RMP
REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

sfei.org/rmp

2019-2020 North Bay Selenium Study

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Cruise Report

2019-20 RMP North Bay Selenium Study

Contract No. 1419

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Submitted to:

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1. Introduction

This report details activities associated with the Regional Monitoring Program North Bay Selenium Study. The study was designed to monitor two sites for selenium (Se) in clam tissues and water six times between June 2019 and February 2020. This report outlines the sampling activities, personnel, and site locations monitored for the project.

2. Cruise Report

2.1. Objectives

The objectives of the sampling effort were to collect the following at each site:

1. Collect one CTD cast for conductivity, salinity, temperature, optical back scatter (OBS), and dissolved oxygen (DO) at each site.
2. Collect whole water samples for on-board filtering and laboratory analysis of particulate selenium by Brooks Applied Labs (BAL).
3. Collect filtered water sample for analysis of dissolved Se by BAL.
4. Collect whole water samples for analysis of Chl-a, SSC, and TOC by Caltest.
5. Collect a minimum of 100 clams (*Potamocorbula amurensis*) for analysis of selenium by BAL.

2.2. Personnel

The personnel and work assignments for this cruise are shown in Table 1.

Table 1. Personnel for 2019-20 North Bay Selenium Study Monitoring Events

Name	Affiliation	Dates
Paul Salop	AMS	7/22/19, 1/11/20, 2/5/20
Winn McEnery	AMS	6/27/19, 8/29/19, 12/3/19
Clifton Herrmann	AMS	6/27/19, 7/22/19, 8/29/19, 12/3/19, 1/11/20, 2/5/20
Don Yee	SFEI	6/27/19
Nina Buzby	SFEI	6/27/19, 7/22/19, 8/29/19, 12/3/19, 1/11/20, 2/5/20
Jamie Yin	SFEI	2/5/20

2.3. Methods

Sampling was conducted at two long-term monitoring locations established by USGS: site 4.1 near Honker Bay and site 8.1 in Carquinez Strait. The majority of sampling was conducted from SFSU's R/V *Questuary*; for the cruise on 2/5/19, work was conducted from USGS's R/V *Parke Snavely*. Upon arrival at target locations, AMS and SFEI personnel would deploy a CTD and collect whole water samples from near-bottom to support analytical chemistry using a Cole Palmer E/S Portable Sampling Drive. AMS would additionally collect near-bottom water in volume using a Niskin water sampler to support depuration at AMS facility.

Upon collection of water sample, SFEI personnel would generate the particulate fraction Se sample using an on-board filtering apparatus. AMS and R/V personnel would concurrently deploy a stainless-steel clam dredge and drag along the sediment surface at low speed until the dredge met refusal, or a sufficient time or distance had been achieved that warranted inspection. AMS personnel then returned the dredge to the vessel deck and deposited collected material into pre-cleaned coolers for inspection and collection of clams. Sampling initially required multiple dredge runs to achieve the target number of live clams of sufficient size (>8 mm) to support analyses. Once ideal locations for clam collection were identified, sufficient numbers were typically achieved with a single dredge run. Once a sufficient number of live clams of the target species were collected, AMS personnel transferred the clams to a container filled with near-bottom site water and placed on blue ice for interim storage.

Once all sampling was completed at both stations, the vessel returned to dock. SFEI personnel retained water samples for same-day shipment to analytical laboratories. AMS retained clam samples and returned to AMS facility for depuration setup.

Upon return to AMS, AMS staff prepared water for the depuration process by filtering near-bottom site water collected in equal parts from the two USGS stations through a new, trace metal-clean filter. The resulting composite filtrate was placed into a large clean cooler and maintained at 10ºC by use of a recirculating water chiller. Aquarium air stones were used to aerate the depuration tank. AMS staff then sorted clams from each site by size into 1mm bins, based on maximum anterior–posterior shell length, and placed into individual mesh bags made from vinyl-coated fiberglass screening material. The mesh bags were then placed into the tank and clams were allowed to depurate for a minimum of 48 hours (Figure 1).

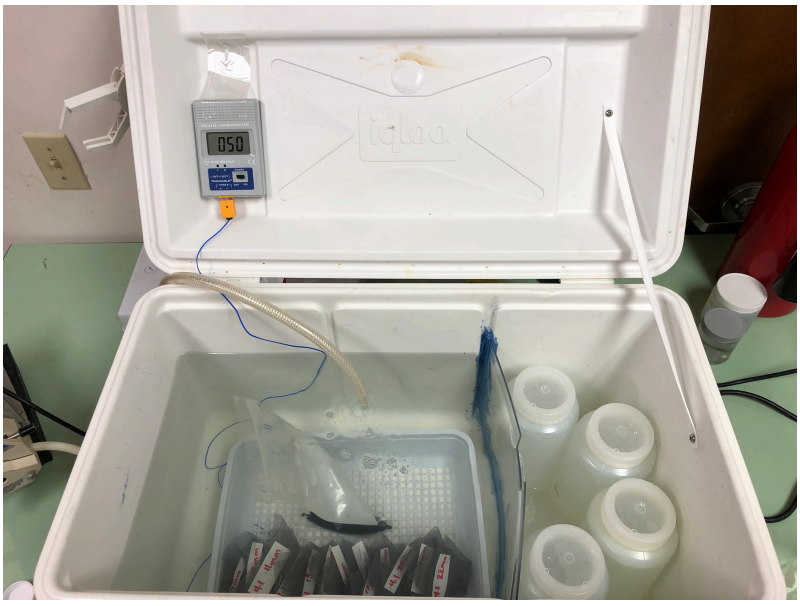


Figure 1. *P. amurensis* clams in filtered site water for depuration at AMS facility.

