Cruise Plan

2014 RMP Bivalve Deployment Cruise

Contract # 1084

June 2, 2014

Submitted to:

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1. Introduction

This report details plans associated with the biennial Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) bivalve deployment cruise. This Cruise Plan was developed based upon the decisions of the RMP Technical Review Committee in 2002 to reduce the number of bivalve transplant stations from twelve to nine, utilize deployment cages rather than bags at all stations, and deploy only *Mytilus californianus*. These changes went into effect with the 2003 program and continued through the 2012 deployments. In 2014, the RMP Technical Review Committee reduced bivalve deployment transplant stations from 9 to 7 stations, 3 of which are back-up deployment sites. In addition, as instituted initially with the 2006 deployments, there is no mid-deployment maintenance cruise, as previous analyses showed no difference in bivalve growth or survival between maintained and unmaintained deployments.

2. Cruise Plan

2.1. Objectives

All sampling will be conducted from the *RV Questuary*. The objectives of the sampling effort are as follows:

1. Collect *M. californianus* from Bodega Head State Reserve.
2. Depurate the collected mussels at Bodega Marine Lab (BML) until time of deployment.
3. Conduct defouling of all collected mussels at BML prior to deployment.
4. Deploy the mussels in containment cages at nine sites throughout the San Francisco Estuary.
5. Collect a CTD water column profile at nine sites.

2.2. Personnel

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

Table 1. Personnel for 2014 RMP Bivalve Deployment Cruise

Name	Affiliation	Duties
Traci Linder	AMS	Bivalve collections, diver
Rebecca Isquith	AMS	Bivalve collections, diver
Jay Johnson	AMS	Diver
Paul Salop	AMS	Cruise manager, bivalve collections, diver
Tony Hale	SFEI	Photodocumentation
David Morgan	RTC	Vessel skipper

Messrs. Isquith, Linder, and Salop will be responsible for bivalve collections. Messrs. Isquith, Linder, Johnson, and Salop will alternate diving and dive tending responsibilities. BML Aquatic Resources Group will assist with collections and care of bivalves while depurating at BML, and will conduct defouling operations. Captain Morgan will be responsible for vessel operation and safety. Mr. Salop will be responsible for overall cruise management, including permitting.

2.3. Cruise Schedule

This cruise schedule assumes that approximately 30 minutes will be required for operations at each site, an additional 30 to 60 minutes will be required at mooring installation sites, and the vessel proceeds between stations at approximately 15 knots. Table 2 gives a tentative schedule for cruise operations.

Table 2. Anticipated Cruise Schedule for 2014 RMP Sediment Cruise

Date	Time	Activity
May 16, 2014	0530-1200	Isquith, Linder, and Salop collect *M. californianus* from Bodega Head State Marine Reserve, Sonoma County. Low tide (-1.0 ft MLLW) occurs at 0600. *M. californianus* are then placed in filtered seawater tanks at Bodega Marine Lab (BML).
June 9, 2014	1000-1400	Linder retrieves bivalves from BML and transports to Oakland.
June 10, 2014	0900-0945	Mobilize equipment on *R/V Questuary* at San Leandro Marina. Depart for Redwood Creek (BA40).
	1045-1530	Check mooring integrity and deploy bivalves at Redwood Creek (BA40), Dumbarton Bridge (BA30), and Coyote Creek (BA10) sites (installing new mooring at Dumbarton Bridge site). Slack current at Dumbarton Bridge is at 1201 (Figure 1).
June 11, 2014	0900-0915	Mobilize gear, load bivalves aboard *RV Questuary*, Emeryville Marina. Depart for YBI site.
	1000-1330	Check mooring integrity and deploy bivalves at Yerba Buena Island (BC10) and Alameda (BB71) sites. Slack current near Alameda is at 1224 (Figure 2).
June 12, 2014	0645-0700	Mobilize gear, load bivalves aboard *RV Questuary*, Vallejo Marina. Depart for San Pablo Bay site.
	0730-1100	Check mooring integrity and deploy bivalves at San Pablo Bay (BD20) and Pinole Point (BD30). Slack current near San Pablo Bay site is at 0809 (Figure 3).
June 13, 2014	As needed	Scheduled makeup day as required.

