

To: Philip Trowbridge, RMP Manager
Jay Davis, RMP Lead Scientist
From: Don Yee, Quality Assurance Officer
Date: June 01, 2018
Re: 2017 RMP Bay Margins Sediment Samples Quality Assurance Report

Introduction

In 2017, composited sediment samples were collected from 40 sites, with samples analyzed for select trace elements, ancillary sediment quality parameters, and PCBs. The sampling and analysis was conducted under the Regional Monitoring Program for Water Quality in San Francisco Bay, as part of a multi-year plan to characterize sediment contamination in the shallow water/intertidal “margins” of the Bay. The details of the cruise and sample collection methods are described 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/programs/sf-bay-regional-monitoring-program#tab-1-2>).

The samples were analyzed for the following compounds by the laboratories indicated:

- *ALS – Sediment ancillary parameters (CHN, TOC, grainsize, total solids)*
- *BA – Sediment Hg, MeHg, Total Solids*
- *SFPUC-STP – Sediment Trace Elements*
- *SGS-AXYS – Sediment PCBs*

The SFEI Data Services Team checked the laboratory results using the methods and data quality objectives in the RMP Quality Assurance Project Plan (QAPP). For all the analyte groups, 99% or more of the results were determined to be acceptable for use in RMP reports and calculations.

This memo provides a high-level summary of the quality assurance assessment for each dataset. Non-conformances with the QAPP and corrective actions needed for the next round of monitoring are highlighted in gray shading. The details of the quality assurance assessment of each dataset are provided in Appendix A.

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; rejected results are uploaded but can only be downloaded by special request rather than through standard queries.

Quality Assurance Summary for 2017 Bay Margins Sediment Samples

ALS – Sediment quality (Total C, N, TOC, grainsize, total solids)

Total carbon (C) and total nitrogen (N), total organic carbon (TOC), grainsize, and total solids were analyzed in 40 field samples, and two field replicates, with lab replicates also reported for C, N, and TOC (3 or more for each analyte). Blanks and lab control (recovery) samples were also reported for C, N, and TOC, at a frequency meeting or exceeding the QAPP required one per batch. Matrix spikes and matrix spike duplicates were also reported for TOC. All ancillary parameters were 100% reportable in field samples, with no results rejected. No results were reported as non-detects for C, N, or TOC. No blank contamination was found for C, N, or TOC. Recovery deviated <10% from target values for total C, TOC, (<10% desired) and N (<15%), so no recovery flags were needed. Similarly precision was within targets (<10% for C and TOC, and <15% for N) with average relative standard deviation <5% for these parameters, so no precision qualifiers were added. Concentrations were also in a similar range as seen in previous margins samples, so appeared reasonable.

Grainsize and total solids were reportable in 100% of field samples. These parameters are not typically reported with blanks or recovery samples, although replicates for precision can be analyzed. However, given the narrow range and low masses for some of the grainsize bins, RMP typically does not base precision targets on relative percent difference or relative standard deviations for individual grainsize bins, but instead the nominal standard deviation in each bin. Some of the coarser grainsize bins are occasionally not found in some samples, although all size ranges were found in over half of the samples. The heterogeneous distribution of very large particles caused the granule+pebble fraction to show an average standard deviation of 22%, so those results were flagged for variable precision but not censored. The distribution of coarse and fine sediments and total solids was similar to previous RMP margin and S&T sampling, so no erroneous results are suspected. Despite previous requests, the lab continues to report grainsize bins as percent of estimated total mass from a separate subsample analyzed for total solids (their lab internal convention), rather than the RMP convention of reporting as a percentage of summed fractions for the subsample actually analyzed for grainsize; this requires that the Data Services group do the conversion before reporting.

