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OFFICE OF ENVIRONMENT, HEALTH AND SAFETY
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October 6, 2010

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Nina Cavett
U.S. Army Corps of Engineers
1455 Market Street
San Francisco, CA 94103-1398

Re: University of California, Berkeley, Richmond Field Station
Western Stege Marsh Restoration Project Year 5 Monitoring Report
And Certification of Compliance of Nationwide Permit

Dear Mr. Browning, Ms. Nakashima, and Ms. Cavett:

Please find enclosed the *Year 5 Monitoring Report for the Western Stege Marsh Restoration Project* (WSMRP) prepared by Tetra Tech EM Inc., the final report of the five-year post-remediation monitoring program conducted at the site. The purposes of the post-remediation monitoring were to assess the success of the WSMRP restoration activities and to adaptively manage the site to aid the restoration processes following marsh remediation activities conducted in 2002 through 2004.

This report presents (1) monitoring events and data analyses conducted during Year 5 activities in 2009 and the beginning of 2010; (2) a comprehensive review of monitoring and restoration activities completed from 2004 through 2010; and (3) conclusions on the effectiveness of restoration activities.

As described in the report, based on the data obtained in Years 1 through 5, the WSMRP site is progressing toward providing the functions of a tidal marsh typical of San Francisco Bay and based on this trajectory no further restoration or monitoring is recommended. The rationale supporting the successful completion of all monitoring and active restoration activities at the WSMRP is based on:

Hydrologic Activity. The engineered marsh plain and slough channels allow for successful daily inundation of the marsh portions of the WSMRP site and support vegetative communities outlined in the WSMRP Monitoring Plan. Survey data, tidal measurements, and hydrologic observations support that the WSMRP site is progressing toward providing the functions of a tidal marsh typical of San Francisco Bay.

Diverse and Native Vegetative Communities. Site observations support that the WSMRP site is progressing toward supporting a diverse, ecologically viable, functioning marsh habitat. The total acreage of Pacific cordgrass (*Spartina foliosa*), pickleweed (*Salicornia virginica*), and the health of the other native cover monitored strongly support that the restoration effort has successfully restored native plant communities within the WSMRP area. The restoration site includes a robust ecotone between the marsh and upland grasslands providing habitat for numerous plant and animal species.

Viable California Clapper Rail Habitat. A complex ecosystem has evolved at the WSMRP site as observed through numerous wildlife species, including birds, insects, reptiles, and mammals. California clapper rails, including fledgling young, were observed immediately adjacent to the WSMRP site and are expected to use the habitat at the WSMRP site as the vegetation matures in the future. The establishment of a compositionally and structurally complex ecosystem within the WSMRP site, with emphasis on the increased habitat function for the California clapper rail, is strongly influenced and supported by site hydrology and native vegetative communities discussed above.

The Year 5 Monitoring Report fulfills the final reporting requirements outlined in the following permits:

- United States Army Corps of Engineers Nation Wide Permit #38 (File #2617S and #28135S) and the associated United States Fish and Wildlife Services Biological Opinion (#1-1-03-F-0228; Letter#1-1-02-I-2866)
- Regional Water Quality Control Board, San Francisco Region Clean Water Act Section 401 Water Quality Certification (File #2199.1185)
- San Francisco Bay Conservation and Development Commission Permit No. M01-52(b)
- East Bay Regional Parks District Encroachment Permits #029E-02-601 and #049E-030601

In accordance with the Nationwide Permit #38, we are also submitting the signed Certification of Compliance for Nationwide Permit, Enclosure 3 of File Permit #28135S.

UC Berkeley will continue to provide routine oversight of the WSMRP site as a part of established facilities management at the Richmond Field Station.

If you have any questions or need further information, please contact me (gjhaet@berkeley.edu, 510-642-4848) or Karl Hans (khans@berkeley.edu, 510-643-9574).

Sincerely,

Greg Haet
Associate Director

Enclosure 3

Permittee: **University of California, Berkeley**

File No.: **28135S** - **Western Stege Marsh Remediation Project**

Certification of Compliance
for
Nationwide Permit

"I hereby certify that the work authorized by the above referenced file number and all required mitigation have been completed in accordance with the terms and conditions of the nationwide permit."

Mark B. Freiberg
(permittee)

October 5, 2010
(date)

Mark B. Freiberg,
Director
Environment, Health & Safety
U.C. Berkeley

Return to:

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Year 5 Monitoring Report for the Western Stege Marsh Restoration Project

University of California, Berkeley
Richmond Field Station, Richmond, California

September 30, 2010

Prepared for
Office of Environment, Health & Safety
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Prepared by

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
Bay Trail	East Bay Regional Park District Bay Trail
BBL	Blasland, Bouck & Lee, Inc.
CAD	Computer-aided design
CAL-IPC	California Invasive Plant Council
DTSC	California Department of Toxic Substances Control
EBRPD	East Bay Regional Park District
EPA	U.S. Environmental Protection Agency
ER-M	Effects range-median
E-SSTL	Ecological site-specific target levels
FAMP	Feral Animal Management Program
GPS	Global positioning system
ISP	San Francisco Estuary Invasive Spartina Program
Kamman	Kamman Hydrology & Engineering, Inc.
mg/kg	Milligrams per kilogram
MHHW	Mean higher high water
MTL	Mean tide level
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NWP 38	Nationwide Permit 38
PCB	Polychlorinated biphenyl
RFS	Richmond Field Station
T-Sheets	U.S. Coast Survey topographic map sheets
Tetra Tech	Tetra Tech EM Inc.
UC	University of California
UC Berkeley	University of California, Berkeley
USFWS	U.S. Fish and Wildlife Service

ACRONYMS AND ABBREVIATIONS (continued)

Water Board	San Francisco Bay Regional Water Quality Control Board
WSMRP	Western Stege Marsh Restoration Project

EXECUTIVE SUMMARY

This Year 5 Monitoring Report for the Western Stege Marsh Restoration Project (WSMRP) at the University of California, Berkeley, Richmond Field Station (RFS) has been prepared on behalf of The Regents of the University of California. The Year 5 monitoring report complies with the remediation permits issued for prior remediation activities conducted under San Francisco Bay Regional Water Quality Control Board (Water Board) Order No. 01-102 (Water Board 2001, rescinded October 2005). The remediation permits require restoration monitoring of the remediated marsh area. The WSMRP Monitoring Plan defines the post-remediation monitoring required under the permits at the WSMRP site (Blasland, Bouck & Lee, Inc. [BBL] 2004c). Section 5.16 of the current California Department of Toxic Substances Control (DTSC) Site Investigation and Remediation Order I/SE-RAO 06/07-004 for the RFS, issued September 15, 2006, requires continued implementation of the WSMRP Monitoring Plan for 5 years. The portions of the marsh subject to this monitoring program were the marsh and ecotone areas remediated in 2002 to 2004 (areas formerly designated 2A, M3, and M1a).

The purpose of post-remediation monitoring was to assess the results of the WSMRP and to adaptively manage the site to aid the restoration processes. The objectives of monitoring were to (1) quantitatively assess the hydrological functions within the site, (2) assess progress toward or deviation from defined project goals, (3) provide regulatory agencies with information on restoration efforts, and (4) identify contingency measures as necessary. Monitoring events were conducted on a semiannual basis for 5 years (BBL 2004c). The WSMRP Monitoring Plan outlined four project targets:

- Project Target 1: Restore the hydrologic complexity to the WSMRP site.
- Project Target 2: Improve water quality by increasing the time water is retained within the WSMRP site.
- Project Target 3: Restore low salt marsh (Pacific cordgrass), middle salt marsh (pickleweed), and emergent and coastal scrub native plant communities within the WSMRP site.
- Project Target 4: Establish a compositionally and structurally complex ecosystem within the WSMRP site with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail.

Recommendations

Data obtained by Tetra Tech EM Inc. (Tetra Tech) and subcontractors monitored various parameters in the marsh to assess the progress of the restored marsh area based on the four project targets. Overall, based on data obtained in Years 1 through 5, the WSMRP site is progressing toward providing the functions of a tidal marsh typical of San Francisco Bay. Based on this trajectory and evaluation against the project targets, no further remediation or monitoring activities are recommended in the WSMRP area.

Summary of Project Standards

Project Target 1: Hydrologic functioning of the restored slough channels has been assessed through a review and analysis of Year 1 through Year 5 monitoring data. Project Target 1 standards were achieved because the hydrology is sufficient to inundate the marsh portions of the WSMRP site daily and support vegetative communities designed in the WSMRP Monitoring Plan.

Project Target 2: Screening criteria outlined in the Year 2 report serve as a baseline for evaluating Project Target 2. Analytical data for surface water, sediment, and stormwater samples collected in Year 5 were compared to data obtained in Years 2, 3, and 4 and to the screening criteria. Data obtained in support of Project Target 2 will be combined with future monitoring as part of the Field Sampling Workplan (Tetra Tech 2010) to assess the WSMRP site sediment and water quality.

Project Target 3: The Project Target 3 standards were achieved. In 2009, all of the four performance standard measurements for Year 5 were achieved. The total acreage of Pacific cordgrass (*Spartina foliosa*) and the total acreage of pickleweed (*Salicornia virginica*) were greater than the adjusted Year 5 project standards. Furthermore, the total native plant coverage of 82 percent exceeded the project standard of 80 percent for Year 5, and the performance measure for vigor of planted stock of 92 percent exceeded the standard of 80 percent. An evaluation of these measurements, along with the health of the other native cover monitored, suggest that the restoration effort has met the intent of the project standards, which is to restore native plant communities within the WSMRP area.

Project Target 4: The Project Target 4 standards were substantially but not yet fully achieved. A complex ecosystem has evolved and is being used by numerous wildlife species, including birds, insects, reptiles, and mammals. California clapper rails were not observed using the WSMRP site for nesting or foraging during surveys conducted in Year 5. However, individual rails were identified near the edge of the site, and rails have successfully nested within 300 feet of the site. Rails are expected to use the habitat at the WSMRP site as the vegetation there matures in the future.

1.0 INTRODUCTION

This Year 5 Monitoring Report for the Western Stege Marsh Restoration Project (WSMRP) site at the University of California, Berkeley (UC Berkeley) Richmond Field Station (RFS) has been prepared on behalf of The Regents of the University of California (UC). The Year 5 monitoring report complies with the remediation permits issued for prior remediation activities conducted under San Francisco Bay Regional Water Quality Control Board (Water Board) Order No. 01-102 (Water Board 2001, rescinded October 2005). Remediation activities at the RFS have been performed in three phases. Remediation within the Western Stege Marsh included Phase 1, completed in 2002; Phase 2, completed in 2003 and 2004; and Phase 3, completed in 2004. The remediation permits required restoration monitoring of the remediated marsh areas. The WSMRP Monitoring Plan defines the post-remediation monitoring required under the permits at the WSMRP site (Blasland, Bouck & Lee, Inc. [BBL] 2004c). Section 5.16 of the current California Department of Toxic Substances Control (DTSC) Site Investigation and Remediation Order I/SE-RAO 06/07-004 for the RFS, issued on September 15, 2006, requires continued implementation of the WSMRP Monitoring Plan.

The portions of the marsh subject to the monitoring program are the marsh and ecotone areas remediated in 2002 to 2004 (areas formerly designated 2A, M3, and M1a). The purpose of post-remediation monitoring was to assess progress at the WSMRP site and to adaptively manage the site and aid in the restoration processes. The WSMRP Monitoring Plan outlines four project targets related to hydrology, water quality, restoration of salt marsh and coastal scrub communities, and establishment of a compositionally and structurally complex ecosystem. The monitoring plan defines a set of performance criteria, or project standards, to assess the success of each of the project targets. Field measurements and indicators—such as hydrological cross sections; surface water, sediment, and stormwater sampling and analysis; vegetation surveys; and California clapper rail (*Rallus longirostris obsoletus*) surveys—were used to evaluate progress in achieving the project standards (BBL 2004c).

The objectives of monitoring were to: (1) quantitatively assess the hydrological functions within the site, (2) assess progress toward or deviation from defined project goals, (3) provide regulatory agencies with information on restoration efforts, and (4) identify contingency measures as necessary. Monitoring events were conducted on a semiannual basis for 5 years (BBL 2004c).

Year 5 monitoring encompassed activities during 2009, except for clapper rail monitoring, which continued into early 2010 (following the format established in Year 1), and additional site surveys and hydrology analysis completed in February and March 2010. This report summarizes the results of Year 5 monitoring conducted at the WSMRP site and recommends no further remediation or monitoring requirements. The site background and the organization of this report are summarized in the following sections.

1.1 SITE BACKGROUND

This section discusses the site location, site history, and the regulatory framework for monitoring of the WSMRP site.

1.1.1 Site Location and History

The RFS is located at 1301 South 46th Street in Richmond, California (see Figure 1). The RFS is bordered by Meade Street off Interstate 580 to the north, by South 46th Street to the east, by the East Bay Regional Park District Bay Trail (Bay Trail) to the south, and by Meeker Slough and Regatta Boulevard to the west (see Figure 2). The California Cap Company owned the property and used it for industrial manufacturing of explosives from the late 1800s until 1948. In 1950, UC purchased the property, primarily for research facilities for the College of Engineering; later, other campus departments used portions of the RFS.

The RFS consists of (1) the Upland Area, containing areas developed for academic teaching and research and a remnant coastal terrace prairie; (2) a tidal salt marsh known as Western Stege Marsh; and (3) a Transition Area between the Upland Area and Western Stege Marsh. Western Stege Marsh extends across the southern portion of the RFS and the adjacent properties between the Transition Area and the Bay Trail (a former rail spur). Most of the inboard (north of the Bay Trail) portion of Western Stege Marsh is located within the RFS property boundary. The eastern portion of the marsh, Eastern Stege Marsh, is located on the adjacent property, formerly owned by Zeneca Inc., (and referred to as the former Zeneca site). The Connector Trail to the Bay Trail prevents tidal interaction between the Western and Eastern Stege Marshes (see Figure 3).

The Western Stege Marsh occupies approximately 9 acres and is bounded by the Transition Area to the north, the Connector Trail and Eastern Stege Marsh to the east, the Bay Trail to the south, and Meeker Slough and Marina Bay (a residential community) to the west. The portions of the marsh subject to the WSMRP Monitoring Plan are the 5-acre marsh and ecotone area created during 2002 to 2004 remediation activities (areas formerly designated 2A, M3, and M1a) (see Figure 3).

The marsh habitat in the project area consists of tidal sloughs, low marsh, middle to high marsh, and an ecotone transition from marsh to upland coastal prairie and coastal scrub. Low marsh is typically dominated by Pacific cordgrass (*Spartina foliosa*), which grows from above the mean tide line (0.43 feet National Geodetic Vertical Datum 1929 [NGVD]) to slightly above the mean high tide line (2.6 feet NGVD). Middle marsh is typically dominated by pickleweed (*Salicornia virginica*), which grows between the mean high tide line (2.6 feet NGVD) and the mean high-high tide line (3.2 feet NGVD). High marsh is typically dominated by salt grass (*Distichlis spicata*), marsh gum plant (*Grindelia stricta angustifolia*), jaumea (*Jaumea carnosa*), and alkali bulrush (*Scirpus robustus*) at an elevation ranging from 3.2 to 5.0 feet NGVD. The ecotone is a vegetated strip about 10 to 30 feet wide between the edge of the marsh (5.0 feet NGVD) and the uplands that provides cover habitat for the California clapper rail during high tides. The surrounding uplands are mostly ruderal except for the island, which was restored in 2005 and 2006, and a 100-foot-wide section in the Transition Area that was planted with native vegetation in 2006 and 2007, and was expanded in 2008. The upper marsh edge is defined as the 5-foot contour in the project area.

Historical industrial operations conducted at the RFS site prior to UC ownership, and historical industrial operations conducted at adjacent properties, caused contamination of sediments in the Western Stege Marsh. As a result, UC Berkeley implemented and completed remediation activities at the Western Stege Marsh. These activities were performed in three phases beginning in 2002 in response to the Water Board Order (No. 01-102) issued to UC Berkeley and Zeneca in October 2001 (Water Board 2001). The construction schedule was designed to avoid disturbing the site during the breeding season (February 1 to

August 31) of the California clapper rail. Remediation within Western Stege Marsh included Phase 1, completed in 2002; Phase 2, completed in 2003 and 2004; and Phase 3, completed in 2004.

Recognizing the need for establishing a baseline for the WSMRP site, UC Berkeley defined January 2004 as the baseline or "time zero" for the restoration project (BBL 2005). Monitoring data obtained during fall 2004 and the California clapper rail surveys conducted in early 2005 were presented in the Year 1 Monitoring Report (BBL 2005); no other monitoring data were obtained during 2005. Data obtained during 2006 are considered Year 2; data obtained in 2007 and early 2008 are considered Year 3; data obtained in 2008 and early 2009 are considered Year 4; data obtained in 2009 and early 2010 are considered Year 5 (presented in this report). Regulatory oversight of the RFS is now provided by DTSC under Site Investigation and Remediation Order, Docket No. ISE-RAO 06/07-004, dated September 15, 2006.

1.1.2 Regulatory Framework

Federal, state, and local governments have jurisdiction over waters and wetlands affected by remediation and restoration activities conducted at the RFS. The list below summarizes the environmental permits issued for remediation and restoration of the Western Stege Marsh during Phase 1, 2, and 3 remediation activities. Monitoring of the WSMRP site is a requirement of these permits.

AGENCY	PERMIT
U.S. Army Corps of Engineers	**Clean Water Act Section 404** **Nationwide Permit (NWP) 38 #26417S and NWP 38 #28135S**
U.S. Fish and Wildlife Service	**Biological Opinion #1-1-03-F-0228** **Letter #1-1-02-I-2866**
Water Board	**Clean Water Act Section 401 Water Quality Certification File #2199.1185(CSF)**
San Francisco Bay Conservation and Development Commission	**Number M01-52(b)**
East Bay Regional Parks District	**Encroachment Permit #029E-02-601 and 049E-03-601**

A complete summary of the regulatory processes and permits associated with the WSMRP site is provided in the WSMRP Monitoring Plan (BBL 2004c).

1.1.3 Year 1 Marsh Monitoring Summary

The Year 1 Monitoring Report was prepared to assess the immediate results of restoration activities in areas of the Western Stege Marsh and establish baseline conditions for future monitoring events (BBL 2005). Overall, the monitoring report concluded that the WSMRP site was progressing toward providing the functions of a tidal marsh typical of San Francisco Bay. Project standards for Project Target 1, restore hydrological complexity, were being achieved: hydrology was sufficient to inundate the WSMRP site and flush sloughs at least once a day. Project Target 2, improve water quality, was not assessed during Year 1; at that time, a separate groundwater and surface water monitoring plan was under regulatory agency review. The Year 1 Monitoring Report indicated that future monitoring reports would include water quality data.

The project standards for Project Target 3, to restore salt marsh and coastal scrub communities, were not achieved. Pacific cordgrass had not begun to colonize the site, and the total acreage of pickleweed was slightly less than the project standard; however, the Year 1 Monitoring Report concluded that the project standards for Project Target 3 were expected to be met by Year 5. The project standards for Project Target 4, establish a compositionally and structurally complex ecosystem, likewise were not achieved. The California clapper rail was not sighted within the WSMRP site during the two surveys performed, and detrital material had not accumulated because of the absence of substantial vegetative cover; however, the report concluded that the clapper rail's use of the WSMRP site was expected to increase as the habitats continued to develop.

1.1.4 Year 2 Marsh Monitoring Summary

Year 2 marsh monitoring was conducted following the project standards outlined in the WSMRP Monitoring Plan (BBL 2004c). In addition, the following management recommendations suggested in the Year 1 Monitoring Report were completed: (1) three additional vegetation monitoring quadrats (C-0, D-0, and E-0) were established in the ecotone area (the vegetated strip between the marsh and upland that provides cover for the California clapper rail during high tides); (2) active planting of the desired Pacific cordgrass and removal of undesired smooth cordgrass (*Spartina alterniflora)* or subsequent hybrids (*S. alterniflora* x *S. foliosa*) was conducted to prevent these invasive species from colonizing the WSMRP site; (3) an assessment of the appropriate frequency for active trapping as part of the Feral Animal Management Program (FAMP) was completed, including a consultation with the U.S. Fish and Wildlife Service (USFWS) at Don Edwards National Wildlife Refuge; and (4) public outreach meetings about ongoing activities at the WSMRP site were continued (Tetra Tech EM Inc. [Tetra Tech] 2008).

In Year 2, Project Target 1 standards were mostly achieved (standards were not achieved in three of the eight cross sections measured). During Year 2, it appeared that the marsh portions of the WSMRP site were inundated daily. Data obtained in support of Project Target 2 were established as a baseline in Year 2. Year 2 data indicated that metals concentrations in some surface water, sediment, and stormwater samples exceeded certain federal and state screening criteria for protection of aquatic life. The Project Target 3 standards were achieved for Year 2. The total acreage of Pacific cordgrass (*Spartina foliosa*) was less than the project standard, while the total acreage of pickleweed (*Salicornia virginica*) was greater than the project standard. Therefore, the overall native plant cover was totaled and the total exceeded the Year 2 standards. The Project Target 4 standards were not achieved. The California clapper rail was not observed using the WSMRP site for nesting or foraging during Year 2 surveys; however, individuals were detected near the edge of the site.

1.1.5 Year 3 Marsh Monitoring Summary

Year 3 marsh monitoring was conducted following the project standards outlined in the WSMRP Monitoring Plan (BBL 2004c). In addition, the following management recommendations suggested in the Year 2 Monitoring Report were implemented: (1) on-site tidal gauge information was deemed noncritical and was not acquired during Year 3, and (2) the combined acreages of Pacific cordgrass and pickleweed were used to assess the success of marsh revegetation goals for Project Target 3 (Tetra Tech 2009a).

In Year 3, Project Target 1 standards were mostly achieved (standards were not achieved in four of the eight cross sections measured), and hydrology was sufficient to inundate the WSMRP site and flush sloughs at least once a day. Data obtained in support of Project Target 2 were established as a baseline in Year 2 and compared to Year 3 data. Year 3 data indicated that metals concentrations in some surface water, sediment, and stormwater samples continued to exceed certain federal and state screening criteria for the protection of aquatic life, but the significance of the results had yet to be determined. The Project Target 3 standards were achieved for Year 3. Although the total acreage of Pacific cordgrass (*Spartina foliosa)* was less than the initial project standard, the total acreage of pickleweed (*Salicornia virginica*) was greater than the initial project standard. Thus, the total native plant cover exceeded the Year 3 project standards. The Project Target 4 standards were not yet achieved. The California clapper rail was not observed using the WSMRP site for nesting or foraging during Year 3 surveys; however, individuals were detected near the edge of the site.

1.1.6 Year 4 Marsh Monitoring Summary

Year 4 marsh monitoring was conducted following the project standards outlined in the WSMRP Monitoring Plan (BBL 2004c). In addition, the following management recommendations suggested in the Year 3 Monitoring Report were implemented: (1) a pair of water-level recorders were installed in the southern slough channel of the WSMRP site to monitor and evaluate tidal exchange between Meeker Slough (represented by the National Oceanic and Atmospheric Association [NOAA] Richmond tide gauge) and Western Stege Marsh via the Central and South Channels; (2) channel profiles were extended longitudinally downstream to Meeker Slough to better evaluate the perceived rapid change in channel depths between the WSMRP site and the adjacent undisturbed marsh; (3) areas that were dominated by non-native plants or had limited vegetative cover were planted with a mixture of fast growing rhizomatous plants and shrubs that had demonstrated high survivorship and/or recruitment at the site; and (4) measurements of percent litter and detrital material were taken(Tetra Tech 2009b).

In Year 4, Project Target 1 standards were mostly achieved (standards were not achieved in six of the eight cross sections measured), and hydrology was sufficient to inundate the WSMRP site and flush sloughs at least once a day. Data obtained in support of Project Target 2 were established as a baseline in Year 2 and compared to Years 2 and 3 data. Year 4 data indicated that metals concentrations in some surface water, sediment, and stormwater samples continued to exceed certain federal and state screening criteria for the protection of aquatic life, but the significance of the results had yet to be determined. The Project Target 3 standards were achieved for Year 4. The total acreage of Pacific cordgrass (*Spartina foliosa)* was less than the initial project standard; however, the total acreage of pickleweed (*Salicornia virginica*) was greater than the initial project standard. The total native plant cover exceeded the Year 4 project standards. The Project Target 4 standards were not yet achieved. The California clapper rail was not using the WSMRP site for nesting or foraging during Year 4 surveys; however, individuals were detected near the edge of the site.

1.1.7 Year 5 Marsh Monitoring Summary

Year 5 monitoring was conducted following the project standards outlined in the WSMRP Monitoring Plan (BBL 2004c). In addition, the following recommendations suggested in the Year 4 Monitoring Report were implemented: (1) a review of available historical aerial photographs was conducted to characterize and quantify the rate of pre-existing historical marsh evolution between the 1930s and 2000s; (2) the project standards for width:depth ratios were revised based on observations of width:depth ratios in the undisturbed marsh adjacent to the WSMRP site; (3) surface water and stormwater samples were analyzed for polychlorinated biphenyls (PCB) using U.S. Environmental Protection Agency (EPA) Method 1668 to obtain lower detection limits; and (4) the project standard for pacific cordgrass was revised to 1.12 acres.

In accordance with the USFWS Biological Opinion (USFWS 2003) and the DTSC Order (Section 5.16), UC Berkeley continued implementation of the Invasive/Exotic Vegetation Management Program begun in January 2004 and the FAMP begun in August 2004. In Year 5, native species planting and non-native, invasive weed removal activities in accordance with the Invasive/Exotic Vegetation Management Program (BBL 2004b) were performed by Tetra Tech and Shelterbelt Builders, Inc.

Year 5 monitoring activities ended in 2010 and represent the last year of monitoring in expectation that all monitoring requirements had been met.

1.2 REPORT ORGANIZATION

The remainder of this monitoring report is organized as follows:

- Section 2.0, Project Targets and Standards—this section describes the project targets, standards, and field indicators and measurements.
- Section 3.0, Methods—this section presents the data acquisition and analysis methods used during the Year 5 monitoring event.
- Section 4.0, Results—this section presents the Year 5 monitoring data and assesses the success of each of the project targets by evaluating whether the project standards are being achieved.
- Section 5.0, Additional Monitoring and Management—this section summarizes activities conducted in Year 5 as part of UC Berkeley's FAMP and the Invasive/Exotic Vegetation Management Program.
- Section 6.0, Conclusions and Recommendations—this section summarizes the results of Year 5 monitoring, draws conclusions based on these results, and makes recommendations for improving the likelihood of successfully meeting the project targets.
- Section 7.0, References—this section lists the documents used to prepare this report.

Figures and tables follow Section 7.0. In addition, the following appendices and attachments are included in this monitoring report:

- Appendix A, Analytical Sampling Data
- Appendix B, Vegetation Survey Results for the WSMRP Site
- Attachment 1, Western Stege Marsh Restoration Project Year 5 Hydrologic Monitoring Report, Kamman Hydrology and Engineering, Inc.

- Attachment 2, Western Stege Marsh Restoration Project: Vegetation Monitoring Report – 2009, May & Associates, Inc.

- Attachment 3, Protocol Surveys for California Clapper Rail (*Rallus longirostris obsoletus*) at the Western Stege Marsh Richmond Field Station: The 2010 Nesting Season, Avocet Research Associates

- Attachment 4, Summary of Feral Animal Trapping Activities, Gary Beeman, Avian Pest Control

- Attachment 5, Western Stege Marsh Restoration Project: Annual Restoration Activities Report – 2009, Tetra Tech EM Inc.

2.0 PROJECT TARGETS AND STANDARDS

Restoration monitoring of a marsh site must be designed to detect changes in marsh dynamics in the years following the initial restoration events. At the WSMRP site, four project targets developed in 2004 (BBL 2004c) were used to monitor the restoration efforts:

- Project Target 1: Restore the hydrologic complexity to the WSMRP site.
- Project Target 2: Improve water quality by increasing the time water is retained within the WSMRP site.
- Project Target 3: Restore low salt marsh (Pacific cordgrass), middle salt marsh (pickleweed), and the emergent and coastal scrub native plant communities within the WSMRP site.
- Project Target 4: Establish a compositionally and structurally complex ecosystem within the WSMRP site with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail.

Project standards, which are criteria used to guide restoration or monitoring, are defined for each project target. Each project standard has an associated field indicator or measurement, which was measured once a year (fall) or twice a year (spring and fall), as described in the monitoring plan (BBL 2004c). An adaptive management approach was used to assess restoration of the WSMRP site, which allowed for review of monitoring results and adjustments to monitoring plans in response to previous results. Therefore the field indicators or measurements used to determine whether project standards are being met were evaluated after every year of monitoring and updated as deemed appropriate. Table 1 presents the revised project standards and field indicators or measurements for each project target established in the WSMRP Monitoring Plan (BBL 2004c).

3.0 METHODS

The following sections describe the methods for obtaining and analyzing data to evaluate each project target. Deviations from the monitoring plan are explained below, as applicable.

3.1 METHODS FOR EVALUATING PROJECT TARGET 1

Project Target 1, restore hydrologic complexity to the WSMRP site, was assessed by evaluating the following data sources: tidal inundation, as recorded by the NOAA Richmond tide gauge (NOAA gauge number 9414863) and compared to previous years monitoring data; marsh elevation and bathymetric data obtained during transect surveys completed in February and March 2010; and a reference site assessment that included the review of historical aerial surveys of the RFS to assess marsh development in the undisturbed marsh adjacent to the WSMRP area. The methods for obtaining data for the various project standards identified for Project Target 1 are summarized below and in Attachment 1. Monitoring results for Project Target 1 are presented in Section 4.1.

Transect surveys of Western Stege Marsh and Meeker Slough were performed by Muir Consulting, Inc., of Oakdale, California, on February 21 and March 15, 2010. The baseline transect and quadrat system, installed and first surveyed in October 2004, was used to establish marsh elevations for Project Target 1 (see Figure 1-5 of BBL's Year 1 Monitoring Report, August 2005). Previously surveyed locations and channel crossings were resurveyed during the Year 5 monitoring survey. A total of 269 individual, transect, and channel cross-section points were surveyed in the marsh in 2010.

Channel crossing widths and depths were measured using the transect survey data completed by Muir Consulting, Inc., for cross-section monitoring locations CS-1 through CS-8 (see Figure 2 in Attachment 1). Channel widths were measured as the distance from the lowest channel shoulder to a shoulder on the opposite channel wall at approximately the same elevation. Channel shoulders are defined as the points at notable breaks in slope between the channel bank and adjacent marsh plain surface. Channel depths were measured as the perpendicular distance from the lowest channel shoulder elevation to the deepest part of the channel. The three longitudinal channel profiles included in the Year 4 report (alignments LP-1 through LP-3) were also surveyed in 2010 by Muir Consulting, Inc. (see Figure 2 in Attachment 1).

Reference reach surveys were completed by Kamman Hydrology & Engineering, Inc., (Kamman) on the undisturbed marsh plain and channels adjacent to the WSMRP area for the Year 4 report. The objective of the surveys was to characterize marsh plain and channel conditions from reference sites lying within wetlands outside of the WSMRP site, undisturbed by the 2002-2004 remediation activities. This marsh developed after the construction of the Southern Pacific Railroad spur in 1959. The undisturbed portion of the marsh exhibits well-developed marsh plain and channel geometry. This rapid evolution suggests good potential over time for the WSMRP area to evolve in a desired fashion through increased marsh plain development (accretion) and improved channel geometry (as measured by width to depth ratio). To better substantiate this hypothesis, Kamman compiled and georeferenced historical aerial photographs, coastal survey sheets, and topographic maps to characterize and quantify historical changes in the WSMRP area and the adjacent undisturbed marsh. An objective of the review was to quantify the rate of marsh evolution in adjacent areas to provide a better context for reasonable and expected evolution in the WSMRP area.

3.2 METHODS FOR EVALUATING PROJECT TARGET 2

To evaluate Project Target 2 (water quality within the WSMRP site), surface water, sediment, and stormwater samples were collected in accordance with the Field Implementation Plan for Surface Water, Stormwater, and Sediment Monitoring (Tetra Tech 2006), as adapted from the original Groundwater, Surface Water, and Sediment Monitoring Plan (BBL 2004d). The methods for obtaining data for Project Target 2 are summarized below. Monitoring results for Project Target 2 are presented in Section 4.2.