2.4. Sampling Procedures

As moorings have not been visited in two years, it is possible that several moorings will require additional maintenance or replacement. Therefore, the cruise is designed with one contingency deployment day, June 13th, to account for any additional installations required.

The target for surviving bivalves retrieved at the conclusion of deployments is a minimum of 180 live organisms for status and trends (S&T) analyses. This would allow for allocation of 100 bivalves for organics analysis, microcystin split, and archive, 10 for siloxanes, 30 for alternative flame retardants, 10 for selenium, and 30 for growth. Sites experiencing extremely high levels of mortality or catastrophic failure of cages may not be able to meet this target.

To meet this target, 240 individuals of *M. californianus* will be deployed at each of four bivalve transplantation sites for S&T analyses and three backup deployment sites (to be analyzed only upon failure of primary deployment stations). At each site, 80 mussels will be placed in each of three cages, with four compartments holding 20 mussels each.

Approximately 1,900 mussels are needed to support S&T analyses (including mussels allocated for T-0 analyses). An additional 100 mussels will be collected to make up for mortality prior to or during deployment operations. Therefore, the total number of bivalves to be collected from Bodega Head is targeted at approximately 2,000 *M. californianus*.

2.5. Sampling Sites

Coordinates for all RMP sampling sites are shown in Table 3. All scheduled samples to be collected at each site are shown in Table 4.

Table 3. Coordinates for 2014 RMP Bioaccumulation Cruise Sampling Sites. All coordinates are listed in WGS-84 datum (See Appendix A for station locations). Coordinates for BG20 and BG30 are approximate only – dredging locations will be established at time of sampling based upon populations present.

Site	Lat	Long	Comments
T-0	38.22050	123.06550	Mussels collected from intertidal rock outcrops
BA10	37.46983	-122.06383	Coyote Creek: Channel marker "18"
BA30	37.51333	-122.13467	Dumbarton Bridge (backup site): Channel marker "14"
BA40	37.54700	-122.19500	Redwood Creek: Channel marker "4"
BB71	37.69550	-122.33967	Alameda (backup site): Channel marker "1" 1.65 nmi. SE of Hunters Point
BC10	37.81392	-122.35873	Yerba Buena Island: Piles 30m SW of Bay Bridge, center pile in only remaining set of dolphins
BD30	38.01667	-122.36750	Pinole Point: Channel marker "P"; no ground line – mooring within body length of pile
BD20	38.05900	-122.42367	San Pablo Bay (backup site): Channel marker "4." New as of 2006, approx. 1 nmi from channel marker "1" (replaced in 2006)
BG20	38.05570	-121.80593	Sacramento River (residents only): Channel marker "8" N of Sherman Island
BG30	38.02362	-121.80048	San Joaquin River (residents only): Channel marker "8" 0.75 nmi. E of Antioch Marina

Table 4. Sample Matrix for 2014 RMP Bioaccumulation Samples

SITE CODE	REGION	Organics	Growth / DFW	Siloxanes	Alternative Flame Retardants	Microcystins	Selenium	Archive
T-0	N/A	x	x	x	x	x	x	x
BA10	South Bay	x	x	x	x	x	x	x
BA30[1]	South Bay	x[1]	x	x[1]	x[1]	x[1]	x[1]	x
BA40	South Bay	x	x	x	x	x	x	x
BB71[1]	Central Bay	x[1]	x	x[1]	x[1]	x[1]	x[1]	x
BC10	Central Bay	x	x	x	x	x	x	x
BD30	North Bay	x	x	x	x	x	x	x
BD20[1]	North Bay	x[1]	x	x[1]	x[1]	x[1]	x[1]	x
BG20[2]	Rivers	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]
BG30[2]	Rivers	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]	x[2]
T-1	N/A		x					
TOTAL		7	11	7	7	7	7	10

Notes:
[1]Back up deployment site. Samples will be deployed and processed using the same methods as the primary sites but will only be analyzed by the laboratory if the primary sites cannot be sampled. Samples from the backup sites will be archived even if the primary stations are sampled.
[2]Will be analyzed from residents only – no transplants

2.6. Sample Handling

Sample handling instructions for all bivalve samples are shown in Table 5. Estimated mass / number of bivalves required by analysis are presented in Table 6.