After the depuration process was completed, AMS personnel coordinated with SFEI to identify five clam sample bins from each site to forward to BAL for analysis. The bins were generated based upon shell length, with the goal of preparing five bins with sufficient mass to support analyses. For clams under 15mm, bins were restricted to a 2mm range (e.g. 8-9mm); clams over 15mm were binned within a 3mm range (e.g. 15-17mm). Once the composite samples were prepared, they were frozen in laboratory freezers, then shipped overnight on dry ice to BAL.

2.4. Sampling Sites

RMP North Bay Selenium Study sampling locations are listed in Table 2. Sample containers and sample handling procedures are summarized in Table 3. Weather conditions encountered at time of sampling are shown in Table 4. The detailed timing and order of sampling events are outlined in Appendix A. Scanned copies of all field datasheets are provided in Appendix B.

Table 2. **North Bay Se Monitoring.** Site Coordinates and Water Depth at Initiation of Sampling. Sample depths are not corrected for tidal action.

Date	Site Code	Target		Actual		Depth (ft)	No. Dredging Runs	No. Clams
		Lat	Long	Lat	Long			
6/27/2019[1]	USGS 4.1	38.05712	-121.94485	38.057	-121.943	19	12	229
	USGS 8.1	38.03167	-122.14027	38.0595	-121.950	52	4	280
7/22/2019	USGS 4.1	38.05712	-121.94485	38.05610	-121.94570	12	2	182
	USGS 8.1	38.03167	-122.14027	38.03180	-122.13900	50	10	256
8/29/2019	USGS 4.1	38.05712	-121.94485	38.05810	-121.94710	15	4	163
	USGS 8.1	38.03167	-122.14027	38.03200	-122.13940	52	2	360
12/3/2019	USGS 4.1	38.05712	-121.94485	38.0679	-121.9688	13	1	261
	USGS 8.1	38.03167	-122.14027	38.03161	-122.14415	50	1	305
1/11/2020	USGS 4.1	38.05712	-121.94485	38.0576	-121.9450	13	1	193
	USGS 8.1	38.03167	-122.14027	38.0552	-122.1776	53	1	271
2/5/2020	USGS 4.1	38.05712	-121.94485	38.05704	-121.94479	13	1	161
	USGS 8.1	38.03167	-122.14027	38.03167	-122.14015	60	1	224

[1] Coordinates not recorded for water quality sampling location. Reported coordinates were recorded at time of initial dredging run.

Table 3. Containers and Sample Handling for North Bay Se Study (T=total, P=particulate, D=dissolved).

Parameter	T/P/D	Lab	Container	Handling Requirements
Water for depuration	T	AMS	10L LDPE plastic container	Stored on blue / wet ice
Se - Dissolved	D	BAL	1L HDPE plastic bottle (1 per site)	Stored on wet ice
Se - Particulate	P	BAL	1L HDPE plastic bottle (1 per site)	Filter on-board vessel, store polycarbonate filter in 15mL centrifuge tube on wet ice
Chl-a	T	Caltest	1 L plastic amber bottle (9 total: 3 per site, plus 3 at USGS4.1 for QA duplicate)	Stored on wet ice
SSC	T	Caltest	500mL clear plastic bottles (2 per site)	Stored on wet ice
TOC	P	Caltest	40 mL amber VOAs (triplicate) (3 per site)	Stored on wet ice
Se in Clams	P	AMS	1L plastic bottle (~100 clams per site)	Stored on wet ice in near-bottom site water until moved into depuration tank, frozen at AMS

Table 4. Weather During RMP North Bay Selenium Study.