To evaluate water sample results, data are screened against criteria that were used for the Year 2 report. The screening criteria for surface water and stormwater samples are presented in Table 6. Total concentrations of chemicals in sediment were compared with effects range-median (ER-M) values, screening criteria based primarily on toxicity to estuarine invertebrates, and with the Tier 2 ecological site-specific target levels (E-SSTL) derived for the California clapper rail. The effects of analyte concentrations on the success of the marsh restoration will be evaluated in the future, after more data are obtained, in order to better understand existing conditions and trends.

Four grab surface water samples and three sediment samples were collected from Western Stege Marsh on April 6, 2009, and again on November 18, 2009 (see Figure 4). Grab surface water samples were collected using a clean dipper pointed in an upstream direction. The dipper was submerged slowly into the surface water to minimize sediment disturbance. Surface water samples were analyzed for metals (both lab-filtered and nonfiltered samples), pH, total dissolved solids, nitrate, total nitrogen, and phosphorus. Per the recommendations of the Year 4 report, the surface water samples were analyzed for PCB congeners using EPA Method 1668. This method yields lower detection limits than EPA Method 8082 used previously for Years 2 to 4. The concentrations of nutrients were measured in surface water for an indication of eutrophication, which can lead to impaired waters by reducing the amount of dissolved oxygen in the water column. Screening criteria for nutrients that are protective of aquatic life do not exist; however, guidance for states and tribes to develop criteria for wetlands using a variety of models was recently published by the EPA (EPA 2008). Phosphorus is generally plentiful in many coastal wetlands, with nitrogen being the limiting nutrient (Zedler 2001). After surface water samples were collected, sediment samples were collected to a depth of 6 inches below ground surface using separate sanitary, disposable scoops for each location. Sediment samples were analyzed for metals, PCBs, and pH. Year 5 sediment samples were not analyzed for pesticides because all results from Years 1 through 4 were non detects.

Six grab stormwater samples were collected on March 2, 2009, and five samples were collected on October 13, 2009. The sampling locations were at the lowest point of the drainage area to obtain samples where the stormwater conveyance discharges stormwater to Meeker Slough or Western Stege Marsh (see Figure 4). Grab stormwater samples were collected using a clean dipper pointed in an upstream direction. The dipper was submerged carefully into the stormwater to minimize inclusion of debris. One of the established sampling locations under the Bay Trail footbridge (STW 104) could not be sampled during the March sampling event due to flooding tide conditions. Two locations could not be sampled during the October event due to lack of flow: west of the EPA laboratory, running into Meeker Tidal Slough (STW109); and south of Building 128, running along the eastern edge of the bulb into the marsh (STW110). The stormwater samples were submitted to the laboratory for analyses for metals, PCBs, and pH. Per the recommendations of the Year 4 report, the stormwater samples were analyzed for PCB congeners using EPA Method 1668. This method involves lower detection limits than the previously utilized EPA Method 8082.

Groundwater samples were not collected during Year 5. Groundwater conditions at the RFS will be investigated under the Field Sampling Workplan that will be implemented by UC Berkeley in mid 2010 (Tetra Tech 2010).

3.3 METHODS FOR EVALUATING PROJECT TARGET 3

As part of Project Target 3, development of the restored plant communities was monitored by measuring various parameters of the native and non-native plants, including percent cover, total acreage of target species, and plant vigor. Plant cover is generally referred to as the percentage of ground surface covered by vegetation. Percent cover is independent of species composition; small and large, abundant and rare species contribute to total cover.

Total acreage and plant stock vigor of specified plants are also field indicators and measurements for Project Target 3. Two plants specifically identified in Project Target 3 as project standards for measurement are Pacific cordgrass and pickleweed. Pacific cordgrass requires a daily flushing of surface salts from its aboveground parts (Josselyn and others 1993), which restricts its range to areas around the upper intertidal areas (Daehler and Strong 1995; Callaway and Josselyn 1992). Perennial pickleweed typically is able to tolerate full sun, alkaline soils, salinity, poor drainage, and seasonal flooding (Calflora 2007). Differences in the salinity, elevation, and inundation requirements of the two plant species make them suitable indicators of ecosystem fitness for the low marsh (Pacific cordgrass) and middle marsh (perennial pickleweed) restoration areas of the WSMRP site (BBL 2004c).

Success of plant communities in the restoration area was evaluated using semiannual quadrat surveys, annual vegetation mapping, and annual evaluation (by visual inspection) of plant vigor. Each of these methods is discussed below. Monitoring results for Project Target 3 are presented in Section 4.3.

3.3.1 Quadrat Surveys

A total of 49 quadrats were surveyed during the Year 5 monitoring. In 2004, 44 quadrats were initially established within and adjacent to the WSMRP site to monitor vegetative growth (BBL 2004c). The monitoring quadrats were placed along transects that extend through the marsh into areas outside the boundary of the WSMRP site (see Figure 4), including low marsh, high marsh, and transitional areas. Three additional quadrats were established in 2006, and four additional quadrats were established in 2007 (to monitor plant growth in the ecotone of the WSMRP site [see Figure 4]) that had not been represented in the original set of 44 quadrats. Two of the quadrats, A-6 and F-0, were accidentally overlooked and not monitored for the Year 5 report. The WSMRP site monitoring quadrats are shown against a backdrop of plant communities on Figure 5.

A field team of botanists from May and Associates, Inc., completed the spring monitoring of ecotone quadrats in May 2009, and in late September 2009 conducted quadrat surveys throughout the WSMRP site. The field teams recorded all plant species, total percent cover, and average plant height in each quadrat. Plants were identified using the *Jepson Manual: Higher Plants of California* (Hickman 1993). In addition, the percentage of native plant cover was estimated by visual inspection using midpoint classes of percent cover, as specified in the WSMRP Monitoring Plan and shown in Table 2. The field team also took photographs at the stations established in Year 1 (shown on Figure 4), using the directional bearings for each photo-monitoring location established during Year 3. Appendices E and F of

Attachment 2 present the Year 5 site photographs. The results of the quadrat surveys are presented in Section 4.3.1.

3.3.2 Vegetation Mapping

The WSMRP Monitoring Plan specifies that percent vegetative cover and percent cover by dominant vegetation groups be calculated and shown on a computer-aided design (CAD) drawing. Following the methodology established in 2007, the aerial extents of pickleweed and other dominant vegetation groups were recorded using a hand-held global positioning system (GPS) unit. The outer edges of all pickleweed and salt grass stands, and upland restoration plot boundaries were recorded using GPS and were mapped using CAD techniques. The results of the vegetation mapping for percent vegetative cover and percent cover by dominant species are presented in Section 4.3.2 and shown on Figure 5.

3.3.3 Vigor of Planted Stock

Vigor of the planted stock in the WSMRP site was defined in the WSMRP Monitoring Plan as the intensity of stress caused by pests or pathogens, as assessed by visual inspection (BBL 2004c). Previous years of monitoring had achieved limited success in evaluating the establishment and vigor of the plantings. As a result, the monitoring area for Year 3 was divided into polygons, representing discrete plant clusters that were visible in the field. This monitoring strategy continued for the Year 4 and 5 data acquisition (see Attachment 2). Pacific cordgrass was mapped using the same cover class types that were used for characterizing the plant cover within the vegetation quadrats. Vigor of plants in all monitoring polygons was visually assessed using the qualitative guidelines described in the WSMRP Monitoring Plan and summarized in Table 3. Also, the field team measured the average height of the most dominant species in each of the quadrats as an independent measure of plant health. Results of the vigor assessment are presented in Section 4.3.3. In addition, each distinct polygon was photographed (see Appendices E and F of Attachment 2), and each polygon and discrete individual were recorded and mapped using GPS.

3.4 METHODS FOR EVALUATING PROJECT TARGET 4

Project Target 4 evaluates the creation of a compositionally and structurally complex ecosystem in the WSMRP site with attributes important to wildlife. This project target specifically focuses on increasing the quantity and quality of habitat functions for the California clapper rail.

The California clapper rail is a year-round resident of emergent salt and brackish tidal marshlands in the San Francisco Bay. It requires direct tidal circulation and areas of sparse or no vegetation for foraging on estuarine invertebrates in small tidal sloughs. For nesting, the California clapper rail prefers dominant stands of pickleweed with extensive stands of Pacific cordgrass, as reported in the Goals Project (Albertson and Evens 2000). Early studies indicated that cordgrass was essential for successful nesting; however, more recent work has shown that other tall monocots, including bulrush (*Scirpus robustus*), can be used as nest canopy when cordgrass declines. Other elements of an essential habitat include dense vegetation above the high tide line to provide shelter from overhead predators such as raptors and from ground predators such as the red fox (Albertson and Evens 2000).

Because of its secretive nature, the California clapper rail is surveyed aurally (by listening for the birds' calls) during the breeding season using methods prescribed by USFWS (2000), which favor the use of listening stations to detect passive (spontaneous) vocalizations. Four listening stations were established during the Year 1 monitoring event, and an additional station was added during the Year 3 monitoring event (BBL 2005). For the Year 4 and Year 5 surveys, two of the listening stations were adjusted to provide more direct coverage of the restored marsh (see Figure 6).

Four surveys of California clapper rails were conducted as planned during the 2010 breeding season. The surveys were performed on January 27, February 10, March 13, and April 1, in accordance with USFWS (2000) guidance. Attachment 3 provides a detailed description of the methods used to survey California clapper rails during Year 5. Section 4.4 summarizes the survey results.

The WSMRP Monitoring Plan specifies that Project Target 4 be evaluated by monitoring both the number of California clapper rails using the site and the percent litter or detrital matter (BBL 2004c). Detrital material was not measured in Year 2 or Year 3 because the aboveground plant biomass (which would eventually become litter or detrital matter) was inadequate to justify the field effort at that time. Monitoring results of detrital material for Project Target 4 for Year 4 and Year 5 are presented in Section 4.4.

4.0 RESULTS

The following sections describe the monitoring results for each project target, including analysis of data and graphical representations of results.

4.1 PROJECT TARGET 1 MONITORING RESULTS

Data obtained in support of Project Target 1 (restore hydrologic complexity to the WSMRP site) includes tidal and marsh elevations, and measurements of channel width, depth, and width-to-depth ratios. Each of these data sets was evaluated against the project standards presented in Table 1, and each is discussed below. The information obtained and assessed for the various project standards identified for Project Target 1 is summarized below and presented in Attachment 1.

4.1.1 Tidal Inundation

Water level data were measured at the NOAA Richmond tide gauge (NOAA gauge number 9414863) to evaluate tidal exchange between the marsh and the bay (see Attachment 1, Figure 3). Tidal monitoring during Year 4 comparing data from the Richmond tide gauge and two tidal gauges installed in the WSMRP area by Kamman revealed good exchange between Meeker Slough and the marsh, with upper tidal elevations virtually unimpeded and lower end controlled by channel depth. The acquired data suggest that ebb and flood water levels in the WSMRP area are synchronous with the tidal cycles of the bay. Therefore, the tidal inundation analysis for Year 5 focused on identifying tidal changes between year 5 and previous years.

Kamman reviewed the monthly mean tide level (MTL) and mean higher high water (MHHW) levels for the Year 1 through Year 5 data (set as June 1 through May 31 to capture an entire winter season). The most notable changes identified from this analysis were periods of higher average monthly water levels during the winter season of Year 5 (December 2009 and January/February 2010). For example, the average January 2010 MHHW level in the Bay was approximately 0.5 to 1.0 foot higher than during the previous four annual monitoring periods, while the MTL was 0.25 to 0.75 feet higher. The increased elevations in Year 5 were likely due to significant changes in regional weather patterns and possible lunar cycles as compared to previous years. The San Francisco Bay area experienced persistent low pressure cells, which allowed ocean water to expand and led to higher tide levels that would have occurred under normal atmospheric pressure conditions (Kamman, pers. obs.). These higher water level elevations mean that greater volumes of water were being exchanged between the Bay and the WSMRP area on any given tidal cycle during the winter of Year 5 relative to previous monitoring periods. This exchange of greater volumes of water would induce greater shear-stresses within tidal channels and increase erosion potential, which would allow channels to evolve to a desired and sustainable geometry over time.

4.1.2 Marsh Elevation

Marsh quadrat and channel cross-sectional surveys were conducted in February and March of 2010 by Muir Consulting, Inc. Quadrat elevation data obtained in 2010 are presented in Table 4. Quadrat elevation data have been obtained since 2004. Data from 2004 through 2010 are displayed in Table 3 of Attachment 1. The data reveal slight variations in quadrat elevations over the years, ranging from +0.29 to -0.18 feet. The mean difference between Year 4 and Year 5 elevations was 0.00 feet; however, individual quadrat locations varied in the direction of the elevation change, with some indicating deposition and others erosion. The lack of consistent changes or trends in one direction over the years suggests no significant change in marsh plain deposition or erosion. The alternating pattern observed for the same monitoring location likely arose from a measurement offset relative to the same vertical datum due to the unavoidable measurement errors within a soft marsh substrate, and cannot be attributed to changes in ground surface elevation due to marsh plain deposition or erosion.

4.1.3 Channel Geometry

All eight channel sections and bathymetric transects were surveyed by Muir Consulting, Inc., as part of the Year 5 monitoring activities. Plots comparing the channel cross sections from Year 1 through Year 5 are presented in Attachment 1, Figures 4-11.

Both visual and tabular data indicate notable changes in channel geometry during the Year 5 monitoring surveys relative to previous years. Except for no change in channel width at CS-1, all cross-sections display increased channel width and increased channel depth (see Table 4 and Figures 4-11). The channel widening and deepening noted during Year 5, indicative of favorable channel evolution, is likely attributable to increased volumes of winter tidal exchange between the Bay and marsh, and associated increased channel scour potential. The increases in channel widths at CS-6, CS-7, and CS-8 now fall within the desired Project Standard range, which did not occur during the Year 4 monitoring period. Although these results clearly indicate channel evolution through erosion, no clear trend is evident in width to depth ratios, with half the cross-section ratios (CS-2, -3, -4 and -6) increasing and half the cross-section ratios (CS-1, -5, -7, -8) decreasing.

An important conclusion from the Year 4 reference reach survey was that mature marsh channels have a width to depth ratio on the order of 3 to 4—significantly less than the suggested project standard ratio of 9.6 to 16. Because the desired evolutionary trajectory of the WSMRP should include mature marsh channels, the stated project width to depth ratio standard is not suitable, as it does not represent mature marsh channel geometry. Therefore, in their review letter of the Year 4 Monitoring Report, dated December 15, 2009, DTSC agreed with the recommendation to deemphasize the stated individual channel hydraulic geometry project standards and evaluate project evolution based on comparison to present and historical reference reach channel development. Because width to depth ratios of 3 to 4 are a desired evolutionary target, any reductions in the width to depth ratios in the future would reflect healthy marsh evolution.

4.1.4 Longitudinal Profiles

Longitudinal profiles for the Year 5 monitoring survey are plotted for LP-1, LP-2, and LP-3, along with Year 1, 3, and 4 surveys, on Figures 12 through 14 in Attachment 1. As with Year 4 surveys, little if any change is evident in the LP-1 profile, which has shown the only significant channel filling observed. Based on a review of historical aerial photographs, it appears that a significant stormwater drainage ditch that formerly fed into the area of LP-1 from the northwest has been redirected, and is no longer providing flow through LP-1, which has reduced erosion and supported filling.

Consistent with the cross-sectional survey results, longitudinal profiles along LP-2 and LP-3 indicate significant channel deepening relative to the Year 3 and 4 surveys. To better evaluate the extent of channel deepening, the survey along LP-2 was extended westward, through the undisturbed marsh to

Meeker Slough (see alignment indicated on Figure 1). Figure 15 compares the Year 4 and Year 5 channel profiles along this 840-foot alignment, which indicates an average of about 0.25 foot of incision in the channel along its entire length, both within and beyond the WSMRP area. The bed elevation within Meeker Slough did not change, as indicated by the merging profiles at Station 0.0. The channel widening and deepening during Year 5, indicative of favorable channel evolution, is likely attributable to increased volumes of winter tidal exchange between Bay and marsh, and associated increased channel scour potential.

4.1.5 Assessment of Historical Wetland Evolution

The historical maps and aerial images compiled and reviewed as part of the Year 5 monitoring program are presented in Appendix A of Attachment 1. The earliest sources of information describing the characteristics of the shoreline, marsh, and adjacent uplands are the U.S. Coast Survey topographic map sheets (T-Sheets). The early T-Sheets and maps based on those surveys show extensive marsh areas along the embayment north of Potrero Point; however, no marsh areas are shown in the vicinity of the present location of Western Stege Marsh. The area presently containing WSMRP appears to have been an open water environment, and subsequent construction of breakwaters and placement of fill materials in the bay altered the environmental conditions of the study area. This is consistent with a 1910 description of the local topography by UC Berkeley anthropologist N. C. Nelson who wrote, "At Stege, there has been, as far back as anyone remembers, a gap in the marsh belt made by a small tongue of the upland which fronts the bay waters with a six to eight foot bluff." Updated coastal surveys and topographic maps show significant changes to the shoreline configuration during the early- to-mid 1900s (see Figure 16 of Attachment 1).

The review of historical data sources suggests that initial development of Western Stege Marsh resulted from placement of fill materials that increased the ground surface elevation to trigger a change from a tidal mud flat environment to tidal marsh. Marsh development began in the 1940s and is depicted on a sequence of aerial photographs and on the collection of maps and aerial imagery presented in Attachment 1. The sequence of environmental changes affecting the landscape of Western Stege Marsh is summarized in the chronology below.

1853	The first U.S. Coast Survey T-Sheet (T-399) and concurrent hydrographic survey (H-464) depicting the study area are produced. The shoreline along the present location of UC Berkeley's RFS is mapped as a sharp transition from upland to tidal mud flat environments.
1895	Updated T-Sheet (T-2245) depicts development along the shoreline including the California Cap Company site at the present location of the RFS. Development includes construction of a wharf (presumably by the California Cap Company, the land owner at the time), which extends into the bay.
1931	Updated T-Sheet (T-2941) depicts second California Cap Company wharf next to the remains of the first. The remains of the second wharf built between 1895 and 1909 are seen in the marsh today.
1943	Updated T-Sheet (T-5927) depicts first mapping evidence of marsh development in the vicinity of the present location of Western Stege Marsh. T-5927 also shows a change in the breakwater resulting in the L-shaped extension which presently delineates the southern extent of Western Stege Marsh.

1945	The earliest aerial image compiled shows fill placed in the area to the west of the California Cap Company wharf. Early images show that the area is elevated above the adjacent tidal flat but do not show much, if any, development of tidal channels through the fill area. Imagery is not sufficiently detailed to evaluate whether the fill area is vegetated. The early imagery also shows a seawall at the south end of the California Cap Company and a parallel linear structure, which appears to be rock, about 200 feet south of the seawall, with areas of fill placed bayward of the seawall.
1953	Aerial imagery indicates additional fill placed in the area of Western Stege Marsh. Still little development of tidal channels is evident in fill area to become Western Stege Marsh.
1953 - 1969	Aerial imagery shows gradual extension of fill materials creating "the Bulb" that projects into Western Stege Marsh from the north.
1957	Aerial imagery shows beginnings of tidal channel development in Western Stege Marsh. New flood wall is constructed along former shoreline.
1959	Fill placed for construction of rail spur (presently used as the Bay Trail) across Western Stege Marsh. Low berm of fill is created north of, and parallel to, the rail line within Western Stege Marsh.
1969	Aerial imagery shows additional fill placement on tidal flat between railroad spur and the breakwater. Further development of tidal channels in the northern area of Western Stege Marsh is evident.
1973	Aerial imagery shows further extension of tidal channels in northern area of Western Stege Marsh (north of railway).
1973 - 1996	Marsh plain accretion (as suggested from increased vegetation density) and further extension of tidal channels yields relatively developed marsh habitat in Western Stege Marsh.

The period between 1957 and 1996 is characterized by clear marsh development and evolution through marsh plain accretion and extension of tidal channels within the adjacent undisturbed marshlands around the WSMRP area. Figure 18 of Attachment 1 presents an overlay of channel networks digitized from historical imagery from 1957, 1973, and 1996. This plot clearly indicates channel evolution, which appears to be continuing and extending into the undisturbed wetlands adjacent to the WSMRP area, as suggested by the changes observed in the Year 5 channel geometry. Kamman hypothesizes that tidal channels did not extend into the WSMRP area prior to remediation because of elevated grades resulting from fill material placement.

Review of historical maps and aerial photography indicate natural tidal marsh development and evolution in Western Stege Marsh, most notably since 1957. Prior to this period, the Marsh underwent a long history of Bay filling and altered hydrodynamic processes through breakwater construction and filling. Assumedly, conditions and hydrologic processes exist to support further marsh plain development and channel evolution in the newly constructed WSMRP.

4.2 PROJECT TARGET 2 MONITORING RESULTS

Surface water, sediment, and stormwater samples were collected to evaluate Project Target 2, improvement of water quality within the WSMRP site. Samples were collected during sampling events on April 6, 2009, and November 18, 2009; and during storm events on March 2, 2009, and October 13, 2009. Complete analytical results are presented in Appendix A and summarized in Table 7 for surface water, Table 8 for stormwater, and Table 9 for sediment. The following paragraphs on surface water and stormwater discuss the sampling results screened against criteria used for the Year 2 report (see Table 6). The paragraphs on sediment discuss the sampling results screened against the NOAA ER-M and the Tier 2 E-SSTL. All sampling results during Year 5 were within comparable ranges of data obtained during Years 2 through 4. No clear trend has emerged; the slight variations in data values can be attributed to the natural heterogeneity of contaminant concentrations.

4.2.1 Surface Water

Eight surface water samples (four locations per event) were collected for Year 5 monitoring during the two sampling events conducted on April 6, 2009, and November 18, 2009. Three of the sampling locations (SW101, SW102, and SW103) were in slough channels within the restored marsh, and the fourth sample (SW104) was collected from Meeker Slough at the Bay Trail bridge (see Figure 4). All samples were analyzed for metals by EPA Methods 6010B and 7470A (mercury), PCB congeners by EPA Method 1668, pH by EPA Method 9040/9045C, total dissolved solids by EPA Method 160.1, nitrate by EPA 353.2, total nitrogen by EPA 351.4, and phosphorus by EPA Method 365.1. Metals analyses were completed on both unfiltered and filtered surface water samples (filtered in the lab) at the request of DTSC.

Beginning with the January 2008 Year 3 sampling event, laboratory analyses for metals were performed for filtered and unfiltered surface water samples. Analytical results of filtered samples representing the dissolved fraction of metals were compared against applicable surface water screening criteria. These data and comparisons are presented in Table 7 as dissolved metals (filtrate). The concentrations of metals reported for unfiltered samples representing the total metals concentrations (dissolved and nondissolved phases) are also presented in Table 7 as total metals. Consistent with previous years of monitoring, the concentrations of total metals in a majority of unfiltered samples were generally greater than the concentrations in filtered samples. This may indicate that filterable particulates are an additional source of metals in the marsh (in addition to dissolved and colloidal metals and the fine particulates found in the filtrate). Because most EPA National Recommended Water Quality Criteria apply to the dissolved fraction (i.e., filtered samples), the unfiltered sample results are presented without a comparison to screening criteria.

Cadmium, copper, and nickel were detected in the filtered surface water samples (i.e., the dissolved phase) at concentrations exceeding their respective screening criteria. Cadmium was detected in two samples during the November sampling event at 18 and 32 micrograms per liter (µg/L) at locations SW103 and SW104, respectively, and exceeded the screening criteria of 8.8 µg/L. Cadmium was not detected in the corresponding unfiltered samples (detection limit 5.0 µg/L). Cadmium had not been previously detected in any samples collected from the Years 2 through 4 sampling events. Copper was detected at concentrations exceeding the screening criterion of 3.1 µg/L in five of the filtered samples with concentrations ranging from 3.1 to 8.5 µg/L; all four locations from the November sampling event and one location (SW102) from the April 6 sampling event. Sampling results for copper were comparable to previous rounds of sampling: concentrations ranged from 6.1 to 7.4 µg/L in Year 2, from 0.7 to 70 µg/L in Year 3, and 2.5 to 4.9 µg/L in Year 4. The reported nickel concentrations in filtered samples exceeded screening criteria at locations SW103 and SW104 during November sampling event. These two results, 8.5 and 11 µg/L respectively, were the first two results to exceed the criterion of 8.2 µg/L in the four years of monitoring.

Eight surface water samples were analyzed for pH. All eight samples were within the pH range of the National Recommended Water Quality Criteria for non-priority pollutants for highly productive coastal and estuarine areas (6.5 to 9.0). These values were consistent with the Year 2 through Year 4 results.

Concentrations of nitrite in all eight surface water samples collected in Year 5 were non-detect (<2,500 µg/L)─consistent with previous years of monitoring. Three of the four samples collected in April had low detections for nitrate ranging between 520 and 900 µg/L; the November samples were all non detect (<1,000 µg/L). In Year 4, all samples were non-detect (<2,500 µg/L), and during Year 3, concentrations of nitrate were between 990 and 2,300 µg/L. Concentrations of phosphorus in the eight surface water samples collected in Year 5 ranged from 91 to 160 µg/L. As a comparison, the concentrations of phosphorus in the eight surface water samples collected in Year 4 ranged from 100 to 190 µg/L, and were much lower than the results from Year 3, which ranged from 100 to 5,200 µg/L. Total Kjeldahl nitrogen was not detected in any of the samples collected in Years 2 through 5.

The concentrations of nutrients (nitrite, nitrate, total dissolved solids, total Kjeldahl nitrogen, and phosphorus) were measured in surface water for an indication of eutrophication, which can lead to impaired waters by reducing the amount of dissolved oxygen in the water column. No screening criteria protective of aquatic life have been established for nutrients. The data obtained reveal similar concentrations during the four years of monitoring. Using these data in conjunction with the results of the vegetation monitoring that suggest healthy vegetation growth, the nutrient concentrations in the marsh are not hindering marsh development. In the future, if vegetation begins to exhibit distress, these nutrients could be sampled and compared with the data that have been obtained between Years 2 and 5 to evaluate trends.

PCBs were not detected in samples analyzed in Years 2 through 4 using EPA Method 8082, which has detection limits greater than current ambient water concentrations in the San Francisco Bay. While a review of these results indicated that highly elevated concentrations of PCBs are not present in the water, the use of EPA Method 1668, with lower detection limits, was used to analyze samples collected during Year 5 so that a comparison to screening criteria could ensue. In Year 5, PCB congeners were detected in all eight samples collected, ranging from 0.0123 to 0.0537 µg/L. Three samples collected during the November sampling event exceeded the screening criterion of total PCBS at 0.03 µg/L.

4.2.2 Stormwater

A total of 11 stormwater samples were collected for Year 5 monitoring─six samples during a sampling event conducted on March 2, 2009, and five samples on October 13, 2009. The samples were collected from locations that drain stormwater from Upland Areas directly into Meeker Slough or Western Stege Marsh (see Figure 4). One of the established sampling locations under the Bay Trail footbridge (STW 104) could not be sampled during the March sampling event due to flooding tide conditions. Two locations could not be sampled during the October event due to lack of flow: west of the EPA Region 9 Laboratory, running into Meeker Tidal Slough (STW109), and south of Building 128, running along the eastern edge of the bulb into the marsh (STW110). All samples were submitted for analysis for metals by EPA Methods 6010B and 7470A (mercury), PCB congeners by EPA Method 1668, and pH by EPA Method 9040/9045C. Metals analyses were completed on both unfiltered and filtered samples (filtered in the lab) at the request of DTSC.

Beginning with the January 2008 Year 3 sampling event, laboratory analyses for metals were performed for filtered and unfiltered surface water samples. Analytical results of filtered samples representing the dissolved fraction of metals were compared against applicable surface water screening criteria. The data and comparisons are presented in Table 8 as dissolved metals (filtrate). The concentrations of metals reported for unfiltered samples representing the total metals concentrations (dissolved and nondissolved phases) are presented in Table 8 as total metals. Because most National Recommended Water Quality

Criteria apply to the dissolved fraction, the unfiltered samples are presented without screening criteria. Four metals─copper, mercury, nickel, and zinc─were detected in filtered samples at concentrations exceeding current screening levels:

- Copper was detected in all 11 filtered samples, 10 at concentrations ranging from 7.2 to 29 µg/L, exceeding the screening criterion of 3.1 µg/L. These results are comparable to previous results: copper concentrations ranged from 3.9 to 9.8 µg/L in Year 4, 4.3 to 38 µg/L in Year 3, and 9.9 to 58 µg/L in Year 2.

- Mercury was detected in six of the 11 filtered samples, with one sample (STW104 in October), at a concentration of 1.3 µg/L, exceeding the criterion of 0.94 µg/L. Results are similar to previous monitoring years. Except for one sample collected during Year 3, all previously collected samples have been below the screening criterion.

- Nickel was detected in 10 of the 11 filtered samples, with one sample (STW109 in March), at a concentration of 9.2 µg/L, exceeding the criterion of 8.2 µg/L. The concentrations from the Year 5 monitoring are similar to those from previous years monitoring: no results exceeded the criterion in either Year 2 or 4; in Year 3, three samples exceeded the criterion.

- Zinc was detected in all of the filtered samples at concentrations ranging from 26 to 200 µg/L. Five of these samples exceeded the screening level of 81 µg/L. These results are comparable to previous results: concentrations ranged from 22 to 250 µg/L in Year 4, 16 to 1,800 µg/L in Year 3, and 60 to 470 µg/L in Year 2.

PCBs were not detected in samples analyzed in Years 2 through 4 using EPA Method 8082, which has detection limits greater than current ambient water concentrations in the San Francisco Bay. While these results show that highly elevated concentrations of PCBs are not present in the stormwater, EPA Method 1668, with lower detection limits, was used to analyze samples collected in Year 5. EPA Method 1668 is significantly more expensive than the EPA Method 8082 analysis; therefore, select locations were combined and analyzed as composite samples.

For the March event, samples RFS-STW-021 and -025 from locations STW 107 and STW 108, along the concrete-lined Meeker ditch and Meeker tidal slough, were to be combined into one sample by the laboratory for analysis; and the samples representing the RFS uplands (locations STW 105, 106, 109, and 110) were to be combined by the laboratory for the other sample. In a deviation from the sampling plan, the stormwater samples sent to Test America for PCB analysis were combined incorrectly due to a field error on the chain-of-custody form. STW-022 and STW-025 were combined for one sample, and STW-020, 021, 023, and 024 were combined to form the other sample. For the October storm event, samples RFS-STW-027 and -028 (locations STW 107 and STW 108)─collected from stormwater flowing along the concrete-lined Meeker ditch and Meeker tidal slough─were combined by the laboratory for analysis; the samples representing the RFS uplands (locations STW 105 and 106) were combined by the laboratory for analysis as a second sample; and a third sample (from location STW104) was also analyzed.

PCB congeners were detected in all five stormwater samples. The total PCB concentrations ranged from 0.00015 to 1.13 µg/L, exceeding the screening criterion of 0.03 µg/L at four locations. Total PCBs concentration in the sample from location STW104 (under the Bay Trail footbridge) was an order of magnitude higher than that in the other samples collected. This location receives the stormwater from on-site RFS areas, adjacent properties to the west of the site that drain into Meeker Slough, and the concrete drainage ditch which runs parallel to the western border of the RFS.

All 11 stormwater samples collected during the Year 5 sampling event were measured for pH. Two samples during the October storm event, from RFS uplands locations STW105 and STW106, had pHs below the pH range of the National Recommended Water Quality Criteria for non-priority pollutants for highly productive coastal and estuarine areas (6.5 to 9.0). All other samples fell within the criteria range, as had all other samples from previous years of monitoring.

4.2.3 Sediment

Six sediment samples (three per sampling event) were collected for Year 5 monitoring from within the WSMRP site (see Figure 4) during the two sampling events on April 6, 2009, and November 18, 2009. All samples were submitted to the analytical laboratory for analysis for metals by EPA Method 6010B and 7470A (mercury), and PCBs by EPA Method 8082. Year 5 samples were not analyzed for pesticides because data in previous years had been either non-detect or estimated close to the method detection limit. No pesticide samples from previous years of monitoring exceeded screening criteria. Concentrations of chemicals in sediment were compared with two screening values, the NOAA ER-M values and the Tier 2 E-SSTLs. Two metals, mercury and nickel, were detected at concentrations exceeding their respective screening criteria in one or more samples (see Table 9), as described below:

- Mercury was detected in all six samples, with concentrations ranging from 1.6 to 3.6 milligrams per kilogram (mg/kg). All of these samples exceeded the ER-M value of 0.71 mg/kg, but were less than the E-SSTL value of 3.8 mg/kg. The average concentration of 2.65 mg/kg is similar to the average concentrations from previous rounds of monitoring: 2.9 mg/kg in Year 4, 2.7 mg/kg in Year 3, and 1.5 mg/kg in Year 1.

