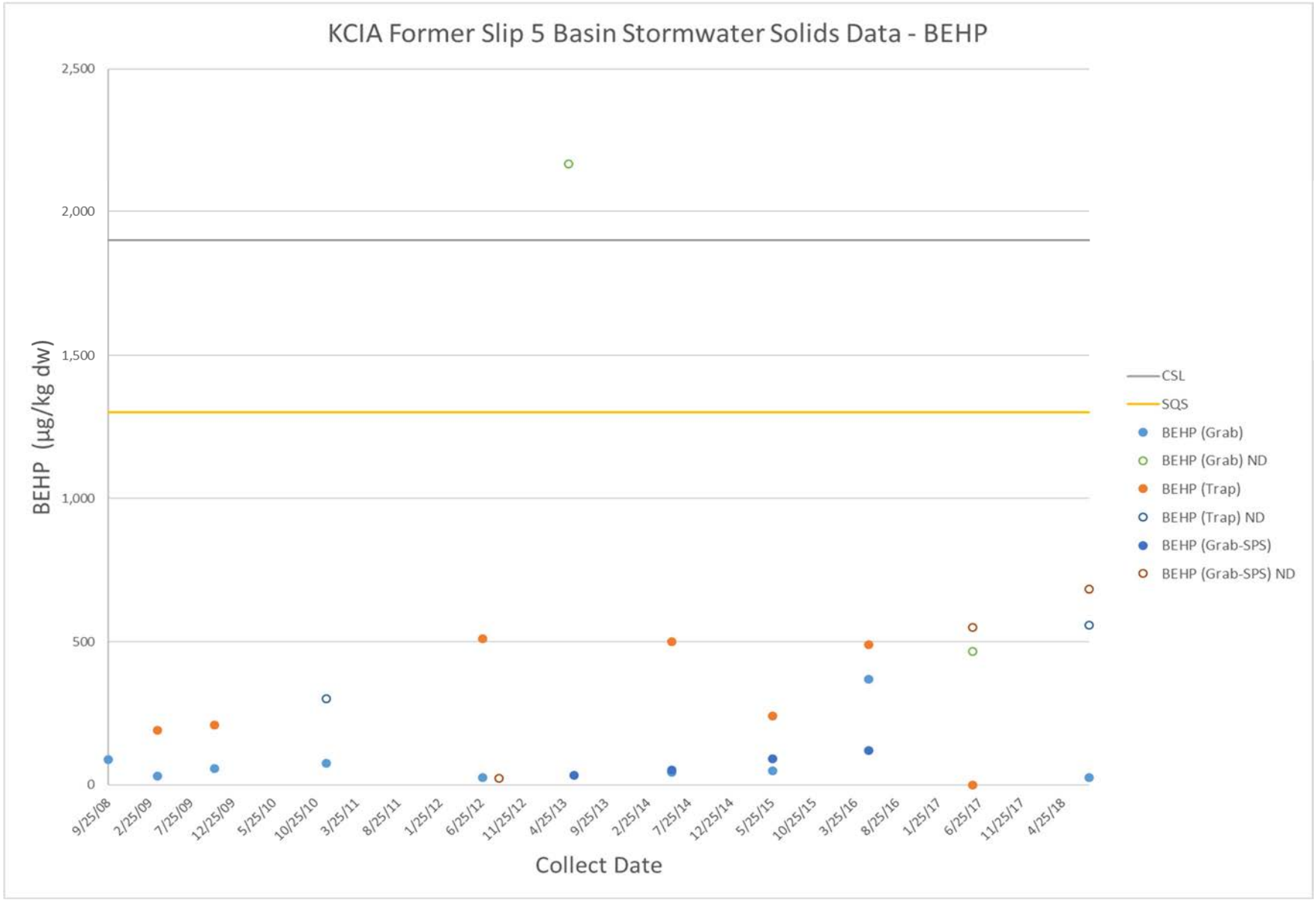

Figure D-49. KCIA Source Tracing Storm Solids Sampling for BEHP Former Slip 5.

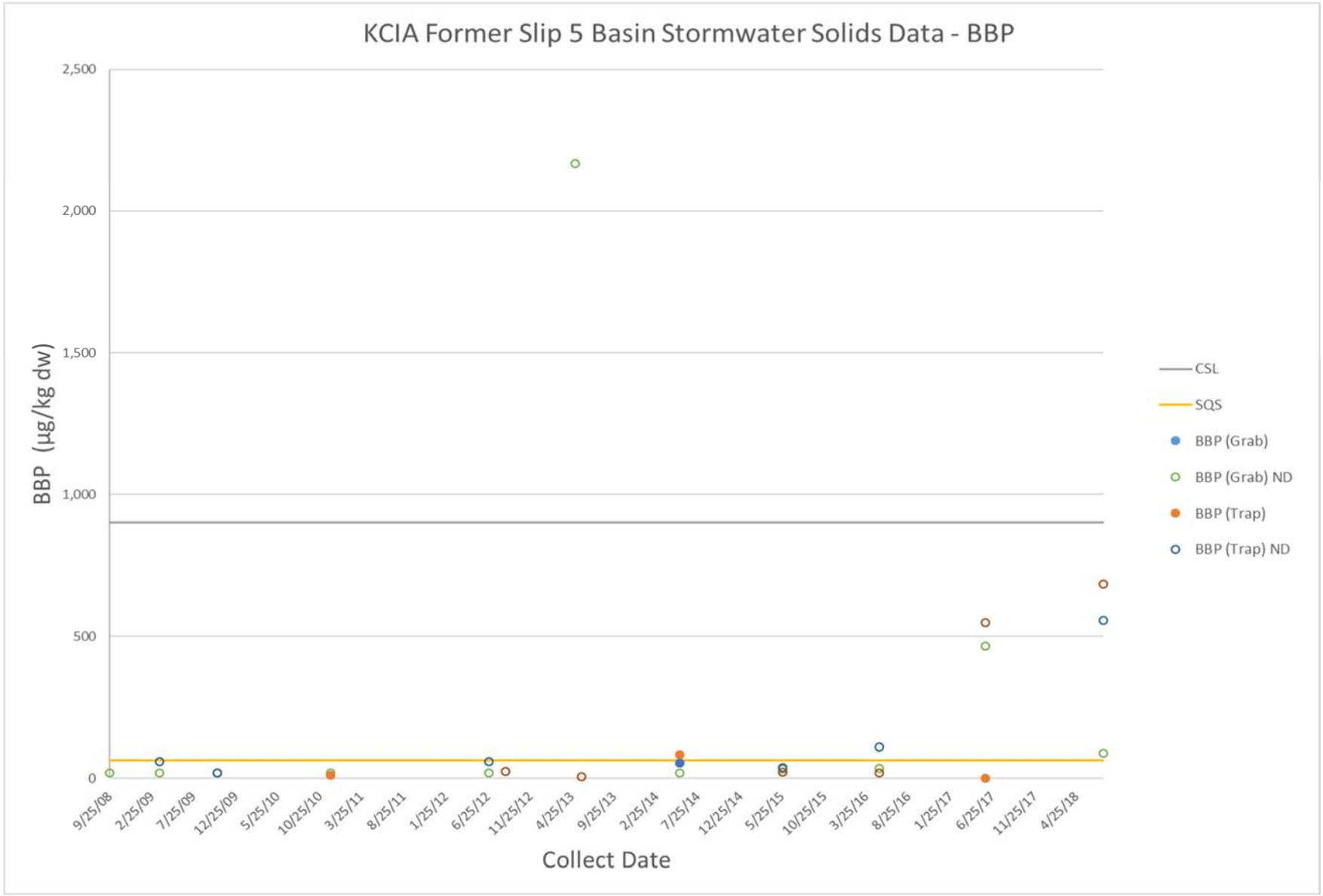

Figure D-50. KCIA Source Tracing Storm Solids Sampling for BBP Former Slip 5.

