

To: Melissa Foley, RMP Manager
Jay Davis, RMP Lead Scientist
From: Don Yee, Quality Assurance Officer
Date: May 20, 2021
Re: 2019 RMP Tissue and Water Data Quality Assurance Report

2019 RMP Data Quality Assurance Report

Introduction

This memo provides a high-level summary of the quality assurance assessment for data reported by the RMP. Non-conformances with the QAPP and possible indicators of variability and uncertainty in reported values, with corrective actions needed for the next round of monitoring are highlighted in gray shading. The details of the quality assurance assessment for each dataset (generally one matrix, lab, and analyte group combination each set) are provided in Appendix A.

In 2019, fish tissue samples were collected from nine Bay/Delta areas and three additional wetland/slough areas for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP). General descriptions of the sample collection methods are provided in the RMP Quality Assurance Program Plan, cruise plans, cruise reports, and field sampling reports. These documents are available from the SFEI website (<http://www.sfei.org/content/status-and-trends-monitoring-documents>).

Sport fish samples were analyzed for the following parameters by the laboratories indicated:

- BAL: Selenium
- DFW-MPSL: Mercury
- SGS-AXYS: PCBs, PBDEs, PCDD/Fs, PFAS

In addition, water samples were collected from 22 RMP Status and Trends water sites, both historical and random stations from the Bay and lower Delta.

Estuary water samples were analyzed for the following parameters by the laboratories indicated:

- ALS: DOC and POC (dissolved and particulate organic carbon)
- AMS: CTD casts (1m depth time series, profiles to the bottom)
- BAL: Copper, Cyanide, Hardness, Methylmercury, Selenium, SSC
- CalTest: Chlorophyll a
- PER: Water toxicity (acute and short term chronic)

Stormwater samples were also collected in 2019, with 12 field samples collected for two projects (the RMP Small Tributaries Loading Studies, and the Priority Margin Units).

Stormwater samples were analyzed for the following parameters by the laboratories indicated:

- BAL : Mercury

- SGS-AXYS: PCBs
- USGS-CWSC: SSC

The SFEI Data Services Team checked the laboratory results using the methods and data quality objectives in the RMP Quality Assurance Project Plan (QAPP).

Due to lab closings for COVID-19, analysis was delayed for many sport fish samples. For the sport fish samples, 100% of the BAL selenium results were reportable, although many were flagged for being analyzed beyond the one year recommended hold time. However, samples were stored frozen, so the impact of the extended holding time is likely small. Sport fish mercury results similarly had no serious issues, with the primary flagging of data being for hold times exceeding the listed 28 days for the method (EPA 7473). However, that hold time is likely overly conservative given frozen storage of samples and volatile mercury species not typically found in tissue samples. Subsequent RMP QAPPs have been updated to extend tissue mercury hold times to a year if frozen, although there is no demonstration or expectation of significant loss for storage beyond the first year.

For the organic compounds reported by SGS-AXYS, many were also analyzed beyond the recommended hold time of one year. However, similar to mercury and selenium, losses of many of these compounds is expected to be small for samples in frozen storage. Overall around 80% of the PCB data were qualified, mostly due to hold time exceedances.

For estuarine water samples, there were some exceedances of recommended hold times of just a few days, not due to COVID-19: some of the cyanide samples were up to two days past their 14 day recommended maximum hold, and some SSC analyzed two days past their recommended seven day maximum hold. The other trace element analytes were analyzed within their 180 day recommended hold times.

Chlorophyll-a had no listed hold time (analyzed 8-22 days after collection), toxicity tests were all started within 1 day of collection, and DOC and POC were all analyzed within their respective 28 and 100 day hold times.

For the stormwater water samples, hold times for SSC all exceeded the RMP QAPP recommended seven days, but were mostly within the USGS internal goal of 120 days. For samples typically dominantly mineral matter (e.g., <5% organic carbon) the impact of extended hold is likely small. All mercury samples were analyzed within the 90 day holding time, and all PCB samples were analyzed within the 365 day recommended maximum holding time.

The data have been approved by the RMP Manager and Lead Scientist, and all results have been uploaded to the San Francisco Regional Data Center and CEDEN.

Quality Assurance Summary for 2019 RMP Sport fish Samples

Mercury in sport fish samples was reported for nine historical sites for the RMP S&T program and three wetland slough areas for special studies. There were no non-detects in field samples, no detects in blanks, and CRM and matrix spike recoveries were always within 15% of target values, and lab replicate RPDs always 15% or less. The only flags needed were for hold time exceedances, likely having no measurable impact on reported concentration.

The selenium data had nearly no issues or QA flags applied aside from hold time exceedances (again likely having minimal impact), with detections in all samples, no detections in method blanks, and recovery errors in matrix spikes and CRMs averaging <5%, and likewise precision <5% RPD on the lab replicate.

For PCBs, a majority of samples were analyzed past the one year hold time, leading to hold time flags, but PCBs are slow to degrade in frozen samples, so impacts on reported concentrations are likely small. Major congeners were always detected, but 25 were not detected in over half of samples. This is typical given the large number of PCB congeners, with many minor contributors. Some congeners were detected in blanks for various batches, but only a handful of congeners were tagged with "VIPND" indicating blank concentrations being over $\frac{1}{3}$ of the reported value. Precision on lab replicates was generally within the target range of <35% RPD. A handful of minor congeners had over 70% RPD, so were flagged "VJ" for estimated values to indicate the quantitation uncertainty in those batches. Recoveries were always within target ranges of <35% deviation from expected values for LCS samples, with CRM and MS samples deviating <35% most of the time. CRMs occasionally deviated >35% from the reported certified or reference consensus values with PCB 037 and 124 averaging outside of +/-70% of their expected values, and a "VJ" estimated flag indicating the uncertainty in recovery.

The PBDEs had more issues, especially PBDE 209 results, which are probably not quantitative (due to blank detects, variable precision, and no recovery on the CRM, although there were acceptable recoveries on the MS and LCS samples). About one-third of the PBDE analytes were non-detect in more than half the samples, but this was expected given inclusion of many minor congeners. Blanks were $>\frac{1}{3}$ of the reported field sample concentrations in two or more samples for 8 of the 50 congeners (PBDE 209 the worst, where the blank was over $\frac{1}{3}$ the result for 90% of samples). PBDE 209 also had poor precision in lab replicates (72% RPD), along with PBDE 207 (200% RPD). CRM recoveries were within 35% of expected values for most compounds, but again PBDE 209 was poor (low, 0% of the expected value), despite MS and LCS recoveries within 35% of target. ***Thus although PBDE 209 is of interest due to deca-BDE being the last formulation phased out, the apparent difficulties in consistent analysis make it impossible to detect small or gradual changes. Future rounds of PBDE analysis should perhaps be contingent on evidence of being able to better quantify PBDE 209 (lower blank concentrations, more consistent lab replicates, and better CRM recovery) from test samples or data from other projects.***

For the 17 PCDD/PCDF compounds analyzed in sport fish samples, none of the data were rejected, but some OCDD results were within three-times the concentrations in blanks, so were considered estimated/not quantitative results. Although there were non-detects for nearly every analyte, the method was sufficiently sensitive to detect slightly less than half the PCDD/Fs in most samples, similar to prior years. Lab replicates had <35% RPD for all compounds that were at least 3x MDL, and recoveries on CRMs, MSs, and LCSs all were within 65-135% MQO targets for all PCDD/F analytes, so no added precision recovery flags were needed.

For PFAS compounds, 95% of the data are reportable, with 5% lab rejected (LRJ flag), likely due to poor LCS recovery (averaging over 200%) for one analyte. About half of the analytes were ND in all samples, with the rest ND in one or more samples. Perfluorotridecanoate, Perfluoroundecanoate, and Fluorotelomer Sulfonate, 6:2-, were all detected in the blank for batch WG73629-AXYS, at a concentration $>\frac{1}{3}$ of the sample results, so flagged VIPND (not distinguishable from blank). Few analytes averaged >3x MDL in replicate samples, but those that did had good precision (<5% RPD), well within the 35% target. Recoveries on LCS samples were between 65-135% targets, aside from Methyl-perfluorooctanesulfonamidoethanol, N- (flagged LRJ by the lab in two batches, with average LCS

recovery of 248% across batches, and 148% in the third batch, so all were flagged VJ (estimated) by SFEI.) Despite some possible quantitation issues with minor/precursor compounds, concentrations of common compounds like PFOS were generally in an expected range.