BA – Sediment Hg, MeHg, Total Solids

Sediment mercury (Hg) and methylmercury (MeHg) were reported in 40 field samples and 2 field replicates, with no field sample results rejected (100% reportable). Blanks, laboratory replicates, MS/MSDs, and CRM samples were also reported. No contamination was detected in lab blanks. No results were non-detect in any field samples. Recovery was

within 10% of expected values for Hg in MS samples and MeHg in the CRM, well within the 35% target. Precision on lab replicate samples averaged <10% RSD, also well within the <35% desired. Concentrations averaged around half those found in Central Bay margins in 2015, so appear reasonable.

SFPUC-STP – Sediment Trace Elements

Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Selenium, Silver, Zinc, and Total Solids results were reported for 40 sediment samples and 2 field replicates. Mercury was also reported, although it was not a requested target analyte for this lab. No non-detects were reported for any of the analytes. For the target analytes 100% of the field sample results were reportable. Aluminum, iron and zinc were detected in one or more method blanks, but concentrations were well below ambient concentrations, so results were flagged for blank contamination, but none rejected. Recovery in certified reference materials deviated from certified values by <15% for all analytes, well within the target MQO of 35% for As, and Se, and the 25% target for the remaining elements so no recovery flags were added. Precision in laboratory replicates had average RSD's 5%, well below the respective target MQOs (35% for As and Se; 25% the rest), so no precision qualifiers were added. The average field sample concentrations were within less than a factor of 2 higher or lower than average concentrations measured in the 2015 Bay Margin sediment samples.

SGS-AXYS – Sediment PCBs

Total solids and 209 PCB congeners (with some as coeluting groups) for samples from 40 sites (5 lab reps). Over 99% of field sample results were reported and not rejected for QA issues. About 20 congeners were non-detect in 50% or more of the samples, typically less prevalent congeners, as would be expected. Method blanks had 61 congeners detected in one or more batches, with the majority of these at concentrations less than one-third of those in field samples, but ~20% of PCB 11 results and 7% of PCB 189 results were rejected for reporting (VRIP flag) due to blank contamination. Precision usually met target MQOs, with only PCB 36 averaging greater than the target 35% RSD in lab replicates and flagged (VIL) but not rejected for marginal precision. Recovery met targets for most congeners, with only PCB 87 and PCB 151 recovery errors over the target 35% (at 43% and 37% respectively), so those congeners were flagged (VIU) in field samples, but not rejected for reporting. Results were less than those from 2015 for Central Bay margin areas, with only 8 of the 153 congeners averaging greater than half the concentrations in Central Bay. This would be expected given the larger relative area of Lower/South Bay margins and relatively less dense and newer urban development in much of the region.

Appendix: Dataset QA Summaries Bay Margins Sediment, 2017

ALS – Sediment CHN

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

Moisture, Total Carbon, and Total Nitrogen were analyzed between 40 and 87 days after collection within the 100 days holding time specified in the 2017 RMP QAPP.

QA Review

Dataset completeness

Moisture, Total Carbon, and Total Nitrogen were reported for 40 sediment samples analyzed in 3 lab batches. Field replicates, lab replicates, method blanks and laboratory control samples (LCS's) were also analyzed. All data was reported not blank corrected.

Two field replicates, 3 method blanks, 3 laboratory replicates, and 3 laboratory control samples were analyzed for the 40 Moisture samples satisfying the requirements in the 2017 RMP QAPP of 1 per 20 samples.

Three field replicates, 4 method blanks, 5 laboratory replicates, and 5 laboratory control samples were analyzed for the 40 Total Carbon and Total Nitrogen field samples satisfying the requirements in the 2017 RMP QAPP of 1 per 20 samples.

Overall acceptability

Overall the data are acceptable. No non-detects (NDs) were reported for Moisture, Total Carbon, and Total Nitrogen. Moisture, Total Carbon, and Total Nitrogen were not measured in any of the method blanks at concentrations greater than the method detection limits (all NDs).

Accuracy was examined using the laboratory control samples (LCSs). The average %error for Total Carbon was 5.84% (average recovery 94.16%), and for Total Nitrogen was 1.94%

(average recovery 100.22%) both less than their respective target MQOs (10% for Total Carbon and 15% for Total Nitrogen). No MQO is listed for Moisture. No qualifiers were needed.