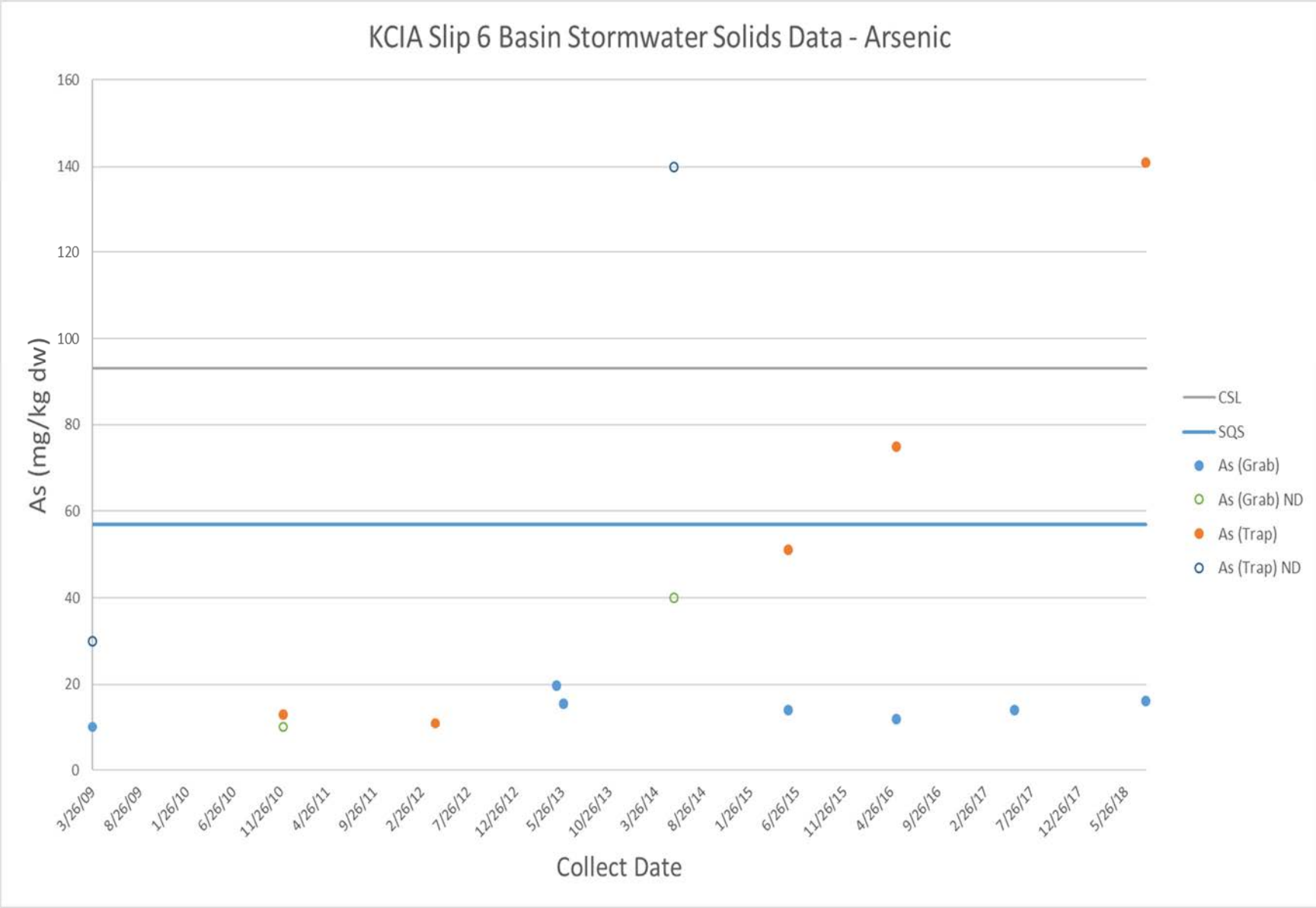

Figure D-51. KCIA Source Tracing Storm Solids Sampling for Arsenic Slip 6.

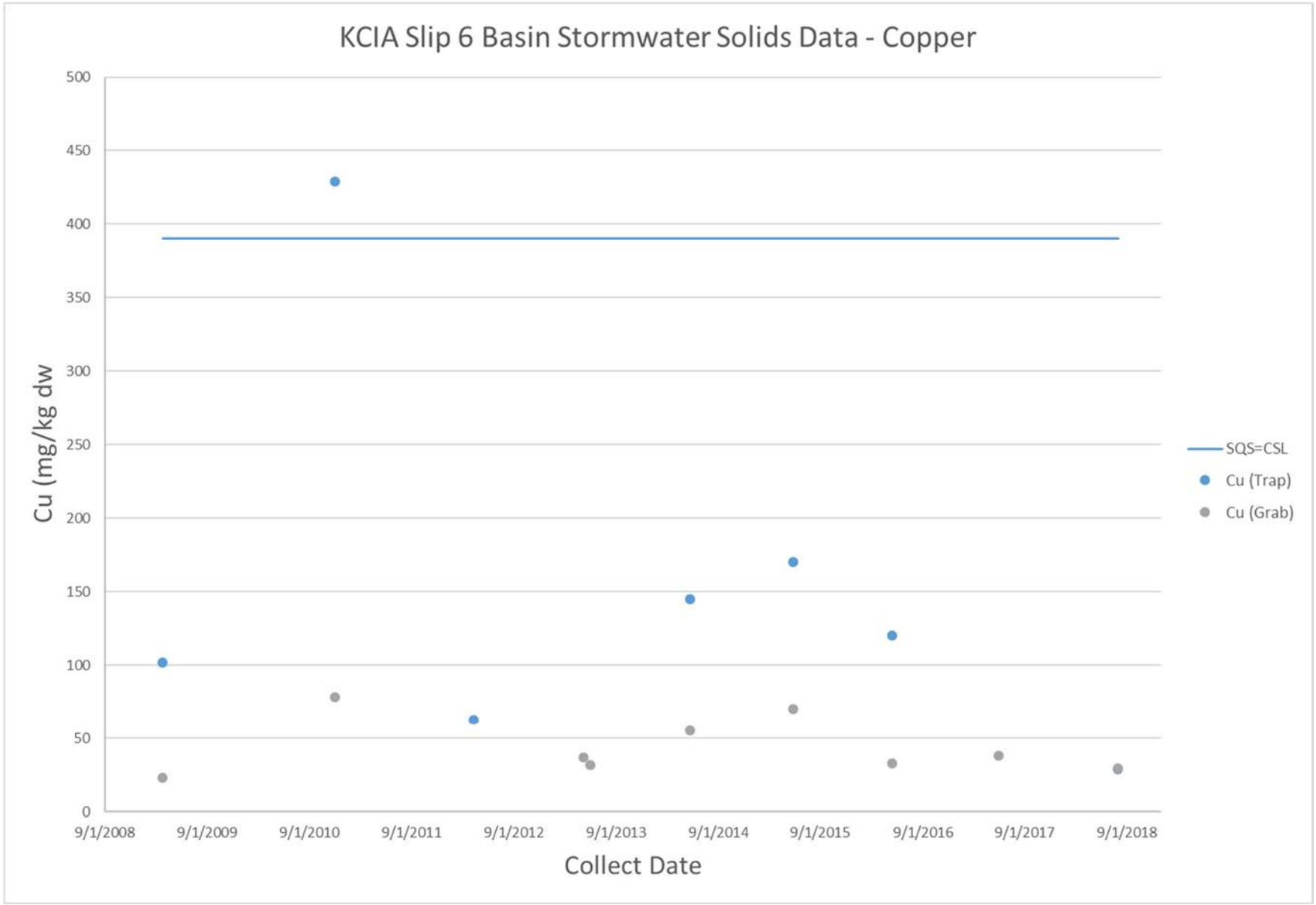

Figure D-52. KCIA Source Tracing Storm Solids Sampling for Copper Slip 6.