Quality Assurance Summary for 2019 RMP Estuarine Water Samples

Analysis of water samples for POC by ALS had no major issues, but all the DOC results were flagged due to very poor matrix spike recovery (average 46%) and rejected/not reported. POC recoveries in LCS averaged 85%, slightly outside the +/-10% goal, but still reasonably quantitative. Communications with the lab about the poor DOC recovery revealed they treated the samples as freshwater because the CoC documents only indicated water samples without specifying they were marine. Review of past year's data suggest that a similar problem may have occurred in prior years, but not as obvious due to somewhat better recovery and freshwater samples being used for matrix spikes (with consequently good recoveries). Precision on lab replicate samples was acceptable, with RPDs well within the 10% target. ***For samples sent in the future to ALS, extreme care should be taken in the CoCs to very specifically note the matrix type (e.g., "seawater", "stormwater", "municipal effluent", rather than just "water") as well as calling out the contract number (and the specified lab method in the contract) to draw attention to the planned analysis method rather than the lab receiving and bench staff relying on just the name of the target analyte to arbitrarily assign one method (of possible multiple variants) for that sample. This may be good general practice for other labs as well, and this recommendation has been relayed to AMS for future sampling.***

The CTD casts by AMS reported temperature, salinity, electrical conductivity, optical backscatter, dissolved oxygen, density, and pressure data from time series near surface (~1 m depth) and profiles to the bottom for a single lowering and raising during occupation at a water site. These had primarily the usual issues with the sensor bouncing in and out of the water with the rocking of the boat, especially at Golden Gate (BC20) where a majority of the data such as backscatter were not usable and the deployment cut short due to rough seas. Any nonsensical readings (environmentally unreasonable, e.g., more than a few percent outside of previous maximum or minimum values) were qualified as rejected in the time series. The majority of data for in-Bay stations appeared reasonably within the expected range based on previous historical data.

Samples analyzed by BAL for Cyanide and dissolved Methylmercury had about 90% nondetects, with 40% ND for particulate Methylmercury, but historically NDs occur frequently for these analytes. The other trace elements and hardness had no NDs. The stdev of lab blanks for methylmercury (a blank corrected analyte) was <MDL, and the other analytes were not detected in blanks. In field blanks only copper and SSC were detected, but at concentrations <2% of the average field sample results. Average recovery on SSC samples was ~100% but error (deviation from 100%) at 11% averaged a bit over the target 10%. Recoveries on other analytes were largely within target ranges, except copper matrix spikes a bit outside their +/-35% target, though the CRM results were within 2% of expected values. All the analytes met their precision goals in lab replicates.

For Chlorophyll-a in water samples analyzed by CalTest, the primary issue was the lack of some corresponding recovery QC samples, which has occurred frequently for many ancillary analyses with multiple labs. Blanks were all non-detects. Lab replicate results (run for another project analyzed in the same period by the lab) had RPD <5%, well within the target 10%. However, variation in field replicates

averaged 21 % RPD, suggesting a degree of spatial (e.g., drifting while anchored) and/or temporal variation (e.g., changing tide or water currents) during the period of sample collection at a station, largely unrelated to the lab's performance. No recovery samples were run, which although common in ancillary analyses, is not ideal. **Development of future scopes of work for this or other labs doing ancillary analyses should include plans for recovery samples either generated in the lab (lab control samples or matrix spikes) or obtained from external suppliers (CRMs or other performance testing standards/samples).**

Toxicity analyses by PER largely experienced no major issues, although some water quality parameters exceeded test recommendations. Test pH drifted more than recommended 0.3 units over the course of the test, but the guidance states effects on tests do not generally appear below drift of <1 pH unit. Salinity also had to be adjusted for some samples faster than the recommended rate to meet holding time. Low DO in some tests also needed to be compensated for by aeration. Some reference toxicant responses were also outside of their usual range (lower EC50 and IC50), but within the acceptance range after using the EPA method for normalization to the 75th percentile CV.

Quality Assurance Summary for 2019 RMP Stormwater Samples

Stormwater samples analyzed by BAL for mercury had no major issues. No samples were non-detects. One lab batch had mercury detected in blanks, and field sample results were flagged, but none had sample concentrations less than three-times those in blanks. Recoveries of mercury in CRM, MS, and LCS were within 10% of their expected values, well within the 35% target, so no results were flagged for accuracy issues. Similarly precision RPDs on lab replicates of different sample types all averaged <5%, well within the 35% target, so needed no flags.

PCB analyses by SGS-AXYS in stormwater samples only had minor issues. Only four non-detect results were reported for individual congeners. About a dozen congeners were detected in the lab blank, and for a minor congener (PCB 049), one sample was less than three times the blank, and that result was rejected. The recoveries of the spiked congeners in the LCS sample reported were all within 3% of their target value, meeting the target 35%. RPDs on individual congeners in the blind field replicate (since sample volume was insufficient for lab replicates) ranged from 2 to 30%, all within the target 35%, so did not require flagging.

SSC reported by USGS-CWSC had no issues aside from lack of any recovery samples. All field samples had detected SSC. No blanks had detected SSC. Precision on a field replicate had an RPD of 0%, well within the target 0%. However no recovery sample was reported (no LCS or MS or CRM). **Development of future scopes of work for this or other labs doing ancillary analyses should include plans for recovery samples either generated in the lab (lab control samples or matrix spikes) or obtained from external suppliers (CRMs or other performance testing standards/samples).** For SSC, SFEI may be able to generate a recovery sample if the lab cannot or will not, as we have fine granular mineral (aluminum oxide, or glass bead) material that we could spike to a blank water sample to serve as an LCS.

Appendix A:

Dataset QA Summaries Bay RMP 2019 Sport fish

DFW-MPSL; RMP S&T Fish

Hg

QA Issues for Project Manager to Review

None

[Overall acceptability](#)

Overall the data are acceptable

[Reporting Issues for Lab to Review](#)

None

[Formatting Issues for Data Manager to Review](#)

Protocolcode of Null for QC samples I will revise to accommodate in queries, but want to make sure that there is a controlled vocabulary for non-Null protocols that aren't truly real project protocols, so that QC doesn't end up unmatched to field samples. Either no placeholder values for protocol, or always using one specific value if a placeholder is used, is preferred. Those 2 variants is fine, just don't want numerous "Not *) variants.

[Hold time review](#) (especially desired by stormwater programs)

Hold time was technically over value (28 days for EPA 7473) in the QAPP in effect at the time, but EPA has research evidence that there are not detectable detriments of longer hold time up to a year. Subsequent QAPPs have updated that value to a year, but even that is likely overly conservative, non-volatile Hg species are unlikely to be lost from frozen samples.

[QA Review](#)

[Dataset completeness](#)

Results were reported for 134 field samples, analyzed in 10 lab batches. At least 3 blanks, and 1 lab rep, CRM and MS was reported with each batch.

[MDLs sensitivity](#)

The method was sensitive enough to detect mercury in all samples.

[QB averages \(procedural, field blank\)](#)

Results were reported not blank corrected, and blanks were always below detection limit.

[Accuracy \(using a variety of SRMs or Matrix spike QRECs\)](#)

Recovery on CRMs was always within 10% of the target value or better, and matrix spikes were always within 13% of target recovery or better. No added accuracy qualifiers were needed.

[Average precision from replicate field sample](#)

Precision on lab dupes was 15% RPD or better, so no precision flags were needed. Within site variations of results were often quite large, due to differences among species and variations among individuals of a species.

[Comparison of dissolved and total phases](#)

Not Applicable

Comparison to previous years

Results are similar to past years, with tissue mercury around 1 ug/g ww or lower for nearly all species.

Ratio Checking Summary

Not applicable.

Sums Summary

Not applicable

SGS AXYS; RMP S&T Fish

PCB

QA Issues for Project Manager to Review

None

Reporting Issues for Lab to Review

None

Formatting Issues for Data Manager to Review

None

Hold time review

A majority of samples were analyzed past the one year hold time, but PCBs are slow to degrade, especially in frozen samples, so the impact is likely negligible.

QA Review

Dataset completeness

Results were reported for 82 field samples in 7 lab batches, with a blank, lab rep, CRM, MS, and LCS in each batch except WG71834-AXYS, which had only a single sample and thus only a blank, CRM, and LCS (no MS or lab rep).