Table 5. Sample Handling for 2014 RMP Bioaccumulation Samples

Sample	Container	Handling Requirements
Trace Elements	N/A	Not collected in 2014
Trace Organics	1 gallon zip-top bag	Collect 90 organisms (60 for organics, 30 for organics archive), do not rinse, wrap in two layers of aluminum foil, place in zip-top bag, freeze or place on dry ice.
Growth	1 gallon zip-top bag, double-bagged	Collect 30 organisms, rinse with site water, place in zip-top bags, freeze or place on dry ice.
Siloxanes	1/2 gallon zip-top bag (or smaller)	Collect 10 organisms, do not rinse, wrap in two layers of aluminum foil, place in double-bagged zip-top bags, freeze or place on dry ice.
Alternative Flame Retardants	1 gallon zip-top bag	Collect 30 to 40 organisms, do not rinse, wrap in two layers of aluminum foil, place in zip-top bag, freeze or place on dry ice.
Microcystins	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS (coordinated by SFEI).
Selenium	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS (coordinated by SFEI).
Archive	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS.

Table 6. Estimated Mass Required Per Analyte

Sample	Required Mass
Siloxanes	1-2 g (ww) minimum per site. 3-5 g would allow for duplicates. Whole bivalves provided by AMS.
Alternative Flame Retardants	30-40 whole bivalves per site to be composited by the analytical lab. Whole bivalves provided by AMS.
Microcystins	2-5 g (ww) homogenate per site. Provided as split of homogenate from AXYS.
Selenium	0.5 g (ww) minimum per site. Provided as split of homogenate from AXYS.

2.7. Sample Labeling

The sample ID labeling system used for the 2014 cruise is as follows:

RMP-14BC-XXXX

Where:

RMP	=	Project
14	=	Cruise Year
BC	=	Matrix (Sediment Cruise)
XXXX	=	Unique ID number

2.8. Current Charts

Predicted currents associated with planned dive operations are shown in the following figures.

