

**Contaminant Concentrations
In San Francisco Bay
North Bay Margins Sediment**

**CRUISE REPORT
Regional Monitoring Program
2020**

**Prepared for the
San Francisco Estuary Institute**

**by
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Moss Landing Marine Labs**

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Introduction

This report contains information on the late summer/early fall field sampling efforts conducted by the Marine Pollution Studies Lab at Moss Landing Marine Labs (MPSL-MLML) in support of the San Francisco Bay Regional Monitoring Program (RMP) North Bay (San Pablo and Suisun Bays) Margins study. The North Bay Margins is the third and final round of a larger San Francisco Bay study collecting sediment and water in shallow margin areas of the bay. The first round was conducted in Central Bay in 2015 and second round in South Bay in 2017. The work was contracted through the San Francisco Estuary Institute (SFEI) to the San Jose State University Research Foundation (SJSURF).

This report includes sample collections over a three week period (August 31st through September 16th) in 2020 encompassing two trips. A total of 40 sediment sites were sampled (Appendix A). Duplicate sediment samples were collected at two sites (SPB039 and SUB25). Detailed sample counts and protocols can be found in the 2020 RMP Bay Margins Sediment Cruise Plan prepared by SFEI.

At each site, field measurements were recorded for sediment pH, ORP (Oxygen Reduction Potential; Eh), color, composition (e.g., sand, mud), and anoxic transition depth. The field pH meter was calibrated daily prior to sampling while the ORP meter was calibrated or checked the Friday prior to each sampling week (i.e., August 28th and September 11th). A new ORP Oakton testr 50 meter was purchased before sampling. Per instructions from Don Yee (SFEI), the ORP meter used in 2017 (Oakton testr 10) and the new ORP meter were placed into Zorbell's solution and checked against each other (Table 1). The new ORP meter was calibrated/adjusted to the reading of the 2017 ORP meter on August 28th. Additional readings of both meters were recorded on September 11th and 18th. Since the new ORP meter had not deviated >10 mV from the 2017 ORP meter, a calibration/adjustment was not performed after August 28th.

Table 1: ORP measurements recorded by the Oakton testr 10 (2017) and testr 50 (2020) meters prior to, during, and after sampling.

Date	Time	testr 10 (2017, mV)	testr 50 (2020, mV)	solution temp (deg C)	Comments
8/28/2020	8:38	237	250	19.0	
8/28/2020	10:30	234	249	18.6	
			234		prior to Trip 1, calibrated/adjusted to 234 based on testr 10 reading
9/11/2020	13:30	235	231	17.9	prior to Trip 2, did not adjust testr 50 since reading <10 mV from testr 10
9/18/2020	14:36	236	231	21.2	post-sampling measurement

Sediment was collected using a stainless steel, Kynar-covered modified Van Veen grab (0.1 m² area) penetrating 8-10 cm into the sediment. Some analytical jars were filled directly by scraping the jar into the top sediment layer of the grab. Additional sediment (top 5 cm) was collected using a polyethylene scoop and then placed into either an analytical jar or a 2-liter trace-cleaned polycarbonate tub. All jars filled on the boat were placed immediately on dry ice while sediment tubs were placed on wet ice. Field-filled jars were stored in a -20°C freezer upon return to

MPSL-MLML. Field duplicate and field blank samples were collected at specific sites depending on the analyte. At the chosen site, a field blank jar was opened on the boat near the sampling area while the regular sample jar was filled. Bottle blanks for specific analytes remained in the lab until shipment and were not opened.

Polycarbonate tubs were brought back to the lab at the end of each sampling trip and maintained at 4-6°C. Tub samples were processed and aliquoted into analytical jars on the Friday of each sampling week. Samples were stored in a -20°C freezer except for grain size, which was refrigerated and stored at 4-6°C, until shipment to the analytical laboratories on September 22nd. Archive jars were picked up by AMS staff on September 29th and driven to Schaeffer's for storage. Hard- and soft-copy COCs were provided to the laboratories and SFEI staff.

This report details weekly synopses of sampling efforts and provides figures for sampling locations (see Figures 1-2). Target and actual latitude and longitude coordinates, sample dates, and type of collections are listed in Appendix A.

Soft copies (pdf files) of field data sheets and CEDEN MS Excel data templates for field, chemistry, and tissue collections were provided to SFEI via email.

Trip 1 - Sampling Dates: August 31 – September 3, 2020

Sampling Crew: Marco Sigala, Stacey Swenson, Evan Mattiasen

The main objective of this cruise was to target sediment collections in San Pablo Bay targeting the early afternoon high tides to access the shallow sites. All 27 sites and one field duplicate were successfully sampled.

Monday, August 31st

The sampling crew started the week driving from MPSL-MLML to the Loch Lomond marina boat launch. The winds were blowing hard but the crew was able to hide behind the hills of Point San Pablo and Pinole Point to sample five sites beginning with SPB040 at 13:00 where the standard volume of sediment plus extra for ALS analyses were collected. The crew then moved to sites SPB047, SPB031, and SPB052 where the standard suite was collected. Site SPB036 was the final site for the day in which extra sediment was collected for ALS. This site was near a shallow beach area with a lot of pebbles and rocks hindering the sediment grabs and probe measurements. The first four sites had mud sediments. All samples were collected and immediately placed on either dry or wet ice depending on the analyte. The crew pulled the boat out of the water around 17:30.

Tuesday, September 1st

The sampling crew launched the vessel from the Petaluma River boat launch and targeted the northern end of San Pablo Bay beginning with site SPB049 at 12:02. The standard volume of sediment was collected in breezy and rough conditions. The crew then transited to site SPB043 to work along the western edge of San Pablo sheltered by the hills. After site SPB043 and SPB027 were sampled, the crew moved to site SPB039 where a field duplicate and field blank for halogenated Azo dyes (AZO) were collected. ORP measured -129 mV but no clear anoxic

transition line from grey to black sediment was observed in the ORP core. The crew completed the day collecting the standard volume of sediment at sites SPB051, SPB046, and SPB035. Negative ORP readings at SPB046 (-115) and SPB035 (-25) were recorded but a clear anoxic transition line was not seen. As with most sites sampled in this study, there was a thin brown layer of muddy sediment at the surface with grey muddy/clay like sediment below. All samples were successfully collected and placed on wet or dry ice. The crew ended the day at 17:15.

Wednesday, September 2nd

The sampling crew started the morning launching out of Loch Lomond and made the long transit to the northern end of San Pablo Bay to start sampling site SPB037 at 12:21. Sites SPB037, SPB050, and SPB033 were sampled in breezy conditions and the winds were getting stronger so the crew moved to site SPB034 to work their way back to the sheltered western edge of San Pablo Bay. After site SPB041 was sampled in strong windy conditions, the crew moved to sites SPB029 and SPB045 to finish the day. All seven sites were sampled for the standard sediment volume, all had positive ORP measurements except for SPB029 (-110, no clear transition line), and all sites had muddy bottoms. Samples were processed and placed on wet or dry ice. Sampling ended and the crew finished their day around 17:30.

Thursday, September 3rd

The sampling crew again launched the boat from Loch Lomond and transited to the Vallejo side of San Pablo Bay. Site SPB028 was sampled at 12:25. Extra sediment was collected for ALS and a field blank for mercury (Hg/MeHg) was opened and processed while the sediment mercury sample was collected. Sediment at this site was hard clay. The crew then moved to sites SPB044 and SPB032 where extra sediment for ALS was collected. Both sites were characterized by muddy sediment. The crew continued working northwards to collect the standard sediment volume at sites SPB038, SPB042, SPB030, and SPB026. Site SPB042 had a negative ORP reading (-31 mV) but no clear transition line was seen. The crew then transited south along the shore and across the shipping channel to site SPB048. The muddy sediment contained a significant number of *Potamocorbula* clams compared to other sampled sites. The ORP measurement was -32 mV and an anoxic transition depth was seen at 2 cm. Extra sediment was collected for ALS. All samples were successfully collected and placed on wet or dry ice. The crew pulled the boat out of Loch Lomond at 17:45 and drove back to Moss Landing to end the sampling week.

Friday, September 4th

Sediment tubs from this trip were processed in the lab. Homogenized sediment for each site was aliquoted into analytical jars and then placed in a refrigerator (grain size) or in a -20°C freezer (all other analytes).

Trip 2 - Sampling Dates: September 14-16, 2020

Sampling Crew: Marco Sigala, Stacey Swenson, Evan Mattiasen

The main objective of this cruise was to sample Suisun Bay and Carquinez Straits. A total of 13 sites and one field duplicate were collected.

Monday, September 14th

The sampling crew drove to Antioch to launch the boat and sample sites SUB22 and SUB18. Both sites had extra sediment collected for ALS analyses and both sites had sandy bottoms. Plant matter was seen in the grab below 5 cm from the surface and an anoxic transition zone was seen at 5 cm. ORP measured 284 mV. A field blank for pesticides (PEST) was opened and processed at site SUB18 since the crew forgot to bring this blank into the field on Trip 1. All samples were successfully collected and stored on wet or dry ice. The crew pulled the boat out of the water at 17:00 and drove to Benicia.

Tuesday, September 15th

The crew launched out of Martinez transiting to the northern edge of Suisun Bay to begin sampling site SUB026 at 11:09. Extra sediment was collected for ALS and for quaternary ammonium compounds (QAC) analyses. The crew then moved to sites SUB019, SUB024, and SUB023 where the standard sediment volume was collected at each site. Site SUB023 had a negative ORP reading (-21 mV) but no clear transition line was seen. The next three sites (SUB027, SUB20, and SUB021) required extra sediment to be collected for QACs. All three sites had muddy sediments with a brown surface and grey bottom. Sediment samples were processed immediately after collection at each site and placed on wet or dry ice. The crew ended the day at 16:00.

Wednesday, September 16th

The crew launched from Martinez and started in Carquinez Straits at site CAR07 at 11:12. The standard sediment volume was collected. A positive ORP measurement of 257 was recorded but a grey to black transition zone at 5-6 cm depth was observed in the ORP core and grab. Site CAR08 was sampled next with extra sediment collected for ALS. The crew then transited into Suisun Bay and sampled near the oil piers at site SUB025. A field duplicate and field blanks for mercury (Hg/MeHg), pesticides (PEST), and halogenated Azo dyes (AZO) were collected at this site. The muddy sediment in each grab had thin grass blades growing. The final site SUB017 was then sampled for the standard volume of sediment. All samples were immediately processed after collection and placed on wet or dry ice. The crew pulled the boat and ended the day at 14:45.

Friday, September 18th

Sediment tubs were processed in the lab. Homogenized sediment for each site was aliquoted into analytical jars and then placed in a refrigerator (grain size) or in a -20°C freezer (all other analytes).

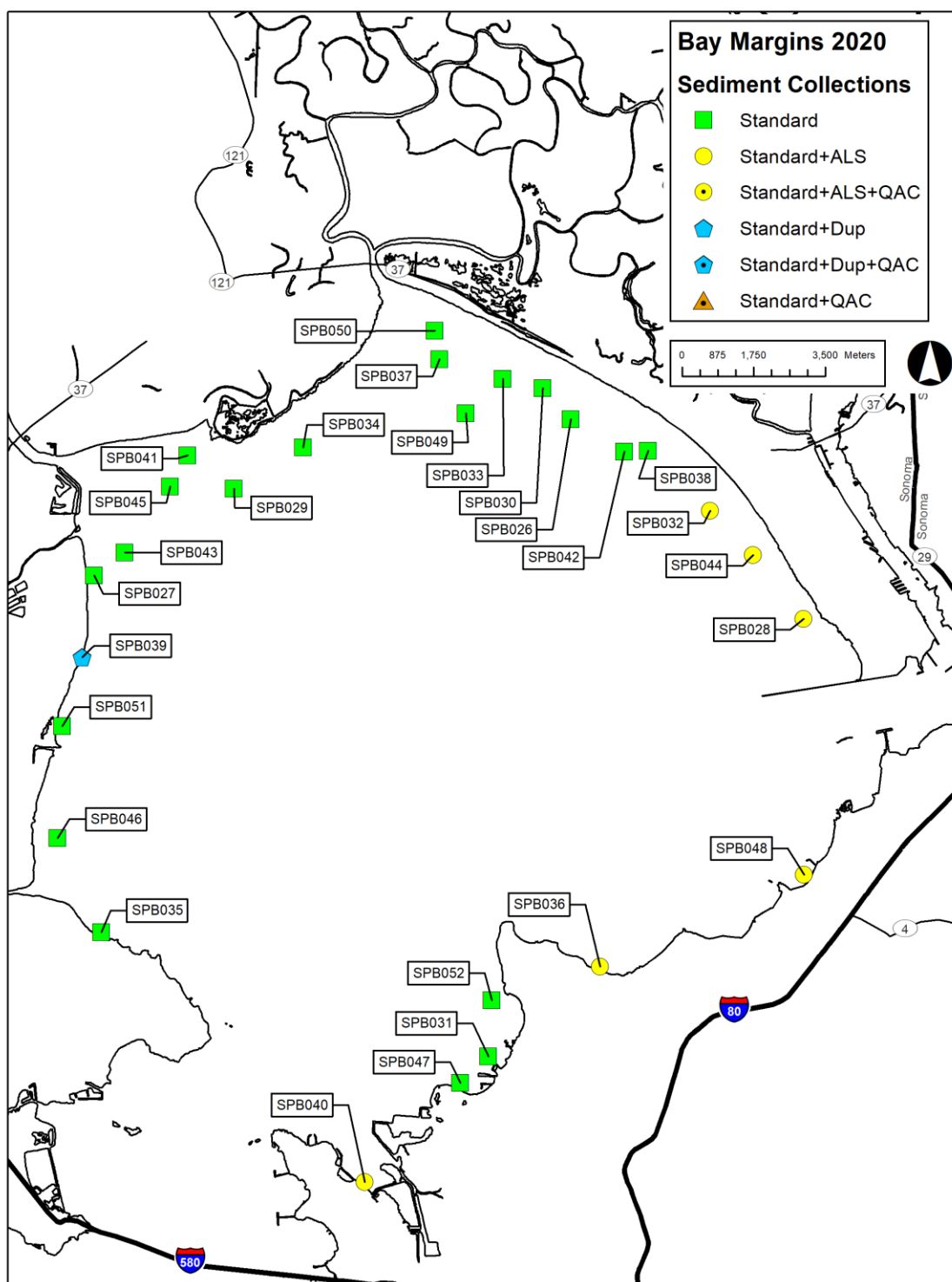


Figure 1: Sites visited in San Pablo Bay in 2020. All sites had the standard amount of sediment collected with some sites having additional sediment collected for specific analyses (ALS = lab, QAC = quaternary ammonium compounds, Dup = field duplicate).

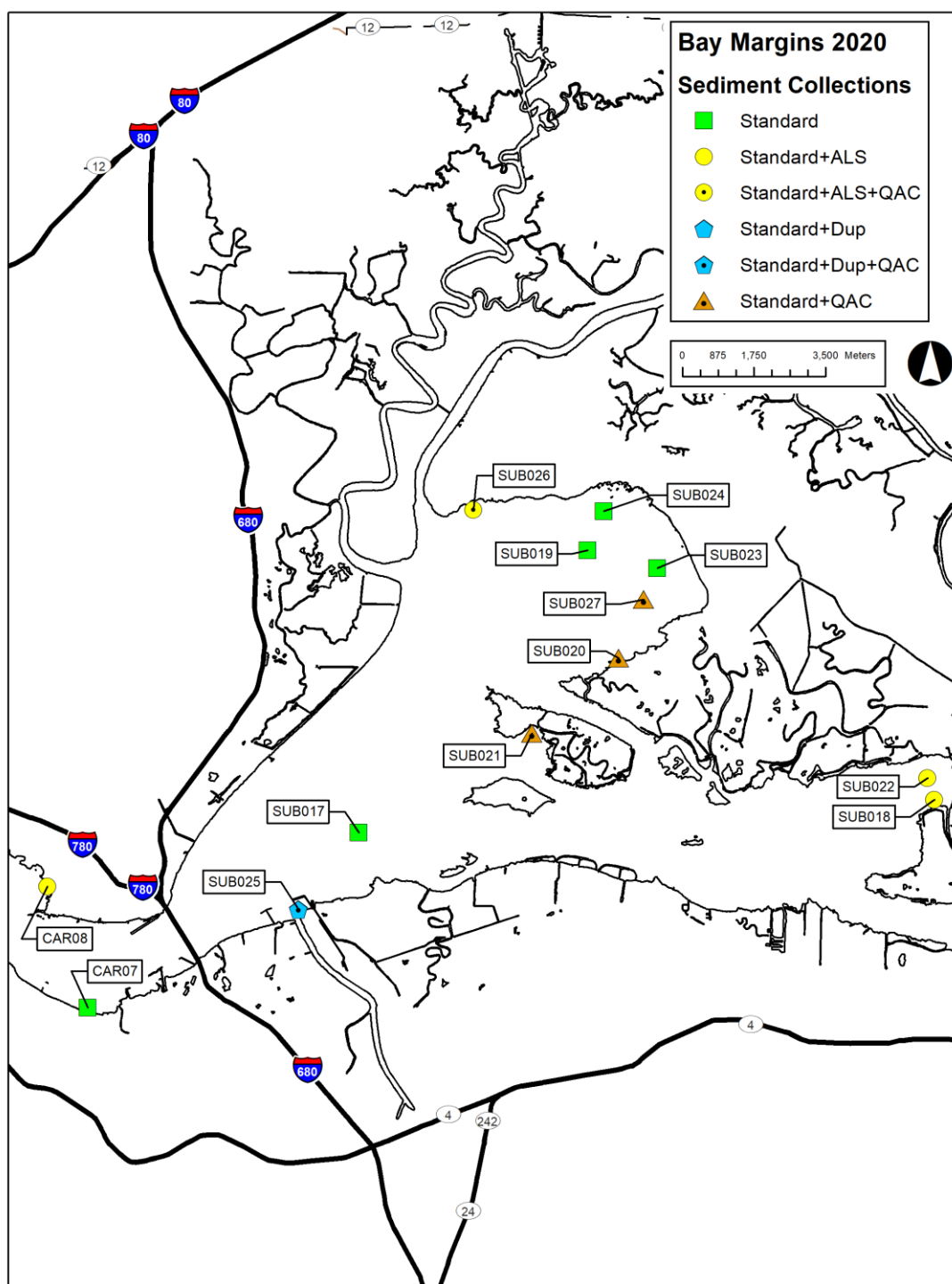


Figure 2: Sites visited in Suisun Bay in 2020. All sites had the standard amount of sediment collected with some sites having additional sediment collected for specific analyses (ALS=lab, QAC=quaternary ammonium compounds, Dup = field duplicate).

Appendix A: Sample date, collection type, and coordinates (target and actual latitude and longitude) for sites visited in the Bay Margins Study focusing on San Pablo and Suisun Bays. S = standard sediment volume, S-A = standard plus extra for ALS analyses, S-D = standard plus field duplicate, S-Q = standard plus extra for QACs (quaternary ammonium compounds), S-A-Q = standard plus extra for ALS and QACs, S-D-Q = standard plus field duplicate and extra for QACs.

Station Code	Station Name	Sample Date	Type	Target Latitude	Target Longitude	Actual Latitude	Actual Longitude
SPB026	San Pablo Bay	9/3/2020	S	38.123047	-122.351088	38.123033	-122.351133
SPB027	San Pablo Bay	9/1/2020	S	38.086153	-122.482979	38.086150	-122.482917
SPB028	San Pablo Bay	9/3/2020	S-A	38.080835	-122.284576	38.080550	-122.284833
SPB029	San Pablo Bay	9/2/2020	S	38.106048	-122.444729	38.105983	-122.444617
SPB030	San Pablo Bay	9/3/2020	S	38.129996	-122.359342	38.129700	-122.359200
SPB031	San Pablo Bay	8/31/2020	S	37.982806	-122.369571	37.982933	-122.369683
SPB032	San Pablo Bay	9/3/2020	S-A	38.103733	-122.311609	38.103767	-122.311667
SPB033	San Pablo Bay	9/2/2020	S	38.131527	-122.370327	38.131600	-122.370300
SPB034	San Pablo Bay	9/2/2020	S	38.115429	-122.425571	38.115450	-122.425533
SPB035	San Pablo Bay	9/1/2020	S	38.007922	-122.478367	38.007983	-122.478300
SPB036	San Pablo Bay	8/31/2020	S-A	38.003263	-122.339132	38.003217	-122.339150
SPB037	San Pablo Bay	9/2/2020	S	38.135318	-122.388057	38.135533	-122.388117
SPB038	San Pablo Bay	9/3/2020	S	38.116578	-122.329364	38.116533	-122.329333
SPB039	San Pablo Bay	9/1/2020	S-D	38.068129	-122.485580	38.068133	-122.485633
SPB040	San Pablo Bay	8/31/2020	S-A	37.954530	-122.403336	37.954667	-122.403167
SPB041	San Pablo Bay	9/2/2020	S	38.112860	-122.457956	38.112983	-122.457783
SPB042	San Pablo Bay	9/3/2020	S	38.116357	-122.336232	38.116300	-122.336000
SPB043	San Pablo Bay	9/1/2020	S	38.091427	-122.474392	38.091400	-122.474567
SPB044	San Pablo Bay	9/3/2020	S-A	38.094299	-122.299416	38.094317	-122.299350
SPB045	San Pablo Bay	9/2/2020	S	38.106146	-122.462441	38.106100	-122.462333
SPB046	San Pablo Bay	9/1/2020	S	38.028380	-122.491134	38.028317	-122.491150
SPB047	San Pablo Bay	8/31/2020	S	37.976929	-122.377403	37.976983	-122.377350

Station Code	Station Name	Sample Date	Type	Target Latitude	Target Longitude	Actual Latitude	Actual Longitude
SPB048	San Pablo Bay	9/3/2020	S-A	38.024213	-122.282847	38.024483	-122.282967
SPB049	San Pablo Bay	9/1/2020	S	38.123661	-122.380553	38.123767	-122.380467
SPB050	San Pablo Bay	9/2/2020	S	38.141852	-122.389608	38.141717	-122.389700
SPB051	San Pablo Bay	9/1/2020	S	38.053111	-122.490637	38.052950	-122.490683
SPB052	San Pablo Bay	8/31/2020	S	37.995308	-122.369158	37.995267	-122.369150
CAR07	Carquinez Straits	9/16/2020	S	38.023355	-122.150310	38.023433	-122.150200
CAR08	Carquinez Straits	9/16/2020	S-A	38.049954	-122.162058	38.049867	-122.162200
SUB017	Suisun Bay	9/16/2020	S	38.063129	-122.075768	38.063250	-122.075767
SUB018	Suisun Bay	9/14/2020	S-A	38.072939	-121.915458	38.073100	-121.915467
SUB019	Suisun Bay	9/15/2020	S	38.126262	-122.013490	38.126283	-122.013517
SUB020	Suisun Bay	9/15/2020	S-Q	38.102534	-122.004337	38.102667	-122.004317
SUB021	Suisun Bay	9/15/2020	S-Q	38.085802	-122.027880	38.085750	-122.028000
SUB022	Suisun Bay	9/14/2020	S-A	38.077647	-121.917366	38.077783	-121.917433
SUB023	Suisun Bay	9/15/2020	S	38.122735	-121.994132	38.122717	-121.994067
SUB024	Suisun Bay	9/15/2020	S	38.135070	-122.009391	38.134950	-122.009267
SUB025	Suisun Bay	9/16/2020	S-D-Q	38.046144	-122.091911	38.046017	-122.092083
SUB026	Suisun Bay	9/15/2020	S-A-Q	38.134633	-122.045700	38.134567	-122.045683
SUB027	Suisun Bay	9/15/2020	S-Q	38.115598	-121.997538	38.115717	-121.997600

Number of Sediment Sites Sampled 40