- Nickel was detected in all six samples, with concentrations ranging from 79 to 110 mg/kg. All six samples had concentrations exceeding the ER-M of 51.6 mg/kg; however, concentrations were less than the San Francisco Bay ambient sediment concentration (112 mg/kg). The average concentration of 90.1 mg/kg is similar to the average concentrations from previous years of monitoring: 75 mg/kg in Year 4, 74 mg/kg in Year 3, and 91 mg/kg in Year 2.

PCBs as Aroclor-1248, -1254, and -1260 were detected in all samples collected during the April sampling event, but were not detected during the November sampling event. Total PCB concentrations for the April sampling event ranged from 0.202 to 0.54, which is comparable to the ranges of 0.096 to 0.432 mg/kg PCB concentrations from Year 4 and 0.109 to 0.545 mg/kg from Year 3. Two sample locations, SED101 and SED103, had Aroclor-1248 concentrations exceeding the ER-M of 0.18 mg/kg—at 0.35 and 0.27 mg/kg, respectively.

4.3 PROJECT TARGET 3 MONITORING RESULTS

The evaluation of Project Target 3 (restore low salt marsh [Pacific cordgrass], middle salt marsh [pickleweed], and the emergent and coastal scrub native plant communities within the WSMRP site) requires data on species and percent cover. The results of the May & Associates, Inc. Year 5 quadrat surveys, site-wide vegetative mapping, and inspection of the vigor of planted stock are summarized below and presented in detail in Attachment 2.

4.3.1 Quadrat Survey Results

Vegetation surveys were conducted in the 14 ecotone quadrats on May 15 and 16, 2009, and in 49 of the 51 monitoring quadrats on September 18 and 26, 2009. Quadrat survey data are provided in Appendix B. The photographic survey is provided in Appendices E and F of Attachment 2.

Native vegetation covered approximately 82 percent of the ground (excluding data from five quadrats located within the tidal mudflats) within the monitoring area. Native vegetation cover totaled approximately 4 acres. Thus, percent cover by native vegetation greatly exceeded the project standard of at least 80 percent native plant cover. Pickleweed was the dominant species in the WSMRP area (see Figure 5); 18 other native plant species were recorded within the quadrats. Species observed in 2009 included California aster (*Aster chilensis*), California sagebrush (*Artemisia californica*), marsh heliotrope (*Heliotropium curassavicum*), marsh gumplant, Pacific cordgrass, salty Susan (*Jaumea carnosa*), and alkali heath (*Frankenia salina).*

	Target	***Achieved***	**Target**	***Achieved***	**Target**	***Achieved***	**Target**	***Achieved***	**Target**	***Achieved***
	Year 1 (2004)	***Year 1 (2004)***	**Year 2 (2006)**	***Year 2 (2006)***	**Year 3 (2007)**	***Year 3 (2007)***	**Year 4 (2008)**	***Year 4 (2008)***	**Year 5 (2009)**	***Year 5 (2009)***
Native species	0.0 acres	*0.0 acres*	20%	*44%*	40%	*59%*	60%	*76%*	80%	*82%*

4.3.2 Vegetation Mapping Results

Vegetation mapping performed in September 2009 documented 1.12 acres of Pacific cordgrass, which is equal to the proposed target acreage of 1.12 acres, and 1.71 acres of pickleweed in the WSMRP site, which is greater than the 1.5 acre targeted for Year 5 in the WSMRP Monitoring Plan. Pickleweed is a quickly colonizing plant. Although the acreage of pickleweed has decreased since Year 2, it still exceeds the target acreage. The acreage no longer colonized by pickleweed has been colonized by the diverse native cover discussed above, including cordgrass.

Consistent with previous years, the target acreage for Project Target 3 was assessed using the combined acreages. The acreage of pickleweed and Pacific cordgrass exceeded the target, as shown in the following list.

Species	Target	*Achieved*	Target	*Achieved*	Target	*Achieved*	Target	*Achieved*	Target	*Achieved*
	Year 1 (2004)	***Year 1 (2004)***	**Year 2 (2006)**	***Year 2 (2006)***	**Year 3 (2007)**	***Year 3 (2007)***	**Year 4 (2008)**	***Year 4 (2008)***	**Year 5 (2009)**	***Year 5 (2009)***
Pacific cordgrass (*Spartina foliosa*)	0.2 acres	*0.0 acres*	0.4 acres	*0.01 acres*	0.65 acres	*0.38 acres*	0.85 acres	*0.65 acres*	1.12 acres	*1.12 acres*
Perennial pickleweed (*Salicornia virginica*)	0.3 acres	*0.2 acres*	0.5 acres	*2.1 acres*	0.9 acres	*1.92 acres*	1.1 acres	*1.84 acres*	1.5 acres	*1.71 acres*
Total native cordgrass/pickleweed	0.5 acres	*0.2 acres*	0.9 acres	*2.11 acres*	1.55 acres	*2.3 acres*	1.95 acres	*2.49 acres*	2.62 acres	*2.83 acres*

4.3.3 Plant Vigor

Plant vigor was evaluated in 48 of the 51 monitoring quadrats using qualitative measures of the visual effect of pests or pathogens, as set forth in the WSMRP Monitoring Plan and presented in Table 3. Table 10 summarizes the evaluation of plant vigor for the WSMRP site; only the dominant planted species was assessed for vigor in each quadrat. Thirty-four of quadrats monitored contained plantings during the Year 5 planting season. The other 17 quadrats were either located in tidal mudflat area or supported vegetation that has established from natural recruitment. In Year 5, no quadrats exhibited "poor" vigor; one quadrat exhibited "fair" vigor; three quadrats exhibited "good" vigor; and 41 quadrats exhibited "excellent" vigor. Forty-four of the 48 quadrats assessed, or 92 percent, were assessed as exhibiting either "good" or "excellent" vigor, exceeding the project target of 80 percent for Year 5. The vigor of the transplanted Pacific cordgrass colonies and the vegetative growth from the existing stand was found to be excellent, with no disease or pathogens observed.

4.4 PROJECT TARGET 4 MONITORING RESULTS

This section provides the results of monitoring to measure and evaluate progress toward Project Target 4, establishing a compositionally and structurally complex ecosystem with important attributes for wildlife, especially the California clapper rail. In general, a complex ecosystem is being established and is being used by numerous wildlife species, including birds, insects, reptiles, and mammals. Project Target 4 standards for the California clapper rail have not yet been fully achieved because the clapper rail has not yet been detected in the WSMRP site, as described below.

Avocet Research Associates performed four protocol level surveys during the 2010 breeding season to estimate the number of California clapper rails present at the Western Stege Marsh. Only one aural detection of two to three clapper rails calling to each other during 5.6 hours of observation was recorded during the Year 5 protocol surveys conducted in 2010 (0.36-0.54 detections/hour). The results are comparable to previous year's surveys: in 2009 a single detection occurred within 5.6 hours of monitoring (0.15 detections/hour); in 2008, five detections were recorded in 7.5 hours of observation (0.6 detections/hour); in 2007, 23 detections were recorded in 4.5 hours (5.1 detections/hour); and in 2006, 14 detections were recorded in 4.5 hours of monitoring (3.1 detections/hour). Based on the standard methods of estimating number of individuals using the number of detections during the survey, an estimated single pair of California clapper rails was present in the inboard tidal marsh. This is consistent with findings in 2009 and 2008 (in 2007, an estimated two pairs of rails were present in the marsh; in 2006, an estimated three pairs were present in the marsh).

The cause for the apparent or possible decline of clapper rails in the marsh after 2007 is not known. Possible factors include unknown aspects of the restoration effort and continued presence of feral cats and other mesopredators in the marshland, which were being subsidized by feeding stations located off site at adjacent properties and access trails. Despite the apparent decline in clapper rails in the WSMRP based on the observations during the protocol surveys, California clapper rails were either seen or heard by members of the community. On August 25, 2009, Karl Hans of UC Berkeley photographed an adult California clapper rail and a juvenile rail. In September 2009, eight reports of clapper rails were communicated by local birders, and Karl Hans (UC Berkeley Office of Environment, Health & Safety) observed and photographed California clapper rail chicks on the inboard side of the marsh on RFS property (with an apparent nesting site within 300 feet of the WSMRP site) along with juveniles and adults foraging in both the inboard and outboard portions of the undisturbed marsh. The pair of rails detected during the 2010 survey was heard near the edge of the WSMRP site near Meeker Slough. During the 2006 through 2009 surveys, discussed in the Years 2 through 4 reports, clapper rails were also detected in the inboard marsh; however, none was detected in the WSMRP site (see Figure 6). Although the census methodology prescribed by the USFWS (2000) provides no means to determine reproductive success, the presence of chicks and juveniles suggests successful nesting is occurring in or near the Western Stege Marsh adjacent to the WSMRP site.

While not included as a measure in the WSMRP Monitoring Plan, plant height is an accepted measure of habitat suitability for the California clapper rail. The average height of the dominant plant in each quadrat was measured during the evaluation of vigor described in Section 4.3.3 (see also Table 10). The California clapper rail is known to prefer vegetation that is tall enough to form a canopy over its nest during the breeding season and to provide shelter from predators throughout the year, but especially during high winter tides when the rail is vulnerable to overhead attacks by raptors (Anderson and Evens 2000). These exploratory data on variability in plant height may prove valuable as the WSMRP habitat develops and use patterns by the California clapper rail become better understood. As the WSMRP area matures and the vegetation becomes thicker as to provide safe cover for the rails as they forage, the rails may extend their territory into the restored marsh.

The WSMRP Monitoring Plan specifies that Project Target 4 should also be evaluated by the percent litter or detrital matter (BBL 2004c). May & Associates, Inc. measured the percents detrital material in 2008 and 2009 for Project Target 4 in the quadrats. In Year 5, nine quadrats had detrital material of varying cover classes. The average cover for the nine quadrats was 38.6 percent. Four quadrats had algal mats present; the average for the four quadrats was 8.3 percent. In Year 4, four quadrats had detrital material at varying cover classes. The average cover for the four quadrats was 32 percent. Two quadrats had algal mats present, both with an average cover class of 3 percent. The increase in detrital matter supports coverage and feeding habitat for the California clapper rail.

5.0 ADDITIONAL MONITORING AND MANAGEMENT

In accordance with the USFWS Biological Opinions (USFWS 2003), and in compliance with NWP 38, UC Berkeley implemented the Feral Animal Management Program and the Invasive/Exotic Vegetation Management Program in 2004 (BBL 2004a, 2004b). These programs were designed to reduce the temporary loss of habitat for the California clapper rail and to assist in reducing the occurrence of invasive and exotic vegetation at the WSMRP site to preserve the quality of habitat for the California clapper rail. The activities within each of these programs are discussed below.

5.1 FERAL ANIMAL MANAGEMENT PROGRAM

The FAMP was developed to reduce predation by feral animals on all life stages (egg, young, and adult) of the California clapper rail, with the goal of making the WSMRP site more suitable for sustaining a population of the California clapper rail. Major predators are the domestic and feral cat (*Felix domesticus)*, Norway rat (*Rattus norvegicus)*, red fox (*Vulpes vulpes)*, raccoon (*Procyon lotor*), and skunks (Family *Mephitidae*) (Anderson and Evens 2000).

Biologist Gary Beeman of Avian Pest Control conducted seven animal trapping events in and around the northern boundary of the WSMRP site and in the RFS Upland between March 2009 and May 2010. During 37 trapping days, 50 major predators were trapped (28 skunks, 12 raccoons, and 10 feral cats) (Attachment 4). Trapping in previous years had yielded similar results: 47 major predators were trapped (14 skunks, 11 raccoons, and 22 feral cats) in 26 trapping days during Year 4, 38 predators were trapped in Year 3 during 30 trapping days (13 skunks, 14 raccoons, and 11 feral cats), and 69 major predators were trapped in Year 2 during 37 trapping days (39 skunks, 20 raccoons, 9 feral cats, and 1 fox).

5.2 INVASIVE/EXOTIC VEGETATION MANAGEMENT PROGRAM

Under contract to UC Berkeley, Tetra Tech, along with Shelterbelt Builders, Inc., implemented the Invasive/Exotic Vegetation Management Program, consisting of three interrelated tasks: (1) controlling colonization of targeted invasive non-native plant species by removing them from within the marsh, ecotone, and adjacent areas; (2) revegetating the marsh, ecotone, and upland habitats consistent with approved habitat reference sites and standard restoration planting practices; and (3) preparing transition areas to place plant material (and mulch) where appropriate. Attachment 5 presents an annual report of activities and figures.

The Invasive/Exotic Vegetation Management Program was designed to control establishment of priority invasive and exotic plants, as classified by the California Invasive Plant Council (CAL-IPC) (also known as the “Weed List” [CAL-IPC 2005]). This list is tailored to the characteristics of the site, such as proximity to sensitive or endangered species habitat, proximity to roads, and other factors. The Invasive/Exotic Vegetation Management Program evaluates the risk posed by each plant species present in and around the site, and assigns a priority rating of I to III (high to low), depending upon the magnitude of the threat to the site. The identification of priority species and the removal of invasive exotic plants are discussed below.

5.2.1 Priority Species

The WSMRP Monitoring Plan identifies two Priority I species: pepperweed (*Lepidium latifolium*), brought in from Europe or Asia in the early 19th century; and smooth cordgrass (*Spartina alterniflora*), a native of the Atlantic and Gulf coasts of North America. Both species are known to occur near the WSMRP site, are highly invasive, and are expected to interfere with restoration of native marsh vegetation at restoration sites. Mechanisms of interference include displacement of the native Pacific cordgrass or perennial pickleweed through competition for space, and genetic contamination of native cordgrass stock by smooth cordgrass, with which it readily hybridizes.

Pepperweed. Infestations of pepperweed occur in all of the western states, covering hundreds of thousands of acres of wildlands, as well as managed pastures. Its aggressive growth and woody stems reduce the suitability of vegetation for nesting birds, occupy space once occupied by native vegetation, and even interfere with livestock foraging. Pepperweed grows in a wide variety of habitats, including saline soils. Periodic tidal inundation restricts this weed from areas of the lower intertidal marsh, where Pacific cordgrass grows. Above the high tide line, however, the ecotone habitat is vulnerable to pepperweed invasion.

Pepperweed is extremely difficult to control by mechanical or chemical means. Top growth responds to herbicides, especially during the blooming season (summer through fall); however, stands readily regenerate from creeping rhizomes. Even when 98 percent of the top growth is affected by the herbicide, plants can resprout the next spring and dominate the landscape by the end of the growing season (Young and others 1997). Pepperweed dominates the land, precluding establishment by natives, during the time required for natural colonization of native plants to occur; however, purposeful revegetation with desirable species can be effective in controlling the spread of pepperweed. Pepperweed roots can remain dormant in soil for several years, making early detection, monitoring, and removal the most cost-efficient and best control measures.

Pepperweed populations expanded in the WSMRP area in 2009. Established populations were also discovered on adjacent properties owned by the City of Richmond and the East Bay Regional Parks District (EBRPD). For purposes of monitoring patterns of invasion and coordinating control efforts with adjacent landowners, Tetra Tech and May & Associates, Inc., mapped all known populations of pepperweed growing within the WSMRP area and adjacent areas in May 2009 (see Figure 4 of Attachment 5). Several established populations were discovered on the outboard side of the marsh, near Meeker Beach. The two largest populations were estimated to contain at least 300 stems.

Additionally, two new populations were discovered within the ecotone of the inboard marsh, and a population in the prairie was discovered growing near the Northern Regional Library Facility. A review of RFS documents revealed that pepperweed had been recorded as present in the prairie in 1993 (Brady and Associates 1993), although the exact locations were not noted.

Populations growing on the RFS were grubbed out and resprouts were treated with glyphosate application. Outboard populations growing closest to the WSMRP area were grubbed out with permission from the EBRPD and City of Richmond. Control methods were not implemented for the newly discovered populations in the outboard marsh due to their size and the extent of invasion.

On November 2, 2009, UC Berkeley hosted a meeting with representatives of neighboring property owners to discuss addressing regional control of pepperweed. Perennial pepperweed will likely continue to invade the WSMRP area unless a comprehensive and coordinated approach is adopted to control this species within the greater south Richmond shoreline region.

Smooth cordgrass.

In Year 2, the target acreage was not being achieved by Pacific cordgrass. The project standard was assessed based on the combined acreage of Pacific cordgrass and pickleweed, which was exceeded. Growth of transplanted Pacific cordgrass was slower than the proposed project standard, although it was uncertain whether this is a normal or slower than normal growth rate due to site-specific conditions (soil structure or nutrients, for example). The rate of transplantation of plants salvaged from other locations was increased. Genetically testing Spartina seedlings to determine whether natural recruitment would be acceptable was also proposed; however, this option was expensive, and therefore Spartina seedlings were removed based on the recommendation of the San Francisco Estuary Invasive Spartina Project (ISP) due to concerns of possible spread of non-native smooth cordgrass or hybrids (which continued through 2009).

Valued in its native habitat for its ability to trap sediment and to grow rapidly into low marshes, smooth cordgrass is largely responsible for much of the valuable marsh accretion that occurs on the Gulf and Atlantic coasts of North America (Simenstad and Thom 1995; Landin 1991). This trait—as well as its wide tolerances for salinity and flooding—makes smooth cordgrass an aggressive invader in San Francisco Bay and elsewhere in California. Historical records show that many Californian estuaries consisted primarily of bare, gently sloping mudflats with shallow tidal channels before the colonization by smooth cordgrass (Ebasco Environmental 1992). Fully developed smooth cordgrass marshes have steeply sloping seaward edges and deep steep-sided tidal channels. The elevation of the marsh rises above the surrounding tidal flat as sediment accretes around the smooth cordgrass (Ebasco Environmental 1992). The high stem densities of smooth cordgrass dissipate wave action, resulting in greater sediment deposition and steeper beach profiles (Gleason and others 1979). The higher rate of accretion associated with smooth cordgrass may change the fundamental nature of portions of the California coastline, thus influencing the quality and quantity of habitat for sensitive and endangered species such as the California clapper rail (Project Target 4). Unvegetated mudflats, which are the favored foraging spots for a variety of shorebirds, can be quickly covered by smooth cordgrass.

Control of smooth cordgrass is just as problematical as control of pepperweed. In addition to its rapid growth, wide physiological tolerances, and physical growth forms that alter historical landscapes, smooth cordgrass poses the risk of contaminating the gene pool of the native Pacific cordgrass. Smooth cordgrass produces abundant pollen that can cover the stigma of the native plants; therefore, the negative traits of the resulting hybrids may be even more exaggerated than in the original invader.

Current control methods focus on herbicide (Imazapyr) application for known smooth cordgrass colonies, as well as physical removal of suspected smooth cordgrass or hybrid seedlings. While adult stands of cordgrass may be relatively easy to identify to a species, seedlings of the native and exotic species look very similar. Since 2004, volunteer seedlings have been removed under the advice of the ISP. During Year 5 (November 2009 through October 2009), approximately 137 volunteer seedlings were hand pulled in the vicinity of the WSMRP site. Random samples of these seedlings were sent by Tetra Tech's Restoration Coordinator to the ISP to determine if they were Pacific, smooth, or hybrid cordgrass. Some of the seedlings that were genetically tested were confirmed to be hybrid cordgrass.

Figure 3.4.2 in Attachment 2 identifies the known locations of smooth cordgrass and hybrids as of December 2008.

In July 2009, the ISP conducted a thorough inventory of smooth cordgrass and hybrids in Western Stege Marsh and surrounding areas. Samples were collected from all suspect populations for genetic testing. Treatment of previously mapped hybrid populations with the herbicide Imazapyr was implemented on the same day. The 2009 map is not yet available because analysis of genetic results is still in progress.

In September 2009, it was apparent that one of the established hybrid populations in the outboard marsh had not been treated in July. The population appeared to have excellent vigor compared to all other known hybrids that had been sprayed. The Restoration Coordinator informed the ISP and clipped flowering stalks to the ground.

July treatment of hybrid populations, which began in 2008, resulted in a substantial increase of herbicide efficacy compared to treatment in October. Approximately 80 percent mortality was observed.

A complete summary of smooth cordgrass control activities is presented in Table 4 of Attachment 5.

Other targeted invasive species: Several other targeted non-native plant species were also removed from the WSMRP site in Year 5, including Russian thistle (*Salsola soda*), stinky tarweed *(Dittrichia graveolens*), bristley ox-tongue (*Picris echiodes*), five-hooked bassia (*Bassia hyssopifolia*), birds foot trefoil (*Lotus corniculatus*), and several other species. Shelterbelt Builders Inc. and Tetra Tech worked on priority large-scale weed control actions. Shelterbelt Builders Inc. continued to selectively utilize chemical-based integrated pest management strategies for adaptively treating targeted invasive weeds such as perennial pepperweed (*Lepidium latifoium*). Other treatment techniques included blanching of bur clover (*Medicago polymorpha*) (using a propane torch) and systematic, repeated, hand removal of birdsfoot trefoil.

A detailed account of the control of each of the targeted species is provided in Attachment 5.

5.2.2 Ecotone Creation and Enhancement of Marsh Habitat

Two overall methods are typically used to achieve a specific assemblage of plants in an area: removal of unwanted plants and direct planting of desired species. Both of these methods are used at the WSMRP site.

During Year 5, invasive and exotic plants were removed from the marsh and uplands by Tetra Tech and Shelterbelt Builders Inc. (see Attachment 5). Methods included hand removal, blanching (flaming), and use of brush cutters. Certified weed-free rice straw was used as mulch and weed suppressant in restoration plots, and wood chips were used to create buffer zones adjacent to the plots. Herbicides were also applied to select targeted species: subcontractors treated pepperweed (*Lepidium latifolium*), harding grass (*Phalaris aquatica*), Bermuda grass (*Cynodon dactylon*), and Himalayan blackberry (*Rubus discolor*) with glyphosate; and ISP treated invasive *Spartina* growing in the outboard marsh with Imazapyr.

The second method used to enhance the ecotone at the WSMRP site was to plant seedlings of desired species. Revegetation in the WSMRP in 2009 focused largely on infill plantings throughout the ecotone and upland, concentrating on areas that have had the previously poorest native plant survivorship. Two new areas were also included in the Year 5 revegetation plan. Plot 14 was extended east to the border of plot 1, and an experimental transect was planted in the remediated area near the Western Storm Drain outfall (see Figures 1 and 2 of Attachment 5). The planting palette consisted of select species that have exhibited the best survivorship and vigor at the site, species likely to out-compete weeds, and less common species for added diversity.

Historical establishment of natives in the project area has been mixed across various subsites: very good in the eastern edge of the marsh, and poor in plots 1 and 2 along the marsh's northern edge. However, during Year 5 monitoring, areas within plots 1 and 2 that had been previously invaded by burclover and birdsfoot trefoil showed a substantial increase in native cover. In particular, patches of California aster (*Aster chilensis*), yarrow (*Achillea millefolium*), and California mugwort (*Artemisia vulgaris*, var. *Douglasiana*) greatly increased in size through rhizomatous growth. Additional infill planting of these species occurred during the winter and early spring. Fast-growing shrubs such as marsh gumplant (*Grindelia stricta*) and divisions of *Leymus* sp. were also planted in these areas.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Year 5 monitoring completed the planned post-remediation assessment of the WSMRP site. During the 2009 Year 5 period, the marsh restoration was assessed using the four established project targets and their respective standards and field indicators/measurements (see Table 1). The completed 5 year monitoring schedule is provided in Table 11.

Analysis and interpretation of the Year 5 monitoring results led to several conclusions presented in this section. The results are interpreted in the context of adaptive management, as was the intent of the WSMRP Monitoring Plan. The adaptive management process has been flexible and has allowed for review of monitoring results while considering adjustments to monitoring plans in response to previous results. Based on data obtained from 2004 through 2009, the WSMRP site is progressing toward providing the functions of a tidal marsh typical of San Francisco Bay. Based on this trajectory and evaluation against the project targets, no further remediation, active restoration, or monitoring activities are recommended.

Project Target 1, Restore the hydrologic complexity to the WSMRP site**:** The hydrologic functioning of the restored marsh plain and slough channels has been assessed through the review and analysis of Year 1 through Year 5 monitoring data. Project Target 1 standards were achieved because the hydrology is sufficient to inundate the marsh portions of the WSMRP site daily and support vegetative communities designed in the WSMRP Monitoring Plan. Although some of the project standards for the dimensions of marsh channels have not yet achieved the dimensions of a mature marsh, the review of inundation data along with the assessment of the historical evolution of the adjacent undisturbed marsh suggests that the WSMRP area is progressing toward a marsh that will support the California clapper rail habitat. The channel widening and deepening measured during Year 5, indicative of favorable channel evolution, is likely attributable to increased volumes of winter tidal exchange between Bay and marsh, and associated increased channel scour potential. Although the WSMRP channels appeared to be underdeveloped through the first 4 years of post-project monitoring, positive signs based on the Year 5 monitoring analyses indicate that the internal marsh channels at WSMRP are evolving along a favorable trajectory.

Project Target 2, Improve water quality by increasing the time water is retained within the WSMRP site**:** Data for surface water, sediment, and stormwater sampling obtained in Year 5 were compared to data obtained in Years 2, 3, and 4. Year 5 data exhibited patterns of concentrations similar to previous years, and no trends were obvious of increasing or decreasing concentrations of chemicals analyzed. Some sample concentrations exceeded some federal and state screening criteria for protection of aquatic life, including some criteria that are within the range of ambient Bay Area concentrations; however, more sampling is necessary to assess the significance of these results. Data obtained in support of Project Target 2 will be combined with future monitoring as part of the Field Sampling Workplan (Tetra Tech 2010) to assess the WSMRP site sediment and water quality.

Project Target 3, Restore low salt marsh (Pacific cordgrass), middle salt marsh (pickleweed), and the emergent and coastal scrub native plant communities within the WSMRP site**:** The Project Target 3 standards were achieved. In 2009, all of the four performance standard measurements for Year 5 were achieved. The total acreage of Pacific cordgrass (*Spartina foliosa*) and the total acreage of pickleweed (*Salicornia virginica*) were greater than the adjusted Year 5 project standards. Furthermore, the total native plant coverage (82 percent) exceeded the project standard for Year 5 (80 percent), and the performance measure for vigor of planted stock exceeded the criteria of 80 percent, measured at 92 percent in Year 5.

Site observations indicate that the WSMRP site is progressing toward supporting a diverse, ecologically viable, functioning marsh habitat. The species richness of the low, middle, and high marsh; ecotone; and associated upland was high in 2009; and the native cover exceeded the standard for Years 2 through 5. The percent cover of native vegetation exhibited a steady and continuous increase from 2004 to 2009. The highest percentage of native cover was recorded in the marsh quadrats. Native cover in upland and ecotone quadrats also improved from 2004 to 2009.

The observed 2009 Pacific cordgrass patch size was almost double the area measured in 2008. Thirty-one patches of Pacific cordgrass, occupying a total of approximately 1.12 acres of the WSMRP low and mid marsh habitat, were mapped in 2009. The vigor of the transplanted colonies and the vegetative growth from the existing stand is excellent, with no disease or pathogens observed.

Following Year 4 monitoring, May & Associates, Inc. assessed the project standard for the total acreage of Pacific cordgrass and concluded that the Year 5 project standard for Pacific cordgrass should be revised from 1.5 acres to 1.12 acres. This suggestion was supported by the review of numerous sources of information. Slow initial growth rates observed in other restored marsh systems in the San Francisco Bay Area suggested that the adopted performance standard may have overestimated the possible annual growth rates of planted cordgrass in early years of establishment. However, the acreage of cordgrass doubled from 2007 to 2008 and 2008 to 2009, and accelerated growth rates are expected to continue now that the Pacific cordgrass stands are established, environmental conditions permitting. Interspecies competition for space and nutrients during early establishment may have also played a role. Pickleweed is a quick colonizer, and established in both the low and middle marsh habitats. However, over time, due to the rhizomatous nature of the Pacific cordgrass, the cordgrass will likely out-compete pickleweed, reducing the cover of the pickleweed in the low marsh over time. This pattern of spread is seen in the intact stands located west of the WSMRP, and in 2009, Pacific cordgrass acreage increased at a rate exceeding pickleweed acreage increases.

Another factor in the assessment of the target acreage was the amount of optimal habitat available, which is affected by the salinity of different areas, length of inundation periods, sediment accretion and/or scouring, and the elevations of the marsh plain. The lack of optimal habitat area could be a remnant of the initial design, or could just be a consequence of the direction in which the marsh is evolving. An important consideration when proposing the new target acreage was that if cordgrass would become the dominant species, the pickleweed cover would be reduced to as low as 0.81 acre, resulting in a failure to achieve the Year 5 performance measure of 1.5 acres. Additionally, the cordgrass would need to colonize the entire unvegetated mud flat habitat, which would considerably reduce areas of high wildlife value habitat for foraging wildlife—an undesirable outcome. Therefore, given the less than optimal habitat area for Pacific cordgrass, the Year 5 performance measure was adjusted to 1.12 acres, a figure reached by delineating the potential habitat that could be successfully colonized within the elevation band defined by 2.25 feet (low land elevation) and 3.25 feet (high land elevation).

Based on the Years 2 through 5 monitoring data results, which indicate greater than 81.7 percent native vegetation cover combined within the low and middle marsh habitats, and a rich diversity of marsh species and vegetative structure with good to excellent vigor, the marsh has met all of the intended performance measures—including value of the marsh in providing California clapper rail habitat. Over time, assumedly, the marsh will continue to evolve, including continued expansion of the Pacific cordgrass colonies.

Project Target 4, Establish a compositionally and structurally complex ecosystem within the WSMRP site with attributes important to wildlife, specifically focused on increasing habitat functions for the California clapper rail**:** The Project Target 4 standards were substantially but not yet fully achieved. A complex ecosystem has evolved and is being used by numerous wildlife species, including birds, insects, reptiles, and mammals. The goal to increase the suitable habitat for the California clapper rail by increasing the complexity of the ecosystem was met during the monitoring period. The establishment of a compositionally and structurally complex ecosystem within the WSMRP site, with emphasis on the increased habitat function for the California clapper rail, is strongly influenced and supported by Project Targets 1 and 3.

Based on the standard method protocol survey of estimating number of individuals using the number of detections during the survey, an estimated single pair of California clapper rails was present in the inboard tidal marsh in 2010. This is consistent with the findings from 2008 but less than the estimates for previous years. The cause for the apparent decline of clapper rails in the marsh after 2007 is not known. Possible factors include unknown aspects of the restoration effort, and continued presence of feral cats and other mesopredators in the marshland, which are subsidized by feeding stations located off UC Berkeley property on adjacent City of Richmond trails and roadways.

California clapper rails were not observed using the WSMRP site for nesting or foraging during the limited protocol surveys conducted in Year 5; however, individual rails including chicks and juveniles were identified near the edge of the site and are expected to use the habitat as the vegetation matures in the future. Fledgeling California clapper rails were observed and photographed in the inboard marsh within 300 feet of the WSMRP site at the end of the 2009 breeding season. The number of other observations by community members of rails (chicks, juveniles, and adults) within both the inner and outer portions of Western Stege Marsh suggests successful nesting is occurring in or near the Western Stege Marsh. As noted in the monitoring survey, California clapper rails inhabit marshes with deeper channels that offer cover from predators. The review of historical aerials suggests that the trajectory of the WSMRP area will follow the adjacent undisturbed marsh where rails have been detected.

7.0 REFERENCES

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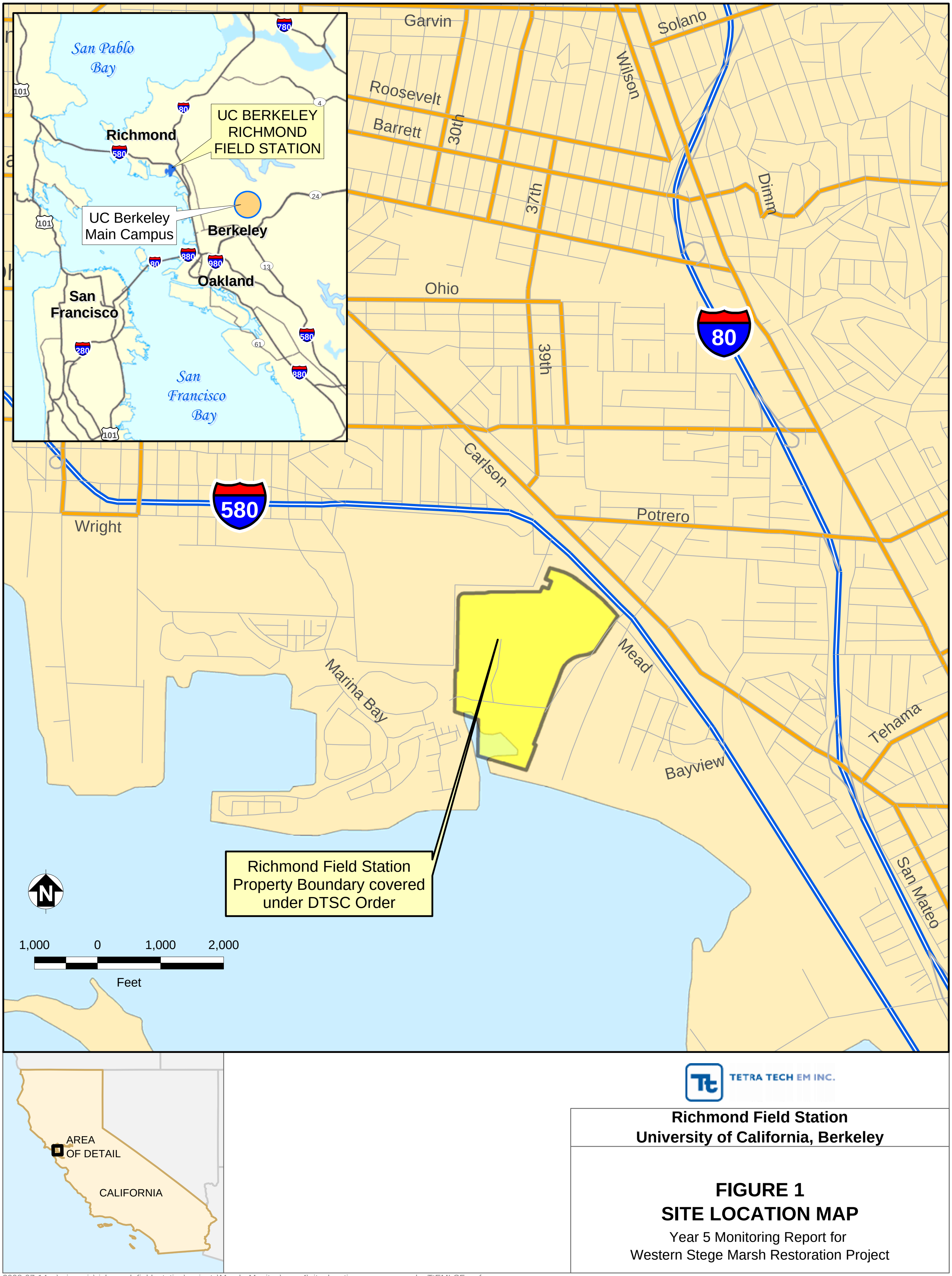
FIGURES



TETRA TECH EM INC.

Richmond Field Station
University of California, Berkeley

FIGURE 1
SITE LOCATION MAP

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

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300 0 300

Feet

Property Boundary

Approximate Property Boundary

Notes:
EBRPD East Bay Regional Parks District
EERC Earthquake Engineering Reseach Center
EPA Environmental Protection Agency
NRLF Northern Regional Library Facility
RFS Richmond Field Station

TETRA TECH EM INC.

Richmond Field Station
University of California, Berkeley

FIGURE 2
SITE MAP

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

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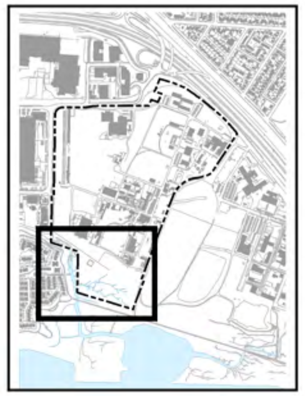

Marsh Monitoring Area

Ecotone Area (as Designed in BBL's August 2004 Marsh Monitoring Plan)

Richmond Field Station Property Boundary

Biologically Active Permeable Barrier Wall

Slurry Wall

Image date March 2005, courtesy of BBL Inc.

EBRPD East Bay Regional Park District
RFS Richmond Field Station

100 0 100
Feet

TETRA TECH EM INC.

Richmond Field Station
University of California, Berkeley

FIGURE 3
WESTERN STEGE MARSH
RESTORATION PROJECT AREA

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

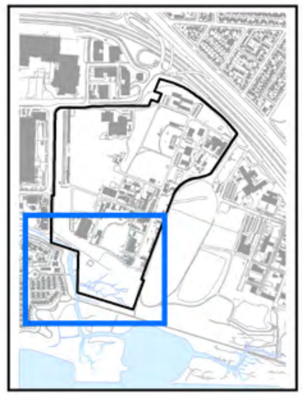

Photo Stations

Channel Crossing

Sampling Location

Vegetation Survey Quadrats

Transects

Richmond Field Station Property Boundary

Marsh Monitoring Area

Ecotone Area (as Designed in BBL's August 2004 Marsh Monitoring Plan)

Surface Water Samples	SW101 SW102 SW103 SW104
Stormwater Samples	STW104 STW105 STW106 STW107 STW108 STW109 STW110
Sediment Samples	SED101 SED102 SED103

Image date March 2008, courtesy of Muir Consulting

EBRPD East Bay Regional Park District
RFS Richmond Field Station

100 0 100
Feet

TETRA TECH EM INC.

Richmond Field Station
University of California, Berkeley

FIGURE 4

MONITORING LOCATIONS

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

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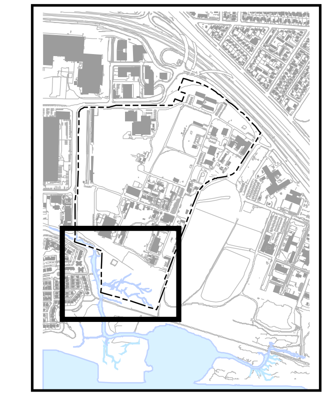

- Vegetation Sampling Quadrat
- Transect
- Exising Building
- Marsh Area Boundary
- Property Boundary
- Surface Water
- Pacific Cordgrass (*Spartina foliosa*); 3.02 acres
- Salty Susan (*Jaumea carnosa*); 0.2 acres
- Saltgrass (*Distichlis spicata*); 1.20 acres
- Pickleweed (*Salicornia virginica*); 1.74 acres
- Ecotone; 0.686 acres
- Restored Upland; 1.90 acres
- Mud; 1.34 acres
- Bulrush (*Scirpus americanus*); 0.32 acres
- Non-Native Transitional Upland; 5.24 acres
- Approximate Clapper Rail Habitat Area
- Approximate 200-foot Buffer
- Biologically Active Permeable Barrier Wall
- Former Seawall (Approximate)
- Slurry Wall
- Road Edge and Other Landscape Feature

Storm Drain Lines:

- Open Swale
- Underground Culvert

Sanitary Sewer Lines:

- Existing Sewer Line
- Removed Sewer Line
- Abandoned Sewer Line

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FIGURE 5
MAJOR PLANT COMMUNITIES PRESENT AT WESTERN STEGE MARSH

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

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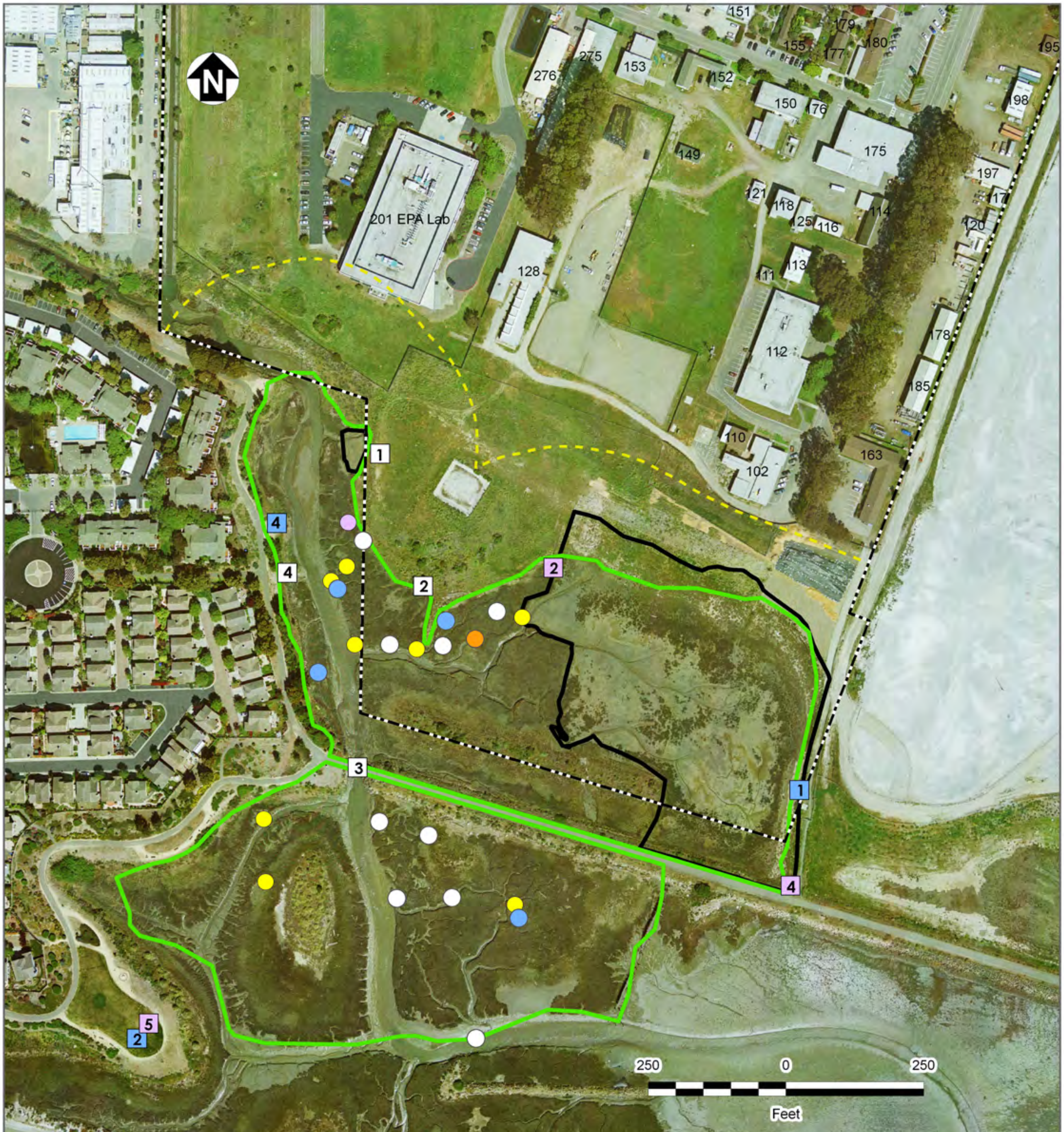

Property Boundary
Habitat Area
Approximate 200-foot Buffer
Marsh Monitoring Area
2006/2007 Listening Stations
2008 Listening Stations
2009/2010 Listening Stations

Estimated Location of Clapper Rail, 2006
Estimated Location of Clapper Rail, 2007
Estimated Location of Clapper Rail, 2008
Estimated Location of Clapper Rail, 2009
Estimated Location of Clapper Rail, 2010

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Richmond Field Station
University of California, Berkeley

FIGURE 6
DISTRIBUTION OF CALIFORNIA CLAPPER RAILS IN WESTERN STEGE MARSH

Year 5 Monitoring Report for
Western Stege Marsh Restoration Project

Notes:
Listening station 1 was the same for 2006, 2007, 2009, and 2010
Listening station 3 was the same for all 5 events

Source:
Aerial photo taken by Point Co., April 09, 2008

2010-08-31 v:\misc_gis\richmond_field_station\projects\marsh_monitng\year_5\clapper_rail.mxd TtEMI-OAK CF

TABLES

Table 1: Western Stege Marsh Restoration Project – Project Standards[a]
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Project Standard	Field Indicator/Measurement
Project Target 1: Restore hydrologic complexity to the WSMRP	
Tidal inundation: water depth during low- and high-tide events	Slough channels, tidal mudflats, and Pacific cordgrass areas exhibit an adequate tidal range based on best professional judgment and values available in current literature
Marsh elevation in relation to mean high tide	Adequate elevations based on best professional judgment and values available in current literature
Bankfull Width	In support of Bankfull Width:Depth Ratio
Bankfull Depth	In support of Bankfull Width:Depth Ratio
Bankfull Width:Depth Ratio	Between 3 and 4 feet at thalweg
Project Target 2: Improve water quality by increasing residence time of water within the WSMRP	
pH	See Surface Water Monitoring Program and Groundwater Monitoring Program (to be submitted)
Conductivity	See Surface Water Monitoring Program and Groundwater Monitoring Program (to be submitted)
Dissolved oxygen	See Surface Water Monitoring Program and Groundwater Monitoring Program (to be submitted)
Turbidity	See Surface Water Monitoring Program and Groundwater Monitoring Program (to be submitted)
Project Target 3: Restore low salt marsh (such as Pacific cordgrass), middle salt marsh (such as pickleweed), and emergent and coastal scrub native plant communities within the WSMRP	
Percent cover of native vegetation (excluding tidal mudflats)	Year 2: Greater than or equal to 20% Year 3: Greater than or equal to 40% Year 4: Greater than or equal to 60% Year 5: Greater than or equal to 80%
Total acreage of Pacific cordgrass	Target Acreage: 1.3 acres Year 1: Greater than or equal to 15% of target acreage (0.2 acres) Year 2: Greater than or equal to 30% of target acreage (0.4 acres) Year 3: Greater than or equal to 50% of target acreage (0.65 acres) Year 4: Greater than or equal to 65% of target acreage (0.85 acres) Year 5: Greater than or equal to 85% of target acreage (1.12 acres)
Total acreage of pickleweed	Target Acreage: 1.7 acres Year 1: Greater than or equal to 15% of target acreage (0.3 acres) Year 2: Greater than or equal to 30% of target acreage (0.5 acres) Year 3: Greater than or equal to 50% of target acreage (0.9 acres) Year 4: Greater than or equal to 65% of target acreage (1.1 acres) Year 5: Greater than or equal to 85% of target acreage (1.5 acres)
Vigor of planted stock	Greater than or equal to 80% of vegetation plots assessed as “Good” or “Excellent”

Table 1: Western Stege Marsh Restoration Project – Project Standards[a] (Continued)
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Project Standard	Field Indicator/Measurement
Project Target 4: Establish a compositionally and structurally complex ecosystem within the WSMRP with attributes important to wildlife, specifically focused on increasing habitat functioning for the California clapper rail	
% litter/detrital matter	Based on best professional judgment and values available in current literature
Annual California clapper rail survey	Restoration sites continue to provide suitable habitat to support the California clapper rail based on best professional judgment

Notes:

a Information provided in the table above is from the WSMRP Monitoring Plan (Blasland, Bouck & Lee, Inc. 2004c).

WSMRP Western Stege Marsh Restoration Project

Table 2: Cover Class Midpoints[a]

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

% Cover Range	Field Indicator/Measurement
<1%	**0.5**
1 to 5%	**3**
6 to 15%	**10.5**
16 to 25%	**20.5**
26 to 45%	**38**
46 to 75%	**63**
76 to 90%	**85.5**
>90%	**98**

Notes:

a Information provided in the table above is from Table 3 in the WSMRP Monitoring Plan (Blasland, Bouck & Lee, Inc. 2004c).

Table 3: Qualitative Score for Assessing the Vigor of Planted Stocks[a]

Year 4 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Score	Description of Score
Excellent	**No evidence of stress; minor pest or pathogen damage may be present**
Good	**Some evidence of stress; pest or pathogen damage present**
Fair	**Moderate level of stress; high levels of pest or pathogen damage**
Poor	**High level of stress; high levels of pest or pathogen damage**

Notes:

a Information provided in the table above is from Table 4 in the WSMRP Monitoring Plan (Blasland, Bouck & Lee, Inc. 2004c).

Table 4: Year 5 Quadrat Elevations

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Quadrat	Spring 2010 Elevation (feet)	Quadrat	Spring 2010 Elevation (feet)
A-1	5.62	D-2	2.11
A-2	5.00	D-3	2.23
A-3	1.60	D-4	2.38
A-4	6.38	D-5	2.19
A-5	6.43	D-6	2.35
A-6	6.18	D-7	2.61
A’-1	5.76	E-0	5.01
A’-2	4.97	E-1	3.85
A’-3	4.99	E-2	2.05
B-1	6.16	E-3	2.66
B-2	3.39	E-4	3.16
B-3	2.69	E-5	4.14
B-4	2.28	E-6	3.92
B-5	2.31	E-7	4.97
B-6	2.11	E-8	4.72
B-7	2.57	E-9	5.29
C-0	6.14	E-10	5.44
C-1	3.22	F-1	4.96
C-2	2.22	F-2	3.01
C-3	1.91	F-3	2.85
C-4	2.20	F-4	2.95
C-5	2.17	G-1	4.73
C-6	2.44	G-2	4.01
D-0	5.90	G-3	3.55
D-1	3.86	G-4	4.40

Note: Elevations are based on National Geodetic Vertical Datum 29.

Table 5: Year 5 Channel Characteristics

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Cross Section Number	Year	Channel Width (feet)	Channel Depth (feet)	Width:Depth Ratio
CS-1	Spring 2010	14.5	0.80	18.1
CS-2	Spring 2010	9.20	1.40	6.6
CS-3	Spring 2010	9.50	1.20	7.9
CS-4	Spring 2010	5.50	0.40	13.8
CS-5	Spring 2010	8.40	1.00	8.4
CS-6	Spring 2010	4.90	0.60	8.2
CS-7	Spring 2010	4.30	0.40	10.8
CS-8	Spring 2010	6.70	0.30	22.3

Note: Measurements are based on National Geodetic Vertical Datum 29.

Table 6: Surface Water Screening Criteria for the Protection of Aquatic Life

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project, University of California, Berkeley, Richmond Field Station, Richmond, California

Chemical	Pseudonym	San Francisco Bay Basin Plan[a] (µg/L)		California Toxics Rule Criteria for Enclosed Bays and Estuaries[e] (µg/L)								National Recommended Water Quality Criteria[k] (µg/L) Saltwater Aquatic Life						National Ambient Water Quality Criteria (AWQC) for Protection of Saltwater Aquatic Life[i] (µg/L) Lowest Observed Effect Level (LOEL)								Selected Toxicity Screening Criteria (µg/L)
				Chronic[g]		Acute[g]			Instantaneous Maximum			Chronic[g]		Acute[g]				Chronic[h]		Acute[i]				Other[j]		
		Conc.	Footnotes	Conc.	Footnotes	Conc.	20 Percent of Conc.[f]	Footnotes	Conc.	10 Percent of Conc.[f]	Footnotes	Conc.	Footnotes	Conc.	20 Percent of Conc.[f]	DTSC-Recommended Screening Value[n]	Footnotes	Conc.	Footnotes	Conc.	20 Percent of Conc.[f]	DTSC-Recommended Screening Value[n]	Footnotes	Conc.	Footnotes	
Arsenic		36	b	36	(1, 4), ii, kk	69	--	(1, 4), ii, kk	--	--	--	36	A,B,bb	69	--	--	A,B,bb	--	--	2,319	--	--	(3)	13	(2)	36
Cadmium		9.3	b	9.3	(1, 4)	42	--	(1, 4)	--	--	--	8.8	B,bb,gg	40	--	--	B,bb,gg	--	--	--	--	--	--	--	--	8.8
Chromium (total)		50 (VI)	b,m	50 (VI)	m	1100 (VI)	--	--	--	--	--	50 (VI)	B,bb,m	1100 (VI)	--	--	B,bb,m	--	--	--	--	--	--	--	--	50
Copper		4.9	c	3.1	(1, 4), jj, kk	4.8	--	(1, 4), jj, kk	--	--	--	3.1	B,cc,ff	4.8	--	--	B,cc,ff	--	--	--	--	--	--	--	--	3.1
Lead		5.6	b	8.1	(1, 4), m	210	--	(1, 4), l	--	--	--	8.1	B,bb	210	--	--	B,bb	--	--	--	--	--	--	--	--	5.6
Mercury	Mercury, inorganic	0.94	b	--	--	--	--	--	--	--	--	0.94	B,ee,hh	1.8	--	--	B,ee,hh	--	--	--	--	--	--	--	--	0.94
Nickel		8.3	b	8.2	(2, 4), kk	74	--	(1, 4), kk	--	--	--	8.2	B,bb	74	--	--	B,bb	--	--	--	--	--	--	--	--	8.2
Selenium		--	--	71	(1, 4)	290	--	(1, 4)	--	--	--	71	B,bb,dd	290	--	--	B,bb,dd	--	--	--	--	--	--	--	--	71
Silver		2.3	d	--	--	1.9	--	(1, 4)	--	--	--	--	--	1.9	0.38	0.19	B,C	--	--	--	--	--	--	--	--	0.19
Thallium		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,130	426	1,065	--	--	--	426
Zinc		58	c	81	(1, 4), ii, kk	90	--	(4), ii, kk	--	--	--	81	B,bb	90	--	--	B,bb	--	--	--	--	--	--	--	--	81
Aroclor-1248	Polychlorinated biphenyls (PCBs)	--	--	0.03	(5, 6) ll	--	--	--	--	--	--	0.03	aa	--	--	--	--	--	--	10	--	--	--	--	--	.03
Aroclor-1260	Polychlorinated biphenyls (PCBs)	--	--	0.03	(5, 6) ll	--	--	--	--	--	--	0.03	aa	--	--	--	--	--	--	10	--	--	--	--	--	.03

Notes: Values shaded are those selected as screening criteria.

µg/L Microgram per liter

-- No criterion available

AWCG Ambient Water Quality Criteria

conc. Concentration

DTSC Department of Toxic Substance Control

LOEL Lowest observed effect level

Footnotes:

a California Environmental Protection Agency, Regional Water Quality Control Board, San Francisco Bay Area Region (Water Board). 1995. "San Francisco Bay Basin Plan Water Quality Control Plan." June 21. Table 3-3 Water Quality Objectives for Toxic Pollutants for Surface Water With Salinities Greater Than 5 Parts Per Billion.

b From Water Board "Basin Plan" 4-Day Average (Chronic).

c From Water Board "Basin Plan" 24-Hour and 1-Hour Average (Acute).

d From Water Board "Basin Plan" Instantaneous Maximum.

e From "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (CTR) (EPA 2000) and "Water Quality Control Plan, San Francisco Bay Basin Region" (Water Board 1995). The most appropriate criteria were used.

f Criterion made more suitably protective by means of standard convention of lowering acute values by 80 percent and instantaneous values by 90 percent to make them more appropriate for use under chronic exposure scenarios.

g An acute criterion (EPA identified as Criteria Maximum Concentration [CMC]) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The chronic concentration (EPA identified as Criterion Continuous Concentration [CCC]) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two if the six parts of an aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States (EPA 2002a).

h EPA National "AWQC Lowest Observed Effect Level (Chronic)" (Water Board 2000).

i EPA National "AWQC Lowest Observed Effect Level (Acute)" (Water Board 2000).

j EPA National "AWQC Lowest Observed Effect Level (Other)" (Water Board 2000).

k From "National Recommended Water Quality Criteria: 2002" (EPA 2002a) and "Revision of National Recommended Water Quality Criteria." (EPA 2002b), unless otherwise noted.

l In instances where criteria from "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (EPA 2000) refer to the "Water Quality Control Plan, San Francisco Bay Basin Region" (Water Board 1995), Water Board 1995 criteria were used. The Water Board 1995 criteria are distinguished by an "m" in the footnote column.

m Detailed application of this toxicity criterion may require the review and/or summation of analyte isomer, congener, or speciation results, as applicable. Please see applicable regulatory agency source document for additional detail.

n Derived using uncertainty factors (UF) from DTSC (For acute values: divide acute LOAEL by 10 to get a chronic LOAEL).

The following lettered footnotes are derived from EPA "National Recommended Water Quality Criteria: 2002" (EPA 2002b), Table 1 - Priority Toxic Pollutants:

A This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EAP 440/5-84-033, January 1985), Species Mean Acute Values (SMAVs) are given for both arsenic (III) and arsenic (V) for five species, and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.

B Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and mulitplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are currently unavailable. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington DC 20460; and 40CFR 131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble - Conversion Factors for Dissolved Metals.

C The criterion is based on 304(a) aquatic life criterion issued in 1980 and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), Dichlorodiphenyltrichloroethane (DDT) (EPA 440/5-80-38), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071), The minimum data requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and was issued in one of the following documents : Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endrin (EPA 4405-80-047), Heptachlor (EPA 440/5-80-052), Polychlorinated biphenyls (EPA 440/5-80-068), Toxaphene (EPA 440/5-86-006). This CCC is currently based on the Final Residue Value (FRV) procedure. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60 FR 15393-15399, March 23, 1995), the EPA no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria. Therefore, the EPA anticipates that future revisions of this CCC will not be based on FRV procedure.

bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* , PB85-227046, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Cadmium (EPA 882-R-01-001), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5-84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene (EPA 440/5-86-006), Zinc (EPA 440/5-87-003).

cc When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic, and use of Water-Effect Rations might be appropriate.

dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fish in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 mg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.

Table 6: Surface Water Screening Criteria for the Protection of Aquatic Life (Continued)

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project, University of California, Berkeley, Richmond Field Station, Richmond, California

Footnotes (Continued):

ee This recommended water quality criterion was derived on page 43 of the mercury document (EPA 440/5-84-026, January1985). The saltwater CCC of 0.025 µg/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60 FR 15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

ff This recommended water quality criterion was derived in Ambient Water Quality Criteria Saltwater Copper Addendum (draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60 FR 22228-222237, May 4, 1995).

gg EPA is actively working on this criterion, and so this recommended water quality criterion may change substantially in the near future.

hh This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury, and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.

The following lettered footnotes are derived from EPA "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (EPA 2000).

ii Criteria for these metals are expressed as a function of the water-effect ratio (WER) (originally footnote I in the CTR).

jj No criterion for protection of human health from consumption of aquatic organisms (excluding water) was presented in the 1980 criteria document or in the 1986 Quality Criteria for Water. Nevertheless, sufficient information was presented in the 1980 document to allow a calculation of a criterion, even though the results of such calculations were not shown in the document.

kk These freshwater and saltwater criteria for metals are expressed in terms of dissolved fraction of the metal in the water column. Criterion values were calculated by using EPA's Clean Water Act 304(a) guidance values (described in the total recoverable fraction) and then applying the conversion factors in 131.36(b)() and (2).

ll PCBs are a class of chemicals that include Aroclors 1242,1254,1221,1232,1248,1260, and 1016. The aquatic life criteria apply to the sum of this set of seven Aroclors.

The following numbered footnotes are derived from "A Compilation of Water Quality Goals" (Water Board 2000). These footnotes directly correlate with the source document.

1 Expressed as dissolved.

2 Pentavalent arsenic [As(V)] effects on plants.

3 For the pentavalent form.

4 Criteria do not apply to waters subject to water quality objectives in Tables III-2A and III-2B of the San Francisco Bay Regional Water Quality Control Board's 1986 Basin Plan.

5 Developed as 24-hour average using 1980 EPA guidelines, but applied as 4-day average in the National Toxics Rule and/or Proposed California Toxics Rule.

6 Applies separately to Aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016; based on carcinogenicity at 1-in-a-million risk level.

References:

San Francisco Bay Regional Water Quality Control Board (Water Board). 1995. "San Francisco Bay Basin Plan." San Francisco Bay Region. June 21.

Water Board. 2000. "A Compilation of Water Quality Goals." Prepared by Jon B. Marshack, Central Valley Region. August.

Water Board. 2001. "Water Quality Goals Update." Central Valley Region. April 18.

U.S. Environmental Protection Agency (EPA). 2000. "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California." 40 CFR Part 131, RIN 2040-AC44. May 18.

EPA. 2002a. "National Recommended Water Quality Criteria: 2002." EPA-822-R-02-047. November.

EPA. 2002b. "Revision of National Recommended Water Quality Criteria." FRL-OW-7431-3. December 27.

Table 7: Summary Analysis for Year 5 Surface Water

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project

University of California, Berkeley, Richmond Field Station, Richmond, California

	Total Metals (ug/L)																							
Sample ID (Location – Date)	**Aluminum**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
RFS-SW-031 (SW102 – 4/6/09)	900	1.0 U	4.3	31	1.0 U	1.0 U	290,000	2.6	0.74 J	6.5	1,300	1.9	820,000	150	0.20 U	6.8	3.5	260,000	0.67 J	1.0 U	7,000,000	1.0 U	4.6	92
RFS-SW-032 (SW101– 4/6/09)	440	1.0 U	3.1	28	1.0 U	1.0 U	250,000	1.5	1.0 U	3.8	450	0.66 J	790,000	190	0.20 U	50 U	2.6	250,000	0.87 J	1.0 U	6,700,000	1.0 U	2.9	9.9
RFS-SW-033 (SW103 – 4/6/09)	580	1.0 U	3.6	28	1.0 U	1.0 U	280,000	1.8	0.50 J	4.3	640	0.82 J	790,000	130	0.20 U	6.7	2.6	250,000	0.76 J	1.0 U	7,100,000	1.0 U	3.4	15
RFS-SW-034 (SW104 – 4/6/09)	690	1.0 U	3.3	25	1.0 U	1.0 U	290,000	1.9	1.0 U	3.5	620	0.92 J	840,000	79	0.20 U	7.1	2.7	270,000	0.56 J	1.0 U	7,000,000	1.0 U	3.5	9.2
RFS-SW-035 (SW102 – 11/18/09)	210	10 U	5.0 U	22	2.0 U	5.0 U	300,000	5.0 U	5.0 U	5.0 U	330	3.0 U	890,000	78	0.20 U	5.7	4.8 J	270,000	10 U	5.0 U	7,800,000	10 U	5.0 U	20 U
RFS-SW-036 (SW101 – 11/18/09)	100 U	10 U	5.0 U	16	2.0 U	5.0 U	280,000	4.4 J	5.0 U	4.2 J	400	3.1 U	850,000	56	0.20 U	5.1	5.0 U	270,000	10 U	5.0 U	7,600,000	10 U	5.0 U	21
RFS-SW-037 (SW103 – 11/18/09)	160	10 U	5.0 U	20	2.0 U	5.0 U	250,000	5.0 U	5.0 U	5.0 U	190	3.0 U	760,000	73	0.20 U	4.8 J	3.9 J	230,000	10 U	5.0 U	6,800,000	10 U	5.0 U	20 U
RFS-SW-038 (SW104 – 11/18/09)	180	10 U	5.0 U	18	2.0 U	5.0 U	300,000	5.0 U	5.0 U	5.0 U	270	3.0 U	890,000	44	0.20 U	5.9	3.7 J	290,000	10 U	5.0 U	8,000,000	10 U	5.0 U	13 J

Table 7: Summary Analysis for Year 5 Surface Water

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Sample ID (Location – Date)	**Filtered Metals (ug/L)**																							
	Aluminum	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
Surface Water Screening Criteria	*NC*	*NC*	*36*	*NC*	*NC*	*8.8*	*NC*	*50*	*NC*	*3.1*	*NC*	*5.6*	*NC*	*NC*	*0.94*	*NC*	*8.2*	*NC*	*71*	*0.19*	*NC*	*426*	*NC*	*81*
RFS-SW-031 (SW102 – 4/6/09)	300	1.0 U	3.1	30	1.0 U	1.0 U	290,000	0.65 J	1.0 U	**3.1**	270	1.0 U	830,000	140	0.20 U	7.1	1.8	260,000	0.83 J	1.0 U	6,800,000	1.0 U	1.7	17
RFS-SW-032 (SW101– 4/6/09)	50 U	1.0 U	3.0	32	1.0 U	1.0 U	290,000	1.0 U	1.0 U	2.9	50 U	1.0 U	820,000	150	0.20 U	6.6	1.8	260,000	0.56 J	1.0 U	6,700,000	1.0 U	2.0	30
RFS-SW-033 (SW103 – 4/6/09)	50 U	1.0 U	2.9	33	1.0 U	1.0 U	250,000	0.51 J	1.0 U	2.3	50 U	1.0 U	720,000	110	0.20 U	6.7	1.5	230,000	1.1	1.0 U	6,600,000	1.0 U	1.8	20
RFS-SW-034 (SW104 – 4/6/09)	50 U	1.0 U	3.0	30	1.0 U	1.0 U	260,000	0.54 J	1.0 U	2.2	50 U	1.0 U	740,000	75	0.20 U	6.6	1.2	230,000	0.55 J	1.0 U	6,300,000	1.0 U	2.0	8.3
RFS-SW-035 (SW102 – 11/18/09)	100 U	10 U	5.0	21	2.0 U	5.0 U	300,000	5.1	5.0 U	**3.9 J**	100 U	3.1 U	920,000	68	0.20 U	3.7 J	5.0 U	280,000	10 U	5.0 U	7,900,000	10 U	2.6 J	20 U
RFS-SW-036 (SW101 – 11/18/09)	100 U	10 U	5.0 U	17	2.0 U	6.3	300,000	5.0 U	5.0 U	**6.7**	100 U	3.0 U	870,000	74	0.20 U	5.5	4.2 J	280,000	10 U	5.0 U	7,800,000	10 U	5.0 U	20 U
RFS-SW-037 (SW103 – 11/18/09)	100 U	10 U	5.0 U	25	1.2 J	**18**	280,000	5.0 U	5.0 U	**8.5**	64 J	3.0 U	840,000	130	0.20 U	9.4	**8.5**	260,000	10 U	5.0 U	7,300,000	10 U	5.0 U	20 U
RFS-SW-038 (SW104 – 11/18/09)	100 U	10 U	5.0 U	17	1.1 J	**32**	280,000	5.0 U	5.0 U	**7.2**	61 J	3.0 U	860,000	140	0.20 U	9.0	**11**	270,000	10 U	5.0 U	7,500,000	5.8 J	5.0 U	20 U

Table 7: Summary Analysis for Year 5 Surface Water
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University of California, Berkeley, Richmond Field Station, Richmond, California

	pH	Anions and Solids (mg/L)				
Sample ID (Location – Date)	**pH**	**Nitrate**	**Nitrite**	**Total Dissolved Solids**	**Total Kjeldahl Nitrogen**	**Phosphorus**
Surface Water Screening Criteria	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*
RFS-SW-031 (SW102 – 4/6/09)	8.2	0.52 J	1.0 U	26,700	1.0 U	0.16
RFS-SW-032 (SW101– 4/6/09)	8.2	0.53 J	1.0 U	25,800	1.0 U	0.11
RFS-SW-033 (SW103 – 4/6/09)	8.3	1.0 U	1.0 U	26,700	1.0 U	0.12
RFS-SW-034 (SW104 – 4/6/09)	8.3	0.90 J	1.0 U	25,200	1.0 U	0.099
RFS-SW-035 (SW102 – 11/18/09)	8.0	2.5 U	2.5 U	29,600	1.0 U	0.14
RFS-SW-036 (SW101 – 11/18/09)	8.0	2.5 U	2.5 U	31,400	1.0 U	0.091
RFS-SW-037 (SW103 – 11/18/09)	8.0	2.5 U	2.5 U	31,700	1.0 U	0.094
RFS-SW-038 (SW104 – 11/18/09)	8.0	2.5 U	2.5 U	31,300	1.0 U	0.11

Table 7: Summary Analysis for Year 5 Surface Water
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University of California, Berkeley, Richmond Field Station, Richmond, California

Sample ID and Location	PCB Congeners (ug/L)														
	PCB 1	PCB 2	PCB 3	PCB 4	PCB 5	PCB 6	PCB 7	PCB 8	PCB 9	PCB 10	PCB 11	PCB 12	PCB 13	PCB 14	PCB 15
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00033 J	0.00043 J	0.0005	0.0002 U	0.00043 J	0.0002 U	0.00033 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00032 J	0.00045 J	0.0005	0.0002 U	0.00045 J	0.0002 U	0.00032 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00035 J	0.0005 J	0.00059	0.0002 U	0.0005 J	0.0002 U	0.00035 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00037 J	0.00047 J	0.00059	0.0002 U	0.00047 J	0.0002 U	0.00037 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00023
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00049 J	0.0009 J	0.00094 J	0.00019 U	0.0009 J	0.00019 U	0.00049 J	0.00019 U	0.00026 J	0.00026 J	0.00019 U	0.00045
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00025 J	0.00042 J	0.00039	0.00019 U	0.00042 J	0.00019 U	0.00025 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00026
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00052 J	0.00085 J	0.00094	0.00019 U	0.00085 J	0.00019 U	0.00052 J	0.00019 U	0.00025 J	0.00025 J	0.00019 U	0.00045
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00038 J	0.00068 J	0.00063	0.00019 U	0.00068 J	0.00019 U	0.00038 J	0.00019 U	0.00024 J	0.00024 J	0.00019 U	0.00048

Sample ID and Location	PCB Congeners (ug/L)														
	PCB 16	PCB 17	PCB 18	PCB 19	PCB 20	PCB 21	PCB 22	PCB 23	PCB 24	PCB 25	PCB 26	PCB 27	PCB 28	PCB 29	PCB 30
RFS-SW-031 (SW102 – 4/6/09)	0.00045 J	0.00035	0.00072	0.0002 U	0.00022 J	0.00022 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00039	0.0002 U	0.00046	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0005 J	0.00038	0.00076	0.00022	0.00024 J	0.00024 J	0.0002 U	0.0002 U	0.0002 U	0.00021	0.00043	0.0002 U	0.00046	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.00057 J	0.00042	0.00086	0.00024	0.00026 J	0.00026 J	0.0002 U	0.0002 U	0.0002 U	0.00024	0.00048	0.0002 U	0.00059	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.00057 J	0.00043	0.00089	0.00024	0.00025 J	0.00025 J	0.0002 U	0.0002 U	0.0002 U	0.00028	0.00054	0.0002 U	0.00051	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.0024 J	0.0018	0.0032	0.00091	0.00099 J	0.00099 J	0.00049	0.00019 U	0.00061 J	0.00095	0.0019	0.00061 J	0.0021	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.0014 J	0.001	0.0017	0.00045	0.00054 J	0.00054 J	0.00029	0.00019 U	0.00033 J	0.00052	0.0011	0.00033 J	0.0012	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.0023 J	0.0018	0.0029	0.00088	0.00084 J	0.00084 J	0.00046	0.00019 U	0.00059 J	0.0009	0.0018	0.00059 J	0.0019	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.0025 J	0.0019	0.0029	0.00078	0.001 J	0.001 J	0.00054	0.00019 U	0.00059 J	0.0011	0.0021	0.00059 J	0.0024	0.00019 U	0.00019 U

Table 7: Summary Analysis for Year 5 Surface Water
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	PCB Congeners (ug/L)														
Sample ID and Location	**PCB 31**	**PCB 32**	**PCB 33**	**PCB 34**	**PCB 35**	**PCB 36**	**PCB 37**	**PCB 38**	**PCB 39**	**PCB 40**	**PCB 41**	**PCB 42**	**PCB 43**	**PCB 44**	**PCB 45**
RFS-SW-031 (SW102 – 4/6/09)	0.00075	0.00045 J	0.00022 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00025 J	0.0002 U	0.00058 J	0.00032	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.00088	0.0005 J	0.00024 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00028 J	0.0002 U	0.00063 J	0.00036	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.00091	0.00057 J	0.00026 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00031 J	0.0002 U	0.0007 J	0.00041	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.001	0.00057 J	0.00025 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00031 J	0.0002 U	0.00076 J	0.00041	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.0032	0.0024 J	0.00099 J	0.00019 U	0.00019 U	0.00019 U	0.00028	0.00019 U	0.00019 U	0.00019 U	0.00049 J	0.00028 J	0.0013 J	0.00071	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.0019	0.0014 J	0.00054 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00036 J	0.00019 U	0.0008 J	0.00044	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.0031	0.0023 J	0.00084	0.00019 U	0.00019 U	0.00019 U	0.00023	0.00019 U	0.00019 U	0.00019 U	0.00042 J	0.00023 J	0.0011 J	0.00061	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.0037	0.0025 J	0.001 J	0.00019 U	0.00019 U	0.00019 U	0.00037	0.00019 U	0.00019 U	0.0002	0.00065 J	0.00033 J	0.0016 J	0.00085	0.00019 U

	PCB Congeners (ug/L)														
Sample ID and Location	**PCB 46**	**PCB 47**	**PCB 48**	**PCB 49**	**PCB 50**	**PCB 51**	**PCB 52**	**PCB 53**	**PCB 54**	**PCB 55**	**PCB 56**	**PCB 57**	**PCB 58**	**PCB 59**	**PCB 60**
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00058 J	0.0002 U	0.0002 U	0.00055 J	0.0002 U	0.0002 U	0.0002 U	0.00028 J	0.0002 U	0.0002 U	0.0002 U	0.00028 J
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.00063 J	0.0002 U	0.0002 U	0.00061 J	0.00022	0.0002 U	0.0002 U	0.00028 J	0.0002 U	0.0002 U	0.0002 U	0.00028 J
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 J	0.0002 J	0.0007 J	0.0002 U	0.0002 U	0.00068 J	0.00025	0.0002 U	0.0002 U	0.0003 J	0.0002 U	0.0002 U	0.0002 U	0.0003 J
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.00024 J	0.00024 J	0.00076 J	0.0002 U	0.0002 U	0.00073 J	0.00026	0.0002 U	0.0002 U	0.00032 J	0.0002 U	0.0002 U	0.0002 U	0.00032 J
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00046 J	0.00046 J	0.0013 J	0.00019 U	0.00019 U	0.0013 J	0.00041	0.00019 U	0.00019 U	0.00056 J	0.00019 U	0.00019 U	0.00028 J	0.00056 J
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00031 J	0.00031 J	0.0008 J	0.00019 U	0.00019 U	0.00083 J	0.00024	0.00019 U	0.00019 U	0.00036 J	0.00019 U	0.00019 U	0.00019 U	0.00036 J
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00041 J	0.00041 J	0.0011 J	0.00019 U	0.00019 U	0.0012 J	0.00036	0.00019 U	0.00019 U	0.00048 J	0.00019 U	0.00019 U	0.00023 J	0.00048 J
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00062 J	0.00062 J	0.0016 J	0.00019 U	0.00019 U	0.0016 J	0.00045	0.00019 U	0.00019 U	0.00078 J	0.00019 U	0.00019 U	0.00033 J	0.00078 J

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Sample ID and Location	PCB Congeners (ug/L)														
	PCB 61	PCB 62	PCB 63	PCB 64	PCB 65	PCB 66	PCB 67	PCB 68	PCB 69	PCB 70	PCB 71	PCB 72	PCB 73	PCB 74	PCB 75
RFS-SW-031 (SW102 – 4/6/09)	0.00025 J	0.0002 U	0.0002 U	0.00025 J	0.0002 U	0.0003 J	0.0002 U	0.00025 J	0.0002 U	0.00044 J	0.00024 J	0.0002 U	0.00055 J	0.00025 J	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.00026 J	0.0002 U	0.0002 U	0.00028 J	0.0002 U	0.0003 J	0.0002 U	0.00028 J	0.0002 U	0.00047	0.00025	0.0002 U	0.00061 J	0.00026 J	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.00028 J	0.0002 U	0.0002 U	0.00031 J	0.0002 U	0.00034 J	0.0002 U	0.00031 J	0.0002 U	0.00051	0.00028	0.0002 U	0.00068 J	0.00028 J	0.0002 J
RFS-SW-034 (SW104 – 4/6/09)	0.0003 J	0.0002 U	0.0002 U	0.00031 J	0.0002 U	0.00035 J	0.0002 U	0.00031 J	0.0002 U	0.00053	0.00031	0.0002 U	0.00073 J	0.0003 J	0.00024 J
RFS-SW-035 (SW102 – 11/18/09)	0.00054 J	0.00019 U	0.00019 U	0.00049 J	0.00019 U	0.00068 J	0.00019 U	0.00049 J	0.00019 U	0.0011	0.0005	0.00019 U	0.0013 J	0.00054 J	0.00046 J
RFS-SW-036 (SW101 – 11/18/09)	0.00036 J	0.00019 U	0.00019 U	0.00036 J	0.00019 U	0.00046 J	0.00019 U	0.00036 J	0.00019 U	0.00071	0.00029	0.00019 U	0.00083 J	0.00036 J	0.00031 J
RFS-SW-037 (SW103 – 11/18/09)	0.00047 J	0.00019 U	0.00019 U	0.00042 J	0.00019 U	0.00059 J	0.00019 U	0.00042 J	0.00019 U	0.00094	0.00042	0.00019 U	0.0012 J	0.00047 J	0.00041 J
RFS-SW-038 (SW104 – 11/18/09)	0.00076	0.00019 U	0.00019 U	0.00065 J	0.00019 U	0.00097 J	0.00019 U	0.00065 J	0.00019 U	0.0015	0.00061	0.00019 U	0.0016 J	0.00076 J	0.00062 J

Sample ID and Location	PCB Congeners (ug/L)														
	PCB 76	PCB 77	PCB 78	PCB 79	PCB 80	PCB 81	PCB 82	PCB 83	PCB 84	PCB 85	PCB 86	PCB 87	PCB 88	PCB 89	PCB 90
RFS-SW-031 (SW102 – 4/6/09)	0.00042	0.000031	0.0002 U	0.0002 U	0.0003 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.00043	0.000028	0.0002 U	0.0002 U	0.0003 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.00048	0.00003	0.0002 U	0.0002 U	0.00034 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0005	0.000034	0.0002 U	0.0002 U	0.00035 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00068 J	0.00005 U	0.00019 U	0.00019 U	0.00068 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00029 J	0.00029 J	0.00019 U	0.0002 J	0.0002 J
RFS-SW-036 (SW101 – 11/18/09)	0.00046 J	0.000033 U	0.00019 U	0.00019 U	0.00046 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0002 J	0.0002 J	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00059 J	0.000043 U	0.00019 U	0.00019 U	0.00059 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00023 J	0.00023 J	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00097 J	0.000077 U	0.00019 U	0.00019 U	0.00097 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00029 J	0.00029 J	0.00019 U	0.0002 J	0.0002 J

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Sample ID and Location	PCB 91	PCB 92	PCB 93	PCB 94	PCB 95	PCB 96	PCB 97	PCB 98	PCB 99	PCB 100	PCB 101	PCB 102	PCB 103	PCB 104	PCB 105
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000068 J, B
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000059 J, B
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000059 J, B
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00007 J, B
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00028 J	0.00019 U	0.00028 J	0.00019 U	0.00029 J	0.00019 U	0.00023	0.00019 U	0.0002 J	0.00019 U	0.00019 U	0.00019 U	0.000087 J
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00022 J	0.00019 U	0.00022 J	0.00019 U	0.0002 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000063 J
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00023 J	0.00019 U	0.00023 J	0.00019 U	0.00023 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000065 J
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00027 J	0.00019 U	0.00027 J	0.00019 U	0.00029 J	0.00019 U	0.00024	0.00019 U	0.0002 J	0.00019 U	0.00019 U	0.00019 U	0.00015 J

Sample ID and Location	PCB 106	PCB 107	PCB 108	PCB 109	PCB 110	PCB 111	PCB 112	PCB 113	PCB 114	PCB 115	PCB 116	PCB 117	PCB 118	PCB 119	PCB 120
RFS-SW-031 (SW102 – 4/6/09)	0.00013 J, B	0.0002 U	0.0002 U	0.0002 U	0.00023 B	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.00013 J, B	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00021 B	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.00012 J, B	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00021 B	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.00012 J, B	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00023 B	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.00013 J, B	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00022 J	0.00019 U	0.00019 U	0.00019 U	0.00039	0.00029 J	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00029 J	0.00022 J	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00029	0.0002 J	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.0002 J	0.00016 J	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00032	0.00023 J	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00023 J	0.00018 J	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00038 J	0.00019 U	0.00019 U	0.00019 U	0.00039	0.00029 J	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00029 J	0.00038 J	0.00019 U	0.00019 U

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Sample ID and Location	PCB 121	PCB 122	PCB 123	PCB 124	PCB 125	PCB 126	PCB 127	PCB 128	PCB 129	PCB 130	PCB 131	PCB 132	PCB 133	PCB 134	PCB 135
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00029 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.0002 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00023 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00029 J	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U

Sample ID and Location	PCB 136	PCB 137	PCB 138	PCB 139	PCB 140	PCB 141	PCB 142	PCB 143	PCB 144	PCB 145	PCB 146	PCB 147	PCB 148	PCB 149	PCB 150
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U

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	PCB Congeners (ug/L)														
Sample ID and Location	**PCB 151**	**PCB 152**	**PCB 153**	**PCB 154**	**PCB 155**	**PCB 156**	**PCB 157**	**PCB 158**	**PCB 159**	**PCB 160**	**PCB 161**	**PCB 162**	**PCB 163**	**PCB 164**	**PCB 165**
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U

	PCB Congeners (ug/L)														
Sample ID and Location	**PCB 166**	**PCB 167**	**PCB 168**	**PCB 169**	**PCB 170**	**PCB 171**	**PCB 172**	**PCB 173**	**PCB 174**	**PCB 175**	**PCB 176**	**PCB 177**	**PCB 178**	**PCB 179**	**PCB 180**
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.00002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000028 B
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.00002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000021 B
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.00002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000024 B
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.00002 U	0.0002 U	0.00002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000028 B
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.000019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00004
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.000019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000031
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.000019 U	0.00019 U	0.000019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000026
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.000019 U	0.00019 U	0.000019 U	0.000036 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000084

Table 7: Summary Analysis for Year 5 Surface Water
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

	PCB Congeners (ug/L)														
Sample ID and Location	PCB 181	PCB 182	PCB 183	PCB 184	PCB 185	PCB 186	PCB 187	PCB 188	PCB 189	PCB 190	PCB 191	PCB 192	PCB 193	PCB 194	PCB 195
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U

	PCB Congeners (ug/L)													
Sample ID and Location	PCB 196	PCB 197	PCB 198	PCB 199	PCB 200	PCB 201	PCB 202	PCB 203	PCB 204	PCB 205	PCB 206	PCB 207	PCB 208	PCB 209
RFS-SW-031 (SW102 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-032 (SW101– 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-033 (SW103 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-034 (SW104 – 4/6/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-SW-035 (SW102 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-036 (SW101 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-037 (SW103 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-SW-038 (SW104 – 11/18/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U

Table 7: Summary Analysis for Year 5 Surface Water
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

	Total PCBs (ug/L)
Surface Water Screening Criteria	*0.03*
RFS-SW-031 (SW102 – 4/6/09)	0.01296
RFS-SW-032 (SW101– 4/6/09)	0.01427
RFS-SW-033 (SW103 – 4/6/09)	0.01665
RFS-SW-034 (SW104 – 4/6/09)	0.01735
RFS-SW-035 (SW102 – 11/18/09)	**0.048357**
RFS-SW-036 (SW101 – 11/18/09)	0.027184
RFS-SW-037 (SW103 – 11/18/09)	**0.042881**
RFS-SW-038 (SW104 – 11/18/09)	**0.05369**

Notes:

ug/L Microgram per liter
J Estimated Value
mg/L Milligram per liter
NC No criterion available
U Not Detected

Table 8: Summary Analysis for Year 5 Stormwater
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

	Total Metals (ug/L)																							
Sample ID (Location – Date)	**Aluminum**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
RFS-STW-020 (STW106 – 3/2/09)	1,100	0.74 J	0.97 J	26	1.0 U	1.0 U	9,700	2.9	1.0 U	20	910	2.3	3,400	26	0.16 J	0.96 J	4.8	1,700	1.0 U	1.0 U	12,000	1.0 U	3.9	99
RFS-STW-021 (STW107 – 3/2/09)	1,200	0.86 J	2.1	27	1.0 U	1.0 U	7,800	4.4	0.66 J	9.7	1,100	6.5	3,200	24	0.20 U	1.0 U	7.0	1,200	1.0 U	1.0 U	4,600	1.0 U	6.4	58
RFS-STW-022 (STW109 – 3/2/09)	1,400	1.0 U	1.6	53	1.0 U	1.0 U	14,000	3.4	1.0 U	15	960	2.0	3,700	10	0.10 J	1.0 U	11	2,900	1.0 U	1.0 U	8,400	1.0 U	11	32
RFS-STW-023 (STW110 – 3/2/09)	340	1.0 U	3.2	45	1.0 U	1.0 U	35,000	1.2	1.0 U	16	260	0.51 J	12,000	32	0.34	0.94 J	3.5	5,500	1.0 U	1.0 U	40,000	1.0 U	3.3	15
RFS-STW-024 (STW105 – 3/2/09)	1,200	0.62 J	2.7	39	1.0 U	1.0 U	21,000	3.7	0.98 J	34	1,300	6.1	4,300	67	0.51	0.64 J	6.2	2,900	0.70 J	1.0 U	12,000	1.0 U	9.4	210
RFS-STW-025 (STW108 – 3/2/09)	1,100	0.78 J	1.8	36	1.0 U	1.0 U	17,000	3.8	0.86 J	12	1,400	7.8	8,400	40	0.20 U	1.0 U	4.1	2,400	1.0 U	1.0 U	43,000	1.0 U	8.3	100
RFS-STW-026 (STW104 – 10/13/09)	5,200	5.9 J	12	77	2.0 U	5.0 U	6,100	16	5.6	35	9,100	57	5,500	190	0.25	5.0 U	21	3,200	10 U	5.0 U	20,000	10 U	22	290
RFS-STW-027 (STW108 – 10/13/09)	1,800	10 U	5.0 J	52	2.0 U	5.0 U	6,100	4.1 J	2.8 J	6.3	5,100	48	4,500	130	0.12 J	5.0 U	8.3	3,100	10 U	5.0 U	25,000	10 U	11	390
RFS-STW-028 (STW107 – 10/13/09)	300	10 U	3.0 J	23	2.0 U	5.0 U	4,700	5.0 U	5.0 U	9.1	460	4.2	1,600	38	0.20 U	5.0 U	2.9 J	1,400	10 U	5.0 U	3,200	10 U	5.0 U	67
RFS-STW-030 (STW106 – 10/13/09)	490	10 U	5.0 U	20	2.0 U	5.0 U	6,000	5.0 U	5.0 U	37	690	3.0 U	2,100	76	0.16 J	5.0 U	5.0 U	2,700	10 U	5.0 U	11,000	10 U	5.0 U	180
RFS-STW-032 (STW105 – 10/13/09)	300	5.8 J	5.0 U	21	2.0 U	5.0 U	9,100	5.0 U	5.0 U	22	520	3.6	1,900	190	0.20 U	5.0 U	5.0 U	3,400	10 U	5.0 U	7,600	10 U	5.0 U	180

Table 8: Summary Analysis for Year 5 Stormwater
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

	Filtered Metals (ug/L)																							
Sample ID (Location – Date)	**Aluminum**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
Surface Water Screening Criteria	*NC*	*NC*	*36*	*NC*	*NC*	*8.8*	*NC*	*50*	*NC*	*3.1*	*NC*	*5.6*	*NC*	*NC*	*0.94*	*NC*	*8.2*	*NC*	*71*	*0.19*	*NC*	*426*	*NC*	*81*
RFS-STW-020 (STW106 – 3/2/09)	210	1.0 U	0.77 J	24	1.0 U	1.0 U	9,400	1.5	1.0 U	**15**	700	0.75 J	3,000	14	0.20 U	0.83 J	3.7	1,400	1.0 U	1.0 U	11,000	1.0 U	5.5	**100**
RFS-STW-021 (STW107 – 3/2/09)	140	1.0 U	1.5	15	1.0 U	1.0 U	7,400	1.5	1.0 U	**7.6**	41 J	0.88 J	2,700	3.7	0.20 U	1.0 U	3.6	960	1.0 U	1.0 U	4,800	1.0 U	5.6	57
RFS-STW-022 (STW109 – 3/2/09)	490	1.0 U	1.4	63	1.0 U	1.0 U	13,000	2.6	1.0 U	**13**	380	1.0 J	3,500	7.7	0.10 J	1.0 U	**9.2**	2,700	1.0 U	1.0 U	8,200	1.0 U	7.6	61
RFS-STW-023 (STW110 – 3/2/09)	30 J	1.0 U	3.3	63	1.0 U	1.0 U	34,000	0.70 J	1.0 U	**13**	50 U	1.0 U	12,000	16	0.11 J	0.78 J	2.6	5,200	1.0 U	1.0 U	39,000	1.0 U	3.0	26
RFS-STW-024 (STW105 – 3/2/09)	140	1.0 U	2.4	30	1.0 U	1.0 U	19,000	7.1	1.0 U	**27**	120	1.6	3,600	34	0.32	1.4	4.2	2,500	0.50 J	1.0 U	11,000	1.0 U	5.9	**150**
RFS-STW-025 (STW108 – 3/2/09)	110	1.0 U	1.1	24	1.0 U	1.0 U	14,000	1.6	1.0 U	**10**	72	0.85 J	6,600	13	0.20 U	1.0 U	2.0	2,000	1.0 U	1.0 U	37,000	1.0 U	3.2	**84**
RFS-STW-026 (STW104 – 10/13/09)	200	0.64 J	2.2	4.2	1.0 U	1.0 U	2,900	1.7	1.0 U	**7.2**	280	2.1	2,400	11	**1.3**	1.1	1.5	2,600	1.0 U	1.0 U	27,000	1.0 U	3.6	48
RFS-STW-027 (STW108 – 10/13/09)	37 J	0.61 J	1.7	8.9	1.0 U	1.0 U	4,100	0.56 J	1.2	1.7	290	2.1	3,100	25	0.77	1.0 J	0.80 J	3,000	1.0 U	1.0 U	31,000	1.0 U	3.4	38
RFS-STW-028 (STW107 – 10/13/09)	50 U	1.0 U	1.0 U	3.1	1.0 U	1.0 U	1,800	0.67 J	1.0 U	**29**	29 J	0.67 J	360	6.6	0.20 U	1.0 U	1.0 U	420	1.0 U	1.0 U	3,100	1.0 U	0.85 J	79
RFS-STW-030 (STW106 – 10/13/09)	150	0.72 J	0.68 J	12	1.0 U	1.0 U	5,500	0.85 J	0.68 J	**25**	150	1.4	1,900	55	0.20 U	1.7	2.2	2,500	1.0 U	1.0 U	13,000	1.0 U	1.8	**150**
RFS-STW-032 (STW105 – 10/13/09)	130	0.50 J	1.5	16	1.0 U	1.0 U	10,000	1.1	0.98 J	**22**	160	4.2	2,100	180	0.13 J	0.95 J	2.5	3,900	1.1	1.0 U	11,000	1.0 U	1.8	**200**

Table 8: Summary Analysis for Year 5 Stormwater
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Sample ID (Location – Date)	**pH**
Surface Water Screening Criteria	*NC*
RFS-STW-020 (STW106 – 3/2/09)	6.8
RFS-STW-021 (STW107 – 3/2/09)	7.0
RFS-STW-022 (STW109 – 3/2/09)	6.7
RFS-STW-023 (STW110 – 3/2/09)	7.4
RFS-STW-024 (STW105 – 3/2/09)	6.8
RFS-STW-025 (STW108 – 3/2/09)	7.0
RFS-STW-026 (STW104 – 10/13/09)	7.3
RFS-STW-027 (STW108 – 10/13/09)	7.3
RFS-STW-028 (STW107 – 10/13/09)	6.6
RFS-STW-030 (STW106 – 10/13/09)	6.3
RFS-STW-032 (STW105 – 10/13/09)	6.3

Table 8: Summary Analysis for Year 5 Stormwater
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Sample ID and Location	PCB 1	PCB 2	PCB 3	PCB 4	PCB 5	PCB 6	PCB 7	PCB 8	PCB 9	PCB 10	PCB 11	PCB 12	PCB 13	PCB 14	PCB 15
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.00029	0.00019 U	0.00048	0.0038 J	0.0089 J	0.011 J	0.00022 J	0.0089 J	0.00022 J	0.0038 J	0.001	0.0049 J	0.0049 J	0.00019 U	0.0076
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00019 U	0.00019 U	0.00019 U	0.0003 J	0.00078 J	0.00081	0.00019 U	0.0078 J	0.00019 U	0.0003 J	0.00039	0.00041 J	0.00041 J	0.00019 U	0.00069
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.0002 U	0.00024 J	0.00052 J	0.00074	0.0002 U	0.00052 J	0.0002 U	0.00024 J	0.0002 U	0.00064 J	0.00064 J	0.0002 U	0.00082

Sample ID and Location	PCB 16	PCB 17	PCB 18	PCB 19	PCB 20	PCB 21	PCB 22	PCB 23	PCB 24	PCB 25	PCB 26	PCB 27	PCB 28	PCB 29	PCB 30
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00093 J	0.00019 U	0.00023	0.00029	0.00019 U	0.00019 U	0.00047	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00069	0.00019 U	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.021 J	0.014 J	0.029 J	0.0063	0.0093 J	0.0093 J	0.0056	0.00019 U	0.005 J	0.013 J	0.026 J	0.005 J	0.019 J	0.00019 U	0.00019 U
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0022 J	0.0013	0.0027	0.00047	0.0014 J	0.0014 J	0.001	0.00019 U	0.00047 J	0.0012	0.0022	0.00047	0.0034	0.00019 U	0.00019 U
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.007 J	0.0014	0.0031	0.0019	0.00067 J	0.00067 J	0.0032	0.0002 U	0.0013 J	0.0009	0.0027	0.0013 J	0.0046	0.0002 U	0.0002 U

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Sample ID and Location	PCB 31	PCB 32	PCB 33	PCB 34	PCB 35	PCB 36	PCB 37	PCB 38	PCB 39	PCB 40	PCB 41	PCB 42	PCB 43	PCB 44	PCB 45
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00033	0.00093 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00045	0.0015 J	0.00064	0.0019 J	0.0019	0.00057
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00039 J	0.0002 U	0.00052 J	0.00032	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.034 J	0.021 J	0.0093 J	0.00039	0.00023	0.00019 U	0.0031	0.00036	0.00019 U	0.0042	0.018 J	0.0082 J	0.04 J	0.022 J	0.0037
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0039	0.0022 J	0.0014 J	0.00019 U	0.00019 U	0.00019 U	0.0008	0.00019 U	0.00019 U	0.00076	0.0027 J	0.0015 J	0.0052 J	0.0037	0.00057
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0031	0.007 J	0.00067 J	0.0002 U	0.0002 U	0.0002 U	0.00061	0.0002 U	0.0002 U	0.0021	0.0061 J	0.0029 J	0.0088 J	0.0082	0.0023

Sample ID and Location	PCB 46	PCB 47	PCB 48	PCB 49	PCB 50	PCB 51	PCB 52	PCB 53	PCB 54	PCB 55	PCB 56	PCB 57	PCB 58	PCB 59	PCB 60
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00025	0.00043 J	0.00043 J	0.0019 J	0.00019 U	0.00019 U	0.0022 J	0.00062	0.00019 U	0.00019 U	0.0013 J	0.00019 U	0.00019 U	0.00064	0.0013 J
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.00052 J	0.0002 U	0.0002 U	0.00058 J	0.0002 U	0.0002 U	0.0002 U	0.00061 J	0.0002 U	0.0002 U	0.0002 U	0.00061 J
RFS-STW-026 (STW104 – 10/13/09)	0.0029	0.017 J	0.017 J	0.04 J	0.00019 U	0.004	0.045 J	0.011 J	0.00019 U	0.00019 U	0.023 J	0.00019 U	0.00073	0.0082 J	0.023 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00031	0.0023 J	0.0023 J	0.0052 J	0.00019 U	0.00034	0.0058 J	0.001	0.00019 U	0.00019 U	0.0044 J	0.00019 U	0.00019 U	0.0015 J	0.0044 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.00092	0.0026 J	0.0026 J	0.0088 J	0.0002 U	0.00075	0.01 J	0.0031	0.0002 U	0.0002 U	0.0057 J	0.0002 U	0.0002 U	0.0029 J	0.0057 J

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Sample ID and Location	PCB 61	PCB 62	PCB 63	PCB 64	PCB 65	PCB 66	PCB 67	PCB 68	PCB 69	PCB 70	PCB 71	PCB 72	PCB 73	PCB 74	PCB 75
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00079 J	0.00019 U	0.00019 U	0.0015 J	0.00019 U	0.00095 J	0.00019 U	0.0015 J	0.00019 U	0.00088	0.00065	0.00019 U	0.0022 J	0.00079 J	0.00043 J
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.00041 J	0.0002 U	0.0002 U	0.00039 J	0.0002 U	0.00059 J	0.0002 U	0.00039 J	0.0002 U	0.00091	0.0002 U	0.0002 U	0.00058 J	0.00041 J	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.013 J	0.00019 U	0.00078	0.0018 J	0.00019 U	0.025 J	0.00019 U	0.018 J	0.00019 U	0.035 J	0.014 J	0.00029	0.045 J	0.013 J	0.017 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0035 J	0.00019 U	0.00019 U	0.0027 J	0.00019 U	0.0048 J	0.00019 U	0.0027 J	0.00019 U	0.0062	0.002	0.00019 U	0.0058 J	0.0035 J	0.0023 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0035 J	0.0002 U	0.00024	0.0061 J	0.0002 U	0.0044 J	0.0002 U	0.0061 J	0.0002 U	0.0028	0.0032	0.0002 U	0.01 J	0.0035 J	0.0026 J

Sample ID and Location	PCB 76	PCB 77	PCB 78	PCB 79	PCB 80	PCB 81	PCB 82	PCB 83	PCB 84	PCB 85	PCB 86	PCB 87	PCB 88	PCB 89	PCB 90
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00095 J	0.00011 U	0.00019 U	0.00019 U	0.00095 J	0.000019 U	0.00023	0.00019 U	0.00042	0.00029 J	0.0012 J	0.0012 J	0.00019 U	0.00085 J	0.00085 J
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.00059 J	0.000075 U	0.0002 U	0.0002 U	0.00059 J	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00055 J	0.00055 J	0.0002 U	0.00036 J	0.00036 J
RFS-STW-026 (STW104 – 10/13/09)	0.025 J	0.0028 U	0.00019 U	0.00019 U	0.025 J	0.00018 U	0.0035	0.0011 J	0.0057	0.0044 J	0.016 J	0.016 J	0.00019 U	0.01 J	0.01 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0048 J	0.00065 U	0.00019 U	0.00019 U	0.0048 J	0.000048 U	0.00084	0.00023 J	0.0011	0.001 J	0.0037 J	0.0037 J	0.00019 U	0.0023 J	0.0023 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0044 J	0.00037 U	0.0002 U	0.0002 U	0.0044 J	0.000036 U	0.00067	0.0002 U	0.0012	0.00069 J	0.0027 J	0.0027 J	0.0002 U	0.0015 J	0.0015 J

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Sample ID and Location	PCB 91	PCB 92	PCB 93	PCB 94	PCB 95	PCB 96	PCB 97	PCB 98	PCB 99	PCB 100	PCB 101	PCB 102	PCB 103	PCB 104	PCB 105
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00022	0.00021	0.0011 J	0.00019 U	0.0011 J	0.00019 U	0.0012 J	0.00019 U	0.00066	0.00019 U	0.00085 J	0.00019 U	0.00019 U	0.00019 U	0.00053 J
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.00038 J	0.0002 U	0.00038 J	0.0002 U	0.0005 J	0.0002 U	0.00035	0.0002 U	0.00036 J	0.0002 U	0.0002 U	0.0002 U	0.00029 J
RFS-STW-026 (STW104 – 10/13/09)	0.0042	0.0032	0.013 J	0.00019 U	0.013 J	0.00036	0.016 J	0.0017 J	0.011 J	0.00019 U	0.01 J	0.0017 J	0.00022	0.00019 U	0.0056 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0008	0.00067	0.0026 J	0.00019 U	0.0026 J	0.00019 U	0.0037 J	0.00021 J	0.0025	0.00019 U	0.0023 J	0.00021 J	0.00019 U	0.00019 U	0.0014 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.00063	0.0004	0.0024 J	0.0002 U	0.0024 J	0.0002 U	0.0027 J	0.00026 J	0.0015	0.0002 U	0.0015 J	0.00026 J	0.0002 U	0.0002 U	0.00087 J

Sample ID and Location	PCB 106	PCB 107	PCB 108	PCB 109	PCB 110	PCB 111	PCB 112	PCB 113	PCB 114	PCB 115	PCB 116	PCB 117	PCB 118	PCB 119	PCB 120
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.001 J	0.00019 U	0.00019 U	0.00019 U	0.0017	0.0012 J	0.00019 U	0.00019 U	0.000022	0.00019 U	0.00019 U	0.0012 J	0.001 J	0.00019 U	0.00029 J
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.00042 J	0.0002 U	0.0002 U	0.0002 U	0.00071	0.00055 J	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.00055 J	0.00042 J	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.01 J	0.0015 J	0.0015 J	0.0011 J	0.018 J	0.016 J	0.00019 U	0.00019 U	0.00031	0.00056 J	0.00056 J	0.016 J	0.01 J	0.00063	0.0044 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.0024 J	0.00035 J	0.00035 J	0.00023 J	0.0046	0.0037 J	0.00019 U	0.00019 U	0.000062	0.00019 U	0.00019 U	0.0037 J	0.0024 J	0.00019 U	0.001 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0014 J	0.0002 U	0.0002 U	0.0002 U	0.0029	0.0027 J	0.0002 U	0.0002 U	0.000045	0.0002 U	0.0002 U	0.0027 J	0.0014 J	0.0002 U	0.00069 J

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Sample ID and Location	PCB 121	PCB 122	PCB 123	PCB 124	PCB 125	PCB 126	PCB 127	PCB 128	PCB 129	PCB 130	PCB 131	PCB 132	PCB 133	PCB 134	PCB 135
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.000037 U	0.00019 U	0.0012 J	0.000019 U	0.00053 J	0.00017	0.00019 U	0.00019 U	0.00019 U	0.00027 J	0.00019 U	0.00019 U	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.00055 J	0.00002 U	0.00029 J	0.000039	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.00019 U	0.00024	0.00025 U	0.00055	0.016 J	0.000053	0.0056 J	0.00084	0.00031	0.00037	0.00019 U	0.0015 J	0.00019 U	0.00034	0.00095 J
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00019 U	0.00019 U	0.000065 U	0.00019 U	0.0037 J	0.00002	0.0014 J	0.00027	0.00019 U	0.00019 U	0.00019 U	0.0004 J	0.00019 U	0.00019 U	0.00027 J
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.000036 U	0.0002 U	0.0027 J	0.0002 U	0.0087 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00023 J	0.0002 U	0.0002 U	0.0002 U

Sample ID and Location	PCB 136	PCB 137	PCB 138	PCB 139	PCB 140	PCB 141	PCB 142	PCB 143	PCB 144	PCB 145	PCB 146	PCB 147	PCB 148	PCB 149	PCB 150
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.00086 J	0.00057 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00057 J	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.00023 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.00077	0.0003	0.0063 J	0.005 J	0.00019 U	0.0011	0.00019 U	0.00019 U	0.0095 J	0.00019 U	0.00089	0.00019 U	0.00019 U	0.005 J	0.00019 U
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00019 U	0.00019 U	0.002 J	0.0014 J	0.00019 U	0.00034	0.00019 U	0.00019 U	0.00027 J	0.00019 U	0.00025	0.00019 U	0.00019 U	0.0014 J	0.00019 U
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.00087 J	0.00063 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00063 J	0.0002 U

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Sample ID and Location	PCB 151	PCB 152	PCB 153	PCB 154	PCB 155	PCB 156	PCB 157	PCB 158	PCB 159	PCB 160	PCB 161	PCB 162	PCB 163	PCB 164	PCB 165
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.00052	0.00019 U	0.00019 U	0.000091	0.000021	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00086 J	0.00086 J	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00023 J	0.00023 J	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.0013	0.00019 U	0.0055	0.00019 U	0.00019 U	0.00048	0.00011	0.00065 J	0.00019 U	0.00065 J	0.00019 U	0.00019 U	0.0063 J	0.0063 J	0.00019 U
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00033	0.00019 U	0.0016	0.00019 U	0.00019 U	0.00015	0.000037	0.0002 J	0.00019 U	0.0002 J	0.00019 U	0.00019 U	0.002 J	0.002 J	0.00019 U
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.00069	0.0002 U	0.0002 U	0.000069	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00087 J	0.00087 J	0.0002 U

Sample ID and Location	PCB 166	PCB 167	PCB 168	PCB 169	PCB 170	PCB 171	PCB 172	PCB 173	PCB 174	PCB 175	PCB 176	PCB 177	PCB 178	PCB 179	PCB 180
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00003	0.00027 J	0.000019 U	0.00011 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00017
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.00002 U	0.0002 U	0.00002 U	0.000046 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00011
RFS-STW-026 (STW104 – 10/13/09)	0.00019 U	0.00024	0.0015 J	0.000019 U	0.0014 J	0.00042	0.00019 U	0.00019 U	0.0013	0.00019 U	0.00019 U	0.00096	0.0003	0.00061	0.0032
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00019 U	0.000071	0.0004 J	0.000019 U	0.00043 J	0.00019 U	0.00019 U	0.00019 U	0.00039	0.00019 U	0.00019 U	0.00028	0.00019 U	0.00019 U	0.001
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.000028	0.00023 J	0.00002 U	0.00014 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00032

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Sample ID and Location	PCB 181	PCB 182	PCB 183	PCB 184	PCB 185	PCB 186	PCB 187	PCB 188	PCB 189	PCB 190	PCB 191	PCB 192	PCB 193	PCB 194	PCB 195
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.000019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.00019 U	0.00085 J	0.001	0.00019 U	0.00019 U	0.00019 U	0.00085 J	0.00019 U	0.000048	0.0014 J	0.00019 U	0.00019 U	0.00019 U	0.00082	0.0002
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00019 U	0.0003 J	0.00028	0.00019 U	0.00019 U	0.00019 U	0.0003 J	0.00019 U	0.00019 U	0.00043 J	0.00019 U	0.00019 U	0.00019 U	0.00022	0.00019 U
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U

Sample ID and Location	PCB 196	PCB 197	PCB 198	PCB 199	PCB 200	PCB 201	PCB 202	PCB 203	PCB 204	PCB 205	PCB 206	PCB 207	PCB 208	PCB 209
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
RFS-STW-026 (STW104 – 10/13/09)	0.0011 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00082	0.00019 U	0.0011 J	0.00019 U	0.00019 U	0.00058	0.00019 U	0.00019 U	0.00035
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	0.00028 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00026	0.00019 U	0.00028 J	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U

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	Total PCBs (ug/L)
Surface Water Screening Criteria	*0.03*
RFS-STW-020, 021, 023, 024 (STW106, 107, 110, 105 – 3/2/09)	**0.055933**
RFS-STW-022, 025 (STW109, 108 – 3/2/09)	0.000156
RFS-STW-026 (STW104 – 10/13/09)	**1.130881**
RFS-STW-027, 028 (STW108, 107 – 10/13/09)	**0.19759**
RFS-STW-030, 032 (STW106, 105 – 10/13/09)	**0.221882**

Notes:
ug/L Microgram per liter
J Estimated Value
NC No criterion available
U Not Detected

Table 9: Summary Analysis for Year 5 Sediment

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Sample Location	**Metals**																							
	Aluminum	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
ER-M Value *E-SSTL Value*	*NC* *NC*	*25* *NC*	*70* *688*	*NC* *NC*	*NC* *NC*	*9.6* *57*	*NC* *NC*	*370* *NC*	*NC* *NC*	*270* *630*	*NC* *NC*	*218* *576*	*NC* *NC*	*NC* *NC*	*0.71* *3.8*	*NC* *NC*	*51.6* *2,778*	*NC* *NC*	*NC* *16*	*3.7* *NC*	*NC* *NC*	*NC* *NC*	*NC* *NC*	*410* *5,378*
RFS-SED-017 (SED102 – 4/6/09)	21,000	0.38 J	16	46	0.58	0.55	3,400	75	14	74	37,000	43	11,000	430	**1.6**	1.4	**79**	3,700	1.1	0.37 J	14,000	0.27 J	63	180
RFS-SED-018 (SED103 – 4/6/09)	25,000	0.54 J	34	59	0.66 J	1.0	3,500	95	16	120	51,000	73	13,000	610	**2.7**	1.6	**96**	4,800	1.6	0.54 J	15,000	0.71 U	78	310
RFS-SED-019 (SED101 – 4/6/09)	25,000	0.47 J	36	64	0.71 J	0.87	3,700	88	17	100	53,000	56	13,000	350	**3.5**	2.2	**92**	4,500	1.3	0.43 J	17,000	0.83 J	73	280
RFS-SED-019Z (SED102 – 11/18/09)	26,000	3.2	16	51	0.60	1.2	3,300	85	13	88	36,000	48	13,000	240	**2.0**	1.5	**81**	4,700	< 1.1	0.74	15,000	1.1 U	74	230
RFS-SED-020 (SED101– 11/18/09)	27,000	4.9	37	62	0.62	1.4	4,200	93	25	110	45,000	62	13,000	380	**3.6**	3.5	**110**	4,100	< 1.5	0.75 J	10,000	1.5 U	82	310
RFS-SED-021 (SED103 – 11/18/09)	26,000	4.9	31	55	0.59	1.5	3,200	89	15	110	44,000	63	13,000	260	**2.5**	3.8	**83**	5,000	< 1.6	0.77 J	22,000	1.6 U	80	300

Table 9: Summary Analysis for Year 5 Sediment
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Sample ID (Location – Date)	Polychlorinated biphenyls (mg/kg)							pH
	Aroclor-1016	**Aroclor-1221**	**Aroclor-1232**	**Aroclor-1242**	**Aroclor-1248**	**Aroclor-1254**	**Aroclor-1260**	**pH**
ER-M Value *E-SSTL Value*	*0.18* *4.2*	*NC* *NC*	*NC* *NC*	*NC* *NC*	*0.18* *5.9*	*0.18* *24*	*NC* *NC*	*NC* *NC*
RFS-SED-017 (SED102 – 4/6/09)	0.023 U	0.045 U	0.023 U	0.023 U	0.11	0.068	0.024	7.3
RFS-SED-018 (SED103 – 4/6/09)	0.034 U	0.069 U	0.034 U	0.034 U	**0.27**	0.14	0.047	7.4
RFS-SED-019 (SED101 – 4/6/09)	0.040 U	0.080 U	0.040 U	0.040 U	**0.35**	0.15	0.04 J	7.2
RFS-SED-019Z (SED102 – 11/18/09)	0.026 U	0.051 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	7.2
RFS-SED-020 (SED101– 11/18/09)	0.036 U	0.073 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	6.6
RFS-SED-021 (SED103 – 11/18/09)	0.039 U	0.077 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	7.2

Notes:
ER-M Effects range-median
E-SSTL Ecological site-specific target level
J Estimated Value
mg/kg Milligrams per kilogram
NC No criterion available
U Not Detected

Table 10: Vigor of Planted Stock at WSMRP Site Quadrats

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Transect	Quadrat	Height (inches)[a]	Score[b]
Planted Stock in WSMRP Site			
A	A-1	0	Bare Ground
	A-2	18	Good
	A-3	21	Excellent
	A-4	9	Good
	A-5	41	Excellent
	A-6	Not Measured	Not Measured
A'	A'-1	27	Excellent
	A'-2	9	Excellent
	A'-3	5	Excellent
B	B-1	26	Excellent
	B-2	8	Excellent
	B-3	8	Excellent
	B-4	10	Excellent
	B-5	9	Excellent
	B-6	9	Good
	B-7	11	Excellent
C	C-0	25	Fair
	C-1	7	Excellent
	C-2	7	Excellent
	C-3	0	Bare Ground
	C-4	9	Excellent
	C-5	6	Excellent
	C-6	8	Excellent
D	D-0	15	Excellent
	D-1	2	Excellent
	D-2	7	Excellent
	D-3	2	Bare Ground
	D-4	9	Excellent
	D-5	10	Excellent
	D-6	9	Excellent
	D-7	18	Excellent
E	E-0	6	Excellent
	E-1	3	Excellent
	E-2	Not Measured	Not Measured
	E-3	11	Excellent
	E-4	8	Excellent
	E-5	19	Excellent
	E-6	5	Excellent
	E-7	5	Excellent

Table 10: Vigor of Planted Stock at WSMRP Site Quadrats (Continued)

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Transect	Quadrat	Height (inches)[a]	Score[b]
E	E-8	26	Excellent
	E-9	38	Excellent
	E-10	8	Excellent
F	F-0	Not Measured	Not Measured
	F-1	7	Excellent
	F-2	6	Excellent
	F-3	9	Excellent
	F-4	8	Excellent
G	G-1	9	Excellent
	G-2	20	Excellent
	G-3	8	Excellent
	G-4	3	Excellent

Notes:

a Average height of dominant plant species in the quadrat was measured.
b See Table 3 for plant vigor definitions.

NA Not available
WSMRP Western Stege Marsh Restoration Project

Table 11: Frequency of Monitoring Efforts over the 5-Year Monitoring Interval

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

	Year 1		Year 2		Year 3		Year 4		Year 5	
Monitoring Activity	**Spring 2004**	**Fall 2004**	**Spring 2005**	**Fall 2006**	**Spring 2007**	**Fall 2007**	**Spring 2008**	**Fall 2008**	**Spring 2009**	**Fall 2009**
Establishment of Transects, Quadrats, Cross-Section Locations, and Pressure Transducer	a									
Project Target #1										
Tidal Inundation	b	b		b	b	b	c	c	c	c
Marsh Elevation (Land Survey)	d	•		•		•		•		•
Marsh Elevation (Aerial Survey)							•			g
Project Target #2										
Surface Water Sampling				•	•	•	•	•	•	•
Sediment Sampling				•	•	•	•	•	•	•
Stormwater Sampling				•	•	•	•	•	•	•
Project Target #3										
Vegetation Quadrat Surveys (Ecotone Quadrats Only)					•		•		•	
Vegetation Quadrat Surveys (All Quadrats)		•		•		•		•		•
Vegetation Dominance Mapping		•		•		•		•		•
Project Target #4										
Vegetation Quadrat Surveys (Ecotone Quadrats Only)					•		•		•	
Vegetation Quadrat Surveys (All Quadrats)		•		•		•		•		•
Vegetation Dominance Mapping		•		•		•		•		•
California Clapper Rail Use			e		e		e		e	
Photodocumentation		•		•	•	•	•	•	•	•
Annual Monitoring Report					f		f		f	

Notes:

a Transects, quadrats, slough cross-section locations, and the pressure transducer were established in summer 2004.

b Data regarding tidal inundation were collected continuously at 15-minute intervals using a pressure transducer or through visual observations.

c Data regarding tidal inundation for Year 4 and 5 will be collected continuously at 15-minute intervals through visual observations.

d Baseline data regarding marsh elevation were collected following establishment of the transects, quadrats, and slough cross-section locations.

e Protocol surveys of California clapper rail use of Western Stege Marsh will occur between January and April each year.

f An annual report will be submitted to the appropriate agencies during the year following completion of the previous year's monitoring activities (the annual report for the fifth year of the program will be submitted in 2010).

g An aerial survey was performed in 2008. It is unlikely that another aerial survey would yield any additional useful information two years later. Additionally, most of the interpretation of the marsh evolution is based on land surveys.

APPENDIX A

ANALYTICAL SAMPLING RESULTS

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	DISSOLVED METALS (Filtrate) (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SW101	10/30/2006	100U	60U	15	38	1J	5U	10U	20U	6.1J	100U	3U	930J	.13UJ	20U	20U	5U	3.2J	9.4UJ	10U	20U
	05/31/2007	NA	.65UJ	6.2	39	1U	1U	4.4	2.1	70	550	4.8	NA	.2U	8.1	4.1	1U	1U	1U	4.9	110
	01/25/2008	100U	1U	25U	34	1U	1U	1U	3.1	2.1	58J	1U	2800	.2U	2.6J	3.3	1U	1U	1U	.53J	34
	06/09/2008	100U	60U	4.7J	23	2U	4U	10U	20U	10U	100U	3U	43	.2U	20U	20U	5U	5U	5U	10U	20U
	11/25/2008	NA	1U	3	28	1U	1U	1U	1U	3.2	50U	1U	NA	.2U	8	1.2	.62J	1U	1U	1.8	11
	04/06/2009	50U	1U	3	32	1U	1U	1U	1U	2.9	50U	1U	150	.2U	6.6	1.8	.56J	1U	1U	2	30
	11/18/2009	100U	10U	5U	17	2U	6.3	5U	5U	6.7	100U	3U	74	.2U	5.5	4.2J	10U	5U	10U	5U	20U
SW102	10/30/2006	100U	60U	15	54	2U	5U	10U	20U	10U	100U	2.7UJ	2600J	.2U	20U	20U	5U	5U	8.4UJ	10U	12J
	05/31/2007	NA	.77UJ	7.6	58	1U	1U	1.9	1.8	13	710	2.3	NA	.2U	4.9J	4.2	1U	1U	1U	7	44
	01/25/2008	100U	1U	4.8	17	1U	1U	1U	.98J	4.6	57J	.93J	570	.11J	5U	2.4	1U	1U	1U	1.3	97
	06/09/2008	100U	60U	6.4	27	2U	4U	10U	20U	10U	62J	3U	45	.2U	20U	20U	5U	5U	5U	10U	20U
	11/25/2008	NA	1U	2.5	33	1U	1U	1U	1U	4.9	31J	1U	NA	.2U	6.9	1.5	.67J	1U	1U	1.8	18
	04/06/2009	300	1U	3.1	30	1U	1U	.65J	1U	3.1	270	1U	140	.2U	7.1	1.8	.83J	1U	1U	1.7	17
	11/18/2009	100U	10U	5	21	2U	5U	5.1	5U	3.9J	100U	3.1U	68	.2U	3.7J	5U	10U	5U	10U	2.6J	20U
SW103	10/30/2006	100U	60U	18	41	2U	5U	10U	20U	10U	100U	3U	1200J	.2U	20U	20U	5U	5U	7.3UJ	10U	20U
	05/31/2007	NA	.66UJ	7.3	44	1U	1U	7.1	2.3	8.8	620	3.5	NA	.2U	7.4	4.6	.73UJ	1U	1U	6.2	58
	01/25/2008	100U	1U	1.9	29	1U	1U	.69J	1.6	.7J	100U	1U	1900	.2U	3.7J	2.1	1U	1U	1U	1U	31
	06/09/2008	100U	60U	5.2	22	2U	4U	10U	20U	10U	67J	3U	37	.2U	20U	20U	5U	5U	5U	10U	20U
	11/25/2008	NA	1U	2.9	34	1U	1U	1U	1U	3	51J	1U	NA	.2U	7.6	2.2	.88J	1U	1U	1.9	16
	04/06/2009	50U	1U	2.9	33	1U	1U	.51J	1U	2.3	50U	1U	110	.2U	6.7	1.5	1.1	1U	1U	1.8	20
	11/18/2009	100U	10U	5U	25	1.2J	18	5U	5U	8.5	64J	3U	130	.2U	9.4	8.5	10U	5U	10U	5U	20U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	DISSOLVED METALS (Filtrate) (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SW104	10/30/2006	100U	60U	9.1	43	2U	5U	10U	20U	7.4J	100U	3U	86J	.2U	20U	20U	5U	5U	4.8UJ	10U	13J
	05/31/2007	NA	1U	3.5	40	1U	1U	4.2	1.4	14	270	2.7	NA	.2U	6.9	2.3	1U	1U	1U	4.8	66
	01/25/2008	100U	1U	2.5	32	1U	1U	.54J	1U	1.2	100U	1U	96	.15J	4.8J	1U	1U	1U	1U	2	29
	06/09/2008	100U	60U	3.5J	17	2U	4U	10U	20U	10U	57J	3U	25	.2U	20U	20U	5U	5U	5U	10U	20U
	11/25/2008	NA	.55J	2.5	37	1U	1U	.85J	1U	2.5	48J	.76J	NA	.2U	7.2	1.4	.68J	1U	1U	3	20
	04/06/2009	50U	1U	3	30	1U	1U	.54J	1U	2.2	50U	1U	75	.2U	6.6	1.2	.55J	1U	1U	2	8.3
	11/18/2009	100U	10U	5U	17	1.1J	32	5U	5U	7.2	61J	3U	140	.2U	9	11	10U	5U	5.8J	5U	20U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	TOTAL METALS (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SW101	01/25/2008	13000	60U	16	79	1.5J	5U	38	20U	48	19000	25	3400	1.1	20U	40	5U	5U	5U	37	180
	06/09/2008	700	60U	5.4	25	2U	5U	10U	20U	7J	550	3U	53	.2U	20U	20U	5U	5U	5U	6J	20U
	11/25/2008	NA	1U	2.9	28	1U	1U	1.1	1U	1.6	390	1U	NA	.2U	8	2	1U	1U	1U	2.8	10
	04/06/2009	440	1U	3.1	28	1U	1U	1.5	1U	3.8	450	.66J	190	.2U	50U	2.6	.87J	1U	1U	2.9	9.9
	11/18/2009	100U	10U	5U	16	2U	5U	4.4J	5U	4.2J	400	3.1U	56	.2U	5.1	5U	10U	5U	10U	5U	21
SW102	01/25/2008	2500	60U	3.8J	31	2U	5U	6.5J	20U	13	8700	4.6	700	1.9	20U	10J	5U	5U	5U	7.1J	110
	06/09/2008	500	60U	5.6	27	2U	5U	10U	20U	5.7J	520	3U	52	.2U	20U	20U	5U	5U	5U	6.4J	20U
	11/25/2008	NA	.5J	3	35	1U	1U	1.2	1U	2.2	340	1U	NA	.2U	7.4	2	1U	1U	1U	2.7	8
	04/06/2009	900	1U	4.3	31	1U	1U	2.6	.74J	6.5	1300	1.9	150	.2U	6.8	3.5	.67J	1U	1U	4.6	92
	11/18/2009	210	10U	5U	22	2U	5U	5U	5U	5U	330	3U	78	.2U	5.7	4.8J	10U	5U	10U	5U	20U
SW103	01/25/2008	15000	60U	17	73	2U	5U	43	20U	55	21000	28	2500	.35	20U	42	5U	5U	5U	41	150
	06/09/2008	470	60U	5.3	25	2U	5U	10U	20U	5.4J	520	3U	44	.2U	20U	20U	5U	5U	5U	5.6J	20U
	11/25/2008	NA	1U	3.3	34	1U	1U	1.5	1U	2.3	550	.58J	NA	.2U	7.9	2.6	.6J	1U	1U	3.1	13
	04/06/2009	580	1U	3.6	28	1U	1U	1.8	.5J	4.3	640	.82J	130	.2U	6.7	2.6	.76J	1U	1U	3.4	15
	11/18/2009	160	10U	5U	20	2U	5U	5U	5U	5U	190	3U	73	.2U	4.8J	3.9J	10U	5U	10U	5U	20U
SW104	01/25/2008	2700	60U	4.2J	44	2U	5U	7.8J	20U	9J	3100	5.1	130	.2U	20U	20U	5U	5U	5U	9.1J	40
	06/09/2008	560	60U	3.8J	19	2U	5U	10U	20U	10U	630	3U	37	.2U	20U	20U	5U	5U	5U	10U	20U
	11/25/2008	NA	1U	2.8	38	1U	1U	3.6	1U	1.7	640	1.1	NA	.2U	7	2.2	1U	1U	1U	4	12
	04/06/2009	690	1U	3.3	25	1U	1U	1.9	1U	3.5	620	.92J	79	.2U	7.1	2.7	.56J	1U	1U	3.5	9.2
	11/18/2009	180	10U	5U	18	2U	5U	5U	5U	5U	270	3U	44	.2U	5.9	3.7J	10U	5U	10U	5U	13J

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PESTICIDES (ug/L)																		
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Alpha-BHC	Alpha-Chlordane	Beta-BHC	Butylate	Chlordane	Cycloate	Delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Endrin Ketone	EPTC
SW101	10/30/2006	.0008UJ	.0007U	.0084U	.0006U	.0005U	.0006U	.0008U	.0089U	.0024U	.0055U	.0007U	.0006U	.0008U	.0009U	.0006U	.0026U	.0009U	.005U	.015U
SW102	10/30/2006	.0008UJ	.0007UJ	.017UJ	.0006UJ	.0005UJ	.0006UJ	.0008UJ	.0089UJ	.0024UJ	.0055UJ	.0007UJ	.0006UJ	.0008UJ	.0009UJ	.0006UJ	.0026UJ	.0009UJ	.005UJ	.015UJ
SW103	10/30/2006	.0008UJ	.0007UJ	.017U	.0006U	.0005U	.0006U	.0008U	.0089U	.0024U	.0055U	.0007U	.0006U	.0008U	.0009U	.0006U	.0026U	.0009U	.005U	.015U
SW104	10/30/2006	.0008UJ	.0007U	.0084U	.0006U	.0005U	.0006U	.0008U	.0089U	.0024U	.0055U	.0007U	.0006U	.0008U	.0009U	.0006U	.0026U	.0009U	.005U	.015U

Location ID	Date Collected	PESTICIDES (ug/L)											
		Eonofos	Gamma-BHC (Lindane)	Gamma-Chlordane	Heptachlor	Heptachlor Epoxide	Methoxychlor	Mirex	Molinate	Napropamide	Pebulate	Toxaphene	Vernolate
SW101	10/30/2006	.5U	.0008U	.0008U	.0005U	.0006U	.0012UJ	NA	.01U	.02U	.0081U	.028U	.016U
SW102	10/30/2006	.5UJ	.0008UJ	.0008UJ	.0005UJ	.0006UJ	.0012UJ	NA	.01UJ	.04UJ	.0081UJ	.028UJ	.016UJ
SW103	10/30/2006	.5U	.0008U	.0008U	.0005U	.0006U	.0012UJ	NA	.01U	.04U	.0081U	.028U	.016U
SW104	10/30/2006	.5U	.0008U	.0008U	.0005U	.0006U	.0012U	NA	.01U	.02U	.0081U	.028U	.016U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-1	PCB-2	PCB-3	PCB-4	PCB-5	PCB-6	PCB-7	PCB-8	PCB-9	PCB-10	PCB-11	PCB-12	PCB-13	PCB-14	PCB-15	PCB-16	PCB-17	PCB-18	PCB-19	PCB-20
SW101	04/06/2009	.0002U	.0002U	.0002U	.00032	.00045	.0005	.0002U	.00045	.0002U	.00032	.0002U	.0002U	.0002U	.0002U	.0002U	.0005	.00038	.00076	.00022	.00024
	11/18/2009	.00019U	.00019U	.00019U	.00025	.00042	.00039	.00019U	.00042	.00019U	.00025	.00019U	.00019U	.00019U	.00019U	.00026	.0014	.001	.0017	.00045	.00054
SW102	04/06/2009	.0002U	.0002U	.0002U	.00033	.00043	.0005	.0002U	.00043	.0002U	.00033	.0002U	.0002U	.0002U	.0002U	.0002U	.00045	.00035	.00072	.0002U	.00022
	11/18/2009	.00019U	.00019U	.00019U	.00049	.0009	.00094	.00019U	.0009	.00019U	.00049	.00019U	.00026	.00026	.00019U	.00045	.0024	.0018	.0032	.00091	.00099
SW103	04/06/2009	.0002U	.0002U	.0002U	.00035	.0005	.00059	.0002U	.0005	.0002U	.00035	.0002U	.0002U	.0002U	.0002U	.0002	.00057	.00042	.00086	.00024	.00026
	11/18/2009	.00019U	.00019U	.00019U	.00052	.00085	.00094	.00019U	.00085	.00019U	.00052	.00019U	.00025	.00025	.00019U	.00045	.0023	.0018	.0029	.00088	.00084
SW104	04/06/2009	.0002U	.0002U	.0002U	.00037	.00047	.00059	.0002U	.00047	.0002U	.00037	.0002U	.0002U	.0002U	.0002U	.00023	.00057	.00043	.00089	.00024	.00025
	11/18/2009	.00019U	.00019U	.00019U	.00038	.00068	.00063	.00019U	.00068	.00019U	.00038	.00019U	.00024	.00024	.00019U	.00048	.0025	.0019	.0029	.00078	.001