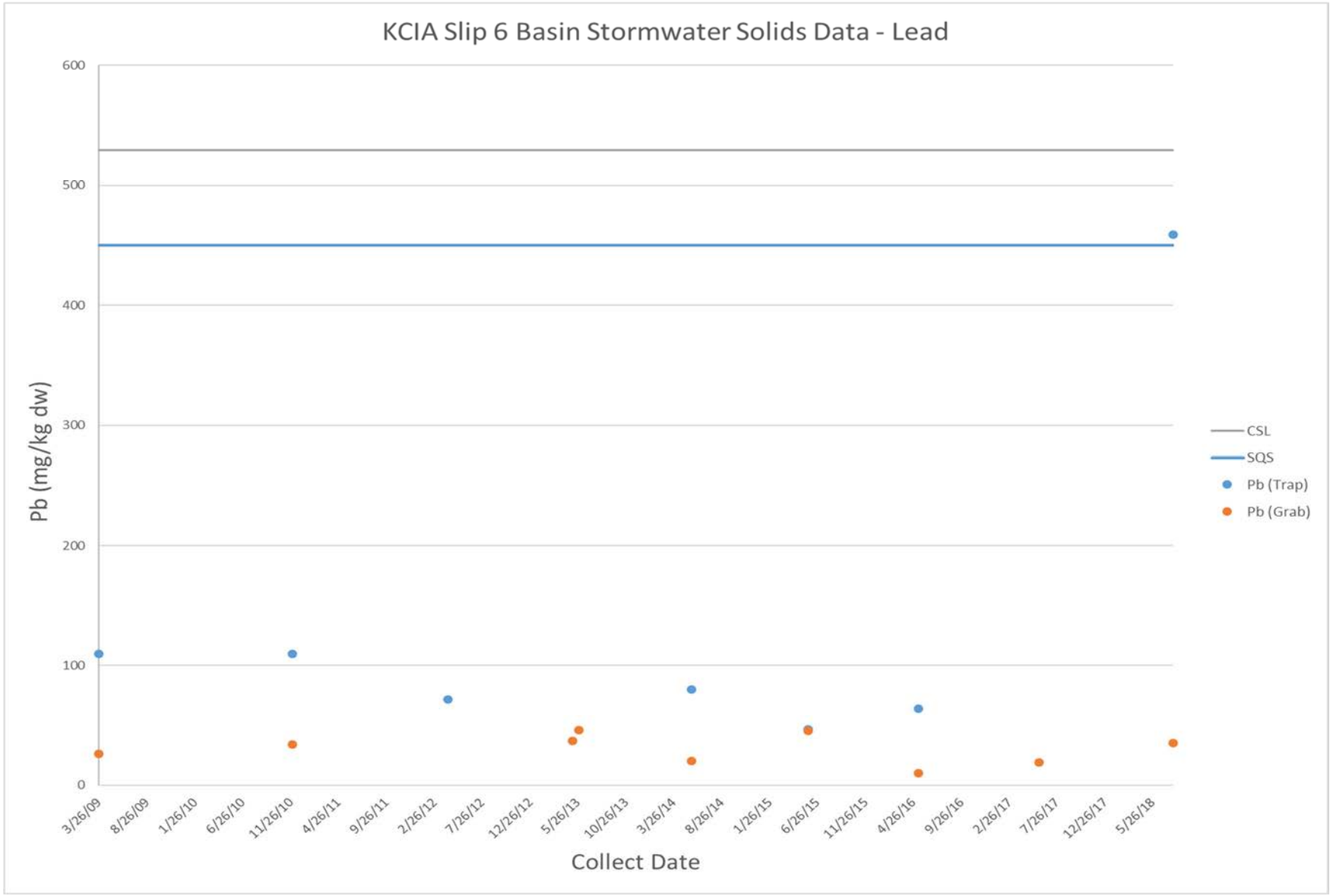

Figure D-53. KCIA Source Tracing Storm Solids Sampling for Lead Slip 6.

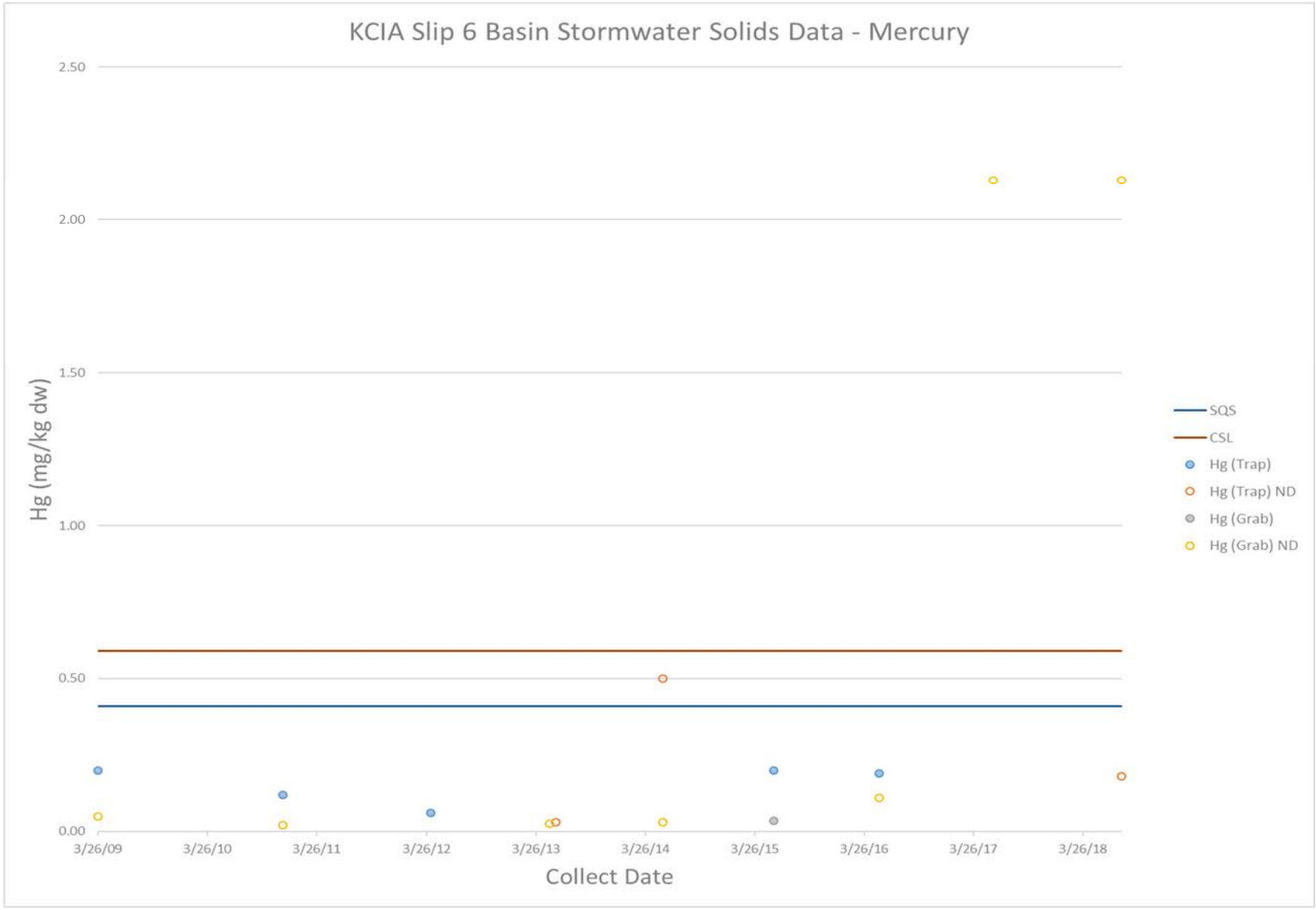

Figure D-54. KCIA Source Tracing Storm Solids Sampling for Mercury Slip 6.