Site	Date	Sea State	Wind Speed (kts)	Wind Dir.	Cloud Cover (% Overcast)
USGS 4.1	6/27/2019	Smooth	18	NW	20
USGS 8.1	6/27/2019	Smooth	17.1	S	40
USGS 4.1	7/22/2019	Slight	15	NW	0
USGS 8.1	7/22/2019	Smooth	16	NW	0
USGS 4.1	8/29/2019	Slight	16	SW	10
USGS 8.1	8/29/2019	Calm (glassy)	11.2	SW	0
USGS 4.1	12/3/2019	Calm (rippled)	9.4	NW	5
USGS 8.1	12/3/2019	Calm (rippled)	9.1	NW	40
USGS 4.1	1/11/2020	Slight	12	N	0
USGS 8.1	1/11/2020	Slight	16	N	0
USGS 4.1	2/5/2020	Calm (rippled)	5	W	10
USGS 8.1	2/5/2020	Calm (rippled)	8	W	5

2.5. Discussion

CTD casts were collected with Eureka Manta+ 35 and YSI 6600 V2 CTDs during the first and second sampling events (6/27 and 7/22) because the SeaBird SBE 19 was out for maintenance during this period. The SBE19 was used for all remaining events. The sampling rate for the Eureka CTD is lower than that of the SeaBird (0.5 Hz vs. 2 Hz, respectively). Therefore, there are more occurrences of depth bins with missing data in the early cruises relative to the later ones, as the CTD drop rate exceeded the recording rate in some cases. Conductivity data collected with the Eureka instrument during the June cruise were unusually low, but still fell within control limits previously identified for RMP work; these data were therefore not qualified but include an associated comment. Conductivity measurements for all remaining CTD casts were in the approximate 0.5 – 3 S/m range.

The initial sampling events required more dredging runs due to the difficulty in identifying locations with greater densities of target clams. Once the crew identified coordinates associated with greater clam densities, these locations were used to target dredging for future events (Figure 2), ultimately decreasing sample time as field operations became more efficient. The field datasheets used for this project were generated by AMS. Following the first four sampling events, the document was updated to provide more appropriate fields for relevant sample collection information.

In adherence to USGS protocol, clam depuration proceeded at AMS for a minimum of 48 hours. AMS prepared five aliquots of collected clams for each station and sampling event as shown in Table 5. After preparation of aliquots, clams were immediately frozen at AMS. Any clams not included in a bin intended for analysis were disposed of at AMS.