Percent usable (non-reject) field data

All the data are reportable, although ~80% of the records were qualified, mostly for hold time exceedance, some blank contamination, and variation on lab reps for minor congeners.

Overall acceptability

Overall the data were acceptable.

MDLs sensitivity

Major congeners were always detected, but eight congeners were ND in 100% of samples, and 25 were ND in over half of samples. However, this is to be expected given the large number of PCB congeners with many being only minor contributors to total PCBs in the environment.

QB averages (procedural, field blank)

A number of congeners were detected in blanks for various batches, but the vast majority of them were at concentrations $< \frac{1}{3}$ those present in field samples. Only a handful of congeners were tagged with "VIPND" indicating blank concentrations being over $\frac{1}{3}$ of the reported value.

Average precision from replicate field sample

Precision on lab replicates was generally within the target range of $< 35\%$ RPD. A handful of minor congeners varied by over 70%, so were flagged "VJ" for estimated values (in addition to the IL/VIL indicating variable precision) to indicate the quantitation uncertainty in those batches. Congeners that were variable across numerous batches also had notes added to their ResultComments in the form of "pjLRavg_RPDxx", indicating project (pj) lab rep (LR) average (avg) RPD being xx%.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

Recoveries were generally within target ranges of $< 35\%$ deviation from expected values for LCS samples all the time, and MS samples most of the time. CRMs more frequently deviated $> 35\%$ from the reported certified or reference consensus values with that noted in result comments in the form of "pjCRMavg_PRxx" (project CRM average percent recovery xx%), and with PCB 037 and 124 averaging outside of $\pm 70\%$ of their expected values, and a "VJ" estimated flag indicating the uncertainty in recovery.

Comparison of dissolved and total phases

Not applicable

Comparison to previous years

Concentrations look overall reasonable, with dominant congeners like PCB 138 and 153 averaging in the 10-20 ng/g ww range. Lipid and moisture also appear reasonable, averaging ~1% & ~80% respectively (across species).

Ratio Checking Summary

Not applicable.

Sums Summary

Not applicable

PBDE

QA Issues for Project Manager to Review

None

Reporting Issues for Lab to Review

Similar to other data sets PrepPreservation is not reported, likely should be FieldFrozen, LabFrozen, based on CoCs/narrative.

Formatting Issues for Data Manager to Review

Similar to other data sets PrepPreservation is not reported, likely should be FieldFrozen, LabFrozen, based on CoCs/narrative. Maybe update along with all other 2019 fish sets.

Hold time review

Hold times ranged 344 to 447 days, over the one year target hold time, but in frozen storage, likely inconsequential to the analysis given PBDE persistence.

QA Review

Dataset completeness

The dataset includes results for 19 field samples and 3 lab replicates, reported for 50 PBDEs (including some coeluters) in three batches. Also reported were three each of MS, CRM, LCS, and blank samples (one each batch).

Percent usable (non-reject) field data

Overall over 98% of the data were reportable, with some lab rejected data. About 6% of the data were estimated (in a non-quantitative range, or with blank contamination possibly accounting for $>1/3$ of the concentration, or RPD $>70\%$ in lab reps). A majority of the rest were qualified, mostly due to hold time, or smaller degrees of blank contamination (less than $1/3$ of the sample concentration).

Overall acceptability

Overall the data are acceptable, except the PBDE 209 results are probably not quantitative (blank hits, variable RPD, no recovery on the CRM (although OK on the MS and LCS sample)).

MDLs sensitivity

Methods were reasonably sensitive for most analytes, with 17 of 50 analytes having 50% to 100% non-detects. However given the large number of minor congeners included this is not unexpected.

QB averages (procedural, field blank)

Fourteen of the PBDEs were found in blanks, with eight of those at concentrations $> \frac{1}{3}$ of the reported field sample concentrations in two or more samples (PBDE 209 the worst, where the blanks was over $\frac{1}{3}$ the result for 90% of samples).

Average precision from replicate field sample

Precision on lab replicates was good, within the target 35% RPD for all but two compounds, PBDE 207 (200% RPD) and 209 (72% RPD)

Accuracy (using a variety of SRMs or Matrix spike QRECs)

CRM recoveries were within 35% of expected values for most compounds, except PBDE 155 (averaging high, 145% recovery) and PBDE 209 (low, 0%). MS and LCS recoveries on PBDE 209 were within 35% of target however so no QACode was added, but comments noting the project average CRM recovery added (pjCRMavg_PR145%).

Comparison to previous years

Concentrations were generally in a similar range as previous years, with PBDE 47 and 99 the most abundant. Maximum concentrations were a little bit lower than in 2014, but the latter was done by a different lab and included some freshwater species samples analyzed in the same batches so may not be directly comparable on a whole batch basis.

Ratio Checking Summary

As expected, PBDE 47 and 99, components of Penta, were the dominant congeners observed in fish samples. Thanks to the lower detection limits now available, PBDE 209 has been observed in Bay fish for the first time; however, specific values are best considered semi-quantitative and are excluded from sums. There is one sample where BDE-209 makes up 7% of the sample, but the presence of other congeners at values greater than the mean plus two times the standard deviation (PBDE 208, 207, 203) is consistent with higher exposure to Deca or Octa (which can contain up to 50% BDE-209). Therefore, the overall fingerprint for that sample does not indicate a data quality concern.

The Artesian Slough sample shows a somewhat unusual distribution of Penta congeners relative to other samples (e.g., low PBDE 47, high PBDE 99). Prior monitoring in the Artesian Slough resulted in samples that had quite variable BDE-47 percentages relative to Bay fish, with one sample even lower (53% 2014, 56% 2019), consistent with this observation.

Sums Summary

Not applicable

Dioxin/Furan

QA Issues for Project Manager to Review

None

Reporting Issues for Lab to Review

None

Formatting Issues for Data Manager to Review

Although the lab reports TEQ values and sums of homolog groups (e.g., Hexa-furans, total), please verify that these are not uploaded to CEDEN.

Hold time review (especially desired by stormwater programs)

Many of the samples were analyzed beyond the one year hold time for dioxins/furans, but given their environmental persistence, the extended hold is unlikely to be consequential.

QA Review

Dataset completeness

Reported data include 14 shiner surfperch, 11 croaker reported for 17 PCDD/PCDF compounds, with two lab reps of each. Also reported were three fish samples for BOG of unspecified species. In addition to the lab replicates, four blank and LCS samples were reported (one per batch) and two CRMs and five MSs (with one a lab dupe of an MS).

Percent usable (non-reject) field data

None of the data were rejected, although some OCDD results were within three-times of the concentrations in blanks, and flagged with VIPND (not distinguishable from blanks) QAcodes, considered estimated/not quantitative results.

Overall acceptability

Overall the data are acceptable. Nothing appears to be a serious problem in the quantitation of PCDD/Fs overall.

MDLs sensitivity

Although there were non-detects for nearly every analyte, the method was sufficiently sensitive to detect slightly less than half the PCDD/Fs in a majority of samples. This is largely in line with past years' analyses.

QB averages (procedural, field blank)

Only OCDD was detected in some blanks, and with very low OCDD concentrations in most samples, in many cases field concentrations were <3x higher than the blank and flagged VIPND, indicating estimated values not distinguishable from blanks.

Average precision from replicate field sample

Precision on lab replicates was generally good, within the <35% RPD target for all the compounds that were at least 3x MDL. Some homolog groups (Hexa-furans, total, and others) had RPDs over the 35% target and flagged with a VIL QACode, but the RMP does not normally report total homologs or sums of congeners directly as provided by labs (RMP normally sums independently after data QA review).

Accuracy (using a variety of SRMs or Matrix spike QRECs)

Recoveries on CRMs, MSs, and LCSs all were within 65-135% MQO targets for all PCDD/F analytes. No added recovery flags were needed.

Comparison to previous years

Concentrations were in a pretty similar range as in previous years, for example the average concentration of the most abundant compound (2,3,7,8 TCDF) averaged 2.5 pg/g ww, similar to the 2014 average of 2.1 pg/g ww.

Ratio Checking Summary

The data did not appear with any apparent problems. The internal consistency is very good, and the prominent congeners match historic data.

Sums Summary

Not applicable

PFAS

QA Issues for Project Manager to Review

None

Reporting Issues for Lab to Review

Sample receiving doc says FieldFrozen, narrative says stored at -20C (LabFrozen), so PrepPreservationName should say at least FieldFrozen (if not both)

Formatting Issues for Data Manager to Review

PrepPreservation is listed as not recorded, although these samples are likely FieldFrozen, LabFrozen before analysis (based on the narrative in the data package PDF and shipping form).

Hold time review (especially desired by stormwater programs)

The EPA water method for PFAS has a hold time listed of 28 days. However, this is in a solid matrix so some of the partitioning loss issues in that form are likely not as significant. All samples had hold times between 246 to 413 days; given the persistence of many PFAS, there is not likely significant degradation, especially in frozen storage.

QA Review

Dataset completeness

The dataset includes results for 14 field samples with two lab replicates in three batches (one batch with only one sample, another with one and a lab rep). A blank and LCS was included in each batch, and one MS in the large batch. Thirty-three results for PFAS analytes, lipid, and moisture were reported.

Percent usable (non-reject) field data

95% of the data are reportable (not-rejected) with the remaining 5% lab rejected (LRJ flag), likely due to poor LCS recovery (averaging over 200%) for one analyte.

Overall acceptability

Overall the data are acceptable.

MDLs sensitivity

About half of the analytes were ND in all samples, with the remaining analytes occasionally to often ND (in one or more samples).

QB averages (procedural, field blank)

Perfluorooctanesulfonamide, Perfluorotridecanoate, Perfluoroundecanoate, and Fluorotelomer Sulfonate, 6:2-, were all detected in the blank for batch WG73629-AXYS. The blank accounted for >1/3 of the reported field sample in the latter three, so flagged VIPND (not distinguishable from blank) in the field sample for that batch.

Average precision from replicate field sample

Few analytes averaged >3x MDL in replicate samples, but those that did had good precision (<5% RPD) well within the 35% target.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

Recoveries on LCS and MS samples were generally good. LCS recoveries were all between 65-135% targets, aside from Methyl-perfluorooctanesulfonamidoethanol, N- (flagged LRJ by the lab in two batches, with average LCS recovery of 248% across batches, and 148% in the third batch, so flagged VJ by SFEI.) MS recovery on Ethyl-perfluorooctanesulfonamidoethanol, N-was just below 65%, so that MS and its parent sample were flagged (VGB). Although MS recovery could vary among samples, since there was only one MS, all other samples for that analyte had pjMSavg_PR64 (pj = project MS average percent recovery 64%) added as a warning in the comments field.

Comparison of dissolved and total phases

Not applicable

Comparison to previous years

Concentrations were generally in an expected range, with PFOS averaging 1 to 9 ng/g ww depending on species, a similar range as in 2014.

Ratio Checking Summary

As expected, PFOS is generally the dominant compound, followed by PFOSA, with ranges of each comparable to previous measurements. In one sample, PFOSA is significantly greater than PFOS, but since these compounds are likely derived from separate uses (rather than commercial mixtures with more consistent distributions, like for PBDEs and PCBs), that unusual fingerprint does not suggest a data quality concern.

In general, detections of short-chain compounds (PFBS, PFHxS), PFOA, and most precursors are limited and close to detection limits, as would be expected. One exception is a detection of 6:2 fluorotelomer sulfonate at levels reasonably well above the detection limit; this compound is used in metal plating and AFFF, so perhaps there's a nearby source contributing to the exposure. Long-chain carboxylates are more commonly detected at low levels, as often observed in Bay seals and bird eggs.

There have been significant improvements to the detection limits associated with previously monitored compounds, along with the addition of new compounds to this improved analytical method. These appear to be some of the first fish monitoring data for newer PFAS such as GenX and ADONA in the US - none detected. In contrast, serum of striped bass from a heavily impacted region of North Carolina have detectable levels of GenX (Perfluoro-2-Propoxypropanoic Acid or HFPO-DA).

Sums Summary

Not applicable

Brooks Applied; RMP S&T Fish

Selenium and Moisture

QA Issues for Project Manager to Review

None

Reporting Issues for Lab to Review

Prep/Preservation method is listed as none, although the narrative states the samples were field frozen for organics sets.

Formatting Issues for Data Manager to Review

Prep/Preservation method is listed as none, although the narrative states the samples were field frozen for organics sets.

Hold time review (especially desired by stormwater programs)

Hold times were between 329-429 days, many beyond the one year target, but in frozen storage degradation or loss is unlikely.

QA Review

Dataset completeness

Data reported included 64 field samples for Selenium and moisture, with seven lab reps, four each of CRMs, LCS, LabBlanks, and seven matrix spike samples.

Percent usable (non-reject) field data

All data were reportable, no data were rejected.

Overall acceptability

Overall the data are acceptable.

MDLs sensitivity

The method was sufficiently sensitive to detect selenium in all samples.

QB averages (procedural, field blank)

Results were reported blank corrected, and the stdev of blanks was below MDL, so no results needed to be flagged.

Average precision from replicate field sample

Precision on lab replicate samples was always 10% RPD or less, averaging 5%. No added precision qualifiers were needed.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

Recovery on LCS samples ranged 102-106%, averaging 104%, CRM recoveries averaged 99% (range 97 to 99.5%) so no recovery flags were needed for those sample types.

MS recoveries ranged 108 to 140%, with a few individual results over the target 65-135% of the expected value, but the average was within target, so only a few individual MS samples and their parents were flagged.

Comparison of dissolved and total phases

Not applicable

Comparison to previous years

Se concentrations were pretty similar to prior years, with *Acipenser transmontanus* (sturgeon) selenium averaging 9 ug/g dw, similar to 2014 average of 1.5 ug/g ww (with moisture content ~75% = approximately 6 ug/g dw).

[Ratio Checking Summary](#)

Not applicable

[Sums Summary](#)

Not applicable

Dataset QA Summaries Bay RMP 2019 Water

CALTEST

Water

Chlorophyll a

QA Issues for Project Manager to Review

None

Overall acceptability

100% of the chlorophyll a results are reportable.

Accuracy

The accuracy for chlorophyll a was flagged following the SFEI RMP Status and Trends convention of using the average percent error of the certified reference material (CRM) results, when present, and the average percent error of the matrix spike/matrix spike replicates when certified material samples (CRMs), are not present.

However, no spiked samples of any sample type were reported/analyzed.

Precision

The precision of field samples in the database is flagged following the SFEI RMP Status and Trends convention of using lab replicates in preference to using field replicates, although both are reviewed and described narratively when provided.

Non-project lab replicates were used to decide whether precision flags were needed for the results. The average RPD (and RSD) was below the MQO target of 10%. No qualifiers were needed.

The average blind field replicates RPD (and RSD) was above the 10% target MQO.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

The chlorophyll a water samples were analyzed between 8 and 22 days after collection. No holding time requirement is listed in the 2018 RMP QAPP.

QA Review

Dataset completeness

Chlorophyll a was reported for 22 water samples analyzed in 6 lab batches. Five blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. Two non-project lab replicates were reported for the 22 water samples meeting the minimum requirement of 1 per 20 samples, or 1 per batch. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Five method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. No matrix spike/spike replicates, certified reference material, or laboratory control samples were analyzed failing to meet the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Overall acceptability

100% of the chlorophyll a results are reportable.

MDLs sensitivity

Method detection limits (MDLs) were satisfactory with no non-detect (ND) results reported for chlorophyll a in the water samples.

QB averages (procedural, field blank)

Chlorophyll a was not measured/reported in any of the method blanks at a concentration above the MDL, meeting the requirement in the QAPP of being "<MDL". No blank contamination qualifiers were needed.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is "spiked" with a known amount of mercury, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and

subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

No spiked samples of any sample type were reported/analyzed.

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

Non-project lab replicates were used to decide whether precision flags were needed for the chlorophyll a results. The average RPD of 2.38% (average RSD 1.68%) was below the MQO target of 10%. No qualifiers were needed.

The average RPD for the blind field replicates was 21.27% (average RSD 15.04%) above the 10% target MQO.

Comparison of dissolved and total phases

Comparison to previous years

Average concentration for chlorophyll a in the water samples was 74% (~0.7x) of the previous average of the 2009-2017 RMP water samples (in units mg/m³).

Ratio Checking Summary

Not Applicable

Sums Summary

AMS-CA

Water

CTD Casts

QA Issues for Project Manager to Review

None

QA Review

Dataset completeness

CTD Data for 2019 water cruise was reviewed 10/1/2019 by JR and no major problems were found.