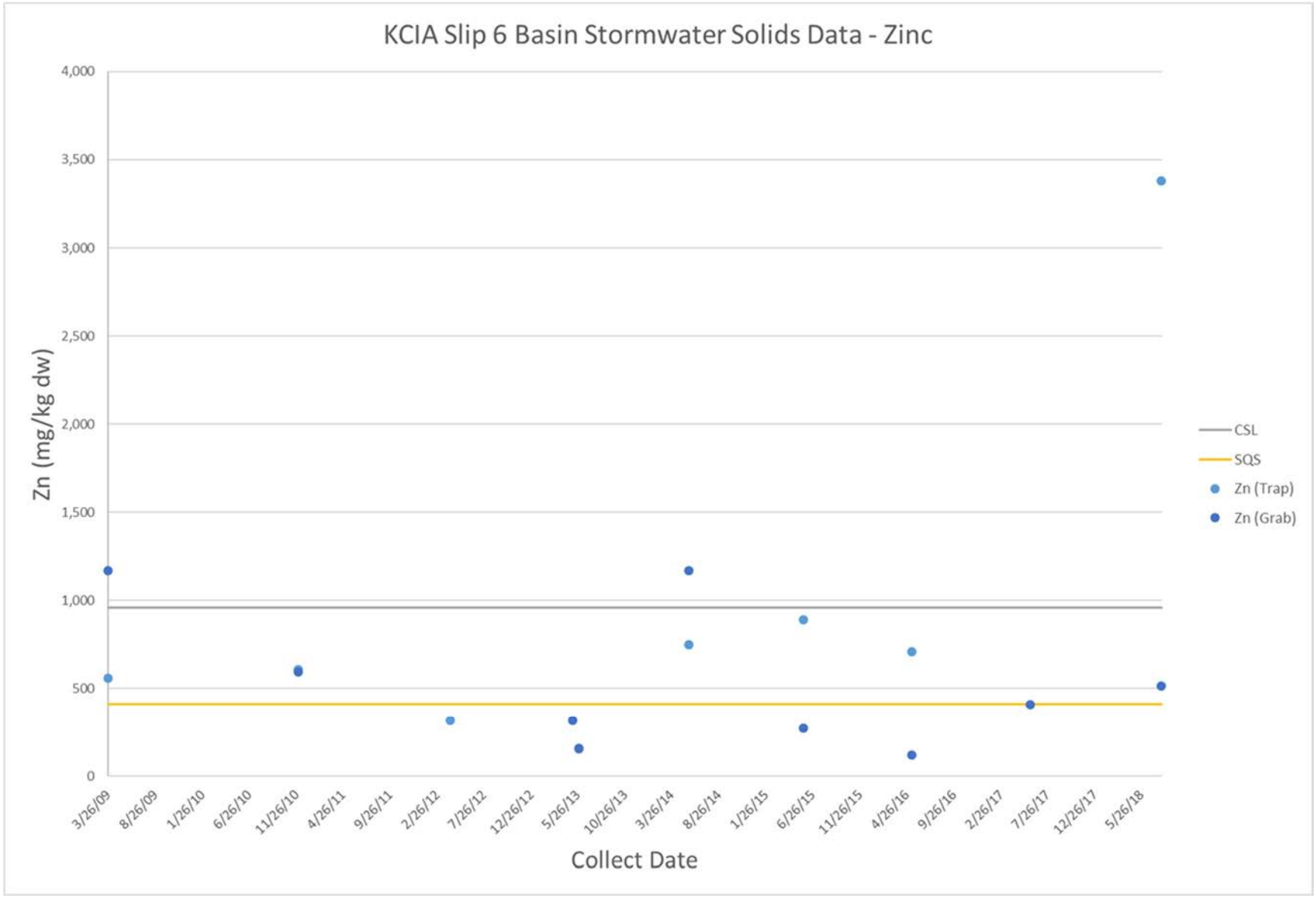

Figure D-55. KCIA Source Tracing Storm Solids Sampling for Zinc Slip 6.

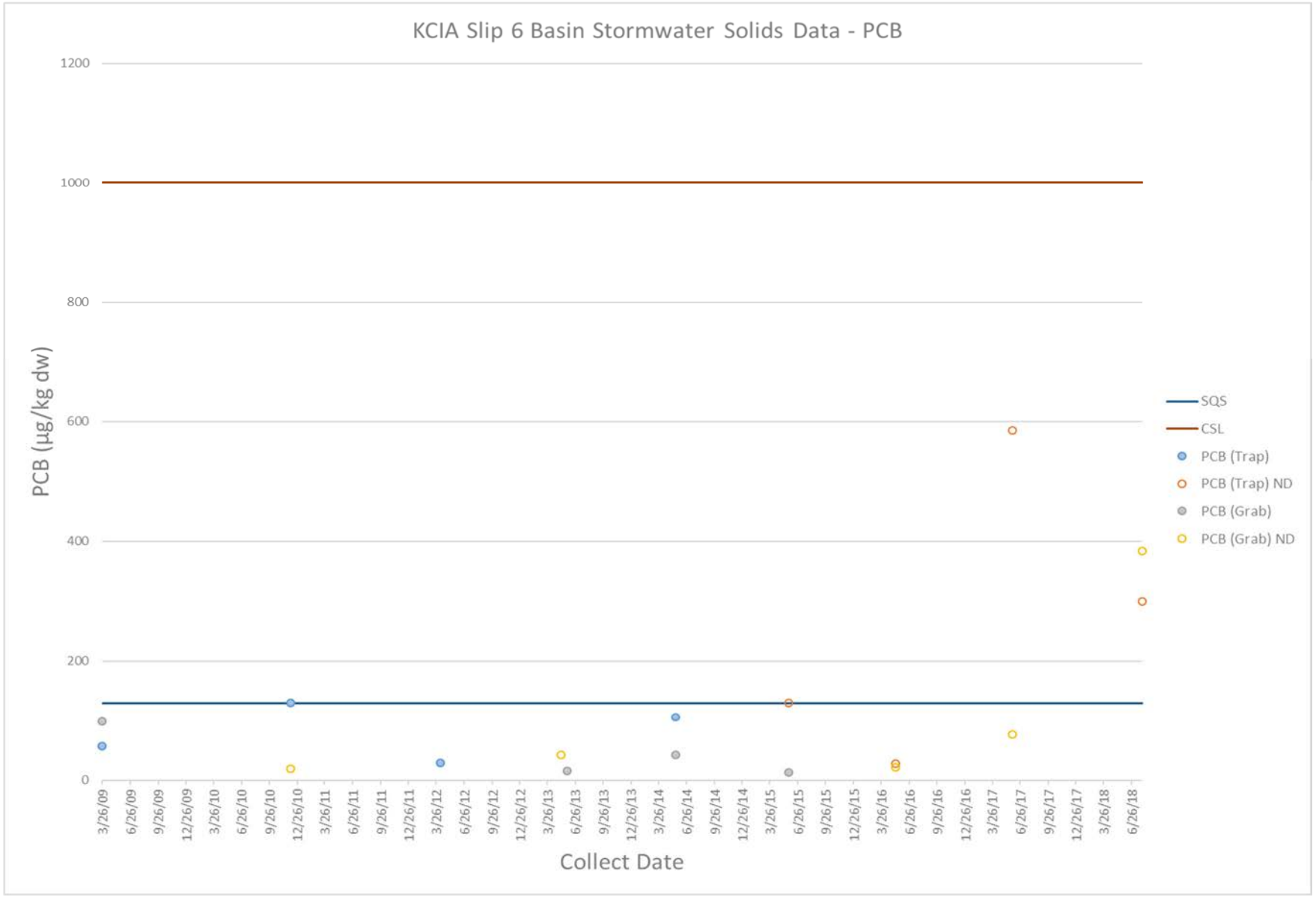

Figure D-56. KCIA Source Tracing Storm Solids Sampling for PCB Slip 6.

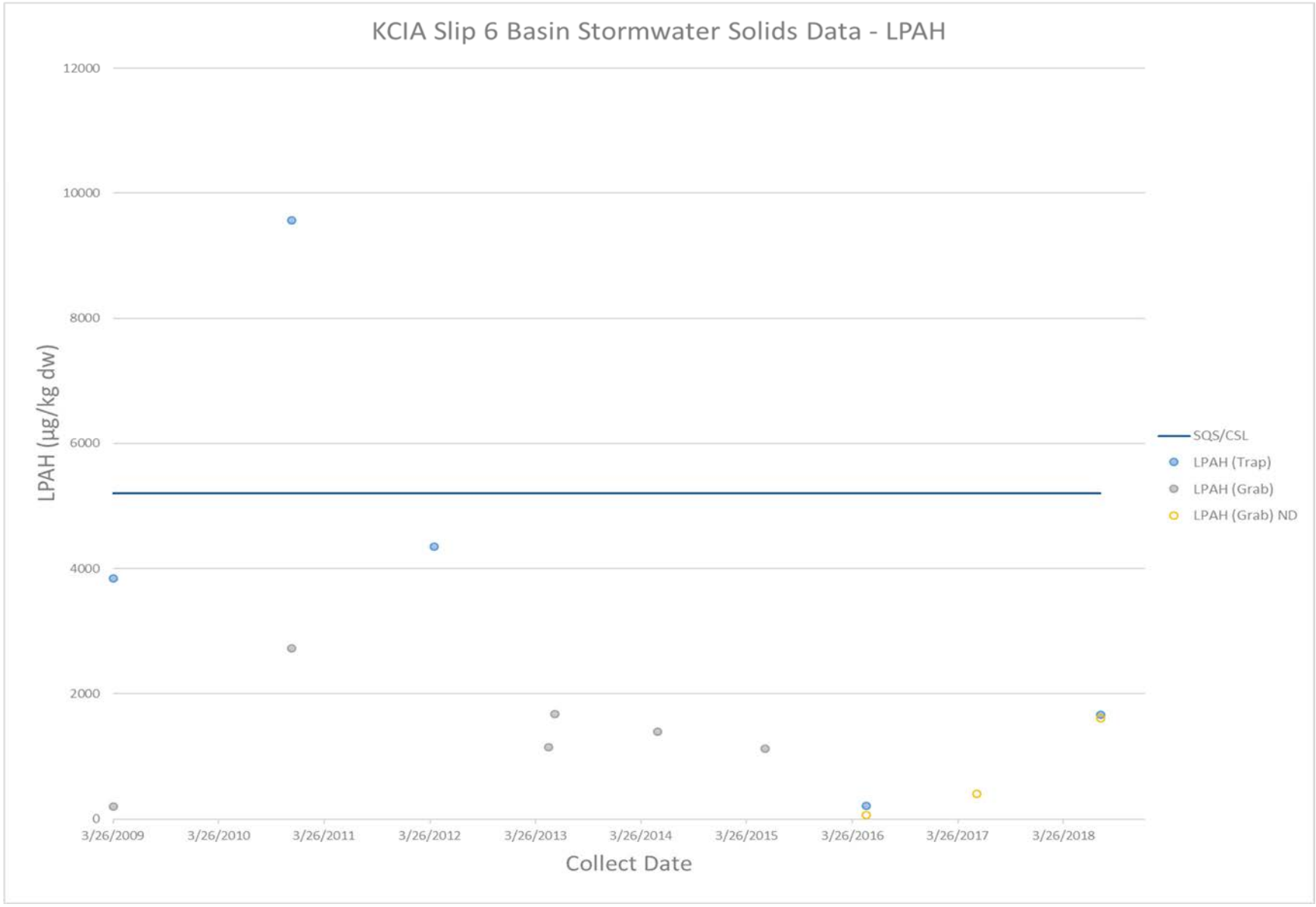

Figure D-57. KCIA Source Tracing Storm Solids Sampling for LPAH Slip 6.