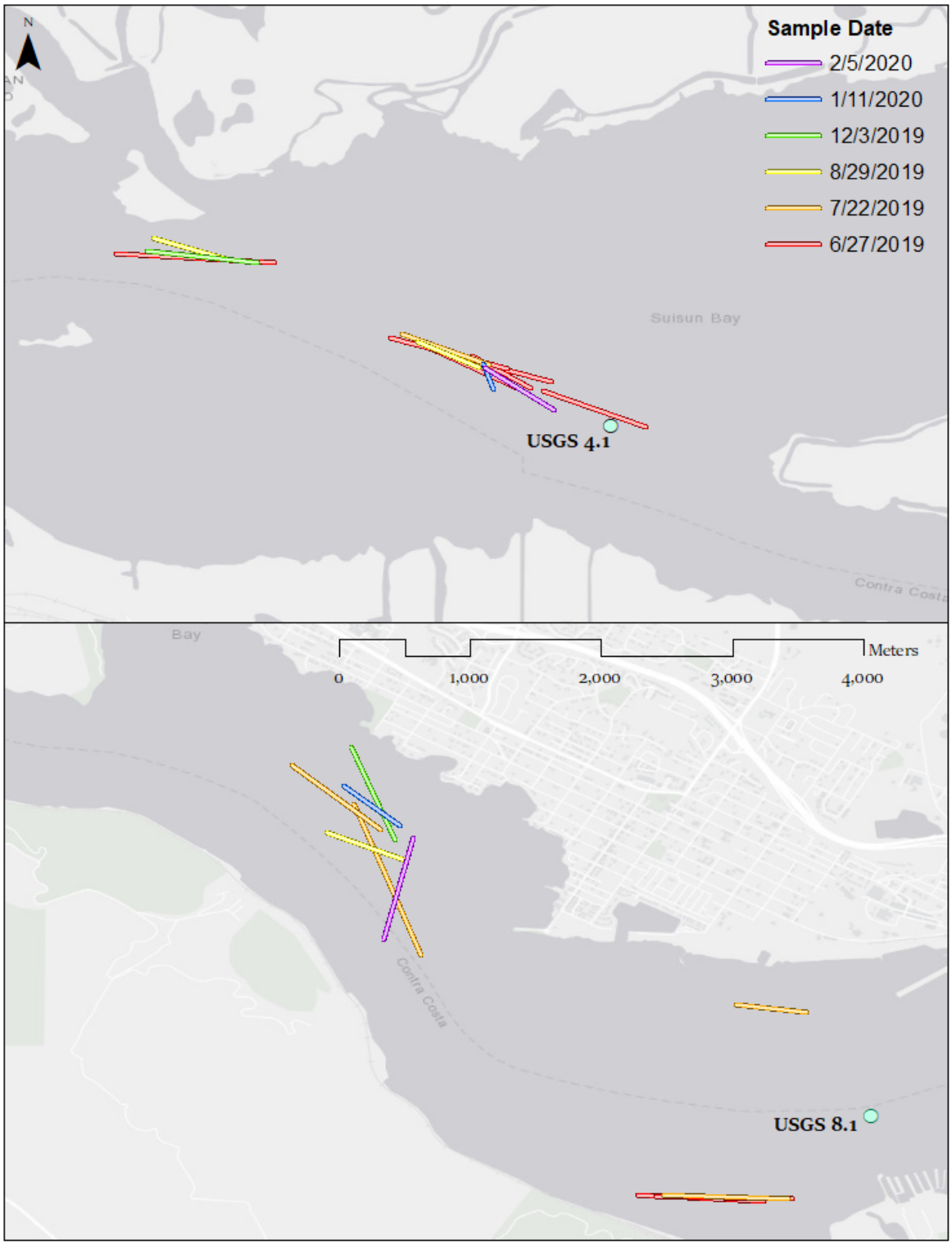


Figure 2. Track Lines for Individual Clam Collection Events

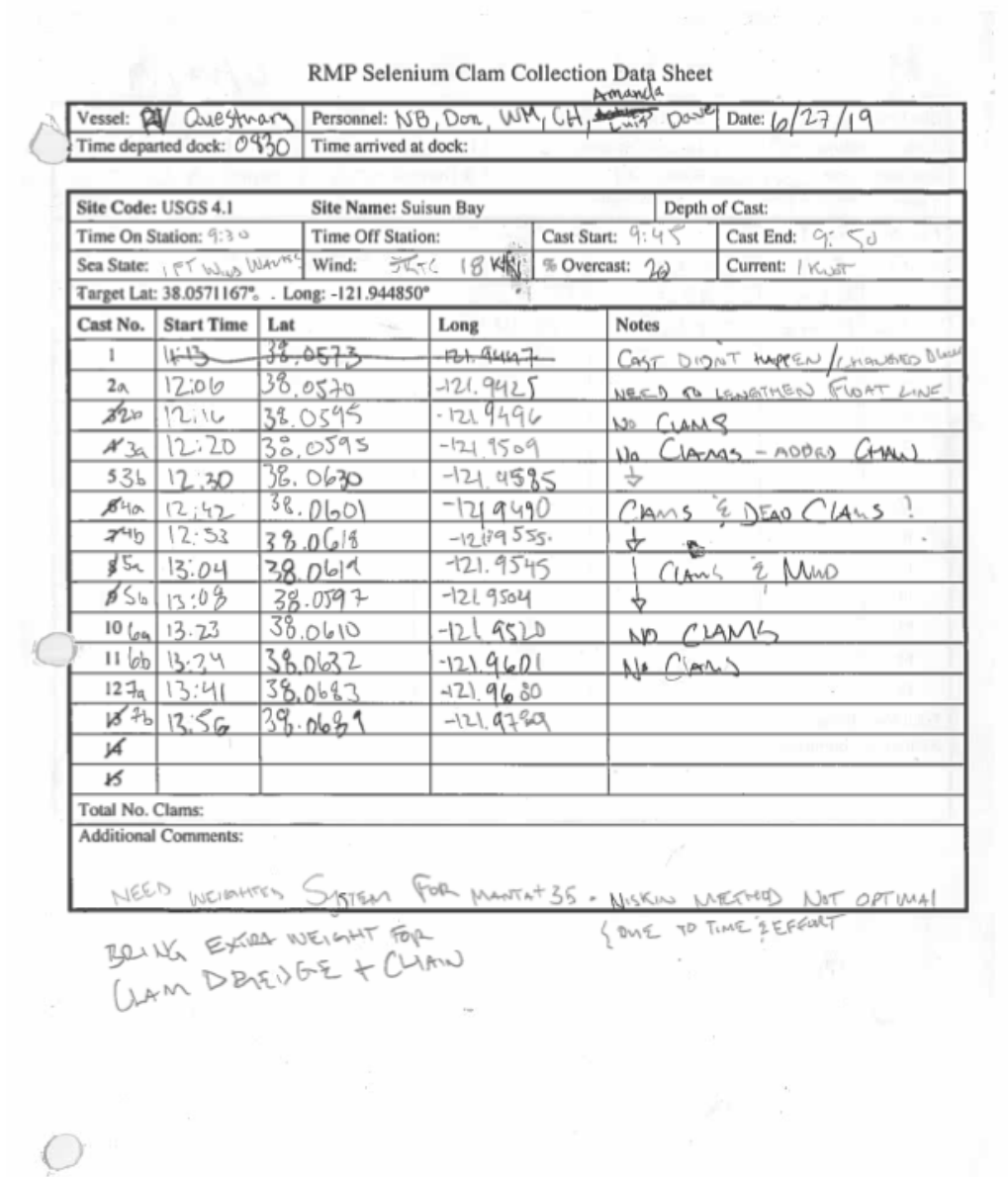
Table 5. Clam Aliquots Prepared for Laboratory Analysis