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-21	PCB-22	PCB-23	PCB-24	PCB-25	PCB-26	PCB-27	PCB-28	PCB-29	PCB-30	PCB-31	PCB-32	PCB-33	PCB-34	PCB-35	PCB-36	PCB-37	PCB-38	PCB-39	PCB-40
SW101	04/06/2009	.00024	.0002U	.0002U	.0002U	.00021	.00043	.0002U	.00046	.0002U	.0002U	.00088	.0005	.00024	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00054	.00029	.00019U	.00033	.00052	.0011	.00033	.0012	.00019U	.00019U	.0019	.0014	.00054	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW102	04/06/2009	.00022	.0002U	.0002U	.0002U	.0002U	.00039	.0002U	.00046	.0002U	.0002U	.00075	.00045	.00022	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00099	.00049	.00019U	.00061	.00095	.0019	.00061	.0021	.00019U	.00019U	.0032	.0024	.00099	.00019U	.00019U	.00019U	.00028	.00019U	.00019U	.00019U
SW103	04/06/2009	.00026	.0002U	.0002U	.0002U	.00024	.00048	.0002U	.00059	.0002U	.0002U	.00091	.00057	.00026	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00084	.00046	.00019U	.00059	.0009	.0018	.00059	.0019	.00019U	.00019U	.0031	.0023	.00084	.00019U	.00019U	.00019U	.00023	.00019U	.00019U	.00019U
SW104	04/06/2009	.00025	.0002U	.0002U	.0002U	.00028	.00054	.0002U	.00051	.0002U	.0002U	.001	.00057	.00025	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.001	.00054	.00019U	.00059	.0011	.0021	.00059	.0024	.00019U	.00019U	.0037	.0025	.001	.00019U	.00019U	.00019U	.00037	.00019U	.00019U	.0002

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-41	PCB-42	PCB-43	PCB-44	PCB-45	PCB-46	PCB-47	PCB-48	PCB-49	PCB-50	PCB-51	PCB-52	PCB-53	PCB-54	PCB-55	PCB-56	PCB-57	PCB-58	PCB-59	PCB-60
SW101	04/06/2009	.00028	.0002U	.00063	.00036	.0002U	.0002U	.0002U	.0002U	.00063	.0002U	.0002U	.00061	.00022	.0002U	.0002U	.00028	.0002U	.0002U	.0002U	.00028
	11/18/2009	.00036	.00019U	.0008	.00044	.00019U	.00019U	.00031	.00031	.0008	.00019U	.00019U	.00083	.00024	.00019U	.00019U	.00036	.00019U	.00019U	.00019U	.00036
SW102	04/06/2009	.00025	.0002U	.00058	.00032	.0002U	.0002U	.0002U	.0002U	.00058	.0002U	.0002U	.00055	.0002U	.0002U	.0002U	.00028	.0002U	.0002U	.0002U	.00028
	11/18/2009	.00049	.00028	.0013	.00071	.00019U	.00019U	.00046	.00046	.0013	.00019U	.00019U	.0013	.00041	.00019U	.00019U	.00056	.00019U	.00019U	.00028	.00056
SW103	04/06/2009	.00031	.0002U	.0007	.00041	.0002U	.0002U	.0002	.0002	.0007	.0002U	.0002U	.00068	.00025	.0002U	.0002U	.0003	.0002U	.0002U	.0002U	.0003
	11/18/2009	.00042	.00023	.0011	.00061	.00019U	.00019U	.00041	.00041	.0011	.00019U	.00019U	.0012	.00036	.00019U	.00019U	.00048	.00019U	.00019U	.00023	.00048
SW104	04/06/2009	.00031	.0002U	.00076	.00041	.0002U	.0002U	.00024	.00024	.00076	.0002U	.0002U	.00073	.00026	.0002U	.0002U	.00032	.0002U	.0002U	.0002U	.00032
	11/18/2009	.00065	.00033	.0016	.00085	.00019U	.00019U	.00062	.00062	.0016	.00019U	.00019U	.0016	.00045	.00019U	.00019U	.00078	.00019U	.00019U	.00033	.00078

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-61	PCB-62	PCB-63	PCB-64	PCB-65	PCB-66	PCB-67	PCB-68	PCB-69	PCB-70	PCB-71	PCB-72	PCB-73	PCB-74	PCB-75	PCB-76	PCB-77	PCB-78	PCB-79	PCB-80
SW101	04/06/2009	.00026	.0002U	.0002U	.00028	.0002U	.0003	.0002U	.00028	.0002U	.00047	.00025	.0002U	.00061	.00026	.0002U	.0003	.000028U	.0002U	.0002U	.0003
	11/18/2009	.00036	.00019U	.00019U	.00036	.00019U	.00046	.00019U	.00036	.00019U	.00071	.00029	.00019U	.00083	.00036	.00031	.00046	.000033U	.00019U	.00019U	.00046
SW102	04/06/2009	.00025	.0002U	.0002U	.00025	.0002U	.0003	.0002U	.00025	.0002U	.00044	.00024	.0002U	.00055	.00025	.0002U	.0003	.000031U	.0002U	.0002U	.0003
	11/18/2009	.00054	.00019U	.00019U	.00049	.00019U	.00068	.00019U	.00049	.00019U	.0011	.0005	.00019U	.0013	.00054	.00046	.00068	.00005U	.00019U	.00019U	.00068
SW103	04/06/2009	.00028	.0002U	.0002U	.00031	.0002U	.00034	.0002U	.00031	.0002U	.00051	.00028	.0002U	.00068	.00028	.0002	.00034	.00003U	.0002U	.0002U	.00034
	11/18/2009	.00047	.00019U	.00019U	.00042	.00019U	.00059	.00019U	.00042	.00019U	.00094	.00042	.00019U	.0012	.00047	.00041	.00059	.000043U	.00019U	.00019U	.00059
SW104	04/06/2009	.0003	.0002U	.0002U	.00031	.0002U	.00035	.0002U	.00031	.0002U	.00053	.00031	.0002U	.00073	.0003	.00024	.00035	.000034U	.0002U	.0002U	.00035
	11/18/2009	.00076	.00019U	.00019U	.00065	.00019U	.00097	.00019U	.00065	.00019U	.0015	.00061	.00019U	.0016	.00076	.00062	.00097	.000077U	.00019U	.00019U	.00097

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-81	PCB-82	PCB-83	PCB-84	PCB-85	PCB-86	PCB-87	PCB-88	PCB-89	PCB-90	PCB-91	PCB-92	PCB-93	PCB-94	PCB-95	PCB-96	PCB-97	PCB-98	PCB-99	PCB-100
SW101	04/06/2009	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.000019U	.00019U	.00019U	.00019U	.00019U	.0002	.0002	.00019U	.00019U	.00019U	.00019U	.00019U	.00022	.00019U	.00022	.00019U	.0002	.00019U	.00019U	.00019U
SW102	04/06/2009	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.000019U	.00019U	.00019U	.00019U	.00019U	.00029	.00029	.00019U	.0002	.0002	.00019U	.00019U	.00028	.00019U	.00028	.00019U	.00029	.00019U	.00023	.00019U
SW103	04/06/2009	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.000019U	.00019U	.00019U	.00019U	.00019U	.00023	.00023	.00019U	.00019U	.00019U	.00019U	.00019U	.00023	.00019U	.00023	.00019U	.00023	.00019U	.00019U	.00019U
SW104	04/06/2009	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.000019U	.00019U	.00019U	.00019U	.00019U	.00029	.00029	.00019U	.0002	.0002	.00019U	.00019U	.00027	.00019U	.00027	.00019U	.00029	.00019U	.00024	.00019U

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-101	PCB-102	PCB-103	PCB-104	PCB-105	PCB-106	PCB-107	PCB-108	PCB-109	PCB-110	PCB-111	PCB-112	PCB-113	PCB-114	PCB-115	PCB-116	PCB-117	PCB-118	PCB-119	PCB-120
SW101	04/06/2009	.0002U	.0002U	.0002U	.0002U	.000059	.0002U	.0002U	.0002U	.0002U	.00021	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.00012	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.000063	.00019U	.00019U	.00019U	.00019U	.00029	.0002	.00019U	.00019U	000019U	.00019U	.00019U	.0002	.00016	.00019U	.00019U
SW102	04/06/2009	.0002U	.0002U	.0002U	.0002U	.000068	.00013	.0002U	.0002U	.0002U	.00023	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.00013	.0002U	.0002U
	11/18/2009	.0002	.00019U	.00019U	.00019U	.000087	.00022	.00019U	.00019U	.00019U	.00039	.00029	.00019U	.00019	000019U	.00019U	.00019U	.00029	.00022	.00019U	.00019U
SW103	04/06/2009	.0002U	.0002U	.0002U	.0002U	.000059	.0002U	.0002U	.0002U	.0002U	.00021	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.00012	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.000065	.00019U	.00019U	.00019U	.00019U	.00032	.00023	.00019U	.00019U	000019U	.00019U	.00019U	.00023	.00018	.00019U	.00019U
SW104	04/06/2009	.0002U	.0002U	.0002U	.0002U	.00007	.0002U	.0002U	.0002U	.0002U	.00023	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.00013	.0002U	.0002U
	11/18/2009	.0002	.00019U	.00019U	.00019U	.00015	.00038	.00019U	.00019U	.00019U	.00039	.00029	.00019U	.00019U	000019U	.00019U	.00019U	.00029	.00038	.00019U	.00019U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-121	PCB-122	PCB-123	PCB-124	PCB-125	PCB-126	PCB-127	PCB-128	PCB-129	PCB-130	PCB-131	PCB-132	PCB-133	PCB-134	PCB-135	PCB-136	PCB-137	PCB-138	PCB-139	PCB-140
SW101	04/06/2009	.0002U	.0002U	.00002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	000019U	.00019U	.0002	000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	00019U
SW102	04/06/2009	.0002U	.0002U	.00002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	000019U	.00019U	.00029	000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	00019U
SW103	04/06/2009	.0002U	.0002U	.00002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	000019U	.00019U	.00023	000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	00019U
SW104	04/06/2009	.0002U	.0002U	.00002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	000019U	.00019U	.00029	000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	00019U

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-141	PCB-142	PCB-143	PCB-144	PCB-145	PCB-146	PCB-147	PCB-148	PCB-149	PCB-150	PCB-151	PCB-152	PCB-153	PCB-154	PCB-155	PCB-156	PCB-157	PCB-158	PCB-159	PCB-160
SW101	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	000019U	000019U	.00019U	.00019U	.00019U
SW102	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	000019U	000019U	.00019U	.00019U	.00019U
SW103	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	000019U	000019U	.00019U	.00019U	.00019U
SW104	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	000019U	000019U	.00019U	.00019U	.00019U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-161	PCB-162	PCB-163	PCB-164	PCB-165	PCB-166	PCB-167	PCB-168	PCB-169	PCB-170	PCB-171	PCB-172	PCB-173	PCB-174	PCB-175	PCB-176	PCB-177	PCB-178	PCB-179	PCB-180
SW101	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.000021
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.000019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000031
SW102	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.000028
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.000019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00004
SW103	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.000024
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.000019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000026
SW104	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.00002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.000028
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.000019U	.000036	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000084

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-181	PCB-182	PCB-183	PCB-184	PCB-185	PCB-186	PCB-187	PCB-188	PCB-189	PCB-190	PCB-191	PCB-192	PCB-193	PCB-194	PCB-195	PCB-196	PCB-197	PCB-198	PCB-199	PCB-200
SW101	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW102	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW103	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW104	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)								
		PCB-201	PCB-202	PCB-203	PCB-204	PCB-205	PCB-206	PCB-207	PCB-208	PCB-209
SW101	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW102	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW103	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
SW104	04/06/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
	11/18/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)							MISCELLANEOUS					
		Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Nitrate (mg/L)	Nitrite (mg/L)	pH	Total Dissolved Solids (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Phosphorus (mg/L)
SW101	10/30/2006	.48U	.96U	.48U	.48U	.48U	.48U	.48U	.5U	5U	8	24800	.56	.31
	05/31/2007	.4U	.8U	.4U	.4U	.4U	.4U	.4U	1.1	1U	8.4	18300	1UJ	3.4
	01/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	1U	1U	7.3	18400	1U	.47
	06/09/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8.2	31600	1U	.14
	11/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8.1	30100	1U	.1
	04/06/2009	NA	NA	NA	NA	NA	NA	NA	.53J	1U	8.2	25800	1U	.11
	11/18/2009	NA	NA	NA	NA	NA	NA	NA	2.5U	2.5U	8	31400	1U	.091
SW102	10/30/2006	.49U	.98U	.49U	.49U	.49U	.49U	.49U	.5U	5U	8.1	24700	2.5	.73
	05/31/2007	.4U	.8U	.4U	.4U	.4U	.4U	.4U	1U	1U	9.1	21500	1UJ	2.4
	01/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	.5U	.5U	7.5	7260	1U	.7
	06/09/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8.2	31800	1U	.19
	11/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	7.6	28200	1U	.12
	04/06/2009	NA	NA	NA	NA	NA	NA	NA	.52J	1U	8.2	26700	1U	.16
	11/18/2009	NA	NA	NA	NA	NA	NA	NA	2.5U	2.5U	8	29600	1U	.14
SW103	10/30/2006	.47U	.94U	.47U	.47U	.47U	.47U	.47U	.5U	5U	8.3	28500	1.4	.57
	05/31/2007	.4U	.8U	.4U	.4U	.4U	.4U	.4U	1.7	1U	8.6	20400	1UJ	5.2
	01/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	.5U	.5U	7.5	19800	1U	.51
	06/09/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8.2	30200	1U	.13
	11/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8	28600	1U	.13
	04/06/2009	NA	NA	NA	NA	NA	NA	NA	1U	1U	8.3	26700	1U	.12
	11/18/2009	NA	NA	NA	NA	NA	NA	NA	2.5U	2.5U	8	31700	1U	.094

TABLE A-1: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)							MISCELLANEOUS					
		Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Nitrate (mg/L)	Nitrite (mg/L)	pH	Total Dissolved Solids (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Phosphorus (mg/L)
SW104	10/30/2006	.48U	.96U	.48U	.48U	.48U	.48U	.48U	NA	NA	7.9	NA	NA	NA
	05/31/2007	.4U	.8U	.4U	.4U	.4U	.4U	.4U	2.3	1U	8.2	19300	1UJ	4.6
	01/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	.99J	1U	7.6	18000	1U	.1
	06/09/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8.2	31100	1U	.17
	11/25/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	2.5U	2.5U	8	25000	1U	.12
	04/06/2009	NA	NA	NA	NA	NA	NA	NA	.9J	1U	8.3	25200	1U	.099
	11/18/2009	NA	NA	NA	NA	NA	NA	NA	2.5U	2.5U	8	31300	1U	.11

Notes:

BHC	Hexachlorocyclohexane	EPTC	1-ethylsulfanyl-N,N-dipropyl-formamide
DDD	Dichlorodiphenyldichloroethane	J	Estimated value
DDE	Dichlorodiphenyldichloroethene	mg/L	Milligrams per liter
DDT	Dichlorodiphenyltrichloroethane	NA	Not analyzed
PCB	Polychlorinated biphenyl	U	Nondetect
ug/L	Micrograms per liter		

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	DISSOLVED METALS (Filtrate) (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
STW104	11/02/2006	100U	60U	6.3	32	2U	5U	10U	20U	9.9J	40J	3U	88	.076J	4.6J	4.7J	5U	1.5J	7.7	10U	38
	04/20/2007	50U	.67UJ	2.6	23	1U	1U	1.2	1U	4.3	98	1U	44	.2U	1.5	1.7	1U	1U	1.3U	2.5	25
	01/04/2008	50U	1U	16	22	1U	1U	1.5	1U	38	170	13	31	.2U	1.7	150	1U	1U	1U	1.9	510
	12/17/2008	NA	.77J	1.6	26	1U	1U	.68J	1U	6.5	NA	1U	NA	.2U	3.2	1.8	1U	1U	1U	2.6	24
	10/13/2009	200	.64J	2.2	4.2	1U	1U	1.7	1U	7.2	280	2.1	11	1.3	1.1	1.5	1U	1U	1U	3.6	48
STW105	11/02/2006	420	60U	1.2J	82	2U	5U	3.4J	2.3J	23	730	2.6J	590	.26	20U	13J	5U	5U	5U	4.8J	470
	04/20/2007	87	1.7UJ	1.4	17	1U	1U	1.4	.61J	19	390	2.8	180	.2U	1U	4.9	1U	1U	2.5U	2.4	1800
	01/04/2008	110	.62J	3.4	21	1U	1U	2.2	1U	16	130	2.7	85	.99	.92J	6.6	.83J	1U	1U	.91J	190
	12/17/2008	NA	1U	.76J	15	1U	1U	.76J	1U	9.5	NA	1.3	NA	.2U	1.2	2.6	1U	1U	1U	1.6	350
	03/02/2009	140	1U	2.4	30	1U	1U	7.1	1U	27	120	1.6	34	.32	1.4	4.2	.5J	1U	1U	5.9	150
	10/13/2009	130	.5J	1.5	16	1U	1U	1.1	.98J	22	160	4.2	180	.13J	.95J	2.5	1.1	1U	1U	1.8	200
STW106	11/02/2006	33J	60U	5U	17	2U	5U	10U	20U	58	89J	3U	64	.033J	24	4.1J	5U	5U	5U	10U	240
	04/20/2007	50U	.62UJ	2.4	38	1U	1U	2	1U	17	150	1U	14	.2U	3.7	2.3	1U	1U	6.3U	1.9	68
	01/04/2008	94	1U	5.4	22	1U	1U	1.8	1U	25	150	2.2	38	.2U	.81J	15	1U	1U	1U	1.4	180
	03/02/2009	210	1U	.77J	24	1U	1U	1.5	1U	15	700	.75J	14	.2U	.83J	3.7	1U	1U	1U	5.5	100
	10/13/2009	150	.72J	.68J	12	1U	1U	.85J	.68J	25	150	1.4	55	.2U	1.7	2.2	1U	1U	1U	1.8	150
STW107	11/02/2006	100U	60U	5U	22	2U	5U	10U	20U	13	64J	3U	25	.2U	2.2J	3.5J	5U	5U	5U	3.2J	60
	04/20/2007	50U	.51UJ	1.5	21	1U	1U	1.6	1U	4.5	41J	1U	3.2	.2U	.97J	1.5	1U	1U	1U	2.3	16
	01/04/2008	75	1U	2.6	17	1U	1U	1.5	1U	8.6	94	1.9	8.1	.2U	.51J	13	1U	1U	1U	1.7	98
	12/17/2008	NA	1.4	.74J	12	1U	1U	.78J	1U	6	NA	1U	NA	.2U	.94J	2.2	1U	1U	1U	2.1	41
	03/02/2009	140	1U	1.5	15	1U	1U	1.5	1U	7.6	41J	.88J	3.7	.2U	1U	3.6	1U	1U	1U	5.6	57
	10/13/2009	50U	1U	1U	3.1	1U	1U	.67J	1U	29	29J	.67J	6.6	.2U	1U	1U	1U	1U	1U	.85J	79

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	DISSOLVED METALS (Filtrate) (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
STW108	11/02/2006	100U	60U	3.3J	38	2U	5U	10U	20U	14	66J	3U	75	.027J	3.6J	6.8J	5U	5U	6	2.6J	87
	04/20/2007	50U	.79UJ	1.9	29	1U	1U	1.3	1U	5.5	170	.65J	35	.2U	2.1	1.5	1U	1U	1U	2.8	49
	01/04/2008	26J	1U	18	120	1U	1U	1.1	1U	6.4	95	.5J	12	.2U	.99J	3.5	1U	1U	1U	1.8	120
	12/17/2008	NA	.67J	2.1	28	1U	1U	.7J	1U	3.8	NA	1U	NA	.2U	4.2	1.6	1U	1U	1U	2.4	22
	03/02/2009	110	1U	1.1	24	1U	1U	1.6	1U	10	72	.85J	13	.2U	1U	2	1U	1U	1U	3.2	84
	10/13/2009	37J	.61J	1.7	8.9	1U	1U	.56J	1.2	1.7	290	2.1	25	.77	1J	.8J	1U	1U	1U	3.4	38
STW109	03/02/2009	490	1U	1.4	63	1U	1U	2.6	1U	13	380	1J	7.7	.1J	1U	9.2	1U	1U	1U	7.6	61
STW110	03/02/2009	30J	1U	3.3	63	1U	1U	.7J	1U	13	50U	1U	16	.11J	.78J	2.6	1U	1U	1U	3	26

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	TOTAL METALS (ug/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
STW104	01/04/2008	390	60U	2.7J	24	2U	5U	10U	20U	10U	400	3U	28	.14J	20U	20U	5U	5U	5U	10U	44
	12/17/2008	NA	.92J	1.8	30	1U	1U	1.5	1U	6.2	NA	1.7	NA	.2U	3.1	2.1	1U	1U	1U	3.3	29
	10/13/2009	5200	5.9J	12	77	2U	5U	16	5.6	35	9100	57	190	.25	5U	21	10U	5U	10U	22	290
STW105	01/04/2008	700	60U	5U	26	2U	5U	10U	20U	18	750	5.2	100	1.2	20U	20U	5U	5U	5U	10U	170
	12/17/2008	NA	.59J	.89J	18	1U	1U	1.4	.68J	10	NA	2.9	NA	.22	1.4	3.7	1U	1U	1U	2.2	400
	03/02/2009	1200	.62J	2.7	39	1U	1U	3.7	.98J	34	1300	6.1	67	.51	.64J	6.2	.7J	1U	1U	9.4	210
	10/13/2009	300	5.8J	5U	21	2U	5U	5U	5U	22	520	3.6	190	.2U	5U	5U	10U	5U	10U	5U	180
STW106	01/04/2008	720	60U	5U	28	2U	5U	10U	20U	22	700	3.1	51	.2U	20U	20U	5U	5U	5U	10U	150
	03/02/2009	1100	.74J	.97J	26	1U	1U	2.9	1U	20	910	2.3	26	.16J	.96J	4.8	1U	1U	1U	3.9	99
	10/13/2009	490	10U	5U	20	2U	5U	5U	5U	37	690	3U	76	.16J	5U	5U	10U	5U	10U	5U	180
STW107	01/04/2008	510	60U	5U	30	2U	5U	10U	20U	11	590	10	36	.2U	20U	20U	5U	5U	5U	10U	82
	12/17/2008	NA	1.6	1.2	17	1U	1U	1.8	1U	8.6	NA	4.5	NA	.2U	.87J	2.5	1U	1U	1U	3.2	56
	03/02/2009	1200	.86J	2.1	27	1U	1U	4.4	.66J	9.7	1100	6.5	24	.2U	1U	7	1U	1U	1U	6.4	58
	10/13/2009	300	10U	3J	23	2U	5U	5U	5U	9.1	460	4.2	38	.2U	5U	2.9J	10U	5U	10U	5U	67
STW108	01/04/2008	2700	60U	2.6J	41	2U	5U	8.6J	20U	17	3400	11	61	.26	20U	20U	5U	5U	5U	8.2J	120
	12/17/2008	NA	.85J	2	32	1U	1U	1.9	1U	5.8	NA	2.6	NA	.2U	4.2	2.7	1U	1U	1U	3.8	32
	03/02/2009	1100	.78J	1.8	36	1U	1U	3.8	.86J	12	1400	7.8	40	.2U	1U	4.1	1U	1U	1U	8.3	100
	10/13/2009	1800	10U	5J	52	2U	5U	4.1J	2.8J	6.3	5100	48	130	.12J	5U	8.3	10U	5U	10U	11	390
STW109	03/02/2009	1400	1U	1.6	53	1U	1U	3.4	1U	15	960	2	10	.1J	1U	11	1U	1U	1U	11	32
STW110	03/02/2009	340	1U	3.2	45	1U	1U	1.2	1U	16	260	.51J	32	.34	.94J	3.5	1U	1U	1U	3.3	15

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

		PESTICIDES (ug/L)																			
Location ID	Date Collected	4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Alpha-BHC	Alpha-Chlordane	Beta-BHC	Delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Gamma-BHC (Lindane)	Gamma-Chlordane	Heptachlor	Heptachlor Epoxide	Methoxychlor	Toxaphene
STW104	01/04/2008	.08U	.08U	.08U	.04U	.04U	.04U	.04U	.04U	.08U	.04U	.08U	.08U	.08U	.08U	.04U	.04U	.04U	.04U	.4U	.8U
STW105	01/04/2008	.1U	.1U	.1U	.05U	.05U	.05U	.05U	.05U	.1U	.05U	.1U	.1U	.1U	.1U	.05U	.05U	.05U	.05U	.5U	1U
STW106	01/04/2008	.1U	.1U	.1U	.05U	.05U	.05U	.05U	.05U	.1U	.05U	.1U	.1U	.1U	.1U	.05U	.05U	.05U	.05U	.5U	1U
STW107	01/04/2008	.08U	.08U	.08U	.04U	.04U	.04U	.04U	.04U	.08U	.04U	.08U	.08U	.08U	.08U	.04U	.04U	.04U	.04U	.4U	.8U
STW108	01/04/2008	.08U	.08U	.06J	.04U	.04U	.04U	.04U	.04U	.08U	.04U	.08U	.08U	.08U	.08U	.04U	.04U	.04U	.04U	.4U	.8U

		PCBS (ug/L)																			
Location ID	Date Collected	PCB-1	PCB-2	PCB-3	PCB-4	PCB-5	PCB-6	PCB-7	PCB-8	PCB-9	PCB-10	PCB-11	PCB-12	PCB-13	PCB-14	PCB-15	PCB-16	PCB-17	PCB-18	PCB-19	PCB-20
STW106,107, 110,105	03/02/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00093	.00019U	.00023	.00029	.00019U
STW109,108	03/02/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW104	10/13/2009	.00029	.00019U	.00048	.0038	.0089	.011	.00022	.0089	.00022	.0038	.001	.0049	.0049	.00019U	.0076	.021	.014	.029	.0063	.0093
STW106,105	10/13/2009	.0002U	.0002U	.0002U	.00024	.00052	.00074	.0002U	.00052	.0002U	.00024	.0002U	.00064	.00064	.0002U	.00082	.007	.0014	.0031	.0019	.00067
STW108,107	10/13/2009	.00019U	.00019U	.00019U	.0003	.00078	.00081	.00019U	.00078	.00019U	.0003	.00039	.00041	.00041	.00019U	.00069	.0022	.0013	.0027	.00047	.0014

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-21	PCB-22	PCB-23	PCB-24	PCB-25	PCB-26	PCB-27	PCB-28	PCB-29	PCB-30	PCB-31	PCB-32	PCB-33	PCB-34	PCB-35	PCB-36	PCB-37	PCB-38	PCB-39	PCB-40
STW106,107, 110,105	03/02/2009	.00019U	.00047	.00019U	.00019U	.00019U	.00019U	.00019U	.00069	.00019U	.00019U	.00033	.00093	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00045
STW109,108	03/02/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW104	10/13/2009	.0093	.0056	.00019U	.005	.013	.026	.005	.019	.00019U	.00019U	.034	.021	.0093	.00039	.00023	.00019U	.0031	.00036	.00019U	.0042
STW106,105	10/13/2009	.00067	.0032	.0002U	.0013	.0009	.0027	.0013	.0046	.0002U	.0002U	.0031	.007	.00067	.0002U	.0002U	.0002U	.00061	.0002U	.0002U	.0021
STW108,107	10/13/2009	.0014	.001	.00019U	.00047	.0012	.0022	.00047	.0034	.00019U	.00019U	.0039	.0022	.0014	.00019U	.00019U	.00019U	.0008	.00019U	.00019U	.00076

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-41	PCB-42	PCB-43	PCB-44	PCB-45	PCB-46	PCB-47	PCB-48	PCB-49	PCB-50	PCB-51	PCB-52	PCB-53	PCB-54	PCB-55	PCB-56	PCB-57	PCB-58	PCB-59	PCB-60
STW106,107, 110,105	03/02/2009	.0015	.00064	.0019	.0019	.00057	.00025	.00043	.00043	.0019	.00019U	.00019U	.0022	.00062	.00019U	.00019U	.0013	.00019U	.00019U	.00064	.0013
STW109,108	03/02/2009	.00039	.0002U	.00052	.00032	.0002U	.0002U	.0002U	.0002U	.00052	.0002U	.0002U	.00058	.0002U	.0002U	.0002U	.00061	.0002U	.0002U	.0002U	.00061
STW104	10/13/2009	.018	.0082	.04	.022	.0037	.0029	.017	.017	.04	.00019U	.004	.045	.011	.00019U	.00019U	.023	.00019U	.00073	.0082	.023
STW106,105	10/13/2009	.0061	.0029	.0088	.0082	.0023	.00092	.0026	.0026	.0088	.0002U	.00075	.01	.0031	.0002U	.0002U	.0057	.0002U	.0002U	.0029	.0057
STW108,107	10/13/2009	.0027	.0015	.0052	.0037	.00057	.00031	.0023	.0023	.0052	.00019U	.00034	.0058	.001	.00019U	.00019U	.0044	.00019U	.00019U	.0015	.0044

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-61	PCB-62	PCB-63	PCB-64	PCB-65	PCB-66	PCB-67	PCB-68	PCB-69	PCB-70	PCB-71	PCB-72	PCB-73	PCB-74	PCB-75	PCB-76	PCB-77	PCB-78	PCB-79	PCB-80
STW106,107, 110,105	03/02/2009	.00079	.00019U	.00019U	.0015	.00019U	.00095	.00019U	.0015	.00019U	.00088	.00065	.00019U	.0022	.00079	.00043	.00095	.00011U	.00019U	.00019U	.00095
STW109,108	03/02/2009	.00041	.0002U	.0002U	.00039	.0002U	.00059	.0002U	.00039	.0002U	.00091	.0002U	.0002U	.00058	.00041	.0002U	.00059	.000075U	.0002U	.0002U	.00059
STW104	10/13/2009	.013	.00019U	.00078	.018	.00019U	.025	.00019U	.018	.00019U	.035	.014	.00029	.045	.013	.017	.025	.0028U	.00019U	.00019U	.025
STW106,105	10/13/2009	.0035	.0002U	.00024	.0061	.0002U	.0044	.0002U	.0061	.0002U	.0028	.0032	.0002U	.01	.0035	.0026	.0044	.00037U	.0002U	.0002U	.0044
STW108,107	10/13/2009	.0035	.00019U	.00019U	.0027	.00019U	.0048	.00019U	.0027	.00019U	.0062	.002	.00019U	.0058	.0035	.0023	.0048	.00065U	.00019U	.00019U	.0048

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-81	PCB-82	PCB-83	PCB-84	PCB-85	PCB-86	PCB-87	PCB-88	PCB-89	PCB-90	PCB-91	PCB-92	PCB-93	PCB-94	PCB-95	PCB-96	PCB-97	PCB-98	PCB-99	PCB-100
STW106,107, 110,105	03/02/2009	.000019U	.00023	.00019U	.00042	.00029	.0012	.0012	.00019U	.00085	.00085	.00022	.00021	.0011	.00019U	.0011	.00019U	.0012	.00019U	.00066	.00019U
STW109,108	03/02/2009	.00002U	.0002U	.0002U	.0002U	.0002U	.00055	.00055	.0002U	.00036	.00036	.0002U	.0002U	.00038	.0002U	.00038	.0002U	.00055	.0002U	.00035	.0002U
STW104	10/13/2009	.00018U	.0035	.0011	.0057	.0044	.016	.016	.00019U	.01	.01	.0042	.0032	.013	.00019U	.013	.00036	.016	.0017	.011	.00019U
STW106,105	10/13/2009	.000036U	.00067	.0002U	.0012	.00069	.0027	.0027	.0002U	.0015	.0015	.00063	.0004	.0024	.0002U	.0024	.0002U	.0027	.00026	.0015	.0002U
STW108,107	10/13/2009	.000048U	.00084	.00023	.0011	.001	.0037	.0037	.00019U	.0023	.0023	.0008	.00067	.0026	.00019U	.0026	.00019U	.0037	.00021	.0025	.00019U