A water column profile (1 meter CTD cast for duration of sampling, followed by a full water column profile where water depth allows) was performed at each of the 22 water sites for analysis of temperature, salinity, electrical conductivity, optical backscatter, dissolved oxygen, density, and pressure by Applied Marine Sciences (AMS-CA).

Due to the rough seas offshore of San Francisco at BC20, the surface CTD cast and depth cast were cut short. In addition, engines were left on at BC20 during sampling to maintain boat orientation. The backscatter data reported out for sites BC20 were rejected and flagged by AMS-CA with “Q” qualifier. All other CTD casts during the 2019 water cruise were completed without issue.

Overall acceptability

43 Records with a questionable backscatter result (negative results) were rejected and flagged with the qualifier Q by AMS-CA.

4 of the records with a questionable backscatter result (negative result) and depth <1m were flagged by SFEI with the qualifier Q,FS.

2887 Records with depths < 1m were flagged with the qualifier FS by SFEI.

PER

Water

Toxicity

QA Issues for Project Manager to Review

None

QA Review

Dataset completeness

Dataset includes water toxicity results for 9 sites and controls. Water Quality measurements reported included Ammonia as NH₃, Unionized Ammonia as NH₃, Dissolved Oxygen, pH, and Salinity. Similar to previous years the case narrative states the tests were conducted in a temperature controlled room [at 26°C with temperature being monitored daily under a 16L:8D photoperiod], but no actual temperature data were submitted, except in a table in the report showing the initial water quality characteristics of the samples.

Overall acceptability

Overall, the data are acceptable.

Hold time was approximately 1 day for all samples.

Mean control survival met the test acceptability threshold of 80%. The minimum requirement for an acceptable test of an average weight of at least 0.20 mg/surviving mysid in the controls was satisfied except for the batch SFEI_0731AB_C1_W_TOX which had an average weight of 0.19 mg/surviving mysid. No significant toxicity or reduction in growth was found in the collected samples.

A reference toxicant test was performed in order to assess the sensitivity of the *Americamysis bahia* test organism to toxic stress. The reference toxicant survival EC50 and growth IC50 were below the lower thresholds of the typical response range established by the reference toxicant test database for this species. However, the current test EC50 and IC50 falls inside the typical response range normalized to EPA's 75th percentile CV, indicating that these organisms were in fact responding to toxic stress in a typical fashion.

The BC10 and CB047W samples were logged in with salinity measuring 28.9, and 30.9 ppt, respectively. Due to the need to meet the sample holding time limit, the organisms had to be adjusted at a rate greater than 3.0 ppt/12 hours as recommended by the EPA manual. Due to the observation of low D.O. during testing, all samples were aerated per EPA guidance. Ammonia as NH₃ and Unionized Ammonia as NH₃ results were all non-detects. The salinity of the test waters were in the range of 24‰ to 31‰. Dissolved oxygen concentrations were greater than 5.0 mg/L.

All samples had > +/- 0.3 pH drift over the duration of the toxicity tests, flagged as VTW (for minor WQ deviances) in TestQACode of ToxSummaryResults table, and ToxResultQACode of ToxReplicateResults table (explanation comment also added to both tables), although the EPA method notes problems don't usually appear unless the shift is >1 pH unit.

The ToxBatch table was updated with "Some WQ deviances" in ToxBatchComments, and flagged with the BatchVerification codes of VLC,VMD (Cursory Verificaton/Validation, Minor Deviations, Flagged by QAO).

BA

Water

Metals

QA Issues for Project Manager to Review

None

Overall acceptability

100% of the cyanide, hardness, suspended sediment concentration, methyl mercury, copper, and selenium results are reportable.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

Cyanide water samples were analyzed between 11 and 16 days after collection, in some cases exceeding the 14 day hold time requirement listed in the 2018 RMP QAPP. Samples exceeding the holding requirement were flagged with the non-censoring QA code of "VH".

Hardness as CaCO₃ water samples were analyzed between 39 and 49 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Suspended Sediment Concentration water samples were analyzed between 5 and 9 days after collection, in some cases exceeding the 7 day hold time requirement listed in the 2018 RMP QAPP. Samples exceeding the holding requirement and not already flagged by the laboratory were flagged with the non-censoring QA code of "VH".

Methyl mercury (Dissolved) water samples were analyzed between 29 and 43 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Methyl mercury (Particulate) water samples were analyzed between 61 and 67 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Copper (Dissolved) water samples were analyzed between 20 and 50 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Copper (Particulate) water samples were analyzed between 69 and 78 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Selenium (Dissolved) water samples were analyzed between 29 and 35 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

Selenium (Particulate) water samples were analyzed between 78 and 84 days after collection well within the 180 day hold time requirement listed in the 2018 RMP QAPP.

QA Review

Dataset completeness

Cyanide

Cyanide (Weak Acid Dissociable) was reported for 22 water samples analyzed in 2 lab batches. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. Four lab replicates were reported for the 22 water samples meeting the minimum requirement of 1 per 20 samples, or 1 per batch, whichever is the least. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Two method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Four matrix spike/spike replicate pairs, and 2 laboratory control samples were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Hardness as CaCO₃

Hardness as CaCO₃ (Dissolved) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. Four lab replicates were reported for the 22 water samples meeting the minimum requirement of 1 per 20 samples, or 1 per batch, whichever is the least. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Eight method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Four matrix spike/spike replicate pairs, and 2 laboratory control samples were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Suspended Sediment Concentration

Suspended Sediment Concentration (Particulate) was reported for 22 water samples analyzed in 2 lab batches. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Four method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. No lab replicates and matrix spike/spike replicate pairs were analyzed for the 22 water samples as normal. Two laboratory control samples (LCS) were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Methyl Mercury - Dissolved

Methyl mercury (Dissolved) was reported for 22 water samples analyzed in 2 lab batches. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Eight method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Three matrix spike/spike replicate pairs (one for non-project sample), and 4 laboratory control samples were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. One laboratory control material (LCM) was analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch, whichever is the least. No lab replicates were reported for the 22 water samples which fails to meet the minimum requirement of 1 per 20 samples, or 1 per batch listed in the 2018 RMP QAPP. All data were reported blank corrected.

Methyl Mercury - Particulate

Methyl mercury (Particulate) was reported 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Three lab replicates were reported for the 22 water samples which meets the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Four method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. No matrix spike/spike replicate pairs were reported for the 22 water samples which fails to meet the minimum requirement of 1 per 20 samples, or 1 per batch listed in the 2018 RMP QAPP. One laboratory control material (LCM) was analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. All data were reported blank corrected.

Copper - Dissolved

Copper (Dissolved) was reported for 22 water samples analyzed in 2 lab batches. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Two lab replicates were reported for the 22 water samples which meets the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Eight method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Three matrix spike/spike replicate pairs (one for non-project sample), 3 laboratory control samples, and 3 certified reference material samples (CRMs) were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. One laboratory control material (LCM) was analyzed meeting the minimum

requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch, whichever is the least. All data were reported not blank corrected.

Copper – Particulate

Copper (Particulate) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Three lab replicates were reported for the 22 water samples which meets the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Four method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. No matrix spike/spike replicate pairs were analyzed so failing to meet the minimum requirement requirement in the QAPP of 1 per 20 samples, or 1 per batch. Two laboratory control samples, and 2 laboratory control material samples (LCMs) were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Selenium – Dissolved

Selenium (Dissolved) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Three lab replicates were reported for the 22 water samples which meets the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Four method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Three matrix spike/spike replicate pairs, 1 laboratory control samples, and 2 certified reference material samples (CRMs) were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

Selenium – Particulate

Selenium (Particulate) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples though no requirement is listed in the 2018 RMP QAPP. One field blank was analyzed though there is no requirement listed in the QAPP for these sample types. Three lab replicates were reported for the 22 water samples which meets the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Four method blanks were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. No matrix spike/spike replicate pairs were analyzed so failing to meet the minimum requirement requirement in the QAPP of 1 per 20 samples, or 1 per batch. Two laboratory control samples, and 2 laboratory control material samples (LCMs) were

analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. All data were reported not blank corrected.

MDLs sensitivity

Method detection limits (MDLs) were satisfactory with no non-detect (ND) results reported for Copper, Hardness as CaCO₃, Selenium, and Suspended Sediment Concentration in the water samples. Extensive non-detects (NDs>50%) were reported for dissolved Methyl Mercury (92% NDs) and Cyanide (90% NDs). While particulate Methyl Mercury results were 40 percent non-detects.

QB averages (procedural, field blank)

Copper, cyanide, hardness as CaCO₃, selenium, and suspended sediment concentration were not measured/reported in any of the method blanks at a concentration above the method detection limit (MDL), meeting the requirement in the QAPP of being "<MDL". Methyl mercury (dissolved and particulate) was found in some of the method blanks, but the standard deviation of the blanks was < average method blank MDL. No blank contamination qualifiers were needed.

Copper (Particulate) and Suspended Sediment Concentration were reported in the field blank at concentrations above the MDL, but at a concentration of only 2% of the average field samples in the case of Suspended Sediment Concentration and only 0.5% of the average field samples in the case of particulate Copper.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is "spiked" with a known amount of mercury, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

Cyanide was evaluated using the matrix spike samples and had an average %error of 9.57% (average recovery 90.43%) below the MQO of 25%. No qualifiers were added. Laboratory control samples were examined and had an average %error of 6.25% (average recovery 93.75%).

Hardness as CaCO₃ (Dissolved) was evaluated using the laboratory control samples and with an average %error of 1.01% (average recovery 98.99%) was below the MQO of 5%. No qualifiers were added.

Suspended Sediment Concentration (Particulate) was also evaluated using the laboratory control samples and with an average %error of 10.10% (average recovery 99.7%) was above the MQO of 10%. All results were flagged with the non-censoring qualifier "VIU" (Percent Recovery exceeds laboratory control limit, flagged by QAO).

Methyl mercury (Dissolved) was evaluated using the matrix spike samples and had an average %error of 5.03% (average recovery 104.88%) below the MQO of 35%. No qualifiers were added. Laboratory control material sample and laboratory control samples were examined and had an average %error of 16.13% and 9.38% (average recovery 83.87% and 92.18%), respectively.

Methyl mercury (Particulate) was evaluated using the laboratory control material sample (LCM) and had an average %error of 16.79% (average recovery 83.21%) below the MQO of 35%. No qualifiers were added. No spiked samples of any other type was analyzed.

Copper (Dissolved) was evaluated using the certified reference material samples and with an average %error of 1.72% (average recovery 101.29%) was well below the 25% MQO. No qualifiers were added. Matrix spike and laboratory control samples were examined and had an average %error of 37.5% and 5.73% (average recovery 62.5% and 94.27%), respectively.

Copper (Particulate) was evaluated using the laboratory control material samples (LCM) and had an average %error of 19.7% (average recovery 80.3%) below the MQO of 25%. No qualifiers were added. Laboratory control samples were examined and had an average %error of 14.58% (average recovery 85.42%).

Selenium (Dissolved) was evaluated using the certified reference material samples and with an average %error of 14.61% (average recovery 85.39%) was well below the 35% MQO. No qualifiers were added. Matrix spike and laboratory control samples were examined and had an average %error of 7.29% and 8.1% (average recovery 92.71% and 91.9%), respectively.

Selenium (Particulate) was evaluated using the laboratory control material samples (LCM) and had an average %error of 1.53% (average recovery 98.47%) below the MQO of 35%. No qualifiers were added. Laboratory control samples were examined and had an average %error of 1% (average recovery 99%).

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

Cyanide precision was evaluated using the matrix spike sample replicates and the average RSD of 1.89% was below the MQO target of 25%. No qualifiers were added. The average RSD of the laboratory control samples was 0.30%.

Hardness as CaCO₃ (Dissolved) was evaluated using the laboratory replicates and with an average RSD of 0.34% was below the 5% target MQO. No qualifiers were needed. The average RSD of the field replicates, matrix spike replicates, and laboratory control sample replicates were examined and were respectively 0.42%, 0.37%, and 1.12%.

Suspended Sediment Concentration (Particulate) was evaluated using the field replicates and the average RSD of 0.94% was below the target MQO of 10%. No qualifiers were added. The average RSD of the laboratory control samples was examined and was 14.33%.

Methyl mercury (Dissolved) was evaluated using the matrix spike sample replicates and the average RSD of 6.78% was below the MQO target of 35%. No qualifiers were needed. The average RSD of the laboratory control samples was examined and was 12.32%.

Methyl mercury (Particulate) was evaluated using the laboratory replicates and with an average RSD of 8.84% was below the target MQO of 35%. No qualifiers were added. The average RSD of the field replicates was examined and was 1.65%.

Copper (Dissolved) was evaluated using the laboratory replicates and with an average RSD of 19.29% was below the target MQO of 25%. No qualifiers were needed. The average RSD of the field replicates, certified reference material and laboratory control material samples, matrix spike replicates, and laboratory control sample replicates were examined and were 10.58%, 1.69%, 4.97%, and 9.63%, respectively.

Copper (Particulate) precision was evaluated using the laboratory replicates and with an average RSD of 4.87% was below the target MQO of 25%. No qualifiers were needed. The average RSD of the field replicates, laboratory control material samples, and laboratory control sample replicates were examined and were 4.37%, 0.27%, and 1.56%, respectively.

Selenium (Dissolved) was evaluated using the laboratory replicates and with an average RSD of 3.51% was below the target MQO of 35%. No qualifiers were needed. The average RSD of the field replicates, certified reference material samples, and matrix spike replicates were examined and were respectively 8.4%, 0.39%, and 0.54%.

Selenium (Particulate) was evaluated using the laboratory replicates and with an average RSD of 6.57% was below the 35% target MQO. No qualifiers were added. The average RSD of the field replicates, laboratory control material samples, and laboratory control sample replicates were examined and were 7.18%, 0.38%, and 1.34%, respectively.

Comparison of dissolved and total phases

Comparison to previous years

Average concentration for cyanide in the water samples was 66% (~0.7x), average Hardness as CaCO₃ was 94% (~0.9x), average Suspended Sediment Concentration was 257% (~2.6x), average methyl mercury (dissolved) was less than 1%, average methyl mercury (particulate) was 15% (~0.2x), average copper (dissolved) was 71% (~0.7x), average copper (particulate) was 223% (~2.2x), average selenium (dissolved) was 93% (~0.9x), and average selenium (particulate) was 150% (~1.5x) of the average of the 2010-2017 RMP water samples.

ALS

Water

DOC and POC

QA Issues for Project Manager to Review

None

Overall acceptability

100% of the DOC results are not reportable because they were flagged with the censoring qualifier VRIU for poor accuracy. 100% of the POC results are reportable.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

Dissolved Organic Carbon water samples were analyzed between 18 and 24 days after collection meeting the 28 day hold time requirement listed in the 2018 RMP QAPP.

Particulate Organic Carbon water samples were analyzed between 29 and 35 days after collection meeting the 100 day hold time requirement listed in the 2018 RMP QAPP.

QA Review

Accuracy

The accuracy for DOC was flagged following the 2018 RMP Quality Assurance Plan convention of using the average percent error of the certified reference material (CRM) results, when present, and the average percent error of the matrix spike/matrix spike replicates when certified material samples (CRMs), are not present.

DOC accuracy was evaluated using the matrix spike samples. All matrix spike sample results were not within $\pm 10\%$ of their expected values and the average %error of 54.3% (average

recovery 45.7%) was above the target MQO of 10%. All DOC results were flagged with the censoring qualifier VRIU (Data rejected - Percent Recovery exceeds laboratory control limit, flagged by QAO). Eight matrix spikes with percent recoveries <51%, and their parent samples, were flagged with the censoring qualifier VRIU for poor accuracy.

DOC laboratory control samples were within $\pm 10\%$ of their expected values and the average %error of the laboratory control samples was 0.35% (average recovery 99.65%).

DOC results were flagged with the qualifier VLB (Result negatively biased, flagged by QAO) for being biased low.

POC accuracy was evaluated using the laboratory control samples. All laboratory control sample results were not within $\pm 10\%$ of their expected values and the average %error of 14.38% (average recovery 85.62%) was above the target MQO of 10%. All POC results were flagged with the non-censoring qualifier VIU (Percent Recovery exceeds laboratory control limit, flagged by QAO). Four LCS samples were flagged with the non-censoring qualifier VIU (percent recoveries were <90%).