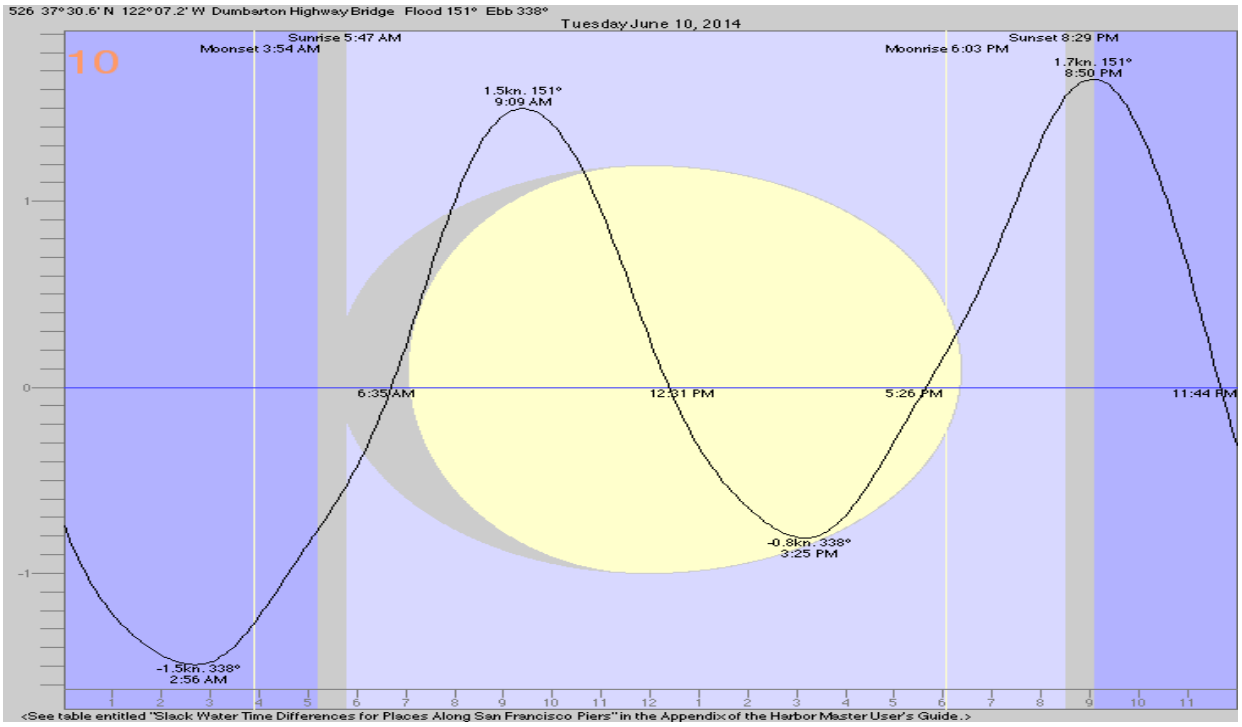

Figure 1. Currents near Dumbarton Bridge on June 10, 2014.

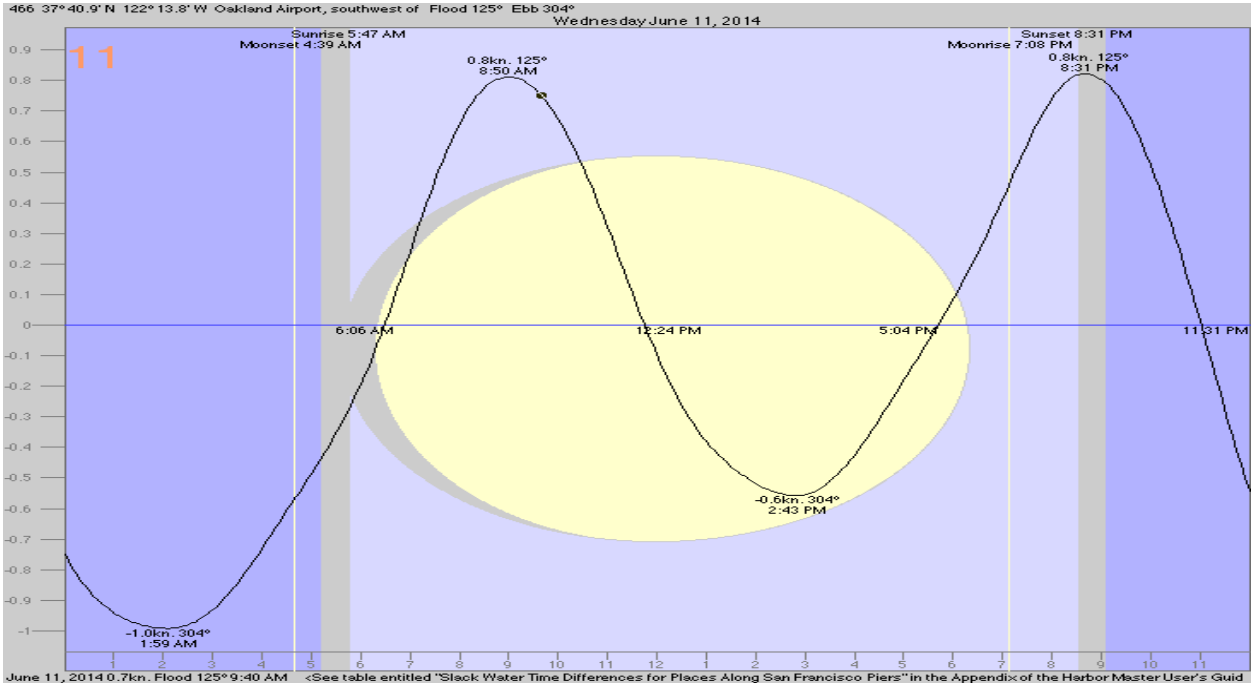

Figure 2. Currents near Alameda on June 11, 2014.