		Station 4.1			Station 8.1		
Date	**Bin**	**Sample ID**	**Size range (mm)**	**Count**	**Sample ID**	**Size range (mm)**	**Count**
6/27/19	1	STN41_2019-0627_10-11	10-11	39	STN81_2019-0627_08-09	8-9	23
	2	STN41_2019-0627_12-13	12-13	71	STN81_2019-0627_10	10	48
	3	STN41_2019-0627_14	14	26	STN81_2019-0627_11	11	70
	4	STN41_2019-0627_15-17	15-17	70	STN81_2019-0627_12	12	63
	5	STN41_2019-0627_18-20	18-20	17	STN81_2019-0627_13-14	13-14	70
7/22/19	1	STN41_2019-0722_10-11	10-11	30	STN81_2019-0722_8-9	8-9	4
	2	STN41_2019-0722_12-13	12-13	65	STN81_2019-0722_10-11	10-11	52
	3	STN41_2019-0722_14-15	14-15	40	STN81_2019-0722_12-13	12-13	124
	4	STN41_2019-0722_16-18	16-18	34	STN81_2019-0722_14-15	14-15	64
	5	STN41_2019-0722_19-20	19-20	13	STN81_2019-0722_16-18	16-18	12
8/29/19	1	STN41_2019-0829_8-9	8-9	44	STN81_2019-0829_8-9	8-9	82
	2	STN41_2019-0829_10-11	10-11	59	STN81_2019-0829_10-11	10-11	101
	3	STN41_2019-0829_14-15	14-15	13	STN81_2019-0829_12-13	12-13	71
	4	STN41_2019-0829_16-18	16-18	29	STN81_2019-0829_14-15	14-15	83
	5	STN41_2019-0829_19-21	19-21	7	STN81_2019-0829_16-18	16-18	23
12/3/19	1	STN41_2019_1203_9-10	9-10	58	STN81_2019_1203_9-10	9-10	28
	2	STN41_2019_1203_11-12	11-12	133	STN81_2019_1203_11-12	11-12	106
	3	STN41_2019_1203_13-14	13-14	41	STN81_2019_1203_13-14	13-14	112
	4	STN41_2019_1203_15-17	15-17	18	STN81_2019_1203_15-16	15-16	46
	5	STN41_2019_1203_19-21	19-21	8	STN81_2019_1203_17-19	17-19	11
1/11/20	1	STN41_2020_0111_9-10	9-10	53	STN81_2020_0111_8-9	8-9	28
	2	STN41_2020_0111_11-12	11-12	61	STN81_2020_0111_10-11	10-11	86
	3	STN41_2020_0111_13-14	13-14	19	STN81_2020_0111_12	12	51
	4	STN41_2020_0111_16-18	16-18	44	STN81_2020_0111_13-14	13-14	72
	5	STN41_2020_0111_19-21	19-21	16	STN81_2020_0111_15-17	15-17	34
2/5/20	1	STN41_2020_0205_11-12	11-12	14	STN81_2020_0205_9-10	9-10	30
	2	STN41_2020_0205_13-14	13-14	17	STN81_2020_0205_11-12	11-12	94
	3	STN41_2020_0205_15-16	15-16	56	STN81_2020_0205_13	13	41
	4	STN41_2020_0205_17-18	17-18	54	STN81_2020_0205_14-15	14-15	47
	5	STN41_2020_0205_19-21	19-21	20	STN81_2020_0205_16-18	16-18	12

Appendix A: Timing and order of sampling events

Date	Time	Events
6/27/19	0800 - 0830	Arrive at Benicia Marina, Mobilize R/V, Depart for USGS 4.1
	0830 - 0945	Transit to USGS 4.1
	0945 - 1400	Sample USGS 4.1, encountered issues with A-frame block requiring transit to/from Pittsburg Marina, 7 dredge runs
	1400 - 1440	Transit to USGS 8.1
	1440 - 1600	Sample USGS 8.1, 2 dredge runs
	1600 - 1615	Transit to Benicia Marina
	1615 - 1700	Demobilize R/V
7/22/19	0800 - 0840	Arrive at Pittsburg Marina, Mobilize R/V, Depart for USGS 4.1
	0840 - 0900	Transit to USGS 4.1
	0900 - 1045	Sample USGS 4.1, 2 dredge runs
	1045 - 1115	Transit to USGS 8.1
	1115 - 1345	Sample USGS 8.1, 5 dredge runs
	1345 - 1500	Transit to Pittsburg Marina
	1500 - 1530	Demobilize R/V
8/29/19	0800 - 0850	Arrive at Pittsburg Marina, Mobilize R/V, Depart for USGS 4.1
	0850 - 0925	Transit to USGS 4.1
	0925 - 1110	Sample USGS 4.1, 2 dredge runs
	1110 - 1150	Transit to USGS 8.1
	1150 - 1320	Sample USGS 8.1, 1 dredge run
	1320 - 1410	Transit to Pittsburg Marina
	1410 - 1445	Demobilize R/V
12/3/19	0800 - 0850	Arrive at Benicia Marina, Mobilize R/V, Depart for USGS 4.1
	0850 - 0940	Transit to USGS 4.1
	0940 - 1100	Sample USGS 4.1, 1 dredge run
	1100 - 1145	Transit to USGS 8.1
	1145 - 1300	Sample USGS 8.1, 1 dredge run
	1300 - 1315	Transit to Benicia Marina
	1315 - 1345	Demobilize R/V
1/11/20	0840 - 0940	Arrive at Benicia Marina, Mobilize R/V, Depart for USGS 4.1
	0940 - 1030	Transit to USGS 4.1
	1030 - 1155	Sample USGS 4.1, 1 dredge run
	1155 - 1255	Transit to USGS 8.1
	1255 - 1415	Sample USGS 8.1, 1 dredge run
	1415 - 1430	Transit to Benicia Marina
	1430 - 1500	Demobilize R/V
2/5/20	0950 - 1040	Arrive at Benicia Marina, Mobilize R/V, Depart for USGS 4.1
	1040 - 1100	Transit to USGS 4.1
	1100 - 1200	Sample USGS 4.1, 1 dredge run
	1200 - 1220	Transit to USGS 8.1
	1220 - 1330	Sample USGS 8.1, 1 dredge run
	1330 - 1340	Transit to Benicia Marina
	1340 - 1415	Demobilize R/V