Precision

The precision of field samples in the database is flagged following the 2018 RMP Quality Assurance Plan convention of using lab replicates in preference to using field replicates, although both are reviewed and described narratively when provided.

DOC precision was evaluated using the lab replicates and the average RSD of 1.99% was well below the 10% target MQO. No qualifiers were added. Precision of the lab and field replicates together was a RSD of 1.99%. Matrix spike replicates were examined and had an average RSD of 3.36%. The RSD of the laboratory control samples was 0.45%.

POC precision was evaluated using the laboratory control sample replicates (no lab replicates were analyzed/reported) and the average RSD of 3.5% was well below the MQO of 10%. No qualifiers were needed. Precision of the lab and field replicates together was a RSD of 2.79%.

Dataset completeness

Dissolved Organic Carbon (DOC) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates and their six lab replicates were analyzed for the 22 water samples; no requirement is listed in the 2018 RMP QAPP for this sample type. Sixty-six lab replicates were reported for the 22 water samples (3 for each water sample) meeting the minimum requirement of 1 per 20 samples, or 1 per batch. Eight method blanks were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. Four equipment blanks were analyzed for the 22 water samples; no requirement is listed in the QAPP for this sample type. Four matrix spike/matrix spike replicate pairs were analyzed meeting the minimum requirement of 1 per 20 samples, or 1 per batch. Eight laboratory control samples were analyzed meeting the minimum requirement listed in the QAPP of 1 per 20 samples, or 1 per batch for laboratory control samples. All data were reported not blank corrected.

Particulate Organic Carbon (POC) was reported for 22 water samples analyzed in 1 lab batch. Two blind field replicates were analyzed for the 22 water samples; no requirement is listed in the 2018 RMP QAPP for this sample type. No lab replicates were reported for the 22 water samples

a failure to meet the minimum requirement of 1 per 20 samples, or 1 per batch. Two method blanks were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. One equipment blank was analyzed for the 22 water samples; no requirement is listed in the QAPP for this sample type. No matrix spike/matrix spike replicate pairs were analyzed failing to meet the minimum requirement of 1 per 20 samples, or 1 per batch. Four laboratory control samples were analyzed meeting the minimum requirement listed in the QAPP of 1 per 20 samples, or 1 per batch for laboratory control samples. All data were reported not blank corrected.

MDLs sensitivity

Method detection limits (MDLs) were not satisfactory with extensive (~92%) non-detect (ND) results reported for DOC in the water samples. Fifty percent of POC results in the water samples were reported as being ND's.

QB averages (procedural, field blank)

DOC and POC was not measured/reported in any of the method blanks or the equipment blanks at a concentration above the method detection limit (MDL), meeting the requirement in the QAPP of being "<MDL". No blank contamination qualifiers were needed.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is "spiked" with a known amount of mercury, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

DOC accuracy was evaluated using the matrix spike samples and the average %error of 54.3% (average recovery 45.7%) was well above the target MQO of 10%. All DOC results were flagged with the censoring qualifier VRIU (Data rejected - Percent Recovery exceeds laboratory control limit, flagged by QAO). Eight matrix spikes with percent recoveries <51%, and their parent samples, were flagged with the censoring qualifier VRIU for poor accuracy.

The average %error of the laboratory control samples was 0.35% (average recovery 99.65%).

DOC results were flagged with the qualifier VLB (Result negatively biased, flagged by QAO) for being biased low.

POC accuracy was evaluated using the laboratory control samples and the average %error of 14.38% (average recovery 85.62%) was above the target MQO of 10%. All POC results were flagged with the non-censoring qualifier VIU (Percent Recovery exceeds laboratory control limit, flagged by QAO).

Four LCS samples were flagged with the non-censoring qualifier VIU (percent recoveries were <90%).

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

DOC precision was evaluated using the lab replicates and the average RSD of 1.99% was well below the 10% target MQO. No qualifiers were added. Precision of the lab and field replicates together was a RSD of 1.99%. Matrix spike replicates were examined and had an average RSD of 3.36%. The RSD of the laboratory control samples was 0.45%.

POC precision was evaluated using the laboratory control sample replicates (no lab replicates were analyzed/reported) and the average RSD of 3.5% was well below the MQO of 10%. No qualifiers were needed. Precision of the lab and field replicates together was a RSD of 2.79%.

Comparison of dissolved and total phases

Not Applicable

Comparison to previous years

Average concentration for DOC in the water samples was 3.5% (~0.04x) of the average of the 2009-2013 RMP status and trends water samples, however, only eight of the 96 results in 2019 were not NDs. Excluding the ND's the DOC in the water samples was 44% (~0.4x) of the average of the 2009-2013 RMP status and trends water samples.

DOC results were flagged with the qualifier VLB (Result negatively biased, flagged by QAO) for being biased low.

Average concentration for POC in the water samples was 109% (~1.1x) of the average of the 2009-2013 RMP status and trends water samples.

Dataset QA Summaries Bay RMP 2019 Stormwater Water

USGS-CAWSC

Stormwater

SSC

QA Issues for Project Manager to Review

None

Overall acceptability

Overall the dataset is acceptable. 100% of the SSC results are reportable.

Accuracy

The accuracy for SSC was flagged following the SFEI RMP Status and Trends convention of using the average percent error of the certified reference material (CRM) results, when present, and the average percent error of the matrix spike/matrix spike replicates when certified material samples (CRMs), are not present.

No spiked samples of any kind were reported/analyzed which is not unusual for a SSC analysis.

Precision

The precision of field samples in the database is flagged following the SFEI RMP Status and Trends convention of using lab replicates in preference to using field replicates, although both are reviewed and described narratively when provided.

No lab replicate was reported/analyzed, instead a single blind field replicate was used to decide whether precision flags were needed for the SSC results. The average RPD of 0% for the blind field replicate was below the MQO target of 10%. No additional qualifiers were added.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

The SSC samples were analyzed between 98 and 175 days after collection exceeding the holding time specified in the 2018 RMP QAPP of 7 days. All results were flagged with the QA code “VH” (Holding time violation occurred, flagged by QAO).

QA Review

QA Issues for Project Manager to Review

Dataset completeness

Suspended sediment concentration (SSC) was reported for 12 water samples for two different projects (19STLS2RMP - STLS Monitoring RMP WY2019; 9 samples and 19PMU2RMP - 2019 Priority Margin Unit; 3 samples) analyzed in 1 lab batch. One blind field replicate was analyzed for the 12 water samples meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Two method blanks were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types. No spiked samples of any kind were analyzed failing to meet the requirement in the QAPP of 1 per 20 samples, or 1 per batch, although this happens quite regularly. All data were reported not blank corrected.

Overall acceptability

Overall the dataset is acceptable. 100% of the SSC results are reportable.

MDLs sensitivity

Method detection limits (MDLs) were satisfactory with SSC results reported above the detection limit for 100% of the water samples.

QB averages (procedural, field blank)

SSC results were reported in the method blanks at a concentration of < 0.5 with a method detection limit of 0.5 meeting the method objective in the 2018 RMP QAPP of being “<MDL”.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs

allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is “spiked” with a known amount of SSC, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

No spiked samples of any kind were reported/analyzed which is not unusual for a SSC analysis.

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

No lab replicate was reported/analyzed, instead a single blind field replicate was used to decide whether precision flags were needed for the SSC results. The average RPD of 0% for the blind field replicate was below the MQO target of 10%. No additional qualifiers were added.

Comparison of dissolved and total phases

Not Applicable

Comparison to previous years

Average concentration of SSC in the water samples was 221% (2.2x) of the average of the 2014-2018 STLS Monitoring water samples (in units mg/l).

Ratio Checking Summary

Not Applicable

Sums Summary

Brooks

Stormwater

Mercury

QA Issues for Project Manager to Review

None

Overall acceptability

100% of the total mercury results are reportable.

Accuracy

The accuracy for total mercury was flagged following the SFEI RMP Status and Trends convention of using the average percent error of the certified reference material (CRM) results, when present, and the average percent error of the matrix spike/matrix spike replicates when certified material samples (CRMs), are not present.

The total mercury in the certified reference material results meet the method quality objective listed in the 2018 RMP QAPP of “expected value \pm 35%, and the average percent error was < 35%. No Qualifiers were needed.

The total mercury matrix spike results meet the method quality objective listed in the QAPP of “expected value \pm 35%, and the average percent error was < 35%.

The total mercury single laboratory control sample met the method quality objective listed in the QAPP of “expected value \pm 35%, and the average percent error was < 35%.

Precision

The precision of field samples in the database is flagged following the SFEI RMP Status and Trends convention of using lab replicates in preference to using field replicates, although both are reviewed and described narratively when provided.

Lab replicates were used to decide whether precision flags were needed for the results. The average RPD for total mercury was below the MQO target of 35%. No qualifiers were added.

The average RPD for total mercury in both the matrix spike/matrix spike replicates and the certified reference material samples were also below the 35% target MQO.

No field replicates were analyzed/reported.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

The total mercury water samples were analyzed between 13 and 26 days after collection well within the 90 day holding time specified in the 2018 RMP QAPP.

QA Review

QA/QC Summary:

Dataset completeness

Total mercury was reported for 8 water samples analyzed in 2 lab batches. Two lab replicates were analyzed for the 8 water samples meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch, whichever is the least. Eight method blanks were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types, whichever is the least. Two certified reference materials (NIST 1641d (2008): Mercury in Water) were analyzed meeting the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch, whichever is the least. Two matrix spike/spike replicates were analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch, whichever is the least. One laboratory control sample was analyzed meeting the minimum requirement in the RMP QAPP of 1 per 20 samples, or 1 per batch for those sample types, whichever is the least. All data were reported blank corrected.

Overall acceptability

100% of the total mercury results are reportable.

MDLs sensitivity

Method detection limits (MDLs) were satisfactory with all total mercury results reported above the detection limit.

QB averages (procedural, field blank)

Total mercury was measured/reported at concentrations above the MDL for two lab blanks in one of the lab batches, and as a consequence four sample concentrations were flagged with the

QA Code “VIP” (Analyte detected in field or lab generated blank, flagged by QAO) for blank contamination.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is “spiked” with a known amount of mercury, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

Total Mercury:

The average percent error for total mercury in the certified reference materials was 1.21% (average recovery 101.21%) well below the target MQO of 35%. No qualifiers were added.

The average percent error for total mercury in the matrix spike samples was 8.32% (average recovery 91.68%) below the target MQO listed in the 2018 RMP QAPP of 35%.

The percent error for total mercury in the single laboratory control samples was 3.35% (recovery 96.65%) below the 35% target MQO.

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

Total Mercury:

Lab replicates were used to decide whether precision flags were needed for the total mercury results. The average RPD of 0.76% was below the MQO target of 35%. No qualifiers were needed.

The average certified reference material samples RPD was 1.39% below the 35% MQO target.

The average RPD for the matrix spike replicates of 2.21% was likewise below the target MQO of 35%.

No field replicates were analyzed/reported.

Comparison of dissolved and total phases

Not Applicable

Comparison to previous years

Average concentration for total mercury in the water samples was 158% (~1.6x) of the previous average of the 2014-2018 STLS water samples (in units ug/L).

Ratio Checking Summary

Not Applicable

Sums Summary

SGS AXYS

Stormwater

PCBs

QA Issues for Project Manager to Review

None

Overall acceptability

99.8% of the PCB results are reportable. Only one PCB 049 result was rejected for blank contamination.

Accuracy

The accuracy for the PCB results was flagged following the SFEI RMP Status and Trends convention of using the average percent error of the laboratory control sample (LCS), when certified reference material (CRM), and matrix spike samples are not present.

PCB results in the single laboratory control sample met the method quality objective listed in the QAPP of "expected value \pm 35%" (except for the surrogate analytes that all failed), and the average percent error was < 35%.

Precision

The precision of field samples in the database is flagged following the SFEI RMP Status and Trends convention of using field replicates, when no lab replicates, or other replicates are available.

Blind field replicates were used to decide whether precision flags were needed for the results. The average RPDs for the PCBs were all below the MQO target of 35%. No qualifiers were added.

No lab replicates, or other replicates were analyzed/reported.

Reporting Issues for Lab to Review

Formatting Issues for Data Manager to Review

Hold time review (especially desired by stormwater programs)

The PCB water samples were analyzed between 118 and 210 days after collection well within the 1 year holding time specified in the 2018 RMP QAPP for in-bay tributary waters; no holding time is specified for in-bay surface waters.

QA Review

QA/QC Summary:

Dataset completeness

Seventy-one PCBs (including coelutions) were reported for the 12 water samples analyzed in 1 lab batch (3 for project 19PMU2RMP: 2019 Priority Margin Unit and 9 for project 19STLS2RMP: STLS Monitoring RMP WY2019). No lab replicates were analyzed for the 12 water samples failing the minimum requirement in the 2018 RMP QAPP of 1 per 20 samples, or 1 per batch. Three blind field replicates were analyzed for the 12 water samples, although there is no minimum requirement listed in the QAPP. One method blank was analyzed meeting the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch for those sample types, whichever is the least. No matrix spike/spike replicates were analyzed failing the minimum requirement in the QAPP of 1 per 20 samples, or 1 per batch. One laboratory control sample was analyzed meeting the minimum requirement in the RMP QAPP of 1 per 20 samples, or 1 per batch for those sample types, whichever is the least. All data were reported not blank corrected.

Overall acceptability

99.8% of the PCB results are reportable. Only one PCB 049 result was rejected for blank contamination.

MDLs sensitivity

Method detection limits (MDLs) were satisfactory for the PCBs with only four non-detects reported (1 for PCB008, PCB019, PCB049 and PCB15).

QB averages (procedural, field blank)

PCB concentrations above the MDL were reported for the one method blank for PCB 028, PCB 031, PCB 033, PCB 044, PCB 049, PCB 052, PCB 066, PCB 070, PCB 105, PCB 110, PCB 149, PCB 153, and PCB 180. As a consequence 1 PCB 049 result was flagged with the censoring QA code of "VRIP" (Data rejected - Analyte detected in field or lab generated blank, flagged by QAO) for blank contamination. The other blank contaminated results were flagged by the analyzing laboratory so no additional flags had to be added.

PCB concentrations above the MDL were reported in the field blanks for PCB 018, PCB 028, PCB 031, PCB 033, PCB 044, PCB 049, PCB 052, PCB 066, PCB 070, PCB 095, PCB 132, PCB 138, and PCB 149. But the average concentrations in the field blanks were less than 1% of the average field sample concentrations.

Accuracy (using a variety of SRMs or Matrix spike QRECs)

For samples with a known concentration, consisting of certified reference material (CRM), were run at a minimum frequency of one per analytical batch (for analytical batches consisting of up to 20 field samples) or per 20 (field) samples for larger analytical batches. Analysis of CRMs allows us to evaluate measurement accuracy, or how close our measurement comes to a consensus/expected value. Matrix spikes, where an environmental sample is "spiked" with a known amount of mercury, provide an alternative determination of method accuracy that can account for matrix interferences or other analytical problems. Laboratory control samples are an aliquot of a reference matrix fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to determine the accuracy of the method by measuring recovery; they are not externally validated values.

No certified reference material samples, and no matrix spike samples were analyzed/reported.

The percent error for the three PCBs included in the single laboratory control sample (PCB 105, PCB 118, and PCB 156) were 2%, 3%, and 3%, respectively (recoveries were 102%, 103%, and 97%) all well below the 35% target MQO. No qualifiers were added.

Average precision from replicate field sample

The precision of analysis methods (ability to consistently obtain the same result) is determined by analyzing replicate or duplicate samples. The analysis of lab replicates (split and analyzed in the laboratory) allows us to assess the repeatability of lab measurements.

Lab replicates were not analyzed/reported so blind field replicates were used to decide whether precision flags were needed for the PCB results. The RPDs were all below the MQO target of 35%, ranging from 1.87% to 29.58%. No qualifiers were needed.

Comparison of dissolved and total phases

Not Applicable

Comparison to previous years

Average concentration for PCBs in the water samples ranged from 35% (~0.4x) to 167% (~1.7x) of the previous average of the 2014-2018 STLS water samples (in units of pg/L).

Ratio Checking Summary

Jay Davis

Thu, Oct 3,
9:52 PM (4
days ago)

to
me,
Data

Hi Adam;

Thanks for the file prep.

The data look good - nothing suspicious.

The most unusual profile is for ESPS with relatively large contributions of 1242 and 1248.

Jay

Sums Summary