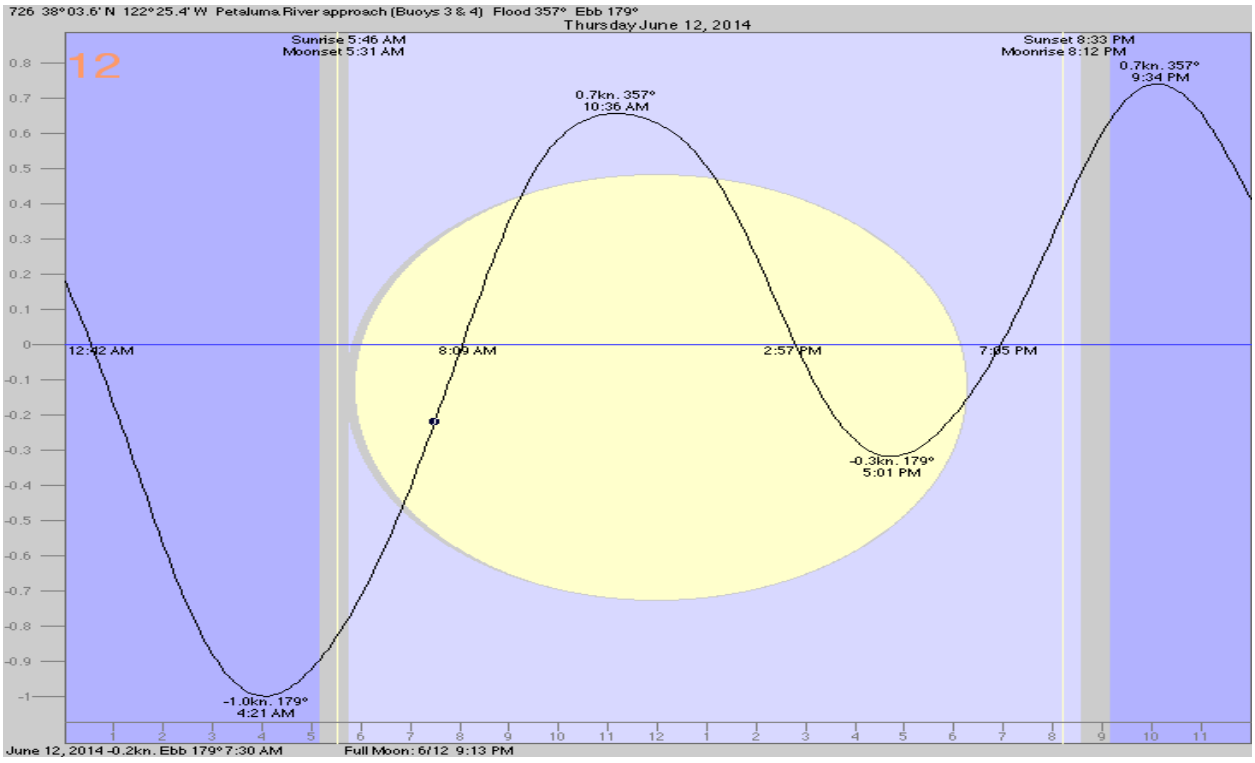

Figure 3. Currents near Petaluma River entrance on June 12, 2014.

3. Appendix A – Map of Deployment / Collection Locations for 2014 RMP Bioaccumulation Program