Precision was evaluated using the laboratory replicates. The average RSD for Total Carbon was 0.96%, and for Total Nitrogen it was 5%, both less than their respective target MQOs (10% for Total Carbon and 15% for Total Nitrogen). No MQO is listed for Moisture. The replicate laboratory control samples were examined but not used in the evaluation with the average RSD for Total Carbon of 2.69%, and for Total Nitrogen of 2.45% being less than the their MQO targets. No qualifiers were added.

Results were compared to the 2015 Bay Margins with average 2017 concentrations for Total Carbon being 149% (1.5x greater), for Total Nitrogen 121% (1.2X greater) and Moisture 91% (~1x greater).

MDLs sensitivity

No non-detects (NDs) were reported for Moisture, Total Carbon, and Total Nitrogen.

QB averages (procedural, field blank)

Moisture, Total Carbon, and Total Nitrogen were not measured in any of the method blanks at concentrations greater than the method detection limits (all NDs).

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

Accuracy was examined using the laboratory control samples (LCSs). The average %error for Total Carbon was 5.84% (average recovery 94.16%), and for Total Nitrogen was 1.94% (average recovery 100.22%) both less than their respective target MQOs (10% for Total Carbon and 15% for Total Nitrogen). No MQO is listed for Moisture. No qualifiers were needed.

Average precision from replicate field sample

Precision was evaluated using the laboratory replicates. The average RSD for Total Carbon was 0.96%, and for Total Nitrogen it was 5%, both less than their respective target MQOs (10% for Total Carbon and 15% for Total Nitrogen). No MQO is listed for Moisture. The replicate laboratory control samples were examined but not used in the evaluation with the average RSD for Total Carbon of 2.69%, and for Total Nitrogen of 2.45% being less than the their MQO targets. No qualifiers were added.

Comparison of dissolved and total phases

Not applicable.

Comparison to previous years

Results were compared to the 2015 Bay Margins with average 2017 concentrations for Total Carbon being 149% (1.5x greater), for Total Nitrogen 121% (1.2X greater) and Moisture 91% (~1x greater).

Ratio Checking Summary

Not applicable

Sums Summary

Not applicable

ALS – Sediment Total Organic Carbon

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

Holding time listed in the 2017 RMP QAPP for TOC is 28 days. Sediment samples were analyzed between 39 and 84 days after collection so all results were flagged with the flag VH for a holding time violation.

QA Review

Dataset completeness

Total Organic Carbon (TOC) results were reported for 40 sediment samples analyzed in 3 lab batches. Field replicates, lab replicates, matrix spike/matrix spike replicates, method blanks and laboratory control samples (LCS's) were also analyzed. Data was reported blank corrected, except for method blanks and LCS's.

Three method blanks, 9 laboratory replicate, 3 laboratory control samples (LCSs), 3 MS/MSD pairs, and 2 field replicates were reported for the 40 samples which satisfies the requirements in the 2017 RMP QAPP of 1 per 20 samples.

Overall acceptability

Method detection limits were acceptable as no non-detects (NDs) were reported for the sediment samples. TOC was not measured in any of the method blanks; all method blank

results were ND.

Accuracy was examined using the matrix spike samples. The average %error was 1.3% (average recovery 98.79%) well below the target 10% MQO. No qualifiers were needed.

Precision was evaluated using the laboratory replicates. The average RSD for TOC was 0.44% which was less than the target MQO of 10%. The matrix spike and laboratory control sample replicates were examined, but not used in the evaluation, and with an average of 1.65% and 6.27%, respectively, were both below the MQO target. No qualifiers were added.

The average field sample TOC concentration was 94% (~0.9x greater) than the average TOC concentration in the 2015 Bay Margin sediment samples.

MDLs sensitivity

Method detection limits were acceptable as no non-detects (NDs) were reported for the sediment samples.

QB averages (procedural, field blank)

TOC was not measured in any of the method blanks; all method blank results were ND.

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

Accuracy was examined using the matrix spike samples. The average %error was 1.3% (average recovery 98.79%) well below the target 10% MQO. No qualifiers were needed.

Average precision from replicate field sample

Precision was evaluated using the laboratory replicates. The average RSD for TOC was 0.44% which was less than the target MQO of 10%. The matrix spike and laboratory control sample replicates were examined, but not used in the evaluation, and with an average of 1.65% and 6.27%, respectively, were both below the MQO target. No qualifiers were added.

Comparison of dissolved and total phases

Not applicable.

Comparison to previous years

The average field sample TOC concentration was 94% (~0.9x) of the average TOC concentration in the 2015 Bay Margin sediment samples.

Ratio Checking Summary

Not applicable

Sums Summary

Not applicable

ALS – Sediment Grainsize and Total Solids

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

Grain size results were analyzed between 19 and 60 days after collection meeting the 6 months holding time specified in the 2017 RMP QAPP. No holding time is listed for Total Solids.

QA Review

QA Issues for Project Manager to Review

Dataset completeness

Results were reported for 40 sediment field sample for 10 analyte/fraction combinations (Fine/ <0.0625 mm; Clay/ <0.0039 mm; Silt/ 0.0039 to <0.0625 mm; Sand/ V. Fine 0.0625 to <0.125 mm; Sand/ Fine 0.125 to <0.25 mm; Sand/ Medium 0.25 to <0.5 mm; Sand/ Coarse 0.5 to <1.0 mm; Sand/ V. Coarse 1.0 to <2.0 mm; Sand/ 0.0625 to <2.0 mm; Granule + Pebble/ 2.0 to <64 mm) analyzed in two lab batches. Field replicates and lab replicates were also analyzed. Data was reported blank corrected.

Total Solids results were reported for 40 sediment samples analyzed in two lab batches. Field replicates and lab replicates were also analyzed. Data was reported blank corrected.

Seven laboratory replicates and 4 field replicates were reported for the 10 grain size analyte/fraction combinations measured in the 40 samples which satisfies the requirements in the 2017 RMP QAPP for lab replicates of 1 per 20 samples. No method blanks or lab/certified reference material was analyzed as listed in the 2017 RMP QAPP, but this is a long-term goal not yet implemented.

Five laboratory replicates and 2 field replicates were reported for the Total Solids measured in the 40 samples which satisfies the requirements in the 2017 RMP QAPP for lab replicates of 1 per 20 samples. No method blanks, matrix spike/matrix spike replicates, or lab/certified reference material were analyzed as listed in the 2017 RMP QAPP, but this is a long-term goal not yet implemented.

The analyte/fraction classifications were rescaled so that the appropriate fractions summed to 100%.

Overall acceptability

Overall the data are acceptable.

MDLs sensitivity

All analyte/fraction combinations had reported results. The Granule + Pebble/ 2.0 to <64 mm and Sand/ Coarse 0.5 to <1.0 mm fraction combinations had 12.5% (6) and 2% (1) non-detect (ND), respectively.

QB averages (procedural, field blank)

No method blanks were analyzed.

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

No spiked samples were analyzed.

Average precision from replicate field sample

Precision was evaluated using the laboratory replicates with the absolute standard deviations being calculated and compared to the target MQO of 20%. Only one analyte/fraction combination, Granule + Pebble/ 2.0 to <64 mm, exceeded this target with an absolute standard deviation of ~22%, these results were flagged with the non-censoring qualifier VIL for poor precision. There is no target MQO for Total Solids.

Comparison of dissolved and total phases

Not applicable.

Comparison to previous years

Average results were compared to the average 2009-2014 RMP Status and Trends sediment grain size fraction concentrations. Grain size results were dominated by Fines (Clay plus Silt: ~63%) similar to the 2009-2014 RMP sediment results (Fines ~66%). Likewise, the grain size results for Sands and Granule + Pebble fractions were also similar. Total Solids average concentration was ~52% compared to the average concentration of 56% for the 2009-2014 sediment samples.

Ratio Checking Summary

Not applicable

Sums Summary

Not applicable

BA – Sediment Hg, MeHg, Total Solids

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

Samples were analyzed between 17 and 74 days after collection; this is within the holding requirement specified in the 2017 RMP QAPP for Mercury, Methyl Mercury, and Total Solids of 1 year.

QA Review

Dataset completeness

Mercury, Methyl Mercury, and Total Solids results were reported for 40 sediment samples analyzed in 6 lab batches.

Field replicates, lab replicates, matrix spike/matrix spike replicates, method blanks, certified reference materials (CRM), and non-project samples were also analyzed. Data was reported blank corrected except for Total Solids and method blanks.

Two field replicates, 4-5 laboratory replicate, 4-5 MS/MSD pairs, 20 method blanks, 3 certified reference materials, and 2 non-project field samples and one non-project MS/MSD pair were reported for the 40 samples which meets the requirements in the 2017 RMP QAPP of 1 per 20 samples.

Overall acceptability

Overall the data is acceptable. Method detection limits were acceptable as no non-detects (NDs) were reported for Mercury, Methyl Mercury, and Total Solids.

Mercury, Methyl Mercury, and Total Solids were not found in the method blanks at concentrations above the method detection limits. All method blank results were NDs.

Accuracy was examined using the certified reference materials; except for Mercury which was evaluated using the matrix spikes (Mercury CRM value was not certified). The average %error for methyl mercury was 7.56% (average recovery 102.1%) and for mercury the average %error was 9.21% (average recovery 90.79%), both below the target MQO of 35% for Mercury and Methyl Mercury. There is no MQO target for Total Solids. No qualifiers were needed.

Precision was evaluated using the laboratory replicates. The average RSD's were for mercury 4.52%, methyl mercury 7.61%, and Total Solids 0.72% well below the 35% target MQOs (Mercury and Methyl Mercury). There is no target MQO for Total Solids.

Lab replicates combined with field replicates, certified reference material replicates, and matrix spike replicates were examined, but not used for the evaluation, with the average RSD ranging between 1.16% and 41.18%; all well below the target MQO of 35%, except for the average methyl mercury RSD for the matrix spike replicates (41.48%). No qualifiers were added.

The average field sample concentrations were compared to the average concentrations measured in the 2015 Bay Margin sediment samples, and were 55% (~0.6x greater) for mercury, 51% (~0.5x greater) for methyl mercury, and 104% (~1x greater) for Total Solids.

MDLs sensitivity

Method detection limits were acceptable as no non-detects (NDs) were reported for Mercury, Methyl Mercury, and Total Solids.

QB averages (procedural, field blank)

Mercury, Methyl Mercury, and Total Solids were not found in the method blanks at concentrations above the method detection limits. All method blank results were NDs.

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

Accuracy was examined using the certified reference materials; except for Mercury which was evaluated using the matrix spikes (Mercury CRM value was not certified). The average %error for methyl mercury was 7.56% (average recovery 102.1%) and for mercury the average %error was 9.21% (average recovery 90.79%), both below the target MQO of 35% for Mercury and Methyl Mercury. There is no MQO target for Total Solids. No qualifiers

were needed.

Average precision from replicate field sample

Precision was evaluated using the laboratory replicates. The average RSD's were for mercury 4.52%, methyl mercury 7.61%, and Total Solids 0.72% well below the 35% target MQOs (Mercury and Methyl Mercury). There is no target MQO for Total Solids.

Lab replicates combined with field replicates, certified reference material replicates, and matrix spike replicates were examined, but not used for flagging, with the average RSD ranging between 1.16% and 41.18%; all well below the target MQO of 35%, except for the average methyl mercury RSD for the matrix spike replicates (41.48%). No qualifiers were added.

Comparison of dissolved and total phases

Not applicable.

Comparison to previous years

The average field sample concentrations were compared to the average concentrations measured in the 2015 Bay Margin sediment samples, and were 55% (~0.6x) for mercury, 51% (~0.5x) of 2015 results for methyl mercury, and 104% (~1x) for Total Solids.

Ratio Checking Summary

Not applicable

Sums Summary

Not applicable

SFPUC-STP – Sediment Trace Elements

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

RMP sediment samples were stored @ -70 °C (Ultra Low Temperature Freezer) upon receipt at SFPUC-STP and analyzed between and 74 and 232 days after collection. This is

within the holding requirements specified in the 2017 RMP QAPP of 1 year @< -15C for Aluminum, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Silver, Zinc and 1 year for Arsenic, Mercury, Selenium, Total Solids.

QA Review

Dataset completeness

Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Zinc, and Total Solids results were reported for 40 sediment samples analyzed in 3 lab batches. Field replicates, lab replicates, matrix spike/matrix spike replicates, field blanks, method blanks, continuous calibration blanks (CCB), certified reference materials (CRM), laboratory control materials (LCM), and laboratory control samples (LCS) were also analyzed. All data was reported not blank corrected.

Two field replicates, 3 laboratory replicate, 3 MS/MSD pairs, 2 field blanks, 5 method blanks, 24 continuous calibration blanks, 3 certified reference materials, 9 to 12 laboratory control materials, and 16 to 43 laboratory control samples (LCS) were reported for the 40 samples which satisfies the requirements in the 2017 RMP QAPP of 1 per 20 samples.

Overall acceptability

Overall the data is acceptable. Method detection limits were acceptable as no non-detects (NDs) were reported for Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Zinc, and Total Solids.

Aluminum, Iron, Mercury and Zinc were found in at least one method blank at concentrations above the method detection limits. Thirty-Two Aluminum, 11 Iron, 11 Mercury, and 11 Zinc results were flagged with the non-censoring qualifier "VIP". No results needed to be censored.

Zinc was found in the field blanks at an average concentration ~40% (~0.4x greater) than the average of zinc measured in the field samples (25.44 mg/kg dw compared to 64.86 mg/kg dw).

Accuracy was examined using the certified reference materials. The average %error ranged from 1.01% to 13.36% (average recoveries ranged from 86.64% to 108.44%) well below the target MQO of 35% for Arsenic, Mercury, and Selenium and the target MQO of 25% for Aluminum, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Silver, and Zinc. Matrix spikes and laboratory control samples were examined, but not used for the evaluation, with the average %error ranging between 1.83% and 12.08%; all well below the MQO target. There is no MQO target for Total Solids. No qualifiers were needed.

Precision was evaluated using the laboratory replicates. The average RSD's ranged from 1.25% to 4.98% well below the respective target MQOs (35% for Arsenic, Mercury, and Selenium; 25% for Aluminum, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Silver, and Zinc). Lab replicates combined with field replicates, certified reference material replicates, matrix spike replicates, and laboratory control sample replicates were examined, but not used for the evaluation, with the average RSD ranging between 0.83% and 11.16%; all well below the target MQO. There is no target MQO for Total Solids. No qualifiers were added.

The average field sample concentrations were compared to the average concentrations measured in the 2015 Bay Margin sediment samples, and ranged from 61.07% (~0.6x greater) for Mercury to 170.90% (~1.7x greater) for Manganese.

MDLs sensitivity

Method detection limits were acceptable as no non-detects (NDs) were reported for Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Zinc, and Total Solids.

QB averages (procedural, field blank)

Aluminum, Iron, Mercury and Zinc were found in at least one method blank at concentrations above the method detection limits. Thirty-Two Aluminum, 11 Iron, 11 Mercury, and 11 Zinc results were flagged with the non-censoring qualifier "VIP". No results needed to be censored.

Zinc was found in the field blanks at an average concentration ~40% (~0.4x greater) than the average of zinc measured in the field samples (25.44 mg/kg dw compared to 64.86 mg/kg dw).

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

Accuracy was examined using the certified reference materials. The average %error ranged from 1.01% to 13.36% (average recoveries ranged from 86.64% to 108.44%) well below the target MQO of 35% for Arsenic, Mercury, and Selenium and the target MQO of 25% for Aluminum, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Silver, and Zinc. Matrix spikes and laboratory control samples were examined, but not used for the evaluation, with the average %error ranging between 1.83% and 12.08%; all well below the MQO target. There is no MQO target for Total Solids. No qualifiers were needed.

Average precision from replicate field sample

Precision was evaluated using the laboratory replicates. The average RSD's ranged from 1.25% to 4.98% well below the respective target MQOs (35% for Arsenic, Mercury, and Selenium; 25% for Aluminum, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Silver, and

Zinc). Lab replicates combined with field replicates, certified reference material replicates, matrix spike replicates, and laboratory control sample replicates were examined, but not used for the evaluation, with the average RSD ranging between 0.83% and 11.16%; all well below the target MQO. There is no target MQO for Total Solids. No qualifiers were added.

Comparison of dissolved and total phases

Not applicable.

Comparison to previous years

The average field sample concentrations were compared to the average concentrations measured in the 2015 Bay Margin sediment samples, and ranged from 61.07% (~0.6x greater) for Mercury to 170.90% (~1.7x greater) for Manganese.

Ratio Checking Summary

Not applicable

Sums Summary

Not applicable

SGS-AXYS –Sediment PCBs

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

Everything was analyzed within ~120 days, well within the ~1 year hold time recommended for EPA 1668.

QA Review

Dataset completeness

The dataset included results for total solids and 209 PCB congeners (with some as coeluting groups) for 45 field samples for 40 sites (5 lab reps). Blanks, CRM, and LCS samples were also reported (with the CRM and LCS samples containing only a subset of congeners with expected values)

Percent usable (non-reject) field data

Over 99.8% of the results were reported and not censored for QA issues.

Overall acceptability

Overall the data is acceptable.

MDLs sensitivity

MDLs were generally sufficient for the usually abundant congeners. About 20 congeners were ND in 50% or more of the samples, generally typically less dominant congeners, as would be expected.

QB averages (procedural, field blank)

A total of 61 congeners were detected in one or more batches. The majority of these were at concentrations less than $\frac{1}{3}$ of those in field samples, but ~20% of PCB 11 results and 7% of PCB 189 were less than 3x blank concentrations, so those results were censored (VRIP flag) for blank contamination.

Average precision from replicate field sample

Precision met targets for most congeners, with only PCB 36 averaging >the target 35% RSD in lab replicates. Those values were flagged (VIL) but not censored for precision deviations.

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

Accuracy met targets for most congeners, with only PCB 87 and PCB 151 showing average recovery errors over the target 35% (at 43% and 37% respectively). Field sample results for those congeners were flagged (VIU) but not censored for recovery deviations.

Comparison of dissolved and total phases

Not applicable

Comparison to previous years

Mean, min, and max results were compared to results from 2015 for Central Bay margin areas. For nearly all congeners, (149 of 153 detected in both years) concentrations in 2017 for these Lower/South Bay sediments averaged lower than in Central Bay. Only 8 of the 153 congeners averaged half those in Central Bay. This would be expected given the larger relative area of Lower/South Bay margins and relatively less dense and newer urban development in much of the region.

Ratio Checking Summary

11/20/2017 Email from Jay Davis

Hey John;

Thanks for the files.

The data look good. Nothing suspect.

The only congener profiles that stand out are for SB053 and SB061.

SB053 is the most unusual, with a heavy domination by 1260 or heavier Aroclors. This sample had the highest sum of PCBs. The odd thing is the relative absence of 1254 congeners in this sample. Would be consistent with contamination from a relatively unmixed source of 1260.

SB061 also had a relatively high amount of 1260, but not to the same degree as SB053, and SB061 had a more typical amount of 1254.

I attached my marked up version of the file in case anyone is interested.

Jay

Sums Summary

Not Applicable