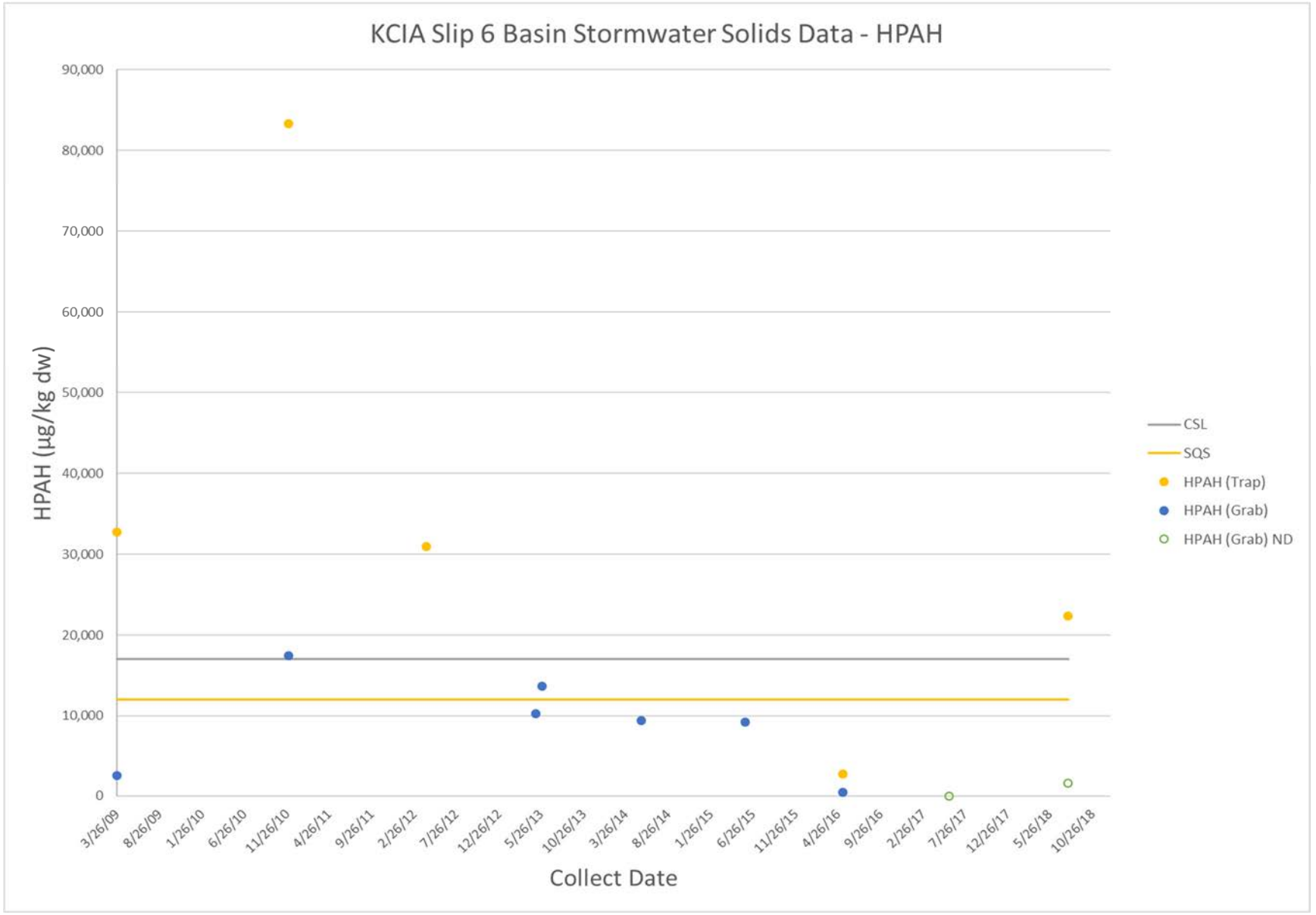

Figure D-58. KCIA Source Tracing Storm Solids Sampling for HPAH Slip 6.

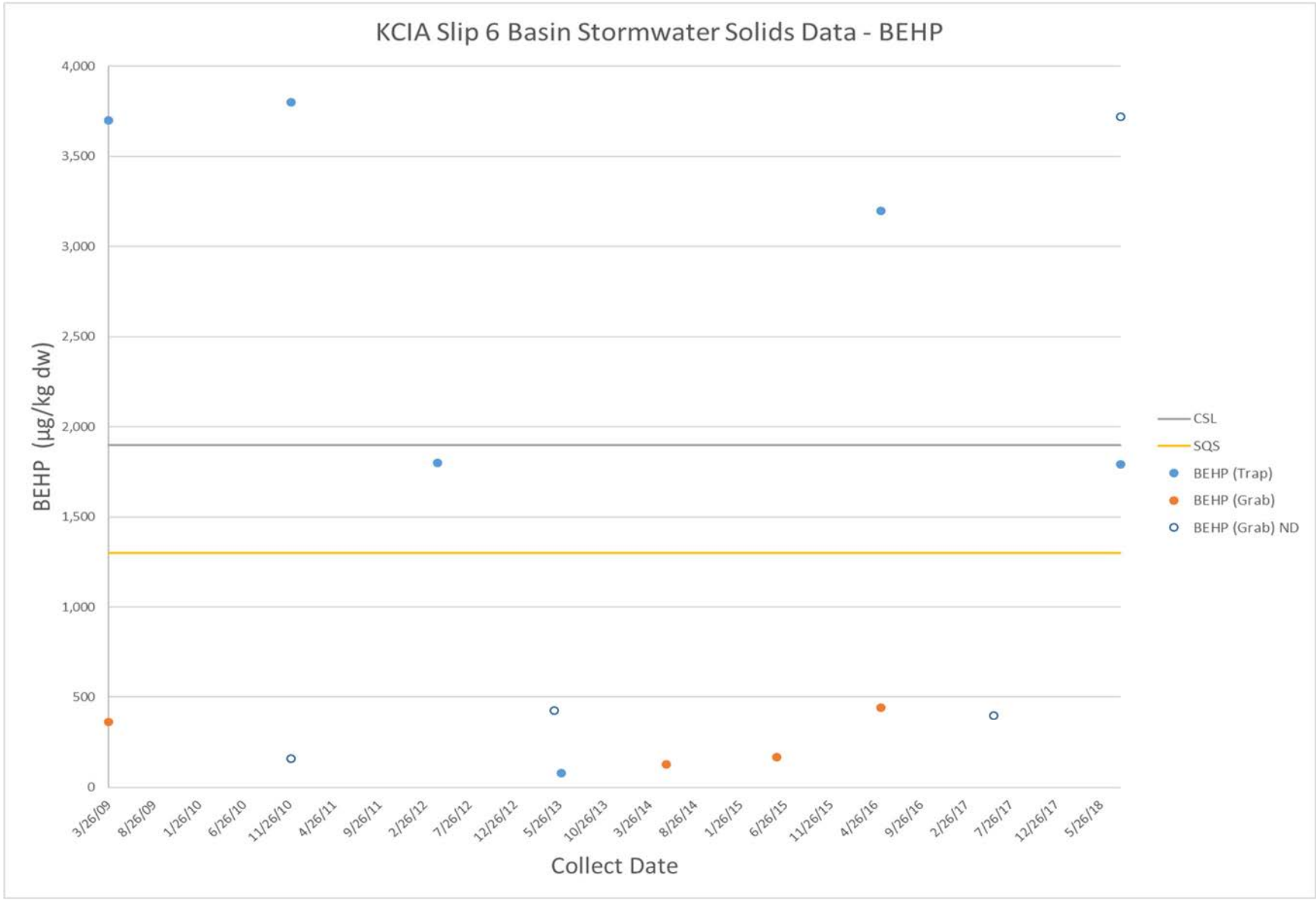

Figure D-59. KCIA Source Tracing Storm Solids Sampling for BEHP Slip 6.

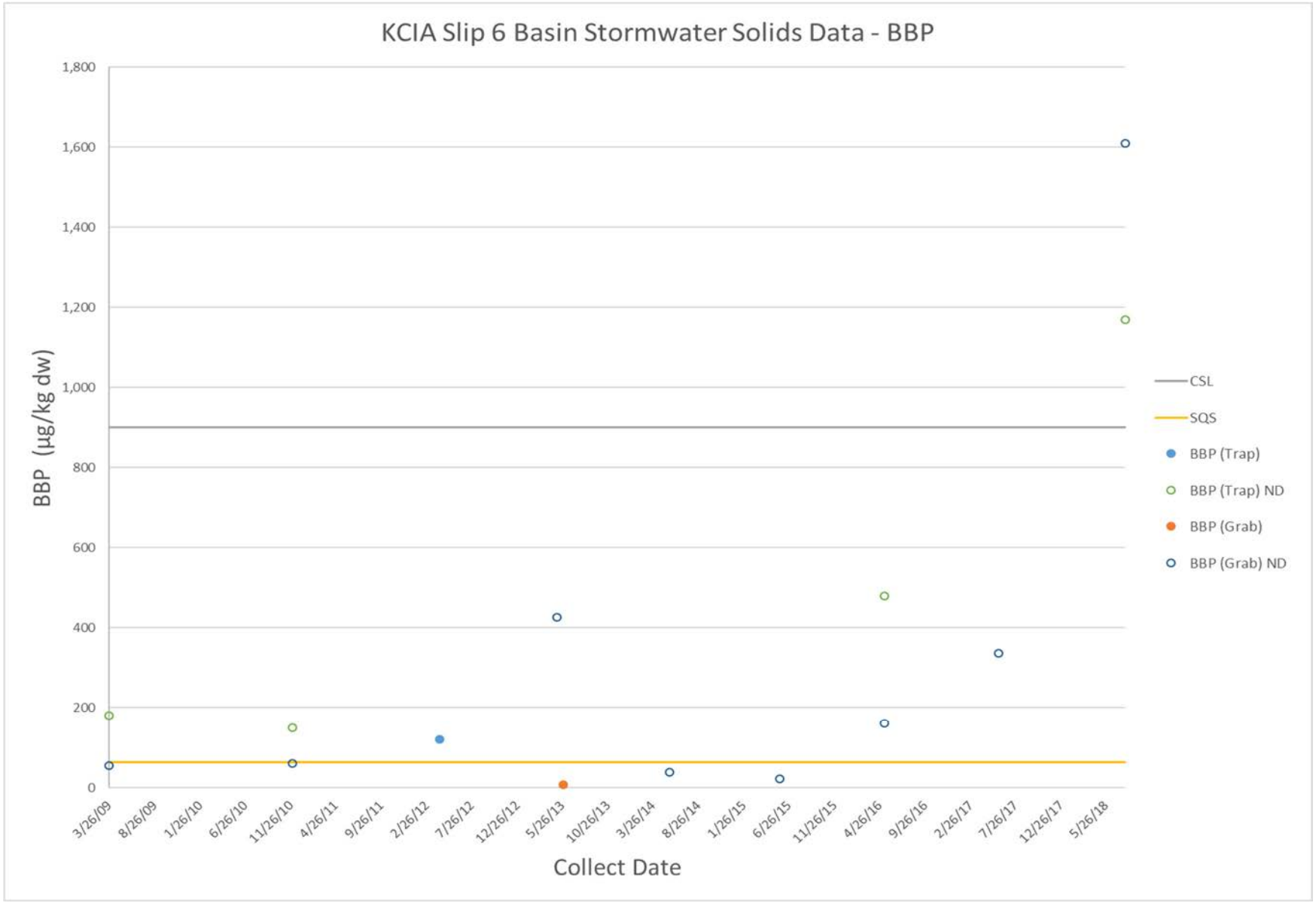

Figure D-60. KCIA Source Tracing Storm Solids Sampling for BBP Slip 6.

Appendix E:

Facilities Management Division Properties in the LDW Drainage Area

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PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
0001800014	LUTHER COLLINS DC	0.7	TAX TITLE	UNDER I-5		N	--	NO	2017
0003800011	BENNETT DC #47	0.01	TAX TITLE	3' X 75' Strip back yard		N	--	NO	NO
0005200078	MAPLE S.A #49	0.01	TAX TITLE	SM. STRIP-NO ACCESS		N	--	NO	NO
0133000460	ALINE HEIGHTS ADD.	0.38	TAX TITLE	POR TR 58 & 59		N	--	NO	2017
0182000255	ALLENTOWN ACRES	0.42	TAX TITLE			N	--	NO	2016
0182000320	ALLENTOWN ACRES	1.71	TAX TITLE			N	--	NO	2016
0185000100	ALLENTOWN ACRES	0.14	TAX TITLE			N	--	NO	2018
0223049135	TAX LOT 135	0.01	TAX TITLE	118 SQ FT Strip betwn lots		N	--	NO	NO
0424049013	TAX LOT 9013	0.02	TAX TITLE			N	--	NO	NO
0523049019	TAX LOT 19	0.03	TAX TITLE	1500 SQ FT ON SR-509		N	--	NO	NO
0523049188	TAX LOT 188	0.04	TAX TITLE	300 SQ FT ON SR-509		N	--	NO	NO
0603002374	BEACON HILL VIEW ADD	0.03	TAX TITLE			N	--	NO	NO
0792000018	BEVERLY HEIGHTS GRDN TRS	0.01	TAX TITLE	Back yard		N	--	NO	NO
0792000019	BEVERLY HEIGHTS GRDN TRS	0.18	TAX TITLE	Back yard		N	--	NO	NO
0795001102	BEVERLY PARK DIV 1	0.66	PARK SITE		PARKS	N	--	NO	2017
0795001240	BEVERLY PARK DIV 1	0.5	PARK SITE		PARKS	N	--	NO	2017
0923049112	TAX LOT 9112	0.33	TAX TITLE			N	--	NO	2015
0942001010	CORRECTIONAL FACILITY	1.31	BUILDING SITE		King Co Adult Detention	N	COMBINED	NO	2018
0942001050	PARKING GARAGE	1.89	BUILDING SITE		King Co Parking Garage	N	COMBINED	NO	2018
0985000261	BOULEVARD PARK ADD	0.11	TAX TITLE			N	--	NO	2014
0985000670	BOULEVARD PARK ADD	0.19	TAX TITLE			N	--	NO	2018
1035000130	BRADNERS GARDEN TRACTS	0.01	TAX TITLE	4' strip betwn lots		N	--	NO	NO
1037000120	BRAILES FIRST ADD.	0.56	TAX TITLE	topography		N	--	NO	2017
1102001226	BRIGHTON BEACH	0.057	TAX TITLE			N	--	NO	NO
1105000430	BRIGHTEN BEACH ACRE TRACT	0.01	TAX TITLE	8' X 62' Strip back yard		N	--	NO	NO
1105000860	BRIGHTEN BEACH ACRE TRACT	0.38	TAX TITLE			N	--	NO	NO
1108000688	BRIGHTON BEACH ORCHRD ADD	0.05	TAX TITLE	5/6 INTEREST IN ROAD		N	--	NO	NO
1223049127	TAX TITLE TL 9127	0.2	TAX TITLE			N	--	NO	2015
1282301050	BYRON ADDN	0.01	TAX TITLE	436 SFTriangle back yard alley access		N	--	NO	NO
1443500642	CEDAR GROVE ADD	0.01	TAX TITLE			N	--	NO	NO
1447200140	CEDARHURST DV3 LOT12 BK18	0.04	TAX TITLE	1800 SQ FT Triangle		N	--	NO	NO
1623049267	TAX LOT 267	0.01	TAX TITLE	3' X 125' STRIP		N	--	NO	NO
1623049390	TAX LOT 390	0.04	TAX TITLE	3' X 292' STRIP		N	--	NO	NO
1623049410	TAX LOT 410	0.1	TAX TITLE	Paved access		N	--	NO	NO
1704900457	COLUMBIA HEIGHTS	0.03	TAX TITLE	1' X 146' STRIP		N	--	NO	NO

PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
1721801605	COMMERCIAL STREET	0.01	TAX TITLE	6' X 102' Strip at property lines		N	--	NO	NO
1722800985	ORCAS BLDG/MOTOR POOL 3-2005-002	1.8	MAINTENANCE BUILDING	707 S ORCAS ST	King Co Fleet Admin	N	COMBINED	YES	2018
1753700545	CORGIAT ADD'N	0.01	TAX TITLE	no access private back yards		N	--	NO	NO
1756700050	CORLISS ADD TO COLUMBIA	0.15	TAX TITLE	topo - buildable		N	--	NO	NO
1801500010	COY HILL ADD	0.17	TAX TITLE			N	--	NO	2018
1824049111	TAX LOT 111	0.01	TAX TITLE			N	--	NO	NO
1924049002	DUWAMISH - BALL-INCON	8.76	OTHER DEVELOPED		Ardagh Glass	YES	SEPARATE	YES	2018
1924049041	DUWAMISH - MANSON	3.19	OTHER DEVELOPED		Manson	YES	SEPARATE	NO	2018
1924049043	DUWAMISH - BALL-INCON	3.38	OTHER DEVELOPED		JA Jacks	YES	SEPARATE	NO	2018
1924049051	DUWAMISH - UTILITIES W.	4.67	OTHER DEVELOPED		Western Utilities	N	SEPARATE	NO	2018
1924049052	DUWAMISH - MANSON	2.16	OTHER DEVELOPED		Cadman	YES	SEPARATE	NO	2018
1924049067	DUWAMISH - MANSON	1.02	OTHER DEVELOPED		Manson	YES	SEPARATE	NO	2018
1924049070	DUWAMISH - MANSON	4.62	OTHER DEVELOPED		Cadman	YES	SEPARATE	NO	2018
2113700550	DUMAR DIV. # 03	0.01	TAX TITLE			N	--	NO	NO
2115200100	DUMAR'S HIGHLAND PARK SUP	0.07	TAX TITLE	30' X 67' Topo betwn Parks		N	--	NO	NO
2124049241	COMET LODGE CEMETERY	2.06	TAX TITLE			N	--	NO	2011
2124049283	TAX LOT 283	0.01	TAX TITLE	5' X 89' STRIP		N	--	NO	NO
2124049290	TAX LOT 9290	0.01	TAX TITLE			N	--	NO	NO
2144800024	EARLINGTON ACRES TRACT	0.45	TAX TITLE			N	--	NO	NO
2254502530	EDES & KNIGHTS ADD SUPPL.	0.01	TAX TITLE	Alley R/W		N	--	NO	NO
2444600540	FAEGRE'S 1ST ADD	0.01	TAX TITLE	" 7"" X 50' STRIP IN ALLEY betwn lots"		N	--	NO	NO
2624049026	TAX LOT 26	0.01	TAX TITLE	9' WALKWAY		N	--	NO	NO
2624049118	TAX LOT 118	0.05	TAX TITLE	9' WALKWAY		N	--	NO	NO
2824049031	TAX LOT 31	0.01	TAX TITLE			N	--	NO	NO
2908700085	YOUTH SERVICE CENTER	5.88	BUILDING SITE		King Co Court & Youth Svcs	N	COMBINED	YES	2018

PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
2976800797	GUTHRIES TERRACE PARK	0.02	TAX TITLE			N	--	NO	NO
2976800894	GUTHRIES TERRACE PARK	0.04	TAX TITLE			N	--	NO	NO
3031200110	HALL BERG 1/4 ACRE TRS	0.03	TAX TITLE			N	--	NO	NO
3124049005	TAX LOT 05	0.12	TAX TITLE	DIRT ROAD		N	--	NO	NO
3145600160	HARTUNGS ADD TO COLUMBIA	0.01	TAX TITLE	6' X 82' STRIP		N	--	NO	NO
3145600260	HARTUNGS TO COLUMBIA	0.01	TAX TITLE	6' X 82' STRIP		N	--	NO	NO
3151600046	HARWOODS ADDN.	0.01	TAX TITLE	10' X 50' STRIP		N	--	NO	NO
3275900030	HIDDEN VALLEY ADD	0.07	TAX TITLE	RAVINE - NO ACCESS		N	--	NO	NO
3325049035	TAX LOT 35	0.01	TAX TITLE	7' X 79' STRIP		N	--	NO	NO
3325049059	TAX LOT 59	0.01	TAX TITLE	10' X 90' STRIP IN YARD		N	--	NO	NO
3330500206	HILLMAN CITY DIV NO. 1	0.01	TAX TITLE	2' X 103' STRIP		N	--	NO	NO
3330501655	HILLMAN CITY DIV. NO. 01	0.02	TAX TITLE	SM BETW. 2 PROP. 10FT		N	--	NO	NO
3331000395	HILLMAN CITY ADD #2 L1 B4	0.07	TAX TITLE	one bldg site contig 0400 0405		N	--	NO	NO
3331000400	HILLMAN CITY DIV. 2	0.03	TAX TITLE	one bldg site contig 0405 0395		N	--	NO	NO
3331000405	HILLMAN CITY DIV. 2	0.04	TAX TITLE	one bldg site contig 0400 0395		N	--	NO	NO
3331500280	HILLMAN CITY DIV NO 3	0.01	TAX TITLE	10' X 103' STRIP		N	--	NO	NO
3348400990	HILLMANS MEADOW GARDENS DIV #2	0.37	TAX TITLE			N	--	NO	2015
3348401022	HILLMANS MEADOW GARDENS #2	0.39	TAX TITLE			N	--	NO	2015
3348401681	HILLMANS MDW. GARDS #2	0.06	TAX TITLE	NO ACCESS		N	--	NO	NO
3348401790	HILLMANS MEADOW GARDENS 2	0.22	TAX TITLE	NO ACCESS		N	--	NO	NO
3352400840	HILLMANS MEADOW GARDENS 4	0.06	TAX TITLE	7' X 60' Strip adj to Seattle FFD 0842		N	--	NO	NO
3352401984	HILLMANS MEADOW GRDN DV#4	0.01	TAX TITLE	3' X 160' Strip betwn lots		N	--	NO	NO
3352402192	HILLMANS CD MDW GARDENS 4	0.01	TAX TITLE	1.5' X 51' STRIP		N	--	NO	NO
3361401020	HILLMANS GARDEN TRS	0.01	TAX TITLE	5' X 102' Strip betwn lots		N	--	NO	NO
3361402031	HILLMANS GARDEN TRS	0.03	TAX TITLE			N	--	NO	NO
3424049048	TAX LOT 48	0.02	TAX TITLE	5' X 193' STRIP		N	--	NO	NO

PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
3438500465	HOMECROFT ADD	0.25	TAX TITLE			N	--	NO	2015
3438500993	HOMECROFT ADD PARCEL B	0.15	TAX TITLE			N	--	NO	2015
3438501685	HOMECROFT ADD LOT 5, BLK 30	0.21	TAX TITLE			N	--	NO	2015
3438501743	HOMECROFT ADD LOT 3 BL 31	0.16	TAX TITLE	Back Lot undeveloped		N	--	NO	2016
3438503179	HOMECROFT ADD	0.01	TAX TITLE	76 SQ FT		N	--	NO	NO
3438503198	HOMECROFT ADD'N	0.01	TAX TITLE	strip betwn lots		N	--	NO	NO
3624039148	TAX LOT 148	0.01	TAX TITLE	strip betwn lots		N	--	NO	NO
3723800408	JOHNS & HANFORDS FIVE AC	0.04	TAX TITLE	PART OF 56 AVE S		N	--	NO	NO
3812400722	KELSEYS BRIGHTON BEACH ACRE	0.01	TAX TITLE	2' STRIP		N	--	NO	NO
3812400745	KELSEYS BRIGHTON BEACH	0.01	TAX TITLE	ACRE TRACTS		N	--	NO	NO
3826000848	KENSINGTON HEIGHTS REPLAT	0.02	TAX TITLE	corner		N	--	NO	NO
3869401065	KING COUNTY 2ND ADDITION	0.31	TAX TITLE	50'X 272' SLOPE BELOW I-5		N	--	NO	2017
3869401235	KING COUNTY 2ND ADDITION	0.25	TAX TITLE			N	--	NO	2014
3904100148	KITTINGERS ADDITION	0.01	TAX TITLE	10' X 47' STRIP		N	--	NO	NO
3959400765	LADDS 2ND ADD TO S SEATTL	0.01	TAX TITLE	TRIANGLE adj to CITY LIGHT R/W		N	--	NO	NO
3959400975	LADDS 2ND ADD TO SEATTLE	0.01	TAX TITLE	TRIANGLE adj to CITY LIGHT R/W		N	--	NO	NO
3959401680	LADDS 2ND ADD TO S SEATTL	0.01	TAX TITLE	TRIANGLE adj to CITY LIGHT R/W		N	--	NO	NO
3959401891	LADDS 2ND ADD TO S.SEATTL	0.01	TAX TITLE	adj to City FFD owned 1892		N	--	NO	NO
4006000275	LAKE DELL SMITHS ADDITION	0.02	TAX TITLE			N	--	NO	NO
4006000371	LAKE DELL LOT 18	0.01	TAX TITLE			N	--	NO	NO
4006000555	LAKE DELL SMITHS ADDN	0.01	TAX TITLE			N	--	NO	NO
4006000564	LAKE DELL SMITHS ADD	0.05	TAX TITLE			N	--	NO	NO
4058802348	LAKE RIDGE DIV.#2 Lot B	0.15	TAX TITLE			N	--	NO	2013
4174600014	LAMPE FW HOMESTEAD ADD	0.05	TAX TITLE			N	--	NO	NO
5312100035	MCELWAINS WP 1ST ADD	0.06	TAX TITLE	2' X 14' STRIP		N	--	NO	NO
5388600045	MC NATTS 1ST TO S PARK HEIGHTS	0.04	TAX TITLE			N	--	NO	NO
5392600080	MOORES FIVE ACRES LOT 44	0.88	TAX TITLE			N	--	NO	2016
5624200750									
6083000073	NICHOLS GARDEN TRS DIV #2	0.02	TAX TITLE			N	--	NO	NO
6083000144	NICHOLS GARDEN TRS DIV #2	0.08	TAX TITLE	ACCESS EASEMENT		N	--	NO	NO

PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
6620400820	PANORAMA HEIGHTSS ASSESORS PLAT	0.01	TAX TITLE			N	--	NO	NO
6840701709	PONCIN GAMMA ADDN.	0.01	TAX TITLE	1' X 70' Strip betwn lots		N	--	NO	NO
6874200195	POTTERY WORKS ADD	0.08	TAX TITLE	EXIST ONLY ON PAPER?		N	--	NO	NO
6874200200	POTTERY WORKS ADD	0.08	TAX TITLE	EXIST ONLY ON PAPER?		N	--	NO	NO
6874200285	POTTERY WORKS ADD	0.08	TAX TITLE			N	--	NO	NO
6874200290	POTTERY WORKS ADD	0.16	TAX TITLE			N	--	NO	2014
6874200980	POTTERY WORKS ADD	0.28	TAX TITLE			N	--	NO	2015
6874200985	POTTORY WORKS ADD	0.2	TAX TITLE			N	--	NO	2015
7129305245	RAINIER BEACH	0.01	TAX TITLE	250 SQ FT Triangle at R/W		N	--	NO	NO
6083000073	NICHOLS GARDEN TRS DIV #2	0.02	TAX TITLE			N	--	NO	NO
6083000144	NICHOLS GARDEN TRS DIV #2	0.08	TAX TITLE	ACCESS EASEMENT		N	--	NO	NO
6620400820	PANORAMA HEIGHTSS ASSESORS PLAT	0.01	TAX TITLE			N	--	NO	NO
6840701709	PONCIN GAMMA ADDN.	0.01	TAX TITLE	1' X 70' Strip betwn lots		N	--	NO	NO
6874200195	POTTERY WORKS ADD	0.08	TAX TITLE	EXIST ONLY ON PAPER?		N	--	NO	NO
6874200200	POTTERY WORKS ADD	0.08	TAX TITLE	EXIST ONLY ON PAPER?		N	--	NO	NO
6874200285	POTTERY WORKS ADD	0.08	TAX TITLE			N	--	NO	NO
6874200290	POTTERY WORKS ADD	0.16	TAX TITLE			N	--	NO	2014
6874200980	POTTERY WORKS ADD	0.28	TAX TITLE			N	--	NO	2015
6874200985	POTTORY WORKS ADD	0.2	TAX TITLE			N	--	NO	2015
7129305245	RAINIER BEACH	0.01	TAX TITLE	250 SQ FT Triangle at R/W		N	--	NO	NO
7129305250	RAINIER BEACH ADDN.	0.01	TAX TITLE	L250 SQ FT TRIANGLE		N	--	NO	NO
7217401090	RENGSTORFFS ADD	0.01	TAX TITLE	2' X 25' Strip back yard no access		N	--	NO	NO
7228500421	RENTON HILL	0.07	TAX TITLE	1' X 30' Strip no access		N	--	NO	NO
7319900284	RILEY'S ADD TO RILEY'S	0.01	TAX TITLE	no access, back yard		N	--	NO	NO
7327901195	DUWAMISH - RIVER PARK	1.26	PARK SITE	acquired as part of a Bond for a dock site	CITY OF SEATTLE	N	--	NO	NO

PIN	DESCRIPTION	ACREAGE	USE TYPE	OTHER_DESC	CURRENT TENANT	Requires SWPPP	Sewer Service	On CSCS List	KC Inspection
7376600737	BARCLAY DEAN BLDG.	0.73	OTHER DEVELOPED		King Co Sheriff	N	COMBINED	NO	2018
7689600185	SEELEYS ADDN.	0.02	TAX TITLE	L900 SQ FT TRIANGLE		N	--	NO	NO
7812500340	SKYWAY FARMS TR D	0.15	TAX TITLE			N	--	NO	2014
7883602860	SOUTH PARK LOTS 38-39, BLK 14	0.06	TAX TITLE			N	--	NO	NO
7883605975	SOUTH PARK	0.13	TAX TITLE			N	--	NO	2018
7896300730	SOUTHSIDE GARDEN TRS	0.11	TAX TITLE			N	--	NO	2016
7949300095	YOUTH SERVICE CENTER	2.71	BUILDING SITE		Parking Lot	N	COMBINED	NO	2018
7972602322	STATE ADDN. TO SEATTLE #4	0.06	TAX TITLE	20' X 128' STRIP		N	--	NO	NO
7972603810	STATE ADD TO SEATTLE NO.4	0.01	TAX TITLE	5' X 47' STRIP		N	--	NO	NO
8013600043	STILES VIEW TRS	0.13	TAX TITLE			N	--	NO	2018
8019200601	STIMSON PARK DIV. NO. 02	0.04	TAX TITLE	PART OF 10' ALLEY		N	--	NO	NO
8019200630	STIMSON PK DV#2 LOTS13&14	0.01	TAX TITLE	BK#7 - PART OF 10' ALLEY		N	--	NO	NO
8019200795	STIMSON PARK DIV #2 UNREC	0.02	TAX TITLE	PART OF 10' ALLEY		N	--	NO	NO
8019200820	STIMSON PARK DIV #2 UNREC	0.03	TAX TITLE	PART OF 10' ALLEY		N	--	NO	NO
8019201091	STIMPSON PARK # 2 UNREC	0.17	TAX TITLE			N	--	NO	2015
8061000045	RECORDS/VOTING WAREHOUSE	1.73	BUILDING SITE		Records Warehouse	N	COMBINED	NO	2018
8113100311	SUNNYSIDE 5-ACRE TRACTS	0.01	TAX TITLE			N	--	NO	NO
8113600350	SUNNYSIDE 5 ACRES TRS	0.03	TAX TITLE			N	--	NO	NO
8728100580	TWENTY SECOND ST ADD'N	0.01	TAX TITLE	triangle betwn several lots		N	--	NO	NO
9122000540	WALKERS ADD	0.01	TAX TITLE			N	--	NO	NO
9188201086	WASHINGTON VIEW ADD	0.01	TAX TITLE	4' X 100' STRIP		N	--	NO	NO
9368700268	WHITES RAINIER BCH GAR AD	0.01	TAX TITLE			N	--	NO	NO
9368700269	WHITES RAINIER BCH GAR	0.04	TAX TITLE	990SQ FT.LESS TRANSP LINE		N	--	NO	NO
9368700290	WHITES RAINIER BCH GARD ADD	0.02	TAX TITLE	Triangle ajd to R/W		N	--	NO	NO
9368700336	WHITES RAINEIR BCH GARD ADD	0.1	TAX TITLE			N	--	NO	NO
9368700340	WHITES RAINIER BEACH GARDENS ADD	0.07	TAX TITLE			N	--	NO	NO
9368700345	WHITES RAINEIR BCH GARD ADD	0.53	TAX TITLE			N	--	NO	2017