Appendix B: Field Datasheets from 2019 – 2020 sampling. Templates were updated in Jan 2020



RMP Selenium Clam Collection Data Sheet

Vessel: Questuary | Personnel: NB, Don, WM, CH, ~~Luis~~ Amanda Dave | Date: 6/27/19

Time departed dock: 0930 | Time arrived at dock:

Site Code: USGS 4.1 | Site Name: Suisun Bay | Depth of Cast:

Time On Station: 9:30 | Time Off Station: | Cast Start: 9:45 | Cast End: 9:50

Sea State: 1 FT WIND WAVES | Wind: ~~JET~~ 18 KTS | % Overcast: 20 | Current: 1 KNOT

Target Lat: 38.0571167° . Long: -121.944850°

Cast No.	Start Time	Lat	Long	Notes
1	~~1:13~~	~~38.0573~~	~~-121.9447~~	CAST DIDNT HAPPEN / TANGLED BLOCK
2a	12:06	38.0570	-121.9425	NEED TO LENGTHEN FLOAT LINE
~~2b~~	12:16	38.0595	-121.9496	NO CLAMS
~~3a~~	12:20	38.0595	-121.9509	NO CLAMS - ADDED CHAIN
3b	12:30	38.0630	-121.9585	↓
~~4a~~	12:42	38.0601	-121.9490	CLAMS & DEAD CLAMS !
~~4b~~	12:53	38.0618	-121.9555	↓
~~5a~~	13:04	38.0612	-121.9545	1 CLAM & MUD
~~5b~~	13:08	38.0597	-121.9504	↓
10 6a	13:23	38.0610	-121.9520	NO CLAMS
11 6b	13:34	38.0622	-121.9601	NO CLAMS
12 7a	13:41	38.0683	-121.9680	
~~13~~ 7b	13:56	39.0689	-121.9789	
~~14~~				
~~15~~				

Total No. Clams:

Additional Comments:

NEED WEIGHTED SYSTEM FOR MANTA 35 - NISKIN METHOD NOT OPTIMAL (ONE TO TIME & EFFORT

BRING EXTRA WEIGHT FOR CLAM DREDGE + CHAIN

RMP Selenium Clam Collection Data Sheet 6/27/19

Site Code: USGS 8.1	Site Name: Carquinez Strait		Depth of Cast: 10.8 M
Time On Station: 14:40	Time Off Station:	Cast Start: 14:47	Cast End: 14:58
Sea State: 1 FT WIND WAVE	Wind: 17.1	% Overcast: 40 %	Current: 0.7 KN
Target Lat: 38.0571167°	Long: -121.944850°		

Cast No.	Start Time	Lat	Long	Notes
1	15:19	38.0258	-122.1476	CLAMS: 86
2	15:30	38.0263	-122.1563	
3	15:42	38.0260	-122.1457	
4	15:52	38.0262	-122.1551	CLAMS!
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
Total No. Clams:				
Additional Comments:				

RMP Selenium Clam Collection Data Sheet

Vessel: QUESTUARY	Personnel: NB, CH, PS		Date: 7/22/19
Time departed dock: 08:40	Time arrived at dock: ~1530		

Site Code: USGS 4.1	**Site Name:** Suisun Bay		Depth of Cast: 11 m
Time On Station: 0857	Time Off Station: 1045	Cast Start: 0910	Cast End:
Sea State: 2ft SSE	Wind: 15 KTS NW	% Overcast: 0, LOW FUEL	Current: LIGHT
Target Lat: 38.0571167°.	Long: -121.944850°		

Cast No.	~~Start~~ Time	Lat	Long	Notes
1a	0910	38.0561	-121.9457	CTD
2b	1004	38.0613	-121.9532	TRANSECT 1 (LOTS OF CLAMS!)
2a	1018	38.0634	-121.9593	2
2b				
3a				
3b				
4a				
4b				
5a				
5b				
6a				
6b				