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-101	PCB-102	PCB-103	PCB-104	PCB-105	PCB-106	PCB-107	PCB-108	PCB-109	PCB-110	PCB-111	PCB-112	PCB-113	PCB-114	PCB-115	PCB-116	PCB-117	PCB-118	PCB-119	PCB-120
STW106,107, 110,105	03/02/2009	.00085	.00019U	.00019U	.00019U	.00053	.001	.00019U	.00019U	.00019U	.0017	.0012	.00019U	.00019U	.000022	.00019U	.00019U	.0012	.001	.00019U	.00029
STW109,108	03/02/2009	.00036	.0002U	.0002U	.0002U	.00029	.00042	.0002U	.0002U	.0002U	.00071	.00055	.0002U	.0002U	.00002U	.0002U	.0002U	.00055	.00042	.0002U	.0002U
STW104	10/13/2009	.01	.0017	.00022	.00019U	.0056	.01	.0015	.0015	.0011	.018	.016	.00019U	.00019U	.00031	.00056	.00056	.016	.01	.00063	.0044
STW106,105	10/13/2009	.0015	.00026	.0002U	.0002U	.00087	.0014	.0002U	.0002U	.0002U	.0029	.0027	.0002U	.0002U	.000045	.0002U	.0002U	.0027	.0014	.0002U	.00069
STW108,107	10/13/2009	.0023	.00021	.00019U	.00019U	.0014	.0024	.00035	.00035	.00023	.0046	.0037	.00019U	.00019U	.000062	.00019U	.00019U	.0037	.0024	.00019U	.001

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-121	PCB-122	PCB-123	PCB-124	PCB-125	PCB-126	PCB-127	PCB-128	PCB-129	PCB-130	PCB-131	PCB-132	PCB-133	PCB-134	PCB-135	PCB-136	PCB-137	PCB-138	PCB-139	PCB-140
STW106,107, 110,105	03/02/2009	.00019U	.00019U	000037U	.00019U	.0012	000019U	.00053	.00017	.00019U	.00019U	.00019U	.00027	.00019U	.00019U	.00019U	.00019U	.00019U	.00086	.00057	.00019U
STW109,108	03/02/2009	.0002U	.0002U	.00002U	.0002U	.00055	.00002U	.00029	.000039	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00023	.0002U	.0002U
STW104	10/13/2009	.00019U	.00024	.00025U	.00055	.016	.000053	.0056	.00084	.00031	.00037	.00019U	.0015	.00019U	.00034	.00095	.00077	.0003	.0063	.005	.00019U
STW106,105	10/13/2009	.0002U	.0002U	000036U	.0002U	.0027	.00002U	.00087	.0002U	.0002U	.0002U	.0002U	.00023	.0002U	.0002U	.0002U	.0002U	.0002U	.00087	.00063	.0002U
STW108,107	10/13/2009	.00019U	.00019U	000065U	.00019U	.0037	.00002	.0014	.00027	.00019U	.00019U	.00019U	.0004	.00019U	.00019U	.00027	.00019U	.00019U	.002	.0014	.00019U

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-141	PCB-142	PCB-143	PCB-144	PCB-145	PCB-146	PCB-147	PCB-148	PCB-149	PCB-150	PCB-151	PCB-152	PCB-153	PCB-154	PCB-155	PCB-156	PCB-157	PCB-158	PCB-159	PCB-160
STW106,107, 110,105	03/02/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00057	.00019U	.00019U	.00019U	.00052	.00019U	.00019U	.000091	.000021	.00019U	.00019U	.00019U
STW109,108	03/02/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002	.00002U	.0002U	.0002U	.0002U
STW104	10/13/2009	.0011	.00019U	.00019U	.00095	.00019U	.00089	.00019U	.00019U	.005	.00019U	.0013	.00019U	.0055	.00019U	.00019U	.00048	.00011	.00065	.00019U	.00065
STW106,105	10/13/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00063	.0002U	.0002U	.0002U	.00069	.0002U	.0002U	.000069	.00002U	.0002U	.0002U	.0002U
STW108,107	10/13/2009	.00034	.00019U	.00019U	.00027	.00019U	.00025	.00019U	.00019U	.0014	.00019U	.00033	.00019U	.0016	.00019U	.00019U	.00015	.000037	.0002	.00019U	.0002

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-161	PCB-162	PCB-163	PCB-164	PCB-165	PCB-166	PCB-167	PCB-168	PCB-169	PCB-170	PCB-171	PCB-172	PCB-173	PCB-174	PCB-175	PCB-176	PCB-177	PCB-178	PCB-179	PCB-180
STW106,107, 110,105	03/02/2009	.00019U	.00019U	.00086	.00086	.00019U	.00019U	.00003	.00027	.000019U	.00011	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00017
STW109,108	03/02/2009	.0002U	.0002U	.00023	.00023	.0002U	.0002U	.00002U	.0002U	.00002U	.000046	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00011
STW104	10/13/2009	.00019U	.00019U	.0063	.0063	.00019U	.00019U	.00024	.0015	.000019U	.0014	.00042	.00019U	.00019U	.0013	.00019U	.00019U	.00096	.0003	.00061	.0032
STW106,105	10/13/2009	.0002U	.0002U	.00087	.00087	.0002U	.0002U	.000028	.00023	.00002U	.00014	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00032
STW108,107	10/13/2009	.00019U	.00019U	.002	.002	.00019U	.00019U	.000071	.0004	.000019U	.00043	.00019U	.00019U	.00019U	.00039	.00019U	.00019U	.00028	.00019U	.00019U	.001

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)																			
		PCB-181	PCB-182	PCB-183	PCB-184	PCB-185	PCB-186	PCB-187	PCB-188	PCB-189	PCB-190	PCB-191	PCB-192	PCB-193	PCB-194	PCB-195	PCB-196	PCB-197	PCB-198	PCB-199	PCB-200
STW106,107, 110,105	03/02/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.000019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
STW109,108	03/02/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW104	10/13/2009	.00019U	.00085	.001	.00019U	.00019U	.00019U	.00085	.00019U	.000048	.0014	.00019U	.00019U	.00019U	.00082	.0002	.0011	.00019U	.00019U	.00019U	.00019U
STW106,105	10/13/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.00002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW108,107	10/13/2009	.00019U	.0003	.00028	.00019U	.00019U	.00019U	.0003	.00019U	.000019U	.00043	.00019U	.00019U	.00019U	.00022	.00019U	.00028	.00019U	.00019U	.00019U	.00019U

Location ID	Date Collected	PCBS (ug/L)								
		PCB-201	PCB-202	PCB-203	PCB-204	PCB-205	PCB-206	PCB-207	PCB-208	PCB-209
STW106,107, 110,105	03/02/2009	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U
STW109,108	03/02/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW104	10/13/2009	.00082	.00019U	.0011	.00019U	.00019U	.00058	.00019U	.00019U	.00035
STW106,105	10/13/2009	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U	.0002U
STW108,107	10/13/2009	.00026	.00019U	.00028	.00019U	.00019U	.00019U	.00019U	.00019U	.00019U

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)							pH
		Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	
STW104	11/02/2006	.48U	.95U	.48U	.48U	.48U	.48U	.48U	7.7
	04/20/2007	.47U	.94U	.47U	.47U	.47U	.47U	.47U	7.6
	01/04/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	7.3
	12/17/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	7.9
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	7.3
STW105	11/02/2006	.48U	.95U	.48U	.48U	.48U	.48U	.48U	6.5
	04/20/2007	.48U	.96U	.48U	.48U	.48U	.48U	.48U	6.7
	01/04/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	7
	12/17/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	6.5
	03/02/2009	NA	NA	NA	NA	NA	NA	NA	6.8
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	6.3
STW106	11/02/2006	.48U	.96U	.48U	.48U	.48U	.48U	.48U	6.9
	04/20/2007	.49U	.97U	.49U	.49U	.4J	.49U	.49U	7.3
	01/04/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	6.9
	03/02/2009	NA	NA	NA	NA	NA	NA	NA	6.8
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	6.3
STW107	11/02/2006	.48U	.95U	.48U	.48U	.48U	.48U	.48U	7.1
	04/20/2007	.47U	.94U	.47U	.47U	.47U	.47U	.47U	7.9
	01/04/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	7.1
	12/17/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	6.7
	03/02/2009	NA	NA	NA	NA	NA	NA	NA	7
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	6.6

TABLE A-2: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR STORM WATER SAMPLES

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University of California, Berkeley, Richmond Field Station, Richmond, California

Location ID	Date Collected	PCBS (ug/L)							pH
		Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	
STW108	11/02/2006	.48U	.95U	.48U	.48U	.48U	.48U	.48U	7.5
	04/20/2007	.47U	.94U	.47U	.47U	.47U	.47U	.47U	7.3
	01/04/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	6.8
	12/17/2008	.5U	1U	.5U	.5U	.5U	.5U	.5U	8
	03/02/2009	NA	NA	NA	NA	NA	NA	NA	7
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	7.3
STW109	03/02/2009	NA	NA	NA	NA	NA	NA	NA	6.7
STW110	03/02/2009	NA	NA	NA	NA	NA	NA	NA	7.4

Notes:

BHC	Hexachlorocyclohexane	NA	Not analyzed
DDD	Dichlorodiphenyldichloroethane	PCB	Polychlorinated biphenyl
DDE	Dichlorodiphenyldichloroethene	U	Nondetect
DDT	Dichlorodiphenyltrichloroethane	ug/L	Micrograms per liter
J	Estimated value		

TABLE A-3: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SEDIMENT SAMPLES

Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

			TOTAL METALS (mg/kg)																			
Location ID	Depth (Feet)	Date Collected	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganses	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SED101	0 - .5	10/30/2006	30300	.47	36.6J	125	.56	.75	87.4	14.5	148	47200	45.8	470J	2.33	.92	79.6	2	.38J	.22	83.2	265
	0 - .5	05/31/2007	NA	.47J	26	42	.42J	1	51	10	76	NA	33	NA	2.6J	1.3	55	.97	1.1U	.54U	43	240
	0 - .5	01/25/2008	NA	.75	34	83	.79	.46J	99	15	120	NA	72	NA	5	1.4	93	1.4	.44J	.64U	81	360
	0 - .5	06/09/2008	NA	.58J	34	59	.59J	1	71	14	110	NA	48	NA	3.3	1	70	1.1	.51J	.93U	59	330
	0 - .5	11/25/2008	NA	.49J	33	56	.69J	1	79	14	120	NA	62	NA	2.7	1.6	76	1.3	.52J	.78U	63	340
	0 - .5	04/06/2009	25000	.47J	36	64	.71J	.87	88	17	100	53000	56	350	3.5	2.2	92	1.3	.43J	.83U	73	280
	0 - .5	11/18/2009	27000	4.9	37	62	.62	1.4	93	25	110	45000	62	380	3.6	3.5	110	1.5U	.75J	1.5U	82	310
SED102	0 - .5	10/30/2006	33900	.23	11.2J	73.8	.7	.45	103	18.7	94.2	48800	32.6	877J	.51	.56	107	1.2	.33J	.18	92.3	167
	0 - .5	05/31/2007	NA	.32J	15	62	.53J	1.1U	67	13	67	NA	36	NA	1.6J	1.3U	70	.51J	1.2U	.6U	57	180
	0 - .5	01/25/2008	NA	.71	17	55	.78	.88	82	16	75	NA	38	NA	1.1	1.3	85	.68	.51	.28J	70	180
	0 - .5	06/09/2008	NA	.68U	17	38	.43J	.68U	57	11	61	NA	34	NA	2.3	.98	58	.69	.68U	.68U	50	190
	0 - .5	11/25/2008	NA	.47J	21	51	.74	1.2	84	18	110	NA	57	NA	1.6	4.3	90	1.2	.55	.48U	67	290
	0 - .5	04/06/2009	21000	.38J	16	46	.58	.55	75	14	74	37000	43	430	1.6	1.4	79	1.1	.37J	.27J	63	180
	0 - .5	11/18/2009	26000	3.2	16	51	.6	1.2	85	13	88	36000	48	240	2	1.5	81	1.1U	.74	1.1U	74	230
SED103	0 - .5	10/30/2006	28100	.26	19.8J	70.9	.64	.79	90.5	16.4	133	42900	45.6	519J	1.6	.8	91.6	2	.43J	.21	80.2	225
	0 - .5	05/31/2007	NA	2	77	97	.9	1.9	110	19	210	NA	97	NA	3.3J	3.2	100	4.5	1.5U	.64J	86	520
	0 - .5	01/25/2008	NA	.51J	16	30	.38J	.45J	44	7.2	62	NA	35	NA	2.7	1.2	42	.85	.42J	.61U	37	140
	0 - .5	06/09/2008	NA	.65J	48	56	.69J	1.3	86	16	140	NA	62	NA	4.4	2.1	83	2	.57J	.74U	74	350
	0 - .5	11/25/2008	NA	.64J	24	52	.9	1.8	81	13	130	NA	73	NA	3.2	2.3	77	1.8	.82J	.83U	64	320
	0 - .5	04/06/2009	25000	.54J	34	59	.66J	1	95	16	120	51000	73	610	2.7	1.6	96	1.6	.54J	.71U	78	310
	0 - .5	11/18/2009	26000	4.9	31	55	.59	1.5	89	15	110	44000	63	260	2.5	3.8	83	1.6U	.77J	1.6U	80	300

TABLE A-3: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SEDIMENT SAMPLES

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Location ID	Depth (Feet)	Date Collected	PESTICIDES (mg/kg)																
			4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	Alpha-BHC	Alpha-Chlordane	Beta-BHC	Butylate	Chlordane	Cycloate	Delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde
SED101	0 - .5	10/30/2006	.0019UJ	.0079J	.0069J	.0015UJ	.00035UJ	.0016UJ	.0021UJ	.0046UJ	.021UJ	.0046UJ	.0018UJ	.00034UJ	.00037UJ	.00046UJ	.00074UJ	.00037UJ	.00046UJ
	0 - .5	05/31/2007	.036U	.036U	.036U	.018U	.018U	.018U	.018U	NA	NA	NA	.018U	.036U	.018U	.036U	.036U	.036U	.036U
	0 - .5	01/25/2008	.084U	.084U	.084U	.043U	.043U	.043U	.043U	NA	NA	NA	.043U	.084U	.043U	.084U	.084U	.084U	.084U
	0 - .5	06/09/2008	.012U	.012U	.012U	.0062U	.0062U	.0034J	.0062U	NA	NA	NA	.0062U	.012U	.0062U	.012U	.012U	.0065J	.012U
	0 - .5	11/25/2008	.052U	.052U	.052U	.027U	.027U	.027U	.027U	NA	NA	NA	.027U	.052U	.027U	.052U	.052U	.052U	.052U
SED102	0 - .5	10/30/2006	.0018UJ	.00065UJ	.0016UJ	.0014UJ	.00035UJ	.0015UJ	.002UJ	.0045UJ	.02UJ	.0045UJ	.0018UJ	.00033UJ	.00036UJ	.00045UJ	.00072UJ	.00036UJ	.00045UJ
	0 - .5	05/31/2007	.039U	.039U	.039U	.02U	.02U	.02U	.02U	NA	NA	NA	.02U	.039U	.02U	.039U	.039U	.039U	.039U
	0 - .5	01/25/2008	.062U	.062U	.062U	.032U	.032U	.032U	.032U	NA	NA	NA	.032U	.062U	.032U	.062U	.062U	.062U	.062U
	0 - .5	06/09/2008	.0089U	.0089U	.0089U	.0046U	.0046U	.0046U	.0046U	NA	NA	NA	.0046U	.0089U	.0046U	.0089U	.0089U	.0089U	.0089U
	0 - .5	11/25/2008	.032U	.032U	.032U	.016U	.016U	.016U	.016U	NA	NA	NA	.016U	.032U	.016U	.032U	.032U	.032U	.032U
SED103	0 - .5	10/30/2006	.0019U	.00065U	.0016U	.0014U	.00035U	.0015U	.002U	.0046UJ	.02U	.0046UJ	.0018U	.00033U	.00037U	.00046U	.00073U	.00037U	.00046U
	0 - .5	05/31/2007	.047U	.047U	.047U	.024U	.024U	.024U	.024U	NA	NA	NA	.024U	.047U	.024U	.047U	.047U	.047U	.047U
	0 - .5	01/25/2008	.081U	.081U	.081U	.042U	.042U	.042U	.042U	NA	NA	NA	.042U	.081U	.042U	.081U	.081U	.081U	.081U
	0 - .5	06/09/2008	.048U	.048U	.048U	.025U	.025U	.025U	.025U	NA	NA	NA	.025U	.048U	.025U	.048U	.048U	.048U	.048U
	0 - .5	11/25/2008	.055U	.055U	.055U	.028U	.028U	.028U	.028U	NA	NA	NA	.028U	.055U	.028U	.055U	.055U	.055U	.055U

TABLE A-3: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SEDIMENT SAMPLES

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Location ID	Depth (Feet)	Date Collected	PESTICIDES (mg/kg)													
			Endrin Ketone	EPTC	Eonofos	Gamma-BHC (Lindane)	Gamma-Chlordane	Heptachlor	Heptachlor Epoxide	Methoxychlor	Mirex	Molinate	Napropamide	Pebulate	Toxaphene	Vernolate
SED101	0 - .5	10/30/2006	.00041UJ	.0046UJ	.025UJ	.0012UJ	.00048UJ	.00045UJ	.00078UJ	.0023UJ	.00041UJ	.0046UJ	.0046UJ	.0046UJ	.039UJ	.0046UJ
	0 - .5	05/31/2007	NA	NA	NA	.018U	.018U	.018U	.018U	.18U	NA	NA	NA	NA	.65U	NA
	0 - .5	01/25/2008	NA	NA	NA	.043U	.043U	.043U	.043U	.43U	NA	NA	NA	NA	1.5U	NA
	0 - .5	06/09/2008	NA	NA	NA	.0062U	.0041J	.0062U	.0047J	.062U	NA	NA	NA	NA	.22U	NA
	0 - .5	11/25/2008	NA	NA	NA	.027U	.027U	.027U	.027U	.27U	NA	NA	NA	NA	.94U	NA
SED102	0 - .5	10/30/2006	.0004UJ	.0045UJ	.025UJ	.0011UJ	.00047UJ	.00044UJ	.00076UJ	.0022UJ	.0004UJ	.0045UJ	.0045UJ	.0045UJ	.038UJ	.0045UJ
	0 - .5	05/31/2007	NA	NA	NA	.02U	.02U	.02U	.02U	.2U	NA	NA	NA	NA	.71U	NA
	0 - .5	01/25/2008	NA	NA	NA	.032U	.032U	.032U	.032U	.32U	NA	NA	NA	NA	1.1U	NA
	0 - .5	06/09/2008	NA	NA	NA	.0046U	.0046U	.0046U	.0046U	.046U	NA	NA	NA	NA	.16U	NA
	0 - .5	11/25/2008	NA	NA	NA	.016U	.016U	.016U	.016U	.16U	NA	NA	NA	NA	.58U	NA
SED103	0 - .5	10/30/2006	.0004U	.0046UJ	.025U	.0012U	.00047U	.00044U	.00076U	.0022U	.0004U	.0046UJ	.0046UJ	.0046UJ	.038U	.0046UJ
	0 - .5	05/31/2007	NA	NA	NA	.024U	.024U	.024U	.024U	.24U	NA	NA	NA	NA	.85U	NA
	0 - .5	01/25/2008	NA	NA	NA	.042U	.042U	.042U	.042U	.42U	NA	NA	NA	NA	1.5U	NA
	0 - .5	06/09/2008	NA	NA	NA	.025U	.025U	.025U	.025U	.25U	NA	NA	NA	NA	.88U	NA
	0 - .5	11/25/2008	NA	NA	NA	.028U	.028U	.028U	.028U	.28U	NA	NA	NA	NA	1U	NA

TABLE A-3: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SEDIMENT SAMPLES

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Location ID	Depth (Feet)	Date Collected	PCBS (mg/kg)							pH
			Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	
SED101	0 - .5	10/30/2006	.013U	.028U	.017U	.007U	.035U	.0092U	.013U	7.38J
	0 - .5	05/31/2007	.021U	.042U	.021U	.021U	.19	.021U	.017J	6.8
	0 - .5	01/25/2008	.031U	.062U	.031U	.031U	.3	.19	.055	6.7
	0 - .5	06/09/2008	.044U	.089U	.044U	.044U	.15	.099	.025J	6.9
	0 - .5	11/25/2008	.038U	.075U	.038U	.038U	.26	.13	.042	7
	0 - .5	04/06/2009	.04U	.08U	.04U	.04U	.35	.15	.04J	7.2
	0 - .5	11/18/2009	.036U	.073U	.036U	.036U	.036U	.036U	.036U	6.6
SED102	0 - .5	10/30/2006	.012U	.027U	.016U	.0069U	.035U	.009U	.012U	7.26J
	0 - .5	05/31/2007	.023U	.046U	.023U	.023U	.13	.023U	.015J	7.1
	0 - .5	01/25/2008	.023U	.045U	.023U	.023U	.051	.04	.018J	7
	0 - .5	06/09/2008	.032U	.065U	.032U	.032U	.061	.035	.032U	7.2
	0 - .5	11/25/2008	.023U	.046U	.023U	.023U	.11	.057	.024	7.2
	0 - .5	04/06/2009	.023U	.045U	.023U	.023U	.11	.068	.024	7.3
	0 - .5	11/18/2009	.026U	.051U	.026U	.026U	.026U	.026U	.026U	7.2
SED103	0 - .5	10/30/2006	.012U	.028U	.017U	.0069U	.035U	.0091U	.012U	7.27J
	0 - .5	05/31/2007	.027U	.054U	.027U	.027U	.3	.027U	.024J	6.6
	0 - .5	01/25/2008	.029U	.059U	.029U	.029U	.16	.11	.035	6.7
	0 - .5	06/09/2008	.035U	.071U	.035U	.035U	.1	.068	.035U	6.7
	0 - .5	11/25/2008	.04U	.08U	.04U	.04U	.24	.12	.038J	7.1
	0 - .5	04/06/2009	.034U	.069U	.034U	.034U	.27	.14	.047	7.4
	0 - .5	11/18/2009	.039U	.077U	.039U	.039U	.039U	.039U	.039U	7.2

TABLE A-3: SUMMARY OF COMPLETE ANALYTICAL RESULTS FOR SEDIMENT SAMPLES

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Notes:	BHC	Hexachlorocyclohexane	J	Estimated value
	DDD	Dichlorodiphenyldichloroethane	mg/kg	Milligrams per kilogram
	DDE	Dichlorodiphenyldichloroethene	NA	Not available
	DDT	Dichlorodiphenyltrichloroethane	PCB	Polychlorinated biphenyl
	EPTC	1-ethylsulfanyl-N,N-dipropyl-formamide	U	Nondetect

APPENDIX B

VEGETATION SURVEY RESULTS FOR THE WSMRP SITE

Appendix B: Vegetation Survey Results for the WSMRP Site
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Location				**% Cover**							
Transect	**Quadrat**	**Scientific Name**	**Common Name**	**<1**	**1 to 5**	**6 to 15**	**16 to 25**	**26 to 45**	**46 to 75**	**76 to 90**	**>90**
A	A-1	Bare Ground	Mud Flat – 100%								x
	A-2	*Achillea millefolium*	Yarrow				x				
		Aster chilensis	California aster			x					
		Atriplex triangularis	Saltbrush, spearscale		x						
		Bromus diandrus	Rip gut brome		x						
		Drift material			x						
		Bare ground					x				
	A-3	*Aster chilensis*	California aster		x						
		Avena sp.		x							
		Bromus diandrus	Rip gut brome	x							
		Gindelia hirsutula var. hirsutula	Gumplant								x
		Bare ground			x						
	A-4	*Aster chilensis*	California aster	x							
		Grindelia stricta var. angustifolia	Marsh gumplant				x				
		Mulch								x	
	A-5	*Aster chilensis*	California aster		x						
		Distichlis spicata	Saltgrass		x						
		Lolium multiflorum	Italian wildrye	x							
		Lupinus arboreus	Tree lupine							x	
	A-6	*Artemisia douglasiana*	Mugwort								
		Distichlis spicata	Saltgrass								
		Lupinus arboreus	Lupine bush								
		Polypogon monspliensis	Rabbits foot grass								
		Bare ground									
		Distichlis spicata	Saltgrass								

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Location				% Cover							
Transect	Quadrat	Scientific Name	Common Name	<1	1 to 5	6 to 15	16 to 25	26 to 45	46 to 75	76 to 90	>90
A’	A’-1	*Bromus diandrus*	Rip gut brome	x							
		Bromus hordeaceous	Soft chess brome	x							
		Disichlis spicata	Saltgrass			x					
		Grindelia stricta var. angustifolia	Marsh gumplant					x			
		Dead plant material			x						
		Drift material				x					
		Bare ground						x			
	A’-2	*Distichlis spicata*	Saltgrass						x		
		Grindelia stricta var. angustifolia	Marsh gumplant					x			
		Salicornia virginica	Pickleweed		x						
	A’-3	*Grindelia stricta var. angustifolia*	Marsh gumplant		x						
		Paraphulis incurva	Sickle grass			x					
		Salicornia virginica	Pickleweed							x	
		Dead plant material				x					
B	B-1	*Aster chilensis*	California aster		x						
		Baccharis pilularis	Coyote brush								x
		Bromus diandrus	Rip gut brome	x							
		Grindelia stricta var. angustifolia	Marsh gumplant		x						
		Mulch			x						
	B-2	*Distichlis spicata*	Saltgrass					x			
		Salicornia virginica	Pickleweed						x		
		Bare ground			x						
	B-3	*Jaumea carnosa*	Salty susan		x						
		Salicornia virginica	Pickleweed							x	
		Bare ground				x					
	B-4	*Salicornia virginica*	Pickleweed							x	
		Spartina foilosa	Pacific cord grass		x						
	B-5	*Salicornia virginica*	Pickleweed								x
		Spartina foilosa	Pacific cord grass	x							
	B-6	*Salicornia virginica*	Pickleweed						x		
		Algal mat				x					
		Bare ground						x			

Location				% Cover							
Transect	**Quadrat**	**Scientific Name**	**Common Name**	**<1**	**1 to 5**	**6 to 15**	**16 to 25**	**26 to 45**	**46 to 75**	**76 to 90**	**>90**
B	B-7	*Salicornia virginica*	Pickleweed								x
		Spartina foilosa	Pacific cord grass				x				
C	C-0	*Achillea millefolium*	Yarrow				x				
		Aster chilensis	California aster		x						
		Bromus diandrus	Rip gut brome		x						
		Paraphulis incurva	Sickle grass		x						
		Salicornia virginica	Pickleweed			x					
	C-1	*Jaumea carnosa*	Salty susan			x					
		Salicornia virginica	Pickleweed						x		
		Bare ground				x					
	C-2	*Salicornia virginica*	Pickleweed					x			
		Algal mat					x				
		Bare Ground					x				
	C-3	Algal mat								x	
		Mulch			x						
	C-4	*Salicornia virginica*	Pickleweed						x		
		Vulpia myuros	Rat-tail fescue					x			
	C-5	*Salicornia virginica*	Pickleweed			x					
		Vulpia myuros	Rat-tail fescue							x	
	C-6	*Salicornia virginica*	Pickleweed							x	
		Algal mat				x					
D	D-0	*Baccharis pilularis*	Coyote brush					x			
		Grindelia stricta var. angustifolia	Marsh gumplant				x				
		Lolium multiflorum	Italian wildrye			x					
		Salicornia virginica	Pickleweed		x						
		Dead plant material				x					
	D-1	*Frankenia*					x				
		Salicornia virginica	Pickleweed					x			
		Bare ground					x				
D	D-2	*Salicornia virginica*	Pickleweed			x					
		Bare ground								x	
	D-3	*Sparinia foliosa*	Pacific cord grass		x						

Location				% Cover							
Transect	**Quadrat**	**Scientific Name**	**Common Name**	**<1**	**1 to 5**	**6 to 15**	**16 to 25**	**26 to 45**	**46 to 75**	**76 to 90**	**>90**
		Algal mat						x			
		Bare ground						x			
	D-4	*Jaumea carnosa*	Salty susan		x						
		Salicornia virginica	Pickleweed								x
	D-5	*Salicornia virginica*	Pickleweed								x
		Bare ground			x						
	D-6	*Salicornia virginica*	Pickleweed							x	
		Algal mat				x					
	D-7	*Distichlis spicata*	Saltgrass				x				
		Salicornia virginica	Pickleweed					x			
		Sparinia foliosa	Pacific cord grass						x		
E	E-0	*Hordeum murinum*	Foxtail	x							
		Paraphulis incurva	Sickle grass			x					
		Salicornia virginica	Pickleweed					x			
		Mulch				x					
	E-1	*Salicornia virginica*	Pickleweed				x				
		Bare ground							x		
	E-2	*Salicornia virginica*	Pickleweed							x	
		Spartina foliosa	Pacific cord grass			x					
		Bare ground			x						
	E-3	*Distichlis spicata*	Saltgrass		x						
		Salicornia virginica	Pickleweed							x	
		Spartina foliosa	Pacific cord grass					x			
	E-4	*Distichlis spicata*	Saltgrass							x	
		Jaumea carnosa	Salty susan	x							
		Spartina foliosa	Pacific cord grass			x					
	E-5	*Distichlis spicata*	Saltgrass		x						
		Grindelia stricta var. angustifolia	Marsh gumplant					x			
		Salicornia virginica	Pickleweed					x			
		Dead plant material				x					

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Location				% Cover							
Transect	**Quadrat**	**Scientific Name**	**Common Name**	**<1**	**1 to 5**	**6 to 15**	**16 to 25**	**26 to 45**	**46 to 75**	**76 to 90**	**>90**
E	E-6	*Distichlis spicata*	Saltgrass						x		
		Salicornia virginica	Pickleweed		x						
		Drift material			x						
		Bare ground					x				
	E-7	*Atriplex triangularis*	Saltbrush, spearscale			x					
		Avena sp.			x						
		Distichlis spicata	Saltgrass				x				
		Grindelia stricta var. angustifolia	Marsh gumplant						x		
		Jaumea carnosa	Salty susan	x							
		Salicornia virginica	Pickleweed				x				
	E-8	*Avena sp.*		x							
		Baccaris pilularis	Coyote brush	x							
		Bromus hordeaceus	Soft chess brome	x							
		Distichlis spicata	Saltgrass				x				
		Grindelia stricta var. angustifolia	Marsh gumplant						x		
		Jaumea carnosa	Salty susan	x							
		Salicornia virginica	Pickleweed				x				
	E-9	*Baccharis pilularis*	Coyote brush			x					
		Bromus diandrus	Rip gut brome	x							
		Distichlis spicata	Saltgrass			x					
		Grindelia stricta var. angustifolia	Marsh gumplant			x					
		Heteromeles arbutifolia	Toyon							x	
	E-10	*Avena sp.*			x						
		Baccharis pilularis	Coyote brush						x		
		Bromus hordeaceus	Soft chess brome	x							
		Distichlis spicata	Saltgrass							x	
F	F-1	*Grindelia stricta var. angustifolia*	Marsh gumplant		x						
		Salicornia virginica	Pickleweed			x					
		Dead plant material	Annual grasses						x		
	F-2	*Salicornia virginica*	Pickleweed								x

Appendix B: Vegetation Survey Results for the WSMRP Site
Year 5 Monitoring Report for the Western Stege Marsh Restoration Project
University of California, Berkeley, Richmond Field Station, Richmond, California

Location				% Cover							
Transect	Quadrat	Scientific Name	Common Name	<1	1 to 5	6 to 15	16 to 25	26 to 45	46 to 75	76 to 90	>90
F	F-3	*Distichlis spicata*	Saltgrass	x							
		Salicornia virginica	Pickleweed							x	
		Spartina alterniflora				x					
	F-4	*Salicornia virginica*	Pickleweed								x
		Bare ground			x						
G	G-1	*Distichlis spicata*	Saltgrass					x			
		Grindelia stricta var. angustifolia	Marsh gumplant			x					
		Limonium californicum	Marsh rosemary			x					
		Toxicodendron diversilobum	Poison Oak				x				
		Drift material			x						
		Bare ground				x					
	G-2	*Distichlis spicata*	Saltgrass				x				
		Grindelia stricta var. angustifolia	Marsh gumplant					x			
		Jaumea carnosa	Salty susan				x				
		Limonium californicum	Marsh rosemary		x						
		Drift material				x					
		Bare ground				x					
	G-3	*Artemistia calfornica*	Common sagebrush			x					
		Distichlis spicata	Saltgrass							x	
		Grindelia stricta var. angustifolia	Marsh gumplant			x					
		Jaumea carnosa	Salty susan		x						
		Salicornia virginica	Pickleweed		x						
	G-4	*Bromus diandrus*	Rip gut brome	x							
		Distichlis spicata	Saltgrass				x				
		Grindelia stricta var. angustifolia	Marsh gumplant		x						
		Heliotopium curassavicum	Marsh heliotrope	x							
		Jaumea carnosa	Salty susan				x				
		Limonium californicum	Marsh rosemary	x							
		Salicornia virginica	Pickleweed		x						
		Dead plant material					x				
		Drift material				x					