Total No. Clams: >100

Additional Comments:

Niskin Grabs

Time	Lat	Long
0932	38.0566	-121.9487
0950	38.0587	-121.9485

CTD Casts

Time	Lat	Long
0910	38.0564	-121.9457

RMP Selenium Clam Collection Data Sheet 7/22/19

Site Code: USGS 8.1	Site Name: Carquinez Strait		Depth of Cast:
Time On Station: 1115	Time Off Station:	Cast Start:	Cast End:
Sea State:	Wind: 323° 16Kn	% Overcast: 0	Current: 2kts
Target Lat: 38.0571167°	Long: -121.944850°		

Cast No.	~~Start~~ Time	Lat	Long	Notes
1a	1215	38.0260	-122.1459	start
1b	1225	38.0263	-122.1545	End
2a	1243	38.0388	-122.1447	start
2b	1247	38.0393	-122.1496	End
3a	1256	38.0[illegible]	122.140	Start
3b	1310	—	—	End
4a	1320	38.0474	-122.1711	start
4b	1325	38.0531	-122.1758	End
5a	1336	38.0513	-122.1739	Start
5b	1343	38.055574	-122.[illegible]	End * CLAM?!
6a				
6b				
7a				
7b				

Total No. Clams:

Additional Comments:

Niskin Grab

Time Lat Long

CTD Casts

Time Lat Long

1135 38.0318 -122.[illegible]

1135 (same one) 38.0318 -122.139

RMP Selenium Clam Collection Data Sheet

Vessel: R/V Questuary	Personnel: CH, WM, Dave, Luis, Nina	Date: 8/29/19
Time departed dock: 0850	Time arrived at dock:	

Site Code: USGS 4.1	Site Name: Suisun Bay		Depth of Cast: 4.5
Time On Station: 0923	Time Off Station: 1110	Cast Start:	Cast End:
Sea State: Choppy	Wind: 16kn 273°	% Overcast: 10	Current:

Target Lat: 38.0571167° Long: -121.944850°

Cast No.	~~Start~~ Time	Lat	Long	Notes
1 1 start	10:15	38.0611	-121.9539	# clams collected AFTER START OF CAST
1 2 stop	10:24	38.0629	-121.9582	END ~20 CLAMS
2 3 start	10:34	38.0686	-121.9718	START
2 4 stop	10:35	38.0700	-121.9763	END ~100 Clams
3 5 start				
3 6 stop				
4 7 start				
4 8 stop				
5 9 start				
5 10 stop				
6 11 start				
6 12 stop				
7 13 start				
7 14 stop				
~~15~~				
Total No. Clams:				
Additional Comments:				

Niskin Grabs

Time	Lat	Long
0945	38.0581	-121.9471
0950	38.0581	-121.9471

CTD Casts

Time	Lat	Long
0930	38.0580	-121.9472
~~1514~~	~~38.0598~~	~~-121.9503~~

Temp 21.96 mS/c 2.33 pH 7.88 mg/L 8.78

RMP Selenium Clam Collection Data Sheet 8/29/19

Site Code: USGS 8.1	Site Name: Carquinez Strait		Depth of Cast:
Time On Station: 1150	Time Off Station: 1320	Cast Start:	Cast End:
Sea State: Flat	Wind: 11.2 kn 288°	% Overcast: 0	Current: ~ 12 kts
Target Lat: 38.0571167°	Long: -121.944850°		

Cast No.	~~Start~~ Time	Lat	Long	Notes
1 1 start	12:59	38.0492	-122.1721	Start
1 2 stop	13:10	38.0511	-122.1776	End
2 3 start				
2 4 stop				
3 5 start				
3 6 stop				
4 7 start				
4 8 stop				
5 9 start				
5 10 stop				
6 11 start				
6 12 stop				
7 13 start				
7 14 stop				
~~15~~				
Total No. Clams:				
Additional Comments:				

Niskin Grabs

Time	Lat	Long
11:57	38.0343	-122.1359
1202	38.0369	-122.1326

CTD Casts

Time	Lat	Long
1154	38.0320	-122.1394
1210	38.0371	-122.1324

T 22.12 ms/c 11.93 ppt 7.88 pH 7.9
mg/L 8.42
R/V flow-Through
T 21.60 7.7 mg/ spc 14.96 ms/c
92.3% pH 8.21 8.73 ppt

RMP Selenium Clam Collection Data Sheet

Vessel: Questuary	Personnel: CH, WM, Nina, Amanda,	Date: 12/3/19
Time departed dock: 0950	Time arrived at dock:	

Site Code: USGS 4.1	**Site Name:** Suisun Bay		Depth of Cast: 4m
Time On Station: 0940	Time Off Station:	Cast Start: 0942	Cast End: 0945
Sea State: <1ft	Wind: 9.4kts	% Overcast: 5	Current:

Target Lat: 38.0571167° Long: -121.944850° Actual: 38.0679, -121.9688

Cast No.	Time	Lat	Long	Notes
1 start	1032	38.0683	-121.9691	
1 stop	10:42	38.0691	-121.9768	Clams & Mud
2 start				
2 stop				
3 start				
3 stop				
4 start				
4 stop				
5 start				
5 stop				
6 start				
6 stop				
7 start				
7 stop				
15				

Total No. Clams:

Additional Comments:

Niskin Grabs

T	Lat	Long
1010	38.0685	-121.9688
1200	38.0537	-121.1756

CTD Casts

Time	Lat	Long

RMP Selenium Clam Collection Data Sheet

12/3/19

Site Code: USGS 8.1	**Site Name:** Carquinez Strait		Depth of Cast: 15m
Time On Station: 1145	Time Off Station:	Cast Start: 11:59	Cast End: 1203
Sea State: Calm	Wind: 9.6 kn	% Overcast: 40	Current:
Target Lat: 38.0571167°	Long: -121.944850°	~~Actual: 38.0506, -122.1729~~	

Cast No.	Start Time	Lat	Long	Notes
1	12:25	38.0506	-122.1729	
2	12:38	38.0570	-122.1739	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Total No. Clams:

Additional Comments: CTD cast Lat: 38.03161, -122.14415

RMP Selenium Clam Collection Data Sheet

Vessel: R/V Questuary	Personnel: CH, FS, Nina, Amanda, Dave	Date: 1/11/20
Time departed dock: 0940	Time arrived at dock: 1430	

Site Code: USGS 4.1	**Site Name:** Suisun Bay		Depth: 4m
Time On Station: 1030	Time Off Station: 1155		
Sea State: Choppy	Wind: 12kts N	% Overcast: 0	Current: 0.2kt flood
Site Target: 38.0571167°, -121.944850°		Clam Target: 38.0614°, -121.9537°	

Cast	Time	Lat	Long	Notes
CTD	1100	38.0573	-121.9429	
Niskin 1	1110	38.0555	-121.9388	
Niskin 2	—			
Niskin 3	—			
Clam Start	1126	38.0614	-121.9537	Living Potamo mixed into Corbicula shells
Clam Stop	1137	38.0596	-121.9580	
Clam Start				
Clam Stop				
Clam Start				
Clam Stop				
Additional Comments:				

Site Code: USGS 8.1	**Site Name:** Carquinez Strait		Depth: 16m
Time On Station: 1250	Time Off Station: 1415		
Sea State: Choppy	Wind: 16kt N	% Overcast: 0	Current: 0.4kt flood
Site Target: 38.031667°, -122.140267°		Clam Target: 38.0516°, -122.1726°	

Cast	Time	Lat	Long	Notes
CTD		38.0544	-122.1754	
Niskin 1		38.0552	-122.1776	
Niskin 2				
Niskin 3				
Clam Start	1350	38.0516	-122.1726	
Clam Stop	1403	38.0543	-122.1765	
Clam Start				
Clam Stop				
Clam Start				
Clam Stop				
Additional Comments:	CTD & Niskin times NR			

RMP Selenium Clam Collection Data Sheet

Vessel: R.V Peale Sunday	Personnel: Dan, Pete, Nina, Paul, Jamie, CH	Date: 2/5/20
Time departed dock: 1040	Time arrived at dock: 1340	

Site Code: USGS 4.1	**Site Name:** Suisun Bay		Depth: 4 m
Time On Station: 1102	Time Off Station: 1200		
Sea State: FLAT	Wind: CALM	% Overcast: 10	Current: SLACK (HIGH)
Site Target: 38.0571167°, -121.944850°		Clam Target: 38.0614°, -121.9537°	

Cast	Time	Lat	Long	Notes
CTD	1109	38.05764	-121.94479	
Niskin 1	1114	38.05724	-121.94487	~~COLLECTED VIA PUMP~~
Niskin 2	1118	"	"	
Niskin 3	1122	"	"	
Clam Start	1125	38.06114	121.95358	
Clam Stop	1144	38.05019	121.94880	
Clam Start				
Clam Stop				
Clam Start				
Clam Stop				

Additional Comments:

Site Code: USGS 8.1	**Site Name:** Carquinez Strait		Depth: 18 m
Time On Station: 1222	Time Off Station: 1330		
Sea State: CALM	Wind: ~~CALM~~ 5-10 KTS W	% Overcast: 5	Current: LIGHT EBB
Site Target: 38.031667°, -122.140267°		Clam Target: 38.0516°, -122.1726°	

Cast	Time	Lat	Long	Notes
CTD 1224	~~38.03167~~	~~38.03167~~ ~~-122.14015~~	-122.14015	
Niskin 1	1230	38.03086	-122.14148	
Niskin 2	1235	"	"	
Niskin 3	1240	"	"	
Clam Start	1308	38.05081	-122.17171	
Clam Stop	1320	38.04388	-122.17372	
Clam Start				
Clam Stop				
Clam Start				
Clam Stop				

Additional Comments: