Wetlands and Water Resources, Inc

818 5th Avenue, Suite 208
San Rafael, California 94901
tel 415.457.0250
fax 415.457.0260
www.swampthing.org

Integrated Regional Wetland Monitoring Pilot Project
Field Data Collection Report
December 2003 to September 2005

Prepared for:
California Bay-Delta Authority Science Program
650 Capitol Mall, 5th Floor
Sacramento, CA 95814
http://calwater.ca.gov
Ph: (916) 445-5511

December 2006

Project No. 1067

TABLE OF CONTENTS

1.0 Introduction.....1
1.1 Project Overview 1
1.2 Science Team Designations and Participating Organizations 2
1.3 Principal Contact for Participating Organizations 3
1.4 Participating Researchers by Team..... 5
2.0 Landscape Ecology Team Report 9
3.0 Plant Team Report 106
4.0 Bird Team Report.....137
5.0 Fish and Invertebrate Team Report.....225
6.0 Primary Productivity and Nutrient Team Report 256
7.0 Physical Processess Team Report 277

1.0 Introduction

This report details the field data collection activities undertaken as part of CALFED's Integrated Regional Wetland Monitoring (IRWM) Pilot Project. This comprehensive data collection and monitoring effort included a variety of public institutions and private organizations in a multi-disciplinary collaboration to collect and analyze a variety of field-based ecological data in restored and natural wetland sites in the northern San Francisco estuary. Field sampling and data collection activities occurred from fall 2003 to fall 2005 at six field study sites located from San Pablo Bay to the Sacramento-San Joaquin River Delta.

This report is a compilation of the individual field data collection reports produced by each participating team detailing the scope of work, the data collection and quality assurance methods and procedures, and data results.

1.1 Project Overview

Regional tidal marsh restoration efforts aim to support and recover populations of plant, fish and wildlife species. These ecological support functions follow successful establishment of a variety of ecological processes in restoration projects. In order to understand the effectiveness of tidal marsh restoration efforts regionally, it is necessary to determine which processes are in fact important to establish and to identify the means by which we measure and quantify these processes.

The IRMW Pilot Project sought to accomplish two goals on behalf of the California Bay-Delta Authority (CBDA): (1) to evaluate the underlying management question, *how are ecosystem restoration efforts throughout the region affecting ecosystem processes at different scales*; and (2) through development and application of adaptive monitoring approaches, prepare for subsequent longer-term monitoring.

To address these needs, IRWM utilized a five-element strategy. (1) IRWM is multi-disciplinary, intensive monitoring program covering physical processes, landscape ecology, vegetation, birds, fish, invertebrates, primary production, and nutrients. (2) IRWM established a series of core and component conceptual models that describe the current state of knowledge and define a suite of hypotheses. (3) IRWM developed sampling and data QA/QC and management programs to test these hypotheses, develop data sets to address the ecological process question, and evaluate different approaches to restoration monitoring. (4) IRWM selected a suite of six sites (four restoration and two natural) spanning from San Pablo Bay to the western Delta based on a set of criteria tied to the conceptual models. (5) IRWM will integrate results across disciplines and thereby begin to address the fundamental ecological process question.

To compliment the data results presented in this report, the IRWM methods and results, including data, aerial imagery, GIS and mapping products, are posted for the public at www.irwm.org

1.2 Science Team Designations and Participating Organizations

Physical Processes Team

- Wetlands and Water Resources, Inc.
- Philip Williams Associates, Ltd.
- Bachand Associates

Landscape Ecology Team

- University of California, Berkeley
- PRBO Conservation Science
- Wetlands and Water Resources, Inc.

Plant Team

- San Francisco State University
- University of San Francisco

Bird Team

- PRBO Conservation Science
- Audubon Canyon Ranch
- Avocet Research Associates

Fish and Invertebrate Team

- San Francisco State University
- University of Washington

Primary Productivity and Nutrient Team

- San Francisco State University - Romberg Tiburon Center

Data Management Team, Science Support

- San Francisco Estuary Institute

1.3 Principal Contact for Participating Organizations

Stuart W. Siegel, Lead Principal Investigator
President, Principal Environmental Scientist
Wetlands and Water Resources
818 5th Street, Suite 208
San Rafael, CA 94901
(415) 457-0250 phone
(415) 457-0260 fax
stuart@swampthing.org

N. Maggi Kelly, Principal Investigator
Cooperative Extension Specialist and Adjunct Assistant Professor, Chair, GIIF
University of California - Berkeley
Ecosystem Sciences Division
Department of Environmental Sciences, Policy and Management
121 Mulford Hall
Berkeley, CA 94720-3114
(510) 642.7272 phone
(510) 642.1477 fax
mkelly@nature.berkeley.edu

John Callaway, Principal Investigator
University of San Francisco
Department of Environmental Science
2130 Fulton Street
San Francisco, CA 94117-1080
(415) 422-5702 phone
(415) 422-6363 fax
callaway@usfca.edu

V. Tom Parker, Principal Investigator
Professor
San Francisco State University
Department of Biology
1600 Holloway Avenue
San Francisco, CA 94132
(415) 338-2375 phone
(415) 338-6406 fax
parker@sfsu.edu

Nadav Nur, Ph.D., Principal Investigator
Director of Quantitative Ecology
PRBO Conservation Science
3820 Cypress Drive, #11
Petaluma, CA 94954
(707) 781-2555 x301
nnur@prbo.org

Stephen M. Bollens, Principal Investigator
Professor, School of Biological Sciences
Director of Science Programs
Washington State University Vancouver
Vancouver WA 98686-9600
(360) 546-9116 phone
(360) 546-9064 fax
bollens@vancouver.wsu.edu

Charles A. "Si" Simenstad, Principal Investigator
Coordinator, Wetlands Ecosystem Team
School of Aquatic and Fishery Sciences
Box 355020, College of Ocean and Fishery Sciences
University of Washington
Seattle, Washington 98195-5020
(206) 543-7185 phone
(206) 685-7471 fax
simenstd@u.washington.edu

Joshua N. Collins, Principal Investigator
Science Director, Wetlands Program
San Francisco Estuary Institute
7770 Pardee Lane, 2nd Floor
Oakland, CA 94621
(510) 746-7365 phone
(510) 746-7300 fax
josh@sfei.org

1.4 Participating Researchers by Team

(* Denotes Principal Investigator)

Stuart W. Siegel, Lead Principal Investigator

Landscape Ecology
*Diana Stralberg, PRBO Conservation Science (dstralberg@prbo.org)
Karin Tuxen, UC Berkeley (karin@nature.berkeley.edu)
*N. Maggi Kelly, UC Berkeley (mkelly@nature.berkeley.edu)
*Stuart Siegel, Wetlands and Water Resources (stuart@swampthing.org)

Plants
*John Callaway, University of San Francisco (callaway@usfca.edu)
*V. Thomas Parker, San Francisco State University (parker@sfsu.edu)
*Michael Vasey, San Francisco State University (mvasey@mercury.sfsu.edu)
Lisa Schile, San Francisco State University (lschile@sfsu.edu)

Physical Processes
*Stuart W. Siegel, Wetlands and Water Resources, Inc. (stuart@swampthing.org)
*Jeremy Lowe, Philip Williams and Associates, Ltd. (J.Lowe@pwa-ltd.com)
*Philip A.M. Bachand, Ph.D., Bachand Associates (phil@bachandassociates.com)
Tim Carson, Wetlands and Water Resources, Inc. (tcarson@swampthing.org)
James Kulpa, Environmental Data Solution (jkulpa@fielddata.biz)
Jake Schwietzer, Wetlands and Water Resources, Inc. (jake@swampthing.org)
Sean Avent, Wetlands and Water Resources, Inc. (sean@seanavent.com)

Birds
*Nadav Nur, Ph.D., PRBO Conservation Science (nnur@prbo.org)
*Mark Herzog, Ph.D., PRBO Conservation Science (mherzog@prbo.org)
Leonard Liu, PRBO Conservation Science (lliu@prbo.org)
John Kelly, Ph.D., Audubon Canyon Ranch (cgrc@egret.org)
Jules Evens, Avocet Research Associates
Diana Stralberg, PRBO Conservation Science (dstralberg@prbo.org)
Nils Warnock, Ph.D., PRBO Conservation Science (nwarnock@prbo.org)

Fish and Invertebrates
*Stephen M. Bollens, Washington State University, Vancouver
(bollens@vancouver.wsu.edu)
*Charles A. Simenstad, University of Washington, (simenstd@u.washington.edu)
Darren Gewant, San Francisco State University (darreng@sfsu.edu)
Sean Avent, San Francisco State University (sean@seanavent.com)

Primary Productivity and Nutrients
*Risa Cohen, Romberg Tiburon Center (rcohen@sfsu.edu)
*Richard Dugdale, Romberg Tiburon Center (rdugdale@sfsu.edu)
*Frances Wilkerson, Romberg Tiburon Center (fwilkers@sfsu.edu)

Data Management and Scientific Support
*Joshua Collins, San Francisco Estuary Institute (josh@sfei.org)
*Mike May, San Francisco Estuary Institute (mmay@sfei.org)
Meredith Williams, San Francisco Estuary Institute (meredith@sfei.org)
Predrag Stevanovic, San Francisco Estuary Institute (predrag@sfei.org)

Integrated Regional Wetland Monitoring Pilot Project

Landscape Ecology Team Data Report

Authors
Diana Stralberg, PRBO Conservation Science (dstralberg@prbo.org)
Karin Tuxen, UC Berkeley (karin@nature.berkeley.edu)
N. Maggi Kelly, UC Berkeley (mkelly@nature.berkeley.edu)
Stuart Siegel, Wetlands and Water Resources (stuart@swampthing.org)

December 24, 2006

1. INTRODUCTION **1**

2. DATA PRODUCTS AND METHODS **1**

2.1. DATA INVENTORY 1
2.2. SITE AND SUBSITE BOUNDARIES 1
2.3. AERIAL IMAGERY 1
2.4. VEGETATION ACCURACY ASSESSMENT POINTS 2
2.5. VEGETATION MAPS 3
2.6. GEOMORPHIC MAPS 4
2.6.1. Polygons *4*
2.6.2. Lines *4*
2.7. TIDAL MARSH PATCH DELINEATION 4
2.8. SITE LEVEL METRICS 5
2.8.1. Vegetation *5*
2.8.2. Geomorphology *5*
2.8.3. Edge characteristics *5*
2.8.4. Patch metrics *5*
2.8.5. Surrounding land use *6*
2.8.6. Integration of metrics across teams *6*
2.9. MOVING WINDOW AND PROXIMITY METRICS (WITHIN-SITE METRICS) 6
2.9.1. Vegetation *6*
2.9.2. Geomorphology *6*
2.9.3. Edge characteristics *7*
2.9.4. North Bay moving window landscape metrics *7*

3. TABLES **8**

4. FIGURES **24**

5. LITERATURE CITED **33**

6. METADATA **33**

APPENDIX A. SPATIAL DATA INVENTORY **34**

APPENDIX B. DATA GAPS REPORT **43**

APPENDIX C. REPORT OF GEOMORPHIC DATA EXTRACTION, SEPTEMBER 2004 ..... **45**

APPENDIX D. PATCH DELINEATION CRITERIA **48**

APPENDIX E. REPORT OF COLLECTED 2003 AND 2004 AERIAL IMAGERY **49**

1. Introduction

The overall goals of the Landscape Ecology Team (LET) were (1) to provide a backdrop of multi-scale marsh structure for other teams to use in their monitoring efforts, and (2) to monitor changes in marsh structure at multiple scales.

The LET used GIS and remote sensing technology and data to produce maps and calculate spatial metrics at the site and landscape scales. In this manner, the LET mapped and quantified landscape composition and pattern with respect to tidal wetlands and surrounding other wetland types and uplands of San Pablo and Suisun Bays and the Delta at multiple scales. These products met the objectives stated in the LET scope of work and supported the data needs of the other teams, providing a cornerstone for integrated analyses of monitoring results.

The specific objectives of our multi-scale maps and spatial metrics were to:
1. Aid in site selection for extensive monitoring efforts led by other IRWM teams;
2. Evaluate each team's conceptual models and identify landscape indicators;
3. Provide an inventory of landscape characteristics at a range of measurement scales for all San Pablo, Suisun, and Delta wetlands;
4. Provide other teams with site-specific imagery, map products and spatial metrics; and
5. Extrapolate observed relationships to potential restoration sites and integrate across taxa.

2. Data Products and Methods

2.1. Data inventory

At the start of the project, the LET developed a data inventory spreadsheet for existing spatial data resources, including aerial imagery, topography and geomorphology, and land use/land cover (Appendix A). Based on the data inventory, we created a report summarizing spatial data gaps (Appendix B) to inform the current project, as well as future mapping and monitoring efforts.

2.2. Site and subsite boundaries

Each site was delineated according to natural or anthropogenic boundaries defining the extent of the marsh plain (Figure 1). Each edge segment was classified according to type: open water (bay or major channel), natural upland, or levee. For organization and cross-team data analysis purposes, subsites were also delineated. Subsites boundaries were loosely based on the midpoints between major drainage basins, modified to reflect areas of distinct vegetation composition, which in some cases were defined by major channels (Figure 1).

2.3. Aerial imagery

Scope of Work. The LET obtained high-resolution aerial imagery for the six sites for two years (2003 and 2004) during the fall season, rectified and processed the imagery so that it could be used by other teams, and provided a detailed report documenting aerial imagery acquisition and processing activities (see Report of Collected 2003 and 2004 imagery).

Data Collection and Quality Assurance. Based upon LET review of IRWM project needs with regard to scale and pixel resolution, site size, number of photos per site, and budget, aerial photographs for all sites were flown at a scale of 1:9,600 and scanned at a resolution of 1,200 dpi, retaining the target 0.67 (0.2m) ft pixel resolution. Aerial photographs were flown at low tide in 2003 and at mid tide in 2004. Aerial control points were laid out in the marshes, and used to ortho-rectify the scanned photo TIFFs using ENVI photo processing software, version 3.6. Additional imagery details and processing methods are documented in the Report of Collected 2003 and 2004 imagery.

2.4. Vegetation accuracy assessment points

Scope of Work. Vegetation data was collected in the field for use as ground reference data in the training and accuracy assessment of the vegetation maps. The LET collaborated closely with the Plant Team for its field work, as both teams used the final dataset (the Plant Team used it for their plot-level richness and diversity vegetation metrics).

Data Collection and Quality Assurance. Between 500-1000 points were randomly-generated in GIS prior to field visits, and transferred to handheld GPS units (i.e. Garmin GPSmap 60). Each field visit consisted of 2-5 personnel, who covered a separate area of the site for that day and visited different points than each other. Field personnel collected as many points as possible within the time allowed for that field visit. In 2003, additional non-random points were also collected and were chosen during the field visit at the discretion of field personnel, which were only used as additional information to train the image classification (they were not used in the accuracy assessments). At all points, samplers recorded absolute percent cover of all species within a circular plot with a three-meter radius. Percent cover was determined with ocular estimates, using a seven-category Daubenmire ranking system (1 for 0-2%, 2 for 2-5%, 3 for 5-25%, 4 for 25-50%, 5 for 50-75%, 6 for 75-95%, and 7 for 95-100%) (Daubenmire 1959). Between 50-300 point locations were visited at each site in 2003 and in 2004 (Table 1). Handheld GPS units with an average recorded location error/offset of five meters were used to navigate to each point. All vegetation accuracy assessment data was visually error-checked by one or two field personnel.

For each site for each year, we computed a clustering method of all vegetation accuracy assessment data in order to produce an objective vegetation classification scheme specific to each site. Agglomerative hierarchical clustering was performed in PCord™ (McCune & Grace 2002), using all the randomly-generated plots from both years, with all species observed in all cover classes. We then combined all data into a universal classification scheme for all six sites (Figures 3 and 4), guided by the alliance-association classification from the Manual of California Vegetation (Sawyer and Keeler-Wolfe 2005).

Results and Observations. A summary of points collected at each site is shown in Table 1. Plot-level analyses, such as richness and diversity were calculated by the Plant Team and are discussed in their Data Report. A map of point (plot) locations for each site is located in Figure 2.

2.5. Vegetation maps

Scope of Work. For all sites with more than one image tile, each tile was classified separately, and then mosaicked before accuracy assessment. This was necessary since different tiles had varying airplane tilt, causing brightness gradients from one side of the tile to the other. Image classification for each tile at each site consisted of several steps, described below. All images from both years were resampled from 0.2m to 1.0m pixel size, in order to reduce image size for use in a GIS. All image classification work was performed with Leica Geosystem's Erdas Imagine software (Leica Geosystems Inc. 2005). Vegetation maps were produced using a hybrid approach (both supervised and unsupervised) to image analysis and classification. The Wetland Regional Monitoring Program's Baylands Vegetation Mapping Protocol was used as a guide for all image classification methods (Collins and Stralberg 2004).

Data Collection and Quality Assurance. First, vegetated and non-vegetated areas were separated using the Normalized Difference Vegetation Index (NDVI). A NDVI threshold value was chosen visually, using prior knowledge of the sites, to represent the NDVI break between vegetation and bare/non-vegetated areas. The bare/non-vegetated areas were then masked out of the dataset, to render imagery with only areas with vegetation. This layer was then inputted into a Principal Components Analysis (PCA) was performed in order to separate spectrally similar vegetation groups. An unsupervised classification (ISODATA) with 20 classes was performed on this PCA image. The unsupervised classification result was then grouped visually into several vegetation groups of similar spectral properties. The raw vegetation image was then masked for each spectral group to product several different raw images, one for each spectrally similar vegetation group. Next, the non-random vegetation points were used as training samples for the remote sensing software about where the specific vegetation classes existed in the image. In addition to these training points, knowledge of the sites were used to choose areas that were known to consist of specific vegetations classes based on multiple site visits. Each vegetation group image was classified based on its training samples using a Maximum Likelihood Classifier (MLC) supervised classification. This step rendered a classified output for each vegetation group, which was combined together and with the non-vegetated areas (bare ground and water), to form a complete vegetation map for each site. At this point, all tiles (if more than one) were mosaicked together. The vegetation maps required that several patches be adjusted with manual changes, and these were performed by recoding it to a different vegetation class. The final step was to filter, or smooth out, the vegetation maps using an elimination filter (termed "Eliminate" in Erdas Imagine) that allows for the specification of a minimum "clump," or patch of pixels of a certain number or area, and clumps smaller than the minimum are filled in from their neighboring large clumps in an iterative fashion until there no longer exists patches below the minimum threshold. The minimum clump size used was four pixels, resulting in a minimum mapped unit (MMU) of approximately four meters^2.

An accuracy assessment was performed for each map using the vegetation accuracy assessment data. The data was revised to reflect the dominant vegetation type in the plot. For each circular plot, the real-world dominant vegetation type was compared to the mapped dominant vegetation type, in order to assess accuracy. Omission and commission errors were calculated for each class for each site. The omission error, also know as the "producer's accuracy," measures the probability of a ground point being correctly classified. The commission error indicates the

probability of a ground point on the map representing what is truly on the ground and is often called the "user's accuracy."

Results and Observations. Vegetation maps for all sites are shown in Figures 3 (2003) and 4 (2004). Error matrixes are shown in Table 2. Map accuracies ranged from 70-91%.

2.6. Geomorphic maps

Scope of Work. Geomorphic attributes maps of each site were created in 2003. To facilitate the development of various metrics, geomorphic attributes were represented both as polygons and as lines.

2.6.1. Polygons

Data Collection and Quality Assurance. Geomorphic polygons were produced in three major steps. First, using the Normalized Difference Vegetation Index (NDVI) created from the imagery, a threshold value was chosen visually, using prior knowledge of the sites, to represent the NDVI break between vegetation and bare/non-vegetated areas (the bare/non-vegetated areas typically denoting pannes). Second, the data were converted from raster to vector format, and then smoothed out to form lines that better represented the channel, pond, and panne boundaries. Third, the smoothed polygons were manually edited to follow along the actual channel, pond, and panne boundaries as visually interpreted on-screen in a GIS. Methods are described in greater detail in Appendix C. Quality assurance and quality control (QA/QC) was conducted in the form of independent review by other LET members.

Results and Observations. Geomorphic polygon maps for all sites are shown in Figure 5.

2.6.2. Lines

Data Collection and Quality Assurance. Polygon geomorphic maps were complemented by manually digitized lines representing first-order channels that were difficult to extract from the aerial imagery via automated methods. A channel centerline layer was also extracted manually from the smoothed polygons. Channel lines were digitized on-screen from 2003 aerial photos using stream mode digitizing and the same scale (1:600) and tolerance settings that were used to edit the polygons (Appendix C). Linear channel segments were also attributed with respect to width class. Quality assurance and quality control (QA/QC) was conducted in the form of independent review by other LET members.

Results and Observations. Geomorphic line maps for all sites are shown in Figure 6.

2.7. Tidal marsh patch delineation

Scope of Work. Three levels of San Francisco Bay marsh patches were delineated from SFEI's EcoAtlas modern baylands layer (SFEI 1998) as part of SFEI's contribution to the Environmental Protection Agency's (EPA) environmental monitoring and assessment program

(EMAP) (Collins et al. 2003). The delineation criteria for each patch level were associated with dispersal and movement limitations of different tidal marsh organisms (see Appendix C).

2.8. Site level metrics

Scope of Work. Site-level metrics were calculated using several GIS data sources of varying resolution and spatial extent, ranging from vegetation and geomorphic layers derived from sub-meter resolution aerial photos to land use / land cover data derived from 30-m satellite imagery.

2.8.1. Vegetation

Data Collection and Quality Assurance. Using the vegetation maps for each site and each year, site-level vegetation characteristics were summarized using a suite of spatial metrics chosen to represent vegetation composition and diversity. Metrics included area and proportion of each vegetation type, patch richness density, Shannon-Wiener diversity index and Shannon-Wiener evenness index.

Results and Observations. A summary of all site-level vegetation metrics is included in Tables 3 and 4.

2.8.2. Geomorphology

Data Collection and Quality Assurance. Using the polygon- and line-based geomorphic maps for each site (2003 only), site-level geomorphic characteristics were summarized using a suite of spatial metrics chosen to represent the extent and complexity of tidal channels and other open water features. Metrics included channel length by width class and overall sinuosity, as well as area and proportion of ponds/pannes and open channels.

Results and Observations. A summary of all site-level geomorphic metrics is included in Table 4.

2.8.3. Edge characteristics

Data Collection and Quality Assurance. Using the line-based site boundary layers for each site, site-level edge characteristics were summarized in terms of total and proportion of each edge type.

Results and Observations. A summary of all site-level edge metrics is included in Table 4.

2.8.4. Patch metrics

Data Collection and Quality Assurance. Based on three levels of tidal marsh patches, size, shape, and isolation metrics were calculated and summarized for all IRWM sites using the Patch Analyst extension for ArcView (Elkie et al. 1999).

Results and Observations. A summary of all site-level patch metrics is included in Table 5.

2.8.5. Surrounding land use

Data Collection and Quality Assurance. For each IRWM site, 30-m data derived from 2000 satellite imagery (NOAA 2000) was used to calculate land use / landcover proportions within 1-, 3-, 5-, 7-, and 10-km buffer distances around each site. Land use / landcover categories included high- and low-intensity urban development, agriculture, tidal marsh, freshwater marsh, and open water.

Results and Observations. A summary of all site-level surrounding land use metrics is included in Table 6.

2.8.6. Integration of metrics across teams

Data Collection and Quality Assurance. Based on each team's selection of key tidal marsh restoration metrics, the LET developed a matrix of potential relationships between indicator and predictor metrics, and associated scales of measurement.

Results and Observations. A summary of all site-level surrounding land use metrics is included in Table 7.

2.9. Moving window and proximity metrics (within-site metrics)

Scope of Work. Within each site, moving window metrics were calculated for each 1-m pixel. Across the entire north bay adjacent uplands, moving window metrics were calculated for each 100-m pixel.

2.9.1. Vegetation

Data Collection and Quality Assurance. Based on 1-m vegetation grid layers for each site and each year (2003 and 2004), moving window metrics were calculated using the FragStats software package (McGarigal and Marks 1995) and a circular, 50-m radius moving window. Outputs were 1-m grid layers. Moving window vegetation metrics included proportion of each vegetation type, Shannon-Wiener diversity index, and Normalized Difference Vegetation Index (NDVI).

Results and Observations. A sample of the moving window vegetation metrics is shown in Figure 7.

2.9.2. Geomorphology

Data Collection and Quality Assurance. Based on 1-m grid representations of the 2003 polygon geomorphology layers for each site, as well as line representations of the linear channel networks, moving window metrics were calculated using the neighborhood statistics and linear density functions in the ArcGIS 9 Spatial Analyst extension (ESRI 2005). Circular, moving window radii used were 25 and 50 m, and outputs were 1-m grid layers. An inverse-weighted distance to nearest channel metric was also calculated using the distance (straight line) and raster calculator functions in the ArcGIS 9 Spatial Analyst extension (ESRI 2005). Moving window geomorphic metrics included linear channel density (m/m^2) and areal channel proportion. The proximity metric was 1/(distance [m] to nearest "open" [not vegetation-covered] channel).

Results and Observations. A sample of the moving window geomorphic metrics is shown in Figure 8.

2.9.3. Edge characteristics

Data Collection and Quality Assurance. Using the line-based site boundary layers for each site, the distance to the nearest levee edge was calculated using the distance (straight line) function in the ArcGIS 9 Spatial Analyst extension (ESRI 2005). The raster calculator was used to calculate the inverse of this distance: 1/(distance [m] to nearest levee). Outputs were 1-m grid layers.

Results and Observations.

2.9.4. North Bay moving window landscape metrics

Data Collection and Quality Assurance. Landscape-level moving window metrics representing surrounding land use composition, wetland configuration, and wetland connectivity, were developed for the entire North Bay region using the FragStats software package (McGarigal and Marks 1995). Metrics were based on a 30-m land use / landcover dataset (NOAA 2000) that was resampled down to a 100-m pixel resolution, and were based on circular, moving window radii of 1, 3, 5, 7, and 10 km. Outputs were 100-m pixel resolution ArcGIS grid layers.

Results and Observations. A sample of the North Bay moving window landscape metrics is shown in Figure 9.

3. Tables

Table 1. Summary of random and non-random points used for vegetation map accuracy assessment in 2003 and 2004.

		2003				2004			
Site	Acres	# Field days	Random points	Non-random points	Total Points	# Field days	Random points	Non-random points	Total Points
Carl's Marsh (CM)	48	4	217	36	253	2	234	0	234
Pond 2A (P2A)	533	8	182	86	268	2	279	0	279
Coon Island (CI)	401	9	206	70	276	7	236	0	236
Bull Island (BuI)	108	7	160	68	228	1	296	0	296
Browns Island (BrI)	683	7	151	51	202	4	272	0	272
Sherman Lake (SL)	972	6	101	70	171	1	53	0	53

Table 2. Classification error matrices for 2003 and 2004 vegetation maps.

Carl's Marsh 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 182 / 217 = 83.9%

		REFERENCE CLASS							
		1	2	3	4	5	6	7	
MAPPED CLASS	1	41	10				1		52
	2		8						8
	3		7	56			1		64
	4	1	1	1	7				10
	5	2	2			32			36
	6	1	2	3	2		36		44
	7					1		2	3
		45	30	60	9	33	38	2	217

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	41/52 = 79%
2	Perennial Pickleweed	8/8 = 100%
3	Annual Pickleweed	56/64 = 88%
4	Cordgrass	7/10 = 70%
5	Upland	32/36 = 89%
6	Bare	36/44 = 82%
7	Water	2/3 = 67%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	41/45 = 91%
2	Perennial Pickleweed	8/30 = 27%
3	Annual Pickleweed	56/60 = 93%
4	Cordgrass	7/9 = 78%
5	Upland	32/33 = 97%
6	Bare	36/38 = 95%
7	Water	2/2 = 100%

Carl's Marsh 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 214 / 234 = 91.5%

		REFERENCE CLASS							
		1	2	3	4	5	7	8	
MAPPED CLASS	1	57	3						60
	2	2	48	1					51
	3	2	2	66		1	2		73
	4	2			9				11
	5		1			6			7
	7	2		2			24		28
	8							4	4
		65	54	69	9	7	26	4	234

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	57/60 = 95%
2	Perennial Pickleweed	48/51 = 94%
3	Annual Pickleweed	66/73 = 90%
4	Cordgrass	9/11 = 82%
5	Upland	6/7 = 86%
6	Bare	24/28 = 86%
7	Water	4/4 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	57/65 = 88%
2	Perennial Pickleweed	48/54 = 89%
3	Annual Pickleweed	66/69 = 96%
4	Cordgrass	9/9 = 100%
5	Upland	6/7 = 86%
6	Bare	24/26 = 92%
7	Water	4/4 = 100%

Table 2, cont.

Pond2a 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 150 / 178 = 84.3%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	
1	97	13	1	2	2		1			116
2	5	16	1							22
3	1	1	7							9
4				1						1
5										0
6						1				1
7			1				19			20
8								9		9
9										0
	103	30	10	3	2	1	20	9	0	178

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	97/116 = 84%
2	Perennial Pickleweed	16/22 = 73%
3	Cordgrass	7/9 = 78%
4	Cattail Wetland	1/1 = 100%
5	Common three-square bul	0/0 = N/A
6	Gumplant	1/1 = 100%
7	Mudflat	19/20 = 95%
8	Water	9/9 = 100%
9	Levee	0/0 = N/A

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	97/103 = 94%
2	Perennial Pickleweed	16/30 = 53%
3	Cordgrass	7/10 = 70%
4	Cattail Wetland	1/3 = 33%
5	Common three-square bul	0/2 = 0%
6	Gumplant	1/1 = 100%
7	Mudflat	19/20 = 95%
8	Water	9/9 = 100%
9	Levee	0/0 = N/A

Pond2a 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 239 / 279 = 85.7%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	10	
1	200	16	4	3		1			2		226
2	5	19				1					25
3	2	1	9				0			2	14
4				1						1	2
5					3						3
6											0
7		1					1				2
8								5			5
9		1							1		2
10											0
	207	38	13	4	3	2	1	5	3	3	279

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	200/226 = 88%
2	Perennial Pickleweed	19/25 = 76%
3	Cordgrass	9/14 = 64%
4	Cattail Wetland	1/2 = 50%
5	Common three-square bul	3/3 = 100%
6	Gumplant	0/0 = N/A
7	Mudflat	1/2 = 50%
8	Water	5/5 = 100%
9	Levee	1/2 = 50%
10	Misc	0/0 = NA

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	200/207 = 97%
2	Perennial Pickleweed	19/38 = 50%
3	Cordgrass	9/13 = 69%
4	Cattail Wetland	1/4 = 25%
5	Common three-square bul	3/3 = 100%
6	Gumplant	0/2 = 0%
7	Mudflat	1/1 = 100%
8	Water	5/5 = 100%
9	Levee	1/3 = 33%
10	Misc	0/3 = 0%

Table 2, cont.

Coon Island 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 176 / 206 = 85.4%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	
1	33	3	3	2	10		2			53
2	1	17								18
3			3							3
4				13						13
5	3	2	1	2	87					95
6						4				4
7	1						4			5
8								7		7
9									8	8
	38	22	7	17	97	4	6	7	8	206

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	33/53 = 62%
2	Cattail	17/18 = 94%
3	Bulrush	3/3 = 100%
4	Bulrush-Cattail mix	13/13 = 100%
5	High Marsh (e.g. Pickleweed)	87/95 = 92%
6	Perennial Pepperweed	4/4 = 100%
7	Upland	4/5 = 80%
8	Cordgrass	7/7 = 100%
9	Water	0/8 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	33/38 = 87%
2	Cattail	17/22 = 77%
3	Bulrush	3/7 = 43%
4	Bulrush-Cattail mix	13/17 = 76%
5	High Marsh (e.g. Pickleweed)	87/97 = 90%
6	Perennial Pepperweed	4/4 = 100%
7	Upland	4/6 = 67%
8	Cordgrass	7/7 = 100%
9	Water	8/8 = 100%

Coon Island 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 204 / 235 = 86.8%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	
1	40	0	3		4			1		48
2		12	1	2			2			17
3			2	1				0		3
4	4			12						16
5	1	4		6	118	1	0	1		131
6						0				0
7							7			7
8								4		4
9									9	9
	45	16	6	21	122	1	9	6	9	235

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	40/48 = 83%
2	Cattail	12/17 = 71%
3	Bulrush	2/3 = 67%
4	Bulrush-Cattail mix	12/16 = 75%
5	High Marsh (e.g. Pickleweed)	118/131 = 90%
6	Perennial Pepperweed	0/0 = N/A
7	Upland	7/7 = 100%
8	Cordgrass	4/4 = 100%
9	Water	0/9 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	40/45 = 89%
2	Cattail	12/16 = 75%
3	Bulrush	2/6 = 33%
4	Bulrush-Cattail mix	12/21 = 57%
5	High Marsh (e.g. Pickleweed)	118/122 = 97%
6	Perennial Pepperweed	0/1 = 0%
7	Upland	7/9 = 78%
8	Cordgrass	4/6 = 67%
9	Water	9/9 = 100%

Table 2, cont.

Bull Island 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 143 / 157 = 91.1%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	
1	35	5		2	1					43
2	1	45								46
3			13							13
4				12						12
5		2			19					21
6			1			5				6
7										0
8		1			1			7		9
9									7	7
	36	53	14	14	21	5	0	7	7	157

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	35/43 = 81%
2	Cattail	45/46 = 98%
3	Common Three-square	13/13 = 100%
4	Bulrush	12/12 = 100%
5	High Marsh (e.g. Pickleweed)	19/21 = 90%
6	Perennial Pepperweed	5/6 = 83%
7	Cordgrass	0/0 = N/A
8	Upland	7/9 = 78%
9	Water	0/7 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	35/36 = 97%
2	Cattail	45/53 = 85%
3	Common Three-square	0/14 = 93%
4	Bulrush	12/14 = 86%
5	High Marsh (e.g. Pickleweed)	19/21 = 90%
6	Perennial Pepperweed	5/5 = 100%
7	Cordgrass	0/0 = N/A
8	Upland	7/7 = 100%
9	Water	0/7 = 100%

Bull Island 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 250 / 295 = 84.7%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	
1	101	15		11	7			0		134
2	3	91		4		1				99
3										0
4				10				1		11
5				2	29			0		31
6	1					6				7
7							1			1
8					0			12		12
9										0
	105	106	0	27	36	7	1	13	0	295

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Alkali Bulrush	101/134 = 75%
2	Cattail	91/99 = 92%
3	Common Three-square	0/0 = N/A
4	Bulrush	10/11 = 91%
5	High Marsh (e.g. Pickleweed)	29/31 = 94%
6	Perennial Pepperweed	6/7 = 86%
7	Cordgrass	1/1 = 100%
8	Upland	12/12 = 100%
9	Water	0/0 = N/A

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Alkali Bulrush	101/105 = 96%
2	Cattail	91/106 = 86%
3	Common Three-square	0/0 = N/A
4	Bulrush	10/27 = 37%
5	High Marsh (e.g. Pickleweed)	29/36 = 81%
6	Perennial Pepperweed	6/7 = 86%
7	Cordgrass	1/1 = 100%
8	Upland	12/13 = 92%
9	Water	0/0 = N/A

Table 2, cont.

Browns Island 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 105 / 135 = 77.8%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	10	11	
1	50	1	3	6	2				1		6	69
2	1	4		1	1							7
3	1		15	1	1	1		1				20
4				22								22
5					2							2
6		1										1
7												0
8												0
9				1					2			3
10		1								1		2
11											9	9
	52	7	18	31	6	1	0	1	3	1	15	135

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Common Three-square	50/69 = 72%
2	Cattail	4/7 = 57%
3	Bulrush	15/20 = 75%
4	High Marsh	22/22 = 100%
5	Perennial Pepperweed	2/2 = 100%
6	Common Reed	0/1 = 0%
7	Grassland	0/0 = N/A
8	Blackberry	0/0 = N/A
9	Trees	2/3 = 67%
10	Floating Aq. Vegetation	1/2 = 50%
11	Water	9/9 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Common Three-square	50/52 = 96%
2	Cattail	4/7 = 57%
3	Bulrush	15/18 = 83%
4	High Marsh	22/31 = 71%
5	Perennial Pepperweed	2/6 = 33%
6	Common Reed	0/1 = 0%
7	Grassland	0/0 = N/A
8	Blackberry	0/1 = 0%
9	Trees	2/3 = 67%
10	Floating Aq. Vegetation	1/1 = 100%
11	Water	9/15 = 60%

Browns Island 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 223 / 272 = 82.0%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	10	11	
1	150	2	2	13								167
2	7	18	1	6			1					33
3	1	1	15									17
4	13			23								36
5				1	4							5
6												0
7							3					3
8												0
9												0
10							1			10		11
11												0
	171	21	18	43	4	0	5	0	0	10	0	272

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Common Three-square	150/167 = 90%
2	Cattail	18/33 = 55%
3	Bulrush	15/17 = 88%
4	High Marsh	23/36 = 64%
5	Perennial Pepperweed	4/5 = 80%
6	Common Reed	0/0 = N/A
7	Grassland	3/3 = 100%
8	Blackberry	0/0 = N/A
9	Trees	0/0 = N/A
10	Floating Aq. Vegetation	10/11 = 91%
11	Water	0/0 = N/A

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Common Three-square	150/171 = 88%
2	Cattail	18/21 = 86%
3	Bulrush	15/18 = 83%
4	High Marsh	23/43 = 53%
5	Perennial Pepperweed	4/4 = 100%
6	Common Reed	0/0 = N/A
7	Grassland	3/5 = 60%
8	Blackberry	0/0 = N/A
9	Trees	0/0 = N/A
10	Floating Aq. Vegetation	10/10 = 100%
11	Water	0/0 = N/A

Table 2, cont.

Sherman Lake 2003 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 82 / 100 = 82.0%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	10	
1	19										19
2	1	8	1	1	2						13
3	1		13		2		1				17
4				20		2					22
5		1		2	12	1					16
6							1				1
7							5				5
8							2	2			4
9											0
10										3	3
	21	9	14	23	16	3	9	2	0	3	100

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Bulrush	19/19 = 100%
2	Cattail	8/13 = 62%
3	Common Three-square	13/17 = 76%
4	Grassland	20/22 = 91%
5	Common Reed	12/16 = 75%
6	Perennial Pepperweed	0/1 = 0%
7	Blackberry	5/5 = 100%
8	Gumplant	2/4 = 50%
9	Floating Aq. Vegetation	0/0 = N/A
10	Water	3/3 = 100%

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Bulrush	19/21 = 90%
2	Cattail	8/9 = 89%
3	Common Three-square	13/14 = 93%
4	Grassland	20/23 = 87%
5	Common Reed	12/16 = 75%
6	Perennial Pepperweed	0/3 = 0%
7	Blackberry	5/9 = 56%
8	Gumplant	2/2 = 100%
9	Floating Aq. Vegetation	0/0 = N/A
10	Water	3/3 = 100%

Sherman Lake 2004 Vegetation Classification Map Error Matrix

OVERALL ACCURACY = 37 / 53 = 69.8%

MAPPED CLASS	REFERENCE CLASS 1	2	3	4	5	6	7	8	9	10	11	
1	17	1	2		2						1	23
2		8	1		7							16
3		1	7									8
4												0
5					5							5
6					1							1
7												0
8												0
9												0
10												0
11												0
	17	10	10	0	15	0	0	0	0	0	1	53

OMISSION ERROR (aka Producer's Accuracy)

No.	Class Name	
1	Bulrush	17/23 = 74%
2	Cattail	8/16 = 50%
3	Common Three-square	7/8 = 88%
4	Grassland	0/0 = N/A
5	Common Reed	5/5 = 100%
6	Perennial Pepperweed	0/1 = 0%
7	Blackberry	0/0 = N/A
8	Gumplant	0/0 = N/A
9	Floating Aq. Vegetation	0/0 = N/A
10	Water	0/0 = N/A
11	Misc	0/0 = N/A

COMMISSION ERROR (aka User's Accuracy)

No.	Class Name	
1	Bulrush	17/17 = 100%
2	Cattail	8/10 = 80%
3	Common Three-square	7/10 = 70%
4	Grassland	0/0 = N/A
5	Common Reed	5/15 = 33%
6	Perennial Pepperweed	0/0 = N/A
7	Blackberry	0/0 = N/A
8	Gumplant	0/0 = N/A
9	Floating Aq. Vegetation	0/0 = N/A
10	Water	0/0 = N/A
11	Misc	0/1 = 0%

Table 3. Site level vegetation metrics and definitions, based on 2003 and 2004 vegetation maps.

		2003						2004					
Metric	Definition	BrI	BuI	CI	CM	P2A	SL	BrI	BuI	CI	CM	P2A	SL
AlkBul	Alkali Bulrush (*Scirpus maritimus*) proportion		0.417	0.437	0.113	0.348			0.306	0.393	0.104	0.607	
AlkCR	Alkali Common Reed (*Phragmites australis*) proportion	0.002				0.015	0.037	0.010					0.185
Bare	Bare proportion				0.122	0.061					0.120	0.029	
Blkber	Himalyan Blackberry (*Rubus discolor*) - California Rose (*Rosa californica*) proportion	0.018					0.002	0.025					0.015
Bul	Bulrush (*Scirpus acutus, S. californicus*) proportion	0.094	0.110	0.023		0.004	0.372	0.184	0.079	0.014			0.466
BulCat	Bulrush (*Scirpus* spp.) - Cattail (*Typha* spp.) proportion									0.014			
Cat	Cattail (*Typha* spp.) proportion	0.073	0.186	0.057		0.026	0.107	0.147	0.279	0.054		0.017	0.092
Co3Sq	Common Three-square (*Scirpus americanus*) proportion	0.390	0.037			0.046	0.171	0.399	0.016			0.004	0.075
Cordgr	Cordgrass (*Spartina foliosa*) proportion		0.008	0.018	0.029	0.108			0.000	0.010	0.078	0.083	
Electr	Electrical tower proportion					0.005							
FAV	Floating aquatic vegetation (e.g. *Hydrocotyle* spp., *Eichhornia* spp.) proportion	0.018					0.029	0.022					0.051
GiReed	Giant reed (*Arundo donax*) proportion					0.010							
Grass	Grassland (e.g., *Distichlis spicata, Lepidium latifolium, Foeniculum vulgare*) proportion	0.006					0.048	0.004					0.062
Gumpl	Gumplant (*Grindelia stricta*) proportion					0.002	0.006					0.010	0.007
Levee	Levee proportion											0.012	
Pepper	Perennial Pepperweed (*Lepidium latifolium*) proportion	0.004	0.032	0.007			0.001	0.001	0.026	0.007			0.003
PwHM	Pickleweed (*Salicornia virginica*) - high marsh (e.g., D*istichlis spicata, Jaumea carnosa, Triglochin maritimum*) proportion	0.133	0.072	0.199	0.057	0.185		0.137	0.186	0.460	0.161	0.129	
Pwsaeu	Pickleweed (*Salicornia europaea*) proportion				0.186						0.357		
RipFor	Riparian forest and woodland (e.g., *Salix* spp., *Acacia* spp.) proportion	0.007						0.004					
Upland	Upland proportion		0.046	0.009	0.203				0.013	0.003	0.075		
Water	Water proportion	0.255	0.092	0.250	0.291	0.190	0.227	0.066	0.094	0.045	0.104	0.110	0.044

Table 4. Site level vegetation, geomorphic, and edge metrics and definitions. Vegetation metrics were calculated for 2003 and 2004; geomorphic and edge metrics were based on 2003 imagery. See McGarigal and Marks (1995) for further explanation of vegetation patch diversity metrics.

		2003						2004					
Metric	Definition	BrI	BuI	CI	CM	P2A	SL	BrI	BuI	CI	CM	P2A	SL
PR	Patch richness	12	10	9	8	13	11	12	10	10	8	10	11
PRD	Patch richness diversity	2.161	7.938	2.333	8.705	2.791	1.286	2.593	11.778	3.228	14.281	2.633	1.485
ShDI	Shannon diversity index	1.695	1.300	1.517	1.664	1.812	1.653	1.685	1.604	1.343	1.467	1.427	1.574
SiDI	Simpson's diversity index	0.765	0.569	0.727	0.742	0.784	0.747	0.753	0.728	0.672	0.646	0.683	0.703
MSiDI	Modified Simpson's diversity index	1.448	0.841	1.299	1.355	1.533	1.376	1.400	1.301	1.115	1.039	1.148	1.215
ShEI	Shannon evenness index	0.682	0.564	0.691	0.800	0.707	0.689	0.678	0.697	0.583	0.705	0.620	0.656
SiEI	Simpson's evenness index	0.835	0.632	0.818	0.848	0.849	0.822	0.822	0.809	0.747	0.738	0.759	0.774
MSiEI	Modified Simpson's evenness index	0.583	0.365	0.591	0.652	0.598	0.574	0.563	0.565	0.484	0.500	0.499	0.507
chlength	Channel length (m)	27048	8998	31986	5635	38446	51977.65						
charea	Channel area (m2)	168100	36362	78469	17070	309684	332965						
areadens	Areal channel density / proportion	0.061	0.083	0.048	0.078	0.147	0.085						
lindens	Linear channel density / drainage density (km / km2)	9.8	20.6	19.7	25.9	18.2	13.2						
linarear	Ratio of linear to areal channel density	161	247	408	330	124	156						
sinuosity	Channel sinuosity (1 - distance made good / total length)	0.099	0.140	0.175	0.074	0.205	0.105						
pondpan	Pond / panne proportion	0.0280	0.0000	0.0000	0.0000	0.0013	0.0056						
TOTLENGTH	Total site edge length (m)	8688	1584	2125	914	2629	7179						
EDGELEVEE	Length of levee edge (m)		2994	1931	2709	7842	7998						
EDGENAT	Length of "natural" (bay) edge (m)	8429	125	4242			6120						
EDGEWAT	Length of channel mouth edge (m)	259	49	201	33	44	241						
ADJAGRI	Length of adjacent agriculture edge (m)				1616								
ADJMARSH	Length of adjacent marsh edge (m)		2093	649	180	2413	901						
ADJPOND	Length of adjacent salt pond edge (m)			1239		2519							
ADJWATER	Length of adjacent open water (bay) edge (m)	8688	1076	4487	946	2954	13458						

Table 5. Site level patch metrics and definitions. Patch metrics were based on the EcoAtlas modern baylands layer (SFEI 1998). See McGarigal and Marks (1995) for further explanation of patch metrics. See Appendix D for patch delineation criteria.

Metric	Definition	BrI	BuI	CI	CM	P2A	SL
P1AREA	Patch level 1 (P1) area (ha)	277	261	1184	22	1184	888
P1AREA_LSD	P1 area - SD from landscape mean	1.84	1.71	8.77	-0.12	8.77	6.51
P1AREA_LPS	P1 area - %ile of landscape distribution	97.8	97.3	99.7	75.5	99.7	99.5
P1PERIM	P1 perimeter (m)	9480	12720	117060	3480	117060	34800
P1PERIM_LSD	P1 perimeter - SD from landscape mean	0.65	1.03	13.21	-0.05	13.21	3.61
P1PERIM_LPS	P1 perimeter - %ile of landscape distribution	90.9	94.2	100.0	70.1	100.0	99.5
P1GYRATE	P1 radius of gyration	664.9	691.7	2963.2	264.6	2963.2	1486.9
P1GYRATE_LSD	P1 radius of gyration - SD from landscape mean	1.13	1.20	7.28	0.06	7.28	3.33
P1GYRATE_LPS	P1 perimeter - %ile of landscape distribution	91.5	92.3	100.0	72.5	100.0	98.9
P1_PARA	P1 perimeter-area ratio (PARA)	34.2	48.8	98.9	160.4	98.9	39.2
P1PARA_LSD	P1 PARA - SD from landscape mean	-1.33	-1.29	-1.16	-1.00	-1.16	-1.31
P1PARA_LPS	P1 PARA - %ile of landscape distribution	0.00	1.92	10.71	17.86	10.71	0.27
P1SHAPE	P1 shape index (SHAPE)	1.41	1.96	8.48	1.81	8.48	2.91
P1SHAPE_LSD	P1 SHAPE - SD from landscape mean	-0.52	0.01	6.33	-0.14	6.33	0.93
P1SHAPE_LPS	P1 SHAPE - %ile of landscape distribution	37.4	62.4	100.0	57.7	100.0	86.5
P1FRAC	P1 fractal dimension (FRAC)	1.05	1.09	1.26	1.10	1.26	1.13
P1FRAC_LSD	P1 FRAC - SD from landscape mean	-0.86	-0.22	2.30	-0.07	2.30	0.40
P1FRAC_LPS	P1 FRAC - %ile of landscape distribution	22.5	44.2	99.5	51.4	99.5	64.8
P1CIRCLE	P1 related circumscribing circle (CIRCLE)	0.52	0.51	0.90	0.79	0.90	0.73
P1CIRCLE_LSD	P1 CIRCLE - SD from landscape mean	-1.04	-1.15	1.11	0.49	1.11	0.12
P1CIRCLE_LPS	P1 CIRCLE - %ile of landscape distribution	20.9	16.5	86.5	58.5	86.5	48.4
P1CONTIG	P1 contiguity index (CONTIG)	0.97	0.96	0.91	0.87	0.91	0.97
P1CONTIG_LSD	P1 CONTIG - SD from landscape mean	1.41	1.37	1.22	1.05	1.22	1.40
P1CONTIG_LPS	P1 CONTIG - %ile of landscape distribution	100.0	97.8	89.6	82.4	89.6	99.7
P1CORE	P1 core area (50-m edge buffer) (CORE)	250.0	226.0	845.7	11.8	845.7	785.1
P1CORE_LSD	P1 CORE - SD from landscape mean	2.03	1.81	7.47	-0.14	7.47	6.92
P1CORE_LPS	P1 CORE - %ile of landscape distribution	98.1	97.5	99.7	78.3	99.7	99.5
P1NCORE	Number of P1 core areas (NCORE)	1	1	23	1	23	3
P1NCORE_LSD	P1 NCORE - SD from landscape mean	-0.06	-0.06	10.94	-0.06	10.94	0.94
P1NCORE_LPS	P1 NCORE - %ile of landscape distribution	47.3	47.3	100.0	47.3	100.0	87.1
P1CAI	P1 core area index (CAI)	90.17	86.62	71.45	54.36	71.45	88.37
P1CAI_LSD	P1 CAI - SD from landscape mean	2.36	2.23	1.71	1.11	1.71	2.29
P1CAI_LPS	P1 CAI - %ile of landscape distribution	100.0	98.1	89.0	80.5	89.0	99.7

Table 5, cont.

Metric	Definition	BrI	BuI	CI	CM	P2A	SL
P2AREA	Patch level 2 (P2) area (ha)	277	261	1370	22	1370	888
P2AREA_LSD	P2 area - SD from landscape mean	1.42	1.32	8.13	-0.15	8.13	5.18
P2AREA_LPS	P2 area - %ile of landscape distribution	96.0	95.0	99.7	80.1	99.7	99.0
P2PERIM	P2 perimeter (m)	9480	12720	121800	3480	121800	34800
P2PERIM_LSD	P2 perimeter - SD from landscape mean	0.47	0.77	10.87	-0.09	10.87	2.81
P2PERIM_LPS	P2 perimeter - %ile of landscape distribution	89.0	91.7	100.0	74.8	100.0	98.3
P2GYRATE	P2 radius of gyration	664.9	691.7	3239.4	264.6	3239.4	1486.9
P2GYRATE_LSD	P2 radius of gyration - SD from landscape mean	0.93	0.99	6.70	0.03	6.70	2.77
P2GYRATE_LPS	P2 perimeter - %ile of landscape distribution	89.7	90.4	100.0	76.4	100.0	97.7
P2_PARA	P2 perimeter-area ratio (PARA)	34.2	48.8	88.9	160.4	88.9	39.2
P2PARA_LSD	P2 PARA - SD from landscape mean	-1.46	-1.42	-1.32	-1.13	-1.32	-1.45
P2PARA_LPS	P2 PARA - %ile of landscape distribution	0.33	1.99	6.98	13.95	6.98	0.66
P2SHAPE	P2 shape index (SHAPE)	1.41	1.96	8.22	1.81	8.22	2.91
P2SHAPE_LSD	P2 SHAPE - SD from landscape mean	-0.50	-0.01	5.51	-0.14	5.51	0.83
P2SHAPE_LPS	P2 SHAPE - %ile of landscape distribution	39.2	62.1	99.7	57.8	99.7	85.0
P2FRAC	P2 fractal dimension (FRAC)	1.05	1.09	1.26	1.10	1.26	1.13
P2FRAC_LSD	P2 FRAC - SD from landscape mean	-0.86	-0.22	2.15	-0.08	2.15	0.39
P2FRAC_LPS	P2 FRAC - %ile of landscape distribution	23.9	42.5	98.7	49.5	98.7	62.8
P2CIRCLE	P2 related circumscribing circle (CIRCLE)	0.52	0.51	0.89	0.79	0.89	0.73
P2CIRCLE_LSD	P2 CIRCLE - SD from landscape mean	-1.03	-1.13	1.00	0.47	1.00	0.11
P2CIRCLE_LPS	P2 CIRCLE - %ile of landscape distribution	22.6	17.3	83.1	56.8	83.1	47.2
P2CONTIG	P2 contiguity index (CONTIG)	0.97	0.96	0.92	0.87	0.92	0.97
P2CONTIG_LSD	P2 CONTIG - SD from landscape mean	1.56	1.51	1.39	1.20	1.39	1.54
P2CONTIG_LPS	P2 CONTIG - %ile of landscape distribution	99.7	98.0	93.0	85.7	93.0	99.3
P2CORE	P2 core area (50-m edge buffer) (CORE)	250.0	226.0	1016.3	11.8	1016.3	785.1
P2CORE_LSD	P2 CORE - SD from landscape mean	1.58	1.41	7.20	-0.16	7.20	5.50
P2CORE_LPS	P2 CORE - %ile of landscape distribution	97.0	96.0	99.7	82.7	99.7	99.0
P2NCORE	Number of P2 core areas (NCORE)	1	1	17	1	17	3
P2NCORE_LSD	P2 NCORE - SD from landscape mean	-0.05	-0.05	7.02	-0.05	7.02	0.83
P2NCORE_LPS	P2 NCORE - %ile of landscape distribution	54.2	54.2	99.7	54.2	99.7	87.4
P2CAI	P2 core area index (CAI)	90.17	86.62	74.16	54.36	74.16	88.37
P2CAI_LSD	P2 CAI - SD from landscape mean	2.66	2.53	2.07	1.33	2.07	2.59
P2CAI_LPS	P2 CAI - %ile of landscape distribution	99.7	98.0	92.4	84.7	92.4	99.3

Table 5, cont.

Metric	Definition	BrI	BuI	CI	CM	P2A	SL
P3AREA	Patch level 3 (P3) area (ha)	277	416	2	6604	6604	891
P3AREA_LSD	P3 area - SD from landscape mean	0.13	0.28	-0.17	7.06	7.06	0.80
P3AREA_LPS	P3 area - %ile of landscape distribution	92.7	93.9	50.8	99.6	99.6	96.2
P3PERIM	P3 perimeter (m)	9240	17280	900	181800	181800	34800
P3PERIM_LSD	P3 perimeter - SD from landscape mean	0.20	0.66	-0.28	10.02	10.02	1.65
P3PERIM_LPS	P3 perimeter - %ile of landscape distribution	88.5	93.1	48.5	100.0	100.0	95.4
P3GYRATE	P3 radius of gyration	664.0	836.3	65.0	3992.7	3992.7	1486.1
P3GYRATE_LSD	P3 radius of gyration - SD from landscape mean	0.59	0.86	-0.33	5.72	5.72	1.86
P3GYRATE_LPS	P3 perimeter - %ile of landscape distribution	90.1	92.7	46.6	99.2	99.2	96.2
P3_PARA	P3 perimeter-area ratio (PARA)	33.4	41.6	370.4	27.5	27.5	39.1
P3PARA_LSD	P3 PARA - SD from landscape mean	-1.30	-1.28	-0.47	-1.32	-1.32	-1.29
P3PARA_LPS	P3 PARA - %ile of landscape distribution	2.67	4.20	41.98	1.15	1.15	3.05
P3SHAPE	P3 shape index (SHAPE)	1.39	2.12	1.36	5.59	5.59	2.91
P3SHAPE_LSD	P3 SHAPE - SD from landscape mean	-0.42	0.43	-0.44	4.42	4.42	1.34
P3SHAPE_LPS	P3 SHAPE - %ile of landscape distribution	42.0	77.9	40.1	99.2	99.2	93.5
P3FRAC	P3 fractal dimension (FRAC)	1.04	1.10	1.07	1.19	1.19	1.13
P3FRAC_LSD	P3 FRAC - SD from landscape mean	-0.78	0.15	-0.29	1.74	1.74	0.75
P3FRAC_LPS	P3 FRAC - %ile of landscape distribution	22.1	59.2	39.7	96.6	96.6	77.1
P3CIRCLE	P3 related circumscribing circle (CIRCLE)	0.53	0.72	0.60	0.76	0.76	0.73
P3CIRCLE_LSD	P3 CIRCLE - SD from landscape mean	-0.79	0.37	-0.40	0.63	0.63	0.43
P3CIRCLE_LPS	P3 CIRCLE - %ile of landscape distribution	26.3	62.6	30.9	71.8	71.8	64.9
P3CONTIG	P3 contiguity index (CONTIG)	0.97	0.96	0.69	0.98	0.98	0.97
P3CONTIG_LSD	P3 CONTIG - SD from landscape mean	1.38	1.36	0.46	1.40	1.40	1.36
P3CONTIG_LPS	P3 CONTIG - %ile of landscape distribution	97.7	95.8	58.0	98.9	98.9	96.6
P3CORE	P3 core area (50-m edge buffer) (CORE)	250.1	364.8	0.4	6080.0	6080.0	787.1
P3CORE_LSD	P3 CORE - SD from landscape mean	0.12	0.26	-0.16	6.81	6.81	0.74
P3CORE_LPS	P3 CORE - %ile of landscape distribution	93.5	94.3	53.8	99.6	99.6	96.2
P3NCORE	Number of P3 core areas (NCORE)	1	7	1	34	34	5
P3NCORE_LSD	P3 NCORE - SD from landscape mean	-0.03	2.28	-0.03	12.68	12.68	1.51
P3NCORE_LPS	P3 NCORE - %ile of landscape distribution	47.7	98.1	47.7	100.0	100.0	95.4
P3CAI	P3 core area index (CAI)	90.32	87.73	14.81	92.06	92.06	88.36
P3CAI_LSD	P3 CAI - SD from landscape mean	2.28	2.19	-0.27	2.34	2.34	2.21
P3CAI_LPS	P3 CAI - %ile of landscape distribution	97.3	95.8	58.0	98.9	98.9	96.6

Table 6. Site level surrounding land use metrics and definitions. Surrounding land use metrics were based on 30-m land use / landcover data (NOAA 2000).

Metric	Definition	BrI	BuI	CI	CM	P2A	SL
HIDEV1KM	prop. of high-density dev. within 1-km buffer	0.136	0.020	0.001	0.003	0.000	0.000
LIDEV1KM	prop. of low-density dev. within 1-km buffer	0.075	0.016	0.003	0.060	0.003	0.000
CULT1KM	prop. of cultivated land within 1-km buffer	0.001	0.122	0.000	0.000	0.000	0.001
GRASS1KM	prop. of grassland within 1-km buffer	0.017	0.261	0.056	0.377	0.054	0.001
DECID1KM	prop. of deciduous forest within 1-km buffer	0.000	0.000	0.000	0.000	0.000	0.000
EGREEN1KM	prop. of evergreen forest within 1-km buffer	0.000	0.000	0.000	0.007	0.002	0.001
MIXFOR1KM	prop. of mixed forest within 1-km buffer	0.000	0.000	0.000	0.029	0.001	0.000
SCRUB1KM	prop. of scrub/shrub within 1-km buffer	0.000	0.002	0.002	0.051	0.002	0.000
FRESHWET1KM	prop. of freshwater wetlands within 1-km buffer	0.000	0.023	0.050	0.040	0.091	0.000
ESTWET1KM	prop. of estuarine wetlands within 1-km buffer	0.325	0.397	0.359	0.237	0.355	0.301
UNCONS1KM	prop. of unconsol. shore within 1-km buffer	0.006	0.003	0.004	0.005	0.001	0.005
BARE1KM	prop. of bare land within 1-km buffer	0.001	0.001	0.007	0.013	0.002	0.000
WATER1KM	prop. of water within 1-km buffer	0.427	0.148	0.512	0.165	0.481	0.675
HIDEV3KM	prop. of high-density dev. within 3-km buffer	0.111	0.035	0.005	0.003	0.000	0.021
LIDEV3KM	prop. of low-density dev. within 3-km buffer	0.148	0.028	0.009	0.041	0.013	0.007
CULT3KM	prop. of cultivated land within 3-km buffer	0.001	0.234	0.100	0.057	0.000	0.011
GRASS3KM	prop. of grassland within 3-km buffer	0.074	0.347	0.147	0.443	0.056	0.255
DECID3KM	prop. of deciduous forest within 3-km buffer	0.000	0.000	0.000	0.002	0.000	0.000
EGREEN3KM	prop. of evergreen forest within 3-km buffer	0.001	0.000	0.000	0.011	0.001	0.002
MIXFOR3KM	prop. of mixed forest within 3-km buffer	0.000	0.002	0.001	0.030	0.000	0.000
SCRUB3KM	prop. of scrub/shrub within 3-km buffer	0.001	0.002	0.002	0.087	0.011	0.001
FRESHWET3KM	prop. of freshwater wetlands within 3-km buffer	0.002	0.035	0.022	0.008	0.061	0.008
ESTWET3KM	prop. of estuarine wetlands within 3-km buffer	0.279	0.146	0.224	0.153	0.298	0.233
UNCONS3KM	prop. of unconsol. shore within 3-km buffer	0.002	0.007	0.008	0.016	0.002	0.004
BARE3KM	prop. of bare land within 3-km buffer	0.001	0.005	0.006	0.005	0.002	0.001
WATER3KM	prop. of water within 3-km buffer	0.372	0.152	0.470	0.132	0.550	0.437
HIDEV5KM	prop. of high-density dev. within 5-km buffer	0.074	0.038	0.017	0.006	0.018	0.052
LIDEV5KM	prop. of low-density dev. within 5-km buffer	0.207	0.041	0.023	0.042	0.064	0.094
CULT5KM	prop. of cultivated land within 5-km buffer	0.001	0.236	0.152	0.040	0.004	0.025
GRASS5KM	prop. of grassland within 5-km buffer	0.167	0.349	0.262	0.512	0.114	0.361
DECID5KM	prop. of deciduous forest within 5-km buffer	0.000	0.000	0.000	0.002	0.000	0.000
EGREEN5KM	prop. of evergreen forest within 5-km buffer	0.001	0.001	0.001	0.008	0.001	0.002
MIXFOR5KM	prop. of mixed forest within 5-km buffer	0.001	0.005	0.002	0.027	0.002	0.000
SCRUB5KM	prop. of scrub/shrub within 5-km buffer	0.002	0.010	0.003	0.050	0.007	0.003
FRESHWET5KM	prop. of freshwater wetlands within 5-km buffer	0.001	0.020	0.022	0.016	0.036	0.006
ESTWET5KM	prop. of estuarine wetlands within 5-km buffer	0.254	0.107	0.193	0.102	0.253	0.158
UNCONS5KM	prop. of unconsol. shore within 5-km buffer	0.002	0.004	0.005	0.011	0.004	0.002
BARE5KM	prop. of bare land within 5-km buffer	0.001	0.007	0.005	0.004	0.004	0.001
WATER5KM	prop. of water within 5-km buffer	0.276	0.174	0.309	0.172	0.491	0.285

Table 6, cont.

Metric	Definition	BrI	BuI	CI	CM	P2A	SL
HIDEV7KM	prop. of high-density dev. within 7-km buffer	0.051	0.027	0.020	0.018	0.031	0.050
LIDEV7KM	prop. of low-density dev. within 7-km buffer	0.180	0.062	0.053	0.072	0.088	0.144
CULT7KM	prop. of cultivated land within 7-km buffer	0.001	0.188	0.160	0.021	0.012	0.044
GRASS7KM	prop. of grassland within 7-km buffer	0.315	0.388	0.329	0.474	0.211	0.395
DECID7KM	prop. of deciduous forest within 7-km buffer	0.000	0.000	0.000	0.003	0.000	0.000
EGREEN7KM	prop. of evergreen forest within 7-km buffer	0.001	0.002	0.001	0.009	0.000	0.001
MIXFOR7KM	prop. of mixed forest within 7-km buffer	0.004	0.011	0.003	0.026	0.002	0.001
SCRUB7KM	prop. of scrub/shrub within 7-km buffer	0.007	0.035	0.009	0.050	0.008	0.004
FRESHWET7KM	prop. of freshwater wetlands within 7-km buffer	0.002	0.013	0.031	0.013	0.026	0.004
ESTWET7KM	prop. of estuarine wetlands within 7-km buffer	0.187	0.084	0.149	0.093	0.184	0.136
UNCONS7KM	prop. of unconsol. shore within 7-km buffer	0.001	0.003	0.004	0.007	0.007	0.001
BARE7KM	prop. of bare land within 7-km buffer	0.002	0.009	0.005	0.004	0.004	0.001
WATER7KM	prop. of water within 7-km buffer	0.238	0.170	0.232	0.202	0.421	0.209
HIDEV10KM	prop. of high-density dev. within 10-km buffer	0.036	0.021	0.024	0.011	0.031	0.033
LIDEV10KM	prop. of low-density dev. within 10-km buffer	0.133	0.092	0.071	0.062	0.090	0.131
CULT10KM	prop. of cultivated land within 10-km buffer	0.012	0.116	0.105	0.021	0.058	0.046
GRASS10KM	prop. of grassland within 10-km buffer	0.446	0.429	0.401	0.415	0.292	0.465
DECID10KM	prop. of deciduous forest within 10-km buffer	0.000	0.006	0.001	0.010	0.000	0.000
EGREEN10KM	prop. of evergreen forest within 10-km buffer	0.001	0.008	0.002	0.033	0.001	0.001
MIXFOR10KM	prop. of mixed forest within 10-km buffer	0.015	0.025	0.011	0.041	0.003	0.005
SCRUB10KM	prop. of scrub/shrub within 10-km buffer	0.014	0.064	0.036	0.070	0.012	0.009
FRESHWET10KM	prop. of freshwater wetlands within 10-km buffer	0.003	0.021	0.025	0.009	0.019	0.004
ESTWET10KM	prop. of estuarine wetlands within 10-km buffer	0.153	0.072	0.107	0.082	0.115	0.118
UNCONS10KM	prop. of unconsol. shore within 10-km buffer	0.001	0.002	0.003	0.004	0.006	0.001
BARE10KM	prop. of bare land within 10-km buffer	0.004	0.006	0.006	0.003	0.004	0.002
WATER10KM	prop. of water within 10-km buffer	0.175	0.132	0.203	0.235	0.365	0.177

Table 7. Table of indicator and predictor metrics across all teams.

Plant Indicator Metrics: Species diversity (presence, abundance, distribution), species assemblages (patch size and distribution), presence and abundance of rare species, growth rates and productivity of dominant species, site-level productivity
Fish Indicator Metrics: Number of individuals, species diversity, biomass, native/non-indigenous species, diet composition, stable isotope condition, feeding rate, growth rate, residence time
Bird Indicator Metrics*: Reproductive success (passerines), density of breeding pairs (passerines), size of breeding territories (passerines), change in abundance (passerines, rails) or occurrence (other marsh birds) over time, species diversity (passerines, rails, other marsh birds)

Predictor Metrics (Independent Variables)	Scale of Measure-ment[1]	Indicator (Dependent) Metrics		
		Plants	Fish	Birds
Water column				
Inundation regime (depth, duration, frequency) outside, at entrance", and on marsh plain (includes tidal range)	1,2	X	X	X
Salinity of source tidal waters (late winter, summer)	1,2	X	X	
Temperature of source tidal waters (late winter, summer)	1,2		X	
Suspended sediment supply (winter, summer)	1,2		X	
Substrate				
Physical properties (grain size, pH, redox, salinity)	1	X	X	
Nutrients	1	X		
Pore Water Salinity	1	X	X	
Geomorphology				
Elevation (min, mean, max)	1,2	X		
Accretion rate	1,2	X		
Drainage isolation	2	X	X	
Channel proximity	1	X		X
Channel density (linear, areal, and volumetric)	1,2	X	X	X
Channel bifurcation ratio or sinuosity	2	X	X	X
Pond/panne density	1,2			X
Primary Productivity / Nutrients				
Inorganic nutrient concentrations (NO_3, NH_4, PO_4, $Si(OH)_4$)	1	X	X	
Phytoplankton biomass	1		X	
Phytoplankton productivity	1		X	
Low marsh vegetation biomass	1	X		X
Low marsh vegetation productivity	1	X		X
Benthic sediment productivity	1		X	X
Vegetation				
Total vegetation cover	1,2		X	X
Estimated primary productivity	1,2		X	
Percent cover of key species[2]	1,2			X
Vegetation structure (number of stems per height category, highest herb or shrub, shrub cover, number of shrubs)	1			X
Vegetation patch diversity and evenness	1,2			X
Vegetation patch size diversity	1,2			X
Invertebrates				
Diversity	1,2		X	X
Abundance	1,2		X	X
Community structure	1,2		X	

Table 7, cont.

Predictor Metrics (Independent Variables)	Scale of Measure-ment[1]	Indicator (Dependent) Metrics		
		Plants	Fish	Birds
Food Web Interactions				
Abundance by size class	2			X
Piscivorous birds	1,2		X	
Fish diet composition	2		X	
Macroinvertebrate stomach contents	2		X	
Stable isotope signature	2		X	
Marsh edge characteristics				
Proximity to levee	1	X		X
Levee edge length	2	X		X
Proximity to upland edge (urban, natural or agricultural)	1	X	X	X
Upland edge length and type	2	X		X
Mudflat/water edge length and type	2	X	X	X
Marsh patch characteristics				
Size and core area	2	X	X	X
Perimeter/area ratio	2		X	X
Shape index, fractal dimension	2		X	X
Landscape context				
Tidal marsh proportion within 1-km, 3-km, 5-km, 7-km, 10-km	2,3	X	X	X
Non-tidal marsh proportion within 1-km, 3-km, 5-km, 7-km, 10-km	2,3		X	X
Urban development proportion within 1-km, 3-km, 5-km, 7-km, 10-km	2,3		X	X
Open water proportion within 1-km, 3-km, 5-km, 7-km, 10-km	2,3			X
Agriculture proportion within 1-km, 3-km, 5-km, 7-km, 10-km	2,3		X	X
Landscape connectivity and marsh patch configuration				
Mean patch size, shape index within 1-km, 3-km, 5-km, 7-km, 10-km	3		X	X
Patch cohesion, contiguity within 1-km, 3-km, 5-km, 7-km, 10-km	3		X	X
Patch interspersion, aggregation within 1-km, 3-km, 5-km, 7-km, 10-km	3		X	X

[1]1 = within-site, 2 = site (e.g., a tidal marsh), 3 = landscape

[2]*Distichlis, Grindelia, Juncus, Lepidium, Sarcocornia, Schoenoplectus acutus, S. californicus, S. americanus, Bolboschoenus. maritimus, Spartina foliosa, Typha latifolia*

*Passerines: Song Sparrow, Common Yellowthroat; Rails: Clapper Rail, Black Rail; Other marsh birds: Northern Harrier, American Avocet, Black-Neck Stilt, other waterbird species to be determined

4. Figures

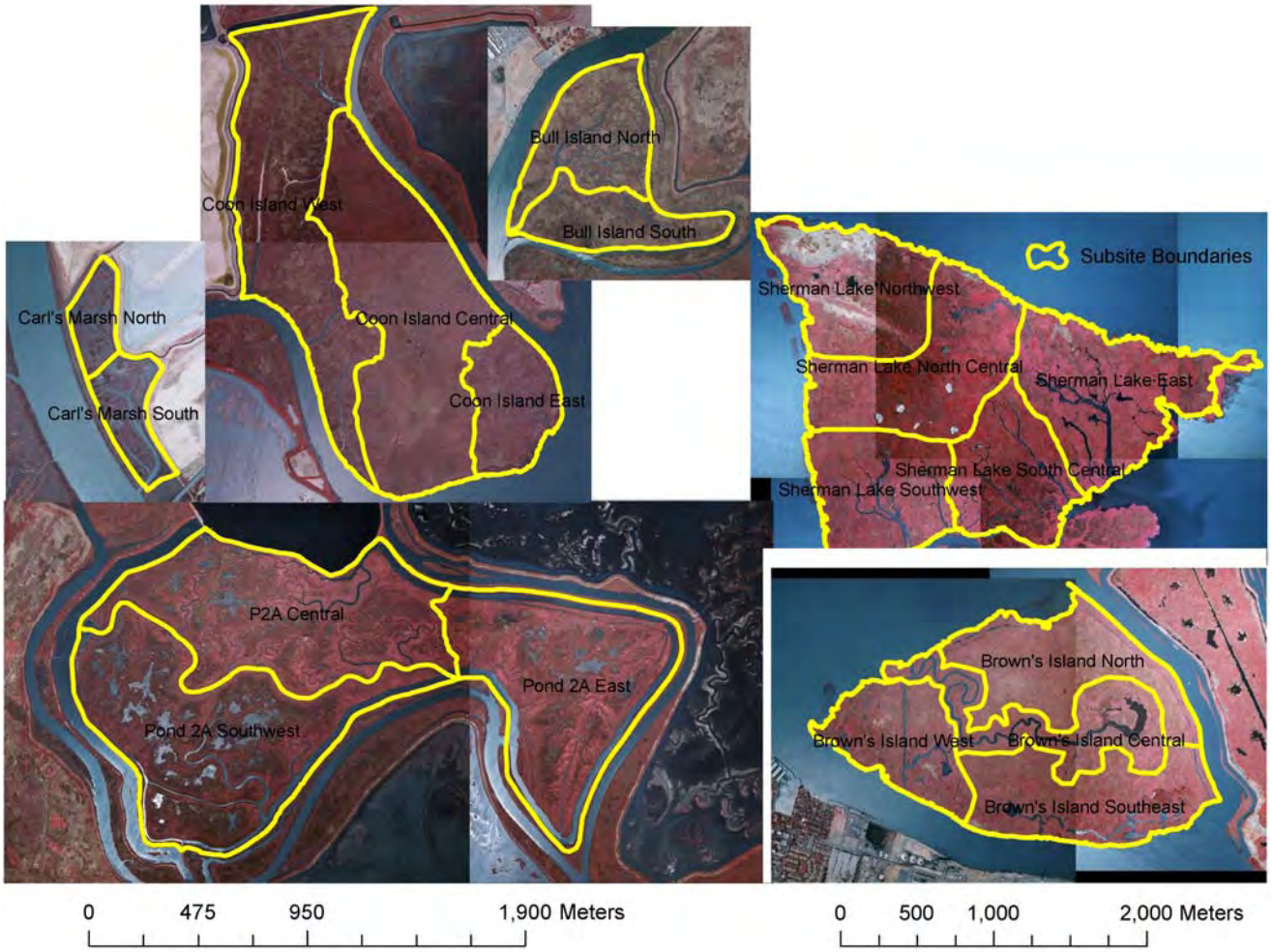


Figure 1. IRWM site and subsite boundaries (in yellow).

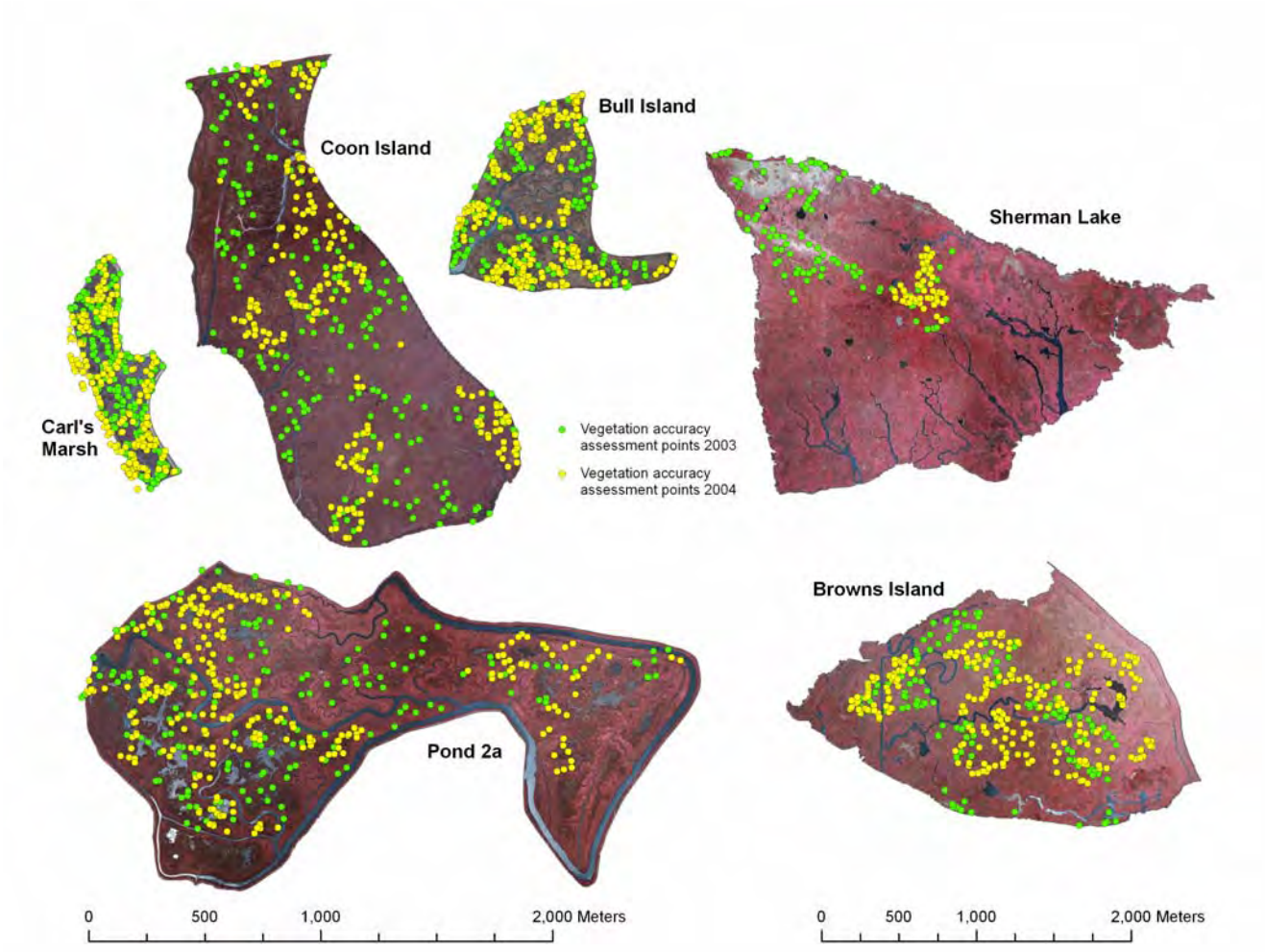


Figure 2. Accuracy assessment points used to validate vegetation maps.

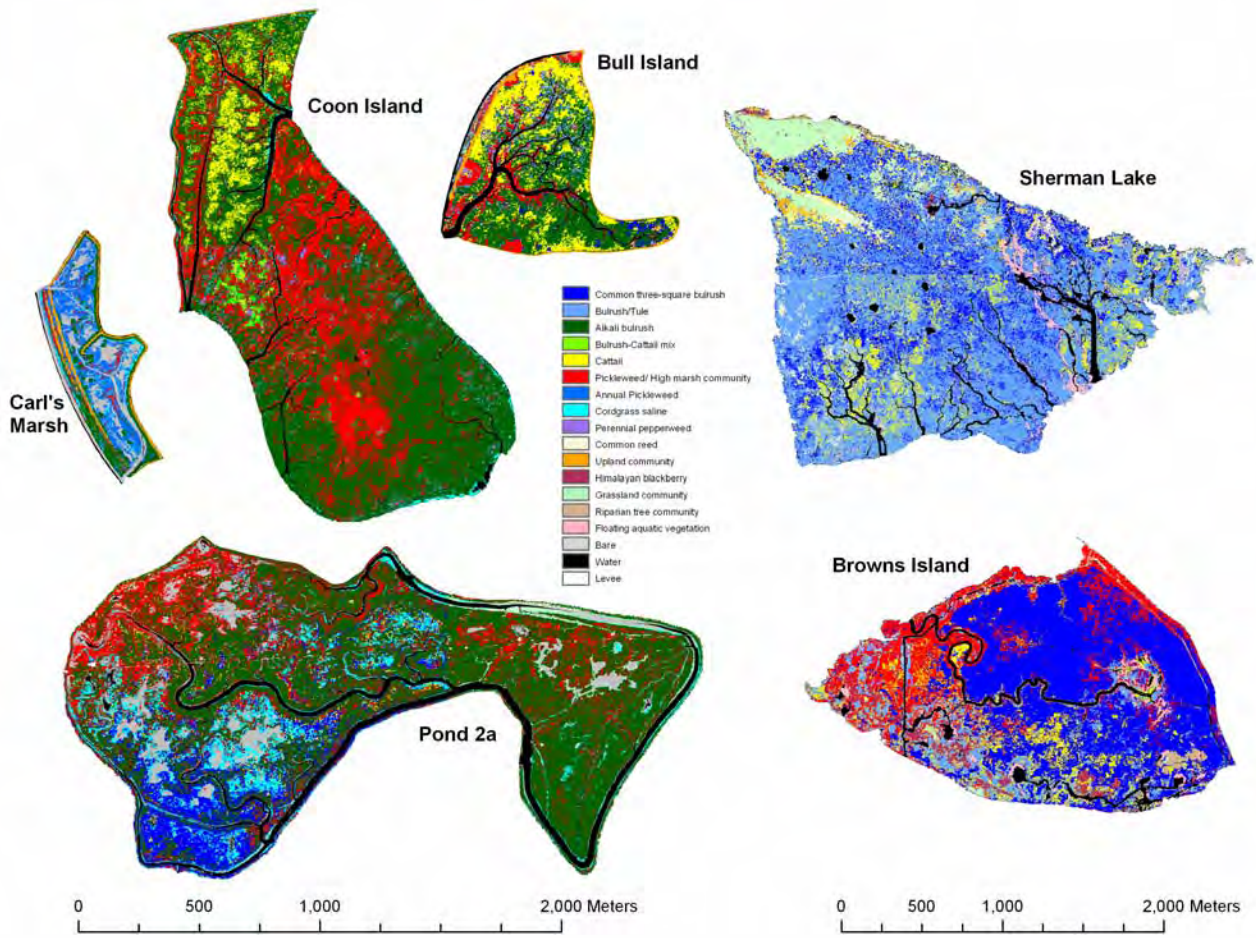


Figure 3. 2003 Vegetation maps.

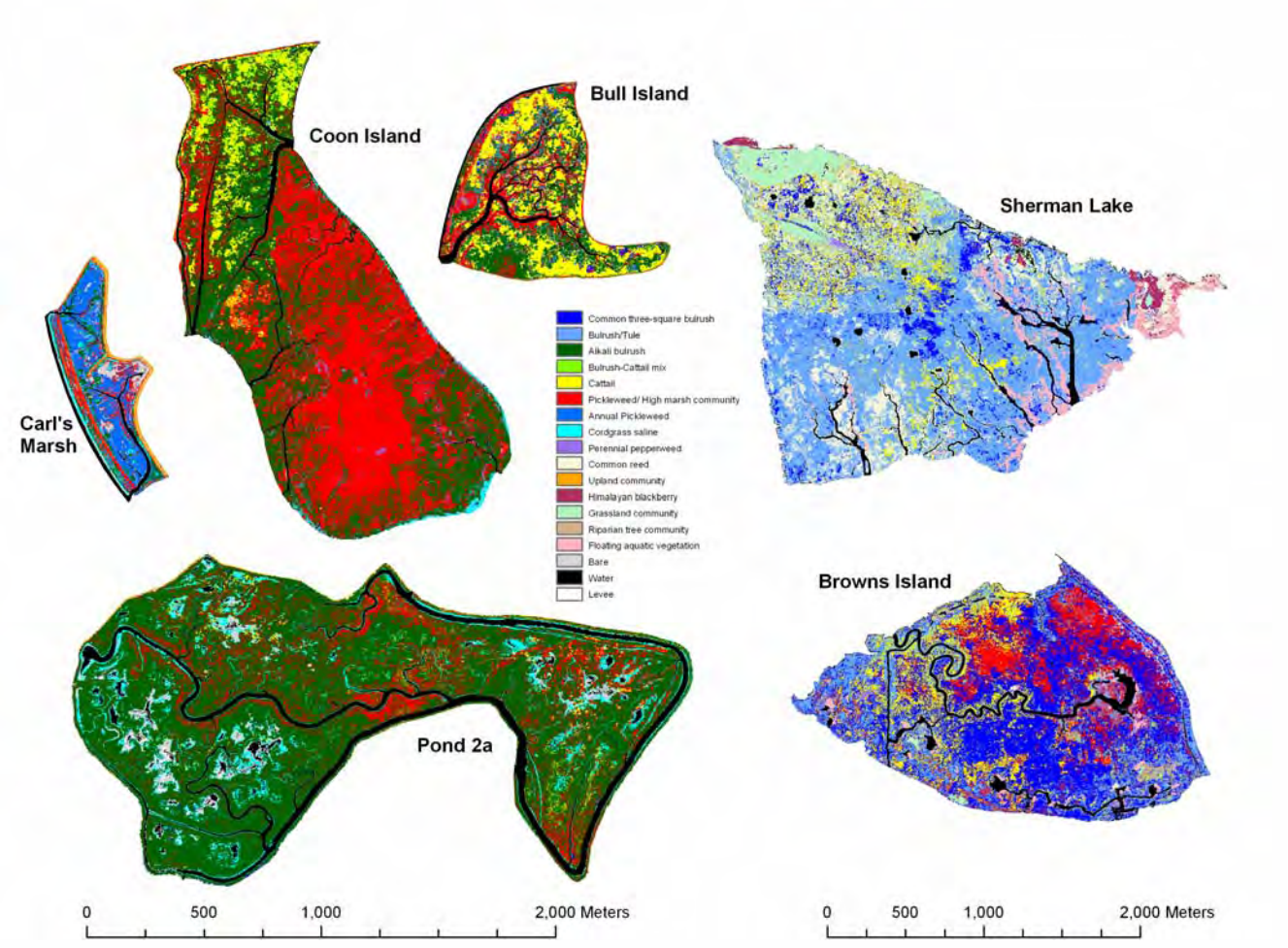


Figure 4. 2004 Vegetation maps.

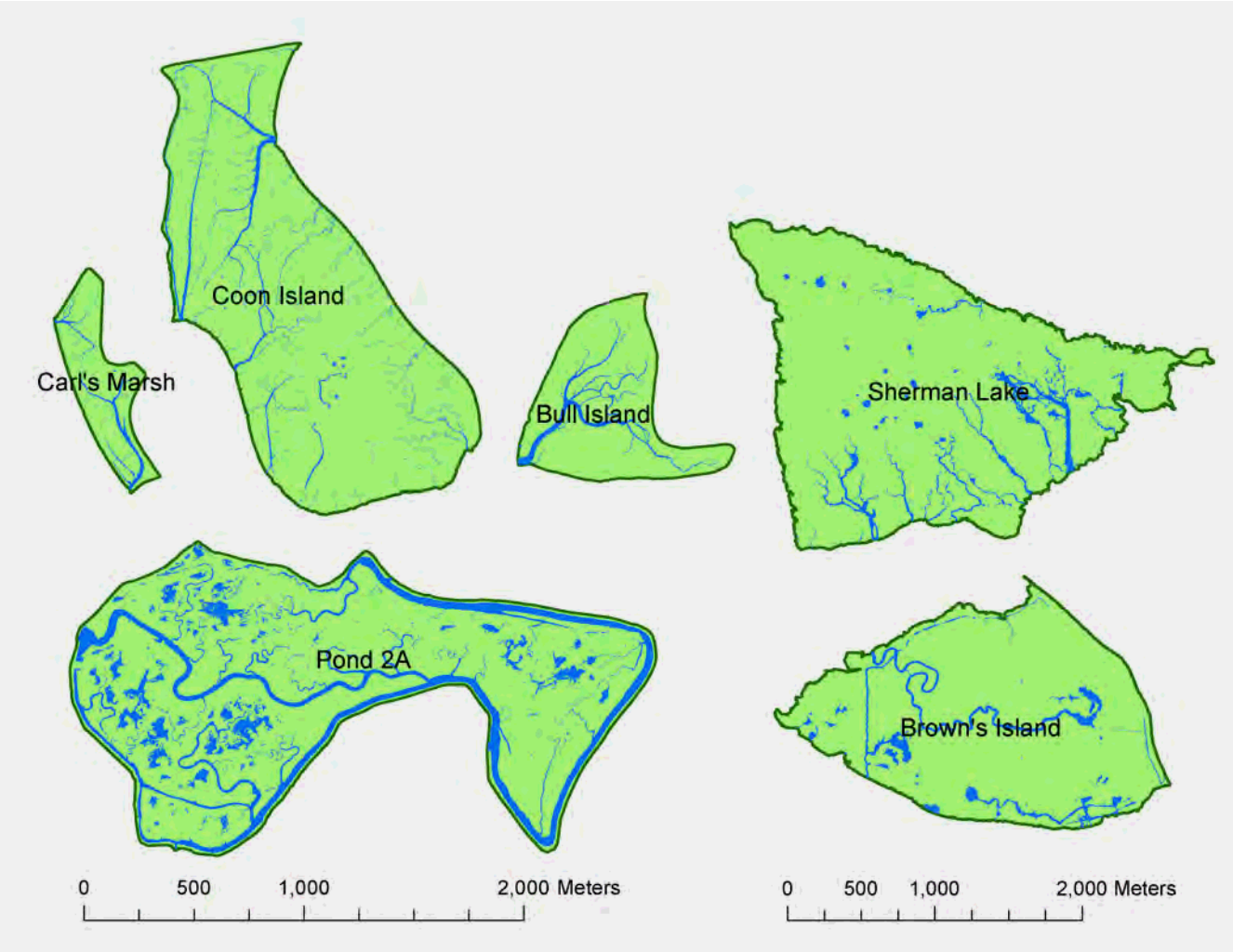


Figure 5. 2003 Geomorphic polygon maps for six IRWM study sites.

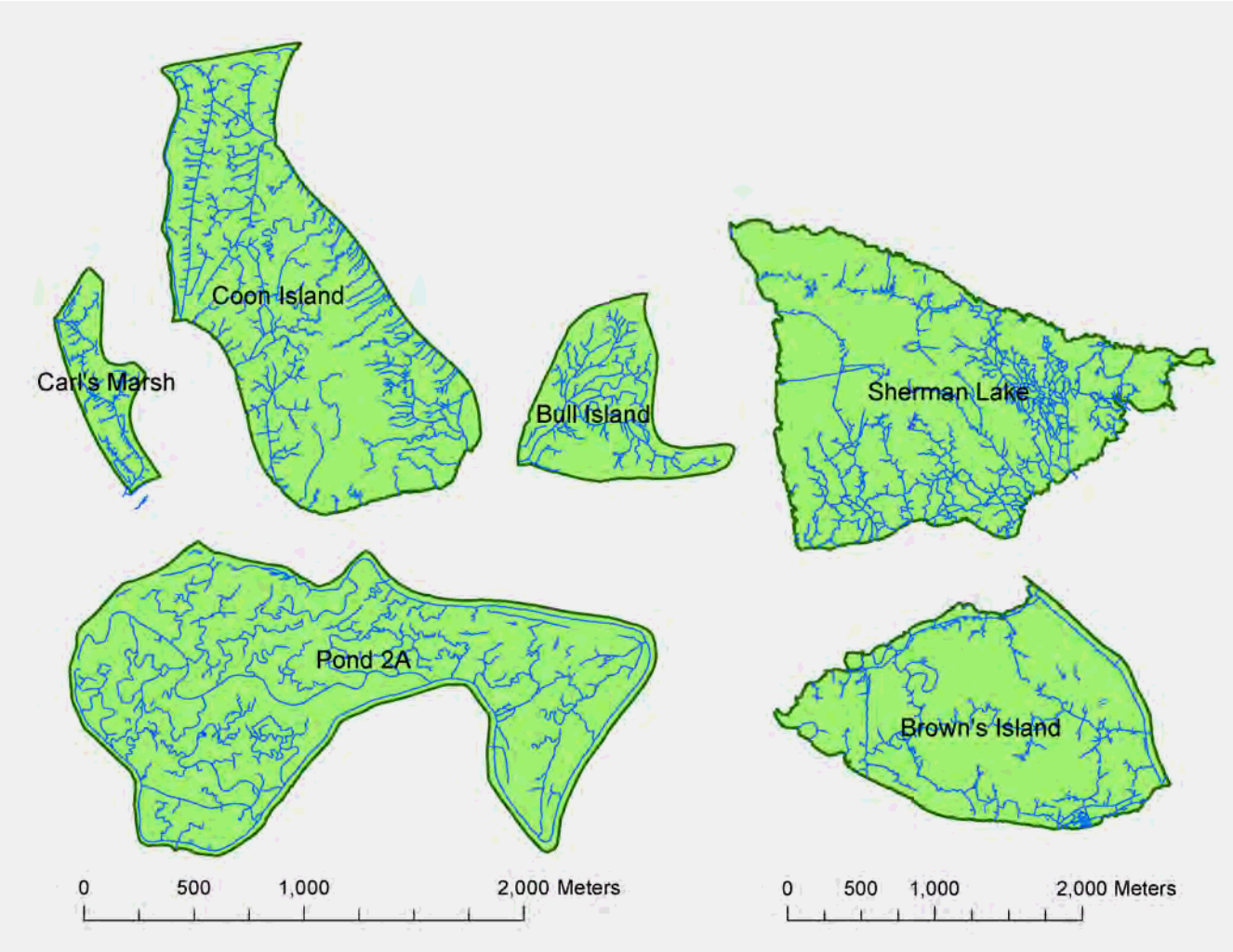


Figure 6. 2003 Geomorphic line maps for six IRWM study sites.

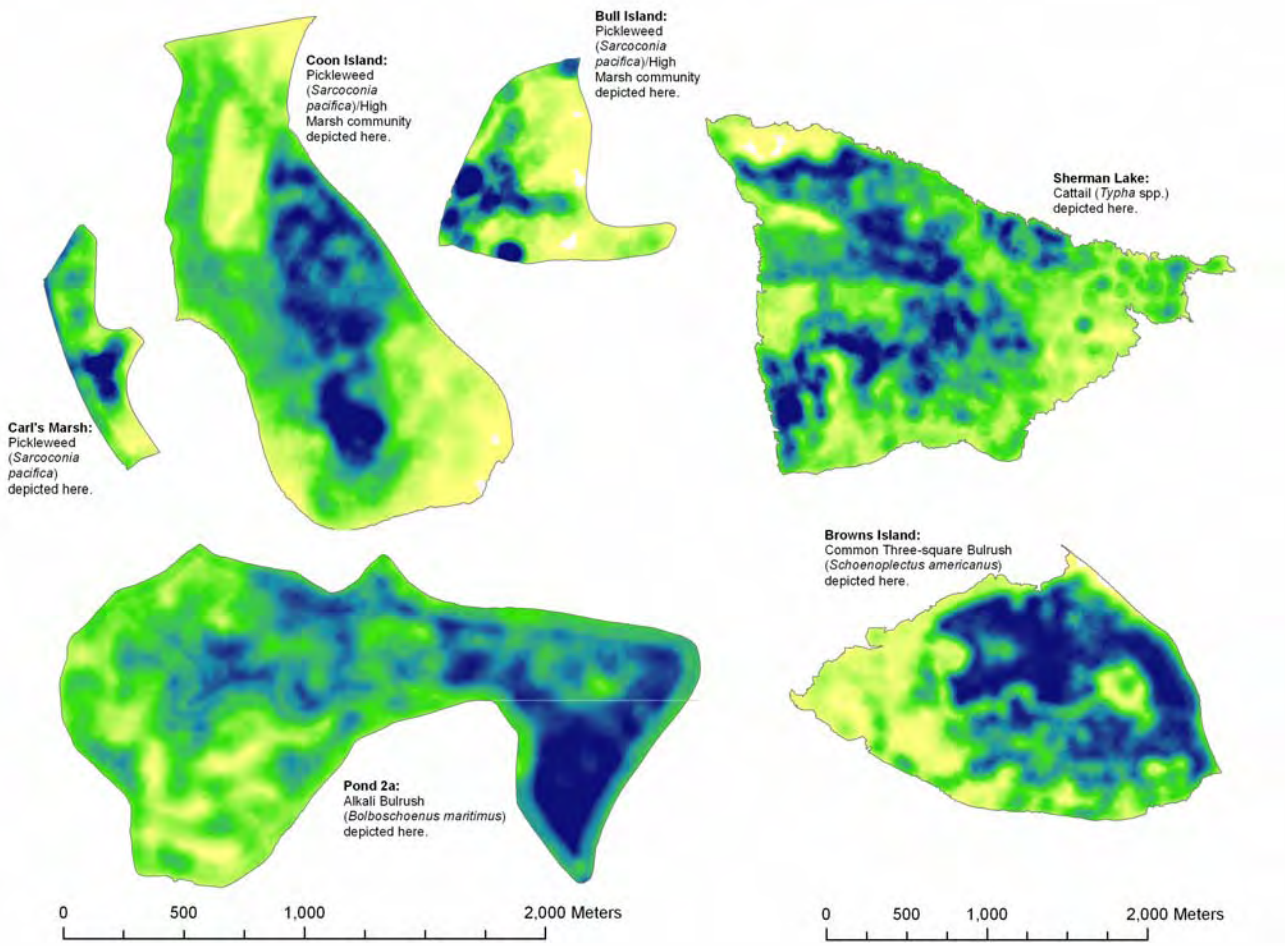


Figure 7. Examples of 1-m pixel site-level moving-window vegetation metrics. Dark blue indicates high densities, yellow indicates low densities.

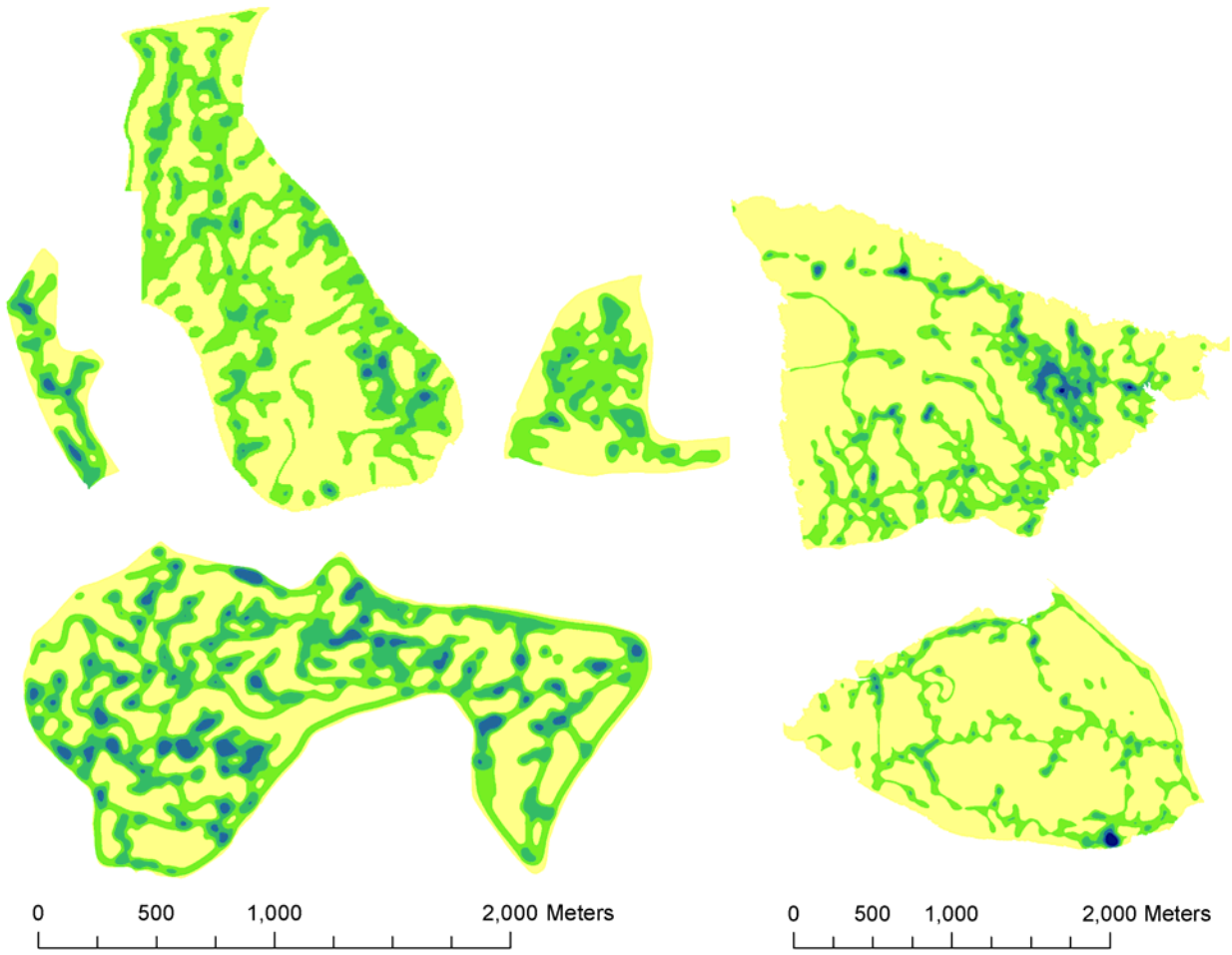


Figure 8. Example of a 1-m pixel site-level moving window geomorphic metric (linear channel density within a 50-m radius).

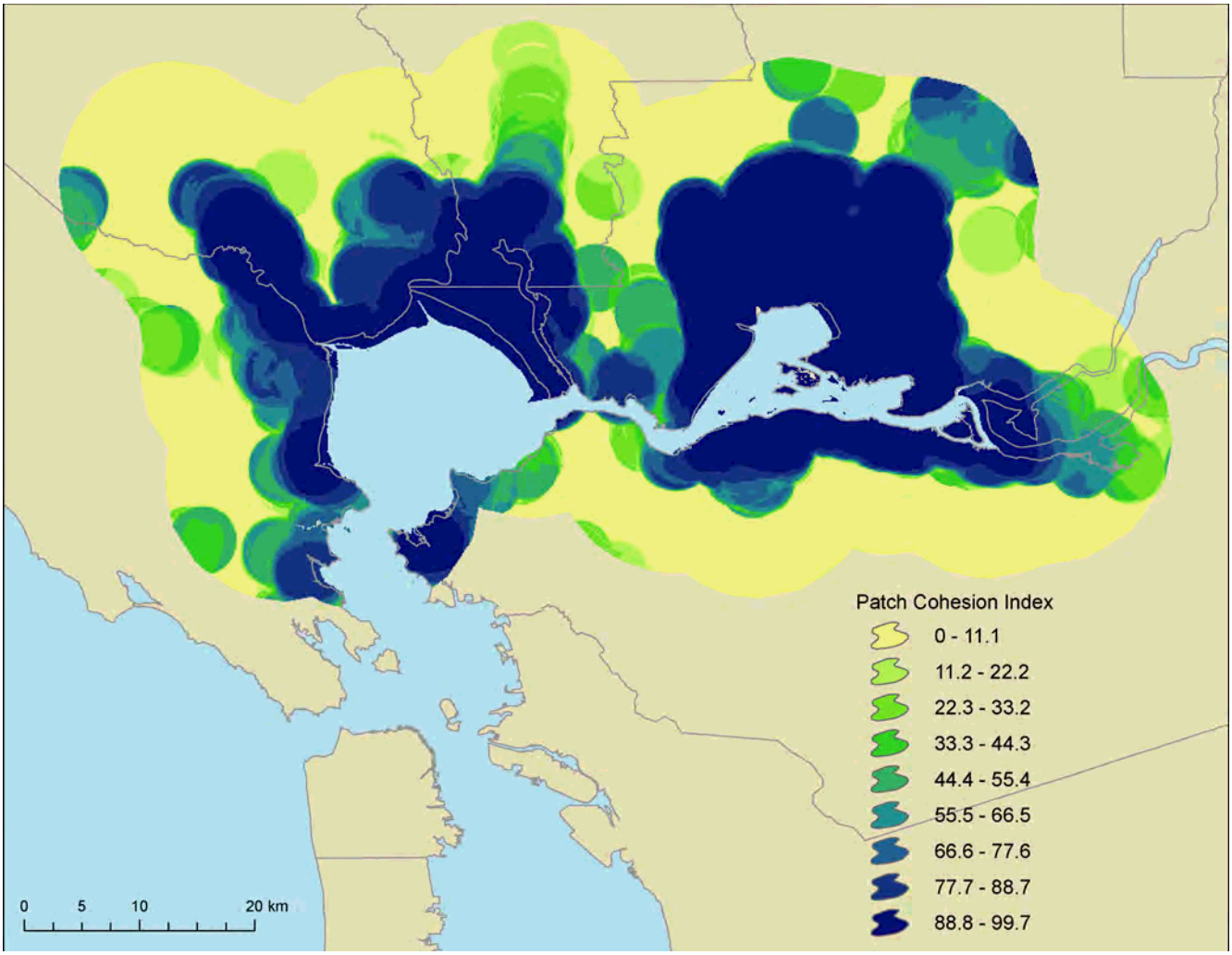


Figure 9. Example of a 100-m pixel North Bay moving window metric (patch cohesion index). See McGarigal and Marks (1995) for metric definition.

5. Literature Cited

Collins, J. N., E. Wittner, C. Grosso, D. Stralberg, and M. Sutula. 2004. San Francisco Bay landscape profiles part one: tidal marshlands. Wetlands Science Program, San Francisco Estuary Institute, Oakland, CA.

Collins, J. N., and D. Stralberg. 2004. Baylands vegetation mapping protocol (version 1.0). Wetlands Science Program, San Francisco Estuary Institute, Oakland, CA. [URL: http://www.sfei.org/wetlands/Reports/veg_map_protocol_final_v4.pdf]

Daubenmire, R. 1959. A canopy-coverage method of vegetation analysis. Northwest Scientist 33:43-64.

Elkie, P., R. Rempel, and A. Carr. 1999. Patch Analyst User's Manual. TM-002, Ontario Ministry of Natural Resources, Northwest Science and Technology, Thunder Bay, Ontario. [URL: http://flash.lakeheadu.ca/~rrempel/patch/]

ESRI. 2005. ArcGIS 9.1. Environmental Systems Research Institute. Redlands, CA. http://www.esri.com/.

Leica Geosystems Inc. 2005. Erdas Imagine 9.0. http://gis.leica-geosystems.com/.

McCune, B., and J. B. Grace. 2002. Analysis of Ecological Communities. MJM Press, New York, NY.

McGarigal, K., and B. J. Marks. 1995. FRAGSTATS: spatial pattern analysis program for quantifying landscape structure. USDA For. Serv. Gen. Tech. Rep. PNW-351. [URL: http://www.umass.edu/landeco/research/fragstats/fragstats.html].

NOAA. 2000. Pacific Coast land cover. The Coastal Change Analysis Program, NOAA Coastal Services Center. [URL: www.csc.noaa.gov/crs/ccap_index.html].

Sawyer, J. O., and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento, CA.

SFEI. 1998. EcoAtlas beta release, version 1.5b4. San Francisco Estuary Institute, Oakland, CA. [URL: http://www.sfei.org/ecoatlas/index.html]

6. Metadata

For each spatial dataset generated by the LET, metadata were generated in compliance with Federal Geographic Data Committee (FGDC) standards and formats. These metadata files, which reside with the spatial datasets they describe (in .xml and .txt format at http://www.irwm.org), include such information as spatial coordinate system, geographic bounding coordinates, time of relevancy, time of data production, status of data, planned updates, attribute definitions, and contact information.

Appendix A. Spatial data inventory

IRWM Aerial Imagery Inventory **March 2005**

Theme	Year	Extent	Pixel size	Scale of capture	Spectral Qualities	Tide at Time of Photo	Vendor	Source
USGS/NIMA 0.3-m natural color imagery for the San Francisco footprint	Oct 2003 - Jan 2004	see map	0.3 m	flown at 2880 m above mean terrain	true color	various	EarthData International	USGS
USGS/NIMA 0.3-m natural color imagery for the Delta footprint	2002				true color	various		USGS
Marin County color orthophotos	Mar 28-31, Apr 1, 2004	Marin County	0.3 ft in urban areas / 0.5 ft in rural areas		true color	various	Vargis, Inc.	Marin Map
Marin County black/white orthophotos	2000	Marin County	0.5 ft	1:4,800	black / white	various		Marin County Planning Dept.
Napa County full color, 1 ft resolution imagery	April 22-23, 2002	Napa County (+ 750 m south of county line)	1 ft	1:2,400	true color	various		Napa County GIS
Sonoma County black/white orthophotos	Spring 2000	Sonoma County	1-2 ft					Sonoma County Planning Dept.
WWR aerial photos--Carl's Marsh, 1995	11/29/95	Carl's Marsh	0.5 ft	7,200	CIR	low tide		WWR
WWR aerial photos--Carl's Marsh, 1998	09/09/98	Carl's Marsh	0.8 ft	1:2,400	CIR	low tide	HJW	WWR
WWR aerial photos--Carl's Marsh, 1999	08/26/99	Carl's Marsh	0.8 ft	1:2,400	CIR	low tide	HJW	WWR
WWR aerial photos--Carl's Marsh, 2001	08/08/01	Carl's Marsh	0.38 ft	7,200	CIR	low tide	HJW	WWR
WWR aerial photos--Carl's Marsh, 2002	08/08/02	Carl's Marsh	1 ft	7,200	CIR	low tide	HJW	WWR
WWR aerial photos--Carl's Marsh, 2000	09/29/00	Carl's Marsh	0.25 ft	3,500	CIR	low tide	HJW	WWR
WWR aerial photos--Carl's Marsh, 1997	03/13/97	Carl's Marsh	0.8 ft	1:2,400	BW	low tide		WWR

IRWM Aerial Imagery Inventory **March 2005**

Theme	Year	Extent	Pixel size	Scale of capture	Spectral Qualities	Tide at Time of Photo	Vendor	Source
BREACH II aerial photos -- Carl's Marsh	Aug 1999, Oct 1999	Carl's Marsh					Pacific Aerial Surveys	PWA
BREACH II aerial photos -- Pond 2A time series	Sept 7 1993, July 26 1995, July 29 1997, June 28 2000	most of Pond 2A		1:12,000	black / white		Pacific Aerial Surveys	PWA
BREACH II aerial photos -- Pond 2A time series	April 26, 1996	most of Pond 2A		1:24,000	black / white		Pacific Aerial Surveys	PWA
Napa-Sonoma Marsh aerial photos	Dec-1999	Napa-Sonoma Marsh (?)	7 ft	1:24,000	true color			Coastal Conservancy (?)
Napa-Sonoma Marsh aerial photos	Sep-1998	Napa-Sonoma Marsh (?)	4 ft		black / white			Coastal Conservancy (?)
Napa-Sonoma Marsh aerial photo mosaic	1996	see map		1:24,000	true color			NGS (National Geodetic Survey)
Napa-Sonoma Marsh aerial photo mosaic	1999	see map	0.6 m		black / white		Towill, Inc.	SFEI
DWR Suisun Marsh color orthophotos	May 1, 2000	Suisun Marsh	1 m	1:6,000	true color	low tide	American Aerial Surveys	California Department of Fish and Game
DWR Suisun Marsh color aerial photos	June 10-14, 1994	Suisun Marsh			true color	low tide	Radman Aerial Surveys	California Department of Water Resources
DWR Statutory Delta color aerial photos	Jun 22-23,1993	Statutory Delta			true color		Radman Aerial Surveys	California Department of Water Resources
AirPhoto USA stock aerial photos	Dec-2003	see map	2 ft.		true color	various		AirPhoto USA
MapMart stock aerial photos			1 m		true color	various		MapMart
USGS black/white 3.25" digital orth quarterquads (DOQQs)	1993	most of U.S.	1 m	1:12,000	black / white	various		USGS

IRWM Aerial Imagery Inventory **March 2005**

Theme	Year	Extent	Pixel size	Scale of capture	Spectral Qualities	Tide at Time of Photo	Vendor	Source
NOAA color aerial photos	1996, 1999	SF Bay			true color	?		NOAA
NASA color infrared orthophotos		SF BAy	3 m		color IR	?		SFEI
IKONOS multispectral satellite imagery	various	global	4 m / 1 m		multispectral	various		Space Imaging
AVIRIS visible/infrared airborne imagery		global	20 m		multispectral	various		NASA JPL
SPOT panchromatic satellite imagery		global	10 m		panchromatic	various		California Spatial Information Library
ASTER hyperspectral satellite imagery		global	15 m		hyperspectral	various		USGS
Landsat TM 7 multispectral satellite imagery		global	30 m / 15 m		multispectral	various		California Spatial Information Library

IRWM Aerial Imagery Inventory **March 2005**

Theme	Contact Information	URL	Cost	Sites Covered	Status	Rectifi-cation Status
USGS/NIMA 0.3-m natural color imagery for the San Francisco footprint	Carol Ostergren, USGS, 7801, Folsom Blvd., Suite 101, Sacramento, CA 95826, Phone: 916-379-3759, Email: costergren@usgs.gov	http://nmviewogc.cr.usgs.gov/viewer.htm	free	P2A, CI, CM, BI, BrI	PRBO in-house UCB in-house, WWR in-house	ortho
USGS/NIMA 0.3-m natural color imagery for the Delta footprint	Carol Ostergren, USGS, 7801, Folsom Blvd., Suite 101, Sacramento, CA 95826, Phone: 916-379-3759, Email: costergren@usgs.gov	http://nmviewogc.cr.usgs.gov/viewer.htm	free	SI	UCB in-house	ortho
Marin County color orthophotos	Andy Preston, San Rafael Public Works Director, 1 Fifth Ave, P. O. Box 151560, San Rafael CA 94915-1560, Phone: 415-485-3359, Email: andy.preston@ci.san-rafael.ca.us	http://www.marinmap.org/Projects.cfm	unknown cos sharing commitment	CM		ortho
Marin County black/white orthophotos	Frederick Vogler, County of Marin, Email: fvogler@co.marin.ca.us;		N/A	CM	PRBO in-house	ortho
Napa County full color, 1 ft resolution imagery	Patrick Kowta, Napa County GIS Coordinator,650 Imperial Way, Suite 201, Napa, CA 94559, Phone: 707-259-8141, Email: pkowta@co.napa.ca.us	http://gis.napa.ca.gov/giscatalog/cnty_02_cat.asp	$15.00/co Free/ Download	P2A, CI, BI	PRBO in-house	ortho
Sonoma County black/white orthophotos	Sonoma County Information Systems Department / Group, 707-565-3819, gis@sonoma-county.org		$300.00	CM		ortho
WWR aerial photos--Carl's Marsh, 1995	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 1998	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 1999	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 2001	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 2002	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 2000	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho
WWR aerial photos--Carl's Marsh, 1997	Stuart Siegel, Phone: 415-457-0250, Email: stuart@swampthing.org			CM	WWR in-house	ortho

IRWM Aerial Imagery Inventory **March 2005**

Theme	Contact Information	URL	Cost	Sites Covered	Status	Rectifi-cation Status
BREACH II aerial photos -- Carl's Marsh	Jeremy Lowe, PWA, Phone: 415-262-2304, Email: j.lowe@pwa-ltd.com			CM		
BREACH II aerial photos -- Pond 2A time series	Jeremy Lowe, PWA, Phone: 415-262-2304, Email: j.lowe@pwa-ltd.com			P2A		
BREACH II aerial photos -- Pond 2A time series	Jeremy Lowe, PWA, Phone: 415-262-2304, Email: j.lowe@pwa-ltd.com			P2A		
Napa-Sonoma Marsh aerial photos	Amy Hutzel, Coastal Conservancy; Larry Wyckoff, DFG			P2A (C5690-01-95), CI (?)		geo
Napa-Sonoma Marsh aerial photos	Amy Hutzel, Coastal Conservancy; Larry Wyckoff, DFG			P2A		geo
Napa-Sonoma Marsh aerial photo mosaic	SFEI			P2A, CI	PRBO in-house	
Napa-Sonoma Marsh aerial photo mosaic	SFEI			P2A, CI	PRBO in-house	
DWR Suisun Marsh color orthophotos	Calif. Dept. of Fish and Game, Information Technol Branch, 1807 13th St. Suite 201, Sacramento, CA 95814	http://www.iep.ca.gov/suisun/photos/aerials.html	free		PRBO in-house	
DWR Suisun Marsh color aerial photos		http://elib.cs.berkeley.edu/air_photos/	free			none
DWR Statutory Delta color aerial photos		http://elib.cs.berkeley.edu/air_photos/	free			none
AirPhoto USA stock aerial photos	Brian Garcia, Email: brian@airphotousa.com	http://www.airphotousa.com/	$300 minimum charge ($30/mi2)			ortho
MapMart stock aerial photos	IntraSearch Inc., 12424 E. Weaver Place, Suite 100, Englewood, CO 80111	http://www.mapmart.com	$375 minimum order ($35/mi2)			ortho
USGS black/white 3.25" digital orth quarterquads (DOQQs)					PRBO in-house	ortho

IRWM Aerial Imagery Inventory **March 2005**

Theme	Contact Information	URL	Cost	Sites Covered	Status	Rectifi-cation Status
NOAA color aerial photos					PRBO in-house	none
NASA color infrared orthophotos					PRBO in-house	
IKONOS multispectral satellite imagery		http://www.spaceimaging.com/				variable
AVIRIS visible/infrared airborne imagery						variable
SPOT panchromatic satellite imagery		http://gis.ca.gov/spot10.epl				variable
ASTER hyperspectral satellite imagery	EDC DAAC User Services / USGS/EROS Data Center, 47914 252nd Street, Sioux Falls, SD, USA, 57198, Phone: 605-594-6116, Email: edc@eos.nasa.gov					variable
Landsat TM 7 multispectral satellite imagery		http://casil-mirror1.ceres.ca.gov/casil/gis.ca.gov/landsat7/				variable

IRWM Landcover-landuse data inventory **March 2005**

Theme	Year	Extent	Minimum mapping unit	Scale of capture	Image/Data Source	Classification Scheme / Attributes
NOAA Coastal Change Analysis Project (C-CAP) -- San Francisco Bay Area	1986, 1993	see map	30-m pixel		Landsat TM	
NOAA Coastal Change Analysis Project (C-CAP) -- Pacific Coast	1995, 2000	see map	30-m pixel		Landsat TM	
DWR Land Use	Marin 1999, Napa 1999, Solano 1994, Delta 1993	Marin, Napa, Solano Counties, SFBay Delta	Field boundaries	1:24,000	Color aerial photographs (unrectified)	Custom DWR classification system
ABAG Land Use	2000		1 hectare grid cells		Aerial photos	Anderson land use / land cover classification system
Marin County parcels		Marin County			Aerial photos	Assessor's parcel database attached
Sonoma County parcels	2004	Sonoma County		1:6,000 - 1:24,000	Aerial photos	
Napa County parcels		Napa County			Aerial photos	
EcoAtlas Modern and Historic Baylands	1998	Former baylands			NASA aerial photos	
National Wetlands Inventory (NWI)						
Napa County vegetation		Napa County	1 hectare	1:24,000	USGS DOQQs	CNPS (Sawyer/Keeler-Wolf) classification system
USGS San Francisco Bay - 1985 Habitat	1985	Sonoma, Sacramento, San Joaquin, Costa Contra, Alameda, Santa Clara, San Mateo, San Francisco and Solano Counties		1:24,000	Based on USFWS National Wetlands Inventory (NWI)	Cowardin wetland classification system
CDFG/DU Wetland and Riparian Inventory	1996	SF Bay, Delta, Central Valley	30-m pixel		Landsat TM	Custom CDFG classification system
USGS National Landcover Characterization Dataset (NLCD)	early to mid-90s	U.S.	30-m pixel		Landsat TM	Modified Anderson land cover classification
USFS existing vegetation (eveg)	mid-90s	Forested portions of California	2.5 acres		Landsat TM	CalVeg / WHR classification systems

IRWM Landcover-landuse data inventory **March 2005**

Theme	Contractor	Source	Contact Information	URL	Cost	Sites Covered
NOAA Coastal Change Analysis Project (C-CAP) -- San Francisco Bay Area		NOAA Coastal Services Center		http://www.csc.noaa.gov/crs/lca/san_fran.html	free	CM, P2A, Brl, Shl
NOAA Coastal Change Analysis Project (C-CAP) -- Pacific Coast	FRAP w/ Pacific Meridian and Earth Satellite Corp.	NOAA Coastal Services Center		http://www.csc.noaa.gov/crs/lca/pacificcoast/	free	all
DWR Land Use		DWR		http://www.landwateruse.water.ca.gov/basicdata/landuse/landusesurvey.cfm	free	CM, Cl, Bl, Brl, Shl
ABAG Land Use		ABAG				
Marin County parcels		Marin County Planning Dept	Frederick Vogler, County of Marin, Email: fvogler@co.marin.ca.us;			
Sonoma County parcels		Sonoma County GIS	County of Sonoma, Information Systems Dept., GIS Central, 2300 Professional Dr., Santa Rosa, CA 95403, phone: (707) 565-3819, email: gis@sonoma-county.org		$100.00	
Napa County parcels		Napa County GIS	Patrick Kowta, Napa County GIS Coordinator,650 Imperial Way, Suite 201, Napa, CA 94559, Phone: 707-259-8141, Email: pkowta@co.napa.ca.us		free	
EcoAtlas Modern and Historic Baylands		SFEI			free	CM, P2A, Cl, Bl, Brl
National Wetlands Inventory (NWI)		USFWS				
Napa County vegetation	UC Davis ICE	ICE	James Thorne, ICE, UC Davis, Davis, CA. 95616, email: jhthorne@ucdavis		free	Cl, Bl
USGS San Francisco Bay - 1985 Habitat		Midcontinent Ecological Science Center (MESC)	MESC, 4512 McMurry Avenue, Fort Collins, CO 80525-3400, phone: (970) 226-9100		free	all
CDFG/DU Wetland and Riparian Inventory				http://gis.ca.gov/catalog/BrowseRecord.epl?id=1507	free (download)	all
USGS National Landcover Characterization Dataset (NLCD)		USGS		http://landcover.usgs.gov/prodescription.asp	free (download)	all
USFS existing vegetation (eveg)		USFS		http://www.fs.fed.us/r5/rsl/clearinghouse/forest-eveg.shtml	free (download)	

IRWM topographic/geomorphic data inventory **March 2005**

Theme	Year	Extent	Resolution	Vertical Accuracy	Source	Contact Information	Cost	Sites Covered
Napa Marsh LiDAR								P2A, CI, BI
Napa County stereo models	2002	Napa County (+ 750 m south of county line)	1-ft	7-15 m	Napa County GIS	Patrick Kowta, Napa County GIS Coordinator,650 Imperial Way, Suite 201, Napa, CA 94559, Phone: 707-259-8141, Email: pkowta@co.napa.ca.us	free	P2A, CI, BI
USGS/NIMA stereo models for the San Francisco footprint	2004	see map	0.3-m		USGS	Carol Ostergren, USGS, 7801, Folsom Blvd., Suite 101, Sacramento, CA 95826, Phone: 916-379-3759, Email: costergren@usgs.gov	free	CM, BI
USGS/NIMA stereo models for the Delta footprint	2002		0.3-m		USGS	Carol Ostergren, USGS, 7801, Folsom Blvd., Suite 101, Sacramento, CA 95826, Phone: 916-379-3759, Email: costergren@usgs.gov	free	SI
USGS national elevation dataset (NED)	various	U.S.	10-m		USGS		free	All
Napa-Sonoma Marsh USCS T-sheets (channels)	1856	see map			United States Coastal Survey, Rodgers / Kerr	SFEI	free	P2A

Appendix B. Data gaps report

March 7, 2005

To: IRWM Teams
From: Landscape Ecology Team

Re: Data Gaps

The following is an assessment of GIS and aerial photo data availability for the IRWM project, as well as the most important data gaps. The primary purpose is to identify data needs for IRWM phase II.

Aerial Imagery

The recent public distribution of aerial photos from two major sources (USGS/NIMA and Napa County) has resulted in good high-resolution image coverage of the IRWM study area (in addition to custom-flown imagery for study sites). These datasets were not available at the start of the project, and would have been more useful for site selection than the 1-m USGS DOQQs from 1993. Currently , they are being used by the LET to develop site ecotones metrics, and by the bird team to identify potential heron and egret colony locations.

However, the aerial photos are true color images, with no data from the infrared or near-infrared spectral ranges. High-resolution multi-spectral (or at least near infrared) imagery for the wetland landscape surrounding each study site would be quite useful for developing better landscape metrics. Current land use / land cover datasets are based on LANDSAT TM imagery, and may be too coarse (30-m pixel size), out of date (1990s vintage), and non wetland-specific for our purposes.

Recommendation: Obtain IKONOS, QuickBird or similar high-resolution multispectral imagery for Petaluma and Napa river corridors, and the western Delta.

Land Use / Land Cover Data

As mentioned above, land cover data for the San Francisco Bay Area comes primarily from satellite imagery, and was produced as part of large-scale remote sensing programs (e.g., NOAA, USGS, USFS) with little or no ground-truthing and, with the exception of NOAA, a terrestrial rather than wetland focus. Slightly better aerial photo-based land use data are available from the California Department of Water Resources (DWR), but coverage is not complete and the focus is on upland land use types, so all upland habitats are treated the same.

Another useful source of land use data is county government. All of the counties in our study area have digital parcel data, including tax assessor's database information, but these datasets are not yet freely available to the public. We have obtained parcel boundaries for Marin, Sonoma and Napa counties, but only have ownership and land use information for Marin County. Additional parcel data would be useful not only for generating landscape metrics, but in the selection of new study sites (with respect to ownership information).

Recommendations: Develop new wetland landcover datasets from high-resolution multispectral imagery. Encourage counties to improve and distribute land use data associated with digital parcel layers.

Topographic Data

Standard 10-m digital elevation models (DEMs) from USGS' national elevation dataset (NED) have a vertical accuracy of 7-15 m and are not adequate for characterizing marsh plain topography. Higher resolution DEMs are available as by-products of the above-named aerial photo volumes. Although the vertical accuracy of these custom DEMs are not known, their high spatial resolution and detailed relative elevation may improve the vertical accuracy when tied to surveyed control points. Light Detection and Ranging (LiDAR) data provide higher vertical accuracy on bare ground, but dense marsh vegetation is hard to separate from bare ground in some cases, confounding the results.

Recommendation: Explore potential partnerships for obtaining LiDAR data for study sites. Encourage NOAA and USGS experimental flights in the North Bay.

Appendix C. Report of geomorphic data extraction, September 2004.

Introduction

This report summarizes the methodologies employed by the IRWM Landscape Ecology Team in producing high-resolution GIS data of geomorphic features for the six project sites.

Objectives

The objectives of geomorphic feature extraction are as follows:

To obtain high-resolution vector data representing major geomorphic features such as channels and pannes at each site

To produce metrics of the vectorized features for the purpose of geomorphic analysis

To produce proxy datasets such as neighborhood analysis grids from the vector data

Development of methodology

Members of the IRWM Landscape Ecology Team convened with other local ecologists and GIS specialists in February of 2004 at a Bay Area workshop on wetland vegetation mapping, convened by Josh Collins of SFEI and Diana Stralberg of PRBO Conservation Science. After reviewing multiple methods for extracting vegetation data, it was determined that a combination of automated and manual digitization of geomorphic features would provide the best results. Manual digitization generally renders the most desirable results, but is cost and time prohibitive. Automated digitizing is much more efficient, but current technology is constrained by resolution spectral quality issues (e.g., shadows have the same spectral properties as water in many areas). The Kelly lab at UC Berkeley presented methodology and results of vegetation data extracted automatically from IRWM color infrared photography. These data were deemed appropriate as a starting point to digitize geomorphic features, as they at least provide boundaries for larger channels and pans.

Methodology

Each of the steps involved in the processing of data to capture geomorphology is describe below.

1. Select out water and depression signature values from vegetation grids produced by UCB Kelly lab. Note that UCB produced several neighborhood grouping iterations, 3x3, 5x5 and 7x7, and it was determined that 5x5 grid yielded the best results (large enough groupings that there are too many “holes,” but small enough to include smaller polygons and to render smooth edges).
2. Convert raster grid to vector coverage and eliminate non-edge cells.
3. Spline vector arcs for smoothing of grid cell edges.
4. Insert site boundary from IRWM_Boundary dataset. Connect all intersecting arcs (as well as all arcs that should intersect) to the site boundary line.
5. Edit to eliminate errant arcs and connect disconnected arcs.
6. Supplement remaining arcs with manually digitized arcs and polygons, such that all clearly definable features visible at a specified scale (see below in “Tolerances” section) are digitized.
7. Close all polygons and build for polygon topology (using ArcInfo BUILD, not CLEAN).
8. Code every polygon as one of the following: OPEN CHANNEL, VEG-FILLED CHANNEL, PANNE, MARSH PLAIN, FLOATING-VEG. Coverages may also have the code of “Doughnut Hole,” which designates an empty polygon “island.” These would be excluded in final shapefile.
9. In addition to polygons, add individual arcs to represent channels less than 2 meters wide.

Tolerances

All digitizing was performed at a scale of 1:600, using the following parameters:

- Weed - 0.1
- Grain - 0.2
- Snap - 3 (closest)
- Intersectarcs – All

All editing was done manually. That is, no large-scale snapping or automatic cleaning functions were applied to the dataset, so as to avoid inadvertent arc movement.

Digitizing Issues

A number of issues were encountered in the extraction of geomorphic features. Some of these issues were related to the nature of the site itself, and some were related to the time of capture of aerial photography.

Site-specific Issues

1. Relic and Incipient Channels.
   - Problem – difficult to determine where channel ends or begins, or whether feature is indeed water-conducting channel.
   - Sites – Pond 2A and to lesser degree, Coon Island
   - Approach Taken – Digitize as much as possible. Many digitized as lines only.

2. Floating Aquatic Vegetation
   - Problem – Not open channel, but not permanently vegetated. Has spectral signature of vegetation. In some cases, it is difficult to discern whether a given channel is contiguous (i.e., water flows unimpeded through channel) or effectively divided into two or more channels by dense vegetation.
   - Sites – Browns Island and Sherman Lake.
   - Approach Taken – Manually digitize and code as separate feature type. ("Aquatic-veg"). Presumed to be quite different in extent from year to year.

3. Unclear Channel Edges
   - Problem – Not clear where to delineate edge of many channels, particularly larger ones. Affects channel area metrics. This problem is in part a function of having produced aerial photography at low tide.
   - Sites – Pond 2A, Coon Island and, to a lesser extent, Carl's Marsh
   - Approach Taken – Digitized edge of marsh plain vegetation as best as possible, including "wet looking" vegetation in channel.

Tide-related Issues

Aerial photographs were taken at all site at low tide. While low tide exposures are useful for extracting such information as channel thalweg and sub-aquatic channel vegetation, the trade off is that it is also more difficult to discern boundaries of open channel.

1. Unclear Channel Edges – See number 3 under Site-Specific Issues

2. Many Channels Terminate in Panne/Pond - Continue into, wide pannes/ponds with multiple micro channels. Channel effectively becomes a thalweg (or several thalwegs) or a pond.
   - Problem – difficult to determine whether to digitize continuation of "actual channel," multiple channel thalwegs, or broader panne/pond.

- Sites – Most notably Pond 2A, but also on all other sites (at Browns Island and Sherman Lake the terminal area is more clearly a pond, filled with water and often aquatic vegetation as well).
- Approach Taken – Digitize broader panne/pond terminus area.

3. Numerous Small, Veg-filled Channels
   - Problem - Difficult to discern which of these channels should be digitized, as it is unclear what role they play in site hydrology without knowing how much or how often water flows through.
   - Sites – All sites
   - Approach Taken – Digitize as many as possible (at specified 1:600 scale) as polygons, and digitize the rest as lines only

4. Relationship of Topographic Depressions to Tide
   - Problem - Difficult to discern if, at high tide, many topographic depressions would be filled with water, or if the feature is indeed a depression "panne," rather than a scald.
   - Sites – All sites
   - Approach Taken – Digitized all such features and coded as "panne."

Appendix D. Patch delineation criteria

Table B.16: Habitat patch definitions

Patch Type	Level	Definition	Reference Species Or Guild that *Might* Pertain to Patches
Tidal Flat	Level One	Patch boundaries are any or all of the following: (A) the foreshore of adjacent marsh, (B) any non-tidal area at least 300 ft wide, (C) any area of open water at least 300 ft wide at low tide, (D) any man-made levee as shown on 1:24k scale USGS topographic quadrangles, (E) any "large channel" (i.e., tidal marsh channel or tidal reach of river or stream that is at least 200 ft wide from bank-to-bank for most of its length, or that receives perennial freshwater discharge, or that extends across the tidal flat to the subtidal environment).	Resident infauna, and vertebrate fauna resident in adjacent tidal marsh
	Level Two	Same as Level One above except disregard large channels (i.e., tidal flat Level One boundary type "E" above).	Shorebirds, large wading birds, intertidal fishes
Marshes and Ponds	Level One	Patch boundaries are any or all of the following: (A) the foreshore, (B) any non-tidal area at least 300 ft wide, (C) any area of open water at least 300 ft wide at low tide, (D) any man-made levee as shown on 1:24k scale USGS topographic quadrangles, (E) any roads (4 lane or larger), (F) any "large channel" (i.e., tidal marsh channel or tidal reach of river or stream that is at least).	Resident intertidal rails (This rule set also defines marsh patches that are separate contributors to the tidal prism of a large channel or the bay).
	Level Two	Same as Level One except disregard any man-made levees from rule D that partition or separate tidal marsh, muted tidal marsh, diked marsh, managed marsh, ruderal bayland, or abandoned salt pond.	Resident intertidal passerine birds, resident intertidal small mammals, intertidal amphibians and reptiles
	Level Three	Same as Level Two except include low-salinity and medium-salinity salt ponds, include treatment ponds, and disregard rule E (any roads 4 lane or larger), and disregard rule F (any tidal marsh channel or tidal reach of river or stream that is at least 200 ft wide in cross-section from bank-top to bank-top at most points along the channel length or that receives perennial freshwater discharge).	Waterfowl, shorebirds, raptors and medium to large mammalian predators

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Report of Collected 2003 and 2004 Aerial Imagery

December 2006

Landscape Ecology Team
University of California, Berkeley
Wetlands and Water Resources, Inc.
PRBO Conservation Science

Prepared by:

Wetlands and Water Resources
818 5th Avenue, Suite 208
San Rafael, CA 94901
(415) 457-0250; (415) 457-0260 fax
www.swampthing.org

Project No. 1067

Report of Collected 2003 and 2004 Aerial Imagery
Integrated Regional Wetland Monitoring Pilot Project

Table of Contents

1. INTRODUCTION 51

1.1. Objectives 51

1.2. Target Photo Scale and Pixel Resolution 51

1.3. Sites Flown 51

2. AERIAL IMAGERY ACQUISITION AND PROCESSING 52

2.1. Projection 52

2.2. Ground Control 52

2.3. Aerial Photography 53

2.4. Image Processing 55
2.4.1. Ortho-rectification 55
2.4.2. Photo Clipping and Mosaicing 55
2.4.3. Compression 56
2.4.4. Geo-rectification for Three Not-Selected Sites 56

2.5. Metadata 56

3. IMAGING PRODUCTS FOR FIELD AND GIS USE 57

FIGURES

Figure 1: IRWM Locations of 2003 Aerial Imagery
Figure 2: IRWM Locations of 2004 Aerial Imagery

APPENDICES

Appendix E-1: Flight Line Maps and Aerial Control Point Tables
Appendix E-2: 2003 Aerial Photograph Maps
Appendix E-3: 2004 Aerial Photograph Maps
Appendix E-4: Aerial Imagery Camera and Flight Metadata
Appendix E-5: Aerial Imagery Metadata Readme.txt File
Appendix E-6: Tables of Aerial Imagery Products (2003 and 2004)

1. Introduction

This report summarizes the activities performed by Wetlands and Water Resources (WWR) to 1) obtain high-resolution aerial imagery of the selected tidal marsh sites and 2) process this imagery for use by the different teams participating in the Integrated Regional Wetland Monitoring (IRWM) Pilot Project. This report is structured with the following sections:

- Section 1 provides the objectives for this scope of work, the photo scale and resolution targets, and a listing of the sites flown for aerial imagery acquisition and processing.
- Section 2 provides a detailed, step-by-step account of how the aerial imagery was acquired and processed, in order to obtain the final products necessary for the IRWM Pilot Project.
- Section 3 describes available imagery products and their intended uses and limitations.
- Four appendices (A through D) which provide the following information: A) flight line maps, B) metadata for the equipment used to collect the aerial imagery, C) a Readme text file presenting metadata for the aerial imagery, and D) a table listing the aerial imagery products. Two CDs with electronic copies of the product suite and the complete set of aerial imagery metadata is also included as part of this report.

1.1. Objectives

The objectives of the aerial imagery work are as follows:

- To obtain high-resolution aerial imagery of the selected sites;
- To process the imagery such that it can be used by the various teams involved in the IRWM Pilot Project; and
- To provide a detailed report documenting aerial imagery acquisition and processing activities.

1.2. Target Photo Scale and Pixel Resolution

The November 2002 "Scope of Work and Budgets for the IRWM Pilot Project" document submitted to the California Bay-Delta Authority Science Program identified WWR as being responsible for obtaining and processing high-resolution color infrared aerial imagery of the selected study sites.

Based upon our review of IRWM project needs with regard to scale and pixel resolution, site size, number of photos per site, and budget, once the project sites were chosen, the aerial photographs for all of the sites were flown at a scale of 1:9,600 and scanned at a resolution of 1,200 dpi, retaining the target 0.67 (0.2m) ft pixel resolution.

1.3. Sites Flown

The IRWM Pilot Project principal investigators ultimately chose the following six sites for the project:

- Brown's Island

- Bull Island
- Carl's Marsh (aka Petaluma River Marsh)
- Coon Island
- Pond 2A
- Sherman Lake (aka Lower Sherman Island)
- Pond 3, though not an IRWM site, as added because of its value in capturing the early phases of restoration

The IRWM team also considered three other sites well into the site selection process, and therefore some of the aerial imagery acquisition and processing activities were also performed for these sites:

- Big Break
- San Souci
- Pond 3

Figure 1 shows the locations of all sites flown in 2003
Figure 2 shows the locations of all sites flown in 2004

2. Aerial Imagery Acquisition and Processing

Each of the steps involved in the acquisition and processing of the aerial photographs is described below.

1. Identifying and establishing an appropriate projection for all site imagery (Section 2.1);
2. Place ground control at sites and obtain spatial coordinates with a Global Positioning System (GPS) unit (Section 2.2);
3. Collect aerial photographs of the sites (Section 2.3);
4. Image processing including rectification, clipping non-data edges, mosaicing and compression (Section 2.4); and
5. Preparation of metadata (Section 2.5).

2.1. Projection

All of the imagery and map products, and the GPS data collected for this project conform to the following projection parameters:

- Projection: UTM
- Zone: 10N
- Datum: NAD 83
- Units: Meters

2.2. Ground Control

The purpose of ground control points is to provide locations across each site that can be identified in the aerial photographs, in order to facilitate rectification of the aerial photographs. At least four ground control points were selected for each photo. These

points were generally spread out in different corners of each photo, in order to maximize the accuracy of the rectification process.

Ground control targets consisted of black and white crosses on 4 foot by 4 foot plywood platforms installed above tidal and vegetation obstructions. The targets were surveyed horizontally using a sub-meter-accuracy GPS unit (Trimble GeoXT). Sub-meter accuracy was verified during data post processing using Trimble Pathfinder 2.0 software. The survey points were then converted to a Geographic Information System (GIS), and used as reference to match the crosses as seen on the photos to corresponding real-world coordinates of the survey/GIS points.

Example of Aerial Target Cross

In some cases, hard, "permanent" structures such as electrical tower footers, dock corners, and building corners were used as ground control points for the 2004 photographs. The positions of these points were extracted from the previously rectified 2003 aerial photographs.

2.3. Aerial Photography

High-resolution color infrared aerial photographs were collected for seven sites in both 2003 and 2004. Tables 1A and B list those sites, date, number of photos, rectification method, scale and pixel resolution for each year. Appendix E-1 presents the flight line maps for each of these sites. Table 2.1 and 2.2 (located in Appendix E-1) present Aerial Control Point station identifiers, description, and coordinates used by site and year.

Table 1A
IRWM 2003 Aerial Imaging Summary Data

Site	Site Code	Date Flown	Number of Photos[1]	Rectification	Scale	Pixel Resolution[1]
Six Selected Sites						
Brown's Island	BrI	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Bull Island	BuI	10/24/2003	1	Ortho	1:9,600	0.67ft / 0.2 m
Carl's Marsh	CM	8/14/2003	1	Ortho	1:7,200	0.5 ft / 0.15m
Coon Island	CI	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Pond 2A	P2A	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Sherman Lake	SL	10/24/2003	5	Ortho	1:9,600	0.67ft / 0.2 m
Three Not-Selected Sites						
Big Break	BB	10/3/2003	2	Geo	1:6,000	0.41 ft /0.12m
Pond 3	P3	9/29/2003	5	Geo	1:9,600	0.67ft / 0.2 m
San Souci	SS	9/29/2003	1	Geo	1:9,600	0.67f / 0.2 m

Notes:
1. Flight lines shown in Appendix E-1.
2. At 1,200 dpi scan.

Table 1B
IRWM 2004 Aerial Imaging Summary Data

Site	Site Code	Date Flown	Number of Photos[1]	Rectification	Scale	Pixel Resolution[2]
Six Selected Sites						
Brown's Island	BrI	08/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Bull Island	BuI	08/19/2004	1	Ortho	1:9,600	0.67ft / 0.2 m
Carl's Marsh	CM	08/19/2004	1	Ortho	1:9,600	0.67ft / 0.2 m
Coon Island	CI	08/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Pond 2A	P2A	08/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Sherman Lake	SL	08/19/2004	5	Ortho	1:9,600	0.67ft / 0.2 m
Secondary						
Pond 3	P3	08/19/2004	5	Ortho	1:9,600	0.67ft / 0.2 m

Notes:
1. Flight lines shown in Appendix E-1.
2. At 1,200 dpi scan.

Aerial photographs were flown at low tide in 2003 and at mid tide in 2004, at a scale of 1:9,600 (1" = 800' or 1 cm = 96 m). The photographs were then scanned at a resolution of 1,200 dpi providing 0.67 ft (20cm) pixel resolution. The 2003 aerial photograph maps are presented in Appendix E-2 the 2004 aerial photograph maps are presented in

Appendix E-3. WWR received a DVD with an electronic file for each photograph (tiff format), two diapositives and two contact prints of each photo from HJW.

The 2003 Carl's Marsh photograph was flown for a different project earlier in the year. That project acquired imagery at 1:7,200, or 1" = 600'/ 1 cm = 72 m. The photograph was scanned at 1,200 dpi, providing a 0.5 ft (15 cm) pixel resolution.

The 2003 Big Break photographs were flown on a separate day, at a scale of 1:6,000, or 1" = 500'/ 1 cm = 60 m. The photograph was scanned at 1,200 dpi, providing a 0.41 ft (13 cm) pixel resolution.

Aerial photographs were taken by Hammon, Jensen & Wallen Geospatial (HJW). Metadata for the plane and camera used for the aerial photography is provided in Appendix E-4.

2.4. Image Processing

Image processing includes rectification of individual photographs, clipping and mosaicing the individual photographs into one seamless image, and compressing the images into different file formats and resolutions. For this project, photographs from each of the six selected sites were ortho-rectified, while photographs from the remaining three non-selected sites were geo-rectified. A more complete description of each of these steps is provided below.

2.4.1. Ortho-rectification

The scanned photo TIFFs were ortho-rectified to the aerial control points using ENVI photo processing software (version 3.6). Ortho-rectification accounts for camera tilt, topographic displacement and lens distortion, and warps the photo pixels (in addition to scaling and rotating) to fit the specified geographic model used in the control point surveys. To account for the local terrain's affect on image distortion, we employed digital elevation models (DEMs) in the rectification process. We used publicly available USGS DEMs, spaced at 10m, resampled to 1m spot elevations, because we did not have higher resolution DEMs available for the sites; however, because the terrain at all sites is relatively homogenous, these coarse DEMs were adequate for the ortho-rectification step.

The accuracy standards employed for ortho-rectification were such that approximately 90% of all control points on the photos are within two meters of their corresponding ground coordinate (which, as stated above, are of sub-meter accuracy—generally within 0.3-0.75 meters of the nominal XY coordinate) determined using the GPS unit. Rectification accuracy information is available in .txt file format in the "Rectification Parameters" folder on DVD with the image files.

2.4.2. Photo Clipping and Mosaicing

One trade off of producing such detailed, 1:9,600 scale photos, is that most of the sites are comprised of more than one photo. In order to view those sites in one seamless image, the individual photos must be combined, or mosaiced, into one image. This

requires that each image be clipped to exclude the photo marginalia (date and time stamp, fiducial marks, etc.), because this information would otherwise obscure features on neighboring photos at the seams. Once clipped, we mosaiced photos into a seamless image using MrSID software, which also compressed the images (see below).

2.4.3. Compression

Another trade off with using such high-resolution aerial photos, exacerbated by mosaicing several photos together, is the very large image file sizes. A typical single photo image in a TIFF format can be as large as 400 megabytes, which can significantly slow or even prevent the most basic digital processes.

The IRWM aerial photos have been converted to compressed MrSID and JPEG files to reduce file size. Each photo mosaic was compressed by a factor of 10, rendering file sizes of 30-50 megabytes per site. MrSID files retain pixel resolution (0.67ft /20cm for the IRWM series) and, for most purposes, are equivalent in quality to the original photo images. In addition, MrSID files are largely designed for use in GIS analysis, such that intensive processing can be performed on high quality images without being bogged down by very large file sizes.

Each site mosaic was converted to a JPEG file as well, at 600 dpi. JPEG compression does not maintain the quality that MrSID compression does, but the file sizes are smaller (on the order of 5-15 megabytes per photo) and many more software packages are able to read JPEG files, allowing for more general utility.

2.4.4. Geo-rectification for Three Not-Selected Sites

Geo-rectification is a process which scales and rotates imagery, essentially embedding the photo with real-world coordinates and scaling information. Unlike ortho-rectification, it does not correct for the effects of camera and topographic distortion on the image. While area information may be extracted from geo-rectified photos with reasonable accuracy, horizontal displacement is likely to be significantly greater than with ortho-rectification, especially toward the photo edges. Thus, temporal analysis comparing discrete locations from different photos of the same area over time would yield less accurate results (e.g., a channel that seems to have migrated from one year to the next is more likely to be a function of rectification error when using geo-rectification compared to ortho-rectification).

Imagery for the non-selected sites in 2003 was geo-rectified using ArcView 3.2 Image Analysis software. As with the ortho-rectified photography, aerial control crosses were used as ground control. Rectification accuracy information is available in .dbf file format in the “Rectification Parameters” folder. The .dbf files have the same name as their corresponding rectified photo image.

2.5. Metadata

Metadata, or the documentation of technical specifications and background information pertaining to data, represents a very important component of any data set, and is particularly essential for complex geographic data. A thorough understanding of technical information such as ortho-rectification accuracy, coordinate system information, and specific spatial/temporal details about the images will greatly enhance the ability to extract meaningful information from them. More general metadata pertaining to "who," "how" and "why" is also useful for ensuring appropriate use of the data (including rights and limits of the user), as well as for providing proper credit to the data owners and producers, and for obtaining additional information if required.

WWR produced metadata for the IRWM aerial photos at two levels and in two file formats. Detailed technical information was recorded in separate files for each individual rectified image. These files include such information as the exact location of ground control points and the accuracy (e.g., RMS) of the photo's ties to those control points. Such statistics are used primarily for specific GIS analyses and high-level QA/QC. This rectification accuracy information is available in the "Rectification Parameters" folder, in .txt files.

More generic information relating to the photo mosaics for each site has been documented in .xml files, as well as .html files. These files include such all-purpose GIS documentation as generalized ortho-rectification accuracy and projection information, as well as data source and contact information. For most users, the majority of relevant information pertaining to each individual image is captured in the photo mosaic metadata, so these .xml and .html files were produced only for the latter. Two .html files—one in long form and one in FAQ form—are included with each photo mosaic.

In addition to these metadata, WWR produced a readme.txt file, which is a general and succinct file, in order to provide quick access to metadata. This file contains information such as the WWR file naming conventions used for the aerial imagery files, data projection information and contact information. This readme.txt file is included in Appendix E-3, and on both of the CDs containing the aerial imagery.

3. Imaging Products for Field and GIS Use

We have generated a number of photography and mapping products to fulfill anticipated IRWM Pilot Project needs. All these products are available as part of this report and at www.irwm.org. A table listing all of these products is provided in Appendix E-4.

1. **Ortho-rectified, unclipped single image air photographs, multiple per site.** These images show the full photo prior to clipping and overlap in the mosaic and provide the data lost within the mosaic due to overlap. These products show 100% of the collected imagery data. These products are available in one resolution, with associated world files.

    a) 0.67' pixel resolution/1200dpi, MrSID compressed-10x
    b) 0.67' pixel resolution/1200dpi, JPEG (2003 only)

2. **Ortho-rectified, clipped, single image air photographs, multiple per site, six selected sites.** These images show the full photo minus the fiduciary data provided at the edge of the photo. These products can be easily imported into a GIS, for creation of customized mosaics. These products are available in one resolution with associated world files.

    a) 0.67' pixel resolution/1200dpi, MrSID compressed-10x

3. **Ortho-rectified mosaic air photograph, one per site.** These images typically combine two or more individual photos into a single image and are the optimal GIS-ready products; they can also be viewed in imaging software such as PhotoShop. Two pieces of original data are lost in the mosaic: overlap between adjacent images and clipping areas external to the site. For the two sites (Carl's Marsh and Bull Island) where only one aerial photograph was flown, the individual photograph and the mosaiced photograph are the same product. Mosaics are available in two resolutions and formats, all with associated world files. These photos are intended for quantitative analyses. Individuals using these products should select the appropriate pixel resolution for the intended application, and then use one consistent resolution across all sites.

    a) 0.67' pixel resolution/1200dpi, MrSID compressed-10x
    b) Variable pixel resolution/600dpi JPEG

4. **Map of each site mosaic, one per site.** These maps are 11x17 (tabloid) layouts showing the mosaic air photo for each site. These maps include scale bar and north arrow. To fit each site onto an 11x17 layout, map scales (and therefore pixel dimensions) vary between sites. These products are ideal for printing as field maps or viewing in imaging software. However, because of the different pixel dimensions, these products are not suitable for quantitative analyses, and the rectified photo mosaic should be used instead. These products are available in one resolution:

    a) 550dpi/variable pixel resolution JPEG (2003)
    b) 300dpi/variable pixel resolution JPEG (2003)
    c) 600dpi/veriable pixel resolution JPEG (2004)

5. **Un-rectified, unclipped, single image air photographs, multiple per site, three not-selected sites (Big Break, Pond 3, San Souci), 2003.** These are the original aerial photographs, converted to JPEG format. These products show 100% of collected imagery data. Available in two resolutions.

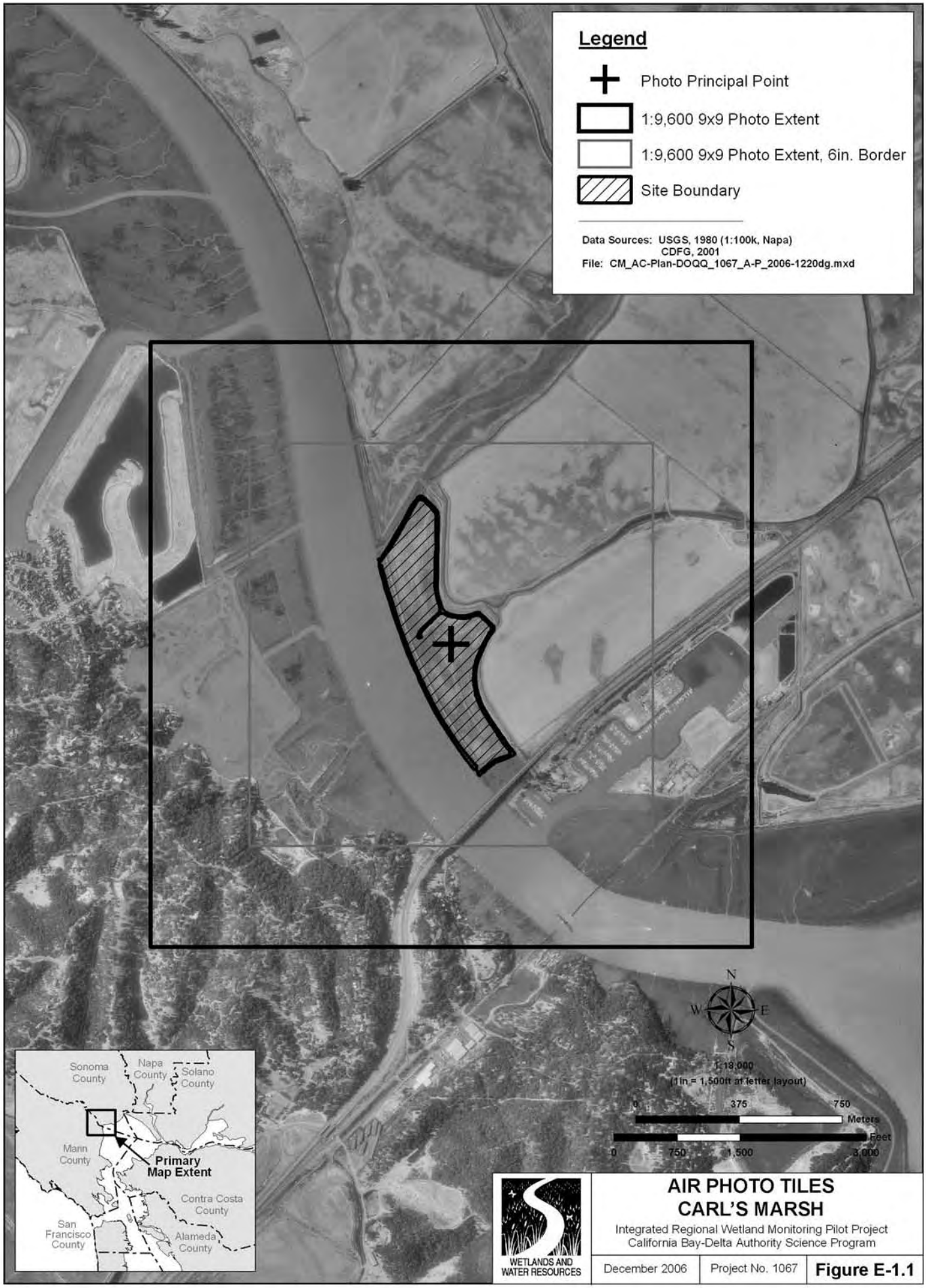
    a) 1.34' pixel resolution/600dpi, JPEG
    b) 2.68' pixel resolution/300dpi, JPEG

6. **Geo-rectified mosaic air photograph, one per site, three not-selected sites, 2003.** Same product as ortho-rectified images but the simpler geo-rectification process yields somewhat lower spatial accuracy. Available in two resolutions, with associated world files.

   a) 1.3' pixel resolution/600dpi JPEG (same pixel resolution all sites)
   b) 2.7' pixel resolution/300dpi JPEG (same pixel resolution all sites)

APPENDIX E-1

FLIGHT LINE MAPS



WETLANDS AND WATER RESOURCES

AIR PHOTO TILES
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure E-1.1**

AIR PHOTO CONTROL POINTS
CARL'S MARSH

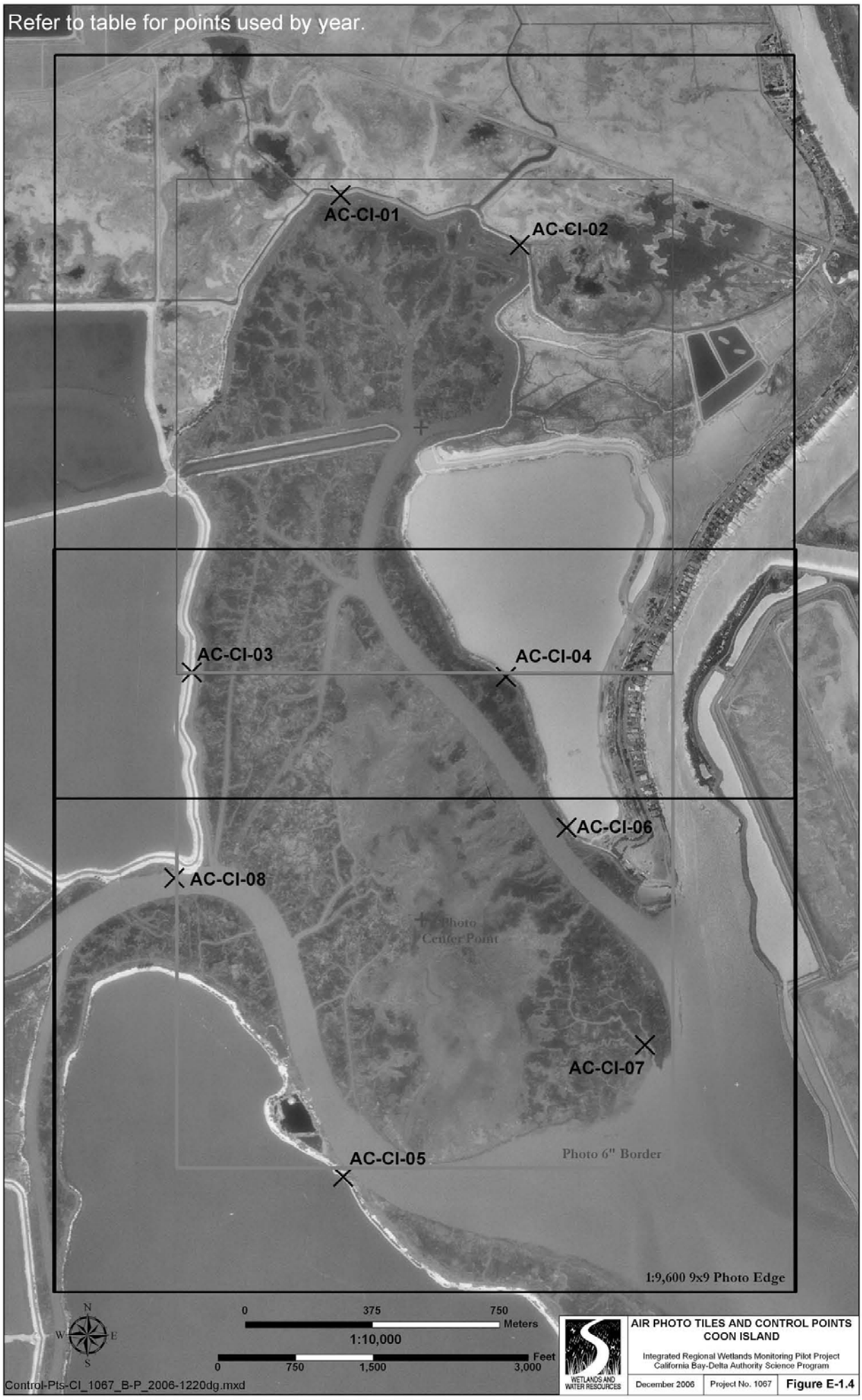
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure E-1.2**

AIR PHOTO TILES AND CONTROL POINTS
POND 2A & POND 3

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

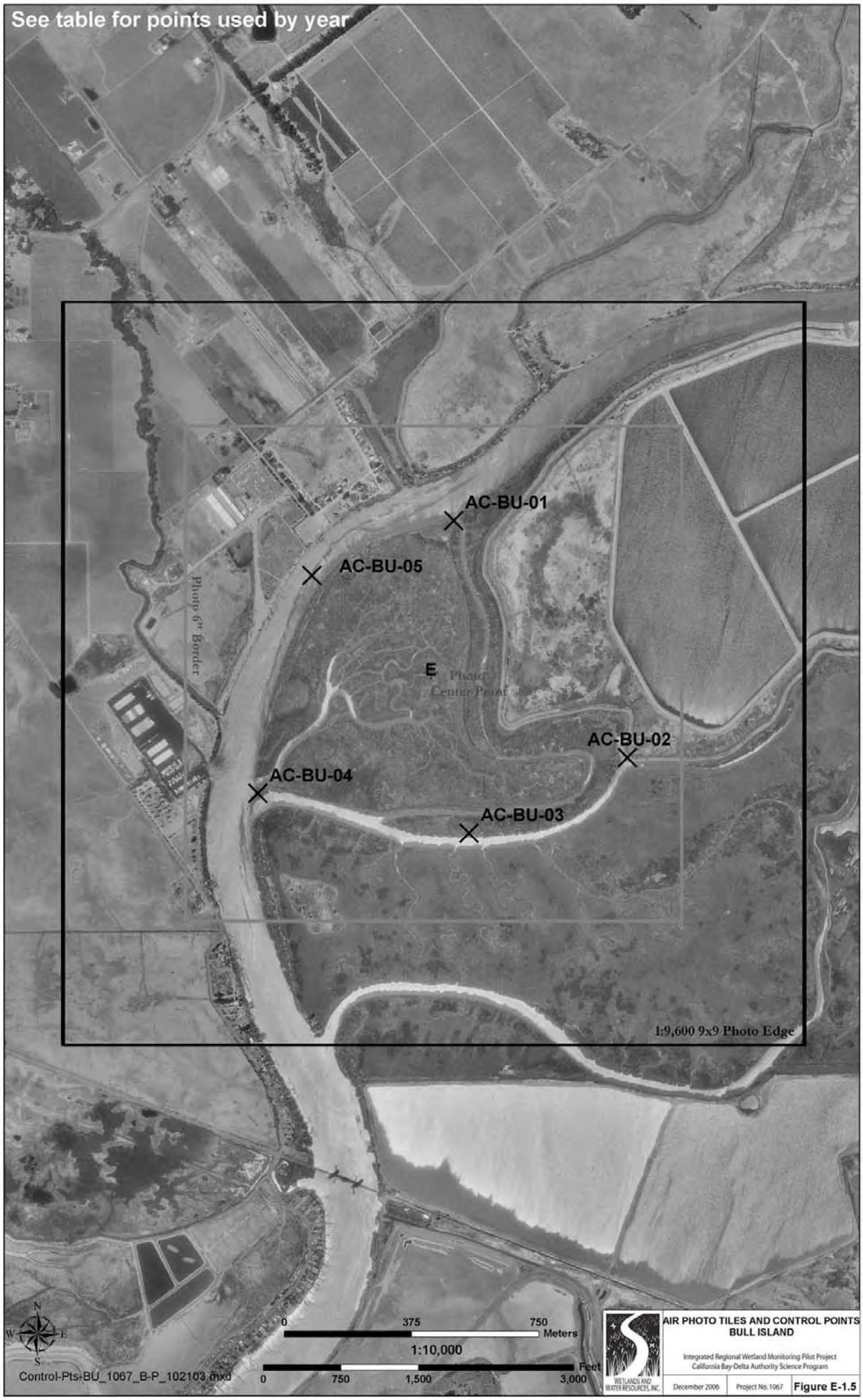
December 2006	Project No. 1067	**Figure E-1.3**



AIR PHOTO TILES AND CONTROL POINTS
COON ISLAND

Integrated Regional Wetlands Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	Figure E-1.4



AIR PHOTO TILES AND CONTROL POINTS
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

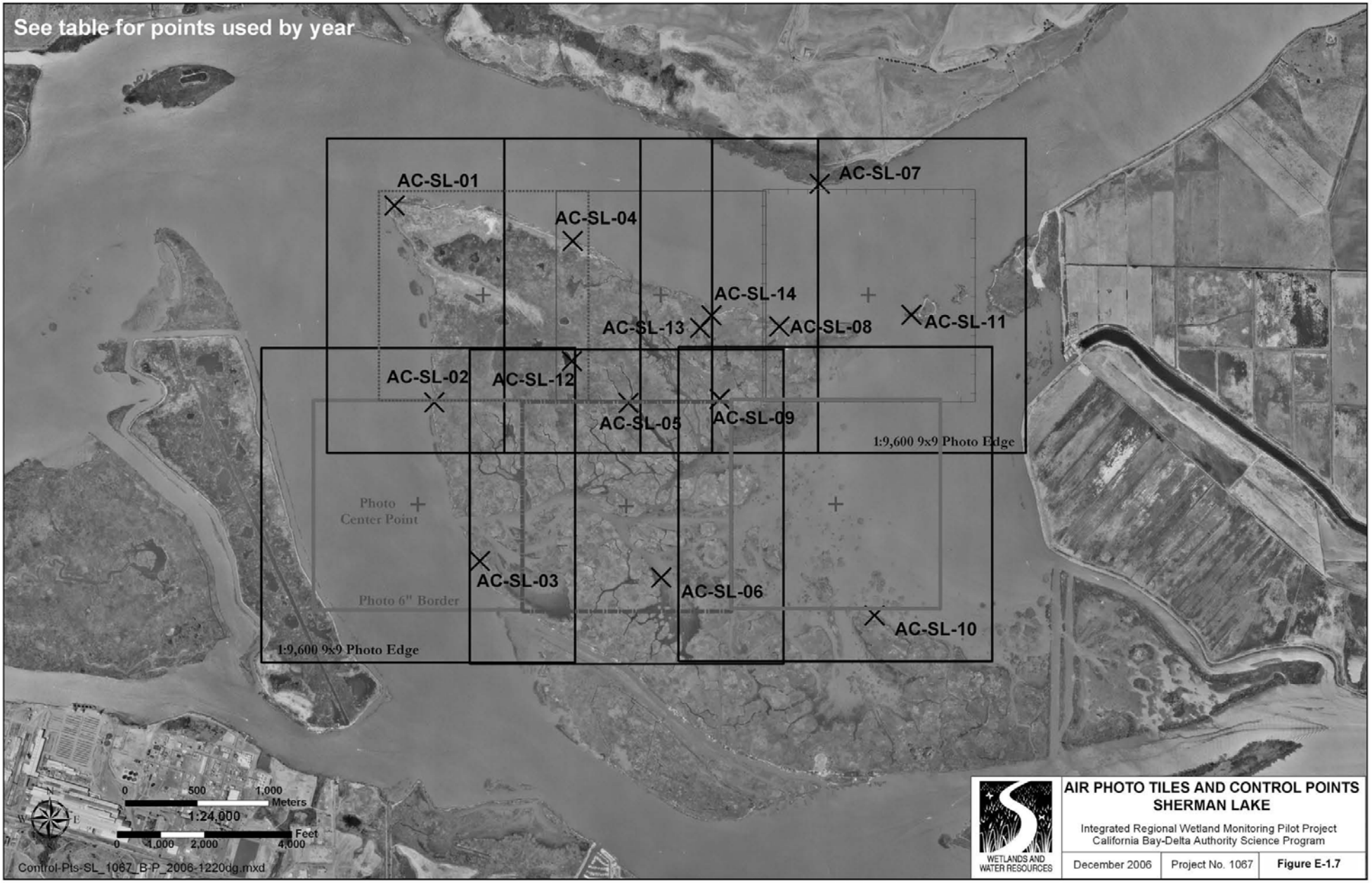
December 2006	Project No. 1067	**Figure E-1.5**

WETLANDS AND WATER RESOURCES, INC.

AIR PHOTO TILES AND CONTROL POINTS
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure E-1.6**



WETLANDS AND WATER RESOURCES

AIR PHOTO TILES AND CONTROL POINTS
SHERMAN LAKE

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure E-1.7**

APPENDIX E-2

2003 AERIAL PHOTOGRAPH MAPS

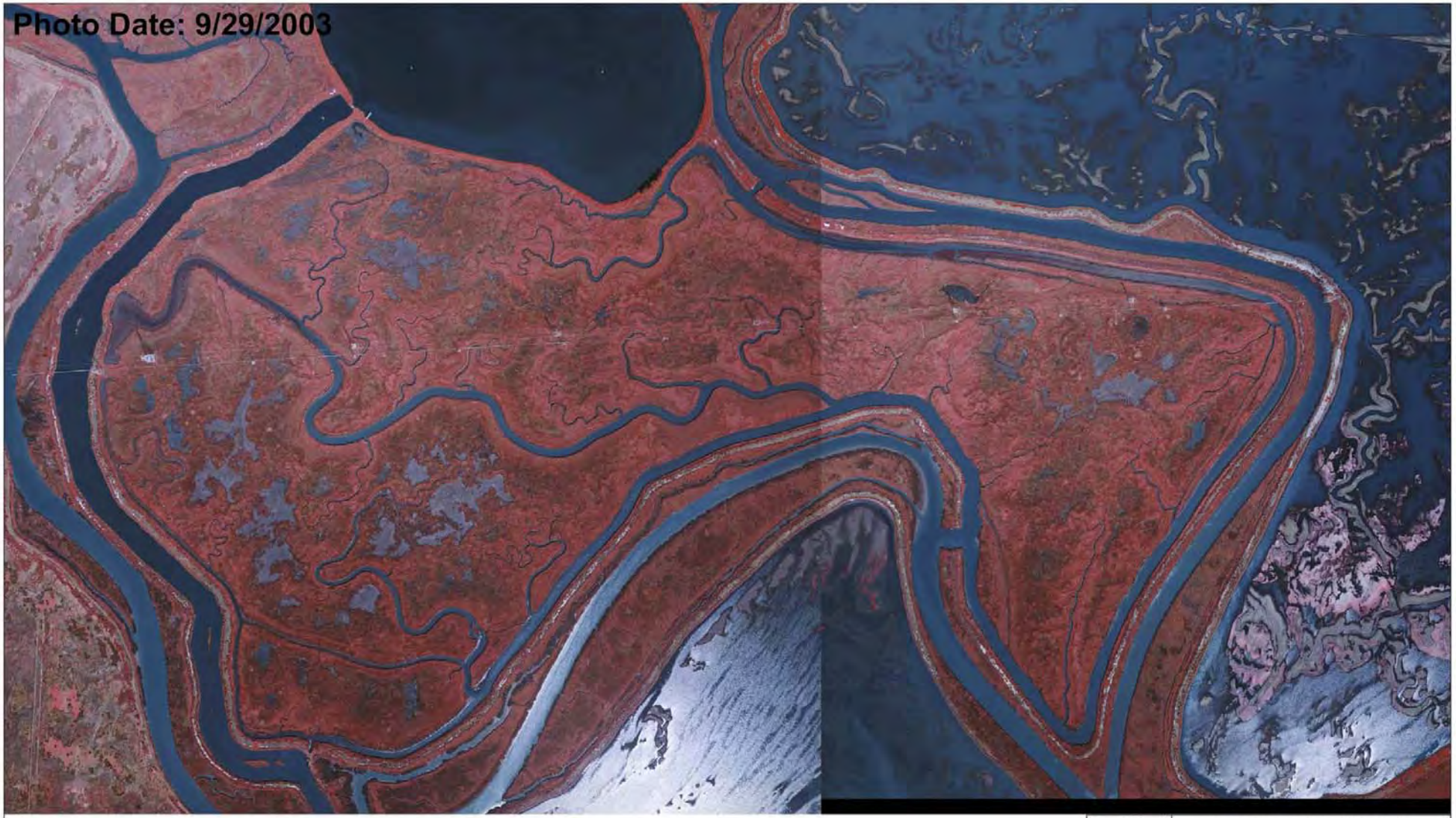
Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: PRM-AP_1067-233_B-P_010704.mxd

WETLANDS AND WATER RESOURCES, INC.

2003 AERIAL PHOTOGRAPH
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067



1:8,000

0 250 500 Meters

0 1,000 2,000 Feet

N W E S

Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: P2A-AP_1067-233_B-L_010704.mxd

WETLANDS AND WATER RESOURCES, INC.

2003 AERIAL PHOTOGRAPH
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067

2003 AERIAL PHOTOGRAPH
COON ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES, INC.

December 2006	Project No. 1067	

2003 AERIAL PHOTOGRAPH
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	

Photo Date: 9/29/2003
1:7,200
0 150 300 Meters
0 600 1,200 Feet
N
W
E
S
Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: BI-AP_1067-233_B-L_010804.mxd
WETLANDS AND WATER RESOURCES, INC.
2003 AERIAL PHOTOGRAPH
BROWNS ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067

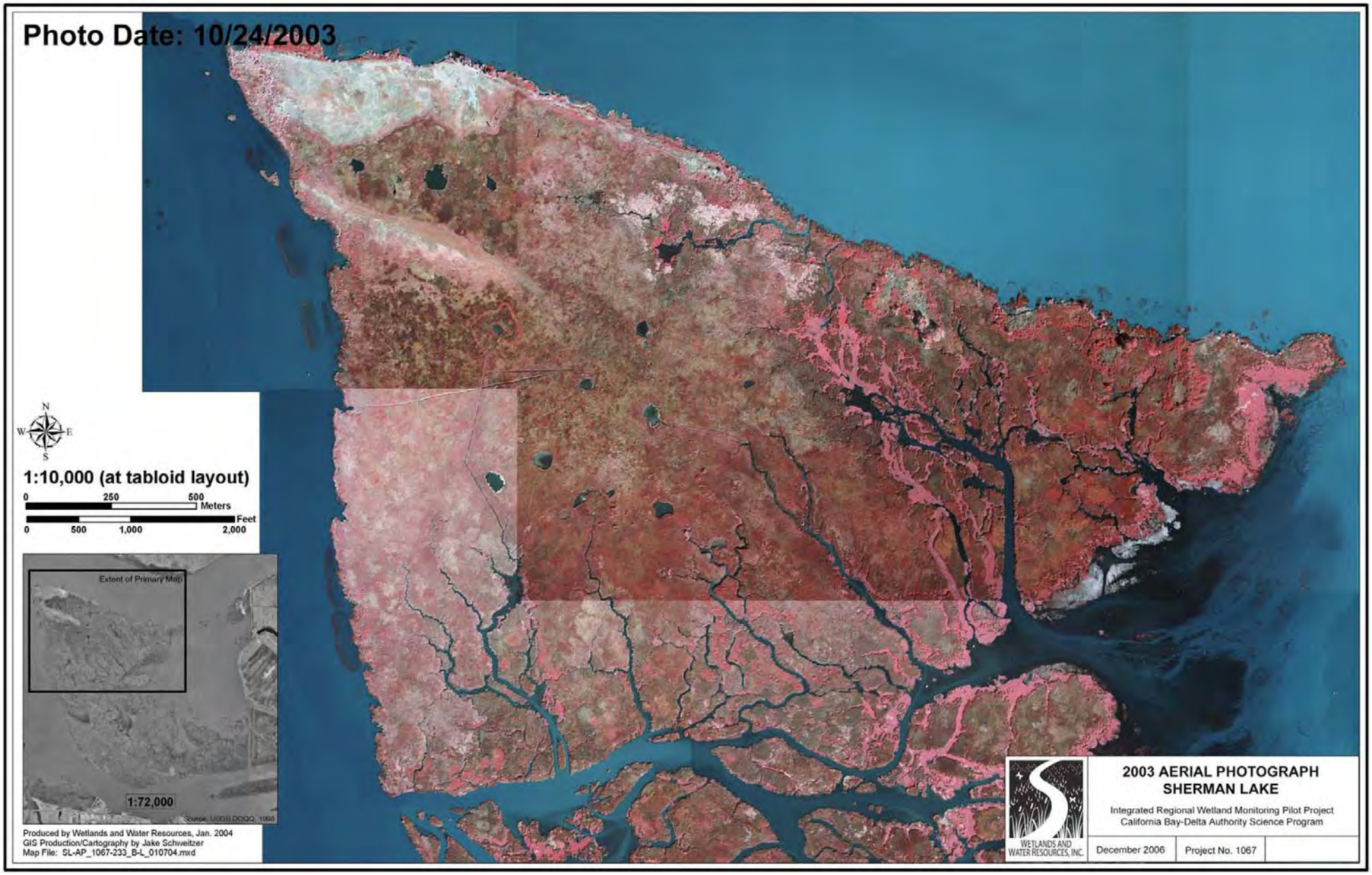


Photo Date: 10/24/2003
N
W
E
S
1:10,000 (at tabloid layout)
0
250
500
Meters
Feet
0
500
1,000
2,000
Extent of Primary Map
1:72,000
Source: USGS DOQQ, 1998
Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: SL-AP_1067-233_B-L_010704.mxd
WETLANDS AND WATER RESOURCES, INC.
2003 AERIAL PHOTOGRAPH
SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067

APPENDIX E-3

2004 AERIAL PHOTOGRAPH MAPS

2004 AERIAL PHOTOGRAPH
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	

1:7,800

0 162.5 325 Meters

0 325 650 1,300 Feet

N W E S

Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Map File: P2A-AP_1067-233_B-L_102104.mxd

WETLANDS AND WATER RESOURCES, INC.

2004 AERIAL PHOTOGRAPH
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 12.2**

2004 AERIAL PHOTOGRAPH
COON ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067

2004 AERIAL PHOTOGRAPH
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

December 2006	Project No. 1067	

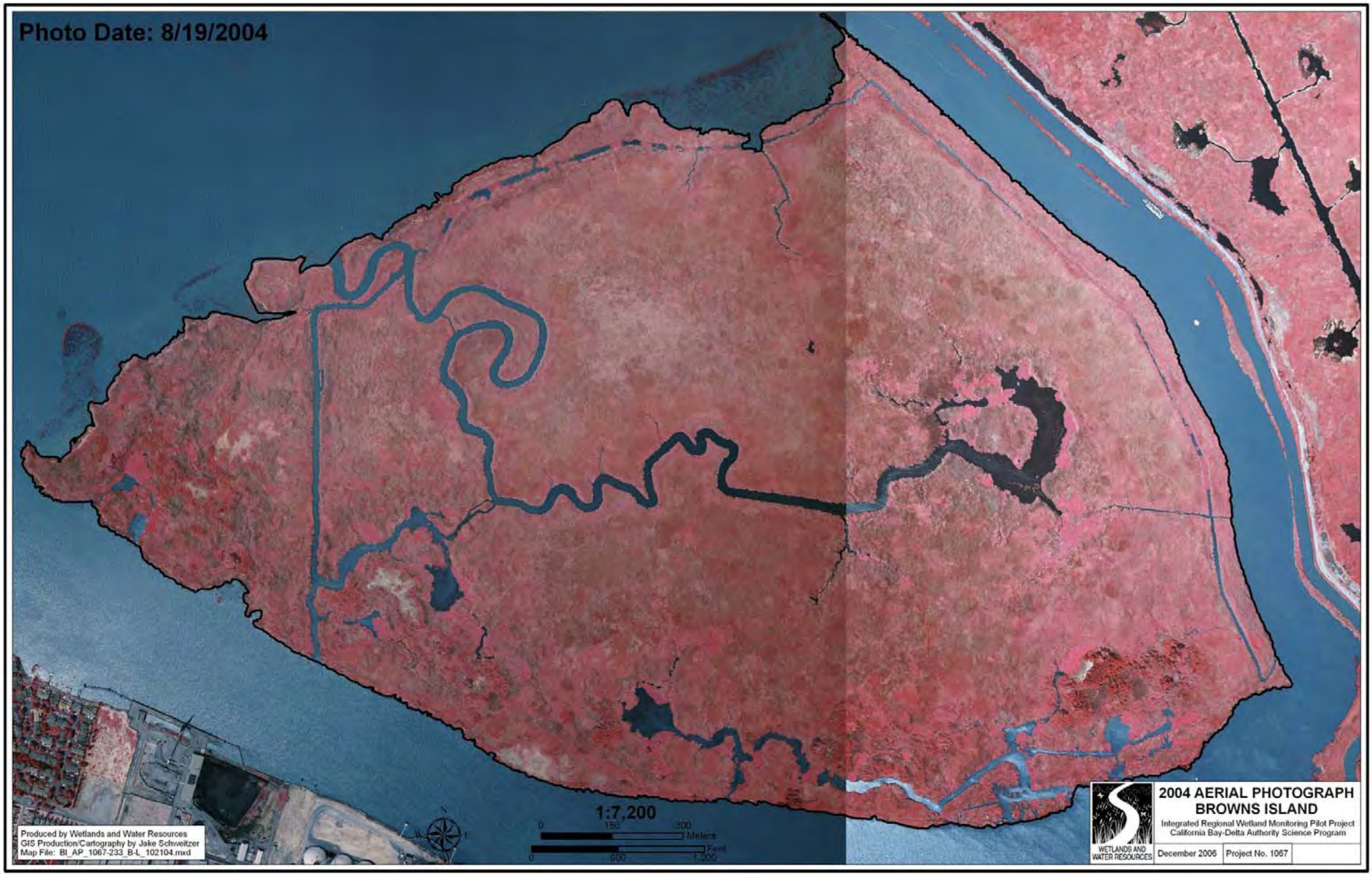


Photo Date: 8/19/2004
1:7,200
0 150 300
Meters
Feet
0 600 1,200
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Map File: BI_AP_1067-233_B-L_102104.mxd
WETLANDS AND WATER RESOURCES
2004 AERIAL PHOTOGRAPH
BROWNS ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067

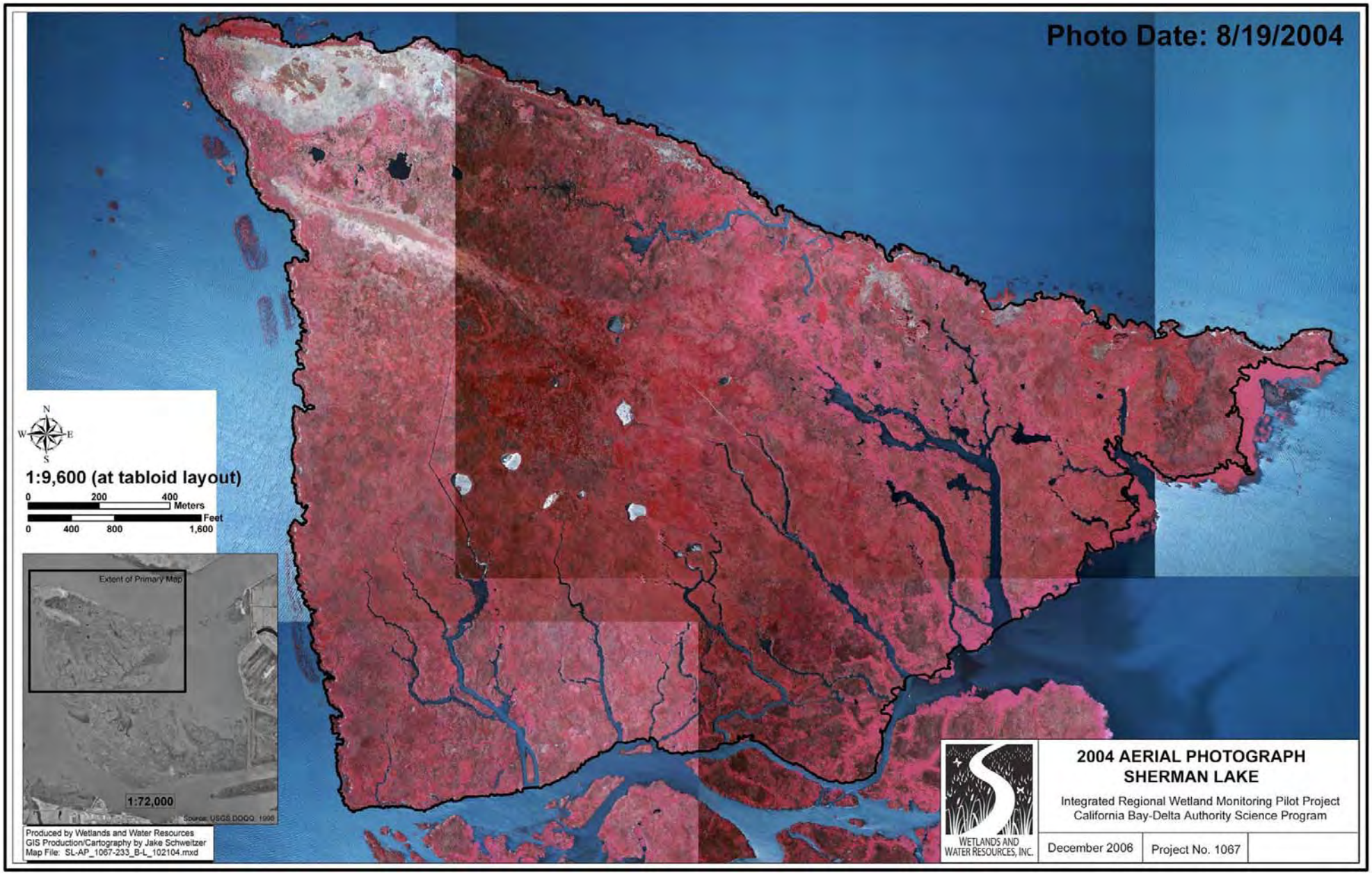


Photo Date: 8/19/2004
N
W
E
S
1:9,600 (at tabloid layout)
0 200 400 Meters
0 400 800 1,600 Feet
Extent of Primary Map
1:72,000
Source: USGS DOQQ 1998
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Map File: SL-AP_1067-233_B-L_102104.mxd
WETLANDS AND WATER RESOURCES, INC.
2004 AERIAL PHOTOGRAPH
SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067

APPENDIX E-4

AERIAL IMAGERY CAMERA AND FLIGHT METADATA

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 20192

REPORT OF CALIBRATION
of Aerial Mapping Camera

April 5, 2002

Camera type: Zeiss RMK TOP 15*
Lens type: Zeiss Pleogon A3/4
Nominal focal length: 153 mm

Camera serial no.: 141291
Lens serial no.: 141314
Maximum aperture: f/4
Test aperture: f/4

Submitted by: Pacific Aerial Surveys
Oakland, California

Reference: HJW & Associates, Inc. purchase order No. 1535, dated April 4, 2002. Signed by Mr. Fred Benton.

These measurements were made on Kodak Micro-flat glass plates, 0.25 inch thick, with spectroscopic emulsion type 157-01 Panchromatic, developed in D-19 at 68° F for 3 minutes with continuous agitation. These photographic plates were exposed on a multicollimator camera calibrator using a white light source rated at approximately 5200K.

I. Calibrated Focal Length: 154.061 mm

II. Lens Distortion

Field angle:	7.5°	15°	22.7°	30°	35°	40°
Symmetric radial (um)	-1	-2	-2	0	1	2
Decentering (um)	0	0	1	1	1	2

Symmetric radial distortion parameters	Decentering distortion parameters	Calibrated principal point
$K_0 = 0.6148 \times 10^{-4}$	$P_1 = -0.1207 \times 10^{-6}$	$x_p = 0.006$ mm
$K_1 = -0.9639 \times 10^{-8}$	$P_2 = -0.2045 \times 10^{-7}$	$y_p = -0.005$ mm
$K_2 = 0.3032 \times 10^{-12}$	$P_3 = 0.0000$	
$K_3 = 0.0000$	$P_4 = 0.0000$	
$K_4 = 0.0000$		

The values and parameters for Calibrated Focal Length (CFL), Symmetric Radial Distortion (K_0,K_1,K_2,K_3,K_4), Decentering Distortion (P_1,P_2,P_3,P_4), and Calibrated Principal Point [point of symmetry] (x_p,y_p) were determined through a least-squares Simultaneous Multiframe Analytical Calibration (SMAC) adjustment. The x and y-coordinate measurements utilized in the adjustment of the above parameters have a standard deviation (σ) of ±3 microns.

* Equipped with Forward Motion Compensation

Lens Resolving Power in cycles/mm

Area-weighted average resolution: 96

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	113	113	113	113	113	95	95
Tangential lines	113	95	80	95	95	80	80

The resolving power is obtained by photographing a series of test bars and examining the resultant image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 5 to 268 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

Filter Parallelism

The two surfaces of the Zeiss TOP 15 KL-F (36%) filter No. 141523, and USGS TOP 15 test filter KL-F (60%) No. 142399 are within 10 seconds of being parallel. The USGS test filter, in conjunction with the internal "B" filter, was used for the calibration.

V. Shutter Calibration

Indicated time (sec)	Rise time (μ sec)	Fall Time (μ sec)	½ width time (ms)	Nom. Speed (sec.)	Efficiency (%)
1/100	3856	3980	11.14	1/120	79
1/200	1832	1859	5.23	1/250	79
1/300	1158	1096	3.60	1/350	79
1/400	887	900	2.60	1/490	79
1/500	708	704	2.11	1/600	79

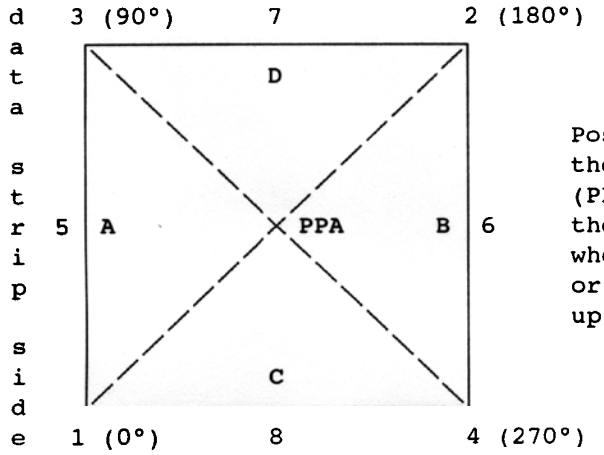
The effective exposure times were determined with the lens at aperture f/4. The method is considered accurate within 3 percent. The technique used is Method I described in American National Standard PH3.48-1972(R1978).

VI. Magazine Platen

The platen mounted in T-MC film magazine No. 137711 does not depart from a true plane by more than 13 um (0.0005 in).

The platen for this film magazine is equipped with an identification marker that will register "141626" in the data strip area for each exposure.

Principal Points and Fiducial Coordinates



Positions of all points are referenced to the principal point of autocollimation (PPA) as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The data strip is to the left.

	X coordinate	Y coordinate
Indicated principal point, corner fiducials	0.004 mm	-0.007 mm
Indicated principal point, midside fiducials	-0.002	-0.003
Principal point of autocollimation (PPA)	0.0	0.0
Calibrated principal point (pt. of sym.) x_p, y_p	0.006	-0.005

Fiducial Marks

1	-112.986 mm	-113.012 mm
2	112.987	112.990
3	-113.012	113.002
4	113.016	-113.012
5	-113.000	-0.005
6	113.010	-0.001
7	-0.007	112.994
8	0.003	-112.995

Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 319.594 mm 3-4: 319.641 mm

Lines joining these markers intersect at an angle of 89° 59' 53"

Midside fiducials

5-6: 226.010 mm 7-8: 225.989 mm

Lines joining these markers intersect at an angle of 90° 00' 05"

Corner fiducials (perimeter)

1-3: 226.014 mm 2-3: 225.998 mm

1-4: 226.002 mm 2-4: 226.001 mm

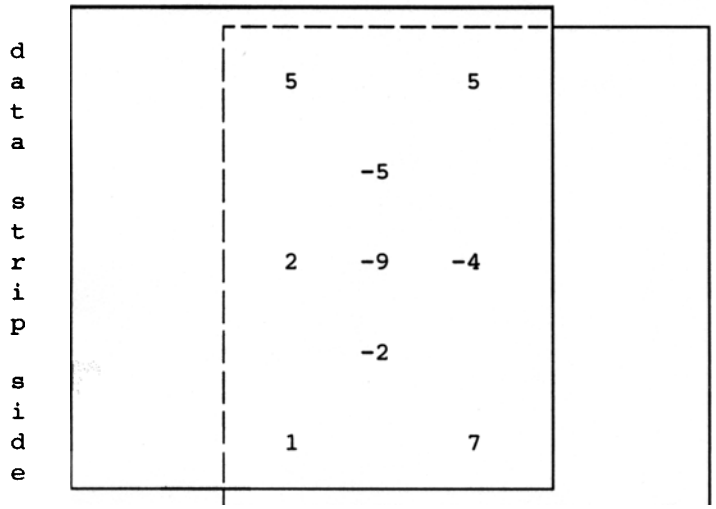
The method of measuring these distances is considered accurate within 0.003 mm

Note: For GPS applications, the nominal entrance pupil distance from the focal plane is 254 mm with a 10 mm filter thickness. Additional filter thickness will increase entrance pupil distance by 0.34 X added thickness.

IX. Stereomodel Flatness

FMC Magazine No.: 137711 Base/Height ratio: 0.6

Platen ID: 141626 Maximum angle of field tested: 40°



Stereomodel
Test point array
(values in micrometers)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereo models. The values are based on comparator measurements on Kodak 4425 copy film made from Kodak 2405 film exposures. These measurements can vary by as much as ± 5 μm from model to model.

X. System Resolving Power on film in cycles/mm

Area-weighted average resolution: 44 Film: Type 2405

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	48	48	48	48	48	48	40
Tangential lines	48	48	40	48	40	40	34

This aerial mapping camera calibration report supersedes the previously issued USGS Report No. OSL/2537, dated April 15, 1999.

John J. Lenart
Chief, Technology Operations Section
National Mapping Division

APPENDIX E-5

AERIAL IMAGERY METADATA README.TXT FILE

Readme_2003_Aerial-photography

This file provides the most basic information pertaining to the images in this package.

The names of the photo files use the following convention:
Example using SL_Ortho-Mosaic_1067_102403_1200-10x.sid (MrSID format photo file):
SL-------Site name (see below)
Ortho----Rectification method (Photo was ortho-rectified, as opposed to Geo-rct, which means the photo was geo-rectified)
Mosaic---Consists of two or more individual photos, mosaiced together
1067-----WWR project number
102403---Date photo was taken (October 24, 2003)
1200-----Pixel resolution of photo image file
10x------Compression factor using MrSID software (compressed by a factor of 10)

The Site abbreviations are as follows:
SELECTED SITES
BrI - Brown's Island
BuI - Bull Island
CI - Coon Island
P2A - Pond 2A
CM - Carl's Marsh (Petaluma River Marsh)
SL - Sherman Lake
NOT-SELECTED SITES
BB - Big Break
P3 - Pond 3
SS - San Souci

Complete metadata is stored in each file's namesake HTML and XML files, but here are the basics:

--All of the selected site mosaics are in MrSID format (compressed from TIFF). MrSID files can be read in most GIS software, though an extension (included in all ESRI GIS products) may be required to view the photos.

--Clipped photos have been included to exclude non-data fiducial/flight information. Clippling occurred subsequent to ortho-rectification and prior to mosaicing.

--All aerial photos were taken between August and October, 2003.

--1:9,600 is the (geographic/fractional) scale for individual photos (and mosaics) for all sites except for Carl's Marsh, which is 1:7,200, and Big Break, which is 1:6,000. Pixel size for all ortho-rectified images is 0.2 meters (0.67ft).

--All image files conform to the following projection parameters:

Projection: UTM
Zone: 10N
Datum: NAD83
Units: Meters

Additional information regarding a photo's horizontal accuracy (rectification RMS) can be found in the folder titled "Rectification Parameters"). For additional information, contact Wetlands and Water Resources (WWR): (415) 457-0250 | www.swampthing.org

All photo images are public domain. Citation and credit information follows:
All photos were produced by Hammon, Jensen & Wallen, Oakland, CA. All photo processing
and documentation was carried out by Jake Schweitzer, WWR, November 2003.

This file provides the most basic information pertaining to the images in this package.

The names of the photo files use the following convention:
Example using SL_Ortho-Mosaic_1067_081904_1200-10x.sid (MrSID format photo file):
SL-------Site name (see below)
Ortho----Rectification method (Photo was ortho-rectified, as opposed to Geo-rct, which means the photo was geo-rectified)
Mosaic---Consists of two or more individual photos, mosaiced together
1067-----WWR project number
081904---Date photo was taken (August 19, 2004)
1200-----Pixel resolution of photo image file
10x------Compression factor using MrSID software (compressed by a factor of 10)

The Site abbreviations are as follows:
SELECTED SITES
BrI - Brown's Island
BuI - Bull Island
CI - Coon Island
P2A - Pond 2A
CM - Carl's Marsh (Petaluma River Marsh)
SL - Sherman Lake
Secondary
P3 - Pond 3

Complete metadata is stored in each file's namesake HTML and XML files, but here are the basics:

--All of the selected site mosaics are in MrSID format (compressed from TIFF). MrSID files can be read in most GIS software, though an extension (included in all ESRI GIS products) may be required to view the photos.

--Clipped photos have been included to exclude non-data fiducial/flight information.

Clippling occurred subsequent to ortho-rectification and prior to mosaicing.

--All aerial photos were taken on August 19th, 2004.

--1:9,600 is the (geographic/fractional) scale for individual photos (and mosaics) for all sites.
Pixel size for all ortho-rectified images is 0.2 meters (0.67ft).

--All image files conform to the following projection parameters:

Projection: UTM
Zone: 10N
Datum: NAD83
Units: Meters

Additional information regarding a photo's horizontal accuracy (rectification RMS) can be found in the folder titled "Rectification Parameters"). For additional information, contact Wetlands and Water Resources (WWR): (415) 457-0250 | www.swampthing.org

All photo images are public domain. Citation and credit information follows:
All photos were produced by Hammon, Jensen & Wallen, Oakland, CA. All photo processing and
documentation was carried out by Jake Schweitzer, WWR, October 2004.

APPENDIX E-6

TABLES OF AERIAL IMAGERY PRODUCTS (2003 AND 2004)

Table of Aerial Image Products - 2003					
IRWM Pilot Project					
Format	**Pixel Resolution**	**dpi**	**Site**	**Filename**	**Notes**
Product 1: Ortho-rectified, unclipped, single image photo (six selected sites)					Includes world files
JPEG	0.67	1200	Brown's Island	BrI-E_Unclipped-ortho_1067_092903_1200	
JPEG	0.67	1200	Brown's Island	BrI-W_Unclipped-ortho_1067_092903_1200	
JPEG	0.67	1200	Bull Island	BuI_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Coon Island	CI-N_Unclipped-ortho_092903_1200	
JPEG	0.67	1200	Coon Island	CI-S_Unclipped-geo-rct_1067_092903_1200	Geo-rectified
JPEG	0.5	1200	Carl's Marsh	CM_Unclipped-ortho_081403_1200	
JPEG	0.67	1200	Sherman Lake	SL-NC_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Sherman Lake	SL-NE_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Sherman Lake	SL-NW_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Sherman Lake	SL-SE_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Sherman Lake	SL-SW_Unclipped-ortho_1067_102403_1200	
JPEG	0.67	1200	Pond 2A	P2A-E_unclipped-geo-rct_1067_092903_1200	Geo-rectified
JPEG	0.67	1200	Pond 2A	P2A-W_unclipped-geo-rct_1067_092903_1200	Geo-rectified
Product 2: Ortho-rectified, clipped, single image air photo (six selected sites)					Includes world files
MrSID	0.67	1200	Brown's Island	BrI-E_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Brown's Island	BrI-W_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Bull Island	BuI_Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Carl's Marsh	CM_Ortho_1067_081403_1200-10x.sid	
MrSID	0.67	1200	Coon Island	CI-N_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Coon Island	CI-S_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Pond 2A	P2A-E_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Pond 2A	P2A-W_Ortho_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Sherman Lake	SL-NC_Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Sherman Lake	SL-NE_Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Sherman Lake	SL-NW_Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Sherman Lake	SL-SE_Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Sherman Lake	SL-SW_Ortho_1067_102403_1200-10x.sid	

Table of Aerial Image Products - 2003					
IRWM Pilot Project					
Format	**Pixel Resolution**	**dpi**	**Site**	**Filename**	**Notes**
Product 3: Ortho-rectified, clipped, mosaiced photo (six selected sites)					Includes world files
MrSID	0.67	1200	Brown's Island	BrI_Ortho-Mosaic_1067_092903_1200-10x.sid	
MrSID	0.67	1200	Bull Island	BuI-Ortho_1067_102403_1200-10x.sid	
MrSID	0.67	1200	Carl's Marsh	CM_Ortho_1067_081903_1200-10x.sid	
MrSID	0.67	1200	Coon Island	CI_Ortho-Mosaic_1067_092903_1200_10x.sid	
MrSID	0.67	1200	Pond 2A	P2A_Ortho-Mosaic_1067_102403_1200-10x	
MrSID	0.67	1200	Sherman Lake	SL_Ortho-Mosaic_1067_102403_1200-10x.sid	
JPEG	1.3	600	Brown's Island	BrI_Ortho-Mosaic_1067_092903_600.jpg	
JPEG	1.3	600	Bull Island	BuI_Ortho_1067_102403_600.jpg	
JPEG	1.3	600	Carl's Marsh	CM_Ortho_1067_081403_600.jpg	
JPEG	1.3	600	Coon Island	CI_Ortho-Mosaic_1067_092903_600.jpg	
JPEG	1.3	600	Pond 2A	P2A_Ortho-Mosaic_1067_092903_600.jpg	
JPEG	1.3	600	Sherman Lake	SL_Ortho-Mosaic_1067_102403_600.jpg	
JPEG	2.7	300	Brown's Island	BrI_Ortho-Mosaic_1067_092903_300.jpg	
JPEG	2.7	300	Bull Island	BuI_Ortho_1067_102403_300.jpg	
JPEG	2.7	300	Carl's Marsh	CM_Ortho_1067_081403_300.jpg	
JPEG	2.7	300	Coon Island	CI_Ortho-Mosaic_1067_092903_300.jpg	
JPEG	2.7	300	Pond 2A	P2A_Ortho-Mosaic_1067_092903_300.jpg	
JPEG	2.7	300	Sherman Lake	SL_Ortho-Mosaic_1067_102403_300.jpg	
Product 4: Un-rectified, unclipped single image photo (3 non-selected sites)					Includes world files
JPEG	1.3	600	Big Break	BB-E_Unclipped-Photo_1067_100303_600	
JPEG	1.3	600	Pond 3	P3-E_Unclipped-Photo_1067_092903_600	
JPEG	1.3	600	Pond 3	P3-Mid-E_Unclipped-Photo_1067_092903_600	
JPEG	1.3	600	Pond 3	P3-Mid-W_Unclipped-Photo_1067_092903_600	
JPEG	1.3	600	Pond 3	P3-NE_Unclipped-Photo_1067_092903_600	
JPEG	1.3	600	Pond 3	P3-SE_Unclipped-Photo_1067_092903_600	
JPEG	1.3	600	San Souci	SS_Unclipped-Photo_1067_092903_600	
JPEG	2.7	300	Big Break	BB-E_Unclipped-Photo_1067_100303_300	
JPEG	2.7	300	Pond 3	P3-E_Unclipped-Photo_1067_092903_300	
JPEG	2.7	300	Pond 3	P3-Mid-E_Unclipped-Photo_1067_092903_300	
JPEG	2.7	300	Pond 3	P3-Mid-W_Unclipped-Photo_1067_092903_300	
JPEG	2.7	300	Pond 3	P3-NE_Unclipped-Photo_1067_092903_300	
JPEG	2.7	300	Pond 3	P3-SE_Unclipped-Photo_1067_092903_300	
JPEG	2.7	300	San Souci	SS_Unclipped-Photo_1067_092903_300	
Product 5: Geo-rectified, mosaiced photo, (3 non-selected sites)					Includes world files
JPEG	1.3	600	Big Break	BB_Geo-rct_1067_100304_600	
JPEG	1.3	600	Pond 3	P3_Geo-rct_Mosaic_092903_600	
JPEG	1.3	600	San Souci	SS_Geo-rct_1067_092903_600	
JPEG	2.7	300	Big Break	BB_Geo-rct_1067_100304_300	
JPEG	2.7	300	Pond 3	P3_Geo-rct_Mosaic_092903_300	
JPEG	2.7	300	San Souci	SS_Geo-rct_1067_092903_300	

Table of Aerial Image Products -2003					
IRWM Pilot Project					
Format	**Pixel Resolution**	**dpi**	**Site**	**Filename**	**Notes**
Product 6: Tabloid Site Map (Rectified mosaic photo base layer)					Does not include world files
JPEG	1.09	550	Brown's Island	BrI_AP_1067-233_B-L_010804_550	Ortho-rectified
JPEG	0.64	550	Bull Island	BuI_AP_1067-233_B-L_010704_550	Ortho-rectified
JPEG	0.45	550	Carl's Marsh	CM_AP_1067-233_B-P_010704_550	Ortho-rectified
JPEG	1.21	550	Coon Island	CI_AP_1067-233_B-P_010704_550	Ortho-rectified
JPEG	1.21	550	Pond 2A	P2A_AP_1067-233_B-L_010704_550	Ortho-rectified
JPEG	1.52	550	Sherman Lake	SL_AP_1067-233_B-L_010704_550	Ortho-rectified
JPEG	1.09	550	Big Break	BB_AP_1067-233_B-L_010904_550.jpg	Geo-rectified
JPEG	0.83	550	San Souci	SS_AP_1067-233_B-P_010904_550.jpg	Geo-rectified
JPEG	2.12	550	Pond 3	P3_AP_1067-233_B-L_010904_550.jpg	Geo-rectified
JPEG	2	300	Brown's Island	BrI_AP_1067-233_B-L_010804_300	Ortho-rectified
JPEG	1.17	300	Bull Island	BuI_AP_1067-233_B-L_010704_300	Ortho-rectified
JPEG	0.83	300	Carl's Marsh	CM_AP_1067-233_B-P_010704_300	Ortho-rectified
JPEG	2.22	300	Coon Island	CI_AP_1067-233_B-P_010704_300	Ortho-rectified
JPEG	2.22	300	Pond 2A	P2A_AP_1067-233_B-L_010704_300	Ortho-rectified
JPEG	2.78	300	Sherman Lake	SL_AP_1067-233_B-L_010704_300	Ortho-rectified
JPEG	2	300	Big Break	BB_AP_1067-233_B-L_010904_300.jpg	Geo-rectified
JPEG	0.45	300	San Souci	SS_AP_1067-233_B-P_010904_300.jpg	Geo-rectified
JPEG	3.89	300	Pond 3	P3_AP_1067-233_B-L_010904_300.jpg	Geo-rectified

Table D-1. Aerial Image Products - 2004				
IRWM Pilot Project				
Format	Pixel Resolution, Feet	dpi	Site	Filename
Product 1: Ortho-rectified, unclipped, individual image photo tiles				
MrSID	0.67	1200	Brown's Island, East	BrI-E_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Brown's Island, West	BrI-W_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Bull Island	BuI_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Coon Island, North	CI-N_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Coon Island, South	CI-S_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Carl's Marsh	CM_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Sherman Lake, North-Central	SL-NC_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Sherman Lake, North-East	SL-NE_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Sherman Lake, North-West	SL-NW_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Sherman Lake, South-East	SL-SE_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Sherman Lake, South-West	SL-SW_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 2A, East	P2A-E_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 2A, West	P2A-W_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3, West	P3-W_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3, Middle	P2A-M_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3, Middle-East	P2A-ME_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3, North-East	P2A-NE_Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3, South-East	P2A-SE_Ortho_1067_081904_1200-10x.sid
Product 2: Ortho-rectified, clipped, individual image photo tiles				
MrSID	0.67	1200	Brown's Island, East	BrI-E_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Brown's Island, West	BrI-W_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Bull Island	BuI_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Coon Island, North	CI-N_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Coon Island, South	CI-S_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Carl's Marsh	CM_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Sherman Lake, North-Central	SL-NC_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Sherman Lake, North-East	SL-NE_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Sherman Lake, North-West	SL-NW_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Sherman Lake, South-East	SL-SE_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Sherman Lake, South-West	SL-SW_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 2A, East	P2A-E_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 2A, West	P2A-W_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 3, West	P3-W_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 3, Middle	P3-M_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 3, Middle-East	P3-ME_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 3, North-East	P3-NE_Ortho_1067_081904_1200-10x_clp.sid
MrSID	0.67	1200	Pond 3, South-East	P3-SE_Ortho_1067_081904_1200-10x_clp.sid

Table D-1. Aerial Image Products - 2004				
IRWM Pilot Project				
Format	**Pixel Resolution, Feet**	**dpi**	**Site**	**Filename**
Product 3: Ortho-rectified, clipped, mosaiced photo				
MrSID	0.67	1200	Brown's Island	BrI_Ortho-Mosaic_1067_081904_1200-10x.sid
MrSID	0.67	1200	Bull Island	BuI-Ortho_1067_081904_1200-10x.sid
MrSID	0.67	1200	Carl's Marsh	CM_Ortho_1067_081903_1200-10x.sid
MrSID	0.67	1200	Coon Island	CI_Ortho-Mosaic_1067_081904_1200_10x.sid
MrSID	0.67	1200	Pond 2A	P2A_Ortho-Mosaic_1067_081904_1200-10x
MrSID	0.67	1200	Sherman Lake	SL_Ortho-Mosaic_1067_081904_1200-10x.sid
MrSID	0.67	1200	Pond 3	P3_Ortho-Mosaic_1067_081904_1200-10x.sid
JPEG	1.4	600	Brown's Island	BrI_Ortho-Mosaic_1067_081904_600.jpg
JPEG	1.2	600	Bull Island	BuI_Ortho_1067_081904_600.jpg
JPEG	0.92	600	Carl's Marsh	CM_Ortho_1067_081904_600.jpg
JPEG	1.97	600	Coon Island	CI_Ortho-Mosaic_1067_081904_600.jpg
JPEG	1.58	600	Pond 2A	P2A_Ortho-Mosaic_1067_081904_600.jpg
JPEG	1.92	600	Sherman Lake	SL_Ortho-Mosaic_1067_081904_600.jpg
JPEG	2.6	600	Pond 3	P3_Ortho-Mosaic_1067_081904_600.jpg
Product 4: Tabloid Site Map (files do not include world file)				
JPEG	1.09	550	Brown's Island	BrI_AP_1067-233_B-L_102104_600.jpg
JPEG	0.64	550	Bull Island	BuI_AP_1067-233_B-L_102104_600.jpg
JPEG	0.45	550	Carl's Marsh	CM_AP_1067-233_B-P_102104_600.jpg
JPEG	1.21	550	Coon Island	CI_AP_1067-233_B-P_102104_600.jpg
JPEG	1.21	550	Pond 2A	P2A_AP_1067-233_B-L_102104_600.jpg
JPEG	1.52	550	Sherman Lake	SL_AP_1067-233_B-L_102104_600.jpg
JPEG	2.12	550	Pond 3	P3_AP_1067-233_B-L_102104_600.jpg

Integrated Regional Wetland Monitoring Pilot Project

Plant Team Data Report

Authors
John Callaway, University of San Francisco (callaway@usfca.edu)
V. Thomas Parker, San Francisco State University (parker@sfsu.edu)
Michael Vasey, San Francisco State University (mvasey@mercury.sfsu.edu)
Lisa Schile, San Francisco State University (lschile@sfsu.edu)

December 29, 2006

1.0 Introduction 1
2.0 Scope of Work 2
2.1 Vegetation relevés 2
2.2 Vegetation transect sampling 2
2.3 Annual net primary productivity measurements 2
2.3.1 2004 dominant species productivity measurements 2
2.3.2 2005 dominant species productivity measurements 2
2.3.3 2005 *Sarcocornia pacifica* productivity measurements 2
2.4 Vegetation/elevation surveys 3
2.5 Voucher specimens 3
2.6 Seed dispersal 3
3.0 Data Collection and Quality Assurance 3
3.1 Vegetation relevés 3
3.2 Vegetation transect sampling 3
3.3 Annual net primary productivity measurements 4
3.3.1 2004 dominant species productivity measurements 4
3.3.2 2005 dominant species productivity measurements 4
3.3.3 2005 *Sarcocornia pacifica* productivity measurements 4
3.4 Vegetation/elevation/inundation surveys 5
3.5 Voucher specimens 5
3.6 Seed dispersal and seed bank studies 5
3.7 Quality Assurance/Quality Control 6
4.0 Result and Observations 6
4.1 Vegetation relevés 6
4.2 Vegetation transect sampling 6
4.3 Annual net primary productivity measurements 7
4.3.1 Dominant species productivity measurements 7
4.3.2 Sarcocornia pacifica productivity measurements 7
4.4 Vegetation/elevation/inundation surveys 8
4.5 Voucher specimens 8
4.6 Seed dispersal and seed bank studies 8
5.0 References 9
6.0 Tables 10
7.0 Figures 12
Appendix 1. 26

1.0 Introduction

In terms of biological processes within wetlands, vegetation plays the central role in ecosystem development. Vegetation is a major focus of wetland restoration and monitoring because plants provide feedback to physical processes, create habitat structure for organisms that use wetlands, and are the source of primary productivity and food web support for detrital food webs. The distribution of plant species and their productivity across wetland sites are influenced by a series of physical processes originating at different scales. Tidal inundation (depth, duration, and frequency of flooding) and salinity directly constrain vegetation processes within estuarine wetlands (Mitsch and Gosselink 2000). In the San Pablo Bay-Suisun-Delta region, annual salinity regimes at any particular site strongly influence what species from the regional pool can germinate and reproduce in any particular wetland (Crain et al. 2004). Salt marshes, for example, are characterized by a high concentration of pore water salts, high densities of channels, sensitivity to inundation, and large tidal amplitudes. Brackish marshes experience similar dynamics, but the tidal energy is somewhat reduced, gradually modifying the density and structure of within-marsh channel systems but magnifying the importance of other processes. In freshwater systems, tidal amplitude is further reduced, but seasonal patterns of water flow, especially flooding events and storm water flow, have greater influences.

Similar dynamics between heterogeneity of physical processes and plant distributions and productivity occur within a given wetland. Four main within-marsh vegetation variables – species composition, species assemblages, productivity, and structure – are cumulatively affected by regional, landscape, and within-marsh processes. Within wetlands, variable patterns in tides, inundation, elevation, and salinity, among others, lead to patches dominated by particular assemblages of species. For example, at Browns Island, areas adjacent to the central channel are dominated by *Schoenoplectus acutus* and *Typha domingensis*, while *Schoenoplectus americanus* dominates areas higher in elevation (Parker, Vasey, Callaway, and Schile, unpublished data). Annual productivity varies greatly both among species (growth rates and allocation patterns) and within species (depending on local site conditions). Because assemblages found along within-marsh environmental gradients differ in the heights and life forms of the species involved, large changes in vegetation structure also may result. Therefore, the structural heterogeneity of vegetation in a wetland depends on the particular distribution and extent of different plant assemblages.

All of these factors are important in determining vegetation dynamics in existing wetlands, as well as recruitment and growth into restored wetlands. Our research has centered on evaluating vegetation patterns within natural and restored tidal wetlands within the San Francisco Bay-Delta. We have evaluated plant distributions and productivity within and among wetlands, including a consideration of heterogeneity in principal physical processes and the effect of this heterogeneity on wetland plant dynamics.

2.0 Scope of Work

The overall IWRM project has focused on the question: how does tidal marsh restoration affect ecological processes at different scales? We have been evaluating this question with regards to vegetation dynamics. Specifically, the objectives of the plant team were to understand how physical processes, in particular inundation and salinity, structure plant communities across the San Francisco Bay-Delta in natural and restored tidal marshes, document species diversity across all sites, measure primary productivity of dominant plant species, and develop methods for measuring species richness and productivity.

2.1 Vegetation relevés

Ground surveys at all IRWM sites were conducted in 2004 and 2005 by the Plant team to document plant distribution, diversity, and abundance at hundreds of randomly-generated points across each site. The data were used in conjunction with the Landscape Ecology team to train and calibrate the 2003 and 2004 vegetation type maps.

2.2 Vegetation transect sampling

This study was implemented in 2004 to compare the effectiveness and efficiency of two vegetation sampling methods, belt and parallel transects, at quantifying species diversity and abundance. Additionally, transects were positioned to begin at the edge of a channel to quantify the relationship, if any, between channel proximity and species composition or diversity.

2.3 Annual net primary productivity measurements

Total standing biomass of many dominant plant species was measured in 2004 and 2005 to quantify changes in productivity across all IRWM sites and to develop methods for non-destructive sampling of productivity.

2.3.1 2004 dominant species productivity measurements

We collected total standing biomass of many dominant plant species across all IRWM sites except for Sherman Lake to examine differences in productivity along a salinity gradient and among species. We also implemented multiple methods for estimating plant productivity using non-destructive methods.

2.3.2 2005 dominant species productivity measurements

We collected total standing biomass of many dominant plant species, excluding *Sarcocornia pacifica* (see 2.3.3) across all IRWM sites to examine differences in productivity along a salinity gradient and among species. We also supplemented data collected in 2004 to examine multiple methods for estimating plant productivity using non-destructive methods.

2.3.3 2005 *Sarcocornia pacifica* productivity measurements

Because *S. pacifica* is a perennial plant, multiple biomass collections were made throughout the growing season in 2005 to calculate the annual production of plants at China Camp State Park, Pond 2a, and Coon Island. The effects of salinity and marsh location on production were also examined.

2.4 Vegetation/elevation surveys

At all IRWM sites, vegetation presence and abundance data and elevation data were simultaneously collected around water level stations to examine the effects of elevation and inundation on plant distribution, abundance, and diversity. Elevation and inundation data were collected in collaboration with the Physical Processes Team.

2.5 Voucher specimens

We collected plant samples at all sites to generate species list for each site and to maintain a voucher specimen collection in the San Francisco State University Herbarium.

2.6 Seed dispersal

The purpose of this work was to document water-based seed dispersal and soil seed banks in the following tidal wetlands along the Napa River: Pond 3 (restored), Pond 2a (restored), Coon Island (natural), and Bull Island (restored). The research was conducted as part of a Master's thesis project by Z. Diggory at San Francisco State University.

3.0 Data Collection and Quality Assurance

3.1 Vegetation relevés

These data were collected in conjunctions with the Landscape Ecology Team. Hundreds of randomly-generated points stratified by dominant vegetation type classes were generated at each IRWM site in 2004 and 2005, of which at least 150 points were located in the field using handheld global positioning system (GPS) units with accuracy of approximately 2-5 meters. At each point, a 3m-diameter vegetation relevé was conducted where all plant species present were identified to species, and the absolute cover class of each plant was recorded. In 2005, the average height of a species with a cover of 50% or higher was measured.

3.2 Vegetation transect sampling

Twenty randomly-generated GPS coordinates located within 5m of a channel were created using ArcMap at all IRWM sites, and from those, ten points were randomly chosen and visited at each site. This approach was adapted from methods developed earlier for EMAP sampling (http://www.wrmp.org/protocols.html). We navigated to each point using a handheld GPS unit, the channel located closest to this point was chosen, and the spatial coordinates were recorded at the channel edge. Once at the channel edge, two sampling methods were implemented (Figure 1):

- A 2m by 40m continuous belt transect sampled every meter, beginning at the channel edge
- Five 10m transects parallel to the channel edge and placed 0, 10, 20, 30 and 40m from channel edge and three plots sampled per transect.

For all 1m by 2m plots, all plants present were identified to species, the percent cover of each species was estimated using cover classes, and average plant height in cm was measured for the dominant species. The amount of time required to sample each transect method was also recorded.

3.3 Annual net primary productivity measurements

3.3.1 2004 dominant species productivity measurements

We collected end-of-year standing biomass of dominant species, including *Schoenoplectus acutus* (tule), *S. americanus* (common threesquare), *S. californicus* (California tule), *Sarcocornia pacifica* (perennial pickleweed), *Salicornia europaea* (annual pickleweed), *Typha* species (cattail), *Bolboschoenus maritimus* (alkali bulrush), and *Phragmites australis* (common reed), at Coon Island, Bull Island, Pond 2a, Carl's Marsh, and Browns Island. At Carl's Marsh, 0.25 m^2 plots were established every 10m along seven 40m transects that were previously used for vegetation sampling earlier in the field season. For the remaining sites, 0.25 m^2 plots were randomly located within monospecific stands of each target species; however, we specifically chose areas throughout the marsh that varied in plant height and stem density. Not all species were collected at each site. At each plot, we recorded plant species present, percent cover of each species, average plant height, and leaf area index (LAI), which was measured using a LiCOR LAI 2000 plant canopy analyzer. All above-ground vegetation within the plot was removed and bagged for lab processing. In the lab, samples were sorted by species and in some cases, live and dead material, and placed in paper bags of known weights. For select plots, target species were separated into 10 cm height classes and the number of stems in each height class was recorded. All samples were dried in a 60°C drying oven for 2 days, after which they were weighed. Biomass was adjusted for bag weight and scaled up to the 1m^2 level.

3.3.2 2005 dominant species productivity measurements

At all six IRWM sites, we collected end-of-year total standing biomass for the following dominant species: *Schoenoplectus acutus, S. americanus, S. californicus, Salicornia europaea, Spartina foliosa, Typha species*, and *Bolboschoenus maritimus.* Not all species were collected at each site and plots were randomly located in monospecific stands that varied in plant height and density. We followed the same field protocol as in 2004 and recorded soil salinity using a refractometer at depths of 5, 10, and 20cm from the soil surface. Bags were stored in a walk-in refrigerator until processing. In the lab, all material was rinsed and sorted by species and live/dead material. We implemented two sorting procedures for the target dominant species. Half of the plots at each site were sorted according to 10 cm height classes and stem density within each height class was recorded. For the remaining plots, only stem density of live material for each target species was recorded. Bags were dried in 60°C drying oven for 2 days, after which they were weighed. Biomass was adjusted for bag weight and scaled up to the 1m^2 level.

3.3.3 2005 *Sarcocornia pacifica* productivity measurements

Because *S. pacifica* is a perennial species, we wanted to examine changes in biomass throughout the growing season and quantify annual net primary productivity. We established 20 1.5m by 1.5m plots at China Camp State Park, Pond 2a, and Coon Island. At China Camp and Coon Island, plots were randomly located in areas that were well-drained (near channel edges) and poorly-drained (at least 200m away from channel edges). At Pond 2a, plots were established in *S. pacifica* patches across the entire site due to its patchy distribution. Each plot was divided into nine 0.25m^2 subplots; however, we only sampled the subplots in the center and at each corner. Beginning in February and ending in September 2005, we collected *S. pacifica* biomass four times. The subplot sampled each time was randomly chosen. In the field, we recorded the plant species present, percent cover of each species, LAI, and average and maximum plant height.

Soil salinity was collected at depths of 5, 10, and 20 cm from the soil surface and measured using a refractometer. All above-ground biomass within the plot was removed and bagged for sorting in the lab. Bags were stored in a walk-in refrigerator until processing. In the lab, all plant material was rinsed of salt, dirt, and any other debris, sorted by species, and placed into paper bags of known weights. Bags were dried in 60°C drying oven for 2 days, after which they were weighed. Biomass was adjusted for bag weight and scaled up to the $1m^2$ level.

3.4 Vegetation/elevation/inundation surveys

We implemented a "hub and spoke method" field sampling method to examine the influence of elevation and inundation on plant distribution and abundance. Elevation and vegetation surveys were centered around water levels stations installed by the Physical Processes team. A total station was set up over a benchmark at a water level station ('hub'). Survey crews with stadia rods walked away from the water level station in a straight line ('spoke'), measured elevation roughly every 5 m, and conducted a 1m-diameter vegetation relevé centered on each elevation survey point. Plant species and their percent cover were recorded. In addition, the degree of topographic heterogeneity (ie: flat, slight slope, severe slope) within a relevé was recorded. All IRWM sites were visited, although not all water level stations were surveyed.

3.5 Voucher specimens

Each IRWM site was visited for the collection of voucher specimens. Collectors explored various areas within a site, recorded what species were present around a specific specimen, and collected the specimen. In the lab, all specimens were identified to species, pressed in a plant press, dried for 2 days in a 60°C drying oven, individually stored and labeled, and placed in the Herbarium at San Francisco State University.

3.6 Seed dispersal and seed bank studies

At Pond 3, Pond 2a, Coon Island, and Bull Island, 20 locations were chosen across each site along channel edges of different channel order. At each location, all existing vegetation in 1m-radius plot was clipped to the ground and one 0.25 by 0.25m seed trap made out of multiple layers of burlap was attached to the soil surface using metal stakes. A 3m-diameter vegetation survey centered at the trap was conducted to document presence and abundance of local species, and the horizontal coordinates were recorded using Trimble RTK GPS 5700 survey equipment. In June 2005, the first traps were installed and each trap was deployed for approximately 3 months, after which it was removed and replaced with a fresh trap. Traps were deployed a total of three times and the final trap was removed in January 2006. Traps removed from the field were placed in cold storage for two weeks and then placed into individual plastic flats filled with sand. Each trap was watered with freshwater and monitored for three months to document the identity of each seedling at the species level and count the total number of each germinating species.

To document seed banks, three shallow soil cores were removed at each seed trap location and consolidated into one bag in January 2006. All of the cores were placed into cold storage for 2 weeks and then flattened into plastic flats filled with sand. Each core was watered with freshwater and monitored for three months to document the identity and number of germinating species.

3.7 Quality Assurance/Quality Control

We implemented multiple methods for maintaining accuracy and consistency in field and laboratory data acquisition and data management. In the field, all plants were identified to the species or sub-species level (when applicable) and verified using plant keys and/or voucher specimens. In the seed bank and dispersal studies, unidentifiable seedlings were grown to maturity to correctly identify the plants. To insure accuracy in determining vegetation cover across all field workers, we conducted training sessions to demonstrate the methodology for calculating cover classes, verified that each field worker was consistently and accurately determining cover, and we often worked in teams when documenting cover. The same methodology was applied to measuring average height in the field. When data were entered into spreadsheets, each entry was verified twice to assure correct entry.

4.0 Result and Observations

The following is a brief summary of our results and observations. Detailed data upon which these results are based can be found at www.irwm.org. A list of all species identified at each site and recent taxonomic changes can be found in Appendix Table 1.

4.1 Vegetation relevés

Across both years of sampling and all sites, we surveyed over 2,300 vegetation relevés. Multiple analyses have and will be conducted using the data. The Landscape Ecology team used the data to generate vegetation type maps for the 2003 and 2004 aerial images at each site. The relevé data were also used in a vegetation sampling method comparison discussed in section 4.2. Additionally, diversity and abundance at the plot level were analyzed and results demonstrated that both are significantly greater at the freshwater sites (Figures 2 and 3).

The data were also used to in a vegetation composition comparison among the Napa sites: Pond 2a, Coon Island, and Bull Island. A species list was generated from the data (Table 1) and showed that Coon Island and Bull Island have much greater richness than Pond 2a. The relative cover and frequency of species also varied among sites (Figures 4 and 5). Additionally, a multivariate TWINSPAN analysis was run for each site (Figure 6). At Coon Island, for example, species were grouped according to an assumed elevation gradient, with species at the top of the dendogram representing a high marsh assemblage and species at the bottom of the dendograms representing a low marsh assemblage (Figure 6a). A similar pattern was seen at Bull Island (Figure 6b) and Pond 2a (Figure 6c).

4.2 Vegetation transect sampling

The vegetation data collected from the two transect methods were used in an analysis with the vegetation relevé data to compare the effectiveness and efficiency of the three methods at Coon Island. These data were presented at the CALFED Science Conference in 2004. We found that the three sampling methods were comparable for estimating species richness; however, the effort involved differed among methods (Table 2). The average percent cover and relative frequency of species were comparable among sampling methods, but two species, *Schoenoplectus acutus* and *Typha angustifolia*, had greater cover and frequency in the random point sampling (Figures 7 and 8). The three sampling methods were comparable in sampling effort at low numbers of species

richness; however, the sampling effort and time to obtain the total species richness increased for the random point sampling as compared to the transect sampling (Tables 3 & 4).

This research established that rapid, structured sampling is as effective as intensive random sampling at representing vegetation in one brackish tidal marsh, Coon Island. On average, the two transect sampling methods more efficiently described vegetation patterns, shown through reduced effort, and demonstrated that the majority of species richness was found within 40m of a channel. Out of the three methods, the belt transect appeared to be the most successful in capturing species richness and also provided the most environmental structure with which to test factors governing species distribution and abundance in a marsh. Although our effort and efficiency estimates tend to support the use of the belt transect, inherently there will be species that are not represented in the sampling due to the patchy nature of these systems. Certain species were underestimated using transect sampling, specifically *Schoenoplectus acutus* and *Typha angustifolia*. This could be due to their location in the marsh (i.e., farther inland than the transects extended) or that the random point sampling was inherently biased towards the initial vegetation classifications from which they were generated. Consequently, we conclude that a belt transect method is the most efficient method for accurately characterizing brackish tidal wetlands. This conclusion is dependent on using random locations to initiate the transects, and depending on the size of the marsh, increasing the transect length to incorporate species located away from channels.

4.3 Annual net primary productivity measurements

Productivity data were collected across all sites in 2004 and 2005 (Figure 9)

4.3.1 Dominant species productivity measurements

Individual stem height, total stem length (which is the sum of all individual stem lengths), and stem density were all highly correlated with biomass for all species, although the best-fitting method varied among species (Figure 10). Most of the methods of estimating productivity that we tested were able to significantly predict the biomass of the dominant species studied, although we were unable to identify a single method that applied to all species. Leaf area index accurately predicted biomass for *T. angustifolia* (data not shown). Within the *Schoenoplectus*, *Bolboschoenus*, and *Spartina* species, individual stem height and stem count were strong predictors of biomass; however, total stem length, a surrogate for both stem height and density, appeared to have the strongest relationship with biomass (Figure 10).

Although no single method applied to all species, the combination of LAI and total stem length provide a powerful predictive method for estimating plant productivity across a strong salinity gradient. Implementation of these methods would:

1) Minimize damage to wetland vegetation
2) Reduce labor costs and increase efficiency

4.3.2 Sarcocornia pacifica productivity measurements

Soil salinity increased at all sites at all depths over time (Figure 11), and salinity was greater in poorly-drained plots than well-drained plots (Figures 11a and b). At China Camp and Coon Island, we found a negative relationship between *S. pacifica* biomass and soil salinity in poorly-drained plots but not in plots that were well-drained and near channels (Figure 12). There was no

relationship with channel proximity or salinity at Pond 2a; however, we found a positive relationship between soil salinity and distance to nearest channel (data not shown).

Our results confirm previous findings that marshes in Mediterranean environments have higher salinities in areas that are not well-flushed (Mahall and Park 1976). While we expected to see productivity decline with increasing salinity, these findings suggest that poor drainage could be a more significant problem for pickleweed marshes than salinity alone. This is consistent with findings elsewhere, such as at Elkhorn Slough, where excessive inundation appears to be causing large-scale *Sarcocornia* marsh die back (Van Dyke and Wasson 2005). It is a significant finding that the combined effects of prolonged inundation and salinity have a strong negative effect on productivity. In addition, increased salinity had a negative effect on the average height of pickleweed, and this effect was much stronger under conditions of prolonged inundation. The differences that we saw in pickleweed inundation at China Camp and Coon Island were not detected at Pond 2a, the restoring site; however, the increase in salinity with greater distances from a channel suggests that, over time, the effects of inundation and salinity might be more profound.

4.4 Vegetation/elevation/inundation surveys

Vegetation and elevation surveys were conducted at four water level stations at Coon Island and Browns Island, three water level stations at Bull Island and Pond 2a, and one water level station at Sherman Lake and Carl's Marsh (Figure 13). Overall, over 2,800 points were visited.

Preliminary analyses of the influence of elevation on plant diversity show that there is a range of elevations where the peak species richness occurs that differs depending on the location in the estuary (Figure 14). At the Napa River sites, plant diversity increases with elevation up to MHHW (2 m NAVD) (Figure 14). Additionally, three dominant plant species that occur at the Napa River sites, *Typha angustifolia*, *Sarcocornia pacifica*, and *Bolboschoenus maritimus*, were found to be distributed along an elevation gradient (Figure 15). T. *angustifolia* tended to grow at lower elevations, *B. maritimus* grew at slightly higher elevations, and *S. pacifica* occupied the highest elevations; however, there is overlap among species that might be explained with the inclusion of inundation data (ie, depth and length of inundation). To date, no inundation data have been incorporated into any analyses. Future analyses to examine the influence of elevation and inundation on plant diversity and distribution will incorporate all sites and average spring and summer water salinities.

4.5 Voucher specimens

Across all six IRWM sites, we collected, identified, and pressed over 300 wetland plants specimens. Samples were catalogued and stored at San Francisco State University's Herbarium.

4.6 Seed dispersal and seed bank studies

Seed dispersal and seed bank data were successfully collected across all of the Napa River sites (Figure 16). Out of all of the Napa River sites samples, the most recently restored site, Pond 3, had the most species germinate from seeds dispersed into the site (Table 5). There was little difference among sites in the number of species germinating from soil seed banks. The majority of the seeds that germinated in both the seed traps and soil samples were wetland species, although not all were native plants (Table 5). Of the non-wetland species that germinate, the

majority of plants were not native (Table 5). These data demonstrate that there is sufficient seed dispersal into breached sites to support restoration. However, the data suggest that rarer species are not represented in these sites. Common species from established sites are able to disperse rapidly into new locations, but rarer species are limited in their dispersal ability to a greater extent than their proportion in the regional vegetation. These results demonstrate that seed dispersal into restored sites is similar to that found in natural sites within the Napa River marshes; further analyses are underway and will be completed as part of Z. Diggory's thesis.

5.0 References

Crain, C. M., B.R. Silliman and S. L. Bertness, and M.D. Bertness. 2004. Physical and biotic drivers of plant distribution across estuarine salinity gradients. Ecology 85(9): 2539-2549.

Mahall, B. E. and R. B. Park. 1976. Ecotone between Spartina foliosa and Salicornia virginica L in salt marshes of northern San Francisco Bay. II. Soil-water and salinity. Journal of Ecology 64(3):793-809.

Mitsch, W.J., and J.G. Gosselink. 2000. Wetlands, 3rd ed edition. John Wiley, New York, NY.

Van Dyke, E. and K. Wasson. 2005. Historical ecology of a central California estuary: 150 years of habitat change. Estuaries 28(2):173-189

6.0 Tables

Table 1. Plant species encountered at the Napa sites while conducting vegetation relevés. Species codes for Figures 2 and 3 were generated by combining the first two letters of the genus and species (ie *Achillea millefolium* = Acmi)

Coon Island	Bull Island	Pond 2A
Achillea millefolium	*Artemisia douglasiana*	*Bolboschoenus maritimus*
Argentina egedii egedii	*Atriplex triangularis*	*Cotula coronopifolia*
Artemisia douglasiana	*Baccharis pilularis*	*Distichlis spicata*
Baccharis pilularis	*Bolboschoenus maritimus*	*Eleocharis parvula*
Beta vulgaris	*Cotula coronopifolia*	*Grindelia stricta*
Bolboschoenus maritimus	*Distichlis spicata*	*Jaumea carnosa*
Distichlis spicata	*Grindelia stricta*	*Lepidium latifolium*
Frankenia salina	*Jaumea carnosa*	*Salicornia europaea*
Grindelia stricta	*Juncus balticus*	*Sarcocornia pacifica*
Jaumea carnosa	*Lepidium latifolium*	*Schoenoplectus americanus*
Juncus balticus	*Sarcocornia pacifica*	*Spartina foliosa*
Lathyrus jepsonii jepsonii	*Schoenoplectus acutus*	*Typha angustifolia*
Lepidium latifolium	*Schoenoplectus americanus*	
Rumex crispus	*Schoenoplectus californicus*	
Sarcocornia pacifica	*Sonchus oleraceus*	
Schoenoplectus acutus	*Spartina foliosa*	
Schoenoplectus americanus	*Triglochin maritima*	
Schoenoplectus californicus	*Typha angustifolia*	
Spartina foliosa	*Typha latifolia*	
Triglochin maritima		
Typha angustifolia		
Typha latifolia		

Table 2. Different measures of sampling effort were calculated for each sampling method.

	Species richness	# of sampling days	Total effort (min)	Ave. # points/ transects per day	Ave. time per point/ transect (min)
Random Points	22	4	1995	49.5	10.1
Belt Transect	20	2	379	5	37.9
Parallel Transect	18	2	320	5	32

Table 3. Estimated number of points or transects required to capture a given number of species at Coon Island.

	Number of Species			
Sampling Method	*5*	*10*	*15*	*20*
Random Point	3	11	28	96
Belt Transect	1	3	5	10
Parallel Transect	1	3	6	10 (18 sp)

Table 4. Estimated sampling time in minutes to obtain different numbers of species using each sampling method at Coon Island.

	Number of Species			
Sampling Method	*5*	*10*	*15*	*20*
Random Point	30.2	110.8	282.1	967.3
Belt Transect	37.9	113.7	189.5	379
Parallel Transect	32	96	192	320

Table 5. Total number of seedlings and propagules identified in seed traps and seed banks at sites along the Napa River.

	Coon Is.		**Bull Is.**		**Pond 2a**		**Pond 3**	
	seed trap	*seed bank*	*seed trap*	*seed bank*	*seed trap*	*seed bank*	*seed trap*	*seed trap*
Total number of species / site	21	18	18	13	18	16	25	16
# native wetland	10	10	9	6	9	8	10	5
# non-native wetland	3	3	3	3	2	3	3	2
# native non-wetland	2	2	2	2	2	2	3	3
# non-native non-wetland	6	3	4	2	5	3	9	6

7.0 Figures

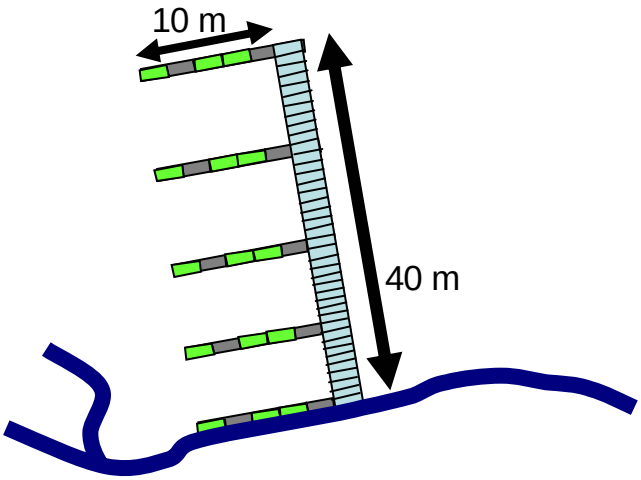


Figure 1. Schematic of the two transect sampling methods, continuous belt and parallel transects, used to quantify species richness and abundance in relation to channel proximity.

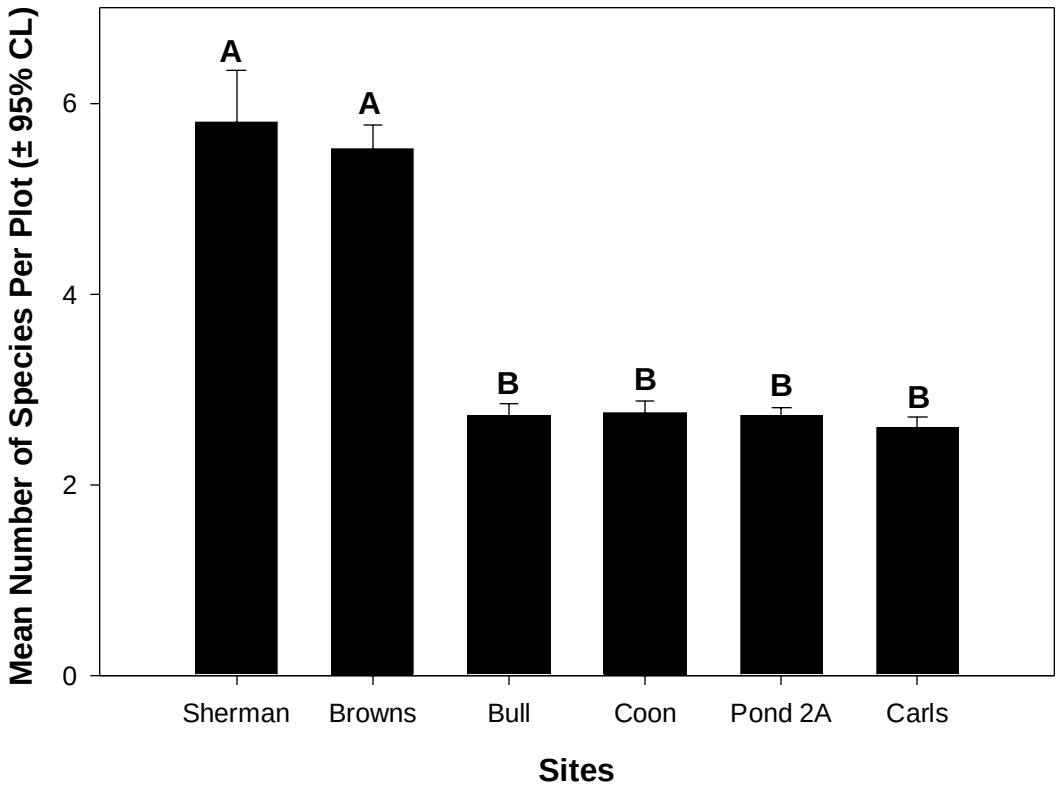


Fig. 2. Mean number of species per plot for six sites (± 95% confidence intervals) based upon relevé data. Capital letters indicate significant differences between different sites based upon one-way ANOVA ($p < .05$).

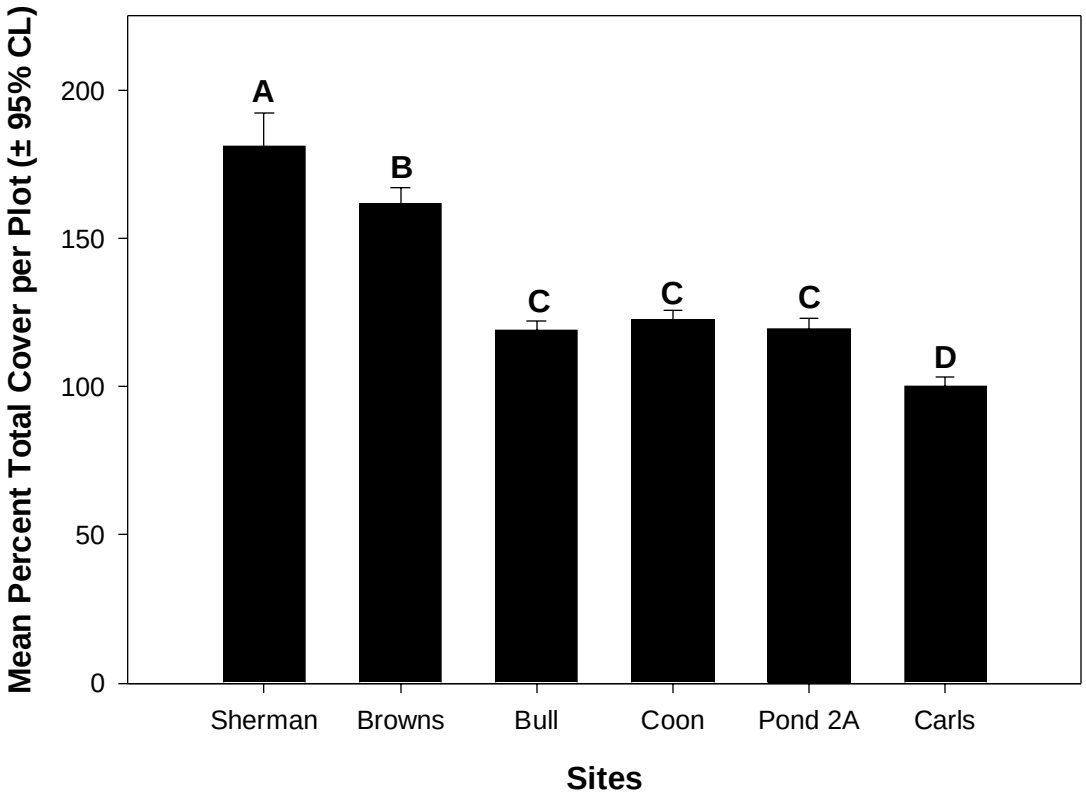


Fig. 3. Mean percent total cover per plot for six sites (± 95% confidence intervals) based upon relevé data. Capital letters indicate significant differences between different sites based upon one way ANOVA ($p < .05$).

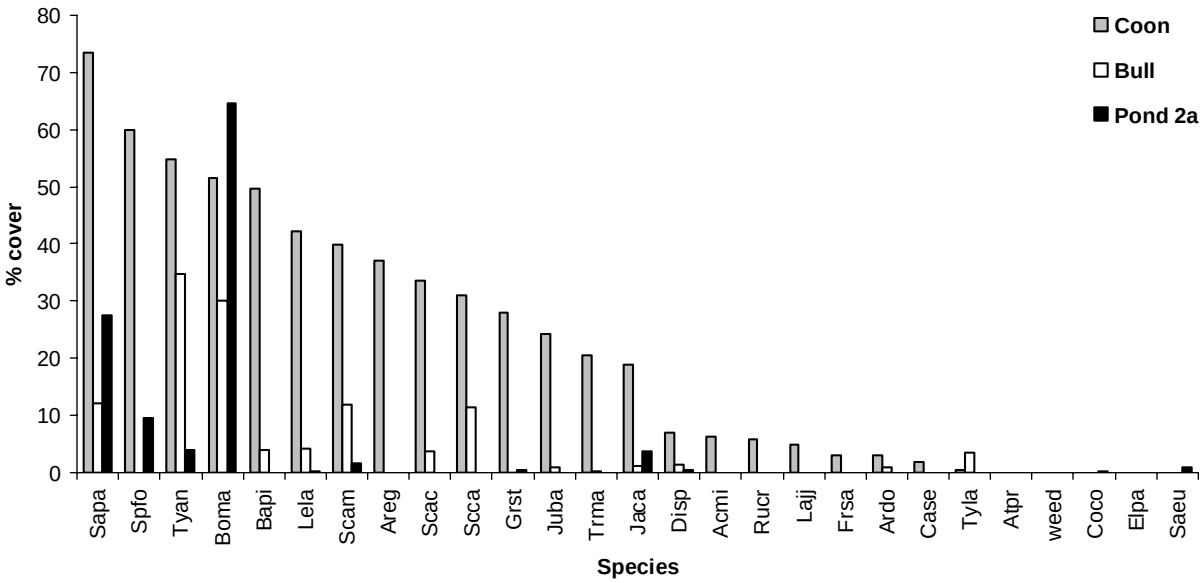


Figure 4. Average percent cover of all species identified through relevé sampling at Pond 2a, Coon Island, and Bull Island was calculated (error bars = ±1 SE). An explanation of the species codes is found in Table n explanation of the species codes is found in Table 1.

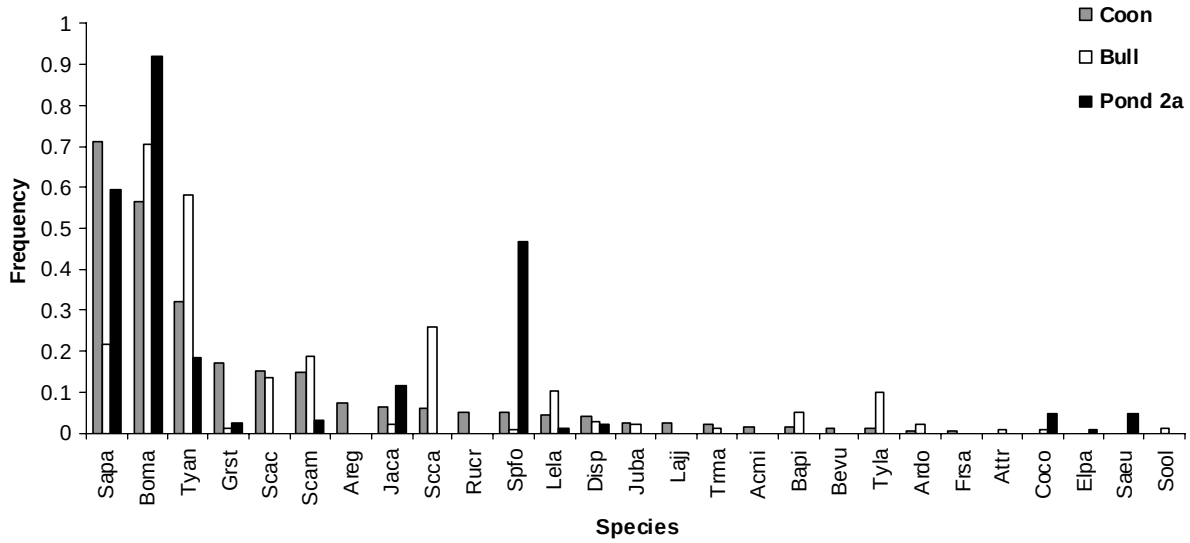


Figure 5. The relative frequency of all species encountered through relevé sampling at Pond 2a, Coon Island, and Bull Island was calculated. An explanation of the species codes is found in Table 1.

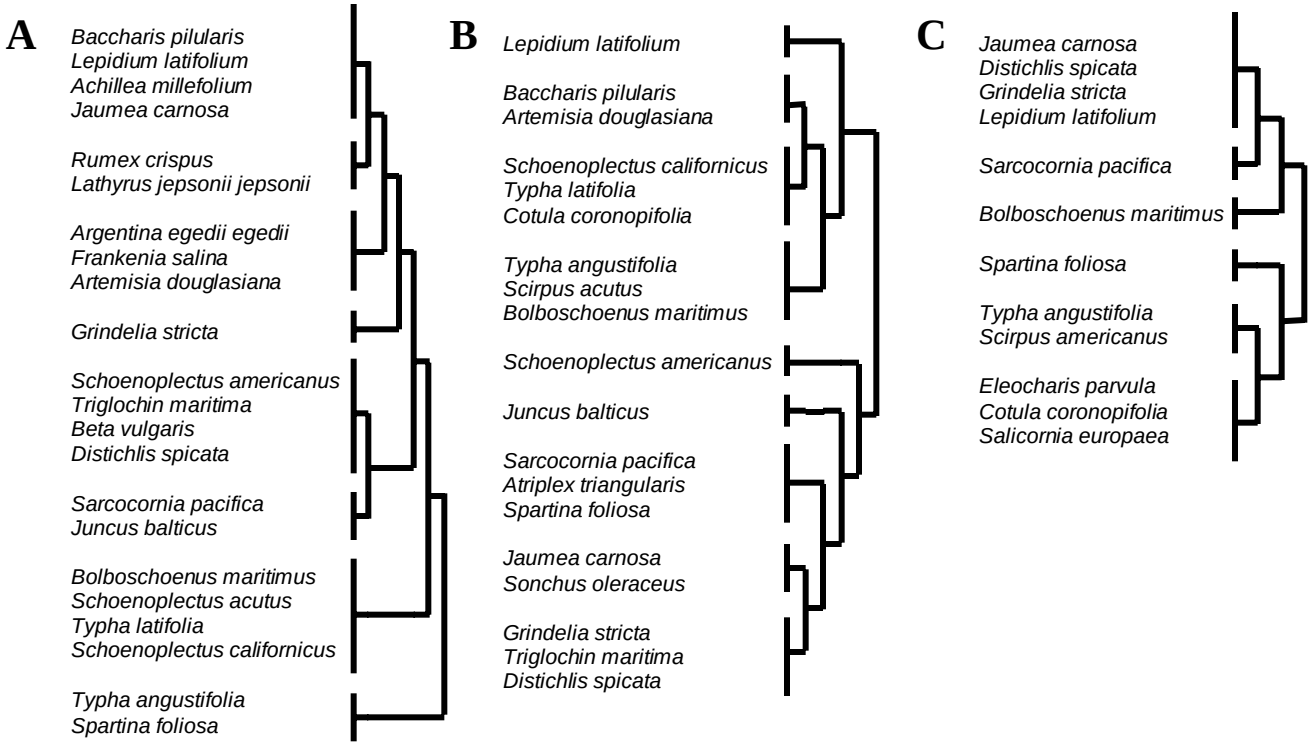


Figure 6. TWINSPAN dendograms were generated using the vegetation relevé data to document the relationships among all species encountered.

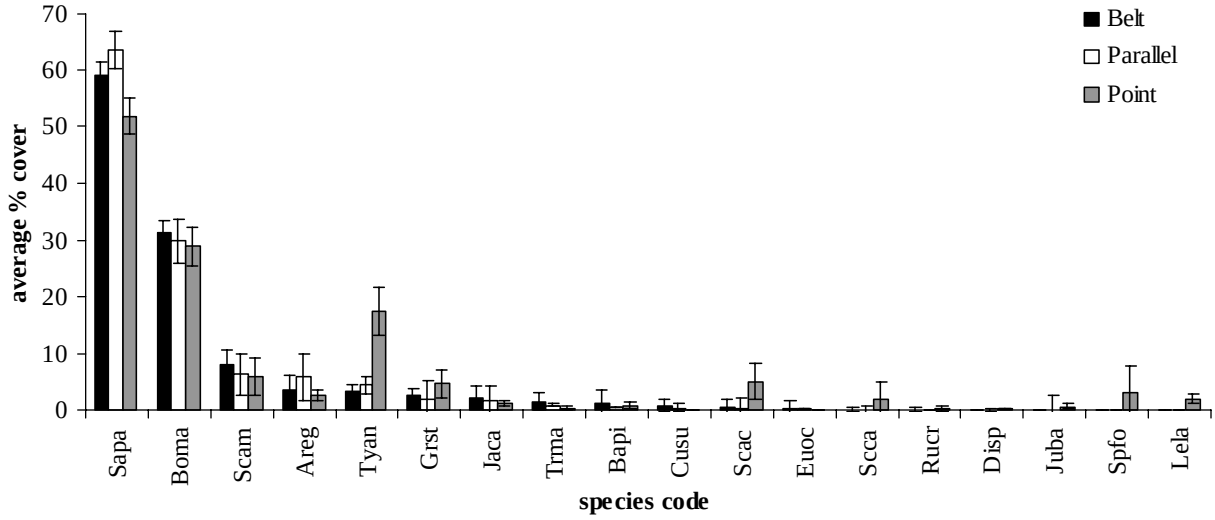


Figure 7. Comparisons of the average percent cover of selected species encountered through continuous belt transect, parallel transect, and relevé sampling at Coon Island (error bars = ±1 SE). An explanation of the species codes is found in Table 1.

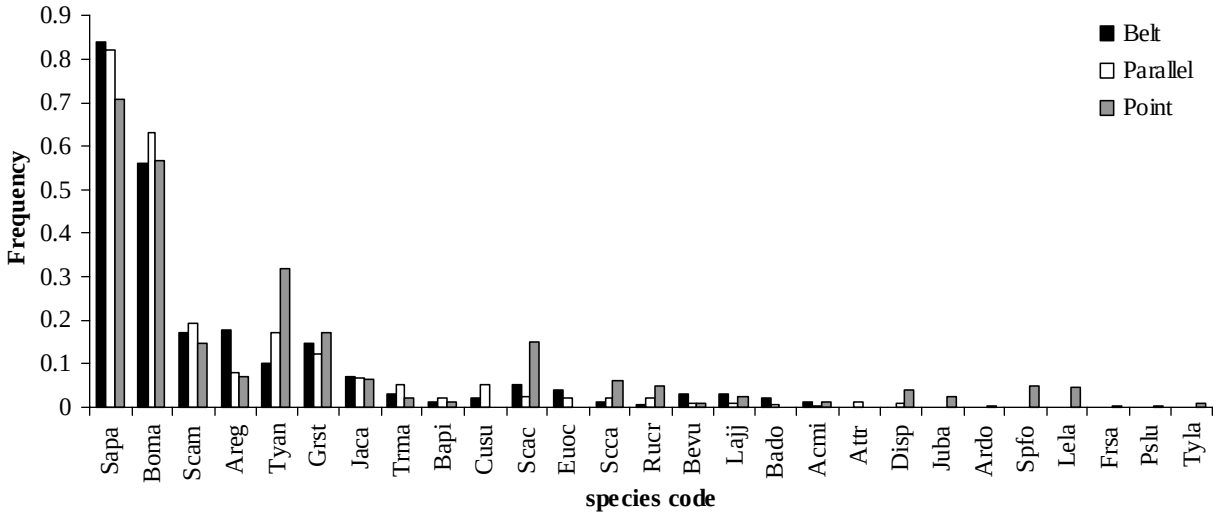


Figure 8. Comparisons of the relative frequency of selected species encountered through continuous belt transect, parallel transect, and relevé sampling at Coon Island.
An explanation of the species codes is found in Table 1.

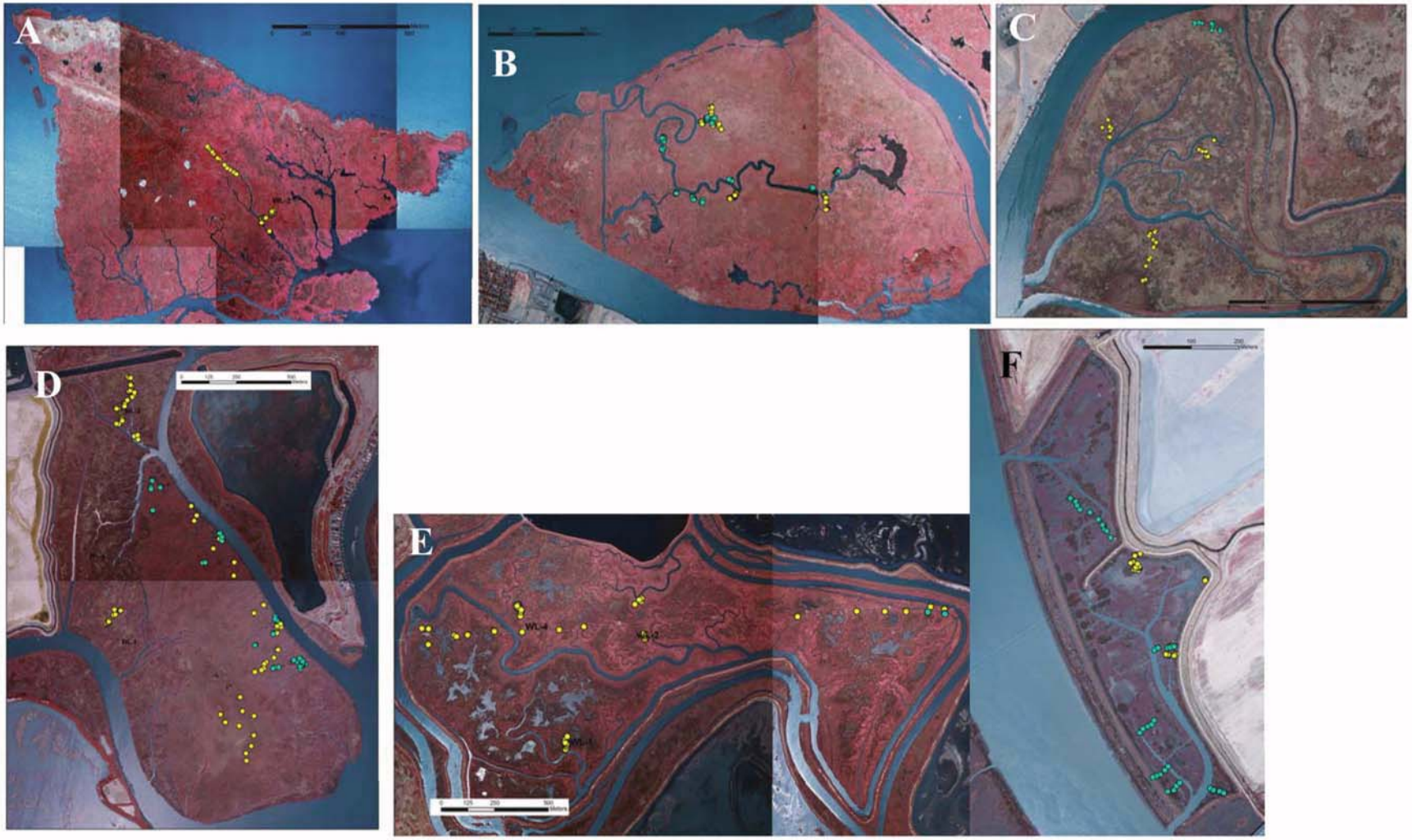


Figure 9. Productivity data were conducted at each site in 2004 (cyan points) and 2005 (yellow points) at A) Sherman Lake B) Browns Island, C) Bull Island, D) Coon Island, E) Pond 2a and F) Carl's Marsh.

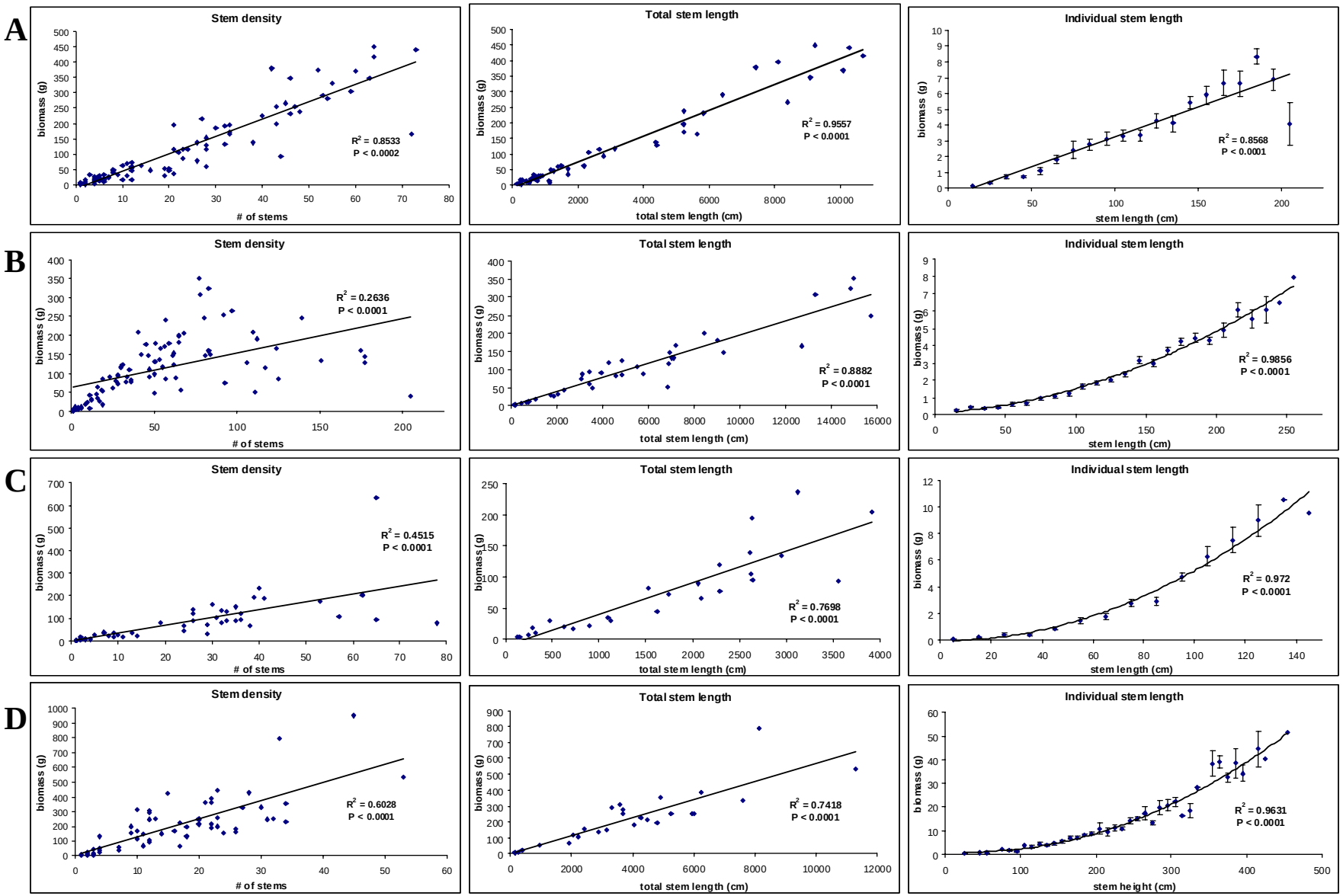


Figure 10. Relationships between biomass and stem density, total stem length, and individual stem length for A) *Bolboschoenus maritimus* B) *Schoenoplectus americanus*, C) *Spartina foliosa*, and D) *Schoenoplectus acutus*.

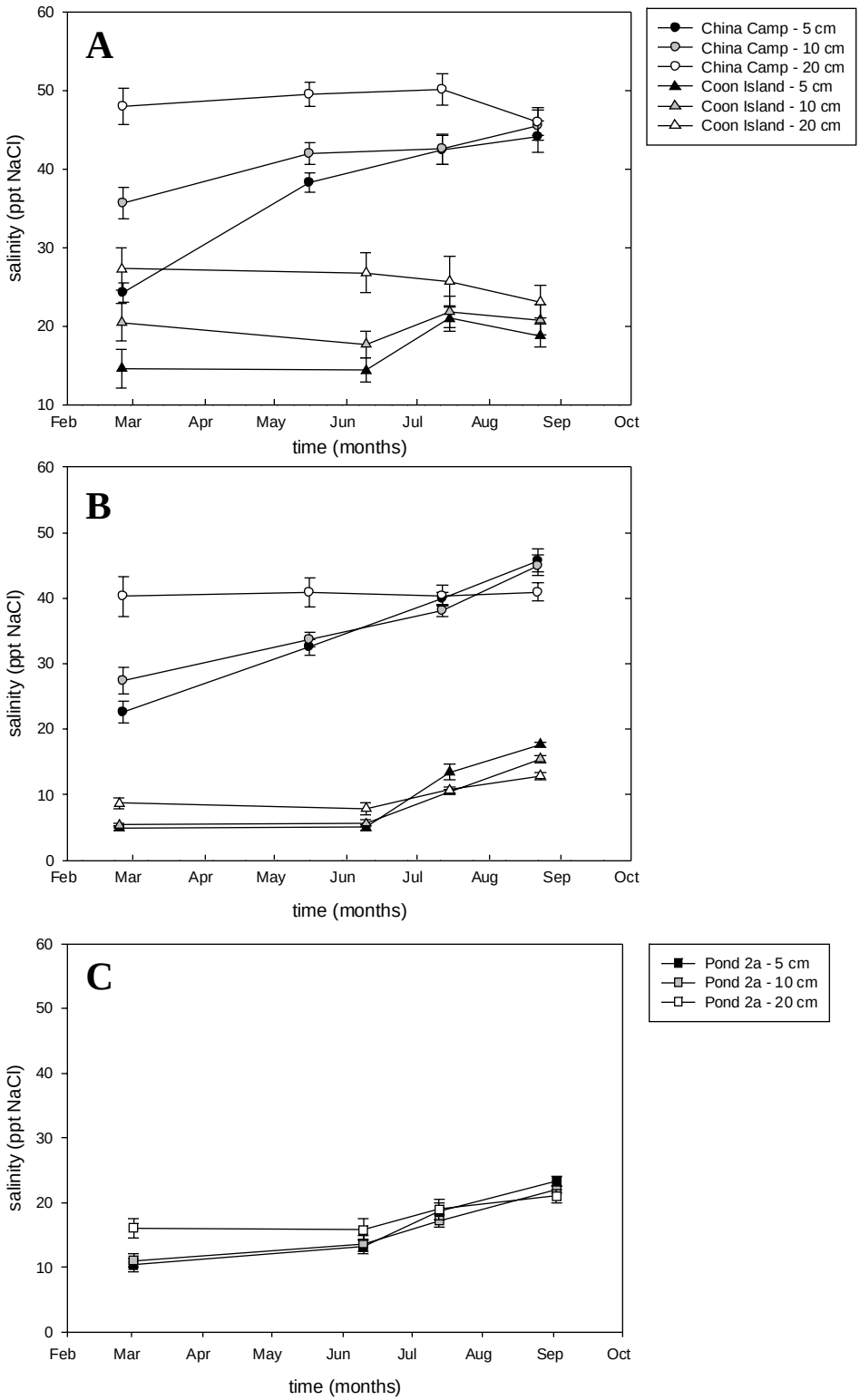


Figure 11. Pore water salinity at depths of 5, 10, and 20 cm increased over time in A) poorly drained plots and B) well drained plots at China Camp and Coon Island. Salinity also increased over time at C) Pond 2a at all depths.

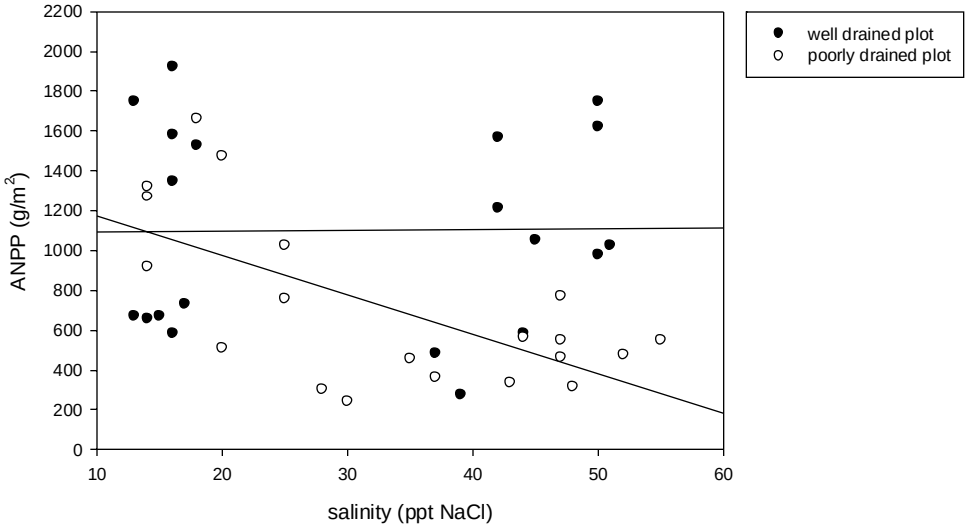


Figure 12. At China Camp and Coon Island, *Sarcocornia pacifica* biomass decreases with increasing salinity in poorly-drained plots but not in well-drained plots.

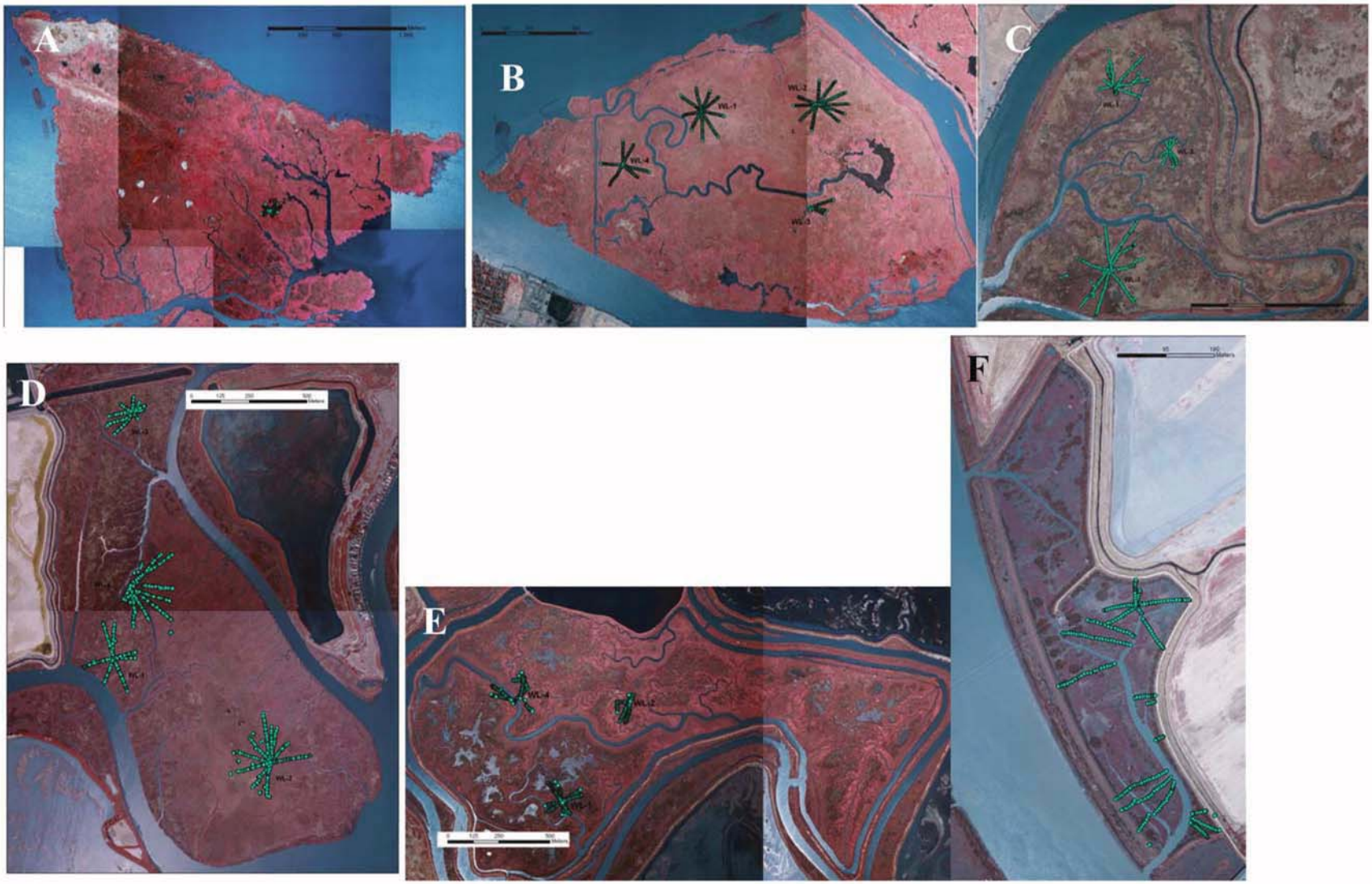


Figure 13. Vegetation and elevation surveys were conducted around water level stations in 2005 at A) Sherman Lake B) Browns Island, C) Bull Island, D) Coon Island, E) Pond 2a and F) Carl's Marsh.

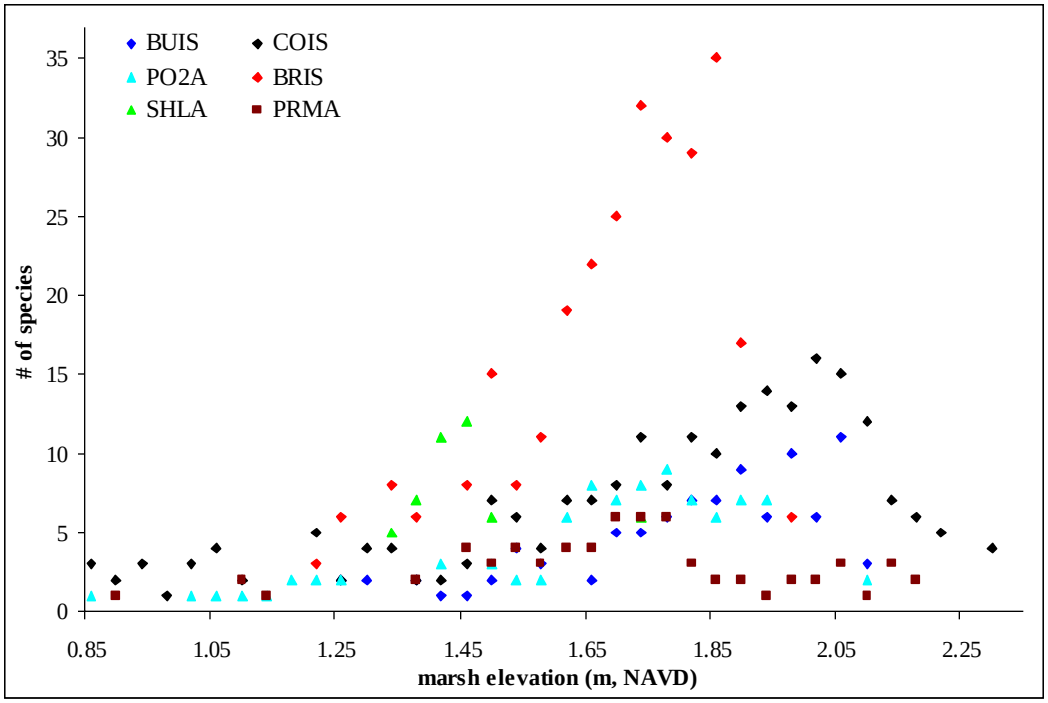


Figure 14. Species richness was calculated for each 4cm elevation bin at all sites.

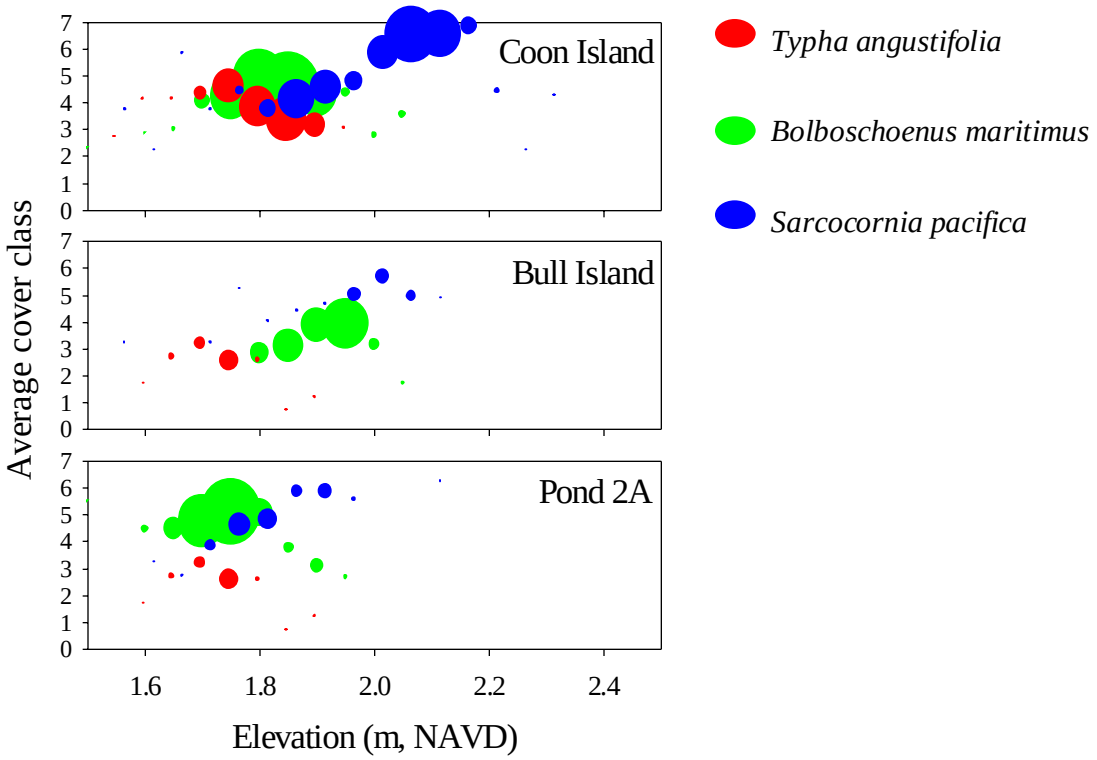


Figure 15. Elevation distribution and abundance in average percent cover of select dominant plant species at Pond 2a, Coon Island, and Bull Island. The size of the circle represents the relative abundance at each elevation. (description of cover classes: 1 = 1-2%; 2 = 2-5%; 3 = 5-25%; 4 = 25-50%; 5 = 50-75%; 6 = 75-95%; 7 = 95-100%).

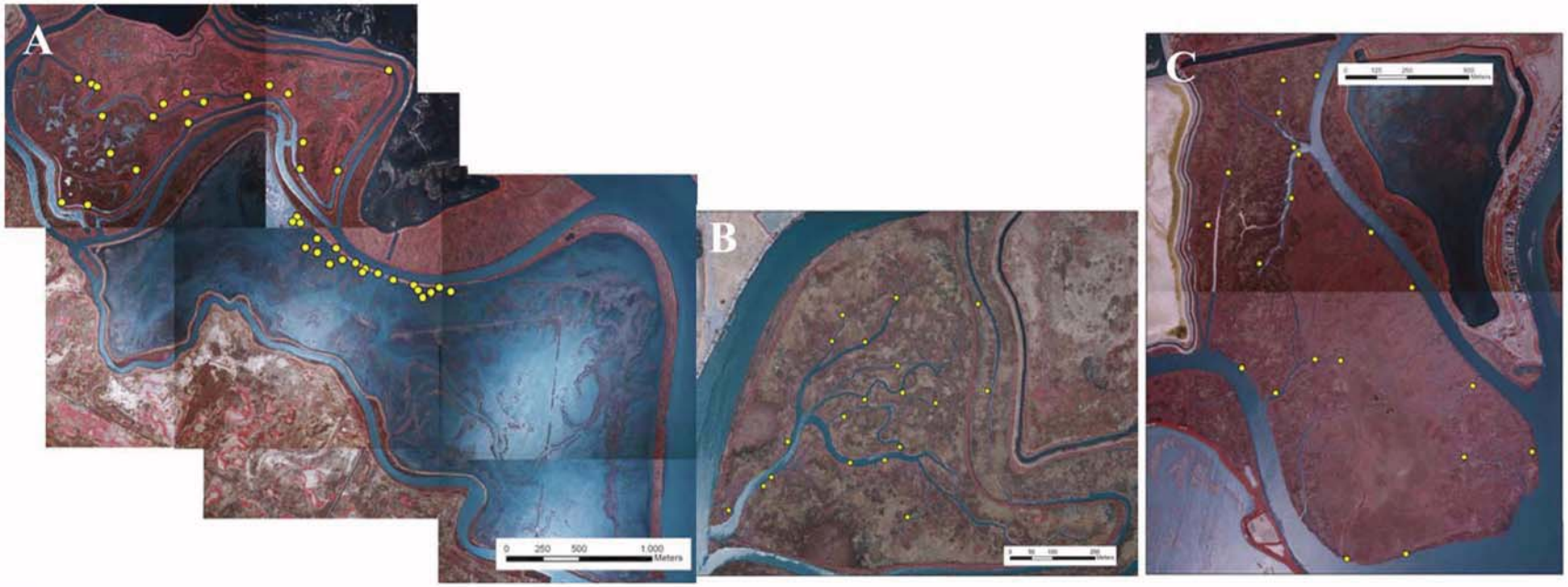


Figure 16. Seed dispersal and seed bank data were collected in 2005 and 2006 at A) Pond 2a and Pond 3 B) Bull Island, and c) Coon Island.

Appendix 1. List of all species identified at all IRWM sites including taxonomic changes, which are listed at the end of the table.

Taxon	Code	Family	Status	PRMA	PO2A	COIS	BUIS	BRIS	SHLA
Acacia melanoxylon	Acme	Fabaceae	introduced				X		
Achillea millefolium	Acmi	Asteraceae	native			X	X		
Agrostis exarata	Agex	Poaceae	native						X
Agrostis viridis	Agvi	Poaceae	introduced					X	
Alisma lanceolatum	Alla	Alismataceae	introduced						X
Alnus rhombifolia	Alrh	Betulaceae	native					X	
Ambrosia psilostachya	Amps	Asteraceae	unknown					X	
Anagallis arvensis	Anar	Primulaceae	introduced	X					
Anemopsis californica	Anca	Saururaceae	native					X	
Apium graveolens	Apgr	Apiaceae	introduced					X	X
Apium graveolens	Apgr	Apiaceae	introduced						
Argentina egedii ssp. egedii	Areg	Rosaceae	native			X	X	X	
Artemesia douglasiana	Ardo	Asteraceae	native			X	X	X	X
Asparagus officinalis ssp. officinalis	Asof	Liliaceae	introduced				X	X	X
Atriplex prostrata	Atpr	Chenopodiaceae	native			X	X		
Atriplex semibaccata	Atse	Chenopodiaceae	introduced		X				
Azolla filiculoides	Azfi	Azollaceae	native					X	X
Baccharis douglasii	Bado	Asteraceae	native			X	X	X	X
Baccharis pilularis	Bapi	Asteraceae	native	X	X	X	X	X	
Bellardia trixago	Betr	Scrophulariaceae	introduced					X	
Bidens laevis	Bila	Asteraceae	native					X	X
Bolboschoenus maritimus	Boma	Cyperaceae	native	X	X	X	X		
Brassica rapa	Brra	Brassicaceae	introduced	X					
Briza minor	Brma	Poaceae	introduced	X					
Bromus carinatus var. carinatus	Brca	Poaceae	native					X	
Bromus diandrus	Brdi	Poaceae	introduced					X	
Bromus hordeaceus	Brho	Poaceae	introduced					X	
Cabomba caroliniana	Caca	Cabombaceae	native						X
Calystegia sepium spp limnophila	Case	Convolvulaceae	native					X	X
Cannabis sativa	Casa	Cannabaceae	introduced					X	X
Carex 1	UNKN	Cyperaceae	unknown					X	X
Carex obupta	Caob	Cyperaceae	native					X	
Carex sp (cespitose)	UNKN	Cyperaceae	native						X
Centaurium muehlenbergii	Cemu	Gentianaceae	native					X	
Cephalanthus occidentalis var. californicus	Ceoc	Rubiaceae	native					X	
Ceratophyllum demersum ?	Cede	Ceratophyllaceae	native					X	X
Chenopodium sp.	Chsp	Chenopodiaceae	introduced			X	X		
Cortaderia selloana	Cose	Poaceae	introduced					X	
Cotula coronopifolia	Coco	Asteraceae	introduced	X	X		X		
Cuscuta salina	Cusa	Cuscutaceae	native	X					
Cuscuta subinclusa	Cusu	Cuscutaceae	native		X	X			
Cyperus eragrostis??	Cy sp	Cyperaceae	native						X
Cyperus sp. #2	Cy sp	Cyperaceae	native						X
Deschampsia caespitosa	Deca	Poaceae	native					X	
Deschampsia caespitosa	Deca	Poaceae	native						
Distichlis spicata	Disp	Poaceae	native	X	X	X	X	X	X
Eleocharis macrostachya	Elma	Cyperaceae	native					X	X

Taxon	Code	Family	Status	PRMA	PO2A	COIS	BUIS	BRIS	SHLA
Eleocharis parvula	Elpa	Cyperaceae	native		X				
Epilobium ciliatum	Epci	Onagraceae	native				X	X	X
Eryngium articulatum	Erar	Apiaceae	native					X	X
Euthamia occidentalis	Euoc	Asteraceae	native			X	X	X	X
Foeniculum vulgare	Fovu	Apiaceae	introduced				X	X	
Frankenia salina	Frsa	Frankeniaceae	native	X	X	X			
Galium trifidum	Gatr	Rubiaceae	native					X	X
Glaux maritima	Glma	Primulaceae	native			X		X	
grass #1	UNKN	Poaceae	unknown						X
grass #4	UNKN	Poaceae	unknown						X
grass #5	UNKN	Poaceae	unknown						X
grass #6	UNKN	Poaceae	unknown						X
grass #7	UNKN	Poaceae	unknown						X
Grindelia camporam	Grst	Asteraceae	native					X	
Grindelia stricta	Grst	Asteraceae	native	X	X	X	X		
Helenium bigelovii	Hebi	Asteraceae	native					X	X
Helianthus californicus	Heca	Asteraceae	native					X	
Heteromeles arbutifolia	Hear	Rosaceae	native					X	
Heterotheca grandiflora	Hegr	Asteraceae	native					X	
Hydrocotyle sp. (floating)	Hy sp	Apiaceae	unknown					X	
Hydrocotyle verticillata	Hyve	Apiaceae	native					X	X
Iris pseudacorus	Irps	Iridaceae	native					X	X
Isolepis cernua	Isce	Cyperaceae	native				X	X	
Jaumea carnosa	Jaca	Asteraceae	native	X	X	X	X	X	
Juncus balticus	Juba	Juncaceae	native		X	X	X	X	X
Juncus effusus	Juef	Juncaceae	native						
Juncus phaeocephalus	Juph	Juncaceae	native						X
Juncus xiphioides	Juxi	Juncaceae	native					X	X
Lactuca serriola	Lase	Asteraceae	introduced			X			
Lathyrus jepsonii var jepsonii	Lajj	Fabaceae	native		X	X	X	X	
Lepidium latifolium	Lela	Brassicaceae	introduced	X	X	X	X	X	
Lilaeopsis masonii	Lima	Apiaceae	native					X	
Lolium perenne	Lopr	Poaceae	introduced	X					
Lonicera involucrata	Loin	Caprifoliaceae	native					X	
Lotus corniculatus	Loco	Fabaceae	introduced	X					
Lotus unifoliolatus	Luun	Fabaceae	native					X	
Lugwigia peploides	Lupe	Onagraceae	native					X	X
Ludwigia uruguayensis	Luur	Onagraceae	introduced					X	X
Lycopus americanus	Lyam	Lamiaceae	native					X	X
Lycopus asper	Lyas	Lamiaceae	native					X	X
Lythrum californicum	Lyca	Lythraceae	native				X	X	X
Melilotus alba	Meal	Fabaceae	introduced				X		
Melilotus indica	Mein	Fabaceae	introduced				X		
Mentha arvensis	Mear	Lamiaceae	native					X	X
Mimulus guttatus	Migu	Scrophulariaceae	native					X	X
Oenanthe sarmentosa	Oesa	Apiaceae	native				X	X	X
Oenothera deltoides ssp. howellii	Oede	Onagraceae	native					X	
Paspalum dilatatum	Padi	Poaceae	native						X
Persicaria amphibia spp. emersum	Peam	Polygonaceae	introduced					X	X

Taxon	Code	Family	Status	PRMA	PO2A	COIS	BUIS	BRIS	SHLA
Persicaria persicaria	Pepe	Polygonaceae	introduced					X	X
Persicaria punctata	Pepu	Polygonaceae	native					X	X
Phragmites australis	Phau	Poaceae	native		X			X	X
Phyla nodiflora var nodiflora	Phno	Verbenaceae	native						X
Picris echioides	Piec	Asteraceae	introduced	X					X
Plantago major	Plma	Plantaginaceae	native					X	X
Plantago subnuda	Plsu	Plantaginaceae	native					X	X
Pluchea odorata	Plod	Asteraceae	native					X	X
Polypogon monspeliensis	Pomo	Poaceae	introduced	X	X		X	X	X
Potamogeton crispus	Pocr	Potamogetonaceae	introduced					X	
Potamogeton pectinatus	Pope	Potamogetonaceae	native					X	
Pseudognaphalium luteoalbum	Pslu	Asteraceae	introduced		X	X	X	X	
Raphanus sativus	Rasa	Brassicaceae	introduced					X	
Rorippa sinuata	Rosi	Brassicaceae	native						X
Rosa californica	Roca	Rosaceae	native				X	X	
Rubus discolor	Rudi	Rosaceae	introduced					X	X
Rumex conglomeratus	Ruco	Polygonaceae	native					X	X
Rumex crispus	Rucr	Polygonaceae	introduced	X	X	X	X		
Rumex salicifolius var denticulatus	Rusd	Polygonaceae	native					X	
Rumex salicifolius var transitorius	Rusa	Polygonaceae	native					X	X
Ruppia maritima?	Ruma	Potamogetonaceae	native			X			
Salicornia europaea	Saeu	Chenopodiaceae	native	X	X				
Salix lasiolepis	Sala	Salicaceae	native					X	X
Samolus valerandi ssp. parviflorus	Sava	Primulaceae	native					X	X
Sarcocornia pacifica	Sapa	Chenopodiaceae	native	X	X	X	X	X	X
Schoenoplectus acutus	Scac	Cyperaceae	native		X	X	X	X	X
Schoenoplectus americanus	Scam	Cyperaceae	native		X	X	X	X	X
Schoenoplectus californicus	Scca	Cyperaceae	native		X	X	X	X	X
Scrophularia californica	Scrcal	Scrophulariaceae	native		X	X	X		
Senecio hydrophilus	Sehy	Asteraceae	native			X		X	
Sium suave	Sisu	Apiaceae	native					X	
Solanum americanum	Soam	Solanaceae	native					X	X
Sonchus oleraceous	Sool	Asteraceae	introduced	X	X	X	X	X	
Sparganium eurycarpum ssp eurycarpum	Speu	Sparganiaceae	native					X	X
Spartina foliosa	Spfo	Poaceae	native	X	X	X	X		
Stachys albens	Stal	Lamiaceae	native					X	
Symphyotrichum lentum	Syle	Asteraceae	native					X	X
Thistle sp.	Thsp	Asteraceae	unknown						X
Toxicodendron diversilobum	Todi	Anacardiaceae	native				X		
Trifolium wormskioldii	Trwo	Fabaceae	native					X	
Triglochin maritimum	Trma	Juncaginaceae	native		X	X	X	X	
Triglochin striata	Trst	Juncaginaceae	native					X	X
Typha angustifolia	Tyan	Typhaceae	native		X	X	X	X	X
Typha domingensis?	Tydo	Typhaceae	native						X
Typha latifolia	Tyla	Typhaceae	native			X	X	X	
Unid grass 1	grass	Poaceae	unknown					X	
Unid grass 3	grass	Poaceae	unknown					X	
Verbena litoralis	Veli	Verbenaceae	introduced						X
Verbena scabra	Vesc	Verbenaceae	native						X

Taxonomic changes: *Argentina egedii ssp. egedii = Potentilla anserina spp. pacifica; Atriplex prostrata = Atriplex triangularis; Bolboschoenus maritimus = Scirpus maritimus; Isolepis cernua = Scirpus cernuus; Lotus unifoliolatus = Lotus purshianus; Ludwigia uruguayensis = Ludwigia hexapetala; Persicaria amphibia spp. emersum = Polygonum amphibium; Persicaria persicaria = Polygonum persicaria; Persicaria punctata = Polygonum punctatum; Samolus valerandi ssp. parviflorus = Samolus parviflorus; Sarcocornia pacifica = Salicornia virginica; Schoenoplectus acutus = Scirpus acutus; Schoenoplectus americanus = Scirpus americanus; Schoenoplectus californicus = Scirpus californicus; Symphyotrichum lentum = Aster lentus; Trifolium wormskioldii = Trifolium willdenovii*

Integrated Regional Wetland Monitoring Pilot Project

Bird Team Data Report

Authors
Nadav Nur[1], Ph.D., PRBO Conservation Science, Principal Investigator (nnur@prbo.org)
Mark Herzog[1], Ph.D., PRBO Conservation Science, Co-Principal Investigator
Leonard Liu[1], PRBO Conservation Science
John Kelly[2], Ph.D., Audubon Canyon Ranch
Jules Evens, Avocet Research Associates
Diana Stralberg[1], PRBO Conservation Science
Nils Warnock[1], Ph.D., PRBO Conservation Science

[1]PRBO Conservation Science, 3820 Cypress Drive #11, Petaluma, CA 94954
[2]Cypress Grove Research Center, Audubon Canyon Ranch, P. O. Box 808, Marshall, CA 94940
[3]Avocet Research Associates, P.O. Box 839, Point Reyes Station, CA 94956

December 31, 2006

1.0 Introduction 1
1.1 Simple Conceptual model for Birds 1
1.2 Specific Questions Addressed by IRWM Bird Team 2
2.0 Scope of Work 2
2.1 Collaborative Integration, Reporting, and Planning 3
2.2 Assess Patterns of Species Richness, Distribution, and Abundance of Migrating and Wintering Waterbirds, resident Passerines, and Other Bird Species of Interest 3
2.3 Assessment of Predation of and by Birds during Winter and the Breeding Season 4
2.4 Distribution, and Abundance of Breeding Clapper Rails 4
2.5 Distribution and Abundance of Breeding Black Rails 5
2.6 Assessment of Reproductive Success of Marsh Nesting Birds 5
2.7 Abundance and nesting success of Herons and Egrets 6
2.8. Integration and Data Transfer between the Bird Team and Other Teams 6
3.0 Data Collection and Quality Assurance 7
3.1 Point Count Surveys 7
3.1.1 Point count station placement 7
3.1.2 Timing 7
3.1.3 Data collection 7
3.1.4 Weather conditions 8
3.1.5 Quality assurance 8
3.2 Point Count Vegetation Surveys 8
3.2.1 Overview 8
3.2.2 Sampling frequency 8
3.2.3 Data collection 8
3.2.4 Quality assurance 10
3.3 Territory Mapping 11
3.3.1 Overview 11
3.3.2 Data collection 11
3.3.3 Quality assurance 11
3.4 Nest Searching and Monitoring 14
3.4.1 Overview 14
3.4.2 Precautions 14
3.4.3 Data collection 14
3.4.4 Quality assurance 15
3.5 Area Survey 16
3.5.1 Overview 16
3.5.2 Data collection 16
3.5.3 Quality assurance 17
3.6 Line Transect 17
3.6.1 Overview 17
3.6.2 Data collection 17
3.6.3 Quality assurance 18
3.7 Heron and Egret breeding studies 18
3.7.1 Data collection 18
3.7.2 Quality assurance 20

4.0 Results and Observations 20
4.1 Abundance and diversity of landbirds and waterbirds in tidal marsh throughout the year 20
4.2 Breeding season abundance of Black Rails and Clapper Rails 22
4.3 Territorial density and nesting success of tidal marsh birds 22
4.4 Heron and egrets breeding in and near historic tidal marsh in San Francisco Estuary 23
5.0 References 24
6.0 Tables 26
7.0 Figures 41
8.0 Appendix 84

1.0 Introduction

The Integrated Regional Wetland Monitoring Pilot Project (IRWM) seeks to address the fundamental resource management question, *how does tidal marsh restoration affect ecological processes at different scales?* IRWM is a collaborative project amongst more than 20 Principal Investigators representing many disciplines and many institutions. The project has focused on *identifying patterns of spatial variation and temporal variation, and their interaction*, with the ultimate goal of elucidating ecological processes operating in tidal marsh ecosystems. The Bird Team has applied these objectives to the study of birds and their ecosystems, in the context of tidal marsh ecosystems of the San Francisco Estuary, by working collaboratively with other IRWM teams.

The bird team has studied heterogeneity at different geographic scales:
(1) the largest scale is **an entire landscape**, composed of numerous marshes interspersed among non-marsh habitat; this could be an entire region (e.g., San Pablo Bay)
(2) the next scale is at the level of the marsh; and includes **comparisons among IRWM marsh sites**
(3) the next smaller scale is **within a marsh**, i.e., sub-areas within a marsh ("sub-sites"), including areas corresponding to channels, adjacent mud flat, marsh plain, levees, ponds and pannes.
(4) the finest scale is that of the individual bird territory or home-range, which may be as small as 50 m across.

Heterogeneity at one scale may not lead to similar patterns of heterogeneity at a second scale. The complementary principle to heterogeneity is that of **integration**. Thus, we can ask, Over what spatial scales do birds integrate diversity in resources and over what temporal scales?

1.1 Simple Conceptual model for Birds

Physical processes (hydrology and geomorphology) principally determine vegetation. Plant establishment and productivity lead to the development of a resource base for other organisms (including food for herbivorous, omnivorous and carnivorous birds). Furthermore, plant growth creates habitat structure for birds. Thus the main causal pathway is:

(Hydrology + Geomorphology) -> Vegetation -> (Habitat & Prey) -> Birds

However, there are important additional pathways including the following:

- First, there is a direct effect of *physical processes* on birds, e.g., salinity, channel structure, and most directly, flooding due to high tides.
- Second, though birds respond to the habitat and prey provided (or supported) by vegetation, they also appear to respond directly to *vegetation characteristics* such as plant species composition.
- Third, the causal pathway of physical processes and vegetation dynamics also affects *predators* that prey on birds, especially nest predators. Channels, mudflats may provide access (or inhibit access) for predators.

- The fourth pathway involves *landscape* context. The nature and pattern of land adjacent to a marsh and the configuration of the marsh can modify more local ecological processes.

1.2 Specific Questions Addressed by IRWM Bird Team

- To what extent can we explain distribution and abundance of birds in relation to vegetation characteristics, both quantitative and qualitative?
- To what extent do birds respond to species composition vs. general vegetation characteristics and structure?
- What is the significance of scale? Both for plants and for the bird response.
- Can we build useful predictive models of avian distribution and abundance?
- Given vegetation characteristics, what additional physical processes or parameters influence distribution, abundance, and species richness of birds**?**
- What is the influence of salinity and inundation on abundance and species richness?
- What factors (temporal and spatial) explain variation in reproductive success of birds?
- Which factors operate at the local scale (within a marsh) and which at the "between marsh" scale?
- For factors operating at the local scale, how much consistency in bird response is there among marshes? Is there consistency from one year to the next?
- For marsh to marsh differences in birds, can we explain these differences just in terms of vegetation and physical characteristics or are there residual differences, e.g., due to restoration status?

The final objectives were to:

- Develop predictive and testable models to explain variation in abundance and distribution of study species and explain variation in reproductive success, incorporating the factors discussed above
- Integrate bird results with other teams, especially Landscape Ecology Team and Plant Team.

2.0 Scope of Work

Bird Team activity focused on the six IRWM study marshes that were also the focus of study for the other teams. The six IRWM marshes are shown in Figure 1, as well as additional marshes studied by the Bird Team. The field data-collection period was October 2003 to July 2005. For Tasks 2 to 6 (described in 2.2., 2.3, 2.4, 2.5, and 2.6) the monthly calendar of surveys (by location and month) is shown in Table 1.

The Bird Team's activities were comprised of eight specific tasks, as follows.

2.1 Collaborative Integration, Reporting, and Planning

This task consisted of refinement of conceptual model, site selection, finalizing study design, participation in scientific workshops, and preparation of the Final Report, and was carried out in close concert with other IRWM teams.

2.2 Assess Patterns of Species Richness, Distribution, and Abundance of Migrating and Wintering Waterbirds, resident Passerines, and Other Bird Species of Interest

This task consisted of surveying individual species as well as groupings of individual species to determine species richness, distribution (presence or absence), and abundance. Species groups surveyed included waterfowl, herons, egrets, shorebirds, gulls and terns, coots, rails, piscivorous birds (such as cormorants), "landbirds" (i.e., terrestrial passerines), and raptors (this group are considered landbirds but were specifically enumerated separate from passerines and relatives). To accomplish this task we utilized two types of surveys: one that focused mainly on passerines and other "landbird" species, termed "point count surveys" (Ralph et al. 1993, Ralph et al. 1995) and one that focused more on waterbird species, termed "area surveys", later modified and renamed "line transects." The "point count survey" method has been used extensively in tidal marshes by PRBO (Nur et al. 1997, Spautz et al. 2006). The "area survey/line transect" method has only recently been used (Stralberg et al. 2005). Both methods were designed to detect and record a wide variety of species, in contrast to more specialized surveys (e.g., Tasks 4 (section 2.4), 5 (section 2.5), and 7 (section 2.7). Both survey types were conducted at the same times of the year; they differed only in the methodology. Locations of surveys (point count and AS/LTs) are shown in Figure 2.

The survey effort for both types of survey was divided among the following seasons:

- Fall – 1 September to 31 October;
- Winter – 1 December to 15 February; and
- Spring – 15 March to 30 May.

The fall and winter surveys were of non-breeding birds only (there is no breeding activity by birds during these time periods in the marshes). The spring surveys included both the migratory period for birds that were passing through the marsh as well as the breeding season for birds that bred in tidal marsh habitat. The two activities by bird species, breeding and migration, overlapped in time, and so we could not distinguish locally breeding individuals from migrating individuals from surveys alone.

The area survey/line transects (AS/LTs) were conducted on both a low tide and a high tide; point count surveys were conducted in the early morning, irrespective of tide. The six marshes were surveyed using both methodologies. Methodological details are provided below (section 3).

The objectives were to count all birds using the marsh study area within a standardized time period and, for AS/LTs to determine each species' use of marsh sub-habitats. The size of the area surveyed was estimated so that density indices can be calculated.

Point count surveys emphasized counts of migratory and resident songbirds found in marshes. Focal species included Song Sparrow (*Melodia melospiza*), Marsh Wren (*Cistothorus palustris*), Common Yellowthroat (*Geothlypis trichas*), and Red-winged Blackbird (*Agelaius phoeniceus*). Also, four rail species were detected: Black Rail (*Laterallus jamaicensis*), Clapper Rail (*Rallus longirostris*), Sora (*Porzan carolina*), and Virginia Rail (*Rallus limicola*), though the first two rail species were the subject of specialized surveys (see Tasks 4 and 5, below). All eight species listed above (four songbirds, four rails) were known or likely to be breeding in the study marshes.

Bird data summarized were of abundance of species, abundance of groups of species (guilds), and species richness. These were examined either separately by season and year, or by combining across the two years per season (fall, winter, or spring). Data were analyzed either **by marsh** (for either point count surveys or AS/LTs) or **by point** (for point count surveys only). In addition, data from both survey methods were allocated to **subsites** (2 to 4 per marsh) within a study marsh. Bird data were then combined with data on vegetation type (derived from vegetation maps produced by the Plant Team and Landscape Ecology Team), and other marsh characteristics (e.g., channel characteristics), as determined and provided by the Landscape Ecology Team.

The combined bird/vegetation/geomorphology dataset was used to develop predictive models of presence/absence or of abundance of select bird species within a marsh, as well as among marshes.

2.3 Assessment of Predation of and by Birds during Winter and the Breeding Season

The objective of this task was to develop innovative methods to survey predators of birds, and of avian predators. The IRWM project was a pilot project, and thus some methods implemented had not yet been developed for multi-marsh surveys. We found that predation events, whether on birds, or by avian predators, were rarely observed during surveys intended to quantify their occurrence. The hours needed in the field to observe even a single predation event did not justify the time expenditure. We concluded that other methods will be needed if one wishes to quantify predation pressure (e.g., use of automated cameras). Alternatively, one might be able to combine nest monitoring studies (see Task 6, section 2.6, below) with predation surveys, but such a method would not yield information about predation during the winter, especially during the markedly high tides of winter.

2.4 Distribution, and Abundance of Breeding Clapper Rails

The general bird surveys described above (Task 2) detected a few Clapper Rails. However, the number of detections was low; this is a common problem with Clapper Rails. Hence, for this task we used specialized, standardized methods that have been developed by USFWS. In particular, the methods we have used for surveys of the IRWM sites are also the same methods

being used for San Francisco Estuary-wide surveys of this species (Liu et al. 2005, Herzog et al., in prep.).

Surveys were conducted from mid-January to mid-April of breeding birds at the four IRWM sites in San Pablo Bay (Figure 1). However, the Delta is currently beyond the geographic range of Clapper Rails and therefore we did not conduct specialized Clapper Rail breeding surveys at Brown's Island and Sherman Island. Three surveys were conducted per marsh, at 5 to 12 stations per marsh, depending on size of marsh.

These data were used to estimate abundance, as well as presence/absence at the survey station level. Absence of Clapper Rails is confirmed by the use of playback of Clapper Rail calls after three surveys (that did not use playback) failed to detect any Clapper Rails at that marsh. See below for methodological details.

2.5 Distribution and Abundance of Breeding Black Rails

This task consisted of carrying out specialized surveys of breeding Black Rails, conducted during April and May at IRWM sites. Two surveys were conducted per marsh. Methods used were the same as those carried out by Evens and colleagues in the past 20 years (see for example, Evens et al. 1991, Evens & Nur 2002, Spautz et al. 2006). All six IRWM sites were surveyed (Figure 1).

Five to twelve stations were established per marsh. Tape recorded calls were played to elicit responses from the Black Rails. Results were then used to estimate abundance and presence/absence of Black Rails, both at the individual station level and at the marsh level.

2.6 Assessment of Reproductive Success of Marsh Nesting Birds

Focal subspecies of interest were the Samuel's (or San Pablo) Song Sparrow (*M. m. samuelis*), Suisun Song Sparrow (*M. m. maxillaris*), Salt-marsh Common Yellowthroat (*G. t. sinuosa*), and Marsh Wren. Period of survey was March to July, in 2004 and 2005.

This Task consisted of two sub-tasks. First, was to identify the number of breeding pairs in each marsh for the three species listed above. This was done using the method of spot-mapping (Ralph et al. 1993); see below (section 3.6) for methodological details. In this method, all singing males, females, and territorial behavior were mapped, to infer territory boundaries and thus overall number of territories within the marsh.

The second sub-task was to estimate parameters of reproduction and reproductive success as well as factors that may influence reproductive outcome. For this method we followed standardized methodology (Martin and Geupel 1993). In each of two IRWM marsh sites, two study plots each containing at least 30 pairs of Song Sparrows were established (or maintained for sites with ongoing tidal marsh-bird studies) and as many nests as possible were located and monitored. This method has been used successfully by Nur et al. (1997) since 1996, resulting in over 2500 nests monitored (Chan et al. 2001, Greenberg et al. 2006), at IRWM sites and elsewhere.

These two sub-tasks were conducted at the two IRWM marsh sites (Carl's Marsh and Pond 2A), as well as two non-IRWM sites (China Camp, Rush Ranch). The latter were studied using matching funds; no CALFED funds were expended for the non-IRWM sites. Thus four marsh sites were studied in total.

Nests were visited at 2 to 4 day intervals (or longer intervals for rails as determined by CDFG and USFWS protocols) and the contents recorded. Song Sparrow and Common Yellowthroat nestlings were banded on the 8th day with USFWS bands and a unique combination of colored leg bands to facilitate field identification after fledging. The ultimate outcome of each nest was determined based on nest condition (presence of eggshell fragments, etc.) and behavior of the breeding pair subsequent to presumed fledging. Assessment of outcome includes ascribing causes of nest failure (predation, flooding, collapse of nest substrate, starvation, etc.).

2.7 Abundance and nesting success of Herons and Egrets

Herons and egrets are important predatory species in tidal marshes. The nesting abundance and reproductive performance of herons and egrets are likely to depend on local processes that influence conditions for feeding and nesting, as well as larger-scale processes that affect regional populations within which colonies exchange birds (Parnell et al. 1988, Kushlan 1992). We measured heron and egret colony size, productivity of successful nests, and nest survivorship at all 45 heronries known to be active in 2004 or 2005 within 10 km of historic tidal marshes of San Pablo Bay and Suisun Bay (Figure 1). We used this information to evaluate relationships between six IRWM study sites and surrounding habitats with regard to the reproductive activities of herons and egrets. The primary study species were Great Blue Heron (*Ardea herodias*), Great Egret (*Ardea alba*), Black-crowned Night-Heron (*Nycticorax nycticorax*), Snowy Egret (*Egretta thula*), and Cattle Egret (*Bubulcus ibis*).

We analyzed landscape associations based on the areal extents of NOAA land cover types (from Landsat images, 2000-2002) and several wetland-patch metrics (FRAGSTATS) within 1, 3, 5, 7, and 10 km of heronries. Wetland patches were determined by spectral analysis of NOAA Landsat images as well as by hand-delineation of wetland boundaries from the San Francisco Bay Area EcoAtlas (San Francisco Estuary Institute 1999). The data were used to (1) compare landscape characteristics associated with heron and egret nesting colonies with those of randomly selected, unoccupied sites and (2) evaluate 15-year patterns of productivity in successful nests with regard to landscape conditions at multiple spatial scales. To estimate patterns of foraging dispersion from heronries, we used aircraft to track the foraging flights of departing Great Egrets.

2.8. Integration and Data Transfer between the Bird Team and Other Teams

This task included compilation of data among investigator within the Bird Team and providing it to the Data Management Team, as well as for other teams, as needed.

3.0 Data Collection and Quality Assurance

3.1 Point Count Surveys

3.1.1 Point count station placement

Point count stations ("points") were placed 200 meters apart, to avoid counting the same birds from adjacent points, and at least 50 m from the edge of the marsh where possible. Points were flagged conspicuously, where possible, in order to facilitate refinding exact spot for subsequent surveys and vegetation measurements. Where possible, points were placed randomly, rather than along a habitat feature such as a tidal channel, to avoid bias in sampling.

3.1.2 Timing

Two breeding season surveys were conducted between March 26 and May 30 each year, with one round March 26-April 26, and a second round April 27-May 30. Avian surveys for Tasks 2 through 6 are summarized in Table 1, by month and year. Surveys began within 15 minutes of sunrise and were completed within approximately 4 hours, the time of maximum bird activity. Each point was surveyed for 5 minutes.

3.1.3 Data collection

Detections of every individual of every bird species were recorded by distance from observer at 10 m increments up to 100 m. Each bird was recorded in the distance band in which it was originally detected, even if detection type changed. When an adult bird was detected, the detection type was recorded in order of priority: Song > Visual > Call. If a detection type changed, (e.g., initially heard calling and later heard singing), the original detection was overwritten with the new code. Thus a bird heard calling at 45 meters, then singing at 55 meters, would have been recorded as S(inging) 45(40-50 m). If a juvenile was detected, it was recorded as "J."

Priority was given to target tidal marsh species (Song Sparrow, Common Yellowthroat, Marsh Wren, Clapper Rail, and Black Rail) and other tidal marsh- or wetland-associated species. Birds detected outside the marsh (e.g., in adjacent upland habitat, in the adjacent neighborhood) were marked with the type of non-marsh habitat they are found in (T= fully tidal marsh, U = upland non-marsh habitat, R = restoration, S = salt pond, P= other non-marsh pond, M = muted marsh, L= Levee). If a bird used both marsh and non-marsh habitat at that point, it was recorded as within the marsh only (e.g., a Marsh Wren singing at the edge of the marsh, flying between upland and marsh vegetation).

Every effort was made to record each individual once only. Birds flying over the marsh were recorded separately. Species detected but not during the 5-minute point counts, especially those of the target tidal marsh species, predators, or rare or endangered species, were recorded on the back of the form.

3.1.4 Weather conditions

Weather conditions were recorded at the bottom of the form at the beginning and end of survey (wind, temperature and precipitation). Surveys were not be conducted when conditions prevented normal bird activity or affected detectability, such as during rain or strong winds. If industrial or traffic noise adjacent to the marsh significantly reduced an observer's ability to detect birds, the survey was conducted on a weekend.

3.1.5 Quality assurance

Point count surveys were conducted only by biologists with demonstrated knowledge of in-the-field species identification of all avian species. Excellent hearing and visual skills were required and needed to be demonstrated by surveying biologists. In addition, project supervisors thoroughly trained each biologist before he or she began their surveys. Instruction covered distance estimation as well as species identification and quantification. Trainers used practice surveys to ensure a high level of accuracy during surveys and provided immediate feedback. Audio recording of songs and calls were used to enhance familiarity with species-specific songs and calls.

After data were input, databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

3.2 Point Count Vegetation Surveys

3.2.1 Overview

We measured a suite of vegetation variables in a 50 m radius circle around each point count location, dividing the sample area into quadrants. The variables were selected to investigate relationships among different kinds of vegetation, abundance of vegetation species, vegetation density, slough densities, and the presence, absence, and densities of target bird species. The quadrants were set up in random directions.

3.2.2 Sampling frequency

Once every year for 0-10 year old restoration marshes, every 2 years for older marshes.

3.2.3 Data collection

The habitat at which the point was located (T = tidal marsh. M = muted marsh, R = restoration marsh, B = boardwalk, L = levee, U = upland, S = salt pond, O = other) was recorded. The percentage of focal habitat, usually tidal marsh or restoration marsh, was noted.

A random direction was selected by spinning a compass without looking at the number, and assigned to Transect 1. The 4 transects were 90 degrees apart and form the boundaries of the quadrants within which percent cover was calculated. If the point count station was located on a levee, Transects 1 and 3 were established parallel to the levee and at the edge of the focal habitat and levee, so the levee portion of the 50m circle was entirely within 2 quadrants.

Each 50 m transect was walked from the center point to the outer end, and the number of sloughs crossed in three different size categories (.2 m-1 m, 1 m-2 m, >2 m) was counted. It was occasionally not necessary to walk the entire 50 m transect when visibility was good, and it was clear that some channels were not hidden by overhanging vegetation. Sloughs smaller than 0.2 m were ignored as they were often difficult to detect reliably.

A long 1/4" dowel was placed at the point and 10 m from the point on each transect, and all vegetation, dead or living, touching the dowel was counted in 9 categories:

1. The highest point that the vegetation contacted the dowel (or vertical extension of the dowel if the dowel was too short)
2. the number of times vegetation contacted the dowel above the 100 cm mark
3. as above, between 60.1 and 100 cm
4. as above, between 50.1-60 cm
5. as above, between 40.1-50 cm
6. as above, between 30.1-40 cm
7. as above, between 20.1-30 cm
8. as above, between 10.1-20 cm
9. as above, under 10 cm.

If a particular leaf touched the dowel in two places, it was counted as two separate hits. Finally, the percent of a 1 m diameter circle that appears as bare ground at a height of 10 cm was estimated. 100% meant there were no vegetation stems at all, whereas 0% could have been where there was a thick mat of *Distichlis* and *Salicornia* and no bare mud could be seen.

The distance from the center point to the closest water, usually a channel (including very narrow channels that were dry due to low tidal conditions) in the marsh was estimated to the closest 0.1 m, as well as the width of the channel, to the closest 0.1 m.

In each quadrant, the percent cover of different landscape types and plant species was visually estimated. Landscape variables, which totaled 100% in each quadrant, were: total vegetation; organic or inorganic debris washed up by the tide; bare ground without any vegetation above it; channel (vegetation in a slough was ignored and the entire slough considered in the channel percentage); open water or bay; permanent pond with water; panne (a natural area of lower elevation within the marsh subject to tidal influence); and other (such as boardwalk). Percentage of levee within each quadrant was recorded separately. Thus, a fully vegetated point that had a levee running through 1 quadrant would be approximately 100% total vegetation and 20% levee.

In each quadrant, the relative percent cover of the total vegetation contributed by each plant species was estimated to the nearest 5% where possible. In each quadrant, the cover of all species together totaled 100% (even if total vegetation was less than 100%). Species with less than 1% cover were not included.

The average maximum height or the height at the 90th percentile, an estimate of the maximum height for each species excluding outliers, for *Grindelia*, *Salicornia*, *Spartina*, and *Scirpus*

species was recorded. For *Spartina* and *Scirpus*, the tallest species was chosen. If dead vegetation was taller than live vegetation, the height of the dead vegetation of that species was recorded. Finally, the tallest shrub species and its height, and the tallest herb species and its height were recorded.

3.2.4 Quality assurance

For point count vegetation assessment, only project staff that demonstrated excellent knowledge of plant species identification were used to collect data. All project staff were trained in plant identification by supervisory staff. A plant identification handbook was developed by PRBO before the project began, and this was used as a reference tool. Specimens were brought in from the field if necessary.

Databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

3.3 Territory Mapping

3.3.1 Overview

Mapping territories involved recording multiple observations of singing males and their mates (spot mapping), and estimating the boundaries of their territories. Bird locations and behavioral observations were recorded on a map, and birds were identified when possible by colored leg bands. Multiple spot maps were created during site visits in order to build final territory maps, which were digitized. This information was used to determine possible nesting areas, study dispersal within a marsh and to other marshes, and calculate densities of each species.

Each spot map area was covered about every 2 weeks, and all individuals encountered were recorded. Primary attention was given to singing males.

3.3.2 Data collection

The codes outlined in the Handbook of Field Methods for Monitoring Landbirds (Ralph et al. 1993) were used. Behaviors that were most useful in directly determining the territory boundaries and determining the phase of the nesting cycle were mapped, including: 1) counter singing with other males, 2) aggression between males, 3) copulation and 4) nest material and food carries.

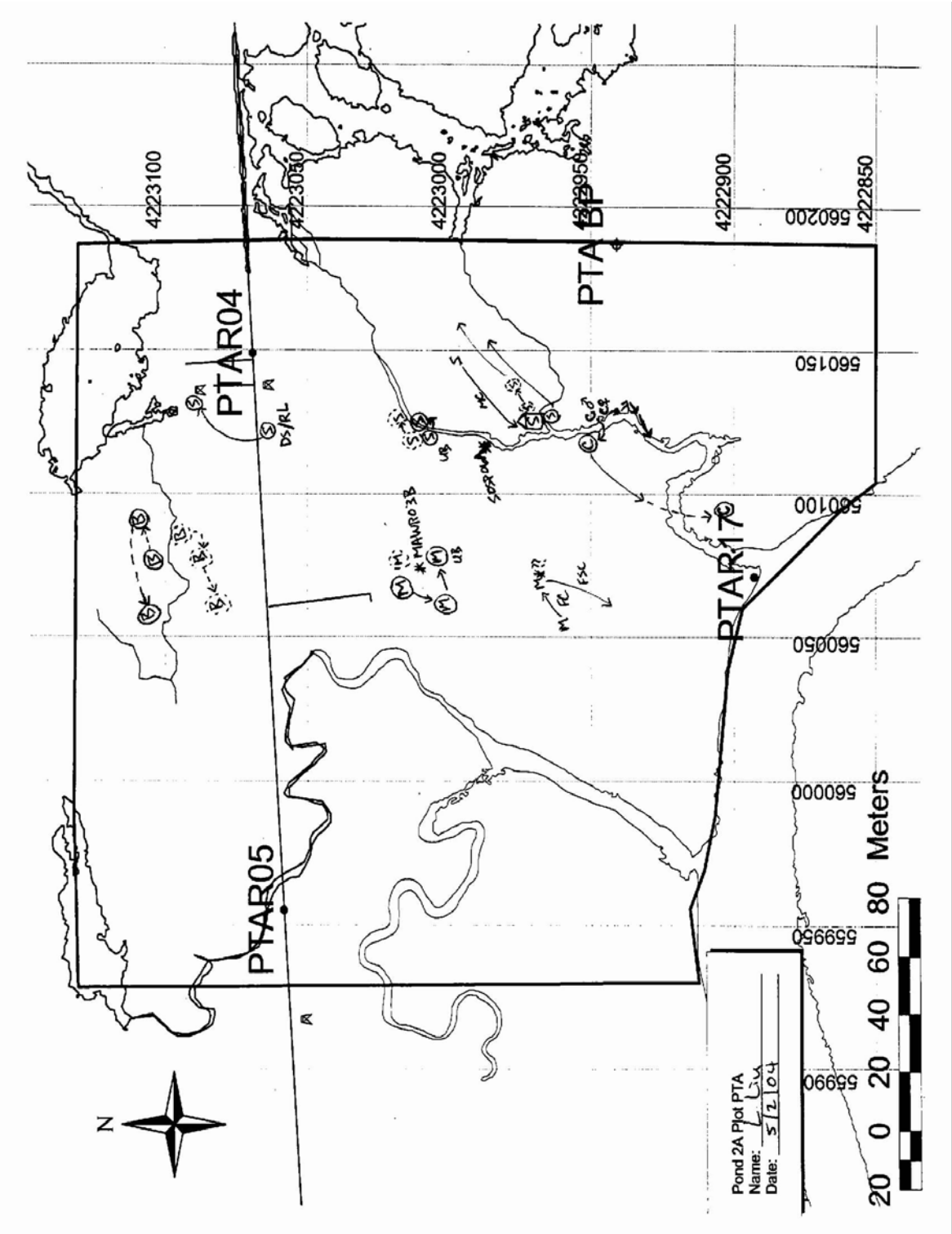
C = Common Yellowthroat	○ = Singing	UB = unbanded
S = Song Sparrow	◌ = Calling	♀ = female
M = Marsh Wren	→ = Known change in position	♂ = male
B = Black Rail	⇢ = Assumed change in position	FC = food carry for nestlings
CR = Clapper Rail	○—|—○ or ○— CS —○ =countersinging	MC = material carry for nest construction
✳ = nest location	⌂ = Pair together, assumed mated	FSC = fecal sac carry
A = aggression	YS/RW = Colorband combination	cop = copulation

3.3.3 Quality assurance

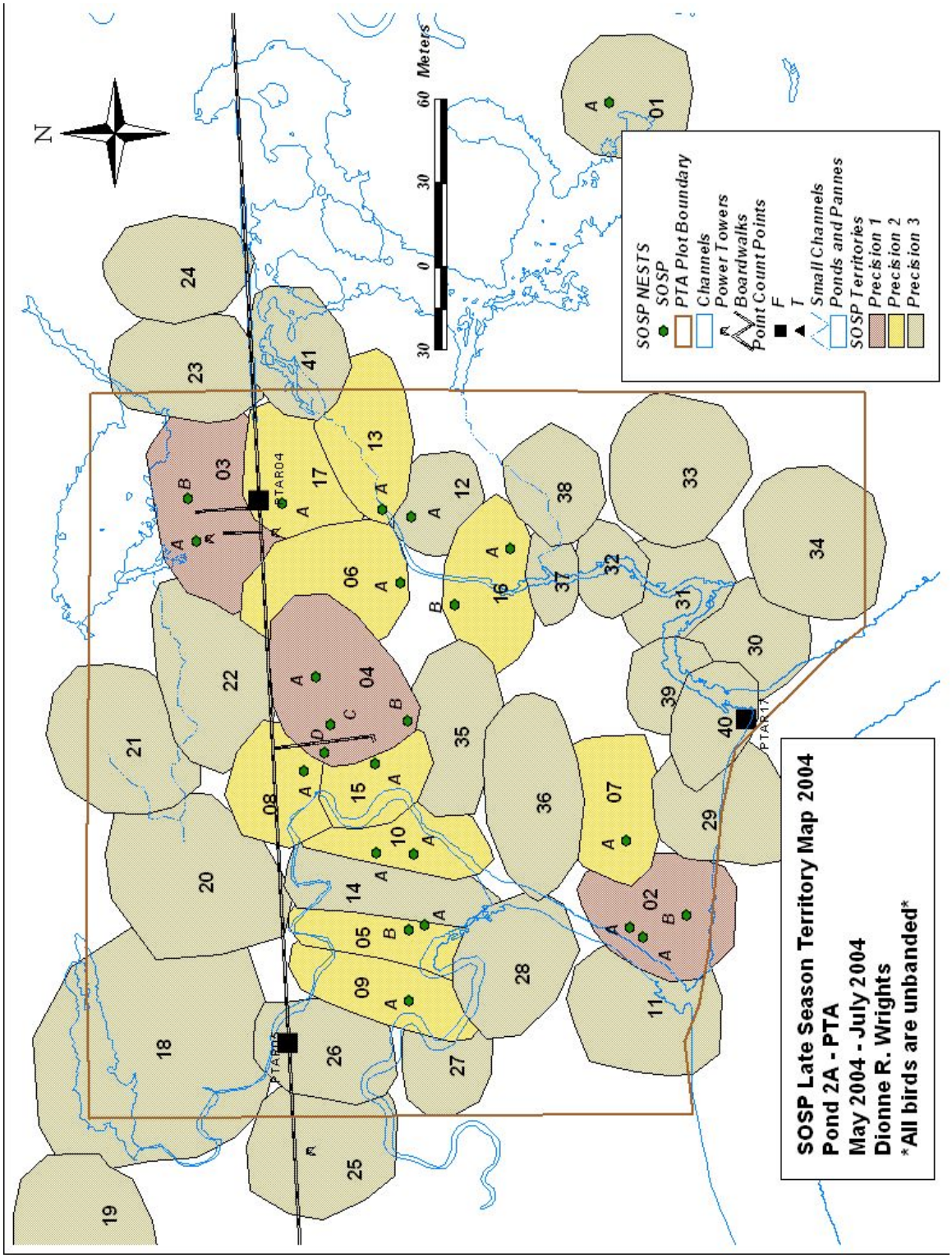
Biologists conducting territory mapping were thoroughly trained by experienced staff members. Training consisted of extensive in-the-field training at the outset of the field season as well as additional training on a weekly basis during the breeding season. Staff biologists closely supervised the field biologists that were conducting territory mapping, and supervisory staff met with the field biologists, usually on site, at least once or twice per week. Staff biologists also examined data sheets and territory maps on a regular basis. Thus, any questions by biologists carrying out territory mapping could be addressed quickly, accurately, and efficiently.

Databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

EXAMPLE SPOT MAP



EXAMPLE TERRITORY MAP



3.4 Nest Searching and Monitoring

3.4.1 Overview

Finding and monitoring nests allowed the calculation of nesting success (proportional and Mayfield calculations), and measuring the vegetation around nests provided information on types of habitats chosen by species and the consequences of particular habitat choices with respect to the likelihood that nests succeeded in producing offspring (Field Protocol of the Breeding Biology Research and Monitoring Database [BBIRD], Martin et al. 1997). Nests were found at various stages of development, from construction to occupation by nestlings, primarily by observing adult bird behaviors. Each nest was assigned a unique ID (when coupled with the year in which it was found). Nests were then visited approximately every 4 days until they fledged young, were depredated, flooded, or otherwise rendered inactive.

The closest possible determination of the following dates, which are major events in the nest cycle, were made: Date of first egg laid; clutch completion date; hatch date; and fledge or fail date. The number of days that nests have eggs or young was used to calculate daily mortality rates using the Mayfield method. Knowing the date of at least one major nest event, such as clutch completion or hatching, allowed a determination of "nest age" upon finding by counting backwards, with the knowledge of the "period days" (number of days in each laying, incubation and nestling periods) of each species. A more detailed description of nest monitoring methods can be found in Martin and Geupel (1993).

3.4.2 Precautions

Because it was imperative that the potential survivorship of a nest was not influenced, precautions were established to minimize observer impacts.

1. Distress calling by the adults was not allowed to continue for over 5 minutes.
2. A nest was not approached when any potential nest predators (i.e., corvids or raptors) were present.
3. It was assumed that a potential predator was watching, so vegetation without nests was also closely examined, and creation of dead end trails to the nest was avoided.
4. Physical disturbance to the area around the nest was minimized.
5. No visitors, friends or photographers were allowed to visit active nests.
6. A nest stick was used to part vegetation at the nest to minimize scent from being left on or near a nest.
7. Visits to the nest for monitoring and nestling banding were kept as short as possible.
8. Flagging to mark the nest was placed at least 10 m away from nests.
9. A description and map of the nest location was recorded to ensure that the nest could be refound quickly.

3.4.3 Data collection

A variety of methods for locating nests was employed. Some techniques were more useful at different stages of nesting, for different species, and with different individuals. For example, Marsh Wren males built nests, and would fly with huge masses of material in their bills. Black Rails were so secretive that nests were only be found by systematically searching an area and hoping for a bird to flush off a nest.

After a nest was found, it was closely monitored to determine the significant dates with respect to the nesting cycle. Based on the amount of detail available, the dates were coded with the degree of precision with which the date was determined.

Birds lay one egg a day and generally begin incubating as soon as the last egg has been laid, so the first egg date or clutch completion date could be determined within 24 hours if a nest was found while under construction (before the first egg was laid) or during laying, and if the final clutch size was known. Hatching date could be determined by visiting the nest around the expected time of hatching (once the date of clutch completion was established and the incubation period was factored in). Close examination of nest contents sometimes revealed eggs in the process of hatching. Newly hatched young were distinctive. The date of fledging or failure was determined by checking a nest the day before expected fledging, and every other day thereafter. Observers also looked for signs of a recently fledged nest, or clues that the nest was flooded or depredated.

Eggs and nestlings were examined to determine if a nest had been parasitized by a Brown-headed Cowbird (*Molothrus ater*). Nestlings were examined to determine their approximate age, to help determine hatch and fledge dates. Song Sparrow nestlings were banded when they were about 7 days old. Marsh Wren nests were monitored by gently extending a finger into the nests and the number of eggs or nestlings counted by touch. Observers attempted to verify the fledging of nests by resighting young birds or hearing begging calls of the young.

After a nest either fledged or failed, measurements of the nest and vegetation supporting and/or concealing the nest were taken. Closeout measurements were done for all nests that were observed with contents and not damaged. The physical dimensions of the nest were recorded, as well its distance from the center and edge of the nest plant. The number of supporting stems and their diameter were recorded. The unbroken conglomerate of multiple plants that surrounds a nest was also measured. The concealment of the nest at 1 meter at nest height in all 4 cardinal directions was recorded in percentages. The percentage of nest plant that was alive (compare to same species in area) was recorded. Finally, the distance from edge of nest to the closest channel, and the width of the channel, are measured to nearest 0.1 m.

3.4.4 Quality assurance

Biologists conducting nest monitoring were thoroughly trained by experienced staff members. Training consisted of extensive in the field training at the outset of the field season as well as additional training on a weekly basis during the breeding season. Staff biologists closely supervised the field biologists that were conducting nest monitoring, and supervisory staff met with the field biologists, usually on site, at least once or twice per week. Staff biologists also examined data sheets and the nest databases on a regular basis. Thus, any questions by biologists conducting the nest monitoring could be addressed quickly, accurately, and efficiently.

Databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

3.5 Area Survey

3.5.1 Overview

Two similar survey methods were used. The first, **area survey** protocol was used in the first year of the IRWM project and in the fall and winter of the second year. The protocol was modified in spring 2005 and to reflect the modification we named the survey "**line transect**". We describe the two methods using different protocols.

The area survey protocol was developed to provide an index of bird abundance, micro-habitat use and behavior. It was most useful for birds that were patchily distributed and not reliably censused using a point count method. Only non-passerines were included in area surveys.

3.5.2 Data collection

Each marsh was surveyed twice on a survey day; once during low tide (defined as <2.49 ft.) and once during high tide (>4.27 ft.) according to the closest tide station, although the critical aspect of the high tide was that mudflats were covered by water and thus inaccessible to shorebirds. Marshes that lacked a contiguous border or boardwalk that permitted the marsh from being surveyed on foot were surveyed at high tide with a boat (Channel Survey), covering navigable channels within the marsh point count area. Also, a Mudflat Survey was conducted from a single location at mudflats that were exposed during a low tide.

It was recommended that marshes with high bird densities were to be counted with an observer and a recorder. The observer began by scanning the marsh with binoculars or a spotting scope if the marsh was wide. Often the banks of channels were visible from only a few vantage points.

To standardize effort, one survey unit corresponded to a 1 km transect surveyed within 1 hour. Depending on size, each marsh had 0.5-2 units, such that the survey time was approximately one hour. Each survey area was walked once during the survey period. If new birds were present on the return trip (such as rare or endangered species like Clapper Rails and Black Rails) they were recorded, but clearly designated as outside the survey time.

A subjective view of how open the marsh being surveyed was recorded. An estimate of how much of the marsh was covered in water, which changed depending on the tide and rains, was recorded. An estimate of relative tide height within the surveyed marsh, which provided an index of the relative proportion of water and bare mud within tidal channels, was estimated at the beginning and end of a survey.

When a non-passerine bird was encountered, its species, behavior and the habitat type in which it was detected were recorded. If birds were exhibiting several behaviors, the behaviors most related to breeding and foraging were recorded. The perpendicular distance from any part of a transect (not necessarily direct distance from the observer), was also recorded, in 50 meter intervals from 0 to 200 meters. Birds over 200 m away from a transect, or flying over the marsh, were recorded separately. When possible, the location of the bird detection was placed on a map of the marsh.

If on a survey no birds were observed, or if no mudflat was exposed, this was so noted..

3.5.3 Quality assurance

Area surveys were conducted only by biologists with demonstrated knowledge of in-the-field species identification of all avian species. Excellent hearing and visual skills were required and needed to be demonstrated by surveying biologists. In addition, project supervisors thoroughly trained each biologist before he or she began their surveys. Instruction covered distance estimation as well as species identification and quantification. Trainers used practice surveys to ensure a high level of accuracy during surveys and provided immediate feedback. Audio recording of songs and calls were used to enhance familiarity with species-specific songs and calls.

Databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

3.6 Line Transect

3.6.1 Overview

The line transect protocol was a modification of the area survey transect protocol, which was developed to provide an index of bird abundance, micro-habitat use and behavior. It was most useful for birds that were patchily distributed and not reliably censused using a point count method. All bird species were included in line transect surveys.

3.6.2 Data collection

Each marsh was surveyed twice on a survey day; once during low tide (defined as <2.49 ft.) and once during high tide (>4.27 ft.) according to the closest tide station, although the critical aspect of the high tide was that mudflats were covered by water and thus inaccessible to shorebirds. Marshes that lacked a contiguous border or boardwalk that permitted the marsh from being surveyed on foot were surveyed at high tide with a boat (Channel Survey), covering navigable channels within the marsh point count area. Also, a Mudflat Survey was conducted from a single location at mudflats that were exposed during a low tide.

It was recommended that marshes with high bird densities were to be counted with an observer and a recorder. The observer began by scanning the marsh with binoculars or a spotting scope if the marsh was wide. Often the banks of channels were visible from only a few vantage points.

To standardize effort, one survey unit was approximately a 1 km transect surveyed within 1 hour. Depending on size, each marsh had 0.5-2 units. Each transect was walked once during the survey period. If new birds were present on the return trip (such as rare or endangered species like Clapper Rails and Black Rails) they were recorded, but clearly designated as outside the survey time. The line transect survey emphasized the transect that was walked rather than the area to be surveyed (cf. “area survey”).

A subjective view of how open the marsh being surveyed was recorded. An estimate of how much of the marsh was covered in water, which changed depending on the tide and rains, was recorded. An estimate of relative tide height within the surveyed marsh, which provided an index of the relative proportion of water and bare mud within tidal channels, was estimated at the beginning and end of a survey.

When a non-passerine bird was encountered, its species, behavior and the habitat type in which it was detected were recorded. If birds were exhibiting several behaviors, the behaviors most related to breeding and foraging were recorded. The perpendicular distance from any part of a transect (not necessarily direct distance from the observer), was also recorded, in 50 meter intervals from 0 to 200 meters. Birds over 200 m away from a transect, or flying over the marsh, were recorded separately. When possible, the location of the bird detection was placed on a map of the marsh.

Passerine birds were tallied in 0-50m and 50-100m bands, without any behavioral or habitat data.

If on a survey no birds were observed, or if no mudflat was exposed, this was so noted.

3.6.3 Quality assurance

Line transect surveys were conducted only by biologists with demonstrated knowledge of in-the-field species identification of all avian species. Excellent hearing and visual skills were required and needed to be demonstrated by surveying biologists. In addition, project supervisors thoroughly trained each biologist before he or she began their surveys. Instruction covered distance estimation as well as species identification and quantification. Trainers used practice surveys to ensure a high level of accuracy during surveys and provided immediate feedback. Audio recording of songs and calls were used to enhance familiarity with species-specific songs and calls.

Databases were compared visually with datasheets to ensure that data had been accurately entered. Databases were also queried and filtered to expose outlier values.

3.7 Heron and Egret breeding studies

3.7.1 Data collection

3.7.1.1 Nesting distribution and abundance

The locations of most heronries in the study area were previously known from continuing monitoring efforts (Kelly et al. 1993, Kelly et al. 2006). Some new colony sites were discovered by ground-based searches along major roads and through communications with state, regional, and local natural resource managers and local bird watching networks. We concentrated searches for new heronries in May and June, when colony sites are relatively conspicuous because of adults actively feeding nestlings, nestlings large enough to be easily seen or heard, and guano accumulations beneath nests. Because we did not systematically search for undiscovered colony sites, some small unknown sites could have been overlooked.

A colony site or heronry was defined as a group of active heron or egret nests within 500 m of each other. GPS or USGS 7.5-min topographic quads were used to record the geographic position of each heronry (NAD83). With the assistance of trained volunteer field observers, we attempted to visit all colony sites during each of five, 3-d observation periods each year, scheduled as closely as possible to 10-12 March, 10-12 April, 10-12 May, 3-5 June, and 20-22 June. All colonies were observed from the ground or from boats using binoculars and telescopes. Observers visited most colony sites at least four times each breeding season. Sites visited only once in a given year were usually observed in May or early June when nests and broods were the most conspicuous.

We used the peak number of active nests as an estimate of annual colony size. Before 1 April, nests were assumed to be active if two adults were present, an adult carrying nest material was present, an adult was incubating or caring for eggs, or chicks were present. After 1 April, all occupied nests were assumed to be active.

For comparisons among the six IRWM sites, breeding density was calculated for colonies within 10 km of an IRWM study marsh.

3.7.1.2 Nest productivity and survivorship

The productivity of successful nests was based on the size of completely visible broods when Great Blue Heron nestlings were 5-8 wks old and Great Egrets were 5-7 wks old. During these periods, nestlings were too young to hop away from their nests and old enough to have survived the period when most brood reduction occurs (Pratt 1970, Pratt and Winkler 1985). Brood size in successful Snowy Egret and Black-crowned Night-Heron nests was measured when the young were 7-14 d old (Frederick and Callopy 1989, Parsons and Master 2000) and 7-15 d old (Custer et al. 1983, Davis 1993), respectively. Estimates of the number of young in successful nests included (focal) nests followed through the nesting cycle as well as nests that were not followed but contained young known to have reached the appropriate age prior to fledging.

Estimates of nest survivorship (proportion surviving) were based on the apparent survivorship of focal nests observed from initiation or early in the incubation period (Figures 5 and 6). In colonies with fewer than 15 active nests, all nests were treated as focal nests. In colonies with more than 15 active nests, a random subset of 10-15 focal nests was selected. In some larger colonies most or all observable nests were selected as focal nests. Great Egret and Great Blue Heron nests were considered successful if at least one chick survived to 7 weeks or 8 weeks post-hatch, respectively (Pratt 1970, Pratt and Winkler 1985). We considered nests to be successful at 14 d after first hatch for Snowy Egret (Frederick and Callopy 1989) and 15 d after first hatch for Black-crowned Night-Heron (Custer et al. 1983).

For comparisons among the six IRWM sites, brood size was calculated for colonies within 10 km of an IRWM study marsh.

3.7.1.3 Foraging dispersion

We used aircraft to track the foraging flights of Great Egrets departing from heronries in Suisun Marsh. These "following flights" were conducted within 4-h observation windows centered on daily low or high tides at times during the nesting period when most nests had reached the post-guardian stage (late May through June, when parents forage simultaneously for food to feed young). Birds were observed from altitudes at least 300-350 m, by circling above a nesting colony and following the first individual seen departing from the colony site. Foraging flight duration was timed with a stop watch and landing sites were recorded manually on topographic maps. GPS coordinates of landing sites were recorded but, because of difficulties in obtaining coordinates from remote locations, they were used only as supplemental data. Whenever a bird landed for less than one minute, we recorded the location but continued following the bird to record the foraging flight distance. Differences between the geographic locations of heronries and the landing sites of foraging birds were used to determine the angular distribution and distances of foraging flights.

3.7.2 Quality assurance

Heronry distributions were measured by experienced staff biologists with excellent experience in the use of GPS equipment, geographic data, and GIS software. The locations of many colony sites were measured on multiple visits. Heronry locations were then mapped and checked against the locations of known landmarks to ensure accuracy.

Field observers who recorded data on nest abundance, productivity, and survivorship included staff biologists with extensive experience in field studies of herons and egrets and volunteer observers who were thoroughly trained by experienced staff biologists. Training included supervised field experience and group meetings to discuss field protocols. Regular, follow-up meetings with field observers at colony sites were made to ensure correct implementation of field protocols and accuracy in field observations.

Foraging flight data were collected by staff biologists with strong geographic knowledge of the study area and extensive experience observing herons and egrets, assisted by volunteer field observers with extensive experience in observing and identifying birds.

All field data were screened independently by at least three experienced staff biologists. Databases were compared twice with field data to ensure data quality and accuracy. Databases were also queried and filtered to expose outlier values.

4.0 Results and Observations

4.1 Abundance and diversity of landbirds and waterbirds in tidal marsh throughout the year

Physical characteristics of the six IRWM marshes are summarized in Table 2, as well as species richness for each season (cumulative over the 2 years). Avian species richness was moderate to high at all study marshes, with winter generally displaying the highest species richness and

spring next-highest. Younger marshes generally had higher species richness than older marshes, reflecting less vegetation (and more open areas) in the former, compared to the latter. Seasonal observed density, for each of the three seasons is summarized, by site, for four principal tidal marsh species: Black Rail, Common Yellowthroat, Marsh Wren, and Song Sparrow (Table 2). Song Sparrows are the most abundant of the four species and display similar density across the three seasons. Common Yellowthroat also demonstrated similar density across the three seasons. Black Rail spring density is shown as determined by intensive, species-specific survey methods (see 4.2, below), whereas density in the fall and winter was determined with point counts, which detect fewer Black Rails, since they do not utilize playback. Therefore, for methodological reasons, one cannot compare Black Rail density between breeding season and the other two seasons (fall, winter).

Seasonal observed density, for each of the three seasons is summarized, by site, for nine species groupings (or guilds) in Table 3. The nine species groupings encompass nearly all observed waterbird and marsh bird species observed in the marsh other than passerines. Passerines are principally represented by Song Sparrow, Marsh Wren, and Common Yellowthroat (see Table 2, and discussion above).

A more detailed summarization of results for Black Rails, Common Yellowthroats, and Song Sparrows is presented in Table 4. Here results are broken down by year and season, and standard errors are also presented. These results are for point count surveys only and thus one can compare observed densities among the three seasons, for all three species, including the Black Rail. Not surprisingly, these results demonstrate greater variability within a season-year, compared to seasonal averages calculated over multiple years. However, in general, the patterns displayed are similar with respect to species differences and seasonal differences.

Densities of eight select species are shown in Table 5, by season and site. These eight species represent ducks, shorebirds, raptors, waders, and rails, five of the important bird groups. The rail group is represented by the Virginia Rail and information on this common species supplements the information on the threatened or endangered rail species, the Black Rail and Clapper Rail presented elsewhere (Tables 2, 4, 7). The data in Table 5 were derived from area survey/line transects.

Information on variation in density among subsites is displayed in Table 6. Results for three study species, Common Yellowthroat, Marsh Wren, and Song Sparrow are displayed in that Table. In general, subsites within a single site differ somewhat in their observed densities, but also demonstrate consistency with respect to subsites at other marsh sites. Thus, two spatial levels of variation are quantified in Table 6; variation within a marsh site and variation among marsh sites.

Trends over time, with respect to density (i.e., abundance index) are depicted for the breeding season at each IRWM marsh site for the three principal passerine tidal marsh species: Common Yellowthroat (Figures 4 to 9), Marsh Wren (Figures 10 to 15), and Song Sparrows (Figures 16 to 21). These figures display trends in abundance for all the years of surveying. All six IRWM sites were surveyed in 2006, hence the minimum number of years depicted is three. For Common Yellowthroats, the four San Pablo sites tended to show a peak in 2005 and then a

decline in 2006. However, the two Delta sites either showed a stable trend (Brown Island) or an increasing trend during 2004 to 2006 (Sherman Island). Carl's Marsh, a young restored site, had no Common Yellowthroats detected in 2004 to 2006, whereas Pond 2A, the other young restored site had, by 2005, a high estimated density of this species.

Marsh Wrens displayed somewhat stable densities or declining densities over the time period studied. They also tended to show a peak in density in 2005, compared to 2004 and 2006. Marsh Wrens, unlike Common Yellowthroats and Black Rails did not display a correlation with marsh age. Song Sparrows generally exhibited stability in density between 2004 and 2005, with a drop between 2005 and 2006. They, like Marsh Wrens, evidenced high density irrespective of marsh age.

Site-specific trends for three species groupings of importance are presented as well: all rail species (Figures 22 to 26), dabbling ducks (Figures 27 to 31), and "land birds" (essentially passerines; Figures 32 to 37). At most sites, the abundance index increased for rails between 2004 and 2005. However, we note that Black Rails and Clapper Rails were better studied using specialized techniques (see 4.2, below). For dabbling ducks, there was no consistent pattern of year to year change at the IRWM sites. For landbirds, the abundance index increased between 2004 and 2005 at three sites and decreased at the other three sites. However, 2006 was generally lower than 2005 at most sites.

4.2 Breeding season abundance of Black Rails and Clapper Rails

Results from species-specific surveys for breeding Black Rails and Clapper Rails are summarized in Table 7. These summarize average density (over the 2-year period) by site. Black Rails were present at all marshes. Note that no Clapper Rail surveys were carried out in the two Delta sites; these lie outside of the current range of the California Clapper Rail. Only one of the remaining sites had moderate densities of Clapper Rails (Coon Island, an older, mature marsh). The other three surveyed sites had either no Clapper Rails (Bull Island, an older restored site) or very low detections (Carl's Marsh and Pond 2A). Black Rails demonstrated a strong correlation between density and age: density was high in the two mature marshes (Brown Island, Coon Island) and lowest in the two youngest restored marshes (Carl's Marsh, Pond 2A), with older restored marshes displaying intermediate densities.

Details of survey estimates by year are presented in Appendix 1.

4.3 Territorial density and nesting success of tidal marsh birds

Territory density is summarized for Song Sparrows at the 2 IRWM study sites (Carl's Marsh and Pond 2A) and at an ancient marsh, China Camp (Table 8). Territory density was consistent between years, but differed substantially among the three marshes (about a two-fold difference).

Reproductive success of Song Sparrows at the 2 IRWM study sites (Carl's Marsh and Pond 2A) is shown for 2004 and 2005, with a comparison to an ancient marsh, China Camp (Table 9). While the nest survival rate for Carl's Marsh was lower than that of China Camp in 2004, in 2005, the parameter values for the two marshes were similar. In contrast, Pond 2A (a young

restored marsh) demonstrated higher nest survival in both years, in comparison with the mature marsh, China Camp.

Nest success is summarized for all species studied at Carl's Marsh, Pond 2A, and China Camp (Table 10). Though nests from 12 different species were discovered at the three sites, only Song Sparrows were found and monitored in sufficient numbers to obtain reliable estimates of nest survival.

Nestlings that survived to 8 days of age were banded with unique band numbers. In addition, free-flying adults and young were caught in mist nets and banded as well. Results from 2004 and 2005 are summarized (Table 11).

4.4 Heron and egrets breeding in and near historic tidal marsh in San Francisco Estuary

Overall trends in the annual numbers of nesting herons and egrets were stable or increasing from 1991 to 2005. We found no significant linear trend in annual nest abundances in Great Blue Heron ($F_{1,13} = 1.5$, $P = 0.25$), Great Egret ($F_{1,13} = 1.6$, $P = 0.23$), or Black-crowned Night-Heron ($F_{1,13} = 0.79$, $P = 0.39$), and a significant linear increase in the number of nesting Great Egrets ($F_{1,13} = 6.3$, $P = 0.03$; Figure 38). Average nest abundance in the study area was 179 ± 8.3 (SE) for Great Blue Heron, 589 ± 29 for Great Egret, 280 ± 14.3 for Black-crowned Night-Heron, and 268 ± 26 for Snowy Egret (Figure 39).

The number of young produced in successful Great Blue Heron and Great Egret nests covaried closely among years, with slightly but consistently higher average annual productivity in Great Egret nests than in Great Blue Heron nests (Figure 40). Annual variation in the number of young produced in successful Snowy Egret and Black-crowned Night-Heron nests revealed no clear patterns of association, although Snowy Egrets consistently produced more young per nest, on average, than Black-crowned Night-Herons (Figure 41).

Annual differences in nest survivorship covaried closely between Great Egrets and Great Blue Herons (Figure 44), although annual differences contrasted sharply in 2001. Annual variation in nest survivorship was substantial in Snowy Egrets and Black-crowned Night-Herons, with no consistent evidence of covariation (Figure 42).

The foraging flights of Great Egrets suggested a declining number of landings with increasing distance from heronries (Figure 43). Foraging activity was concentrated near nesting sites with most individuals landing within 8 km of heronries (Figure 43).

5.0 References

Chan, Y., N. Nur, H. Spautz, D. Stralberg, and J. Wood. 2001. Spatial and temporal heterogeneity in reproductive success for tidal salt marsh Song Sparrows (*Melospiza melodia*): the significance of "edge effects." Paper presented at 2001 State of the Estuary conference, Oakland, October 2001. Available at www.prbo.org/tm.

Custer, T. W., and R.G. Osborn. 1978. Feeding habitat use by colonially-breeding herons, egrets, and ibises in North Carolina. Auk 95:733-743.

Davis. W. E., Jr. 1993. Black-crowned Night-Heron (*Nycticorax nycticorax*). *In* The Birds of North America, No. 74 (A. Pool and G. F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Evens, J., and N. Nur. 2002. California Black Rails in the San Francisco Bay region: spatial and temporal variation in distribution and abundance. Bird Populations 6:1-12.

Evens, J., G.W. Page, S.A. Laymon, and R.W. Stallcup. 1991. Distribution, relative abundance, and status of the California black rail in western North America. Condor 93:952-966.

Greenberg, R., C. Elphick, J. C. Nordby, C. Djerdum, H. Spautz, G. Shriver, B. Schmeling, B. Olson, P. Marra, N. Nur, and M. Winter. 2006. Flooding and predation: trade-offs in the nesting ecology of tidal marsh sparrows. Studies in Avian Biology 32: 96-109.

Frederick, P. C., and M. W. Callopy. 1989. Nesting success of five Ciconiiform species in relation to water conditions in the Florida Everglades. Auk 106: 625-634.

Kelly, J. P., K. Etienne, C. Strong, M. McCaustland, and M. L. Parkes. 2006. Annotated atlas and implications for conservation of heron and egret nesting colonies in the San Francisco Bay area. ACR Technical Report 90-3-17, Audubon Canyon Ranch, P.O. Box 808, Marshall, CA 94940.

Kelly, J. P., H. M. Pratt, and P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds 16:18-27.

Kushlan, J. A. 1992. Population biology and conservation of colonial wading birds. Colonial Waterbirds 15: 1-7.

Liu, L., J. Evens, M. Herzog, D. Stralberg, N. Nur, H. Spautz, and C. Wilcox. 2005. California Clapper Rail population trends in the San Francisco Bay Estuary. Paper presented at 2005 State of the Estuary Conference, Oakland, CA, October 2005.

Martin, T. E., and G. R. Geupel. 1993. Nest-monitoring plots: Methods for locating nests and monitoring success. Journal of Field Ornithology 64:507-519.

Martin, T. E., C. Paine, C. J. Conway, W. M. Hochachka, P. Allen, and W. Jenkins. 1997. The Breeding Biology Research and Monitoring Database (BBIRD) Field Protocol. BRD, MCWRU, Univ. of Montana, Missoula, MT 59812. available at www.umt.edu/bbird/protocol.

Nur, N, S. Zack, J. Evens, and T. Gardali. 1997. Tidal marsh birds of the San Francisco Bay region: status, distribution, and conservation of five Category 2 taxa. Final draft report to U.S. Geol. Survey-Biol. Res. Div. Available from Point Reyes Bird Observatory and on PRBO web site at: www.prbo.org/tm.

Parnell, J. F., D. G. Ainley, H. Blokpoel, B. Cain, T. W. Custer, J. L. Dusi, S. Kress, J. A. Kushlan, W. E. Souther, L. E. Stenzel, and B. C. Thompson. 1988. Colonial waterbird management in North America. Colonial Waterbirds 11: 129-169.

Parsons, K. C., and T. L. Master. 2000. Snowy Egret (*Egretta thula*). *In* The Birds of North America, no. 489 (A. Pool and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia, PA.

Pratt, H. M. 1970. Breeding biology of Great Blue Herons and Common Egrets in central California. Condor 72: 407-416.

Pratt, H. M., and D. W. Winkler. 1985. Clutch size, timing of laying, and reproductive success in a colony of Great Blue Herons and Great Egrets. Auk 102: 49-63.
Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. USDA Forest Service Publication, PSW-GTR 144, Albany, CA.

Ralph, C. J., J. R. Sauer, and S. Droege. 1995. Monitoring Bird Populations by Point Counts. USDA Forest Service Publication, PSW-GTR 149, Albany, CA.

San Francisco Estuary Institute. 1998. Bay Area EcoAtlas, Version 1.5, b4. San Francisco Estuary Institute, Oakland, CA.

Spautz, H., N. Nur, D. Stralberg, and Y. Chan. 2006. Multiple-scale habitat relationships of tidal-marsh breeding birds in the San Francisco Bay estuary. Studies in Avian Biology 32:247-269.

Stralberg, D., N. Warnock, N. Nur, H. Spautz, and G. W. Page. 2005. Building a habitat conversion model for San Francisco Bay wetlands: A multi-species approach for integrating GIS and field data. pp. 121-129 **in** *Bird Conservation Implementation and Integration in the Americas,* C.J. Ralph and T.D. Rich, eds. USDA For. Serv. Gen. Tech. Report PSW-GTR-191.

6.0 Tables

Table 1. Calendar of surveys, by month of survey for Bird Team field data collection (exclusive of Heron & Egret task). Note no nest monitoring conducted at Brown's I., Bull I., Coon I., or Sherman I.

	FALL 2003		WINTER 2004			BREEDING 2004					FALL 2004		WINTER 2005			BREEDING 2005				
SITE	Sept	Oct	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Sept	Oct	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
survey type																				
Brown I.																				
Point Count		X	X	X			X	X			X	X	X	X		X		X		
Area Survey		X	X	X			X	X			X	X	X	X		X		X		
Black Rail								X	X									X		
Clapper Rail																				
Bull Island																				
Point Count		X	X	X		X	X				X	X	X	X			X	X		
Area Survey			X	X		X	X				X	X	X	X			X	X		
Black Rail						X										X	X	X		
Clapper Rail						X	X									X	X	X		
Coon I.																				
Point Count		X	X	X			X	X			X	X	X	X			X	X		
Area Survey		X	X	X			X	X			X	X	X	X			X	X		
Black Rail							X	X								X	X			
Clapper Rail						X	X								X	X	X			
Pond 2A																				
Point Count		X	X	X			X	X			X	X	X	X		X		X		
Area Survey		X	X	X			X	X			X	X	X	X		X		X		
Nest Monitoring						X	X	X	X	X						X	X	X	X	X
Black Rail							X	X	X								X	X		
Clapper Rail						X	X								X	X				
Carl's Marsh																				
Point Count		X	X	X		X	X				X	X	X	X			X	X		
Area Survey		X	X	X		X	X				X	X	X	X			X	X		
Nest Monitoring						X	X	X	X	X						X	X	X	X	X
Black Rail									X							X	X	X		
Clapper Rail					X	X	X								X	X	X			
Sherman I.																				
Point Count			X	X			X	X			X	X	X	X			XX			
Area Survey			X	X			X	X			X	X	X	X			XX			
Black Rail								X	X									X		
Clapper Rail																				

Table 2. Summary of site data for the study period, by season, part I. Size of Site (marsh) and patch (habitat patch containing the site) shown, as well as approximate age of habitat patch. Breeding season density and average brood size for Greater Egret and Great Blue Heron colonies associated with each site (within 10 km of site; see text) are shown. Cumulative species richness, combining point count and area survey/line transect data, shown for 2 year period. Average density over 2 years, from point count survey, shown for four tidal marsh species by season (BLRA, Black Rail; COYE, Common Yellowthroat; MAWR, Marsh Wren; SOSP, Song Sparrow).

Site	**Site size**	**Patch size**	**Patch age (years)**	GREG bsize	GBHE bsize	GREG dens	GBHE dens	**Season**	**Species richness**	**BLRA mean density**	**COYE mean density**	**MAWR mean density**	**SOSP mean density**
Brown's Island	276.6	277.3	150	2.25	2.11	3.74	3.77	Spring	21	4.000	1.305	5.475	3.310
								Fall	19	0.064	0.605	3.788	3.056
								Winter	28	0.095	0.668	2.546	2.610
Bull Island	43.8	260.9	53	1.79	1.54	2.94	3.4	Spring	19	1.908	0.776	8.567	5.186
								Fall	14	0.032	0.568	3.822	4.681
								Winter	19	0.000	0.629	2.547	5.958
Coon Island	162.4	1183.6	150	1.79	1.76	0	2.21	Spring	23	3.535	0.605	3.247	7.608
								Fall	18	0.191	0.605	3.438	4.520
								Winter	19	0.095	0.573	1.878	6.112
Pond 2A	215.6	1183.6	12	1.531	1.531	0.15	1.35	Spring	28	0.904	1.156	4.732	5.544
								Fall	26	0.060	1.020	5.307	4.590
								Winter	33	0.025	1.136	2.795	5.576
Carl's Marsh	19.5	21.7	13	1.86	1.54	0.6	1.27	Spring	32	0.700	0.000	5.887	6.555
								Fall	20	0.000	1.034	5.747	8.326
								Winter	35	0.000	0.584	3.093	9.717
Sherman Lake	393.2	888.4	82	2.27	2.08	7.11	4.71	Spring	22	2.533	1.915	3.625	5.105
								Fall	20	0.174	0.580	3.717	4.812
								Winter	25	0.000	0.524	2.210	3.813

Table 3. Summary of site data for the study period, by season, part II. Summary by species grouping ("guild") for 9 avian species groupings, by site and season, from area survey/line transect data averaged over the 2-year study period.

Site	Season	Dabbling ducks	Diving ducks	Geese	Herons/Egrets	Rails	Raptors	Small shorebirds	Medium shorebirds	Piscivores
Brown's Island	Spring	1.040	0.000	0.266	0.178	0.178	0.284	0.000	0.000	0.178
	Fall	1.124	0.000	0.000	0.311	0.414	0.355	0.000	0.000	0.355
	Winter	1.736	0.178	0.000	0.178	0.621	2.059	0.000	0.000	0.710
Bull Island	Spring	0.678	0.000	0.356	0.000	0.356	0.237	0.000	0.000	0.119
	Fall	1.128	0.000	0.000	0.119	0.593	0.178	0.000	0.119	0.000
	Winter	4.243	0.000	0.712	0.237	0.297	0.203	0.178	0.119	0.000
Coon Island	Spring	0.211	0.000	0.000	0.000	0.000	0.070	0.000	0.000	0.000
	Fall	0.105	0.000	0.000	0.140	0.140	0.070	0.000	0.000	0.000
	Winter	0.211	0.398	0.140	0.000	0.070	0.140	0.000	0.000	0.000
Pond 2A	Spring	0.628	0.526	0.153	0.055	0.110	0.153	1.753	0.082	0.000
	Fall	0.701	0.000	0.000	0.082	0.408	0.146	4.041	0.204	0.110
	Winter	0.888	2.105	0.000	0.110	0.244	0.183	4.941	0.900	0.055
Carl's Marsh	Spring	0.661	0.213	0.000	0.000	0.640	0.560	3.781	2.434	0.000
	Fall	1.280	0.000	0.000	0.000	0.597	0.213	2.097	2.773	0.000
	Winter	1.280	0.284	0.000	0.427	0.267	0.485	6.677	6.300	0.000
Sherman Lake	Spring	1.548	0.000	0.000	2.752	0.688	0.688	0.000	0.000	7.567
	Fall	3.783	0.000	0.000	1.147	1.376	1.376	0.000	0.000	0.000
	Winter	3.182	0.000	0.000	1.376	4.643	1.605	2.064	2.408	0.688

Table 4. Summary of abundance indices (mean and S.E. shown) for three focal tidal-marsh bird species for IRWM sites for 2003 to 2005, by season (Fall [F], Winter [W], Breeding [B] = Spring). Abundance index = number of birds detected per survey per ha of habitat surveyed. Derived from point count surveys (n = 20 per site per season-year = 10 survey stations, each surveyed twice per season-year).

		BLRA		COYE		SOSP	
Site abbrev	year/season	birds/ha	SE	birds/ha	SE	birds/ha	SE
Brown	2003F	0.00	0.00	0.51	0.00	1.91	0.00
Brown	2003W	0.00	0.00	0.51	0.22	2.55	0.22
Brown	2004B	0.06	0.09	1.27	0.40	3.31	0.80
Brown	2004F	0.13	0.13	0.70	0.35	4.20	0.81
Brown	2004W	0.19	0.09	0.83	0.27	2.67	0.70
Brown	2005B	0.32	0.20	1.34	0.55	3.31	0.52
Bull	2003F	0.00	0.00	0.00	0.00	4.02	0.00
Bull	2003W	0.00	0.00	0.87	0.23	6.50	1.54
Bull	2004B	0.06	0.09	0.66	0.26	5.58	1.02
Bull	2004F	0.06	0.09	1.14	0.33	5.34	0.79
Bull	2004W	0.00	0.00	0.39	0.26	5.42	0.56
Bull	2005B	0.11	0.15	0.89	0.30	4.79	0.34
Coon	2003F	0.00	0.00	0.38	0.00	4.97	0.00
Coon	2003W	0.00	0.00	0.38	0.18	6.18	1.22
Coon	2004B	0.51	0.34	0.45	0.20	7.77	0.84
Coon	2004F	0.38	0.22	0.83	0.35	4.07	0.60
Coon	2004W	0.19	0.20	0.76	0.25	6.05	1.10
Coon	2005B	0.57	0.27	0.76	0.28	7.45	0.89
Carl's	2003F	0.00	0.00	1.31	0.00	9.53	0.00
Carl's	2003W	0.00	0.00	0.24	0.10	9.07	2.17
Carl's	2004B	0.08	0.12	0.00	0.00	6.05	1.62
Carl's	2004F	0.00	0.00	0.75	0.52	7.12	2.11
Carl's	2004W	0.00	0.00	0.93	0.50	10.36	1.06
Carl's	2005B	0.00	0.00	0.00	0.00	7.06	2.46
Pond2A	2003F	0.00	0.00	0.83	0.00	4.87	0.00
Pond2A	2003W	0.00	0.00	1.20	0.57	6.42	0.88
Pond2A	2004B	0.12	0.17	0.62	0.30	5.36	1.02
Pond2A	2004F	0.12	0.12	1.21	0.54	4.31	0.84
Pond2A	2004W	0.05	0.07	1.07	0.26	4.73	0.44
Pond2A	2005B	0.13	0.13	1.69	0.52	5.73	0.72
Sherman	2003W	0.00	0.00	0.70	0.35	3.57	0.75
Sherman	2004B	0.17	0.14	1.80	0.27	5.51	0.63
Sherman	2004F	0.17	0.14	0.58	0.28	4.81	0.80
Sherman	2004W	0.00	0.00	0.35	0.12	4.06	0.84
Sherman	2005B	0.29	0.14	2.03	0.38	4.70	0.46

Table 5. Observed densities by season and site, from Area survey/line transects, for select species, over the 2-year study period.
Density = number of birds detected per survey per ha surveyed.
A) Selected Duck species (Gadwall, Mallard).

	Gadwall						**Mallard**					
	Spring		Fall		Winter		Spring		Fall		Winter	
Site	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island	0.123	0.010	0.000	0.000	0.000	0.000	0.277	0.006	0.246	0.024	0.185	0.016
Bull Island	0.366	0.036	0.000	0.000	0.000	0.000	1.097	0.024	1.303	0.056	6.492	0.064
Coon Island	0.333	0.048	0.191	0.000	0.000	0.000	0.159	0.022	0.095	0.000	0.286	0.045
Pond 2A	0.404	0.004	0.000	0.000	0.000	0.000	0.583	0.003	0.448	0.009	0.472	0.017
Carl's Marsh	0.537	0.033	0.000	0.000	0.000	0.000	0.750	0.019	0.000	0.000	1.432	0.000
Sherman Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.085	0.000	0.000	0.000	0.233	0.013

Table 5, cont.
B) Selected shorebird species (Killdeer, Greater Yellowlegs, Least Sandpiper).

	Killdeer						**Greater Yellowlegs**						**Least Sandpiper**					
	Spring		Fall		Winter		Spring		Fall		Winter		Spring		Fall		Winter	
Site	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bull Island	0.000	0.000	0.137	0.000	0.137	0.000	0.000	0.000	0.000	0.000	0.137	0.000	0.000	0.000	0.000	0.000	0.206	0.032
Coon Island	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pond 2A	0.000	0.000	0.122	0.005	0.035	0.000	0.035	0.000	0.157	0.006	0.315	0.000	1.120	0.000	3.744	0.013	5.371	0.007
Carl's Marsh	0.657	0.027	2.189	0.027	1.671	0.099	0.239	0.000	0.000	0.000	0.477	0.024	3.820	0.042	2.674	0.043	8.117	0.089
Sherman Lake	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.212	0.012	0.000	0.000	0.000	0.000	0.254	0.000

Table 5, cont.
C) Select species other than ducks and shorebirds (Northern Harrier, Snowy Egret, and Virginia Rail).

	Northern Harrier						**Snowy Egret**						**Virginia Rail**					
	Spring		Fall		Winter		Spring		Fall		Winter		Spring		Fall		Winter	
Site	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island	0.055	0.006	0.103	0.017	0.082	0.015	0.000	0.000	0.062	0.010	0.041	0.000	0.041	0.000	0.123	0.019	0.274	0.009
Bull Island	0.274	0.048	0.274	0.000	0.274	0.040	0.000	0.000	0.000	0.000	0.137	0.000	0.411	0.000	0.686	0.078	0.309	0.015
Coon Island	0.095	0.000	0.000	0.000	0.238	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pond 2A	0.080	0.002	0.117	0.009	0.105	0.003	0.035	0.000	0.035	0.000	0.079	0.004	0.047	0.005	0.350	0.005	0.216	0.004
Carl's Marsh	0.000	0.000	0.000	0.000	0.418	0.017	0.000	0.000	0.000	0.000	0.477	0.000	0.000	0.000	0.477	0.084	0.239	0.000
Sherman Lake	0.085	0.000	0.169	0.000	0.254	0.025	0.000	0.000	0.085	0.000	0.085	0.000	0.000	0.000	0.169	0.030	0.705	0.027

Table 6. Densities of tidal marsh study species (birds detected per hectare per survey), by season, over the 2-year study period, by subsite, from point count surveys.
A) Common Yellowthroat

	Common Yellowthroat					
	Spring		Fall		Winter	
Subsite	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island Central	1.733	0.573	0.707	0.406	0.477	0.402
Brown's Island North	1.273	0.604	0.743	0.862	0.849	0.735
Brown's Island West	0.531	0.626	0.000	0.000	0.637	0.735
Bull Island North	0.157	0.201	1.046	0.638	0.716	0.477
Bull Island South	0.968	0.367	0.635	0.455	0.572	0.369
Carl's Marsh North	0.226	0.462	1.410	1.189	0.361	0.474
Carl's Marsh South	0.113	0.231	0.866	0.759	0.449	0.469
Coon Island Central	0.531	0.240	0.755	0.327	0.637	0.300
Coon Island East	1.273	1.801	0.000	0.000	0.000	0.000
Coon Island West	0.637	0.490	0.000	0.000	0.000	0.000
Pond 2A Central	0.821	0.320	0.869	0.749	0.590	0.402
Pond 2A East	1.291	0.614	1.493	0.656	1.087	0.445
Pond 2A Southwest	0.862	0.442	0.676	0.447	1.142	0.503
Sherman Lake North Central	2.716	0.581	0.255	0.255	0.382	0.403
Sherman Lake South Central	2.502	1.031	0.853	0.429	0.424	0.300
Sherman Lake Southwest	2.617	1.060	0.849	0.849	0.849	0.625

Table 6, cont.
B) Marsh Wren

	Marsh Wren					
	Spring		Fall		Winter	
Subsite	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island Central	6.225	0.889	3.395	0.442	2.653	0.534
Brown's Island North	6.175	1.546	5.305	1.945	2.016	0.735
Brown's Island West	4.138	1.072	4.456	1.424	3.024	1.363
Bull Island North	7.645	1.310	4.881	1.209	2.588	0.910
Bull Island South	8.775	1.542	3.332	0.564	2.645	0.918
Carl's Marsh North	5.651	1.558	5.477	1.575	3.810	1.725
Carl's Marsh South	4.691	0.861	3.882	1.086	2.491	0.944
Coon Island Central	2.664	0.669	2.924	0.757	1.910	0.503
Coon Island East	3.820	0.000	0.000	0.000	0.000	0.000
Coon Island West	5.199	1.666	3.820	1.273	1.592	2.410
Pond 2A Central	5.515	1.066	4.885	1.306	3.530	2.169
Pond 2A East	5.632	1.312	4.869	1.364	6.849	1.222
Pond 2A Southwest	3.606	0.857	6.018	1.267	3.742	0.752
Sherman Lake North Central	3.268	1.181	3.056	0.624	1.528	0.632
Sherman Lake South Central	5.551	1.600	4.928	1.251	2.670	1.183
Sherman Lake Southwest	4.173	1.405	3.608	0.300	2.476	0.548

Table 6, continued.
C) Song Sparrow

	Song Sparrow					
	Spring		Fall		Winter	
Subsite	Mean density index	SE	Mean density index	SE	Mean density index	SE
Brown's Island Central	3.749	0.966	3.183	1.261	2.865	1.007
Brown's Island North	4.287	2.127	4.350	2.612	3.714	2.382
Brown's Island West	4.244	2.388	4.456	0.637	1.910	0.900
Bull Island North	5.686	1.018	4.464	0.815	5.711	1.763
Bull Island South	5.876	0.796	5.367	1.147	5.844	1.489
Carl's Marsh North	7.121	1.937	9.942	2.251	11.459	4.132
Carl's Marsh South	6.377	1.525	8.487	3.616	9.127	2.218
Coon Island Central	7.439	0.930	4.338	0.638	6.295	1.196
Coon Island East	3.820	0.000	0.000	0.000	0.000	0.000
Coon Island West	4.244	0.490	4.669	1.945	4.456	3.031
Pond 2A Central	5.557	0.904	5.546	1.860	6.625	2.385
Pond 2A East	7.975	1.942	6.226	2.025	10.063	2.680
Pond 2A Southwest	5.385	1.254	4.658	1.559	6.887	1.228
Sherman Lake North Central	7.088	1.510	5.220	1.260	4.329	1.452
Sherman Lake South Central	8.197	2.495	3.426	0.966	3.625	1.462
Sherman Lake Southwest	6.366	2.006	5.517	1.801	3.360	1.061

Table 7. Summary of Black Rail and Clapper Rail surveys conducted during breeding seasons 2004 and 2005. Shown are mean density (number of individuals detected per survey per hectare surveyed), S.E. of density, number of survey stations (averaged over the set of surveys), proportion of survey stations at which target species was detected, and its S.E.

site	Mean Dens	SE Dens	N station (average)	Proportion stat'ns detctd	SE Propn stat'ns detctd
Black Rail survey					
Brown's Island	4.00	0.76	6.75	0.74	0.034
Bull Island	1.91	0.43	5.80	0.58	0.076
Carl's Marsh	0.70	0.57	7.25	0.20	0.172
Coon Island	4.38	1.00	7.00	0.81	0.030
Pond 2A	1.03	0.20	12.25	0.28	0.054
Sherman Island	2.53	0.33	7.75	0.52	0.018
Clapper Rail survey					
Brown's Island	0		0.00		
Bull Island	0	0	7.00	0	0
Carl's Marsh	0.045	0.006	5.20	0.500	0.06
Coon Island	0.156	0.073	6.40	0.630	0.179
Pond 2A	0.003	0.003	8.33	0.037	0.037
Sherman Island	0		0.00		

Note: No Clapper Rail surveys were conducted at Brown's Island and Sherman Island. These sites are outside the current geographic range for this species.

Table 8. Song Sparrow breeding densities at Carl's Marsh, Pond 2A, and China Camp, 2004 and 2005. For territory mapping method, please see text.

marsh	number of territories	area (ha)	density (pairs/ha)	density (birds/ha)
Carl's Marsh 2004				
Plot A	38	9.02	4.21	8.42
Plot B	37	13.55	2.73	5.46
Total	**75**	**21.63**	**3.32**	**6.64**
Carl's Marsh 2005				
Plot A	48	14.03	3.42	6.84
Plot B	41	9.46	4.33	8.67
Total	**89**	**23.49**	**3.79**	**7.58**
Pond 2A 2004				
Plot A	35	6.43	5.44	10.89
Plot B	44	5.37	8.20	16.40
Total	**79**	**11.8**	**6.70**	**13.40**
Pond 2A 2005				
Plot A	39	5.67	6.88	13.76
Plot B	51	5.37	9.50	18.99
Total	**90**	**11.04**	**8.15**	**16.30**
China Camp 2004				
Plot A	67	11.49	5.83	11.76
Plot B	69	10.14	6.80	13.60
Total	**136**	**21.63**	**6.29**	**12.58**
China Camp 2005				
Plot A	76	11.49	6.61	13.23
Plot B	70	10.14	6.90	13.81
Total	**146**	**21.63**	**6.75**	**13.50**

Table 9. Song Sparrow nest survival probability: Mayfield method and proportion of nests successful. A comparison of San Pablo Bay Song Sparrow (*Melospiza melodia samuelis*) at Carl's Marsh, Pond 2A, and China Camp for the 2004 and 2005 field seasons.

Site	Nest Phase	Sample size	Daily Mayfield nest success [1]		Mayfield nest success rate for period [2]	Mayfield period nest success 95% confidence interval		Raw Proportion Successful [3]
			Rate	SE		Lower	Upper	
Carl's Marsh 2004	Overall	75	0.886	0.013	**0.064**	0.033	0.122	0.133
	Laying / Incubation	67	0.895	0.015	0.218	0.037	0.163	
	Nestling	28	0.865	0.026	0.267	0.009	0.141	
Carl's Marsh 2005	Overall	92	0.914	0.01	**0.130**	0.08	209	0.207
	Laying / Incubation	83	0.911	0.011	0.281	0.067	0.211	
	Nestling	35	0.923	0.017	0.481	0.067	0.375	
Pond 2A 2004	Overall	33	0.941	0.019	**0.249**	0.098	0.616	0.303
	Laying / Incubation	29	0.987	0.013	0.84	0.415	1.327	
	Nestling	20	0.890	0.037	0.346	0.01	0.429	
Pond 2A 2005	Overall	62	0.950	0.008	**0.312**	0.207	0.466	0.468
	Laying / Incubation	47	0.959	0.011	0.564	0.229	0.637	
	Nestling	47	0.944	0.013	0.590	0.143	0.495	
China Camp 2004	Overall	101	0.923	0.008	**0.160**	0.108	0.234	0.267
	Laying / Incubation	86	0.951	0.008	0.507	0.218	0.470	
	Nestling	66	0.876	0.016	0.297	0.021	0.108	
China Camp 2005	Overall	147	0.912	0.008	**0.123**	0.083	0.182	0.211
	Laying / Incubation	125	0.923	0.009	0.335	0.102	0.252	
	Nestling	81	0.8929	0.0143	0.3550	0.0360	0.1552	

1 The Mayfield method of calculating nest survival probability or success takes into account the number of days each nest was under observation
2 The success rate for each phase or period of the nest cycle is calculated as the daily survival for the period to the nth power where n = the number of days in the period: laying = 1.996 days, incubation = 11.661, nestling = 9.145. The arrows represent change in rate from 2004.
3 The proportion successful is the number of nests that fledged at least one young divided by the total number of active nests found. Here the sample size includes only nests used for Mayfield calculations, i.e. nests observed while still active.

Table 10. Nests of breeding birds located during the 2004 and 2005 breeding seasons at Carl's Marsh, Pond 2A., and China Camp.

		American Goldfinch	Black Rail	Clapper Rail	Common Yellowthroat	Gadwall	House Finch	Mallard	Marsh Wren	Mourning Dove	Red-winged Blackbird	Song Sparrow	Virginia Rail
	Carl's Marsh												
2004	Total nests found	0	1	0	1	0	0	1	30	0	8	102	0
2004	Total nests of known fate	0	0	0	1	0	0	0	12	0	7	75	0
2004	Successful nests	0	0	0	0	0	0	0	5	0	3	10	0
2005	Total nests found	0	0	1	0	1	1	0	47	0	4	131	0
2005	Total nests of known fate	0	0	0	0	1	1	0	14	0	4	96	0
2005	Successful nests	0	0	0	0	1	0	0	2	0	4	20	0
	Pond 2A												
2004	Total nests found	0	0	0	2	0	0	0	19	0	0	54	0
2004	Total nests of known fate	0	0	0	2	0	0	0	7	0	0	41	0
2004	Successful nests	0	0	0	1	0	0	0	3	0	0	12	0
2005	Total nests found	0	1	0	4	0	0	0	17	0	0	90	1
2005	Total nests of known fate	0	0	0	3	0	0	0	10	0	0	64	1
2005	Successful nests	0	0	0	1	0	0	0	5	0	0	31	1
	China Camp												
2004	Total nests found	1	3	2	0	0	0	1	1	0	0	143	0
2004	Total nests of known fate	1	3	0	0	0	0	1	0	0	0	102	0
2004	Successful nests	1	2	0	0	0	0	0	0	0	0	27	0
2005	Total nests found	1	1	3	0	0	0	0	0	1	0	214	0
2005	Total nests of known fate	1	1	2	0	0	0	0	0	1	0	149	0
2005	Successful nests	1	0	1	0	0	0	0	0	0	0	31	0

Table 11. Summary of banding results in 2004 and 2005 field season for Song Sparrows.

Site	Total Newly Captured	Adults	Juveniles	Nestlings
Carl's Marsh 2004	26	5	0	21
Carl's Marsh 2005	71	15	4	52
Pond 2A 2004	4	0	0	4
Pond 2A 2005	37	3	0	34
China Camp 2004	57	8	0	49
China Camp 2005	106	2	0	104
Totals	301	33	4	264

7.0 Figures

Figure 1. IRWM Study sites for study period (2003 to 2005, with additional surveys in 2006) and additional tidal marsh sites studied in 2006. All sites (IRWM or not) are shown by a circle and dot. The IRWM study sites are (from west to east): Carl's Marsh, Coon Island, Pond 2A, Bull Island, Brown's Island and Sherman Island (a.k.a. Sherman Lake).

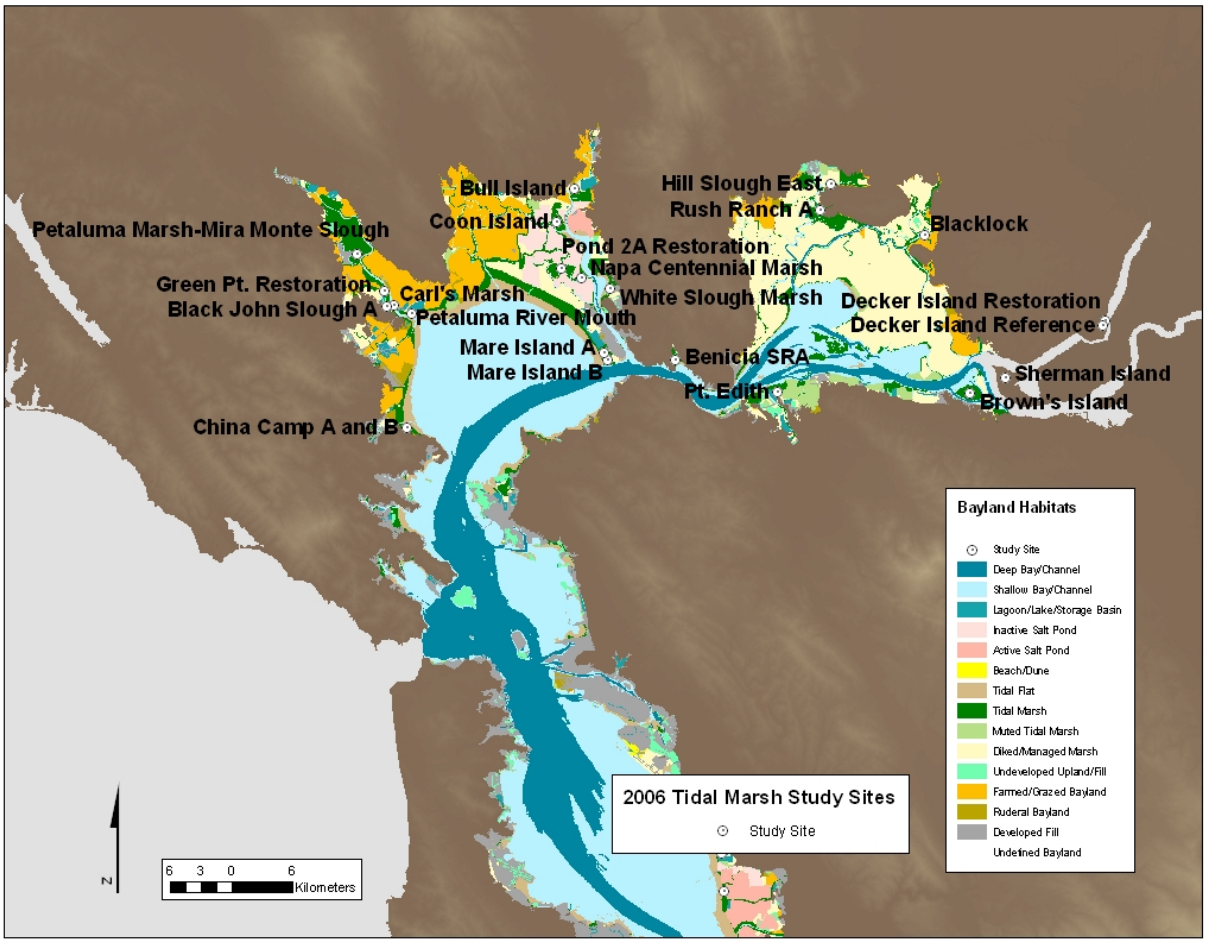


Figure 2. Map of survey locations (Rail Surveys [Black Rail, Clapper Rail], Area Surveys/Line Transects, Nest Plots, and Point Count surveys) for the six study marshes. Note that at many locations both rail surveys and point counts were carried out. Not all locations were surveyed in each year.

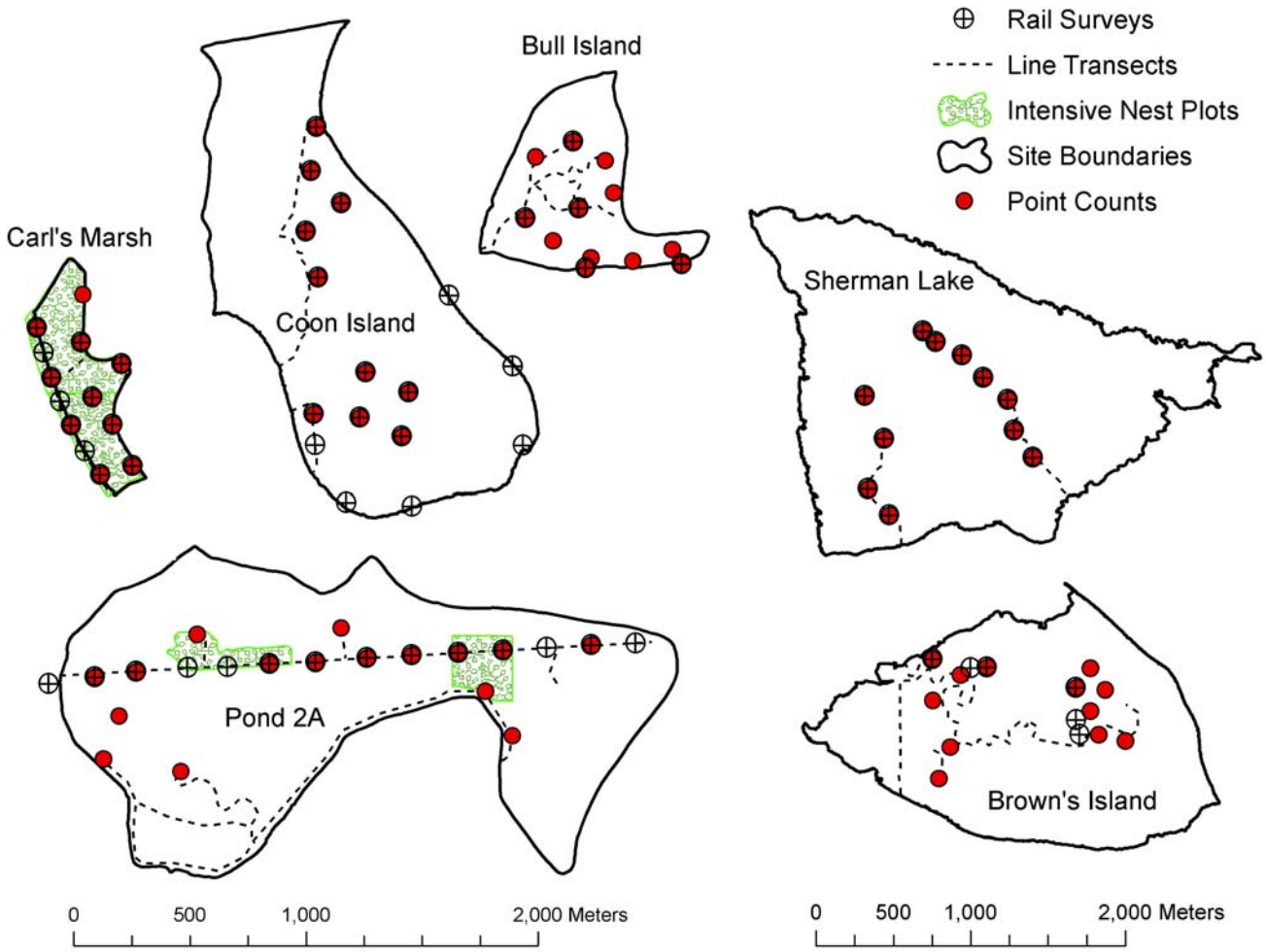


Figure 3. Heron and egret nesting colonies (open circles) within 10 km of historic tidal marsh in the northern San Francisco Bay area, 2004-2005. Cross-hatched areas indicate the locations of IRWM study marshes.

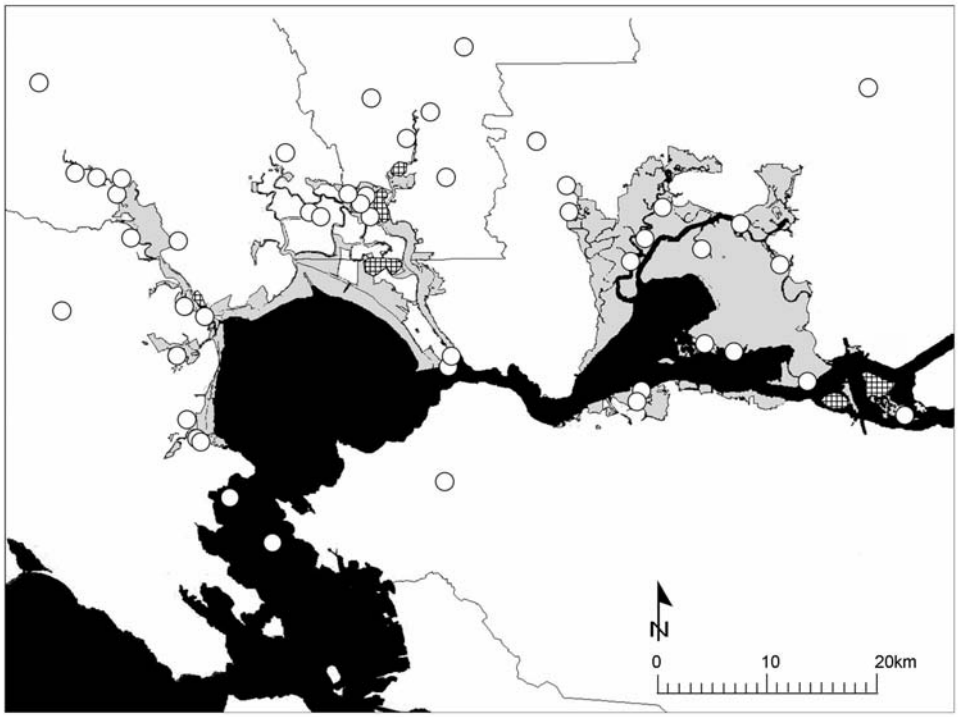


Figure 4. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

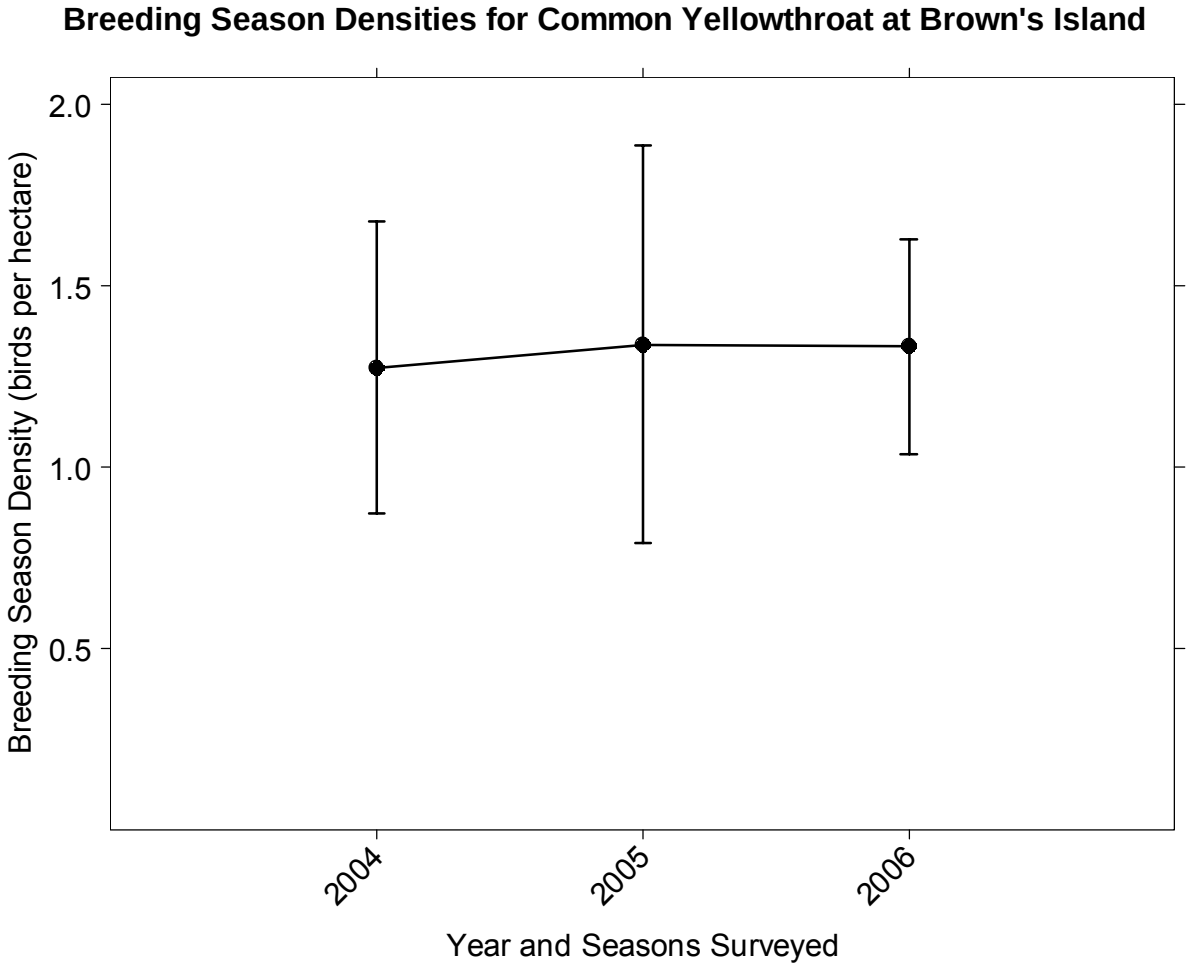


Figure 5. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

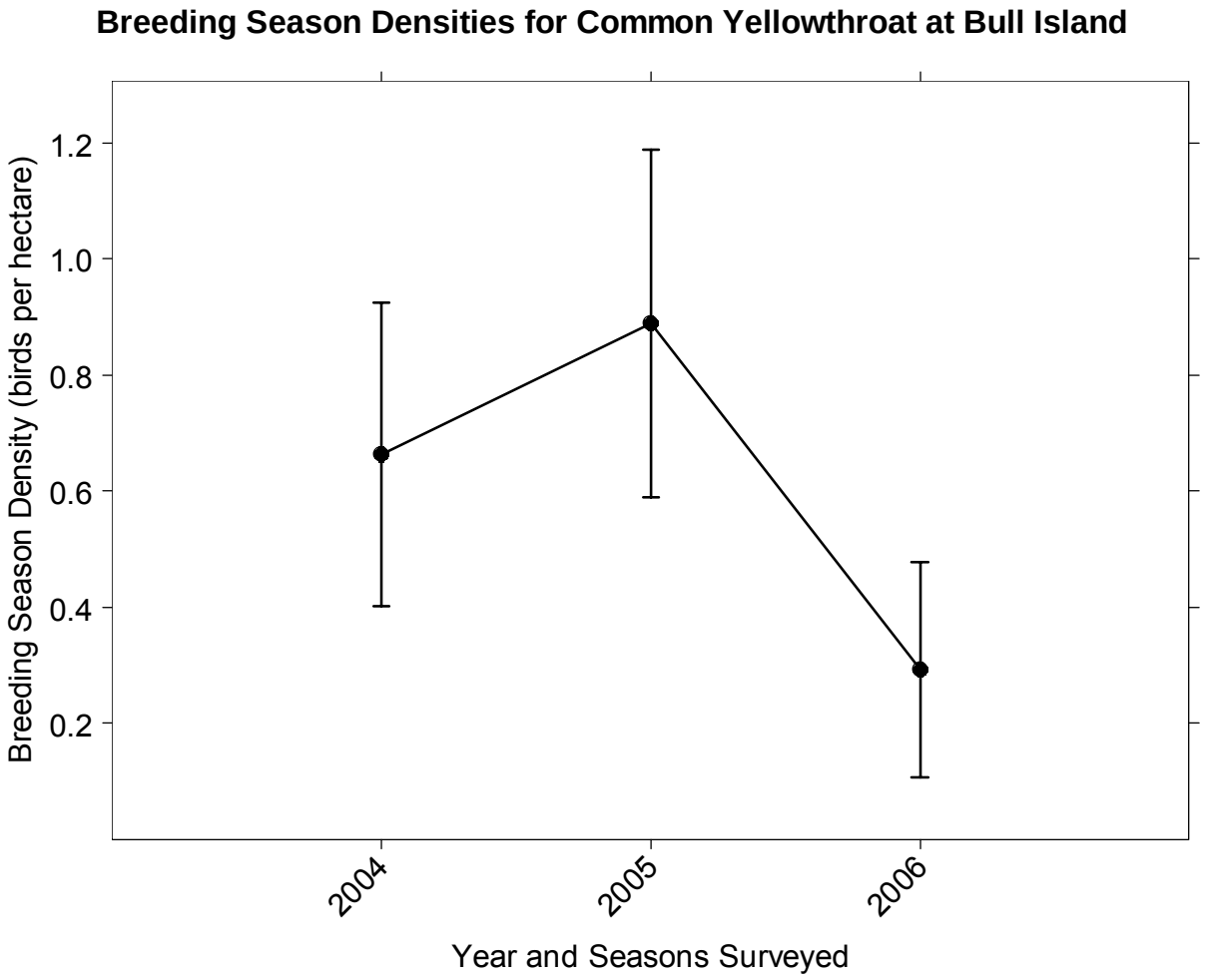


Figure 6. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

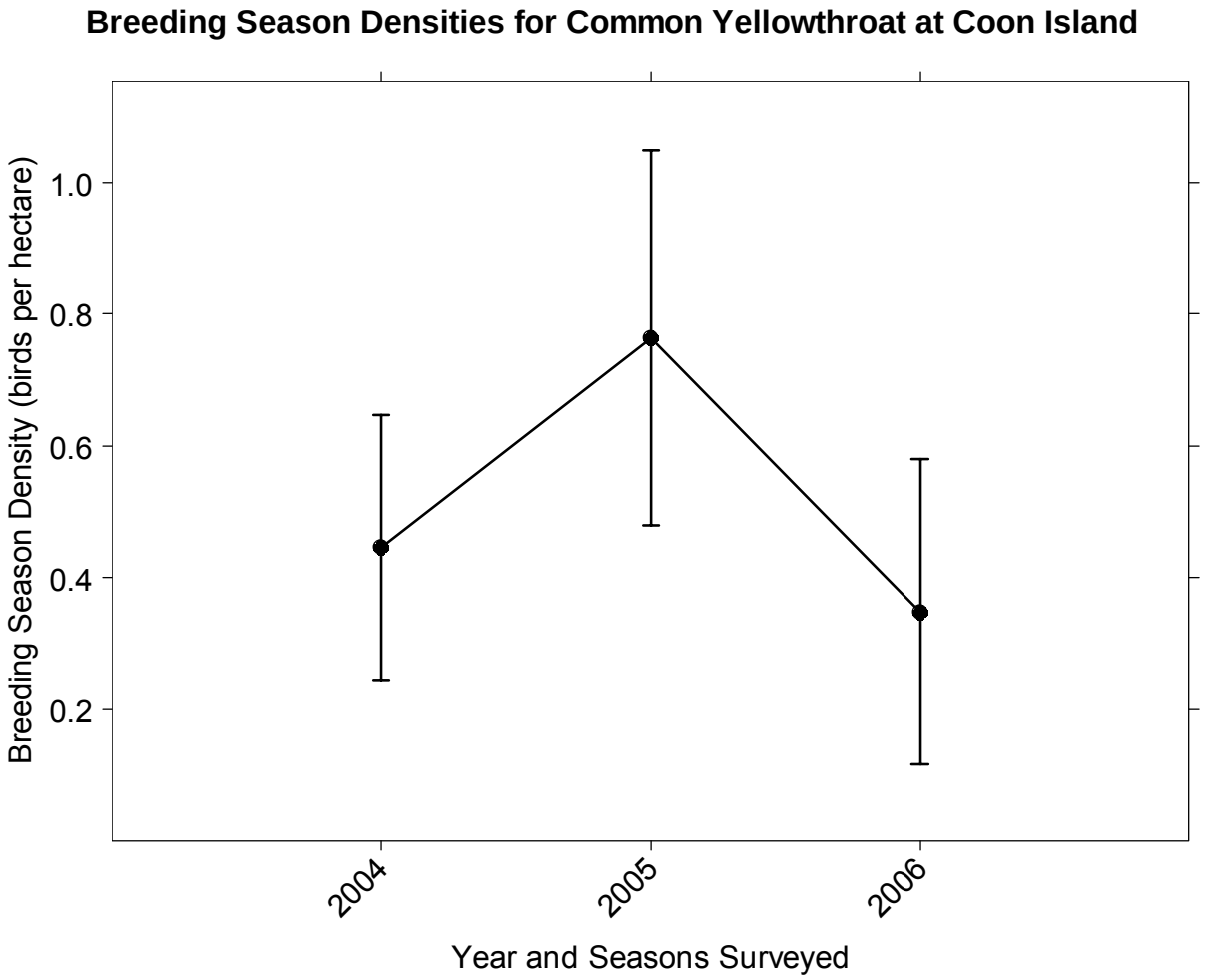


Figure 7. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Carl's Marsh during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

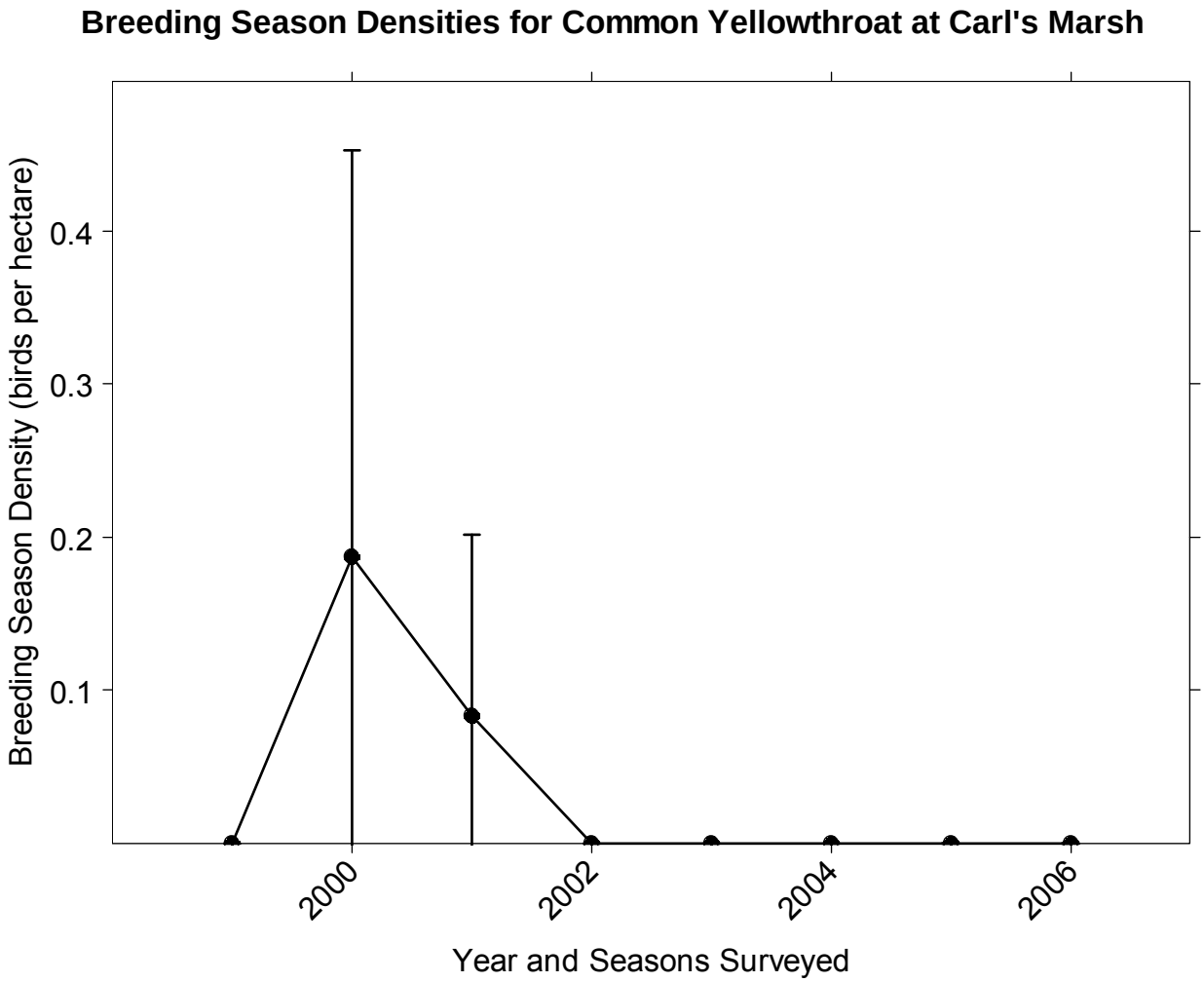


Figure 8. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

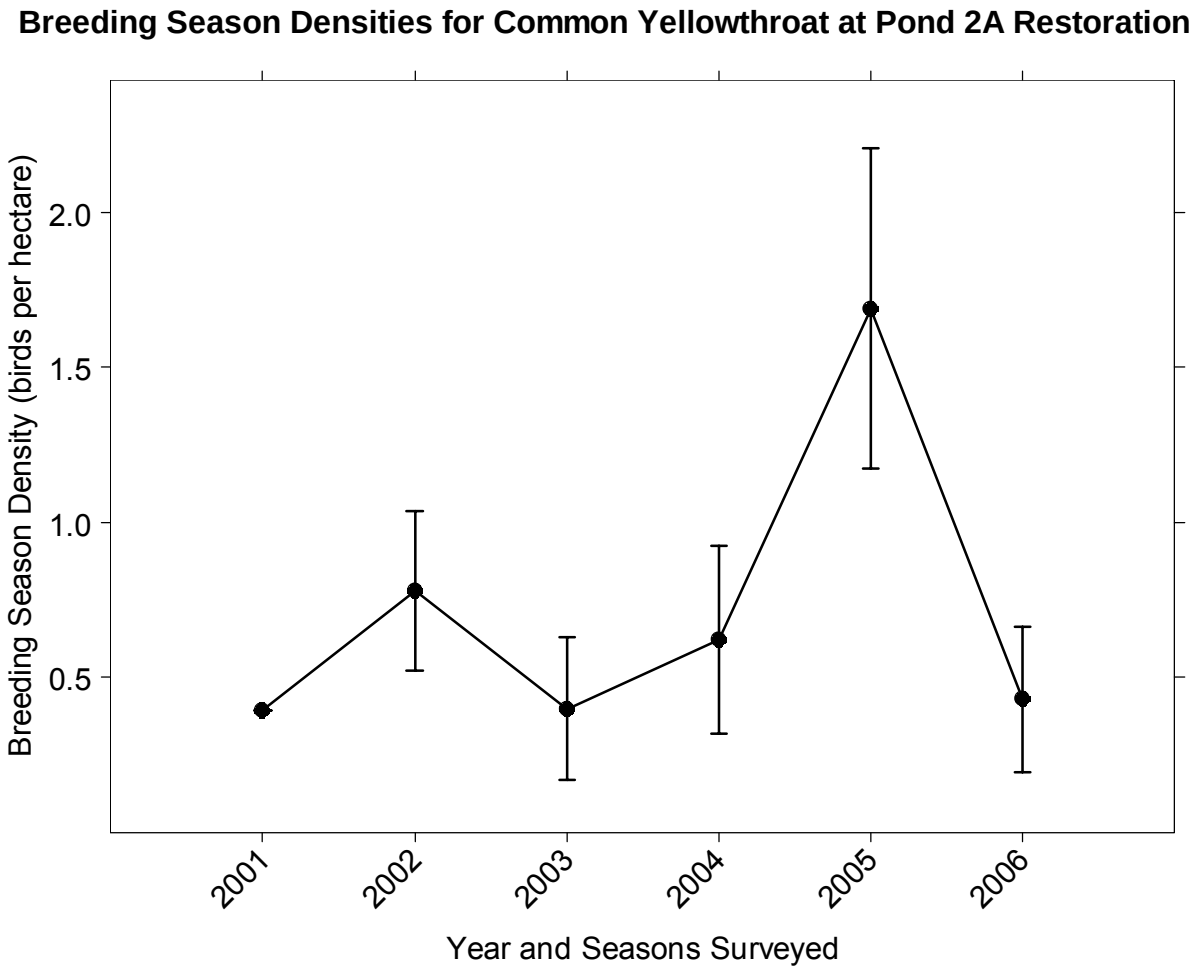


Figure 9. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Common Yellowthroat at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

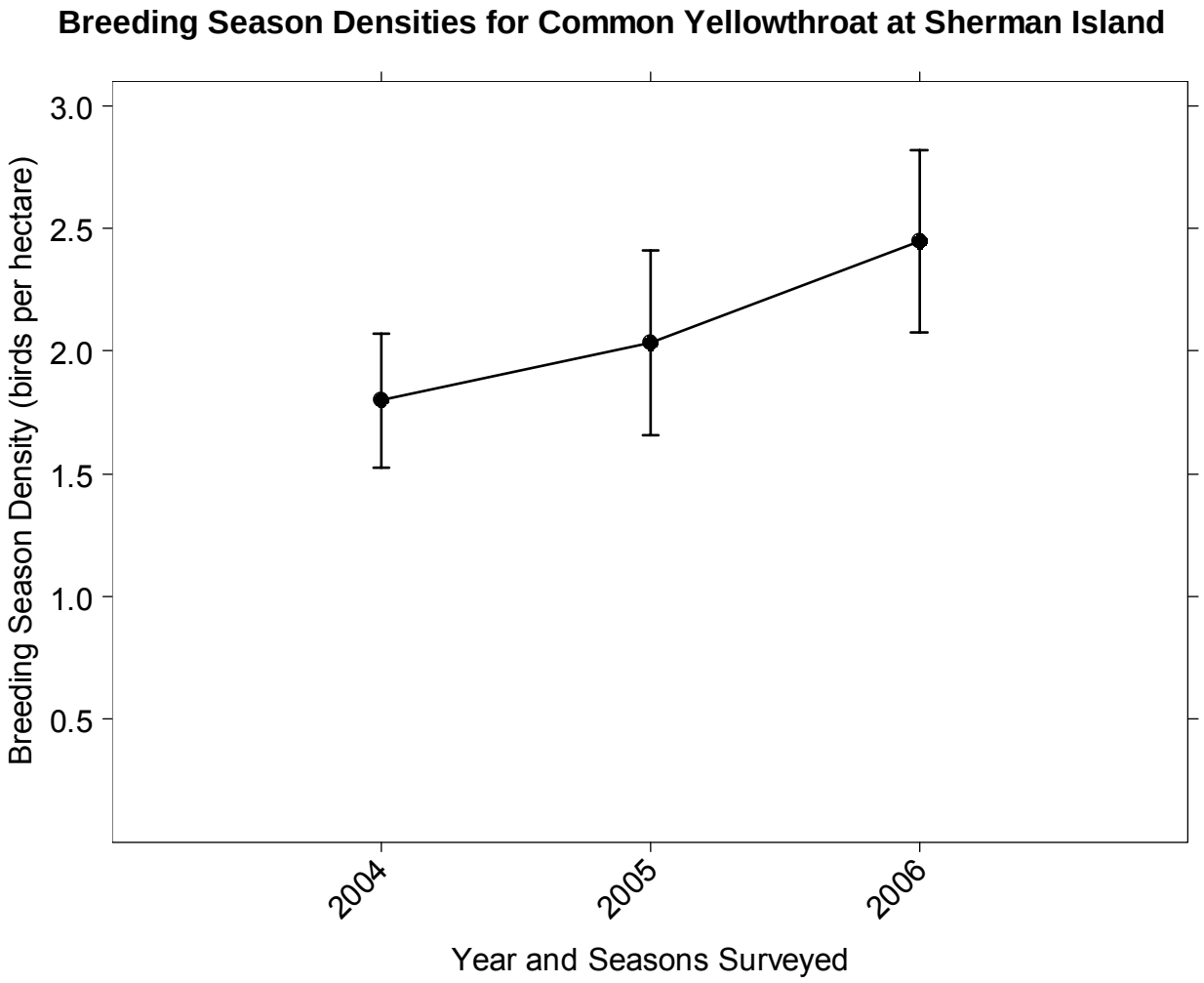


Figure 10. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

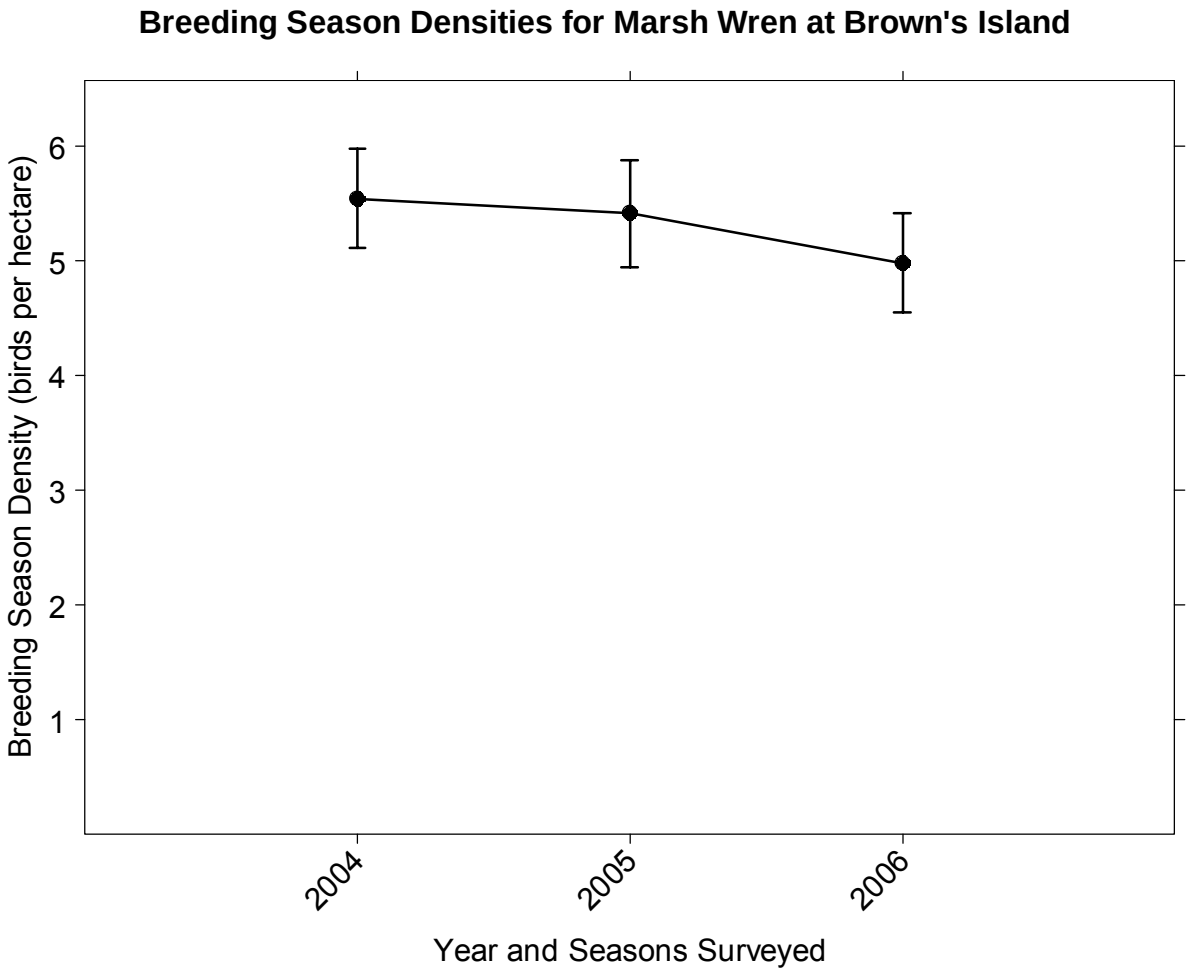


Figure 11. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

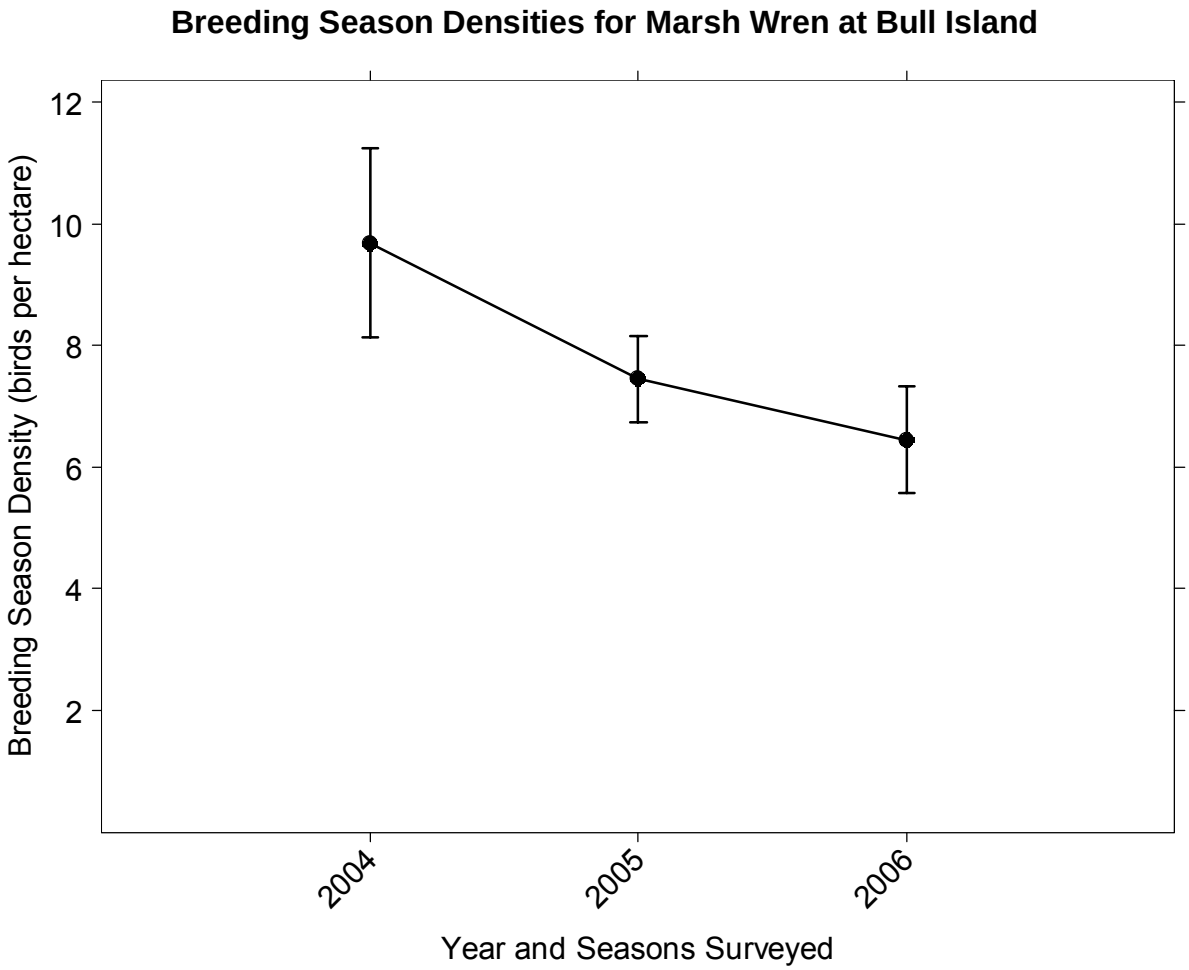


Figure 12. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

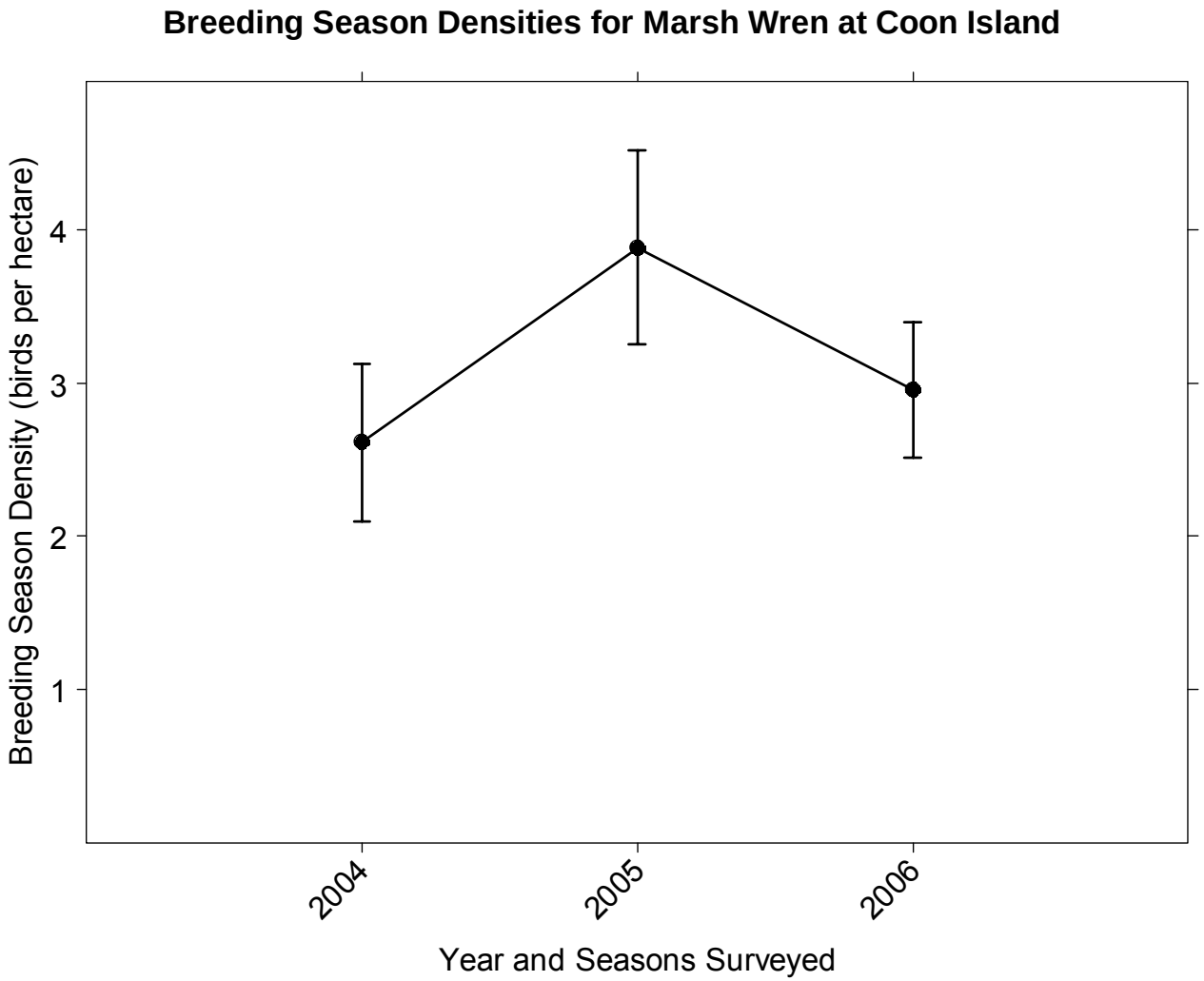


Figure 13. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Carl's Marsh during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

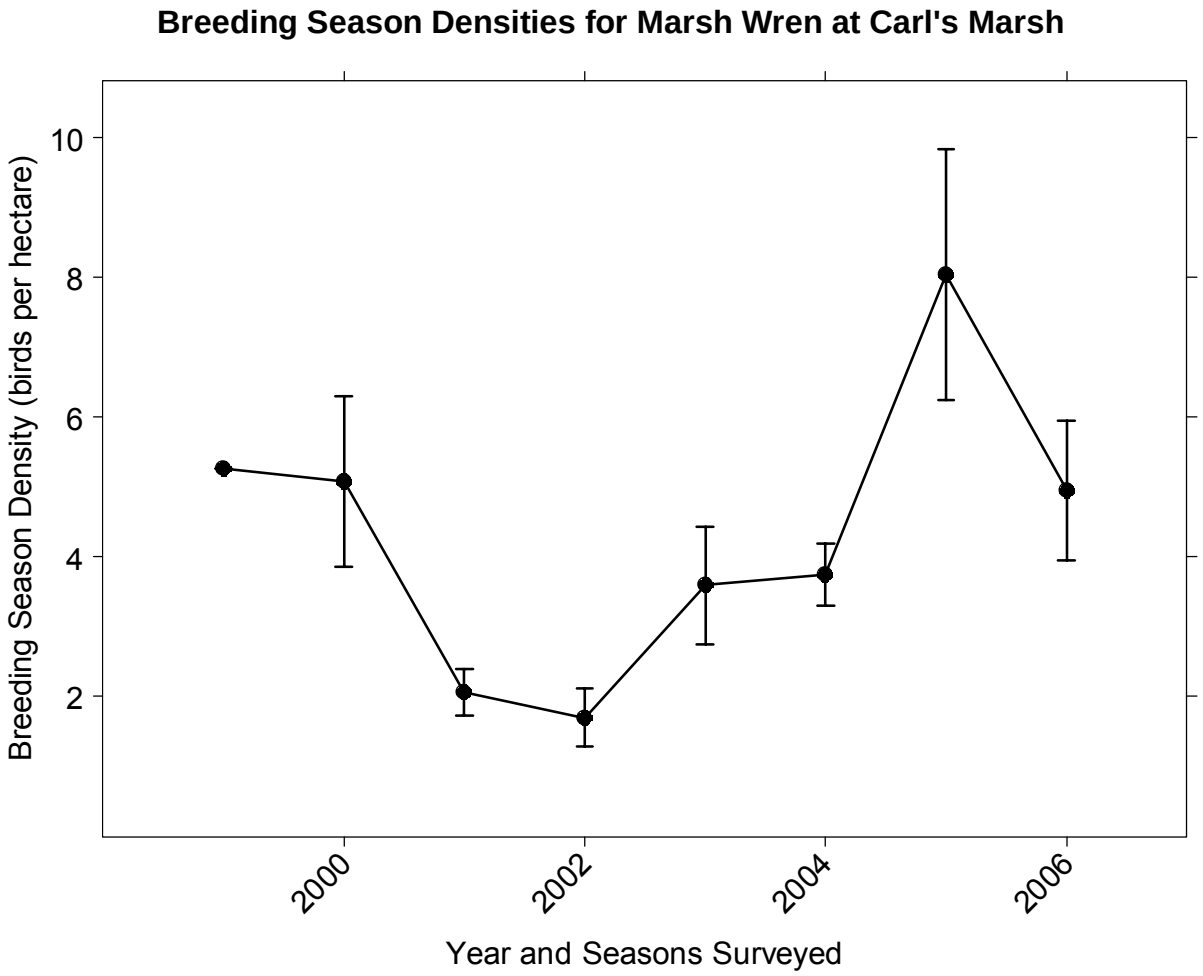


Figure 14. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

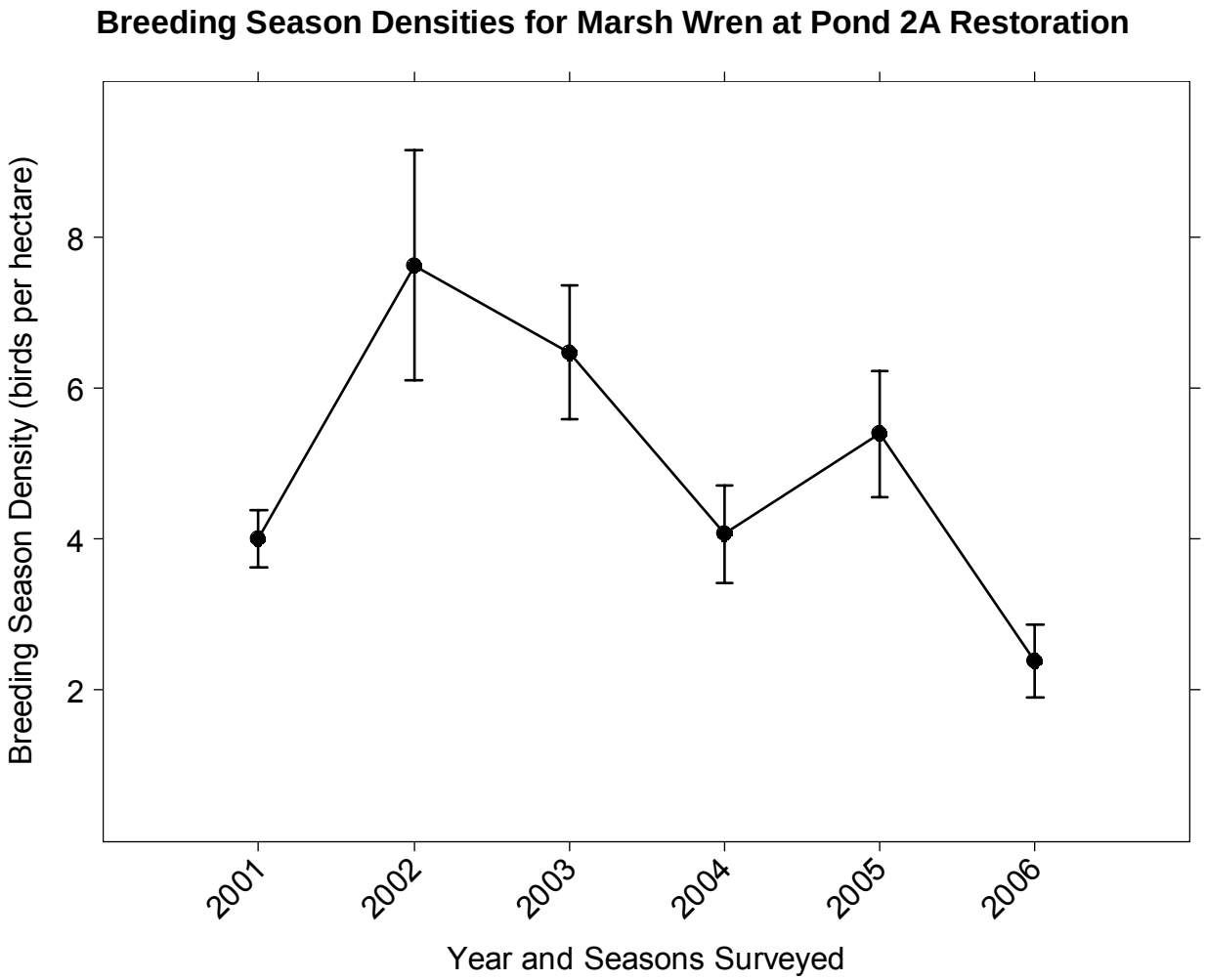


Figure 15. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Marsh Wren at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

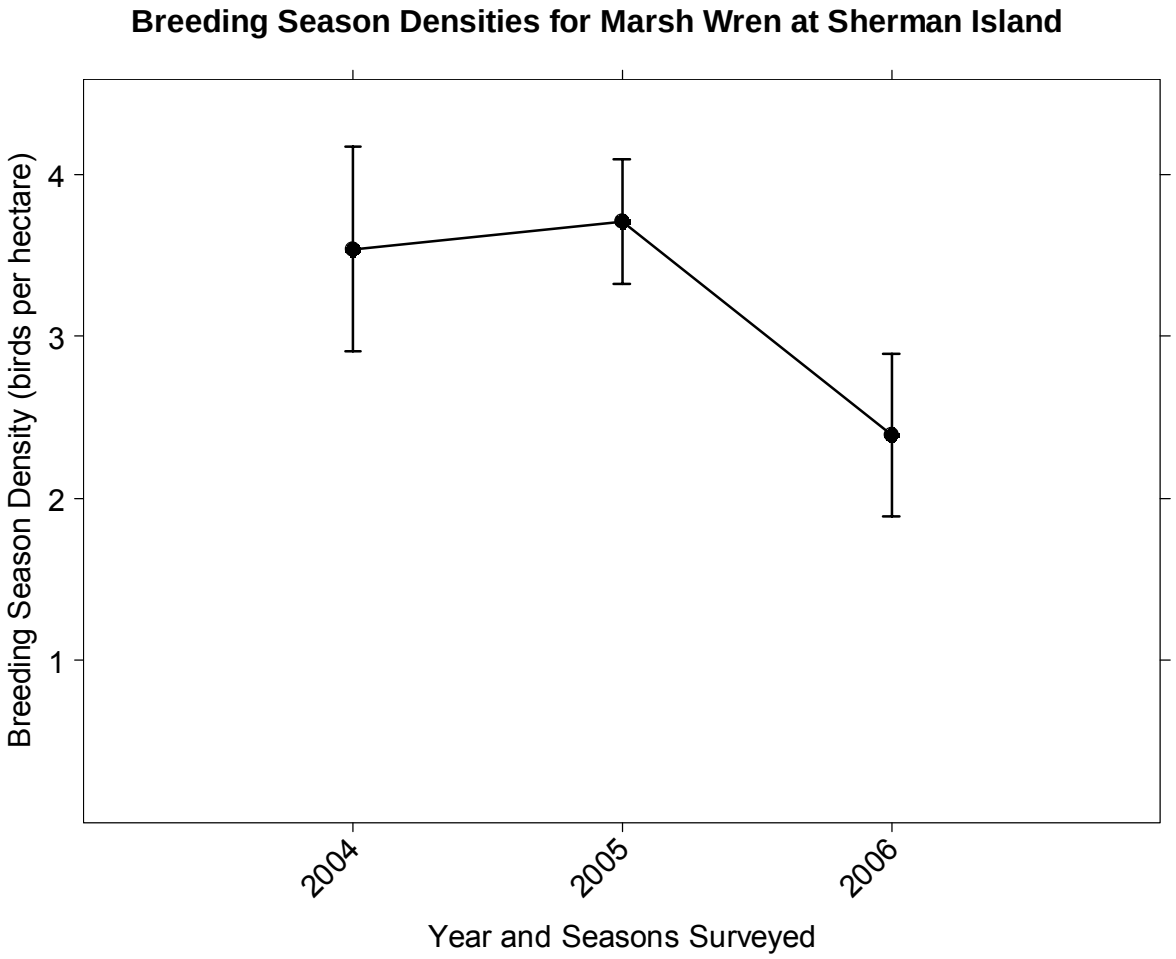


Figure 16. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

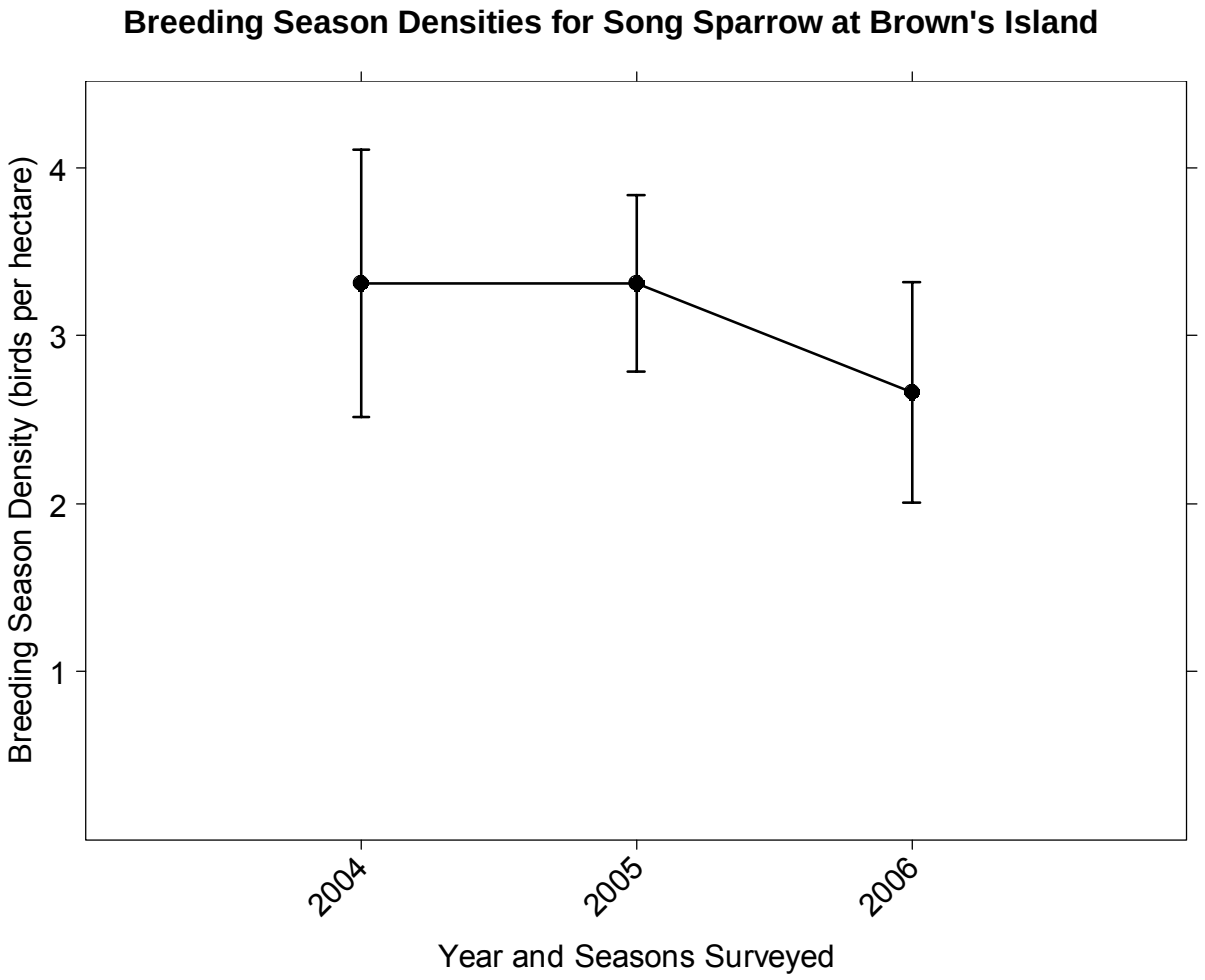


Figure 17. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

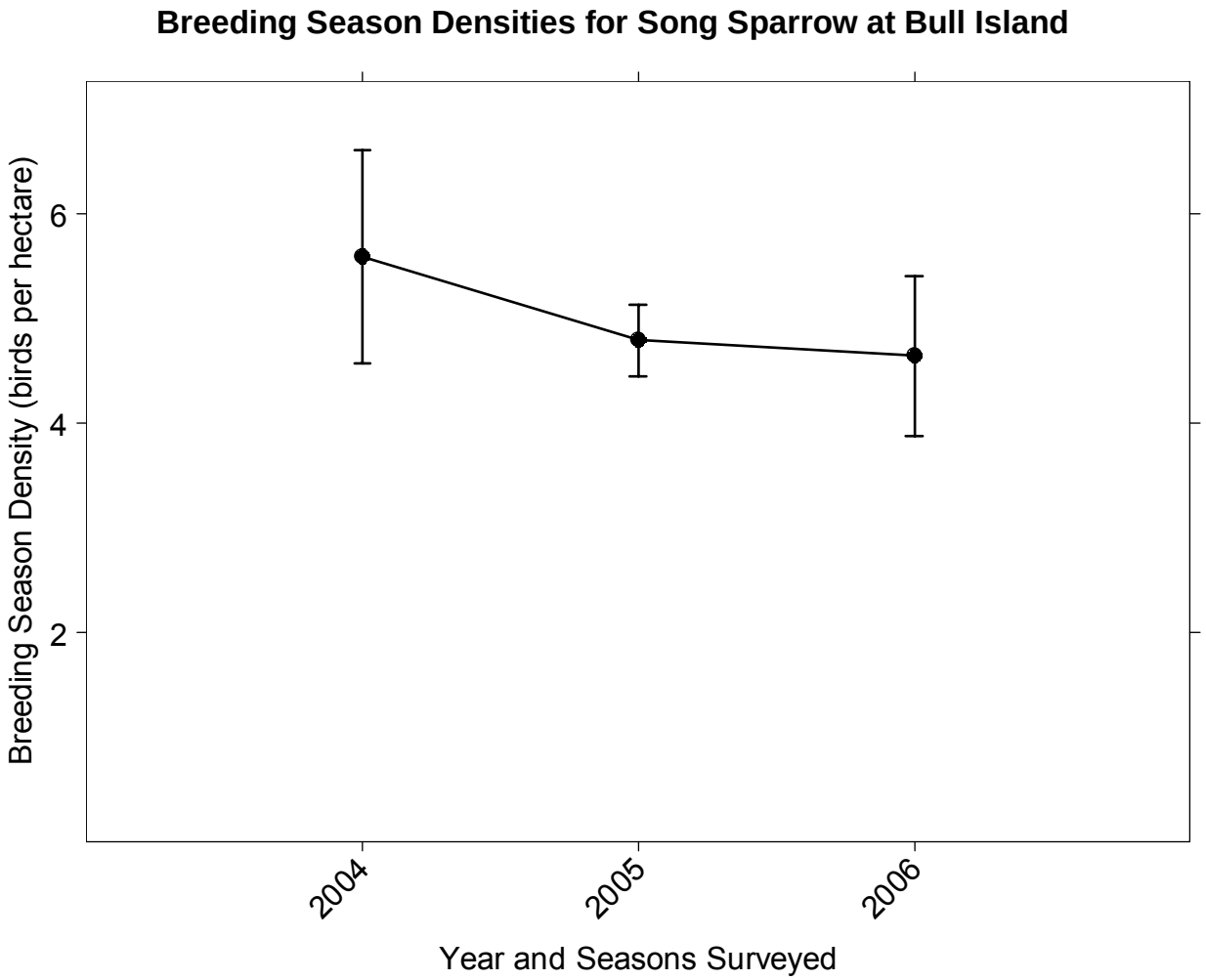


Figure 18. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

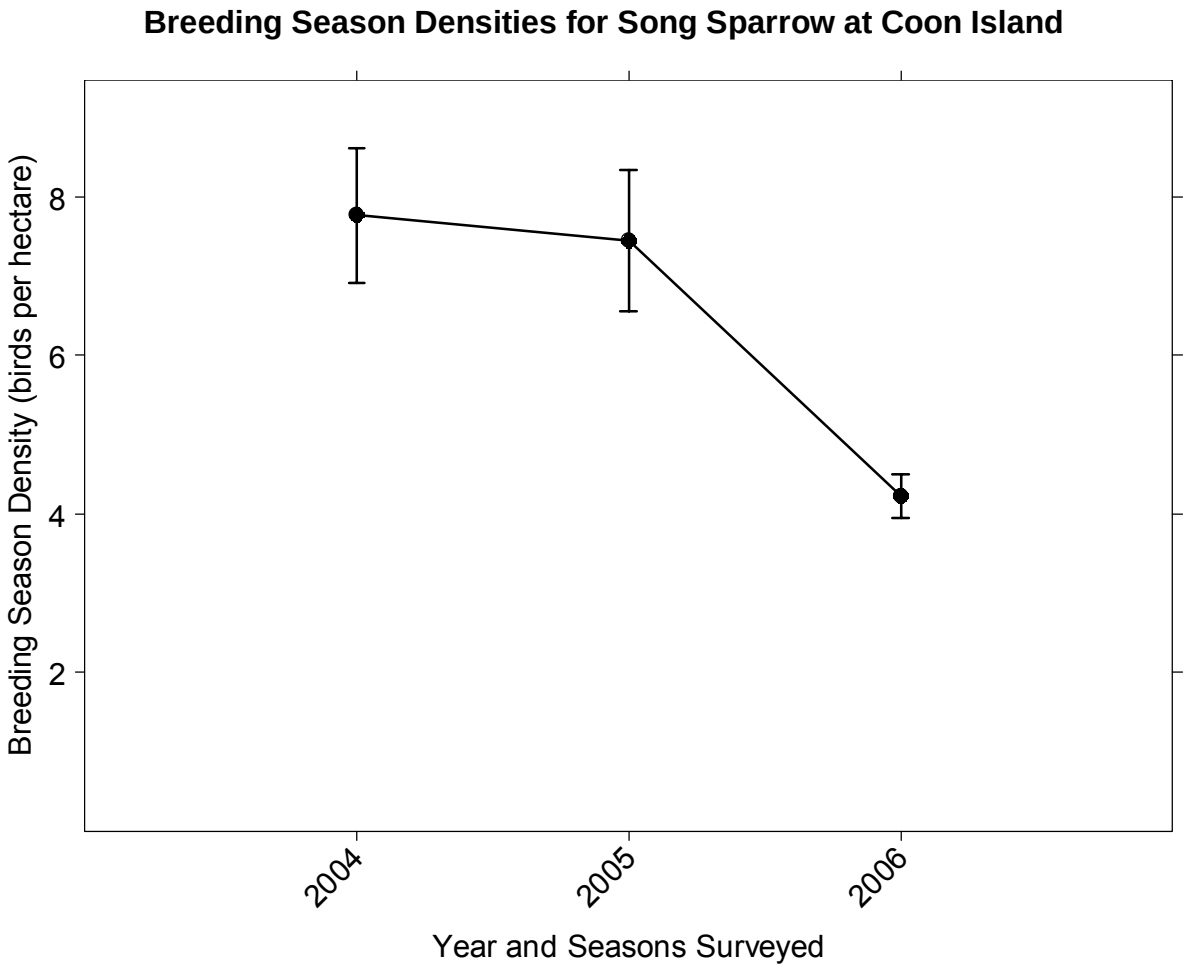


Figure 19. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Carl's Marsh during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

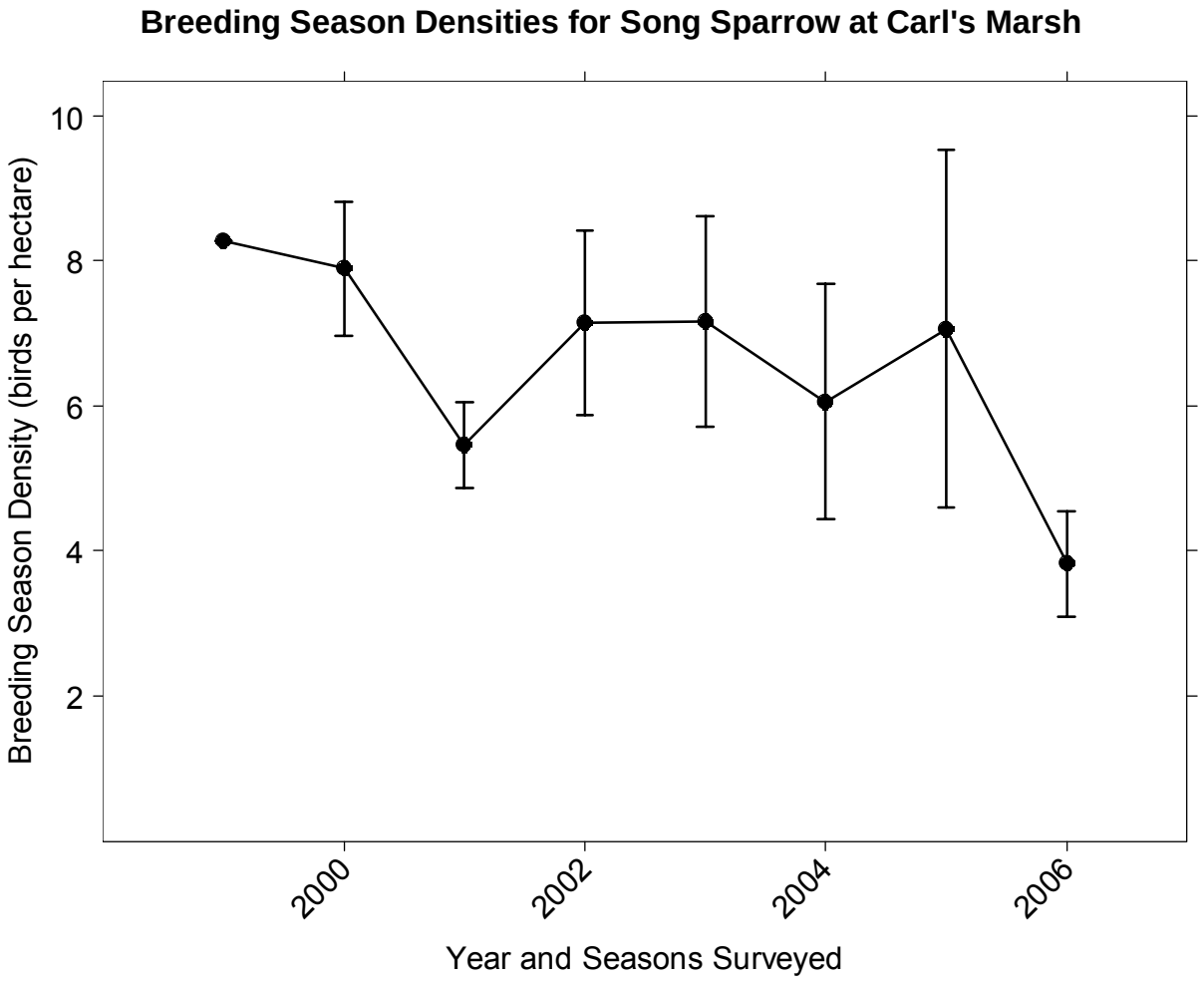


Figure 20. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

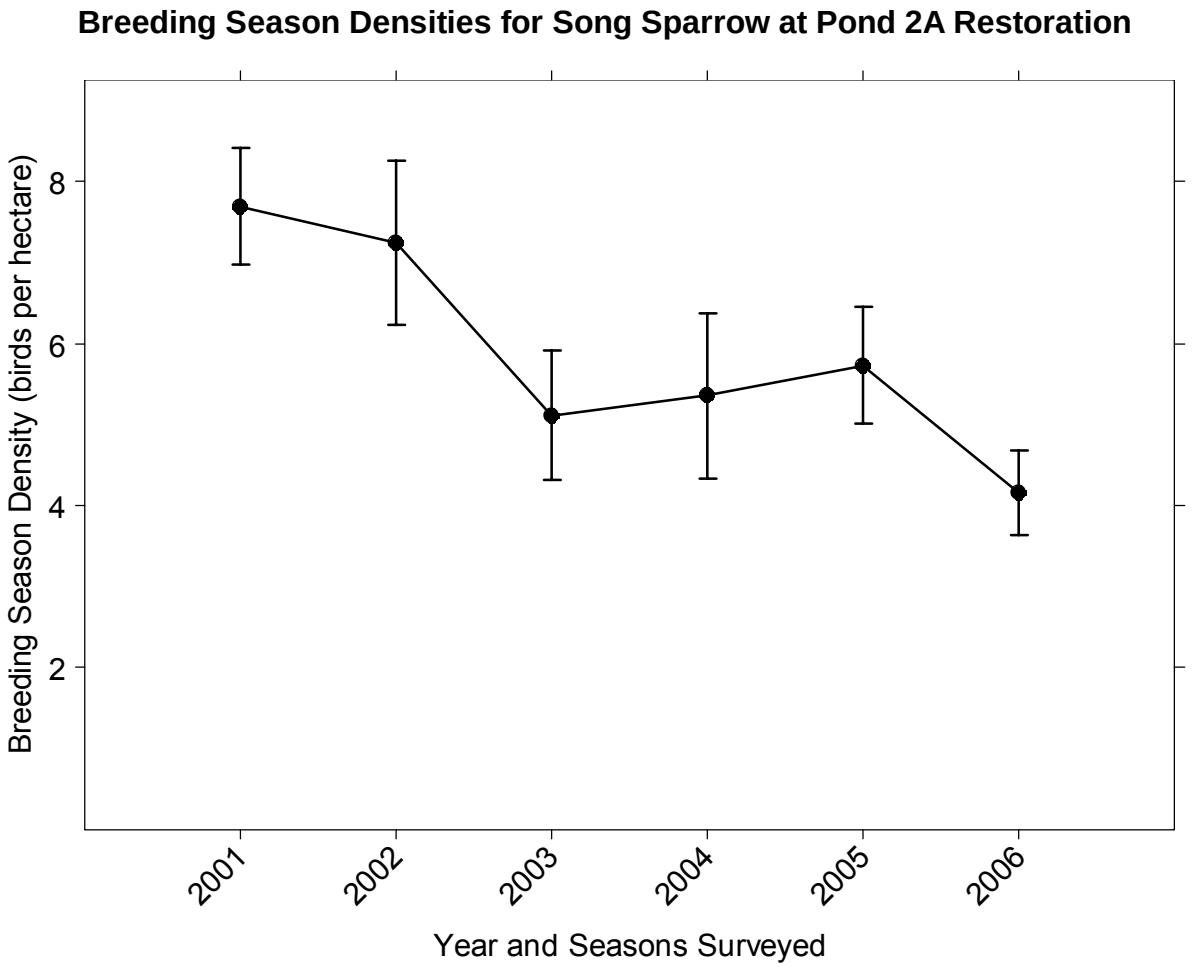


Figure 21. Observed density (number of birds detected with point counts per hectare of suitable habitat) of Song Sparrow at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean. IRWM project conducted in 2004 and 2005.

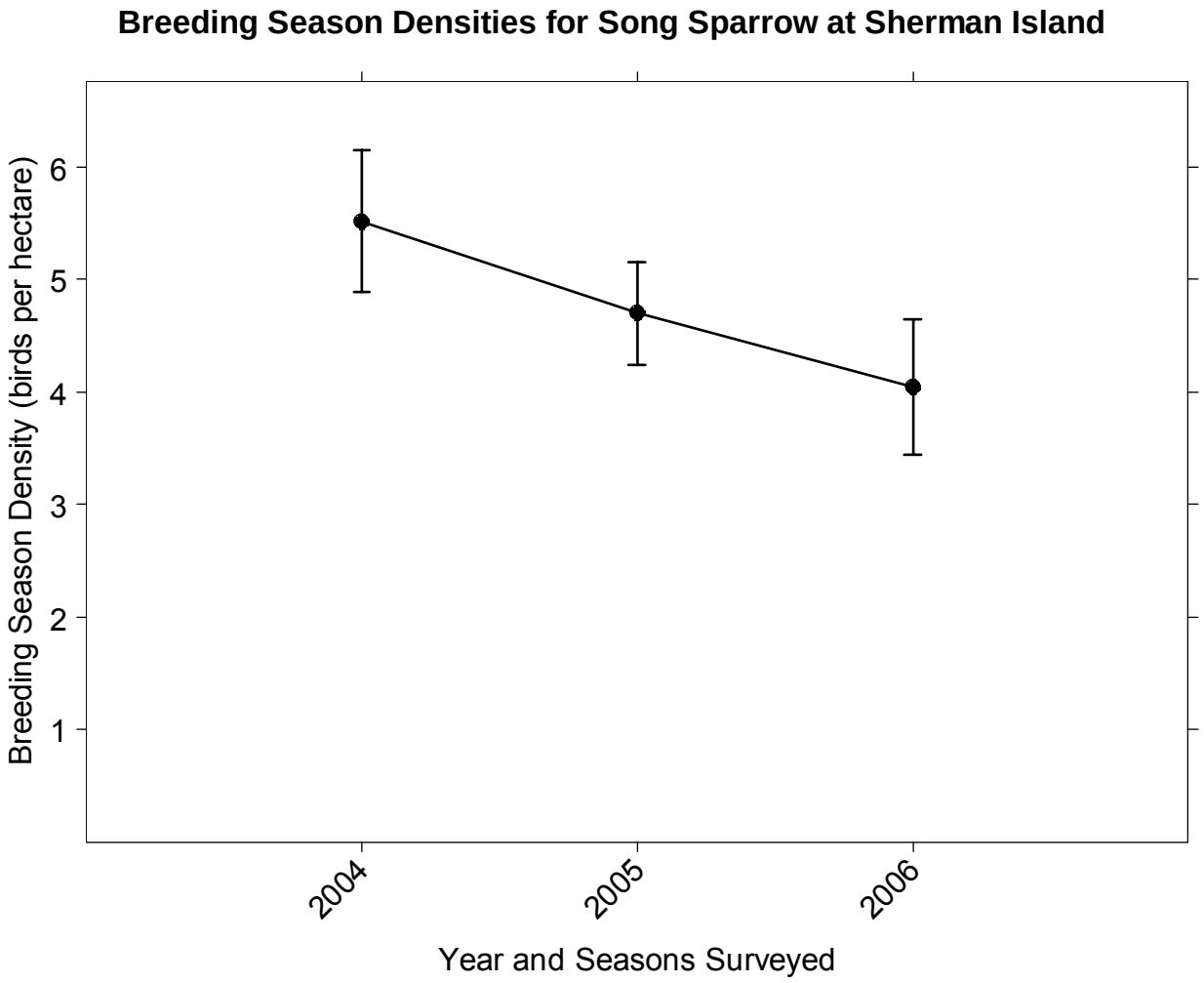


Figure 22. Observed density (number of birds detected with point counts per hectare of suitable habitat) of rails (Black Rail, Clapper Rail, Sora, and Virginia Rail) at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

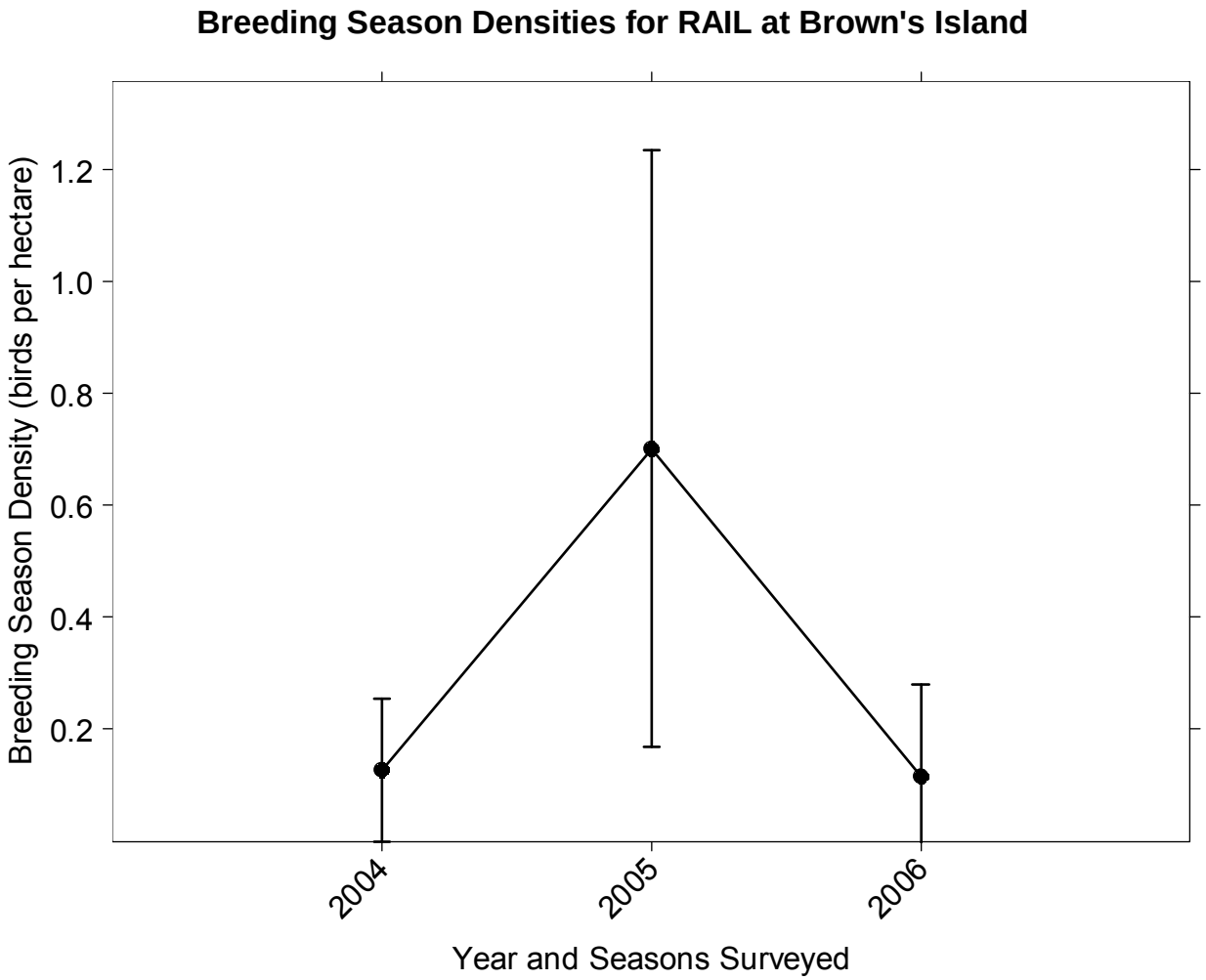


Figure 23. Observed density (number of birds detected with point counts per hectare of suitable habitat) of rails (Black Rail, Clapper Rail, Sora, and Virginia Rail) at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

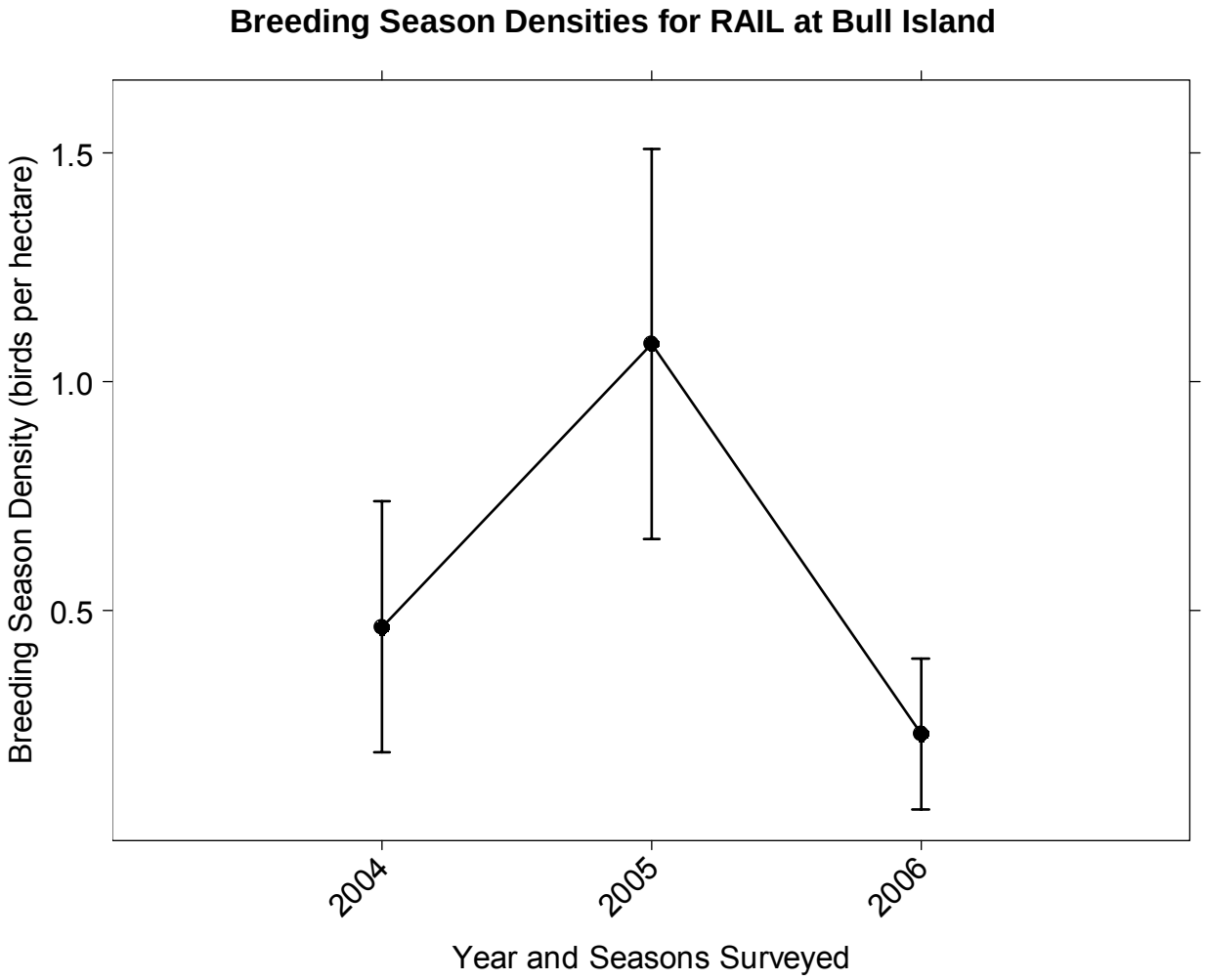


Figure 24. Observed density (number of birds detected with point counts per hectare of suitable habitat) of rails (Black Rail, Clapper Rail, Sora, and Virginia Rail) at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

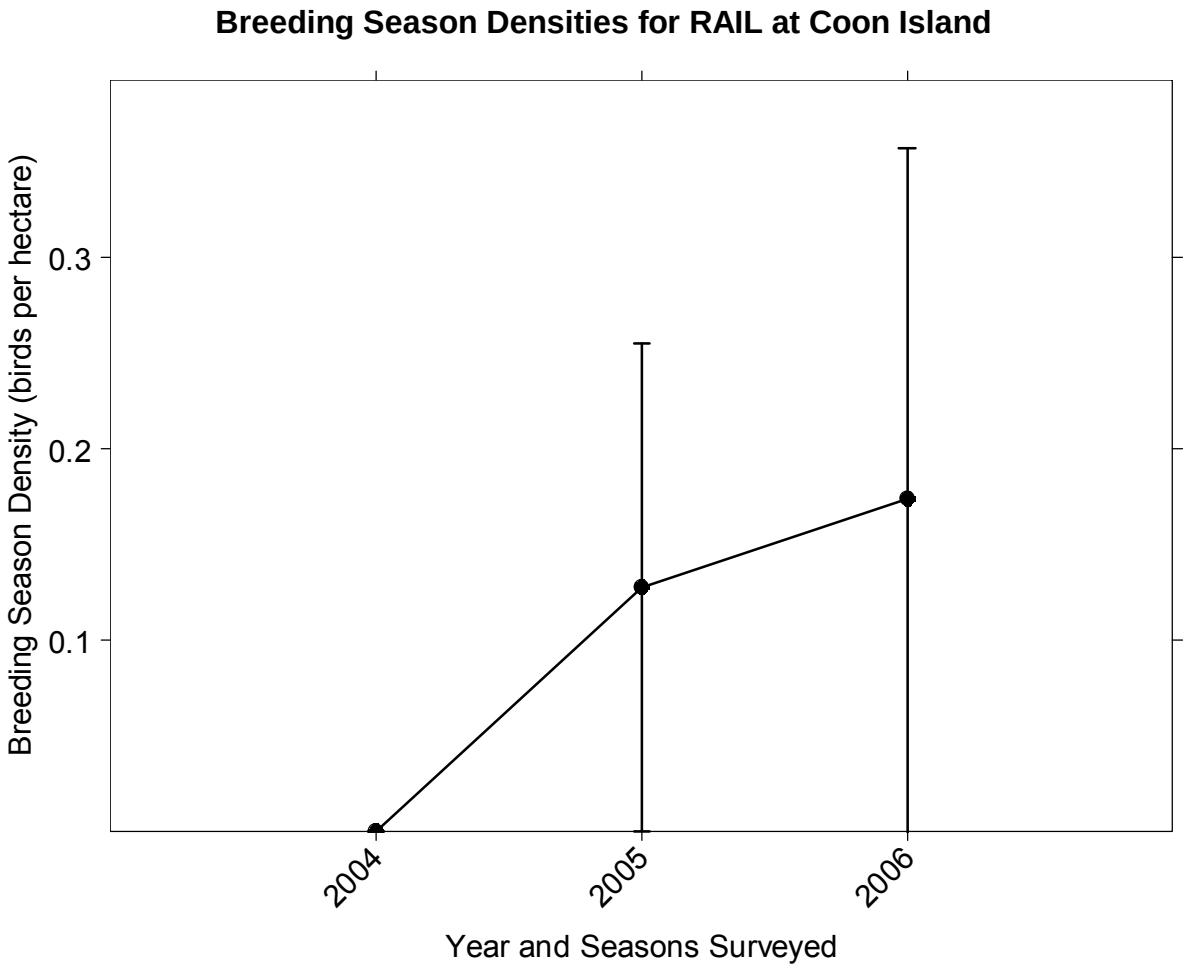


Figure 25. Observed density (number of birds detected with point counts per hectare of suitable habitat) of rails (Black Rail, Clapper Rail, Sora, and Virginia Rail) at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

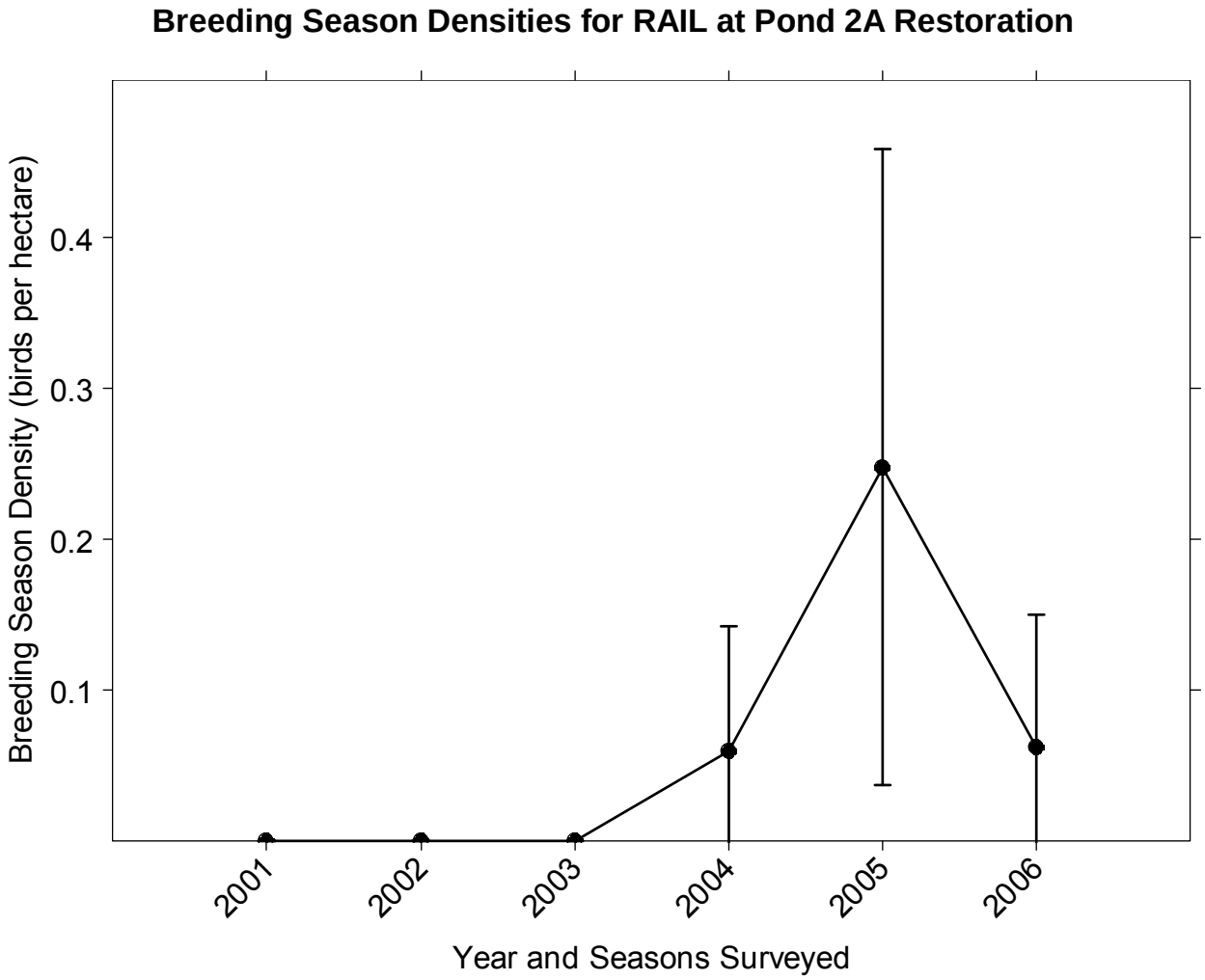


Figure 26. Observed density (number of birds detected with point counts per hectare of suitable habitat) of rails (Black Rail, Clapper Rail, Sora, and Virginia Rail) at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

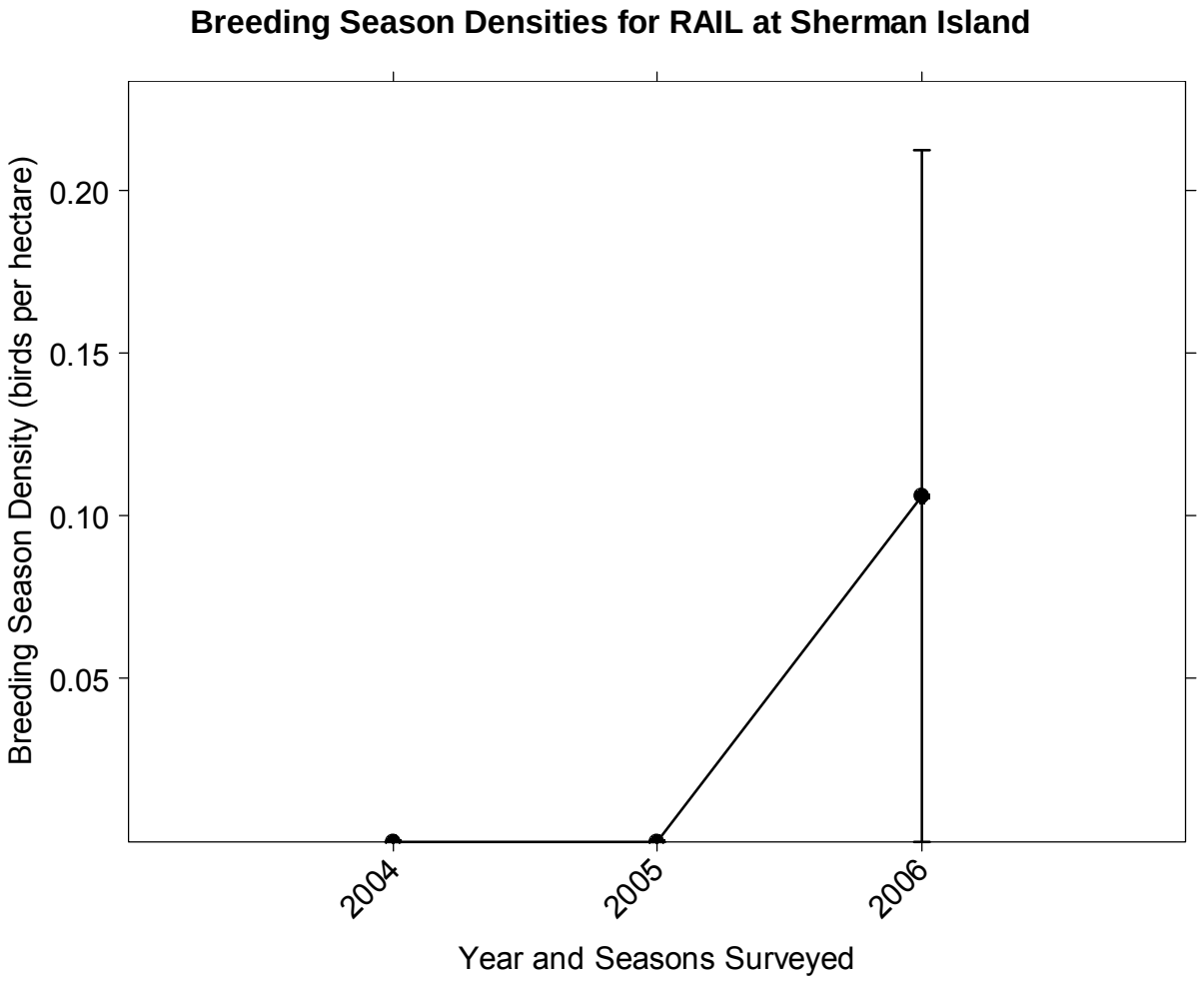


Figure 27. Observed density (number of birds detected with point counts per hectare of suitable habitat) of dabbling ducks (American Wigeon, Blue-winged Teal, Cinnamon Teal, Gadwall, Green-winged Teal, Mallard, Northern Pintail, and Northern Shoveler) at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

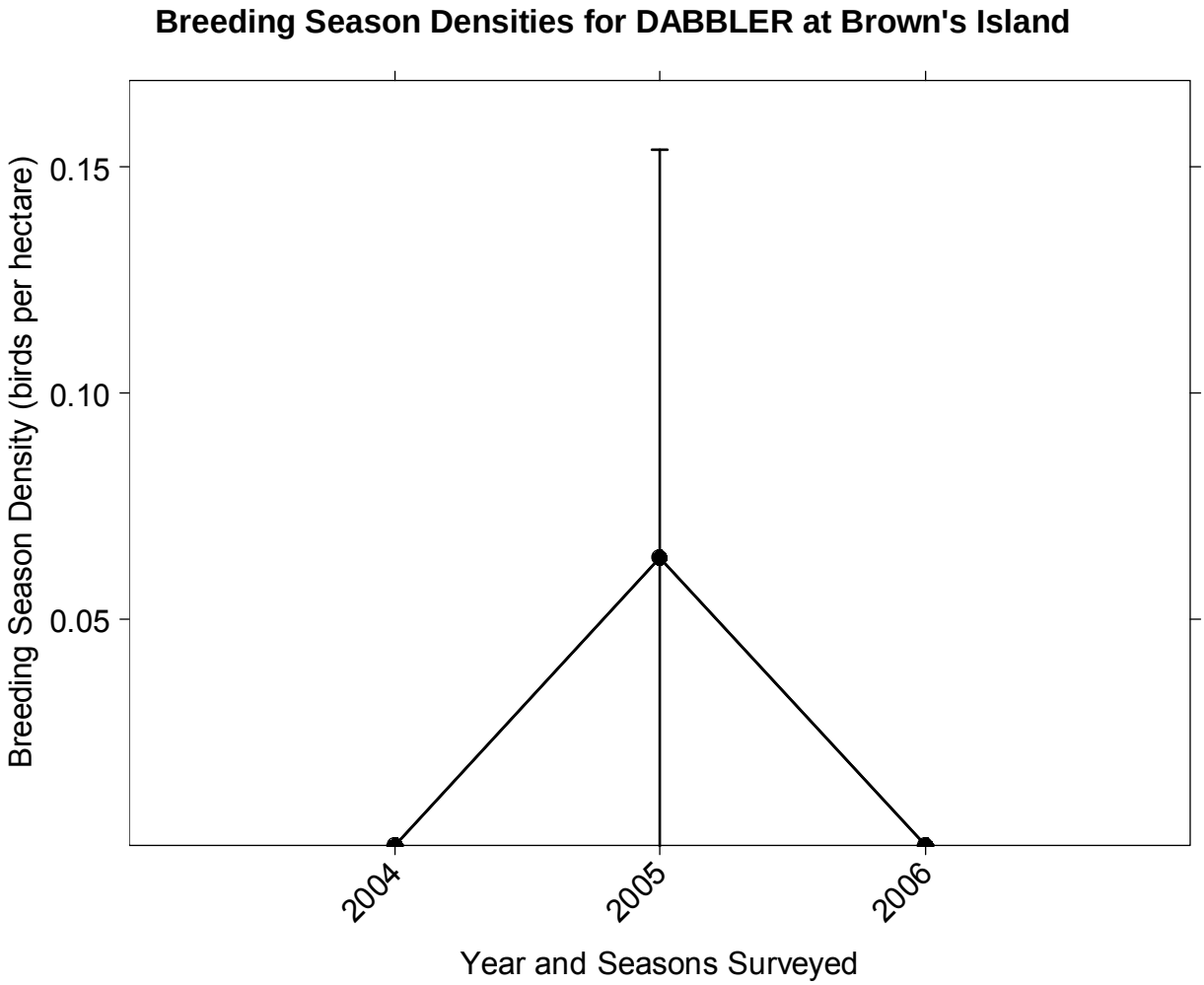


Figure 28. Observed density (number of birds detected with point counts per hectare of suitable habitat) of dabbling ducks (American Wigeon, Blue-winged Teal, Cinnamon Teal, Gadwall, Green-winged Teal, Mallard, Northern Pintail, and Northern Shoveler) at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

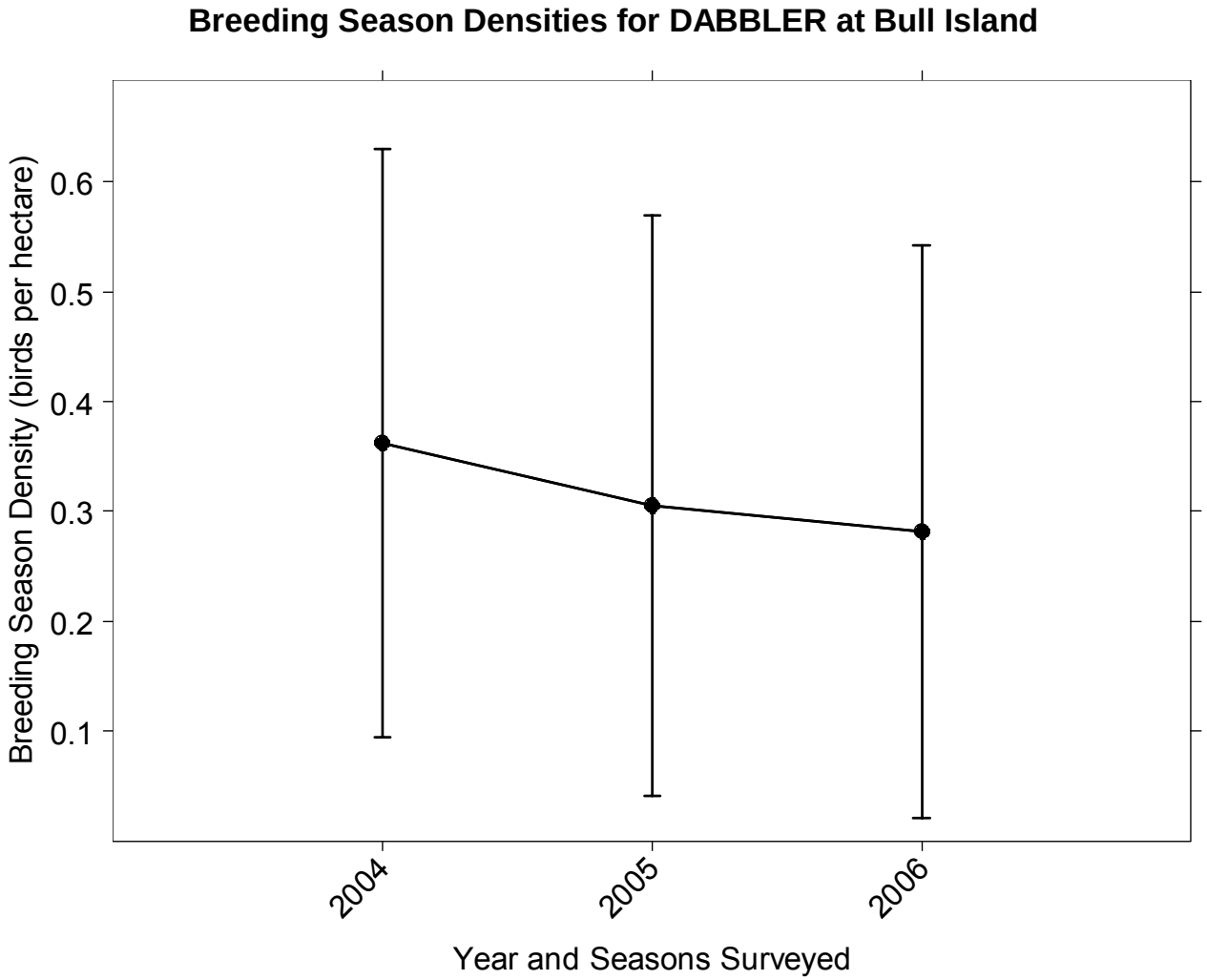


Figure 29. Observed density (number of birds detected with point counts per hectare of suitable habitat) of dabbling ducks (American Wigeon, Blue-winged Teal, Cinnamon Teal, Gadwall, Green-winged Teal, Mallard, Northern Pintail, and Northern Shoveler) at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

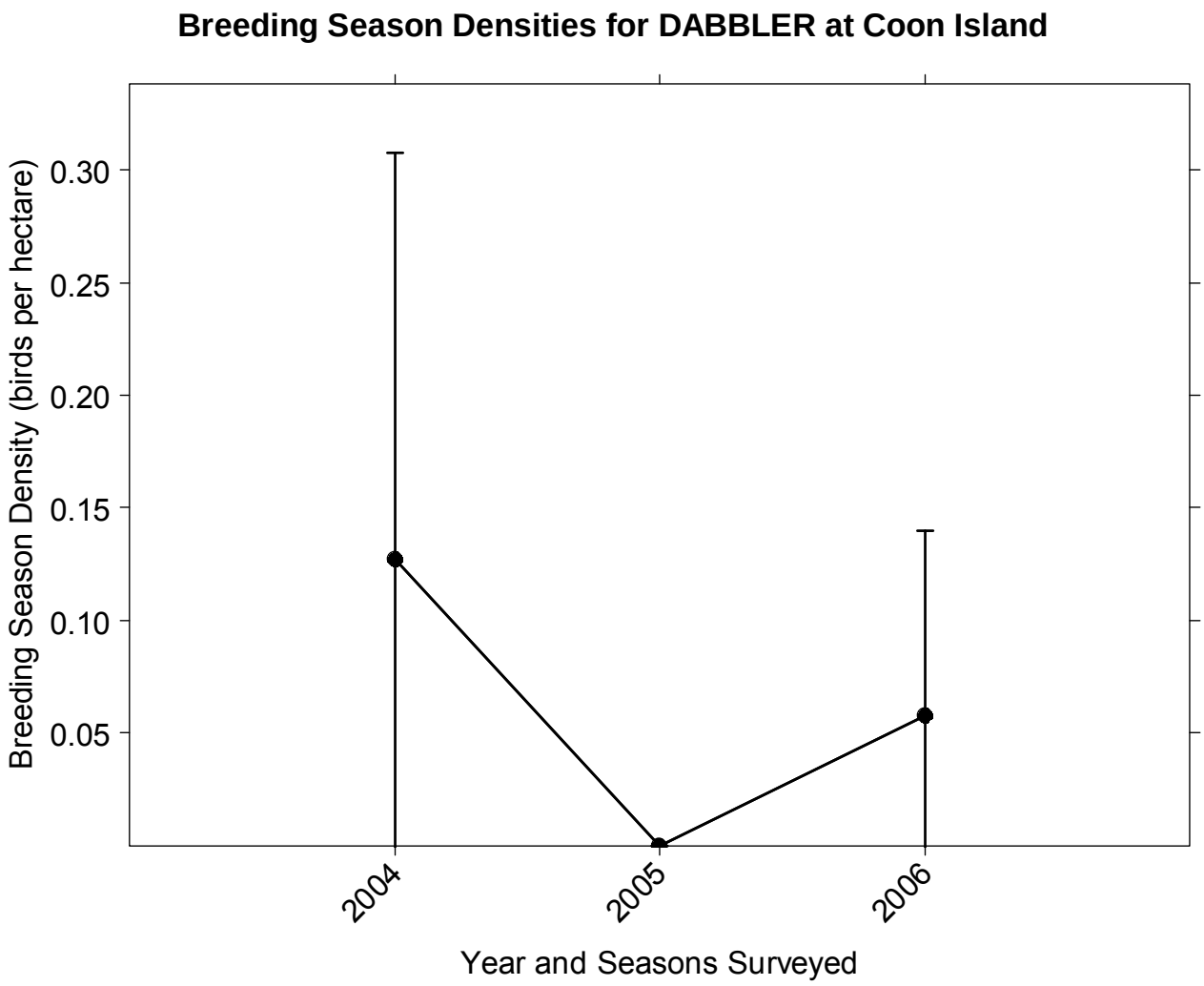


Figure 30. Observed density (number of birds detected with point counts per hectare of suitable habitat) of dabbling ducks (American Wigeon, Blue-winged Teal, Cinnamon Teal, Gadwall, Green-winged Teal, Mallard, Northern Pintail, and Northern Shoveler) at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

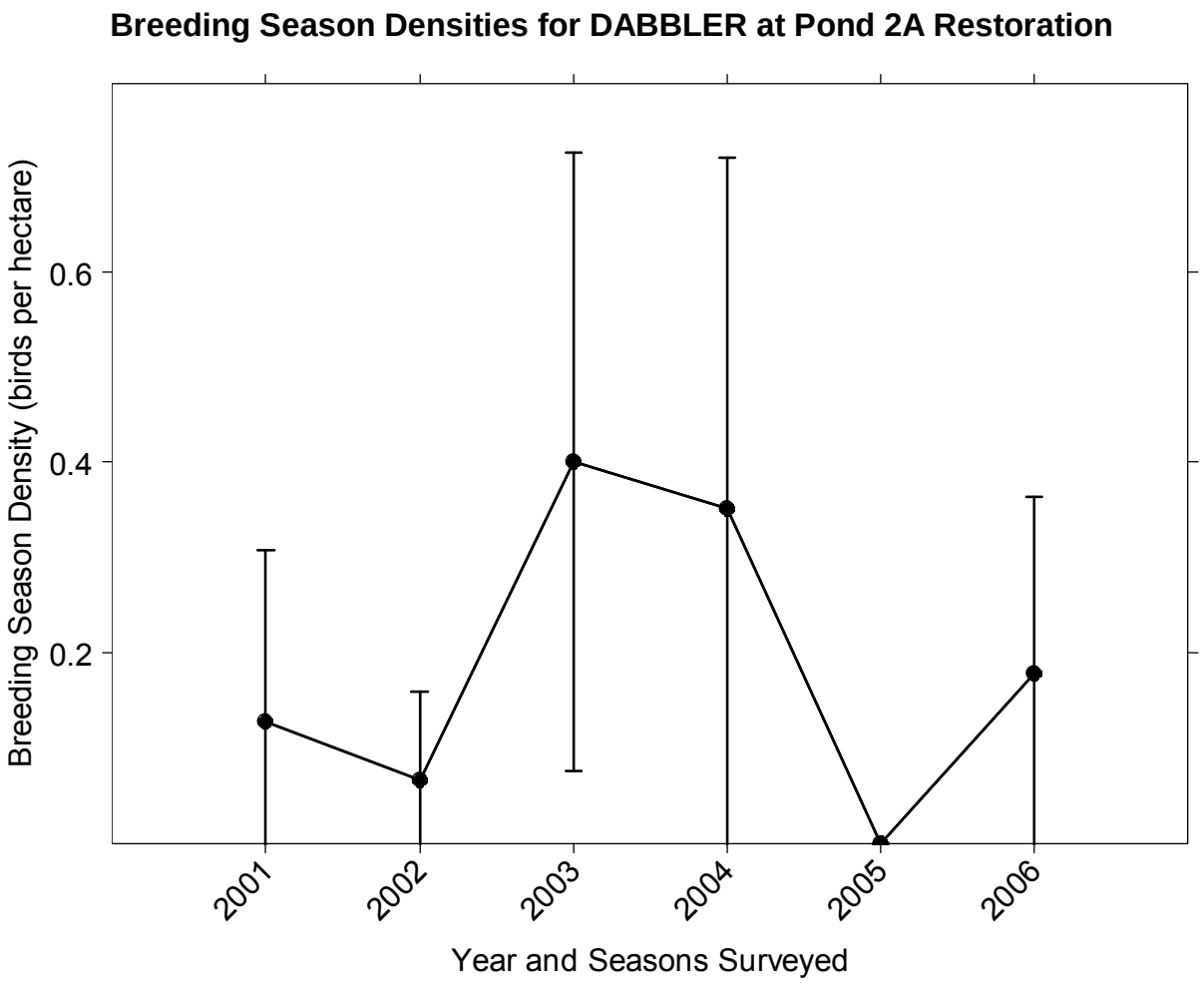


Figure 31. Observed density (number of birds detected with point counts per hectare of suitable habitat) of dabbling ducks (American Wigeon, Blue-winged Teal, Cinnamon Teal, Gadwall, Green-winged Teal, Mallard, Northern Pintail, and Northern Shoveler) at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

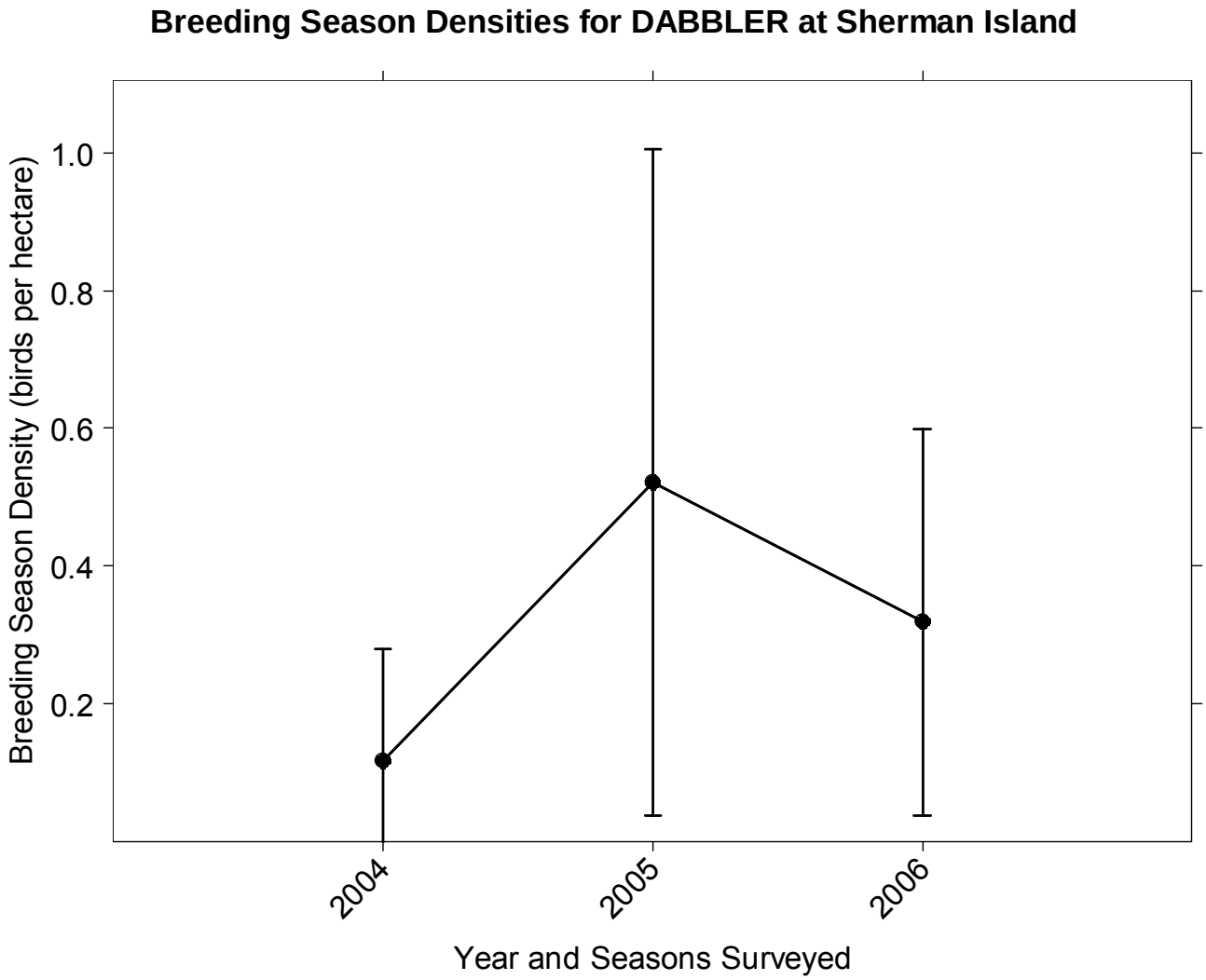


Figure 32. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Brown's Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

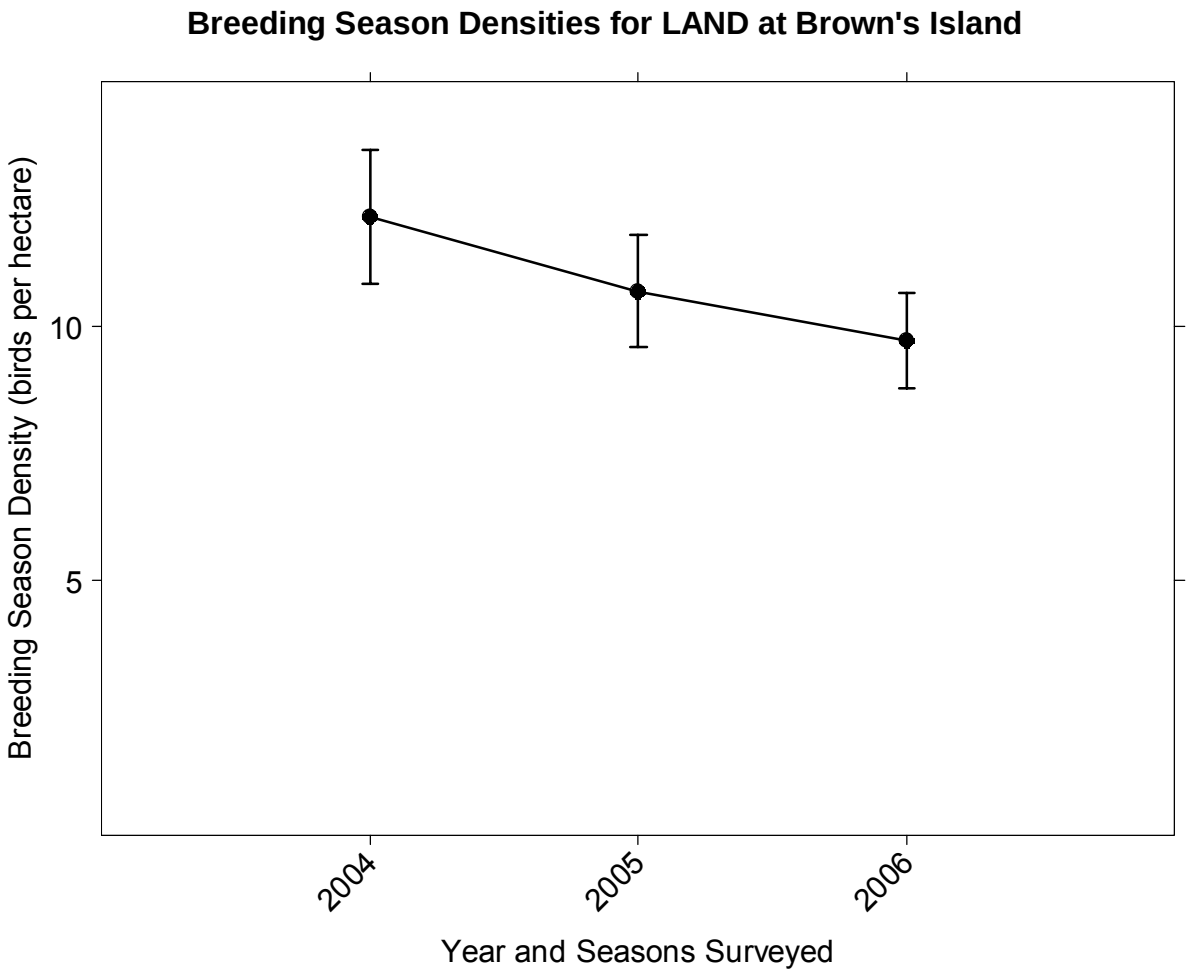


Figure 33. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Bull Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

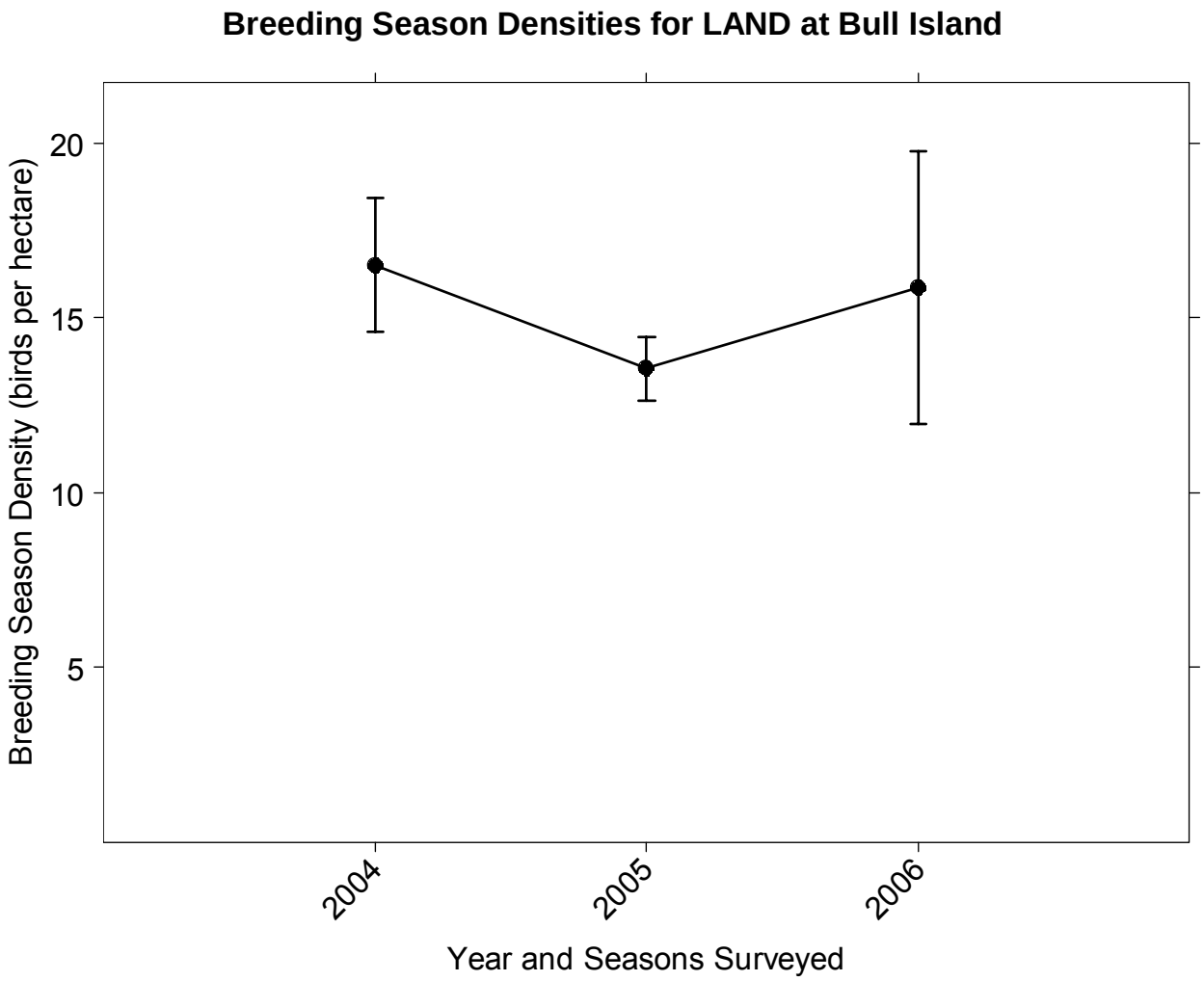


Figure 34. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Coon Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

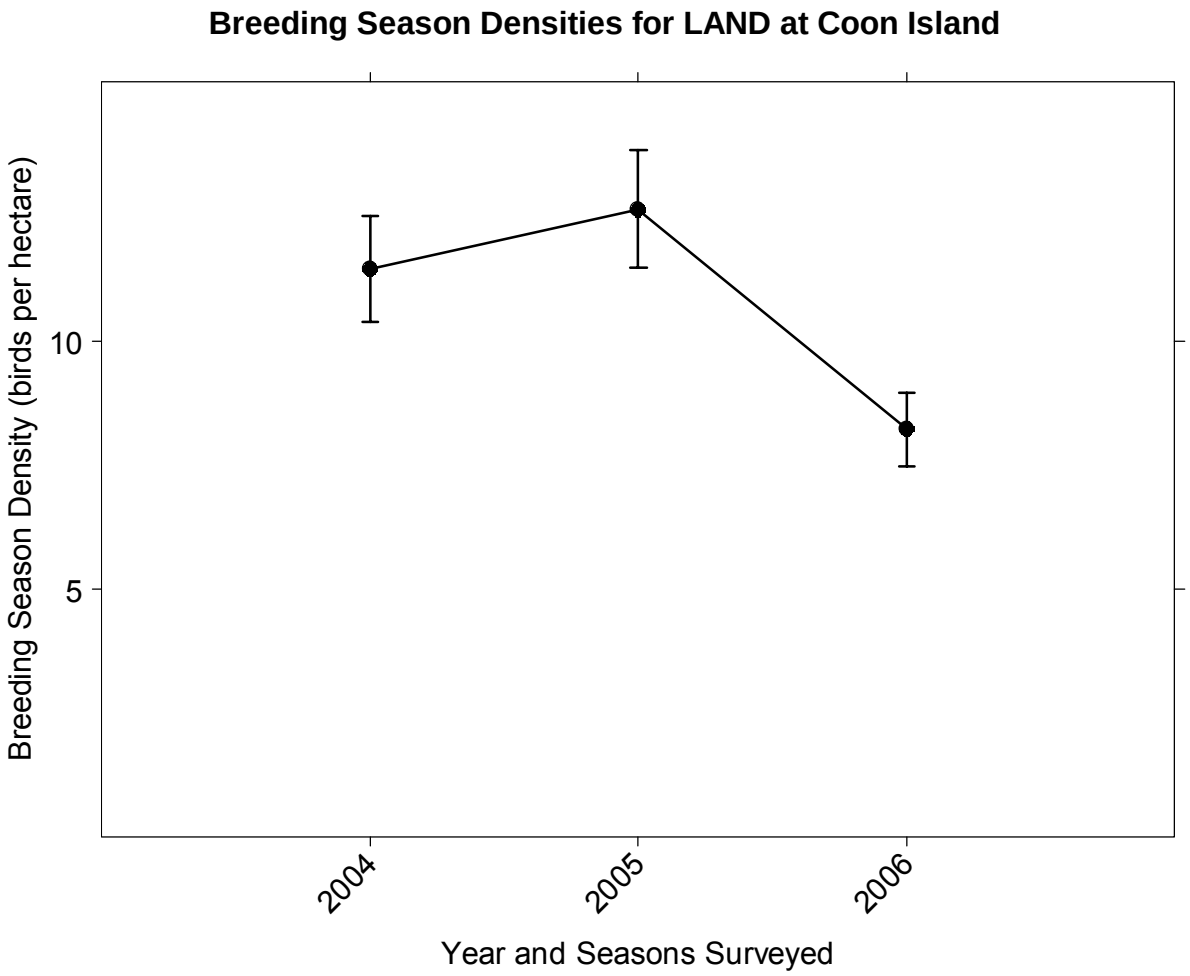


Figure 35. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Carl's Marsh during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

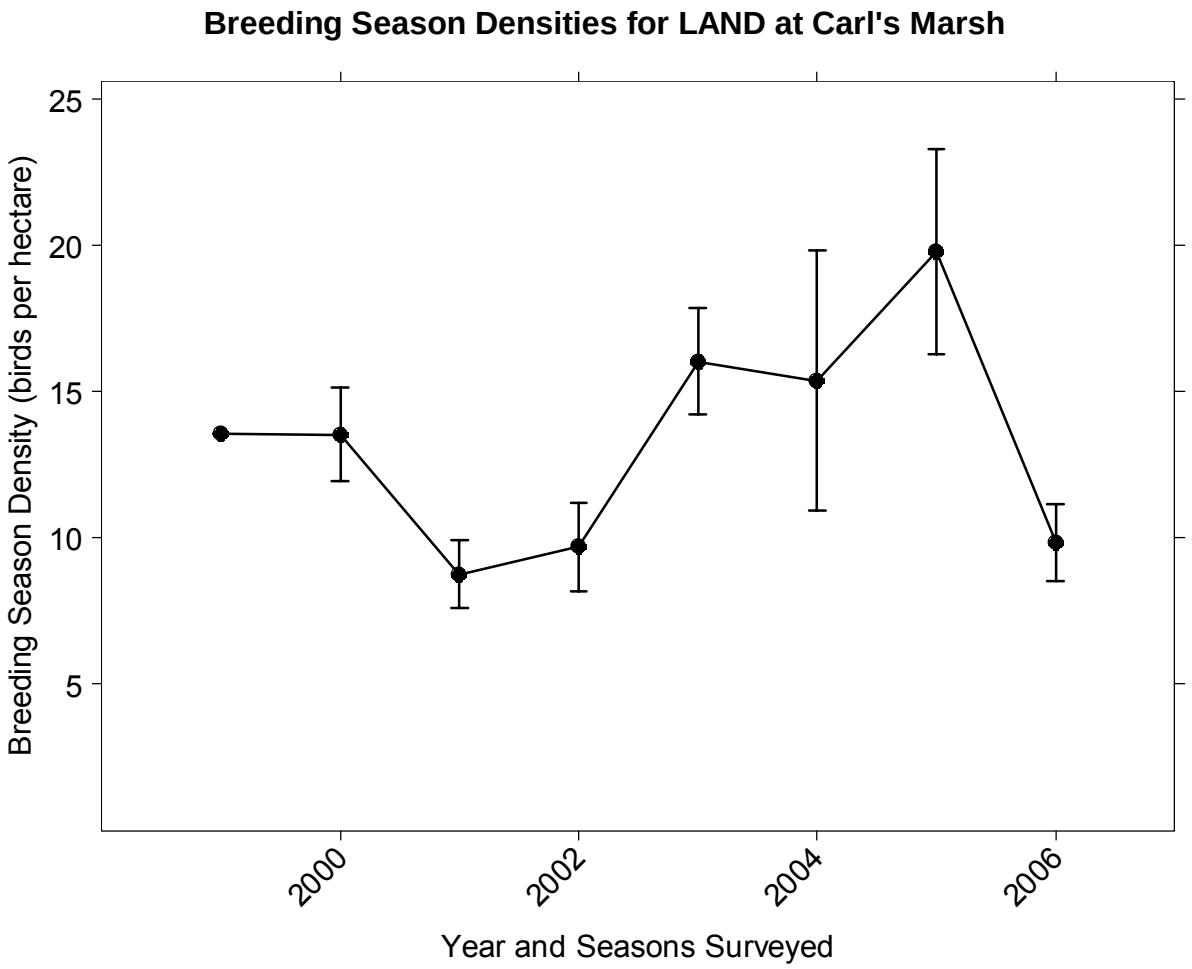


Figure 36. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Pond 2A during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

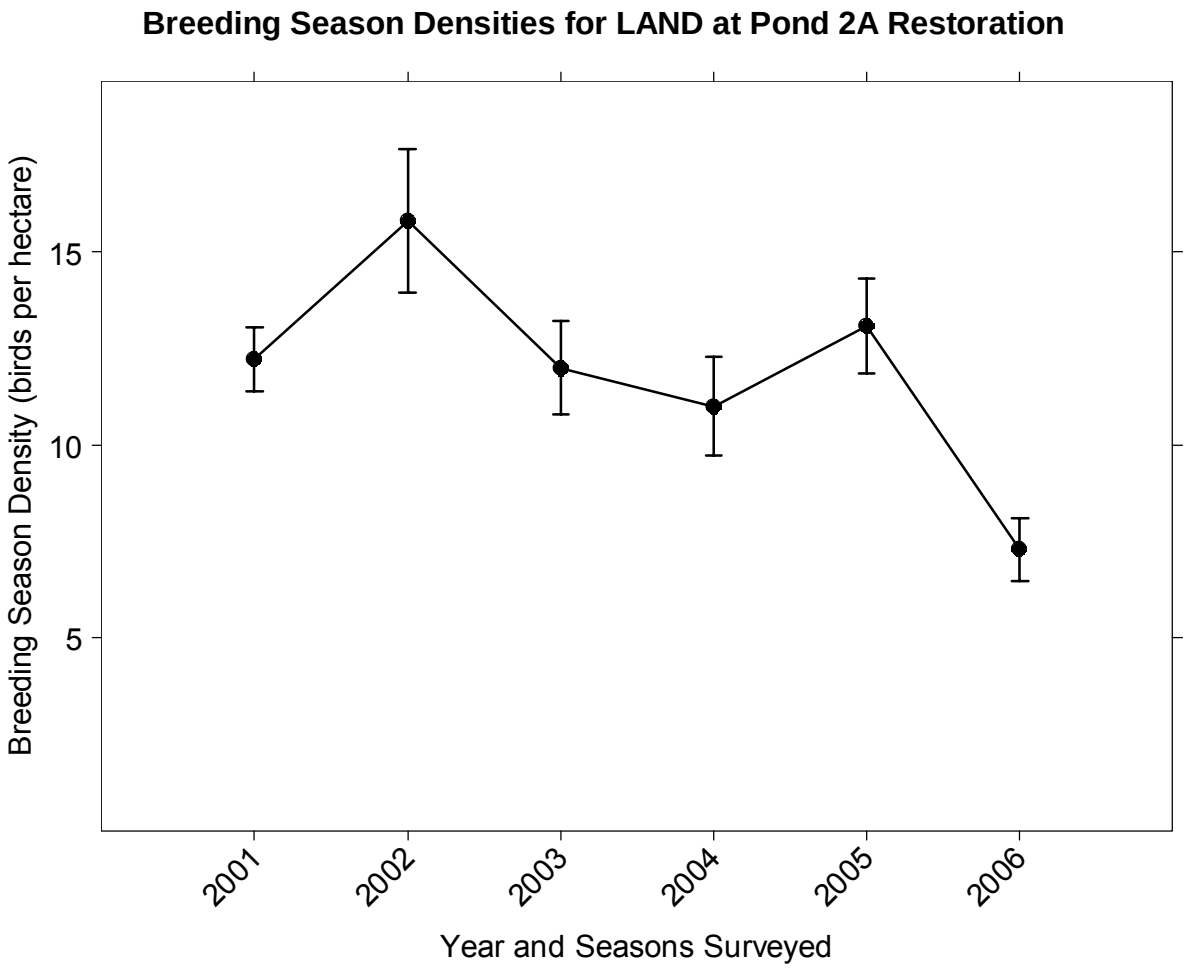


Figure 37. Observed density (number of birds detected with point counts per hectare of suitable habitat) of landbird species (see text) at Sherman Island during the breeding season. Mean density (n = 20 = 10 point count stations x 2 surveys/station) shown per year, plus S.E. of the mean.

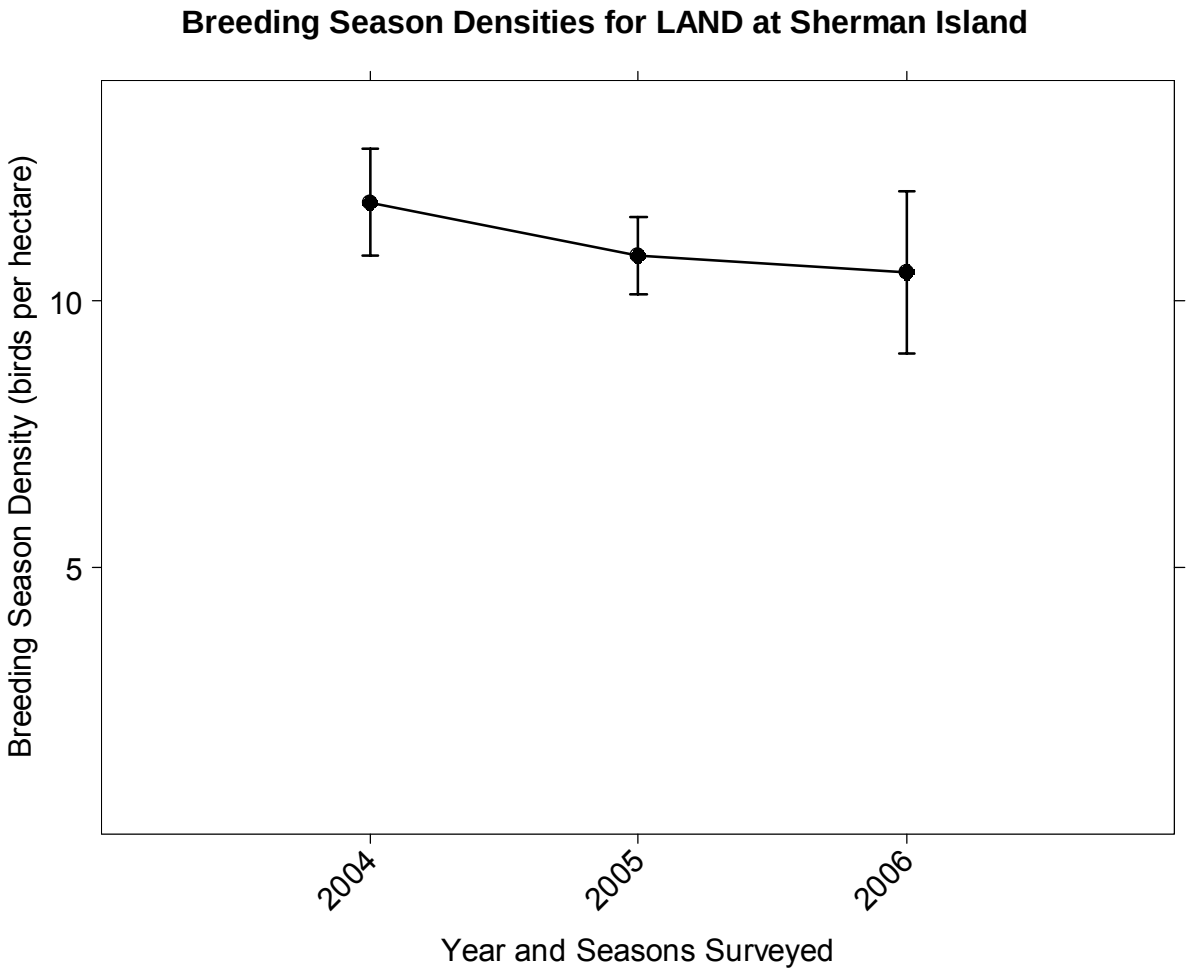


Figure 38. Nest abundance of Great Blue Heron (solid circles), Great Egret (open circles). Snowy Egret (open triangles), and Black-crowned Night-Heron (solid triangles) within 10 km of historic tidal marsh in the northern San Francisco Bay area, 1991-2005.

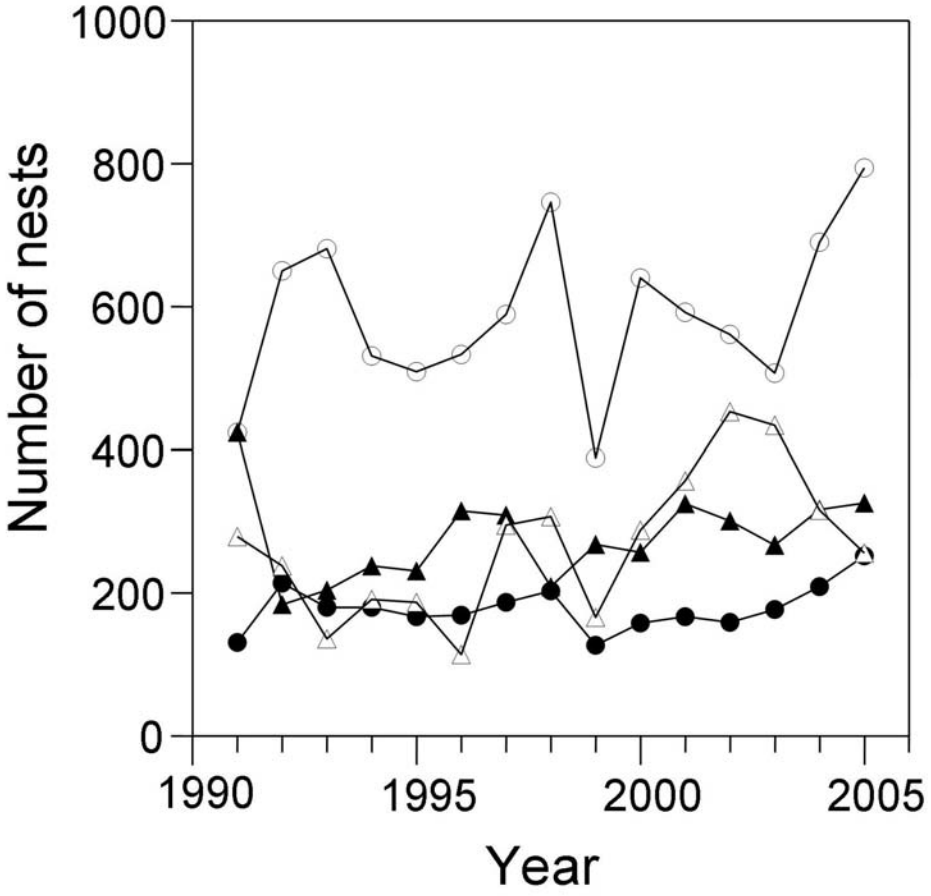


Figure 39. Annual prefledging brood size ± SE in successful Great Egret (bold line) and Great Blue Heron (thin line) nests in the northern San Francisco Bay are, 1991-2005.

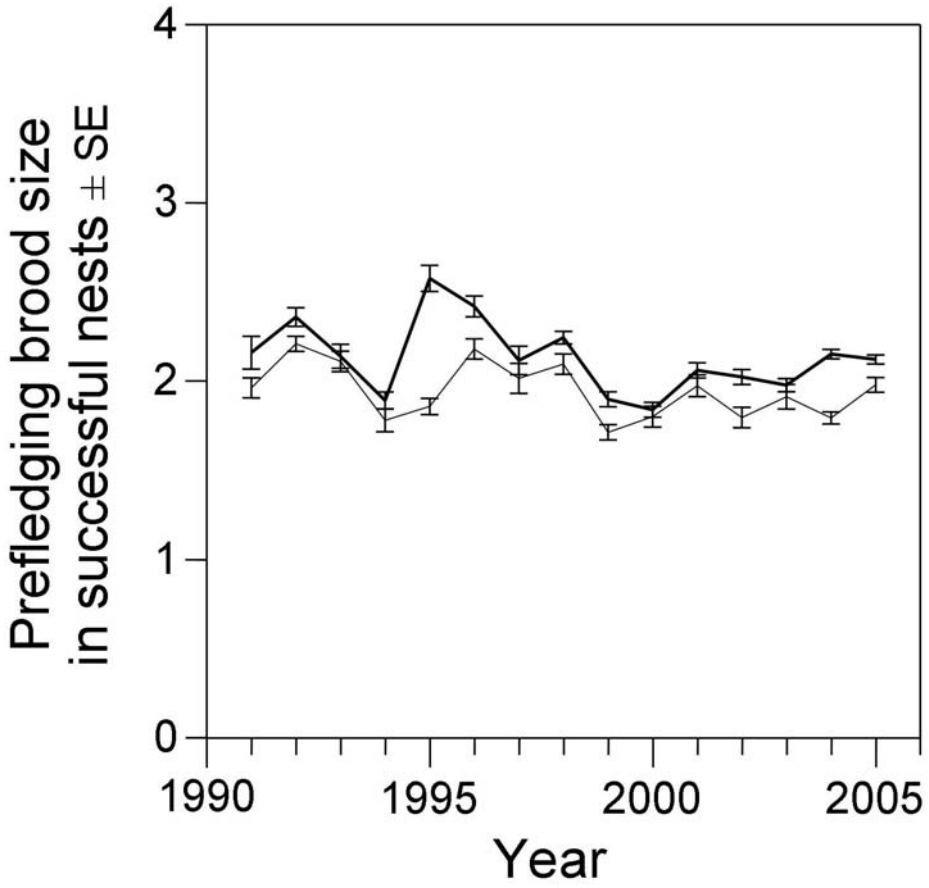


Figure 40. Annual prefledging brood size ± SE in successful Snowy Egret (bold line) and Black-crowned Night-Heron (thin line) nests in the northern San Francisco Bay are, 1991-2005.

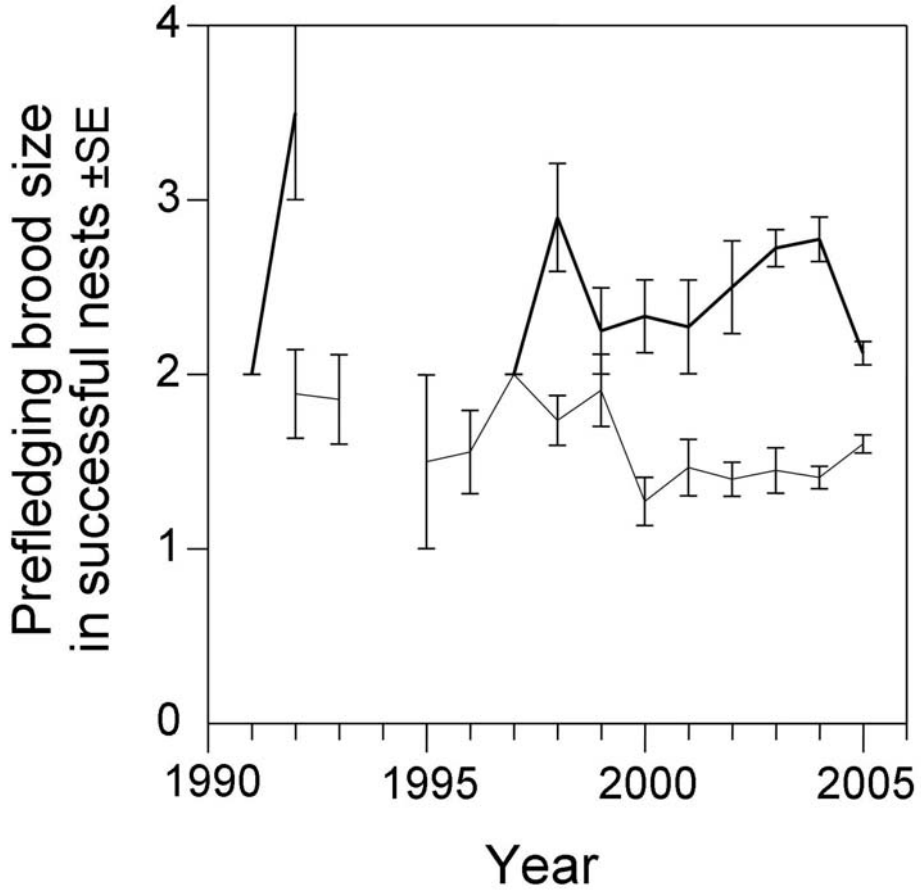


Figure 41. Annual percent nest survivorship ± SE of Great Egret (bold line) and Great Blue Heron (thin line) nests in the northern San Francisco Bay are, 1993-2005.

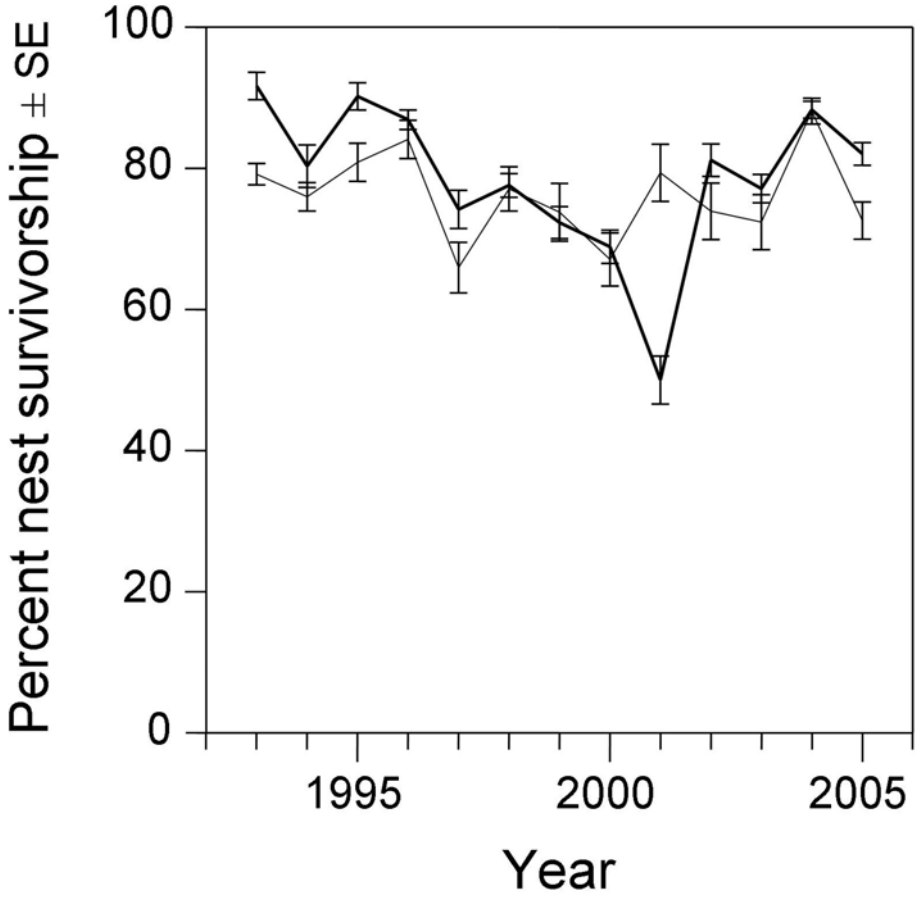


Figure 42. Annual percent nest survivorship ± SE of Snowy Egret (bold line) and Black-crowned Night-Heron (thin line) nests in the northern San Francisco Bay are, 1993-2005.

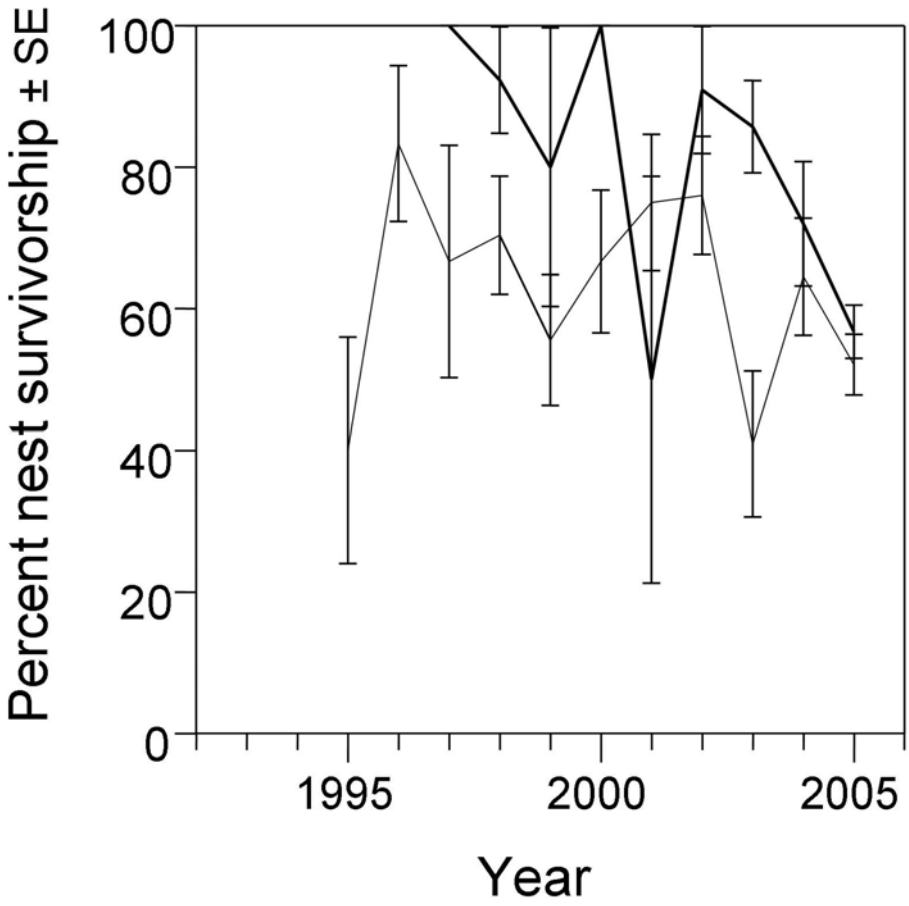
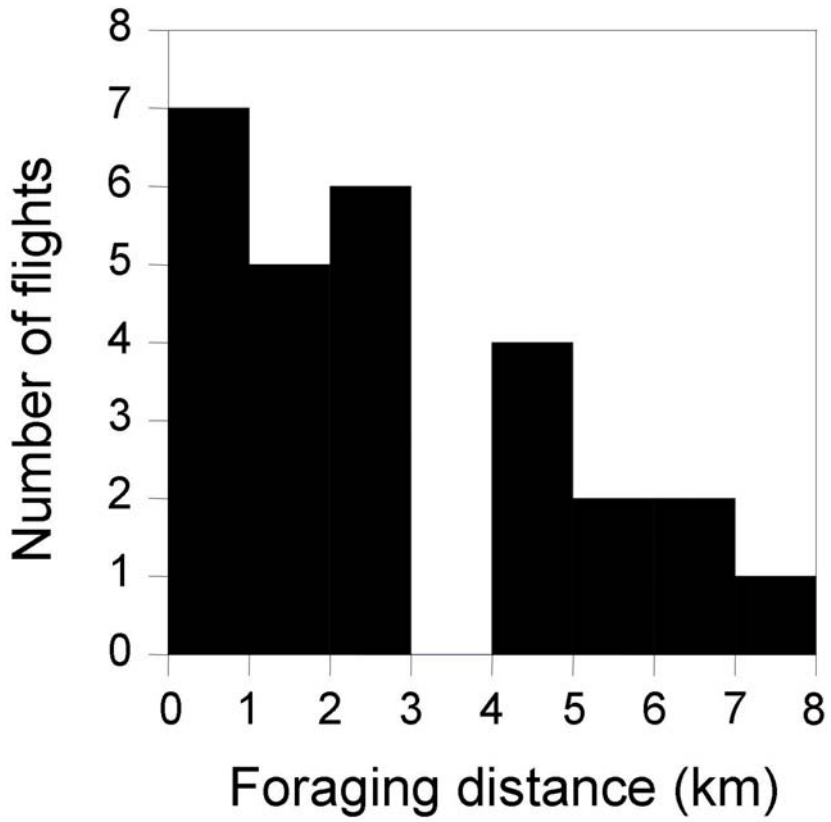


Figure 43. Distances of Great Egret foraging flights (n = 31) from Tree Slough and Hidden Cove heronries in Suisun Marsh.



8.0 Appendix

Appendix 1. Summary of Survey Results, by individual survey, for Black Rails (BLRA) and Clapper Rails (CLRA), 2004 and 2005. Summary statistics are presented in Table XX.
A) 2004

Survey site	Date	type	# of stations	# individuals	Ha surveyed	D*	AI**	%†
Coon I.	3/11/2004	CLRA	11	13-20	138.2	0.12	1.2	0.55
Coon I.	3/30/2004	CLRA	nd	nd	nd	nd	nd	nd
Coon I.	4/8/2004	CLRA	12	5-6	150.7	0.04	0.46	0.17
Coon I.	4/8/2004	BLRA(p)	12	5	4.9	1.0	0.42	0.25
Coon I.	4/14/2004	BLRA	11	22	4.5	4.9	2.0	0.82
Coon I.	5/12/2004	BLRA	13	31	5.35	5.8	2.39	0.85
Bull I.	3/12/2004	CLRA	5	0	62.8	0.0	0.0	0.0
Bull I.	3/13/2004	BLRA	5	5	2.1	2.38	1.0	0.8
Bull I	3/29/2004	BLRA	6	6-7	2.5	2.6	1.1	0.7
Bull I.	4/9/2004	CLRA	8	0	100.5	0.0	0.0	0.0
Bull I.	4/23/2004	CLRA	7	0	88.0	0.0	0.0	0.0
Carl's	2/12/2004	CLRA	6	2-3	75.4	0.03	0.4	0.33
Carl's	3/23/2004	CLRA	4	1-2	50.2	0.04	0.4	0.25
Carl's	3/30/2004	CLRA	5	1-3	62.8	0.03	0.4	0.60
Carl's	4/15/04	CLRA	5	2	62.5	0.03	0.4	0.20
Carl's	6/9/2004	BLRA	12	2	4.9	0.4	0.17	0.08
Carl's	6/19/2004	BLRA	7	7	2.9	2.4	1.0	0.71
2A	3/25/2004	CLRA	9	0	113.0	0.0	0.0	0.0
2A	4/9/2004	CLRA	9	0	113.0	0.0	0.0	0.0
2A	4/16/2004	CLRA	6	0	75.4	0.0	0.0	0.0
2A	4/16/2004	BLRA(p)	6	1	2.5	0.4	0.17	0.17
2A	5/20/2004	BLRA	13	3	5.4	0.6	0.23	0.23
2A	6/10/2004	BLRA	11	3-4	4.5	0.8	0.32	0.18
Brown I	5/25/2004	BLRA	6	8-9	2.5	3.0	1.4	0.67
Brown I.	6/25/2004	BLRA	7	10	2.9	2.4	1.4	0.71
Sherman I.	5/24/2004	BLRA	10	9	4.1	2.2	0.9	0.50
Sherman I.	6/26/2004	BLRA	8	6	3.3	1.8	0.75	0.50

* D = birds/hectare surveyed
** AI = abundance index (birds/station)
† = % of stations where detected
(p) partial survey; data not used for density calculations.

Appendix 1, cont.
B) 2005

Survey site	Date	type	# of stations	# individuals	Ha surveyed	D*	AI**	%†
Coon I.	2/1/2005	CLRA	5	5-9	62.8	0.08-0.11	1.4	0.80
Coon I.	3/3/2005	CLRA	4	15-22	50.2	0.30-0.44	4.6	1.00
Coon I.	4/17/2005	CLRA	0	nd	nd	nd	nd	nd
Coon I.	3/3/2005	BLRA	4	5	2.1	2.44	1.3	0.75
Coon I.	4/17/2005	BLRA	0	nd	nd	nd	nd	nd
Bull I.	3/27/2005	BLRA	6	6-7	2.47	2.43-2.83	1.1	0.50
Bull I.	4/16/2005	BLRA	8	5	3.29	1.52	0.6	0.38
Bull I	5/17/2005	BLRA	4	4	1.64	0.41	1.0	0.50
Bull I.	4/16/2005	CLRA	8	0	100.5	0.00	0.0	0.00
Bull I.	5/17/2005	CLRA	7	0	87.9	0.00	0.0	0.00
Carl's	2/16/2005	CLRA	6	2	75.4	0.03	0.3	0.50
Carl's	2/24/2005	CLRA	5	3-4	62.8	0.05-0.06	0.7	0.60
Carl's	3/10/2005	CLRA	5	3-5	62.8	0.05-0.08	0.8	0.50
Carl's	3/13/2005	CLRA	6	5-7	75.4	0.07-0.90	1.0	0.66
Carl's	3/22/2005	CLRA	5	4	62.8	0.06	0.8	0.80
Carl's	4/15/2005	CLRA	5	2	62.8	0.03	0.4	0.60
Carl's	3/13/2005	BLRA	5	0	10.9	0.0	0.0	0.00
Carl's	5/26/2005	BLRA	5	0	10.9	0.0	0.0	0.00
2A	2/8/2005	CLRA	10	0				
2A	3/7/2005	CLRA	7	0				
2A	3/21/2005	CLRA	9	2				
2A	4/19/2005	BLRA	11	6	4.53	1.33	0.6	0.27
2A	5/24/2005	BLRA	14	7-9	5.76	1.22-1.56	0.6	0.43
Brown I	5/13/2005	BLRA	8	15-20	3.29	4.6-6.1	0.5	0.75
Brown I.	5/25/2005	BLRA	6	12-14	2.47	4.8-5.7	0.5	0.83
Sherman I.	5/12/2005	BLRA	6	7	2.47	2.83	1.2	0.50
Sherman I.	5/26/2005	BLRA	7	9-10	2.9	3.1-3.5	0.7	0.57

* D = birds/hectare surveyed
** AI = abundance index (birds/station)
† = % of stations where detected
(p) partial survey; data not used for density calculations.

Integrated Regional Wetland Monitoring Pilot Project

Fish and Invertebrate Team Data Report

Authors
Stephen M. Bollens, Washington State University Vancouver (bollens@vancouver.wsu.edu)
Charles A. Simenstad, University of Washington (simenstd@u.washington.edu)
Darren Gewant, San Francisco State University (darreng@sfsu.edu)
Sean Avent, San Francisco State University (sean@seanavent.com)

December 2006

1.0 Introduction 1
2.0 Scope of Work 1
2.1 Objectives 1
2.1.1 Fish 1
2.1.2 Invertebrates 1
2.1.2.1 Zooplankton 1
2.1.2.2 Insects 1
2.1.2.3 Benthos 1
2.2.3 Food Web 2
3.0 Data Collection 2
3.1 Fish 2
3.2 Zooplankton 2
3.3 Benthos 2
3.4 Neuston 2
3.5 Fish Diet 2
3.6 Stable Isotopes 3
3.7 Hydrography 3
4.0 Result and Observations 3
4.1 Fish 3
4.1.1 Dominant taxa – Table 1. 3
4.1.2 Distribution and abundance – Figure 1. 3
4.2 Zooplankton 3
4.2.1 Species Richness – Table 2. 3
4.2.2 Dominant taxa – Table 3. 3
4.2.3 Distribution and abundance – Figure 2. 4
4.3 Benthos 4
4.3.1 Species Richness – Table 4. 4
4.3.2 Density – Figure 3. 4
4.3.2 Numerical Composition – Figure 4 4
4.4 Neuston 4
4.4.1 Species Richness – Table 4. 4
4.4.2 Density – Figure 5. 4
4.4.3 Numerical Composition – Figure 6 4
4.5 Fish Diet 5
4.5.1 Diet Composition – Figures 7-11 5
4.6 Food Web 5
4.6.1 Organic Matter Sources – Figure 12. 5
4.6.2 Sources of Organic Matter to Marsh Consumers – Figure 13. 5
5.0 References Cited 6
6.0 Tables and Figures 7

1.0 Introduction

The Integrated Regional Wetland Monitoring project is supported by CALFED to establish a rigorous comprehensive monitoring program to evaluate how (or if) wetland restoration sites in the North Bay and Delta are changing over time, and which ecological functions are (or are not) returning to "normal". The central hypothesis of the Fish, Invertebrate and Food Web Team is that food web structure, habitat supplementation and nekton use change from allochthonous to autochthonous with increasing development of restoring wetlands.

2.0 Scope of Work

Our overall goal of the study is to identify and quantify metrics for monitoring the ecological contribution of emergent marshes to the broader SFE ecosystem. We specifically seek to identify metrics that are diagnostic of food web interactions between intertidal wetlands and the San Francisco Estuaries adjacent open waters, particularly those related to fish and macroinvertebrate assemblages. Specifically we will document the occurrence, abundance and population structure of fish and motile macroinvertebrates in tidal channels of restored and reference marshes in the Upper San Francisco Estuary.

2.1 Objectives

2.1.1 Fish

To identify and describe metrics and processes that relate to fish in a variety of different stages of marsh development. To capture natural variability in fish abundance and structure, 3 channels within each marsh system were sampled concurrently.

2.1.2 Invertebrates

To assess the composition and relative availability of various invertebrate groups that might be fed upon by fishes occupying the marshes of different stages of development (2.1.1)

2.1.2.1 Zooplankton

Zooplankton were sampled in same channels of fish to address questions regarding abundance and composition to better understand food web dynamics and prey availability

2.1.2.2 Insects

Insects that fall onto the marsh surface or tidal channel surface were sampled as neuston or surface drift in the channels to assess availability of these as prey of fishes.

2.1.2.3 Benthos

Organisms inhabiting the surface and top layers of sediments in marsh tidal channels were sampled to assess availability of these benthic or epibenthic (on surface) prey of fishes.

2.2.3 Food Web

To determine organisms fed upon by priminent fishes occupying marshes at different stages of development (2.1.1) and to assess the overall contribution of organic matter from different autochthonous (marsh) and allochthonous (external) sources to representative fish and invertebrate consumers.

3.0 Data Collection

3.1 Fish

We have sampled each of six tidal marshes – Sherman Lake, Brown's Island, Bull Island, Coon Island, Pond 2a, and Carl's Marsh in 7 quarterly sampling events: October - 2003, February, June and September - 2004, January, March and June - 2005. We deploy a fyke net (3.1-mm mesh) at the mouth of each of 3 channels per marsh during moderate spring tides, set during high tide and recovered at low tide. During the ebbing tide, the codend was routinely checked for fish species captured with a dipping net then speciated, counted, measured for total length, and weighed. Individuals were promptly returned to the channel beyond the fyke net. Individuals remaining in net at low tide when the fyke net was removed were preserved in a formalin mixture for later analysis in the laboratory. The first 50 individuals of each fish were identified to species, measured for total length, and weighed.

3.2 Zooplankton

Zooplankton were sampled using a 73 micron ring net, vertically hauled at 3 random locations within each of the three fish channels upstream of the mouth, taken immediately following set of the fyke net. Zooplankton were preserved in the field and analyzed back in the laboratory and sub sampled depending on overall sample density to calculate total count. Individuals of zooplankton were identified to the lowest possible taxonomic resolution and further subdivided into 8 main life history stages where appropriate: Male, Female, Female with eggs, Nauplii, Copepid stage I-III, Copepid stage IV-V, Adult, Invertebrate larvae / Crab Zoea.

3.3 Benthos

Benthic and epibenthic invertebrate populations were sampled in the same tidal channels from which fish were sampled, using a 0.0024-m^2, 10-cm deep benthic core. Five core samples were acquired from each channel.

3.4 Neuston

Invertebrates on or immediately under the surface of the water were sampled in the same tidal channels from which fish were sampled, using a 0.41-m x 0.20-m neuston net with 0.130-µm mesh net. The net was towed by hand along five 10-m transects in each channel.

3.5 Fish Diet

Systematic analyses of fish stomach contents—measuring frequency of occurrence, abundance and biomass for all taxa identifiable under a dissecting microscope with illuminated light—were conducted on either whole preserved fish or gastric lavage samples, interpreted though the Index of Relative Importance (IRI; Pinkas *et al.* 1971).

3.6 Stable Isotopes

Stable isotope analysis involved measuring $\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$ signatures of consumer (fish, macroinvertebrate) organisms that are broadly represented in fish and invertebrate collections at most study sites, and of organic matter sources (water column microalgae, benthic micro- and macroalgae, emergent marsh vascular plants, scrub-shrub and other woody vegetation) within tidal wetlands and in adjoining bay waters. The relative percent contribution of primary producer types to consumer base diets was estimated using SOURCE, a multiple source mixing model that uses linear programming techniques with multiple tracers to estimate the central tendency of a consumer's direct and indirect uptake of autotrophic sources (Lubetkin and Simenstad 2004).

3.7 Hydrography

Salinity and temperature were measured using a handheld YSI meter, collected for each of the three channels at the surface and at depth during regular intervals during the ebbing tide.

4.0 Result and Observations

4.1 Fish

4.1.1 Dominant taxa – Table 1.

A total of 9,452 individuals of fish were captured over the course of the study comprising 30 species (Table 1). The non-native inland silverside accounted for greater than half the total number of fish, and fish counts combined between Western mosquitofish, yellowfin goby, and rainwater killifish, accounted for greater than 95% of the total count.

4.1.2 Distribution and abundance – Figure 1.

Marked seasonal variation in fish composition and abundance occurred across all sites with the largest catches often occurring during summer (i.e., June) or late fall (September / October).

4.2 Zooplankton

4.2.1 Species Richness – Table 2.

A total of 968,171 individuals of zooplankton were counted from all samples over the course of the study, comprising over 160 zooplankton species. Copepods were the numerically dominant taxon, followed by (Cl.) Ostracoda, (P.) Rotifera. In terms of species richness, Copepods still dominated the study with over 50 individual species identified. Cladocera were also species rich, with 16 species represented.

4.2.2 Dominant taxa – Table 3.

9 species of the top 16 most abundant taxa were copepods, which accounted for greater than 75% of the total individuals counted. Two harpacticoid species, *Limnoithona tetraspina* and *Oithona davisae* accounted for almost 70%. Other abundant taxonomic categories included Ostrocods, Rotifers, and gastropods.

4.2.3 Distribution and abundance – Figure 2.

Zooplankton exhibited marked variation both seasonally and spatially between the six marshes sampled. All marshes appear to host different assemblages within winter/spring, summer, and fall months. For example, *Oithona davisae* is almost exclusively present in September and October and most abundant in the Napa sites (i.e., Bull Island, Coon Island, and Pond 2A). The Calanoid copepod *Pseudodiaptomus forbesi* also displays strong regional and seasonal variation, abundant during June and primarily located in the West Delta sites of Brown Island and Sherman's Lake.

4.3 Benthos

4.3.1 Species Richness – Table 4.

Total benthos taxa richness varied from 33 taxa at Sherman Island, an older restoring marsh, to 51 taxa at Pond 2A, one of the younger, most flooded restoring sites. Natural reference marshes (Coon Island, 46 taxa; Browns Island 48) had slightly more taxa than the other restoring marshes.

4.3.2 Density – Figure 3.

Mean total densities of benthic invertebrates were significantly higher (>80,000 organisms m^{-2}) at Coon Island and Pond 2A than at Sherman, Browns and Bull islands (25,000-50,000 organisms $m^{-2)}$ and Carls Marsh was intermediate. Relatively narrow variability around these estimates (error lines on histogram bars) illustrate that temporal variability was considerably lower than site variability.

4.3.2 Numerical Composition – Figure 4.

4.4 Neuston

4.4.1 Species Richness – Table 4.

Total neuston taxa richness had a narrow range, similary to the benthos, between 39 and 55 taxa. Coon and Bull islands and Carl's Marsh were the most taxa rich (52-55 taxa) sites.

4.4.2 Density – Figure 5.

Total mean densities of neustonic orgnanism were significantly higher in Browns and Bull islands (mean of ~90 organisms m^{-2}) natural and older restoring marshes, respectively). Neuston characteristically were ~1/2 as dense at the other sites, irrespective of marsh status or age.

4.4.3 Numerical Composition – Figure 6.

Neuston composition displayed a marked gradient from the eastern (western Delta) to the western sites, where the dominance of collembolans decreased from ~70-85% at Browns and Shermans islands, to ~10% at Carls Marsh. This coincided with a less consistent increase in the contribution of dipterans (predominantly Chrionomidae) and homopterans from east to west. Within the Napa River sites, the natural (Coons Island) and youngest restoring marsh (Pond 2A) had more similar numerical compositions than the older restoring marsh (Bull Island).

4.5 Fish Diet

4.5.1 Diet Composition – Figures 7-11.

Consistent comparisons among study sites were best illustrated for yellowfin goby, inland silversides and striped bass. Yellowfin goby in 2004 indicated broad diversity among Browns and Coons islands and Pond 2A, where the isopod *Gnorimossphaeroma oregonensis* at the diet at Browns Island and Pond 2A but the amphipod *Corophium alienense* was prevalent at both Coon Island and Pond 2A. In 2005, diets at Coon Island and Pond 2A were more divergent, with the cumacen *Nippoleucon hinumensis* and amphipod *Traskorchestia* sp. dominating among the diverse prey spectrum at Coon Island but juvenile shrimp, *Neomysis kadiakensis* and beetles (Corixidae) being more prevalent at Pond 2A.

Inland silverside indicated a more consistent diet in 2003, focused predominantly on *C. alienense* at Bull Island and Carls Marsh but the diets were more diverse, including the amphipod *Hyallela azteca* and Noteridae (water beetles) at Coon Island and corixid beetles at Pond 2A. In 2004, silverside diets at Bull, Coon and Sherman islands and Pond 2A were similarly concentrated on gammarid amphipods but also included *N. hinumensis* at Bull Island and chironomid (diperan midges) pupae and emerging adults, corixid beetles and *Gnorimosphaerima* sp. isopods at Sherman Island.

Striped bass captured at Bull Island and Pond 2A in 2004 had diets dominated by either inland silverside (Bull Island) or the amphipod *Grandidierella japonixa*.

4.6 Food Web

4.6.1 Organic Matter Sources – Figure 12.

Utilizing the combination of stable isotopes of carbon ($\delta^{13}C$), nitrogen ($\delta^{15}N$) and sulfur($\delta^{34}S$) enabled us to distinguish the major organic matter sources to the marsh food webs.

4.6.2 Sources of Organic Matter to Marsh Consumers – Figure 13.

We found no strong differences in the percent contribution of any primary producer between inland silversides and yellowfin gobies. Both species exhibited remarkably similar base diet distributions within a specific marsh. Conversely, the contributing distributions of primary producers appeared to vary between marshes. This diet variation is tracked by both species among marshes. This can be interpreted that both silversides and gobies display site fidelity, which assumes that the compositional make-up of the available detritus pool is different among marshes. A striking feature of these findings is the minimal contribution of phytoplankton in all three marshes, regardless of marsh age. Coon Island, the ancient marsh, has no less contribution of phytoplankton than the two restoring sites.

5.0 References Cited

Lubetkin, S.. C., and C. A. Simenstad. 2004. Multi-source mixing models to quantify food web sources and pathways. *J. Appl. Ecol.* **41**:996-1008

Pinkas, L., M. S. Oliphant, and I. L. K. Iverson. 1971. Food habits of albacore, bluefin tuna, and bonito in California waters. Calif. *Dept. Fish and Game, Fish Bull.* **152**. 105 p.

6.0 Tables and Figures

Legend	Scientific name	Common name	Total Count (n)	Mean size (cm)	Size range (cm)
	Menidia beryllina	inland silverside	5,765	5.0	1.4 - 10.2
	Gambusia affinis	mosquitofish	1,792	3.1	1.5 - 6.5
	Acanthogobius flavimanus	yellowfin goby	641	6.4	2.1 - 21.4
	Lucania parva	rainwater killifish	258	2.9	1.4 - 5.3
	Gasterosteus aculeatus	threespine stickleback	220	3.6	1.6 - 5.6
	Hysterocarpus traskii	tule perch	174	8.5	1.8 - 16.7
	Clupea pallasi	Pacific herring	121	3.2	2.3 - 8
	Pogonichthys macrolepidotus	Sacramento splittail	96	13.6	4.4 - 36.6
	Cottus asper	prickly sculpin	77	5.7	1.6 - 11
	Morone saxatilis	striped bass	74	16.5	1.9 - 38.5
	Leptocottus armatus	staghorn sculpin	62	4.9	2.0 - 11.4
	Lepidogobius lepidus	bay goby	46	4.0	2.8 - 6.2
	Dorosoma petenense	threadfin shad	28	9.0	4.4 - 15.7
	Tridentiger bifasciatus	Shimofuri goby	26	6.9	2.2 - 9.6
	Lavinia exilicauda	hitch	11	7.9	6.1 - 10.6
	Oncorhynchus tshawytscha	Chinook salmon	9	3.7	3.1 - 4.4
	Alosa sapidissima	American shad	8	11.2	8.3 - 19.2
	Gillichthys mirabilis	longjaw mudsucker	7	10.3	7.8 - 12.8
	Archoplites interruptus	Sacramento perch	7	14.1	11.8 - 20.4
	Hypomesus transpacificus	Delta smelt	6	5.6	3.4 - 7.5
	Spirinchus thaleichthys	longfin smelt	5	6.0	3.8 - 7
	Cymatogaster aggregata	shiner perch	4	8.1	6.0 - 9.3
	Tridentiger trigonocephalus	chameleon goby	4	5.6	2.7 - 10.3
	Engraulis mordax	Northern anchovy	3	8.9	8.4 - 9.5
	Micropterus dolomieui	smallmouth bass	2	14.3	14.3 - 14.3
	Cyprinus carpio	common carp	2	6.5	4.3 - 8.6

Legend color	Scientific name	Common name	Total Count (n)	Mean size (cm)	Size range (cm)
	Platichthys stellatus	starry flounder	1		8.8
	Atherinops affinis	topsmelt	1		35.0
	Ameiurus nebulosus	brown bullhead	1		28.5
	Ptychocheilus grandis	Sacramento pikeminnow	1		8.1

Table 1. Table of fish species captured during the entire length of the study across all six marshes sampled. Legend color in column one refers to species codes in figure 1, and are only shown for the top 14 taxa. Common name species in red are non-native species, black are native species.

Table 2. Total count of zooplankton for the entire study period at all sampling sites.

Common Division	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
(S.Cl.) Copepoda									
Calanoida									
	Tortanus dextrilobatus			492	632	1,008	655		
	Diaptomus siciloides					1	1		
	Acartiella sinensis			791	406	1,180	665		
	Eurytemora affinis			8,773	3,905	1,143	160	361	
	Sinocalanus doerii			90	116	469	398		
	Tortanus discaudatus					5			
	Acartia omorii				2	11	22		
	Acartia acartiura			369	109	175	386		
	Diaptomus sp.						3		
	(F.) Diaptomidae			52	91				
	Acartia californiensis				1,656	727	732		
	Pseudodiaptomus inopinus						1	1	
	Pseudodiaptomus sp.		15,137	713	73				
	Diaptomus franciscanus					63	48		
	Diaptomus pallidus					4	3		
	Pseudodiaptomus marinus				69	45	67	19	
	Paracalanus parvus				31	5	10		
	Pseudodiaptomus forbesi			9,394	3,298	3,413	1,452	1,279	
	Acartia tonsa				6	67	13		
	Pseudodiaptomus euryhalinus			400	202	97	45	20	
	Eurytemora americana				1			2	
	Osphranticum labronectum					1	1		
	Acartia sp.			9	2				
Cyclopoida									
	Macrocyclops ater						2	1	
	Macrocyclops albidus				273	64	74	2	
	Acanthocyclops robustus			3,172	932	150	120	29	
	(F.) Cyclopinidae				350	162	148	243	
	Mesocyclops sp.					2			
	(O.) Cyclopoida	766		2,708	24	57	150		
	Limnoithona tetraspina				97,424	57,053	71,870	4,657	
	Halicyclops sp.			26	85	70	82	10	
	Eucyclops agilis				50	42	68	65	
	Mesocyclops edax						11		
	Diacyclops thomasi	670		446	80	59	116		

Table 2. (continued)

Common division	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
	Microcyclops varicans				419	102	180	18	
	Eucyclops speratus					2			
	Eucyclops sp.	27			1	1	5		
	Macrocyclops sp.				257				
	Oithona similis				9		8		
	Oithona davisae				120,839	10,324	42,466	2,109	
Harpacticoida									
	(F.) Tisbidae				1		11		
	Bryocamptus sp.					1			
	(F.) Darcythompsoniidae	238							
	(F.) Cletodidae								
	Coullana canadensis			1,170	317	382	139	87	
	Onychocamptus mohammed			119	96	38	20	31	
	Neotachidius triangularis					52	103	3	
	Nitokra lacustris					3	6	3	
	Nannopus palustris				499	128	189	29	
	Nitokra spinipes					4	7		
	Microarthridion littorale					69	32		
	Nitokra sp.					16	68	27	
	(F.) Ectinosomatidae	61							
	Mesochra rapiens				106	137	114	70	
	Mesochra alaskana				190	61	66	76	
	Mesochra lilljeborgi					22	63	12	
	Limnocletodes behningi							6	
	Mesochra sp.			110					
	Leimia vaga				7				
	(F.) Tachidiidae				272	24	37	5	
	Schizopera sp.				76	21	42	54	
	Euterpina acutifrons				77	33	28	36	
	Pseudobradya sp.	1,244			1,344	447	1,203	204	
	Tachidius discipes					5	15		
	Huntemannia jadensis	1							
	(O.) Harpacticoida	104	5,105	64	270				
	(F.) Laophontidae			92	104	101	106	60	
Poecilostomatoida									
	Oncaea subtilis				4	12	5		
	Oncaea spp.				26				

Table 2. (continued)

Common division	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
	Corycaeus affinis					4	3		
	(F.) Ergasilidae					1			
	(F.) Clausidiidae				985				
(S.Cl.) Copepoda			310,809						
(O.) Amphipoda									
Gammaridea									
	Gammarus sp.	930							
	Americorophium spinicorne	2							
	Grandidierella japonica	33							
	Corophium sp.	940							
	Sinocorophium sp.	52							
	(F.) Gammaridae	703							
Caprellidea									
	(F.) Caprellidea	1							
(O.) Cumacea	*Nippoleucon hinumensis*	736							
(O.) Decapoda									
	Hemigrapsus								86
	(S.F.) Grapsoidea								59
	Rhithropanopeus harrisii								392
	(S.F.) Pandaloidea								19
	(F.) Majidae								
(O.) Isopoda		34							
	Munna sp.	46							
	(F.) Cryptoniscidae								5
	Gnorimosphaeroma sp.	267							
(O.) Mysida									
	Neomysis kadiakensis	706							
	(F.) Mysidae	54							
	Acanthomysis aspera	27							
	Acanthomysis bowmani	57							
	Alienacanthomysis macropsis	1							
	Deltamysis holmquistae	1							
(S.O.) Cladocera									
	Evadne tergestina	1							
	Sida crystallina	1							
	(F.) Daphniidae	531							
	Daphnia magna					10	30		

Table 2. (continued)

Common division	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
	Daphnia pulex	5							
	Daphnia pulicaria					1	13		
	Simocephalus serrulatus	4							
	Simocephalus spp.	138							
	Simocephalus vetulus	65							
	Bosmina longirostris	1,556							
	(F.) Chydoridae								
	Ceriodaphnia sp.	19							
	(F.) Macrothricidae	77							
	Evadne sp.	0							
	Kurzia latissima	14							
	(F.) Chydoridae	599							
	Ilyocryptus sp.	117							
	Diaphanosoma sp.	108							
	Daphnia laevis	2							
	Daphnia spp.					2	1		
	(S.O) Cladocera	291							
	Moina sp.	3							
(Cl.) Ostracoda	(Cl.) Ostracoda	25,469							
(O.) Tanaidacea		27							
	Sinelobus stanfordi	226							
(P.) Rotifera		25,700							
	Asplanchna sp.	26							
	(F.) Brachionidae	81							
	Kellicottia sp.	5							2
(P.) Cnidaria	(Cl). Anthozoa								4
	(Cl). Hydrozoa	143							
(I.Cl.) Cirripedia									3,293
(P.) Mollusca	(Cl). Gastropoda	16,277							
	(Cl). Bivalvia	1,112							
(P.) Nemata		9,532							
(P.) Platyhelminthes	(Cl). Turbellaria	2,264							
(P.) Ectoprocta									254
(P.) Tardigrada		10							
(S.P.) Tunicata	*Oikopleura dioica*	7							
(S.Cl.) Oligochaeta		4,893							
(K.) Protozoa	(F.) Foraminiferida	341							

Table 2. (continued)

Common division	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
	(F.) Tintinnidae	152							
(Cl.) Insecta									335
	(O.) Coleoptera								2
	(F.) Chironomidae	275							
	(F.) Culicidae	1							
	Clitellaria meigen	40							
	(F.) Delphacidae	1							
	(F.) Corixidae	45							
	(F.) Cicadellidae	8							
	(F.) Psyllidae								1
	(F.) Mymaridae	2							
	(O.) Psocoptera								1
	(O.) Thysanoptera	18							49
(S.P.) Hexapoda	(O.) Collembola								59
	(F.) Sminthuridae								25
	(F.) Isotomidae								
(S.P.) Chelicerata	(Cl). Arachnida	11							
	(S.Cl.) Acarina	50							
(Cl.) Polychaeta	*Sabellida* sp.	13							
	Spionida sp.larvae								13,170
	(Cl.) Polychaeta larvae								22,957
OTHER									
	Parasitic crustacea, unid.	1							
	Pisces ova	48							
	Pisces larva	16							
	Eggs, unid.	23,836							

Legend code	Taxa	Adult	Copepod						Crab Zoea / Larvae
			Nauplii	Copepid I-III	Copepid IV-V	Male	Female	Female w/eggs	
	A. *californiensis*				1,656	727	732		
	A. *sinensis*			791	406	1,180	665		
	Corophium sp.	940							
	(O). *Cyclopoida*	766		2,708	24	57	150		
	E. *affinis*			8,773	3,905	1,143	160	361	
	Gammarus sp.	930							
	(Cl.) *Gastropoda*	16,277							
	L. *tetraspina*				97,424	57,053	71,870	4,657	
	(P.) *Nemata*	9,532							
	O. *davisae*				120,839	10,324	42,466	2,109	
	(Cl.) *Oligochaeta*	4,893							
	(Cl.) *Ostracoda*	25,469							
	P. *forbesi*			9,394	3,298	3,413	1,452	1,279	
	Pseudobradya sp.	1,244			1,344	447	1,203	204	
	(P.) *Rotifera*	25,700							
	T. *dextrilobatus*			492	632	1,008	655		
	OTHER	12,207	331,051	6,831	6,186	2,723	2,908	908	40,712

Table 3. Numerically dominant zooplankton taxa across all sites and times. The summed counts of the adult forms of these taxa (i.e., categories male, female, female w/eggs and adult) are graphed in Figure 2 to reflect their seasonal variation in abundance and are coded using the colors in column one.

Table 4. Overall taxa richness (number of taxa) at each site for benthic and neuston invertebrates.

Site	Benthic Taxa Richness	Neuston Taxa Richness
Browns	48	39
Sherman	33	44
Coon Island	46	55
Bull Island	43	53
Pond 2A	51	49
Carl's Marsh	45	52

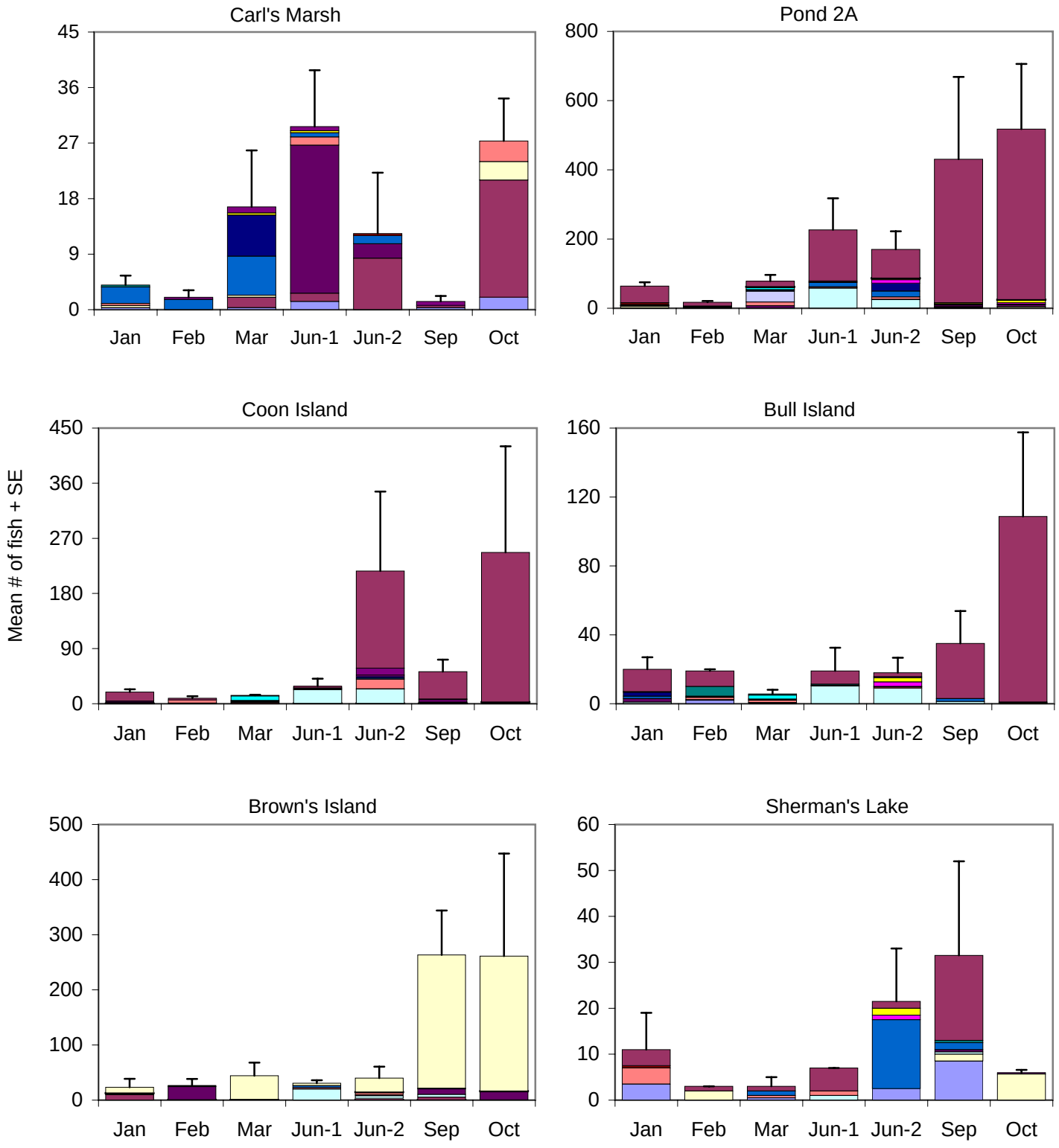


Figure 1. Mean fish count + SE across the six marshes sampled. Months are listed in calender order to emphasize seasonal variation but do not reflect the annual order that samples were taken: Jan=2005, Feb=2004, Mar=2005, Jun-1=2004, Jun-2=June 2005, Sep=2004, Oct=2003. See table 1 for color codes.

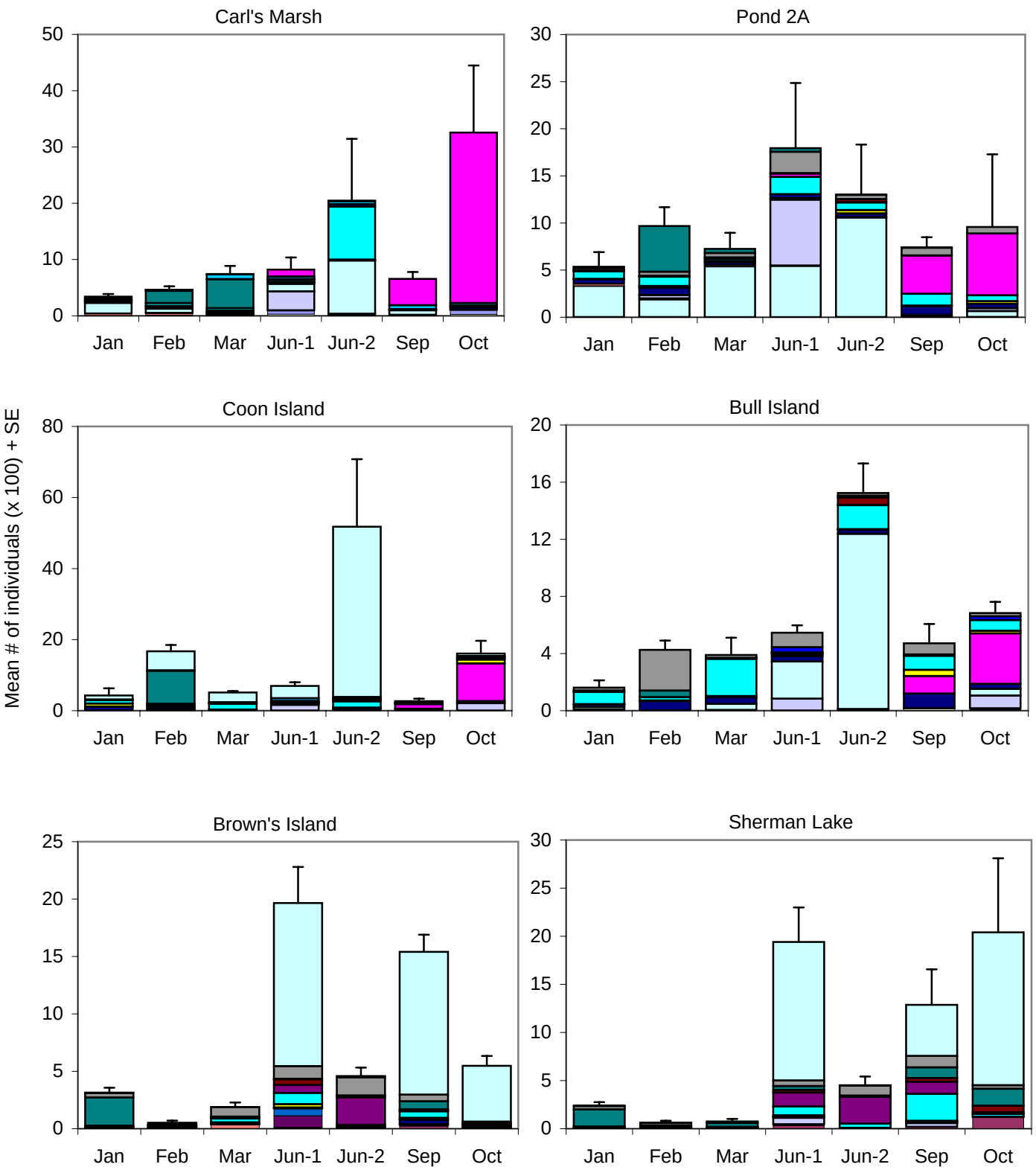


Figure 2. Mean zooplankton (x 100)+SE across the six marshes sampled. Months are listed is calender order to emphasize seasonal variation but do not reflect the annual order samples were taken: Jan=2005, Feb=2004, Mar=2005, Jun-1=2004, Jun-2 = June 2005, Sep=2004, Oct=2003. See Table 3 for color codes.

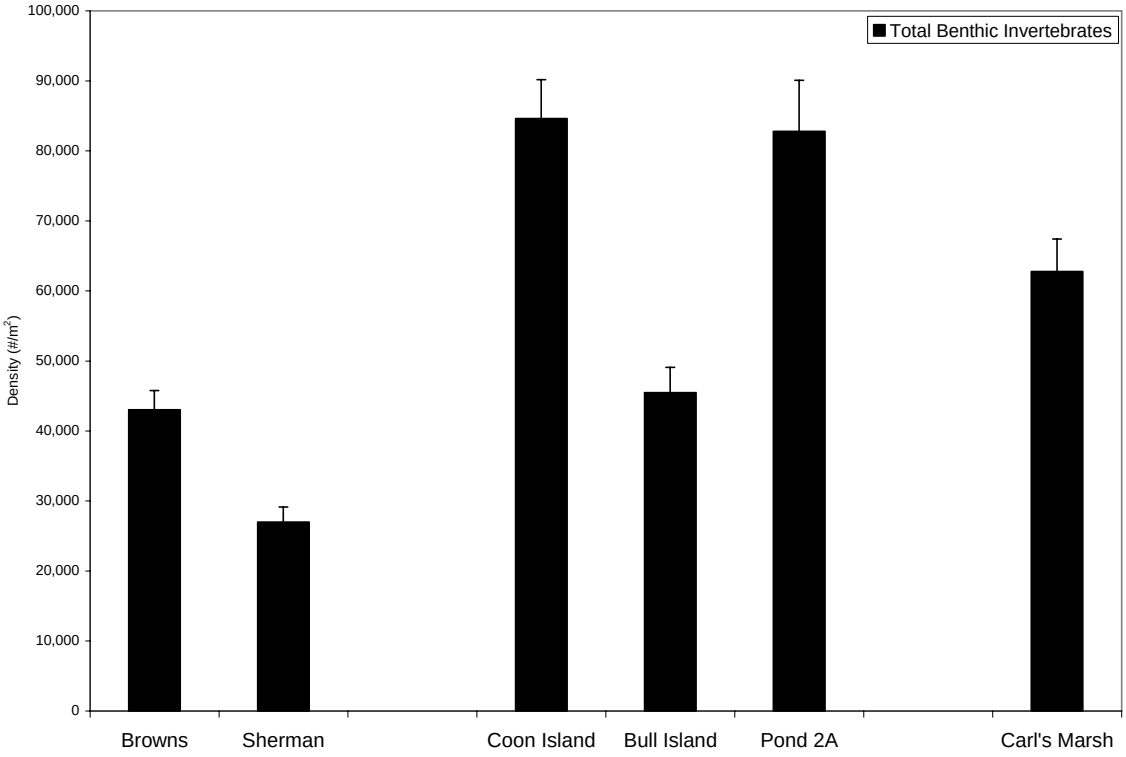


Figure 3 Average density (number m^{-2}) of total benthic invertebrates at all sites averaged over all dates of sampling. Error bars represent standard error.

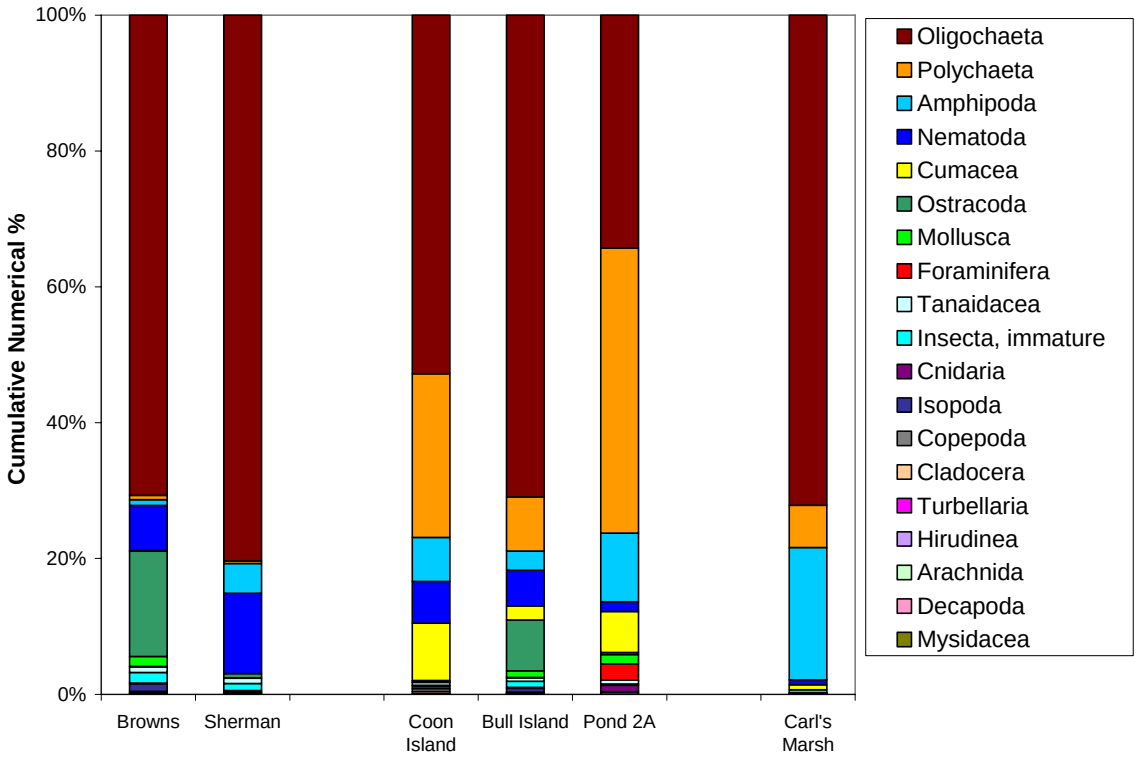


Figure 4 Percent numerical composition of major taxa of benthic invertebrates at all sites averaged over all dates of sampling.

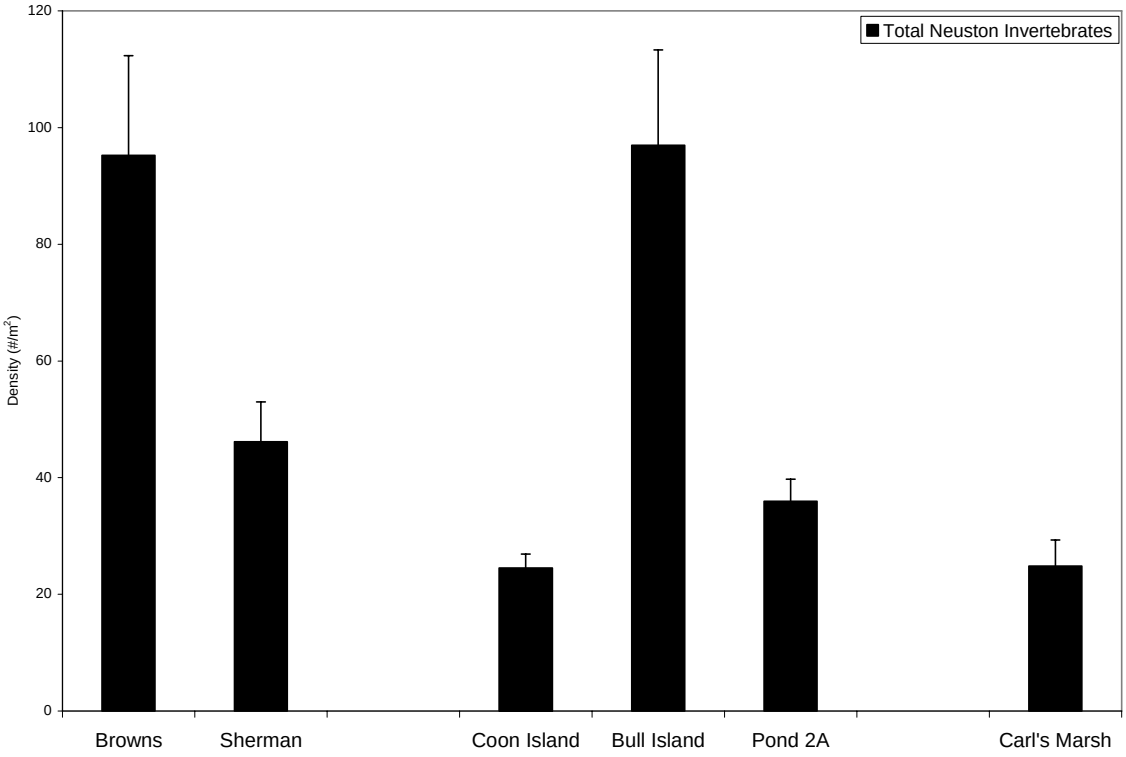


Figure 5 Average density (number m^{-2}) of total neustonic invertebrates at all sites averaged over all dates of sampling. Error bars represent standard error.

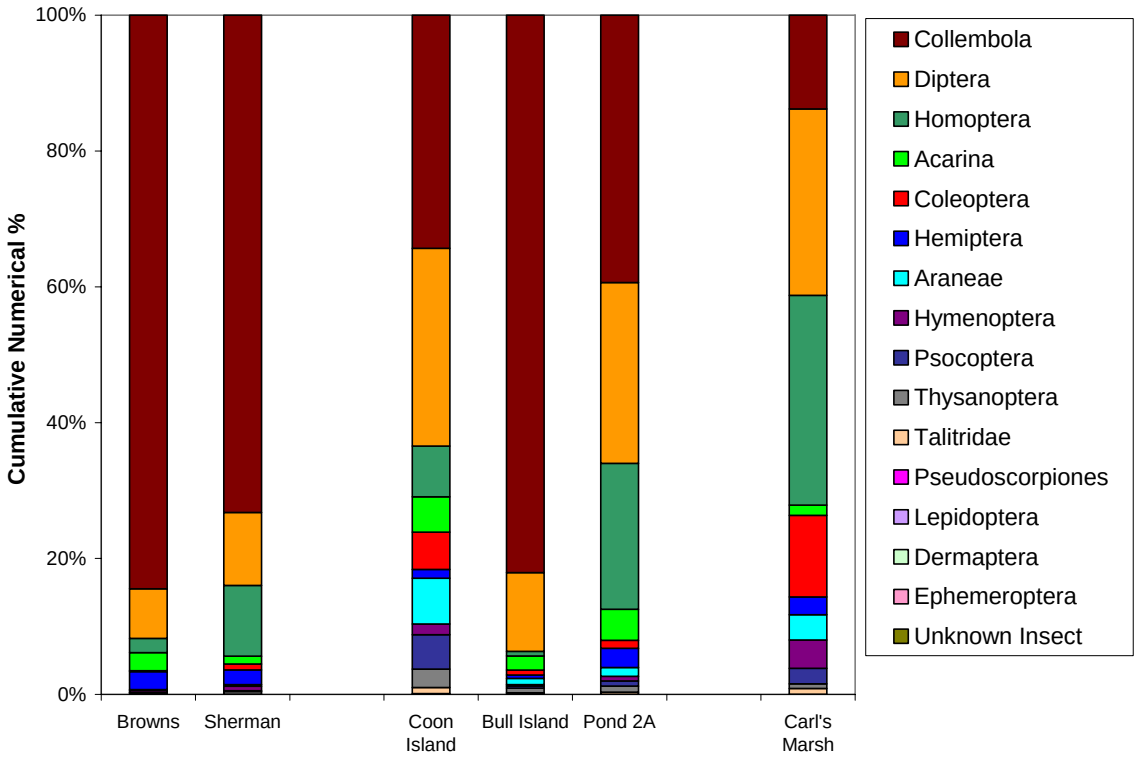


Figure 6 Percent numerical composition of major taxa of neustonic invertebrates at all sites averaged over all dates of sampling.

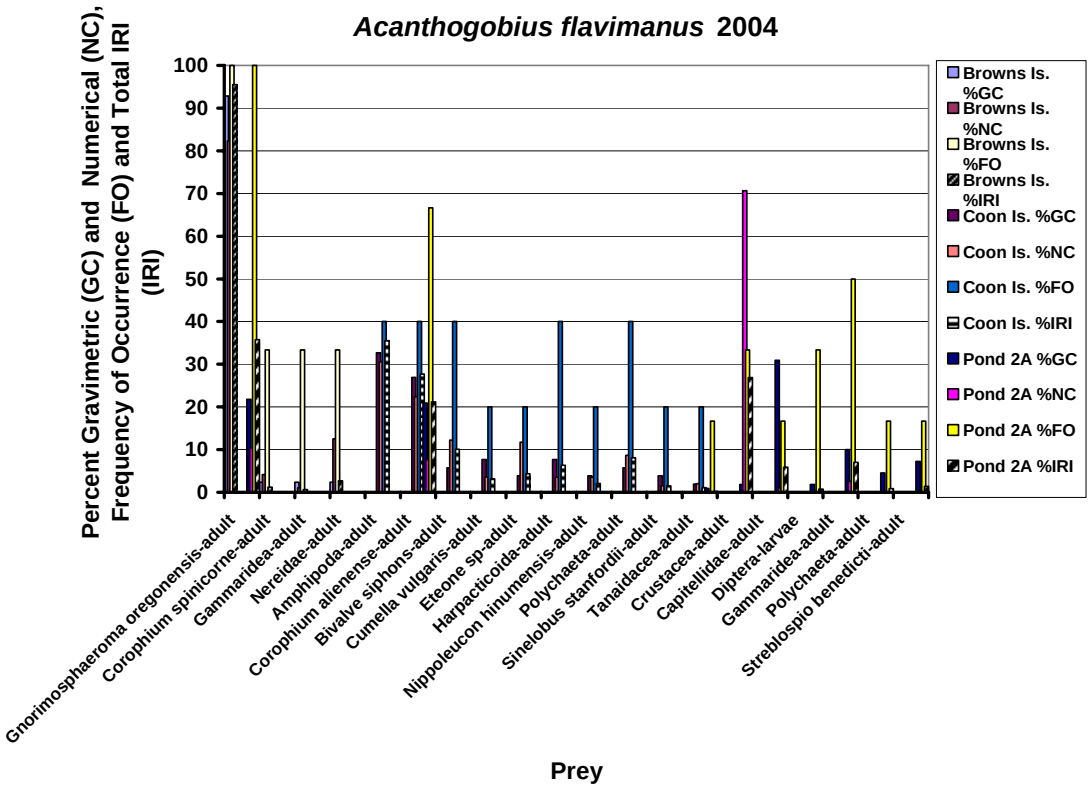


Figure 7 Diet composition of yellowfin goby (*Acanthogobius flavimanus*) at Brown and Coon Islands and Pond 2A in 2004; %GC = percent gravimetric composition, %NC = percent numerical composition, %FO = percent frequency of occurrence, and %IRI = percent total Index of Relative Importance (equal to [%GC + %NC] x %FO)

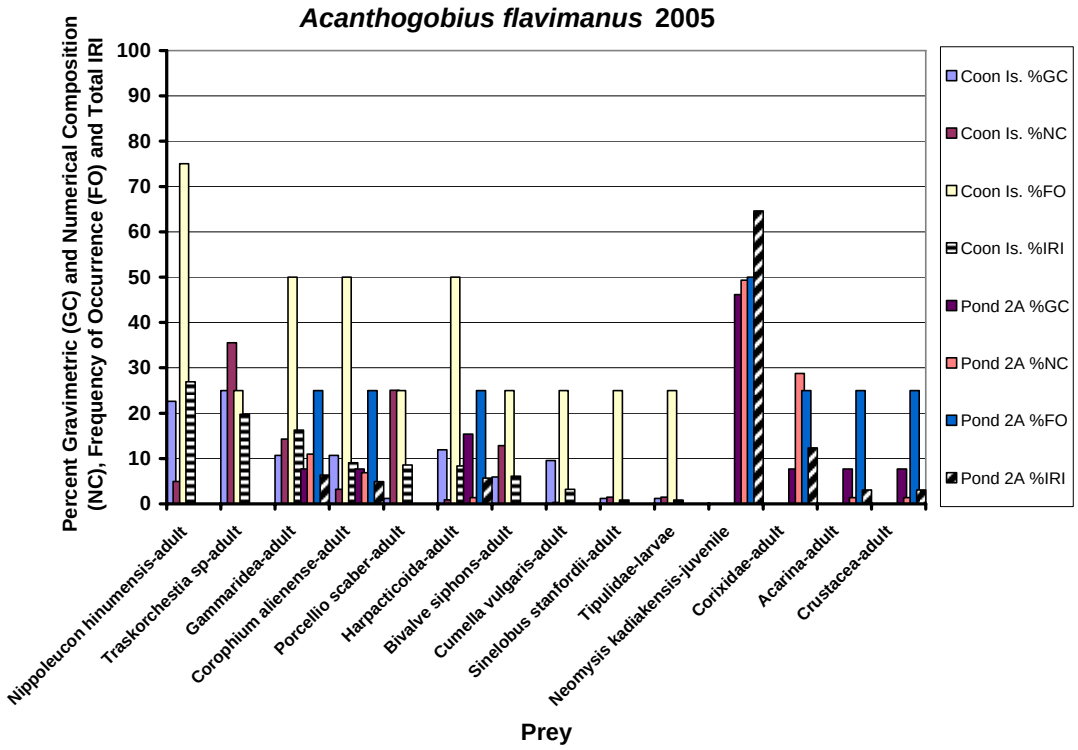


Figure 8 Diet composition of yellowfin goby (*Acanthogobius flavimanus*) at Coon Island and Pond 2A in 2005; %GC = percent gravimetric composition, %NC = percent numerical composition, %FO = percent frequency of occurrence, and %IRI = percent total Index of Relative Importance (equal to [%GC + %NC] x %FO)

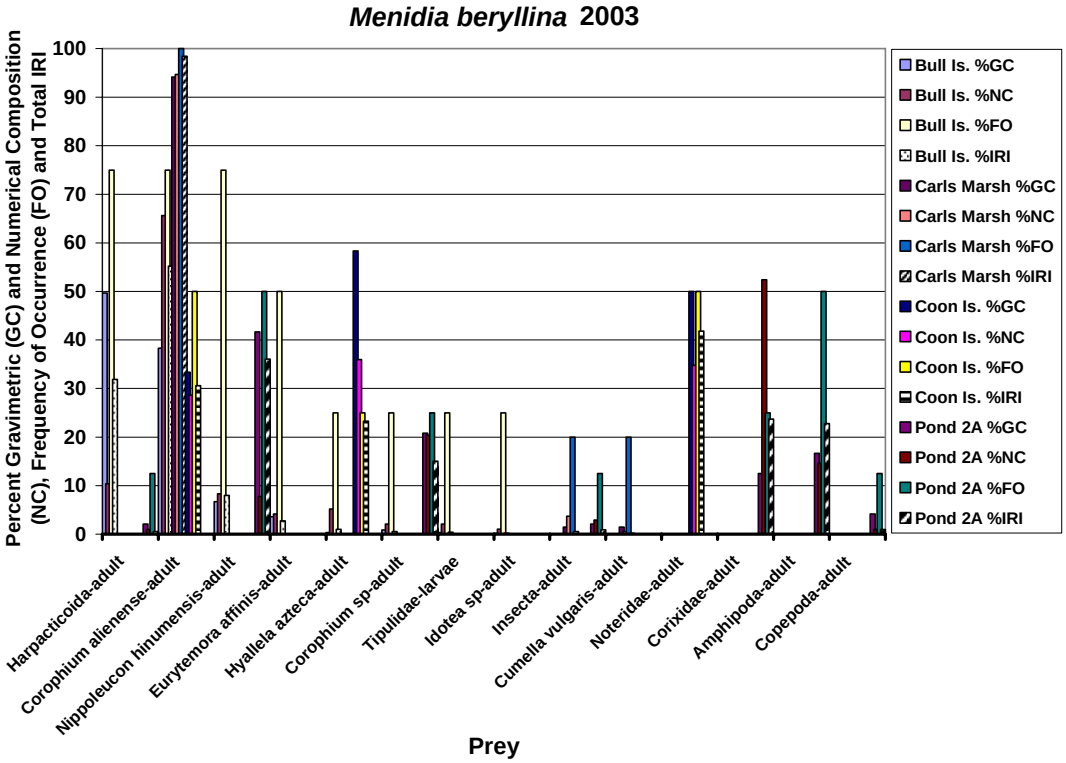


Figure 9 Diet composition of inland silverside (*Menidia beryllina*) at Bull and Coon islands, Carls Marsh and Pond 2A in 2003; %GC = percent gravimetric composition, %NC = percent numerical composition, %FO = percent frequency of occurrence, and %IRI = percent total Index of Relative Importance (equal to [%GC + %NC] x %FO)

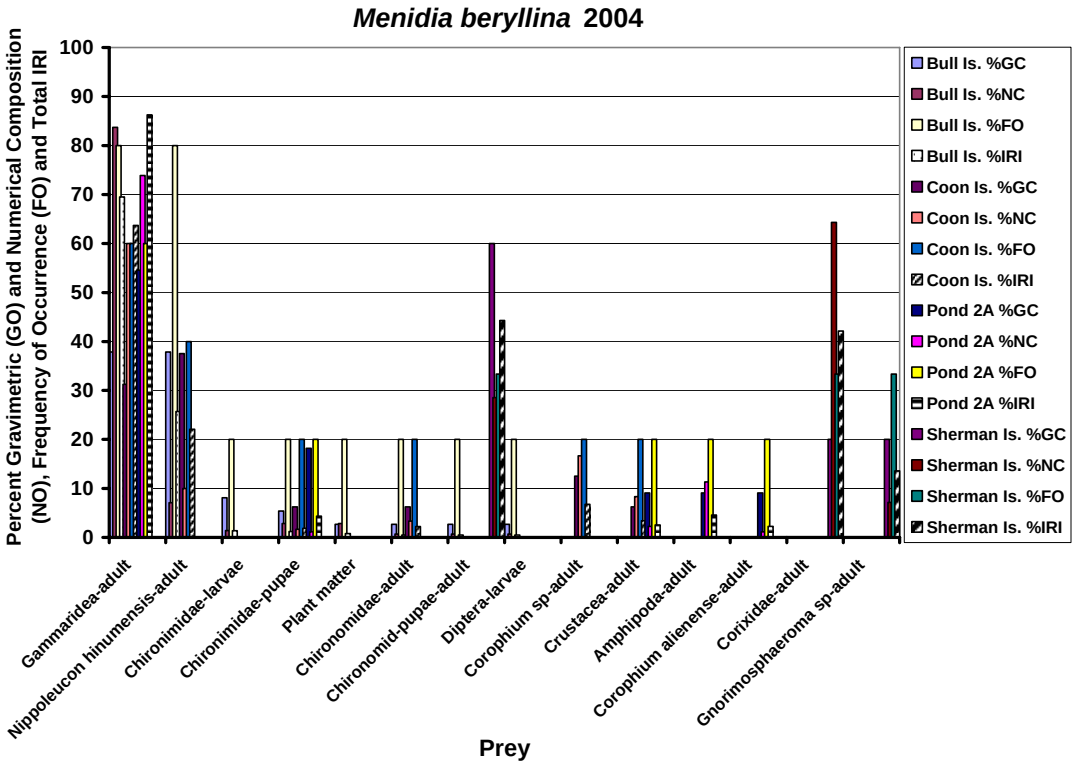


Figure 10 Diet composition of inland silverside (*Menidia beryllina*) at Bull,Coon and Sherman islands and Pond 2A in 2004; %GC = percent gravimetric composition, %NC = percent numerical composition, %FO = percent frequency of occurrence, and %IRI = percent total Index of Relative Importance (equal to [%GC + %NC] x %FO)

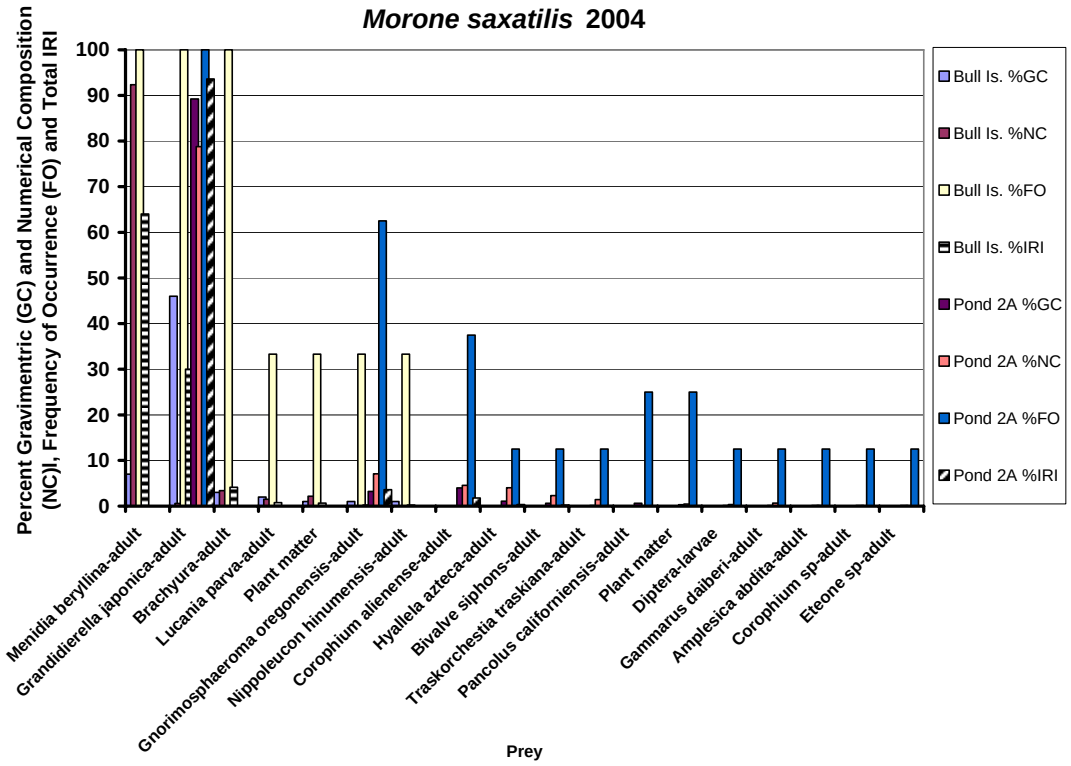


Figure 11 Diet composition ofstriped bass (*Morone saxatilis*) at Bull Island and Pond 2A in 2004; %GC = percent gravimetric composition, %NC = percent numerical composition, %FO = percent frequency of occurrence, and %IRI = percent total Index of Relative Importance (equal to [%GC + %NC] x %FO)

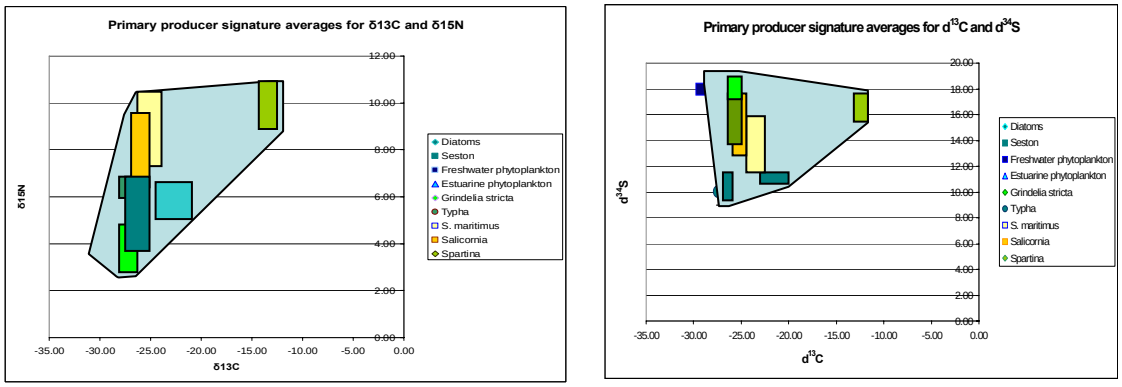
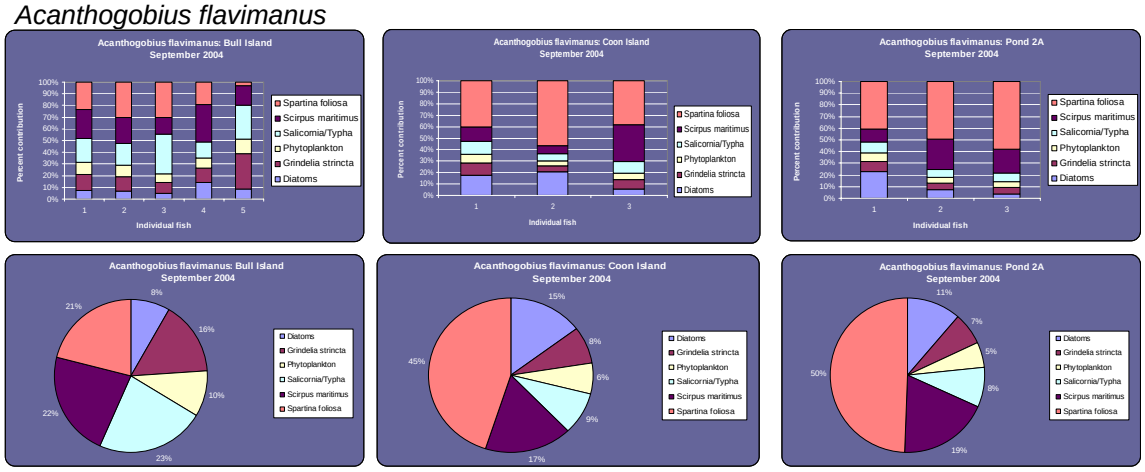


Figure 12 The combination of carbon, nitrogen, and sulfur isotopes enable us to distinguish the dominant primary producers from one another.

Bull Island Coon Island Pond 2A

Acanthogobius flavimanus



Menedia beryllina

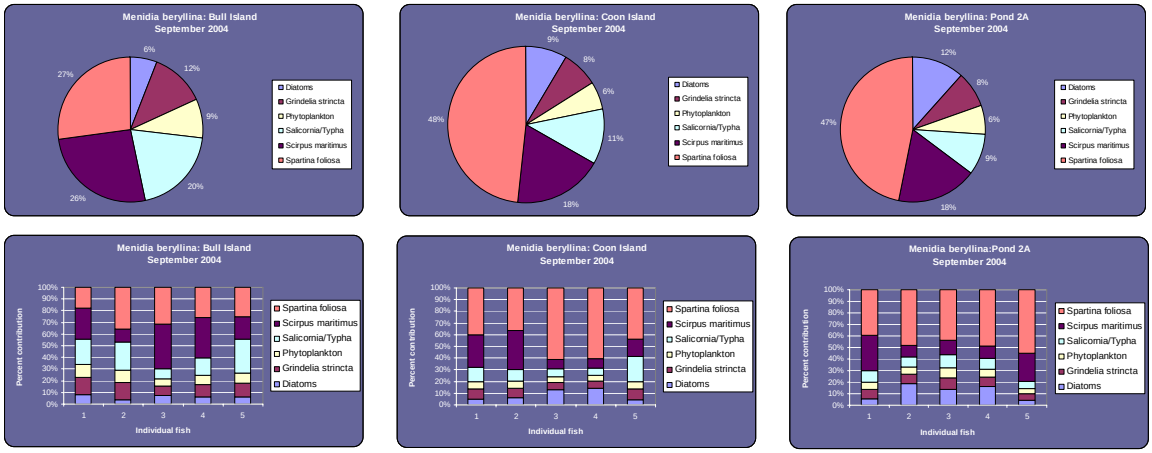


Figure 13 Isotope mixing model results comparing the contributions of different organic matter sources assimilated by yellowfin goby (top) and inland silversides (bottom) in September 2004.

Integrated Regional Wetland Monitoring Pilot Project

Primary Productivity and Nutrients Team Data Report

Authors
Risa Cohen, Romberg Tiburon Center (rcohen@sfsu.edu)
Richard Dugdale, Romberg Tiburon Center (rdugdale@sfsu.edu)
Frances Wilkerson, Romberg Tiburon Center (fwilkers@sfsu.edu)

December 2006

1.0 Introduction 1
2.0 Scope of Work 2
3.0 Data Collection and Quality Assurance 2
3.1 Nutrients 2
3.2 Phytoplankton productivity 2
3.3 Mudflat productivity 3
3.4 Submerged Aquatic Vegetation productivity 3
3.5 Low marsh macrovegetation productivity 3
3.6 Quality Assurance 3
References 4
Tables 5
Table 1. 2004 Phytoplankton Productivity
Table 2. 2004 Sediment - Benthic Diatom Productivity
Table 3. 2004 Submerged Aquatic Vegetation Productivity
Table 4. 2004 Low Marsh Vegetation Productivity
Table 5. 2004 Water Nutrient (NO_3^-, $Si(OH)_4$, PO_4, NH_4^+) Concentrations
Table 6. 2004 Sampling Dates
Table 7. 2005 Phytoplankton Productivity
Table 8. 2005 Sediment - Benthic Diatom Productivity
Table 9. 2005 Submerged Aquatic Vegetation Productivity
Table 10. 2005 Low Marsh Vegetation Productivity
Table 11. 2005 Water Nutrient (NO_3^-, $Si(OH)_4$, PO_4, NH_4^+) Concentrations
Table 12. 2005 Sampling Dates

1.0 Introduction

Primary production plays a central role in regulating the abundance and health of salt marsh vegetation and the productivity of higher trophic levels, yet this has not been well studied in tidal marshes in the SFE. Jassby *et al.* (1993) stated that phytoplankton and benthic microalgae are the dominant sources of primary production in the SFE, although other sources such as eelgrass (*Zostera marina*), a submerged aquatic plant, and salt marsh vegetation (*Spartina* spp) might also be important, but that less data are available on their significance. However *within* marshes, the stands of low marsh vegetation such as cordgrass (*Spartina* spp.) are important primary producers (Pomeroy *et al.* 1981). Research in both east and west coast estuaries has shown the potential importance of eelgrass productivity (Phillips 1974), and it is known to be present in the SFE (Wyllie-Echeverria and Rutten 1989), however there exists little information on rates of primary productivity in SFE marshes. Macroalgae are also present in the SFE, but it is thought that they are not major contributors to primary production (Jassby *et al.* 1993). Again, we know very little about the relative importance of different groups of primary producers within the SFE, and almost nothing about the effects of restoration stage (age) on primary productivity in the SFE.

Inorganic nutrients such as nitrate, ammonium, silicate and phosphate are essential to primary production and productivity of higher trophic levels. Yet very little is known of the relative contribution of wetlands to nutrients in the SFE. Changes due to restoration efforts may impact the different inorganic sources entering the SFE, which in turn will influence the aquatic primary producers (both macro and micro) that grow and feed higher trophic levels (Cloern *et al.*, 1983). $Si(OH)_4$ is required for diatoms, the key primary producers in short energetically efficient pelagic food chains that may also be important in wetland channels, and PO_4 may modulate the amount of atmospheric N_2 fixation that can occur in salt marshes. The balance of various constituents of the nitrogen cycle (e.g., NO_3 vs. NH_4) may be important in determining the food web that results. Our previous research in the SFE has measured these dissolved inorganic nutrients in open waters and has shown that nutrients throughout most of the year are at levels assumed to be non limiting- i.e. nitrate (NO_3) greater than 15 µM, silicate often greater than 50µM and ammonium (NH_4) > 3 µM (Dugdale *et al.* 2000, Wilkerson *et al.* 1999, 2000a,b & c, Hogue 2000, Hogue *et al.* 2001). However, NH_4 concentrations are high, within the range known to inhibit the uptake of NO_3 by phytoplankton (Glibert *et al.* 1982).

Although studies of the nutrient exchanges between wetlands and estuaries have been made in other regions (e.g., Smith 1973, Nixon *et al.* 1976, Haines *et al.* 1977, Armstrong and Hinson 1978, Daly and Mathieson 1981), little has been reported for salt marsh areas of the SFE and most studies have described nitrogen fluxes only (e.g., Bucholz 1982). The stage of development (age) of a marsh may also be a factor in its ability to process nutrients, especially nitrogen. For instance, denitrification rates (nitrate reduced to nitrogen gas, N_2) were 44 times higher in a natural marsh compared to an adjacent transplanted marsh (Thompson, et al., 1995). According to Childers *et al.* (1993) and Dame and Gardner (1993), young accretional marshes import more dissolved inorganic nitrogen (DIN) than they export, whereas older, more mature, erosional marshes export DIN on a net seasonal basis. In spite of the range of these estimates, on balance it appears that wetlands have the potential to absorb significant quantities of nitrogen, especially NH_4. Reduction of ambient NH_4 by wetlands restoration could potentially result in

improvement of the estuarine productivity of diatoms, the most favored source of phytoplankton for higher trophic levels.

2.0 Scope of Work

The objective of the primary productivity and nutrient team was to evaluate primary productivity and nutrient concentrations as a potential metric of wetland state. We determined the concentrations of various inorganic nutrients in marsh waters and their relationships with the productivity of four different groups of autotrophs at restored and natural reference sites in San Pablo Bay, Suisun Marsh and the Sacramento-San Joaquin Delta.

3.0 Data Collection and Quality Assurance

3.1 Nutrients

Water adjacent to the productivity locations was sampled on the incoming tide, monthly during the growing season and analyzed for nitrate (NO_3^-), silicate ($Si(OH)_4$), phosphate (PO_4) and ammonium (NH_4) using hand-held sampling bottles. Water samples for nitrate, silicate and phosphate were frozen in 20 ml polypropylene bottles until analysis with a Bran and Luebbe AutoAnalyzer II [NO_3 and PO_4 according to Whitledge et al. (1981), $Si(OH)_4$ using Bran and Luebbe Method G-177-96 (Bran and Luebbe, 1999)]. Frozen samples were thawed 24 hours prior to analysis to avoid polymerization effects on $Si(OH)_4$ measurements and poor reproducibility (MacDonald et al. 1986). Typically, water samples for the AutoAnalyzer do not need pre-filtering due to the tubing dimensions and small volumes required for the chemical analyses. For ammonium (NH_4) analyses, water was filtered through pre-combusted GF/F filters before analysis to remove any sediment, which yields anomalously high NH_4 values. Filtered samples were then treated with phenol reagent (Solorzano, 1969) and held at 4ºC until analysis using a Hewlett Packard Model 8452A diode array spectrophotometer.

3.2 Phytoplankton productivity

Five replicate 1 L water samples were collected monthly from each site. Upon return from the field, 50 ml from each replicate was filtered onto a GF/F glass fiber filter for chlorophyll a analysis. Each filter was extracted in 8 ml of 90% acetone for 24 h and fluorescence was measured on a Turner Designs 10 AU fluorometer. The ^{14}C light-dark bottle JGOFS protocol (IOC 1996) was modified to measure SFE phytoplankton primary productivity. Incubations of collected baywater were prepared by adding 0.8 μCi of ^{14}C bicarbonate to each 250 ml polycarbonate bottle. After incubating for 24 hours in a flow-through water table under appropriate light conditions, 100 ml from each bottle was filtered onto a GF/F glass fiber filter and ^{14}C incorporation was be determined by placing the filter in scintillation cocktail and counted in a scintillation counter. The chlorophyll *a* content was then used to calculate photosynthetic activity (assimilation number) per unit biomass. Since many of the sample sites were in relatively low salinity water, the dissolved inorganic carbon content (required for calculating C fixation) was determined with a TCO_2 analyzer.

3.3 Mudflat productivity

Primary productivity was measured using a ^{14}C technique developed for marsh sediments (modified from VanRaalte *et al.* 1974). From each sampling site, 15 cores (2.5 cm diameter, 0.5 cm depth) were collected and incubated in a flow-through water table under appropriate light conditions. The cores were incubated intact and upright in 30 ml clear polycarbonate sealed containers. The surface of each core was covered with 10 mL of solution containing GF/F filtered water from the collection site and 0.4 μCi of ^{14}C bicarbonate. After the 24 h incubation, cores were killed in formalin to stop all photosynthetic activity and rinsed with dilute hydrochloric acid to remove ^{14}C that was not incorporated. The core was then digested using nitric acid to release labeled, fixed ^{14}C into solution and the activity measured using liquid scintillation counting. The chlorophyll a content of the benthic diatoms was determined by grinding and extraction in 90% acetone and read on a Turner Designs 10 AU fluorometer.

3.4 Submerged Aquatic Vegetation productivity

Productivity of submerged aquatic vegetation (SAV) including macroalgae was determined using oxygen evolution (Littler and Littler 1985). Replicate SAV samples were collected when present and brought back to the lab for incubation under the same temperature and light conditions as the phytoplankton and benthic diatom core samples. Tissue was rinsed to remove epiphytes, invertebrates and debris and spun in a lettuce spinner to remove excess water. One-gram wet-weight samples were placed into each 300 ml BOD bottle with baywater from the collection site. Four light and two dark bottles were incubated in a flow-through water table under appropriate light conditions. After one hour, dissolved oxygen was measured using a WTW 197i meter with self-stirring probe. The chlorophyll a content of the SAV was determined by grinding and extraction in 90% acetone and read on a Turner Designs 10 AU fluorometer.

3.5 Low marsh macrovegetation productivity

To assess net productivity in low marsh plants, we measured CO_2 uptake using an infrared gas exchange technique (Geider and Osborne 1992). Measurements of photosynthesis were made at monthly intervals throughout the growing season (March-October). Blades of the intact living plants were placed within a chamber with a flow-through gas flow between the chamber and an infrared gas analyzer (CIRAS-1, PP Systems). Carbon fixation was measured directly as the decrease in CO_2 over the incubation period. We sampled replicate (n=5 per plot) plants at peak light intensity (points between 10 am and 2 pm) to determine C fixation m^{-2} μg chlorphyll a^{-1}. The chlorophyll a content of the plant tissue within the chamber was determined by grinding and extraction in 90% acetone and read on a Turner Designs 10 AU fluorometer.

3.6 Quality Assurance

We implemented regimented sampling procedures to ensure accuracy and consistency across all data collected. In the field, all assistants were instructed with on site demonstrations of the sampling protocols, and supervised throughout the entire sampling period. During sample processing in the laboratory, assistants first discussed the procedure with the supervisor, and then observed procedures performed by the supervisor. Next, the assistant performed the same

procedures while the supervisor observed. Only when the supervisor approved were the assistants allowed to analyze samples on their own. Data was verified at least twice to assure correct entry.

References

Bran Luebbe AutoAnalyzer Applications. 1999. AutoAnalyzer Method No. G-177-96 Silicate in water and seawater. Bran Luebbe, Inc. Buffalo Grove, IL.

Geider, R. J. and B. A. Osborne. 1992. Algal Photosynthesis. Chapman & Hall, New York. 256 pp.

IOC (Intergovernmental Oceanographic Commission) 1996. JGOFS Report 19. Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements.

Littler, M.M. and Littler, D.S. (eds.) 1985. Ecological Field Methods: Macroalgae. Handbook of Phycological Methods. Cambridge Univ. Press, New York, 617 pp.

MacDonald, R. W., F. A. McLaughlin and C. S. Wong. 1986. The storage of reactive silicate samples by freezing. Limnology and Oceanography 31:1139-1142.

Solorzano, L. 1969. Determination of ammonia in natural waters by the phenolhypochlorite method. Limnology and Oceanography 14: 799-801.

VanRaalte, C., W. C. Stewart, I. Valiella and E. J. Carpenter. 1974. A ^{14}C technique for measuring algal productivity in salt marsh muds. *Bot. Mar.* **17**:186-188.

Whitledge, T. E., S. C. Malloy, C. J. Patton and C. D. Wirick. 1981. Automated Nutrient Analysis in Seawater, Report BNL 51398. Brookhaven National Laboratory, Upton NY, 216 pp.

Table 1.

2004
Phytoplankton

Phytoplankton Productivity units = micrograms Carbon fixed per microgram chlorophyll a per hour
units = µg C / µg Chl h^{-1}

Site	sample (Light bottle 1-4)	March	April	May	June	July	August	September	October
Brown's	L1	0.68	1.25	1.57	1.73	1.66	2.39	5.78	2.69
Brown's	L2	0.97	1.34	1.58	1.70	1.31	1.83	4.31	3.86
Brown's	L3	1.46	1.43	1.66	1.80	1.22	1.83	5.27	5.81
Brown's	L4	1.74	1.52	1.33	1.87	1.10	1.43	4.70	3.31
Sherman	L1	1.48	1.91	2.35	2.18	3.02	0.65	0.81	1.30
Sherman	L2	1.01	1.70	3.03	2.63	1.58	0.79	0.98	0.51
Sherman	L3	1.40	1.61	1.67	2.06	1.48	0.59	1.39	0.97
Sherman	L4	1.25	1.25	1.65	2.71	2.50	0.89	1.17	0.41
Coon	L1	1.23	2.67	1.40	3.64	6.08	6.45	1.76	0.73
Coon	L2	1.05	3.72	1.07	3.24	5.59	4.06	1.39	1.26
Coon	L3	1.17	3.17	1.47	3.53	4.67	4.93	2.27	2.16
Coon	L4	0.96	3.11	1.82	3.51	5.22	6.15	2.53	1.32
Bull	L1	1.75	1.78	4.28	3.89	3.69	3.39	1.72	2.13
Bull	L2	1.34	1.75	2.88	3.41	2.92	3.91	3.34	1.63
Bull	L3	1.63	1.60	3.88	3.71	2.79	3.36	2.55	1.72
Bull	L4	1.43	1.09	4.05	3.51	2.66	3.66	2.43	2.24
Pond 2A	L1	1.81	4.87	1.95	3.58	6.59	1.74	7.71	1.28
Pond 2A	L2	1.09	4.68	2.08	4.47	9.56	3.81	4.00	3.06
Pond 2A	L3	1.26	4.68	2.14	5.37	6.44	1.49	5.68	3.29
Pond 2A	L4	1.60	5.53	3.02	4.98	8.49	2.14	5.45	2.63
Carl's	L1	1.68	2.08	1.07	2.26	2.52	0.96	5.41	2.55
Carl's	L2	1.85	3.02	0.74	1.60	2.89	1.24	6.71	2.11
Carl's	L3	1.40	2.97	0.89	2.27	2.66	1.09	5.45	2.84
Carl's	L4	0.84	2.99	0.69	2.31	3.08	0.72	5.34	2.56

Table 2.

2004
Sediment - Benthic Diatoms

Benthic Diatom Productivity Units = mg carbon fixed per mg chlorophyll a per hour
= mg C/mg Chl hr-1

Site	sample Plot A, B, C Light bottle (1-3)	March	April	May	June	July	August	Sept	Oct
Browns	A-L1	0.161	0.023	0.009	0.005	0.002	0.004	0.008	0.065
Browns	A-L2	0.020	0.023	0.010	0.003	0.004	0.004	0.008	0.072
Browns	A-L3	0.028	0.021	0.008	0.005	0.002	0.004	0.007	0.049
Browns	B-L1	0.002	0.031	0.002	0.016	0.006	0.003	0.005	0.009
Browns	B-L2	0.002	0.036	0.005	0.014	0.009	0.002	0.006	0.012
Browns	B-L3	0.002	0.032	0.003	0.015	0.007	0.002	0.005	0.010
Browns	C-L1	0.003	0.030	0.007	0.018	0.004	0.003	0.006	0.009
Browns	C-L2	0.002	0.030	0.008	0.017	0.004	0.003	0.006	0.001
Browns	C-L3	0.003	0.032	0.007	0.016	0.004	0.004	0.004	0.014
Sherman	A-L1	0.036	0.349	0.064	0.017	0.022	0.017	0.022	0.026
Sherman	A-L2	0.040	0.461	0.057	0.016	0.023	0.020	0.024	0.023
Sherman	A-L3	0.049	0.309	0.056	0.017	0.026	0.026	0.018	0.031
Sherman	B-L1	0.044	0.167	0.031	0.036	0.027	0.016	0.011	0.028
Sherman	B-L2	0.038	0.193	0.023	0.046	0.035	0.015	0.010	0.035
Sherman	B-L3	0.035	0.185	0.019	0.046	0.034	0.018	0.010	0.016
Sherman	C-L1	0.018	0.017	0.152	0.016	0.028	0.016	0.013	0.020
Sherman	C-L2	0.034	0.021	0.178	0.018	0.025	0.022	0.014	0.021
Sherman	C-L3	0.009	0.033	0.173	0.017	0.026	0.020	0.009	0.019
Coon	A-L1	0.037	0.010	0.008	0.007	0.010	0.009	0.008	0.002
Coon	A-L2	0.032	0.020	0.011	0.012	0.011	0.008	0.006	0.003
Coon	A-L3	0.043	0.028	0.005	0.008	0.010	0.009	0.006	0.002
Coon	B-L1	0.038	0.020	0.000	0.002	0.009	0.008	0.007	0.000
Coon	B-L2	0.065	0.015	0.011	0.002	0.009	0.007	0.008	0.000
Coon	B-L3	0.055	0.013	0.003	0.013	0.008	0.005	0.010	0.003
Coon	C-L1	0.026	0.008	0.021	0.010	0.008	0.005	0.010	0.000
Coon	C-L2	0.042	0.013	0.019	0.018	0.009	0.004	0.010	0.000
Coon	C-L3	0.048	0.020	0.023	0.013	0.007	0.003	0.008	0.000
Bull	A-L1	N/A	0.003	0.041	0.006	0.010	0.009	0.004	0.015
Bull	A-L2	N/A	0.009	0.039	0.005	0.010	0.006	0.005	0.008
Bull	A-L3	N/A	0.013	0.030	0.008	0.010	0.006	0.003	0.011
Bull	B-L1	N/A	0.002	0.016	0.010	0.011	0.004	0.003	0.011
Bull	B-L2	N/A	0.000	0.013	0.018	0.015	0.008	0.005	0.013
Bull	B-L3	N/A	0.010	0.039	0.017	0.011	0.006	0.006	0.014
Bull	C-L1	N/A	0.026	0.061	0.017	0.009	0.005	0.001	0.012
Bull	C-L2	N/A	0.069	0.040	0.015	0.008	0.007	0.002	0.012
Bull	C-L3	N/A	0.042	0.022	0.014	0.011	0.004	0.001	0.013
Pond 2A	A-L1	0.015	0.032	0.015	0.024	0.009	0.013	0.007	0.004
Pond 2A	A-L2	0.021	0.025	0.027	0.031	0.007	0.014	0.006	0.006
Pond 2A	A-L3	0.019	0.023	0.012	0.038	0.008	0.018	0.006	0.003
Pond 2A	B-L1	0.016	0.046	0.018	0.015	0.007	0.008	0.002	0.005
Pond 2A	B-L2	0.017	0.055	0.020	0.035	0.007	0.010	0.005	0.000
Pond 2A	B-L3	0.022	0.040	0.022	0.019	0.006	0.010	0.003	0.003
Pond 2A	C-L1	0.019	0.012	0.026	0.012	0.012	0.012	0.003	0.002
Pond 2A	C-L2	0.024	0.010	0.028	0.013	0.002	0.011	0.003	0.002
Pond 2A	C-L3	0.019	0.012	0.026	0.014	0.017	0.013	0.005	0.002
Carl's	A-L1	N/A	0.081	0.081	0.012	0.007	0.000	0.002	0.004
Carl's	A-L2	N/A	0.068	0.048	0.011	0.011	0.003	0.000	0.005
Carl's	A-L3	N/A	0.071	0.053	0.020	0.012	0.001	0.003	0.006
Carl's	B-L1	N/A	0.101	0.023	0.015	0.004	0.000	0.005	0.001
Carl's	B-L2	N/A	0.090	0.049	0.021	0.008	0.002	0.002	0.000
Carl's	B-L3	N/A	0.079	0.039	0.018	0.003	0.003	0.001	0.003
Carl's	C-L1	N/A	0.060	0.037	0.023	0.018	0.003	0.000	0.000
Carl's	C-L2	N/A	0.024	0.019	0.016	0.011	0.005	0.002	0.000
Carl's	C-L3	N/A	0.036	0.040	0.011	0.011	0.004	0.001	0.000

Table 3.

2004
Submerged Aquatic Vegetation

SAV productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample (Light bottle 1-4)	March	April	May	June	July	August	Sept	Oct
Sherman	L1	0.009	0.010	0.013	0.009	0.015	0.016	0.016	0.010
Sherman	L2	0.009	0.010	0.019	0.012	0.020	0.014	0.019	0.015
Sherman	L3	0.009	0.007	0.016	0.017	0.016	0.010	0.018	
Sherman	L4	0.012	0.012	0.012	0.020	0.023	0.010	0.018	0.014
Brown's	L1					0.022			
Brown's	L2					0.021			
Brown's	L3					0.018			
Brown's	L4					0.014			
Bull	L1			0.035	0.056		0.027	0.023	0.014
Bull	L2			0.076	0.092		0.024	0.016	0.019
Bull	L3			0.049	0.053		0.040	0.018	0.017
Bull	L4			0.035	0.050		0.037	0.016	0.018
Coon	L1				0.041			0.001	
Coon	L2				0.165			0.001	
Coon	L3				0.089			0.002	
Coon	L4				0.068			0.001	

*No SAV found at Pond 2A or Carl's

Table 4.

2004
Low Marsh Vegetation

Vegetation productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample Plot A, B, C (Replicates 1-5)	March	April	May	June	July	August	Sept	Oct
Browns	A1	N/A	2.90	3.56	1.98	1.73	1.78	1.61	0.23
Browns	A2	N/A	2.68	2.75	3.07	1.98	1.81	1.16	0.80
Browns	A3	N/A	2.67	2.75	1.99	1.38	1.91	1.77	0.84
Browns	A4	N/A	2.89	5.26	2.00	2.36	1.51	1.24	0.95
Browns	A5	N/A	3.12	1.99	3.38	3.46	1.15	1.57	0.52
Browns	B1	N/A	2.24	3.33	2.18	1.17	2.54	1.07	0.86
Browns	B2	N/A	3.19	2.88	N/A	1.32	2.05	1.29	0.58
Browns	B3	N/A	2.24	3.18	3.69	1.85	1.75	1.58	0.78
Browns	B4	N/A	2.68	N/A	2.24	2.56	1.90	1.79	0.42
Browns	B5	N/A	2.99	1.79	2.62	1.34	2.70	1.49	0.80
Browns	C1	N/A	2.26	0.76	1.87	2.66	1.05	0.77	0.45
Browns	C2	N/A	2.45	2.24	N/A	2.75	1.03	0.88	0.74
Browns	C3	N/A	1.91	2.28	1.94	1.55	1.04	1.26	0.96
Browns	C4	N/A	1.76	2.51	2.22	2.74	2.12	1.23	0.24
Browns	C5	N/A	2.90	2.46	1.59	1.93	1.59	1.45	1.31
Coon	A1	N/A	5.74	N/A	2.49	1.71	1.06	1.22	0.21
Coon	A2	N/A	N/A	N/A	4.35	2.12	1.14	2.17	0.71
Coon	A3	0.85	3.02	N/A	2.97	2.08	1.30	1.55	0.45
Coon	A4	N/A	2.44	N/A	3.21	2.25	1.15	1.09	0.63
Coon	A5	2.88	4.00	N/A	3.10	3.75	1.76	0.54	0.83
Coon	B1	3.82	3.55	4.11	6.15	3.45	0.63	1.98	0.30
Coon	B2	2.44	5.62	2.86	4.78	2.35	1.37	2.01	0.41
Coon	B3	2.61	3.46	2.69	N/A	1.76	1.30	1.78	0.55
Coon	B4	4.10	6.32	2.59	5.34	2.23	0.64	1.36	0.38
Coon	B5	3.55	7.30	N/A	N/A	3.10	1.86	0.86	0.62
Coon	C1	2.52	4.76	N/A	2.95	2.93	1.41	1.38	0.19
Coon	C2	N/A	3.90	2.71	2.88	2.60	1.13	1.14	0.75
Coon	C3	3.04	4.38	4.94	2.68	2.45	1.22	1.57	0.77
Coon	C4	3.17	2.78	N/A	5.33	2.32	1.65	0.80	0.96
Coon	C5	4.14	3.90	3.84	2.25	1.66	1.31	1.03	0.83

Table 4. *continued*

2004
Low Marsh Vegetation

Vegetation productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample Plot A, B, C (Replicates 1-5)	March	April	May	June	July	August	Sept	Oct
Bull	A1	N/A	0.72	2.49	2.28	1.19	0.64	0.47	0.36
Bull	A2	N/A	0.61	2.59	N/A	3.48	0.64	0.59	0.57
Bull	A3	N/A	0.48	2.96	0.76	1.06	0.77	1.27	0.51
Bull	A4	N/A	0.71	2.61	2.49	2.14	0.39	0.84	0.59
Bull	A5	N/A	0.44	1.96	3.47	2.07	0.38	0.52	0.43
Bull	B1	N/A	0.63	3.35	2.12	2.72	0.47	0.48	0.47
Bull	B2	N/A	0.46	2.27	4.47	3.02	0.43	0.58	0.46
Bull	B3	N/A	0.34	4.06	2.70	1.37	0.34	0.26	0.80
Bull	B4	N/A	0.90	4.53	2.29	2.32	0.59	0.30	0.89
Bull	B5	N/A	1.03	3.26	3.77	2.84	0.31	0.20	1.27
Bull	C1	N/A	0.96	3.01	3.60	3.16	0.32	0.34	0.68
Bull	C2	N/A	0.87	2.69	1.17	1.97	0.55	0.52	0.65
Bull	C3	N/A	0.53	3.06	2.62	1.69	0.41	0.50	0.84
Bull	C4	N/A	1.43	2.40	2.35	2.63	0.30	0.68	0.88
Bull	C5	N/A	N/A	3.02	2.28	1.30	0.60	0.49	1.04
Pond 2A	A1	1.78	1.60	1.44	1.93	2.26	2.54	3.10	0.37
Pond 2A	A2	1.75	1.44	0.43	2.92	2.90	2.43	2.13	0.65
Pond 2A	A3	2.44	N/A	0.16	4.11	2.65	3.27	2.56	0.65
Pond 2A	A4	2.73	2.27	1.01	2.25	2.92	3.36	2.29	0.83
Pond 2A	A5	2.30	0.92	0.96	3.01	3.52	3.24	2.55	0.93
Pond 2A	B1	2.09	0.96	2.83	2.77	3.10	2.24	2.28	0.95
Pond 2A	B2	1.83	0.47	1.49	2.97	3.19	0.60	1.57	0.97
Pond 2A	B3	2.02	1.60	1.92	3.33	4.81	2.22	0.55	0.53
Pond 2A	B4	2.65	1.19	1.61	1.66	2.76	2.06	1.07	0.49
Pond 2A	B5	2.92	2.39	0.75	0.46	4.96	2.41	1.41	0.73
Pond 2A	C1	2.66	1.55	1.87	3.33	2.71	1.88	1.31	0.55
Pond 2A	C2	3.19	1.00	1.81	2.55	2.69	1.99	0.76	0.48
Pond 2A	C3	2.96	1.72	2.47	1.58	1.94	1.99	1.07	0.91
Pond 2A	C4	2.83	0.76	2.61	2.81	2.55	2.11	0.79	0.29
Pond 2A	C5	2.50	1.97	2.13	3.43	2.15	2.10	0.48	1.13

Table 4. *continued*

2004
Low Marsh Vegetation

Vegetation productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample Plot A, B, C (Replicates 1-5)	March	April	May	June	July	August	Sept	Oct
Carl's	A1	2.91	1.37	2.53	3.28	1.81	0.58	0.19	0.65
Carl's	A2	3.94	2.00	4.10	3.61	1.66	1.74	0.27	0.40
Carl's	A3	3.15	2.24	3.85	1.94	2.13	0.88	0.35	0.95
Carl's	A4	N/A	2.81	5.18	2.34	1.15	1.65	0.22	0.35
Carl's	A5	N/A	1.62	N/A	2.25	2.06	2.07	0.41	0.37
Carl's	B1	1.49	2.42	N/A	3.21	1.47	0.76	0.28	0.32
Carl's	B2	2.89	1.60	1.92	2.69	1.03	1.76	0.35	0.35
Carl's	B3	3.91	2.16	N/A	2.45	2.53	1.05	0.35	0.44
Carl's	B4	N/A	2.75	2.42	2.03	2.20	0.86	0.46	0.36
Carl's	B5	N/A	1.88	3.42	2.23	2.34	1.20	0.37	0.32
Carl's	C1	2.73	2.00	3.87	3.84	2.20	0.87	0.30	0.99
Carl's	C2	3.72	1.56	N/A	2.76	2.64	1.26	0.30	0.53
Carl's	C3	3.09	1.60	N/A	2.30	2.44	0.93	0.37	0.35
Carl's	C4	N/A	2.47	N/A	2.92	1.64	1.84	0.28	0.67
Carl's	C5	N/A	1.21	5.41	3.74	2.19	1.70	0.25	0.54

* no low marsh vegetation was found at Sherman Lake

Table 5.

2004
Water Nutrients
All values are concentrations in micromolar (μM)

NO_3 = nitrate, $Si(OH)_4$ = silicate, PO_4 = phosphate, NH_4 = ammonium Concentrations in μM

		March	March	March	March	April	April	April	April	May	May	May	May	June	June	June	June	July	July	July	July	August	August	August	August	Sept	Sept	Sept	Sept	Oct	Oct	Oct	Oct
Site	Sample	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+
Brown's	1	14.76	317.4	1.4	3.1	16.52	249.6	1.8	4.0	9.2	213.3	1.7	3.9	19.28	190.2	3.2	6.2	5.08	211	1.8	2.1	4	198.6	2.3	10.9	2.44	175.6	2.0	1.9	17.88	171.8	3.7	6.9
Brown's	2	14.84	311.1	1.5	3.8	16.56	248.4	1.7	3.6	8.72	222.2	1.4	2.7	19.2	200.2	3.3	4.0	4.28	211.5	1.2	1.7	4	197.7	2.3	10.7	2.16	177.5	2.1	1.8	17.68	170.8	3.7	4.8
Brown's	3	14.72	311.4	1.4	3.0	16.68	253.7	1.8	3.7	8.32	213.3	1.3	2.6	18.76	204.6	3.2	3.3	4.28	209.4	1.1	1.4	4	196.1	2.2	10.9	2.04	176.8	2.1		17.44	171.6	3.7	5.9
Sherman	1	1.96	316.2	4.1	4.7	0.12	309	5.9	15.6	2.32	248.6	5.4	4.2	1.68	296.5	4.4	4.4	0	313.9	2.4	10.1	0	326.5	3.4	8.0	0	334.2	2.6	6.9	0.28	318	2.2	10.1
Sherman	2	1.96	322	4.2	5.4	0.2	312.4	6.0	14.9	2.32	248.5	5.2	3.7	1.16	288.1	4.7	4.5	0	319.6	2.2	9.0	0	333.1	3.6	8.7	0	326	2.8	7.9	0.4	314.5	2.3	10.6
Sherman	3	1.6	312.4	4.3	5.9	0	303.7	5.9	12.7	2.24	254.1	5.3	3.4	1.88	279.7	4.6	7.1	0	314.7	2.2	8.4	0	328.2	3.6	6.3	0	325.2	2.9	7.0	0.2	319.2	2.3	10.1
Coon	1	83.08	460.9	2.3	14.9	41.68	233.7	2.2	5.0	5.84	148.5	1.8	7.5	0.48	89.68	3.7	1.1	0	83.4	1.3	4.1	7.2	123.5	3.3	7.9	9.8	160.5	5.6	10.3	20.6	226.9	3.2	14.7
Coon	2	80.84	444.5	1.6	12.9	42.64	241.9	1.8	6.4	6.44	157.9	1.7	6.9	0.36	88.96	3.6	0.9	0	82.32	1.1	4.0	6.88	121.8	3.9	8.9	9.36	160.9	4.5	10.2	20.88	226.6	3.5	15.3
Coon	3	82.32	451.4	2.4	16.1	43.32	240	2.0	4.6	5.96	150.2	1.5	7.0	0.24	87.88	3.6	0.9	0	86.36	1.1	3.8	6.84	122.6	3.2	7.4	9.4	158.8	4.2	10.3	20.88	228.8	3.2	15.0
Bull	1	85.96	496.8	1.8	13.3	18.44	174.8	1.4	10.3	0	112.7	2.4	2.3	0	82.16	2.3	2.9	1.92	120.3	2.8	2.0	1.72	102	2.3	6.5	6.44	172	2.6	8.7	10	173.7	3.1	7.8
Bull	2	84.16	498.9	1.8	11.2	19.36	181.4	1.5	10.6	0	108.4	2.1	1.8	0	80.4	2.3	2.3	1.48	119.6	2.8	0.9	1.36	98.24	2.4	5.9	6.64	172.2	2.5	8.4	10.12	172.6	3.2	8.0
Bull	3	87.16	516.1	1.6	11.3	18.68	180.3	1.6	10.3	0	101.1	2.0	1.2	0	77.88	2.2	2.3	1.48	119	2.7	1.4	1.24	99.88	2.3	4.2	6.64	174.8	2.5	8.1	10.24	173.5	2.9	7.8
Pond 2A	1	6.48	182.8	2.8	9.0	2.04	94.68	2.1	6.9	1	78.56	3.2	4.8	0.68	90.2	3.1	4.8	0	111.6	2.4	5.4	5.04	145.6	2.4	9.7	6.24	207.5	3.7	10.7	10.24	148.2	4.9	13.6
Pond 2A	2	6.36	182	1.7	7.4	1.28	65.4	1.2	7.6	0.76	74.96	3.2	4.8	0.56	90.32	3.0	3.9	0	110.8	2.6	5.3	4.28	140.6	2.4	9.1	5.92	204.3	3.6	9.9	10.36	148.3	4.4	13.7
Pond 2A	3	6.32	181.3	1.6	6.8	1.96	93.8	1.9	6.7	0.72	75.12	3.2	4.5	0.56	90.32	3.2	4.1	0	110.5	2.7	5.3	4.32	145.8	2.2	8.9	5.76	203.3	3.6	9.9	10.28	149.5	4.4	13.5
Carl's	1	52.64	263.7	7.3	13.1	29.76	159	9.0	13.5	9.32	171.1	5.2	14.0	21.96	163.9	7.1	15.2	19.68	156.8	5.7	9.5	25.12	166.5	7.0	0.1	10.24	168	5.3	12.9	12.2	160.5	5.5	13.4
Carl's	2	58.72	264	9.1	16.2	29.4	160	8.6	11.0	9.36	170.5	5.4	13.6	22	166.4	7.5	15.2	19.28	157.3	5.8	9.0	25.08	163	7.3	0.2	9.72	166.8	5.2		11.84	162.5	6.6	13.5
Carl's	3	61.52	267.4	10.2	18.1	30.16	161.4	8.7	10.4	9.36	170.5	5.4	13.6	23.28	163.3	7.0	14.8	19.28	155.9	6.0	9.0	24.4	164.2	8.4	0.0	10.32	169.6	5.1	12.4	11.8	160.6	5.5	13.1

Table 6.

Sampling Dates 2004

Month	Day	Site
March	8	Carl's Marsh
March	9	Bull
March	10	Coon
March	22	Brown's
March	23	Sherman
March	24	Pond 2A
April	5	Brown's
April	6	Carl's Marsh
April	7	Coon
April	20	Sherman
April	19	Bull
April	21	Pond 2A
May	3	Brown's
May	4	Carl's Marsh
May	5	Coon
May	17	Sherman
May	18	Bull
May	19	Pond 2A
June	1	Brown's
June	2	Bull
June	15	Sherman
June	16	Coon
June	21	Pond 2A
June	22	Carl's Marsh
July	5	Brown's
July	6	Carl's Marsh
July	14	Sherman
July	19	Bull
July	20	Coon
July	21	Pond 2A
August	2	Bull
August	3	Coon
August	4	Pond 2A
August	16	Sherman
August	17	Brown's
August	18	Carl's Marsh
September	13	Brown's
September	14	Coon
September	15	Pond 2A
September	27	Sherman
September	28	Bull
September	29	Carl's Marsh
October	11	Sherman
October	12	Bull
October	13	Pond 2A
October	14	Carl's Marsh
October	27	Coon
October	28	Brown's

Table 7.

2005
Phytoplankton

Phytoplankton Productivity units = micrograms Carbon fixed per microgram chlorophyll a per hour
= µg C / µg Chl h^{-1}

Site	sample (Light bottle 1-4)	March	April	May	June	July	August	Sept	Oct
Brown's	L1	2.46	2.28	2.52	1.63	9.00	3.00	2.50	3.47
Brown's	L2	6.81	2.34	2.48	1.96	9.60	2.64	2.12	5.96
Brown's	L3	5.75	2.27	2.91	2.09	10.05	2.90	2.24	5.83
Brown's	L4	2.68	2.59	2.56	2.14	8.81	2.48	2.08	1.42
Sherman	L1	2.28	0.89	1.57	0.59	0.52	0.83	0.88	2.19
Sherman	L2	3.58	0.92	1.26	0.62	1.06	0.53	0.97	5.38
Sherman	L3	1.54	0.70	1.65	1.71	0.68	0.64	0.91	2.37
Sherman	L4	3.21	1.08	1.62	0.88	0.60	0.88	1.01	2.93
Coon	L1	1.87	0.78	3.12	1.12	1.41	3.79	1.21	7.57
Coon	L2	1.16	1.03	5.88	2.97	0.66	4.28	1.91	5.53
Coon	L3	1.69	1.28	4.93	1.41	0.76	4.16	1.67	5.12
Coon	L4	2.47	1.08	4.82	1.12	0.67	3.36	1.20	2.15
Bull	L1	1.23	2.07	2.18	0.96	2.55	3.25	3.74	2.82
Bull	L2	1.41	1.37	3.26	1.26	3.22	1.50	5.37	3.84
Bull	L3	1.29	1.61	2.29	1.20	2.28	0.59	4.25	4.22
Bull	L4	1.42	1.50	2.73	1.46	2.85	3.03	4.66	3.32
Pond 2A	L1	3.01	1.96	6.19	2.21	6.27	8.36	8.09	3.39
Pond 2A	L2	1.43	2.01	6.65	1.94	7.64	6.90	7.54	3.42
Pond 2A	L3	3.09	3.79	5.80	1.59	8.16	8.88	6.65	3.28
Pond 2A	L4	2.56	3.87	7.20	1.63	7.76	7.21	9.30	9.86
Carl's	L1	1.45	0.76	2.69	2.13	9.19	3.60	2.59	1.66
Carl's	L2	2.07	0.70	0.87	2.17	8.36	4.28	3.79	2.43
Carl's	L3	1.73	1.58	2.17	2.77	9.20	3.03	1.99	2.22
Carl's	L4	1.18	1.50	1.44	1.75	7.09	3.84	4.60	2.30

Table 8.

2005

Sediment - Benthic Diatoms

Benthic Diatom Productivity Units = mg carbon fixed per mg chlorophyll a per hour
= mg C/mg Chl hr-1

Site	sample Plot A, B, C Light bottle (1-3)	March	April	May	June	July	August	Sept	Oct
Browns	A-L1	0.002	0.005	0.003	0.006	0.008	0.007	0.007	0.002
Browns	A-L2	0.003	0.005	0.004	0.007	0.008	0.007	0.007	0.002
Browns	A-L3	0.003	0.004	0.002	0.005	0.007	0.008	0.008	0.003
Browns	B-L1	0.006	0.013	0.016	0.005	0.006	0.020	0.014	0.007
Browns	B-L2	0.005	0.013	0.014	0.006	0.009	0.016	0.014	0.004
Browns	B-L3	0.009	0.013	0.012	0.005	0.008	0.020	0.012	0.008
Browns	C-L1	0.004	0.006	0.004	0.016	0.009	0.010	0.011	0.003
Browns	C-L2	0.006	0.006	0.007	0.015	0.010	0.012	0.011	0.004
Browns	C-L3	0.004	0.004	0.007	0.015	0.008	0.006	0.010	0.004
Sherman	A-L1	0.014	0.019	0.014	0.015	0.014	0.012	0.015	0.016
Sherman	A-L2	0.015	0.021	0.008	0.011	0.014	0.010	0.014	0.013
Sherman	A-L3	0.017	0.018	0.010	0.014	0.015	0.011	0.014	0.014
Sherman	B-L1	0.022	0.012	0.011	0.020	0.029	0.018	0.011	0.010
Sherman	B-L2	0.021	0.013	0.010	0.026	0.029	0.015	0.050	0.017
Sherman	B-L3	0.022	0.010	0.012	0.024	0.023	0.019	0.010	0.014
Sherman	C-L1	0.018	0.017	0.012	0.032	0.031	0.019	0.023	0.016
Sherman	C-L2	0.016	0.021	0.008	0.035	0.031	0.023	0.029	0.016
Sherman	C-L3	0.018	0.020	0.008	0.039	0.031	0.026	0.029	0.016
Coon	A-L1	0.178	0.014	0.011	0.002	0.005	0.014	0.006	0.008
Coon	A-L2	0.022	0.014	0.012	0.001	0.020	0.013	0.006	0.007
Coon	A-L3	0.021	0.011	0.015	0.002	0.008	0.008	0.004	0.006
Coon	B-L1	0.024	0.001	0.016	0.005	0.011	0.010	0.008	0.007
Coon	B-L2	0.020	0.004	0.015	0.004	0.015	0.011	0.004	0.007
Coon	B-L3	0.016	0.005	0.006	0.005	0.023	0.004	0.004	0.007
Coon	C-L1	0.017	0.010	0.020	0.008	0.015	0.012	0.000	0.007
Coon	C-L2	0.018	0.013	0.015	0.004	0.013	0.014	0.001	0.008
Coon	C-L3	0.016	0.009	0.008	0.005	0.013	0.016	0.004	0.007
Bull	A-L1	0.005	0.004	0.003	0.012	0.010	0.004	0.005	0.006
Bull	A-L2	0.003	0.004	0.004	0.012	0.006	0.004	0.006	0.004
Bull	A-L3	0.006	0.003	0.004	0.013	0.009	0.004	0.007	0.004
Bull	B-L1	0.004	0.007	0.002	0.009	0.030	0.004	0.008	0.008
Bull	B-L2	0.005	0.007	0.004	0.007	0.021	0.005	0.008	0.002
Bull	B-L3	0.005	0.007	0.007	0.007	0.022	0.008	0.008	0.010
Bull	C-L1	0.004	0.004	0.011	0.005	0.012	0.003	0.007	0.003
Bull	C-L2	0.002	0.007	0.010	0.005	0.013	0.002	0.006	0.004
Bull	C-L3	0.002	0.006	0.009	0.006	0.011	0.003	0.008	0.007
Pond 2A	A-L1	0.009	0.013	0.013	0.008	0.011	0.013	0.007	0.003
Pond 2A	A-L2	0.009	0.012	0.012	0.010	0.010	0.019	0.009	0.003
Pond 2A	A-L3	0.010	0.011	0.011	0.009	0.010	0.016	0.007	0.003
Pond 2A	B-L1	0.007	0.014	0.010	0.019	0.007	0.011	0.018	0.002
Pond 2A	B-L2	0.006	0.012	0.008	0.006	0.010	0.020	0.013	0.002
Pond 2A	B-L3	0.009	0.007	0.008	0.005	0.006	0.015	0.015	0.004
Pond 2A	C-L1	0.008	0.006	0.005	0.004	0.004	0.016	0.014	0.004
Pond 2A	C-L2	0.009	0.006	0.007	0.012	0.014	0.016	0.013	0.002
Pond 2A	C-L3	0.009	0.007	0.008	0.010	0.007	0.009	0.011	0.003
Carl's	A-L1	0.021	0.004	0.002	0.015	0.012	0.006	0.013	0.005
Carl's	A-L2	0.015	0.004	0.003	0.004	0.015	0.026	0.015	0.005
Carl's	A-L3	0.010	0.006	0.004	0.004	0.018	0.031	0.013	0.009
Carl's	B-L1	0.011	0.014	0.003	0.010	0.008	0.006	0.009	0.001
Carl's	B-L2	0.006	0.015	0.004	0.019	0.006	0.006	0.009	0.002
Carl's	B-L3	0.004	0.018	0.004	0.012	0.004	0.013	0.011	0.005
Carl's	C-L1	0.012	0.012	0.007	0.005	0.010	0.004	0.010	0.003
Carl's	C-L2	0.009	0.013	0.007	0.015	0.005	0.003	0.009	0.005
Carl's	C-L3	0.007	0.013	0.009	0.022	0.007	0.008	0.006	0.005

Table 9.

2005
Submerged Aquatic Vegetation

SAV productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample (Light bottle 1-4)	March	April	May	June	July	August	Sept	Oct
Sherman	L1	0.005	0.011	0.002	0.007	0.009	0.022	0.019	0.012
Sherman	L2	0.005	0.013	0.002	0.009	0.011	0.015	0.023	0.010
Sherman	L3	0.004	0.012	0.001	0.007	0.009	0.017	0.023	0.012
Sherman	L4	0.005	0.014	0.002	0.009	0.011	0.015	0.020	0.011
Brown's	L1				0.012	0.008	0.013	0.014	
Brown's	L2				0.014	0.007	0.014	0.014	
Brown's	L3				0.013	0.016	0.014	0.012	
Brown's	L4				0.013	0.007	0.014	0.012	
Bull	L1	0.024		0.043	0.044	0.013	0.032	0.055	
Bull	L2	0.015		0.065	0.045	0.014	0.032	0.046	
Bull	L3	0.023		0.035	0.030	0.014	0.045	0.029	
Bull	L4	0.021		0.029	0.041	0.012	0.038	0.065	
Pond 2A	L1				0.054				
Pond 2A	L2				0.035				
Pond 2A	L3				0.053				

*No SAV found at Coon or Carl's

Table 10.

2005
Low Marsh Vegetation

Vegetation productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample Plot A, B, C (Replicates 1-5)	March	April	May	June	July	August	Sept	Oct
Browns	A1	1.47	1.67	0.98	1.79	0.52	0.50	1.43	1.07
Browns	A2	0.96	1.72	1.32	1.05	1.04	1.20	1.52	1.59
Browns	A3	1.35	1.55	2.38	1.57	1.22	0.67	2.16	1.13
Browns	A4	2.57	2.36	1.59	1.36	1.93	1.28	1.24	1.04
Browns	A5	1.88	1.56	1.30	0.74	1.03	1.55	1.33	0.78
Browns	B1	1.98	1.89	1.31	1.28	1.45	1.32	2.03	1.31
Browns	B2	1.51	2.00	1.68	1.55	1.57	0.92	1.55	0.49
Browns	B3	1.58	2.12	2.40	1.22	1.05	0.87	1.06	0.87
Browns	B4	1.88	1.89	1.26	0.73	1.73	0.87	1.82	0.83
Browns	B5	1.80	1.65	1.60	1.69	2.01	1.09	1.23	0.56
Browns	C1	1.64	1.83	1.64	1.58	1.52	0.84	1.65	0.74
Browns	C2	1.52	1.43	1.65	1.11	1.27	1.26	1.06	0.96
Browns	C3	1.10	1.28	1.17	1.44	1.86	0.78	0.83	0.69
Browns	C4	1.54	1.36	1.16	1.58	1.30	1.15	0.96	0.97
Browns	C5	1.50	1.45	0.91	1.68	0.71	1.37	0.71	1.00
Coon	A1	1.83	2.28	2.38	3.35	2.05	1.98	0.51	0.30
Coon	A2	2.61	3.98	1.86	2.32	1.41	3.89	0.27	0.46
Coon	A3	3.28	3.54	1.98	1.57	1.02	1.41	0.49	0.94
Coon	A4	2.59	3.39	2.18	2.59	1.72	2.06	0.31	0.60
Coon	A5	3.31	3.73	2.16	2.38	1.40	1.39	0.40	0.80
Coon	B1	2.16	4.56	1.73	3.91	1.16	1.70	0.28	0.94
Coon	B2	2.93	2.43	1.53	2.20	2.48	1.36	0.35	0.86
Coon	B3	2.71	2.37	2.76	2.17	1.16	2.89	0.72	0.46
Coon	B4	1.90	3.62	2.55	3.38	1.77	0.91	0.21	0.48
Coon	B5	3.40	2.17	2.65	2.03	1.64	1.79	0.41	0.53
Coon	C1	3.26	2.51	3.32	2.17	2.15	1.26	0.27	0.55
Coon	C2	2.46	3.03	3.39	3.74	1.49	0.61	0.16	0.68
Coon	C3	3.00	2.60	3.12	2.75	1.96	1.70	0.43	0.53
Coon	C4	3.96	2.98	2.30	2.35	2.07	1.47	0.51	0.49
Coon	C5	2.69	2.07	3.82	3.34	2.52	0.95	0.31	0.80
Bull	A1	1.65	2.86	1.96	1.82	0.55	0.90	0.81	0.60
Bull	A2	1.33	3.32	1.62	1.40	0.64	1.19	1.33	0.57
Bull	A3	2.11	2.89	0.89	1.64	0.68	1.25	1.05	0.89
Bull	A4	1.28	2.75	1.96	2.32	0.53	1.07	1.03	0.43
Bull	A5	0.77	3.64	2.73	1.71	0.96	0.40	1.59	0.53
Bull	B1	0.52	3.21	1.80	3.20	0.50	1.42	2.25	0.48
Bull	B2	0.97	3.74	2.14	1.32	0.50	1.16	0.97	0.48
Bull	B3	1.28	4.20	1.02	2.39	0.67	1.39	0.64	0.47
Bull	B4	0.85	2.40	3.39	0.70	0.66	0.60	1.77	0.36
Bull	B5	1.39	2.70	2.51	1.48	0.72	1.18	2.09	0.62
Bull	C1	0.84	2.59	2.57	1.85	0.60	0.69	1.17	0.70
Bull	C2	1.00	2.09	2.48	2.39	0.79	1.68	1.12	0.50
Bull	C3	1.49	3.11	1.43	1.27	0.70	1.23	1.67	0.50
Bull	C4	2.08	3.37	2.20	1.47	0.53	0.81	0.62	0.48
Bull	C5	1.78	2.76	1.34	1.98	0.39	0.29	1.47	0.55

Table 10. *continued*

2005
Low Marsh Vegetation

Vegetation productivity units = milligrams carbon fixed per milligram chlorophyll a per hour
units = mg C/mg Chl hr-1

Site	sample Plot A, B, C (Replicates 1-5)	March	April	May	June	July	August	Sept	Oct
Pond 2A	A1	N/A	2.23	2.63	N/A	0.98	1.99		1.15
Pond 2A	A2	N/A	1.38	2.73	N/A	0.57	0.91	1.61	0.38
Pond 2A	A3	N/A	2.72	2.14	N/A	1.40	1.56	0.55	
Pond 2A	A4	N/A	1.84	2.44	N/A	2.92	1.36	1.16	1.17
Pond 2A	A5	N/A	1.89	2.70	N/A	2.91	2.03	0.94	0.54
Pond 2A	B1	N/A	2.46	1.70	N/A	2.24	1.34	0.90	0.38
Pond 2A	B2	N/A	1.87	2.13	N/A	1.91	1.92	2.46	0.78
Pond 2A	B3	N/A	2.96	2.14	N/A	2.84	1.25	1.13	0.81
Pond 2A	B4	N/A	1.75	2.87	N/A	1.39	1.67	1.09	0.42
Pond 2A	B5	N/A	2.30	4.18	N/A	2.08	1.84	1.10	0.44
Pond 2A	C1	1.05	2.72	1.69	N/A	1.51	1.34	1.81	0.93
Pond 2A	C2	1.73	3.19	2.99	N/A	1.39	1.99	0.97	1.01
Pond 2A	C3	1.31	3.01	2.07	N/A	1.21	1.16	1.71	1.12
Pond 2A	C4	1.70	3.30	2.70	N/A	1.82		1.54	0.24
Pond 2A	C5	0.87	1.83	3.93	N/A	1.10	1.47	0.99	0.65
Carl's	A1	2.29	1.74	1.36	1.83	0.40	0.36	0.16	0.06
Carl's	A2	2.40	2.22	1.93	1.48	0.26	0.38	0.22	0.25
Carl's	A3	2.38	2.26	1.42	1.20	0.51	0.41	0.14	0.06
Carl's	A4	1.80	2.38	1.10	1.93	0.27	0.24	0.15	0.05
Carl's	A5	2.98	2.29	0.87	6.39	0.59	0.33	0.08	0.02
Carl's	B1	2.87	1.98	1.96	2.44	0.47	0.53	0.18	0.02
Carl's	B2	2.86	3.54	2.18	2.30	0.60	0.58	0.10	0.06
Carl's	B3	3.68	1.47	1.58	1.29	0.53	0.39	0.15	0.12
Carl's	B4	2.45	2.45	2.13	1.73	0.38	0.35	0.07	0.05
Carl's	B5	2.65	3.11	1.83	2.06	0.31	0.41	0.11	0.06
Carl's	C1	2.73	2.01	1.58	2.01	0.37	0.47	0.08	0.05
Carl's	C2	2.68	2.86	1.37	1.95	0.24	0.61	0.07	0.04
Carl's	C3	2.09	2.09	1.53	1.84	0.28	0.30	0.18	0.12
Carl's	C4	2.86	2.55	1.34	2.18	0.34	0.36	0.22	0.06
Carl's	C5	1.86	2.35	1.90	1.53	0.20	0.33	0.67	0.03

* no low marsh vegetation was found at Sherman Lake

Table 11.

Water Nutrients
All values are concentrations in micromolar (μM)

NO_3 = nitrate, $Si(OH)_4$ = silicate, PO_4 = phosphate, NH_4 = ammonium

		March	March	March	March	April	April	April	April	May	May	May	May	June	June	June	June	July	July	July	July	August	August	August	August	Sept	Sept	Sept	Sept	Oct	Oct	Oct	Oct
Site	sample	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+	NO_3^-	$Si(OH)_4$	PO_4	NH_4^+
Brown's	1	20.0	287.2	1.9	3.2	12.1	246.8	2.8	3.2	3.7	265.4	2.4	5.8	2.3	253.3	1.3	2.0	2.4	211.2	2.2	1.2	2.1	197.1	1.9	3.2	4.9	165.7	1.9	1.6	9.4	176.1	2.2	4.6
Brown's	2	19.4	282.6	2.1	2.7	11.9	246.1	2.5	2.5	3.3	256.4	2.5	1.8	2.1	257.7	1.5	1.6	2.3	216.3	2.2	1.3				2.0	4.0	159.3	1.7	1.4	9.3	184.1	2.3	3.7
Brown's	3	19.0	289.6	1.9	2.6	11.9	243.8	2.5	2.6	3.3	262.9	2.3	2.0	2.1	257.4	1.4	1.6	2.3	213.9	2.2	1.0	1.7	201.7	2.0	1.8	4.2	166.9	1.8	1.5	9.7	190.1	2.3	3.5
Sherman	1	1.2	320.9	4.8	5.8	2.2	334.4	4.8	8.7	0.7	287.1	3.4	3.2	0.0	334.2	3.1	2.3	0.0	279.8	3.0	0.6	0.1	338.0	4.1	4.6	0.1	282.8	3.1	4.0	0.9	286.0	3.3	3.9
Sherman	2	0.9	290.5	4.6	5.8	0.9	338.0	4.6	10.4	0.6	283.4	4.3	2.1	0.0	337.5	3.1	1.6	0.0	282.5	3.0	0.6	0.0	315.7	4.2	3.2	0.0	282.1	3.2	3.2				2.8
Sherman	3	1.0	312.1	4.6	5.2	0.8	335.9	4.6	10.8	0.7	283.2	4.2	2.7	0.0	337.4	3.2	1.5	0.0	293.4	3.0	0.7	0.1	309.5	4.0	3.2	0.0	281.5	3.1	3.2	0.9	281.7	3.3	3.4
Coon	1	39.7	375.4	2.6	20.4	24.4	230.7	2.1	7.7	9.0	335.6	2.1	7.1	5.66	354.05	2.38	4.4	4.1	198.0	1.0	7.4	6.4	128.2	3.6	12.4	6.5	111.5	2.5	13.6	10.8	101.4	3.0	7.9
Coon	2	40.5	359.0	3.4	20.8	24.7	223.6	1.9	7.5	8.6	330.6	2.2	6.4	5.47	357.15	2.45	4.0	3.9	190.2	0.7	7.8	6.4	134.6	3.7	10.8	5.4	108.5	2.5	13.3	10.9	102.8	3.0	7.9
Coon	3	40.6	371.6	2.6	21.7	24.2	224.7	1.9	7.4	8.6	329.7	2.2	6.5	5.37	360.77	2.45	3.9	3.7	198.0	1.0	7.5	6.0	126.5	2.6	11.4	4.5	106.3	2.4	13.4	10.8	98.2	3.0	7.9
Bull	1	74.3	476.0	1.7	15.6	49.4	412.5	1.7	11.1	17.1	583.7	2.5	4.0	4.59	424.68	1.68	3.8	0.0	229.0	0.1	6.7	0.2	119.6	1.3	2.7	1.8	49.6	1.5	3.4	3.2	69.5	1.5	4.5
Bull	2	74.0	470.4	1.7	15.3	50.0	412.9	1.9	11.3	16.8	583.6	1.7	3.6	4.33	430.95	2.23	3.1	0.0	227.2	0.0	2.7	0.2	125.2	1.4	2.1	1.8	57.2	1.5	3.1	3.1	68.4	1.5	4.4
Bull	3	74.4	468.6	1.5	15.0	49.2	417.3	1.8	10.7	17.0	606.9	1.7	4.4	4.25	422.41	1.69	3.0	0.0	228.1	0.0	5.5	0.2	127.1	1.4	2.8	1.8	58.5	1.4	3.0	3.3	69.0	1.5	4.8
Pond 2A	1	8.2	154.6	0.0	6.7	0.0	157.8	1.0	5.2	0.1	100.2	1.0	3.5	0.3	192.1	1.3	4.7	3.9	181.3	1.3	4.2	2.4	154.4	4.6	7.1	11.0	145.2	3.3	9.0	10.5	123.7	3.5	9.9
Pond 2A	2	7.7	153.0	0.0	6.4	4.2	156.4	1.9	4.7	0.0	103.4	1.0	3.2	1.2	197.1	1.4	4.4	3.8	180.1	1.4	4.5	2.7	147.7	4.4	6.9	10.3	138.7	3.0	9.2	10.3	121.9	3.4	9.6
Pond 2A	3	7.8	152.0	0.0	6.5	1.4	157.0	1.5	4.7	0.0	102.0	1.0	3.5	0.0	196.0	1.3	4.6	3.7	179.8	1.3	4.3	3.7	155.7	4.6		10.3	134.9	3.0	9.0	10.4	123.2	3.5	10.0
Carl's	1	49.2	277.0	11.0	20.6	38.5	238.2	11.6	8.7	7.4	130.9	9.9	7.5	11.3	196.1	9.3	8.8	19.4	165.7	10.4	2.8	30.0	164.7	8.1			157.5	6.7	10.3	12.2	143.8	5.4	12.0
Carl's	2	50.2	297.8	10.8	19.0	41.2	243.5	13.1	10.4	7.3	129.6	10.3	7.6	11.1	197.6	9.2	8.7	19.6	170.1	10.4	2.3	29.9	170.5	8.1	0.5	24.6	170.5	7.2	9.9	12.8	153.2	5.7	11.8
Carl's	3	49.1	283.1	9.8	15.5	40.1	238.5	12.2	10.8	7.3	129.7	10.0	7.5	11.1	195.5	9.3	8.8	19.1	167.1	10.3	2.1	30.0	173.1	8.0	0.4	23.5	163.5	6.9	10.4	12.2	144.5	5.4	11.7

Table 12.

Sampling Dates 2005

Month	Day	Site
March	15	Pond 2A
March	16	Carl's Marsh
March	17	Bull
March	28	Brown's
March	30	Sherman
March	31	Coon
April	11	Sherman
April	12	Pond 2A
April	13	Carl's Marsh
April	25	Brown's
April	26	Bull
April	27	Coon
May	9	Sherman
May	10	Carl's Marsh
May	11	Pond 2A
May	23	Brown's
May	24	Bull
May	25	Coon
June	6	Bull
June	7	Coon
June	8	Pond 2A
June	20	Brown's
June	21	Sherman
June	22	Carl's Marsh
July	5	Bull
July	6	Coon
July	7	Pond 2A
July	19	Brown's
July	20	Sherman
July	21	Carl's Marsh
August	2	Brown's
August	3	Sherman
August	4	Carl's Marsh
August	8	Bull
August	9	Coon
August	10	Pond 2A
September	6	Bull
September	7	Coon
September	8	Carl's Marsh
September	19	Brown's
September	20	Sherman
September	21	Pond 2A
October	3	Sherman
October	4	Bull
October	5	Coon
October	17	Brown's
October	18	Carl's Marsh
October	19	Pond 2A

Wetlands and Water Resources, Inc

818 5th Avenue, Suite 208
San Rafael, California 94901
tel 415.457.0250
fax 415.457.0260
www.swampthing.org

Integrated Regional Wetland Monitoring Pilot Project

Physical Processes Team Field Data Collection Report December 2003 to September 2005

December 2006

Updated August 2007

Prepared for:

California Bay-Delta Authority Science Program
650 Capitol Mall, 5th Floor
Sacramento, CA 95814
http://calwater.ca.gov
Ph: (916) 445-5511

Prepared by:

Wetlands and Water Resources, Inc.
818 5th Avenue, Suite 208
San Rafael, CA 94901
www.swampthing.org
(415) 457-0250

Project No. 1067

TABLE OF CONTENTS

1.0 Introduction 1
2.0 Scope of Work 2
2.1 Aerial Photography 3
2.1.1 Establishing Ground Control 3
2.2 Topographic and Bathymetric Surveying 4
2.2.1 Benchmark Surveys 4
2.2.2 Marsh Plain Topography 4
2.2.3 Channel Bathymetry 5
2.3 Tidal Water Supply 5
2.3.1 Inlet Channel Water Levels 6
2.3.2 Inlet Channel Suspended Sediment Concentrations 7
2.3.3 Inlet Channel Salinity 7
2.3.4 Inlet Channel Temperature 7
2.3.5 Marsh Plain and Channel Water Levels 8
2.4 Sediment Sampling 8
2.5 Pore Water Salinity 8
3.0 Data Collection and Quality Assurance 9
3.1 Aerial Photography 9
3.1.1 Aerial Ground Control 9
3.2 Topographic and Bathymetric Surveys 10
3.2.1 Topographic Survey Methodologies 10
3.2.1.1 Static GPS 10
3.2.1.2 Real-time Kinematic Positioning (RTK) 11
3.2.1.3 Post-processed Kinematic Positioning (PPK) 11
3.2.1.4 Real-time Differential GPS (DGPS) 11
3.2.1.5 Total station and Optical Level Surveys 11
3.2.2 Bathymetric Surveys 12
3.2.3 Survey Method Accuracies 12
3.2.4 Benchmark Fabrication, Classification, and Installation 12
3.3 Tidal Water Supply 13
3.3.1 Inlet Channel Water Levels 13
3.3.2 Inlet Channel Suspended Sediment Concentrations 16
3.3.3 Inlet Channel Salinity 18
3.3.4 Inlet Channel Temperature 19
3.3.5 Marsh Plain and Channel Water Levels 20
3.3.6 Telemetry Communication Stations 21
3.4 Sediment Sampling 22
3.5 Pore Water Salinity 23
4.0 Results 23
4.1 Aerial Photography 23
4.2 Topographic and Bathymetric Surveys 24
4.2.1 RTK and PPK GPS Benchmark Surveys 24
4.2.2 Marsh Plain Topography – Data Itself not Presented 25

4.2.3 Optical Level Benchmark Elevation Replicate Surveys 26
4.2.4 Channel Bathymetry 26
4.3 Tidal Water Supply 27
4.3.1 Inlet Channel Water Levels 27
4.3.2 Inlet Channel Suspended Sediment Concentrations 29
4.3.3 Inlet Channel Salinity 29
4.3.4 Inlet Channel Temperature 29
4.3.5 Marsh Plain and Channel Water Levels 29
4.4 Sediment Sampling 31
4.5 Pore Water Salinity 31
5.0 References 31

List of Figures

1.0 IRWM Study Sites
2.1 Access Directions – Carl's Marsh
2.2 Access Directions – Napa Sites (Pond 2A, Coon Island, Bull Island)
2.3 Access Directions - Suisun/West Delta Sites (Browns, Sherman Lake)
3.1 Carl's Marsh Air Photo Planning Tiles
3.2 Carl's Marsh Aerial Control Points
3.3 Pond 2A/Pond 3 Air Photo Planning Tiles and Control Points
3.4 Coon Island Air Photo Planning Tiles and Control Points
3.5 Bull Island Air Photo Planning Tiles and Control Points
3.6 Browns Island Air Photo Planning Tiles and Control Points
3.7 Sherman Lake Air Photo Planning Tiles and Control Points
4.1 Primary Benchmark (PBM) schematic and photograph
4.2 Secondary Benchmark (SBM) schematic and photograph
5.1 Marsh Plain Water Level Station photograph
5.2 Marsh Plain Water Level Station schematic design
5.3 Channel Water Level Station photographs
6.1 Carl's Marsh PPT Field Sampling Locations
6.2 Pond 2A PPT Field Sampling Locations
6.3 Coon Island PPT Field Sampling Locations
6.4 Bull Island PPT Field Sampling Locations
6.5 Browns Island PPT Field Sampling Locations
6.6 Sherman Lake PPT Field Sampling Locations
7.0 CTDS and Channel Water Level Mooring photographs
8.0 CTDS Logger Box/Telemetry station photographs
9.1 Carl's Marsh Telemetry Station location
9.2 Napa River (Pond 2A, Coon, Bull) Telemetry Stations locations
9.3 Browns/Sherman Telemetry Stations locations
10.0 Shallow Groundwater Piezometer schematic design
11.1 Carl's Marsh 2003 Aerial Photography
11.2 Pond 2A 2003 Aerial Photography
11.3 Coon Island 2003 Aerial Photography
11.4 Bull Island 2003 Aerial Photography
11.5 Browns Island 2003 Aerial Photography

11.6 Sherman Lake 2003 Aerial Photography
12.1 Carl's Marsh 2004 Aerial Photography
12.2 Pond 2A 2004 Aerial Photography
12.3 Coon Island 2004 Aerial Photography
12.4 Bull Island 2004 Aerial Photography
12.5 Browns Island 2004 Aerial Photography
12.6 Sherman Lake 2004 Aerial Photography
13.1 Carl's Marsh Benchmark Locations and Elevations
13.2 Pond 2A Benchmark Locations and Elevations
13.3 Coon Island Benchmark Locations and Elevations
13.4 Bull Island Benchmark Locations and Elevations
13.5 Browns Island Benchmark Locations and Elevations
13.6 Sherman Lake Benchmark Locations and Elevations
14.0 NGS Benchmark Locations Browns-Sherman
15.0 Towill Benchmarks Napa Sites
16.0 Histogram of Marsh Plain Elevations
17.1 Carl's Marsh - Marsh Plain Elevation Transects
17.2 Pond 2A Marsh Plain Elevation Transects
17.3 Coon Island Marsh Plain Elevation Transects
17.4 Bull Island Marsh Plain Elevation Transects
17.5 Browns Island Marsh Plain Elevation Transects
17.6 Sherman Lake Marsh Plain Elevation Transects
18.1 Carl's Marsh XS Location and Profiles
18.2 Pond 2A XS Location and Profiles
18.3 Coon Island XS Location and Profiles
18.4 Bull Island XS Location and Profiles
18.5 Browns Island XS Location and Profiles
18.6 Sherman Lake XS Location and Profiles
19.1 Carl's Marsh XS Profile Overlay
19.2 Pond 2A XS Profile Overlay
19.3 Coon Island XS Profile Overlay
19.4 Bull Island XS Profile Overlay
19.5 Browns Island XS Profile Overlay
19.6 Sherman Lake XS Profile Overlay
20.1 Carl's Marsh CTDS Water Surface Elevations
20.2 Pond 2A CTDS Water Surface Elevations
20.3 Coon Island CTDS Water Surface Elevations
20.4 Bull Island CTDS Water Surface Elevations
20.5 Browns Island CTDS Water Surface Elevations
20.6 Sherman Lake CTDS Water Surface Elevations
21.1 Carl's Marsh Inlet Channel Suspended Sediment Concentrations
21.2 Pond 2A Inlet Channel Suspended Sediment Concentrations
21.3 Coon Island Inlet Channel Suspended Sediment Concentrations
21.4 Bull Island Inlet Channel Suspended Sediment Concentrations
21.5 Browns Island Inlet Channel Suspended Sediment Concentrations
21.6 Histograms of Suspended Sediment Concentrations

22.1 Carl's Marsh Inlet Channel Salinity
22.2 Pond 2A Inlet Channel Salinity
22.3 Coon Island Inlet Channel Salinity
22.4 Bull Island Inlet Channel Salinity
22.5 Browns Island Inlet Channel Salinity
22.6 Sherman Lake Inlet Channel Salinity
23.1 Carl's Marsh Inlet Channel Temperature
23.2 Pond 2A Inlet Channel Temperature
23.3 Coon Island Inlet Channel Temperature
23.4 Bull Island Inlet Channel Temperature
23.5 Browns Island Inlet Channel Temperature
23.6 Sherman Lake Inlet Channel Temperature
24.1 Carl's Marsh Marsh Plain Water Surface Elevation - Water Level 1
24.2 Carl's Marsh Marsh Plain Water Surface Elevation - Water Level 2
24.3 Carl's Marsh Channel Water Surface Elevation - Water Level 3
25.1 Pond 2A Marsh Plain Water Surface Elevation - Water Level 1
25.2 Pond 2A Marsh Plain Water Surface Elevation - Water Level 2
25.3 Pond 2A Marsh Plain Water Surface Elevation - Water Level 3
25.4 Pond 2A Channel Water Surface Elevation - Water Level 4
26.1 Coon Island Marsh Plain Water Surface Elevation - Water Level 1
26.2 Coon Island Marsh Plain Water Surface Elevation - Water Level 2
26.3 Coon Island Marsh Plain Water Surface Elevation - Water Level 3
26.4 Coon Island Marsh Plain Water Surface Elevation - Water Level 4
27.1 Bull Island Marsh Plain Water Surface Elevation - Water Level 1
27.2 Bull Island Marsh Plain Water Surface Elevation - Water Level 2
27.3 Bull Island Marsh Plain Water Surface Elevation - Water Level 3
27.4 Bull Island Marsh Plain Water Surface Elevation - Water Level 4
28.1 Browns Island Marsh Plain Water Surface Elevation - Water Level 1
28.2 Browns Island Marsh Plain Water Surface Elevation - Water Level 2
28.3 Browns Island Marsh Plain Water Surface Elevation - Water Level 3
28.4 Browns Island Marsh Plain Water Surface Elevation - Water Level 4
28.5 Browns Island Channel Water Surface Elevation - Water Level 5
29.1 Sherman Lake Channel Water Surface Elevation - Water Level 1
29.2 Sherman Lake Marsh Plain Water Surface Elevation - Water Level 2
29.3 Sherman Lake Marsh Plain Water Surface Elevation - Water Level 3
29.4 Sherman Lake Marsh Plain Water Surface Elevation - Water Level 4
30.1 Carl's Marsh Soil Analytical Results
30.2 Pond 2A Soil Analytical Results
30.3 Coon Island Soil Analytical Results
30.4 Bull Island Soil Analytical Results
30.5 Browns Island Soil Analytical Results
30.6 Sherman Lake Soil Analytical Results
31 Soil composition (sand, silt clay) by Site and Depth
32 Soil nutrients by Site and Depth
33 Soil bulk density by Site and Depth

List of Tables

1.1 Carl's Marsh Field Activity Calendar
1.2 Pond 2A Pore Field Activity Calendar
1.3 Coon Island Pore Field Activity Calendar
1.4 Bull Island Pore Field Activity Calendar
1.5 Browns Island Pore Field Activity Calendar
1.6 Sherman Lake Pore Field Activity Calendar
2.1 2003 Site Aerial Imagery Summary Data
2.2 2004 Site Aerial Imagery Summary Data
3.1 2003 Aerial ground control point description and coordinates
3.2 2004 Aerial ground control point description and coordinates
4.0 Topographic Survey Method Overview
5.0 Secondary Benchmark Description and Construction Method
6.1 Carl's Marsh Water Level Field Offset Calibration Summary
6.2 Pond 2A Water Level Field Offset Calibration Summary
6.3 Coon Island Water Level Field Offset Calibration Summary
6.4 Bull Island Water Level Field Offset Calibration Summary
6.5 Browns Island Water Level Field Offset Calibration Summary
6.6 Sherman Lake Water Level Field Offset Calibration Summary
7.1 Carl's Marsh Water Level Field Offset Calibration Detail Sheets
7.2 Pond 2A Water Level Field Offset Calibration Detail Sheets
7.3 Coon Island Water Level Field Offset Calibration Detail Sheets
7.4 Bull Island Water Level Field Offset Calibration Detail Sheets
7.5 Browns Island Water Level Field Offset Calibration Detail Sheets
7.6 Sherman Lake Water Level Field Offset Calibration Detail Sheets
8.0 Soil Analytes and Methods
9.0 Survey Benchmarks – station names, coordinates, elevations, survey dates
10 Vegetation-Elevation Transect topographic survey summary results
11.1 Carl's Marsh Channel Cross-section survey results
11.2 Pond 2A Channel Cross-section survey results
11.3 Coon Island Channel Cross-section survey results
11.4 Bull Marsh Channel Cross-section survey results
11.5 Browns Island Channel Cross-section survey results
11.6 Sherman Lake Channel Cross-section survey results
12.1 Inlet channel suspended sediment concentration summary statistics
12.2 Inlet channel NTU to SSC transformation equations
13.1 Inlet channel salinity summary statistics
13.2 Inlet channel salinity seasonal summary statistics
14 Inlet channel temperature summary statistics for each site
15.1 Carl's Marsh Pore water salinity sampling results
15.2 Pond 2A Pore water salinity sampling results
15.3 Coon Island Pore water salinity sampling results
15.4 Bull Marsh Pore water salinity sampling results
15.5 Browns Island Pore water salinity sampling results
15.6 Sherman Lake Pore water salinity sampling results

Appendices

Appendix A – Instrument specifications
Appendix B – National Geodetic Survey Benchmark Datasheets – Browns Island and Sherman Lake Vicinity
Appendix C – Tucker Associates Static GPS Data sheets Browns Island/Sherman Lake
Appendix D – Tucker Associates PPK GPS Data sheets Browns Island
Appendix E – Tucker Associates PPK GPS Data sheets Sherman Island
Appendix F – Towill, Inc. Benchmark Datasheets Napa Salt Pond Vicinity
Appendix G – Tucker Associates PPK GPS Data sheets Coon Island
Appendix H – Tucker Associates PPK GPS Data sheets Bull Island
Appendix I – Newton/Field Designs RTK GPS Data sheet Pond 2A
Appendix J – WWR Total Station and Optical Surveys of Benchmarks - Detail Sheets
Appendix K – Vegetation-Elevation Transects Survey Data Points

1.0 Introduction

This Physical Processes Team (PPT) conducted field data collection activities as part of CALFED's multi-team Integrated Regional Wetland Monitoring (IRWM) Pilot Project focused geographically on the northern San Francisco Estuary and Delta. IRWM included a number of organizations in a multi-disciplinary effort to collect and analyze a variety of field-based ecological data in restored and natural wetland sites in San Pablo Bay and in the Sacramento-San Joaquin river Delta. This effort sought to accomplish two goals on behalf of the California Bay-Delta Authority (CBDA): (1) to evaluate the underlying management question, *how are ecosystem restoration efforts throughout the region affecting ecosystem processes at different scales*; and (2) through development and application of adaptive monitoring approaches, prepare for subsequent longer-term monitoring.

The PPT monitored physical process indicators at the six IRWM sites for two principal reasons. First, the status of tidal marshes and the consequences of restoration and other activities are strongly reflected in hydraulic, topographic, and edaphic (soil) variables. These variables, in turn, exert a strong influence on and are modified by a variety of biological variables such as vegetation colonization. Thus, changes in marsh form, function, and extent are often reflected in the distribution of water and sediment. Second, interpretation of the distribution, abundance, and habits of living organisms that utilize tidal marshes generally requires knowledge of the spatial and temporal variations in physical parameters.

The Physical Processes Team was responsible for collecting and analyzing data including tidal channel and marsh plain water surface elevations, suspended sediment concentrations, salinity, water temperature, geomorphic characteristics, and sediment and pore water chemistry.

Team Composition
Wetlands and Water Resources, Inc. led the Physical Processes Team for the IRWM Pilot Project. Other organizations that assisted with data collection and analyses for the Physical Processes Team include Environmental Data Solutions (EDS), Philip Williams and Associates (PWA), and Bachand Associates.

The Principal Investigators by organization include:

Stuart W. Siegel, Ph.D., PWS, Wetlands and Water Resources, Inc.
Jeremy Lowe, Philip Williams and Associates, Ltd.
Philip A.M. Bachand, Ph.D., Wetlands and Water Resources, Inc./Bachand Associates

Key collaborators include:

Tim Carson, Wetlands and Water Resources, Inc.
James Kulpa, Environmental Data Solutions
Sean Avent, Wetlands and Water Resources, Inc.
Jake Schwietzer, Wetlands and Water Resources, Inc.
Dan Gillenwater Wetlands and Water Resources, Inc.

2.0 Scope of Work

Monitoring activities conducted by the PPT sought to characterize the physical and environmental conditions at each of the six selected sites. The selected sites include two natural "reference" marshes, Coon and Browns Islands, and four comparison "restoring" marshes, Carl's Marsh (aka Petaluma River Marsh), Pond 2A, Bull Island, and Sherman Island. Figures 1 – 2.3 show the site locations and site access directions. To characterize conditions at each site, the PPT team conducted a suite of monitoring activities from December 2003 to September 2005. Tables 1.1 – 1.6 present the complete calendar of field data collection activities conducted at each of the sites. Activities included aerial photography, extensive topographic and bathymetric surveying, deployment of automated hydrologic monitoring instruments in tidal inlet channels and on the marsh plain, shallow sub-surface marsh plain pore water salinity sampling, and marsh plain soil sampling. The monitoring activities conducted by the PPT focused on characterizing the following:

Aerial Imagery

The objective of this task was to obtain and process high-resolution aerial imagery of the IRWM sites to support the multi-scale marsh monitoring efforts conducted by the various IRWM teams. The aerial imagery was fundamental to the research of the Landscape Ecology Team (LET) which used GIS and remote sensing technology and data to produce maps and calculate spatial metrics at the site and landscape scales and to quantify the landscape composition and pattern at multiple scales.

Tidal Water Supply

The objective of this task was to determine environmental conditions at each of the six sites by quantifying fundamental tidal water quality parameters. An instrument mooring was deployed in the principal inlet channel of each site equipped with sensors to obtain continuous ***c***onductivity, ***t***emperature, ***d***epth and ***s***uspended sediment concentration (CTDS) data. At multiple locations on the marsh plain, continuous water depth and temperature monitoring occurred. The tidal water supply data aided evaluating physical and ecological processes at the sites.

Geomorphology and Topography

The objective of this task was to provide field topographic data to establish channel cross-section geometry, establish marsh plain topography, enable the conversion of water depth data (feet) to water surface elevation in the project datum (feet NAVD88), calculate inundation regimes, and to enable the Landscape Ecology Team to perform aerial imagery processing. Marsh plain topography surveys were conducted in conjunction with the Plant Team vegetation surveys to develop vegetation-elevation transects for species composition analyses and inundation analyses.

Soil Characteristics

The objective of this task was to characterize site soil conditions by sampling multiple locations on the marsh plain and mudflats for soil nutrients and physical properties. These data supported analyses of vegetation composition, and vegetation establishment, survival and expansion.

Pore Water Chemistry

The objective of this task was to characterize soil pore water chemistry using multiple shallow groundwater monitoring stations (piezometers) sampled quarterly for pore water salinity. These data supported analyses of vegetation zonation and composition.

2.1 Aerial Photography

The PPT established aerial control targets for the 2003 and 2004 site photographs. Site photos were used a basis for much of the work conducted by the Landscape Ecology Team. WWR contracted with HJW GeoSpatial of Oakland, CA to provide high resolution aerial photography of the following sites in 2003 and 2004. Figure 1 shows the locations of the IRWM sites. Photographed sites include:

IRWM Sites (2003, 2004)

- Carl's Marsh (aka Petaluma River Marsh)
- Pond 2A (Napa River)
- Coon Island (Napa River)
- Bull Island (Napa River)
- Browns Island (West Delta)
- Sherman Lake (aka Lower Sherman Island; West Delta)

Additional Sites

- Pond 3 (Napa River) (2003, 2004)
- Big Break (west Delta) (2003 only)
- San Souci (west Delta) (2003 only)

IRWM team also considered three additional sites well into the site selection process, and therefore some of the aerial imagery acquisition and processing activities were also performed for these three sites. Pond 3 of the Napa-Sonoma marsh complex was photographed because of its value in capturing a site in the early phases of restoration.

The ortho-rectified images and data are available at available at www.irwm.org, as well as the data acquisition and ortho-rectification methods and procedures as detailed the Landscape Ecology Team Data Report (2006).

2.1.1 Establishing Ground Control

The purpose of ground control points is to provide sufficient identifiable locations with known geographic coordinates across each site in the aerial photograph to facilitate rectification of the aerial photograph using image processing software. The quantity of ground control points required depends on the size of the site. For IRWM, a minimum of four control points were utilized for each photo, typically more. Control points extended to different corners of each photo, in order to maximize the accuracy of the rectification process.

Ground control targets consisted of black and white crosses on 4 foot by 4 foot plywood platforms installed above tidal and vegetation obstructions. Horizontal coordinates were

established using a sub-meter accuracy GPS unit (*Trimble* GeoXT). Subsequent point conversion into a Geographic Information System (GIS) enabled matching the crosses as seen on the photos to corresponding real-world coordinates of the survey/GIS points.

In some cases, "permanent" on-site structures such as electrical tower footers, dock corners, and building corners were used as ground control points for the 2004 photographs. The positions of these points were extracted from the previously rectified 2003 aerial photographs.

2.2 Topographic and Bathymetric Surveying

Establishing elevation was integral to a variety of the monitoring activities conducted at the IRWM sites. Hydrologic monitoring and vegetation and geomorphologic characterization data require associated accurate information on coordinate position and elevation relative to project datum. A mix of survey techniques and technologies were utilized because various monitoring activities differed with regard to their required horizontal and vertical accuracy, as well as differences in relative remoteness and access difficulty amongst monitoring location. This section details the types of survey performed and how the data were applied to each IRWM monitoring activity.

2.2.1 Benchmark Surveys

Each IRWM site contains multiple benchmarks (stable, in-ground monuments) surveyed to provide high level horizontal and vertical coordinate accuracy. Benchmarks were integral to a number of different data collection efforts. Benchmarks served as horizontal and vertical position control to enable water depth data (feet) to be converted into water surface elevations (feet NAVD88), served as position control points for vegetation-elevation surveys, and provided control for hydrographic surveys used in determining tidal channel geometries.

Off-site reference benchmarks served as the controls for establishing on-site benchmarks. The off-site reference benchmarks utilized were established by the National Oceanic and Atmospheric Administration's National Geodectic Survey (NGS) or by the firm Towill, Inc. The survey method used to establish the vertical and horizontal coordinates for on-site primary and secondary benchmarks based upon off-site reference benchmarks varied amongst sites depending upon the proximity to off-site reference benchmarks. A California certified professional land surveyor (PLS) surveyed the IRWM sites utilizing a variety of Global Positioning System (GPS) technology and techniques for data acquisition. GPS survey methods utilized included Static Positioning, Post Processed Kinematic (PPK) Positioning, and Real Time Kinematic (RTK) Positioning. Wetlands and Water Resources conducted additional topographic surveys using a total station, optical level and bathymetric survey equipment.

2.2.2 Marsh Plain Topography

Marsh plain topographic surveys were conducted by the PPT in conjunction with the Plant Team vegetation composition surveys. The vegetation-elevation transect surveys were conducted using a total station surveying instrument to provide northing and easting coordinates and elevation. Vegetation-elevation transects were typically conducted in a "hub-and-spoke" design centered on a marsh plain water level station. This approach enabled coupling the water level station

inundation regime (depth, duration, and frequency) data with the elevation and species composition survey data to analyze observed vegetation patterns.

2.2.3 Channel Bathymetry

Bathymetric surveys were performed to characterize tidal channel geometry (width and depth) at four to six locations per site. Cross-section surveys of the principal tidal channel occurred at multiple locations between the inlet (mouth) and head of the head of the channel. Hydrographic surveys were conducted using a small survey vessel outfitted with bathymetric survey equipment. In locations with shallow, narrow head-ward channels, surveys were conducted using a total station.

2.3 Tidal Water Supply

Tide heights and characteristics were a fundamental component of site monitoring because of the defining role tidal inundation plays in shaping biological, physical, and chemical processes and ecological functions in tidal marshes. Site monitoring included one multi-parameter monitoring station recording conductivity, temperature, depth, and suspended sediments (CTDS station) deployed near the head of the main inlet channel of each site. The monitoring design featured an extended deployment duration at the CTDS station. The extended deployment achieves three primary objectives. First, this sampling regime provides a large sample size necessary to minimize uncertainty in tidal datum determination (Swanson 1974; Gill and Schultz 2001). Second, it provides the opportunity to document a variety of routine extreme tide stage events that may influence ecological processes monitored by the other teams. Third, it allows an evaluation of an appropriate shorter-duration monitoring period for future monitoring endeavors. Additionally, it allows evaluation of actual versus predicted tide stage for use in making long-term projections based on external data.

The inundation regime (depth, duration, and frequency) at a given location is a result of surface water level fluctuation and ground surface topography. Budget constraints preclude achieving the optimal results: detailed topographic maps covering the entirety of each site overlaid by summary inundation data. Thus, we focused upon data that we expected to provide a good understanding of the marsh inundation and provide key physical and chemical data to the biological teams and the Landscape Ecology Team. Our approach focused upon developing a comprehensive data set describing the tide stage, salinity, and suspended sediment concentration at the inlets to each marsh and an assessment of elevation and water surface elevations at the 2 - 4 marsh plain water level monitoring locations within each marsh. The PPT and Plant Team conducted elevation and vegetation surveys in targeted locations around marsh plain water level monitoring stations in a “hub and spoke” design.

Subtasks. This task includes the following subtasks:

- Inlet Channel Water Levels
- Inlet Channel Water Suspended Sediment Concentrations
- Inlet Channel Water Salinity
- Inlet Channel Water Temperature

- Marsh Plain Water Levels
- Marsh Plain Water Temperature

Deployment Periods, Field Service Dates, Calibration Dates:
Instruments were deployed between December 2003 to September 2005; actual dates by site are presented in the Field Activity Calendars, Tables 1.1 – 1.6. Each site experienced some gaps in data collection for a variety of reasons, with principal causes including telemetry communication failure, sensor malfunction, and station vandalism. The Field Activity Calendars also display station names, instrumentation make and model.

Periodic service visits included collecting field measurements to convert instrument water depth data into NAVD water surface levels (elevations), downloading data, and servicing the instrument (cleaning, calibration, battery check) as needed. Tables 1.1 – 1.6 includes instrument service dates as well as field calibrations performed on deployed instruments.

Sampling Interval: Data was collected at synoptic 12-minute intervals beginning at the top of the hour, concurrent with National Ocean Service continuous recording stations in the region. The 12-minute sampling interval accomplishes two objectives. First, it balances data resolution to capture height and timing of twice-daily slack water events with data quantity for management and analysis. Second, it obtains data synoptic with the sampling intervals at the National Ocean Service long-term continuously recording stations in the Estuary for calculating tidal datum.

2.3.1 Inlet Channel Water Levels

Monitoring tidal supply at the inlet channel enables quantifying the inundation regime (depth, duration, and frequency of inundation), which is a key variable that fundamentally influences physical and ecological processes within a tidal marsh. The inundation regime directly affects plant establishment, survival, and expansion into a restored site. It affects wildlife use in numerous ways, for example, by providing a physical environment for estuarine fish access and egress from a marsh, defining mammal occupation of and access to a tidal marsh, and impacts bird utilization and whether bird nests are flooded.

Fundamental to defining inundation regimes at the six field sites was to monitor tide water levels at the principal inlet channel. To achieve this, a multi-parameter CTDS station was established near the mouth of the inlet and a stand-alone water level station deployed near the head-ward end of the channel. Each stations' water depth time-series data were converted to water surface elevations based upon field calibrated sensor offset values surveyed to nearby, newly-installed, benchmarks established by the PPT for vertical control to the North American Vertical Datum (NAVD) of 1988.

The channel water levels were used to calculate tidal datum values of *mean higher high water* (MHHW), *mean high water* (MHW), *mean tide level* (MTL), *mean low water* (MLW), and *mean lower low water* (MLLW) for each site pursuant to National Ocean Service (NOS) definitions and standards (Swanson 1974, Gill and Schultz 2001, NOAA 2003).

2.3.2 Inlet Channel Suspended Sediment Concentrations

Suspended sediments are an important aspect of the tidal water supply as they affect both biological and physical processes. Suspended sediments affect sunlight penetration into the water column influencing photosynthetic rates and thus primary production. Suspended sediments generated by fluctuating tides and wind waves affect the physical environment through deposition and re-suspension. One of the key factors determining the accretion rate of the marsh is the amount of suspended sediment that enters the site on each tide and that is deposited on the marsh surface. The suspended sediment concentration of the water column will be a major factor in determining the rate at which the marsh surface evolves.

To monitor suspended sediment concentrations (SSC), a turbidity sensor was included in the CTDS station deployed at the inlet channel of the six sites. Turbidity was measured using an optical backscatter sensor (OBS) fitted to the mooring and held in place by a polyvinyl chloride (PVC) casing and wired to a land-based Campbell data logger. The OBS sensor measured average and variance of turbidity in Nephelometric Turbidity Units (NTU). The field calibrations of each OBS sensor included water samples collected on multiple occasions submitted for laboratory analyses to determine particle size distribution and suspended sediment concentration (mg/L). The laboratory analyses enabled conversion of the field data from the sensor's electrical output (NTU) values into SSC concentrations using the site specific calibration values to determine the best fit transformation equation of NTU to SSC.

2.3.3 Inlet Channel Salinity

Salinity fundamentally affects the ecological conditions and habitat of a site by influencing vegetation patterns and wildlife use. Invertebrates, fish, wildlife, and birds can vary along salinity gradients for several reasons some of which are physiological tolerance to salt, physiological tolerance of prey items to salt, and characteristic marsh structure and its influence on species colonization. Vegetation patterns also reflect salinity gradients.

To characterize the channel water salinity regime at the six sites, the multi-parameter CTDS mooring deployed in the inlet channel included a conductivity sensor. The sensor output in conductivity data (mmhos/cm) was converted to Practical Salinity Units (PSU) per established methods (Lewis, IEEE Journal of Oceanic Engineering, Vol. OE-5, No.1). Time series plots and summary statistics were developed for each IRWM site to characterize its salinity regime. These data were compared to marsh plain pore water salinity data.

2.3.4 Inlet Channel Temperature

Temperature is a fundamental environmental parameter effecting the biological and chemical conditions and physical properties of water. The multi-parameter CTDS mooring deployed in the inlet channel included a temperature sensor. From these field data, time series plots and summary statistics for each IRWM site were developed to characterize channel temperature regime.

2.3.5 Marsh Plain and Channel Water Levels

In addition to monitoring water levels at the principal channel inlet (CTDS station), tide water level stations included two to four locations on the marsh plain as well as a channel station at the back (head-ward) end of the principal tidal channel. The marsh plain and channel water depth time-series data were converted to water surface elevations based upon field calibrated sensor offset values surveyed to nearby, newly-installed, benchmarks established by the PPT for vertical control to the North American Vertical Datum (NAVD) of 1988. All marsh plain and channel depth and temperature data were collected concurrent with the CTDS collection schedule to facilitate comparisons between the channel stations, marsh plain stations, CTDS stations, and the NOS reference stations.

2.4 Sediment Sampling

Soil characteristics affect habitat conditions and plant community composition by influencing plant establishment, survival, and expansion. Sediment and pore water chemistry also affect sediment deposition processes (settling of suspended sediments, peat accretion, oxidation). The sampling design and methods were developed in conjunction with the Plant Team, as the intent of the soil sampling was to aid in evaluating site vegetation characteristics.

The PPT collected sediment samples at each site to establish baseline soil conditions. The two types of sampling conducted were nutrient sampling and bulk density sampling. Sampling occurred at two depth intervals; a top layer from 0 – 10 centimeters below ground surface, and a secondary layer from 10 – 30 cm below ground surface. Typically, both nutrient sampling and bulk density sampling occurred at each location. Nutrient samples were typically composites samples, bulk density samples were discrete samples. Nutrient analytes included total nitrogen, total carbon, organic matter (%), organic carbon, and particle size distribution (% sand/silt/clay).

2.5 Pore Water Salinity

Pore water salinity effects vegetation establishment, growth, and expansion and affects plant community composition. Pore water salinity also reflects sediment deposition processes (settling of suspended sediments, peat accretion, and oxidation). The PPT collected pore water salinity samples to determine sub-surface salinity conditions at the six sites. Total salinity measurements were made quarterly at a minimum from December 2003 – September 2005. Individual site sampling dates are shown in Tables 1.1 – 1.6. The pore water salinity monitoring procedures were based upon the method identified by Culberson (2001). Sample locations were determined in conjunction with the Plant Team, and based upon vegetation zonation. Typically, three shallow sub-surface piezometers were installed at each zone at each marsh site. Marsh plain water level monitoring locations were co-located with piezometers. The number of sample locations varied by site, most sites had twelve piezometers, though the smallest site Carl’s Marsh had only five.

3.0 Data Collection and Quality Assurance

This section presents the methods employed for data collection and quality assurance for all field data. This section addresses the following activities:

- Aerial Photography (Section 3.1)
- Topographic and Bathymetric Surveys (Section 3.2)
- Tidal Water Supply (Section 3.3)
- Sediment Sampling (Section 3.4)
- Pore Water Salinity (Section 3.5)

WWR utilized numerous quality assurance protocols to ensure an accurate and representative dataset. These protocols were followed during each step of the monitoring effort; from instrument deployment, instrument programming, data downloads, field calibrations, to data reduction.

3.1 Aerial Photography

High-resolution color infrared aerial photographs were taken by HJW Geospatial (HJW) of Oakland, CA for selected sites in both 2003 and 2004. Tables 2.1 and 2.2 list those sites, date, number of photos, rectification method, scale and pixel resolution for each year. Flight line maps and photo tiles are presented in this report in Figures 3.1 – 3.7. A more detailed description of photo acquisition and image processing is present in the IRWM Landscape Ecology Team Data Report, available at www.irmw.org. The report includes flight line maps, aerial control point identifiers and coordinates used by site and year, and a full description of image processing, orthorectification, photo clipping and mosaicing, photo compression, flight and camera metadata, resulting images and maps.

Aerial photographs were flown at low tide in 2003 and at mid tide in 2004, at a scale of 1:9,600 (1” = 800’ or 1 cm = 96 m). The photographs were then scanned at a resolution of 1,200 dpi providing 0.67 ft (20cm) pixel resolution. WWR received a DVD with an electronic file for each photograph (tiff format), two diapositive and two contact prints of each photo from HJW.

The 2003 Carl’s Marsh photograph was flown for a different project earlier in the year. That project acquired imagery at 1:7,200, or 1” = 600’/ 1 cm = 72 m. The photograph was scanned at 1,200 dpi, providing a 0.5 ft (15 cm) pixel resolution.

The 2003 Big Break photographs were flown on a separate day, at a scale of 1:6,000, or 1” = 500’/ 1 cm = 60 m. The photograph was scanned at 1,200 dpi, providing a 0.41 ft (13 cm) pixel resolution.

3.1.1 Aerial Ground Control

Verification of sub-meter aerial ground control position accuracy occurred during data post-processing using *Trimble* Pathfinder 2.0 software. Subsequent point conversion into a

Geographic Information System (GIS) enabled matching the crosses as seen on the photos to corresponding real-world coordinates of the survey/GIS points. Ground control points were installed prior to annual photos and removed following annual photos. Aerial control point locations are shown in Figures 3.2 – 3.7. Aerial ground control point description and coordinates for 2003 and 2004 shown in Table 3.1 and 3.2.

3.2 Topographic and Bathymetric Surveys

All topographic surveys were performed relative to the North American Vertical Datum of 1988 for vertical (NAVD88) and North American Datum of 1983 for horizontal (NAD83). The topographic and bathymetric surveying program included a mix of surveying technologies to collect elevation and position data on the marsh plain and within tidal channels. The surveying sub-task included:

1. Establishing project site primary and secondary control
2. Surveying marsh plain vegetation / elevation transects
3. Surveying WL and CTDS instrumentation platforms
4. Tidal channel cross sections
5. Aerial target survey

Each of the surveying sub-tasks required a unique survey technology due to accuracy requirements, site environment and data end-use. The following section outlines different survey technologies and how they were utilized at each of the monitoring sites.

1.1.1 Topographic Survey Methodologies

1.1.1.1 Static GPS

Static GPS methodologies were used to establish primary control points at each monitoring site. WWR field personnel installed primary benchmarks at each site that were subsequently surveyed using RTK GPS base stations. Tom Tucker of Tucker Associates (PLS 4120, Calistoga, CA) conducted the static survey occupation and data reduction. The base stations established vertical and horizontal control within the project datum:

- Horizontal datum – State Plane Coordinate System, Zone 2, Feet, NAD 83
- Vertical datum – North American Vertical Datum of 1988 (NAVD 88), Feet

Static GPS provides the highest accuracy but requires the longest equipment occupation time with multiple base stations set-up over a network of reference benchmarks for extended periods (4 – 7 hours). A least squares adjustment of observations is required to finalize data returns. Static positioning is capable of providing vertical accuracies of ~ 0.05 feet. At Browns and Sherman Island, static positioning was utilized to establish on-site control points which then enabled the more rapid PPK GPS data collection methods for the remaining on-site benchmarks.

1.1.1.2 Real-time Kinematic Positioning (RTK)

RTK surveys provided benchmark (primary and secondary) coordinates for Pond 2A, Coon and Bull Islands. RTK GPS requires only short occupation periods, comparable to PPK, however does not require post-processing of data returns. RTK accuracy is a function of the quality of the control points (level of benchmark accuracy, geographic arrangement) and communication between host and rover stations. RTK requires multiple, high quality reference benchmark control points in order to return accurate data. A *Trimble model 4000 ssi* base station was used to occupy primary benchmarks and establish control at secondary benchmarks.

1.1.1.3 Post-processed Kinematic Positioning (PPK)

PPK GPS requires much shorter occupation periods than static positioning, enabling greater productivity, but requires proximity between reference base station and rover units, high quality reference benchmarks and unobstructed views of satellites. PPK surveys are more sensitive, relative to static, to short-term fluctuations in Position Dilution of Precision (PDOP) relating to the number and configuration of satellites interrupting or limiting periods of reliable data collection. PPK requires a least squares adjustment or similar multiple baseline statistical analyses to provide a weighted mean average of data returns. PPK surveys occurred at Browns, Sherman, and Bull Islands using *Trimble 4000 ssi* units.

1.1.1.4 Real-time Differential GPS (DGPS)

DGPS surveying consists of collecting two types of positioning data simultaneously: GPS satellite data, and position correction data broadcast (UHF) from the network of Continually Operating Reference Stations (CORS) maintained by the National Geodetic Survey (NGS) and National Oceanic and Atmospheric Administration (NOAA). CORS provides GPS carrier phase and code range measurements in support of 3-dimensional real-time positioning activities resulting in “on-the-fly” horizontal position solutions with an average accuracy of ± 1meter. DPGS was used for all of the bathymetric portions of each tidal channel cross section survey.

1.1.1.5 Total station and Optical Level Surveys

Topographic surveys using a total station or an optical level were conducted at all of the monitoring sites for vegetation-elevation relationships, instrumentation platform surveys and for channel cross-section surveys in channels too small for a boat to maneuver to conduct bathymetric surveys. The total station provides high accuracy horizontal and vertical coordinate positioning at distances less than 300 meters. Optical levels are capable of providing the highest-level accuracy for elevation surveys when used over short distances.

The total station was set over a site primary control point and oriented to a second primary control point in order to collect data within the project horizontal and vertical datums. The level was set near an instrument platform and back-sighted to a project primary or secondary benchmark in order to assign a datum offset to the collect water surface elevation time series.

3.2.2 Bathymetric Surveys

Tidal channel geometries were surveyed using a small survey vessel (Boston Whaler 17' Montauk) outfitted with bathymetric survey equipment. The hydrographic surveys utilized Class 1 methods and accuracies as outlined in the Army Corps of Engineers' Hydrographic Surveying Manual (EM 1110-2-1003, January 2002).

Bathymetric data were collected using an *Odom Hydrotrac* survey-grade fathometer with a 3-degree 200-kHz transducer. Position data (collected in geographic coordinates) were collected using a *Trimble AG123* Real-Time differential GPS (DGPS). Survey vessel motion was detected and applied to the fathometer output using a *TSS CMS-25* motion sensor (the motion sensor was attached to the top of the transducer). The data stream was collected using a *Toshiba Pentium* laptop running *Hypack Max (Version 4.3)* survey planning, data collection and reduction software.

Horizontal control data were collected in NAD 83 geographic coordinates using a *Trimble* DGPS. *Corpscon* Version 6.0 was used to convert the collected geographic positions to California State Plane Zone 2 (NAD 83) coordinates.

3.2.3 Survey Method Accuracies

Accuracy of vertical and horizontal survey results vary by method. A variety of method-specific factors determine the confidence in a given survey result. Because the IRWM on-site benchmarks were utilized as control points for a variety of subsequent monitoring activities (e.g., water surface elevations, vegetation-elevation transect surveys) particular emphasis was placed employing high-precision GPS survey methods that would target results with high optimum vertical accuracy (less than +/- 0.1 feet (+/- 0.03m). Static GPS, RTK-GPS, and PPK-GPS can yield high accuracy vertical and horizontal results, though actual accuracies are affected upon factors including number of satellites and satellite configuration, PDOP (position dilution of precision) and environmental conditions. Table 4 provides a summary of methods and accuracies.

3.2.4 Benchmark Fabrication, Classification, and Installation

The two classifications of on-site benchmarks installed during the IRWM project are Primary (PBM) and Secondary (SBM) as distinguished by the materials and installation methodology.

Primary Benchmarks

Primary benchmarks are 0.5 to 1.5 inch diameter galvanized pipe in 10 foot sections installed to refusal (depths of 10 – 30 feet), subsequently filled with concrete. Total length of pipe utilized varied with depth to resistance; resistance defined as the point at which the pipe could not be driven deeper into marsh plain using hand tools (post driver and sledge hammer). A 6 inch diameter PVC collar installed around the pipe to a depth of approximately 24 inches below the marsh plain and extending approximately 6 - 10 inches above the marsh plain was also filled with concrete. A survey pin, stamped with station identification (e.g. PBM01), was placed into top of benchmark. Figure 4.1 presents a typical primary benchmark schematic and photograph.

Secondary Benchmarks
Secondary benchmarks (SBMs) are present at marsh plain and channel water level stations and channel cross-sections. SBMs are typically 10 foot sections of 2 inch diameter PVC or galvanized pipe extending 0.5 to 4 feet above the marsh plain. Unlike primary benchmarks there is no concrete fill. Secondary benchmark description and acronyms include: Top of Galvanized Pipe (TOGP), Total Station Control Points (TSCP), channel cross-section right bank and left bank endpoints (EPRB and EPLB), and Top of Angle Iron at selected water level structures (TOAI). Figure 4.2 presents the secondary benchmark construction details and photographs. Table 5 provides a description of the secondary benchmarks and construction method.

Each IRWM site has 2 – 4 marsh plain water level stations and 1 – 2 channel water level stations. The galvanized pipe at water level stations serves both as a secondary benchmark (TOGP) as well as the support structure for the PVC stilling well that houses the water level sensor. Figure 5.1 and 5.2 present a design schematic and photograph of a typical marsh plain station. Figure 5.3 presents photographs of typical water level stations. The SBM constructed of slotted angle iron At Carl's Marsh are engraved/notched to indicate the Top of Angle Iron (TOAI) reference point. PVC pipe SBMs installed at channel cross-section right bank and left bank endpoints (EPRB and EPLB) provided the benchmark for the subsequent channel hydrographic surveys. Each IRWM site has 4 – 7 locations with SBMs marking channel cross section end points. SBMs also include Total Station Control Points (TSCP), PVC pipes extending 0.5 – 3 feet above the marsh plain capped with a black square PVC plug to provide a point over which a survey instrument can be set-up over or optical level can reference for topographic surveys. Clustered groups of 2 – 3 secondary benchmark are generally present at water level recorders and cross-sections with the intended purpose of detecting any relative elevation change between benchmarks over time – an indication of benchmark settling or tampering.

3.3 Tidal Water Supply

During the development of the site monitoring design, field personnel conducted a site visit to identify specific locations most suitable for each monitoring feature. Site conditions and geomorphology considered in determining CTDS mooring and telemetry station locations and water level locations. The initial reconnaissance was critical in develop sensor platform designs specific to each site. Sampling locations for the PPT activities are shown in Figures 6.1 – 6.6.

1.1.1 Inlet Channel Water Levels

To characterize water levels, a pressure transducer was incorporated into the CTDS mooring deployed in the inlet channel to sample depths over the extended deployment period.

Equipment Description. A *Wika LS-10* atmospherically vented pressure transducer was attached to rectangle "box" mooring constructed of galvanized slotted angle iron with 100-pound cement base (Figure 7) and deployed into inlet channel at all sites excepting Carl's Marsh at which the *Wika LS-10* was attached to a previously established channel monitoring station. Moorings were attached to a steel drag chain attached to a steel pipe driven into the adjacent shoreline. The pressure transducer was wired to a *Campbell* data logger located in land-based logger box adjacent to the channel (Figure 8). The stainless steel pressure transducer's electric current output signal (4 – 20 mA) was converted to water depth (feet).

Due to *Wika LS-10* sensor failure at Bull Island and due to concerns about theft and vandalism after monitoring stations were stolen at Sherman Lake in April 2004, a submersible self-contained multi-parameter data sonde manufactured by *Coastal Leasing* (model *Macrotide)* were installed at these two sites to monitor water level, temperature, conductivity and suspended sediment concentration**s**. These datasondes do not connect to a land-based data logger, rather use an onboard internal data logger. The *Macrotide* mooring consisted of a one-foot long, six inch diameter PVC, horizontally bolted to the top of a 100-pound cement block. The sensor was placed within the protective PVC housing. The mooring block tapers toward the top and wide at the bottom to ensure stability (Figure 7).

The *Macrotide* data logger activated the pressure transducer every 12 minutes and take readings at 2 hertz (2 samples per second) for 5 seconds, yielding 10 samples per burst. The data logger stored the average value of these burst samples into memory with a date and time stamp (Pacific Standard Time). Downloaded data files contain a comma-delimited file of temperature, absolute pressure and time and date stamp. Because the *Coastal Leasing* pressure transducers are not atmospherically vented, atmospheric pressure values were obtained from nearby monitoring stations to compensate for atmospheric pressure in determining water depths. Atmospheric pressure values obtained from the Napa Airport located approximately one mile east of Bull Island were utilized for Bull Island. Initially, atmospheric pressure values for Sherman Lake were obtained from a second pressure transducer mounted above MHHW on the adjacent shoreline. Beginning in February 2005, atmospheric pressure values were obtained from Travis Air Force Base, located approximately 20 miles north-west of Sherman Lake. Data post-processing included the subtraction of concurrent atmospheric pressure values from the absolute pressure values.

In order to convert collected water level data into the project datum, CTDS deployment offsets were determined by comparison of synoptic measurement of sensor depth value and surveyed water surface elevations relative to established benchmarks in the immediate vicinity. Offset measurements and/or survey shots were recorded prior to and following each instrument deployment and removal during field visits.

Appendix A contains the specifications for the sensors listed in this section.

Sampling Frequency. All data collection occurred at synoptic 12-minute intervals beginning at the top of the hour. This is concurrent with National Ocean Service continuous recording stations in the region. NOS Richmond Station 9414863 served as reference station for Carl's Marsh and the three Napa sites and NOS Port Chicago Station 9415144 served as reference station for Browns Island and Sherman Lake.

Sensor Calibration and Field Maintenance. The field service intervals varied by site and station throughout the duration of the field monitoring period, as shown in Table 1.1 – 1.6. Water level instruments were factory calibrated prior to deployment. Instrument deployments and field recoveries typically included sensor checks on the following:

1) Open-air pressure readings were recorded during field service visits when the instrument was recovered and exposed to open air to ensure readings were at or very near 0.00.
2) The offset conversion (before instrument recovery) between raw sensor readings and the project datum was checked against the offset conversion derived from the previous post-deployment readings. Post deployment and pre-recovery conversions should be very similar; differences in conversions are indicative of either the sensor physically moving or experiencing transducer drift during that particular deployment.
3) Instruments inspected for physical damage or corrosion.
4) Checking battery power and remaining memory space.
5) Cleaning the instrument of any biological fouling or sediment accumulation.

Water Level Offset Calibration Summary and Detail Sheets. The water level offset summaries are presented by site and station in Tables 6.1 – 6.6. Instrument offset values were typically calculated at the start and end of each deployment, with starting offsets measured/surveyed once the mooring was deployed into the channel and ending offsets measured/surveyed prior to removing the mooring/instruments for field servicing. Offset calibration detail sheets containing all field metadata and calculated offset values are presented by site and station in Tables 7.1 – 7.6.

The offset calibration summary sheets present the following information:

- Site
- Station name
- Calibration start date
- Calibration end date
- Calibration Method (Staff gauge and Solinst/Tape, Survey, Interpolation, Manual)
- Summary statistics by method (Mean, Stnd. Dev., Count, Stnd. Error)
- Resulting (applied) offset and summary statistics (Mean, Std. Dev., Count, Std. Error)

The offset calibration detail sheets present the following information:

- Site
- Station name
- Calibration start date
- Calibration end date
- Field calibration date
- Instrument session (test) start date
- Field book number and page number
- Benchmark survey name (used for offset calibration)
- Survey point elevation (Ft NAVD)
- Calibration point name
- Calibration point offset (distance to benchmark survey point)
- Relative distance offset to the Top of Staff Gauge
- Staff gauge length
- Calibration method
- Measurement repetition
- Field measured value (feet)

- Corresponding sensor value (feet)
- Solinst or Tape Measure Water Surface Elevation (Ft NAVD) (*calculated value*)
- Staff gauge Water Surface Elevation (Ft NAVD) (*calculated value*)
- Solinst or Tape Measure Offset value (feet) (*calculated value*)
- Staff gauge Offset value (feet) (*calculated value*)
- Standard deviation of Solinst or Tape Measure Offset value (feet) (*calculated value*)
- Standard error of Solinst or Tape Measure Offset value (feet) (*calculated value*)
- Standard deviation of Staff gauge Offset value (feet) (*calculated value*)
- Standard error of Staff gauge Offset value (feet) (*calculated value*)
- Average of Sensor Offset (Feet) (*calculated value*)
- Standard deviation (Feet) (*calculated value*)
- Standard error (Feet) (*calculated value*)

Data Management. All field data downloads were performed with hand-held field computers or laptops. Field measurements for calibration are both in electronic format and on hard copy field forms for permanent data records and data validation. The PPT converted the instrument water depth data to water surface elevations and provided time-series water depth and water surface elevation (Ft NAVD) measurements electronically to SFEI for inclusion in the overall project database.

3.3.2 Inlet Channel Suspended Sediment Concentrations

To characterize the suspended sediment concentrations (SSC) at the six sites, a turbidity sensor was deployed in the inlet channel as part of the CTDS station.

Equipment Description. Turbidity was measured using a *Forest Tech DTS-12* optical backscatter sensor (OBS) wired to a separate *Campbell* data logger. The OBS sensor measures turbidity in Nephelometric Turbidity Units (NTU) using optical back scatter to detect the intensity of light scatter at 90 degrees to the incident light beam using infrared laser technology. Sensor outputs average and variance of NTU values. OBS sensors were mounted to inlet channel moorings encased in protective casing (PVC) oriented to provide the manufacturer recommended 4 inch axial and 2 inch radial clearance from physical structure to prevent signal interference. Field and bench calibrations of each station involved recording NTU values for different turbidity concentrations (e.g., low, medium, high) using channel water and bottom sediments collected at the respective station field site with samples subsequently submitted for laboratory analyses to determine particle size distribution and suspended sediment concentration (mg/L). The laboratory SSC concentrations enabled conversion of the CTDS station time-series NTU data output into SSC concentrations using the site specific calibration values to determine the best fitting transformation equation of NTU to SSC.

Monitoring Locations. An OBS sensor was deployed as part of the multi-parameter CTDS station situated at the inlet channel of each site. The OBS sensor head was typically located 10 – 12 inches above the channel ground surface. CTDS stations were typically deployed into sub-tidal channels that were inundated most, if not all, of the time to maximize sample size. Four of the six IRWM site inlet channels were sub-tidal, however Carl's Marsh and Coon Island inlet

channels were comparatively shallow and thus CTDS moorings were exposed to open air during some low tide events. Exposed data are invalid data record was retained but marked as invalid and exclude from the final validated data set.

Sampling Frequency. All CTDS instruments sampled concurrently at 12-minute intervals from the top of the hour, concurrent with water level, salinity, and temperature measurements.

Sensor Calibration. OBS sensor calibration typically occurred one to three times during this project, near the start of the project, at mid-term and at project completion. Calibrations consist of using water and sediment from the site in three to four concentration mixtures (low, medium, high, and highest spanning the full sensor response range), recording sensor NTU output at each concentration, and taking a sample from each concentration to submit for laboratory analysis of suspended sediment concentration. These data provided the basis to generate calibration curves and best fit equations for each instrument to convert the sensor's electrical output in NTU to SSC in mg/L. Other researchers have determined these instruments to have a linear response across a broad range of concentrations when measuring the fine-grained silts and clays commonly in suspension in the lower San Francisco Estuary (Shoellhamer and Buchanan 1998). Linear regressions were established for low to medium range NTU values (this captured ~ 99% of all data points). Non-linear transformations were applied to high range data points (typically >500 NTU) at several sites. NTU to SSC transformation equations utilized and associated regression graphs and statistics for each site are presented in Table 12.2 – 12.6.

Bench calibrations were conducted using approximately 5 gallons of channel water and bottom sediment from each site collected using a Van Veen grab sampler. A dark colored 10 gallon tub served as the "bathtub" in which channel sediment and water were mixed. The tub was large enough to sufficiently submerge the sensor while maintaining the required 4-inch front and 2-inch side clearance around the sensor. Sediment was incrementally added to achieve desired concentration range (low, med, high) based upon sensor output (NTU) values. Once a desired range was achieved, no additional sediment was added and a paint-stirring rod attached to a variable speed cordless drill was used to continuously mix the solution to maintain relatively uniform conditions during calibration readings. Following each set of readings (low, med, high) a 750-ml sample bottle of that water-sediment mixture was extracted and labeled per lab protocols. A chain of custody form was completed and submitted with the samples to the Cooper Testing Laboratory, an independent geotechnical laboratory located in Palo Alto, California, for analytical laboratory determination of sediment concentrations (mg/L) and selected samples analyzed for particle size distribution.

Field calibrations at Browns, Bull, and Coon Island included three discrete spot samples of channel water at the CTDS OBS sensor collected using a Van Dorn sampler and three depth integrated samples collected using a depth-integrating sampler (type US DH-59). The Van Dorn sampler is a clear plastic tube that is lowered by an attached cable into the water column; the sampling tube has rubber end caps that can be shut to capture a sample from the desired depth. The DH-59 is a medium-weight suspended-sediment sampler that was lowered by hand into the water column using a rope. The sampler has a glass pint bottle with a tensioned gasket serving as a lid that is opened to allow sample water to be collected. Sampler photographs and full

specifications and user manual are available via http://water.usgs.gov/osw/pubs/OFR_2005 _1087/ index.html#DH-59. Samples were bottled and labeled and submitted for laboratory analyses to determine sediment concentrations (mg/L).

Sensor field maintenance. OBS sensitivity is affected by biological and physical fouling of the sensor. The *DTS-12* model has a mechanical wiper blade analogous to an automobile's windshield wiper that is intended to reduce fouling. Wipers performed well for the initial year however all failed operating due to corrosion by the conclusion of the project. The sensor casing was wrapped with copper mesh to inhibit biological growth leading to instrument fouling. Sensor casing pitted and cracked leading to sensor failure, and subsequent replacement, at Carl's Marsh and Pond 2A. Field service intervals varied throughout the duration of the field monitoring period, typically occurring at 1.5 months intervals.

Data Management. Data were reviewed to identify erratic increases or decreases in average NTU values to flag potentially invalid data points. Erractic data jumps greater than two standard deviation were flagged and reviewed. Erractic jumps not associated with increasing or decreasing trends were flagged as invalid and not included in final graphic or and tabular statistical summary. Using the calibration values for each sensor-site combination SSC vs. sensor output regression equations were calculated to convert the sensor output values from NTU to SSC (mg/L). The PPT provided time series of SSC (average and variance) for each site electronically to SFEI for inclusion in the overall project database.

1.1.1 Inlet Channel Salinity

To characterize the channel water salinity regime at the six sites, a conductivity sensor was deployed in the inlet channel as part of the CTDS station.

Equipment Description. A polypropylene electrode-less inductive conductivity sensor manufactured by *GLI* (model 3725E2T) measured conductivity. The sensor internally compensates for temperature and outputs conductivity values in microSiemens/cm. As previously described, most IRWM sites had CTDS moorings wired to land-based Campbell data loggers for the full project duration. However, *Coastal Leasing* multi-parameter data sondes were deployed mid-project at Sherman Lake and Bull Island. The *Coastal Leasing MacroCTDs* data sonde includes an inductive conductivity sensor manufactured by *Falmouth Scientific* model (C-T Sensor).

Methodological Overview. The sensor output in conductivity data (mmhos/cm) was converted to Practical Salinity Units (PSU) per standard methods of the Practical Salinity Scale 1978 (Lewis, IEEE Journal of Oceanic Engineering, Vol. OE-5, No.1) and its subsequent extension to lower salinities (Hill et al., IEEE Journal of Oceanic Engineering, Vol. OE-11, No.1). Time series plots and summary statistics of salinity were developed for each site to characterize its salinity regime.

Monitoring Locations. Salinity monitoring occurred at the inlet channel CTDS stations at each site.

Monitoring Period. Instruments were deployed between December 2003 to September 2005; actual dates by site are in Tables 1.1 – 1.6. Each site experienced some gaps in data collection for a variety of reasons, with principal causes including telemetry communication failure, sensor malfunction, and station vandalism.

Sampling Frequency. The sampling interval occurred at 12-minute intervals, concurrent with water level, temperature, and suspended sediment measurements.

Sensor calibration. Conductivity sensors were periodically tested in calibration solutions of known concentrations to compare sensor output against calibration solution. Sensors remained operational for the duration of the project.

Sensor field maintenance. Field service intervals varied throughout the duration of the field monitoring period, typically occurring at 1.5 months intervals.

Data Management. The PPT provided time series of conductivity and the converted salinity values, in conductivity (mmhos/cm) and in Practical Salinity Units (PSU), for each site electronically to SFEI for inclusion in the overall project database.

1.1.1 Inlet Channel Temperature

To characterize the channel water temperature regime at the six sites, a temperature sensor was deployed in the inlet channel as part of the CTDS station.

Equipment Description. The *Forest Tech DTS-12* sensor measured temperature (degrees Celsius); this sensor also measured turbidity.

Monitoring Locations. Temperature monitoring occurred at the inlet channel CTDS stations at each site.

Monitoring Period. Instrument deployment occurred from December 2003 to September 2005; actual dates by site are in Tables 1.1 – 1.6. Each site experienced some gaps in data collection for a variety of reasons, with principal causes including telemetry communication failure, sensor malfunction, and station vandalism.

Sampling Interval. The sampling interval occurred at 12-minute intervals, concurrent with water level, suspended sediment, and salinity measurements.

Sensor field maintenance. Field service intervals varied throughout the duration of the field monitoring period, typically occurring at 1.5 months intervals.

Data Management. The PPT provided time series of temperature (degrees Celsius) for each site electronically to SFEI for inclusion in the overall project database.

1.1.2 Marsh Plain and Channel Water Levels

Fundamental in defining inundation regimes at the six field sites is to monitor tide water levels. The following section provides a description of data collection and data management methods and procedures for monitoring marsh plain and channel water levels.

Instrument Description. Several different makes and models of atmospherically vented pressure transducers were utilized over the course of the project. Models include *Instrumentation Northwest PT2X*, *In-Situ miniTroll*s, *In-Situ 4000*, *In-Situ 8000*, and *Wika LS-10*. Excepting the *LS-10* model, these sensors monitored pressure/temperature and used an integrated datalogger. The *LS-10* lacked an integrated data logger and was wired to a separate Campbell datalogger. Because Sherman Lake was the least accessible site, the marsh plain sensors were initially also included as part of the IRWM telemetry network. Following theft and vandalism to some of the stations at Sherman in April 2004, telemetry monitoring stations were removed and stand-alone pressure/temperature sensors with an integrated datalogger were deployed. The pressure transducers include propriety operating software for computer to sensor communication. *In-Situ's WinSitu* (version 4.5) was used for the *miniTrolls* and *Troll* 4000s. *Instrumentation Northwest's Aqua 4 Plus* was used for the *PT2X* sensor.

Monitoring locations and periods. Water level stations included two to four locations on the marsh plain as well as a channel station at the headward end of each "main" tidal channel (with the CTDS station located at the inlet of the channel). Deployments occurred between December 2003 and September 2005; dates by site are in Tables 1.1 – 1.6. Each site experienced some gaps in data collection for a variety of reasons, with principal causes including telemetry communication failure, sensor malfunction, and station vandalism.

Station Description. Marsh plain stations consisted of a pressure transducer within a 2-inch PVC stilling well attached to a 1-inch galvanized pipe driven into the substrate to refusal. The top of the galvanized pipe was subsequently surveyed into the project datum thus becoming a calibration benchmark for each water level station. Channel stations were similar installed within a 2-inch PVC stilling well attached to a galvanized pipe driven into the channel thalweg to refusal. At Browns Island, the channel station was deployed attached to a mooring, similar to the previously described CTDS mooring.

Instrument surveying to reference benchmarks. The PPT surveyed mash plain water level sensors into nearby, newly-installed, benchmarks for vertical control to the North American Vertical Datum (NAVD) of 1988.

Instrument field service. Periodic service visits included collecting field measurements to convert instrument water depth data into water surface elevations, downloading data, and servicing the instrument (clean, battery check, etc.) as needed. Tables 1.1 – 1.6 present the Field Activity Calendar which includes instrument service dates. Instrument deployments and recoveries involved sensor checks on the following:

1) An open-air pressure reading was recorded when the sensor was recovered to ensure readings were equal to or very near to 0.0.

2) The offset conversion (before instrument recovery) between raw sensor readings and the project datum was checked against the offset conversion derived from the previous post-deployment readings. Post deployment and pre-recovery conversions should be very similar; differences in conversions are indicative of either the sensor physically moving or experiencing transducer drift during that particular deployment.
3) Instruments inspected for physical damage or corrosion.
4) Ensuring o-rings are not cracked and are properly lubricated.
5) Checking battery power and remaining memory space.
6) Cleaning the instrument of any biological fouling or sediment accumulation.
7) For sensors deployed in protective water barrier bags (necessary for *miniTroll* sensors deployed in saline environments), visual confirmation of water bag integrity.

Sampling frequency. All data was collected at 12-minute intervals concurrent with National Ocean Service continuous recording stations in the region. The 12-minute sampling interval matched the CTDS collection schedule interval to facilitate comparisons between the channel stations, marsh plain stations, CTDS stations, and the NOS reference stations.

Sensor field maintenance. The field service intervals varied by site and station throughout the duration of the field monitoring period, as shown in Table 1.1 – 1.6.

Water Level Offset Calibration Summary and Detail Sheets. Marsh plain and water level field calibration methods are similar to the previously described for the inlet channel (CTDS) station (see 3.3.1). All marsh plain and channel field measured offsets are presented in water level offset calibration summary and detail sheets.

Data Management. All field data downloads were performed with hand-held field computers or laptops. Field calibration offset measurements are both in electronic format and on hard copy field forms for permanent data records and data validation. The PPT converted the instrument water depth data to NAVD water surface levels and provided water depth, water level, and field NAVD conversion measurements electronically to SFEI for inclusion in the overall project database.

1.1.3 Telemetry Communication Stations

Telemetry stations were installed at each IRWM site to house the *Campbell* datalogger wired to the CTDS station and selected marsh plain stations and were able to provide near real-time data transfer from selected monitoring locations to the WWR offices. Telemetry stations included “Host” and “Remote” stations; Remote stations communicated with Host stations via radio-frequency, the Host station in-turn transferred data from both Host/Remote stations via cell phone to modem for download to a computer located in the WWR office. All sites had a telemetry station at the CTDS station; initially Sherman Lake (the most remote site) also had telemetry stations at each of the four marsh plain locations. Following theft and fire at Sherman Lake in April 2004, telemetry stations (which proved difficult to conceal/camouflage due to antennae height and solar panel) were removed due to concerns about future vandalism. Host stations were in place at Carl’s Marsh, Pond 2A, and Browns Island. Coon and Bull Island

Remote stations communicated with the host station at Pond 2A. Remote stations at Sherman Lake communicated with the Host station at Browns. Telemetry station maps are shown in Figures 9.1 – 9.3.

The telemetry station/logger box set-up was designed and built for the IRWM project by Eyasco, Inc. of Aptos, California and utilized Eyasco's Merlin data management software.

1.1 Sediment Sampling

To assess baseline soil conditions at the six sites, nutrient sampling and bulk density sampling occurred at 0 – 10 centimeters below ground surface and from 10 – 30 cm below ground surface. Nutrient samples were typically composites samples, bulk density samples were discrete samples. Nutrient analytes include: total nitrogen, total carbon, organic matter (%), organic carbon, and particle size distribution (% sand/silt/clay).

Sampling Locations and Periods. Sampling locations were determined in conjunction with the Plant Team and included a range of vegetation communities and were typically co-located with vegetation productivity sampling plots. The number of sample locations varied by site, ranging from 5 to 16 locations. Typically, both nutrient sampling and bulk density sampling occurred at each location. In total, there were 192 nutrient samples and 40 bulk density samples. Figures 31.1 – 31.6 show sampling locations by site. Sampling occurred from July – September 2005. Individual site sampling dates are shown in Table 1.1 – 1.6.

Equipment Description. Nutrient samples were typically collected using an AMS Soil Recovery Probe. In some locations, upon extraction from the marsh plain AMS soil probe repeatedly failed to provide a complete in-tact sample. To overcome this, in some instances we utilized a Russian peat core sampler. Bulk Density sampling was conducted with an aluminum cylindrical sampler equipped with razor blades on the bottom of the sampler to facilitate pushing the sampler to the desired 30 cm depth. Upon extraction from the marsh plain, both nutrient and bulk density samples were measured and divided using a large, sharp knife into 0 – 10 cm and 10 – 30 cm partitions. Samples were placed in plastic bags. Samples were labeled on the outside of the bag and sample ID tag was also placed on the inside of each sample bag. A chain of custody form was completed and submitted with the samples to the analytical laboratory for analyses.

Laboratory Analytical Methods. Soil nutrient samples were analyzed at University of California, Davis soils laboratory and at the University of California ANR Analytical Laboratory. Bulk density samples were conducted at the Callaway laboratory at the University of San Francisco.

The UC Davis soils lab did the total nitrogen, total carbon, pH, and ECe analyses. The ANR lab performed the organic matter, percent organic carbon, and sand, silt and clay analyses. The standard operating procedure (SOP) number is a reference to the laboratory method used. A description of methods is available at http://groups.ucanr.org/danranlab/Soil_Analysis/index.htm The soil analytes and method are presented in Table 8.

Sampling Frequency. Sediment sampling occurred once per location.

Data Management. The PPT provided all soil sampling results by sample location, depth, parameter, and result electronically to SFEI for inclusion in the overall project database.

3.5 Pore Water Salinity

The PPT collected periodic pore water salinity samples to determine sub-surface salinity conditions at the six field sites. Sample locations were determined in conjunction with the Plant Team, and based upon vegetation zonation. Typically, three shallow piezometers were installed at each zone at each marsh site. Total salinity measurements were made quarterly at a minimum and coordinated with other field activities at each site.

Methodological Overview. The pore water salinity monitoring procedures were based upon the method identified by Culberson (2001). Piezometers were constructed to collect pore water at a depth of 15 – 20 cm below the ground surface. Stations were constructed using 2.5 inch PVC (typically approximately 1.5 meters in length) joined by coupler to short (~20 – 30 cm) screened/slotted PVC to allow aqueous exchange below the marsh plain surface. A schematic design of a piezometer is shown in Figure 10. Piezometers extend approximately 1.5 meters above the marsh plain surface to prevent over-topping during high tide events and were capped to prevent rainfall or debris from falling into the piezometers.

Sampling locations and periods. Sampling locations were developed in conjunction with the Plant Team and included a range of vegetation communities. The number of sample locations varied by site, most sites had 12 locations, though the smallest site Carl's Marsh had only 5 locations. Locations are shown in Figures 6.1 – 6.6 as well as Table 15.1-15.6. Typically, marsh plain water level monitoring locations were co-located with piezometers. Monitoring occurred from December 2003 – September 2005. Individual site sampling dates are shown in Table 1.1 – 1.6 as well as in Table 15.1-15.6.

Sampling Equipment Description. Initially, a refractometer was utilized to determine salinity (PPT) during piezometers pore water sampling. Beginning in June 2004, all samples measurements were made using the *YSI EC 300* hand-held electronic probe. The *YSI EC 300* measures conductivity, temperature compensated conductivity (specific conductance, 25°C), temperature, salinity (PPT), and estimated total dissolved solids.

Data Management. The PPT provided all piezometer sampling results by sample location, date, and result electronically to SFEI for inclusion in the overall project database.

4.0 Results

4.1 Aerial Photography

Aerial imaging efforts resulted in low altitude color infrared photographs taken in fall 2003 and 2004. The aerial imagery summary data are presented in Table 2.1 and 2.2 and control point data are shown in Table 3.1 and 3.2. The air photo flight planning tiles and control points are shown

in Figures 3.1 – 3.7. The results of the 2003 and 2004 aerial imaging efforts can be seen in Figures 11.1 – 11.6 and 12.1 – 12.6.

4.2 Topographic and Bathymetric Surveys

4.2.1 RTK and PPK GPS Benchmark Surveys

In 2003 and 2004, RTK and PPK GPS surveys conducted at the six IRWM sites provided high accuracy horizontal and vertical coordinates for benchmark established for the IRWM Pilot Project. The following sections detail the survey methods, procedures and reference benchmarks utilized during the surveys at each site. The Benchmark Maps 13.1 – 13.6 show the location of primary and secondary benchmarks. Table 9 contains the benchmark station names, coordinates, elevations, survey dates and installation metadata.

Browns and Sherman Islands

On May 4, 12, and 13, 2004, Tucker Associates of Calistoga, California surveyed Browns and Sherman Island using both Static and Post-Processed Kinematic GPS methods. The accuracy specification of the *Trimble* PPK GPS unit utilized is 1 centimeter + 1 part per million (as a function of the distance between the base station and the survey point). The initial May 4 Static GPS survey utilized 4 host base stations established over off-site NGS reference benchmarks (HT0142, AA3823, JS1894, HS3615) with verified horizontal and vertical accuracies and 2 stations set-up to establish coordinates at PBMs on Browns (PBM01) and Sherman (SBM4) with an observation period of 5 hours. Figure 14 shows the location and point identification of the off-site NGS reference benchmarks used and Appendix B contains the NGS datasheets containing benchmark metadata. The purpose of the initial Static survey was to establish coordinates at a primary benchmark at each site to enable subsequent PPK GPS surveys which require substantially shorter observation periods (seconds to minutes) thus enables logging numerous survey points in a single day.

For the May 12 PPK survey of Sherman Lake, base stations were set-up over Sherman PBMs 2 and 4, Browns PBM 1 from 8:30 – 1:30 p.m. For the May 13 PPK survey of Browns Island, base stations were set-up over Sherman PBM 4 and Browns PBMs 1 and 2 from 8:30 – 4:00 p.m. On both days, establishing host base stations enabled traversing Sherman and Browns with a rover unit (portable back-pack sized receiver and antennae) to collect survey points at the IRWM primary and secondary benchmarks. 17 points were collected at Sherman and 26 points collected at Browns. The elevation difference observed at Browns PBM 1 between the May 11 static and May 12 PPK survey was 0.00 ft. The elevation difference observed at Sherman PBM 4 between the May 11 static and May 12 PPK survey was 0.002 ft (0.001 m).

The Tucker Associates point summary sheet and closure log for the Static GPS survey of Browns and Sherman are in Appendix C, the point summary sheet and closure log for the PPK GPS survey of Browns and Sherman are in Appendix D and E, respectively.

Bull and Coon Islands

On May 5 and 6, 2004, Tucker Associates surveyed Bull and Coon Island using PPK GPS. Unlike, Browns and Sherman, the proximity of a reference benchmark to both Bull and Coon Islands did not require a base station established on either island. A base station was set-up over Towill benchmark 1006 proximate to the islands and a secondary base set-up at Tucker Associates office in Calistoga, approximately 30 miles north; see Figure 15 for location of Towill benchmark 1006 and Appendix F for Towill benchmark datasheets and metadata. The data returned from the two base stations were consistent. Tucker used the data return from the Towill benchmark 1006 base station in post-processing data and refined the Bull and Coon coordinates to within 0.065 feet (0.03m) vertical accuracy. At Bull Island, Tucker surveyed 24 benchmarks, including four primary benchmarks and 20 secondary benchmarks. The May 5, Coon Island survey recorded 25 benchmarks, including 4 primary and 21 secondary benchmarks. The May 6, Bull Island survey recorded 24 benchmarks, including 4 primary and 21 secondary benchmarks. The point summary sheet and closure log for the PPK GPS survey of Coon and Bull and are in Appendix G and H, respectively.

Pond 2A

On January 11, 2004 Chris Newton of Field Designs in Point Richmond, CA surveyed Pond 2A in the Napa Salt pond complex using RTK GPS. 16 IRWM benchmarks were surveyed; additionally 7 Towill benchmarks (1, 400, 529, 1001, 1018, 1021, 1022) as shown in Figure 15, were surveyed for accuracy assessment and found to match within 0.01 foot of Towill's survey sheets. Subsequent surveys conducted using a total station and optical level tied RTK GPS surveyed benchmarks into additional Pond 2A survey points of interest. The Field Designs point summary sheet are in Appendix I. A detail sheet of April 14, 2004 total station and Optical topographic surveys of primary and secondary benchmarks at water level station are in Appendix J.

Carl's Marsh

Wetlands and Water Resources, Inc. conducted the Carl's Marsh benchmark surveys using a total station and optical level survey instruments. A reference benchmark located on the northeastern footing of the Petaluma River Bridge served as the primary elevation control with additional benchmarks/aerial control points previously established by Stuart Siegel of Wetlands and Water Resources, Inc. serving as additional survey reference points. A December 10, 2003 total station survey established secondary benchmark elevations at water level stations. A subsequent optical level survey conducted March 11, 2004 tied the bridge benchmark to the benchmark/aerial control points previously established by Siegel. Survey detail sheets for the March 11 optical level loop survey is located in Appendix J.

1.1.1 Marsh Plain Topography – Data Itself not Presented

Extensive marsh plain vegetation-elevation transects were surveyed at the six sites principally during spring 2005; a total of 2838 survey points were recorded. Surveys were performed using a *TopCon* total station survey instrument. The marsh plain transects typically radiated from marsh plain water level monitoring stations in a hub-and-spoke design, some sites also included representative cross-sections across the marsh plain. Transects lengths ranged from short distances (tens of meters) to long distances (up to 300 meters). The number of survey points

ranged from 100 (Sherman Lake) to over 900 (Coon Island). The intent of the surveys was to establish a relationship between vegetation type and associated colonization elevation. For each survey point, a member of the Plant Team (who was also the prism rod-person) recorded data describing the vegetation type and density.

The summary statistics (count, minimum, mean, median, maximum, standard deviation) of results are presented by site in Table 10, complete survey data by site, location, and date presented in Appendix L. Figure 16 presents histograms of the marsh plain elevations by site. Elevation transects are presented on site aerial images in Figures 17.1 – 17.6.

4.2.3 Optical Level Benchmark Elevation Replicate Surveys

Primary and secondary benchmark elevations were re-surveyed using an optical level in order to identify change in elevation over time and determine if any benchmark settling was occurring. Results are presented in Table 9. Many of the replicate surveys primary and secondary benchmarks do not indicate any significant change in elevation, however settling occurred at some locations, most notably at Browns PBM-03 which lowered by 0.12 meters (0.4 feet).

4.2.4 Channel Bathymetry

Carl's Marsh

Bathymetry surveys were conducted on December 3 and 10, 2003 and March 11, 2004 using a *TopCon* total station. Channel cross section locations and profiles are shown in Figure 18.1. Cross-section profiles are also presented in Figure 19.1, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.1

Pond 2A

Bathymetry surveys of channel cross sections were conducted December 19, 2003 at XS-1, XS-1, and XS-3 using a *TopCon* total station and at XS-4 using an *Odom Hydrotrac* survey-grade fathometer. Channel cross section locations and profiles are shown in Figure 18.2. Cross-section profiles are also presented in Figure 19.2, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.2.

Coon Island

Bathymetry surveys of channel cross sections were conducted on December 4, 2003 at XS-3 and on January 22, 2004 at XS-4 and XS-6 using a *TopCon* total station. Surveys of XS-3, XS-5, and XS-7 were conducted on January 22, 2004 using an *Odom Hydrotrac* survey-grade fathometer. Channel cross section locations and profiles are shown in Figure 18.3. Cross-section profiles are also presented in Figure 19.3, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.3.

Bull Island

Bathymetry surveys of channel cross sections were conducted on December 12, 2003 at XS-3 using a *TopCon* total station. Surveys of XS-1, XS-2, and XS-4 were conducted on January 21, 2004 using an *Odom Hydrotrac* survey-grade fathometer. Channel cross section locations and profiles are shown in Figure 18.4. Cross-section profiles are also presented in Figure 19.4, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.4.

Browns Island
Bathymetric surveys were conducted at four locations on December 19, 2003 using an *Odom Hydrotrac* survey-grade fathometer. Channel cross section locations and profiles are shown in Figure 18.5. Cross-section profiles are also presented in Figure 19.5, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.5.

Sherman Island
Bathymetric surveys were conducted at two locations (XS-1, XS-2) on December 18, 2003 using an *Odom Hydrotrac* survey-grade fathometer. Surveys were conducted at two locations (XS-3, XS-4) on January 15, 2004 using a *TopCon* total station. Channel cross section locations and profiles are shown in Figure 18.6. Cross-section profiles are also presented in Figure 19.6, which overlays the cross-sections to demonstrate relative differences in channel depth and width. Individual survey points results and metadata (coordinates, elevation, date, point description, survey type) are presented in Table 11.6.

4.3 Tidal Water Supply

Tables 1.1 – 1.6 contain metadata (name, location, instrumentation, and data period) for each monitoring station. Figures 5.1 – 5.3 and 7 present representative field photos of the different station types. Figures 20.1 – 20.6 present graphs of each station's time-series water level data. Summary deployment details of each station are presented below.

4.3.1 Inlet Channel Water Levels

The following summary presents deployment dates and water level calibration summaries for the CTDS station pressure transducer (depth) sensors.

Calibration Summary and Detail Sheets. The water level calibration summaries are presented by site and station in Tables 6.1 – 6.6. Instrument offset values were typically calculated at the start and end of each deployment, with starting offsets measured/surveyed once the mooring was deployed into the channel and ending offsets measured/surveyed prior to removing the mooring/instruments for field servicing. Calibration detail sheets containing all field metadata and calculated offset values are presented by site and station in Tables 7.1 – 7.6.

Carl's Marsh (Petaluma River Marsh)
The Carl's Marsh CTDS station was installed on 22 December 2003 and removed on 14 August 2005. The *Wika LS-10* was used for the duration of the deployment. The CTDS station

experienced data gaps principally due to telemetry communication errors, the dates and cause of data gaps are presented in Table 1.1. This period consisted of 15 individual deployments; dates and calibration values are presented in Table 6.1 and 7.1. A graph of water levels for the duration of the deployment period is presented in Figure 20.1.

Pond 2A

The Pond 2A CTDS station was installed on 27 February 2004 and removed on 2 August 2005. The *Wika LS-10* was used for the duration of the deployment. The CTDS station experienced data gaps principally due to telemetry communication errors and one instance of battery/power failure, the dates and cause of data gaps are presented in Table 1.2. This period consisted of 14 individual deployments; dates and calibration values are presented in Table 6.2 and 7.2. Beginning in 21 January 2005 the pressure transducer began to exhibit upwards pressure drift. To compensate for this drift, the calibration methods for the four affected deployment periods interpolated offset values were applied to the raw data. A graph of water levels for the duration of the deployment period is presented in Figure 20.2.

Coon Island

The Coon Island CTDS station was installed on 12 February 2004 and removed on 7 April 2005. The CTDS station experienced data gaps principally due to telemetry communication errors, the dates and cause of data gaps are presented in Table 1.3. This period consisted of 12 individual deployments; dates and calibration values are presented in Table 6.3 and 7.3. A graph of water levels for the duration of the deployment period is presented in Figure 20.3.

Bull Island

The Bull Island CTDS station was installed on 13 February 2004 and removed on 20 September 2005. A *Wika LS-10* pressure transducer was deployed for the period from 13 February 2004 until it failed on 15 November 2004. Subsequently, a *Coastal Leasing Macrotide* unit was deployed from 01 December 2004 to 04 April 2005; this unit also failed. A different *Coastal Leasing Macrotide* unit was deployed from 04 April 2005 to 20 September 2005. The CTDS station experienced data gaps due initially to telemetry communication errors and subsequently in between pulling the *Wika* transducer and installing the *Coastal Leasing*, the dates and cause of data gaps are presented in Table 1.4. This period consisted of 16 individual deployments; dates and calibration values are presented in Table 6.4 and 7.4. A graph of water levels for the duration of the deployment period is presented in Figure 20.4.

Browns Island

The Browns Island CTDS station was installed on 30 January 2004 and removed on 11 August 2005. A *Wika LS-10* pressure transducer was deployed for the period from 30 January 2004 until 09 December 2004. Subsequently, a *Troll* SP-4000 was deployed from 09 December 2004 to 20 April 2005. A *Troll* SP-8000 was deployed from 20 April 2005 to 11 August 2005. The only significant data gap in water level data at the CTDS station occurred from 19 November 04 to 09 December 2004 due to sensor failure; the dates and causes of data gaps are presented in Table 1.5. This period consisted of 9 individual deployments; dates and calibration values are presented in Table 6.5 and 7.6. A graph of water levels for the duration of the deployment period is presented in Figure 20.5.

Sherman Lake

The Sherman Lake CTDS station was installed on 30 January 2004 and the datalogger box and telemetry station was stolen on 16 April 2004. Prior to being stolen, the pressure transducer was a *Wika LS-10* attached to a land-based data logger/telemetry station. Following this theft, to reduce visibility and potential for additional theft, a submersible self-contained *Macrotide* multi-parameter data sonde manufactured by *Coastal Leasing* was installed. This unit was deployed from 07 October 2004 until in failed on 01 February 2005. A second *Macrotide* data sonde was installed from 20 April 2005 to 10 August 2005. Deployment dates and causes of data gaps are presented in Table 1.6. This period consisted of 9 individual deployments; dates and calibration values are presented in Table 6.6 and 7.6. A graph of water levels for the duration of the deployment period is presented in Figure 20.6.

4.3.2 Inlet Channel Suspended Sediment Concentrations

Inlet channel suspended sediment concentration summary statistics for each site are presented in Table 12.1. The linear and non-linear transformation equation utilized in converting NTU values to SSC in milligrams per liter are presented in Table 12.2. Graphs of time-series suspended sediment concentration data for the duration of the deployment periods are presented for each site in Figures 21.1 – 21.6. Histograms of the turbidity sensor NTU values at each site are presented in Figure 21.7.

4.3.3 Inlet Channel Salinity

Inlet channel salinity summary statistics for each site are presented in Table 13.1 and seasonally summaries are presented in Table 13.2. Graphs of time-series salinity data for the duration of the deployment periods are presented for each site in Figures 22.1 – 22.6.

4.3.4 Inlet Channel Temperature

Inlet channel temperature summary statistics for each site are presented in Table 14. Graphs of time-series temperature data for the duration of the deployment periods are presented for each site in Figures 23.1 – 23.6.

1.1.1 Marsh Plain and Channel Water Levels

Each IRWM site contained from 2 – 4 marsh plain stations, one inlet channel station (the previously described CTDS station), and one channel station typically at the head-ward end of the inlet channel. The following summary presents deployment dates and water level calibration summaries for the marsh plain and channel water level station pressure transducer (depth) sensors.

Calibration Summary and Detail Sheets. The water level calibration summaries are presented by site and station in Tables 6.1 – 6.6. Instrument offset values were typically calculated at the start and end of each deployment, with starting offsets measured/surveyed once the mooring was deployed into the channel and ending offsets measured/surveyed prior to removing the mooring/instruments for field servicing. Calibration detail sheets containing all field metadata and calculated offset values are presented by site and station in Tables 7.1 – 7.6.

Carl's Marsh (Petaluma River Marsh)
Two marsh plain stations (WL-01, WL-02) and one channel water level station (WL-03) were installed at Carl's Marsh; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.1. Field calibration offset measurements and deployment period offsets are presented in Table 7.1. Graphs of each station's complete time-series water level data is presented in Figures 24.1 – 24.3.

Pond 2A
Three marsh plain stations (WL-01, WL-02, WL-03) and one channel water level station (WL-04) were installed at Pond 2A; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.2. Field calibration offset measurements and deployment period offsets are presented in Table 7.2. Graphs of each station's complete time-series water level data is presented in Figures 25.1 – 25.4.

Coon Island
Three marsh plain stations (WL-01, WL-02, WL-03) and one channel water level station (WL-04) were installed at Coon Island; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.3. Field calibration offset measurements and deployment period offsets are presented in Table 7.3. Graphs of each station's complete time-series water level data is presented in Figures 26.1 – 26.4.

Bull Island
Three marsh plain stations (WL-01, WL-02, WL-03) and one channel water level station (WL-04) were installed at Bull Island; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.4. Field calibration offset measurements and deployment period offsets are presented in Table 7.4. Graphs of each station's complete time-series water level data is presented in Figures 27.1 – 27.4.

Browns Island
Four marsh plain stations (WL-01, WL-02, WL-03, WL-04) and one channel water level station (WL-05) were installed at Browns Island; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.5. Field calibration offset measurements and deployment period offsets are presented in Table 7.5. Graphs of each station's complete time-series water level data is presented in Figures 28.1 – 28.4.

Sherman Lake
Initially three marsh plain stations (WL-02, WL-03, WL-04) and one channel water level station (WL-01) were installed at Sherman Lake. Following theft and fire at the site in April 2004, it was decided to leave only marsh plain stations WL-02 and WL-04 in place as these stations were located in areas of tall vegetation and not readily visible and therefore were considered (in hindsight, accurately) to be unlikely targets vandalism or theft; dates of deployments, data gaps, field service, data downloads and calibration offset measurements are presented in Table 1.6. Field calibration offset measurements and deployment period offsets are presented in Table 7.6. Graphs of each station's complete time-series water level data is presented in Figures 29.1 – 29.4.

4.4 Sediment Sampling

Sediment sampling results are presented on site maps by sample location in Figures 30.1 – 30.6. These figures present the results for all nutrient and bulk density data. Soil grain size is shown by site and by depth in Figure 31. Soil nutrients are shown by site and by depth in Figure 32. Soil bulk density is shown by site and by depth in Figure 33.

4.5 Pore Water Salinity

Pore water salinity sampling results are presented in Table 15.1 – 15.6, which include a map indicating sampling location and tabular listing of pore water salinity measurements by date.

5.0 References

Culberson, S.D. 2001. The Interaction of Physical and Biological Determinants Producing Vegetation Zonation in Tidal Marshes of San Francisco Bay Estuary, California, USA. Dissertation. University of California at Davis.

Edwards, T.K., and Glysson, G.D., 1999, Field Methods for Measurement of Fluvial Sediment: U.S. Geological Survey Techniques of Water Resources Investigations, book 3 chapter C2, 89 p.10, available at http://pubs.usgs.gov/twri/.

Gill, S.K. and J.R. Schultz. 2001. Tidal Datums and Their Applications. NOAA Special Publication NOS CO-OPS 1. National Oceanic and Atmospheric Administration, Silver Springs, MD. February.

National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Center for Operational Oceanographic Products and Services (CO-OPS), 2003. Computational techniques for tidal datums handbook: NOAA Special Publication, NOS CO-OPS 2, September 2003, 98 p.

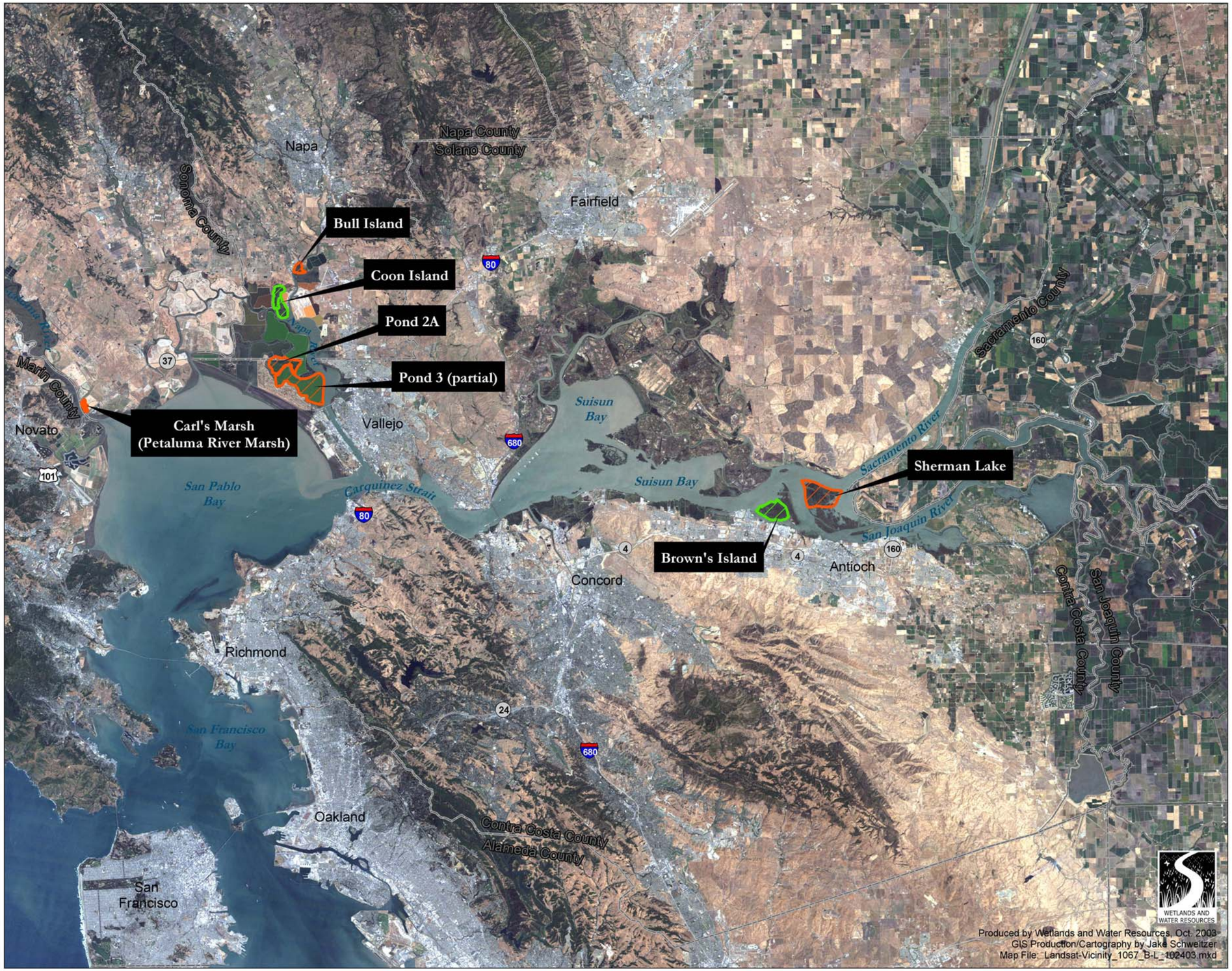
Swanson, R. L. 1974. Variability of Tidal Datums and Accuracy in Determining Datums from Short Series of Observations. Rockville, MD.: National Ocean Survey; 1974; NOAA Technical Report NOS 64.

Schoellhamer, D. H. and Buchanan, P. A. 1998. Measuring Suspended-Solids Concentration with Optical Backscatter Sensors. St. Petersburg, Fl.: Federal Interagency Workshop, "Sediment Technology for the 21 Century".

United States Army Corps of Engineers (USACE), 2002. Hydrographic Surveying Manual (EM 1110-2-1003). January.

IRWM TIDAL MARSH RESTORATION STUDY SITES
San Francisco Bay-Delta Region, CA
October 24, 2003

Figure 1



Legend

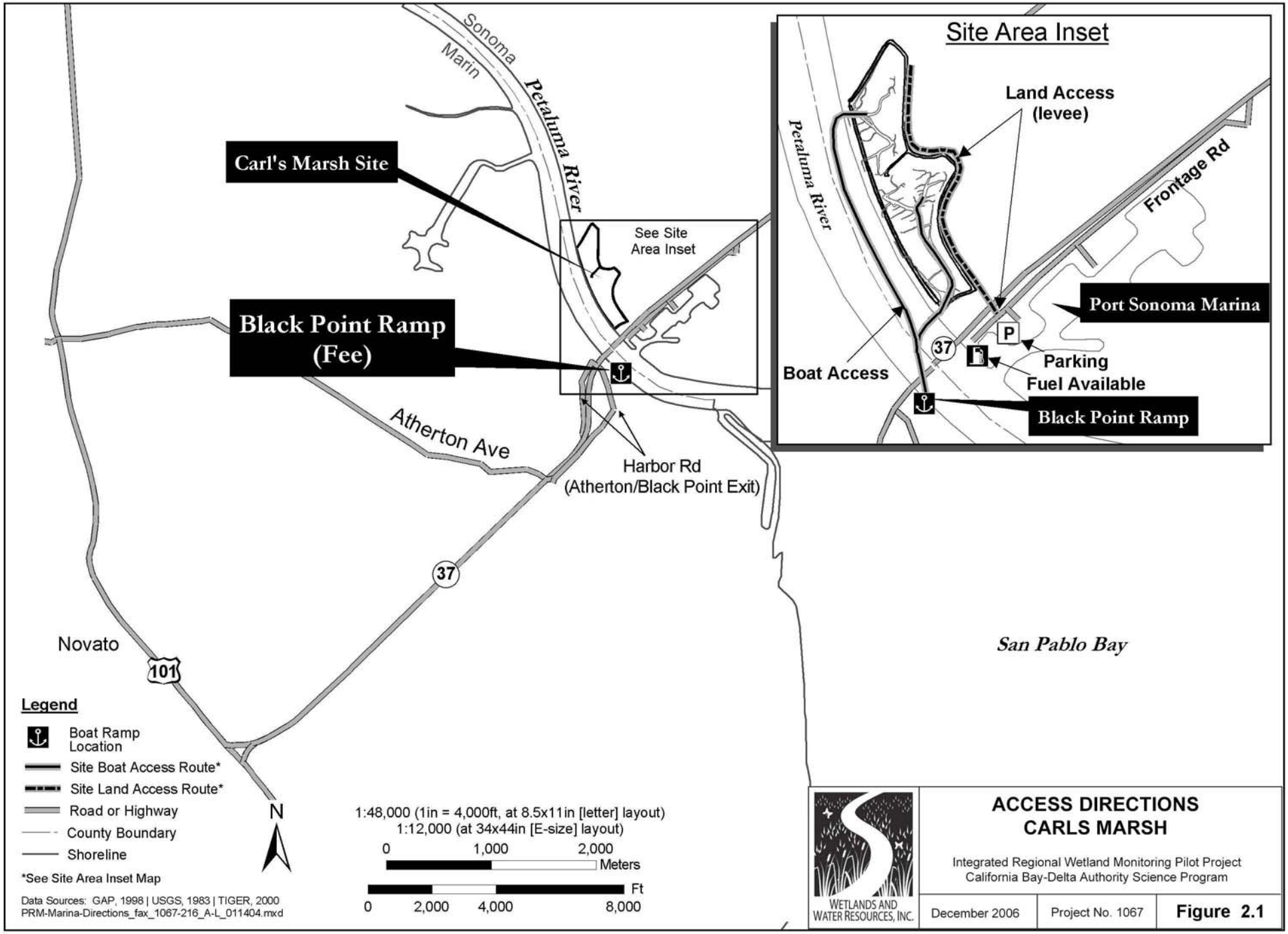
- Restored Marsh
- Natural Marsh
- County Boundary
- Monitoring Site Name

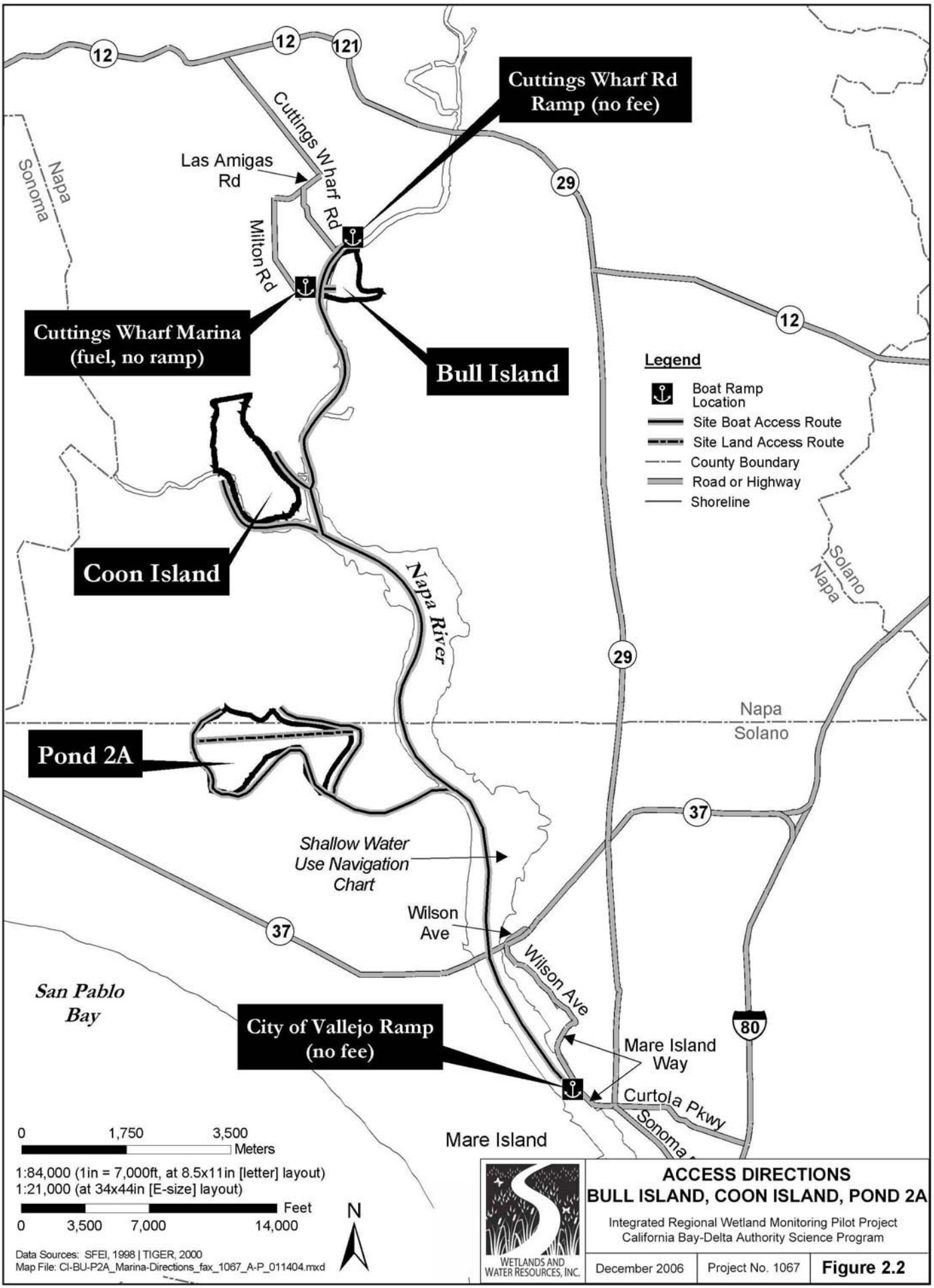
N
W E
S

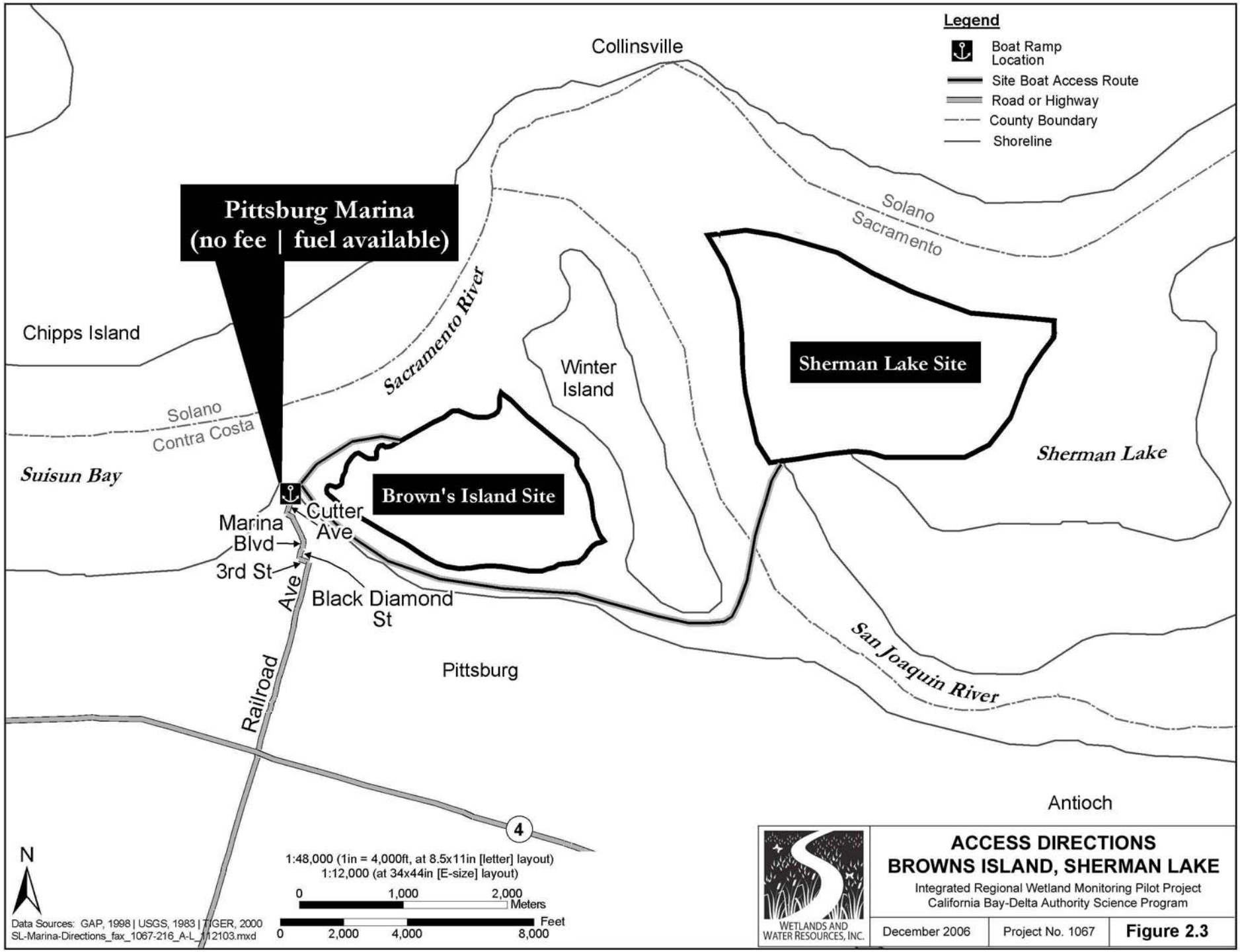
1:316,800
(1in = 5miles at tabloid layout)

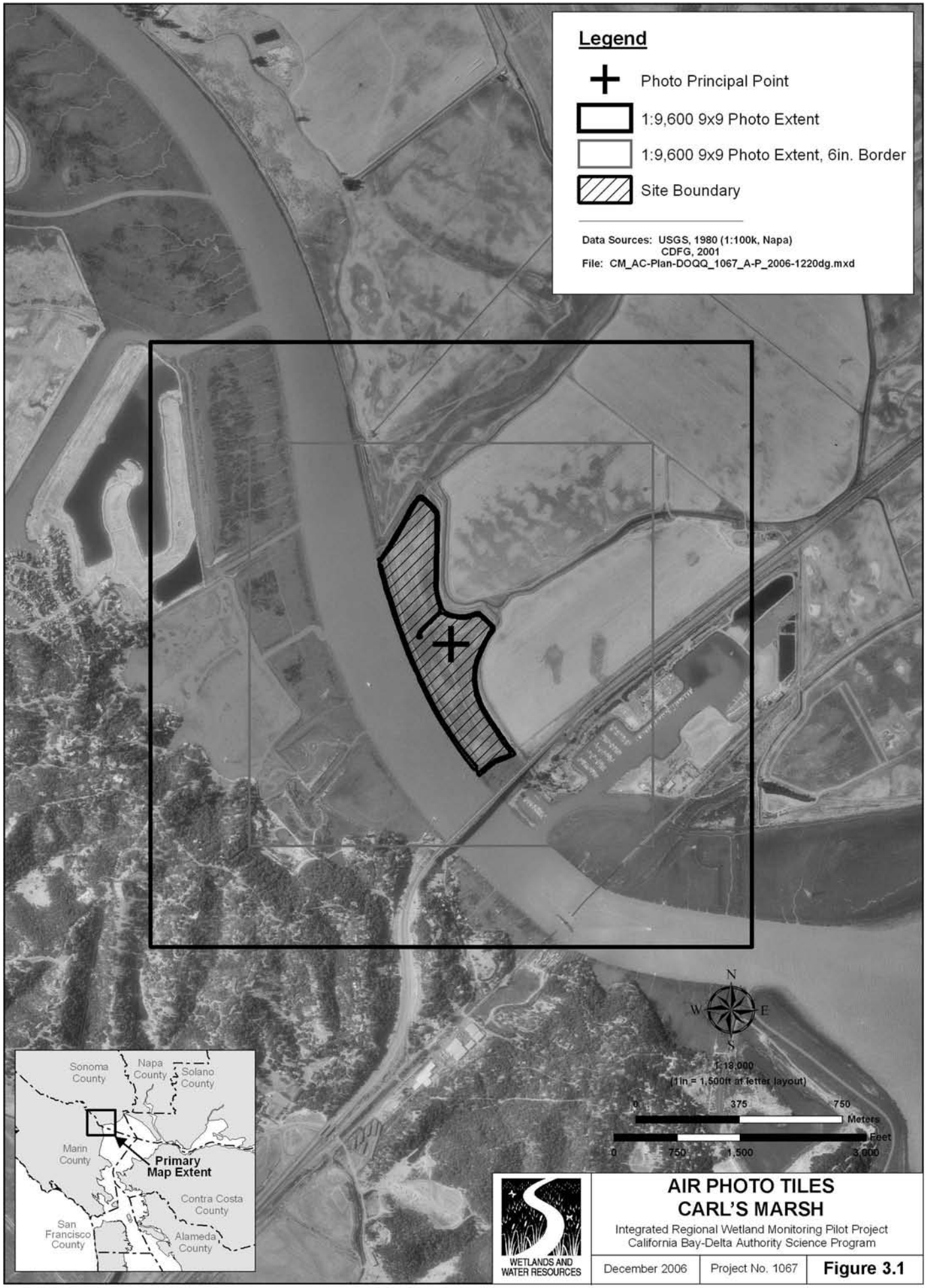
0 5 10 Kilometers

0 5 10 Miles


Site Area Inset
Land Access
(levee)
Petaluma River
Frontage Rd
Port Sonoma Marina
P
37
Parking
Fuel Available
Boat Access
Black Point Ramp
Sonoma
Marin
Petaluma River
Carl's Marsh Site
See Site
Area Inset
Black Point Ramp
(Fee)
Atherton Ave
Harbor Rd
(Atherton/Black Point Exit)
37
Novato
101
San Pablo Bay
Legend
Boat Ramp
Location
Site Boat Access Route*
Site Land Access Route*
Road or Highway
County Boundary
Shoreline
*See Site Area Inset Map
N
1:48,000 (1in = 4,000ft, at 8.5x11in [letter] layout)
1:12,000 (at 34x44in [E-size] layout)
0
1,000
2,000
Meters
Ft
0
2,000
4,000
8,000
Data Sources: GAP, 1998 | USGS, 1983 | TIGER, 2000
PRM-Marina-Directions_fax_1067-216_A-L_011404.mxd
WETLANDS AND
WATER RESOURCES, INC.
ACCESS DIRECTIONS
CARLS MARSH
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 2.1


Cuttings Wharf Rd Ramp (no fee)
Cuttings Wharf Marina (fuel, no ramp)
Bull Island
Coon Island
Pond 2A
City of Vallejo Ramp (no fee)
Las Amigas Rd
Cuttings Wharf Rd
Milton Rd
Napa
Sonoma
Napa River
Solano
Napa
Napa
Solano
Shallow Water Use Navigation Chart
Wilson Ave
Wilson Ave
Mare Island Way
Curtola Pkwy
Sonoma
Mare Island
San Pablo Bay
12
121
29
37
80
Legend
Boat Ramp Location
Site Boat Access Route
Site Land Access Route
County Boundary
Road or Highway
Shoreline
0 1,750 3,500 Meters
1:84,000 (1in = 7,000ft, at 8.5x11in [letter] layout)
1:21,000 (at 34x44in [E-size] layout)
0 3,500 7,000 14,000 Feet
N
Data Sources: SFEI, 1998 | TIGER, 2000
Map File: CI-BU-P2A_Marina-Directions_fax_1067_A-P_011404.mxd
WETLANDS AND WATER RESOURCES, INC.
ACCESS DIRECTIONS
BULL ISLAND, COON ISLAND, POND 2A
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 2.2


Legend
Boat Ramp Location
Site Boat Access Route
Road or Highway
County Boundary
Shoreline
Collinsville
Pittsburg Marina
(no fee | fuel available)
Chipps Island
Solano
Contra Costa
Suisun Bay
Sacramento River
Winter Island
Solano
Sacramento
Sherman Lake Site
Sherman Lake
Brown's Island Site
Marina Blvd
Cutter Ave
3rd St
Ave
Black Diamond St
Railroad
Pittsburg
San Joaquin River
Antioch
4
N
1:48,000 (1in = 4,000ft, at 8.5x11in [letter] layout)
1:12,000 (at 34x44in [E-size] layout)
0 1,000 2,000 Meters
0 2,000 4,000 8,000 Feet
Data Sources: GAP, 1998 | USGS, 1983 | TIGER, 2000
SL-Marina-Directions_fax_1067-216_A-L_112103.mxd
WETLANDS AND WATER RESOURCES, INC.
ACCESS DIRECTIONS
BROWNS ISLAND, SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 2.3



AIR PHOTO TILES
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 3.1**

AIR PHOTO CONTROL POINTS
CARL'S MARSH

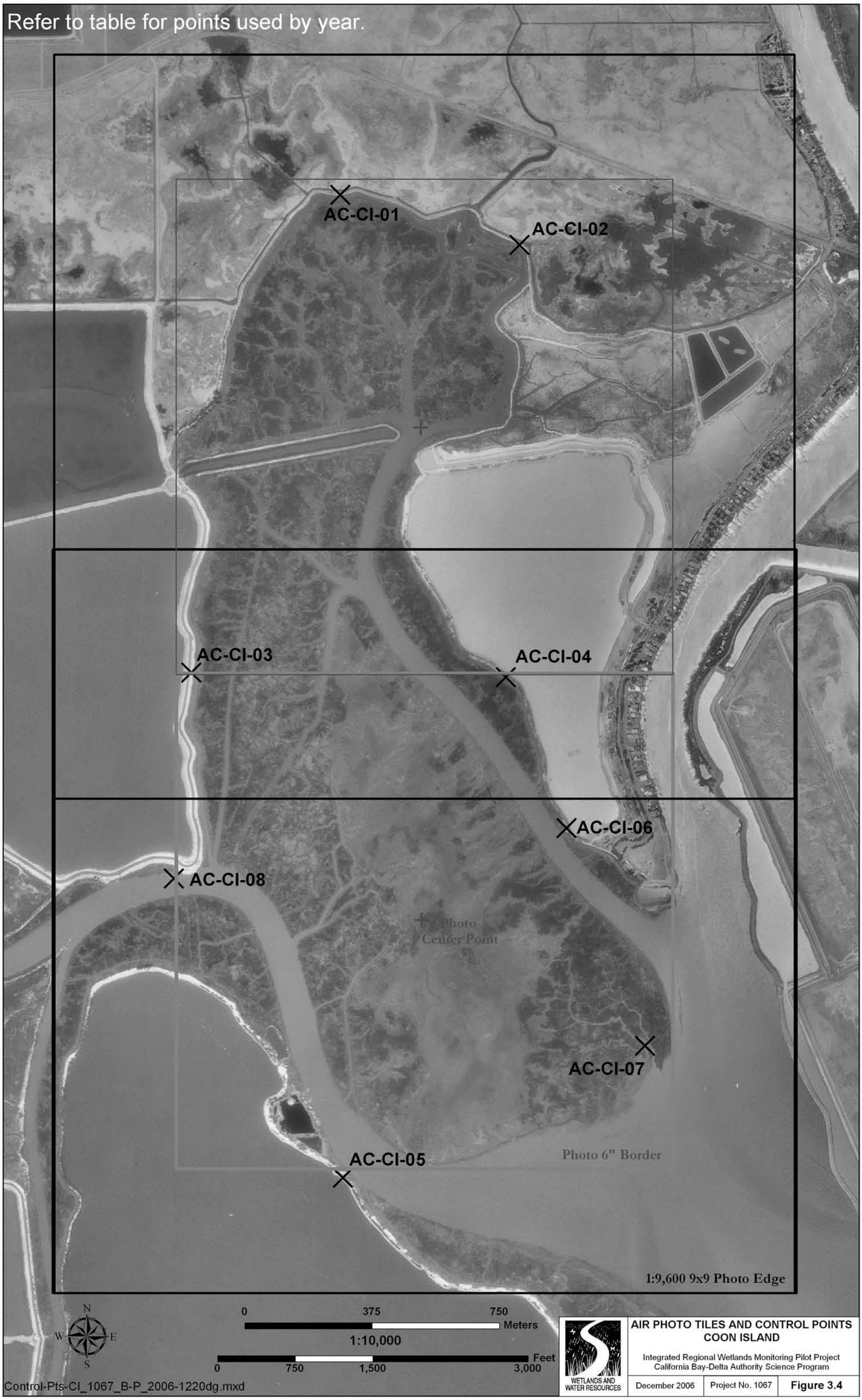
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 3.2**

AIR PHOTO TILES AND CONTROL POINTS POND 2A & POND 3

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

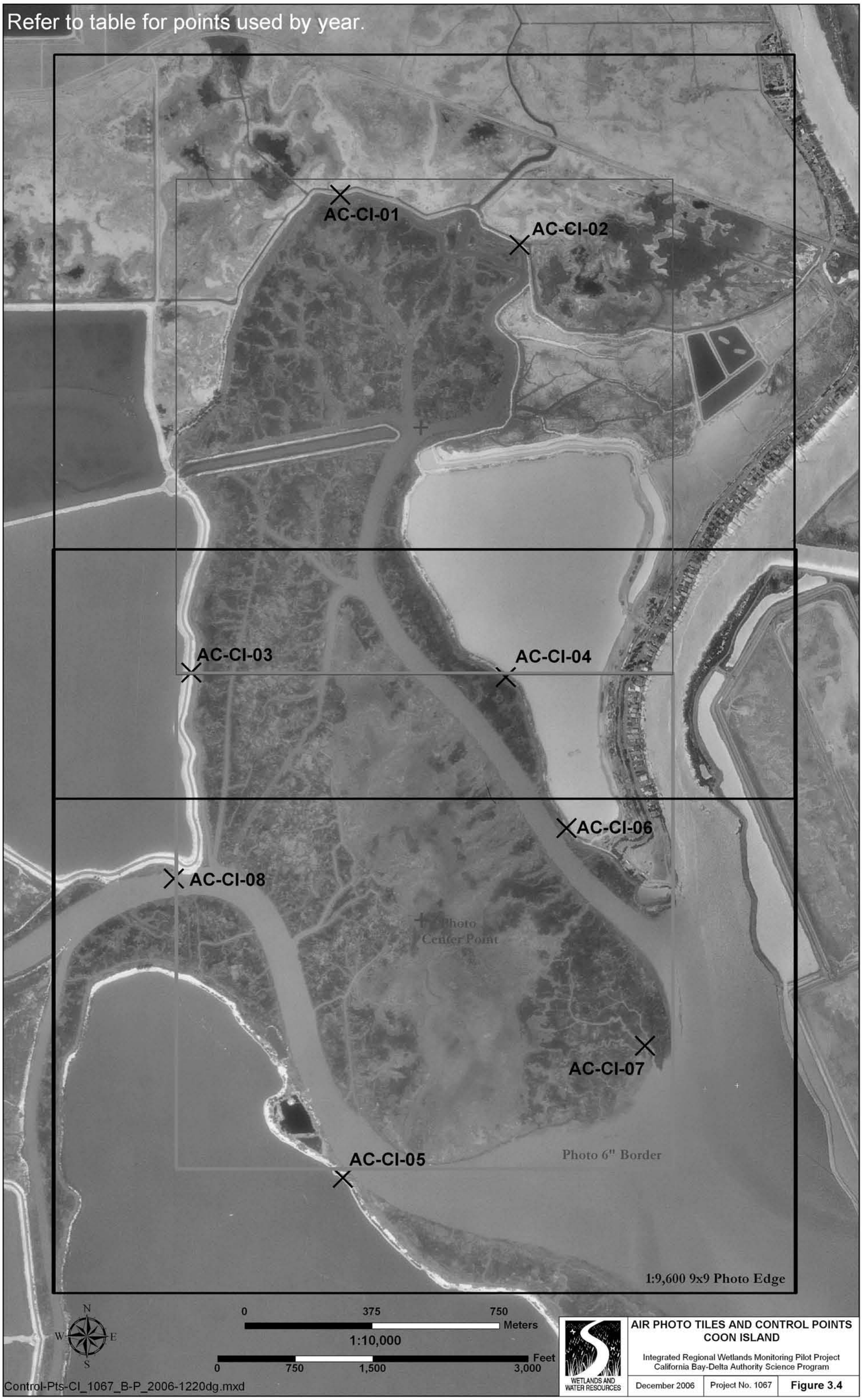
December 2006	Project No. 1067	**Figure 3.3**



AIR PHOTO TILES AND CONTROL POINTS
COON ISLAND

Integrated Regional Wetlands Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 3.4**



AIR PHOTO TILES AND CONTROL POINTS
COON ISLAND

Integrated Regional Wetlands Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 3.4**

AIR PHOTO TILES AND CONTROL POINTS
BULL ISLAND

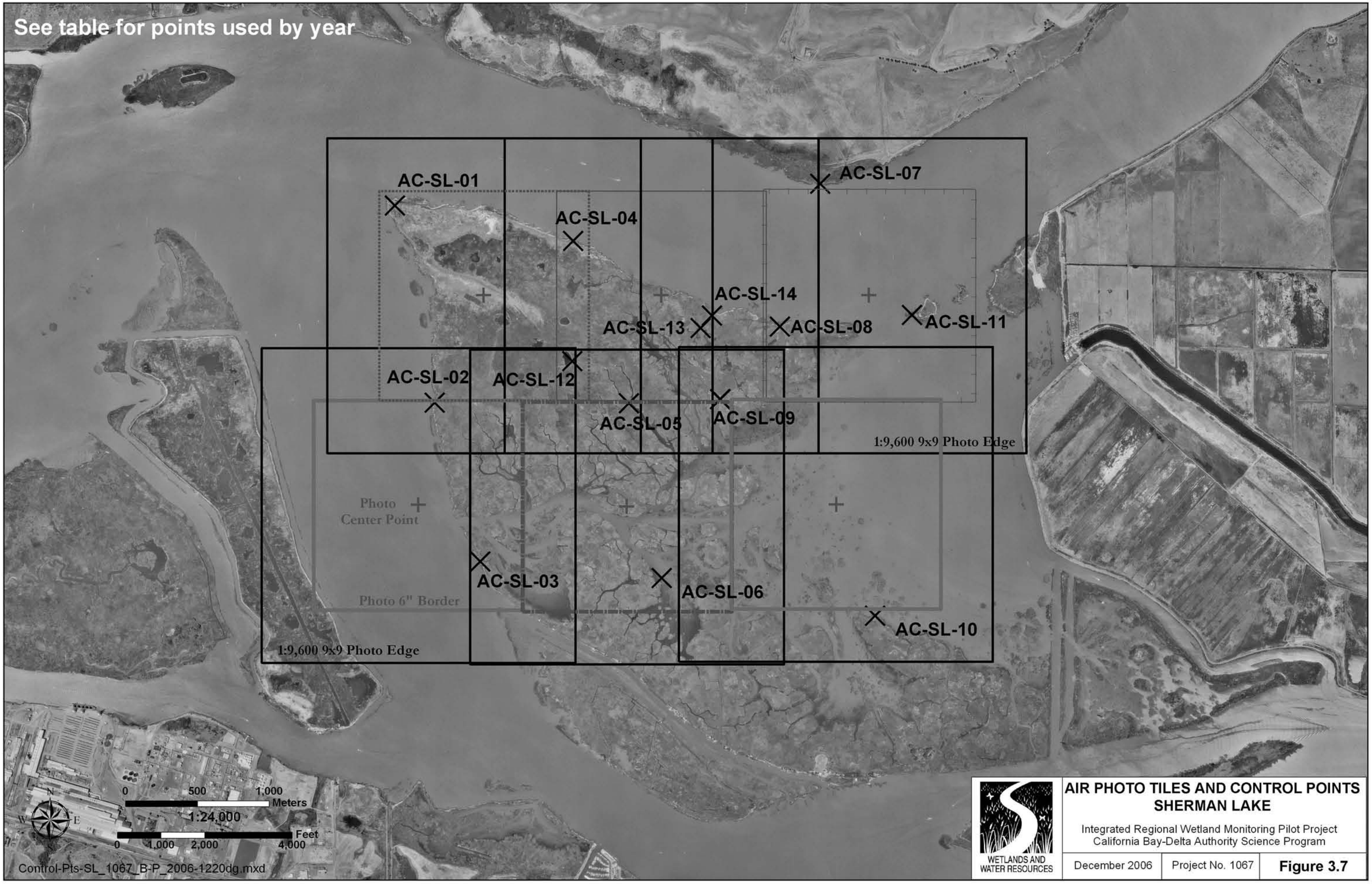
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	Figure 3.5

AIR PHOTO TILES AND CONTROL POINTS
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

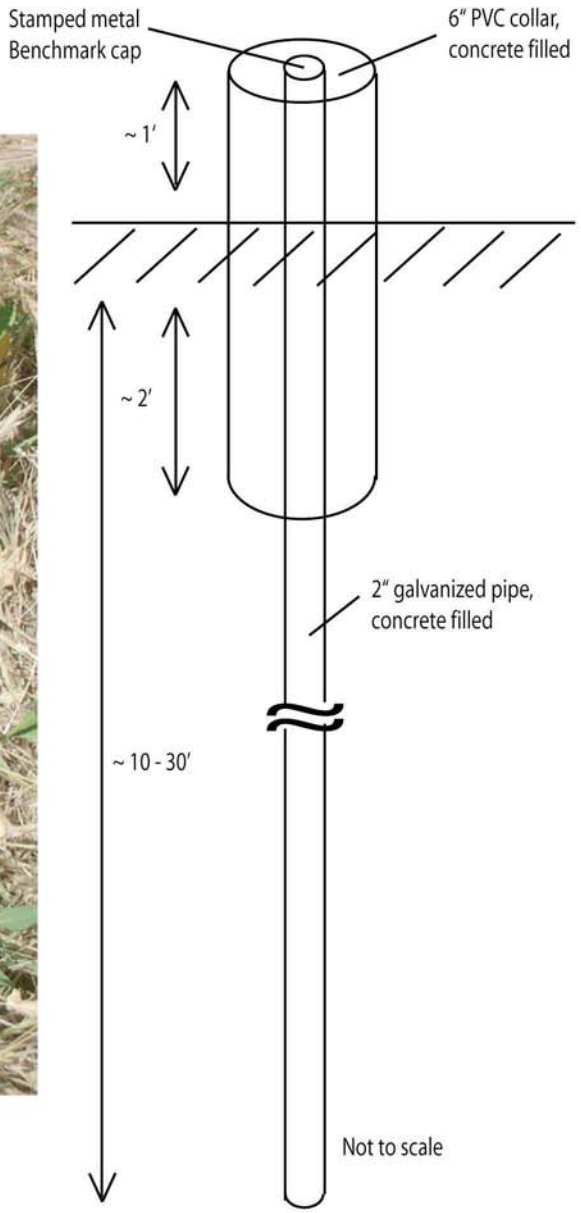
December 2006	Project No. 1067	**Figure 3.6**



AIR PHOTO TILES AND CONTROL POINTS
SHERMAN LAKE

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 3.7**



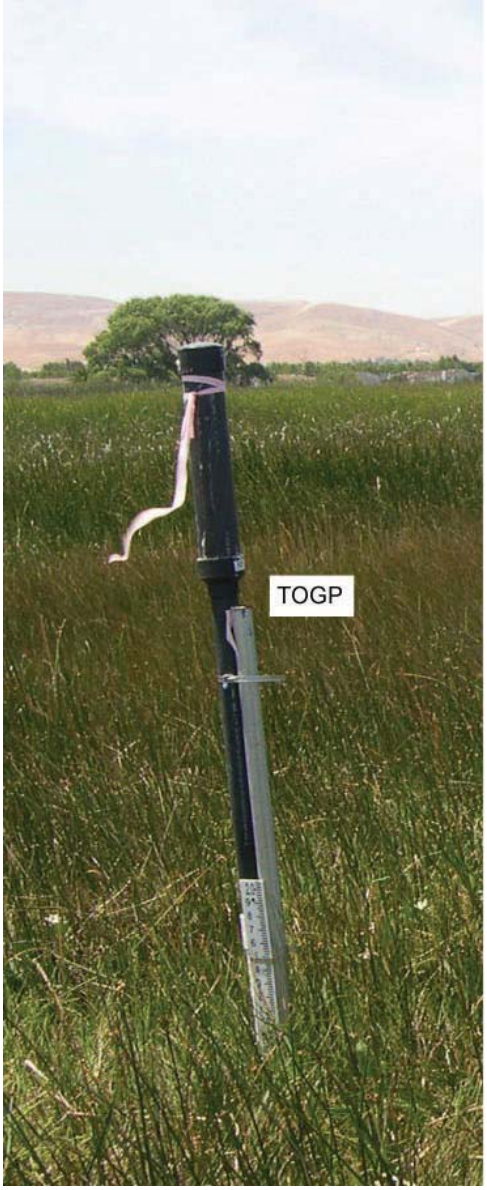
WETLANDS AND WATER RESOURCES

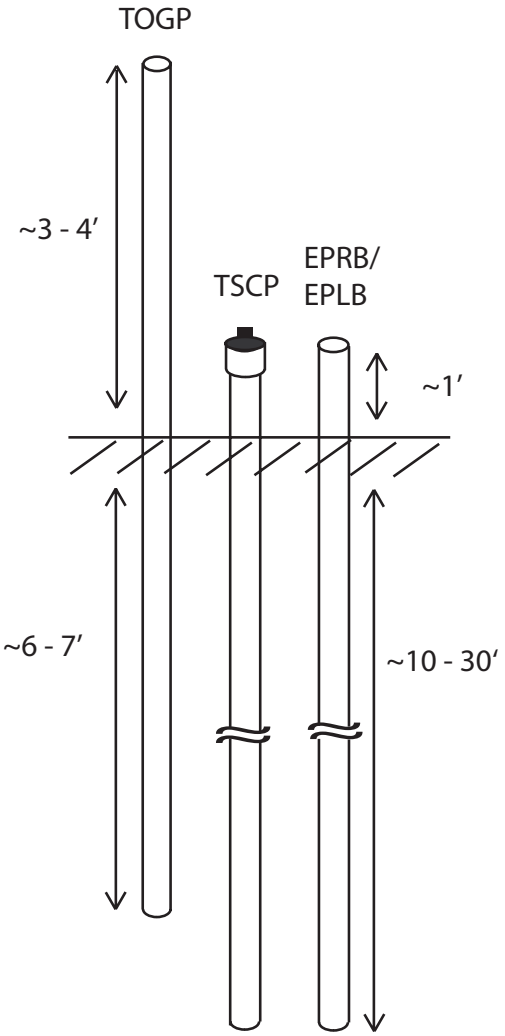
Primary Benchmark Construction Detail

Intergrated Regional Wetland Monitoring

California Bay-Delta Authority Science Program

June 2005	Project No. 1067	**Figure 4.1**





Not to scale

Secondary Benchmark Construction Detail

Intergrated Regional Wetland Monitoring
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

June 2005	Project No. 1067	**Figure 4.2**

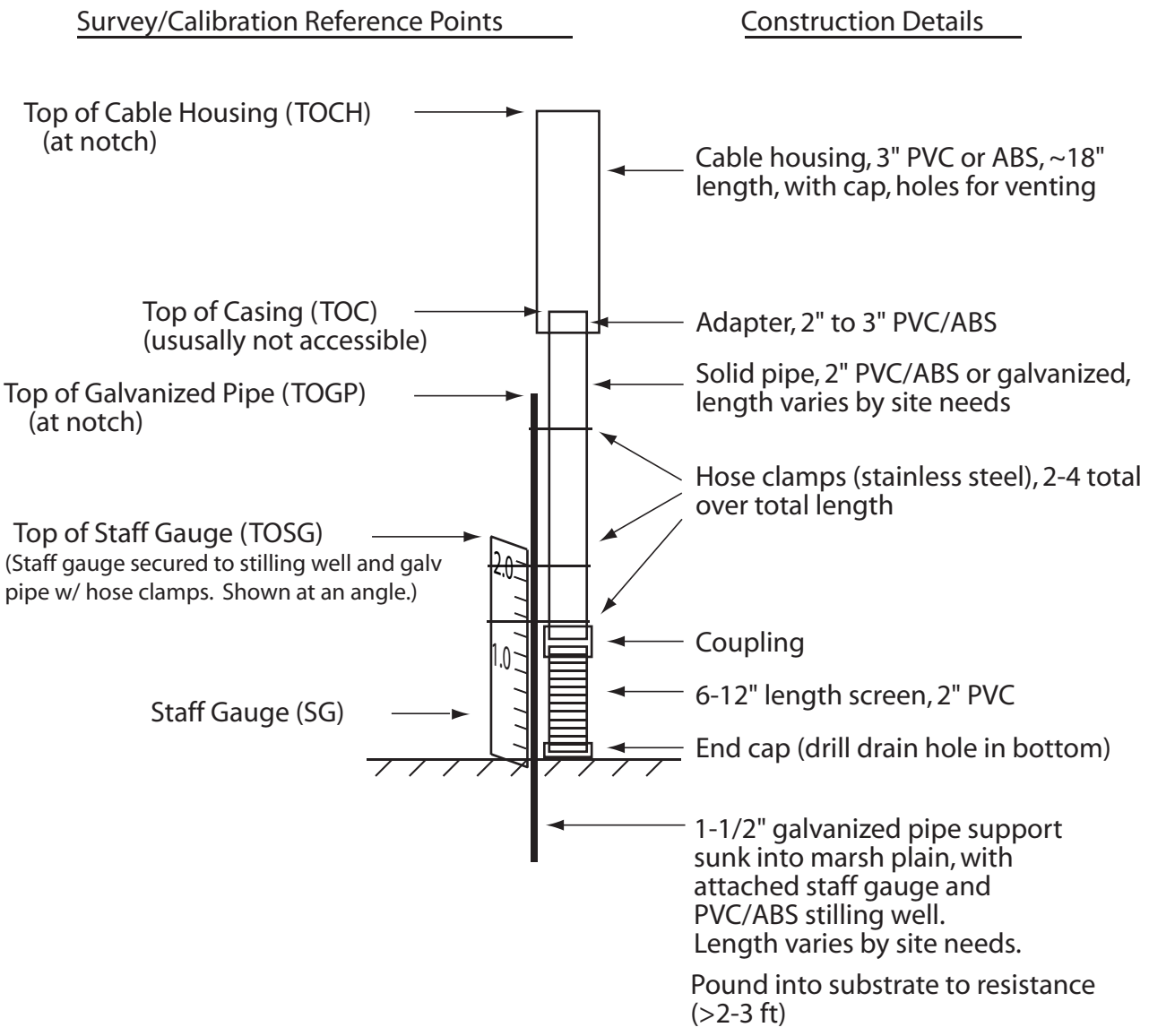
WETLANDS AND WATER RESOURCES, INC.

MARSH PLAIN WATER LEVEL STATION

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	Figure 5.1

MP water level photo_1067_2006-1221dg.pdf



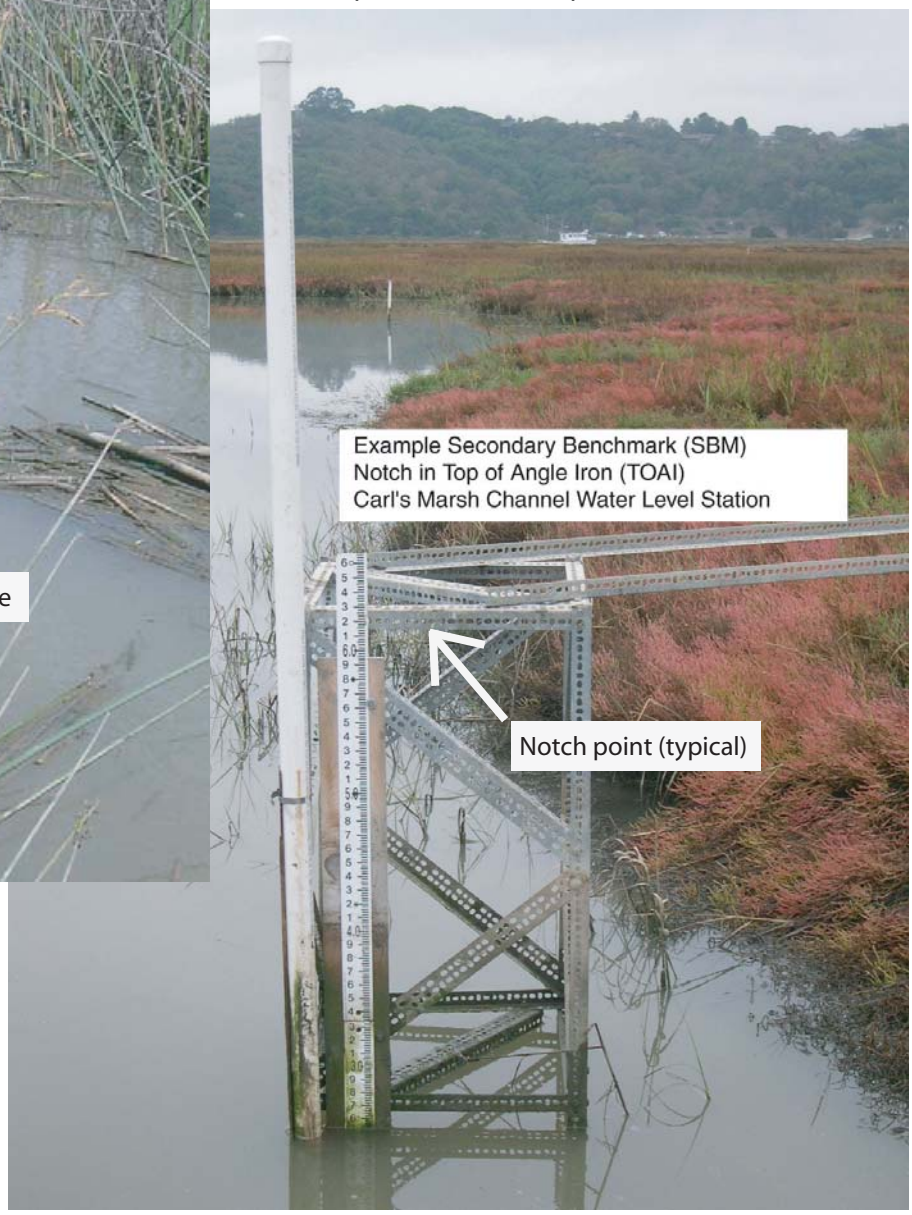
WETLANDS AND WATER RESOURCES, INC.

MARSH PLAIN WATER LEVEL STATION SCHEMATIC

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 5.2**

Marsh plain WL station_1067-2007-0104dg.pdf



WETLANDS AND WATER RESOURCES

Channel Water Level Stations

Intergrated Regional Wetland Monitoring
California Bay-Delta Authority Science Program

June 2005	Project No. 1067	**Figure 5.3**

Legend
Cross Section (Physical Processes Team, 03/11/04)
Multi-parameter Station (Physical Processes Team, 03/17/04)
Piezometer (Physical Processes Team, 04/21/04)
Water Level Station (Physical Processes Team, 0/23/04)
Site Boundary
Notes:
--Legend date represents most recent date from point survey(s)
--Map labels represent point ID information provided by team
XS-04-EPRB
XS-04-EPLB
PZ-02
WL-02
PZ-03
PZ-08
PZ-04
PZ-01
WL-01
XS-05-EPRB
XS-05-EPLB
WL-03
XS-02-EPLB
XS-02-EPRB
CTDS
XS-03-EPRB
XS-03-EPLB
N
W
E
S
1:3,000 (at tabloid layout)
0
50
100
Meters
Feet
0
250
500
Photo Date: 08/14/03
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 08/14/2003
Map File: CM_FS_1067-233_B-P_090704.mxd
WETLANDS AND WATER RESOURCES, INC.
FIELD SAMPLING LOCATIONS - PPT
CARL'S MARSH
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 6.1

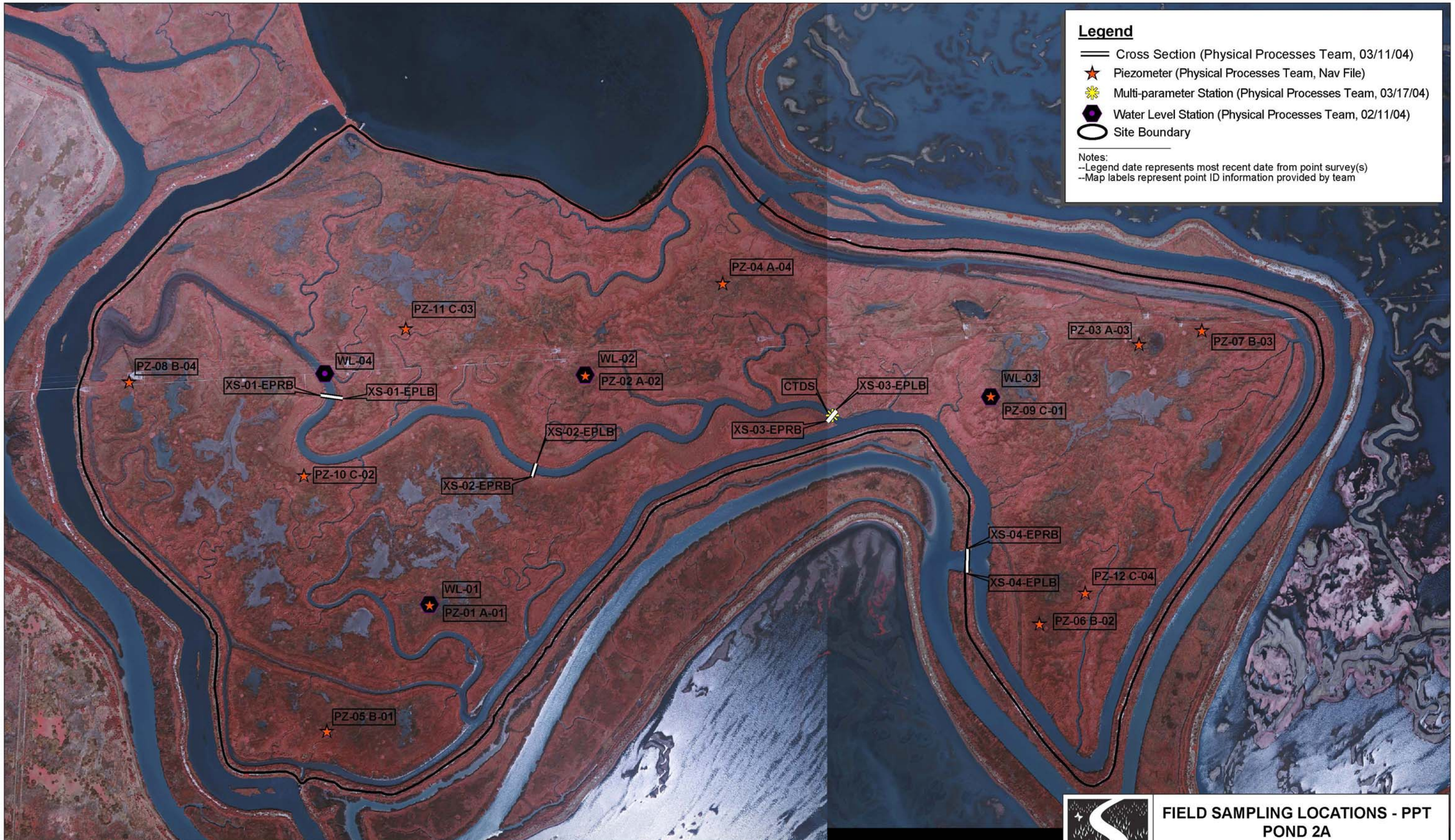


Photo Date: 09/29/03

Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 10/24/2003
Map File: P2A_FS_1067-233_B-L_111704.mxd

1:7,800 (at tabloid layout)

0 162.5 325 Meters
0 325 650 1,300 Feet

N W E S

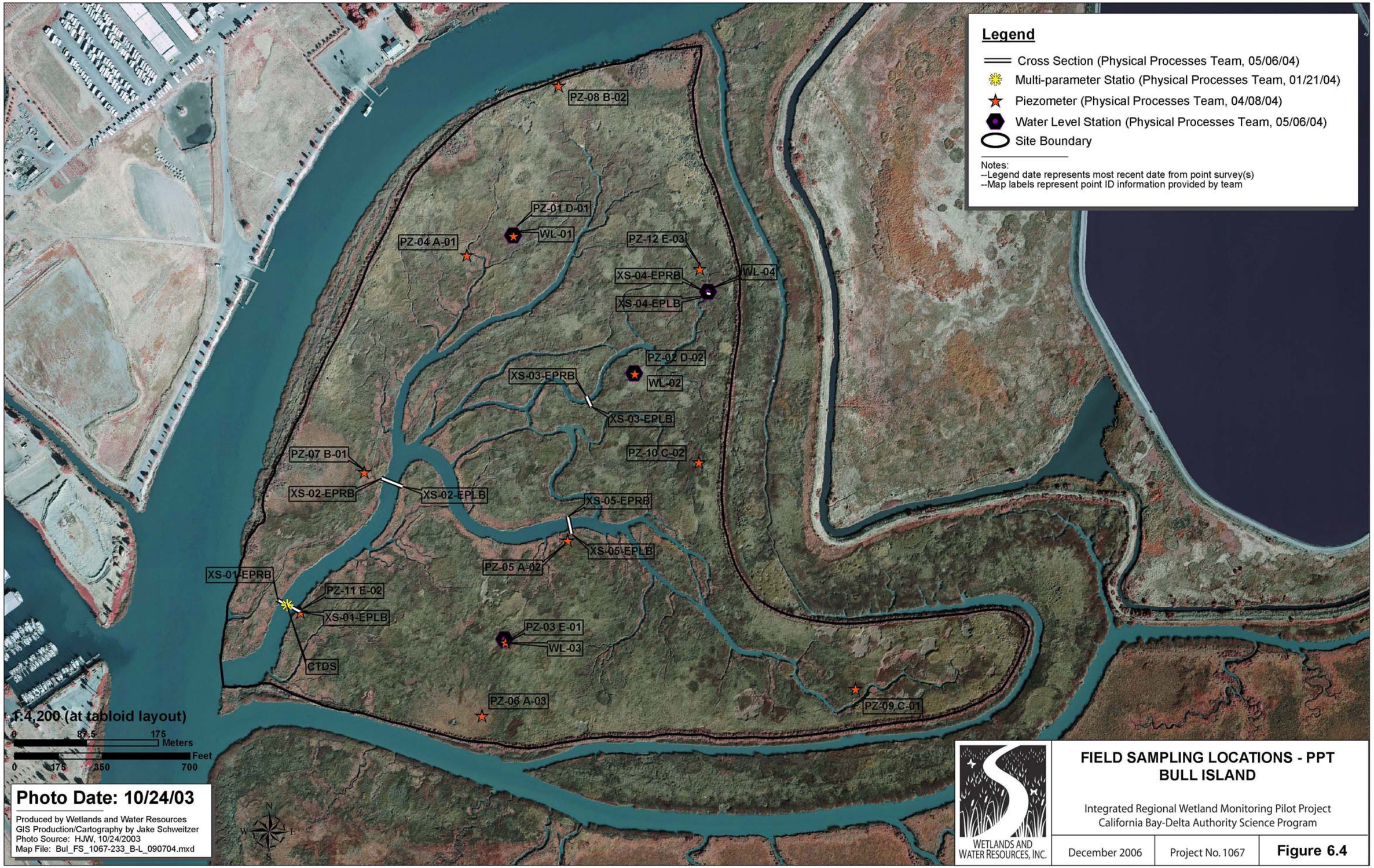
WETLANDS AND WATER RESOURCES, INC.

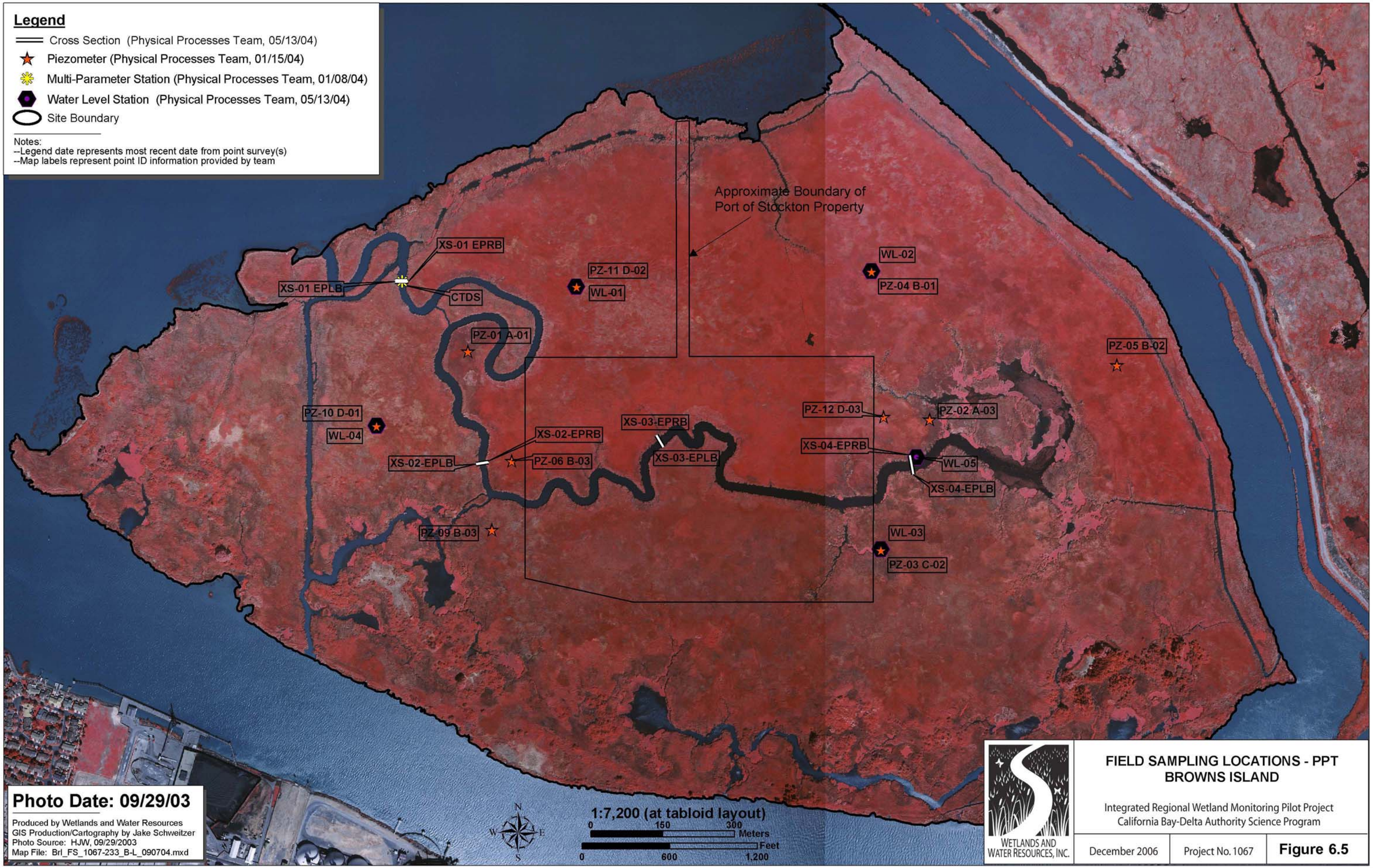
FIELD SAMPLING LOCATIONS - PPT POND 2A

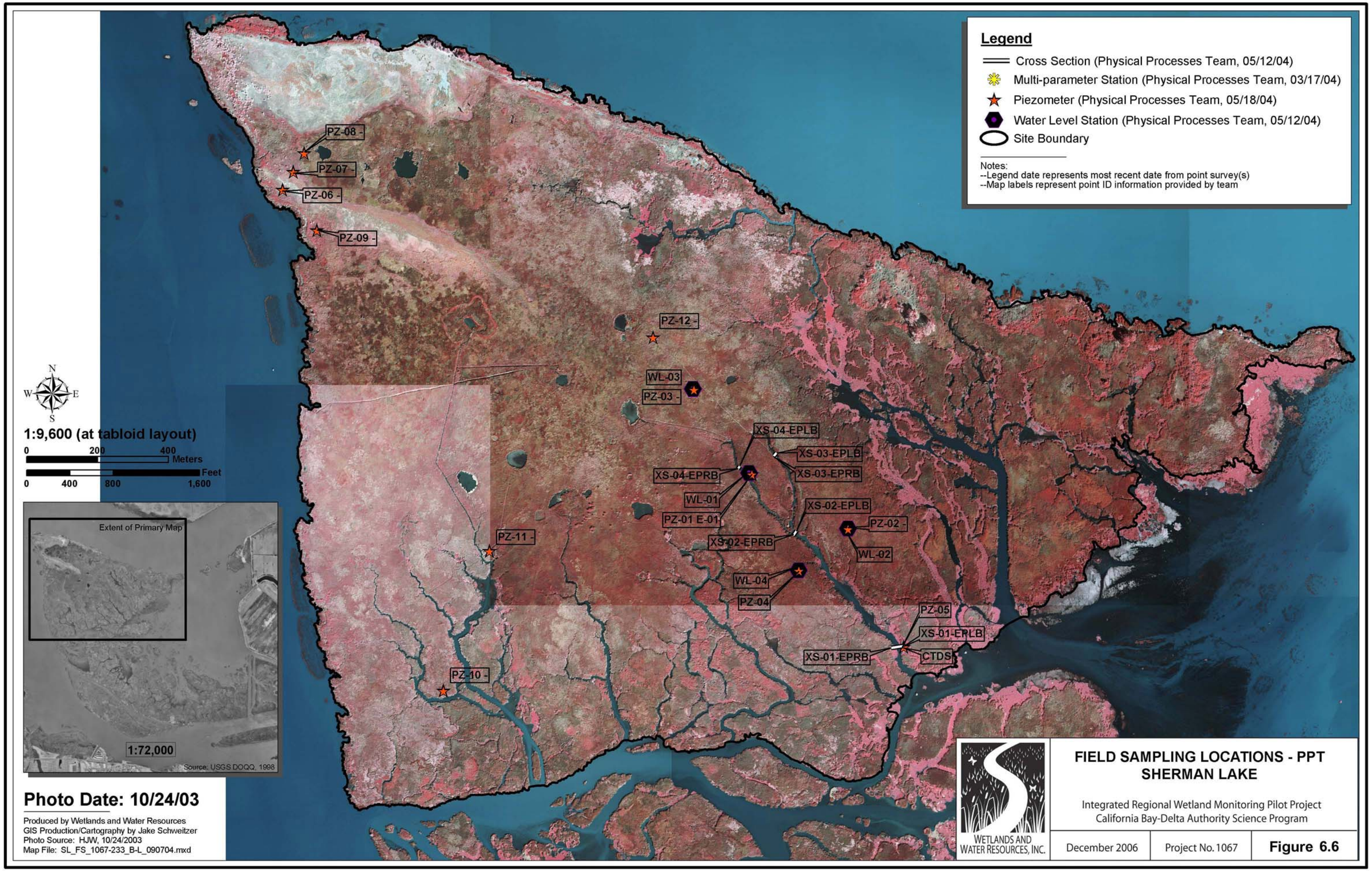
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 6.2**

Legend
Cross Section (Physical Processes Team, 05/13/04)
Piezometer (Physical Processes Team, 04/07/04)
Multi-parameter Station (Physical Processes Team, 03/17/04)
Water Level Station (Physical Processes Team, 05/06/04)
Site Boundary
Notes:
--Legend date represents most recent date from point survey(s)
--Map labels represent point ID information provided by team
WL-03
PZ-03
PZ-10 A-03
XS-07-EPLB
PZ-05 D-02
XS-07-EPRB
XS-02-EPLB
XS-02-EPRB
XS-05-EPRB
XS-05-EPLB
XS-06-EPLB
XS-06-EPRB
WL-04
PZ-06 D-03
PZ-09 A-02
WL-01
XS-04-EPRB
XS-04-EPLB
XS-03-EPRB
CTDS
XS-03-EPLB
PZ-11 B-02
PZ-02 A-01
WL-02
PZ-08 C-02
PZ-07 C-01
PZ-12 C-03
N
W
E
S
1:7,800 (at tabloid layout)
0
162.5
325
Meters
Feet
0
325
650
1,300
Photo Date: 09/29/03
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 09/29/2003
Map File: CI_FS_1067-233_B-P_090704.mxd
WETLANDS AND WATER RESOURCES, INC.
FIELD SAMPLING LOCATIONS - PPT
COON ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 6.3


Legend
Cross Section (Physical Processes Team, 05/06/04)
Multi-parameter Statio (Physical Processes Team, 01/21/04)
Piezometer (Physical Processes Team, 04/08/04)
Water Level Station (Physical Processes Team, 05/06/04)
Site Boundary
Notes:
--Legend date represents most recent date from point survey(s)
--Map labels represent point ID information provided by team
PZ-08 B-02
PZ-01 D-01
WL-01
PZ-04 A-01
PZ-12 E-03
XS-04-EPRB
WL-04
XS-04-EPLB
PZ-02 D-02
XS-03-EPRB
WL-02
XS-03-EPLB
PZ-10 C-02
PZ-07 B-01
XS-02-EPRB
XS-02-EPLB
XS-05-EPRB
XS-05-EPLB
PZ-05 A-02
XS-01-EPRB
PZ-11 E-02
XS-01-EPLB
PZ-03 E-01
WL-03
CTDS
PZ-06 A-03
PZ-09 C-01
F:4,200 (at tabloid layout)
0 87.5 175 Meters
0 175 350 700 Feet
Photo Date: 10/24/03
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 10/24/2003
Map File: Bul_FS_1067-233_B-L_090704.mxd
N
W
E
S
WETLANDS AND WATER RESOURCES, INC.
FIELD SAMPLING LOCATIONS - PPT
BULL ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 6.4


Legend
Cross Section (Physical Processes Team, 05/13/04)
Piezometer (Physical Processes Team, 01/15/04)
Multi-Parameter Station (Physical Processes Team, 01/08/04)
Water Level Station (Physical Processes Team, 05/13/04)
Site Boundary
Notes:
--Legend date represents most recent date from point survey(s)
--Map labels represent point ID information provided by team
Approximate Boundary of Port of Stockton Property
XS-01 EPRB
XS-01 EPLB
CTDS
PZ-11 D-02
WL-01
WL-02
PZ-04 B-01
PZ-01 A-01
PZ-05 B-02
PZ-10 D-01
WL-04
XS-02-EPRB
XS-02-EPLB
PZ-06 B-03
XS-03-EPRB
XS-03-EPLB
PZ-12 D-03
PZ-02 A-03
XS-04-EPRB
WL-05
XS-04-EPLB
PZ-09 B-03
WL-03
PZ-03 C-02
Photo Date: 09/29/03
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 09/29/2003
Map File: Brl_FS_1067-233_B-L_090704.mxd
N
W
E
S
1:7,200 (at tabloid layout)
0 150 300 Meters
0 600 1,200 Feet
WETLANDS AND WATER RESOURCES, INC.
FIELD SAMPLING LOCATIONS - PPT
BROWNS ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 6.5


Legend
Cross Section (Physical Processes Team, 05/12/04)
Multi-parameter Station (Physical Processes Team, 03/17/04)
Piezometer (Physical Processes Team, 05/18/04)
Water Level Station (Physical Processes Team, 05/12/04)
Site Boundary
Notes:
--Legend date represents most recent date from point survey(s)
--Map labels represent point ID information provided by team
PZ-08
PZ-07
PZ-06
PZ-09
PZ-12
WL-03
PZ-03
XS-04-EPLB
XS-03-EPLB
XS-04-EPRB
XS-03-EPRB
WL-01
PZ-01 E-01
XS-02-EPLB
PZ-02
XS-02-EPRB
WL-02
PZ-11
WL-04
PZ-04
PZ-05
XS-01-EPLB
XS-01-EPRB
CTDS
PZ-10
N
W
E
S
1:9,600 (at tabloid layout)
0
200
400
Meters
Feet
0
400
800
1,600
Extent of Primary Map
1:72,000
Source: USGS DOQQ, 1998
Photo Date: 10/24/03
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Photo Source: HJW, 10/24/2003
Map File: SL_FS_1067-233_B-L_090704.mxd
WETLANDS AND WATER RESOURCES, INC.
FIELD SAMPLING LOCATIONS - PPT
SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 6.6

CTDS Mooring - typical

CTDS Mooring - Coastal Leasing
(partial deployments at
Bull Island, Sherman Lake)

Brown's Island channel water level mooring

WETLANDS AND WATER RESOURCES, INC.

CTDS AND CHANNEL MOORINGS

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	Figure 7

CTDS Telemetry Station

Inside logger box

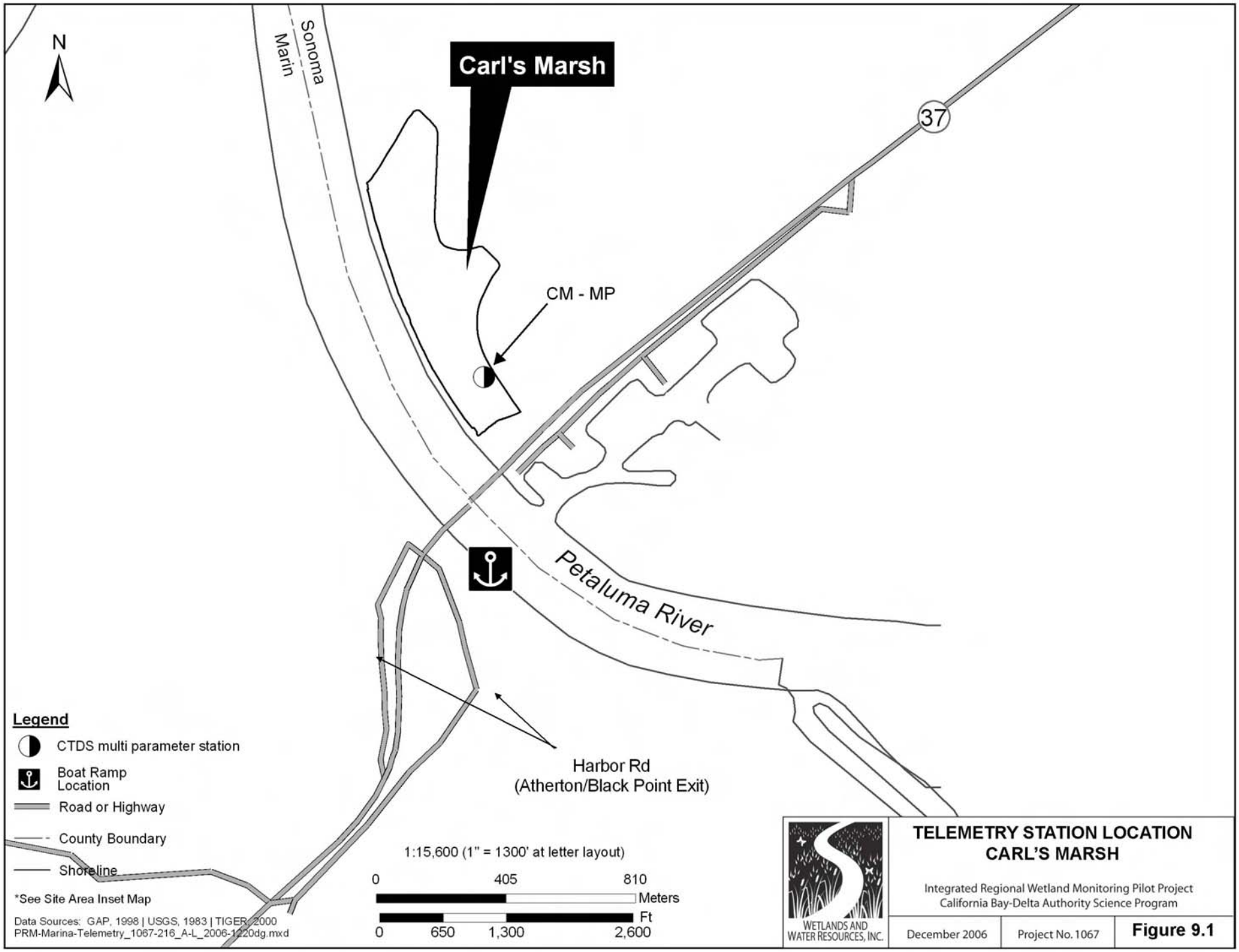
TELEMETRY STATION

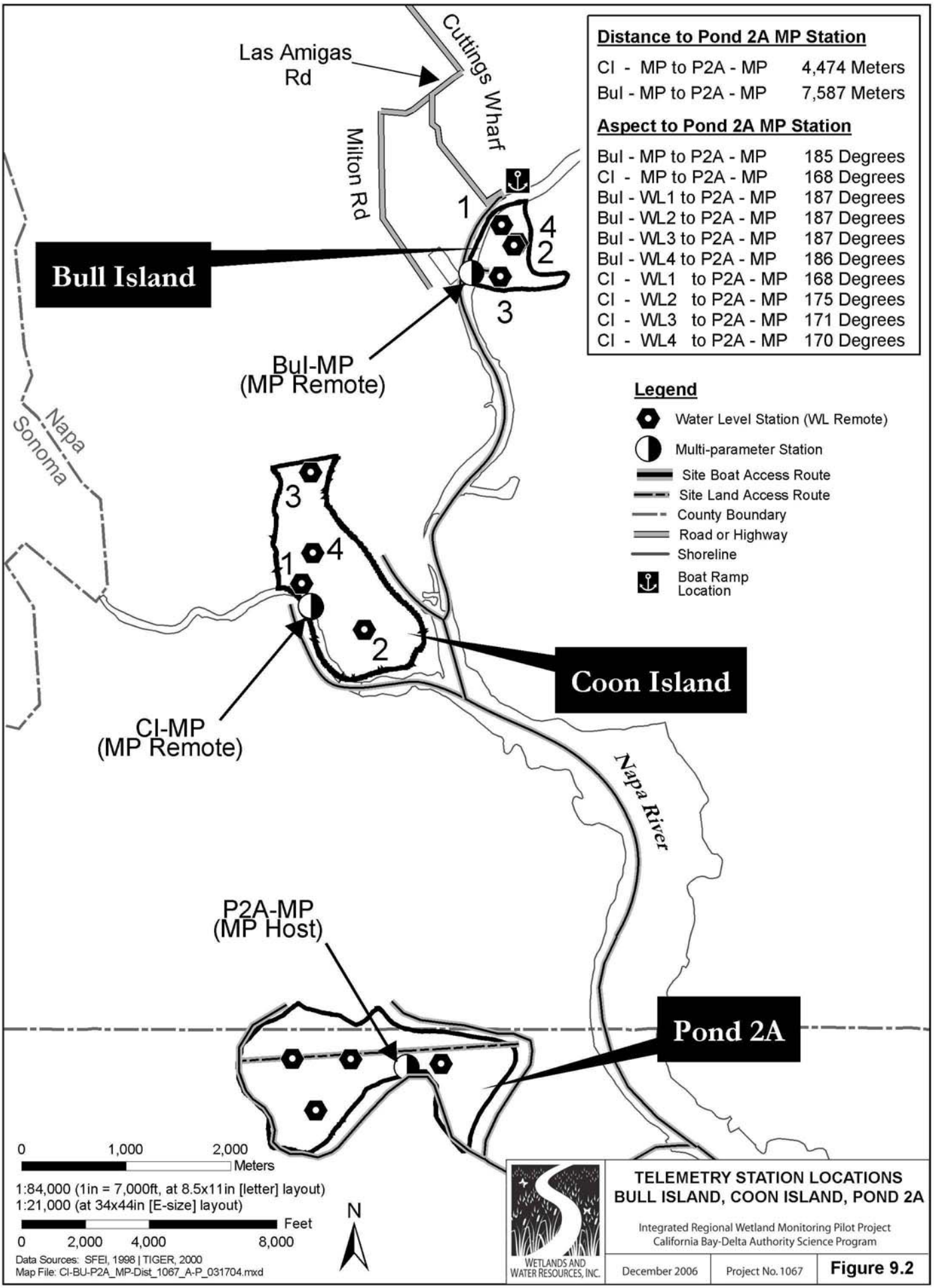
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

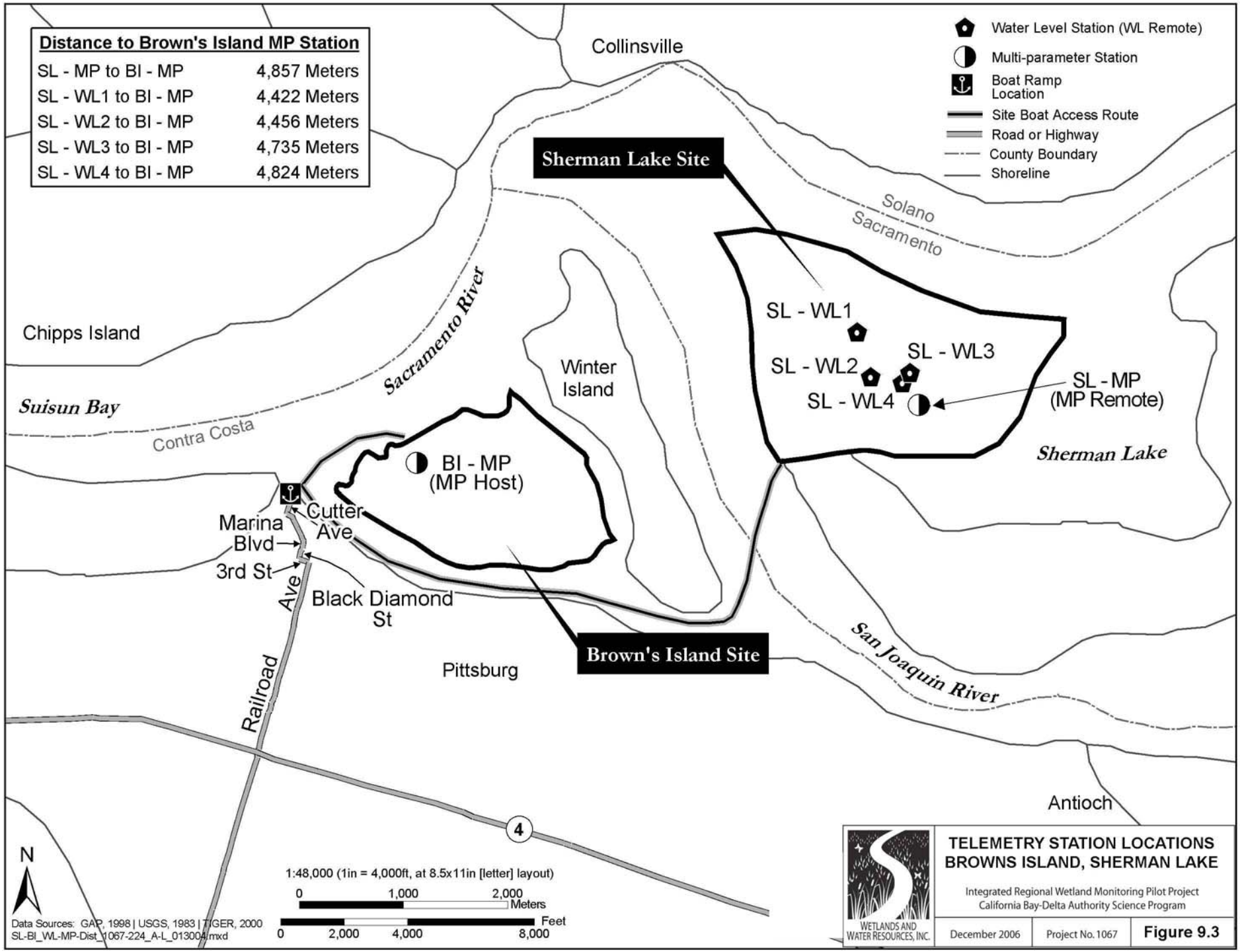
WETLANDS AND WATER RESOURCES, INC.

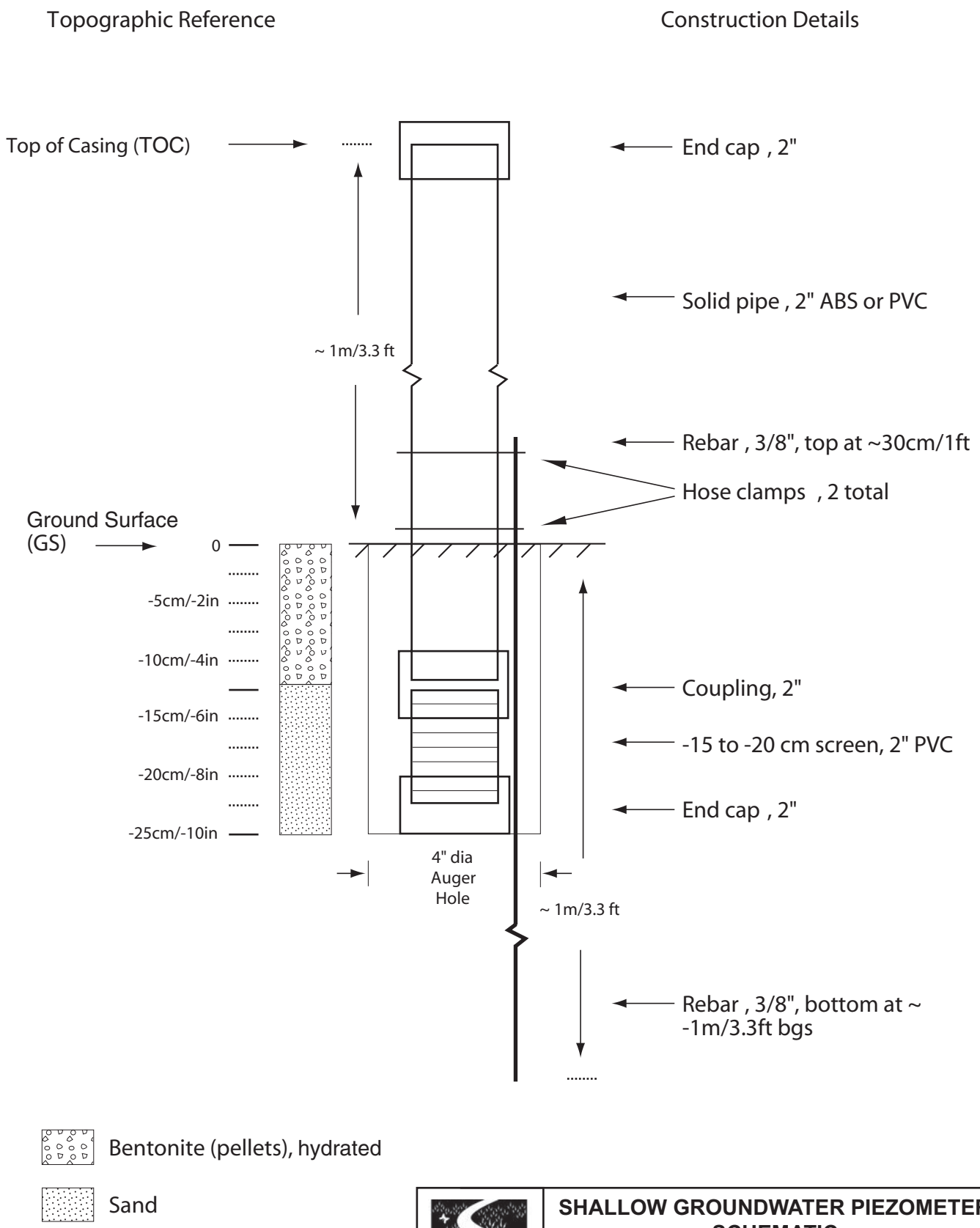
December 2006	Project No. 1067	Figure 8

Telemetry station_1067_2006-1230trc.pdf


N
Sonoma
Marin
Carl's Marsh
37
CM - MP
Petaluma River
Harbor Rd
(Atherton/Black Point Exit)
Legend
CTDS multi parameter station
Boat Ramp Location
Road or Highway
County Boundary
Shoreline
*See Site Area Inset Map
Data Sources: GAP, 1998 | USGS, 1983 | TIGER, 2000
PRM-Marina-Telemetry_1067-216_A-L_2006-1220dg.mxd
1:15,600 (1" = 1300' at letter layout)
0 405 810
Meters
Ft
0 650 1,300 2,600
WETLANDS AND WATER RESOURCES, INC.
TELEMETRY STATION LOCATION
CARL'S MARSH
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 9.1


Las Amigas Rd
Cuttings Wharf
Milton Rd
Bull Island
1
2
3
4
Bul-MP
(MP Remote)
Napa
Sonoma
Coon Island
CI-MP
(MP Remote)
Napa River
P2A-MP
(MP Host)
Pond 2A
Distance to Pond 2A MP Station
CI - MP to P2A - MP 4,474 Meters
Bul - MP to P2A - MP 7,587 Meters
Aspect to Pond 2A MP Station
Bul - MP to P2A - MP 185 Degrees
CI - MP to P2A - MP 168 Degrees
Bul - WL1 to P2A - MP 187 Degrees
Bul - WL2 to P2A - MP 187 Degrees
Bul - WL3 to P2A - MP 187 Degrees
Bul - WL4 to P2A - MP 186 Degrees
CI - WL1 to P2A - MP 168 Degrees
CI - WL2 to P2A - MP 175 Degrees
CI - WL3 to P2A - MP 171 Degrees
CI - WL4 to P2A - MP 170 Degrees
Legend
Water Level Station (WL Remote)
Multi-parameter Station
Site Boat Access Route
Site Land Access Route
County Boundary
Road or Highway
Shoreline
Boat Ramp Location
0 1,000 2,000
Meters
1:84,000 (1in = 7,000ft, at 8.5x11in [letter] layout)
1:21,000 (at 34x44in [E-size] layout)
Feet
0 2,000 4,000 8,000
N
Data Sources: SFEI, 1998 | TIGER, 2000
Map File: CI-BU-P2A_MP-Dist_1067_A-P_031704.mxd
WETLANDS AND WATER RESOURCES, INC.
TELEMETRY STATION LOCATIONS
BULL ISLAND, COON ISLAND, POND 2A
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 9.2


Distance to Brown's Island MP Station
SL - MP to BI - MP 4,857 Meters
SL - WL1 to BI - MP 4,422 Meters
SL - WL2 to BI - MP 4,456 Meters
SL - WL3 to BI - MP 4,735 Meters
SL - WL4 to BI - MP 4,824 Meters
Water Level Station (WL Remote)
Multi-parameter Station
Boat Ramp Location
Site Boat Access Route
Road or Highway
County Boundary
Shoreline
Collinsville
Sherman Lake Site
Solano
Sacramento
Chipps Island
Sacramento River
Suisun Bay
Contra Costa
Winter Island
SL - WL1
SL - WL2
SL - WL3
SL - WL4
SL - MP (MP Remote)
Sherman Lake
BI - MP (MP Host)
Marina Blvd
Cutter Ave
3rd St
Ave
Black Diamond St
Railroad
Brown's Island Site
Pittsburg
San Joaquin River
Antioch
4
N
1:48,000 (1in = 4,000ft, at 8.5x11in [letter] layout)
0 1,000 2,000 Meters
0 2,000 4,000 8,000 Feet
Data Sources: GAP, 1998 | USGS, 1983 | TIGER, 2000
SL-BI_WL-MP-Dist_1067-224_A-L_013004.mxd
WETLANDS AND WATER RESOURCES, INC.
TELEMETRY STATION LOCATIONS
BROWNS ISLAND, SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 9.3

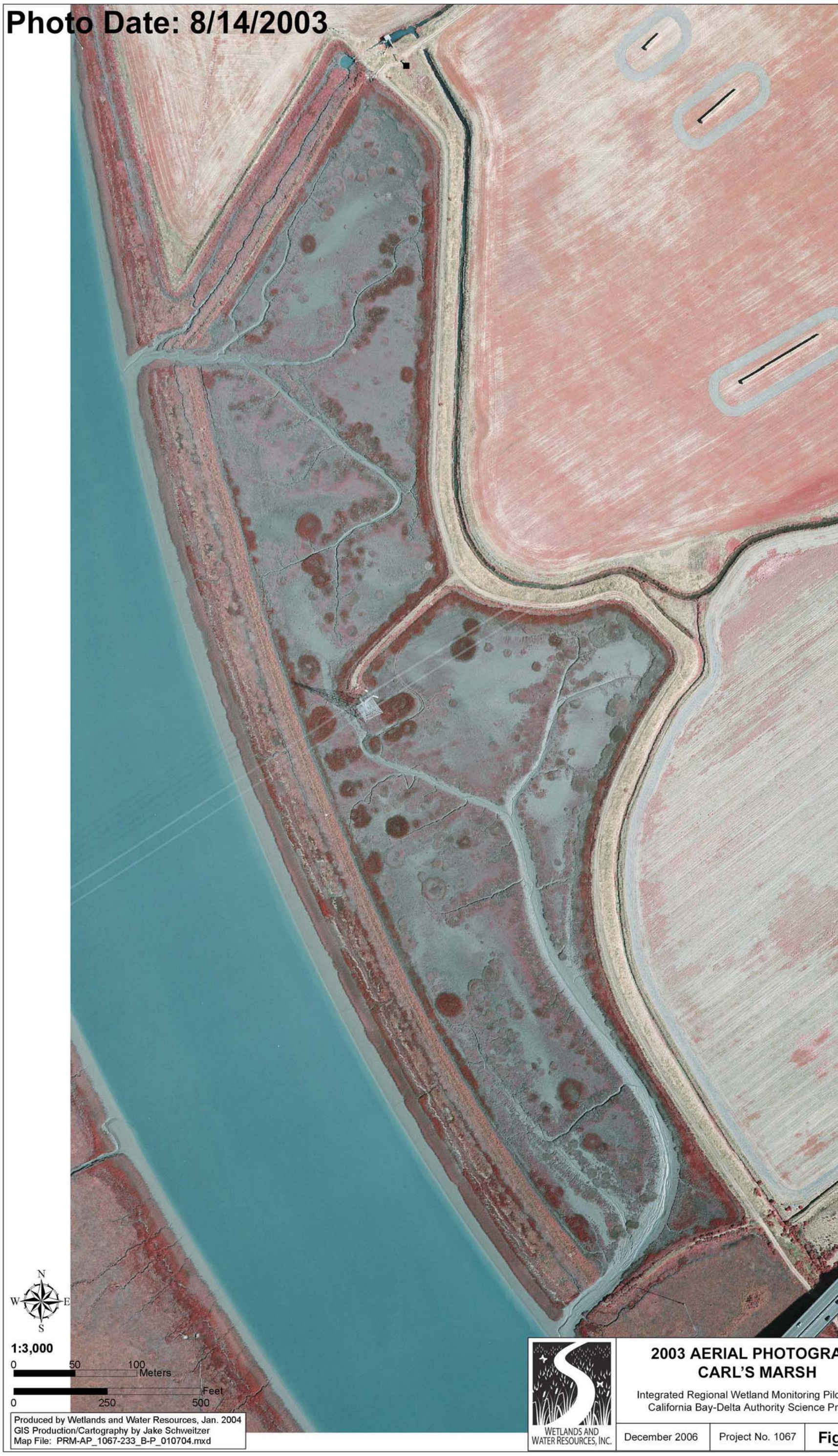


WETLANDS AND WATER RESOURCES

SHALLOW GROUNDWATER PIEZOMETER SCHEMATIC

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	Figure 10

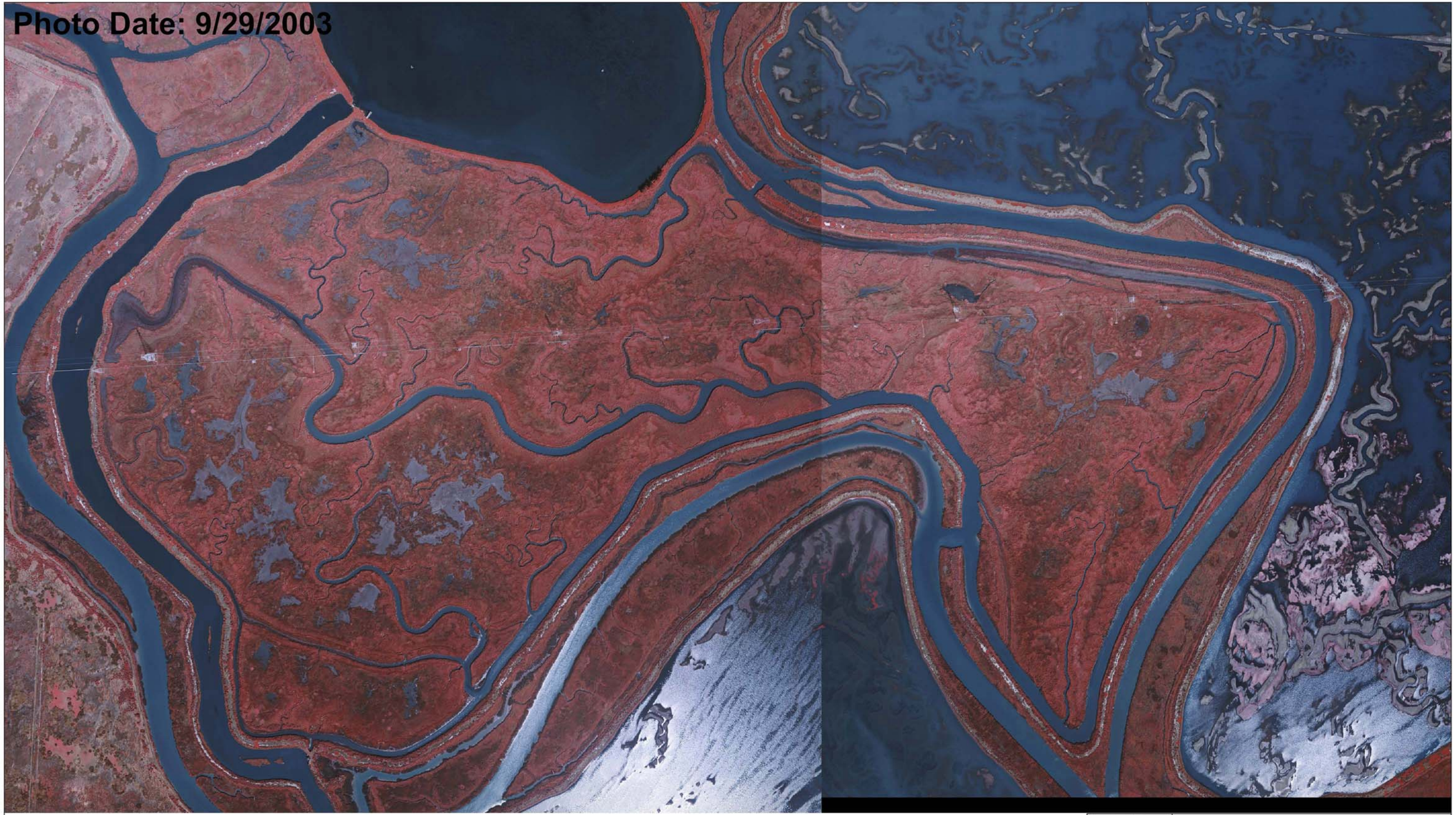


WETLANDS AND WATER RESOURCES, INC.

2003 AERIAL PHOTOGRAPH
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 11.1**



1:8,000

0 250 500 Meters

0 1,000 2,000 Feet

N W E S

Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: P2A-AP_1067-233_B-L_010704.mxd

WETLANDS AND WATER RESOURCES, INC.

2003 AERIAL PHOTOGRAPH
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 11.2**

2003 AERIAL PHOTOGRAPH
COON ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 11.3**

2003 AERIAL PHOTOGRAPH
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

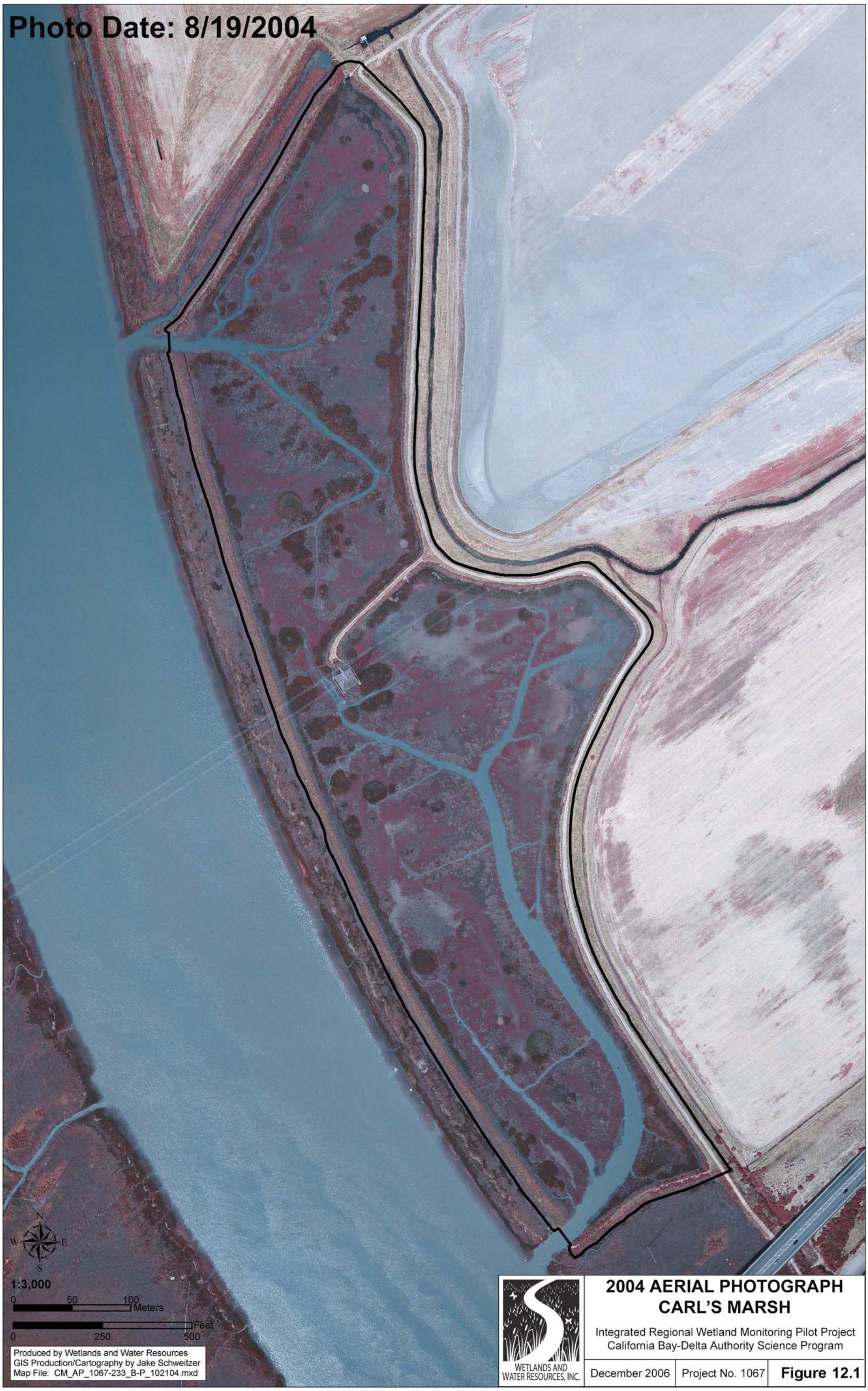
December 2006	Project No. 1067	**Figure 11.4**

2003 AERIAL PHOTOGRAPH
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 11.5**

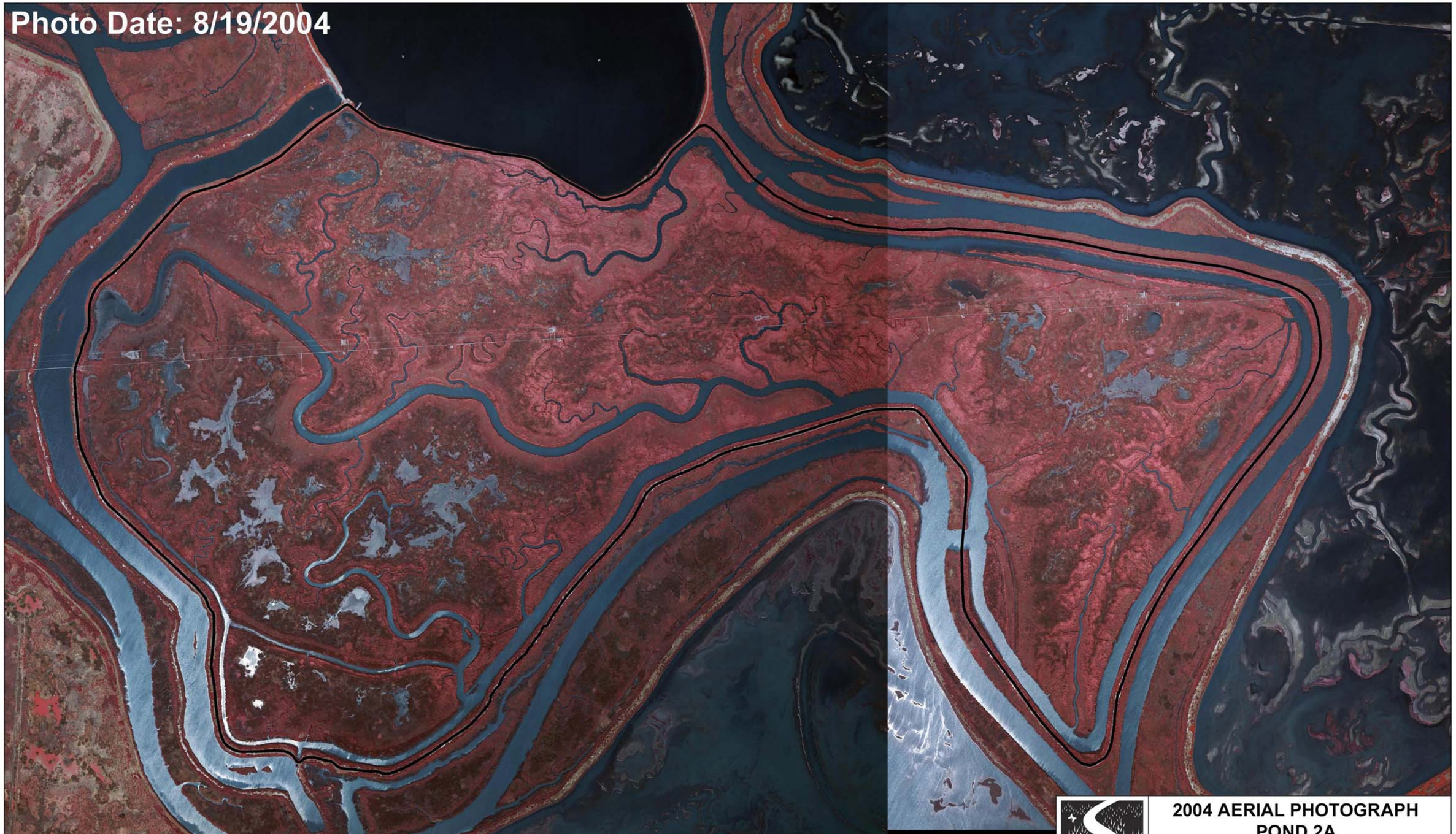
Photo Date: 10/24/2003
N
W
E
S
1:10,000 (at tabloid layout)
0
250
500
Meters
Feet
0
500
1,000
2,000
Extent of Primary Map
1:72,000
Source: USGS DOQQ, 1998
Produced by Wetlands and Water Resources, Jan. 2004
GIS Production/Cartography by Jake Schweitzer
Map File: SL-AP_1067-233_B-L_010704.mxd
WETLANDS AND WATER RESOURCES, INC.
2003 AERIAL PHOTOGRAPH
SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 11.6



2004 AERIAL PHOTOGRAPH
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 12.1**



1:7,800

0 162.5 325 Meters

0 325 650 1,300 Feet

N W E S

Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Map File: P2A-AP_1067-233_B-L_102104.mxd

WETLANDS AND WATER RESOURCES, INC.

2004 AERIAL PHOTOGRAPH
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 12.2**

2004 AERIAL PHOTOGRAPH
COON ISLAND

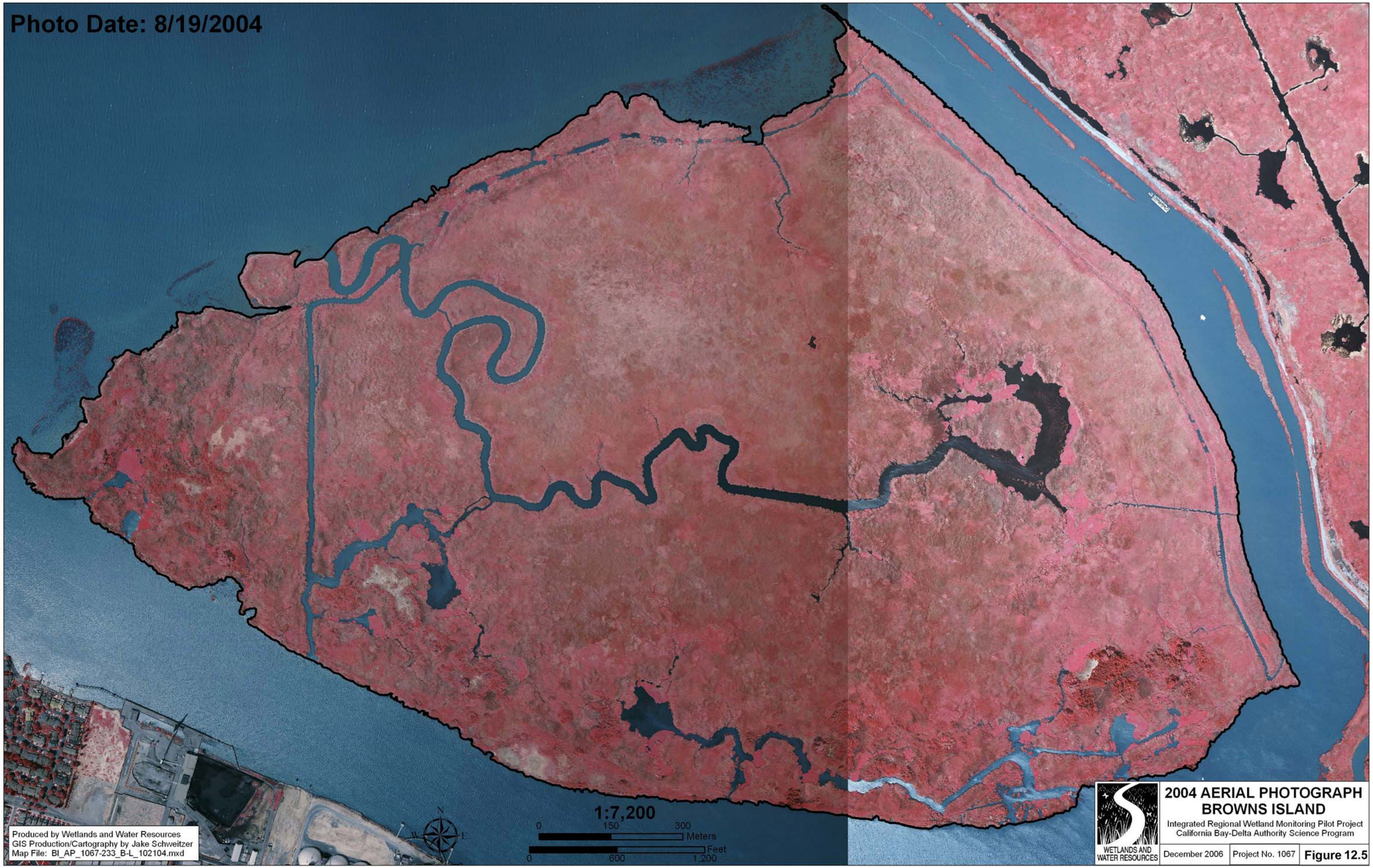
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 12.3**

2004 AERIAL PHOTOGRAPH
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

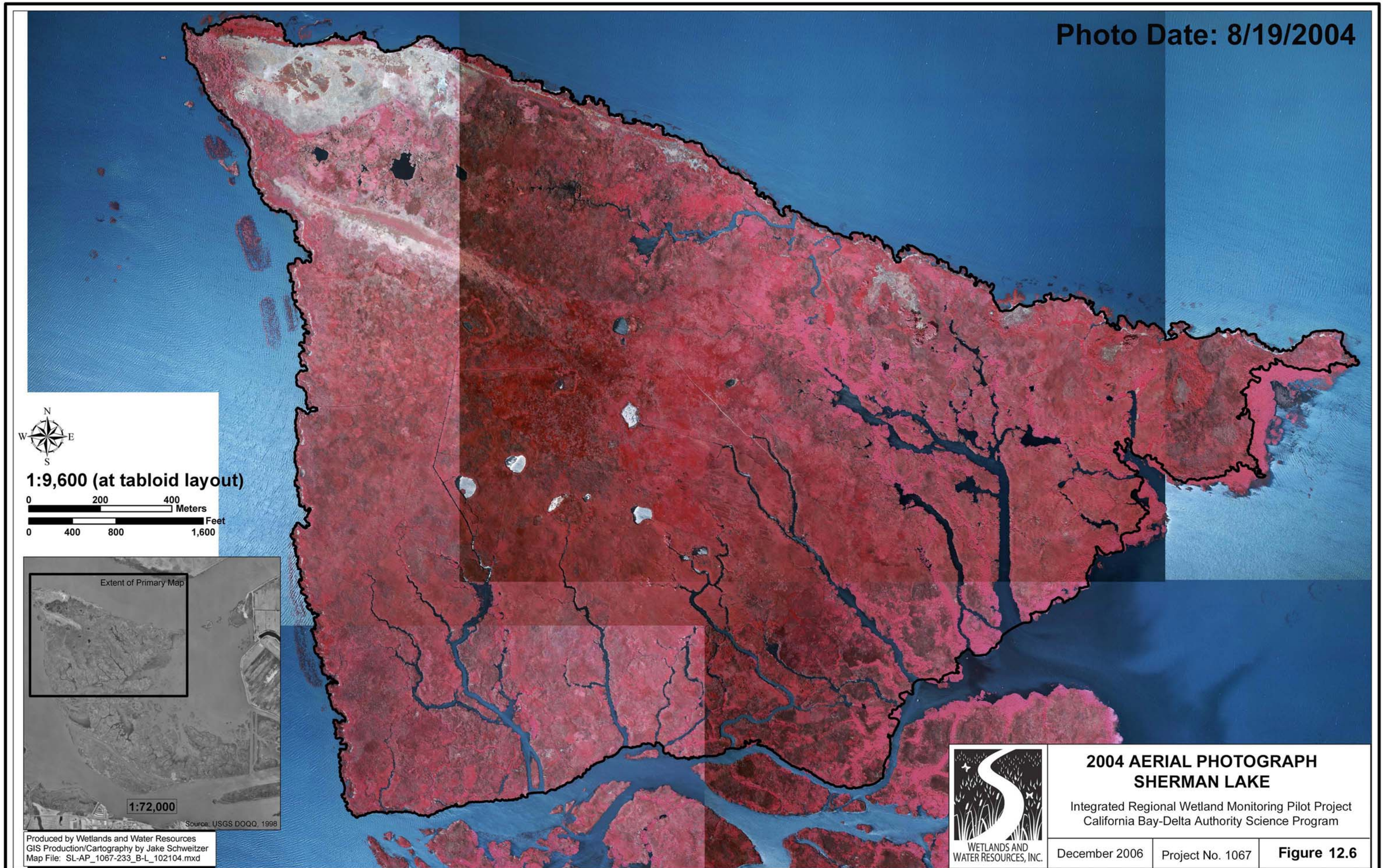
December 2006	Project No. 1067	**Figure 12.4**



2004 AERIAL PHOTOGRAPH
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

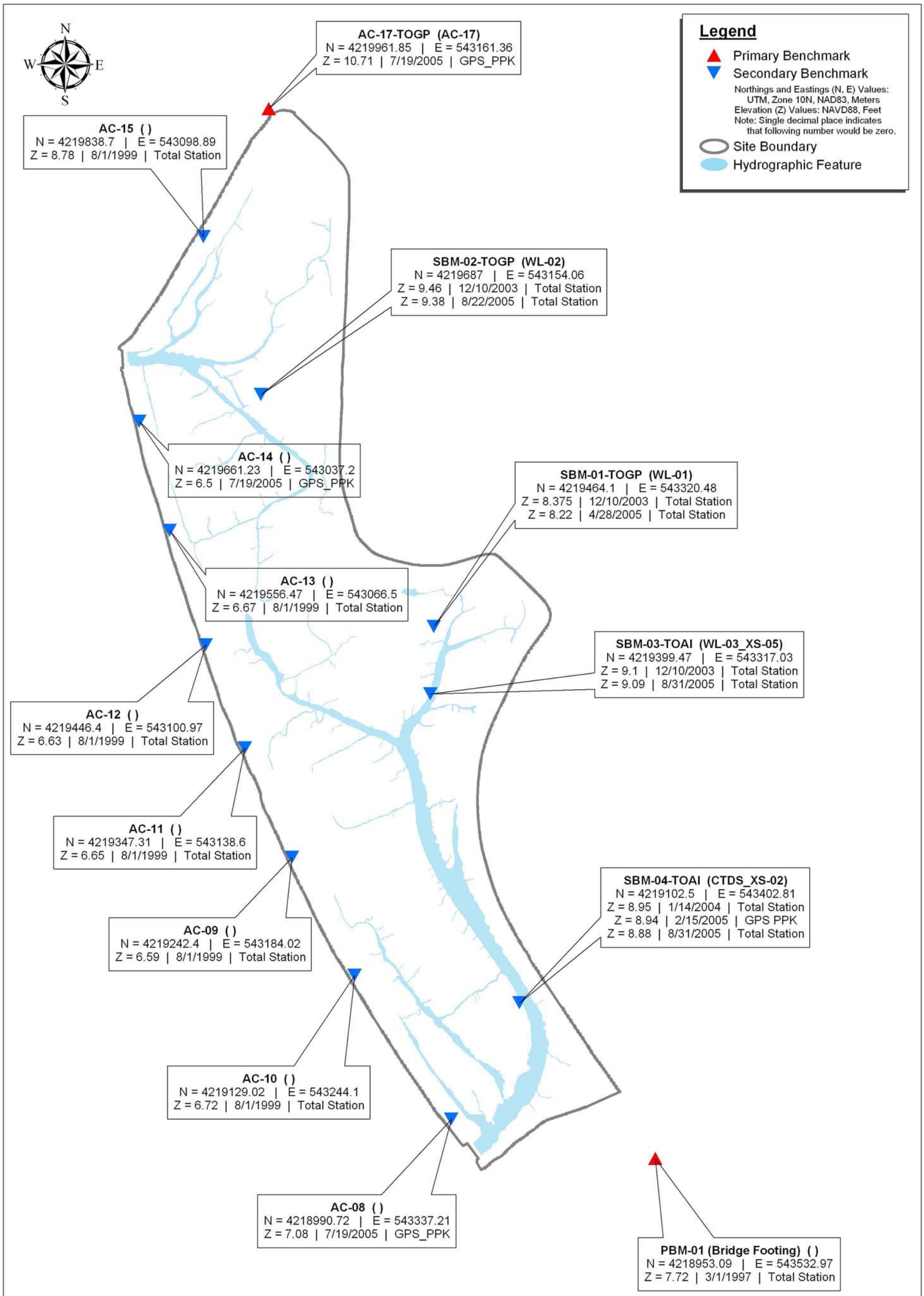
December 2006	Project No. 1067	**Figure 12.5**



2004 AERIAL PHOTOGRAPH
SHERMAN LAKE

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 12.6**



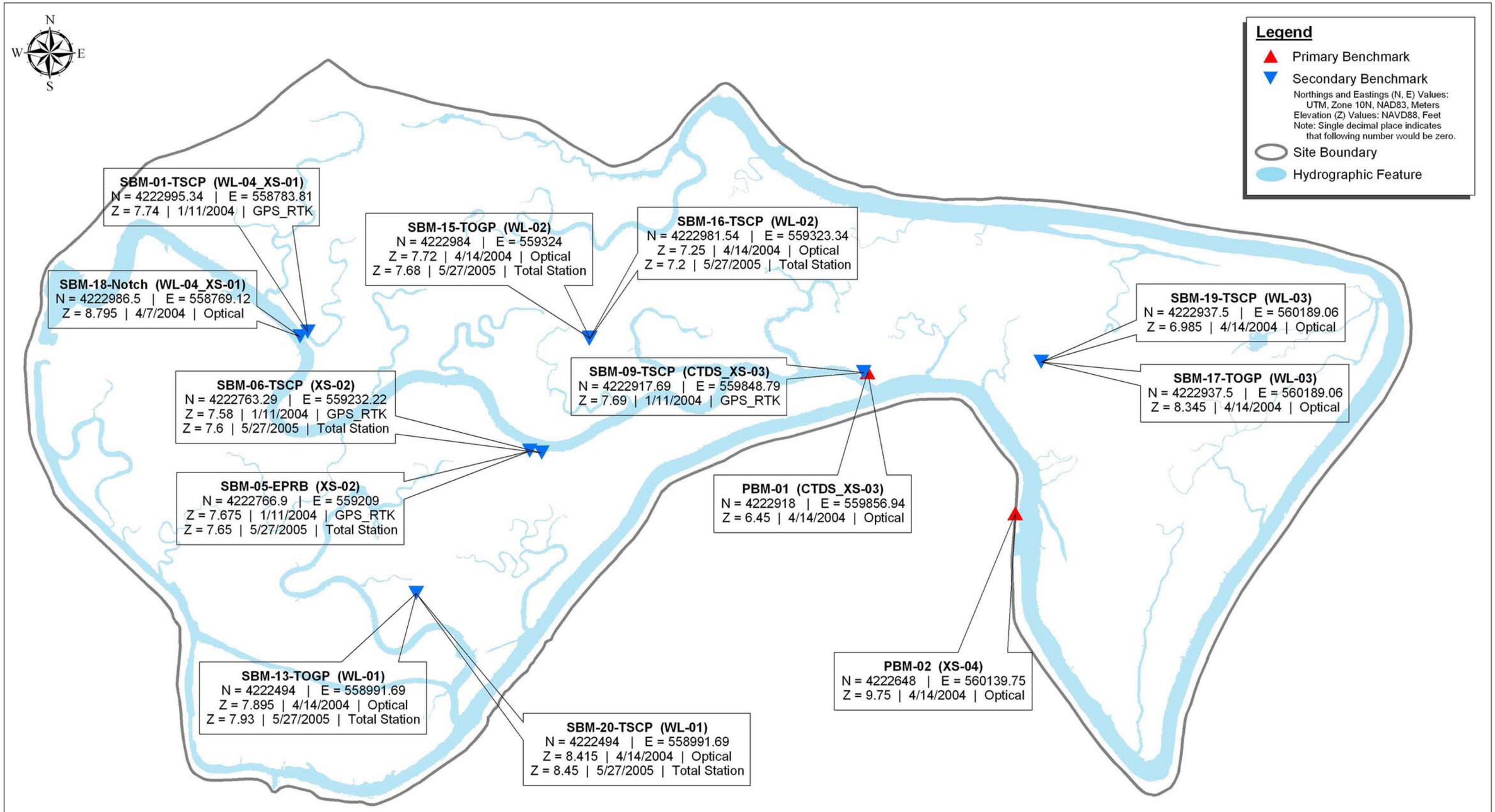
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer
Base Grid Source: Revision 2, produced by Karin Tuxen, U.C.B.
Base Photo Source: HJW, 08/14/2003
Map File: CM_BM-Geomorph_1067-233_B-P_090704.mxd

WETLANDS AND WATER RESOURCES

BENCHMARK LOCATIONS & ELEVATIONS
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 13.1**



Data sources: Karin Tuxen (base grid); WWR(Data)
Base Photo Source: HJW, 10/24/2003
Produced by Wetlands and Water Resources, Dec 2006
GIS/Cartography by Jake Schweitzer and Dan Gillenwater
Map File: P2A_BM-GeoMorph_1067-233_B-L_2006_1207dg.mxd

1:7,200 (1" = 600' at tabloid layout)

0 180 360 Meters

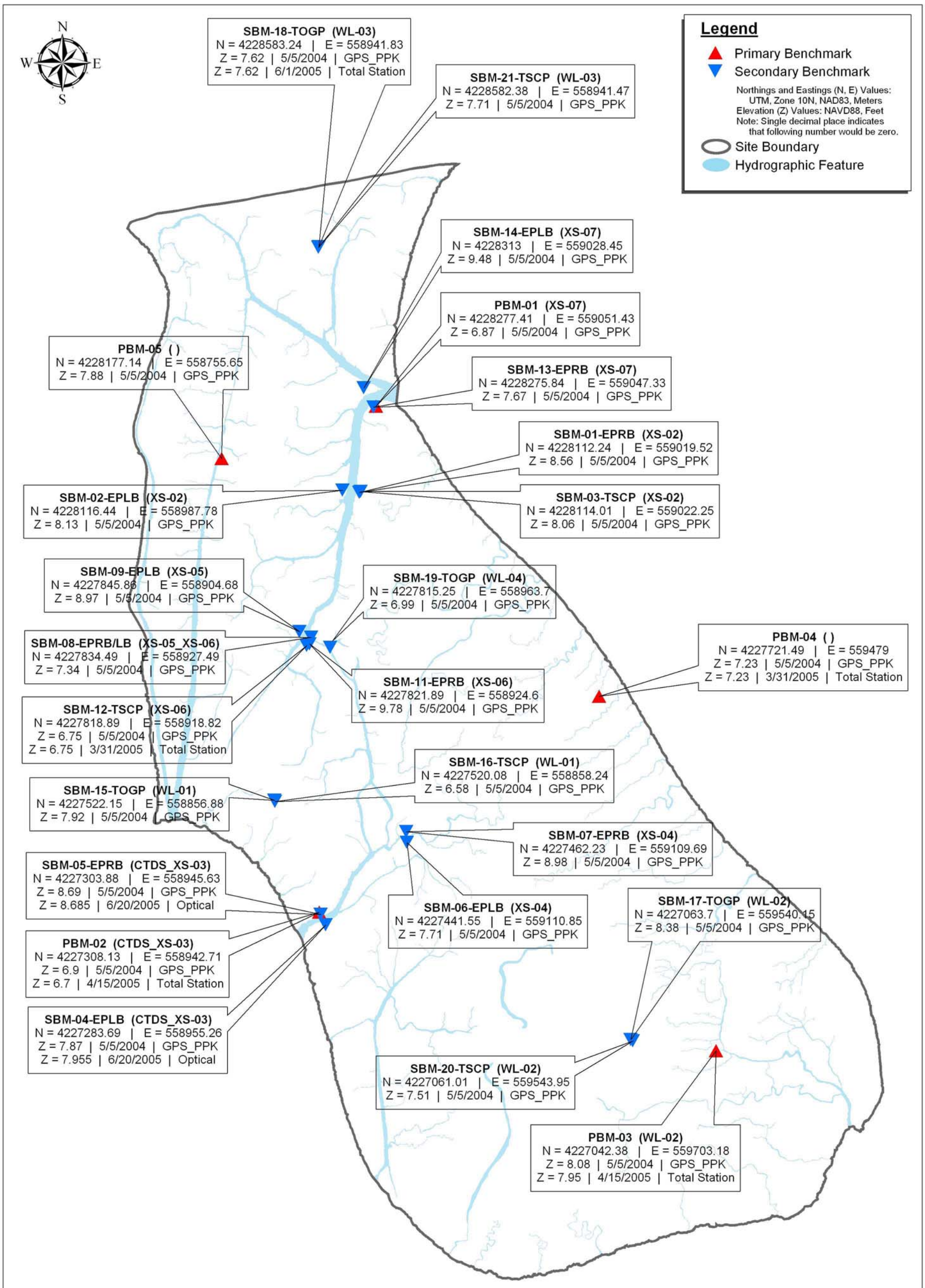
0 600 1,200 Feet

WETLANDS AND WATER RESOURCES

BENCHMARK LOCATIONS & ELEVATIONS
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 13.2**



1:7,200 (1" = 600' at tabloid layout)

0 180 360 Meters

0 600 1,200 Feet

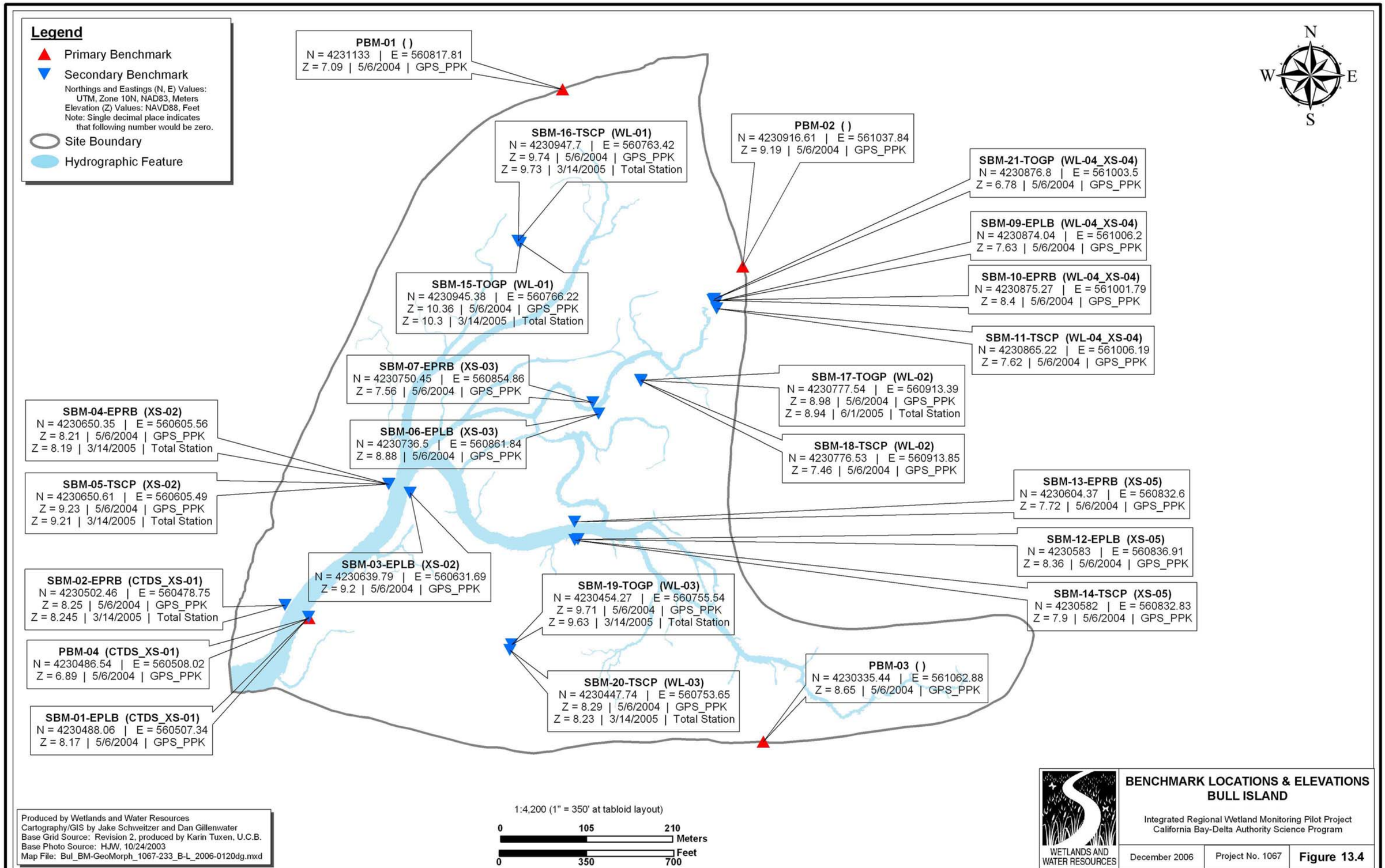
Produced by Wetlands and Water Resources
GIS Production/Cartography by Jake Schweitzer and Dan Gillenwater
Base Grid Source: Revision 2, produced by Karin Tuxen, U.C.B.
Base Photo Source: HJW, 09/29/2003
Map File: CI_BM-Geomorph_1067-233_B-P_2006-0120dg.mxd

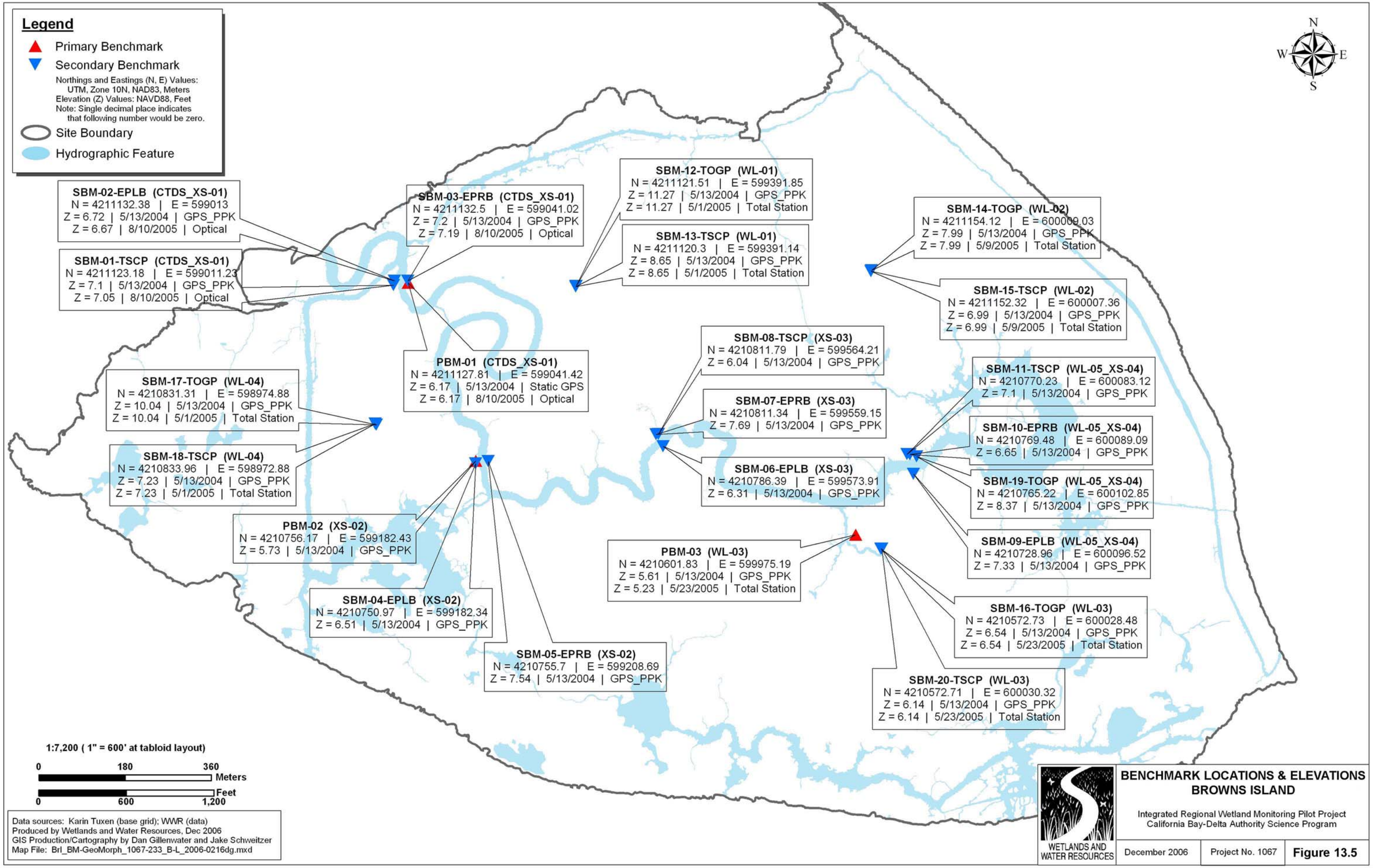
WETLANDS AND WATER RESOURCES

BENCHMARK LOCATIONS & ELEVATIONS
COON ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 13.3**

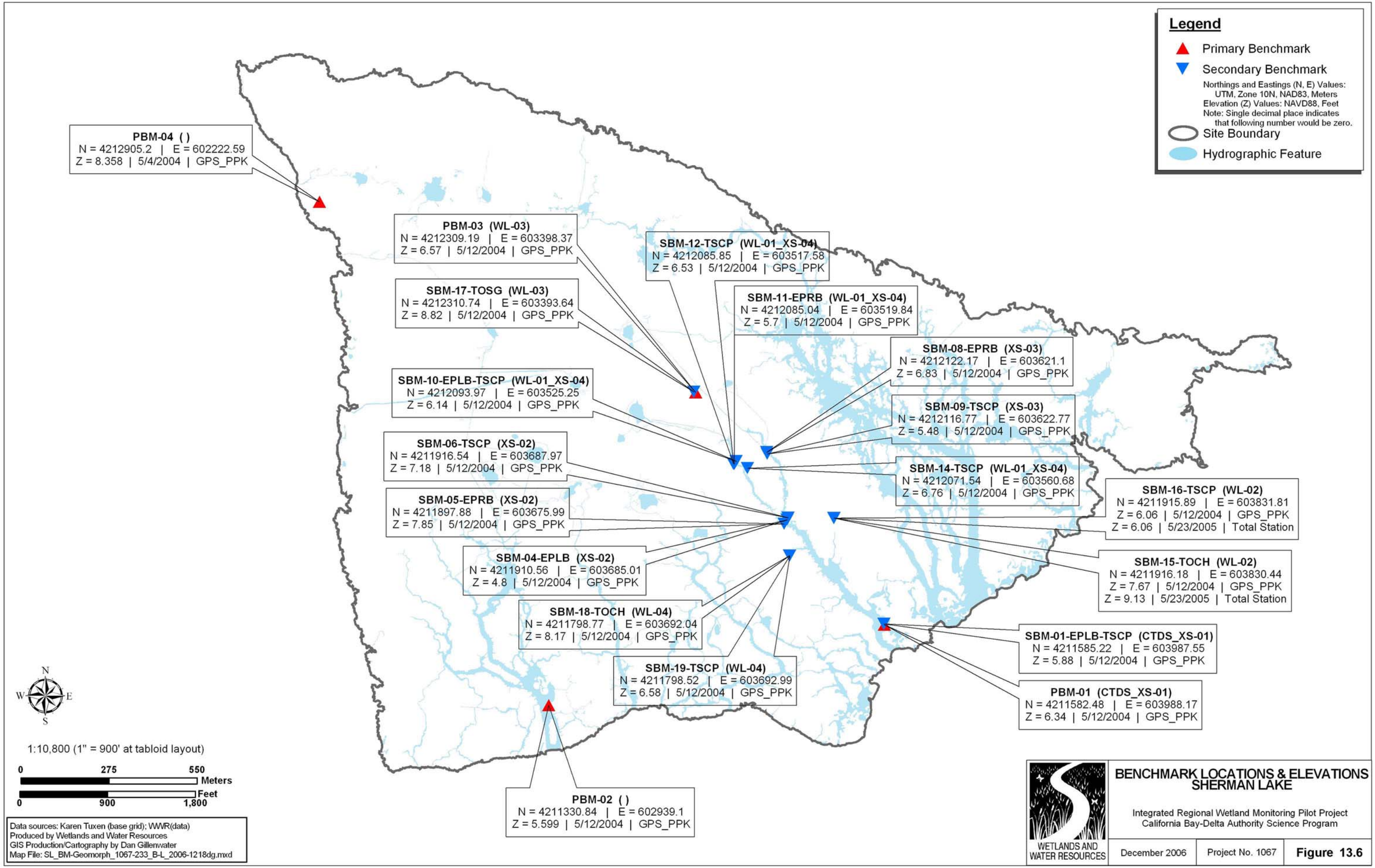

Legend
Primary Benchmark
Secondary Benchmark
Northings and Eastings (N, E) Values: UTM, Zone 10N, NAD83, Meters
Elevation (Z) Values: NAVD88, Feet
Note: Single decimal place indicates that following number would be zero.
Site Boundary
Hydrographic Feature
N
W
E
S
PBM-01 ( )
N = 4231133 | E = 560817.81
Z = 7.09 | 5/6/2004 | GPS_PPK
SBM-16-TSCP (WL-01)
N = 4230947.7 | E = 560763.42
Z = 9.74 | 5/6/2004 | GPS_PPK
Z = 9.73 | 3/14/2005 | Total Station
PBM-02 ( )
N = 4230916.61 | E = 561037.84
Z = 9.19 | 5/6/2004 | GPS_PPK
SBM-21-TOGP (WL-04_XS-04)
N = 4230876.8 | E = 561003.5
Z = 6.78 | 5/6/2004 | GPS_PPK
SBM-09-EPLB (WL-04_XS-04)
N = 4230874.04 | E = 561006.2
Z = 7.63 | 5/6/2004 | GPS_PPK
SBM-10-EPRB (WL-04_XS-04)
N = 4230875.27 | E = 561001.79
Z = 8.4 | 5/6/2004 | GPS_PPK
SBM-11-TSCP (WL-04_XS-04)
N = 4230865.22 | E = 561006.19
Z = 7.62 | 5/6/2004 | GPS_PPK
SBM-15-TOGP (WL-01)
N = 4230945.38 | E = 560766.22
Z = 10.36 | 5/6/2004 | GPS_PPK
Z = 10.3 | 3/14/2005 | Total Station
SBM-07-EPRB (XS-03)
N = 4230750.45 | E = 560854.86
Z = 7.56 | 5/6/2004 | GPS_PPK
SBM-17-TOGP (WL-02)
N = 4230777.54 | E = 560913.39
Z = 8.98 | 5/6/2004 | GPS_PPK
Z = 8.94 | 6/1/2005 | Total Station
SBM-04-EPRB (XS-02)
N = 4230650.35 | E = 560605.56
Z = 8.21 | 5/6/2004 | GPS_PPK
Z = 8.19 | 3/14/2005 | Total Station
SBM-06-EPLB (XS-03)
N = 4230736.5 | E = 560861.84
Z = 8.88 | 5/6/2004 | GPS_PPK
SBM-18-TSCP (WL-02)
N = 4230776.53 | E = 560913.85
Z = 7.46 | 5/6/2004 | GPS_PPK
SBM-05-TSCP (XS-02)
N = 4230650.61 | E = 560605.49
Z = 9.23 | 5/6/2004 | GPS_PPK
Z = 9.21 | 3/14/2005 | Total Station
SBM-13-EPRB (XS-05)
N = 4230604.37 | E = 560832.6
Z = 7.72 | 5/6/2004 | GPS_PPK
SBM-12-EPLB (XS-05)
N = 4230583 | E = 560836.91
Z = 8.36 | 5/6/2004 | GPS_PPK
SBM-03-EPLB (XS-02)
N = 4230639.79 | E = 560631.69
Z = 9.2 | 5/6/2004 | GPS_PPK
SBM-02-EPRB (CTDS_XS-01)
N = 4230502.46 | E = 560478.75
Z = 8.25 | 5/6/2004 | GPS_PPK
Z = 8.245 | 3/14/2005 | Total Station
SBM-19-TOGP (WL-03)
N = 4230454.27 | E = 560755.54
Z = 9.71 | 5/6/2004 | GPS_PPK
Z = 9.63 | 3/14/2005 | Total Station
SBM-14-TSCP (XS-05)
N = 4230582 | E = 560832.83
Z = 7.9 | 5/6/2004 | GPS_PPK
PBM-04 (CTDS_XS-01)
N = 4230486.54 | E = 560508.02
Z = 6.89 | 5/6/2004 | GPS_PPK
PBM-03 ( )
N = 4230335.44 | E = 561062.88
Z = 8.65 | 5/6/2004 | GPS_PPK
SBM-20-TSCP (WL-03)
N = 4230447.74 | E = 560753.65
Z = 8.29 | 5/6/2004 | GPS_PPK
Z = 8.23 | 3/14/2005 | Total Station
SBM-01-EPLB (CTDS_XS-01)
N = 4230488.06 | E = 560507.34
Z = 8.17 | 5/6/2004 | GPS_PPK
1:4,200 (1" = 350' at tabloid layout)
0 105 210 Meters
0 350 700 Feet
Produced by Wetlands and Water Resources
Cartography/GIS by Jake Schweitzer and Dan Gillenwater
Base Grid Source: Revision 2, produced by Karin Tuxen, U.C.B.
Base Photo Source: HJW, 10/24/2003
Map File: Bul_BM-GeoMorph_1067-233_B-L_2006-0120dg.mxd
WETLANDS AND WATER RESOURCES
BENCHMARK LOCATIONS & ELEVATIONS
BULL ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 13.4

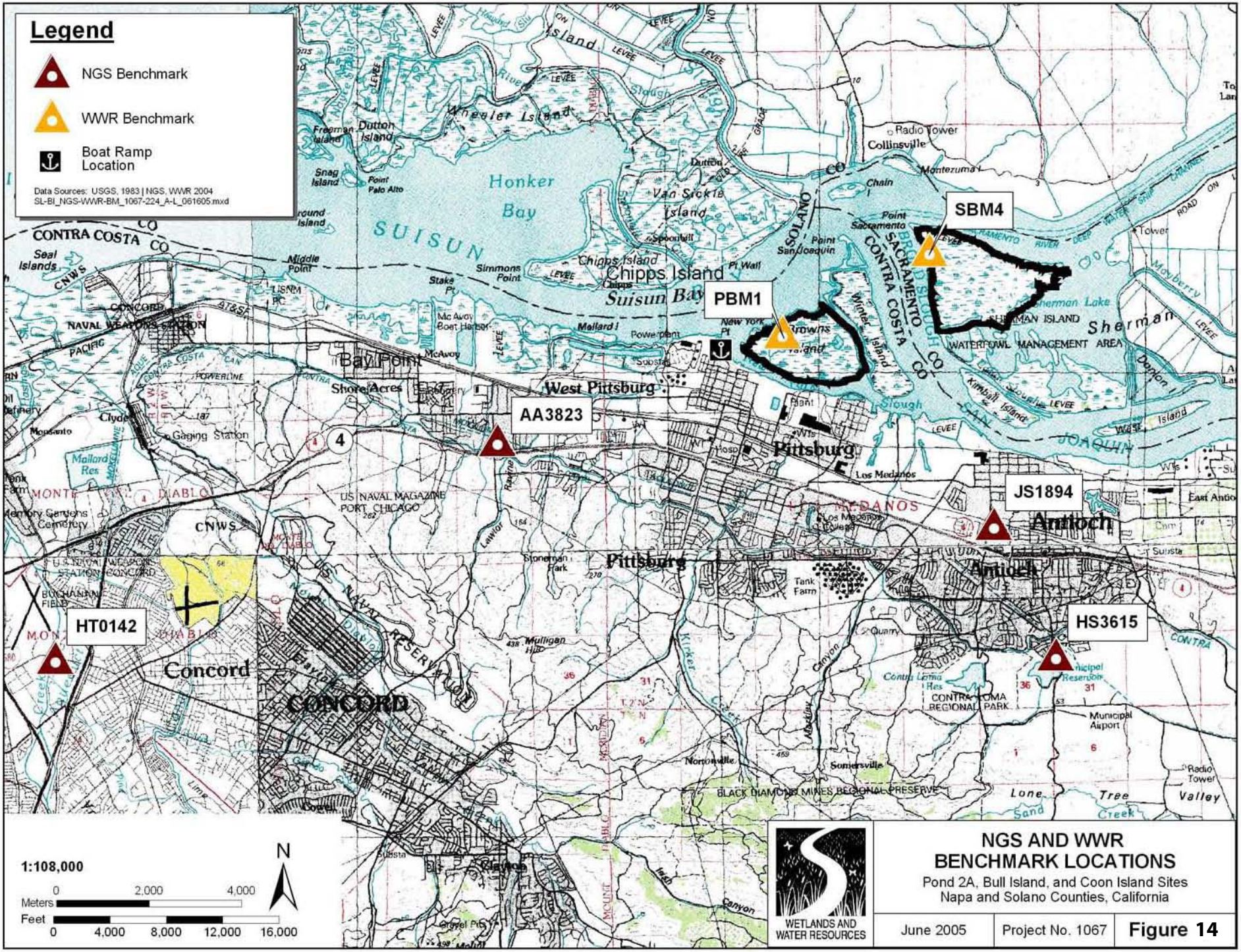


BENCHMARK LOCATIONS & ELEVATIONS
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 13.5**

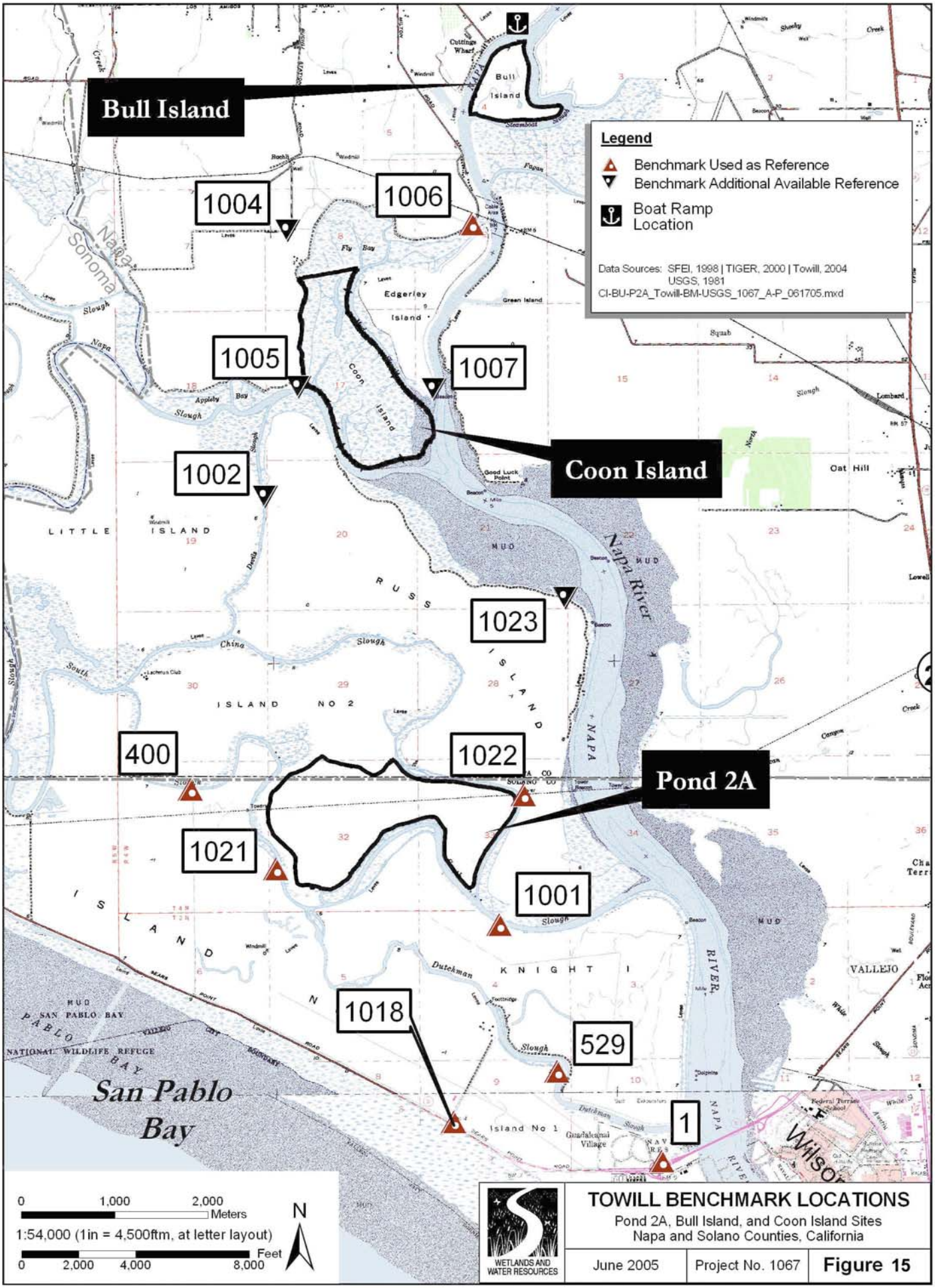

Legend
Primary Benchmark
Secondary Benchmark
Northings and Eastings (N, E) Values: UTM, Zone 10N, NAD83, Meters
Elevation (Z) Values: NAVD88, Feet
Note: Single decimal place indicates that following number would be zero.
Site Boundary
Hydrographic Feature
PBM-04 ( )
N = 4212905.2 | E = 602222.59
Z = 8.358 | 5/4/2004 | GPS_PPK
PBM-03 (WL-03)
N = 4212309.19 | E = 603398.37
Z = 6.57 | 5/12/2004 | GPS_PPK
SBM-12-TSCP (WL-01_XS-04)
N = 4212085.85 | E = 603517.58
Z = 6.53 | 5/12/2004 | GPS_PPK
SBM-17-TOSG (WL-03)
N = 4212310.74 | E = 603393.64
Z = 8.82 | 5/12/2004 | GPS_PPK
SBM-11-EPRB (WL-01_XS-04)
N = 4212085.04 | E = 603519.84
Z = 5.7 | 5/12/2004 | GPS_PPK
SBM-08-EPRB (XS-03)
N = 4212122.17 | E = 603621.1
Z = 6.83 | 5/12/2004 | GPS_PPK
SBM-10-EPLB-TSCP (WL-01_XS-04)
N = 4212093.97 | E = 603525.25
Z = 6.14 | 5/12/2004 | GPS_PPK
SBM-09-TSCP (XS-03)
N = 4212116.77 | E = 603622.77
Z = 5.48 | 5/12/2004 | GPS_PPK
SBM-06-TSCP (XS-02)
N = 4211916.54 | E = 603687.97
Z = 7.18 | 5/12/2004 | GPS_PPK
SBM-14-TSCP (WL-01_XS-04)
N = 4212071.54 | E = 603560.68
Z = 6.76 | 5/12/2004 | GPS_PPK
SBM-05-EPRB (XS-02)
N = 4211897.88 | E = 603675.99
Z = 7.85 | 5/12/2004 | GPS_PPK
SBM-16-TSCP (WL-02)
N = 4211915.89 | E = 603831.81
Z = 6.06 | 5/12/2004 | GPS_PPK
Z = 6.06 | 5/23/2005 | Total Station
SBM-04-EPLB (XS-02)
N = 4211910.56 | E = 603685.01
Z = 4.8 | 5/12/2004 | GPS_PPK
SBM-15-TOCH (WL-02)
N = 4211916.18 | E = 603830.44
Z = 7.67 | 5/12/2004 | GPS_PPK
Z = 9.13 | 5/23/2005 | Total Station
SBM-18-TOCH (WL-04)
N = 4211798.77 | E = 603692.04
Z = 8.17 | 5/12/2004 | GPS_PPK
SBM-01-EPLB-TSCP (CTDS_XS-01)
N = 4211585.22 | E = 603987.55
Z = 5.88 | 5/12/2004 | GPS_PPK
SBM-19-TSCP (WL-04)
N = 4211798.52 | E = 603692.99
Z = 6.58 | 5/12/2004 | GPS_PPK
PBM-01 (CTDS_XS-01)
N = 4211582.48 | E = 603988.17
Z = 6.34 | 5/12/2004 | GPS_PPK
PBM-02 ( )
N = 4211330.84 | E = 602939.1
Z = 5.599 | 5/12/2004 | GPS_PPK
N
W
E
S
1:10,800 (1" = 900' at tabloid layout)
0 275 550 Meters
0 900 1,800 Feet
Data sources: Karen Tuxen (base grid); WWR(data)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: SL_BM-Geomorph_1067-233_B-L_2006-1218dg.mxd
WETLANDS AND WATER RESOURCES
BENCHMARK LOCATIONS & ELEVATIONS
SHERMAN LAKE
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 13.6



NGS AND WWR BENCHMARK LOCATIONS

Pond 2A, Bull Island, and Coon Island Sites
Napa and Solano Counties, California

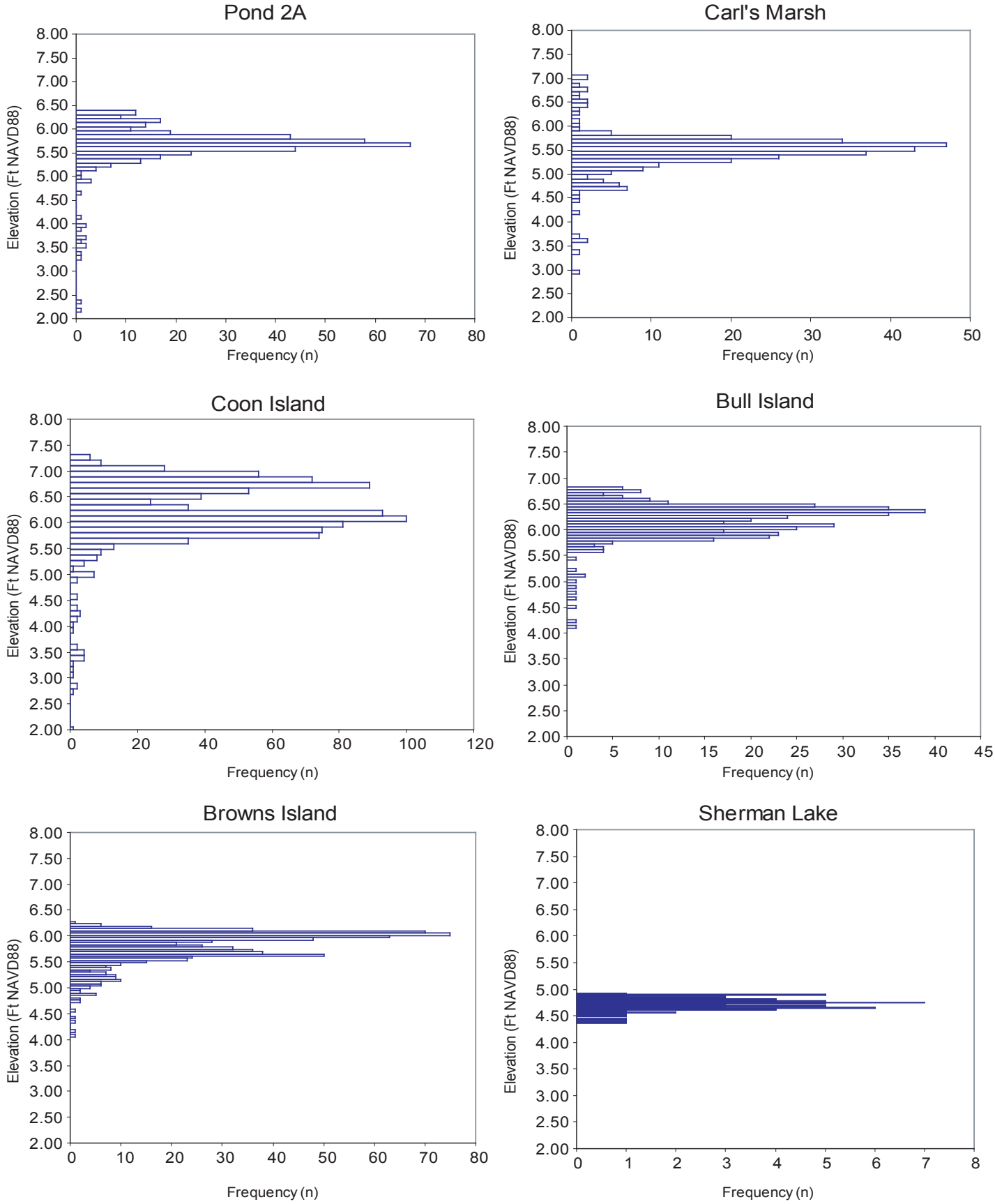
June 2005	Project No. 1067	**Figure 14**



TOWILL BENCHMARK LOCATIONS

Pond 2A, Bull Island, and Coon Island Sites
Napa and Solano Counties, California

June 2005	Project No. 1067	**Figure 15**

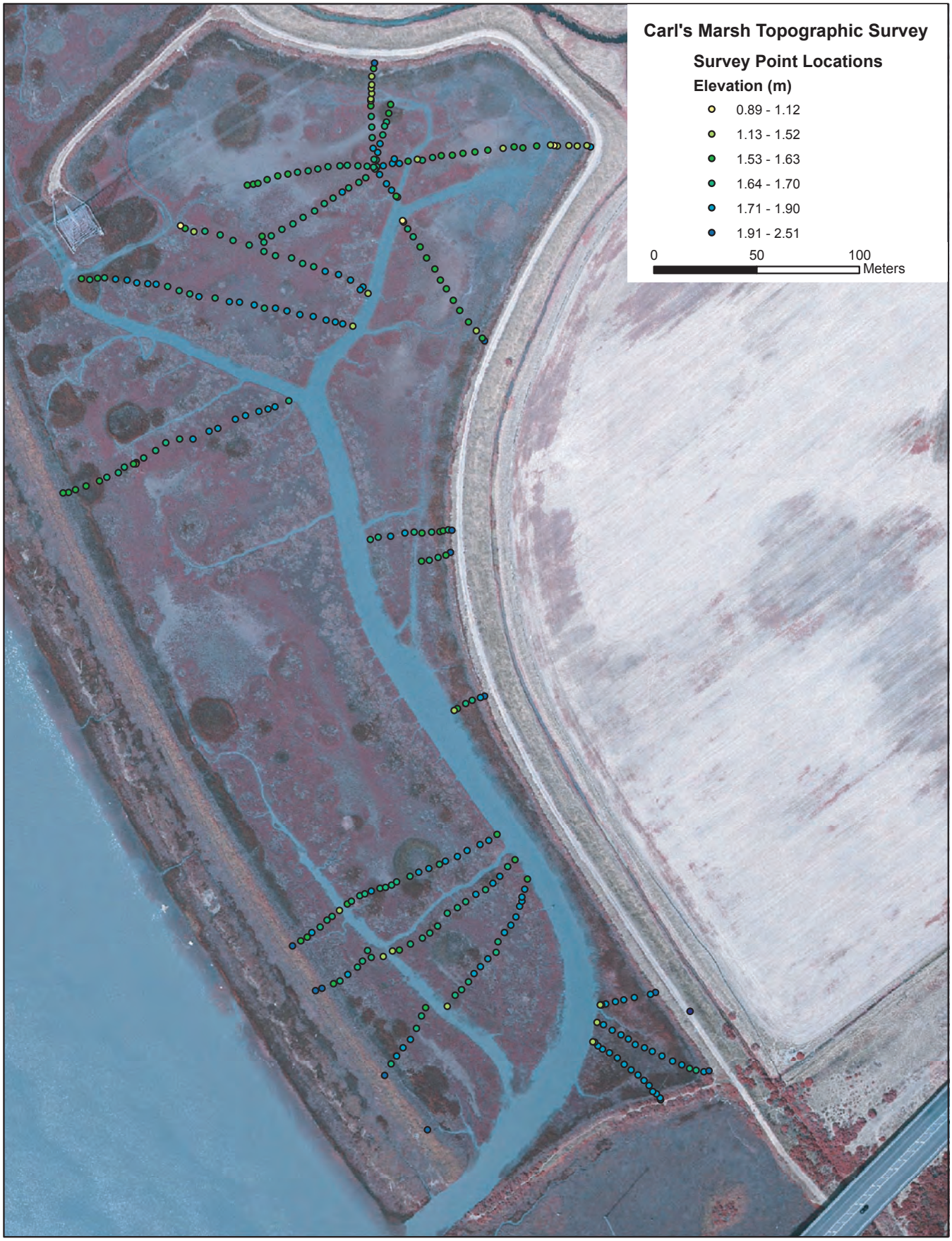


WETLANDS AND WATER RESOURCES

Marsh Plain Elevation Histogram

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 16



WETLANDS AND WATER RESOURCES

CARL'S MARSH

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.1

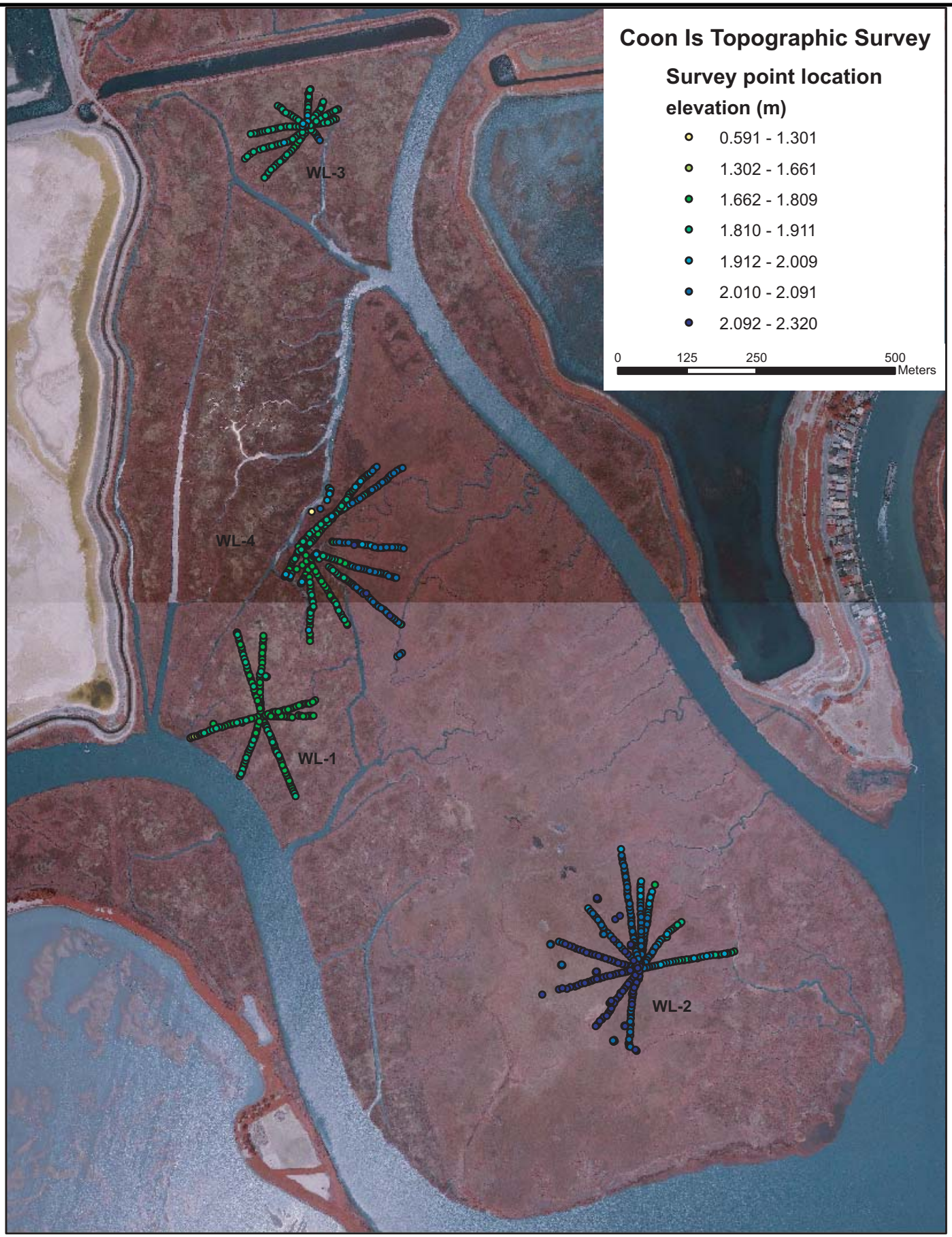
WETLANDS AND WATER RESOURCES

Pond 2A

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.2



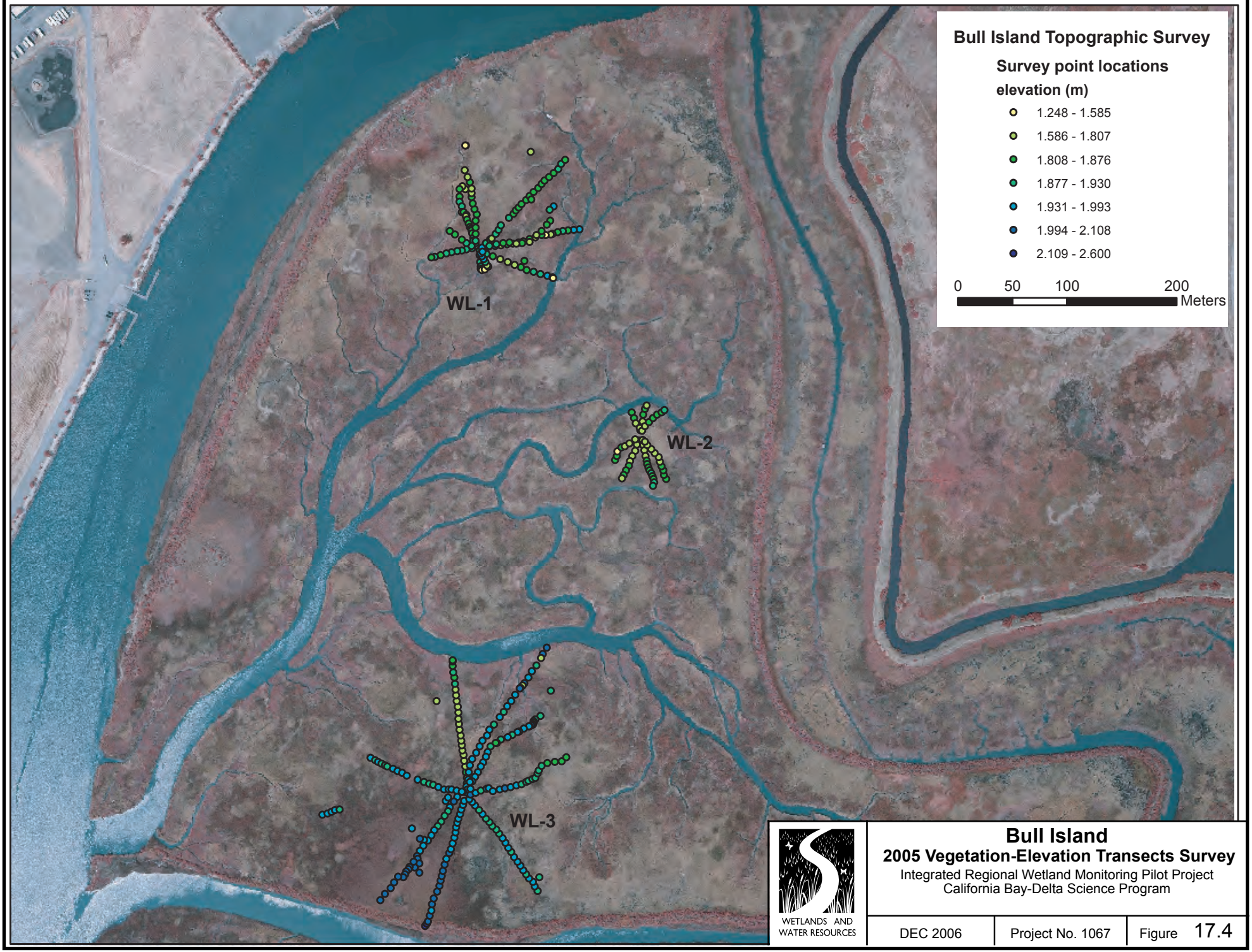
WETLANDS AND WATER RESOURCES

Coon Island

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.3



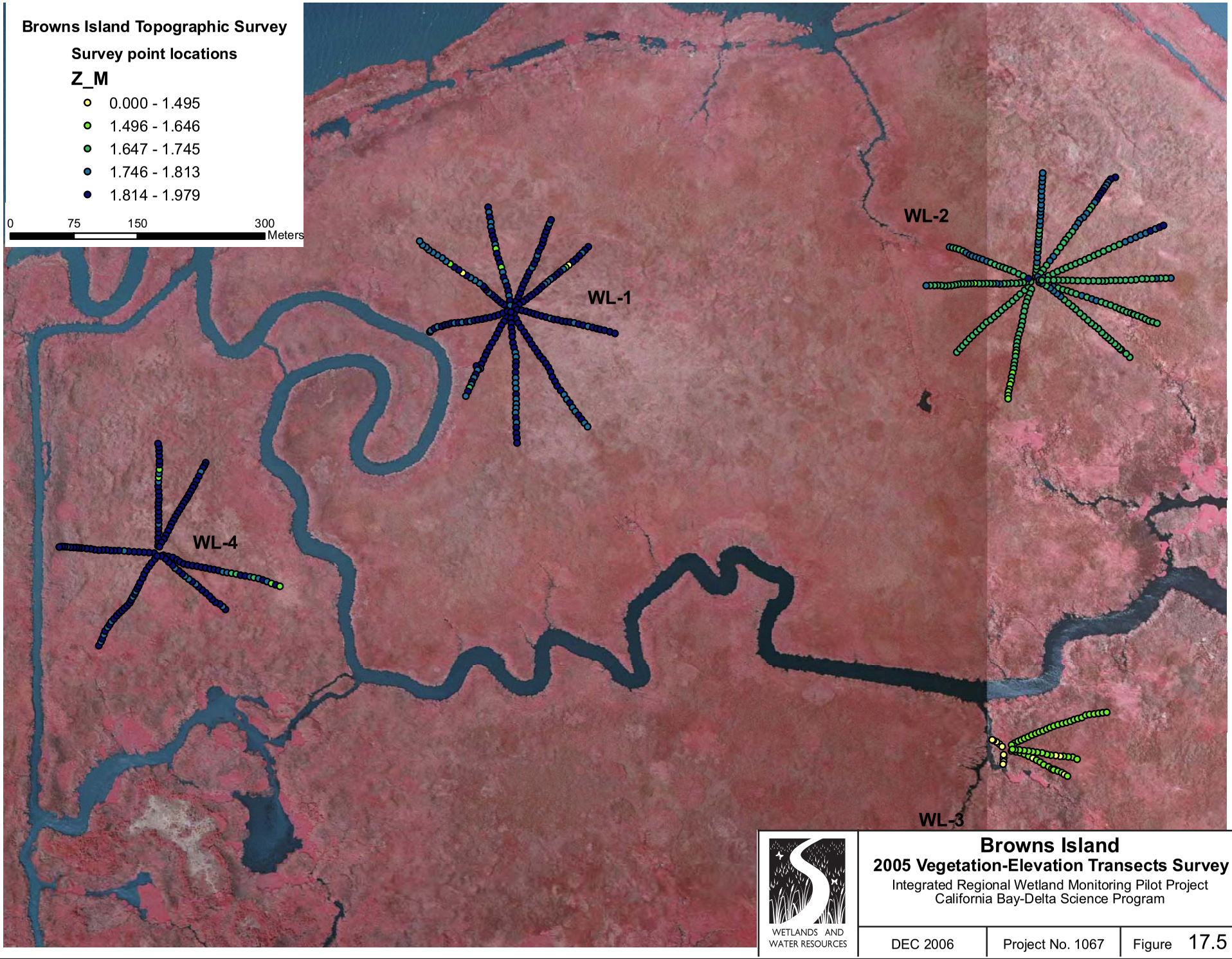
WETLANDS AND WATER RESOURCES

Bull Island

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.4



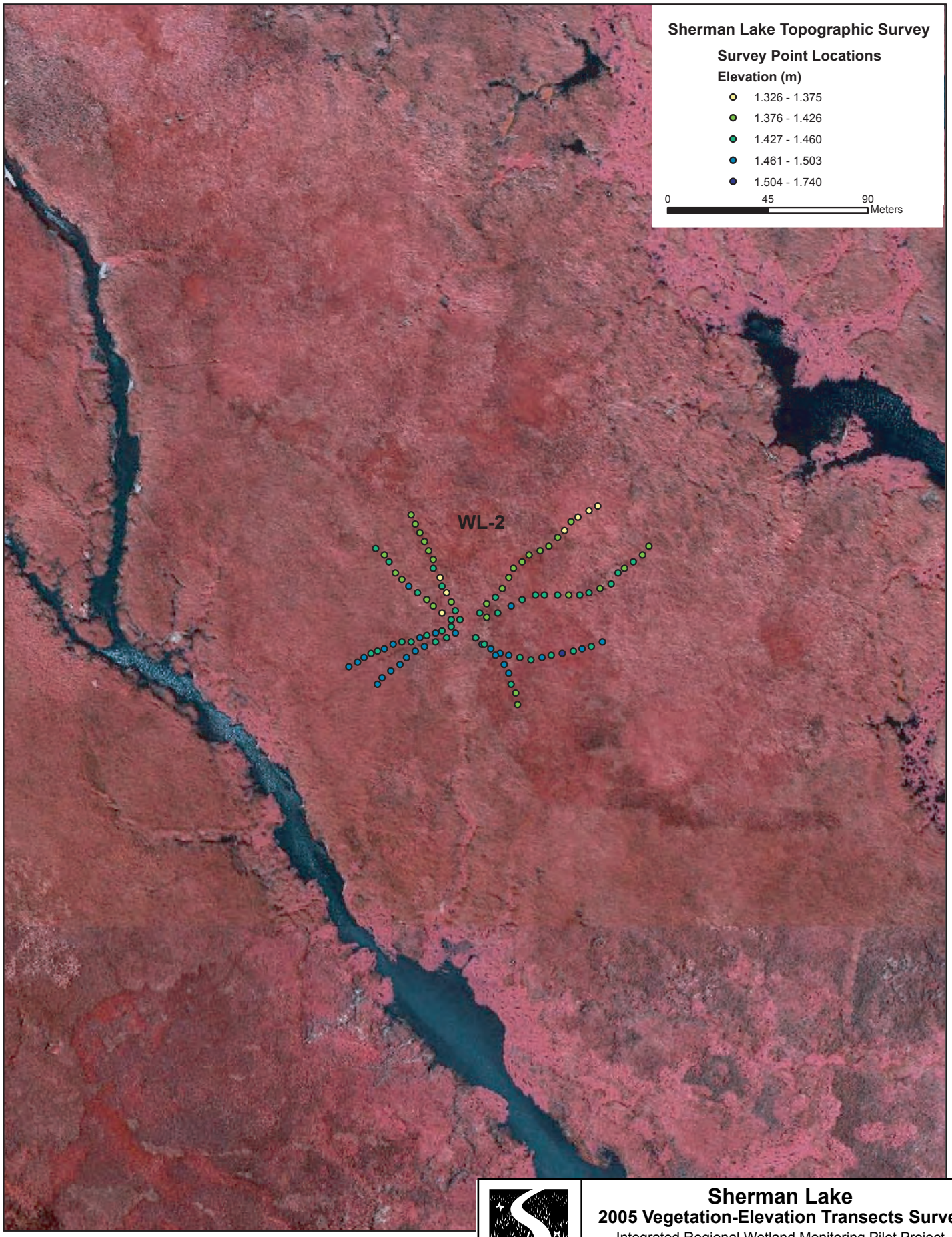
WETLANDS AND WATER RESOURCES

Browns Island

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.5



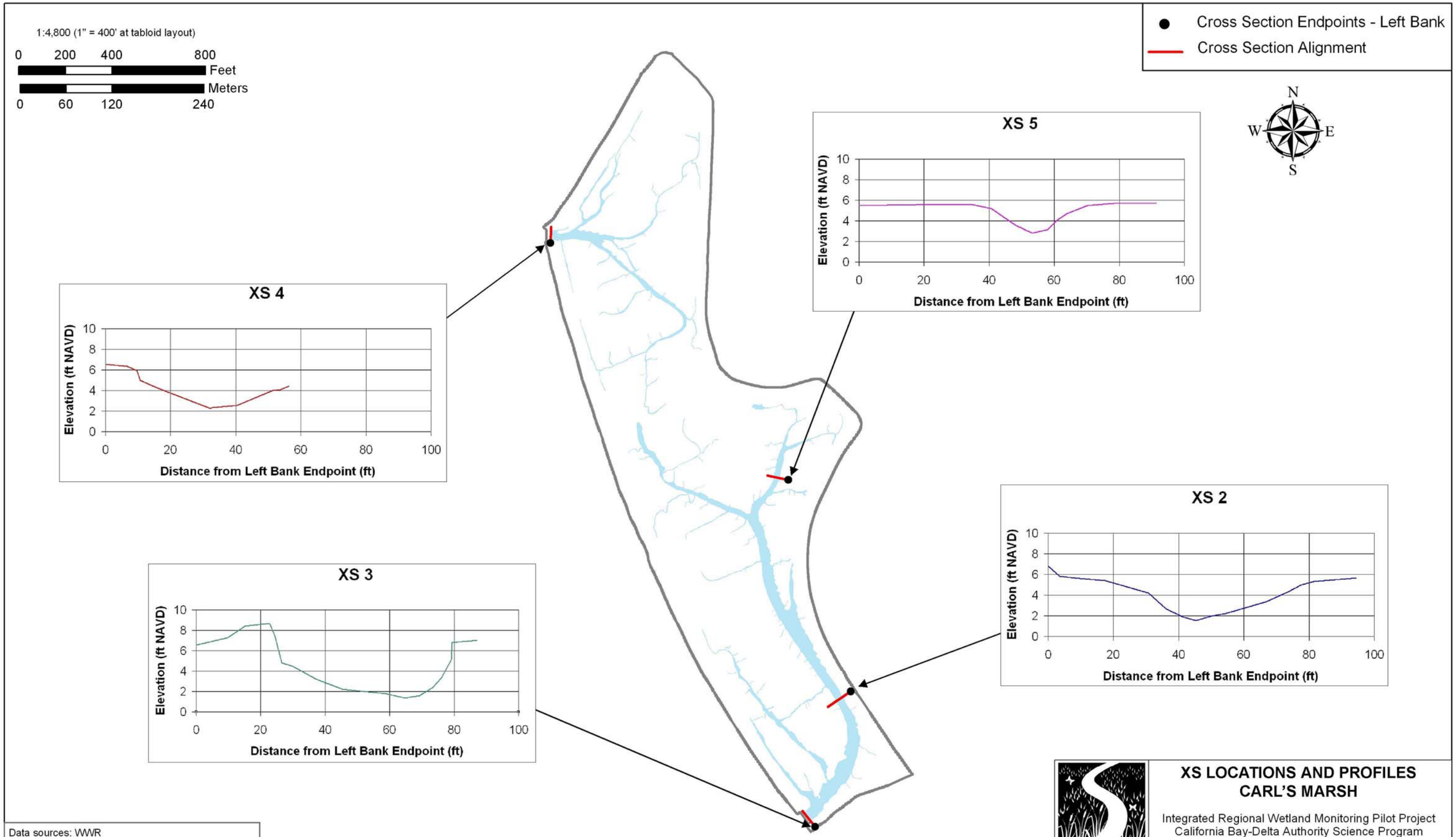
WETLANDS AND WATER RESOURCES

Sherman Lake

2005 Vegetation-Elevation Transects Survey

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

DEC 2006	Project No. 1067	Figure 17.6



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: CM_XS-locations_1067_2006-1211dg.mxd

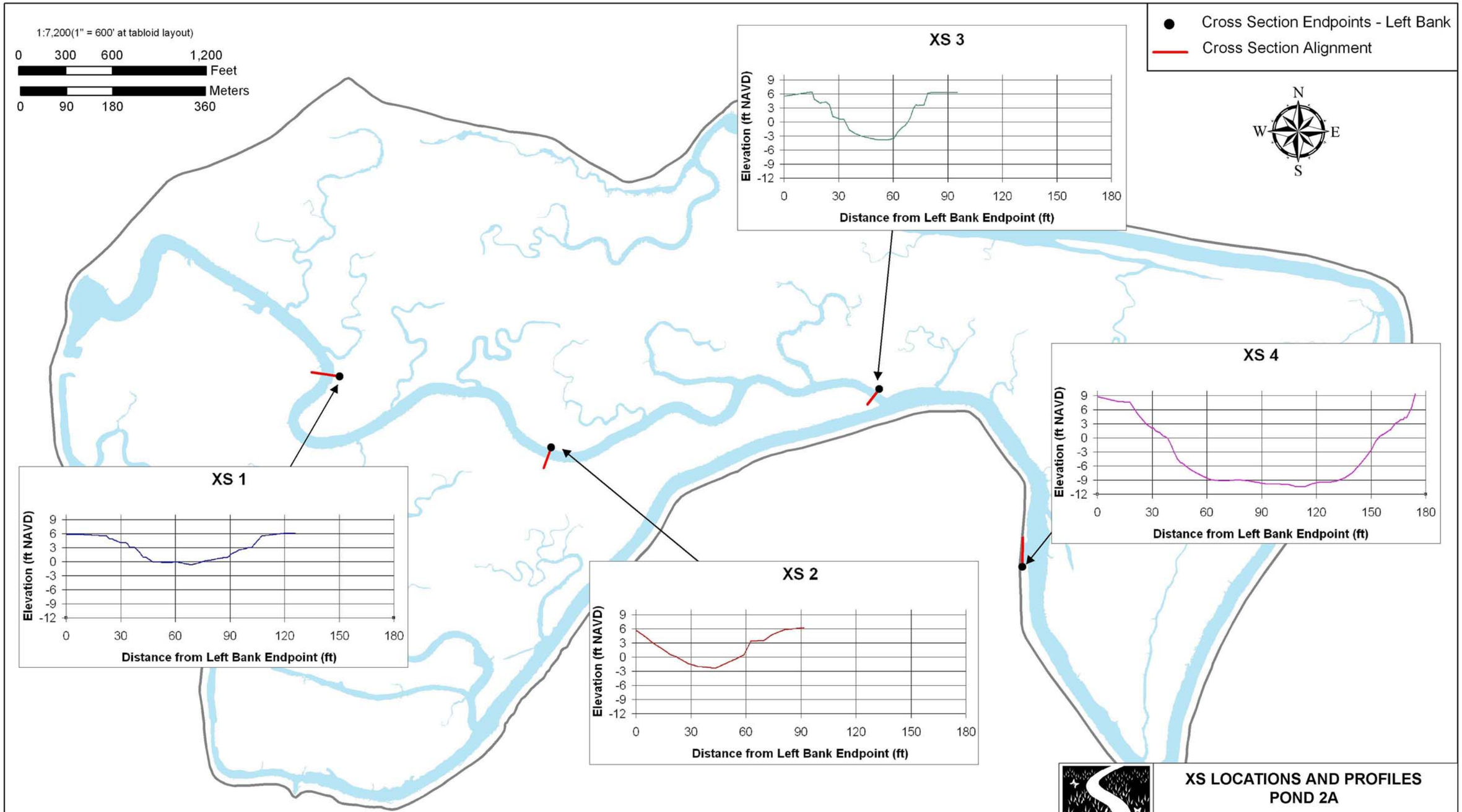
XS 2, 3, 4, 5: Total station survey - 3/11/2004

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
CARL'S MARSH

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 18.1**



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: P2A_XS-locations_1067_2006-1211dg.mxd

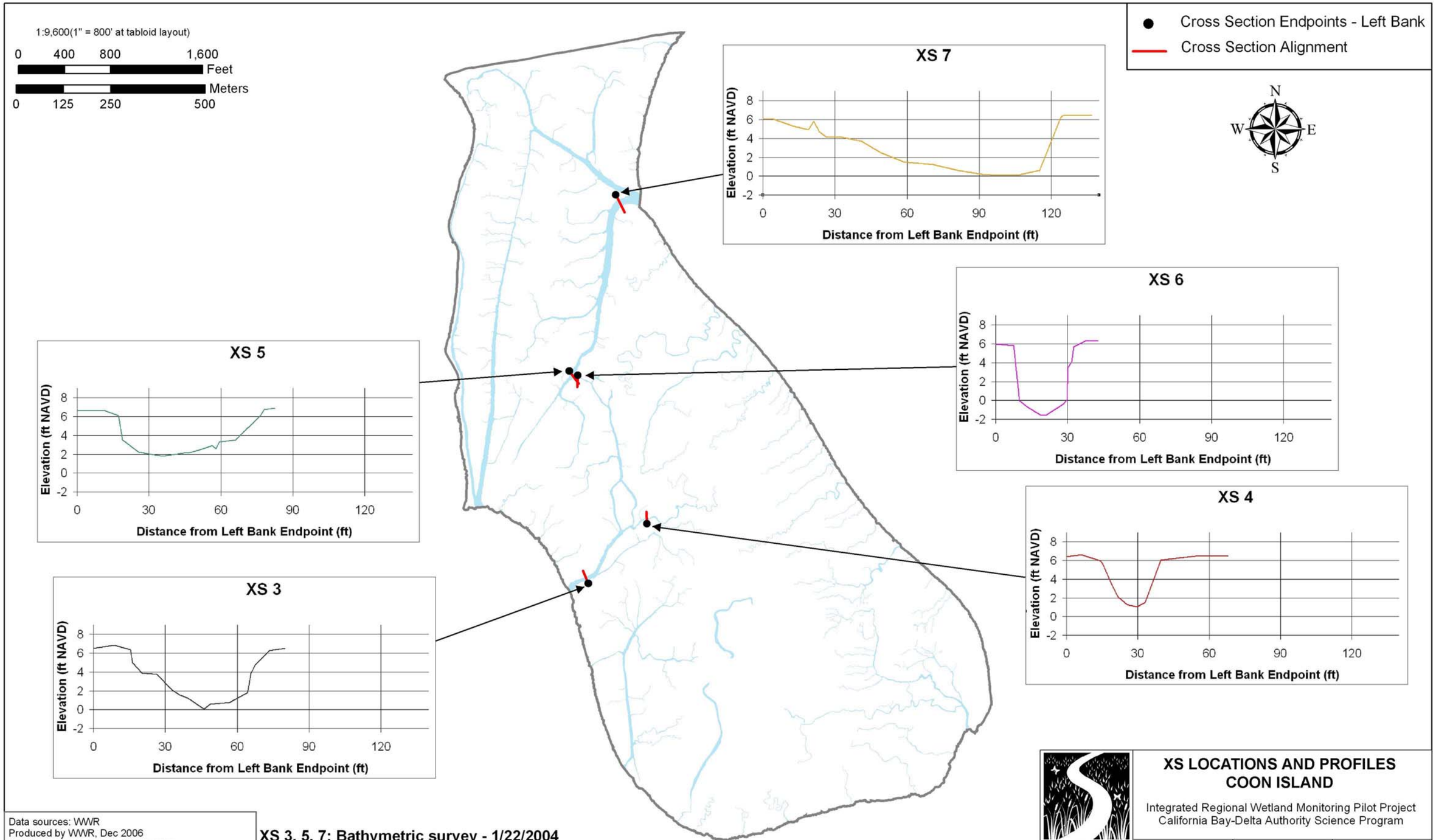
XS 1, 2, 3, 4: Bathymetric survey - 12/19/2003

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
POND 2A

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 18.2**



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: CI_XS-locations_1067_2006-1211dg.mxd

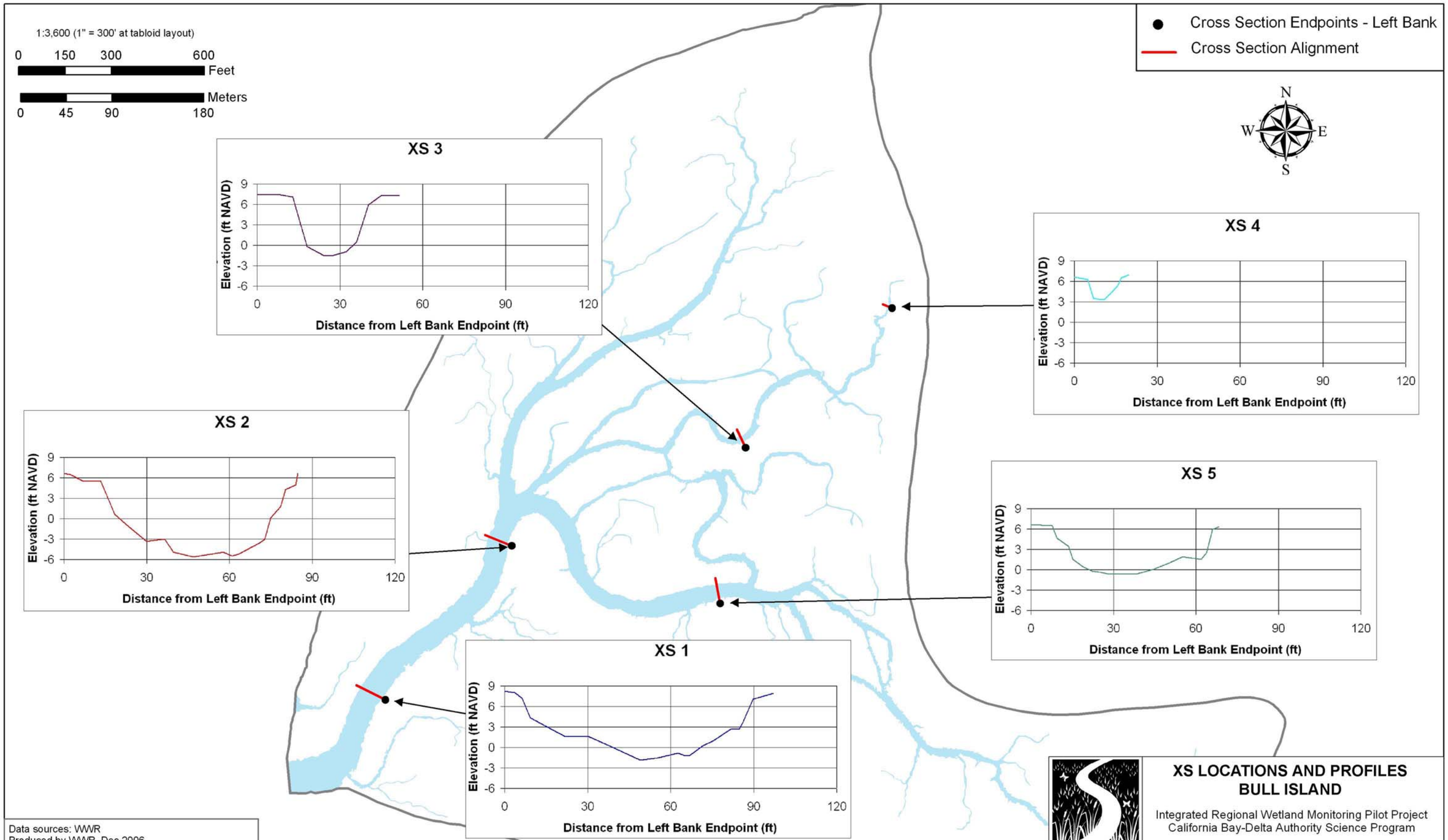
XS 3, 5, 7: Bathymetric survey - 1/22/2004
XS 4, 6: Total station survey - 12/4/2003, 1/22/2004

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
COON ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 18.3**



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: Brl_XS-locations_1067_2006-1211dg.mxd

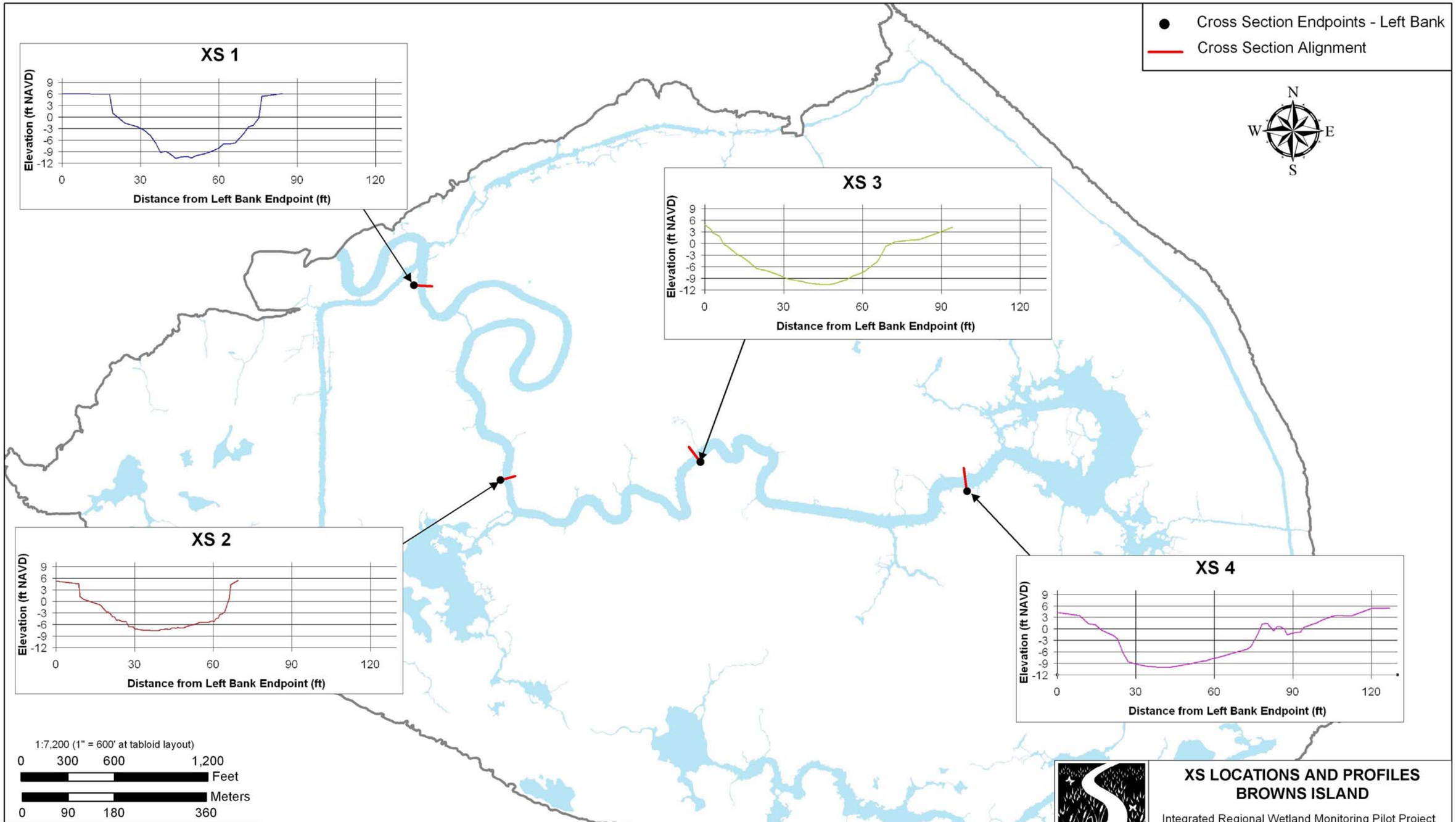
XS 1, 2, 5: Bathymetric survey - 1/21/2004
XS 3, 4: Total station survey - 12/12/2003

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
BULL ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 18.4**



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: Brl_XS-locations_1067_2006-1208dg.mxd

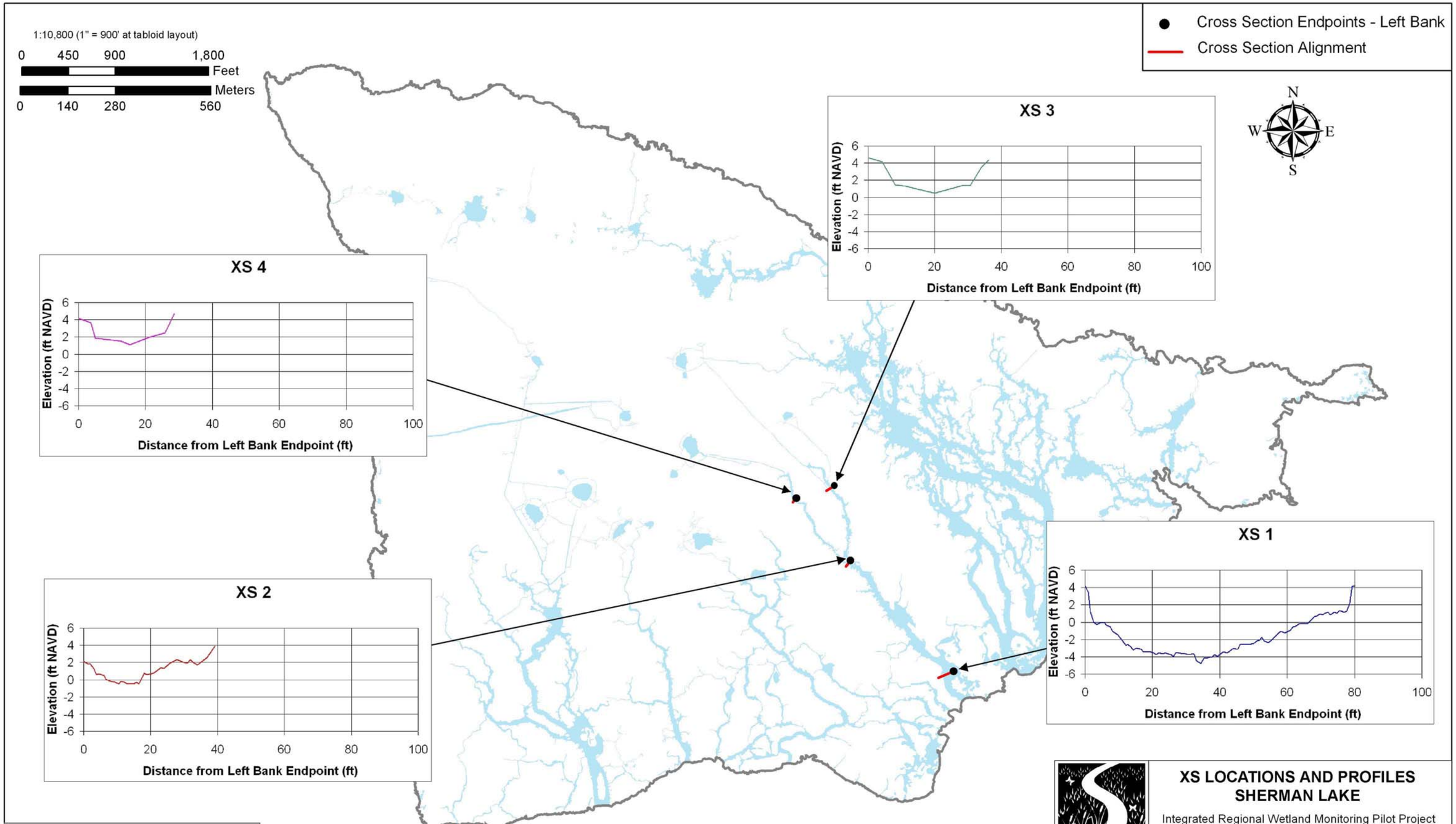
XS 1, 2, 3, 4: Bathymetric survey - 12/09/2004

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
BROWNS ISLAND

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 18.5**



Data sources: WWR
Produced by WWR, Dec 2006
GIS/Cartography by Dan Gillenwater
Map File: SL_XS-locations_1067_2006-1211dg.mxd

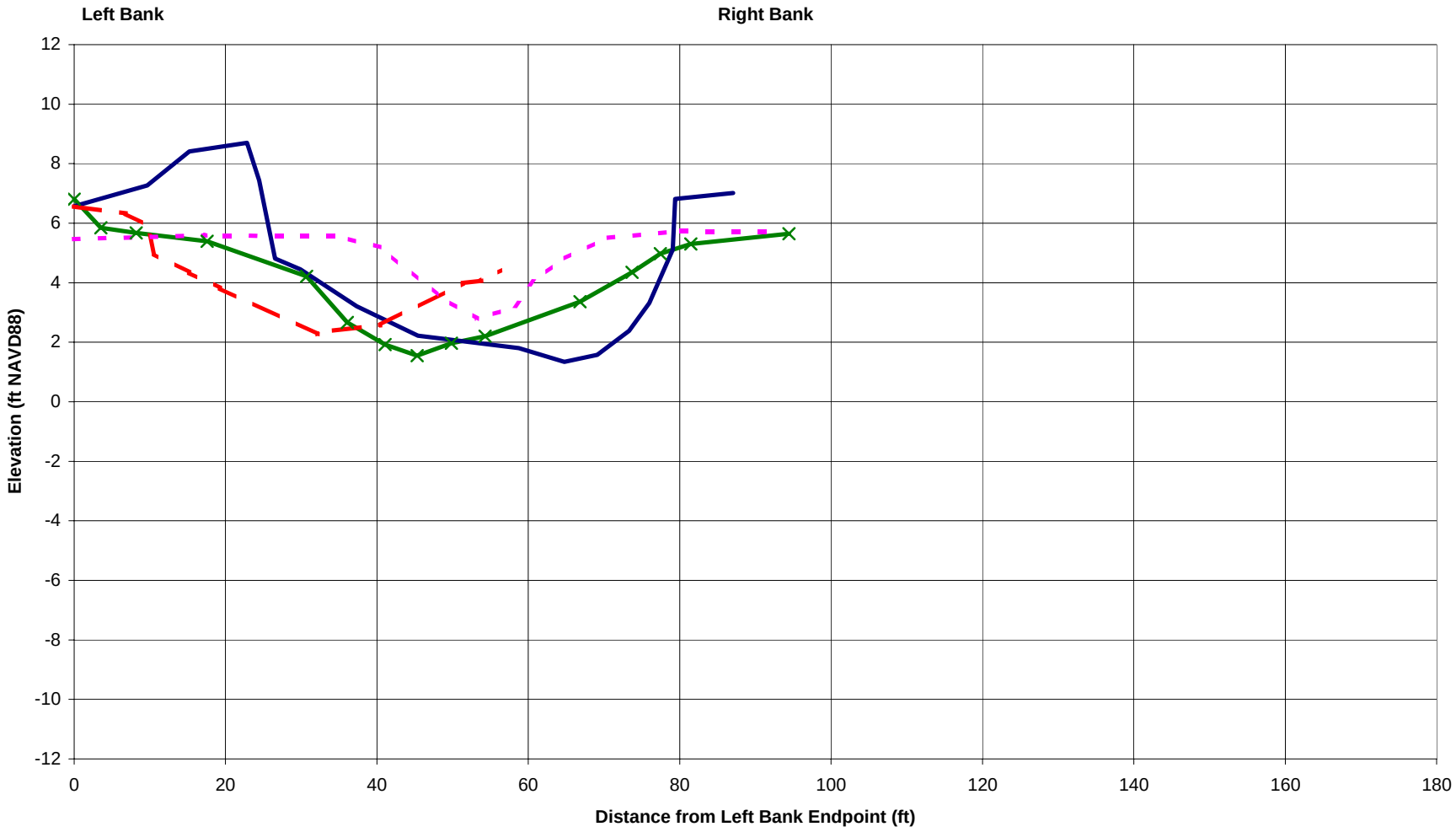
XS 1, 2: Bathymetric survey - 12/18/2003
XS 3, 4: Total station survey - 1/15/2004

WETLANDS AND WATER RESOURCES

XS LOCATIONS AND PROFILES
SHERMAN LAKE

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 18.6**



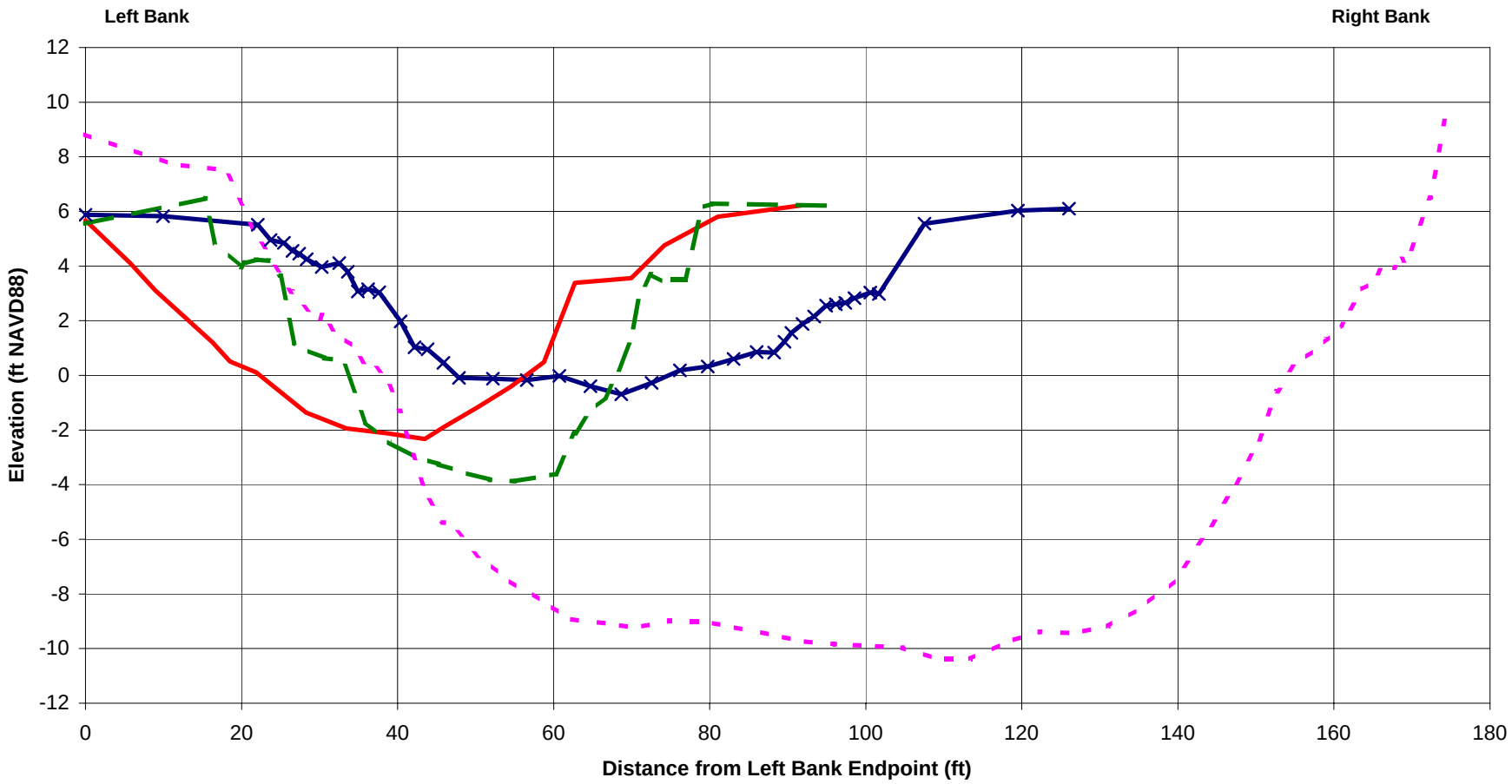
XS 2 — XS 3 - South Breach — XS 4 - North Breach — XS 5

TopCon Survey Date: 12/10/03

WETLANDS AND WATER RESOURCES, INC.

Carl's Marsh
Tidal Channel Cross Sectional Geometry
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.1



XS 1 XS 2 XS 3 XS 4

Hydrographic Survey Date: 12/19/03

WETLANDS AND WATER RESOURCES, INC.

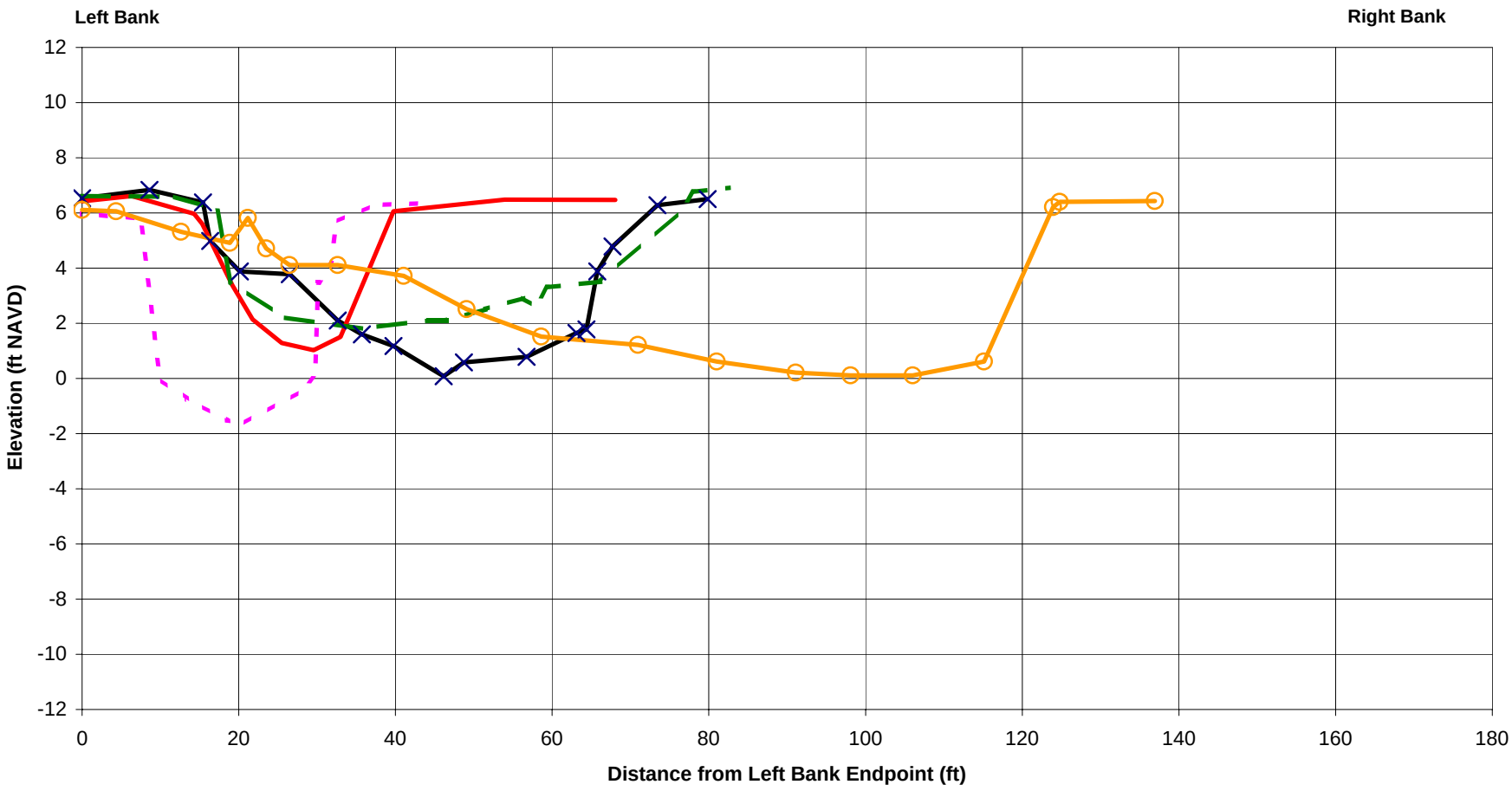
Pond 2A

Tidal Channel Cross Sectional Geometry

Integrated Regional Wetland Monitoring Pilot Project

California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.2



XS 3 XS 4 XS 5 XS 6 XS 7

Hydrographic and TopCon Survey Date: 1/22/04

WETLANDS AND WATER RESOURCES, INC.

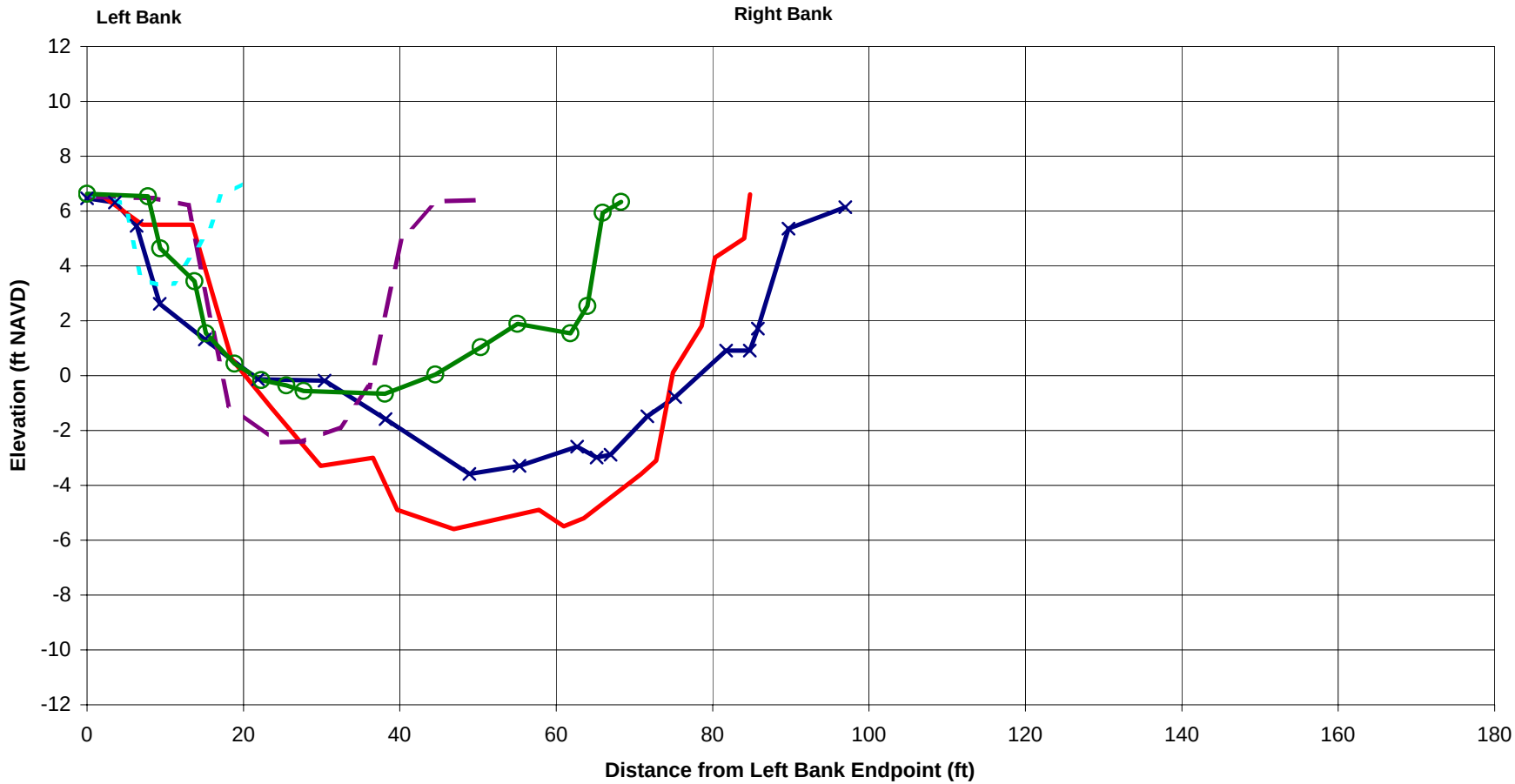
Coon Island

Tidal Channel Cross Sectional Geometry

Integrated Regional Wetland Monitoring Pilot Project

California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.3



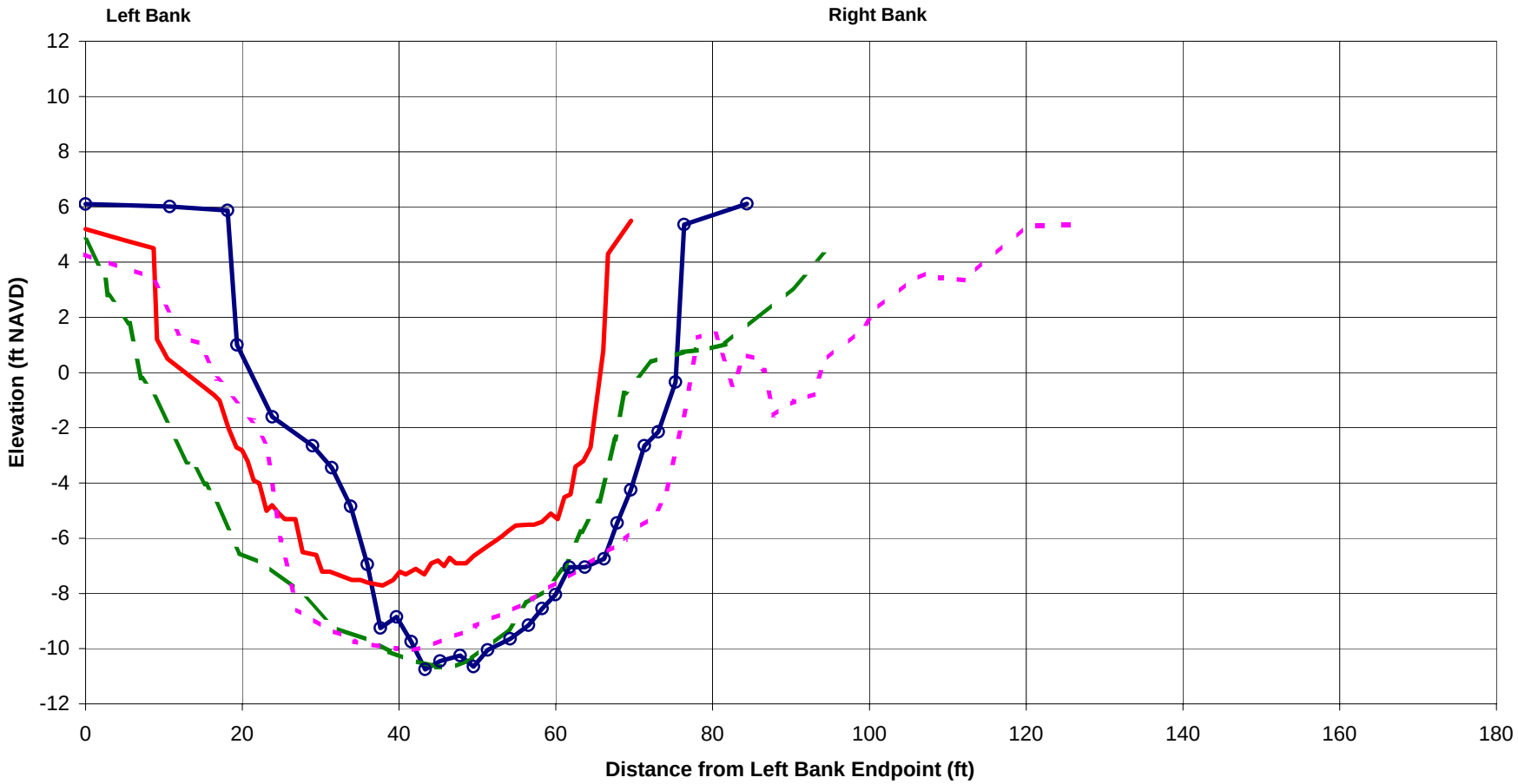
XS 1 XS 2 XS 3 XS 4 XS 5

TopCon Total Station Surveys XS-2, XS-3, XS-4: 12/12/03
Hydrographic Surveys XS-1, XS-2, XS-5: 1/21/04

WETLANDS AND WATER RESOURCES, INC.

Bull Island
Tidal Channel Cross Sectional Geometry
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.4



XS 1 XS 2 XS 3 XS 4

Hydrographic Survey Survey Date: 12/09/04

WETLANDS AND WATER RESOURCES, INC.

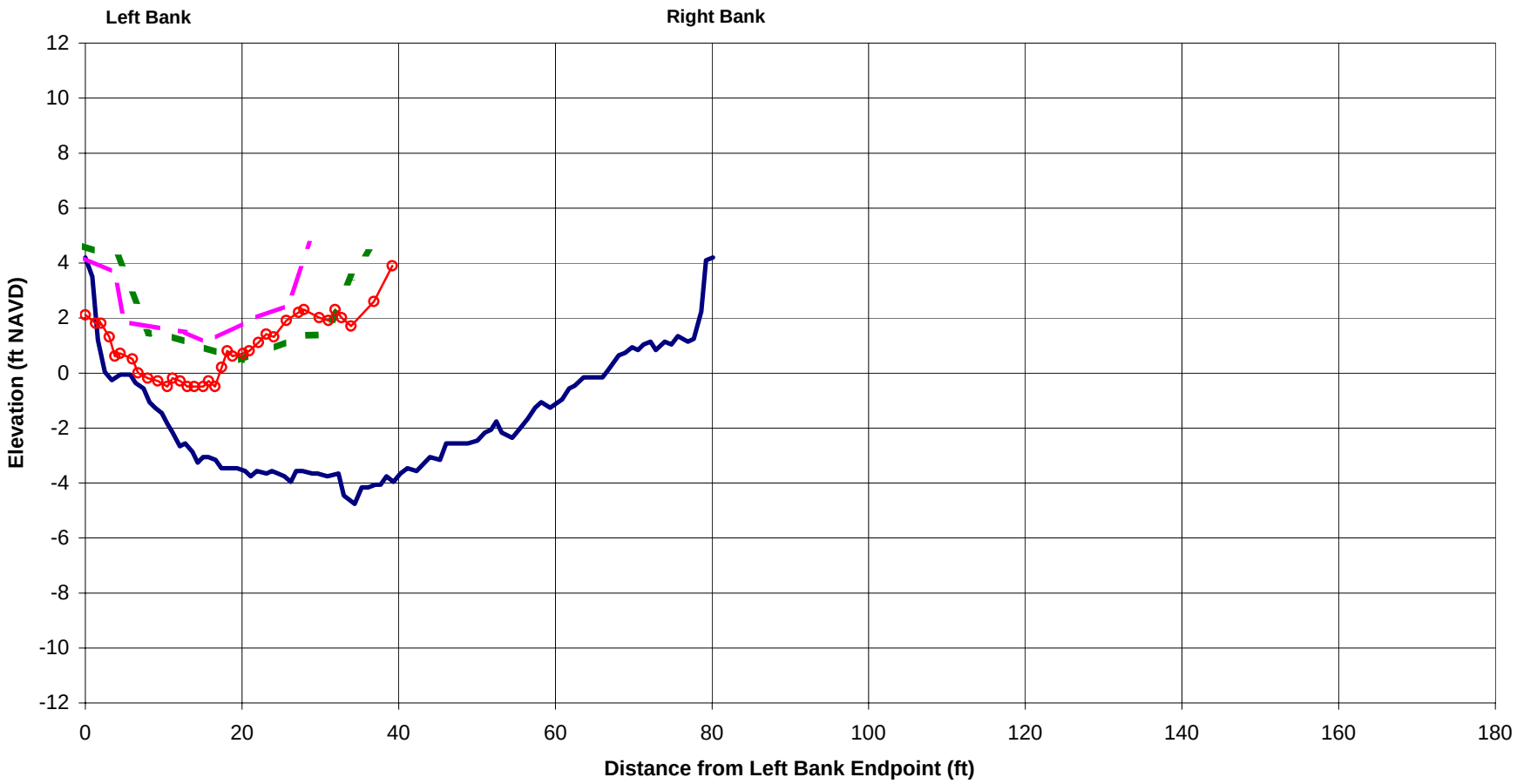
Browns Island

Tidal Channel Cross Sectional Geometry

Integrated Regional Wetland Monitoring Pilot Project

California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.5



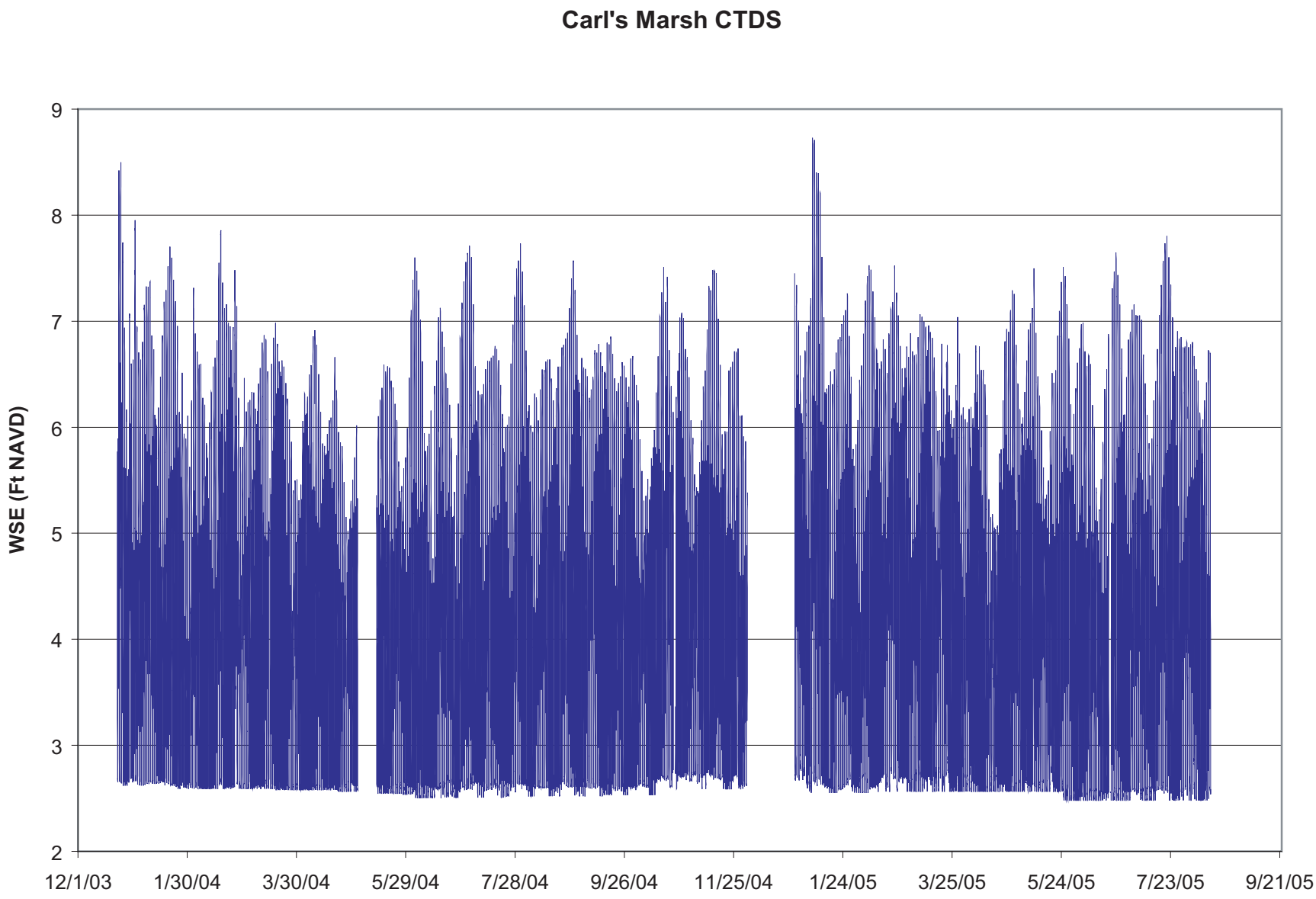
XS 1 XS 2 XS 3 XS 4

Hydrographic Surveys XS-1, XS-2: 12/18/03
TopCon Total Station Surveys XS-3, XS-4: 1/22/04

WETLANDS AND WATER RESOURCES, INC.

Sherman Island
Tidal Channel Cross Sectional Geometry
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Science Program

Jan 2006	Project No. 1067	Figure 19.6

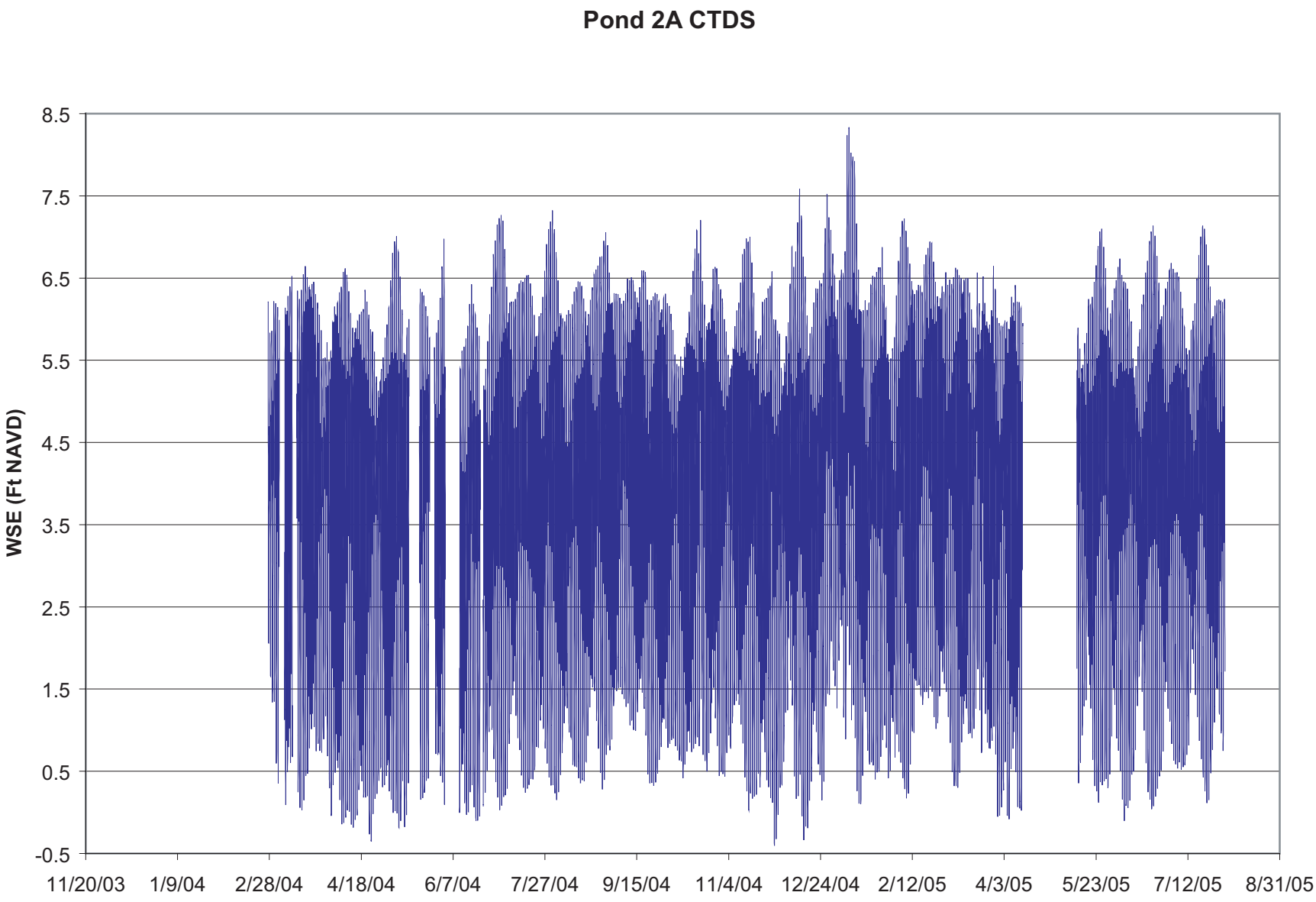


WETLANDS AND WATER RESOURCES

Carl's Marsh CTDS
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 20.1**

Fig-20.1_CM_CTDS_WSE_2007-0810lee.pdf

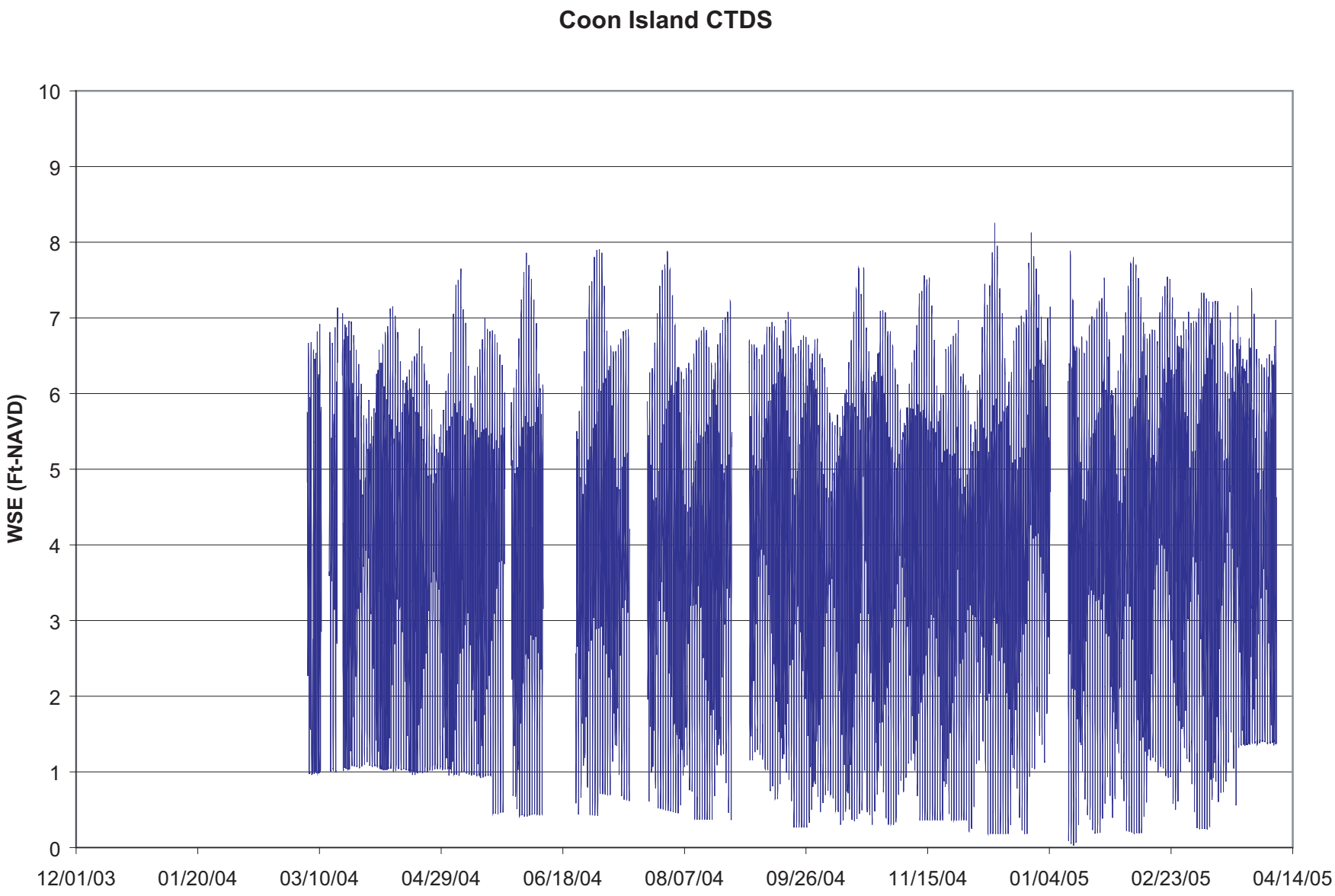


WETLANDS AND WATER RESOURCES

Pond 2A CTDS
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 20.2**

Fig-20.2_P2A_CTDS_WSE_2007-0810lee.pdf

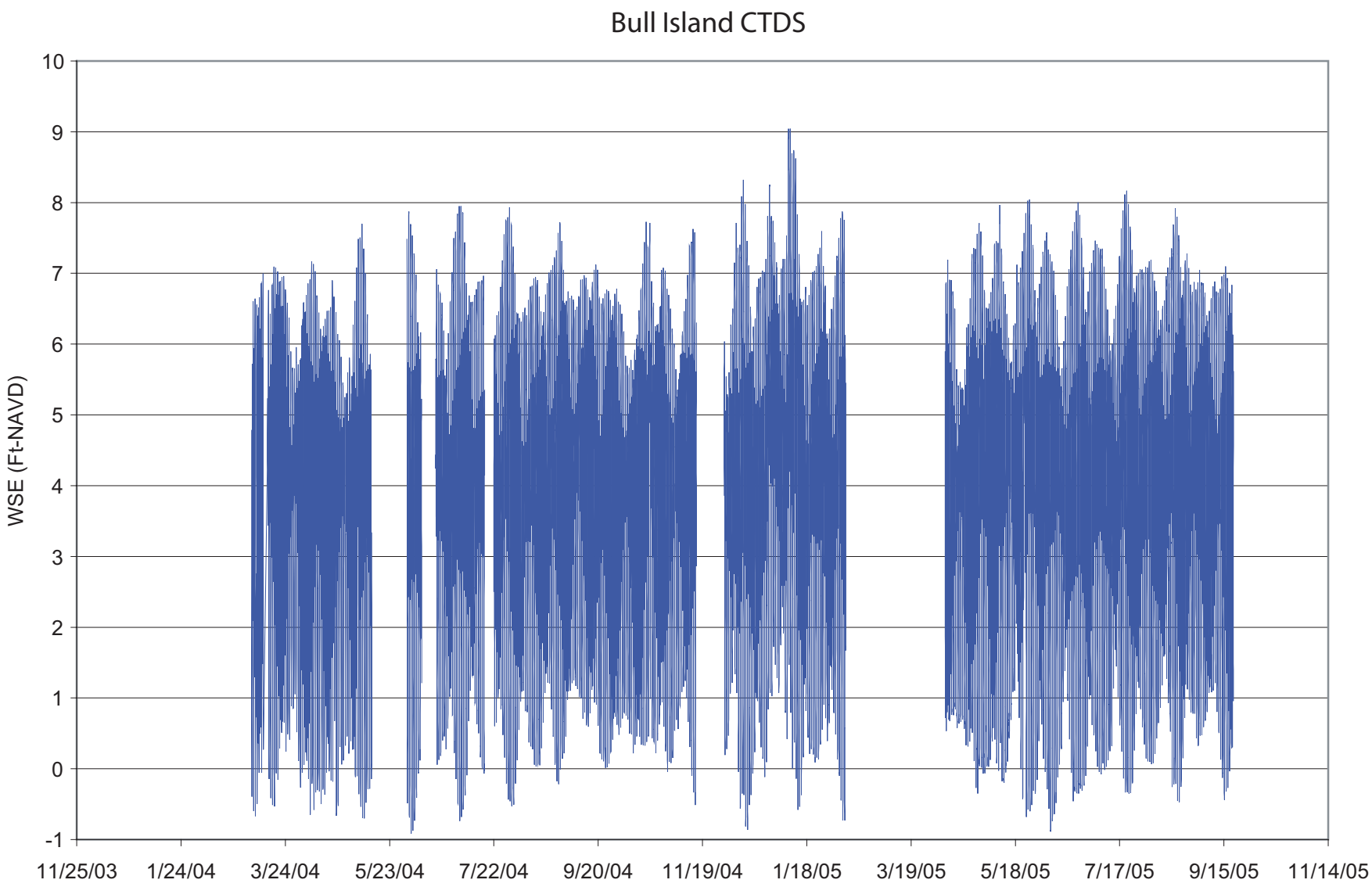


WETLANDS AND WATER RESOURCES

Coon Island CTDS
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 20.3**

Fig-20.3_CI_CTDS_WSE_2007-0810lee.pdf

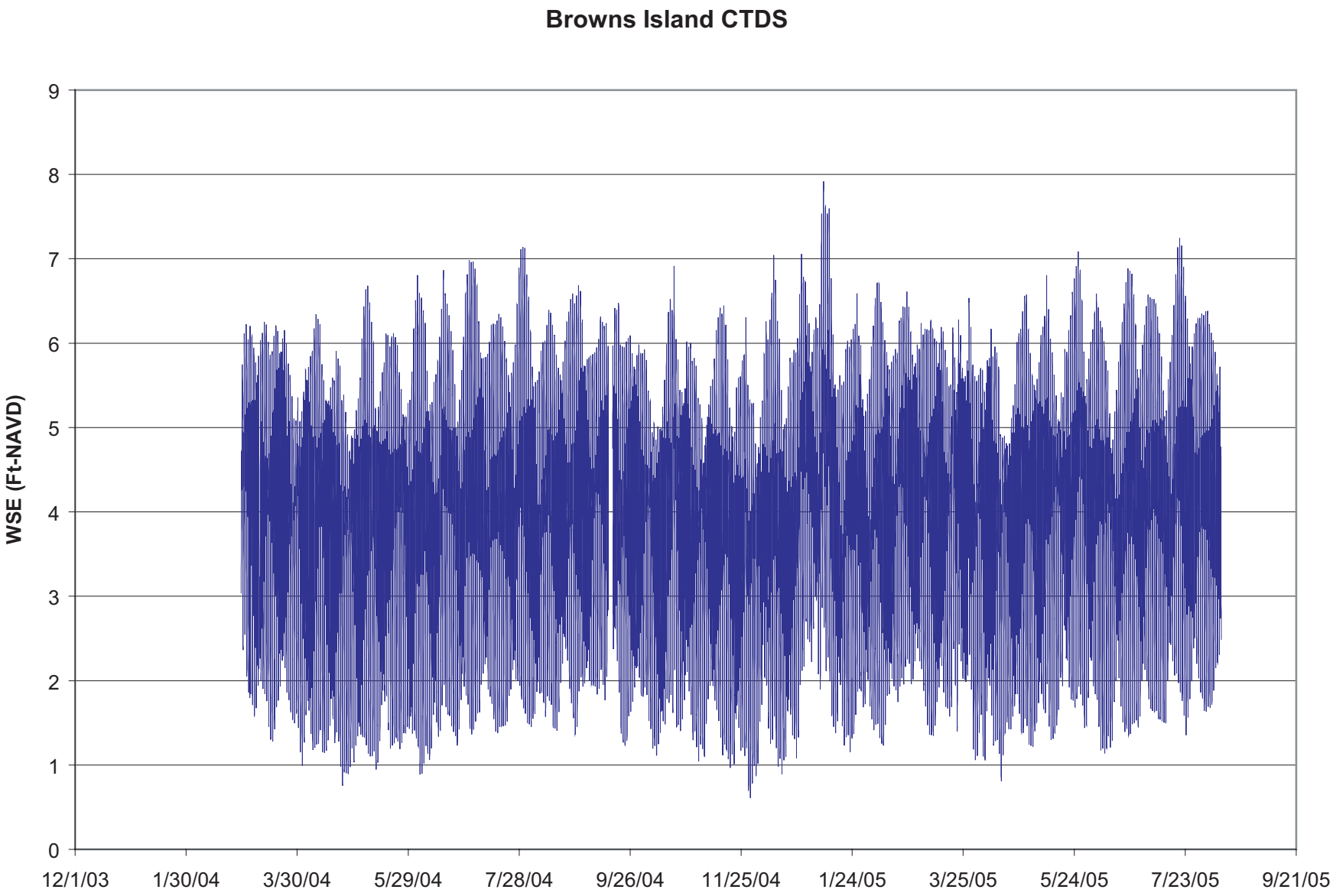


WETLANDS AND WATER RESOURCES

Bull Island CTDS
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 20.4**

Fig-20.4_Bul_CTDS_WSE_2007-0810lee.pdf



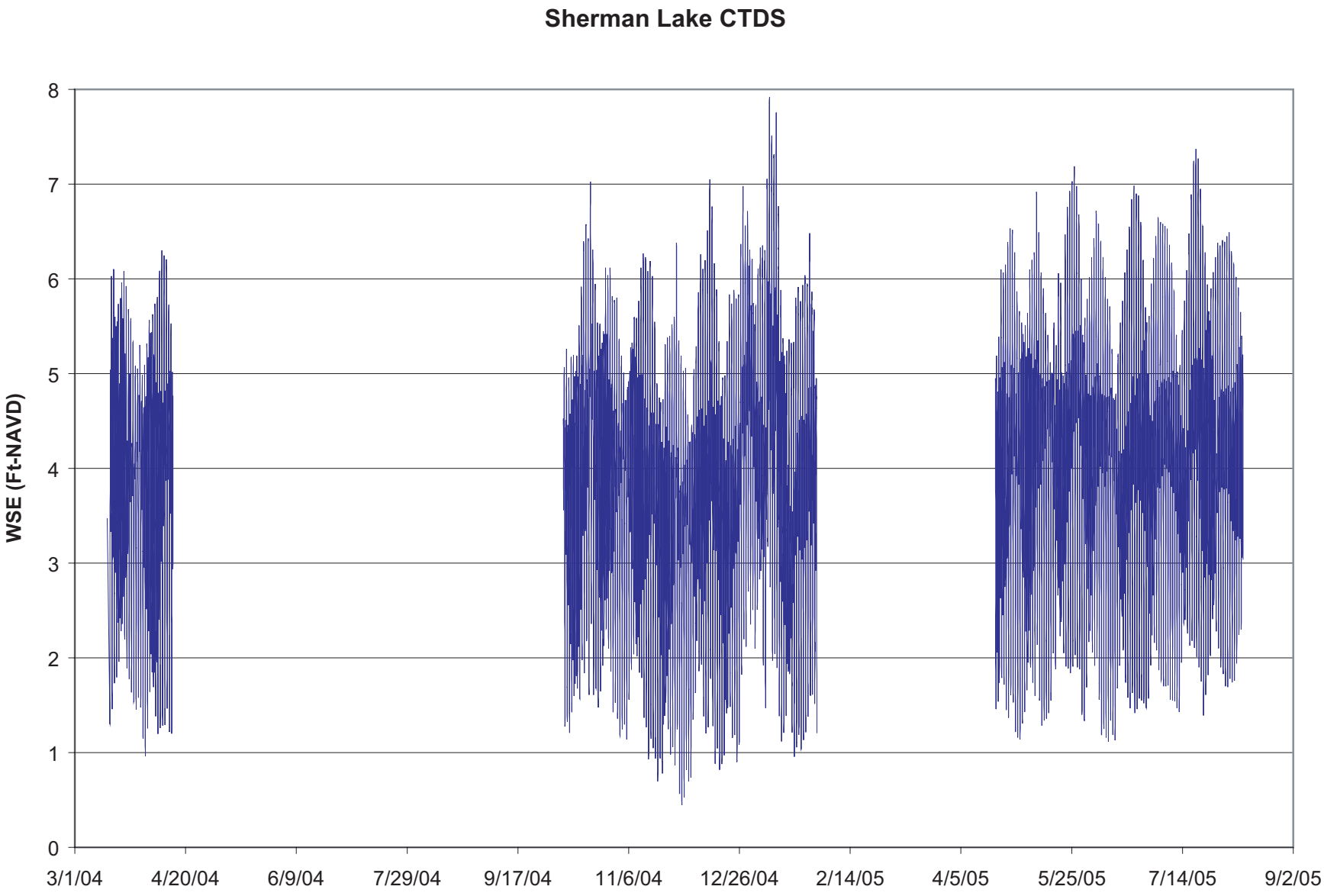
WETLANDS AND WATER RESOURCES

Browns Island CTDS Station
Water Surface Elevation Time-Series Data

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 20.5**

Fig_20.5_Brl_CTDS_2007-0810lee.pdf

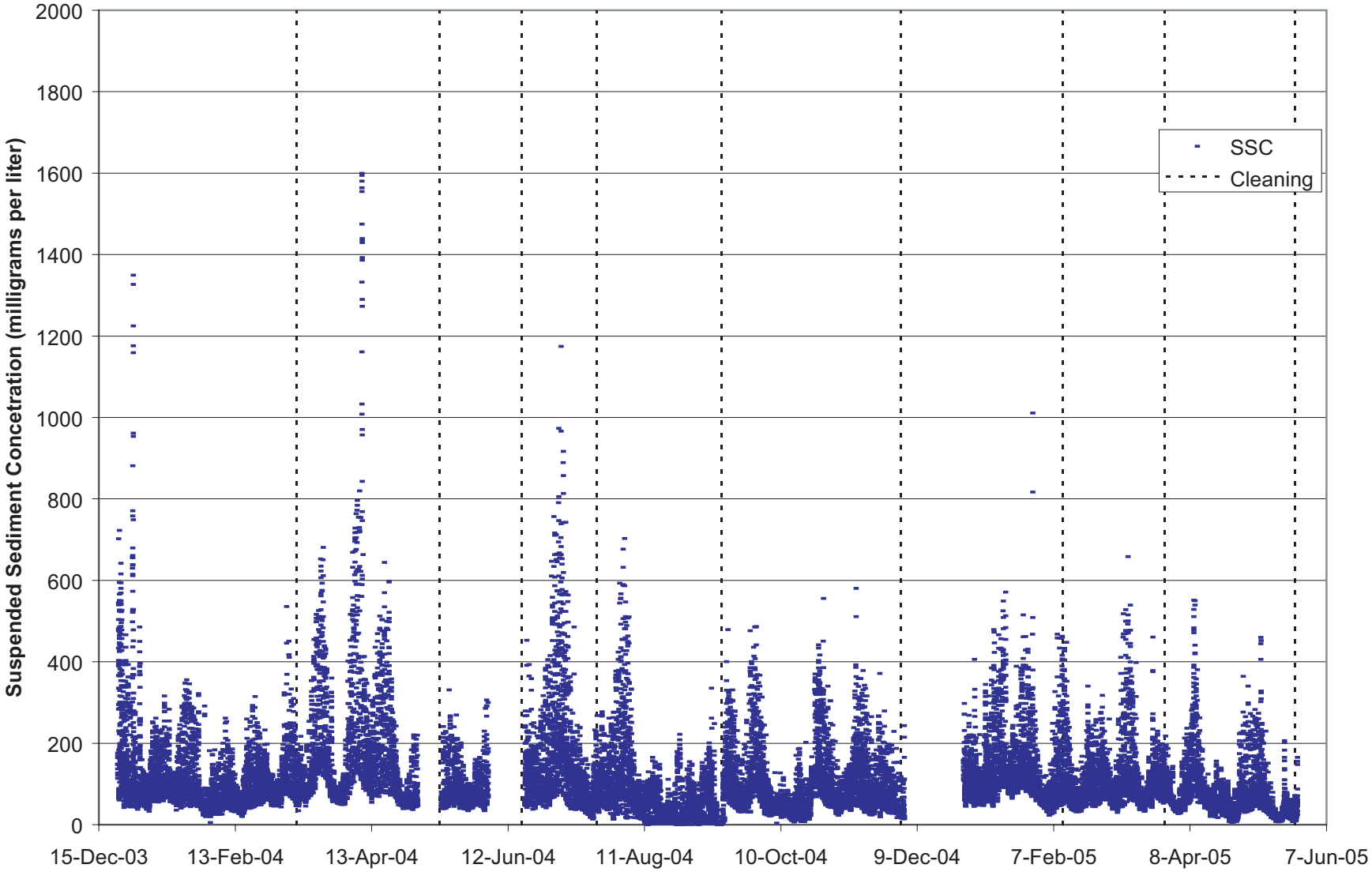


WETLANDS AND WATER RESOURCES

Sherman Lake CTDS
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 20.6**

Fig-20.6_SL_CTDS_WSE_2007-0810lee.pdf



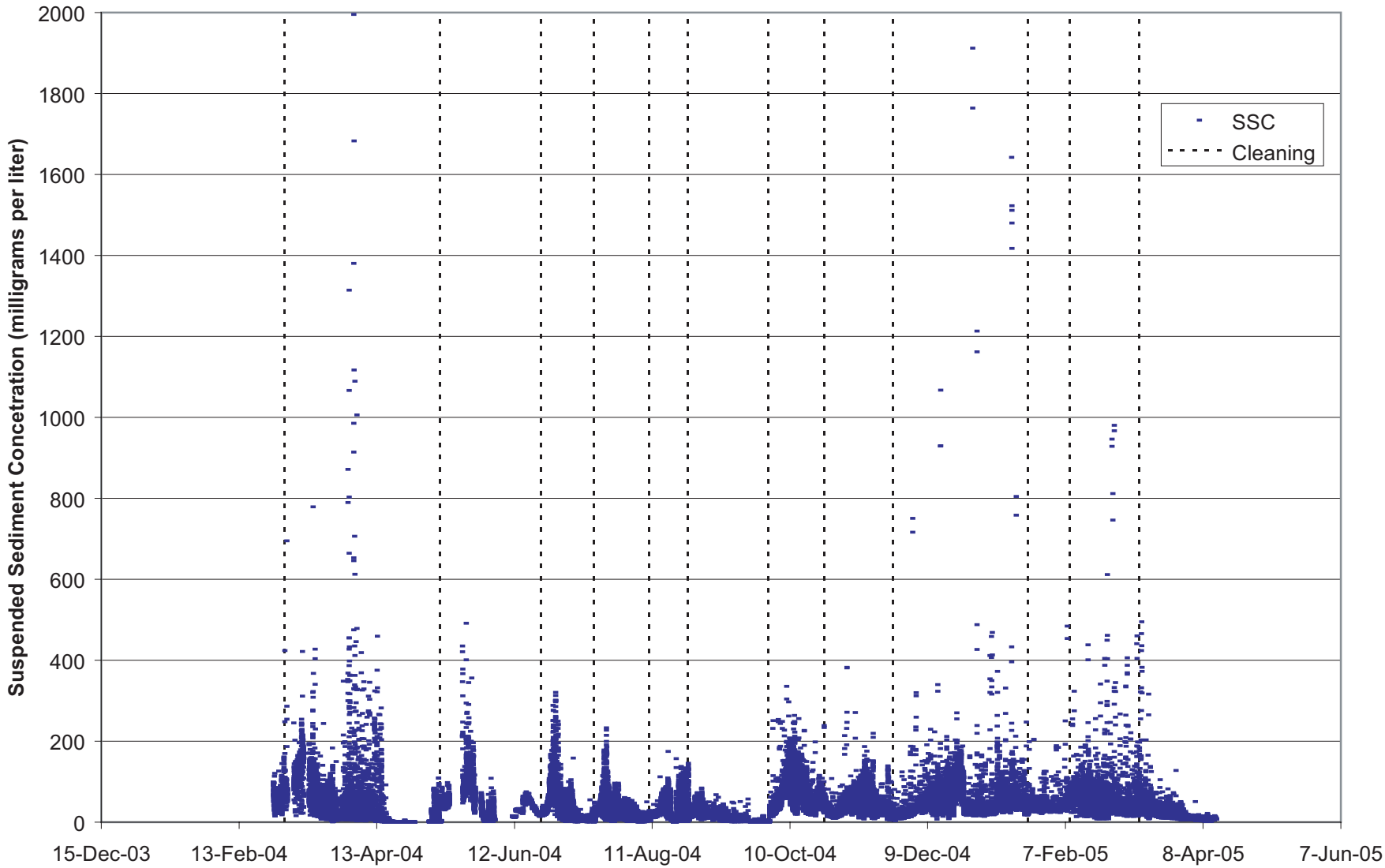
1067_CM_Final_OBS_SSC_2007-0806trc

WETLANDS AND WATER RESOURCES

Carl's Marsh Inlet Channel
Suspended Sediment Concentrations

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Dec 2006	Project No. 1067	**Figure 21.1**

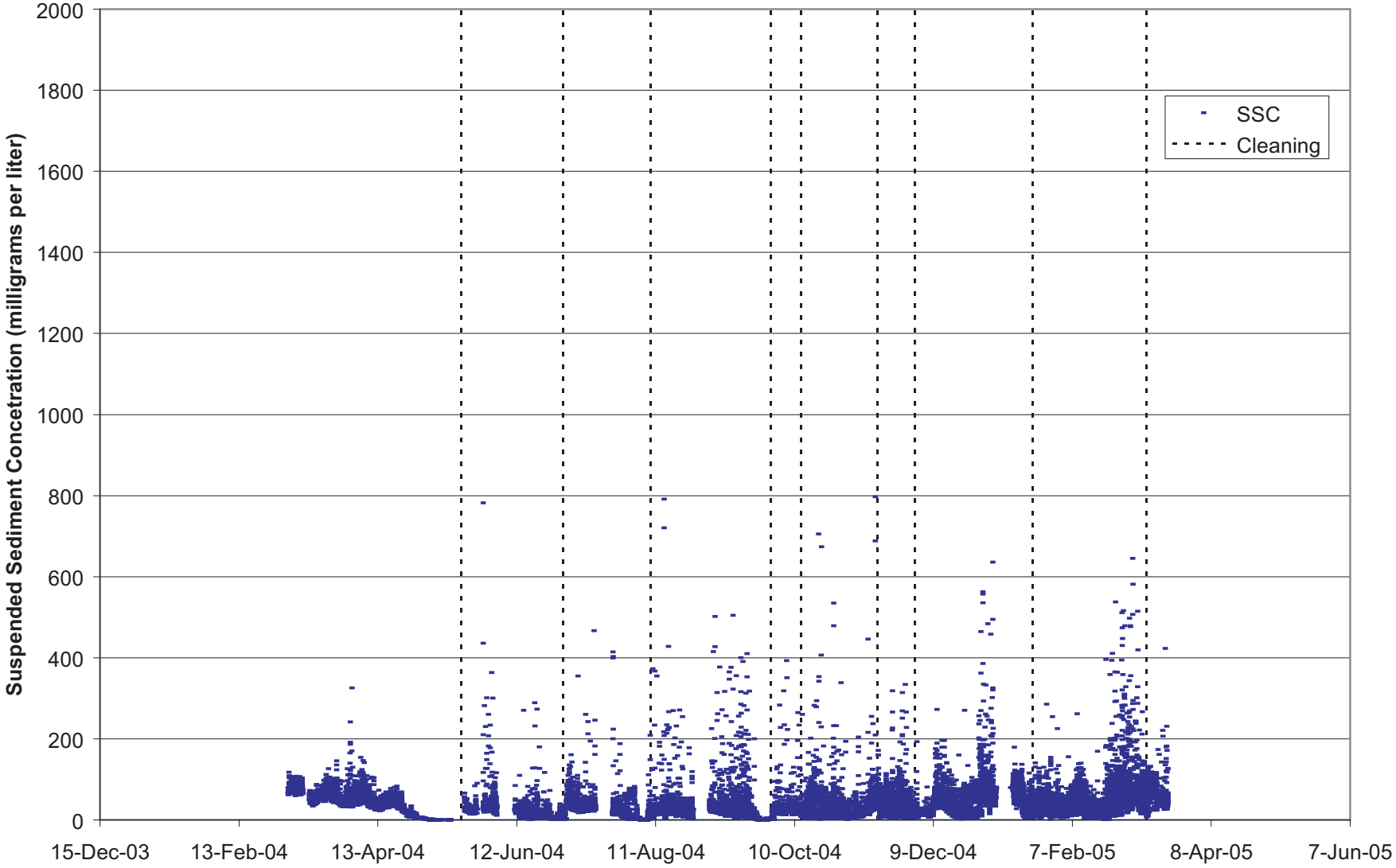


1067_P2A_Final_OBS_SSC_2007-0806trc

WETLANDS AND WATER RESOURCES

Pond 2A Inlet Channel
Suspended Sediment Concentrations
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Dec 2006	Project No. 1067	**Figure 21.2**

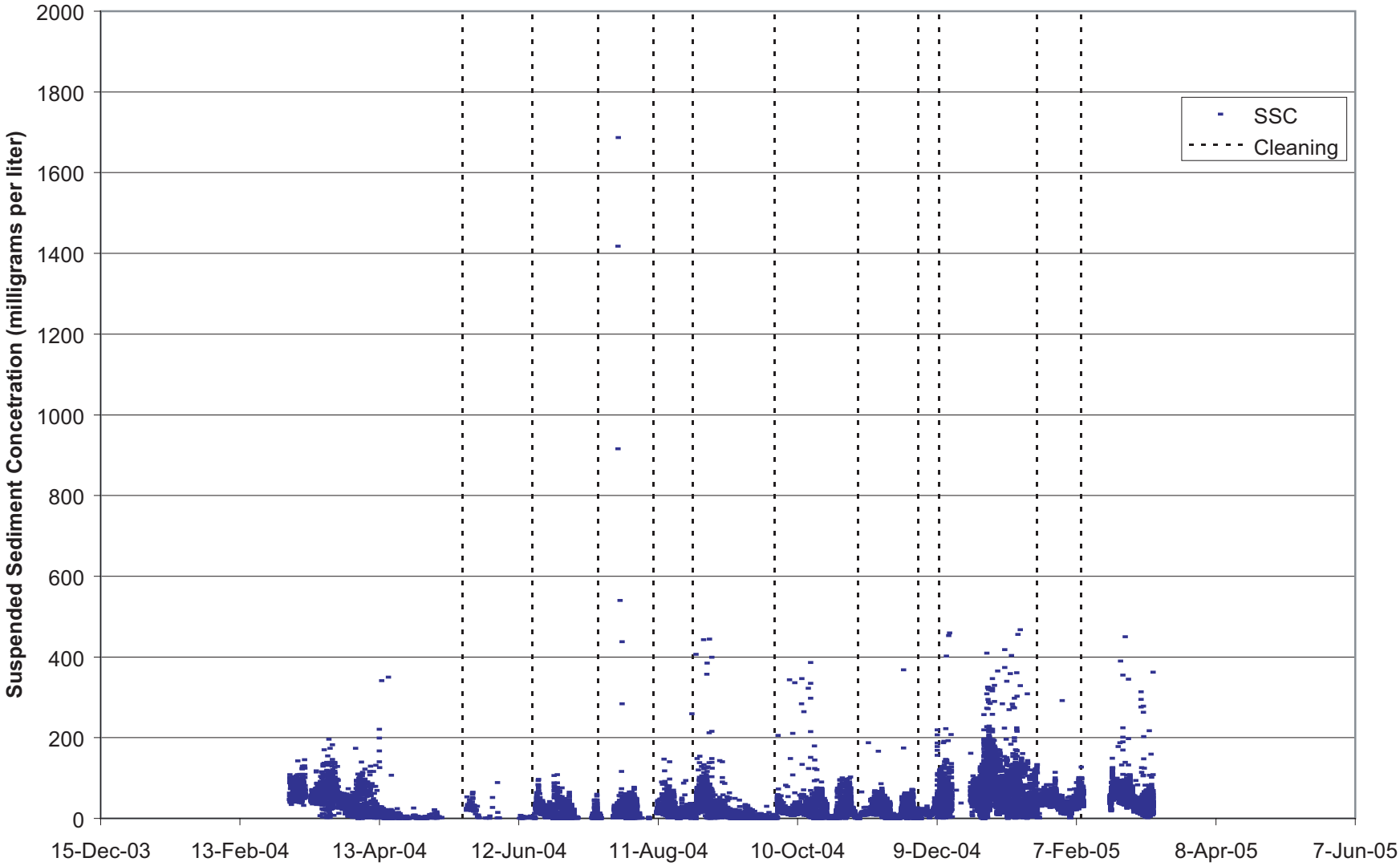


1067_CI_Final_OBS_SSC_2007-0806trc

WETLANDS AND WATER RESOURCES

Coon Island Inlet Channel
Suspended Sediment Concentrations
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Dec 2006	Project No. 1067	**Figure 21.3**

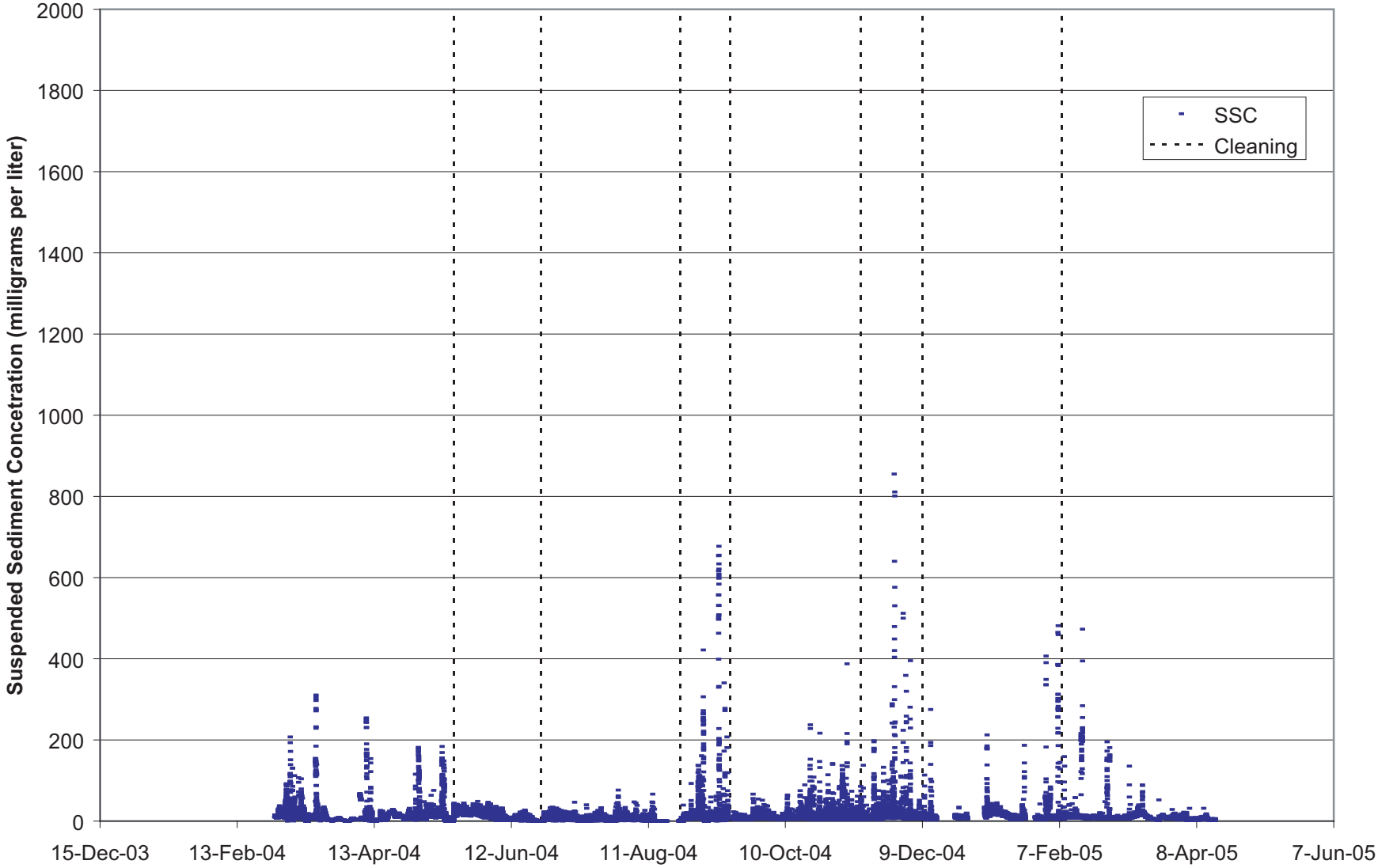


1067_Bul_Final_OBS_SSC_2007-0806trc

WETLANDS AND WATER RESOURCES

Bull Island Inlet Channel
Suspended Sediment Concentrations
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Dec 2006	Project No. 1067	**Figure 21.4**

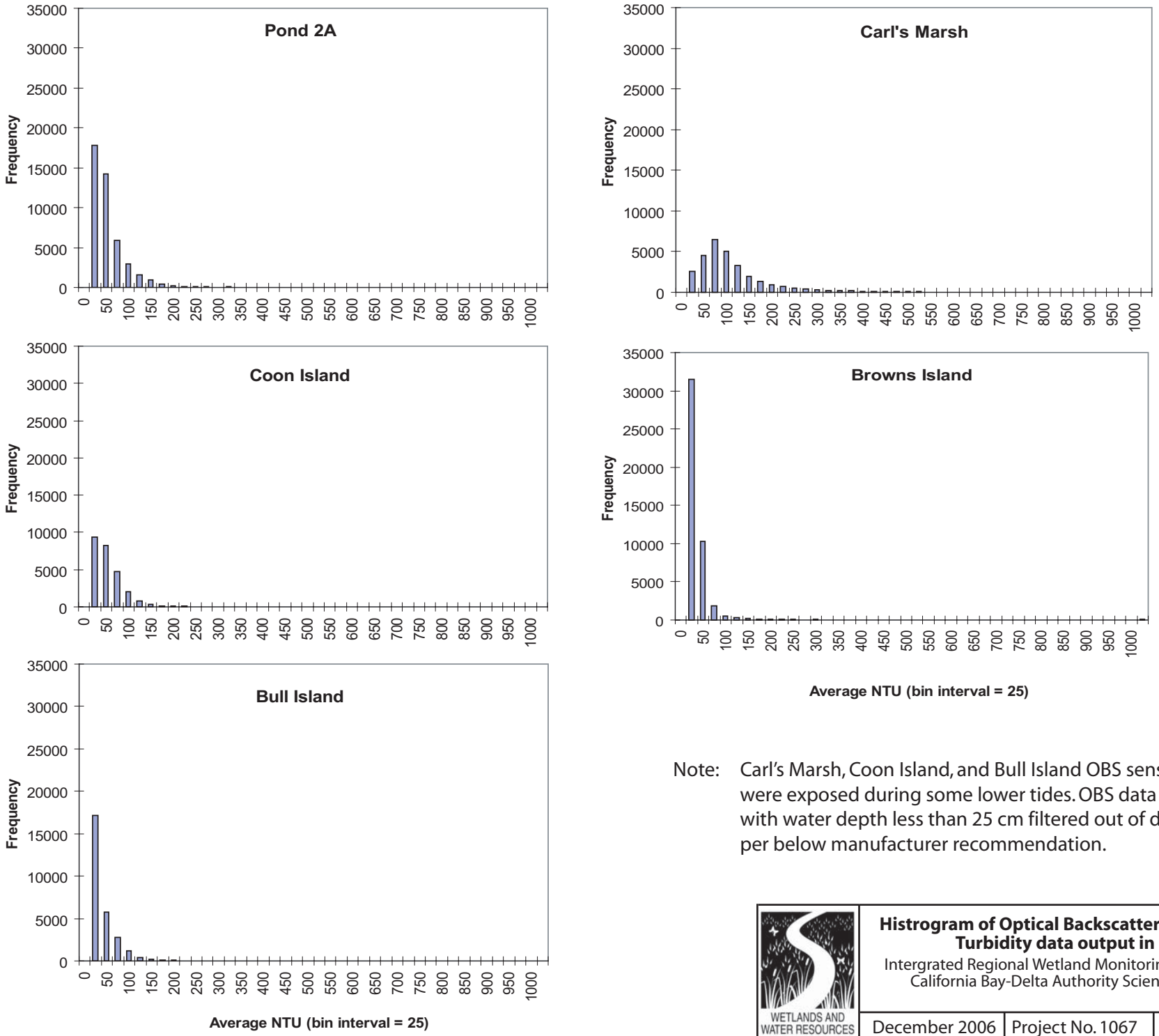


1067_Brl_Final_OBS_SSC_2007-0802trc

WETLANDS AND WATER RESOURCES

Browns Island Inlet Channel
Suspended Sediment Concentrations
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

Dec 2006	Project No. 1067	**Figure 21.5**



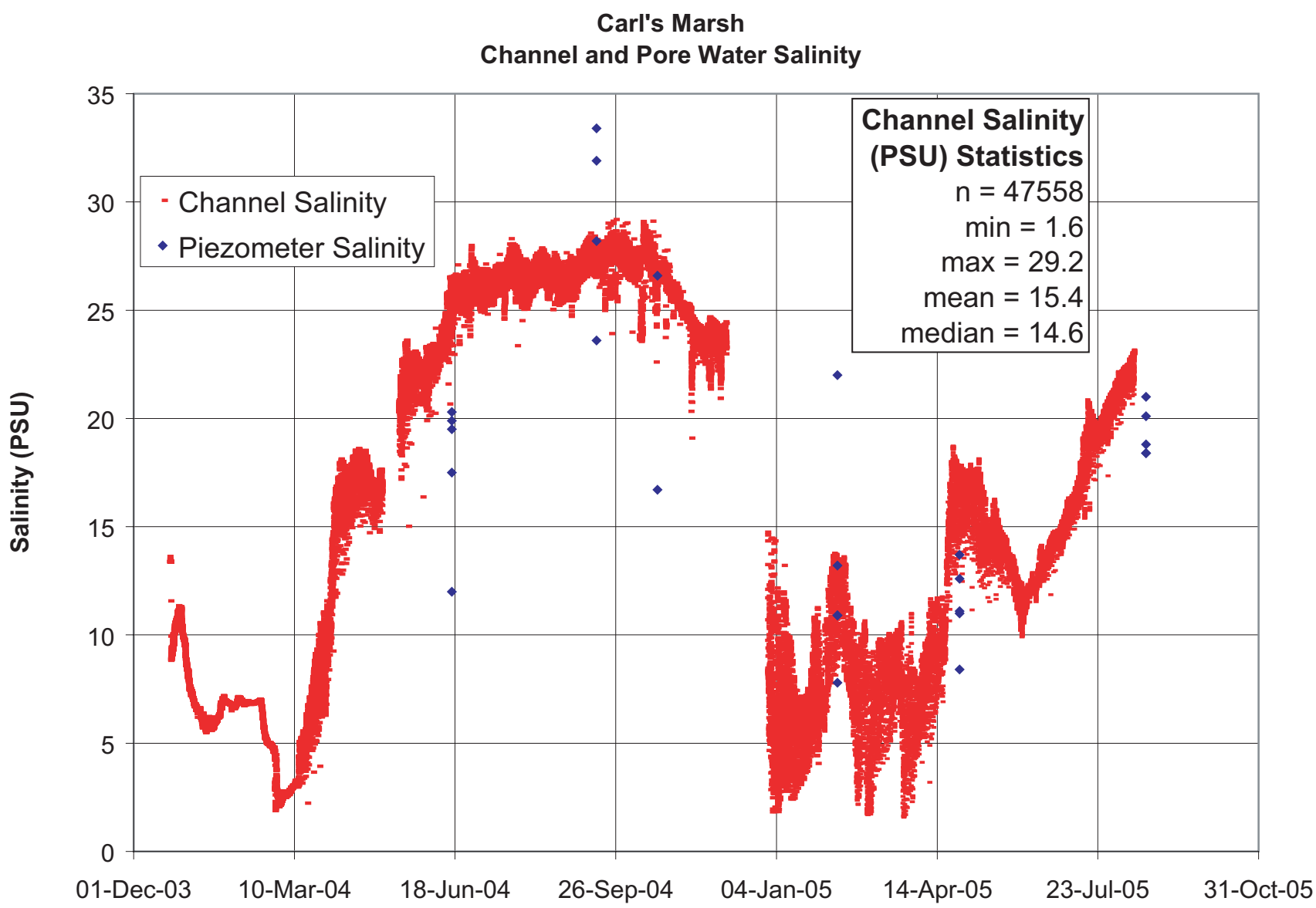
Note: Carl's Marsh, Coon Island, and Bull Island OBS sensors were exposed during some lower tides. OBS data coincident with water depth less than 25 cm filtered out of data set per below manufacturer recommendation.

WETLANDS AND WATER RESOURCES

Histrogram of Optical Backscatter Sensor (OBS) Turbidity data output in NTU

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 21.6**



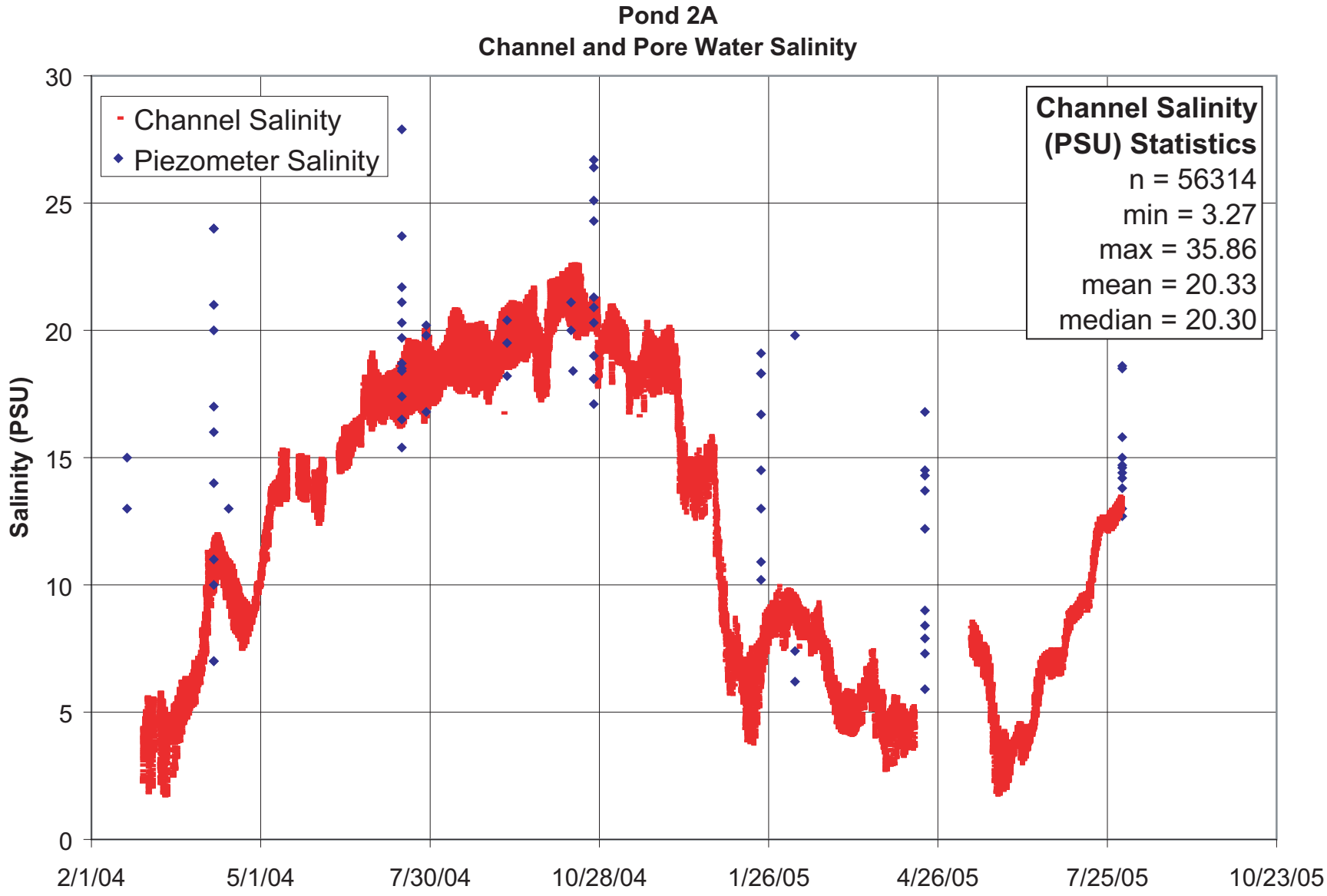
Carl's Marsh CTDS Station Conductivity Time-Series Data

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 22.1**

1067_CM_Conductivity_Updated_Dec_2006-1230trc.xls

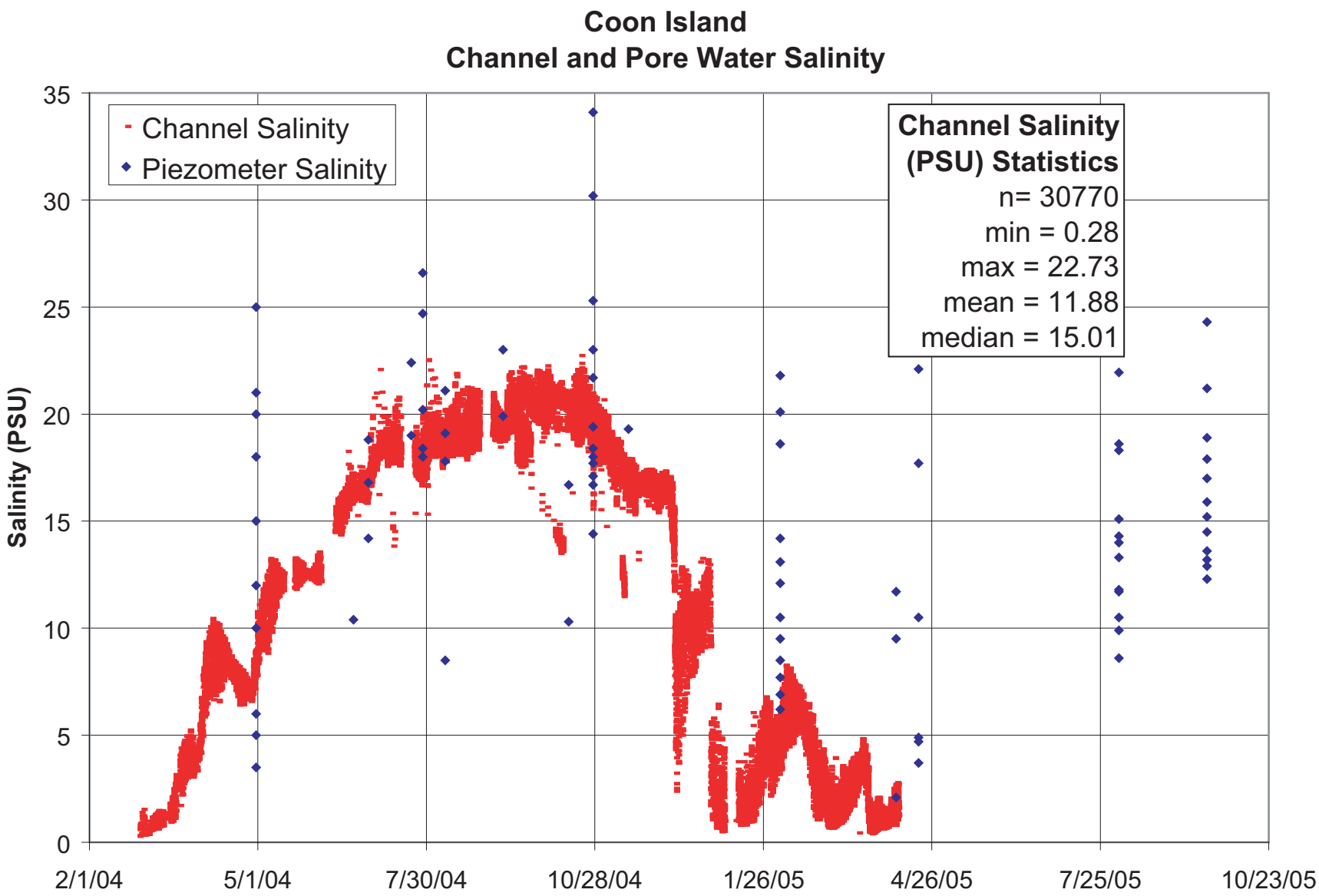


Pond 2A CTDS Station
Conductivity Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 22.2**

Fig-22.2_P2A_Conductivity_2006-1231.pdf



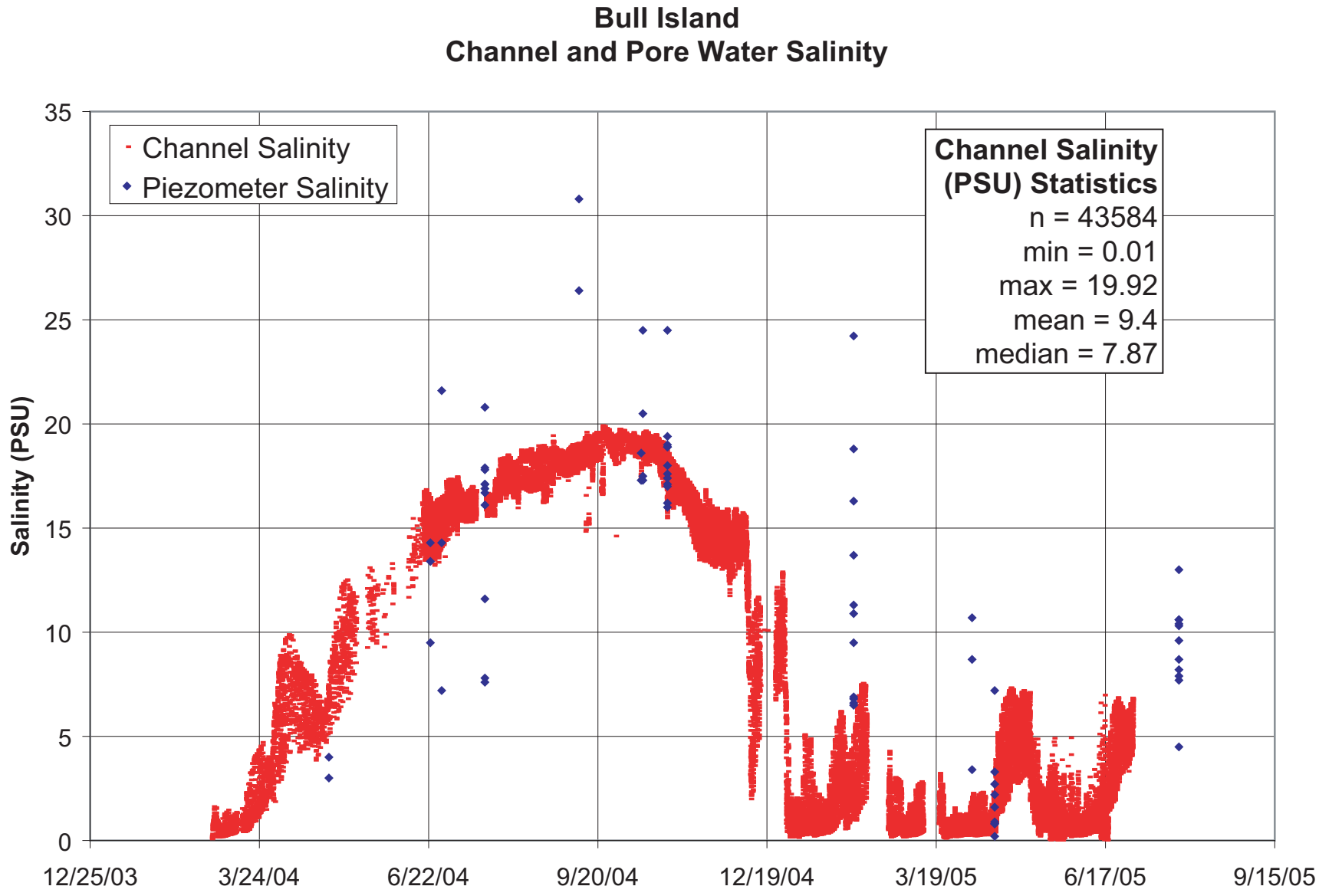
Coon Island CTDS Station Conductivity Time-Series Data

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006 | Project No. 1067 | **Figure 22.3**

Fig-22.3_CI_Conductivity_2006-1231.pdf

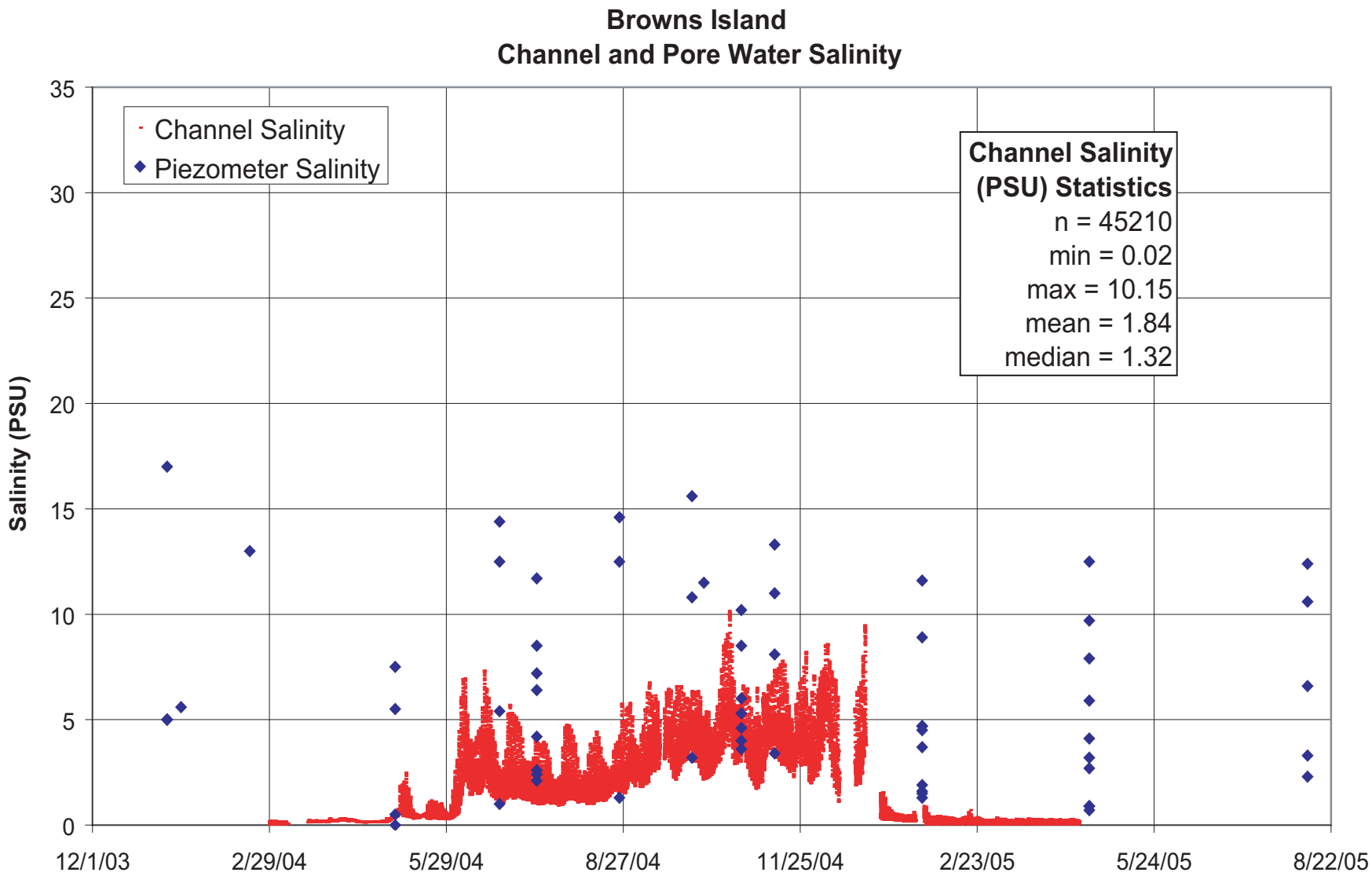


Bull Island CTDS Station
Conductivity Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 22.4**

1067_Bul_Conductivity_Updated_Dec_2006-1230trc.xls



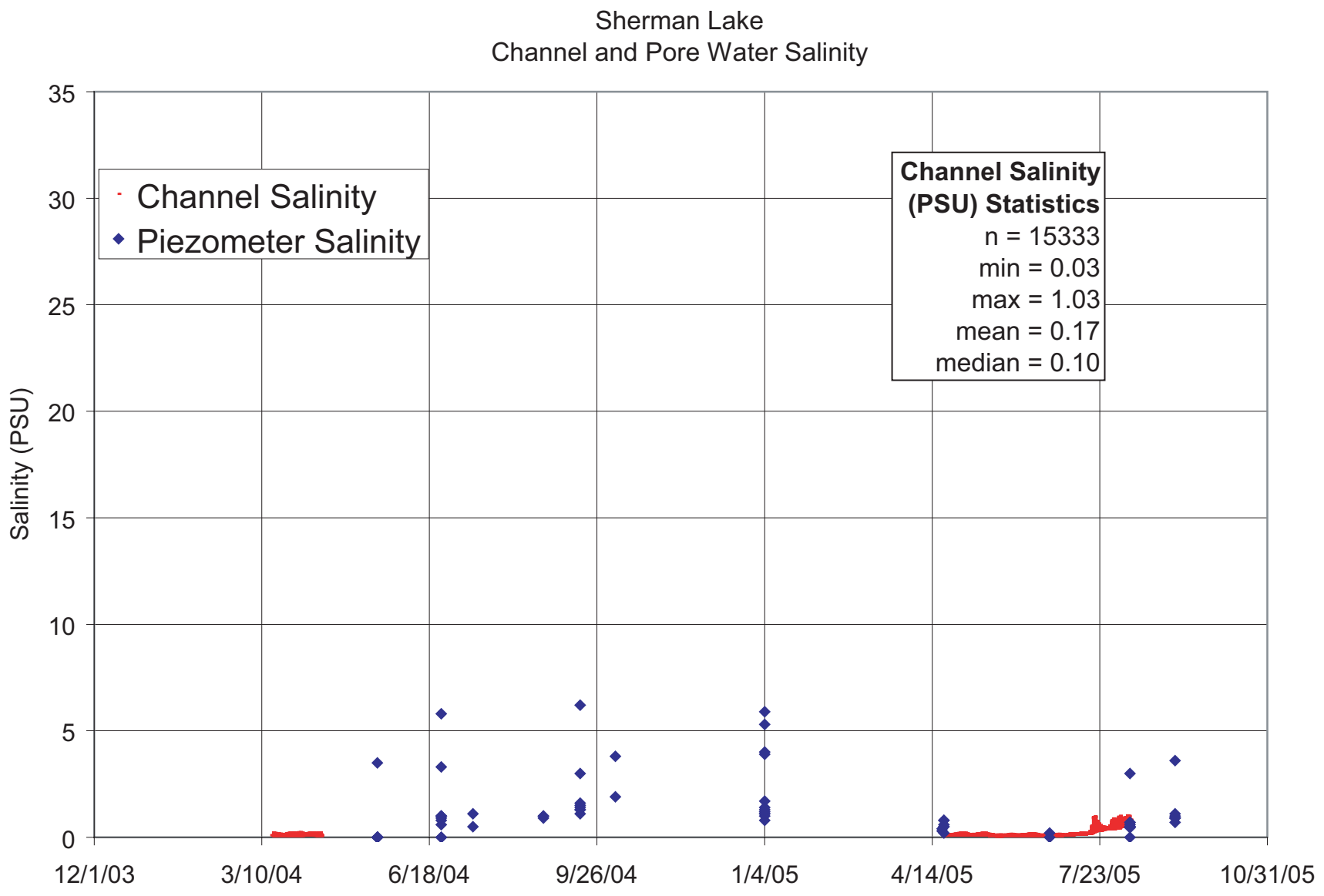
Browns Island CTDS Station Conductivity Time-Series Data

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 22.5**

Fig-22.5_Brl_Conductivity_2006-1231.pdf



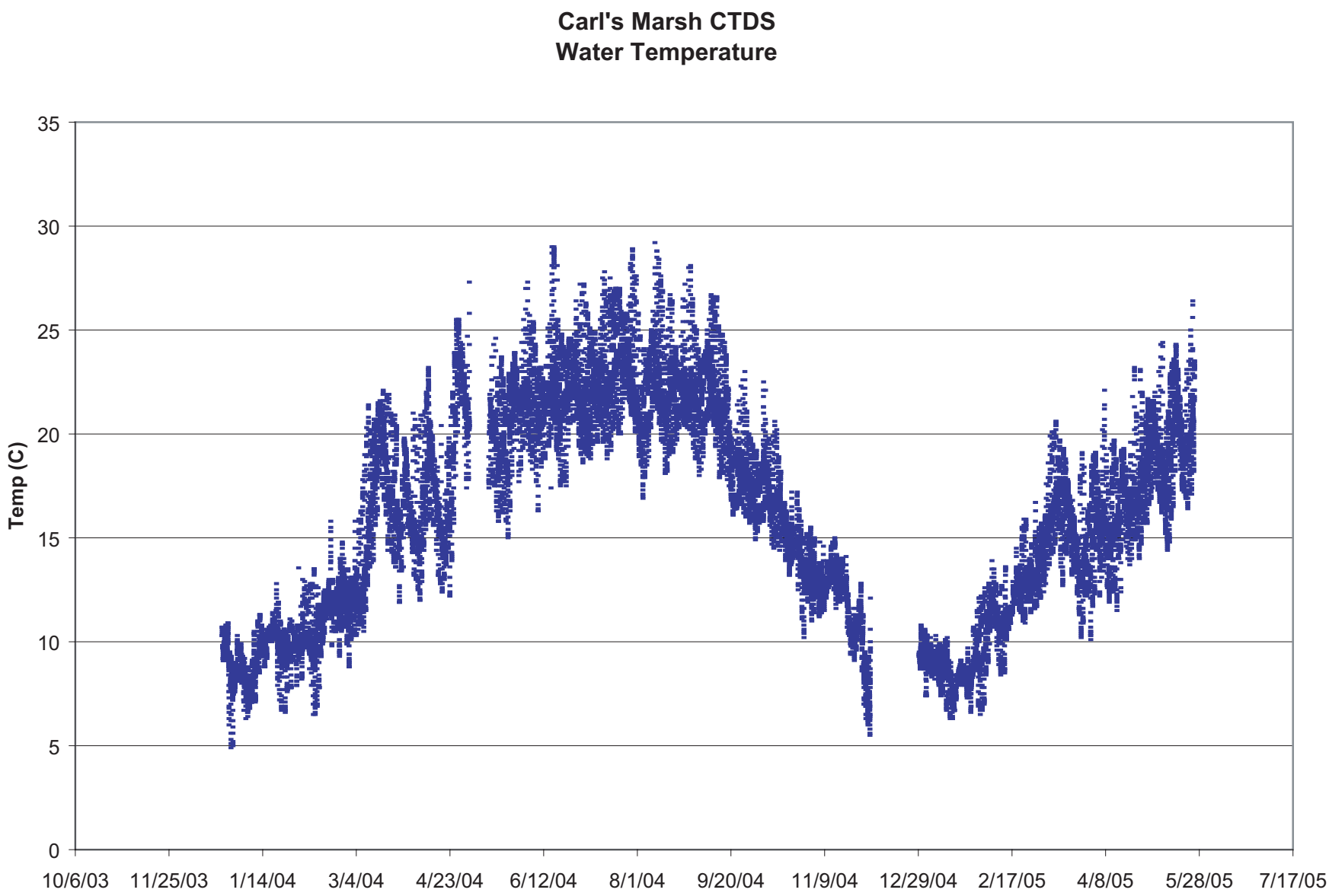
WETLANDS AND WATER RESOURCES

Sherman Lake CTDS Station
Conductivity Time-Series Data

Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 22.6**

Fig-22.6_SL_Conductivity_2006-1231.pdf

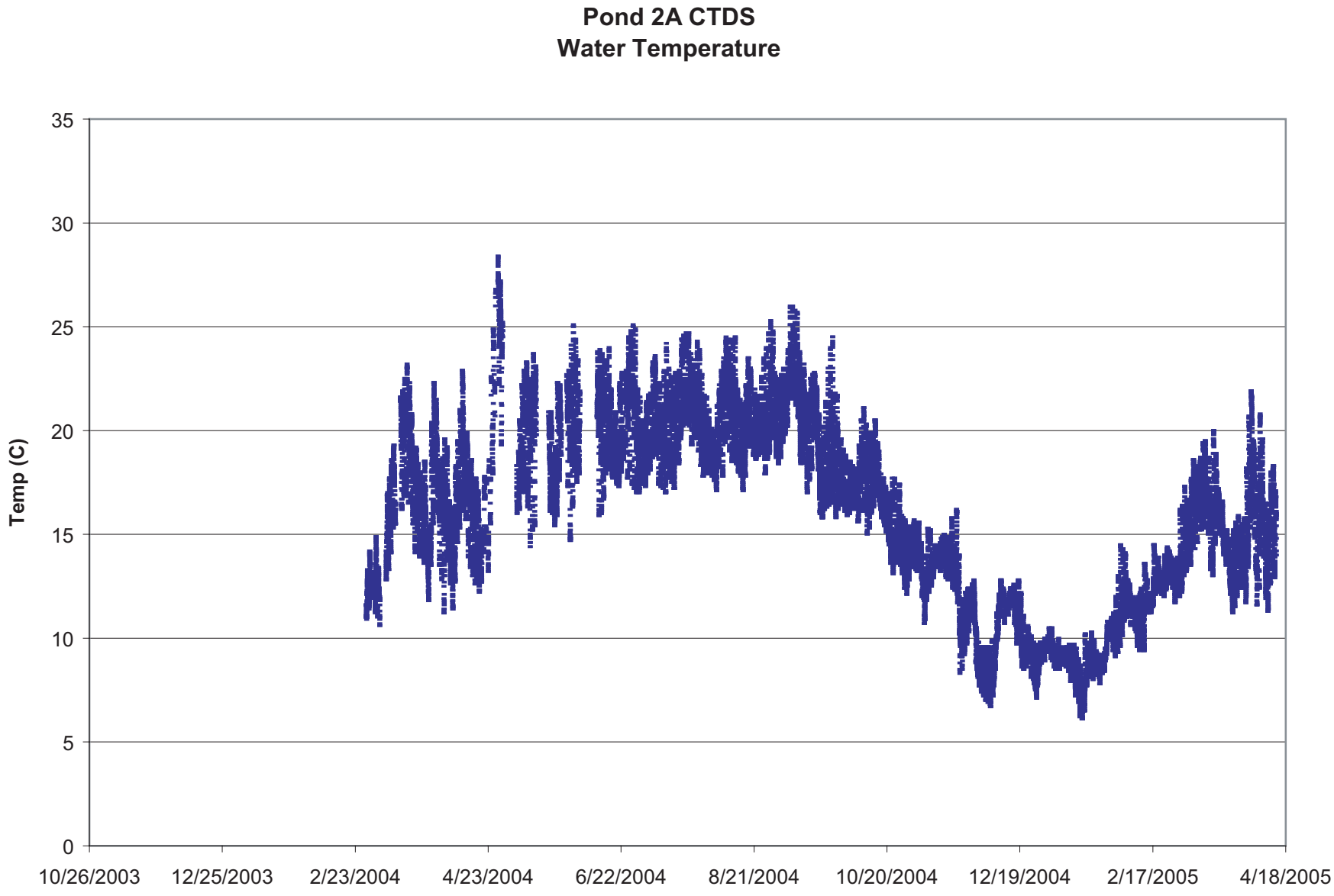


WETLANDS AND WATER RESOURCES

Carl's Marsh CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 23.1**

1067_CM_WL_CTDS_Temp_2007-0111trc.xls

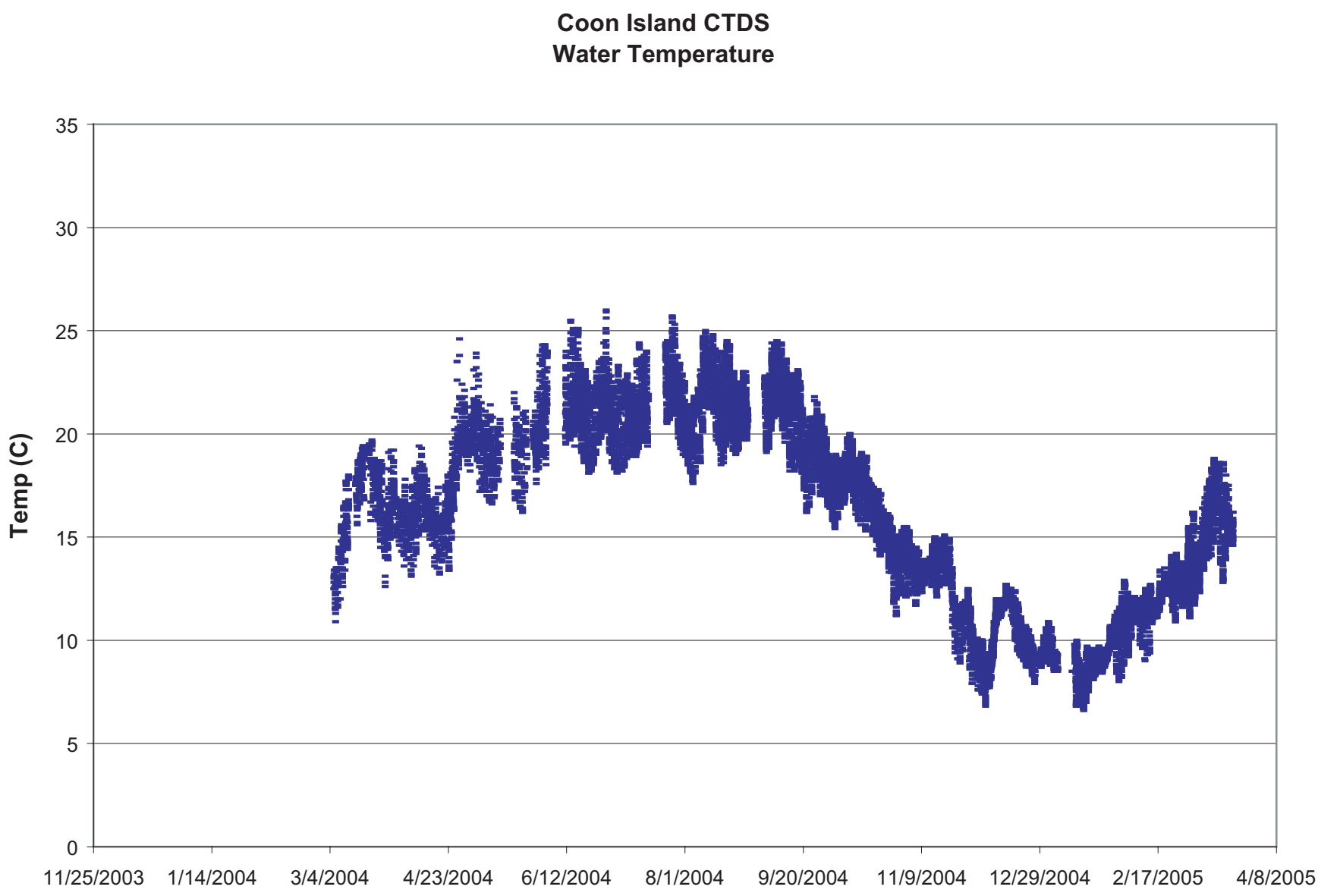


WETLANDS AND WATER RESOURCES

Pond 2A CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 23.2**

Fig-23.2_P2A_CTDS_Temp_2006-1231.pdf

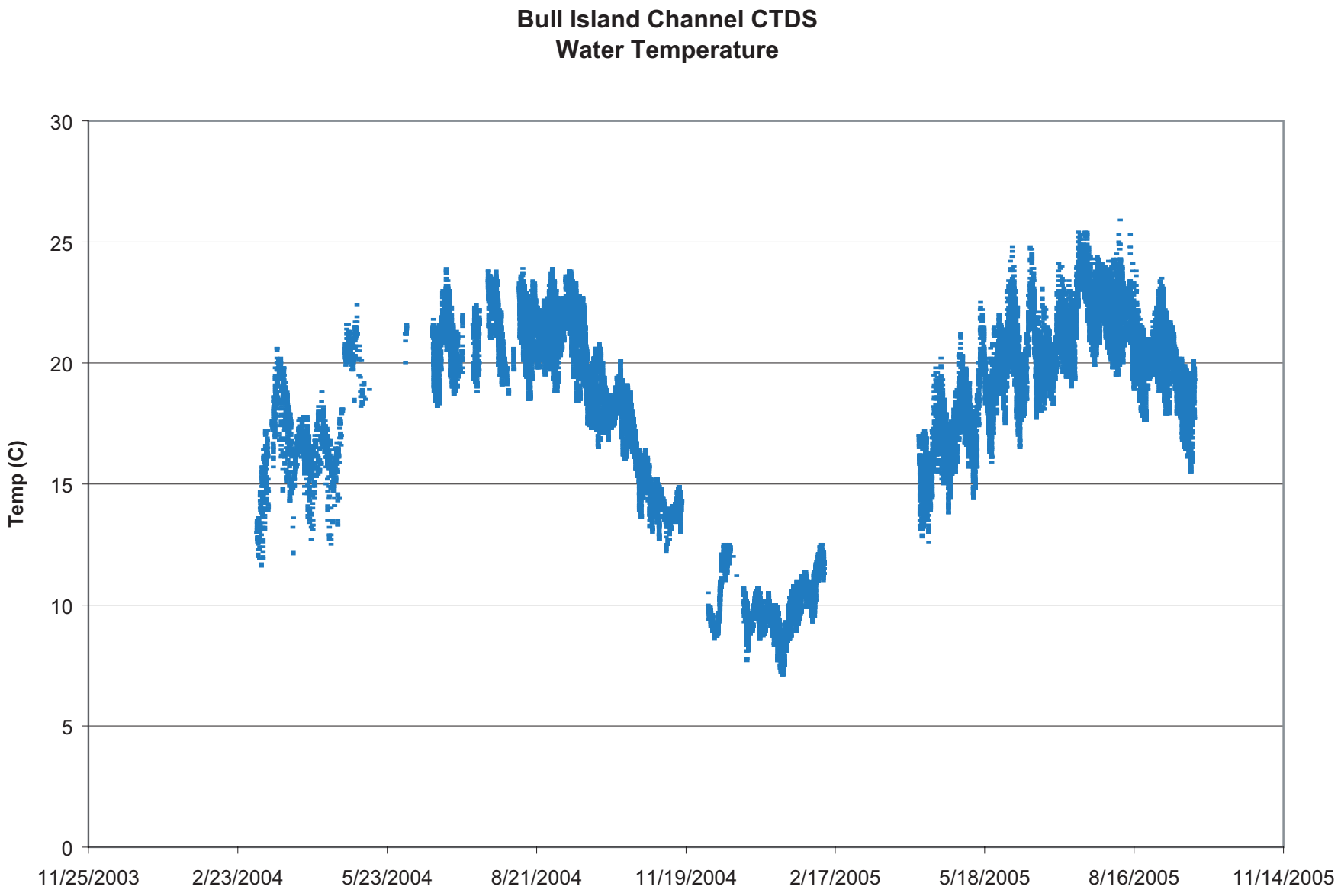


Coon Island CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 23.3**

Fig-23.3_CI_CTDS_Temp_2006-1231.pdf

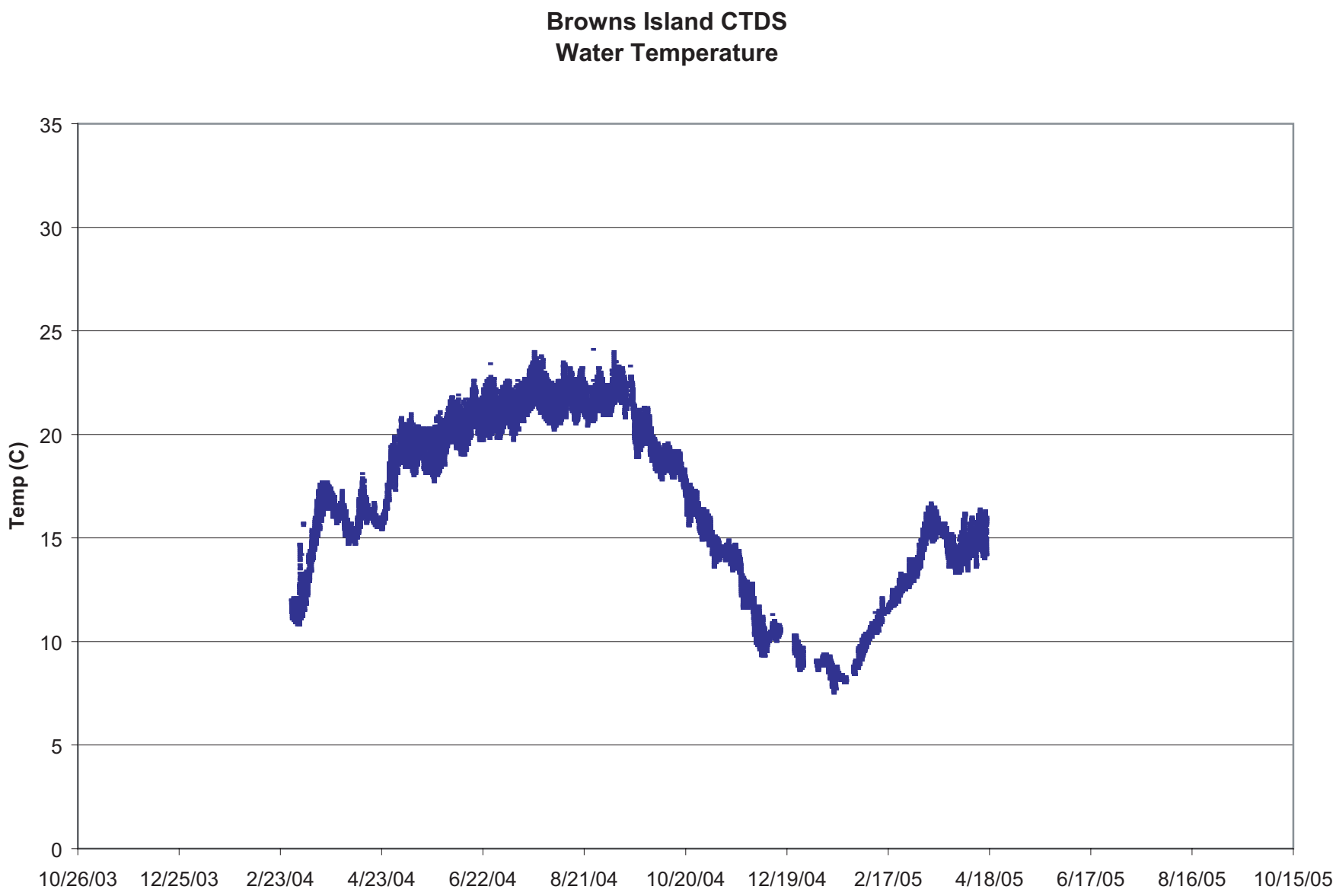


WETLANDS AND WATER RESOURCES

Bull Island CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 23.4**

Fig-23.4_Bul_CTDS_Temp_2006-1231.pdf

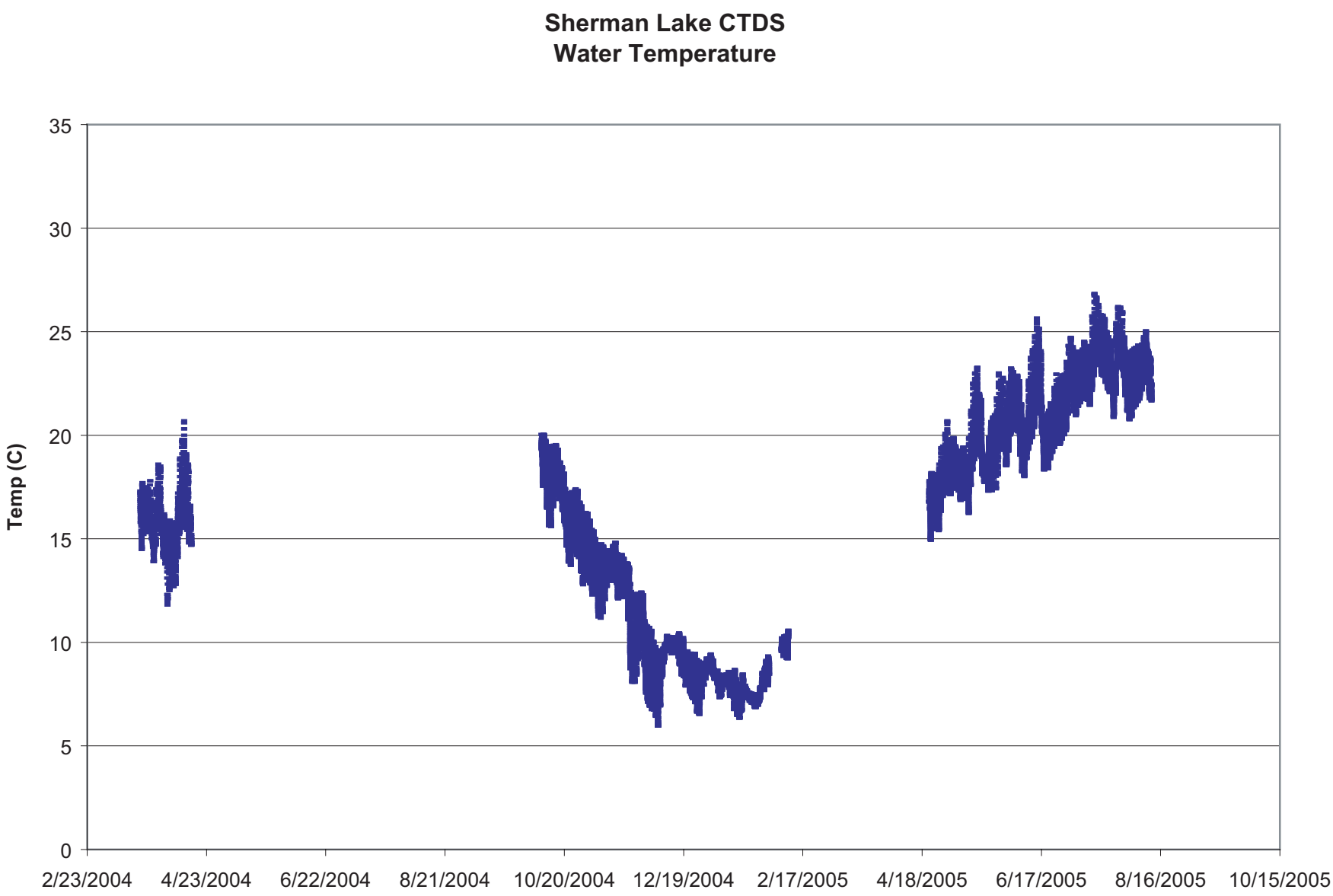


Browns Island CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006 | Project No. 1067 | **Figure 23.5**

Fig-23.5_Brl_CTDS_Temp_2006-1231.pdf

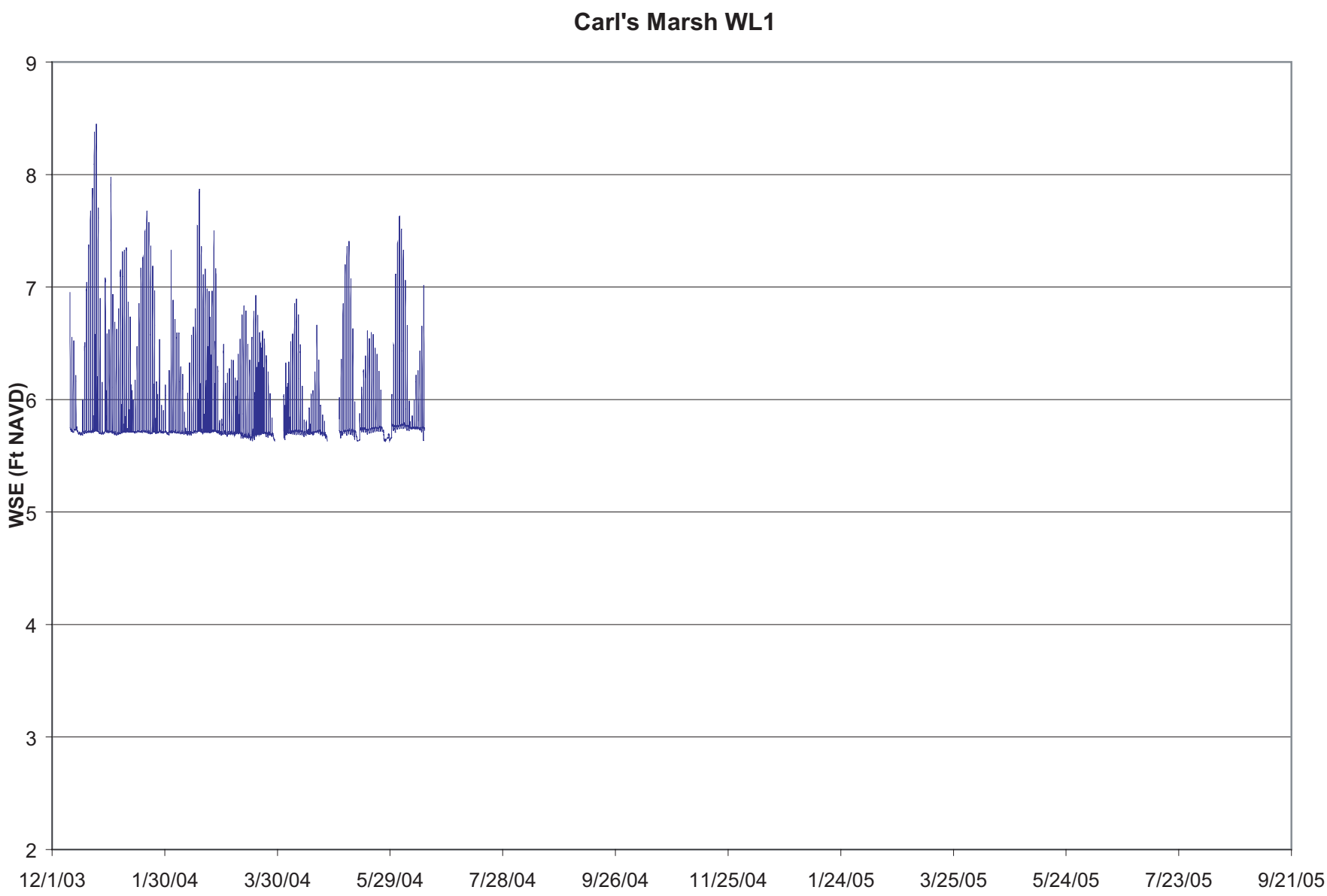


WETLANDS AND WATER RESOURCES

Sherman Lake CTDS
Water Temperature Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 23.6**

Fig-23.6_SL_CTDS_Temp_2006-1231.pdf

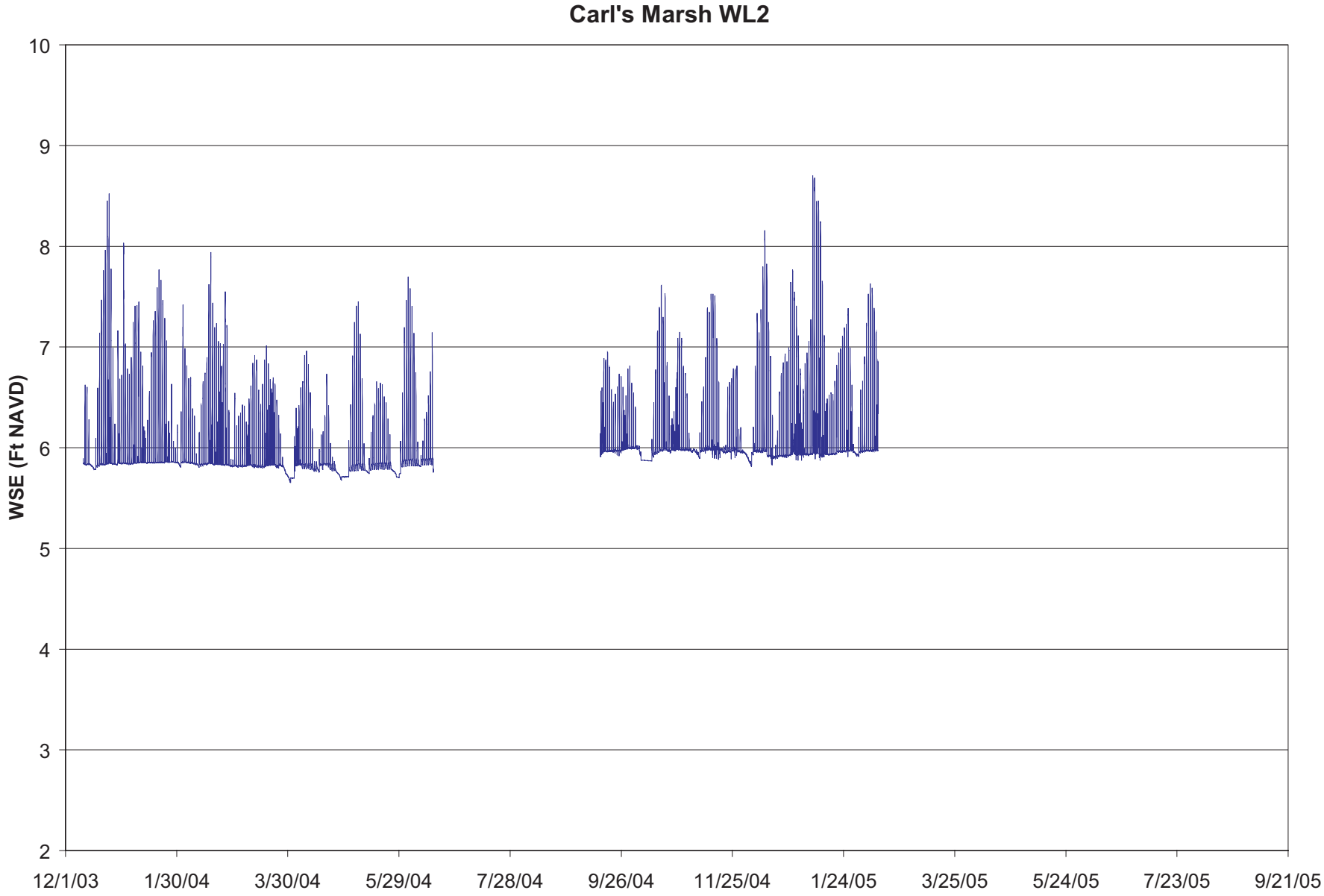


WETLANDS AND WATER RESOURCES

Carl's Marsh WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2007	Project No. 1067	**Figure 24.1**

Fig-24.1_CM_WL1_WSE_2006-1231.pdf

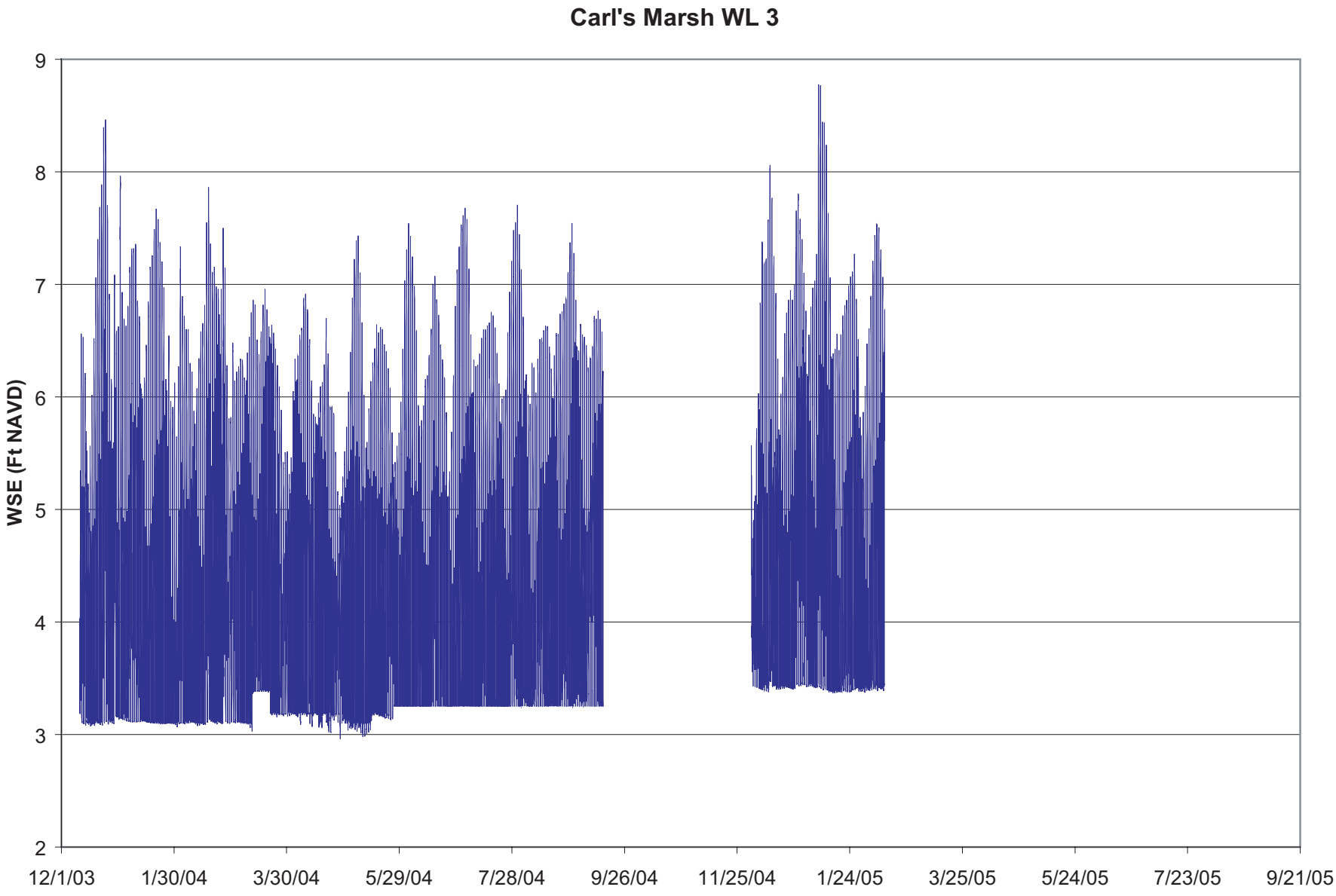


WETLANDS AND WATER RESOURCES

Carl's Marsh WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 24.2**

Fig-24.2_CM_WL2_WSE_2006-1231.pdf

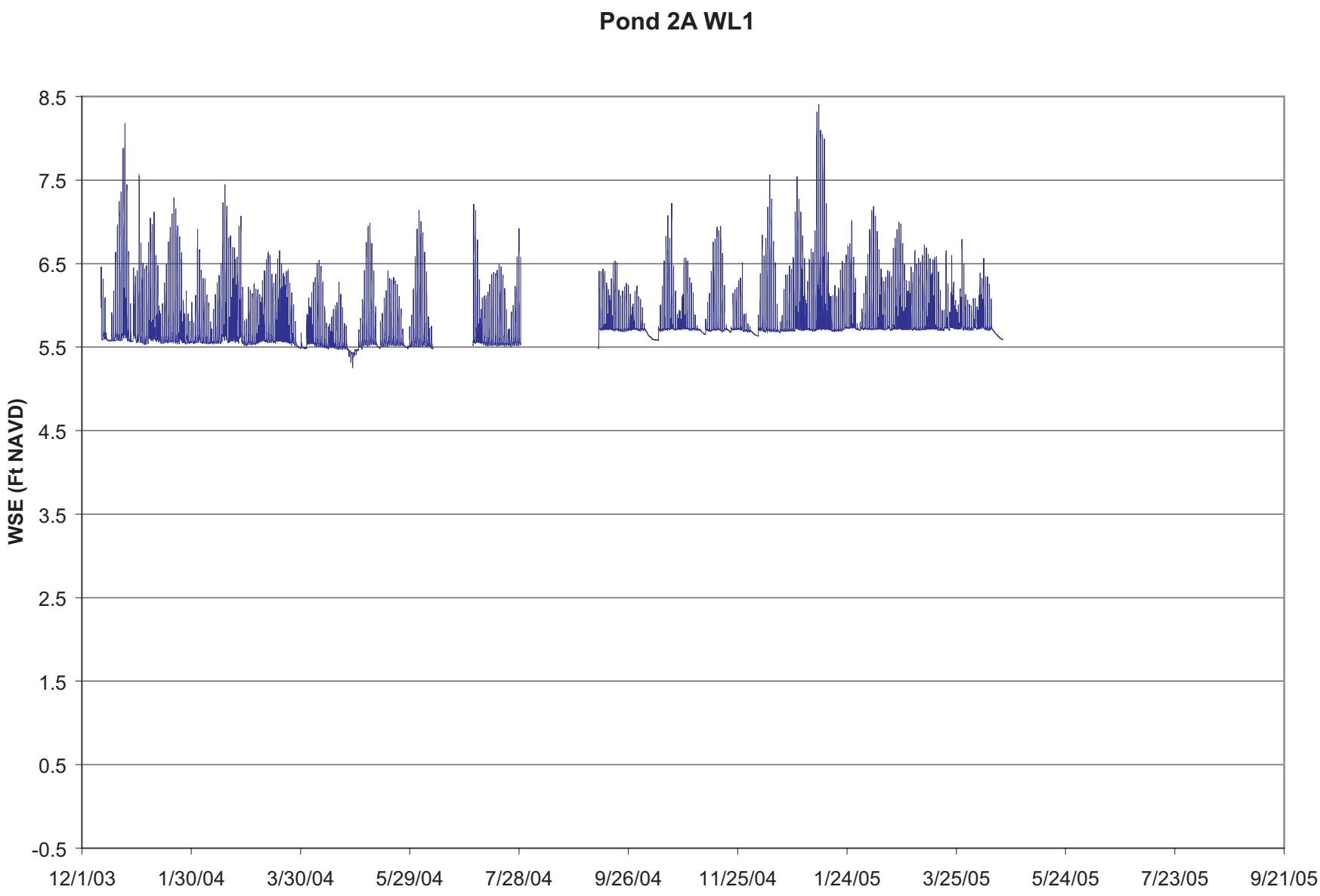


WETLANDS AND WATER RESOURCES

Carl's Marsh WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 24.3**

Fig-24.3_CM_WL3_WSE_2006-1231.pdf

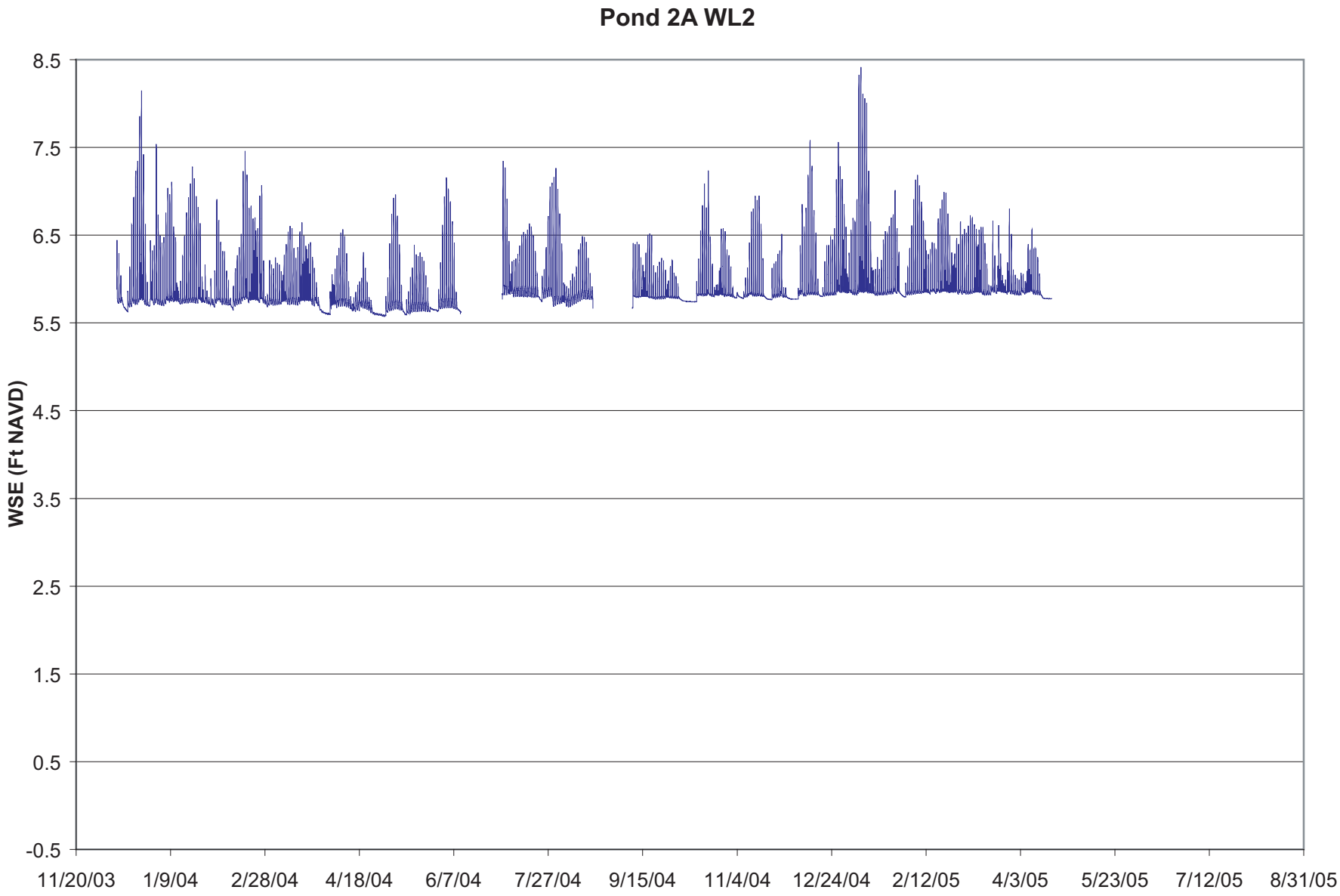


Pond 2A WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 25.1**

Fig-25.1_P2A_WL1_WSE_2006-1231.pdf

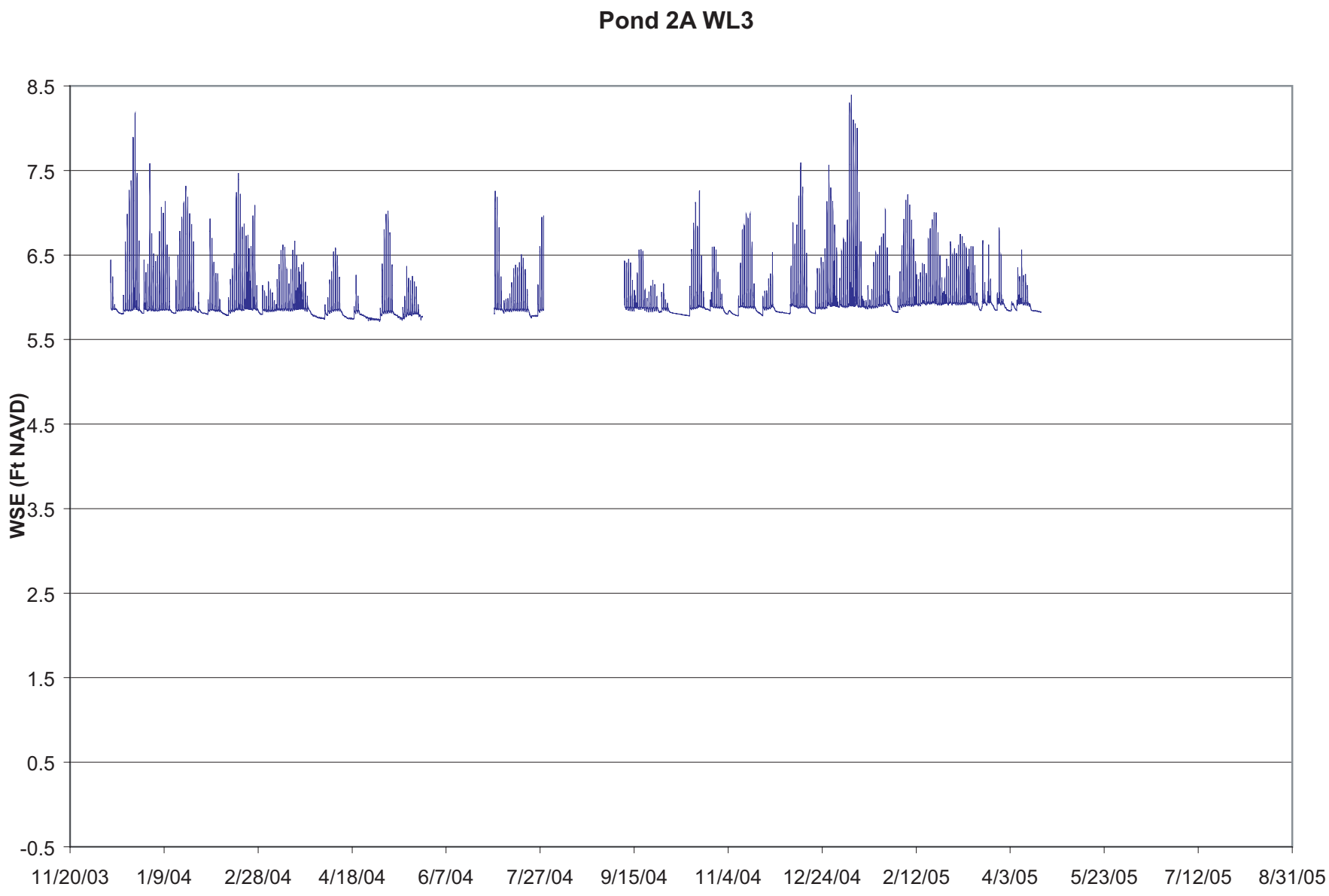


WETLANDS AND WATER RESOURCES

Pond 2A WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 25.2**

Fig-25.2_P2A_WL2_WSE_2006-1231.pdf

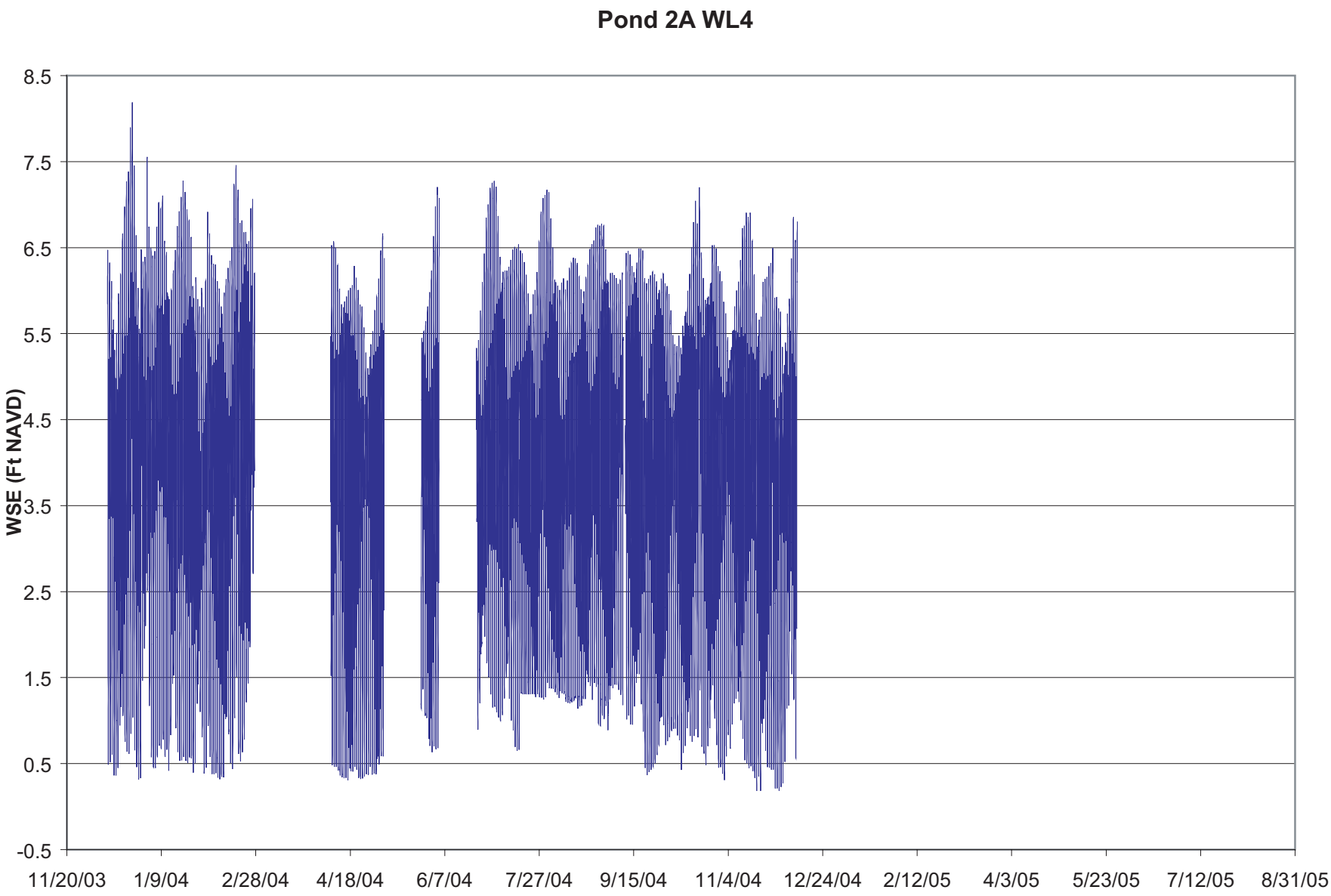


WETLANDS AND WATER RESOURCES

Pond 2A WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 25.3**

Fig-25.3_P2A_WL3_WSE_2006-1231.pdf

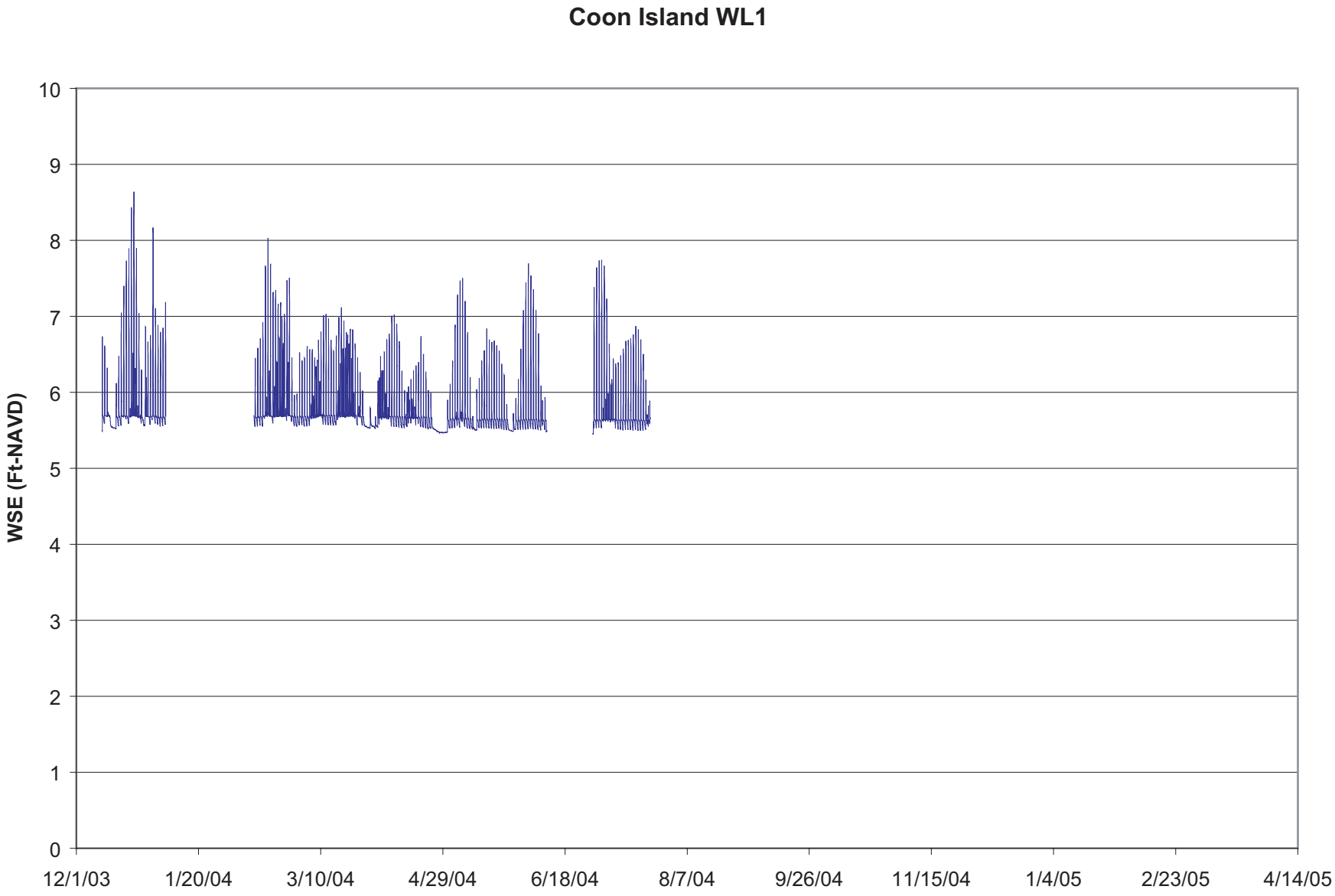


Pond 2A WL4
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2007 | Project No. 1067 | **Figure 25.4**

\\Server3\WWR_Network\Active_Projects\1067_CALFED_IRWM\22-PPT\226-Data Report\Figures\Draft\WLs

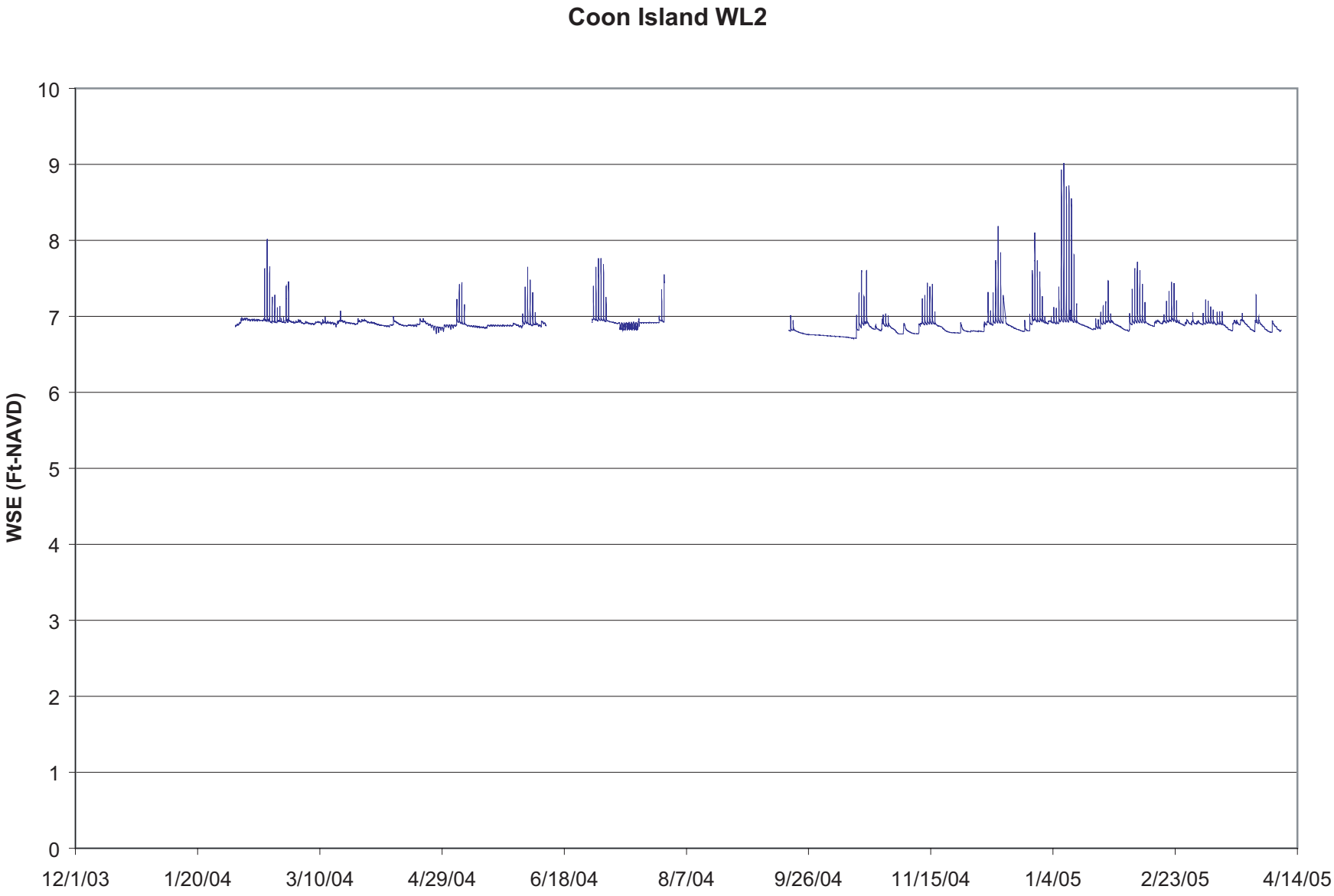


WETLANDS AND WATER RESOURCES

Coon Island WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 26.1**

Fig-26.1_CI_WL1_WSE_2006-1231pdf

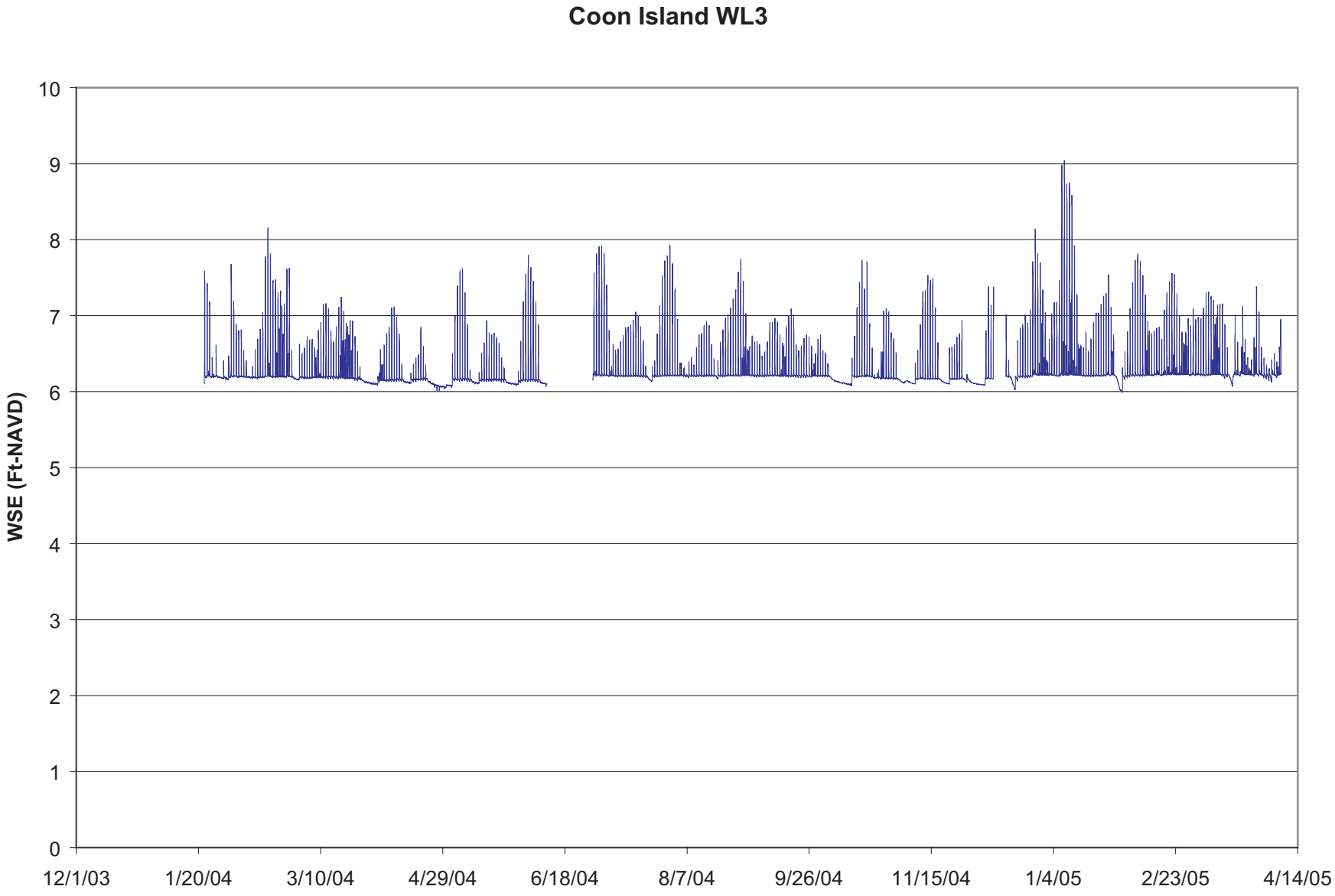


WETLANDS AND WATER RESOURCES

Coon Island WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 26.2**

Fig-26.2_CI_WL2_WSE_2006-1231.pdf

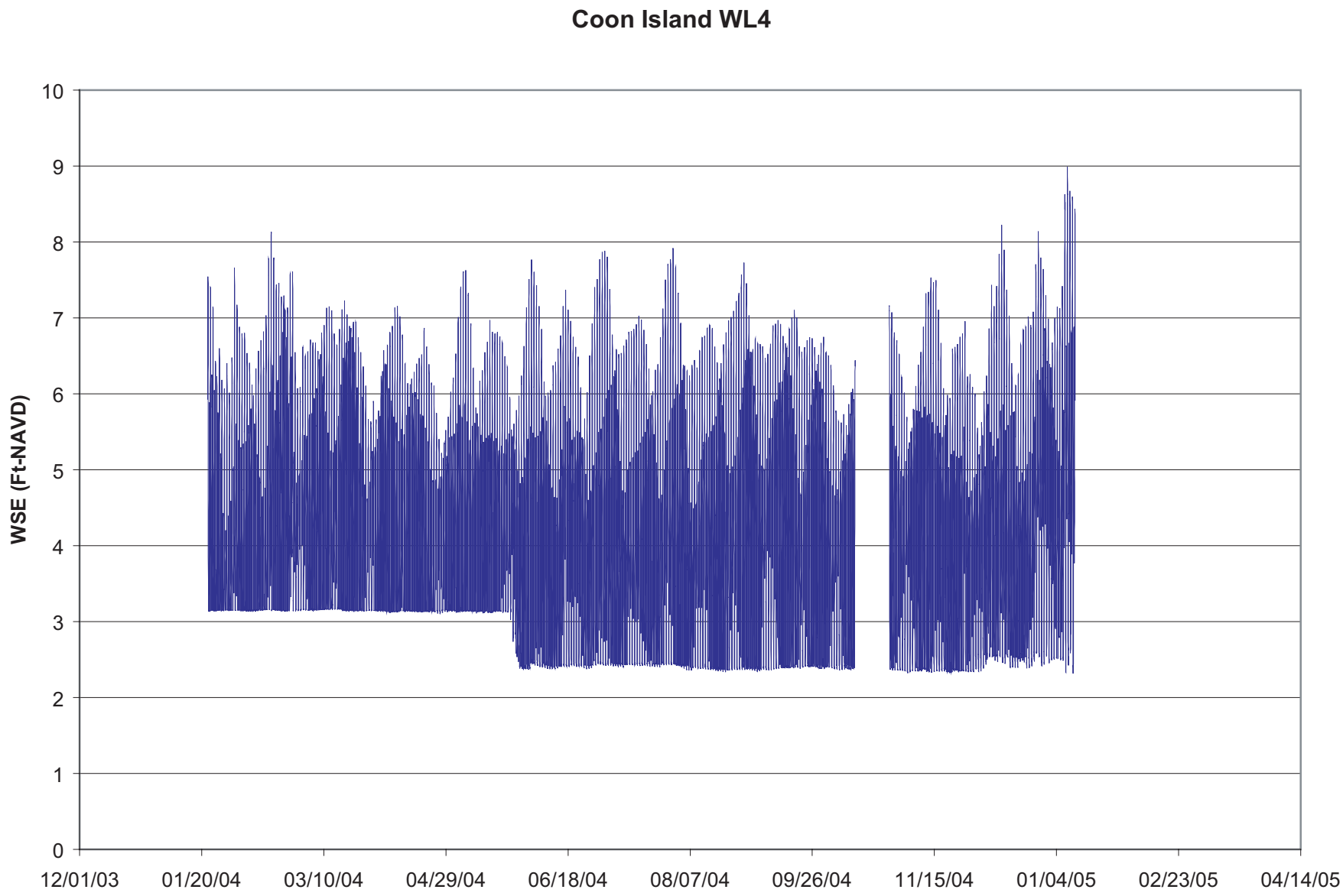


WETLANDS AND WATER RESOURCES

Coon Island WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 26.3**

Fig-26.3_CI_WL3_WSE_2006-1231.pdf

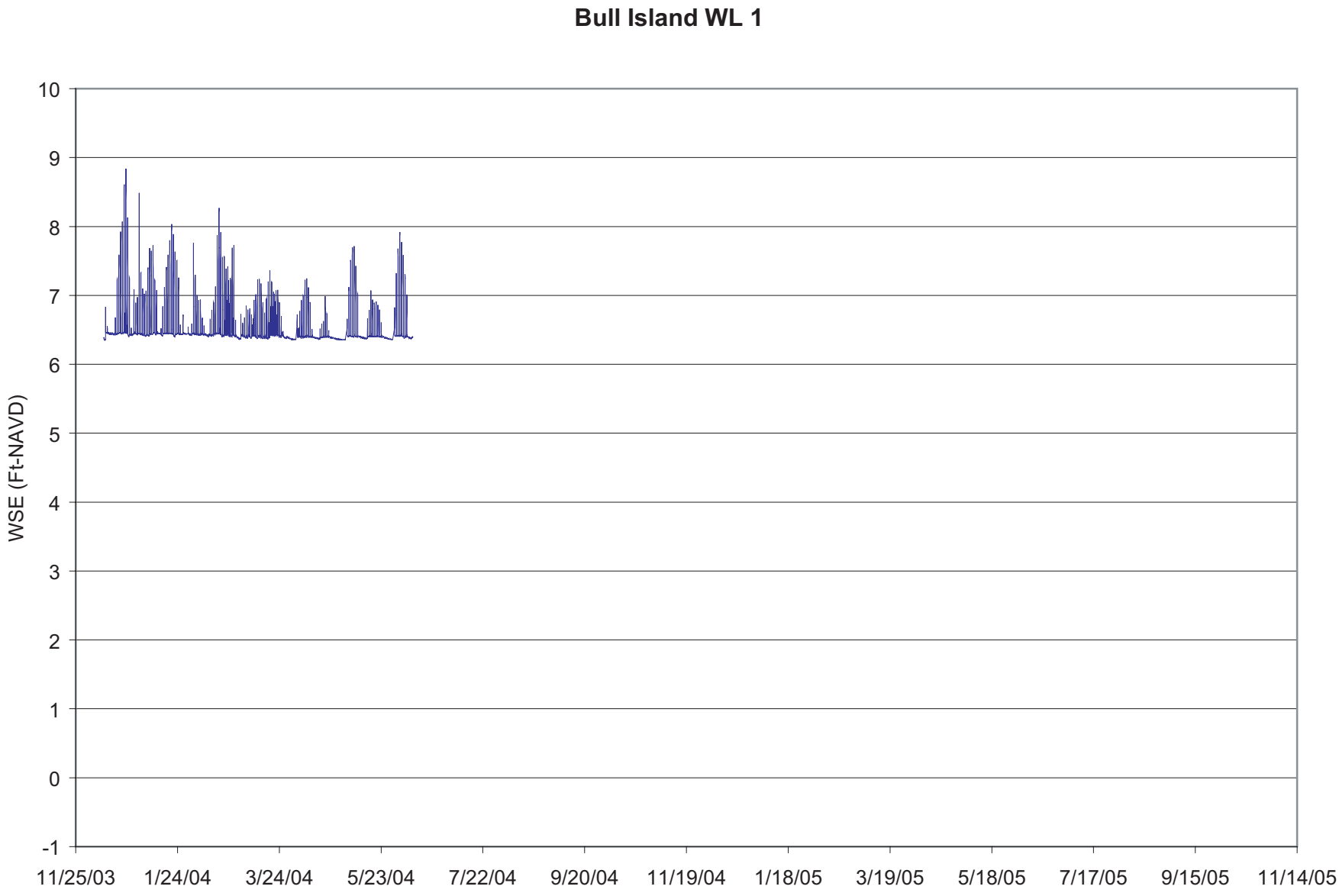


Coon Island WL4
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006 | Project No. 1067 | **Figure 26.4**

Fig-26.4_CI_WL4_WSE_2006-1231pdf

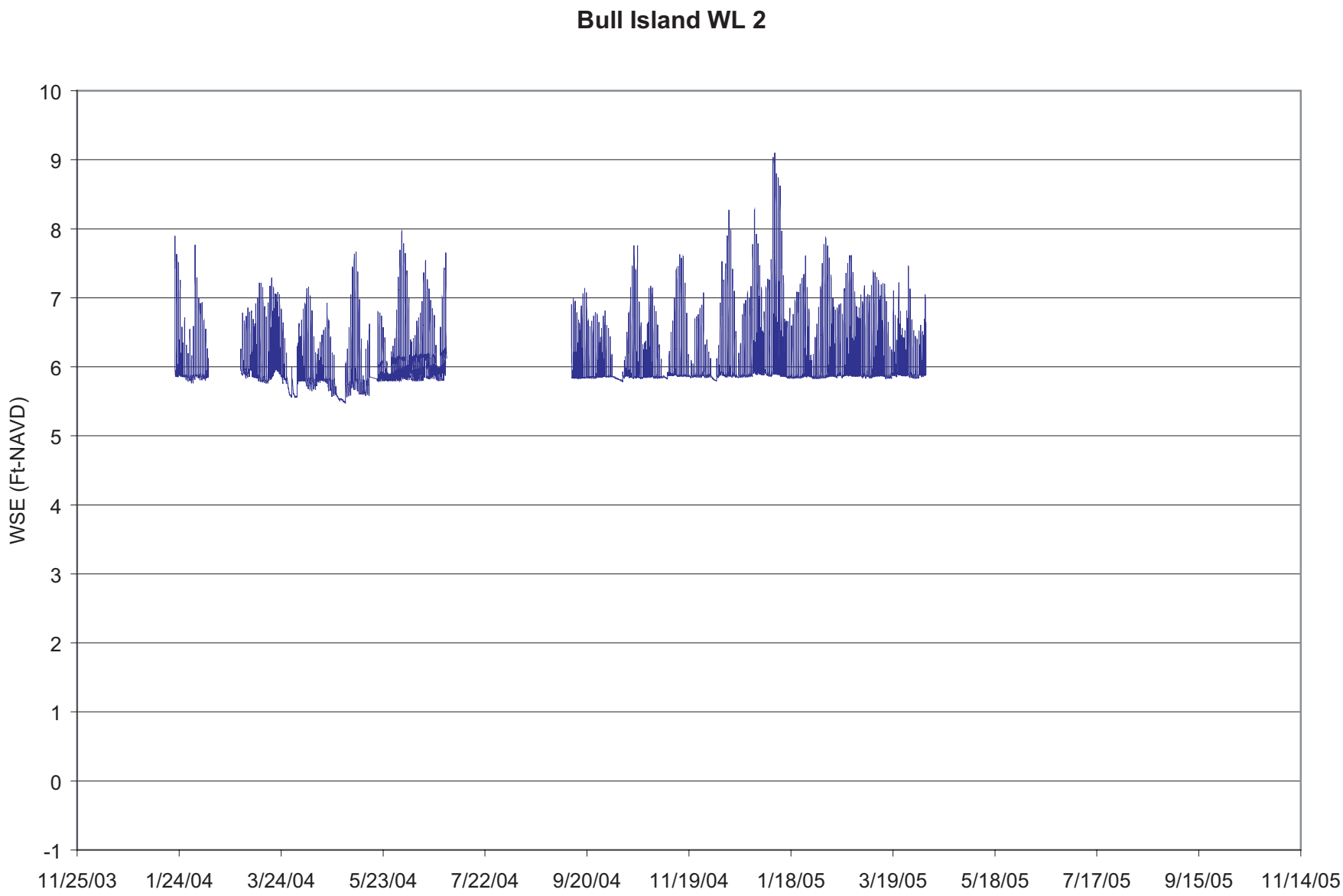


Bull Island WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 27.1**

Fig-27.1_Bul_WL1_WSE_2006-1231pdf

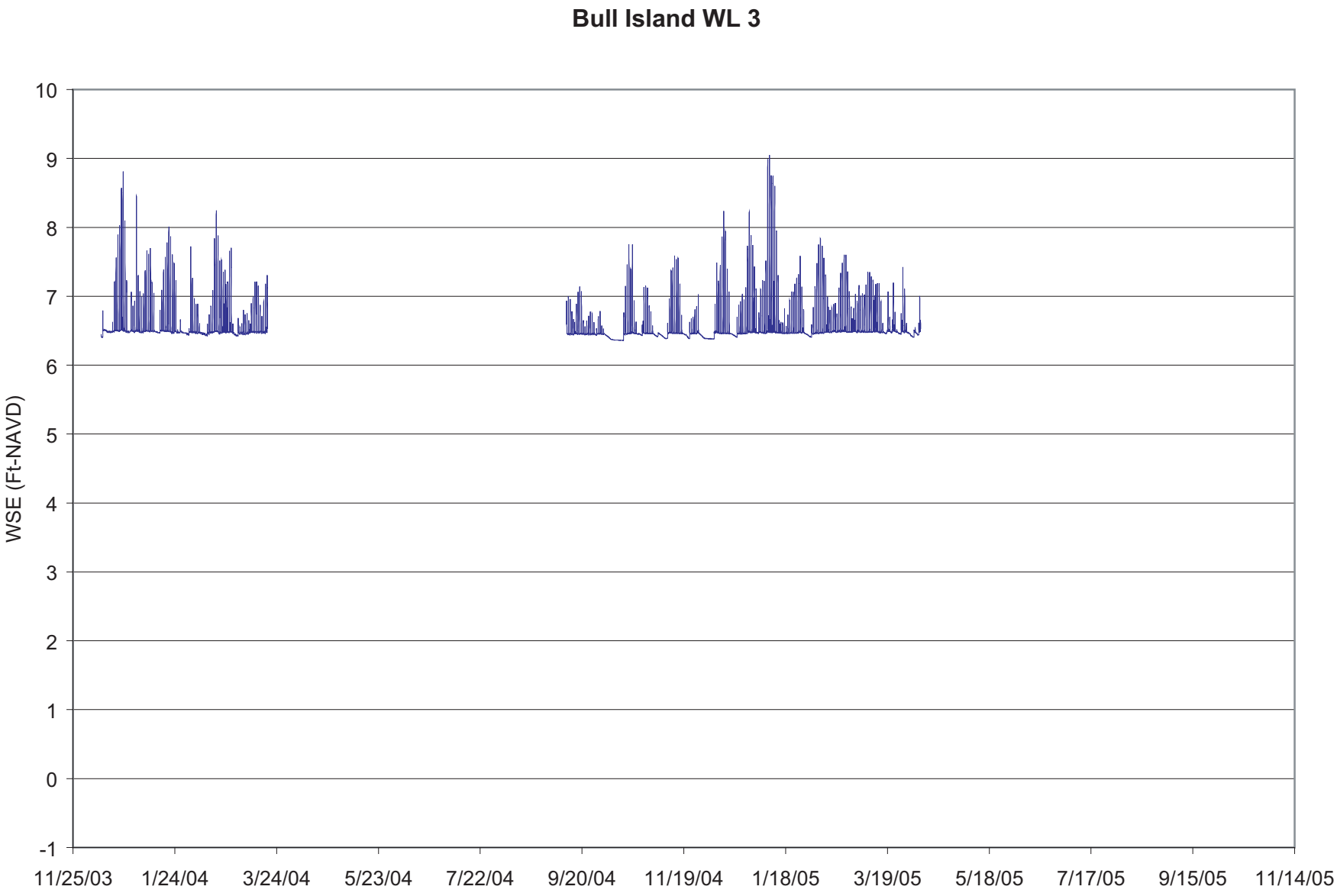


Bull Island WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 27.2**

Fig-27.2_Bul_WL2_WSE_2006-1231pdf

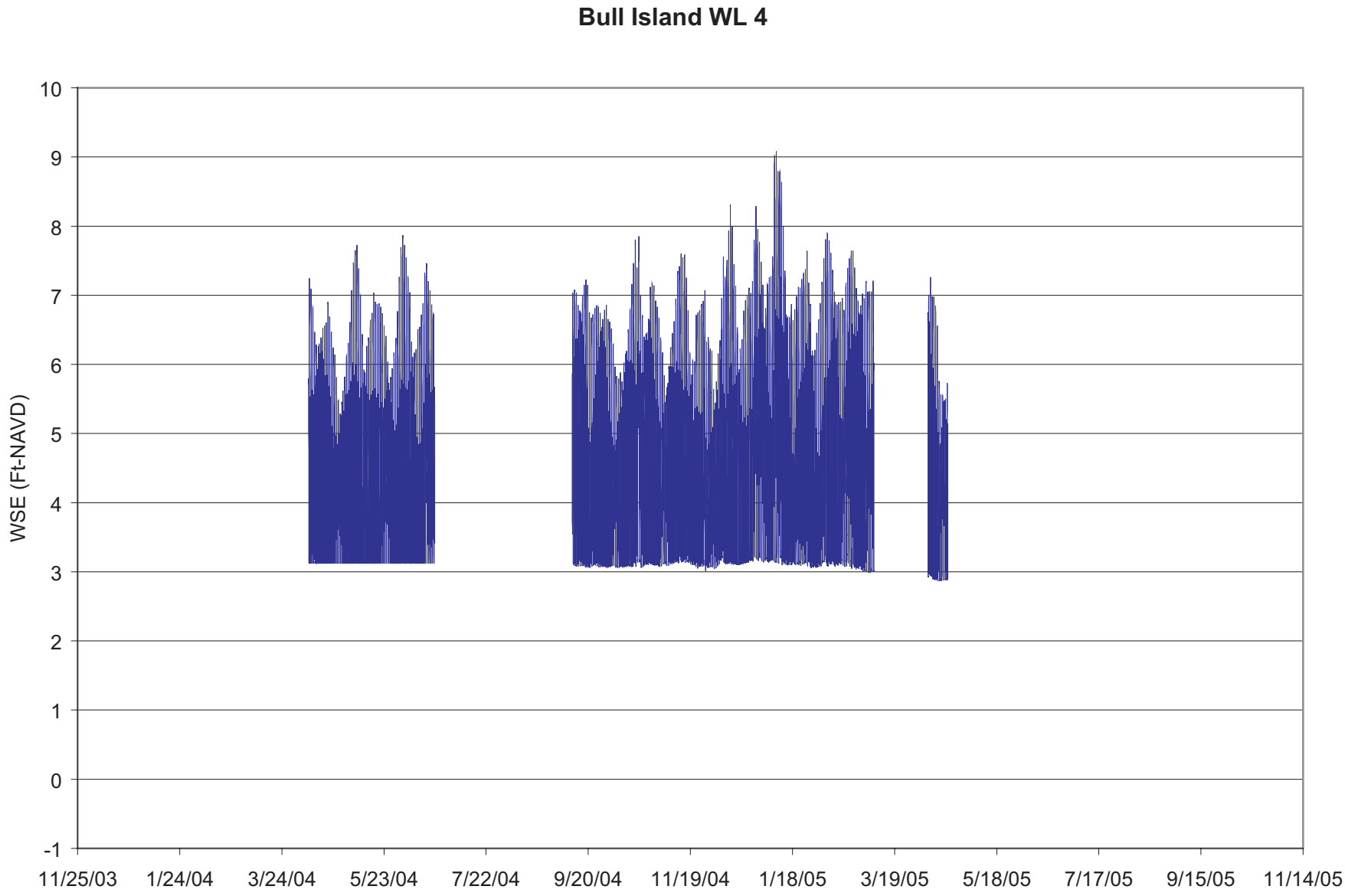


WETLANDS AND WATER RESOURCES

Bull Island WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 27.3**

Fig-27.3_Bul_WL3_WSE_2006-1231pdf

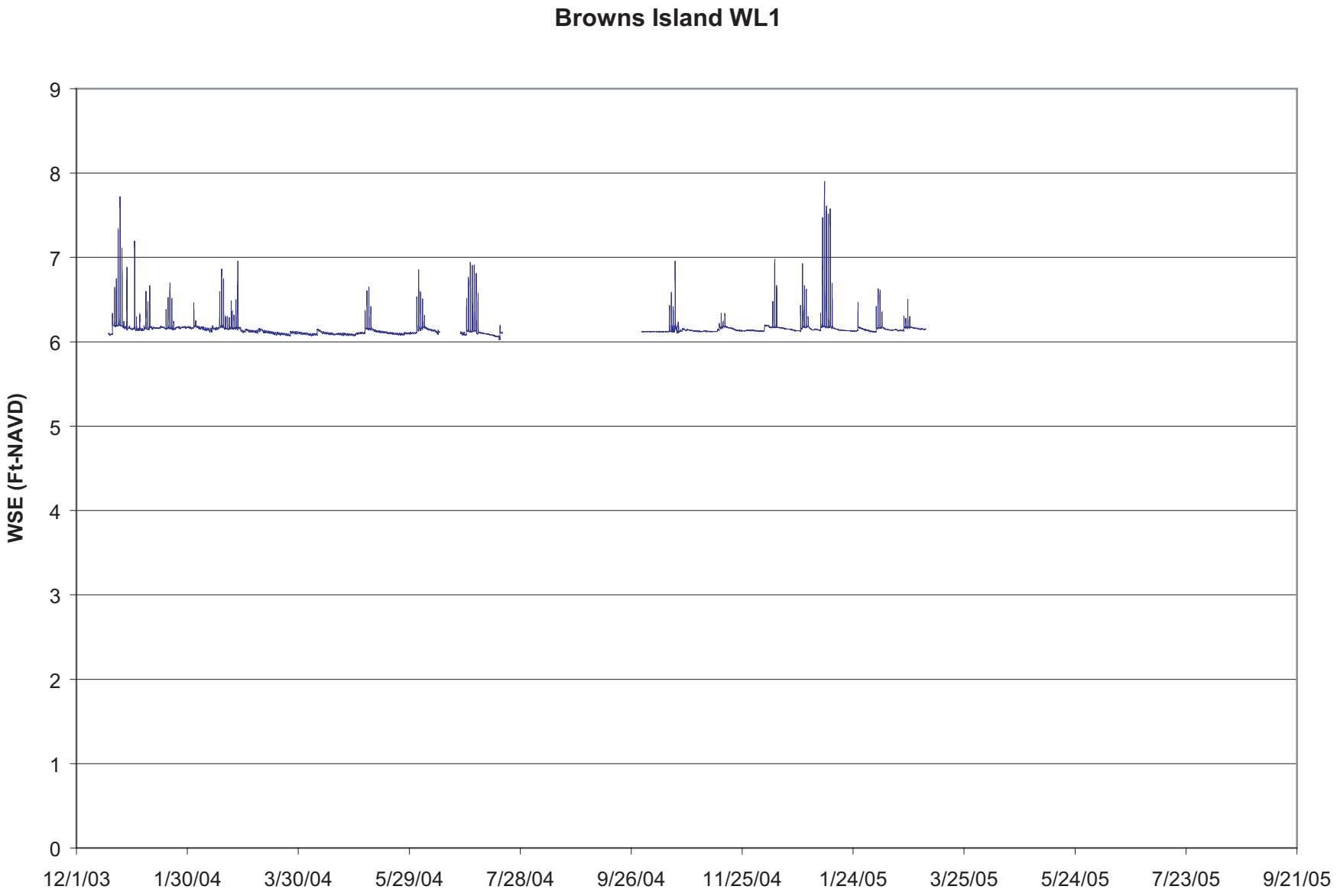


WETLANDS AND WATER RESOURCES

Bull Island WL4
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 27.4**

Fig-27.4_Bul_WL4_WSE_2006-1231pdf

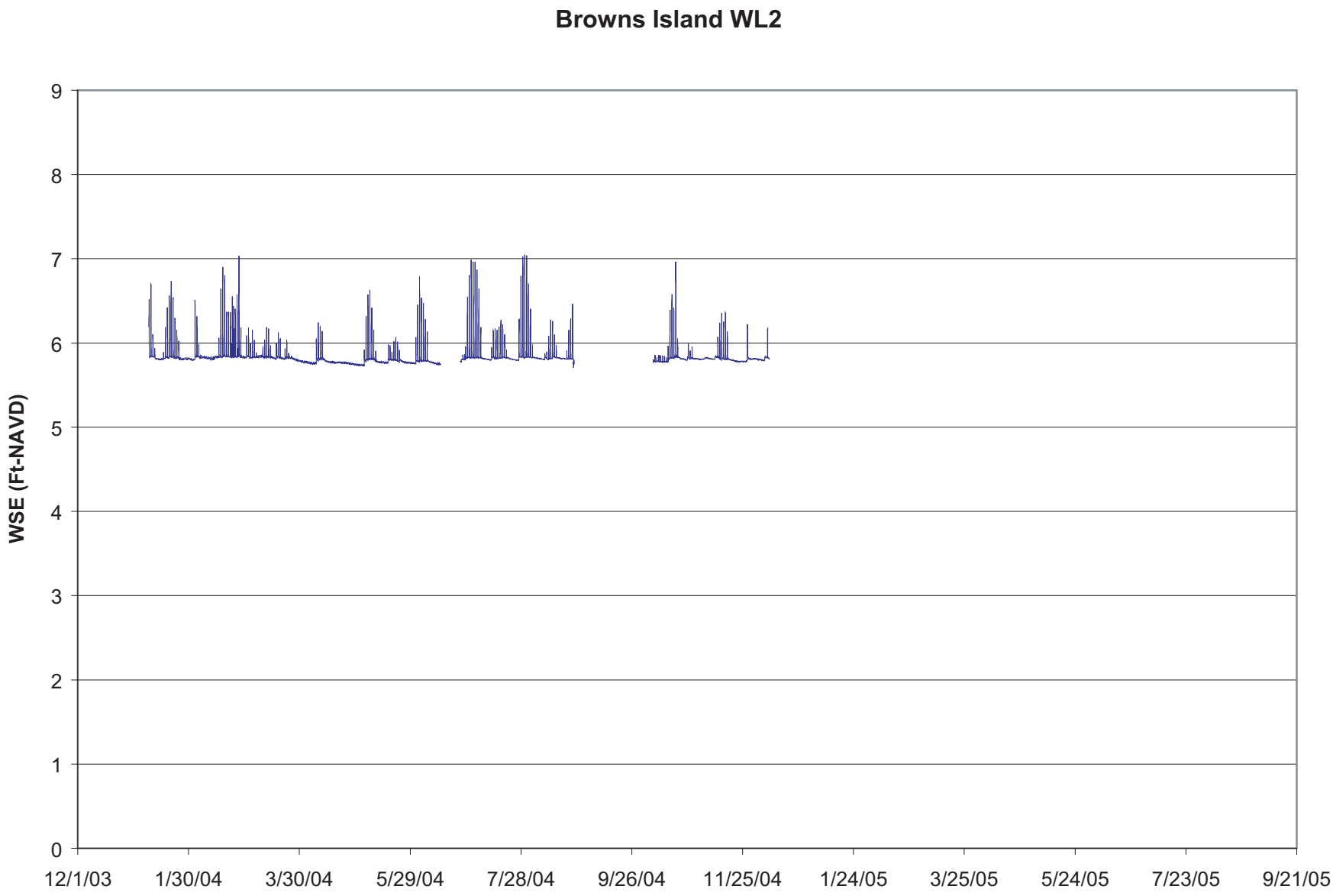


WETLANDS AND WATER RESOURCES

Browns Island WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 28.1**

Fig_28.1_Brl_WL1_WSE_2006-1231.pdf

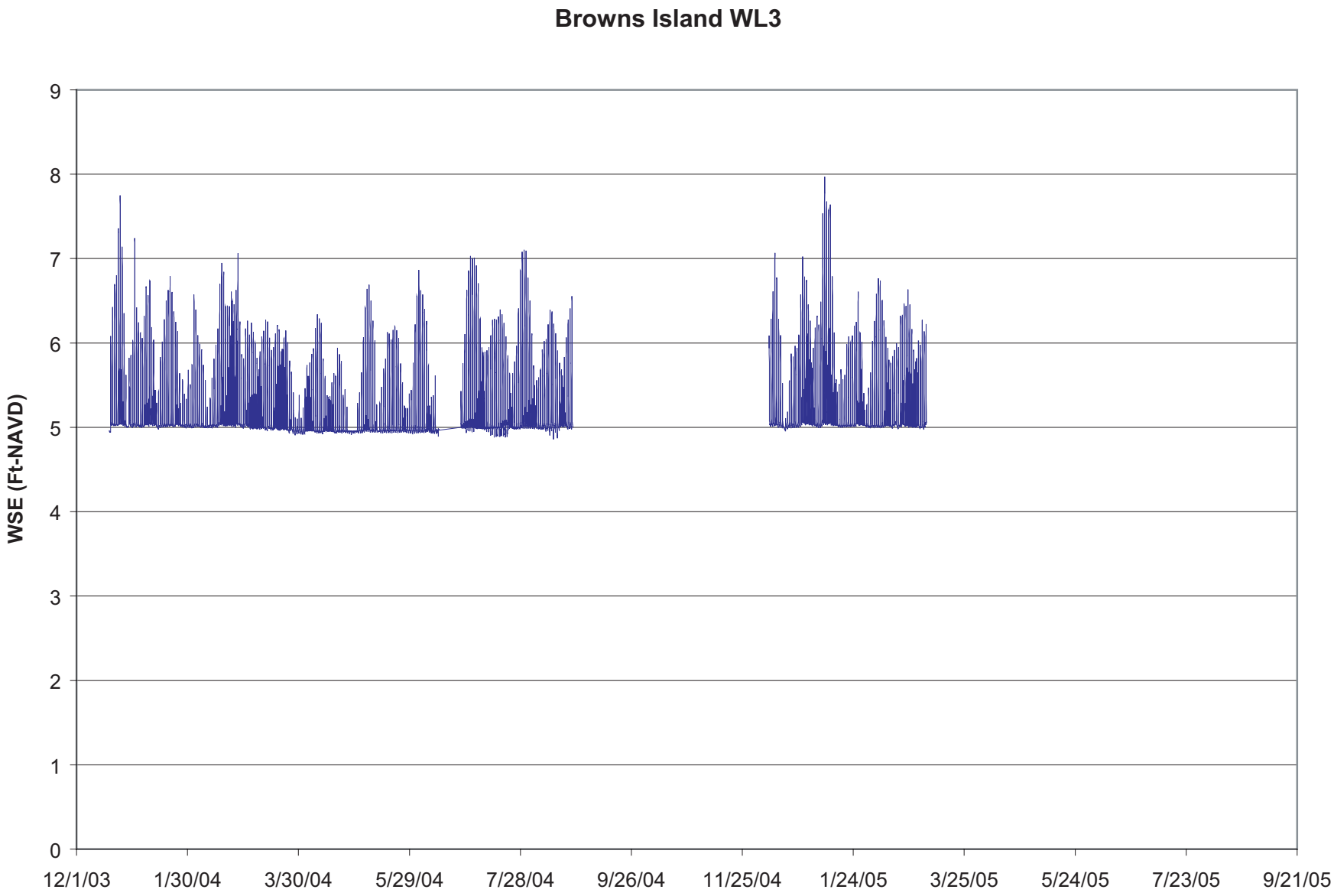


WETLANDS AND WATER RESOURCES

Browns Island WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 28.2**

Fig-28.2_Brl_WL2_WSE_2006-1231pdf

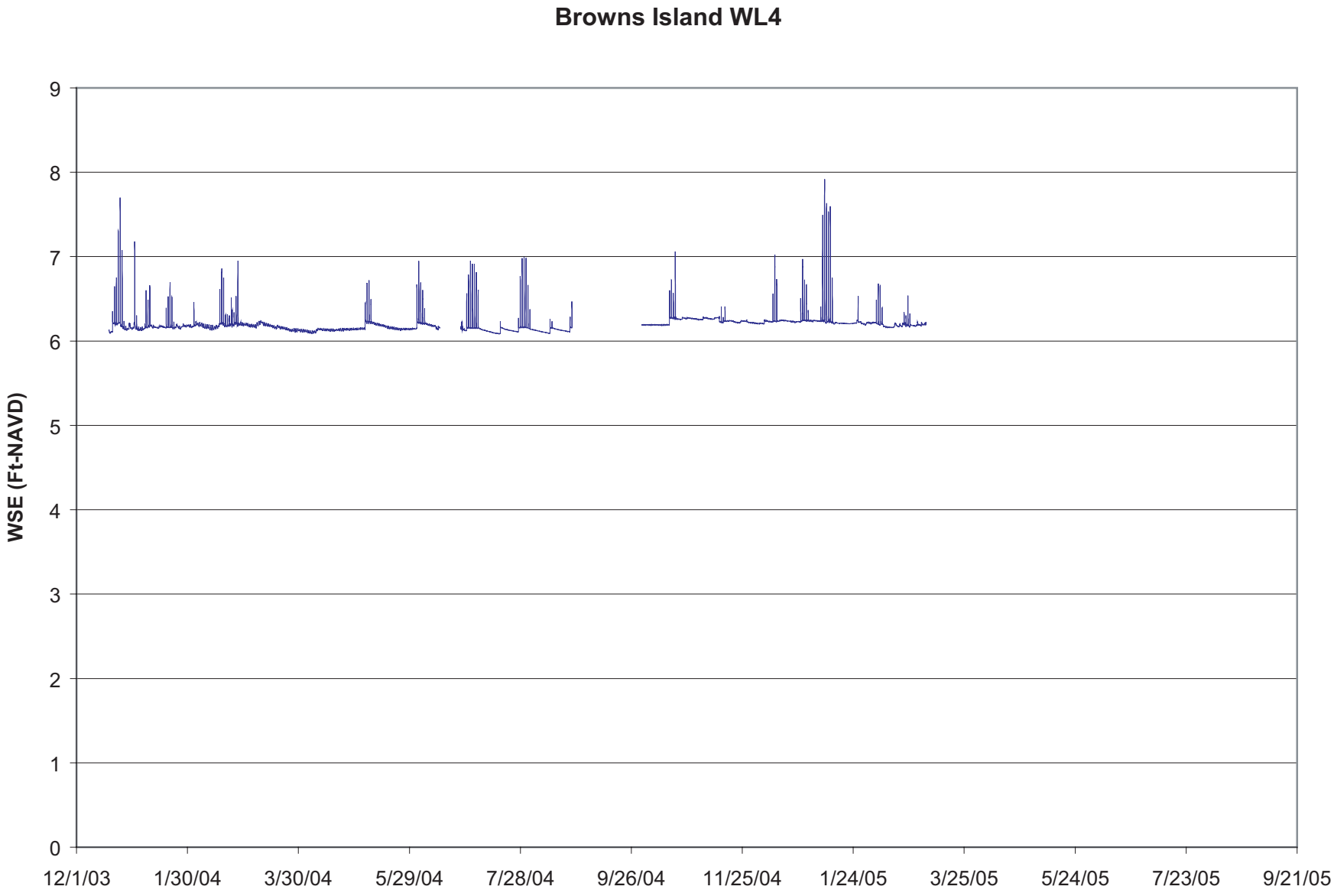


WETLANDS AND WATER RESOURCES

Browns Island WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 28.3**

Fig-28.3_Brl_WL3_WSE_2006-1231.pdf

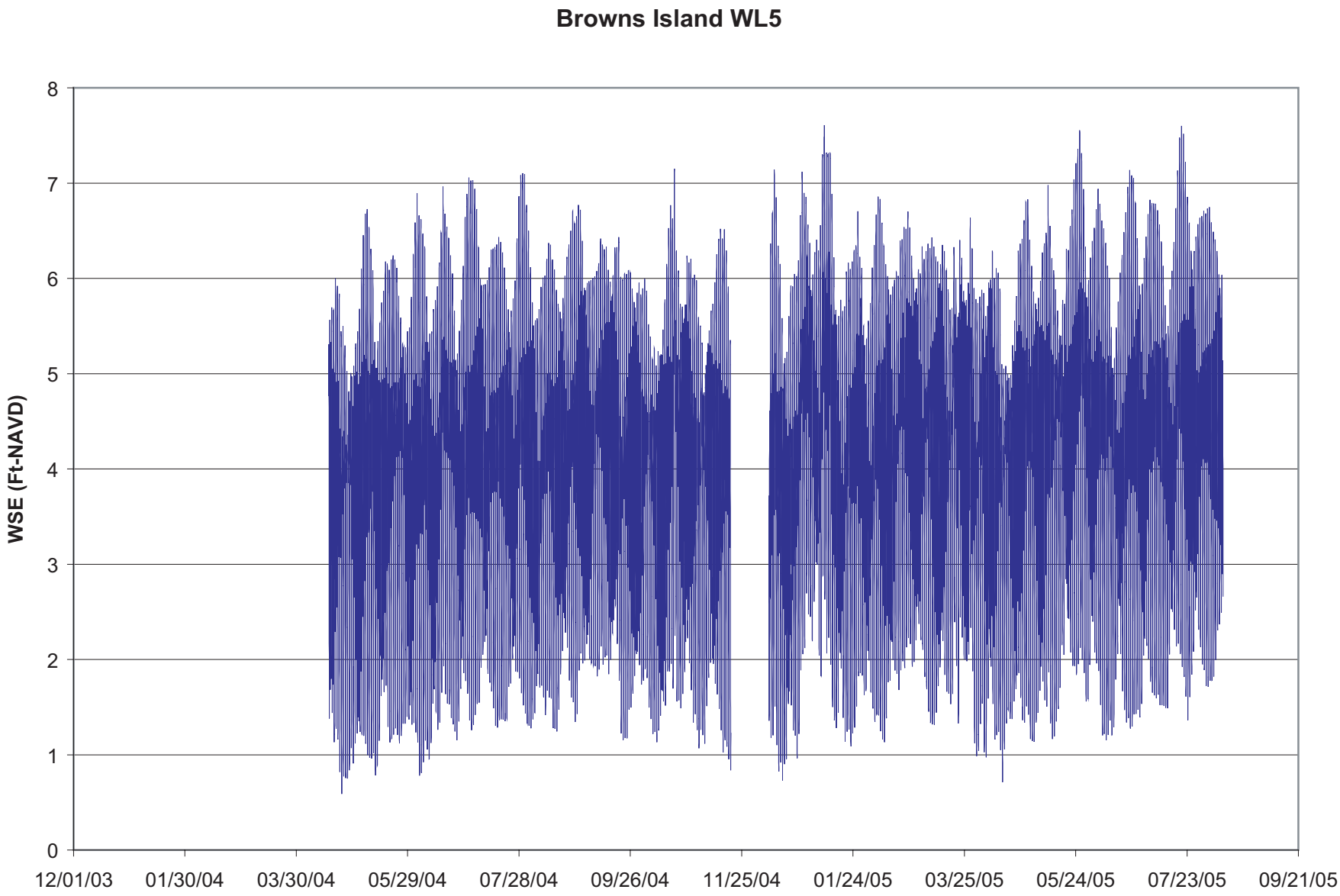


WETLANDS AND WATER RESOURCES

Browns Island WL4
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 28.4**

Fig-28.4_Brl_WL4_WSE_2006-1231.pdf

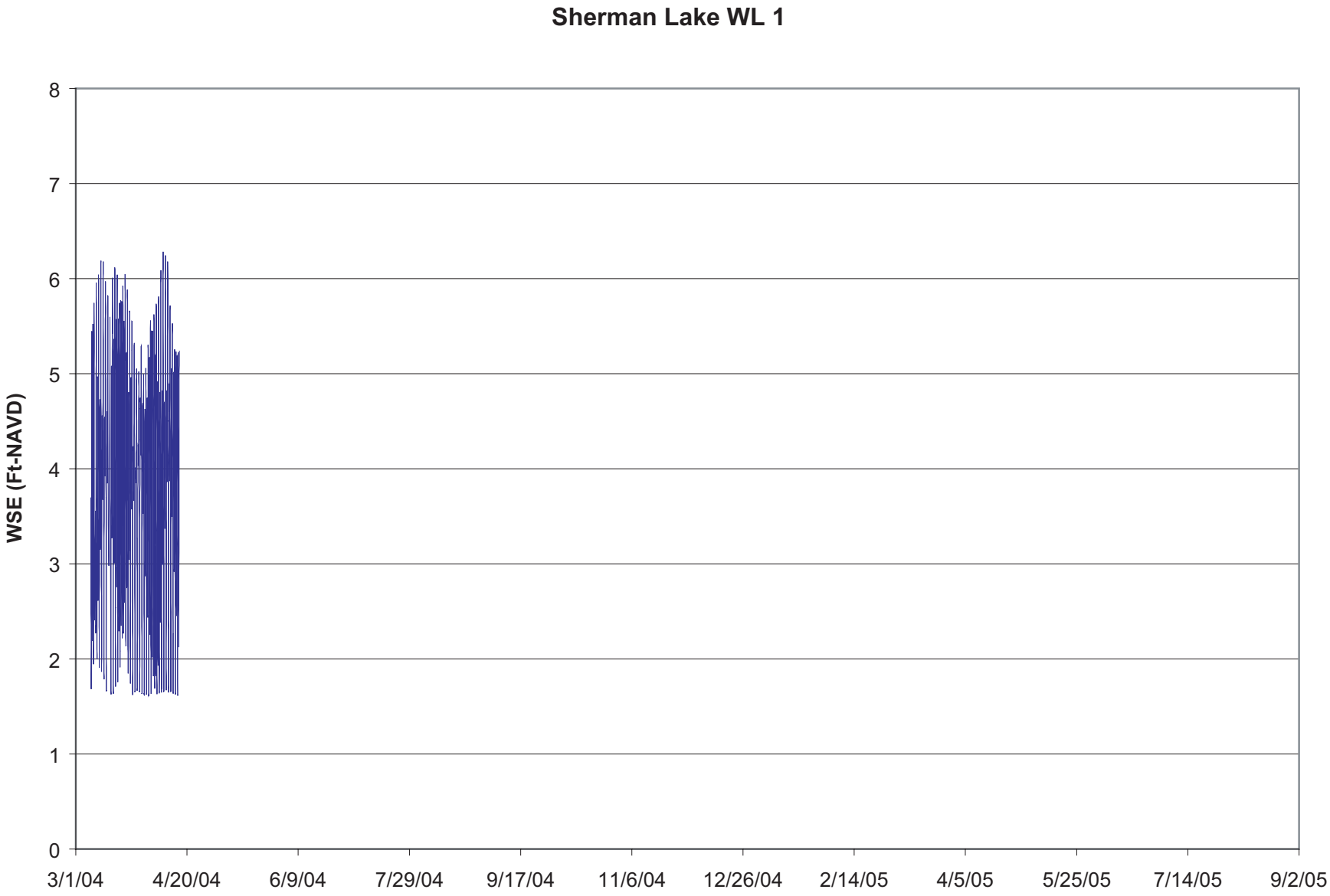


Browns Island - WL5
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 28.5**

Fig-28.5_Brl_WL5_WSE_2006-1231.pdf

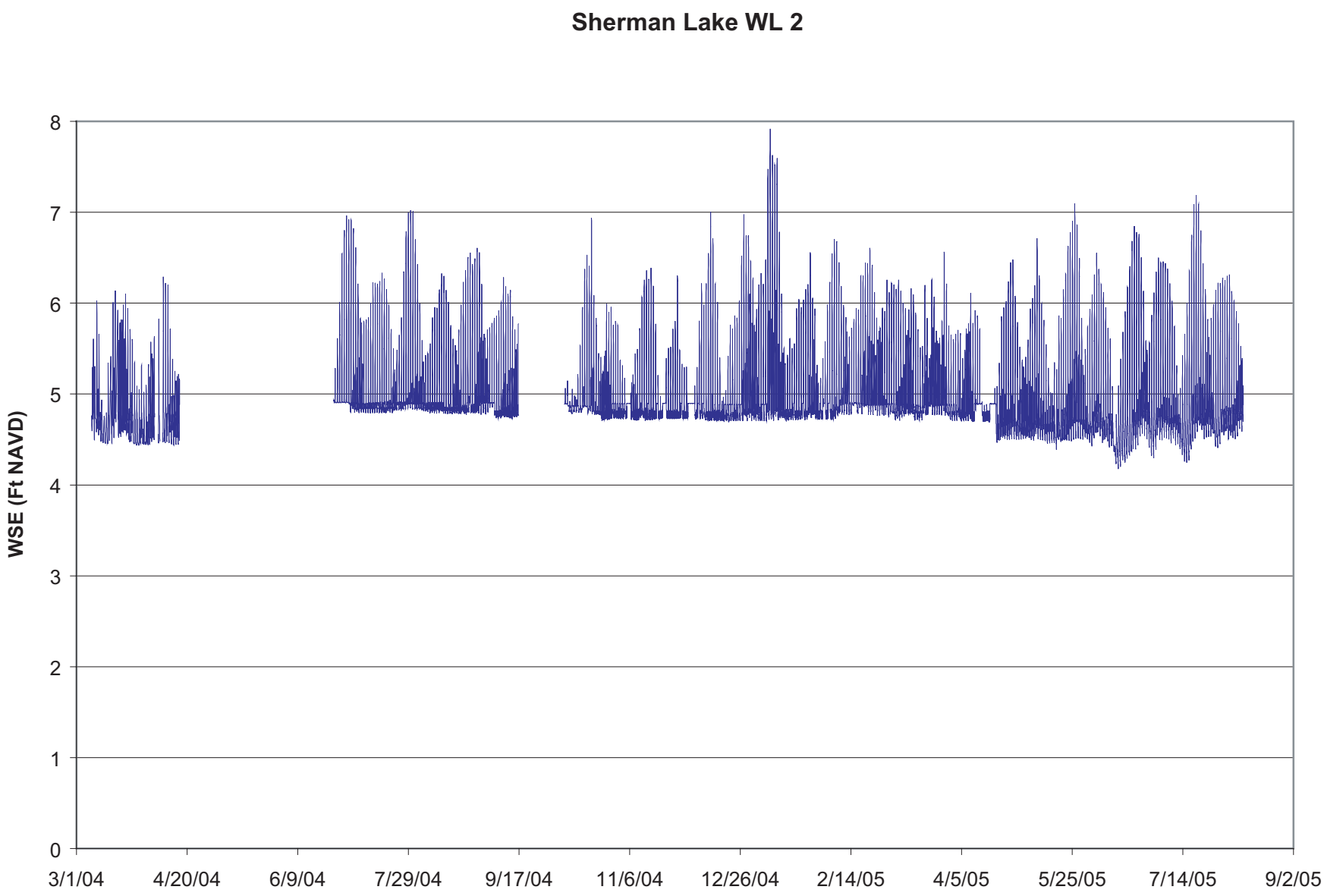


WETLANDS AND WATER RESOURCES

Sherman Lake WL1
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 29.1**

Fig-29.1_SL_WL1_WSE_2006-1231.pdf

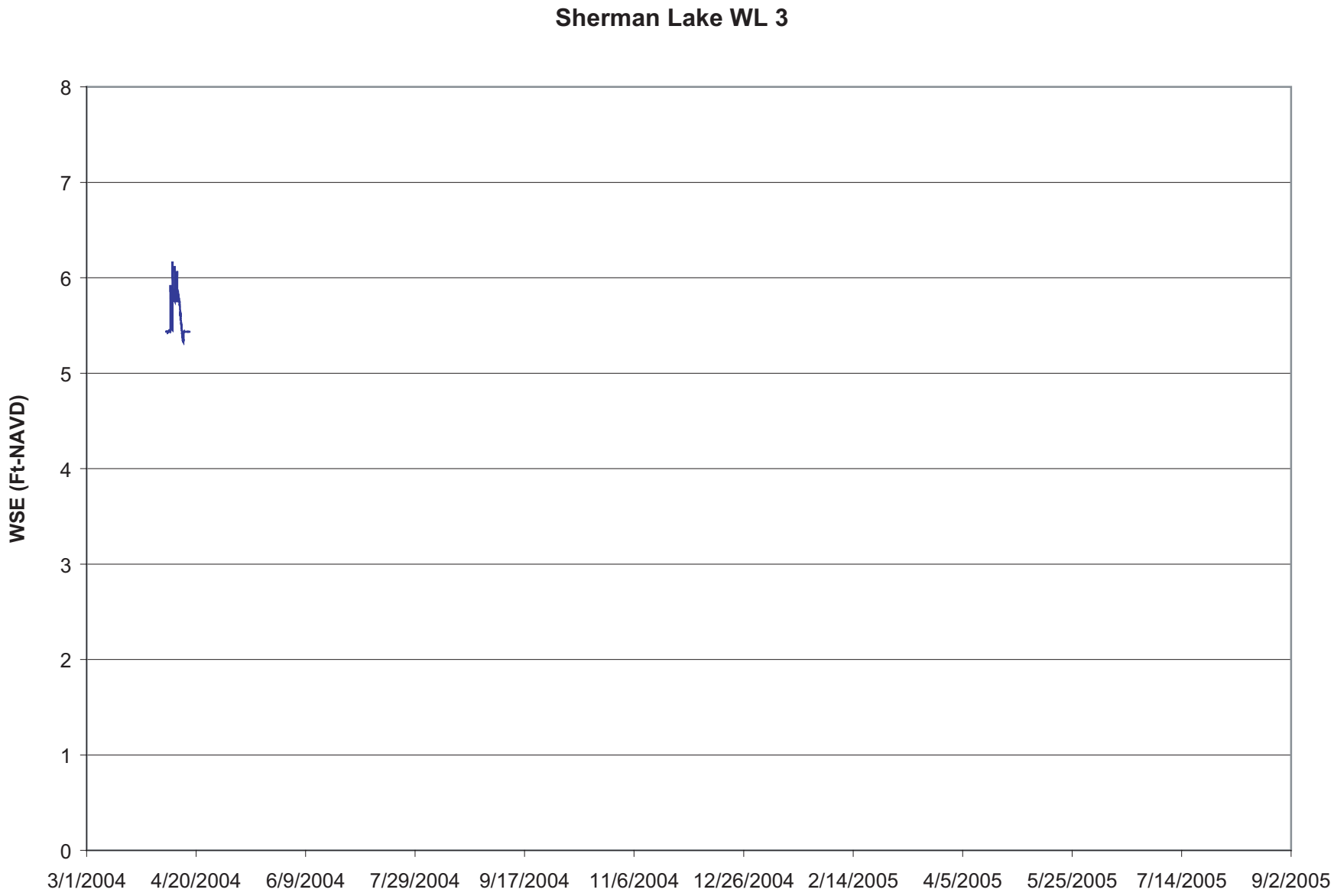


WETLANDS AND WATER RESOURCES

Sherman Lake WL2
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 29.2**

Fig-29.2_SL_WL2_WSE_2006-1231.pdf

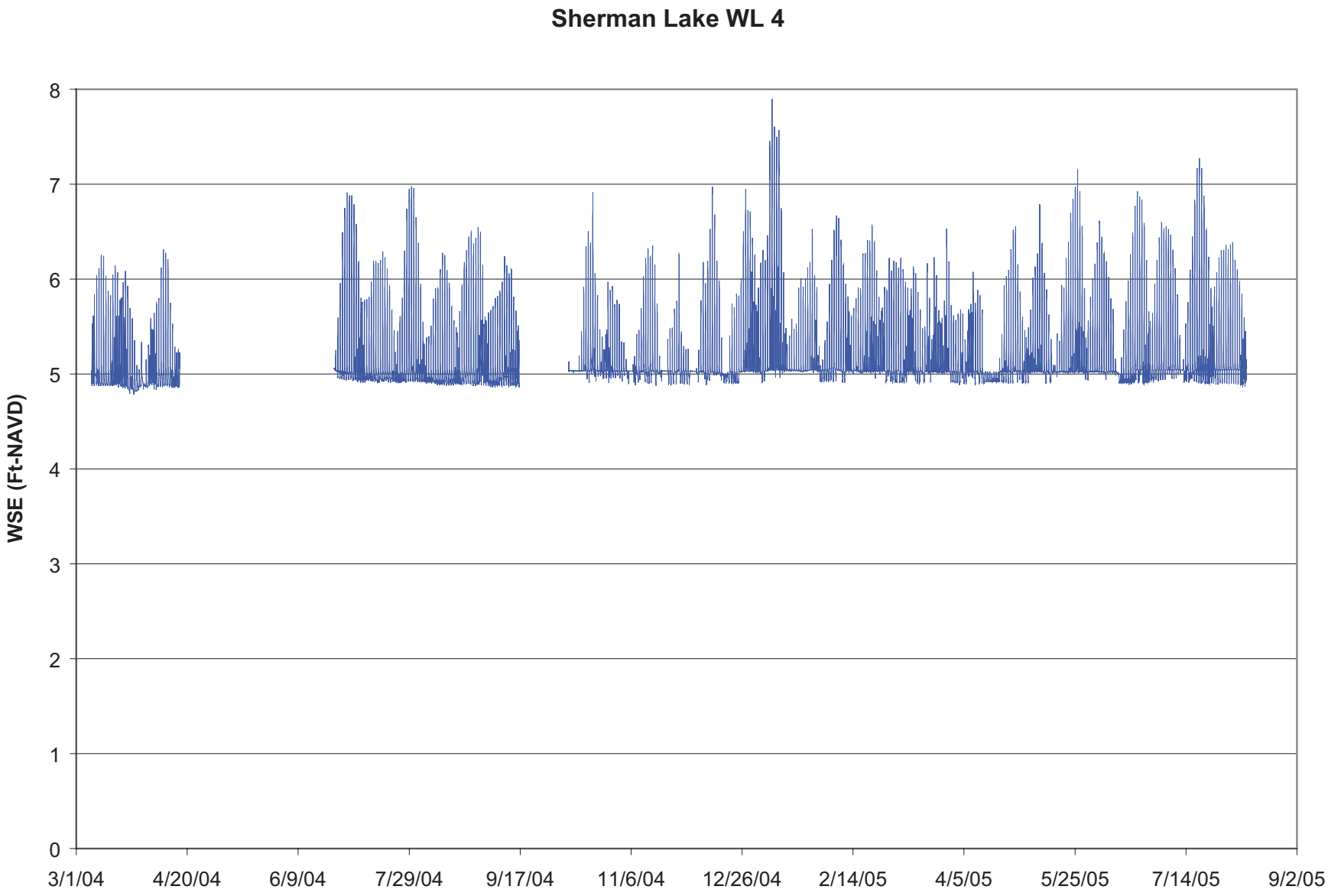


WETLANDS AND WATER RESOURCES

Sherman Lake - WL3
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 29.3**

SL_WSE_All-Stations_2007-0111dag.xls

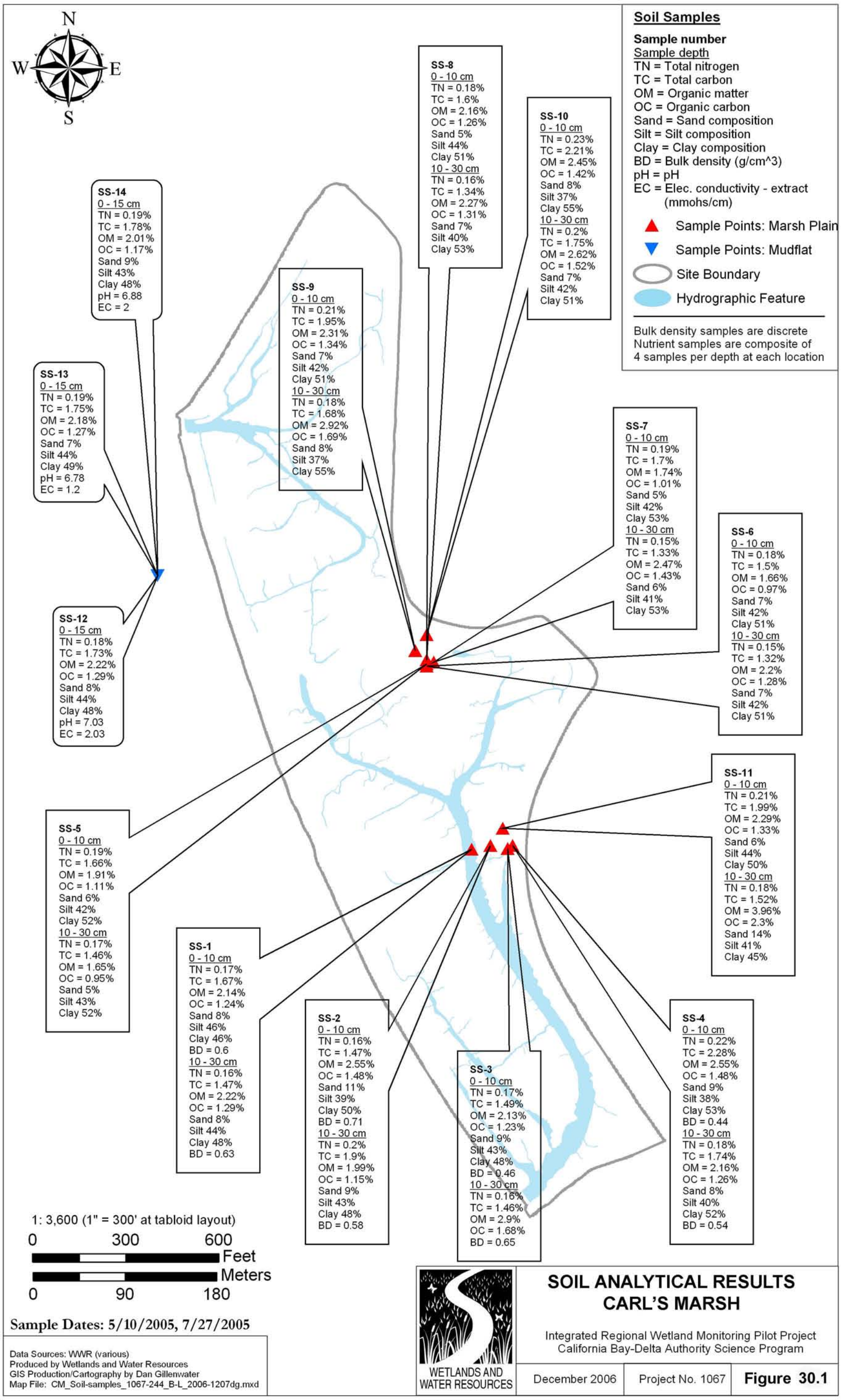


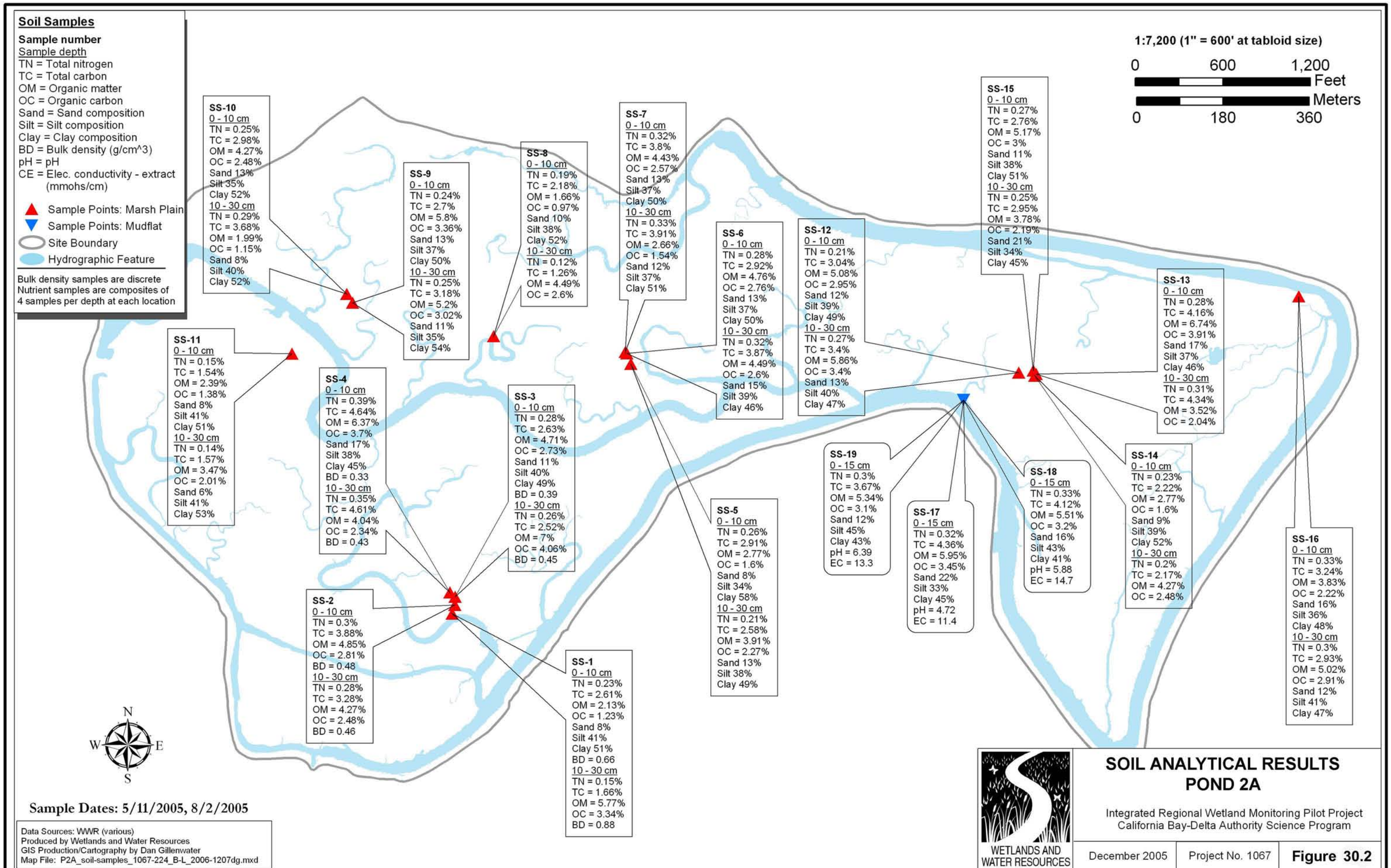
WETLANDS AND WATER RESOURCES

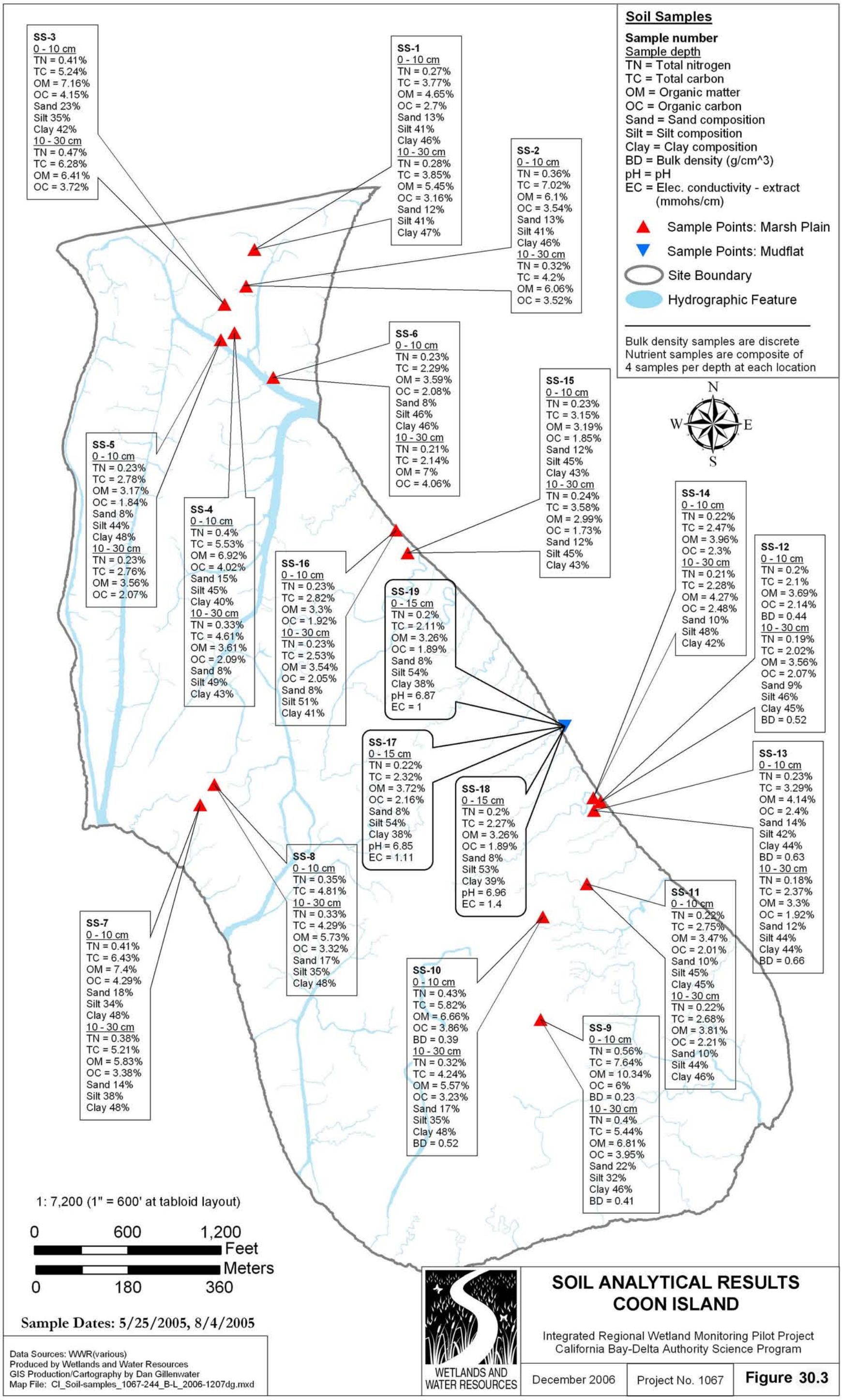
Sherman Lake WL4
Water Surface Elevation Time-Series Data
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

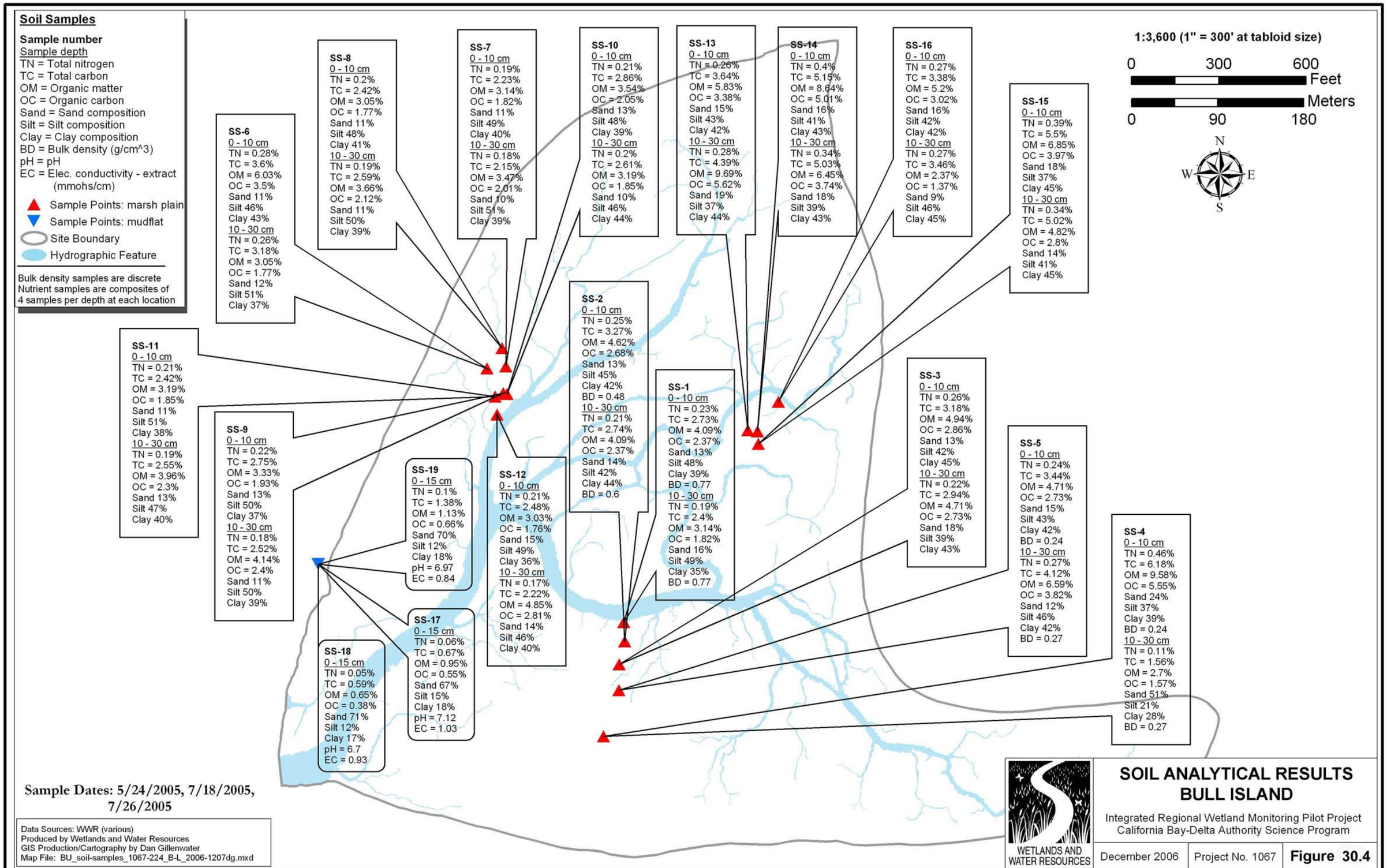
December 2006	Project No. 1067	**Figure 29.4**

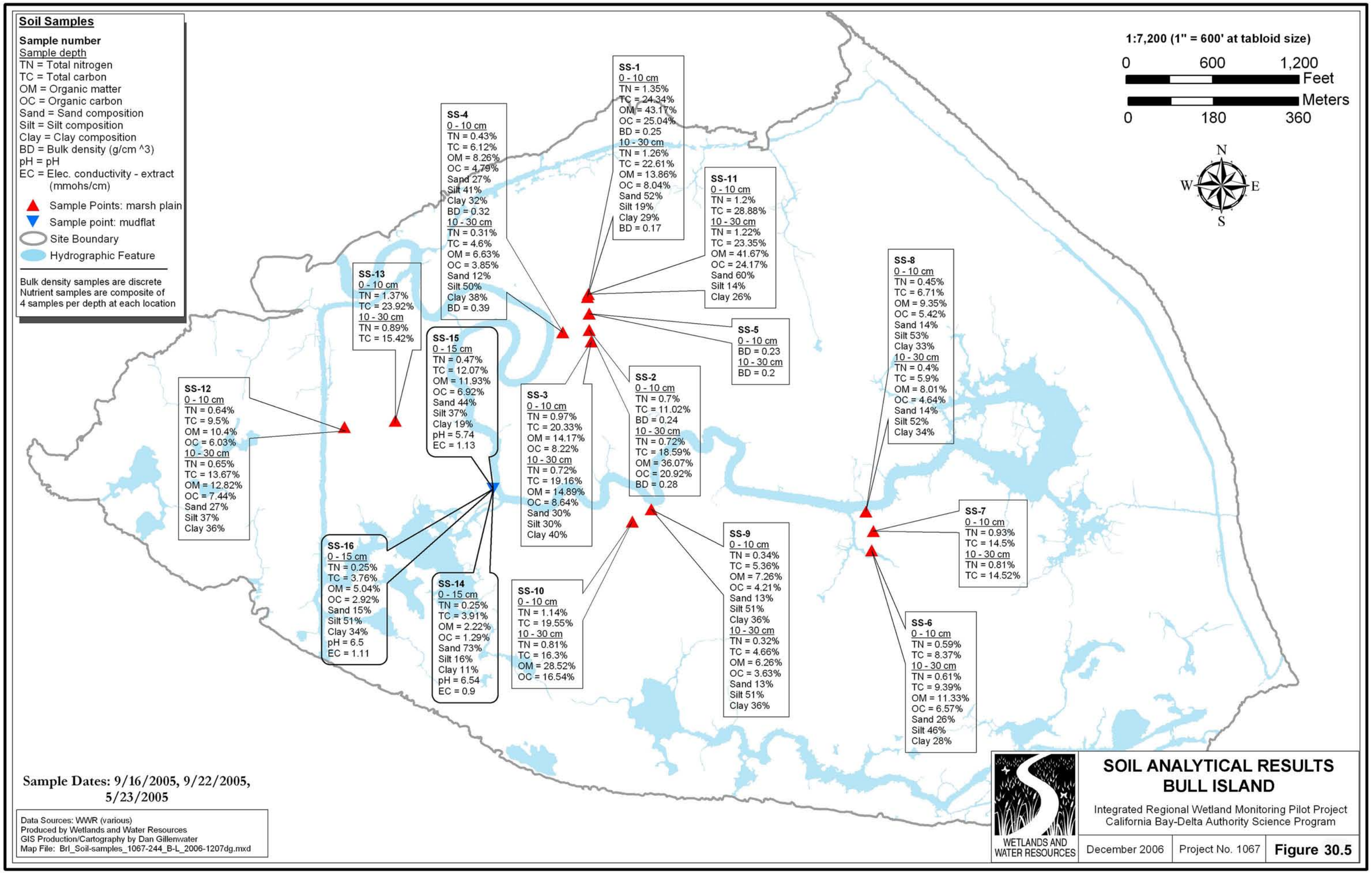
Fig-29.4_SL_WL4_WSE_2006-1231.pdf


N
W
E
S
Soil Samples
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm^3)
pH = pH
EC = Elec. conductivity - extract (mmohs/cm)
Sample Points: Marsh Plain
Sample Points: Mudflat
Site Boundary
Hydrographic Feature
Bulk density samples are discrete
Nutrient samples are composite of 4 samples per depth at each location
SS-8
0 - 10 cm
TN = 0.18%
TC = 1.6%
OM = 2.16%
OC = 1.26%
Sand 5%
Silt 44%
Clay 51%
10 - 30 cm
TN = 0.16%
TC = 1.34%
OM = 2.27%
OC = 1.31%
Sand 7%
Silt 40%
Clay 53%
SS-10
0 - 10 cm
TN = 0.23%
TC = 2.21%
OM = 2.45%
OC = 1.42%
Sand 8%
Silt 37%
Clay 55%
10 - 30 cm
TN = 0.2%
TC = 1.75%
OM = 2.62%
OC = 1.52%
Sand 7%
Silt 42%
Clay 51%
SS-14
0 - 15 cm
TN = 0.19%
TC = 1.78%
OM = 2.01%
OC = 1.17%
Sand 9%
Silt 43%
Clay 48%
pH = 6.88
EC = 2
SS-9
0 - 10 cm
TN = 0.21%
TC = 1.95%
OM = 2.31%
OC = 1.34%
Sand 7%
Silt 42%
Clay 51%
10 - 30 cm
TN = 0.18%
TC = 1.68%
OM = 2.92%
OC = 1.69%
Sand 8%
Silt 37%
Clay 55%
SS-13
0 - 15 cm
TN = 0.19%
TC = 1.75%
OM = 2.18%
OC = 1.27%
Sand 7%
Silt 44%
Clay 49%
pH = 6.78
EC = 1.2
SS-7
0 - 10 cm
TN = 0.19%
TC = 1.7%
OM = 1.74%
OC = 1.01%
Sand 5%
Silt 42%
Clay 53%
10 - 30 cm
TN = 0.15%
TC = 1.33%
OM = 2.47%
OC = 1.43%
Sand 6%
Silt 41%
Clay 53%
SS-6
0 - 10 cm
TN = 0.18%
TC = 1.5%
OM = 1.66%
OC = 0.97%
Sand 7%
Silt 42%
Clay 51%
10 - 30 cm
TN = 0.15%
TC = 1.32%
OM = 2.2%
OC = 1.28%
Sand 7%
Silt 42%
Clay 51%
SS-12
0 - 15 cm
TN = 0.18%
TC = 1.73%
OM = 2.22%
OC = 1.29%
Sand 8%
Silt 44%
Clay 48%
pH = 7.03
EC = 2.03
SS-11
0 - 10 cm
TN = 0.21%
TC = 1.99%
OM = 2.29%
OC = 1.33%
Sand 6%
Silt 44%
Clay 50%
10 - 30 cm
TN = 0.18%
TC = 1.52%
OM = 3.96%
OC = 2.3%
Sand 14%
Silt 41%
Clay 45%
SS-5
0 - 10 cm
TN = 0.19%
TC = 1.66%
OM = 1.91%
OC = 1.11%
Sand 6%
Silt 42%
Clay 52%
10 - 30 cm
TN = 0.17%
TC = 1.46%
OM = 1.65%
OC = 0.95%
Sand 5%
Silt 43%
Clay 52%
SS-1
0 - 10 cm
TN = 0.17%
TC = 1.67%
OM = 2.14%
OC = 1.24%
Sand 8%
Silt 46%
Clay 46%
BD = 0.6
10 - 30 cm
TN = 0.16%
TC = 1.47%
OM = 2.22%
OC = 1.29%
Sand 8%
Silt 44%
Clay 48%
BD = 0.63
SS-2
0 - 10 cm
TN = 0.16%
TC = 1.47%
OM = 2.55%
OC = 1.48%
Sand 11%
Silt 39%
Clay 50%
BD = 0.71
10 - 30 cm
TN = 0.2%
TC = 1.9%
OM = 1.99%
OC = 1.15%
Sand 9%
Silt 43%
Clay 48%
BD = 0.58
SS-3
0 - 10 cm
TN = 0.17%
TC = 1.49%
OM = 2.13%
OC = 1.23%
Sand 9%
Silt 43%
Clay 48%
BD = 0.46
10 - 30 cm
TN = 0.16%
TC = 1.46%
OM = 2.9%
OC = 1.68%
BD = 0.65
SS-4
0 - 10 cm
TN = 0.22%
TC = 2.28%
OM = 2.55%
OC = 1.48%
Sand 9%
Silt 38%
Clay 53%
BD = 0.44
10 - 30 cm
TN = 0.18%
TC = 1.74%
OM = 2.16%
OC = 1.26%
Sand 8%
Silt 40%
Clay 52%
BD = 0.54
1: 3,600 (1" = 300' at tabloid layout)
0 300 600
Feet
Meters
0 90 180
Sample Dates: 5/10/2005, 7/27/2005
Data Sources: WWR (various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: CM_Soil-samples_1067-244_B-L_2006-1207dg.mxd
WETLANDS AND WATER RESOURCES
SOIL ANALYTICAL RESULTS
CARL'S MARSH
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 30.1


Soil Samples
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm^3)
pH = pH
CE = Elec. conductivity - extract (mmohs/cm)
Sample Points: Marsh Plain
Sample Points: Mudflat
Site Boundary
Hydrographic Feature
Bulk density samples are discrete
Nutrient samples are composites of 4 samples per depth at each location
1:7,200 (1" = 600' at tabloid size)
0 600 1,200 Feet
0 180 360 Meters
SS-10
0 - 10 cm
TN = 0.25%
TC = 2.98%
OM = 4.27%
OC = 2.48%
Sand 13%
Silt 35%
Clay 52%
10 - 30 cm
TN = 0.29%
TC = 3.68%
OM = 1.99%
OC = 1.15%
Sand 8%
Silt 40%
Clay 52%
SS-9
0 - 10 cm
TN = 0.24%
TC = 2.7%
OM = 5.8%
OC = 3.36%
Sand 13%
Silt 37%
Clay 50%
10 - 30 cm
TN = 0.25%
TC = 3.18%
OM = 5.2%
OC = 3.02%
Sand 11%
Silt 35%
Clay 54%
SS-8
0 - 10 cm
TN = 0.19%
TC = 2.18%
OM = 1.66%
OC = 0.97%
Sand 10%
Silt 38%
Clay 52%
10 - 30 cm
TN = 0.12%
TC = 1.26%
OM = 4.49%
OC = 2.6%
SS-7
0 - 10 cm
TN = 0.32%
TC = 3.8%
OM = 4.43%
OC = 2.57%
Sand 13%
Silt 37%
Clay 50%
10 - 30 cm
TN = 0.33%
TC = 3.91%
OM = 2.66%
OC = 1.54%
Sand 12%
Silt 37%
Clay 51%
SS-15
0 - 10 cm
TN = 0.27%
TC = 2.76%
OM = 5.17%
OC = 3%
Sand 11%
Silt 38%
Clay 51%
10 - 30 cm
TN = 0.25%
TC = 2.95%
OM = 3.78%
OC = 2.19%
Sand 21%
Silt 34%
Clay 45%
SS-6
0 - 10 cm
TN = 0.28%
TC = 2.92%
OM = 4.76%
OC = 2.76%
Sand 13%
Silt 37%
Clay 50%
10 - 30 cm
TN = 0.32%
TC = 3.87%
OM = 4.49%
OC = 2.6%
Sand 15%
Silt 39%
Clay 46%
SS-12
0 - 10 cm
TN = 0.21%
TC = 3.04%
OM = 5.08%
OC = 2.95%
Sand 12%
Silt 39%
Clay 49%
10 - 30 cm
TN = 0.27%
TC = 3.4%
OM = 5.86%
OC = 3.4%
Sand 13%
Silt 40%
Clay 47%
SS-13
0 - 10 cm
TN = 0.28%
TC = 4.16%
OM = 6.74%
OC = 3.91%
Sand 17%
Silt 37%
Clay 46%
10 - 30 cm
TN = 0.31%
TC = 4.34%
OM = 3.52%
OC = 2.04%
SS-11
0 - 10 cm
TN = 0.15%
TC = 1.54%
OM = 2.39%
OC = 1.38%
Sand 8%
Silt 41%
Clay 51%
10 - 30 cm
TN = 0.14%
TC = 1.57%
OM = 3.47%
OC = 2.01%
Sand 6%
Silt 41%
Clay 53%
SS-4
0 - 10 cm
TN = 0.39%
TC = 4.64%
OM = 6.37%
OC = 3.7%
Sand 17%
Silt 38%
Clay 45%
BD = 0.33
10 - 30 cm
TN = 0.35%
TC = 4.61%
OM = 4.04%
OC = 2.34%
BD = 0.43
SS-3
0 - 10 cm
TN = 0.28%
TC = 2.63%
OM = 4.71%
OC = 2.73%
Sand 11%
Silt 40%
Clay 49%
BD = 0.39
10 - 30 cm
TN = 0.26%
TC = 2.52%
OM = 7%
OC = 4.06%
BD = 0.45
SS-19
0 - 15 cm
TN = 0.3%
TC = 3.67%
OM = 5.34%
OC = 3.1%
Sand 12%
Silt 45%
Clay 43%
pH = 6.39
EC = 13.3
SS-18
0 - 15 cm
TN = 0.33%
TC = 4.12%
OM = 5.51%
OC = 3.2%
Sand 16%
Silt 43%
Clay 41%
pH = 5.88
EC = 14.7
SS-14
0 - 10 cm
TN = 0.23%
TC = 2.22%
OM = 2.77%
OC = 1.6%
Sand 9%
Silt 39%
Clay 52%
10 - 30 cm
TN = 0.2%
TC = 2.17%
OM = 4.27%
OC = 2.48%
SS-17
0 - 15 cm
TN = 0.32%
TC = 4.36%
OM = 5.95%
OC = 3.45%
Sand 22%
Silt 33%
Clay 45%
pH = 4.72
EC = 11.4
SS-5
0 - 10 cm
TN = 0.26%
TC = 2.91%
OM = 2.77%
OC = 1.6%
Sand 8%
Silt 34%
Clay 58%
10 - 30 cm
TN = 0.21%
TC = 2.58%
OM = 3.91%
OC = 2.27%
Sand 13%
Silt 38%
Clay 49%
SS-16
0 - 10 cm
TN = 0.33%
TC = 3.24%
OM = 3.83%
OC = 2.22%
Sand 16%
Silt 36%
Clay 48%
10 - 30 cm
TN = 0.3%
TC = 2.93%
OM = 5.02%
OC = 2.91%
Sand 12%
Silt 41%
Clay 47%
SS-2
0 - 10 cm
TN = 0.3%
TC = 3.88%
OM = 4.85%
OC = 2.81%
BD = 0.48
10 - 30 cm
TN = 0.28%
TC = 3.28%
OM = 4.27%
OC = 2.48%
BD = 0.46
SS-1
0 - 10 cm
TN = 0.23%
TC = 2.61%
OM = 2.13%
OC = 1.23%
Sand 8%
Silt 41%
Clay 51%
BD = 0.66
10 - 30 cm
TN = 0.15%
TC = 1.66%
OM = 5.77%
OC = 3.34%
BD = 0.88
N
W
E
S
Sample Dates: 5/11/2005, 8/2/2005
Data Sources: WWR (various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: P2A_soil-samples_1067-224_B-L_2006-1207dg.mxd
WETLANDS AND WATER RESOURCES
SOIL ANALYTICAL RESULTS
POND 2A
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2005
Project No. 1067
Figure 30.2


Soil Samples
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm^3)
pH = pH
EC = Elec. conductivity - extract (mmohs/cm)
Sample Points: Marsh Plain
Sample Points: Mudflat
Site Boundary
Hydrographic Feature
Bulk density samples are discrete
Nutrient samples are composite of 4 samples per depth at each location
N
W
E
S
SS-3
0 - 10 cm
TN = 0.41%
TC = 5.24%
OM = 7.16%
OC = 4.15%
Sand 23%
Silt 35%
Clay 42%
10 - 30 cm
TN = 0.47%
TC = 6.28%
OM = 6.41%
OC = 3.72%
SS-1
0 - 10 cm
TN = 0.27%
TC = 3.77%
OM = 4.65%
OC = 2.7%
Sand 13%
Silt 41%
Clay 46%
10 - 30 cm
TN = 0.28%
TC = 3.85%
OM = 5.45%
OC = 3.16%
Sand 12%
Silt 41%
Clay 47%
SS-2
0 - 10 cm
TN = 0.36%
TC = 7.02%
OM = 6.1%
OC = 3.54%
Sand 13%
Silt 41%
Clay 46%
10 - 30 cm
TN = 0.32%
TC = 4.2%
OM = 6.06%
OC = 3.52%
SS-6
0 - 10 cm
TN = 0.23%
TC = 2.29%
OM = 3.59%
OC = 2.08%
Sand 8%
Silt 46%
Clay 46%
10 - 30 cm
TN = 0.21%
TC = 2.14%
OM = 7%
OC = 4.06%
SS-15
0 - 10 cm
TN = 0.23%
TC = 3.15%
OM = 3.19%
OC = 1.85%
Sand 12%
Silt 45%
Clay 43%
10 - 30 cm
TN = 0.24%
TC = 3.58%
OM = 2.99%
OC = 1.73%
Sand 12%
Silt 45%
Clay 43%
SS-5
0 - 10 cm
TN = 0.23%
TC = 2.78%
OM = 3.17%
OC = 1.84%
Sand 8%
Silt 44%
Clay 48%
10 - 30 cm
TN = 0.23%
TC = 2.76%
OM = 3.56%
OC = 2.07%
SS-4
0 - 10 cm
TN = 0.4%
TC = 5.53%
OM = 6.92%
OC = 4.02%
Sand 15%
Silt 45%
Clay 40%
10 - 30 cm
TN = 0.33%
TC = 4.61%
OM = 3.61%
OC = 2.09%
Sand 8%
Silt 49%
Clay 43%
SS-16
0 - 10 cm
TN = 0.23%
TC = 2.82%
OM = 3.3%
OC = 1.92%
10 - 30 cm
TN = 0.23%
TC = 2.53%
OM = 3.54%
OC = 2.05%
Sand 8%
Silt 51%
Clay 41%
SS-19
0 - 15 cm
TN = 0.2%
TC = 2.11%
OM = 3.26%
OC = 1.89%
Sand 8%
Silt 54%
Clay 38%
pH = 6.87
EC = 1
SS-14
0 - 10 cm
TN = 0.22%
TC = 2.47%
OM = 3.96%
OC = 2.3%
10 - 30 cm
TN = 0.21%
TC = 2.28%
OM = 4.27%
OC = 2.48%
Sand 10%
Silt 48%
Clay 42%
SS-12
0 - 10 cm
TN = 0.2%
TC = 2.1%
OM = 3.69%
OC = 2.14%
BD = 0.44
10 - 30 cm
TN = 0.19%
TC = 2.02%
OM = 3.56%
OC = 2.07%
Sand 9%
Silt 46%
Clay 45%
BD = 0.52
SS-17
0 - 15 cm
TN = 0.22%
TC = 2.32%
OM = 3.72%
OC = 2.16%
Sand 8%
Silt 54%
Clay 38%
pH = 6.85
EC = 1.11
SS-18
0 - 15 cm
TN = 0.2%
TC = 2.27%
OM = 3.26%
OC = 1.89%
Sand 8%
Silt 53%
Clay 39%
pH = 6.96
EC = 1.4
SS-13
0 - 10 cm
TN = 0.23%
TC = 3.29%
OM = 4.14%
OC = 2.4%
Sand 14%
Silt 42%
Clay 44%
BD = 0.63
10 - 30 cm
TN = 0.18%
TC = 2.37%
OM = 3.3%
OC = 1.92%
Sand 12%
Silt 44%
Clay 44%
BD = 0.66
SS-8
0 - 10 cm
TN = 0.35%
TC = 4.81%
10 - 30 cm
TN = 0.33%
TC = 4.29%
OM = 5.73%
OC = 3.32%
Sand 17%
Silt 35%
Clay 48%
SS-11
0 - 10 cm
TN = 0.22%
TC = 2.75%
OM = 3.47%
OC = 2.01%
Sand 10%
Silt 45%
Clay 45%
10 - 30 cm
TN = 0.22%
TC = 2.68%
OM = 3.81%
OC = 2.21%
Sand 10%
Silt 44%
Clay 46%
SS-7
0 - 10 cm
TN = 0.41%
TC = 6.43%
OM = 7.4%
OC = 4.29%
Sand 18%
Silt 34%
Clay 48%
10 - 30 cm
TN = 0.38%
TC = 5.21%
OM = 5.83%
OC = 3.38%
Sand 14%
Silt 38%
Clay 48%
SS-10
0 - 10 cm
TN = 0.43%
TC = 5.82%
OM = 6.66%
OC = 3.86%
BD = 0.39
10 - 30 cm
TN = 0.32%
TC = 4.24%
OM = 5.57%
OC = 3.23%
Sand 17%
Silt 35%
Clay 48%
BD = 0.52
SS-9
0 - 10 cm
TN = 0.56%
TC = 7.64%
OM = 10.34%
OC = 6%
BD = 0.23
10 - 30 cm
TN = 0.4%
TC = 5.44%
OM = 6.81%
OC = 3.95%
Sand 22%
Silt 32%
Clay 46%
BD = 0.41
1: 7,200 (1" = 600' at tabloid layout)
0
600
1,200
Feet
Meters
0
180
360
Sample Dates: 5/25/2005, 8/4/2005
Data Sources: WWR(various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: CI_Soil-samples_1067-244_B-L_2006-1207dg.mxd
WETLANDS AND WATER RESOURCES
SOIL ANALYTICAL RESULTS
COON ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 30.3


Soil Samples
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm^3)
pH = pH
EC = Elec. conductivity - extract (mmohs/cm)
Sample Points: marsh plain
Sample Points: mudflat
Site Boundary
Hydrographic Feature
Bulk density samples are discrete
Nutrient samples are composites of 4 samples per depth at each location
1:3,600 (1" = 300' at tabloid size)
0 300 600 Feet
0 90 180 Meters
N
W
E
S
SS-6
0 - 10 cm
TN = 0.28%
TC = 3.6%
OM = 6.03%
OC = 3.5%
Sand 11%
Silt 46%
Clay 43%
10 - 30 cm
TN = 0.26%
TC = 3.18%
OM = 3.05%
OC = 1.77%
Sand 12%
Silt 51%
Clay 37%
SS-8
0 - 10 cm
TN = 0.2%
TC = 2.42%
OM = 3.05%
OC = 1.77%
Sand 11%
Silt 48%
Clay 41%
10 - 30 cm
TN = 0.19%
TC = 2.59%
OM = 3.66%
OC = 2.12%
Sand 11%
Silt 50%
Clay 39%
SS-7
0 - 10 cm
TN = 0.19%
TC = 2.23%
OM = 3.14%
OC = 1.82%
Sand 11%
Silt 49%
Clay 40%
10 - 30 cm
TN = 0.18%
TC = 2.15%
OM = 3.47%
OC = 2.01%
Sand 10%
Silt 51%
Clay 39%
SS-10
0 - 10 cm
TN = 0.21%
TC = 2.86%
OM = 3.54%
OC = 2.05%
Sand 13%
Silt 48%
Clay 39%
10 - 30 cm
TN = 0.2%
TC = 2.61%
OM = 3.19%
OC = 1.85%
Sand 10%
Silt 46%
Clay 44%
SS-13
0 - 10 cm
TN = 0.26%
TC = 3.64%
OM = 5.83%
OC = 3.38%
Sand 15%
Silt 43%
Clay 42%
10 - 30 cm
TN = 0.28%
TC = 4.39%
OM = 9.69%
OC = 5.62%
Sand 19%
Silt 37%
Clay 44%
SS-14
0 - 10 cm
TN = 0.4%
TC = 5.15%
OM = 8.64%
OC = 5.01%
Sand 16%
Silt 41%
Clay 43%
10 - 30 cm
TN = 0.34%
TC = 5.03%
OM = 6.45%
OC = 3.74%
Sand 18%
Silt 39%
Clay 43%
SS-16
0 - 10 cm
TN = 0.27%
TC = 3.38%
OM = 5.2%
OC = 3.02%
Sand 16%
Silt 42%
Clay 42%
10 - 30 cm
TN = 0.27%
TC = 3.46%
OM = 2.37%
OC = 1.37%
Sand 9%
Silt 46%
Clay 45%
SS-15
0 - 10 cm
TN = 0.39%
TC = 5.5%
OM = 6.85%
OC = 3.97%
Sand 18%
Silt 37%
Clay 45%
10 - 30 cm
TN = 0.34%
TC = 5.02%
OM = 4.82%
OC = 2.8%
Sand 14%
Silt 41%
Clay 45%
SS-11
0 - 10 cm
TN = 0.21%
TC = 2.42%
OM = 3.19%
OC = 1.85%
Sand 11%
Silt 51%
Clay 38%
10 - 30 cm
TN = 0.19%
TC = 2.55%
OM = 3.96%
OC = 2.3%
Sand 13%
Silt 47%
Clay 40%
SS-9
0 - 10 cm
TN = 0.22%
TC = 2.75%
OM = 3.33%
OC = 1.93%
Sand 13%
Silt 50%
Clay 37%
10 - 30 cm
TN = 0.18%
TC = 2.52%
OM = 4.14%
OC = 2.4%
Sand 11%
Silt 50%
Clay 39%
SS-2
0 - 10 cm
TN = 0.25%
TC = 3.27%
OM = 4.62%
OC = 2.68%
Sand 13%
Silt 45%
Clay 42%
BD = 0.48
10 - 30 cm
TN = 0.21%
TC = 2.74%
OM = 4.09%
OC = 2.37%
Sand 14%
Silt 42%
Clay 44%
BD = 0.6
SS-1
0 - 10 cm
TN = 0.23%
TC = 2.73%
OM = 4.09%
OC = 2.37%
Sand 13%
Silt 48%
Clay 39%
BD = 0.77
10 - 30 cm
TN = 0.19%
TC = 2.4%
OM = 3.14%
OC = 1.82%
Sand 16%
Silt 49%
Clay 35%
BD = 0.77
SS-3
0 - 10 cm
TN = 0.26%
TC = 3.18%
OM = 4.94%
OC = 2.86%
Sand 13%
Silt 42%
Clay 45%
10 - 30 cm
TN = 0.22%
TC = 2.94%
OM = 4.71%
OC = 2.73%
Sand 18%
Silt 39%
Clay 43%
SS-5
0 - 10 cm
TN = 0.24%
TC = 3.44%
OM = 4.71%
OC = 2.73%
Sand 15%
Silt 43%
Clay 42%
BD = 0.24
10 - 30 cm
TN = 0.27%
TC = 4.12%
OM = 6.59%
OC = 3.82%
Sand 12%
Silt 46%
Clay 42%
BD = 0.27
SS-4
0 - 10 cm
TN = 0.46%
TC = 6.18%
OM = 9.58%
OC = 5.55%
Sand 24%
Silt 37%
Clay 39%
BD = 0.24
10 - 30 cm
TN = 0.11%
TC = 1.56%
OM = 2.7%
OC = 1.57%
Sand 51%
Silt 21%
Clay 28%
BD = 0.27
SS-19
0 - 15 cm
TN = 0.1%
TC = 1.38%
OM = 1.13%
OC = 0.66%
Sand 70%
Silt 12%
Clay 18%
pH = 6.97
EC = 0.84
SS-12
0 - 10 cm
TN = 0.21%
TC = 2.48%
OM = 3.03%
OC = 1.76%
Sand 15%
Silt 49%
Clay 36%
10 - 30 cm
TN = 0.17%
TC = 2.22%
OM = 4.85%
OC = 2.81%
Sand 14%
Silt 46%
Clay 40%
SS-17
0 - 15 cm
TN = 0.06%
TC = 0.67%
OM = 0.95%
OC = 0.55%
Sand 67%
Silt 15%
Clay 18%
pH = 7.12
EC = 1.03
SS-18
0 - 15 cm
TN = 0.05%
TC = 0.59%
OM = 0.65%
OC = 0.38%
Sand 71%
Silt 12%
Clay 17%
pH = 6.7
EC = 0.93
Sample Dates: 5/24/2005, 7/18/2005, 7/26/2005
Data Sources: WWR (various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: BU_soil-samples_1067-224_B-L_2006-1207dg.mxd
WETLANDS AND WATER RESOURCES
SOIL ANALYTICAL RESULTS
BULL ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 30.4


Soil Samples
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm ^3)
pH = pH
EC = Elec. conductivity - extract (mmohs/cm)
Sample Points: marsh plain
Sample point: mudflat
Site Boundary
Hydrographic Feature
Bulk density samples are discrete
Nutrient samples are composite of 4 samples per depth at each location
1:7,200 (1" = 600' at tabloid size)
0 600 1,200 Feet
0 180 360 Meters
N
W
E
S
SS-1
0 - 10 cm
TN = 1.35%
TC = 24.34%
OM = 43.17%
OC = 25.04%
BD = 0.25
10 - 30 cm
TN = 1.26%
TC = 22.61%
OM = 13.86%
OC = 8.04%
Sand 52%
Silt 19%
Clay 29%
BD = 0.17
SS-4
0 - 10 cm
TN = 0.43%
TC = 6.12%
OM = 8.26%
OC = 4.79%
Sand 27%
Silt 41%
Clay 32%
BD = 0.32
10 - 30 cm
TN = 0.31%
TC = 4.6%
OM = 6.63%
OC = 3.85%
Sand 12%
Silt 50%
Clay 38%
BD = 0.39
SS-11
0 - 10 cm
TN = 1.2%
TC = 28.88%
10 - 30 cm
TN = 1.22%
TC = 23.35%
OM = 41.67%
OC = 24.17%
Sand 60%
Silt 14%
Clay 26%
SS-13
0 - 10 cm
TN = 1.37%
TC = 23.92%
10 - 30 cm
TN = 0.89%
TC = 15.42%
SS-5
0 - 10 cm
BD = 0.23
10 - 30 cm
BD = 0.2
SS-8
0 - 10 cm
TN = 0.45%
TC = 6.71%
OM = 9.35%
OC = 5.42%
Sand 14%
Silt 53%
Clay 33%
10 - 30 cm
TN = 0.4%
TC = 5.9%
OM = 8.01%
OC = 4.64%
Sand 14%
Silt 52%
Clay 34%
SS-15
0 - 15 cm
TN = 0.47%
TC = 12.07%
OM = 11.93%
OC = 6.92%
Sand 44%
Silt 37%
Clay 19%
pH = 5.74
EC = 1.13
SS-2
0 - 10 cm
TN = 0.7%
TC = 11.02%
BD = 0.24
10 - 30 cm
TN = 0.72%
TC = 18.59%
OM = 36.07%
OC = 20.92%
BD = 0.28
SS-3
0 - 10 cm
TN = 0.97%
TC = 20.33%
OM = 14.17%
OC = 8.22%
10 - 30 cm
TN = 0.72%
TC = 19.16%
OM = 14.89%
OC = 8.64%
Sand 30%
Silt 30%
Clay 40%
SS-12
0 - 10 cm
TN = 0.64%
TC = 9.5%
OM = 10.4%
OC = 6.03%
10 - 30 cm
TN = 0.65%
TC = 13.67%
OM = 12.82%
OC = 7.44%
Sand 27%
Silt 37%
Clay 36%
SS-7
0 - 10 cm
TN = 0.93%
TC = 14.5%
10 - 30 cm
TN = 0.81%
TC = 14.52%
SS-9
0 - 10 cm
TN = 0.34%
TC = 5.36%
OM = 7.26%
OC = 4.21%
Sand 13%
Silt 51%
Clay 36%
10 - 30 cm
TN = 0.32%
TC = 4.66%
OM = 6.26%
OC = 3.63%
Sand 13%
Silt 51%
Clay 36%
SS-16
0 - 15 cm
TN = 0.25%
TC = 3.76%
OM = 5.04%
OC = 2.92%
Sand 15%
Silt 51%
Clay 34%
pH = 6.5
EC = 1.11
SS-14
0 - 15 cm
TN = 0.25%
TC = 3.91%
OM = 2.22%
OC = 1.29%
Sand 73%
Silt 16%
Clay 11%
pH = 6.54
EC = 0.9
SS-10
0 - 10 cm
TN = 1.14%
TC = 19.55%
10 - 30 cm
TN = 0.81%
TC = 16.3%
OM = 28.52%
OC = 16.54%
SS-6
0 - 10 cm
TN = 0.59%
TC = 8.37%
10 - 30 cm
TN = 0.61%
TC = 9.39%
OM = 11.33%
OC = 6.57%
Sand 26%
Silt 46%
Clay 28%
Sample Dates: 9/16/2005, 9/22/2005, 5/23/2005
Data Sources: WWR (various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: Brl_Soil-samples_1067-244_B-L_2006-1207dg.mxd
WETLANDS AND WATER RESOURCES
SOIL ANALYTICAL RESULTS
BULL ISLAND
Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program
December 2006
Project No. 1067
Figure 30.5

Soil Samples

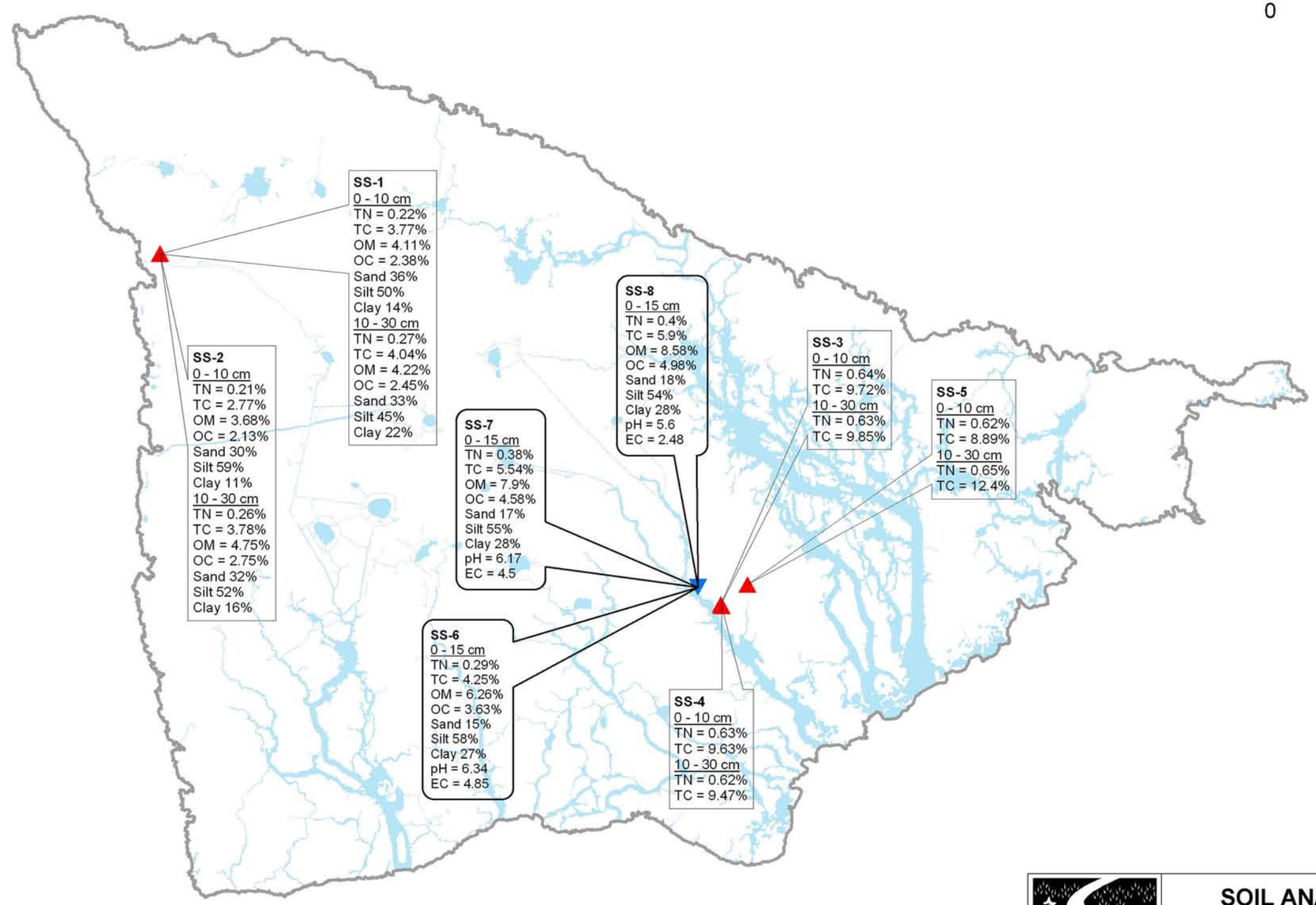
Sample number
Sample depth
TN = Total nitrogen
TC = Total carbon
OM = Organic matter
OC = Organic carbon
Sand = Sand composition
Silt = Silt composition
Clay = Clay composition
BD = Bulk density (g/cm^3)
pH = pH
EC = Elec. conductivity - extract (mmohs/cm)

Sample Points: Marsh Plain
Sample Points: Mudflat
Site Boundary
Hydrographic Feature

Bulk density samples are discrete
Nutrient samples are composites of 4 samples per depth at each location

1:12,000 (1" = 1000' at tabloid size)

0 1,000 2,000 Feet
0 300 600 Meters



N
W E
S

Sample Date: 5/9/2005, 9/6/2005

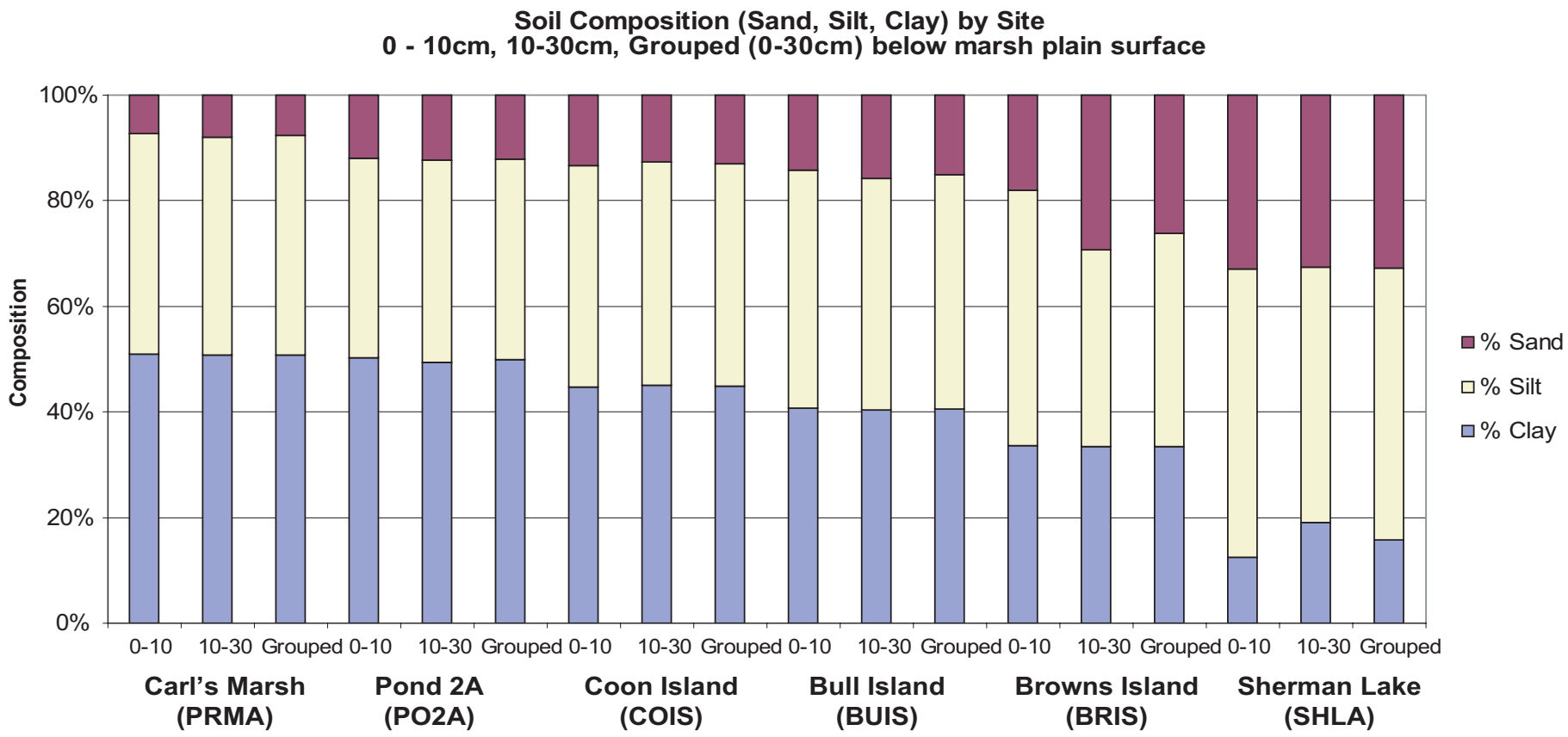
Data Sources: WWR (various)
Produced by Wetlands and Water Resources
GIS Production/Cartography by Dan Gillenwater
Map File: SL_Soil-samples_1067-244_B-L_2006-1207dg.mxd

WETLANDS AND WATER RESOURCES

SOIL ANALYTICAL RESULTS SHERMAN LAKE

Integrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006 | Project No. 1067 | **Figure 30.6**

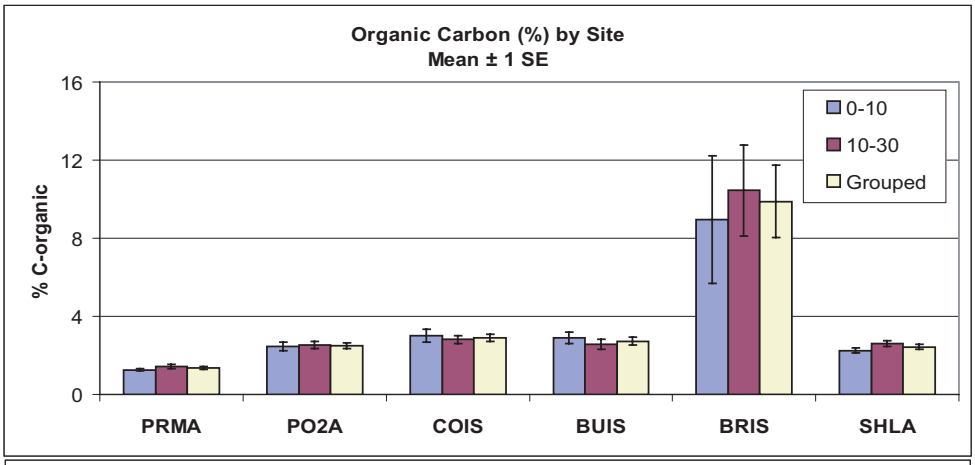


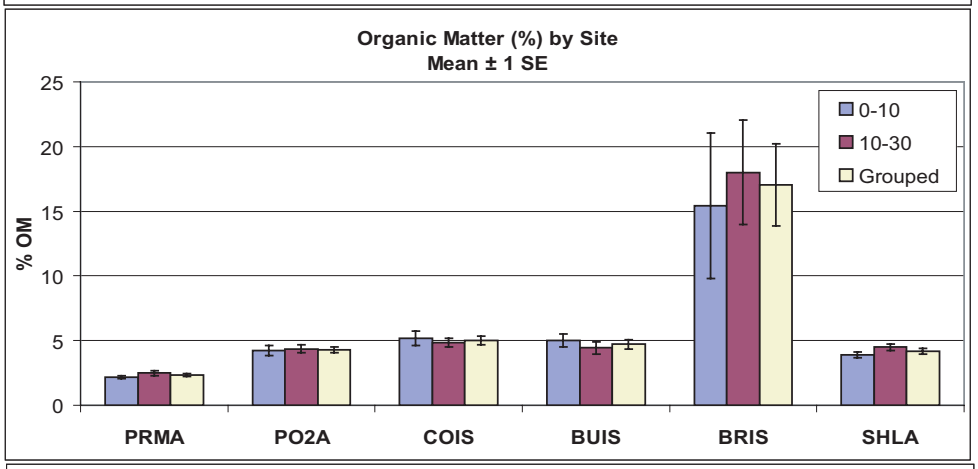
Soil Composition (Sand, Silt, Clay) by Site and Depth below Marsh Plain

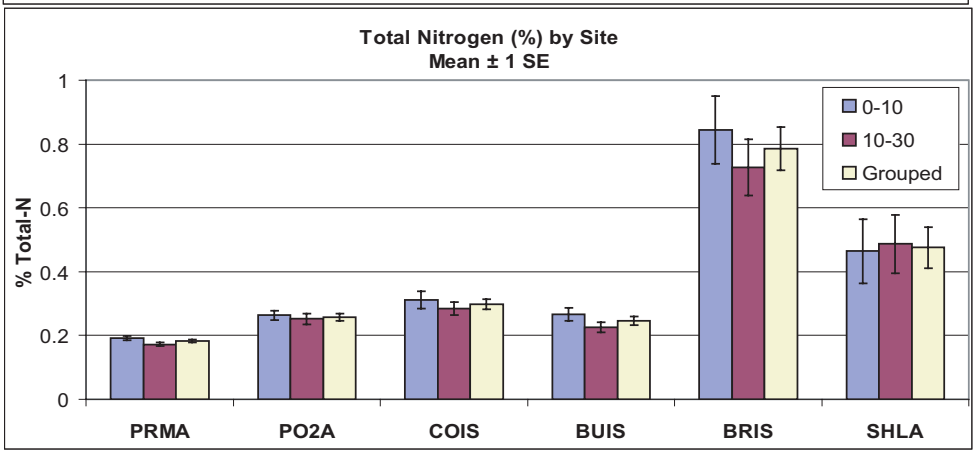
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

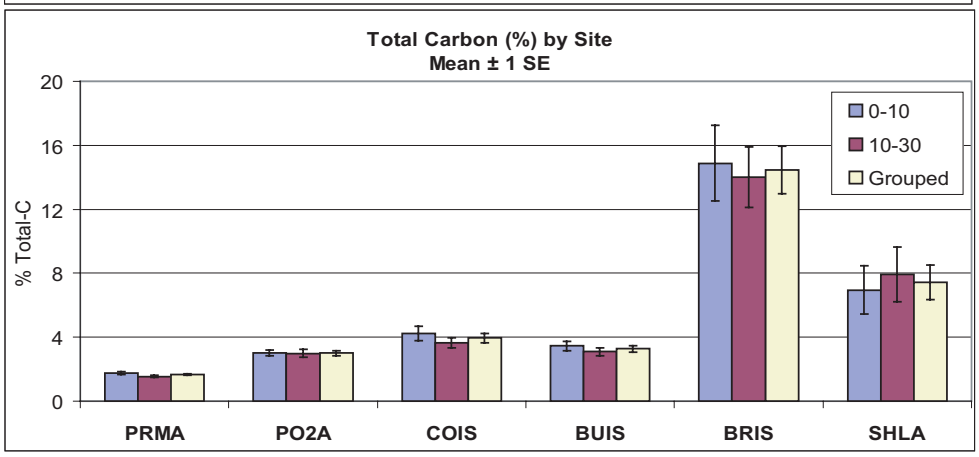
WETLANDS AND WATER RESOURCES

December 2006	Project No. 1067	**Figure 31**









Legend

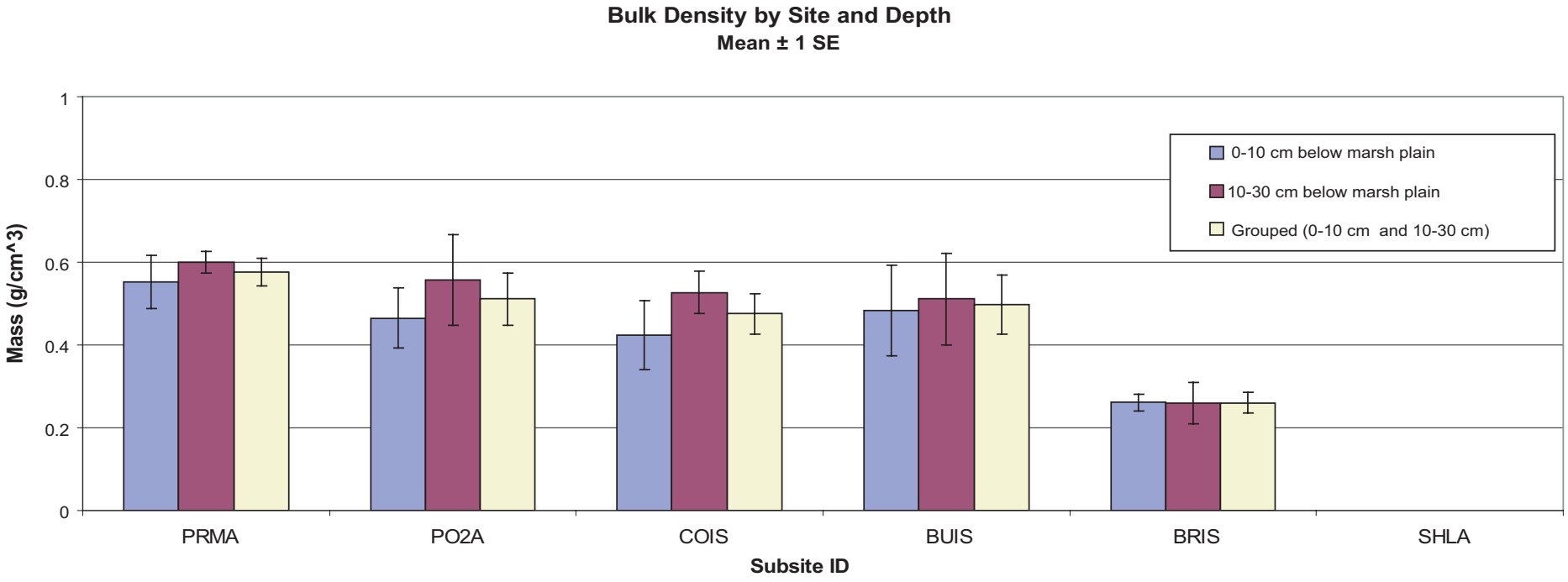
PRMA = Carl's Marsh aka Petaluma River Marsh
PO2A = Pond 2A
COIS = Coon Island
BUIS = Bull Island
BRIS = Browns Island
SHLA = Sherman Lake

0-10 cm below marsh plain
10-30 cm below marsh plain
Grouped (0-10 cm and 10-30 cm)

WETLANDS AND WATER RESOURCES

Soil Properties
by Site and Depth below Marsh Plain
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 32**



No bulk density samples were successfully collected at Sherman Lake due to extensive root layer

Legend
PRMA = Carl's Marsh aka Petaluma River Marsh
PO2A = Pond 2A
COIS = Coon Island
BUIS = Bull Island
BRIS = Browns Island
SHLA = Sherman Lake

WETLANDS AND WATER RESOURCES

Soil Bulk Density
by Site and Depth below Marsh Plain
Intergrated Regional Wetland Monitoring Pilot Project
California Bay-Delta Authority Science Program

December 2006	Project No. 1067	**Figure 33**

Table 1.1 Field Data Collection Schedule, Carl's Marsh[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																											
marsh plain	WL-1	PT2X	2346015				10i						16r														
MP-N	WL-2	PT2X	2346008				10i						16r														
MP-N	WL-2	Troll 4000	10075													14i					11r						
channel	WL-3	PT2X	2346007				10i					26r															
channel	WL-3	Troll 4000	10513									26i				14f			2i		11r						
channel	CTDS - Depth	LS-10 250	4044407				22i					(2-12)															14; 22r
channel	CTDS - Cond	GLI 3725E2T	401				22i					(2-12)															
channel	CTDS - Temp	Forest Tech DTS 12	12113				22i					(2-8)							2f								
channel	CTDS - Temp	Forest Tech DTS 12	12124																28i					24f			
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12113									(2-8)							2f								
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12124																28i					24f			
Category 2: Periodic Field Activities																											
Water Level Offset Measurements			**1067.221**																								
marsh plain	WL-1	PT2X	2346015				10	23																			
MP-N	WL-2	PT2X	2346008				10	23																			
MP-N	WL-2	Troll 4000	10075													14			13	13	11						
channel	WL-3	PT2X	2346007				10	23		11	21	26															
channel	WL-3	Troll 4000	10513									26		21		14	22		2,13	13	11						
channel	CTDS	LS-10 250	4044407				22	23		18	21	8,26	2,18	21		14	22		2,13,28		11			24			14
Water Level Data Downloads			**1067.221**																								
marsh plain	WL-1	PT2X	2346015					23		11	21		16														
MP-N	WL-2	PT2X	2346008					23		11	21		16														
MP-N	WL-2	Troll 4000	10075														22		2,13	13	11						
channel	WL-3	PT2X	2346007					23		11	21	26															
channel	WL-3	Troll 4000	10513											21		14	22		2,13	13	11						
channel	CTDS	LS-10 250	4044407					23				13,26	18			14	22		2,28		11						
CTDS In-field Sensor Maintenance			**1067.221**																								
Sensor cleaning dates										11		13	18	21		14			2		11		28	24			
Conductivity calibration		GLI 3725E2T	401				22						18			14											
OBS calibration		Forest Tech DTS 12	12113											21					2f,r								
OBS calibration		Forest Tech DTS 12	12124																13i				28				
Channel Cross-section Surveying			**1067.223**																								
Channel South	XS-2	Topographic - TopCon					10			11																	
South Breach	XS-3	Topographic - TopCon					10																				
North Breach	XS-4	Topographic - TopCon					10																				
Channel North	XS-5	Topographic - TopCon					10																				
Benchmark Surveying			**1067.223**																								
Bridge[4]	PBM-1																										
AC-17	PBM-2	GPS_PPK																								19	
WL-01	SBM-1	TopCon Total Station					10																28				
WL-02	SBM-2	TopCon Total Station					10																				22
WL-03	SBM-3	TopCon Total Station					10																				31
CTDS	SBM-4	GPS_PPK / TopCon Total Station						14													15						31
Pore Water Salinity			**1067.224**																								
WL-1	PZ-1									11i			16			14					11		28				22
WL-2	PZ-2									11i			16			14	22				11		28				22
	PZ-3										21i		16				22				11		28				22
	PZ-4										21i		16			14					11		28				22
	PZ-8										21i		16			14					11		28				22
Sediment Sampling			**1067.224**																								
SS-1 to SS-11 marsh plain - bulk density (8), nutrient (22)																										27	
SS-12, 13, 14 mudflat samples[5]																								10			
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
				2003				2004												2005							

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, f = instrument failure

Table 1.2 Field Data Collection Schedule, Pond 2A[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																											
MP-SW	WL-1	INW-PT2X	2346023				11i						10r														
MP-SW	WL-1	miniTroll	16433											2i, 28	19r	9ib							19r				
MP-Mid	WL-2	INW-PT2X	2346009				11i						10r														
MP-Mid	WL-2	miniTroll	16391											2i	19r												
MP-Mid	WL-2	miniTroll	16432													9ib							19r				
MP-E	WL-3	INW-PT2X	2346005				11i					25f	10r														
MP-E	WL-3	miniTroll	16604											2i	19r	9ib	14r										
MP-E	WL-3	miniTroll	16231														14i	24r									
MP-E	WL-3	miniTroll	16634															24ib					19r				
channel	WL-4	INW-PT2X	2346016				11i		27r																		
channel	WL-4	INW-PT2X	2346013						27i,f																		
channel	WL-4	INW-PT2X	2346011								7i	6f															
channel	WL-4	Troll 4000	10788									25i	10r														
channel	WL-4	Troll 4000	10789										23i	16r													
channel	WL-4	miniTroll	16291											16i		9r											
channel	WL-4	Troll 4000	10788													10i				22f							
channel	CTDS - Depth	LS-10 250	4044404						27				(2-11)														2r
channel	CTDS - Cond	GLI 3725E2T	309663056						27			(14-19)	(2-11)										(13 - 12)				1
channel	CTDS - Temp	Forest Tech DTS 12	12127						12i			(14-19)	(2-11)										13f	12r			
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12127						12i			(14-19)	(2-11)										13f	12r			
Category 2: Periodic Field Activities																											
Water Level Offset Measurements			**1067.221**																								
MP-SW	WL-1	PT2X	2346023				11	5	20																		
MP-SW	WL-1	miniTroll	16433											28			13,25	24	10	22							
MP-Mid	WL-2	PT2X	2346009					5	20																		
MP-Mid	WL-2	miniTroll	16391											28													
MP-Mid	WL-2	miniTroll	16432														13,25	24	10	22							
MP-E	WL-3	PT2X	2346005				11		20																		
MP-E	WL-3	miniTroll	16604											28			14										
MP-E	WL-3	miniTroll	16231														14,25	24									
MP-E	WL-3	miniTroll	16234															24	10	22							
channel	WL-4	PT2X	2346016					5	11,20,27																		
channel	WL-4	PT2X	2346013						27		6																
channel	WL-4	PT2X	2346011								7	25															
channel	WL-4	Troll 4000	10788									25															
channel	WL-4	Troll 4000	10789											16													
channel	WL-4	miniTroll	16291											16	9	9											
channel	WL-4	Troll 4000	10788													10	14,25	24	10								
channel	CTDS	LS-10 250	4044404						12	4	6	10	23	16	9	30	25	24	10	21	9	11			20		2r
Water Level Data Downloads			**1067.221**																								
MP-SW	WL-1	PT2X	2346023					5	20		6		2,10														
MP-SW	WL-1	miniTroll	16433											15,28	19		13,25	24	10	22			19				
MP-Mid	WL-2	PT2X	2346009					5	20		6	25	10														
MP-Mid	WL-2	miniTroll	16391											15,28	19												
MP-Mid	WL-2	miniTroll	16432														13,25	24	10	22			19				
MP-E	WL-3	PT2X	2346005						20		6	25	10														
MP-E	WL-3	miniTroll	16604											15,28	19		14										
MP-E	WL-3	miniTroll	16231														25	24	10	22							
channel	WL-4	PT2X	2346016					5	11,20,27																		
channel	WL-4	PT2X	2346013								6																
channel	WL-4	PT2X	2346011									25															
channel	WL-4	Troll 4000	10788										10														
channel	WL-4	Troll 4000	10789											16													
channel	WL-4	miniTroll	16291												9	9											
channel	WL-4	Troll 4000	10788														14,25	24	10								
channel	CTDS	LS-10 250	4044404							19			10,21,23	15,16		30	25	24		21		11					
CTDS In-field Sensor Maintenance			**1067.221**																								
Sensor cleaning dates									12				23	16	9, 26	30	25	24		21							
Conductivity calibration		GLI 3725E2T	309663056						12			10				30											
OBS calibration		Forest Tech DTS 12	12127									10						24						12			
Channel Cross-section Surveying			**1067.223**																								
boardwalk	XS-1	Hydrographic - Odom Hydrotrack					19																				
mid	XS-2	Hydrographic - Odom Hydrotrack					19																				
CTDS	XS-3	Hydrographic - Odom Hydrotrack					19																				
breach	XS-4	Hydrographic - Odom Hydrotrack					19																				
Benchmark Surveying[4]			**1067.223**																								
CTDS	PBM-1	optical								4i	14														20o		
XS-4-TSCP	PBM-2	optical									14																
XS-1-LB	SBM-1	GPS_RTK						11																			
XS-2-RB	SBM-5	GPS_RTK						11																27ts			
XS-2-TSCP	SBM-6	GPS_RTK						11																27ts			
XS-3-TSCP	SBM-9	GPS_RTK						11																	20o		
WL-1-TOGP	SBM-13	optical									14													27ts			
WL-2-TOGP	SBM-15	optical									14													27ts			
WL-2-TSCP	SBM-16	optical									14													27ts			
WL-3-TOGP	SBM-17	optical									14																
WL-4-Bdwk	SBM-18	optical							27i		7																
WL-3-TSCP	SBM-19	optical									14																
WL-1-TSCP	SBM-20	optical									14													27ts			
Pore Water Salinity			**1067.224**																								
WL-1	PZ-1							5i	20		6			15, 28		9	13,25	24	10	21			19				2
WL-2	PZ-2							5i	20		6			15, 28		9	13,25	24	10	21			19				2
	PZ-3								27i		6			15			25			21			19				2
	PZ-4								27i		6			15						21	9		19				2
	PZ-5										6i,14			15						21			19				2
	PZ-6								27i		6			15			25			21	9		19				2
	PZ-7								27i		6			15			25			21			19				2
	PZ-8								27i		6			15			25			21			19				2
WL-3	PZ-9								27i		6			15, 28		9	14,25	24		21			19				2
	PZ-10								27i		6			15			25			21			19				2
	PZ-11								27i		6			15			25			21			19				2
	PZ-12								27i		6			15			13,25			21	9		19				2
Sediment Sampling			**1067.224**																								
SS-1 to SS-16 marsh plain; bulk density (8), nutrient (32)																											2
SS-17, 18, 19 mudflat[5]																								11			
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
				2003				2004												2005							

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, f = instrument failure
4. Re-survey date followed by o = optical level, ts = TopCon Total Station
5. Sampled by Primary Productivity and Nutrient Team

Table 1.3 Field Data Collection Schedule, Coon Island[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																											
MP-Mid	WL-1	PT2X	2346013				11i	6a	11r																		
MP-Mid	WL-1	PT2X	2346003						11i				10r														
MP-Mid	WL-1	miniTroll	16376										29i		1f,19r												
MP-S (old)	WL-2	PT2X	2346006				11i		4r																		
MP-S (new)	WL-2	PT2X	2346006						4i				10r														
MP-S	WL-2	miniTroll	16187										29i		19r												
MP-S	WL-2	miniTroll	16603													9i,b							7r				
MP-N	WL-3	PT2X	2346017					22i					10r														
MP-N	WL-3	miniTroll	16430										29i						10r								
MP-N	WL-3	miniTroll	16604																14i,b				7r				
channel	WL-4	PT2X	2346025					22i				25r															
channel	WL-4	Troll 4000	10645									25i					(13-27)				9v						
channel	CTDS - Depth	LS-10 250	4044413						12i											(4-11)			7r				
channel	CTDS - Cond	GLI	309663051						27											(4-11)			7r				
channel	CTDS - Temp	Forest Tech DTS 12	12130						27			(14-19	(2-10)	(15-22)	(26-2)							19f					
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12130						27			(14-19	(2-10)	(15-22)	(26-2)							19f					
Category 2: Periodic Field Activities																											
Water Level Offset Measurements			**1067.221**																								
MP-Mid	WL-1	PT2X	2346013				11		4																		
MP-Mid	WL-1	PT2X	2346003								6																
MP-Mid	WL-1	miniTroll	16376											28													
MP-S (old)	WL-2	PT2X	2346006				11		4																		
MP-S (new)	WL-2	PT2X	2346006										2														
MP-S	WL-2	miniTroll	16187											28													
MP-S	WL-2	miniTroll	16603															15	10,14	10	9						
MP-N	WL-3	PT2X	2346017						4	17																	
MP-N	WL-3	miniTroll	16430														14,27		10								
MP-N	WL-3	miniTroll	16604																14	10	4						
channel	WL-4	PT2X	2346025					22	4	17	30	25															
channel	WL-4	Troll 4000	10645									25	10,29				13,27		1	11	9						
channel	CTDS	LS-10 250	4044413							4,17		19		2	9,26	30	13	5,15	1,14	10,21	9	11	7				
Water Level Data Downloads			**1067.221**																								
MP-Mid	WL-1	PT2X	2346013						4																		
MP-Mid	WL-1	PT2X	2346003								6,30		10														
MP-Mid	WL-1	miniTroll	16376											28	19												
MP-S (old)	WL-2	PT2X	2346006						4																		
MP-S (new)	WL-2	PT2X	2346006							17	7,30		2,10														
MP-S	WL-2	miniTroll	16187											22, 28	19		14										
MP-S	WL-2	miniTroll	16603															15	10,14	10	9		7				
MP-N	WL-3	PT2X	2346017						4	17	30		10														
MP-N	WL-3	miniTroll	16430											22	9	9	14,27		10								
MP-N	WL-3	miniTroll	16604																	10			7				
channel	WL-4	PT2X	2346025						4	17	30	25															
channel	WL-4	Troll 4000	10645										10,29			10	13,27		1	11	9						
channel	CTDS	LS-10 250	4044413								30		10,21,23	2,15		10,30	13,27	15	1	10,21	9	11	7				
CTDS In-field Sensor Maintenance			**1067.221**																								
Sensor cleaning dates										17		19		2	9	30		15	1	21		11	7				
Conductivity calibration		GLI 3725E2T	309663036						12			19				30	13										
OBS calibration		Forest Tech DTS 12	12126									19							1				7				
Channel Cross-section Surveying			**1067.223**																								
	XS-1	Hydrographic - Odom Hydrotrack					19																				
	XS-2	Hydrographic - Odom Hydrotrack					19																				
CTDS	XS-3	Hydrographic - Odom Hydrotrack						22																			
	XS-4	Topo - TopCon					4																				
WL-4	XS-5	Hydrographic - Odom Hydrotrack						22																			
	XS-6	Topo - TopCon						22																			
	XS-7	Hydrographic - Odom Hydrotrack						22																			
Benchmark Surveying[4]			**1067.223**																								
XS-7-TSCP	PBM-1	GPS_PPK								3i		5															
CTDS	PBM-2	GPS_PPK								4i		5											15ts				
WL-2	PBM-3	GPS_PPK								17i		5											15ts				
east central	PBM-4	GPS_PPK								4i		5										31ts					
northwest	PBM-5	GPS_PPK								17i		5															
XS-2-LB	SBM-1	GPS_PPK					19i					5															
XS-2-RB	SBM-2	GPS_PPK					19i					5															
XS-2-TSCP	SBM-3	GPS_PPK										5															
XS-3-LB	SBM-4	GPS_PPK						22i				5													20o		
XS-3-RB	SBM-5	GPS_PPK						22i				5													20o		
XS-4-LB	SBM-6	GPS_PPK					4i					5															
XS-4-RB	SBM-7	GPS_PPK					4i					5															
XS-5/XS-6	SBM-8	GPS_PPK										5															
XS-5-LB	SBM-9	GPS_PPK						22i				5															
XS-6-LB	SBM-10	GPS_PPK						22i				5															
XS-6-RB	SBM-11	GPS_PPK						22i				5															
XS-6-TSCP	SBM-12	GPS_PPK										5										31ts					
XS-7-RB	SBM-13	GPS_PPK						22i				5															
XS-7-LB	SBM-14	GPS_PPK						22i				5															
WL-1-TOGP	SBM-15	GPS_PPK					11i					5															
WL-1-TSCP	SBM-16	GPS_PPK										5															
WL-2-TOGP	SBM-17	GPS_PPK					11i		4i			5															
WL-3-TOGP	SBM-18	GPS_PPK						22i				5															
WL-4-TOGP	SBM-19	GPS_PPK						22i				5															
WL-2-TSCP	SBM-20	GPS_PPK										5															
WL-3-TSCP	SBM-21	GPS_PPK										5															
Pore Water Salinity			**1067.224**																								
WL-1	PZ-1										6i,30		21,29	28			27				4		19				4
WL-2	PZ-2										7i,30		29	22, 28		9	14,27	15			4		7				4
WL-3	PZ-3						22i						29	22	9	9	14,27				4		7				4
	PZ-4										6i			22			27				4		19				4
	PZ-5										6i,30			22			27				4		19				4
	PZ-6										7i			22			27				4		19				4
	PZ-7										6i,30						27				4		19				4
	PZ-8										7i,30				9		27				4		7				4
	PZ-9										7i,30				9		27				4		19				4
	PZ-10										6i,30				9		27				4		19				4
	PZ-11										7i,30						27				4		19				4
	PZ-12										7i,30						27				4		19				4
Sediment Sampling			**1067.224**																								
SS-1 to SS-16 marsh plain; bulk density (8), nutrient (32)																											4
SS-17, 18, 19 mudflat[5]																								25			
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
				2003				2004												2005							

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, v = vandalized, f = instrument failure
4. Re-survey date followed by o = optical level, ts = TopCon Total Station
5. Sampled by Primary Productivity and Nutrient Team

Table 1.4 Field Data Collection Schedule, Bull Island[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug	2005 Sep
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																												
MP-N	WL-1	PT2X	2346004				11i						10r			*discontinued*												
MP-Mid (old location)	WL-2	PT2X	2346010				11i	21r																				
MP-Mid (new location)	WL-2	PT2X	2346010					21i	10f			19r																
MP-Mid (new location)	WL-2	Troll SP-4000	10650									19i		2f		10r												
MP-Mid (new location)	WL-2	miniTroll	16291													10i,b							7r					
MP-S	WL-3	PT2X	2346020				11i			18	30f,r																	
MP-S	WL-3	Troll SP-4000	10526									10i			19r													
MP-S	WL-3	miniTroll	16187													10i,b							7r					
channel	WL-4	PT2X	2346003				12i, 15f	21r																				
channel	WL-4	PT2X	2346014					22i	13f		7r																	
channel	WL-4	Troll SP-8000	40137								7i		25a	2r														
channel	WL-4	miniTroll	16078											2i,16fr														
channel	WL-4	Troll SP-8000	40092													10i,b						7a	7-19r					
channel	CTDS - Depth	LS-10 250	4044425						13i									15f										
channel	CTDS - Depth	Coastal Leasing	10653																1i				4f					
channel	CTDS - Depth	Coastal Leasing	10589																				4r					20r
channel	CTDS - Cond	GLI	309663051						27			(13-19)	(2-10)						(14-22)		(9-20)	(11-19)	7r (4r)					
channel	CTDS - Cond	Coastal Leasing	10589																				7i			1f		
channel	CTDS - Temp	Forest Tech DTS 12	12130						13i			(13-19)	(2-10)									11f						
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12130						13i			(13-19)	(2-10)									11f						
Category 2: Periodic Field Activities																												
Water Level Offset Measurements			**1067.221**																									
MP-N	WL-1	PT2X	2346004					21	4	18																		
MP-Mid (new location)	WL-2	PT2X	2346010					21	4	18																		
MP-Mid (new location)	WL-2	Troll SP-4000	10650																									
MP-Mid (new location)	WL-2	miniTroll	16291														14,27		10,14	10	9		7					
MP-S	WL-3	PT2X	2346020					21	4	18																		
MP-S	WL-3	Troll SP-4000	10526																									
MP-S	WL-3	miniTroll	16187														14,27		10	7	3,9							
channel	WL-4	PT2X	2346003				12	21																				
channel	WL-4	PT2X	2346014					22	4																			
channel	WL-4	Troll SP-8000	40137								8,30		29															
channel	WL-4	miniTroll	16078											2,16														
channel	WL-4	Troll SP-8000	40092													10	13,27		1,10,14	21	9		7, 14					
channel	CTDS	LS-10 250	4044425								7	19	18	16	9	30	13	5,15										
channel	CTDS	Coastal Leasing	TBD																1,10	21	9	11	7, 11, 19		20		4	
Water Level Data Downloads			**1067.221**																									
MP-N	WL-1	PT2X	2346004					21	4	18			2,10															
MP-Mid (new location)	WL-2	PT2X	2346010						4	18	30	19																
MP-Mid (new location)	WL-2	Troll SP-4000	10650										29	2,16	9	10												
MP-Mid (new location)	WL-2	miniTroll	16291														14,27		1,10	10	9							
MP-S	WL-3	PT2X	2346020					21	4	18	30																	
MP-S	WL-3	Troll SP-4000	10526										29	22	9													
MP-S	WL-3	miniTroll	16187														14,27		10	7	9							
channel	WL-4	PT2X	2346003					21																				
channel	WL-4	PT2X	2346014						4		7																	
channel	WL-4	Troll SP-8000	40137								30		29	6														
channel	WL-4	miniTroll	16078											16														
channel	WL-4	Troll SP-8000	40092														13,27		1,10,14	21	9		7, 19					
channel	CTDS	LS-10 250	4044425										10,18,21	2,16	9	10,30	13,27	15										
channel	CTDS	Coastal Leasing	TBD																10	21	9	11	19		20		4	
CTDS In-field Sensor Maintenance			**1067.221**																									
Sensor cleaning dates												19	18	16	9	30		15	1		9		7r				4	
Conductivity calibration		GLI 3725E2T	309663051						13			19	18	16		30	13						7r					
OBS calibration		Forest Tech DTS 12	12130									19							1				7r					
Channel Cross-section Surveying			**1067.223**																									
CTDS	XS-1	Hydrographic - Odom Hydrotrack						21																				
	XS-2	Topographic & Hydrographic					12	21																				
	XS-3	Topographic					12																					
WL-4	XS-4	Topographic					12																					
	XS-5	Hydrographic - Odom Hydrotrack						21																				
Benchmark Surveying[3,4]			**1067.223**																									
N	PBM-1	GPS_PPK								3i		6																
E	PBM-2	GPS_PPK								3i		6																
SE	PBM-3	GPS_PPK								3i		6																
CTDS	PBM-4	GPS_PPK								3i		6													20o		4o	
XS-1-LB	SBM-1	GPS_PPK						21i				6													20o			
XS-1-RB	SBM-2	GPS_PPK						21i				6										14ts			20o			
XS-2-LB	SBM-3	GPS_PPK					12i					6																
XS-2-RB	SBM-4	GPS_PPK					12i					6										14ts						
XS-2-TSCP	SBM-5	GPS_PPK									8i	6										14ts						
XS-3-LB	SBM-6	GPS_PPK										6																
XS-3-RB	SBM-7	GPS_PPK										6																
XS-4-LB	SBM-9	GPS_PPK					12i					6																
XS-4-RB	SBM-10	GPS_PPK					12i					6																
XS-4-TSCP	SBM-11	GPS_PPK										6																
XS-5-LB	SBM-12	GPS_PPK						21i				6																
XS-5-RB	SBM-13	GPS_PPK						21i				6																
XS-5-TSCP	SBM-14	GPS_PPK									8i	6																
WL-1-TOGP	SBM-15	GPS_PPK					11i					6										14ts						
WL-1-TSCP	SBM-16	GPS_PPK									8i	6										14ts						
WL-2-TOGP	SBM-17	GPS_PPK					11i	21i				6													1			
WL-2-TSCP	SBM-18	GPS_PPK									8i	6																
WL-3-TOGP	SBM-19	GPS_PPK					11i					6										14ts						
WL-3-TSCP	SBM-20	GPS_PPK									8i	6										14ts						
WL-4-TOGP	SBM-21	GPS_PPK					12i	22i	7i			6																
Pore Water Salinity			**1067.224**																									
WL-1	PZ-1							21i						22			14,27				3		19			26	4	
WL-2	PZ-2							21i			30		29				13,14,27				3		7, 19			26	4	
WL-3	PZ-3										8i,30d		29	22		10	27				3		7			26	4	
	PZ-4										8i			22			27				3		19			26	4	
	PZ-5										8i			22			27				3		19			26	4	
	PZ-6										8i,30d		29	22		10	14,27				3		7			26	4	
	PZ-7										8i		23	22			27				3		19			26	4	
	PZ-8										8i			22			27				3					26	4	
	PZ-9										8i			22			27				3		19			26	4	
	PZ-10										8i		23	22			27				3		19				4	
CTDS	PZ-11										7i,30d		23	22			13,27				3		7, 19			26	4	
WL-4	PZ-12							21i			30			22			27						19			26	4	
Sediment Sampling			**1067.224**																									
SS-1 to SS-16 marsh plain; bulk density (8), nutrient (32)																										18, 26	4	
SS-17, 18, 19 mudflat[5]																								24				
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
				2003				2004												2005								

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, d = dry, f = instrument failure
4. Re-survey date followed by o = optical level; ts = TopCon Total Station
5. Sampled by Primary Productivity and Nutrient Team

Table 1.5 Field Data Collection Schedule, Brown's Island[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug	2005 Sep
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																												
MP-NW	WL-1	PT2X	2346012				18i						12r															
MP-NW	WL-1	miniTroll	16180										25i	18f	25r		1i					4r						
MP-NE	WL-2	PT2X	2346021					8i					12r															
MP-NE	WL-2	miniTroll	16359										25i		25r		7i		9r									
MP-SE	WL-3	PT2X	2346001				18i						12r															
MP-SE	WL-3	miniTroll	16432										25i		25r													
MP-SE	WL-3	miniTroll	16078														1i,f		9			4r						
MP-SW	WL-4	PT2X	2346018				18i						12r															
MP-SW	WL-4	miniTroll	16634										25i		25r													
MP-SW	WL-4	miniTroll	16453														1i					4r						
channel	WL-5	Troll SP-8000	40090								16i							19f	9r									
channel	WL-5	Troll SP-8000	40137																9i				20r					
channel	WL-5	Troll SP-4000	10650																				20f				11r	
channel	CTDS - Depth	LS-10 250	4044414					30i										12f										
channel	CTDS - Depth	LS-10 250																12i	9r									
channel	CTDS - Depth	Troll SP-4000	10650																9i				20r					
channel	CTDS - Depth	Troll SP-8000	40093																				20i				11r	
channel	CTDS - Cond.	GLI						30i							(18-23)				(27-4; 22-27)				15r					
channel	CTDS - Temp.	Forest Tech DTS 12	12128					30i							(18-23)				(14-22)				15r					
channel	CTDS - Sus. Sed.	Forest Tech DTS 12	12128					30i							(18-23)				(14-22)				15r					
Category 2: Periodic Field Activities																												
Water Level Offset Measurements			**1067.221**																									
MP-NW	WL-1	PT2X	2346012					8	19																			
MP-NW	WL-1	miniTroll	16180															12		26	8							
MP-NE	WL-2	PT2X	2346021					8																				
MP-NE	WL-2	miniTroll	16359															12	9									
MP-SE	WL-3	PT2X	2346001					8																				
MP-SE	WL-3	miniTroll	16432																									
MP-SE	WL-3	miniTroll	16078															12	9	26								
MP-SW	WL-4	PT2X	2346018					8																				
MP-SW	WL-4	miniTroll	16634												25													
MP-SW	WL-4	miniTroll	16453															12		26	8							
channel	WL-5	Troll SP-8000	40090									18		14	25		7,26											
channel	WL-5	Troll SP-8000	40137																9	4	8	4	20					
channel	WL-5	Troll SP-4000	10650																				20		23		11	
channel	CTDS	LS-10 250	4044414							5		18	25		25	16	7,26	12										
channel	CTDS	LS-10 250	TBD															12										
channel	CTDS	Troll SP-4000	10650																9	4,26	8	4	20r					
channel	CTDS	Troll SP-4000	40093																				20i		23		11	
Water Level Data Downloads			**1067.221**																									
MP-NW	WL-1	PT2X	2346012					8	19			3	12															
MP-NW	WL-1	miniTroll	16180											14	25			12	9	26	8	4						
MP-NE	WL-2	PT2X	2346021									3	12															
MP-NE	WL-2	miniTroll	16359											14	25			12	9									
MP-SE	WL-3	PT2X	2346001					8		31		3	12															
MP-SE	WL-3	miniTroll	16432											14	25													
MP-SE	WL-3	miniTroll	16078															12	9	26		4						
MP-SW	WL-4	PT2X	2346018					8				3	12															
MP-SW	WL-4	miniTroll	16634											14	25													
MP-SW	WL-4	miniTroll	16453															12	9	26	8	4						
channel	WL-5	Troll SP-8000	40090									18	25	14	25	16	7,26	12	9,21									
channel	WL-5	Troll SP-8000	40137																9	4	8	4	20r					
channel	WL-5	Troll SP-4000	10650																								11	
channel	CTDS	LS-10 250	4044414																									
channel	CTDS	LS-10 250	TBD																									
channel	CTDS	Troll SP-4000	10650																9	4,26	8	4	20					
channel	CTDS	Troll SP-4000	40093																				20		23		11	
CTDS In-field Sensor Maintenance			**1067.221**																									
Sensor cleaning dates													25		25	16		12	9		8		20r					
Conductivity calibration		GLI 3725E2T	309663049						30			18				16							20r					
OBS calibration		Forest Tech DTS 12	12128										25		25								20					
Channel Cross-section Surveying			**1067.223**																									
CTDS	XS-1	Hydrographic - Odom Hydrotrack																	9									
	XS-2	Hydrographic - Odom Hydrotrack																	9									
	XS-3	Hydrographic - Odom Hydrotrack																	9									
WL-5	XS-4	Hydrographic - Odom Hydrotrack																	9									
Benchmark Surveying[3,4]			**1067.223**																									
CTDS_XS-1	PBM-1	GPS_Static								5i		13													23o		10o	
XS-2	PBM-2	GPS_PPK								5i		13																
WL-3	PBM-3	GPS_PPK								12i		13												23ts				
NE	PBM-4	GPS_PPK								12i																		
XS-1-TSCP	SBM-1	GPS_PPK										13i,13															10o	
XS-1-LB	SBM-2	GPS_PPK					18i					13															10o	
XS-1-RB	SBM-3	GPS_PPK					18i					13															10o	
XS-2-LB	SBM-4	GPS_PPK					18i					13																
XS-2-RB	SBM-5	GPS_PPK					18i					13																
XS-3-LB	SBM-6	GPS_PPK					18i					13																
XS-3-RB	SBM-7	GPS_PPK					18i					13																
XS-3-TSCP	SBM-8	GPS_PPK										13																
XS-4-LB	SBM-9	GPS_PPK					18i					13																
XS-4-RB	SBM-10	GPS_PPK					18i					13																
XS-4-TSCP	SBM-11	GPS_PPK										13																
WL-1-TOGP	SBM-12	GPS_PPK					18i					13												1ts				
WL-1-TSCP	SBM-13	GPS_PPK										13i,13												1ts				
WL-2-TOGP	SBM-14	GPS_PPK						8i				13												9ts				
WL-2-TSCP	SBM-15	GPS_PPK										13												9ts				
WL-3-TOGP	SBM-16	GPS_PPK					18i					13												23ts				
WL-4-TOGP	SBM-17	GPS_PPK					18i					13												1ts				
WL-4-TSCP	SBM-18	GPS_PPK										13												1ts				
WL-5-TOGP	SBM-19	GPS_PPK									16i	13																
WL-3-TSCP	SBM-20	GPS_PPK										13i,13												23ts				
Pore Water Salinity			**1067.224**																									
	PZ-1							15i						14			26			26			21				10	
	PZ-2							15i				3		14			26			26			21					
WL-3 (SE)	PZ-3							8i,8				3	25	14	25		1	12		26			dry					
WL-2 (NE)	PZ-4							8i,8					25	14			7	12		26			21				10	
	PZ-5							15i,15									26			26			21					
	PZ-6							15i				3		14			26			26			21				10	
	PZ-7 (not installed)																											
	PZ-8									31i							26			26			21				10	
	PZ-9							15i				3		14			26			26			21					
WL-4 (SW)	PZ-10							8i,8					25	14	25		1	12		26			21					
WL-1 (NW)	PZ-11							8i,8	19i,19				25	14	25		1	12					21				10	
	PZ-12							15i									26			26			21					
Sediment Sampling			**1067.224**																									
SS-1 to SS-13 marsh plain; bulk density (8), nutrient (26)																												16,22
SS-14, 15, 16 mudflat[5]																								23				
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
				2003				2004												2005								

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, f = instrument failure
4. Re-survey date followed by o = optical level
5. Sampled by Primary Productivity and Nutrient Team

Table 1.6 Field Data Collection Schedule, Sherman Lake[1]

Location	ID	Equipment	SN	2003 Sep	2003 Oct	2003 Nov	2003 Dec	2004 Jan	2004 Feb	2004 Mar	2004 Apr	2004 May	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2004 Dec	2005 Jan	2005 Feb	2005 Mar	2005 Apr	2005 May	2005 Jun	2005 Jul	2005 Aug	2005 Sep
Category 1: Continuously Recording Autonomous Field Equipment Data Collection[2,3]																												
channel	WL-1	LS-10 250	4044402						19i	7	16r																	
MP-E	WL-2	LS-10 250	4011557						5i	7	16r																	
MP-E	WL-2	miniTroll	16325										25i			16r												
MP-E	WL-2	Troll 8000	40137													16i	7r											
MP-E	WL-2	miniTroll	16325														7i										10r	
marsh plain	WL-3	LS-10 250	4011546						5i		6-14s																	
MP-W	WL-4	LS-10 250	4011559						5i		16r																	
MP-W	WL-4	miniTroll	16231										25i			16r												
MP-W	WL-4	Troll 8000	40093													16i	7r											
MP-W	WL-4	miniTroll	16391														7i										10	6r
channel	CTDS - Depth	LS-10 250	4044407					30i		15	14s																	
channel	CTDS	Coastal Leasing	10112														7i				1f		20r					
channel	CTDS	Coastal Leasing	10587																				20i				10r	
Category 2: Periodic Field Activities																												
Water Level Offset Measurements			**1067.221**																									
channel	WL-1	LS-10 250	4044402							19																		
MP-E	WL-2	LS-10 250	4011557							5,19																		
MP-E	WL-2	mini Troll	16325													16												
MP-E	WL-2	Troll 8000	40137													16												
MP-E	WL-2	miniTroll	16325																9	4,12			20				10	
marsh plain	WL-3	LS-10 250	4011546							19																		
MP-W	WL-4	LS-10 250	4011559							5,19																		
MP-W	WL-4	mini Troll	16231													16												
MP-W	WL-4	Troll 8000	40093													16												
MP-W	WL-4	miniTroll	16391																9	4,12	8							6
channel	CTDS	LS-10 250	4044407					30		19		7																
channel	CTDS	Coastal Leasing	10112														7		9		8	4	20,21		23		10	
Water Level Data Downloads			**1067.221**																									
channel	WL-1	LS-10 250	4044402																									
MP-E	WL-2	LS-10 250	4011557																									
MP-E	WL-2	mini Troll	16325											14	25	16												
MP-E	WL-2	Troll 8000	40137														7											
MP-E	WL-2	miniTroll	16325																9	4,12	8	4	20		23		10	
marsh plain	WL-3	LS-10 250	4011546							5																		
MP-W	WL-4	LS-10 250	4011559																									
MP-W	WL-4	mini Troll	16231											14	25	16												
MP-W	WL-4	Troll 8000	40093														7											
MP-W	WL-4	miniTroll	16391																9	4,12	8	4	20		23			6
channel	CTDS	Coastal Leasing	10112															12	9		8	4			23		10	
CTDS In-field Sensor Maintenance			**1067.221**																									
Sensor cleaning dates																		12	9		8	4			23		10	
Conductivity calibration		GLI 3725E2T	309663037					30				7																
OBS calibration		Forest Tech DTS 12	12124									7																
Channel Cross-section Surveying			**1067.223**																									
CTDS	XS-1	Hydrographic - Odom Hydrotrack					18																					
	XS-2	Hydrographic - Odom Hydrotrack					18																					
	XS-3	Topographic - TopCon						15																				
WL-1	XS-4	Topographic - TopCon						15																				
Benchmark Surveying[3]			**1067.223**																									
CTDS	PBM-1	GPS_PPK								12i,25		12																
SW	PBM-2	GPS_PPK								12i		12																
WL-3-TSCP	PBM-3	GPS_PPK								5i		12																
NW	PBM-4	GPS_PPK								12i		4																
XS-1-LB	SBM-1	GPS_PPK					18i					12																
XS-2-LB	SBM-4	GPS_PPK					18i					12																
XS-2-RB	SBM-5	GPS_PPK					18i					12																
XS-2-TSCP	SBM-6	GPS_PPK										12i,12																
XS-3-RB	SBM-8	GPS_PPK						15i				12																
XS-3-TSCP	SBM-9	GPS_PPK										12																
XS-4-LB WL-1	SBM-10	GPS_PPK						15i				12																
XS-4-RB WL-1	SBM-11	GPS_PPK						15i				12																
XS-4-TSCP WL-1	SBM-12	GPS_PPK										12																
WL-1-TSCP	SBM-14	GPS_PPK										12																
WL-2-TOCH	SBM-15	GPS_PPK							5i			12												23ts				
WL-2-TSCP	SBM-16	GPS_PPK										12i,12												23ts				
WL-3-TOSG	SBM-17	GPS_PPK							5i			12																
WL-4-TOCH	SBM-18	GPS_PPK							5i			12																
WL-4-TSCP	SBM-19	GPS_PPK										12i,12																
Pore Water Salinity			**1067.224**																									
WL-1	PZ-1											18i	25							4			21				10	6r
WL-2	PZ-2											3i,18	25	14	25	16				4			20				10	6r
WL-3	PZ-3											3i,18	25			16				4			21				10	6r
WL-4	PZ-4											3i,18		14	25	16	7			4			20				10	6r
CTDS	PZ-5									25i					25		7			4			21				10	6r
	PZ-6											3i,18	25			16				4			21				dry	6r
	PZ-7											3i,18	25			16				4			21				dry	6r
	PZ-8											3i,18	25			16				4			21				10	6r
	PZ-9											3i,18	25			16				4			21				10	6r
	PZ-10											3i,18	25				7			4			21					
	PZ-11											3i	25				7			4			21				10	6r
	PZ-12											3i,18	25			16				4			21				10	6r
Sediment Sampling			**1067.224**																									
SS-1 to SS-5 marsh plain, nutrient (5)																												6
SS-6, 7, 8 mudflat[4]																								9				
				Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
				2003				2004												2005								

Notes:

1. Numbers in each row represent day of month continuous recording started/ended (Category 1 activities) or occurred (Category 2 activities).
2. Equipment deployment periods indicated by shaded boxes.
3. i = install date, r = removal date, s = stolen, f = instrument failure
4. Sampled by Primary Productivity and Nutrient Team

Table 2.1
2003 Aerial Imaging Summary Data

Site	Site Code	Date Flown	Number of Photos	Rectification Method	Scale	Pixel Resolution[1]
Six IRWM Sites						
Browns Island	BRIS	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Bull Island	BUIS	10/24/2003	1	Ortho	1:9,600	0.67ft / 0.2 m
Carl's Marsh aka Petaluma River Marsh	CM PRMA	8/14/2003	1	Ortho	1:7,200	0.5 ft / 0.15m
Coon Island	COIS	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Pond 2A	PO2A	9/29/2003	2	Ortho	1:9,600	0.67ft / 0.2 m
Sherman Lake	SHLA	10/24/2003	5	Ortho	1:9,600	0.67ft / 0.2 m
Three Non-IRWM Sites						
Big Break	BB	10/3/2003	2	Geo	1:6,000	0.41 ft /0.12m
Pond 3	P3	9/29/2003	5	Geo	1:9,600	0.67ft / 0.2 m
San Souci	SS	9/29/2003	1	Geo	1:9,600	0.67f / 0.2 m

Note: 1. At 1200 dpi scan

Table 2.2
2004 Aerial Imaging Summary Data

Site	Site Code	Date Flown	Number of Photos	Rectification	Scale	Pixel Resolution[1]
Six IRWM Sites						
Browns Island	BRIS	8/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Bull Island	BUIS	8/19/2004	1	Ortho	1:9,600	0.67ft / 0.2 m
Carl's Marsh aka Petaluma River Marsh	CM PRMA	8/19/2004	1	Ortho	1:9,600	0.67ft / 0.2 m
Coon Island	COIS	8/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Pond 2A	PO2A	8/19/2004	2	Ortho	1:9,600	0.67ft / 0.2 m
Sherman Lake	SHLA	8/19/2004	5	Ortho	1:9,600	0.67ft / 0.2 m
Non-IRWM Site						
Pond 3	P3	8/19/2004	5	Ortho	1:9,600	0.67ft / 0.2 m

Note: 1. At 1200 dpi scan

Table 3.1: 2003 AirPhoto Control Points

Site	Station	Description	Northing (UTM meters)	Easting (UTM meters)	Year
BRIS	AC-01	Aerial target	4211067.00	598559.69	2003
BRIS	AC-02	Aerial target	4210535.50	598520.25	2003
BRIS	AC-03	Aerial target	4210069.00	599479.38	2003
BRIS	AC-04	Aerial target	4210207.00	600729.38	2003
BRIS	AC-05	Aerial target	4211451.50	600207.88	2003
BRIS	AC-06	Aerial target	4211512.50	599548.13	2003
BUIS	AC-01	Aerial target	4231145.50	560904.63	2003
BUIS	AC-02	Aerial target	4230483.50	561500.38	2003
BUIS	AC-03	Aerial target	4230262.50	561000.50	2003
BUIS	AC-04	Aerial target	4230444.00	560432.75	2003
BUIS	AC-05	Aerial target	4231000.50	560624.44	2003
COIS	AC-01	Aerial target	4229467.00	559037.44	2003
COIS	AC-02	Aerial target	4229319.50	559565.94	2003
COIS	AC-03	Aerial target	4228059.50	558598.25	2003
COIS	AC-04	Aerial target	4228046.00	559525.00	2003
COIS	AC-05	Aerial target	4226571.00	559044.88	2003
COIS	AC-06	NE-corner of pumphouse	4227601.00	559704.38	2003
COIS	AC-07	SE corner of dredge structure	4226960.00	559934.94	2003
PRMA	AC-01	Aerial target	4219784.99	543232.29	2003
PRMA	AC-04	Aerial target	4219487.69	543420.88	2003
PRMA	AC-06	Aerial target	4219144.46	543407.05	2003
PRMA	AC-07	Aerial target	4219042.61	543473.02	2003
PRMA	AC-09	Aerial target	4219242.40	543184.02	2003
PRMA	AC-11	Aerial target	4219347.31	543138.60	2003
PO2A	AC-01	Aerial target	4223462.50	558525.19	2003
PO2A	AC-02	Aerial target	4222287.50	558461.88	2003
PO2A	AC-03	Aerial target	4223356.50	559689.88	2003
PO2A	AC-04	Aerial target	4222494.50	559438.56	2003
PO2A	AC-05	Aerial target	4223098.00	560987.00	2003
PO2A	AC-06	Aerial target	4222290.50	560625.63	2003
P3	AC-01	Aerial target	4221099.00	558934.13	2003
P3	AC-02	Aerial target	4221332.50	559845.88	2003
P3	AC-03	Aerial target	4220817.50	560572.38	2003
P3	AC-04	Aerial target	4220231.50	561477.69	2003
P3	AC-05	Aerial target	4219616.80	561854.71	2003
P3	AC-06	Aerial target	4219486.30	562676.22	2003
P3	AC-07	Aerial target	4220170.00	562658.75	2003
P3	AC-08	Aerial target	4220871.50	562729.94	2003
P3	AC-09	Aerial target	4221991.50	562491.13	2003
P3	AC-11	Aerial target	4221720.50	560684.81	2003

Table 3.2: 2004 Air Photo Control Points

Site	Station	Description	Northing (UTM meters)	Easting (UTM meters)	Year
BRIS	AC-01	Aerial target	4211061.65	598564.06	2004
BRIS	AC-02	Aerial target	4210535.67	598518.21	2004
BRIS	AC-03	Aerial target	4210066.13	599477.60	2004
BRIS	AC-04	Aerial target	4210207.35	600728.13	2004
BRIS	AC-05	Aerial target	4211449.91	600207.55	2004
BRIS	AC-06	Aerial target	4211512.20	599539.33	2004
BUIS	AC-01	Aerial target	4231145.66	560904.62	2004
BUIS	AC-02	Aerial target	4230483.56	561500.39	2004
BUIS	AC-03	Aerial target	4230262.28	561000.51	2004
BUIS	AC-04	Aerial target	4230444.15	560432.78	2004
BUIS	AC-05	Aerial target	4231000.29	560624.41	2004
COIS	AC-01	Aerial target	4229467.22	559035.27	2004
COIS	AC-02	Aerial target	4229319.53	559569.23	2004
COIS	AC-03	Aerial target	4228059.30	558598.27	2004
COIS	AC-04	Aerial target	4228047.97	559523.25	2004
COIS	AC-05	Aerial target	4226571.56	559043.16	2004
COIS	AC-06	NE-corner of pumphouse	4227600.93	559704.40	2004
COIS	AC-07	SE corner of dredge structure	4226960.06	559934.95	2004
COIS	AC-08	Northeast corner of dock	4227452.96	558547.41	2004
PRMA	AC-04	Aerial target	4219488.35	543421.63	2004
PRMA	AC-07	Aerial target	4219042.93	543472.11	2004
PRMA	AC-08	Aerial target	4218991.25	543335.97	2004
PRMA	AC-14	Aerial target	4219661.69	543036.24	2004
PO2A	AC-07	SE footer of tower. East marsh point	4222969.69	558600.58	2004
PO2A	AC-08	End of dock. SW corner of site	4222112.15	558713.24	2004
PO2A	AC-09	End of eastern dock pier. NW corner of site	4223514.84	558855.24	2004
PO2A	AC-10	No target or structure. Southcentral levee point	4222731.81	559535.71	2004
PO2A	AC-11	No target or structure. Northcentral levee point	4223472.57	559590.10	2004
PO2A	AC-12	NE footer of small tower. Central marsh point	4223040.35	559699.53	2004
PO2A	AC-13	No target or structure. Pond 3 levee point	4222603.89	559770.50	2004
PO2A	AC-14	No target or structure. NW levee point	4223289.96	559799.36	2004
PO2A	AC-15	No target or structure. East levee point	4222414.37	560530.26	2004
PO2A	AC-16	SE footer of south tower. East marsh point	4223103.12	560940.94	2004
P3	AC-01	Aerial target	4221098.44	558932.72	2004
P3	AC-02	Aerial target. P3-W tile	4221336.43	559847.31	2004
P3	AC-02	Aerial target. P3-ME tile	4221341.39	559829.93	2004
PO2A	AC-02	Aerial target. P3-W tile	4222287.93	558461.05	2004
PO2A	AC-02	Aerial target. P2A-photo	4222293.32	558443.07	2004
P3	AC-03	Aerial target	4220823.00	560553.52	2004
P3	AC-04	Aerial target	4220235.27	561458.24	2004
PO2A	AC-04	Aerial target. Pond 2A AC-04. P3-W tile	4222493.86	559438.40	2004
PO2A	AC-04	Aerial target. Pond 2A AC-04. P3-M tile	4222498.64	559421.07	2004
P3	AC-05	Aerial target	4219623.11	561839.49	2004
P3	AC-06	Aerial target	4219490.33	562661.16	2004
PO2A	AC-06	Aerial target	4222295.82	560610.38	2004
P3	AC-07	Aerial target	4220173.78	562644.55	2004
P3	AC-08	Aerial target	4220877.71	562711.67	2004
P3	AC-09	Aerial target	4221995.95	562472.22	2004
P3	AC-10	Aerial target	4221689.24	561593.23	2004
P3	AC-11	Aerial target	4221722.81	560671.80	2004
P3	AC-12	No target/structure. Exterior marsh plain point	4220706.06	559693.20	2004
P3	AC-13	No target/structure. Interior marsh plain point	4220710.48	561393.16	2004

Table 4. Topographic Survey Method Overview

Method	Description	Instrument	Horizontal Accuracy	Vertical Accuracy	Notes
GPS_GeoXT	Handheld GPS reciever	Trimble GeoXT	Optimal conditions (<1 meter); typical ±1 - 2 m	± 2 - 6 meter	Accuracy dependent upon number of satelites and configuration, PDOP and environmental conditions.
GPS_PPK	Post Processed Kinematic GPS	Trimble 4000SSi	Optimal conditions (±0.05 meter)	Optimal conditions (±0.05 meter)	
GPS_RTK	Real Time Kinematic GPS	Trimble 4000SSi	Optimal conditions (±0.05 meter)	Optimal conditions (±0.05 meter)	
GPS_Static	Static GPS	Trimble 4000SSi	Optimal conditions (±0.05 meter)	Optimal conditions (±0.05 meter)	
GPS_Towill	GPS Method Not Stated - Bencmark established by Towill Survey Inc.	Not Stated	Order and Class dependent	Order and Class dependent	Refer to individual benchmark sheets/notes for stated Class and Order
Level Line	Towill Inc. Survey benchmark sheets survey type "Levels"	Not Stated	Order and Class dependent	Order and Class dependent	Refer to individual benchmark sheets/notes for stated Class and Order
NGS_ Precise_GPS	NOAA National Geodetic Survey GPS observation and high-resolution geoid model	Laplace correction DEFLEC99; ellipsoidal height GPS observation referenced to NAD83; geoid height model GEOID03	Order B (approx. ±0.05 meter)		
NGS_ Topo_Scaled	NOAA National Geodetic Survey Horizontal Coordinated Determination	Scaled from topographic map	± 6 seconds	N/A	
NGS_ VERTCON	NOAA National Geodetic Survey Vertical Elevation Determinition	VERTCON shift value applied to NGVD 29 to determine NAVD 88 value.	N/A	Very High (~±0.02 meter)	http://www.ngs.noaa.gov/TOOLS/Vertcon/vert_method.html
Optical	Optical Level Survey	Various	N/A	Very High (~±0.02 meter)	
Total Station	Total Station Survey System	Trimble Total Station	Very High (±0.05 meter)	Very High (~±0.05 meter)	

Table 5. Secondary Benchmark Description and Construction Method

Designation	Acronym	Locations Used	Constructed With
Top of Galvanized Pipe	TOGP	Marsh Plain/Channel Water Level Stations	1-½" galvanized pipe 10 ft pipe sections 6-9 ft bgs[1] and 4-1 ft ags[1]
Total Station Control Points	TSCP	Proximate to Marsh Plain and Channel Water Level stations, Channel cross-sections	2" PVC to refusal 10 ft pipe sections Black flat top plug
End Point Left Bank End Point Right Bank	EPLB/ EPRB	Channel cross-sections endpoints	2" PVC 10 ft pipe sections
Top of Angle Iron	TOAI	Carl's Marsh existing metal instrument structures	1-¾ " to 2-¾ " slotted angle iron driven in to refusal, cross arms and structural supports bolted into place, survey point etched into metal

Notes:

1) bgs = below ground surface, ags = above ground surface

Table 6.1

Carl's Marsh - Channel and Marsh Plain Water Level Offset Calibration Summary

		Calibration Method				Staff Gage - Solinst/Measuring Tape Calibration Results												Survey Method Calibration Results				
						Staff Gage Offset (Feet)				Solinst/Tape Offset (Feet)				Resulting Offset (Feet)								
Calib Start Date	Calib End Date	Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Avg Survey Offset Ft	StdDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
12/22/2003	1/23/2004	☑	☐	☐	☐	2.623	0.011	2	0.007			0		2.623	0.011	2	0.007					
1/23/2004	3/18/2004	☑	☐	☐	☐	2.590	0.009	3	0.005			0		2.590	0.009	3	0.005					
3/18/2004	4/21/2004	☑	☐	☐	☐	2.580	0.007	2	0.005			0		2.580	0.007	2	0.005					
4/21/2004	5/8/2004	☑	☐	☐	☐	2.565	0.017	3	0.010			0		2.565	0.017	3	0.010					
5/8/2004	5/26/2004	☑	☐	☐	☐	2.545	0.014	2	0.010			0		2.545	0.014	2	0.010					
5/26/2004	6/2/2004	☑	☐	☐	☐	2.535		1				0		2.535		1						
6/2/2004	6/18/2004	☑	☐	☐	☐	2.505		1				0		2.505		1						
6/18/2004	7/21/2004	☑	☐	☐	☐	2.508	0.006	3	0.003	2.500		1		2.506	0.006	4	0.003					
7/21/2004	9/14/2004	☑	☐	☐	☐	2.519	0.012	8	0.004			0		2.519	0.012	8	0.004					
9/14/2004	10/22/2004	☑	☐	☐	☐	2.545	0.010	3	0.006	2.524	0.005	5	0.002	2.532	0.013	8	0.005					
10/22/2004	12/2/2004	☑	☐	☐	☐	2.608	0.006	3	0.003	2.567	0.015	3	0.009	2.588	0.025	6	0.010					
12/2/2004	12/9/2004	☑	☐	☐	☐	2.555	0.000	3	0.000	2.600	0.000	3	0.000	2.578	0.025	6	0.010					
12/9/2004	2/11/2005	☑	☐	☐	☐	2.548	0.032	3	0.019	2.560	0.000	3	0.000	2.554	0.021	6	0.009					
2/11/2005	5/24/2005	☑	☐	☐	☐	2.535		1		2.573	0.024	3	0.014	2.564	0.027	4	0.014					
5/24/2005	8/14/2005	☑	☐	☐	☐	2.480	0.035	2	0.025			0		2.480	0.035	2	0.025					
WL	**01**																					
12/10/2003	6/16/2004	☑	☐	☐	☐	5.660	0.027	4	0.014			0		5.660	0.027	4	0.014					
WL	**02**																					
12/10/2003	6/16/2004	☐	☐	☑	☐	5.743	0.014	4	0.007			0		5.743	0.014	4	0.007					Applied interpolated offset to compensate for sensor downward drift, starting offset 5.743, ending 5.843.
9/14/2004	12/13/2004	☐	☐	☑	☐	5.851	0.096	8	0.034	5.840	0.096	8	0.034	5.845	0.093	16	0.023					Applied interpolated offset start 5.91, end 5.731
12/13/2004	1/13/2005	☑	☐	☐	☐	5.747	0.020	6	0.008	5.756	0.030	6	0.012	5.752	0.025	12	0.007					
1/13/2005	2/11/2005	☑	☐	☐	☐	5.790	0.020	6	0.008	5.749	0.027	6	0.011	5.770	0.031	12	0.009					

Carl's Marsh - Channel and Marsh Plain Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Calibration Method: Survey	Calibration Method: Inter-polation	Calibration Method: Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet) Mean	Staff Gage Offset StdDev	Staff Gage Offset n	Staff Gage Offset StdErr	Solinst/Tape Offset (Feet) Mean	Solinst/Tape Offset StdDev	Solinst/Tape Offset n	Solinst/Tape Offset StdErr	Resulting Offset (Feet) Mean	Resulting Offset StdDev	Resulting Offset n	Resulting Offset StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
WL	**03**																					
12/10/2003	3/11/2004	☑	☐	☐	☐			0		2.797	0.036	4	0.018	2.797	0.036	4	0.018					
3/11/2004	3/21/2004	☐	☐	☐	☑																	Applied offset 3.4 as field calibration did not match prior or subsequen deployments
3/21/2004	5/26/2004	☐	☐	☐	☑	3.641	0.125	6	0.051	3.389	0.113	7	0.043	3.505	0.173	13	0.048					Inconsisent offsets; begin 3.5, mid 3.25, end 3.75. Matched to CTDS, applied manual offset of 3.2
5/26/2004	9/14/2004	☑	☐	☐	☐	3.257	0.041	11	0.013	3.248	0.045	8	0.016	3.253	0.042	19	0.010					New stilling well set up
9/14/2004	10/22/2004	☑	☐	☐	☐	3.226	0.041	8	0.015	3.210	0.040	8	0.014	3.218	0.040	16	0.010					Sensor failure.
10/22/2004	12/2/2004	☐	☐	☐	☐	3.126	0.089	7	0.034	3.101	0.091	7	0.034	3.113	0.087	14	0.023					Sensor failure.Mud acccumulation in base of stilling well at end of deployment
12/2/2004	1/13/2005	☐	☐	☑	☐	3.306	0.123	9	0.041	3.297	0.123	9	0.041	3.301	0.119	18	0.028					Cleaned, reinstalled stilling well at beginning of deployment. Ending open air = 0.147
1/13/2005	2/11/2005	☑	☐	☐	☐	3.120	0.029	6	0.012	3.069	0.055	6	0.022	3.094	0.050	12	0.014					Sensor drift upwards, beginning offset 3.44, ending 3.15.

Table 6.2

Pond 2A - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet) Mean	StdDev	n	StdErr	Solinst/Tape Offset (Feet) Mean	StdDev	n	StdErr	Resulting Offset (Feet) Mean	StdDev	n	StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
2/12/2004	3/4/2004	☐	☑	☐	☐													-2.861	0.029	2	0.021	
3/4/2004	5/10/2004	☐	☐	☑	☐													-2.909	0.093	2	0.066	
5/10/2004	6/23/2004	☐	☑	☐	☐													-2.975	0.042	2	0.030	
6/23/2004	7/16/2004	☐	☑	☐	☐													-2.860		1		Removed starting survey, very windy
7/16/2004	8/9/2004	☐	☐	☑	☐													-2.938	0.095	2	0.068	
8/9/2004	8/26/2004	☐	☑	☐	☐													-2.878	0.002	2	0.002	
8/26/2004	9/30/2004	☐	☑	☐	☐													-2.994	0.025	2	0.018	
9/30/2004	10/25/2004	☐	☑	☐	☐													-3.190	0.040	2	0.028	
10/25/2004	11/24/2004	☐	☐	☑	☐													-2.958	0.093	2	0.066	
11/24/2004	1/21/2005	☐	☑	☐	☐													-3.268	0.046	2	0.032	
1/21/2005	2/9/2005	☐	☐	☑	☐													-2.930		1		
2/9/2005	3/11/2005	☐	☐	☑	☐													-3.580		1		
3/11/2005	6/20/2005	☐	☐	☑	☐													-3.790		1		
6/20/2005	8/2/2005	☐	☐	☑	☐													-4.959	0.445	2	0.315	Wika failed, final open air 2.45 (8/4/2005)
WL	**01**																					
12/11/2003	2/20/2004	☑	☐	☐	☐	5.519	0.010	5	0.005	5.504	0.018	4	0.009	5.512	0.016	9	0.005					
2/20/2004	6/10/2004	☑	☐	☐	☐	5.503	0.025	4	0.013	5.486	0.003	4	0.002	5.494	0.019	8	0.007					
7/2/2004	7/28/2004	☑	☐	☐	☐	5.514	0.003	3	0.002	5.520	0.006	3	0.003	5.517	0.005	6	0.002					
9/9/2004	10/13/2004	☑	☐	☐	☐	4.653	0.005	3	0.003	4.665	0.006	3	0.004	4.659	0.008	6	0.003					
10/13/2004	12/10/2004	☑	☐	☐	☐	4.659	0.014	13	0.004	4.663	0.013	13	0.004	4.661	0.013	26	0.003					
12/10/2004	4/19/2005	☑	☐	☐	☐	4.684	0.019	6	0.008	4.686	0.020	6	0.008	4.685	0.018	12	0.005					
WL	**02**																					
12/11/2003	2/20/2004	☑	☐	☐	☐	5.619	0.009	4	0.005	5.608	0.006	3	0.004	5.614	0.009	7	0.003					

Pond 2A - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Calibration Method: Survey	Calibration Method: Inter-polation	Calibration Method: Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet) Mean	Staff Gage Offset (Feet) StdDev	Staff Gage Offset (Feet) n	Staff Gage Offset (Feet) StdErr	Solinst/Tape Offset (Feet) Mean	Solinst/Tape Offset (Feet) StdDev	Solinst/Tape Offset (Feet) n	Solinst/Tape Offset (Feet) StdErr	Resulting Offset (Feet) Mean	Resulting Offset (Feet) StdDev	Resulting Offset (Feet) n	Resulting Offset (Feet) StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
2/20/2004	6/10/2004	☑	☐	☐	☐	5.603	0.000	3	0.000	5.596	0.003	3	0.002	5.600	0.004	6	0.002					
7/2/2004	7/28/2004	☑	☐	☐	☐	5.761	0.020	3	0.011	5.756	0.016	3	0.009	5.759	0.016	6	0.007					
7/28/2004	8/19/2004	☑	☐	☐	☐	5.632	0.004	3	0.002	5.622	0.004	3	0.002	5.627	0.007	6	0.003					
9/9/2004	10/13/2004	☑	☐	☐	☐	4.888	0.001	3	0.001	4.888	0.001	3	0.001	4.888	0.001	6	0.000					
10/13/2004	12/10/2004	☑	☐	☐	☐	4.915	0.003	13	0.001	4.909	0.002	13	0.001	4.912	0.004	26	0.001					
12/10/2004	4/19/2005	☑	☐	☐	☐	4.939	0.002	6	0.001	4.930	0.004	6	0.001	4.934	0.005	12	0.002					
WL	***03***																					
12/11/2003	2/20/2004	☑	☐	☐	☐	5.782	0.016	4	0.008	5.776	0.013	4	0.006	5.779	0.014	8	0.005					
2/20/2004	6/10/2004	☑	☐	☐	☐	5.787	0.001	3	0.000	5.786	0.002	3	0.001	5.786	0.001	6	0.000					
7/2/2004	7/28/2004	☑	☐	☐	☐	5.801	0.002	3	0.001	5.789	0.004	3	0.002	5.795	0.007	6	0.003					
7/28/2004		☑	☐	☐	☐																	
9/9/2004	10/14/2004	☑	☐	☐	☐	4.860	0.020	3	0.012	4.840	0.003	3	0.002	4.850	0.017	6	0.007					
10/14/2004	11/24/2004	☑	☐	☐	☐	4.863	0.024	10	0.008	4.853	0.012	10	0.004	4.858	0.019	20	0.004					
11/24/2004	12/10/2004	☑	☐	☐	☐	4.830	0.020	10	0.006	4.824	0.036	10	0.011	4.827	0.029	20	0.006					
12/10/2004	4/19/2005	☑	☐	☐	☐	4.834	0.008	6	0.003	4.810	0.011	6	0.004	4.822	0.015	12	0.004					
WL	***04***																					
12/11/2003	2/20/2004	☑	☐	☐	☐			0		0.390	0.021	9	0.007	0.390	0.021	9	0.007					
2/20/2004	2/27/2004	☑	☐	☐	☐			0		-0.528	0.010	6	0.004	-0.528	0.010	6	0.004					
4/7/2004	5/25/2004	☑	☐	☐	☐			0		0.385	0.005	3	0.003	0.385	0.005	3	0.003					
5/25/2004	6/10/2004	☑	☐	☐	☐			0		-0.426		1		-0.426		1						New sensor installed
6/23/2004	7/16/2004	☑	☐	☐	☐	-0.039	0.007	3	0.004	-0.036	0.006	3	0.003	-0.037	0.006	6	0.002					New sensor installed
7/16/2004	8/9/2004	☑	☐	☐	☐	1.356	0.005	3	0.003	1.304	0.053	6	0.021	1.321	0.049	9	0.016					New sensor installed
8/9/2004	9/9/2004	☑	☐	☐	☐			0		1.235	0.004	3	0.002	1.235	0.004	3	0.002					
9/10/2004	11/24/2004	☑	☐	☐	☐	0.094	0.019	7	0.007	0.083	0.033	13	0.009	0.086	0.029	20	0.007					
11/24/2004	12/10/2004	☑	☐	☐	☐	0.124	0.002	3	0.001	0.139	0.004	3	0.003	0.132	0.009	6	0.004					

Table 6.3

Coon Island - Channel and Marsh Plain Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet) Mean	StdDev	n	StdErr	Solinst/Tape Offset (Feet) Mean	StdDev	n	StdErr	Resulting Offset (Feet) Mean	StdDev	n	StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
2/12/2004	3/17/2004	☐	☑	☐	☐													1.075		1		
3/17/2004	5/19/2004	☐	☐	☑	☐													1.020		1		
5/19/2004	7/2/2004	☐	☐	☑	☐													0.467	0.066	2	0.047	
7/2/2004	8/9/2004	☐	☐	☑	☐													0.565	0.219	2	0.155	Beginning survey offset 0.720, ending 0.410. Both single shot surveys. Used interpolation method.
8/9/2004	8/26/2004	☐	☑	☐	☐													0.367	0.059	2	0.042	
8/26/2004	9/30/2004	☐	☑	☐	☐													0.264	0.042	2	0.030	
9/30/2004	11/5/2004	☐	☑	☐	☐													0.301	0.034	3	0.019	
11/5/2004	12/1/2004	☐	☑	☐	☐													0.360	0.013	3	0.008	
12/1/2004	1/21/2005	☐	☑	☐	☐			0		0.155	0.000	3	0.000	0.155	0.000	3	0.000	0.181	0.041	2	0.029	
1/21/2005	3/11/2005	☑	☐	☐	☐			0		0.283	0.009	4	0.004	0.283	0.009	4	0.004	0.343		1		
3/11/2005	3/23/2005	☑	☐	☐	☐			0		0.660		1		0.660		1						Mooring disturbed during deployment. Used begin SG-solinst calibrations from 3/11/05 to 3/23/05 12:24:00 pm
3/23/2005	4/7/2005	☐	☑	☐	☐													1.433		1		Mooring disturbed during deployment. Used ending survey calibration from 3/23/05 12:24:00 pm
WL	**01**																					
12/11/2003	2/4/2004	☑	☐	☐	☐	5.514	0.042	6	0.017	5.515	0.046	4	0.023	5.514	0.041	10	0.013					
2/11/2004	4/6/2004	☑	☐	☐	☐	5.542	0.033	6	0.013	5.520	0.033	6	0.013	5.531	0.033	12	0.010					
4/6/2004	6/10/2004	☑	☐	☐	☐	5.523	0.033	6	0.013	5.508	0.033	6	0.013	5.516	0.032	12	0.009					
6/29/2004	7/28/2004	☑	☐	☐	☐	5.494	0.033	6	0.014	5.488	0.033	6	0.013	5.491	0.032	12	0.009					Sensor drift beginning 7/23/04
WL	**02**																					
12/11/2003	2/4/2004	☐	☐	☐	☐	5.691	0.030	9	0.010	5.680	0.029	9	0.010	5.686	0.029	18	0.007					Station relocated, deployment period not utilized
2/4/2004	6/10/2004	☐	☐	☐	☑	6.993	0.032	3	0.019			0		6.993	0.032	3	0.019					High Tide Measure (HTM) method for calibration
6/29/2004	7/28/2004	☑	☐	☐	☐	6.978	0.028	9	0.009	6.984	0.028	9	0.009	6.981	0.027	18	0.006					If manual offset applied, reduce calibration by 0.02 ft to compensate for sensor drift

Coon Island - Channel and Marsh Plain Water Level Offset Calibration Summary

		Calibration Method				Staff Gage - Solinst/Measuring Tape Calibration Results												Survey Method Calibration Results				
						Staff Gage Offset (Feet)				Solinst/Tape Offset (Feet)				Resulting Offset (Feet)								
Calib Start Date	Calib End Date	Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Avg Survey Offset Ft	StdDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
9/9/2004	12/10/2004	☑	☐	☐	☐	5.800	0.027	18	0.006	5.802	0.027	18	0.006	5.801	0.027	36	0.005					
12/10/2004	12/14/2004	☑	☐	☐	☐	5.812	0.033	18	0.008	5.812	0.033	18	0.008	5.812	0.033	36	0.005					
12/14/2004	4/7/2005	☑	☐	☐	☐	5.814	0.030	30	0.005	5.815	0.031	30	0.006	5.814	0.030	60	0.004					
WL	***03***																					
1/22/2004	3/17/2004	☑	☐	☐	☐	6.124	0.006	4	0.003	6.119	0.005	4	0.002	6.121	0.006	8	0.002					
3/17/2004	6/10/2004	☑	☐	☐	☐	6.092	0.001	3	0.000	6.087	0.001	3	0.000	6.090	0.003	6	0.001					
6/29/2004	10/14/2004	☑	☐	☐	☐	6.148	0.014	10	0.004	6.150	0.012	10	0.004	6.149	0.012	20	0.003					
10/14/2004	12/10/2004	☑	☐	☐	☐	6.137	0.003	3	0.002	6.130	0.000	3	0.000	6.133	0.004	6	0.002					
12/14/2004	1/10/2005	☑	☐	☐	☐	5.060	0.008	7	0.003	5.060	0.008	7	0.003	5.060	0.008	14	0.002					
1/10/2005	4/7/2005	☑	☐	☐	☐	5.057	0.006	3	0.003	5.063	0.006	3	0.003	5.060	0.006	6	0.003					
WL	***04***																					
1/22/2004	3/17/2004	☑	☐	☐	☐	3.171	0.010	5	0.005	3.153	0.006	3	0.004	3.165	0.013	8	0.004					
3/17/2004	5/25/2004	☑	☐	☐	☐	3.154	0.013	6	0.005	3.144	0.012	9	0.004	3.148	0.013	15	0.003					
5/25/2004	10/27/2004	☑	☐	☐	☐	1.921	0.033	6	0.014	1.899	0.034	12	0.010	1.906	0.035	18	0.008					
10/27/2004	12/1/2004	☐	☐	☐	☑	1.738	0.004	3	0.002	1.728	0.004	3	0.002	1.733	0.006	6	0.003					Manual offset if applied would increase SG-Tape method offset by 0.104 to adjust for sensor drift noted in field notebook
12/1/2004	1/11/2005	☐	☐	☐	☑	1.677	0.010	6	0.004	1.677	0.013	6	0.005	1.677	0.011	12	0.003					Manual offset calculated based upon avg. high tide diff compared to WL3 for period 5/25/04 to 10/27/04
1/11/2005	2/9/2005	☐	☐	☐	☐	1.234	0.014	3	0.008	1.029	0.206	6	0.084	1.097	0.193	9	0.064					Data invalid sensor pressure drift precluded accurate field measure calibration values

Table 6.4

Bull Island - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Calibration Method: Survey	Calibration Method: Inter-polation	Calibration Method: Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet): Mean	Staff Gage Offset (Feet): StdDev	Staff Gage Offset (Feet): n	Staff Gage Offset (Feet): StdErr	Solinst/Tape Offset (Feet): Mean	Solinst/Tape Offset (Feet): StdDev	Solinst/Tape Offset (Feet): n	Solinst/Tape Offset (Feet): StdErr	Resulting Offset (Feet): Mean	Resulting Offset (Feet): StdDev	Resulting Offset (Feet): n	Resulting Offset (Feet): StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
2/13/2004	5/19/2004	☐	☑	☐	☐													-2.965	0.019	2	0.014	
5/19/2004	6/18/2004	☐	☑	☐	☐													-3.012	0.031	2	0.022	
6/18/2004	7/16/2004	☐	☑	☐	☐													-2.818	0.014	2	0.010	
7/16/2004	8/9/2004	☐	☑	☐	☐													-2.828	0.044	2	0.031	
8/9/2004	8/26/2004	☐	☑	☐	☐													-2.892	0.002	2	0.002	
8/26/2004	9/30/2004	☐	☑	☐	☐													-2.903	0.030	2	0.021	
9/30/2004	11/5/2004	☐	☑	☐	☐													-2.916	0.054	3	0.031	
11/5/2004	11/15/2004	☐	☑	☐	☐													-2.899	0.083	2	0.059	Wika pressure tranducer removed
12/1/2004	12/10/2004	☐	☑	☐	☐			0		-1.885		1		-1.885		1		-1.862	0.040	2	0.029	Coastal Leasing installed
12/10/2004	1/21/2005	☐	☑	☐	☐			0		-2.023	0.039	4	0.020	-2.023	0.039	4	0.020	-2.034	0.043	3	0.025	
1/21/2005	2/9/2005	☐	☑	☐	☐			0		-1.550		1		-1.550		1		-1.598	0.060	2	0.042	
2/9/2005	4/7/2005	☐	☐	☐	☐															0		
4/7/2005	4/19/2005	☐	☑	☐	☐													0.581		1		
4/19/2005	6/20/2005	☐	☑	☐	☐													-1.596	0.099	2	0.070	
6/20/2005	8/4/2005	☐	☑	☐	☐													-0.301	0.210	2	0.149	
8/4/2005	9/20/2005	☐	☑	☐	☐													-0.430	0.057	2	0.040	
WL	**01**																					
12/11/2003	3/18/2004	☑	☐	☐	☐	6.390	0.014	5	0.006	6.384	0.013	5	0.006	6.387	0.013	10	0.004					
3/18/2004	6/10/2004	☐	☐	☐	☑	6.374	0.002	3	0.001	6.364	0.002	3	0.001	6.369	0.006	6	0.002					Adjusted calibration + 0.036 to compensate for drift observed during open air sensor reading
WL	**02**																					
1/21/2004	3/18/2004	☐	☐	☐	☑	5.554	0.064	5	0.029	5.514	0.103	5	0.046	5.534	0.083	10	0.026					Adjusted calibration period 21-Jan-04 to 18-Mar-04. Only used avg of first calibration 5.62 due to discrepency in subsequent calibrations.

Bull Island - Channel and Marsh Planin Water Level Offset Calibration Summary

		Calibration Method				Staff Gage - Solinst/Measuring Tape Calibration Results												Survey Method Calibration Results				
						Staff Gage Offset (Feet)				Solinst/Tape Offset (Feet)				Resulting Offset (Feet)								
Calib Start Date	Calib End Date	Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Avg Survey Offset Ft	StdDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
2/10/2004		☐	☐	☐	☑																	Adjusted calibration period 10-Feb-04 to 18-Mar-04. Only used avg of 18-Mar-4 calibrations.
3/18/2004	5/19/2004	☐	☐	☑	☐	5.505	0.002	3	0.001	5.490	0.003	3	0.002	5.497	0.009	6	0.003					Applied interpolation offset due to sensor drift
5/19/2004		☐	☐	☐	☑																	No field calibration; set offset value to match peaks WLs with prior calibration at other site station
9/10/2004	10/14/2004	☑	☐	☐	☐	4.595	0.026	3	0.015	4.611	0.006	3	0.003	4.603	0.019	6	0.008					
10/14/2004	12/10/2004	☑	☐	☐	☐	4.577	0.018	9	0.006	4.574	0.032	9	0.011	4.576	0.025	18	0.006					
12/10/2004	12/14/2004	☑	☐	☐	☐	4.660	0.005	6	0.002	4.661	0.014	6	0.006	4.660	0.010	12	0.003					
12/14/2004	1/10/2005	☑	☐	☐	☐	4.560	0.005	4	0.003	4.554	0.013	7	0.005	4.556	0.011	11	0.003					
1/10/2005	4/7/2005	☑	☐	☐	☐	4.531	0.014	6	0.006	4.528	0.035	9	0.012	4.529	0.028	15	0.007					
WL	***03***																					
12/11/2003	3/18/2004	☑	☐	☐	☐	6.438	0.014	5	0.006	6.429	0.012	5	0.005	6.434	0.013	10	0.004					
9/10/2004	10/14/2004	☑	☐	☐	☐	5.608	0.024	3	0.014	5.615	0.007	3	0.004	5.611	0.016	6	0.007					
10/14/2004	12/10/2004	☑	☐	☐	☐	5.609	0.004	10	0.001	5.617	0.016	10	0.005	5.613	0.012	20	0.003					
12/10/2004	2/9/2005	☑	☐	☐	☐	5.615	0.002	6	0.001	5.596	0.037	9	0.012	5.604	0.029	15	0.008					
2/9/2005	4/7/2005	☑	☐	☐	☐	5.614	0.001	3	0.001	5.614	0.004	3	0.002	5.614	0.003	6	0.001					
WL	***04***																					
4/8/2004	6/25/2004	☑	☐	☐	☐	3.122	0.010	9	0.003	3.126	0.012	9	0.004	3.124	0.011	18	0.003					
9/10/2004	12/1/2004	☑	☐	☐	☐			0		1.010	0.054	9	0.018	1.010	0.054	9	0.018					
12/1/2004	12/10/2004	☑	☐	☐	☐	1.052	0.012	6	0.005	1.005	0.005	6	0.002	1.029	0.026	12	0.007					
12/10/2004	3/7/2005	☑	☐	☐	☐	1.049	0.009	16	0.002	1.010	0.034	12	0.010	1.032	0.030	28	0.006					
4/7/2005	4/19/2005	☑	☐	☐	☐	1.059	0.002	3	0.001	1.038	0.002	3	0.001	1.049	0.012	6	0.005					

Table 6.5

Browns Island - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet) Mean	StdDev	n	StdErr	Solinst/Tape Offset (Feet) Mean	StdDev	n	StdErr	Resulting Offset (Feet) Mean	StdDev	n	StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
1/30/2004	5/18/2004	☐	☑	☐	☐													-7.009	0.009	2	0.007	
5/18/2004	6/25/2004	☐	☐	☐	☑													-8.006	0.326	2	0.230	Used ending survey only (-7.775)
6/25/2004	8/25/2004	☐	☐	☑	☐													-5.392	0.139	2	0.098	Starting offset -5.29, ending offset -5.49
8/25/2004	9/16/2004	☐	☑	☐	☐													-7.985		1		
9/16/2004	11/12/2004	☐	☐	☑	☐													-7.957	0.093	5	0.042	Interpolation of survey dates (9/16, 10/7, 10/26, 10/27, 11/12)
11/12/2004	12/9/2004	☐	☑	☐	☐													-8.873		1		No ending calibration
12/9/2004	4/20/2005	☐	☑	☐	☐													-3.078	0.014	3	0.008	Wika removed, Troll 4000 pressure transducer
4/20/2005	6/23/2005	☐	☐	☐	☑													-2.778	0.117	3	0.067	Wika removed, Troll 8000 pressure transducer. Start -2.91 (4/20/05), -2.71 (6/23/05). Created sub-deployment for offsets.
6/23/2005	8/11/2005	☐	☐	☐	☑																	Wika removed, Troll 8000 pressure transducer. -2.71 (6/23/05), -2.71 (8/11/05). Created sub-deployment for offsets.
WL	**01**																					
12/18/2003	2/19/2004	☑	☐	☐	☐	6.113	0.003	4	0.002	6.100	0.003	3	0.002	6.107	0.007	7	0.003					
2/19/2004	6/12/2004	☑	☐	☐	☐	6.096	0.003	3	0.002	6.085	0.001	3	0.001	6.090	0.006	6	0.003					
6/25/2004	8/25/2004	☐	☐	☐	☑			0				0				0						No field calibration; sensor failed 7/18/04. Applied avg. of prior offsets (6.09)
10/1/2004	2/8/2005	☑	☐	☐	☐	6.126	0.022	9	0.007	6.117	0.016	9	0.005	6.122	0.020	18	0.005					
2/8/2005	3/4/2005	☑	☐	☐	☐	6.127	0.005	3	0.003	6.100	0.001	3	0.000	6.114	0.015	6	0.006					
WL	**02**																					
1/8/2004	6/12/2004	☑	☐	☐	☐	5.758		1		5.778		1		5.768	0.014	2	0.010					
6/25/2004	8/25/2004	☐	☐	☐	☑			0				0				0						No field calibration, applied prior and subsequent offset (5.76)
10/7/2004	12/9/2004	☑	☐	☐	☐	5.768	0.010	7	0.004	5.770	0.006	7	0.002	5.769	0.008	14	0.002					
WL	**03**																					
1/8/2004	6/12/2004	☑	☐	☐	☐	4.997		1		4.987		1		4.992	0.007	2	0.005					
6/25/2004	8/25/2004	☐	☐	☐	☑			0				0				0						No field calibration. applied prior offset (4.992).

Browns Island - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Calibration Method: Survey	Calibration Method: Inter-polation	Calibration Method: Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet): Mean	Staff Gage Offset (Feet): StdDev	Staff Gage Offset (Feet): n	Staff Gage Offset (Feet): StdErr	Solinst/Tape Offset (Feet): Mean	Solinst/Tape Offset (Feet): StdDev	Solinst/Tape Offset (Feet): n	Solinst/Tape Offset (Feet): StdErr	Resulting Offset (Feet): Mean	Resulting Offset (Feet): StdDev	Resulting Offset (Feet): n	Resulting Offset (Feet): StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
10/1/2004	12/9/2004	☐	☐	☐	☐	5.448	0.001	3	0.001	5.445	0.005	3	0.003	5.447	0.004	6	0.002					Invalid data period. Sensor not situated at base of stilling well.
12/9/2004	3/4/2005	☑	☐	☐	☐	4.979	0.009	7	0.003	4.989	0.005	7	0.002	4.984	0.009	14	0.002					
WL	**04**																					
1/8/2004	6/12/2004	☑	☐	☐	☐	6.147		1		6.147		1		6.147	0.000	2	0.000					
6/25/2004	8/25/2004	☑	☐	☐	☐	6.113	0.001	3	0.000	6.103	0.001	3	0.000	6.108	0.006	6	0.002					
10/1/2004	11/12/2004	☑	☐	☐	☐	6.198	0.001	3	0.000	6.181	0.005	3	0.003	6.189	0.010	6	0.004					
11/12/2004	2/8/2005	☑	☐	☐	☐	6.163	0.029	6	0.012	6.155	0.027	6	0.011	6.159	0.027	12	0.008					
2/8/2005	3/4/2005	☑	☐	☐	☐	6.139	0.003	3	0.002	6.146	0.008	3	0.004	6.142	0.006	6	0.003					
WL	**05**																					
4/16/2004	7/14/2004	☐	☑	☐	☐													-0.801	0.007	3	0.004	
7/14/2004	8/25/2004	☐	☐	☑	☐													0.002	0.078	2	0.055	Offsets: start 0.057 (7/14/04), end -0.053 (8/25/04)
8/25/2004	10/1/2004	☐	☑	☐	☐													0.102		1		Single survey, end of deployment
10/1/2004	10/7/2004	☐	☐	☐	☑													0.449	0.219	4	0.109	Offset start 0.722 (10/1/04)
10/7/2004	11/19/2004	☐	☐	☑	☐																	Sensor failed 11/19/04. Offsets: start 0.722 (10/1/04), 0.528 (10/7/04),0.271 (10/26/04), no final field calib used slope method final -0.06 (11/19/04).
12/9/2004	12/21/2004	☐	☐	☐	☑			0		-0.749	0.074	12	0.021	-0.749	0.074	12	0.021					Applied only starting offset of -0.86 (12/9/04) because sensor moved on next visit and subsequent calibrations did not correspond well.
12/21/2004	2/8/2005	☐	☐	☐	☑																	Applied average of survey offsets -0.73 (12/21/04), -0.70 (1/4/05), -0.69 (2/8/05)
2/8/2005	3/4/2005	☐	☐	☐	☑													-0.576	0.305	2	0.216	Applied only ending offset. Offsets: start -0.79 (2/8/05), end -0.36 (3/4/05). Starting offset too low, did not correspond to prior/post WSE.
3/4/2005	4/20/2005	☐	☐	☐	☑			0		-0.713	0.003	3	0.001	-0.713	0.003	3	0.001	-0.787		1		Applied -0.75, the average of starting -0.787 (3/4/05 survey method) and ending -0.713 (4/20/05 tape method)
4/20/2005	6/23/2005	☐	☐	☑	☐			0		-1.071	0.293	5	0.131	-1.071	0.293	5	0.131					Offsets: start -0.75 (4/20/05 tape method) and mid offset -1.29 (6/23/05 tape). Created sub-deployment to interpolate.
6/23/2005	8/11/2005	☐	☐	☑	☐													-1.133		1		Offsets: start offset -1.29 (6/23/05 tape), ending -1.13 (8/11/05 survey). Created sub-deployment to interpolate. Ending open air 0.457,0.471

Table 6.6

Sherman Lake - Channel and Marsh Planin Water Level Offset Calibration Summary

Calib Start Date	Calib End Date	Calibration Method: Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Staff Gage - Solinst/Measuring Tape Calibration Results: Staff Gage Offset (Feet): Mean	StdDev	n	StdErr	Solinst/Tape Offset (Feet): Mean	StdDev	n	StdErr	Resulting Offset (Feet): Mean	StdDev	n	StdErr	Survey Method Calibration Results: Avg Survey Offset Ft	StDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
CTDS	**01**																					
1/30/2004	4/16/2004	☑	☐	☐	☐			0		-2.367	0.006	3	0.003	-2.367	0.006	3	0.003					
10/7/2004	11/12/2004	☑	☐	☐	☐			0		-1.492	0.009	6	0.004	-1.492	0.009	6	0.004					
11/12/2004	12/9/2004	☑	☐	☐	☐			0		-2.222	0.000	3	0.000	-2.222	0.000	3	0.000					
12/9/2004	2/8/2005	☐	☐	☑	☐			0		-2.245		1		-2.245		1						Interpolated to match prior/post offsets. Starting = -1.785, ending -2.245. Ending offset based on field calibration.
2/8/2005	3/4/2005	☑	☐	☐	☐			0		-2.225		1		-2.225		1						
3/4/2005	4/20/2005	☑	☐	☐	☐			0		-2.042	0.003	3	0.002	-2.042	0.003	3	0.002					
4/20/2005	6/23/2005	☑	☐	☐	☐			0		-1.811	0.029	6	0.012	-1.811	0.029	6	0.012					
6/23/2005	8/10/2005	☑	☐	☐	☐			0		-1.030	0.000	3	0.000	-1.030	0.000	3	0.000					
WL	**01**																					
2/19/2004	4/16/2004	☑	☐	☐	☐	1.668	0.010	3	0.006			0		1.668	0.010	3	0.006					
WL	**02**																					
3/5/2004	4/16/2004	☑	☐	☐	☐	4.437	0.016	8	0.006			0		4.437	0.016	8	0.006					
6/25/2004	9/16/2004	☑	☐	☐	☐	4.927	0.004	5	0.002			0		4.927	0.004	5	0.002					
10/7/2004	12/9/2004	☑	☐	☐	☐	4.941	0.003	3	0.002	4.891	0.003	3	0.002	4.916	0.028	6	0.011					
12/9/2004	1/12/2005	☑	☐	☐	☐	4.909	0.002	3	0.001	4.898	0.005	3	0.003	4.904	0.007	6	0.003					
1/12/2005	2/8/2005	☑	☐	☐	☐	4.910	0.003	3	0.002	4.898	0.006	3	0.003	4.904	0.007	6	0.003					
2/8/2005	4/20/2005	☐	☐	☐	☑																	No valid field calibration, marsh dry on both visits. Manual offset set to be similar to be 2 prior visits.
4/20/2005	8/10/2005	☑	☐	☐	☐	4.408	0.033	7	0.012	4.496	0.045	7	0.017	4.452	0.059	14	0.016					New station setup; lowered
WL	**03**																					
2/5/2004	4/16/2004	☑	☐	☐	☐	5.460		1				0		5.460		1						
WL	**04**																					
3/5/2004	4/16/2004	☑	☐	☐	☐	4.920	0.009	6	0.004			0		4.920	0.009	6	0.004					
6/25/2004	9/16/2004	☑	☐	☐	☐	5.059	0.003	5	0.001			0		5.059	0.003	5	0.001					

Sherman Lake - Channel and Marsh Planin Water Level Offset Calibration Summary

		Calibration Method				Staff Gage - Solinst/Measuring Tape Calibration Results												Survey Method Calibration Results				
						Staff Gage Offset (Feet)				Solinst/Tape Offset (Feet)				Resulting Offset (Feet)								
Calib Start Date	Calib End Date	Staff Gage Solinst/Tape	Survey	Inter-polation	Manual	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Mean	StdDev	n	StdErr	Avg Survey Offset Ft	StdDev Survey Offset Ft	Survey Events	StErr Survey Offset	Calilbration Notes
10/7/2004	1/4/2005	☑	☐	☐	☐	5.066	0.003	3	0.002	5.049	0.000	3	0.000	5.057	0.009	6	0.004					
1/4/2005	1/12/2005	☑	☐	☐	☐	5.046	0.003	3	0.002	5.096	0.003	3	0.002	5.071	0.028	6	0.011					
1/12/2005	2/8/2005	☑	☐	☐	☐	5.038	0.004	6	0.002	5.080	0.014	6	0.006	5.059	0.024	12	0.007					
2/8/2005	8/10/2004	☑	☐	☐	☐	5.040	0.002	3	0.001	5.068	0.001	3	0.001	5.054	0.016	6	0.006					

Table 7.1

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
CM CTDS 01																									
Sensor SN: 4044407																									
22-Dec-03	23-Jan-04	22-Dec-03	22-Dec-03	2/98	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	6.32	3.73		6.3450		2.615	0.011	0.007			2.623	0.011	0.007
22-Dec-03	23-Jan-04	22-Dec-03	22-Dec-03	2/98	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	6.32	3.73		6.2650		2.535	0.011	0.007			2.623	0.011	0.007
22-Dec-03	23-Jan-04	22-Dec-03	22-Dec-03	2/98	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	6.32	3.73		6.3350		2.605	0.011	0.007			2.623	0.011	0.007
22-Dec-03	23-Jan-04	23-Jan-04	22-Dec-03	1/72	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	6.965	4.36		6.9900		2.630	0.011	0.007			2.623	0.011	0.007
22-Dec-03	23-Jan-04	23-Jan-04	22-Dec-03	1/72	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	6.965	4.36		6.9100		2.550	0.011	0.007			2.623	0.011	0.007
22-Dec-03	23-Jan-04	23-Jan-04	22-Dec-03	1/72	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	6.965	4.36		6.9800		2.620	0.011	0.007			2.623	0.011	0.007
Sensor SN: 4044407																									
23-Jan-04	18-Mar-04	23-Jan-04	23-Jan-04	1/72	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	7.025	4.45		7.0500		2.600	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	23-Jan-04	23-Jan-04	1/72	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	7.025	4.45		6.9700		2.520	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	23-Jan-04	23-Jan-04	1/72	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	7.025	4.45		7.0400		2.590	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	4.18	1.62		4.1950		2.575	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	4.18	1.62		4.2050		2.585	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	4.18	1.62		4.1250		2.505	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	4.19	1.63		4.2050		2.575	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	4.19	1.63		4.2150		2.585	0.009	0.005			2.590	0.009	0.005
23-Jan-04	18-Mar-04	18-Mar-04	23-Jan-04	1/128	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	4.19	1.63		4.1350		2.505	0.009	0.005			2.590	0.009	0.005
Sensor SN: 4044407																									
18-Mar-04	21-Apr-04	18-Mar-04	18-Mar-04	1/128	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	4.17	1.61		4.1950		2.585	0.007	0.005			2.580	0.007	0.005
18-Mar-04	21-Apr-04	18-Mar-04	18-Mar-04	1/128	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	4.17	1.61		4.1150		2.505	0.007	0.005			2.580	0.007	0.005
18-Mar-04	21-Apr-04	18-Mar-04	18-Mar-04	1/128	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	4.17	1.61		4.1850		2.575	0.007	0.005			2.580	0.007	0.005
18-Mar-04	21-Apr-04	21-Apr-04	18-Mar-04	4/88	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	4.79	2.24		4.8150		2.575	0.007	0.005			2.580	0.007	0.005
18-Mar-04	21-Apr-04	21-Apr-04	18-Mar-04	4/88	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	4.79	2.24		4.7350		2.495	0.007	0.005			2.580	0.007	0.005
18-Mar-04	21-Apr-04	21-Apr-04	18-Mar-04	4/88	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	4.79	2.24		4.8050		2.565	0.007	0.005			2.580	0.007	0.005
Sensor SN: 4044407																									

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	4.78	2.23		4.8050		2.575	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	4.78	2.23		4.7250		2.495	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	4.78	2.23		4.7950		2.565	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	4.8	2.25		4.8150		2.565	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	4.8	2.25		4.7450		2.495	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	21-Apr-04	21-Apr-04	4/88	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	4.8	2.25		4.8250		2.575	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	08-May-04	21-Apr-04	5/40	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	4.96	2.44		4.9050		2.465	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	08-May-04	21-Apr-04	5/40	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	4.96	2.44		4.9750		2.535	0.017	0.010			2.565	0.017	0.010
21-Apr-04	08-May-04	08-May-04	21-Apr-04	5/40	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	4.96	2.44		4.9850		2.545	0.017	0.010			2.565	0.017	0.010
Sensor SN: 4044407																									
08-May-04	26-May-04	08-May-04	08-May-04	5/40	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	4.96	2.43		4.9850		2.555	0.014	0.010			2.545	0.014	0.010
08-May-04	26-May-04	08-May-04	08-May-04	5/40	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	4.96	2.43		4.9050		2.475	0.014	0.010			2.545	0.014	0.010
08-May-04	26-May-04	08-May-04	08-May-04	5/40	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	4.96	2.43		4.9750		2.545	0.014	0.010			2.545	0.014	0.010
08-May-04	26-May-04	26-May-04	08-May-04	4/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	4.87	2.36		4.8950		2.535	0.014	0.010			2.545	0.014	0.010
08-May-04	26-May-04	26-May-04	08-May-04	4/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	4.87	2.36		4.8150		2.455	0.014	0.010			2.545	0.014	0.010
08-May-04	26-May-04	26-May-04	08-May-04	4/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	4.87	2.36		4.8850		2.525	0.014	0.010			2.545	0.014	0.010
Sensor SN: 4044407																									
26-May-04	02-Jun-04	02-Jun-04	26-May-04	5/104	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.1	2.59		5.1150		2.525					2.535		
26-May-04	02-Jun-04	02-Jun-04	26-May-04	5/104	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.1	2.59		5.1250		2.535					2.535		
26-May-04	02-Jun-04	02-Jun-04	26-May-04	5/104	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.1	2.59		5.0450		2.455					2.535		
Sensor SN: 4044407																									
02-Jun-04	18-Jun-04	18-Jun-04	02-Jun-04	6/6	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.19	2.71		5.2050		2.495					2.505		
02-Jun-04	18-Jun-04	18-Jun-04	02-Jun-04	6/6	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.19	2.71		5.2150		2.505					2.505		
02-Jun-04	18-Jun-04	18-Jun-04	02-Jun-04	6/6	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.19	2.71		5.1350		2.425					2.505		
Sensor SN: 4044407																									
18-Jun-04	21-Jul-04	18-Jun-04	18-Jun-04	6/6	TOAI	8.950	TOAI	0	1.055	9.98	Tape	1	3.74	2.71	5.2100		2.500		0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	18-Jun-04	18-Jun-04	6/6	TOAI	8.870	TOAI	0	1.055	9.98	Tape	1	3.74	2.71	5.1300		2.420		0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	18-Jun-04	18-Jun-04	6/6	TOAI	8.940	TOAI	0	1.055	9.98	Tape	1	3.74	2.71	5.2000		2.490		0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.44	2.96		5.4650		2.505	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.44	2.96		5.3850		2.425	0.006	0.003			2.506	0.006	0.003

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.44	2.96		5.4550		2.495	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	5.44	2.96		5.4650		2.505	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	5.44	2.96		5.3850		2.425	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	5.44	2.96		5.4550		2.495	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	5.44	2.95		5.4550		2.505	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	5.44	2.95		5.4650		2.515	0.006	0.003			2.506	0.006	0.003
18-Jun-04	21-Jul-04	21-Jul-04	18-Jun-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	5.44	2.95		5.3850		2.435	0.006	0.003			2.506	0.006	0.003
Sensor SN: 4044407																									
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	4	5.76	3.28		5.7750		2.495	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	4	5.76	3.28		5.7050		2.425	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	4	5.76	3.28		5.7850		2.505	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	5	5.76	3.28		5.7850		2.505	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	5	5.76	3.28		5.7050		2.425	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	5	5.76	3.28		5.7750		2.495	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.950	TOAI	0	1.055	9.98	SG	6	5.76	3.28		5.7850		2.505	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.870	TOAI	0	1.055	9.98	SG	6	5.76	3.28		5.7050		2.425	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	21-Jul-04	21-Jul-04	6/126	TOAI	8.940	TOAI	0	1.055	9.98	SG	6	5.76	3.28		5.7750		2.495	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.39	2.89		5.4150		2.525	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.39	2.89		5.3350		2.445	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.39	2.89		5.4050		2.515	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	5.4	2.9		5.3450		2.445	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	5.4	2.9		5.4150		2.515	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	5.4	2.9		5.4250		2.525	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	5.41	2.91		5.3550		2.445	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	5.41	2.91		5.4250		2.515	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	5.41	2.91		5.4350		2.525	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	SG	4	5.42	2.92		5.4450		2.525	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	SG	4	5.42	2.92		5.3650		2.445	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	SG	4	5.42	2.92		5.4350		2.515	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	SG	5	5.44	2.93		5.4650		2.535	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	SG	5	5.44	2.93		5.3850		2.455	0.012	0.004			2.519	0.012	0.004
21-Jul-04	14-Sep-04	14-Sep-04	21-Jul-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	SG	5	5.44	2.93		5.4550		2.525	0.012	0.004			2.519	0.012	0.004
Sensor SN: 4044407																									
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	Tape	1	3.54	2.89	5.4100		2.520		0.010	0.006	0.005	0.002	2.532	0.013	0.005

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	Tape	1	3.54	2.89	5.3300		2.440		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	Tape	1	3.54	2.89	5.4000		2.510		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	Tape	2	3.53	2.9	5.4200		2.520		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	Tape	2	3.53	2.9	5.3400		2.440		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	Tape	2	3.53	2.9	5.4100		2.510		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	Tape	3	3.52	2.91	5.4300		2.520		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	Tape	3	3.52	2.91	5.3500		2.440		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	Tape	3	3.52	2.91	5.4200		2.510		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	Tape	4	3.5	2.92	5.4500		2.530		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	Tape	4	3.5	2.92	5.3700		2.450		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	Tape	4	3.5	2.92	5.4400		2.520		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.950	TOAI	0	1.055	9.98	Tape	5	3.49	2.93	5.4600		2.530		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.870	TOAI	0	1.055	9.98	Tape	5	3.49	2.93	5.3800		2.450		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/78	TOAI	8.940	TOAI	0	1.055	9.98	Tape	5	3.49	2.93	5.4500		2.520		0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	3.78	1.27		3.7950		2.525	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	3.78	1.27		3.8050		2.535	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	3.78	1.27		3.7250		2.455	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	3.77	1.25		3.7850		2.535	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	3.77	1.25		3.7950		2.545	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	3.77	1.25		3.7150		2.465	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	3.76	1.23		3.7850		2.555	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	3.76	1.23		3.7050		2.475	0.010	0.006	0.005	0.002	2.532	0.013	0.005
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	3.76	1.23		3.7750		2.545	0.010	0.006	0.005	0.002	2.532	0.013	0.005
Sensor SN: 4044407																									
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	Tape	1	5.13	1.27	3.8200		2.550		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	Tape	1	5.13	1.27	3.7400		2.470		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	Tape	1	5.13	1.27	3.8100		2.540		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	Tape	2	5.13	1.25	3.8200		2.570		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	Tape	2	5.13	1.25	3.7400		2.490		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	Tape	2	5.13	1.25	3.8100		2.560		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.940	TOAI	0	1.055	9.98	Tape	3	5.14	1.23	3.8000		2.570		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.870	TOAI	0	1.055	9.98	Tape	3	5.14	1.23	3.7300		2.500		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/15	TOAI	8.950	TOAI	0	1.055	9.98	Tape	3	5.14	1.23	3.8100		2.580		0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.3	2.71		5.3250		2.615	0.006	0.003	0.015	0.009	2.588	0.025	0.010

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.3	2.71		5.2450		2.535	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.3	2.71		5.3150		2.605	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	5.3	2.72		5.3250		2.605	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	5.3	2.72		5.2450		2.525	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	5.3	2.72		5.3150		2.595	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	5.31	2.73		5.2550		2.525	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	5.31	2.73		5.3250		2.595	0.006	0.003	0.015	0.009	2.588	0.025	0.010
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	5.31	2.73		5.3350		2.605	0.006	0.003	0.015	0.009	2.588	0.025	0.010
Sensor SN: 4044407																									
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	Tape	1	3.64	2.71	5.2300		2.520		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	Tape	1	3.64	2.71	5.3000		2.590		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	Tape	1	3.64	2.71	5.3100		2.600		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	Tape	2	3.63	2.72	5.3200		2.600		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	Tape	2	3.63	2.72	5.2400		2.520		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	Tape	2	3.63	2.72	5.3100		2.590		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.940	TOAI	0	1.055	9.98	Tape	3	3.62	2.73	5.3200		2.590		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.870	TOAI	0	1.055	9.98	Tape	3	3.62	2.73	5.2500		2.520		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	02-Dec-04	02-Dec-04	9/146	TOAI	8.950	TOAI	0	1.055	9.98	Tape	3	3.62	2.73	5.3300		2.600		0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	7.69	5.16		7.7050		2.545	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	7.69	5.16		7.6350		2.475	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	7.69	5.16		7.7150		2.555	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	7.69	5.16		7.7050		2.545	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	7.69	5.16		7.6350		2.475	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	7.69	5.16		7.7150		2.555	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	7.69	5.16		7.7050		2.545	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	7.69	5.16		7.6350		2.475	0.000	0.000	0.000	0.000	2.578	0.025	0.010
02-Dec-04	09-Dec-04	09-Dec-04	02-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	7.69	5.16		7.7150		2.555	0.000	0.000	0.000	0.000	2.578	0.025	0.010
Sensor SN: 4044407																									
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	Solinst	1	1.23	5.16	7.6400		2.480		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	Solinst	1	1.23	5.16	7.7100		2.550		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	Solinst	1	1.23	5.16	7.7200		2.560		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	Solinst	2	1.23	5.16	7.6400		2.480		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	Solinst	2	1.23	5.16	7.7100		2.550		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	Solinst	2	1.23	5.16	7.7200		2.560		0.032	0.019	0.000	0.000	2.554	0.021	0.009

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.950	TOAI	0	1.055	9.98	Solinst	3	1.23	5.16	7.7200		2.560		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.870	TOAI	0	1.055	9.98	Solinst	3	1.23	5.16	7.6400		2.480		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	09-Dec-04	09-Dec-04	10/12	TOAI	8.940	TOAI	0	1.055	9.98	Solinst	3	1.23	5.16	7.7100		2.550		0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	4.86	2.35		4.8050		2.455	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	4.86	2.35		4.8750		2.525	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	4.86	2.35		4.8850		2.535	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	4.83	2.33		4.8550		2.525	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	4.83	2.33		4.7750		2.445	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	4.83	2.33		4.8450		2.515	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	4.81	2.25		4.8350		2.585	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	4.81	2.25		4.7550		2.505	0.032	0.019	0.000	0.000	2.554	0.021	0.009
09-Dec-04	11-Feb-05	11-Feb-05	09-Dec-04	11/102	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	4.81	2.25		4.8250		2.575	0.032	0.019	0.000	0.000	2.554	0.021	0.009
Sensor SN: 4044407																									
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.940	TOAI	0	1.055	9.98	Tape	1	4.035	2.35	4.9050		2.555				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.950	TOAI	0	1.055	9.98	Tape	1	4.035	2.35	4.9150		2.565				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.870	TOAI	0	1.055	9.98	Tape	1	4.035	2.35	4.8350		2.485				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.940	TOAI	0	1.055	9.98	Tape	2	4.065	2.33	4.8750		2.545				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.950	TOAI	0	1.055	9.98	Tape	2	4.065	2.33	4.8850		2.555				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.870	TOAI	0	1.055	9.98	Tape	2	4.065	2.33	4.8050		2.475				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.950	TOAI	0	1.055	9.98	Tape	3	4.1	2.25	4.8500		2.600				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.870	TOAI	0	1.055	9.98	Tape	3	4.1	2.25	4.7700		2.520				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	11-Feb-05	11-Feb-05	11/102	TOAI	8.940	TOAI	0	1.055	9.98	Tape	3	4.1	2.25	4.8400		2.590				0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	24-May-05	11-Feb-05	11/135	TOAI	8.950	TOAI	0	1.055	9.98	SG	1	5.48	2.97		5.5050		2.535			0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	24-May-05	11-Feb-05	11/135	TOAI	8.870	TOAI	0	1.055	9.98	SG	1	5.48	2.97		5.4250		2.455			0.024	0.014	2.564	0.027	0.014
11-Feb-05	24-May-05	24-May-05	11-Feb-05	11/135	TOAI	8.940	TOAI	0	1.055	9.98	SG	1	5.48	2.97		5.4950		2.525			0.024	0.014	2.564	0.027	0.014
Sensor SN: 4044407																									
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.940	TOAI	0	1.055	9.98	SG	2	5.47	2.99		5.4850		2.495	0.035	0.025			2.480	0.035	0.025
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.950	TOAI	0	1.055	9.98	SG	2	5.47	2.99		5.4950		2.505	0.035	0.025			2.480	0.035	0.025
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.870	TOAI	0	1.055	9.98	SG	2	5.47	2.99		5.4150		2.425	0.035	0.025			2.480	0.035	0.025
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.940	TOAI	0	1.055	9.98	SG	3	5.46	3.03		5.4750		2.445	0.035	0.025			2.480	0.035	0.025
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.950	TOAI	0	1.055	9.98	SG	3	5.46	3.03		5.4850		2.455	0.035	0.025			2.480	0.035	0.025
24-May-05	14-Aug-05	24-May-05	24-May-05	11/135	TOAI	8.870	TOAI	0	1.055	9.98	SG	3	5.46	3.03		5.4050		2.375	0.035	0.025			2.480	0.035	0.025

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
CM WL 01																									
Sensor SN: 2346015																									
10-Dec-03	16-Jun-04	10-Dec-03	10-Dec-03	2/34	TOGP	8.375	TOGP	0	-0.91	2.06	SG	1	1.54	1.326		6.9450		5.619	0.027	0.014			5.660	0.027	0.014
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/64	TOGP	8.375	TOGP	0	-0.91	2.06	SG	1	1.795	1.525		7.2000		5.675	0.027	0.014			5.660	0.027	0.014
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/64	TOGP	8.375	TOGP	0	-0.91	2.06	SG	2	1.795	1.528		7.2000		5.672	0.027	0.014			5.660	0.027	0.014
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/64	TOGP	8.375	TOGP	0	-0.91	2.06	SG	3	1.795	1.528		7.2000		5.672	0.027	0.014			5.660	0.027	0.014
CM WL 02																									
Sensor SN: 2346008																									
10-Dec-03	16-Jun-04	10-Dec-03	10-Dec-03	2/38	TOGP	9.460	TOGP	0	-1.98	2.06	SG	4	0.45	0.148		5.8700		5.722	0.014	0.007			5.743	0.014	0.007
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/72	TOGP	9.460	TOGP	0	-1.98	2.06	SG	1	1.815	1.485		7.2350		5.750	0.014	0.007			5.743	0.014	0.007
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/72	TOGP	9.460	TOGP	0	-1.98	2.06	SG	2	1.815	1.485		7.2350		5.750	0.014	0.007			5.743	0.014	0.007
10-Dec-03	16-Jun-04	23-Jan-04	10-Dec-03	1/72	TOGP	9.460	TOGP	0	-1.98	2.06	SG	3	1.815	1.485		7.2350		5.750	0.014	0.007			5.743	0.014	0.007
Sensor SN: 10075																									
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	SG	1	0.7	0.242		6.1200		5.878	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	SG	2	0.74	0.241		6.1600		5.919	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	SG	3	0.75	0.239		6.1700		5.931	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	SG	4	0.75	0.238		6.1700		5.932	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	SG	5	0.75	0.236		6.1700		5.934	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	Tape	1	3.31	0.242	6.1500		5.908		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	Tape	2	3.31	0.241	6.1500		5.909		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	Tape	3	3.31	0.239	6.1500		5.911		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	Tape	4	3.31	0.238	6.1500		5.912		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	14-Sep-04	14-Sep-04	8/84	TOGP	9.460	TOGP	0	-1.98	2.06	Tape	5	3.32	0.236	6.1400		5.904		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	SG	1	1.97	1.652		7.3900		5.738	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	SG	2	1.96	1.64		7.3800		5.740	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	SG	3	1.95	1.636		7.3700		5.734	0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	Solinst	1	2.08	1.652	7.3800		5.728		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	Solinst	2	2.1	1.64	7.3600		5.720		0.096	0.034	0.096	0.034	5.845	0.093	0.023
14-Sep-04	13-Dec-04	13-Dec-04	14-Sep-04	10/14	TOGP	9.460	TOGP	0	-1.98	2.06	Solinst	3	2.1	1.636	7.3600		5.724		0.096	0.034	0.096	0.034	5.845	0.093	0.023

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
Sensor SN: 10075																									
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	SG	1	1.88	1.568		7.2900		5.722	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	SG	2	1.88	1.556		7.2900		5.734	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	SG	3	1.87	1.547		7.2800		5.733	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	1	2.17	1.568	7.2900		5.722		0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	2	2.17	1.556	7.2900		5.734		0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Dec-04	13-Dec-04	10/14	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	3	2.18	1.547	7.2800		5.733		0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	SG	1	1.3	0.952		6.7100		5.758	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	SG	2	1.3	0.941		6.7100		5.769	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	SG	3	1.29	0.935		6.7000		5.765	0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	1	2.735	0.935	6.7250		5.790		0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	2	2.74	0.941	6.7200		5.779		0.020	0.008	0.030	0.012	5.752	0.025	0.007
13-Dec-04	13-Jan-05	13-Jan-05	13-Dec-04	CalibS	TOGP	9.460	TOGP	0	-1.99	2.06	Solinst	3	2.745	0.935	6.7150		5.780		0.020	0.008	0.030	0.012	5.752	0.025	0.007
Sensor SN: 10075																									
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	SG	1	1.27	0.914		6.7200		5.806	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	SG	2	1.265	0.903		6.7150		5.812	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	SG	3	1.255	0.899		6.7050		5.806	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	1	2.77	0.914	6.6900		5.776		0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	2	2.78	0.903	6.6800		5.777		0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	3	2.795	0.899	6.6650		5.766		0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	SG	1	0.84	0.516		6.2900		5.774	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	SG	2	0.84	0.509		6.2900		5.781	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	SG	3	0.82	0.507		6.2700		5.763	0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	1	3.22	0.516	6.2400		5.724		0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	2	3.225	0.509	6.2350		5.726		0.020	0.008	0.027	0.011	5.770	0.031	0.009
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	11/128	TOGP	9.460	TOGP	0	-1.95	2.06	Tape	3	3.23	0.507	6.2300		5.723		0.020	0.008	0.027	0.011	5.770	0.031	0.009
CM WL 03																									
Sensor SN: 2346007																									
10-Dec-03	11-Mar-04	10-Dec-03	10-Dec-03	2/40	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	4.785	1.57	4.3150		2.745				0.036	0.018	2.797	0.036	0.018
10-Dec-03	11-Mar-04	23-Jan-04	10-Dec-03	1/72	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	1	1.98	4.293	7.1200		2.827				0.036	0.018	2.797	0.036	0.018

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
10-Dec-03	11-Mar-04	23-Jan-04	10-Dec-03	1/72	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	2	1.99	4.302	7.1100		2.808				0.036	0.018	2.797	0.036	0.018
10-Dec-03	11-Mar-04	23-Jan-04	10-Dec-03	1/72	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	3	1.985	4.306	7.1150		2.809				0.036	0.018	2.797	0.036	0.018
Sensor SN: 2346007																									
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	1.35	0.655		4.1850		3.530	0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	1.36	0.67		4.1950		3.525	0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	1.365	0.673		4.2000		3.527	0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	4.93	0.655	4.1700		3.515		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	4.925	0.67	4.1750		3.505		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	11-Mar-04	11-Mar-04	3/84	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	4.92	0.673	4.1800		3.507		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	21-Apr-04	11-Mar-04	4/88	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	4.67	1.136	4.4300		3.294		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	21-Apr-04	11-Mar-04	4/88	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	4.68	1.152	4.4200		3.268		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	21-Apr-04	11-Mar-04	4/88	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	4.62	1.165	4.4800		3.315		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	21-Apr-04	11-Mar-04	4/88	TOAI	9.100	TOAI	0	0.395	6.66	Tape	4	4.59	1.19	4.5100		3.320		0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	26-May-04	21-Apr-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.29	1.37		5.1250		3.755	0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	26-May-04	21-Apr-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.288	1.368		5.1230		3.755	0.125	0.051	0.113	0.043	3.505	0.173	0.048
21-Mar-04	26-May-04	26-May-04	21-Apr-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.285	1.366		5.1200		3.754	0.125	0.051	0.113	0.043	3.505	0.173	0.048
Sensor SN: 10513																									
26-May-04	14-Sep-04	26-May-04	26-May-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.195	1.776		5.0300		3.254	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	26-May-04	26-May-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.198	1.778		5.0330		3.255	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	26-May-04	26-May-04	4/126	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.2	1.782		5.0350		3.253	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.75	2.393		5.5850		3.192	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.75	2.384		5.5850		3.201	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.75	2.384		5.5850		3.201	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.52	2.393	5.5800		3.187		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.52	2.384	5.5800		3.196		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	21-Jul-04	26-May-04	6/128	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.52	2.384	5.5800		3.196		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	3.12	2.659		5.9550		3.296	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	3.12	2.661		5.9550		3.294	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	3.12	2.664		5.9550		3.291	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	SG	4	3.12	2.666		5.9550		3.289	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	SG	5	3.13	2.668		5.9650		3.297	0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.16	2.659	5.9400		3.281		0.041	0.013	0.045	0.016	3.253	0.042	0.010

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.16	2.661	5.9400		3.279		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.16	2.664	5.9400		3.276		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	Tape	4	3.15	2.666	5.9500		3.284		0.041	0.013	0.045	0.016	3.253	0.042	0.010
26-May-04	14-Sep-04	14-Sep-04	26-May-04	8/80	TOAI	9.100	TOAI	0	0.395	6.66	Tape	5	3.15	2.668	5.9500		3.282		0.041	0.013	0.045	0.016	3.253	0.042	0.010
Sensor SN: 10513																									
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	3.18	2.818		6.0150		3.197	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	3.18	2.825		6.0150		3.190	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	3.19	2.829		6.0250		3.196	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	SG	4	3.19	2.825		6.0250		3.200	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	SG	5	3.19	2.827		6.0250		3.198	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.1	2.818	6.0000		3.182		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.1	2.825	6.0000		3.175		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.09	2.829	6.0100		3.181		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	Tape	4	3.09	2.825	6.0100		3.185		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	14-Sep-04	14-Sep-04	8/82	TOAI	9.100	TOAI	0	0.395	6.66	Tape	5	3.09	2.827	6.0100		3.183		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.73	2.291		5.5650		3.274	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.73	2.284		5.5650		3.281	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.72	2.282		5.5550		3.273	0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.55	2.291	5.5500		3.259		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.56	2.284	5.5400		3.256		0.041	0.015	0.040	0.014	3.218	0.040	0.010
14-Sep-04	22-Oct-04	22-Oct-04	14-Sep-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.56	2.282	5.5400		3.258		0.041	0.015	0.040	0.014	3.218	0.040	0.010
Sensor SN: 10513																									
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.57	2.18		5.4050		3.225	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.56	2.178		5.3950		3.217	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.56	2.176		5.3950		3.219	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.72	2.18	5.3800		3.200		0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.725	2.178	5.3750		3.197		0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	22-Oct-04	22-Oct-04	9/13	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.725	2.176	5.3750		3.199		0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	0.855	0.636		3.6900		3.054	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	0.86	0.639		3.6950		3.056	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	0.86	0.641		3.6950		3.054	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	SG	4	0.86	0.641		3.6950		3.054	0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	5.44	0.636	3.6600		3.024		0.089	0.034	0.091	0.034	3.113	0.087	0.023

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	5.43	0.639	3.6700		3.031		0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	5.43	0.641	3.6700		3.029		0.089	0.034	0.091	0.034	3.113	0.087	0.023
22-Oct-04	02-Dec-04	02-Dec-04	22-Oct-04	9/140	TOAI	9.100	TOAI	0	0.395	6.66	Tape	4	5.43	0.641	3.6700		3.029		0.089	0.034	0.091	0.034	3.113	0.087	0.023
Sensor SN: 10513																									
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	1.06	0.45		3.8950		3.445	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	1.07	0.457		3.9050		3.448	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	1.075	0.466		3.9100		3.444	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	5.21	0.45	3.8900		3.440		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	5.2	0.457	3.9000		3.443		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	02-Dec-04	02-Dec-04	9/141	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	5.2	0.466	3.9000		3.434		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	4.78	4.305		7.6150		3.310	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	4.77	4.296		7.6050		3.309	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	4.77	4.292		7.6050		3.313	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	1	1.5	4.305	7.6000		3.295		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	2	1.51	4.296	7.5900		3.294		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Dec-04	02-Dec-04	10/13	TOAI	9.100	TOAI	0	0.395	6.66	Solinst	3	1.51	4.292	7.5900		3.298		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	3.59	3.267		6.4250		3.158	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	3.59	3.261		6.4250		3.164	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	3.585	3.256		6.4200		3.164	0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	2.69	3.267	6.4100		3.143		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	2.68	3.261	6.4200		3.159		0.123	0.041	0.123	0.041	3.301	0.119	0.028
02-Dec-04	13-Jan-05	13-Jan-05	02-Dec-04	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	2.68	3.256	6.4200		3.164		0.123	0.041	0.123	0.041	3.301	0.119	0.028
Sensor SN: 10513																									
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	3.48	3.169		6.3150		3.146	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	3.47	3.162		6.3050		3.143	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	3.465	3.153		6.3000		3.147	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	2.81	3.169	6.2900		3.121		0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	2.82	3.162	6.2800		3.118		0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	13-Jan-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	2.83	3.153	6.2700		3.117		0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	1	2.49	2.221		5.3250		3.104	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	2	2.44	2.187		5.2750		3.088	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	SG	3	2.42	2.166		5.2550		3.089	0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	1	3.86	2.221	5.2400		3.019		0.029	0.012	0.055	0.022	3.094	0.050	0.014

Carl's Marsh - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	2	3.9	2.187	5.2000		3.013		0.029	0.012	0.055	0.022	3.094	0.050	0.014
13-Jan-05	11-Feb-05	11-Feb-05	13-Jan-05	CalibS	TOAI	9.100	TOAI	0	0.395	6.66	Tape	3	3.91	2.166	5.1900		3.024		0.029	0.012	0.055	0.022	3.094	0.050	0.014

Table 7.2

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
P2A WL 01																									
Sensor SN: 2346023																									
11-Dec-03	20-Feb-04	11-Dec-03	11-Dec-03	2/48	TOGP	7.90	TOGP	0	-0.68	2.06	SG	1	0.77	0.424		5.925		5.501	0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	05-Jan-04	11-Dec-03	2/104	TOGP	7.90	TOGP	0	-0.68	2.06	SG	1	0.9	0.528		6.055		5.527	0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	05-Jan-04	11-Dec-03	2/104	TOGP	7.90	TOGP	0	-0.68	2.06	Solinst	1	1.89	0.528	6.005		5.477		0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	SG	1	0.74	0.371		5.895		5.524	0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	SG	2	0.74	0.371		5.895		5.524	0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	SG	3	0.74	0.375		5.895		5.520	0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	Tape	1	2.01	0.371	5.885		5.514		0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	Tape	2	2.01	0.371	5.885		5.514		0.010	0.005	0.018	0.009	5.512	0.016	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	3/11	TOGP	7.90	TOGP	0	-0.68	2.06	Tape	3	2.01	0.375	5.885		5.510		0.010	0.005	0.018	0.009	5.512	0.016	0.005
Sensor SN: 2346023																									
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	SG	1	0.81	0.46		5.955		5.495	0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	SG	2	0.86	0.465		6.005		5.540	0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	SG	3	0.82	0.473		5.965		5.492	0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	SG	4	0.82	0.48		5.965		5.485	0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	1	1.95	0.46	5.945		5.485		0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	2	1.94	0.465	5.955		5.490		0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	3	1.94	0.473	5.955		5.482		0.025	0.013	0.003	0.002	5.494	0.019	0.007
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/16	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	4	1.93	0.48	5.965		5.485		0.025	0.013	0.003	0.002	5.494	0.019	0.007
Sensor SN: 16433																									
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	SG	1	1.46	1.09		6.605		5.515	0.003	0.002	0.006	0.003	5.517	0.005	0.002
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	SG	2	1.46	1.095		6.605		5.510	0.003	0.002	0.006	0.003	5.517	0.005	0.002
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	SG	3	1.47	1.099		6.615		5.516	0.003	0.002	0.006	0.003	5.517	0.005	0.002
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	1	1.29	1.09	6.605		5.515		0.003	0.002	0.006	0.003	5.517	0.005	0.002
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	2	1.28	1.095	6.615		5.520		0.003	0.002	0.006	0.003	5.517	0.005	0.002
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.90	TOGP	0	-0.69	2.06	Tape	3	1.27	1.099	6.625		5.526		0.003	0.002	0.006	0.003	5.517	0.005	0.002
Sensor SN: 16433																									

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	0.26	1.227		5.875		4.648	0.005	0.003	0.006	0.004	4.659	0.008	0.003
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	0.263	1.224		5.878		4.654	0.005	0.003	0.006	0.004	4.659	0.008	0.003
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	0.262	1.22		5.877		4.657	0.005	0.003	0.006	0.004	4.659	0.008	0.003
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	2.01	1.227	5.885		4.658		0.005	0.003	0.006	0.004	4.659	0.008	0.003
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	2.005	1.224	5.890		4.666		0.005	0.003	0.006	0.004	4.659	0.008	0.003
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/138	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	2.005	1.22	5.890		4.670		0.005	0.003	0.006	0.004	4.659	0.008	0.003
Sensor SN: 16433																									
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	0.24	1.169		5.855		4.686	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	0.239	1.165		5.854		4.689	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	0.215	1.161		5.830		4.669	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	2.04	1.169	5.855		4.686		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	2.045	1.165	5.850		4.685		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/139	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	2.05	1.161	5.845		4.684		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	0.38	1.344		5.995		4.651	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	0.39	1.351		6.005		4.654	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	0.4	1.356		6.015		4.659	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	1.89	1.344	6.005		4.661		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	1.89	1.351	6.005		4.654		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/24	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	1.88	1.356	6.015		4.659		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	0.18	1.14		5.795		4.655	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	0.18	1.144		5.795		4.651	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	0.185	1.146		5.800		4.654	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	SG	4	0.185	1.149		5.800		4.651	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	2.095	1.14	5.800		4.660		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	2.09	1.144	5.805		4.661		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	2.09	1.146	5.805		4.659		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/100	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	4	2.09	1.149	5.805		4.656		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	1.065	2.029		6.680		4.651	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	1.068	2.032		6.683		4.651	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	1.07	2.035		6.685		4.650	0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	1.215	2.029	6.680		4.651		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	1.21	2.032	6.685		4.653		0.014	0.004	0.013	0.004	4.661	0.013	0.003
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	1.21	2.035	6.685		4.650		0.014	0.004	0.013	0.004	4.661	0.013	0.003
Sensor SN: 16433																									

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	1.12	2.036		6.735		4.699	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	1.125	2.04		6.740		4.700	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	1.129	2.042		6.744		4.702	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	1.155	2.036	6.740		4.704		0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	1.15	2.04	6.745		4.705		0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	1.15	2.042	6.745		4.703		0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	SG	1	0.87	1.82		6.485		4.665	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	SG	2	0.865	1.81		6.480		4.670	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	SG	3	0.86	1.81		6.475		4.665	0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	1	1.405	1.82	6.490		4.670		0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	2	1.415	1.81	6.480		4.670		0.019	0.008	0.020	0.008	4.685	0.018	0.005
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/62	TOGP	7.90	TOGP	0	-0.22	2.06	Tape	3	1.42	1.81	6.475		4.665		0.019	0.008	0.020	0.008	4.685	0.018	0.005
P2A WL 02																									
Sensor SN: 2346009																									
11-Dec-03	20-Feb-04	05-Jan-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	SG	1	0.63	0.588		6.220		5.632	0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	SG	1	0.565	0.542		6.155		5.613	0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	SG	2	0.57	0.545		6.160		5.615	0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	SG	3	0.578	0.554		6.168		5.614	0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	1	1.565	0.542	6.155		5.613		0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	2	1.565	0.545	6.155		5.610		0.009	0.005	0.006	0.004	5.614	0.009	0.003
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/102	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	3	1.565	0.554	6.155		5.601		0.009	0.005	0.006	0.004	5.614	0.009	0.003
Sensor SN: 2346009																									
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	SG	1	0.66	0.647		6.250		5.603	0.000	0.000	0.003	0.002	5.600	0.004	0.002
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	SG	2	0.665	0.652		6.255		5.603	0.000	0.000	0.003	0.002	5.600	0.004	0.002
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	SG	3	0.67	0.657		6.260		5.603	0.000	0.000	0.003	0.002	5.600	0.004	0.002
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	1	1.48	0.647	6.240		5.593		0.000	0.000	0.003	0.002	5.600	0.004	0.002
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	2	1.47	0.652	6.250		5.598		0.000	0.000	0.003	0.002	5.600	0.004	0.002
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/18	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	3	1.465	0.657	6.255		5.598		0.000	0.000	0.003	0.002	5.600	0.004	0.002
Sensor SN: 16391																									
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	1	0.53	0.336		6.120		5.784	0.020	0.011	0.016	0.009	5.759	0.016	0.007
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	2	0.54	0.38		6.130		5.750	0.020	0.011	0.016	0.009	5.759	0.016	0.007

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	3	0.545	0.385		6.135		5.750	0.020	0.011	0.016	0.009	5.759	0.016	0.007
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	1	1.61	0.336	6.110		5.774		0.020	0.011	0.016	0.009	5.759	0.016	0.007
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	2	1.59	0.38	6.130		5.750		0.020	0.011	0.016	0.009	5.759	0.016	0.007
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	3	1.59	0.385	6.130		5.745		0.020	0.011	0.016	0.009	5.759	0.016	0.007
Sensor SN: 16391																									
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	1	0.62	0.574		6.210		5.636	0.004	0.002	0.004	0.002	5.627	0.007	0.003
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	2	0.62	0.582		6.210		5.628	0.004	0.002	0.004	0.002	5.627	0.007	0.003
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	SG	3	0.63	0.587		6.220		5.633	0.004	0.002	0.004	0.002	5.627	0.007	0.003
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	1	1.52	0.574	6.200		5.626		0.004	0.002	0.004	0.002	5.627	0.007	0.003
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	2	1.52	0.582	6.200		5.618		0.004	0.002	0.004	0.002	5.627	0.007	0.003
28-Jul-04	19-Aug-04	28-Jul-04	28-Jul-04	6/142	TOGP	7.72	TOGP	0	-0.07	2.06	Tape	3	1.51	0.587	6.210		5.623		0.004	0.002	0.004	0.002	5.627	0.007	0.003
Sensor SN: 16432																									
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.04	0.943		5.830		4.887	0.001	0.001	0.001	0.001	4.888	0.001	0.000
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.04	0.942		5.830		4.888	0.001	0.001	0.001	0.001	4.888	0.001	0.000
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.04	0.941		5.830		4.889	0.001	0.001	0.001	0.001	4.888	0.001	0.000
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.89	0.943	5.830		4.887		0.001	0.001	0.001	0.001	4.888	0.001	0.000
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.89	0.942	5.830		4.888		0.001	0.001	0.001	0.001	4.888	0.001	0.000
09-Sep-04	13-Oct-04	13-Oct-04	09-Sep-04	8/140	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.89	0.941	5.830		4.889		0.001	0.001	0.001	0.001	4.888	0.001	0.000
Sensor SN: 16432																									
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.03	0.909		5.820		4.911	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.03	0.909		5.820		4.911	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.03	0.909		5.820		4.911	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.9	0.909	5.820		4.911		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.9	0.909	5.820		4.911		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	13-Oct-04	13-Oct-04	8/142	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.9	0.909	5.820		4.911		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.18	1.051		5.970		4.919	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.18	1.048		5.970		4.922	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.175	1.047		5.965		4.918	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.76	1.051	5.960		4.909		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.765	1.048	5.955		4.907		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	25-Oct-04	13-Oct-04	9/28	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.765	1.047	5.955		4.908		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.195	1.068		5.985		4.917	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.2	1.073		5.990		4.917	0.003	0.001	0.002	0.001	4.912	0.004	0.001

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.2	1.075		5.990		4.915	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	SG	4	0.2	1.076		5.990		4.914	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.74	1.068	5.980		4.912		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.74	1.073	5.980		4.907		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.735	1.075	5.985		4.910		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	24-Nov-04	13-Oct-04	9/104	TOGP	7.72	TOGP	0	0.13	2.06	Tape	4	1.735	1.076	5.985		4.909		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.82	1.698		6.610		4.912	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.82	1.694		6.610		4.916	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.815	1.69		6.605		4.915	0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.115	1.698	6.605		4.907		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.12	1.694	6.600		4.906		0.003	0.001	0.002	0.001	4.912	0.004	0.001
13-Oct-04	10-Dec-04	10-Dec-04	13-Oct-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.125	1.69	6.595		4.905		0.003	0.001	0.002	0.001	4.912	0.004	0.001
Sensor SN: 16432																									
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.75	1.604		6.540		4.936	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.75	1.602		6.540		4.938	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.748	1.6		6.538		4.938	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.18	1.604	6.540		4.936		0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.19	1.602	6.530		4.928		0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.19	1.6	6.530		4.930		0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	1	0.72	1.57		6.510		4.940	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	2	0.72	1.57		6.510		4.940	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	SG	3	0.72	1.57		6.510		4.940	0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	1	1.225	1.57	6.495		4.925		0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	2	1.22	1.57	6.500		4.930		0.002	0.001	0.004	0.001	4.934	0.005	0.002
10-Dec-04	19-Apr-05	21-Jan-05	10-Dec-04	CalibS	TOGP	7.72	TOGP	0	0.13	2.06	Tape	3	1.22	1.57	6.500		4.930		0.002	0.001	0.004	0.001	4.934	0.005	0.002
P2A WL 03																									
Sensor SN: 2346005																									
11-Dec-03	20-Feb-04	11-Dec-03	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	SG	1	0.49	0.267		6.025		5.758	0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	11-Dec-03	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	Solinst	1	2.32	0.267	6.025		5.758		0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	SG	1	0.94	0.687		6.475		5.788	0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	SG	2	0.948	0.694		6.483		5.789	0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	SG	3	0.958	0.701		6.493		5.792	0.016	0.008	0.013	0.006	5.779	0.014	0.005

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	1	1.87	0.687	6.475		5.788		0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	2	1.87	0.694	6.475		5.781		0.016	0.008	0.013	0.006	5.779	0.014	0.005
11-Dec-03	20-Feb-04	20-Feb-04	11-Dec-03	2/50	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	3	1.867	0.701	6.478		5.777		0.016	0.008	0.013	0.006	5.779	0.014	0.005
Sensor SN: 2346005																									
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	SG	1	1.039	0.788		6.574		5.786	0.001	0.000	0.002	0.001	5.786	0.001	0.000
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	SG	2	1.045	0.793		6.580		5.787	0.001	0.000	0.002	0.001	5.786	0.001	0.000
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	SG	3	1.05	0.798		6.585		5.787	0.001	0.000	0.002	0.001	5.786	0.001	0.000
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	1	1.77	0.788	6.575		5.787		0.001	0.000	0.002	0.001	5.786	0.001	0.000
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	2	1.768	0.793	6.577		5.784		0.001	0.000	0.002	0.001	5.786	0.001	0.000
20-Feb-04	10-Jun-04	20-Feb-04	20-Feb-04	3/22	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	3	1.76	0.798	6.585		5.787		0.001	0.000	0.002	0.001	5.786	0.001	0.000
Sensor SN: 16604																									
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	SG	1	1.51	1.246		7.045		5.799	0.002	0.001	0.004	0.002	5.795	0.007	0.003
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	SG	2	1.515	1.249		7.050		5.801	0.002	0.001	0.004	0.002	5.795	0.007	0.003
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	SG	3	1.52	1.252		7.055		5.803	0.002	0.001	0.004	0.002	5.795	0.007	0.003
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	1	1.31	1.246	7.035		5.789		0.002	0.001	0.004	0.002	5.795	0.007	0.003
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	2	1.31	1.249	7.035		5.786		0.002	0.001	0.004	0.002	5.795	0.007	0.003
02-Jul-04	28-Jul-04	28-Jul-04	02-Jul-04	6/142	TOGP	8.35	TOGP	0	-0.75	2.06	Tape	3	1.3	1.252	7.045		5.793		0.002	0.001	0.004	0.002	5.795	0.007	0.003
Sensor SN: 16604																									
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	SG	1	0.25	1.262		6.145		4.883	0.020	0.012	0.003	0.002	4.850	0.017	0.007
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	SG	2	0.2	1.248		6.095		4.847	0.020	0.012	0.003	0.002	4.850	0.017	0.007
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	SG	3	0.2	1.246		6.095		4.849	0.020	0.012	0.003	0.002	4.850	0.017	0.007
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	1	2.24	1.262	6.105		4.843		0.020	0.012	0.003	0.002	4.850	0.017	0.007
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	2	2.26	1.248	6.085		4.837		0.020	0.012	0.003	0.002	4.850	0.017	0.007
09-Sep-04	14-Oct-04	14-Oct-04	09-Sep-04	8/151	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	3	2.26	1.246	6.085		4.839		0.020	0.012	0.003	0.002	4.850	0.017	0.007
Sensor SN: 16231																									
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	SG	1	0.05	1.11		5.945		4.835	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	SG	2	0.05	1.111		5.945		4.834	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	SG	3	0.06	1.113		5.955		4.842	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	1	2.39	1.11	5.955		4.845		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	2	2.38	1.111	5.965		4.854		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	25-Oct-04	14-Oct-04	9/26	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	3	2.39	1.113	5.955		4.842		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	SG	1	0.08	1.112		5.975		4.863	0.024	0.008	0.012	0.004	4.858	0.019	0.004

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	SG	2	0.08	1.115		5.975		4.860	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	SG	3	0.08	1.115		5.975		4.860	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	SG	4	0.08	1.119		5.975		4.856	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	1	2.39	1.112	5.955		4.843		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	2	2.38	1.115	5.965		4.850		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	3	2.38	1.115	5.965		4.850		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	24-Nov-04	14-Oct-04	9/106	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	4	2.38	1.119	5.965		4.846		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	SG	1	0.18	1.174		6.075		4.901	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	SG	2	0.18	1.182		6.075		4.893	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	SG	3	0.18	1.185		6.075		4.890	0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	1	2.29	1.174	6.055		4.881		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	2	2.3	1.182	6.045		4.863		0.024	0.008	0.012	0.004	4.858	0.019	0.004
14-Oct-04	24-Nov-04	14-Oct-05	14-Oct-04	8/145	TOGP	8.35	TOGP	0	-0.39	2.06	Tape	3	2.3	1.185	6.045		4.860		0.024	0.008	0.012	0.004	4.858	0.019	0.004
Sensor SN: 16634																									
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	SG	1	0.105	1.126		5.980		4.854	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	SG	2	0.11	1.131		5.985		4.854	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	SG	3	0.12	1.139		5.995		4.856	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	SG	4	0.12	1.144		5.995		4.851	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	1	2.35	1.126	5.995		4.869		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	2	2.345	1.131	6.000		4.869		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	3	2.345	1.139	6.000		4.861		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	24-Nov-04	24-Nov-04	9/108	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	4	2.34	1.144	6.005		4.861		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	1	0.76	1.817		6.635		4.818	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	2	0.76	1.824		6.635		4.811	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	3	0.77	1.828		6.645		4.817	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	4	0.52	1.58		6.395		4.815	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	5	0.52	1.582		6.395		4.813	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	6	0.52	1.58		6.395		4.815	0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	1	1.73	1.817	6.615		4.798		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	2	1.725	1.824	6.620		4.796		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	3	1.725	1.828	6.620		4.792		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	4	1.965	1.58	6.380		4.800		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	5	1.969	1.582	6.376		4.794		0.020	0.006	0.036	0.011	4.827	0.029	0.006
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	6	1.97	1.58	6.375		4.795		0.020	0.006	0.036	0.011	4.827	0.029	0.006

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
Sensor SN: 16634																									
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	1	0.45	1.491		6.325		4.834	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	2	0.445	1.488		6.320		4.832	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	SG	3	0.45	1.485		6.325		4.840	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	1	2.035	1.491	6.310		4.819		0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	2	2.035	1.488	6.310		4.822		0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	10-Dec-04	10-Dec-04	CalibS	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	3	2.045	1.485	6.300		4.815		0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	SG	1	0.56	1.59		6.435		4.845	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	SG	2	0.56	1.61		6.435		4.825	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	SG	3	0.56	1.61		6.435		4.825	0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	1	1.945	1.59	6.400		4.810		0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	2	1.94	1.61	6.405		4.795		0.008	0.003	0.011	0.004	4.822	0.015	0.004
10-Dec-04	19-Apr-05	22-Jan-05	10-Dec-04	11/60	TOGP	8.35	TOGP	0	-0.41	2.06	Tape	3	1.935	1.61	6.410		4.800		0.008	0.003	0.011	0.004	4.822	0.015	0.004
P2A WL 04																									
Sensor SN: 2346016																									
11-Dec-03	20-Feb-04	05-Jan-04	11-Dec-03	2/104	TSCP	7.74	Notch	1.085		2.06	Solinst	1	2.45	6.019	6.375		0.356				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	11-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Solinst	1	4.25	4.22	4.575		0.355				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	11-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Solinst	2	4.205	4.229	4.620		0.391				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	11-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Solinst	3	4.2	4.234	4.625		0.391				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	20-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Tape	1	3.85	4.571	4.975		0.404				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	20-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Tape	2	3.82	4.596	5.005		0.409				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	20-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Tape	3	3.79	4.633	5.035		0.402				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	20-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Tape	4	3.775	4.647	5.050		0.403				0.021	0.007	0.390	0.021	0.007
11-Dec-03	20-Feb-04	20-Feb-04	11-Feb-04	3/12	TSCP	7.74	Notch	1.085		2.06	Tape	5	3.755	4.668	5.070		0.402				0.021	0.007	0.390	0.021	0.007
Sensor SN: 2346016																									
20-Feb-04	27-Feb-04	20-Feb-04	20-Feb-04	3/14	TSCP	7.74	Notch	1.085		2.06	Tape	1	3.38	5.965	5.445		-0.520				0.010	0.004	-0.528	0.010	0.004
20-Feb-04	27-Feb-04	20-Feb-04	20-Feb-04	3/14	TSCP	7.74	Notch	1.085		2.06	Tape	2	3.375	5.974	5.450		-0.524				0.010	0.004	-0.528	0.010	0.004
20-Feb-04	27-Feb-04	20-Feb-04	20-Feb-04	3/14	TSCP	7.74	Notch	1.085		2.06	Tape	3	3.355	5.987	5.470		-0.517				0.010	0.004	-0.528	0.010	0.004
20-Feb-04	27-Feb-04	27-Feb-04	20-Feb-04	1/122	TSCP	7.74	Notch	1.085		2.06	Tape	1	5.02	4.345	3.805		-0.540				0.010	0.004	-0.528	0.010	0.004
20-Feb-04	27-Feb-04	27-Feb-04	20-Feb-04	1/122	TSCP	7.74	Notch	1.085		2.06	Tape	2	5.025	4.338	3.800		-0.538				0.010	0.004	-0.528	0.010	0.004

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
20-Feb-04	27-Feb-04	27-Feb-04	20-Feb-04	1/122	TSCP	7.74	Notch	1.085		2.06	Tape	3	5.025	4.331	3.800		-0.531				0.010	0.004	-0.528	0.010	0.004
Sensor SN: 2346011																									
07-Apr-04	25-May-04	07-Apr-04	07-Apr-04	4/30	TSCP	7.74	Notch	1.085		2.06	Tape	1	5.78	2.661	3.045		0.384				0.005	0.003	0.385	0.005	0.003
07-Apr-04	25-May-04	07-Apr-04	07-Apr-04	4/30	TSCP	7.74	Notch	1.085		2.06	Tape	2	5.77	2.675	3.055		0.380				0.005	0.003	0.385	0.005	0.003
07-Apr-04	25-May-04	07-Apr-04	07-Apr-04	4/30	TSCP	7.74	Notch	1.085		2.06	Tape	3	5.75	2.685	3.075		0.390				0.005	0.003	0.385	0.005	0.003
Sensor SN: 10788																									
25-May-04	10-Jun-04	25-May-04	25-May-04	5/96	TSCP	7.74	Notch	1.085		2.06	Tape	1	5.36	3.891	3.465		-0.426						-0.426		
Sensor SN: 10789																									
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	1	3.91	4.27		4.225		-0.045	0.007	0.004	0.006	0.003	-0.037	0.006	0.002
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	2	3.92	4.275		4.235		-0.040	0.007	0.004	0.006	0.003	-0.037	0.006	0.002
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	3	3.94	4.287		4.255		-0.032	0.007	0.004	0.006	0.003	-0.037	0.006	0.002
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	4.59	4.27	4.235		-0.035		0.007	0.004	0.006	0.003	-0.037	0.006	0.002
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	4.58	4.275	4.245		-0.030		0.007	0.004	0.006	0.003	-0.037	0.006	0.002
23-Jun-04	16-Jul-04	16-Jul-04	23-Jun-04	6/112	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	4.58	4.287	4.245		-0.042		0.007	0.004	0.006	0.003	-0.037	0.006	0.002
Sensor SN: 16291																									
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	1	4.48	3.443		4.795		1.352	0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	2	4.49	3.449		4.805		1.356	0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	3	4.5	3.454		4.815		1.361	0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	4.03	3.443	4.795		1.352		0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	4.02	3.449	4.805		1.356		0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	16-Jul-04	16-Jul-04	6/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	4.025	3.454	4.800		1.346		0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	09-Aug-04	16-Jul-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	5.64	1.928	3.185		1.257		0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	09-Aug-04	16-Jul-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	5.65	1.926	3.175		1.249		0.005	0.003	0.053	0.021	1.321	0.049	0.016
16-Jul-04	09-Aug-04	09-Aug-04	16-Jul-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	5.64	1.924	3.185		1.261		0.005	0.003	0.053	0.021	1.321	0.049	0.016
Sensor SN: 16291																									
09-Aug-04	09-Sep-04	09-Aug-04	09-Aug-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	5.63	1.956	3.195		1.239				0.004	0.002	1.235	0.004	0.002
09-Aug-04	09-Sep-04	09-Aug-04	09-Aug-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	5.63	1.96	3.195		1.235				0.004	0.002	1.235	0.004	0.002
09-Aug-04	09-Sep-04	09-Aug-04	09-Aug-04	7/10	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	5.63	1.964	3.195		1.231				0.004	0.002	1.235	0.004	0.002
Sensor SN: 10788																									
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	1	4.4	4.634		4.715		0.081	0.019	0.007	0.033	0.009	0.086	0.029	0.007

Pond 2A - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	2	4.38	4.621		4.695		0.074	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	3	4.38	4.621		4.695		0.074	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	4	4.38	4.61		4.695		0.085	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	4.185	4.634	4.640		0.006		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	4.115	4.621	4.710		0.089		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	4.135	4.621	4.690		0.069		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	10-Sep-04	10-Sep-04	7/48	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	4	4.145	4.61	4.680		0.070		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	14-Oct-04	10-Sep-04	9/4	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	3.845	4.927	4.980		0.053		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	14-Oct-04	10-Sep-04	9/4	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	3.85	4.911	4.975		0.064		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	14-Oct-04	10-Sep-04	9/4	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	3.85	4.91	4.975		0.065		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	1	5.72	5.919		6.035		0.116	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	2	5.72	5.921		6.035		0.114	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	3	5.72	5.924		6.035		0.111	0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	2.795	5.919	6.030		0.111		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	2.805	5.921	6.020		0.099		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	25-Oct-04	10-Sep-04	9/23	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	2.805	5.924	6.020		0.096		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	24-Nov-04	10-Sep-04	9/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	5.501	3.229	3.324		0.095		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	24-Nov-04	10-Sep-04	9/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	5.525	3.178	3.300		0.122		0.019	0.007	0.033	0.009	0.086	0.029	0.007
10-Sep-04	24-Nov-04	24-Nov-04	10-Sep-04	9/114	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	5.54	3.151	3.285		0.134		0.019	0.007	0.033	0.009	0.086	0.029	0.007
Sensor SN: 10788																									
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	1	5.78	5.971		6.095		0.124	0.002	0.001	0.004	0.003	0.132	0.009	0.004
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	2	5.77	5.963		6.085		0.122	0.002	0.001	0.004	0.003	0.132	0.009	0.004
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	SG	3	5.76	5.949		6.075		0.126	0.002	0.001	0.004	0.003	0.132	0.009	0.004
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	1	2.72	5.971	6.105		0.134		0.002	0.001	0.004	0.003	0.132	0.009	0.004
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	2	2.72	5.963	6.105		0.142		0.002	0.001	0.004	0.003	0.132	0.009	0.004
24-Nov-04	10-Dec-04	10-Dec-04	24-Nov-04	CalibS	TSCP	7.74	Notch	1.085	-0.765	6.66	Tape	3	2.735	5.949	6.090		0.141		0.002	0.001	0.004	0.003	0.132	0.009	0.004

Table 7.3

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
CI CTDS 01																									
Sensor SN: 4044413																									
01-Dec-04	21-Jan-05	14-Dec-04	01-Dec-04	11/17	TPBM	6.90	TSCP	0	0	2.06	Tape	1	-0.47	7.21	7.365		0.155				0.000	0.000	0.155	0.000	0.000
01-Dec-04	21-Jan-05	14-Dec-04	01-Dec-04	11/17	TPBM	6.90	TSCP	0	0	2.06	Tape	2	-0.47	7.21	7.365		0.155				0.000	0.000	0.155	0.000	0.000
01-Dec-04	21-Jan-05	14-Dec-04	01-Dec-04	11/17	TPBM	6.90	TSCP	0	0	2.06	Tape	3	-0.47	7.21	7.365		0.155				0.000	0.000	0.155	0.000	0.000
Sensor SN: 4044413																									
21-Jan-05	11-Mar-05	09-Feb-05	21-Jan-05	11/96	TPBM	6.90	TSCP	0	0	2.06	Tape	1	-0.5	7.12	7.400		0.280				0.009	0.004	0.283	0.009	0.004
21-Jan-05	11-Mar-05	09-Feb-05	21-Jan-05	11/96	TPBM	6.90	TSCP	0	0	2.06	Tape	2	-0.5	7.12	7.395		0.275				0.009	0.004	0.283	0.009	0.004
21-Jan-05	11-Mar-05	09-Feb-05	21-Jan-05	11/96	TPBM	6.90	TSCP	0	0	2.06	Tape	3	-0.49	7.11	7.390		0.280				0.009	0.004	0.283	0.009	0.004
21-Jan-05	11-Mar-05	11-Mar-05	21-Jan-05	10/51	TPBM	6.90	TSCP	0	0	2.06	Tape	1	0.275	6.33	6.625		0.295				0.009	0.004	0.283	0.009	0.004
Sensor SN: 4044413																									
11-Mar-05	23-Mar-05	11-Mar-05	11-Mar-05	10/51	TPBM	6.90	TSCP	0	0	2.06	Tape	1	0.39	5.85	6.510		0.660						0.660		
CI WL 01																									
Sensor SN: 2346013																									
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/56	TOGP	7.92	TOGP	0	-0.53	2.06	SG	1	1.37	1.251		6.700		5.449	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/56	TOGP	7.98	TOGP	0	-0.53	2.06	SG	1	1.37	1.251		6.760		5.509	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/56	TOGP	7.98	TOGP	0	-0.53	2.06	Tape	1	1.21	1.251	6.770		5.519		0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/56	TOGP	7.92	TOGP	0	-0.53	2.06	Tape	1	1.21	1.251	6.710		5.459		0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.98	TOGP	0	-0.53	2.06	SG	1	1.34	1.169		6.730		5.561	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.92	TOGP	0	-0.53	2.06	SG	1	1.34	1.169		6.670		5.501	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.92	TOGP	0	-0.53	2.06	SG	2	1.34	1.169		6.670		5.501	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.98	TOGP	0	-0.53	2.06	SG	2	1.34	1.169		6.730		5.561	0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.98	TOGP	0	-0.53	2.06	Tape	1	1.24	1.169	6.740		5.571		0.042	0.017	0.046	0.023	5.514	0.041	0.013
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/56	TOGP	7.92	TOGP	0	-0.53	2.06	Tape	1	1.24	1.169	6.680		5.511		0.042	0.017	0.046	0.023	5.514	0.041	0.013
Sensor SN: 2346003																									

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	1	0.385	0.214		5.785		5.571	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	1	0.385	0.214		5.725		5.511	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	2	0.385	0.213		5.725		5.512	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	2	0.385	0.213		5.785		5.572	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	3	0.385	0.213		5.785		5.572	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	3	0.385	0.213		5.725		5.512	0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	1	2.22	0.214	5.700		5.486		0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	1	2.22	0.214	5.760		5.546		0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	2	2.215	0.213	5.765		5.552		0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	2	2.215	0.213	5.705		5.492		0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	3	2.215	0.213	5.765		5.552		0.033	0.013	0.033	0.013	5.531	0.033	0.010
11-Feb-04	06-Apr-04	06-Apr-04	11-Feb-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	3	2.215	0.213	5.705		5.492		0.033	0.013	0.033	0.013	5.531	0.033	0.010
Sensor SN: 2346003																									
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	1	0.37	0.216		5.770		5.554	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	1	0.37	0.216		5.710		5.494	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	2	0.37	0.218		5.770		5.552	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	2	0.37	0.218		5.710		5.492	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	SG	3	0.37	0.217		5.710		5.493	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	SG	3	0.37	0.217		5.770		5.553	0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	1	2.225	0.216	5.755		5.539		0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	1	2.225	0.216	5.695		5.479		0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	2	2.225	0.218	5.755		5.537		0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	2	2.225	0.218	5.695		5.477		0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.98	TOGP	0	-0.52	2.06	Tape	3	2.225	0.217	5.755		5.538		0.033	0.013	0.033	0.013	5.516	0.032	0.009
06-Apr-04	10-Jun-04	06-Apr-04	06-Apr-04	4/24	TOGP	7.92	TOGP	0	-0.52	2.06	Tape	3	2.225	0.217	5.695		5.478		0.033	0.013	0.033	0.013	5.516	0.032	0.009
Sensor SN: 16376																									
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	SG	1	0.82	1.014		6.485		5.471	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	SG	1	0.82	1.014		6.545		5.531	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	SG	2	0.8	1.004		6.465		5.461	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	SG	2	0.8	1.004		6.525		5.521	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	SG	3	0.79	0.994		6.455		5.461	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	SG	3	0.79	0.994		6.515		5.521	0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	Tape	1	1.45	1.014	6.470		5.456		0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	Tape	1	1.45	1.014	6.530		5.516		0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	Tape	2	1.455	1.004	6.525		5.521		0.033	0.014	0.033	0.013	5.491	0.032	0.009

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	Tape	2	1.455	1.004	6.465		5.461		0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.98	TOGP	0	-0.195	2.06	Tape	3	1.47	0.994	6.510		5.516		0.033	0.014	0.033	0.013	5.491	0.032	0.009
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/143	TOGP	7.92	TOGP	0	-0.195	2.06	Tape	3	1.47	0.994	6.450		5.456		0.033	0.014	0.033	0.013	5.491	0.032	0.009
CI WL 02																									
Sensor SN: 2346006																									
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.44	TOGP	0	-1.04	2.06	SG	1	1.43	1.057		6.770		5.713	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.38	TOGP	0	-1.04	2.06	SG	1	1.43	1.057		6.710		5.653	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.39	TOGP	0	-1.04	2.06	SG	1	1.43	1.057		6.720		5.663	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.38	TOGP	0	-1.04	2.06	Tape	1	1.675	1.057	6.705		5.648		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.39	TOGP	0	-1.04	2.06	Tape	1	1.675	1.057	6.715		5.658		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	11-Dec-03	11-Dec-03	2/ 56	TOGP	8.44	TOGP	0	-1.04	2.06	Tape	1	1.675	1.057	6.765		5.708		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.39	TOGP	0	-1.04	2.06	SG	1	1.315	0.915		6.605		5.690	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.44	TOGP	0	-1.04	2.06	SG	1	1.315	0.915		6.655		5.740	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.38	TOGP	0	-1.04	2.06	SG	1	1.315	0.915		6.595		5.680	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.38	TOGP	0	-1.04	2.06	SG	2	1.315	0.924		6.595		5.671	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.44	TOGP	0	-1.04	2.06	SG	2	1.315	0.924		6.655		5.731	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.39	TOGP	0	-1.04	2.06	SG	2	1.315	0.924		6.605		5.681	0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.44	TOGP	0	-1.04	2.06	Tape	1	1.8	0.915	6.640		5.725		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.39	TOGP	0	-1.04	2.06	Tape	1	1.8	0.915	6.590		5.675		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.38	TOGP	0	-1.04	2.06	Tape	1	1.8	0.915	6.580		5.665		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.44	TOGP	0	-1.04	2.06	Tape	2	1.8	0.924	6.640		5.716		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.39	TOGP	0	-1.04	2.06	Tape	2	1.8	0.924	6.590		5.666		0.030	0.010	0.029	0.010	5.686	0.029	0.007
11-Dec-03	04-Feb-04	04-Feb-04	11-Dec-03	2/158	TOGP	8.38	TOGP	0	-1.04	2.06	Tape	2	1.8	0.924	6.580		5.656		0.030	0.010	0.029	0.010	5.686	0.029	0.007
Sensor SN: 2346006																									
04-Feb-04	10-Jun-04	02-Jun-04	04-Feb-04	5/108	TOGP	8.38	TOGP	0	-0.16	2.06	HTM	1							0.032	0.019			6.993	0.032	0.019
04-Feb-04	10-Jun-04	02-Jun-04	04-Feb-04	5/108	TOGP	8.39	TOGP	0	-0.16	2.06	HTM	1							0.032	0.019			6.993	0.032	0.019
04-Feb-04	10-Jun-04	02-Jun-04	04-Feb-04	5/108	TOGP	8.44	TOGP	0	-0.16	2.06	HTM	1							0.032	0.019			6.993	0.032	0.019
04-Feb-04	10-Jun-04	02-Jun-04	17-Mar-04	5/108	TOGP	8.39	TOGP	0	-0.16	2.06	SG	2	1.29	0.48		7.460		6.980	0.032	0.019			6.993	0.032	0.019
04-Feb-04	10-Jun-04	02-Jun-04	17-Mar-04	5/108	TOGP	8.38	TOGP	0	-0.16	2.06	SG	2	1.29	0.48		7.450		6.970	0.032	0.019			6.993	0.032	0.019
04-Feb-04	10-Jun-04	02-Jun-04	17-Mar-04	5/108	TOGP	8.44	TOGP	0	-0.16	2.06	SG	2	1.29	0.48		7.510		7.030	0.032	0.019			6.993	0.032	0.019
Sensor SN: 16187																									
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.59	0.498		7.450		6.952	0.028	0.009	0.028	0.009	6.981	0.027	0.006

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.59	0.498		7.460		6.962	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.59	0.498		7.510		7.012	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.59	0.491		7.510		7.019	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.59	0.491		7.450		6.959	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.59	0.491		7.460		6.969	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.58	0.488		7.500		7.012	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.58	0.488		7.440		6.952	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.58	0.488		7.450		6.962	0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	0.92	0.498	7.460		6.962		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	0.92	0.498	7.470		6.972		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	0.92	0.498	7.520		7.022		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	0.93	0.491	7.510		7.019		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	0.93	0.491	7.460		6.969		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	0.93	0.491	7.450		6.959		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	0.93	0.488	7.460		6.972		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	0.93	0.488	7.510		7.022		0.028	0.009	0.028	0.009	6.981	0.027	0.006
29-Jun-04	28-Jul-04	28-Jul-04	29-Jun-04	6/145	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	0.93	0.488	7.450		6.962		0.028	0.009	0.028	0.009	6.981	0.027	0.006
Sensor SN: 16603																									
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.29	1.372		7.150		5.778	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.29	1.372		7.160		5.788	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.29	1.372		7.210		5.838	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.3	1.376		7.160		5.784	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.3	1.376		7.170		5.794	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.3	1.376		7.220		5.844	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.3	1.381		7.160		5.779	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.3	1.381		7.170		5.789	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.3	1.381		7.220		5.839	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.23	1.372	7.150		5.778		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.23	1.372	7.160		5.788		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.23	1.372	7.210		5.838		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.225	1.376	7.155		5.779		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.225	1.376	7.165		5.789		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.225	1.376	7.215		5.839		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.22	1.381	7.160		5.779		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.22	1.381	7.170		5.789		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	15-Nov-04	09-Sep-04	9/90	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.22	1.381	7.220		5.839		0.027	0.006	0.027	0.006	5.801	0.027	0.005

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.43	1.513		7.290		5.777	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.43	1.513		7.350		5.837	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.43	1.513		7.300		5.787	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.42	1.511		7.280		5.769	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.42	1.511		7.290		5.779	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.42	1.511		7.340		5.829	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.42	1.509		7.280		5.771	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.42	1.509		7.290		5.781	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.42	1.509		7.340		5.831	0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.08	1.513	7.300		5.787		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.08	1.513	7.310		5.797		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.08	1.513	7.360		5.847		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.09	1.511	7.290		5.779		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.09	1.511	7.300		5.789		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.09	1.511	7.350		5.839		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.1	1.509	7.280		5.771		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.1	1.509	7.290		5.781		0.027	0.006	0.027	0.006	5.801	0.027	0.005
09-Sep-04	10-Dec-04	10-Dec-04	09-Sep-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.1	1.509	7.340		5.831		0.027	0.006	0.027	0.006	5.801	0.027	0.005
Sensor SN: 16603																									
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.39	1.439		7.250		5.811	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.39	1.439		7.260		5.821	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.39	1.439		7.310		5.871	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.39	1.443		7.310		5.867	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.39	1.443		7.250		5.807	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.39	1.443		7.260		5.817	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.39	1.445		7.310		5.865	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.39	1.445		7.260		5.815	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.39	1.445		7.250		5.805	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.13	1.439	7.250		5.811		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.13	1.439	7.260		5.821		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.13	1.439	7.310		5.871		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.13	1.443	7.250		5.807		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.13	1.443	7.260		5.817		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.13	1.443	7.310		5.867		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.13	1.445	7.310		5.865		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.13	1.445	7.250		5.805		0.033	0.008	0.033	0.008	5.812	0.033	0.005

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.13	1.445	7.260		5.815		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.39	1.48		7.310		5.830	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.39	1.48		7.250		5.770	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.39	1.48		7.260		5.780	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.39	1.48		7.250		5.770	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.39	1.48		7.260		5.780	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.39	1.48		7.310		5.830	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.39	1.48		7.250		5.770	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.39	1.48		7.260		5.780	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.39	1.48		7.310		5.830	0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.13	1.48	7.260		5.780		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.13	1.48	7.310		5.830		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.13	1.48	7.250		5.770		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.13	1.48	7.250		5.770		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.13	1.48	7.260		5.780		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.13	1.48	7.310		5.830		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.13	1.48	7.250		5.770		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.13	1.48	7.260		5.780		0.033	0.008	0.033	0.008	5.812	0.033	0.005
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.13	1.48	7.310		5.830		0.033	0.008	0.033	0.008	5.812	0.033	0.005
Sensor SN: 16603																									
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.34	1.41		7.200		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.34	1.41		7.210		5.800	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.34	1.41		7.260		5.850	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.34	1.39		7.200		5.810	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.34	1.39		7.210		5.820	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.34	1.39		7.260		5.870	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.345	1.39		7.205		5.815	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.345	1.39		7.215		5.825	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.345	1.39		7.265		5.875	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	4	0.34	1.4		7.200		5.800	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	4	0.34	1.4		7.210		5.810	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	4	0.34	1.4		7.260		5.860	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.17	1.41	7.210		5.800		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.17	1.41	7.270		5.860		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.17	1.41	7.220		5.810		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.175	1.39	7.265		5.875		0.030	0.005	0.031	0.006	5.814	0.030	0.004

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.175	1.39	7.215		5.825		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.175	1.39	7.205		5.815		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.175	1.39	7.205		5.815		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.175	1.39	7.215		5.825		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.175	1.39	7.265		5.875		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	4	1.175	1.4	7.205		5.805		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	4	1.175	1.4	7.215		5.815		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	14-Dec-04	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	4	1.175	1.4	7.265		5.865		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.52	1.61		7.390		5.780	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.52	1.61		7.440		5.830	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.52	1.61		7.380		5.770	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.52	1.6		7.390		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.52	1.6		7.440		5.840	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.52	1.6		7.380		5.780	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.51	1.59		7.370		5.780	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.51	1.59		7.380		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.51	1.59		7.430		5.840	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1	1.61	7.380		5.770		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1	1.61	7.390		5.780		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1	1.61	7.440		5.830		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1	1.6	7.380		5.780		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1	1.6	7.390		5.790		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1	1.6	7.440		5.840		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.01	1.59	7.370		5.780		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.01	1.59	7.380		5.790		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	10-Jan-05	14-Dec-04	CalibS	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.01	1.59	7.430		5.840		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	SG	1	0.43	1.5		7.290		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	SG	1	0.43	1.5		7.300		5.800	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	SG	1	0.43	1.5		7.350		5.850	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	SG	2	0.43	1.51		7.350		5.840	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	SG	2	0.43	1.51		7.290		5.780	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	SG	2	0.43	1.51		7.300		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	SG	3	0.44	1.51		7.360		5.850	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	SG	3	0.44	1.51		7.300		5.790	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	SG	3	0.44	1.51		7.310		5.800	0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	Tape	1	1.095	1.5	7.285		5.785		0.030	0.005	0.031	0.006	5.814	0.030	0.004

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	Tape	1	1.095	1.5	7.295		5.795		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	Tape	1	1.095	1.5	7.345		5.845		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	Tape	2	1.09	1.51	7.290		5.780		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	Tape	2	1.09	1.51	7.300		5.790		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	Tape	2	1.09	1.51	7.350		5.840		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.44	TOGP	0	0.54	2.06	Tape	3	1.085	1.51	7.355		5.845		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.39	TOGP	0	0.54	2.06	Tape	3	1.085	1.51	7.305		5.795		0.030	0.005	0.031	0.006	5.814	0.030	0.004
14-Dec-04	07-Apr-05	08-Feb-05	14-Dec-04	11/92	TOGP	8.38	TOGP	0	0.54	2.06	Tape	3	1.085	1.51	7.295		5.785		0.030	0.005	0.031	0.006	5.814	0.030	0.004
CI WL 03																									
Sensor SN: 2346017																									
22-Jan-04	17-Mar-04	04-Feb-04	22-Jan-04	1/160	TOGP	7.62	TOGP	0	0.325	2.06	SG	1	1	0.771		6.885		6.114	0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	04-Feb-04	22-Jan-04	1/160	TOGP	7.62	TOGP	0	0.325	2.06	Tape	1	0.74	0.768	6.880		6.112		0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	SG	1	1.24	0.998		7.125		6.127	0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	SG	2	1.24	0.998		7.125		6.127	0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	SG	3	1.24	0.999		7.125		6.126	0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	Tape	1	0.5	0.998	7.120		6.122		0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	Tape	2	0.5	0.998	7.120		6.122		0.006	0.003	0.005	0.002	6.121	0.006	0.002
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/110	TOGP	7.62	TOGP	0	0.325	2.06	Tape	3	0.5	0.999	7.120		6.121		0.006	0.003	0.005	0.002	6.121	0.006	0.002
Sensor SN: 2346017																									
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	SG	1	1.24	1.033		7.125		6.092	0.001	0.000	0.001	0.000	6.090	0.003	0.001
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	SG	2	1.24	1.032		7.125		6.093	0.001	0.000	0.001	0.000	6.090	0.003	0.001
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	SG	3	1.24	1.033		7.125		6.092	0.001	0.000	0.001	0.000	6.090	0.003	0.001
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	Tape	1	0.5	1.033	7.120		6.087		0.001	0.000	0.001	0.000	6.090	0.003	0.001
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	Tape	2	0.5	1.032	7.120		6.088		0.001	0.000	0.001	0.000	6.090	0.003	0.001
17-Mar-04	10-Jun-04	17-Mar-04	17-Mar-04	3/112	TOGP	7.62	TOGP	0	0.325	2.06	Tape	3	0.5	1.033	7.120		6.087		0.001	0.000	0.001	0.000	6.090	0.003	0.001
Sensor SN: 16430																									
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	1	0.505	0.518		6.645		6.127	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	2	0.505	0.516		6.645		6.129	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	3	0.505	0.514		6.645		6.131	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	1	0.965	0.518	6.655		6.137		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	2	0.97	0.516	6.650		6.134		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	14-Oct-04	29-Jun-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	3	0.97	0.514	6.650		6.136		0.014	0.004	0.012	0.004	6.149	0.012	0.003

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	SG	1	0.96	0.943		7.100		6.157	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	SG	2	0.96	0.945		7.100		6.155	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	SG	3	0.96	0.947		7.100		6.153	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	SG	4	0.965	0.948		7.105		6.157	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	Tape	1	0.51	0.943	7.110		6.167		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	Tape	2	0.52	0.945	7.100		6.155		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	Tape	3	0.53	0.947	7.090		6.143		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	27-Oct-04	29-Jun-04	9/54	TOGP	7.62	TOGP	0	0.58	2.06	Tape	4	0.52	0.948	7.100		6.152		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	SG	1	0.78	0.763		6.920		6.157	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	SG	2	0.77	0.752		6.910		6.158	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	SG	3	0.76	0.74		6.900		6.160	0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	Solinst	1	0.7	0.763	6.920		6.157		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	Solinst	2	0.71	0.752	6.910		6.158		0.014	0.004	0.012	0.004	6.149	0.012	0.003
29-Jun-04	14-Oct-04	10-Dec-04	29-Jun-04	CalibS	TOGP	7.62	TOGP	0	0.58	2.06	Solinst	3	0.72	0.74	6.900		6.160		0.014	0.004	0.012	0.004	6.149	0.012	0.003
Sensor SN: 16430																									
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	1	0.49	0.49		6.630		6.140	0.003	0.002	0.000	0.000	6.133	0.004	0.002
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	2	0.486	0.49		6.626		6.136	0.003	0.002	0.000	0.000	6.133	0.004	0.002
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	SG	3	0.484	0.49		6.624		6.134	0.003	0.002	0.000	0.000	6.133	0.004	0.002
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	1	1	0.49	6.620		6.130		0.003	0.002	0.000	0.000	6.133	0.004	0.002
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	2	1	0.49	6.620		6.130		0.003	0.002	0.000	0.000	6.133	0.004	0.002
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/153	TOGP	7.62	TOGP	0	0.58	2.06	Tape	3	1	0.49	6.620		6.130		0.003	0.002	0.000	0.000	6.133	0.004	0.002
Sensor SN: 16604																									
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	1	1.06	2.132		7.190		5.058	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	2	1.07	2.137		7.200		5.063	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	3	1.08	2.139		7.210		5.071	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	4	1.08	2.142		7.210		5.068	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	1	0.43	2.132	7.190		5.058		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	2	0.42	2.137	7.200		5.063		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	3	0.41	2.139	7.210		5.071		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	4	0.41	2.142	7.210		5.068		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	1	0.21	1.29		6.340		5.050	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	2	0.2	1.28		6.330		5.050	0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	SG	3	0.18	1.25		6.310		5.060	0.008	0.003	0.008	0.003	5.060	0.008	0.002

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	1	1.28	1.29	6.340		5.050		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	2	1.28	1.28	6.340		5.060		0.008	0.003	0.008	0.003	5.060	0.008	0.002
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CalibS	TOGP	7.62	TOGP	0	0.57	2.06	Tape	3	1.32	1.25	6.300		5.050		0.008	0.003	0.008	0.003	5.060	0.008	0.002
Sensor SN: 16604																									
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	SG	1	0.72	1.8		6.850		5.050	0.006	0.003	0.006	0.003	5.060	0.006	0.003
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	SG	2	0.71	1.78		6.840		5.060	0.006	0.003	0.006	0.003	5.060	0.006	0.003
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	SG	3	0.7	1.77		6.830		5.060	0.006	0.003	0.006	0.003	5.060	0.006	0.003
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	Tape	1	0.76	1.8	6.860		5.060		0.006	0.003	0.006	0.003	5.060	0.006	0.003
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	Tape	2	0.78	1.78	6.840		5.060		0.006	0.003	0.006	0.003	5.060	0.006	0.003
10-Jan-05	07-Apr-05	04-Feb-05	10-Jan-05	11/67	TOGP	7.62	TOGP	0	0.57	2.06	Tape	3	0.78	1.77	6.840		5.070		0.006	0.003	0.006	0.003	5.060	0.006	0.003
CI WL 04																									
Sensor SN: 2346025																									
22-Jan-04	17-Mar-04	22-Jan-04	22-Jan-04	2/142	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	1.37	2.292		5.480		3.188	0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	04-Feb-04	22-Jan-04	2/160	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	2.7	3.637		6.810		3.173	0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	2.525	3.474		6.635		3.161	0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	2.51	3.452		6.620		3.168	0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	2.5	3.444		6.610		3.166	0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	0.37	3.474	6.620		3.146		0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	0.38	3.452	6.610		3.158		0.010	0.005	0.006	0.004	3.165	0.013	0.004
22-Jan-04	17-Mar-04	17-Mar-04	22-Jan-04	3/118	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	0.39	3.444	6.600		3.156		0.010	0.005	0.006	0.004	3.165	0.013	0.004
Sensor SN: 2346025																									
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	2.3	3.251		6.410		3.159	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	2.3	3.242		6.410		3.168	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	2.29	3.231		6.400		3.169	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	0.58	3.251	6.410		3.159		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	0.59	3.242	6.400		3.158		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	17-Mar-04	17-Mar-04	3/120	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	0.6	3.231	6.390		3.159		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	1.03	1.997		5.140		3.143	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	1.03	1.999		5.140		3.141	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	1.035	2.002		5.145		3.143	0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.855	1.997	5.135		3.138		0.013	0.005	0.012	0.004	3.148	0.013	0.003

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.855	1.999	5.135		3.136		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	30-Apr-04	17-Mar-04	4/100	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	1.85	2.002	5.140		3.138		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	25-May-04	17-Mar-04	5/94	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	2.12	1.729	4.870		3.141		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	25-May-04	17-Mar-04	5/94	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	2.14	1.721	4.850		3.129		0.013	0.005	0.012	0.004	3.148	0.013	0.003
17-Mar-04	25-May-04	25-May-04	17-Mar-04	5/94	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	2.16	1.695	4.830		3.135		0.013	0.005	0.012	0.004	3.148	0.013	0.003
Sensor SN: 10645																									
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	0.98	3.132		5.090		1.958	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	0.98	3.142		5.090		1.948	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	0.98	3.142		5.090		1.948	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.9	3.132	5.090		1.958		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.91	3.142	5.080		1.938		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	10-Jun-04	25-May-04	5/122	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	1.91	3.142	5.080		1.938		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	0.32	2.534		4.430		1.896	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	0.31	2.527		4.420		1.893	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	0.3	2.525		4.410		1.885	0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	2.57	2.534	4.420		1.886		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	2.58	2.527	4.410		1.883		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	29-Jun-04	25-May-04	6/68	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	2.59	2.525	4.400		1.875		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	13-Oct-04	25-May-04	8/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	0.84	4.298	6.150		1.852		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	13-Oct-04	25-May-04	8/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	0.84	4.291	6.150		1.859		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	13-Oct-04	25-May-04	8/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	0.84	4.286	6.150		1.864		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	27-Oct-04	25-May-04	9/52	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	0.29	4.785	6.700		1.915		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	27-Oct-04	25-May-04	9/52	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	0.29	4.794	6.700		1.906		0.033	0.014	0.034	0.010	1.906	0.035	0.008
25-May-04	27-Oct-04	27-Oct-04	25-May-04	9/52	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	0.28	4.796	6.710		1.914		0.033	0.014	0.034	0.010	1.906	0.035	0.008
Sensor SN: 10645																									
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	1.29	3.66		5.400		1.740	0.004	0.002	0.004	0.002	1.733	0.006	0.003
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	1.28	3.649		5.390		1.741	0.004	0.002	0.004	0.002	1.733	0.006	0.003
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	1.27	3.646		5.380		1.734	0.004	0.002	0.004	0.002	1.733	0.006	0.003
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.6	3.66	5.390		1.730		0.004	0.002	0.004	0.002	1.733	0.006	0.003
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.61	3.649	5.380		1.731		0.004	0.002	0.004	0.002	1.733	0.006	0.003
27-Oct-04	01-Dec-04	01-Dec-04	27-Oct-04	9/136	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	1.62	3.646	5.370		1.724		0.004	0.002	0.004	0.002	1.733	0.006	0.003
Sensor SN: 10645																									

Coon Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	1.22	3.641		5.330		1.689	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	1.21	3.644		5.320		1.676	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	1.21	3.646		5.320		1.674	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.67	3.641	5.320		1.679		0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.68	3.644	5.310		1.666		0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	01-Dec-04	01-Dec-04	9/137	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	1.68	3.646	5.310		1.664		0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	1.3	3.735		5.410		1.675	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	1.24	3.662		5.350		1.688	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	1.19	3.639		5.300		1.661	0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.57	3.735	5.420		1.685		0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.63	3.662	5.360		1.698		0.010	0.004	0.013	0.005	1.677	0.011	0.003
01-Dec-04	11-Jan-05	11-Jan-05	01-Dec-04	11/32	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	1.68	3.639	5.310		1.671		0.010	0.004	0.013	0.005	1.677	0.011	0.003
Sensor SN: 10645																									
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	SG	1	0.96	3.824		5.070		1.246	0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	SG	2	0.94	3.812		5.050		1.238	0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	SG	3	0.89	3.782		5.000		1.218	0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	1.94	3.824	5.050		1.226		0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	1.96	3.812	5.030		1.218		0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	11-Jan-05	11-Jan-05	11/33	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	2	3.782	4.990		1.208		0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	09-Feb-05	11-Jan-05	11/95	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	1	-0.51	6.656	7.500		0.844		0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	09-Feb-05	11-Jan-05	11/95	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	2	-0.51	6.658	7.500		0.842		0.014	0.008	0.206	0.084	1.097	0.193	0.064
11-Jan-05	09-Feb-05	09-Feb-05	11-Jan-05	11/95	TOGP	6.99	TOGP	0	-0.82	2.06	Tape	3	-0.51	6.658	7.495		0.837		0.014	0.008	0.206	0.084	1.097	0.193	0.064

Table 7.4

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
BuI CTDS 01																									
Sensor SN: 10653																									
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	10/8	TPBM	6.89	TSCP	0	0		Tape	1	-0.07	8.84	6.955		-1.885						-1.885		
Sensor SN: 10653																									
10-Dec-04	21-Jan-05	10-Dec-04	10-Dec-04	10/8	TPBM	6.89	TSCP	0	0		Tape	1	-0.42	9.32	7.310		-2.010				0.039	0.020	-2.023	0.039	0.020
10-Dec-04	21-Jan-05	14-Dec-04	10-Dec-04	11/14	TPBM	6.89	TSCP	0	0		Tape	1	-0.1	9.07	6.990		-2.080				0.039	0.020	-2.023	0.039	0.020
10-Dec-04	21-Jan-05	21-Jan-05	10-Dec-04	11/50	TPBM	6.89	TSCP	0	0		Tape	1	-0.15	9.05	7.038		-2.012				0.039	0.020	-2.023	0.039	0.020
10-Dec-04	21-Jan-05	21-Jan-05	10-Dec-04	11/50	TPBM	6.89	TSCP	0	0		Tape	2	-0.12	9	7.010		-1.990				0.039	0.020	-2.023	0.039	0.020
Sensor SN: 10653																									
21-Jan-05	09-Feb-05	21-Jan-05	21-Jan-05	11/51	TPBM	6.89	TSCP	0	0		Tape	1	0.09	8.35	6.800		-1.550						-1.550		
BuI WL 01																									
Sensor SN: 2346004																									
11-Dec-03	18-Mar-04	21-Jan-04	21-Jan-04	2/138	TOGP		TOGP	0	-2.23	2.06	SG	1	1.06	0.75					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	21-Jan-04	21-Jan-04	2/138	TOGP		TOGP	0	-2.23	2.06	Tape	1	3.235	0.75					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	04-Feb-04	21-Jan-04	1/80	TOGP		TOGP	0	-2.23	2.06	SG	1	0.765	0.465					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	04-Feb-04	21-Jan-04	1/80	TOGP		TOGP	0	-2.23	2.06	Tape	2	3.535	0.458					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	1	0.8	0.474					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	2	0.82	0.487					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	3	0.83	0.499					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	1	3.49	0.474					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	2	3.48	0.487					0.014	0.006	0.013	0.006	6.387	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	21-Jan-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	3	3.47	0.499					0.014	0.006	0.013	0.006	6.387	0.013	0.004
Sensor SN: 2346004																									
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	1	0.94	0.637					0.002	0.001	0.002	0.001	6.369	0.006	0.002

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	2	0.95	0.648					0.002	0.001	0.002	0.001	6.369	0.006	0.002
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	SG	3	0.96	0.654					0.002	0.001	0.002	0.001	6.369	0.006	0.002
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	1	3.36	0.637					0.002	0.001	0.002	0.001	6.369	0.006	0.002
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	2	3.35	0.648					0.002	0.001	0.002	0.001	6.369	0.006	0.002
18-Mar-04	10-Jun-04	18-Mar-04	18-Mar-04	3/134	TOGP		TOGP	0	-2.23	2.06	Tape	3	3.34	0.654					0.002	0.001	0.002	0.001	6.369	0.006	0.002
BuI WL 02																									
Sensor SN: 2346010																									
21-Jan-04	18-Mar-04	21-Jan-04	21-Jan-04	2/132-	TOGP		TOGP	0	-1.33	2.06	SG	1	1.9	1.872					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	21-Jan-04	21-Jan-04	2/132-	TOGP		TOGP	0	-1.33	2.06	Tape	1	1.49	1.872					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	04-Feb-04	21-Jan-04	2/158	TOGP		TOGP	0	-1.33	2.06	SG	1	0.695	0.656					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	04-Feb-04	21-Jan-04	2/158	TOGP		TOGP	0	-1.33	2.06	Tape	1	2.69	0.656					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	1	1.73	1.815					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	2	1.73	1.812					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	3	1.73	1.811					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	1	1.73	1.815					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	2	1.73	1.812					0.064	0.029	0.103	0.046	5.534	0.083	0.026
21-Jan-04	18-Mar-04	18-Mar-04	21-Jan-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	3	1.725	1.811					0.064	0.029	0.103	0.046	5.534	0.083	0.026
Sensor SN: 2346010																									
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	1	1.7	1.787					0.002	0.001	0.003	0.002	5.497	0.009	0.003
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	2	1.7	1.783					0.002	0.001	0.003	0.002	5.497	0.009	0.003
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	SG	3	1.695	1.781					0.002	0.001	0.003	0.002	5.497	0.009	0.003
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	1	1.7	1.787					0.002	0.001	0.003	0.002	5.497	0.009	0.003
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	2	1.71	1.783					0.002	0.001	0.003	0.002	5.497	0.009	0.003
18-Mar-04	19-May-04	18-Mar-04	18-Mar-04	3/136	TOGP		TOGP	0	-1.33	2.06	Tape	3	1.71	1.781					0.002	0.001	0.003	0.002	5.497	0.009	0.003
Sensor SN: 16291																									
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	1	0.14	1.395					0.026	0.015	0.006	0.003	4.603	0.019	0.008
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	2	0.2	1.405					0.026	0.015	0.006	0.003	4.603	0.019	0.008
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	3	0.2	1.416					0.026	0.015	0.006	0.003	4.603	0.019	0.008
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.98	1.395					0.026	0.015	0.006	0.003	4.603	0.019	0.008
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.96	1.405					0.026	0.015	0.006	0.003	4.603	0.019	0.008
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.95	1.416					0.026	0.015	0.006	0.003	4.603	0.019	0.008

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
Sensor SN: 16291																									
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	1	0.32	1.551					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	2	0.32	1.555					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	SG	3	0.325	1.567					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.82	1.551					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.82	1.555					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/146	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.81	1.567					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	SG	1	1.02	2.249					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	SG	2	1.01	2.239					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	SG	3	1.01	2.233					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.15	2.249					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.16	2.239					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/60	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.16	2.233					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	1	0.5	1.77					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	2	0.49	1.752					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	3	0.47	1.736					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.67	1.77					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.69	1.752					0.018	0.006	0.032	0.011	4.576	0.025	0.006
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.72	1.736					0.018	0.006	0.032	0.011	4.576	0.025	0.006
Sensor SN: 16291																									
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	1	0.22	1.385					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	2	0.21	1.371					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	3	0.2	1.367					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.95	1.385					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.95	1.371					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.97	1.367					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	1	0.995	2.15					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	2	0.98	2.137					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	3	0.97	2.125					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.16	2.15					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.17	2.137					0.005	0.002	0.014	0.006	4.660	0.010	0.003
10-Dec-04	14-Dec-04	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.18	2.125					0.005	0.002	0.014	0.006	4.660	0.010	0.003
Sensor SN: 16291																									

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	1	0.49	1.749					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	2	0.47	1.724					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	3	0.44	1.703					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	SG	4	0.42	1.686					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.67	1.749					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.69	1.724					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.71	1.703					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	14-Dec-04	14-Dec-04	CalibS	TOGP		TOGP	0	-1.1	2.06	Tape	4	2.73	1.686					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CS	TOGP		TOGP	0	-1.1	2.06	Tape	1	0.26	4.18					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CS	TOGP		TOGP	0	-1.1	2.06	Tape	2	0.25	4.19					0.005	0.003	0.013	0.005	4.556	0.011	0.003
14-Dec-04	10-Jan-05	10-Jan-05	14-Dec-04	CS	TOGP		TOGP	0	-1.1	2.06	Tape	3	0.24	4.2					0.005	0.003	0.013	0.005	4.556	0.011	0.003
Sensor SN: 16291																									
10-Jan-05	07-Apr-05	10-Jan-05	10-Jan-05	CS	TOGP		TOGP	0	-1.1	2.06	Tape	1	0.21	4.226					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	10-Jan-05	10-Jan-05	CS	TOGP		TOGP	0	-1.1	2.06	Tape	2	0.21	4.222					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	10-Jan-05	10-Jan-05	CS	TOGP		TOGP	0	-1.1	2.06	Tape	3	0.21	4.222					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	SG	1	1.555	2.83					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	SG	2	1.545	2.82					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	SG	3	1.54	2.82					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	Tape	1	1.6	2.83					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	Tape	2	1.61	2.82					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	09-Feb-05	10-Jan-05	11/98	TOGP		TOGP	0	-1.1	2.06	Tape	3	1.62	2.82					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	SG	1	0.86	2.159					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	SG	2	0.86	2.162					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	SG	3	0.86	2.164					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	Tape	1	2.38	2.159					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	Tape	2	2.3	2.162					0.014	0.006	0.035	0.012	4.529	0.028	0.007
10-Jan-05	07-Apr-05	07-Apr-05	10-Jan-05	10/82	TOGP		TOGP	0	-1.1	2.06	Tape	3	2.3	2.164					0.014	0.006	0.035	0.012	4.529	0.028	0.007
BuI WL 03																									
Sensor SN: 2346020																									
11-Dec-03	18-Mar-04	21-Jan-04	11-Dec-03	2/138	TOGP		TOGP	0	-1.8	2.06	SG	1	1.575	0.972					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	21-Jan-04	11-Dec-03	2/138	TOGP		TOGP	0	-1.8	2.06	Tape	1	2.32	0.972					0.014	0.006	0.012	0.005	6.434	0.013	0.004

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
11-Dec-03	18-Mar-04	04-Feb-04	11-Dec-03	1/82	TOGP		TOGP	0	-1.8	2.06	SG	1	0.88	0.281					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	04-Feb-04	11-Dec-03	1/82	TOGP		TOGP	0	-1.8	2.06	Tape	1	2.99	0.274					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	SG	1	0.67	0.092					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	SG	2	0.66	0.069					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	SG	3	0.66	0.089					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	Tape	1	3.2	0.092					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	Tape	2	3.19	0.09					0.014	0.006	0.012	0.005	6.434	0.013	0.004
11-Dec-03	18-Mar-04	18-Mar-04	11-Dec-03	3/138	TOGP		TOGP	0	-1.8	2.06	Tape	3	3.19	0.089					0.014	0.006	0.012	0.005	6.434	0.013	0.004
Sensor SN: 16187																									
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	SG	1	0.2	1.029					0.024	0.014	0.007	0.004	5.611	0.016	0.007
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	SG	2	0.2	1.027					0.024	0.014	0.007	0.004	5.611	0.016	0.007
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	SG	3	0.155	1.025					0.024	0.014	0.007	0.004	5.611	0.016	0.007
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	Tape	1	3.07	1.029					0.024	0.014	0.007	0.004	5.611	0.016	0.007
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	Tape	2	3.06	1.027					0.024	0.014	0.007	0.004	5.611	0.016	0.007
10-Sep-04	14-Oct-04	14-Oct-04	10-Sep-04	8/154	TOGP		TOGP	0	-1.2	2.06	Tape	3	3.075	1.025					0.024	0.014	0.007	0.004	5.611	0.016	0.007
Sensor SN: 16187																									
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	SG	1	0.14	0.977					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	SG	2	0.145	0.979					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	SG	3	0.14	0.989					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	Tape	1	3.09	0.977					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	Tape	2	3.09	0.979					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	14-Oct-04	14-Oct-04	8/155	TOGP		TOGP	0	-1.2	2.06	Tape	3	3.09	0.989					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	SG	1	0.64	1.483					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	SG	2	0.64	1.482					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	SG	3	0.64	1.479					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	SG	4	0.63	1.476					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	Tape	1	2.63	1.483					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	Tape	2	2.625	1.482					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	Tape	3	2.625	1.479					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	27-Oct-04	14-Oct-04	9/58	TOGP		TOGP	0	-1.2	2.06	Tape	4	2.625	1.476					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	1	0.93	1.771					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	2	0.93	1.773					0.004	0.001	0.016	0.005	5.613	0.012	0.003

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	3	0.935	1.776					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	1	2.33	1.771					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	2	2.325	1.773					0.004	0.001	0.016	0.005	5.613	0.012	0.003
14-Oct-04	10-Dec-04	10-Dec-04	14-Oct-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	3	2.32	1.776					0.004	0.001	0.016	0.005	5.613	0.012	0.003
Sensor SN: 16187																									
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	1	0.97	1.803					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	2	0.975	1.807					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	SG	3	0.975	1.81					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	1	2.27	1.803					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	2	2.28	1.807					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	-1.2	2.06	Tape	3	2.28	1.81					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	07-Jan-05	10-Dec-04	11/24	TOGP		TOGP	0	-1.2	2.06	Tape	1	0.79	3.384					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	07-Jan-05	10-Dec-04	11/24	TOGP		TOGP	0	-1.2	2.06	Tape	2	0.78	3.376					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	07-Jan-05	10-Dec-04	11/24	TOGP		TOGP	0	-1.2	2.06	Tape	3	0.78	3.374					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	SG	1	0.58	1.418					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	SG	2	0.57	1.406					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	SG	3	0.56	1.397					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	Tape	1	2.68	1.418					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	Tape	2	2.69	1.406					0.002	0.001	0.037	0.012	5.604	0.029	0.008
10-Dec-04	09-Feb-05	09-Feb-05	10-Dec-04	11/100	TOGP		TOGP	0	-1.2	2.06	Tape	3	2.7	1.397					0.002	0.001	0.037	0.012	5.604	0.029	0.008
Sensor SN: 16187																									
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	SG	1	0.325	1.162					0.001	0.001	0.004	0.002	5.614	0.003	0.001
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	SG	2	0.32	1.156					0.001	0.001	0.004	0.002	5.614	0.003	0.001
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	SG	3	0.315	1.15					0.001	0.001	0.004	0.002	5.614	0.003	0.001
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	Tape	1	2.93	1.162					0.001	0.001	0.004	0.002	5.614	0.003	0.001
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	Tape	2	2.94	1.156					0.001	0.001	0.004	0.002	5.614	0.003	0.001
09-Feb-05	07-Apr-05	09-Feb-05	09-Feb-05	11/103	TOGP		TOGP	0	-1.2	2.06	Tape	3	2.95	1.15					0.001	0.001	0.004	0.002	5.614	0.003	0.001
BuI WL 04																									
Sensor SN: 40137																									
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	SG	1	1.43	2.393					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	SG	2	1.43	2.399					0.010	0.003	0.012	0.004	3.124	0.011	0.003

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	SG	3	1.43	2.404					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	Tape	1	1.27	2.393					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	Tape	2	1.27	2.399					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	08-Apr-04	08-Apr-04	4/48	TOGP		TOGP	0	0.63	3.33	Tape	3	1.265	2.404					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	SG	1	0.4	1.357					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	SG	2	0.38	1.34					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	SG	3	0.375	1.33					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	Tape	1	2.28	1.357					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	Tape	2	2.31	1.34					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	30-Apr-04	08-Apr-04	4/110	TOGP		TOGP	0	0.63	3.33	Tape	3	2.32	1.33					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	SG	1	1.03	1.981					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	SG	2	1.03	1.986					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	SG	3	1.05	1.991					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	Tape	1	1.68	1.981					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	Tape	2	1.66	1.986					0.010	0.003	0.012	0.004	3.124	0.011	0.003
08-Apr-04	25-Jun-04	29-Jun-04	08-Apr-04	6/60	TOGP		TOGP	0	0.63	3.33	Tape	3	1.65	1.991					0.010	0.003	0.012	0.004	3.124	0.011	0.003
Sensor SN: 40092																									
10-Sep-04	01-Dec-04	13-Oct-04	10-Sep-04	8/130	TOGP		TOGP	0	0.63	3.33	Tape	1	0.52	5.243							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	13-Oct-04	10-Sep-04	8/130	TOGP		TOGP	0	0.63	3.33	Tape	2	0.515	5.25							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	13-Oct-04	10-Sep-04	8/130	TOGP		TOGP	0	0.63	3.33	Tape	3	0.5	5.252							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	27-Oct-04	10-Sep-04	9/62	TOGP		TOGP	0	0.63	3.33	Tape	1	0.065	5.77							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	27-Oct-04	10-Sep-04	9/62	TOGP		TOGP	0	0.63	3.33	Tape	2	0.08	5.76							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	27-Oct-04	10-Sep-04	9/62	TOGP		TOGP	0	0.63	3.33	Tape	3	0.08	5.753							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	01-Dec-04	10-Sep-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	1	0.99	4.719							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	01-Dec-04	10-Sep-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	2	0.99	4.728							0.054	0.018	1.010	0.054	0.018
10-Sep-04	01-Dec-04	01-Dec-04	10-Sep-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	3	0.98	4.731							0.054	0.018	1.010	0.054	0.018
Sensor SN: 40092																									
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	SG	1	1.86	4.896					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	SG	2	1.89	4.898					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	SG	3	1.89	4.91					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	1	0.88	4.896					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	2	0.87	4.898					0.012	0.005	0.005	0.002	1.029	0.026	0.007

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
01-Dec-04	10-Dec-04	01-Dec-04	01-Dec-04	9/128	TOGP		TOGP	0	0.63	3.33	Tape	3	0.86	4.91					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	1	0.89	3.93					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	2	0.88	3.911					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	3	0.85	3.883					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	1	1.85	3.93					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	2	1.87	3.911					0.012	0.005	0.005	0.002	1.029	0.026	0.007
01-Dec-04	10-Dec-04	10-Dec-04	01-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	3	1.89	3.883					0.012	0.005	0.005	0.002	1.029	0.026	0.007
Sensor SN: 40092																									
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	1	0.78	3.817					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	2	0.76	3.8					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	3	0.75	3.798					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	1	1.96	3.817					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	2	1.97	3.8					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	10-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	Tape	3	1.98	3.798					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	1	1.9	4.924					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	2	1.91	4.931					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	3	1.91	4.933					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	14-Dec-04	10-Dec-04	CalibS	TOGP		TOGP	0	0.63	3.33	SG	4	1.92	4.938					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	SG	1	2.76	5.791					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	SG	2	2.76	5.781					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	SG	3	2.75	5.774					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	Tape	1	0.05	5.791					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	Tape	2	0.035	5.781					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	21-Jan-05	10-Dec-04	11/52	TOGP		TOGP	0	0.63	3.33	Tape	3	0.03	5.774					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	1	3.16	6.197					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	2	3.15	6.188					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	3	3.14	6.181					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	1	-0.45	6.197					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	2	-0.44	6.188					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	09-Feb-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	3	-0.44	6.181					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	1	2.34	5.375					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	2	2.345	5.377					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	SG	3	2.35	5.382					0.009	0.002	0.034	0.010	1.032	0.030	0.006

Bull Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	*Calib End Date*	*Field Calib Date*	*Session Start Date*	*Field Bk/Pg*	*Srvy Pt ID*	*Srvy Pt Elev Ft-NAVD*	*Cal Pt Name*	*Cal Pt Offset Ft*	*Rel Hght TOSG Ft*	*SG Ft*	*Method*	*Rep*	*Field Value Ft*	*Corr Sensor Value*	*Sol-Tape WSE Ft-NAVD*	*SG WSE Ft-NAVD*	*Sol-Tape Sensor Offset Ft*	*SG Sensor Offset Ft*	*StDev SG Sensor Offset*	*StErr SG Sensor Offset*	*StDev SolTape-Sensor Offset*	*StErr SolTape-Sensor Offset*	*Avg Sensor Offset Ft*	*StDev Sensor Offset*	*StErr Sensor Offset*
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	1	0.365	5.375					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	2	0.365	5.377					0.009	0.002	0.034	0.010	1.032	0.030	0.006
10-Dec-04	07-Mar-05	07-Apr-05	10-Dec-04	11/99	TOGP		TOGP	0	0.63	3.33	Tape	3	0.355	5.382					0.009	0.002	0.034	0.010	1.032	0.030	0.006
Sensor SN: 40092																									
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	SG	1	1.1	4.123					0.002	0.001	0.002	0.001	1.049	0.012	0.005
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	SG	2	1.11	4.13					0.002	0.001	0.002	0.001	1.049	0.012	0.005
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	SG	3	1.12	4.139					0.002	0.001	0.002	0.001	1.049	0.012	0.005
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	Tape	1	1.62	4.123					0.002	0.001	0.002	0.001	1.049	0.012	0.005
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	Tape	2	1.61	4.13					0.002	0.001	0.002	0.001	1.049	0.012	0.005
07-Apr-05	19-Apr-05	19-Apr-05	07-Apr-05	10/95	TOGP		TOGP	0	0.63	3.33	Tape	3	1.605	4.139					0.002	0.001	0.002	0.001	1.049	0.012	0.005

Table 7.5

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
BrI WL 01																									
Sensor SN: 2346012																									
18-Dec-03	19-Feb-04	08-Jan-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.24	0.182		6.290		6.108	0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.17	0.106		6.220		6.114	0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.17	0.106		6.220		6.114	0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.17	0.105		6.220		6.115	0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	5.07	0.103	6.200		6.097		0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	5.065	0.103	6.205		6.102		0.003	0.002	0.003	0.002	6.107	0.007	0.003
18-Dec-03	19-Feb-04	19-Feb-04	18-Dec-03	2/112	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	5.065	0.103	6.205		6.102		0.003	0.002	0.003	0.002	6.107	0.007	0.003
Sensor SN: 2346012																									
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.16	0.113		6.210		6.097	0.003	0.002	0.001	0.001	6.090	0.006	0.003
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.16	0.112		6.210		6.098	0.003	0.002	0.001	0.001	6.090	0.006	0.003
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.155	0.113		6.205		6.092	0.003	0.002	0.001	0.001	6.090	0.006	0.003
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	5.075	0.111	6.195		6.084		0.003	0.002	0.001	0.001	6.090	0.006	0.003
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	5.075	0.11	6.195		6.085		0.003	0.002	0.001	0.001	6.090	0.006	0.003
19-Feb-04	12-Jun-04	19-Feb-04	19-Feb-04	3/8-9	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	5.075	0.109	6.195		6.086		0.003	0.002	0.001	0.001	6.090	0.006	0.003
Sensor SN: 16180																									
25-Jun-04	25-Aug-04	25-Jun-04	25-Jun-04		TOGP	11.27	TOGP	0	-3.16		Tape	1													
Sensor SN: 16180																									
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.1	0.053		6.150		6.097	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.1	0.053		6.150		6.097	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.1	0.053		6.150		6.097	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	5.12	0.053	6.150		6.097		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	5.12	0.053	6.150		6.097		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	12-Nov-04	01-Oct-04	9/82	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	5.12	0.053	6.150		6.097		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.25	0.165		6.300		6.135	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.25	0.161		6.300		6.139	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.25	0.156		6.300		6.144	0.022	0.007	0.016	0.005	6.122	0.020	0.005

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	4.98	0.165	6.290		6.125		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	4.99	0.161	6.280		6.119		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	26-Jan-05	01-Oct-04	10/34	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	4.995	0.156	6.275		6.119		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.3	0.206		6.350		6.144	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.3	0.204		6.350		6.146	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.29	0.201		6.340		6.139	0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	4.94	0.206	6.330		6.124		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	4.93	0.204	6.340		6.136		0.022	0.007	0.016	0.005	6.122	0.020	0.005
01-Oct-04	08-Feb-05	08-Feb-05	01-Oct-04	11/78	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	4.93	0.201	6.340		6.139		0.022	0.007	0.016	0.005	6.122	0.020	0.005
Sensor SN: 16180																									
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	SG	1	0.25	0.17		6.300		6.130	0.005	0.003	0.001	0.000	6.114	0.015	0.006
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	SG	2	0.25	0.17		6.300		6.130	0.005	0.003	0.001	0.000	6.114	0.015	0.006
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	SG	3	0.24	0.169		6.290		6.121	0.005	0.003	0.001	0.000	6.114	0.015	0.006
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	1	5	0.17	6.270		6.100		0.005	0.003	0.001	0.000	6.114	0.015	0.006
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	2	5	0.17	6.270		6.100		0.005	0.003	0.001	0.000	6.114	0.015	0.006
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/79	TOGP	11.27	TOGP	0	-3.16	2.06	Tape	3	5	0.169	6.270		6.101		0.005	0.003	0.001	0.000	6.114	0.015	0.006
BrI WL 02																									
Sensor SN: 2346021																									
08-Jan-04	12-Jun-04	08-Jan-04	08-Jan-04	2/109	TOGP	7.99	TOGP	0	-0.81	2.06	SG	1	0.82	0.182		5.940		5.758					5.768	0.014	0.010
08-Jan-04	12-Jun-04	08-Jan-04	08-Jan-04	2/109	TOGP	7.99	TOGP	0	-0.81	2.06	Solinst	1	2.03	0.182	5.960		5.778						5.768	0.014	0.010
Sensor SN: 16359																									
25-Jun-04	25-Aug-04	25-Jun-04	25-Jun-04		TOGP	7.99	TOGP	0	-0.81		Tape	1													
Sensor SN: 16359																									
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	SG	1	0.96	0.319		6.090		5.771	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	SG	2	0.965	0.327		6.095		5.768	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	SG	3	0.98	0.331		6.110		5.779	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	1	1.91	0.319	6.080		5.761		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	2	1.9	0.327	6.090		5.763		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	12-Nov-04	07-Oct-04	9/76	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	3	1.89	0.331	6.100		5.769		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	SG	1	0.76	0.123		5.890		5.767	0.010	0.004	0.006	0.002	5.769	0.008	0.002

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	SG	2	0.75	0.133		5.880		5.747	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	SG	3	0.78	0.138		5.910		5.772	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	SG	4	0.79	0.147		5.920		5.773	0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	1	2.09	0.123	5.900		5.777		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	2	2.08	0.133	5.910		5.777		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	3	2.08	0.138	5.910		5.772		0.010	0.004	0.006	0.002	5.769	0.008	0.002
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOGP	7.99	TOGP	0	-0.8	2.06	Tape	4	2.07	0.147	5.920		5.773		0.010	0.004	0.006	0.002	5.769	0.008	0.002
BrI WL 03																									
Sensor SN: 2346001																									
08-Jan-04	12-Jun-04	08-Jan-04	18-Dec-03	2/111	TOGP	6.54	TOGP	0	0.13	2.06	SG	1	1.96	1.573		6.570		4.997					4.992	0.007	0.005
08-Jan-04	12-Jun-04	08-Jan-04	18-Dec-03	2/111	TOGP	6.54	TOGP	0	0.13	2.06	Tape	1	-0.02	1.573	6.560		4.987						4.992	0.007	0.005
Sensor SN: 16432																									
25-Jun-04	25-Aug-04	25-Jun-04	25-Jun-04		TOGP	6.54	TOGP	0	0.13		Tape	1													
Sensor SN: 16078																									
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	SG	1	1.72	0.883		6.330		5.447	0.001	0.001	0.005	0.003	5.447	0.004	0.002
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	SG	2	1.72	0.881		6.330		5.449	0.001	0.001	0.005	0.003	5.447	0.004	0.002
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	SG	3	1.72	0.881		6.330		5.449	0.001	0.001	0.005	0.003	5.447	0.004	0.002
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	Tape	1	0.21	0.883	6.330		5.447		0.001	0.001	0.005	0.003	5.447	0.004	0.002
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	Tape	2	0.21	0.881	6.330		5.449		0.001	0.001	0.005	0.003	5.447	0.004	0.002
01-Oct-04	09-Dec-04	12-Nov-04	01-Oct-04	9/78	TOGP	6.54	TOGP	0	0.13	2.06	Tape	3	0.22	0.881	6.320		5.439		0.001	0.001	0.005	0.003	5.447	0.004	0.002
Sensor SN: 16078																									
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	SG	1	1.26	0.904		5.870		4.966	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	SG	2	1.27	0.907		5.880		4.973	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	SG	3	1.29	0.923		5.900		4.977	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	SG	4	1.29	0.928		5.900		4.972	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	Tape	1	0.64	0.904	5.900		4.996		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	Tape	2	0.64	0.907	5.900		4.993		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	Tape	3	0.63	0.923	5.910		4.987		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	09-Dec-04	09-Dec-04	CalSh	TOGP	6.54	TOGP	0	0.13	2.06	Tape	4	0.63	0.928	5.910		4.982		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	SG	1	1.285	0.907		5.895		4.988	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	SG	2	1.3	0.92		5.910		4.990	0.009	0.003	0.005	0.002	4.984	0.009	0.002

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	SG	3	1.305	0.93		5.915		4.985	0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	Tape	1	0.64	0.907	5.900		4.993		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	Tape	2	0.63	0.92	5.910		4.990		0.009	0.003	0.005	0.002	4.984	0.009	0.002
09-Dec-04	04-Mar-05	26-Jan-05	09-Dec-04	10/30	TOGP	6.54	TOGP	0	0.13	2.06	Tape	3	0.625	0.93	5.915		4.985		0.009	0.003	0.005	0.002	4.984	0.009	0.002
BrI WL 04																									
Sensor SN: 2346018																									
08-Jan-04	12-Jun-04	08-Jan-04	18-Dec-03	2/112	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.29	0.163		6.310		6.147					6.147	0.000	0.000
08-Jan-04	12-Jun-04	08-Jan-04	18-Dec-03	2/112	TOGP	10.04	TOGP	0	-1.96	2.06	Solinst	1	3.73	0.163	6.310		6.147						6.147	0.000	0.000
Sensor SN: 16634																									
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.14	0.047		6.160		6.113	0.001	0.000	0.001	0.000	6.108	0.006	0.002
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	SG	2	0.14	0.047		6.160		6.113	0.001	0.000	0.001	0.000	6.108	0.006	0.002
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	SG	3	0.14	0.046		6.160		6.114	0.001	0.000	0.001	0.000	6.108	0.006	0.002
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	1	3.89	0.047	6.150		6.103		0.001	0.000	0.001	0.000	6.108	0.006	0.002
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	2	3.89	0.047	6.150		6.103		0.001	0.000	0.001	0.000	6.108	0.006	0.002
25-Jun-04	25-Aug-04	25-Aug-04	25-Jun-04	8/26	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	3	3.89	0.046	6.150		6.104		0.001	0.000	0.001	0.000	6.108	0.006	0.002
Sensor SN: 16453																									
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.22	0.043		6.240		6.197	0.001	0.000	0.005	0.003	6.189	0.010	0.004
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	SG	2	0.22	0.042		6.240		6.198	0.001	0.000	0.005	0.003	6.189	0.010	0.004
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	SG	3	0.22	0.042		6.240		6.198	0.001	0.000	0.005	0.003	6.189	0.010	0.004
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	1	3.81	0.043	6.230		6.187		0.001	0.000	0.005	0.003	6.189	0.010	0.004
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	2	3.82	0.042	6.220		6.178		0.001	0.000	0.005	0.003	6.189	0.010	0.004
01-Oct-04	12-Nov-04	12-Nov-04	01-Oct-04	9/80	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	3	3.82	0.042	6.220		6.178		0.001	0.000	0.005	0.003	6.189	0.010	0.004
Sensor SN: 16453																									
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.21	0.04		6.230		6.190	0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	SG	2	0.21	0.04		6.230		6.190	0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	SG	3	0.21	0.04		6.230		6.190	0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	1	3.82	0.04	6.220		6.180		0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	2	3.82	0.04	6.220		6.180		0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	12-Nov-04	12-Nov-04	9/81	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	3	3.82	0.04	6.220		6.180		0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.31	0.19		6.330		6.140	0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	SG	2	0.32	0.206		6.340		6.134	0.029	0.012	0.027	0.011	6.159	0.027	0.008

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	SG	3	0.33	0.214		6.350		6.136	0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	1	3.72	0.19	6.320		6.130		0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	2	3.705	0.206	6.335		6.129		0.029	0.012	0.027	0.011	6.159	0.027	0.008
12-Nov-04	08-Feb-05	08-Feb-05	12-Nov-04	11/75	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	3	3.695	0.214	6.345		6.131		0.029	0.012	0.027	0.011	6.159	0.027	0.008
Sensor SN: 16453																									
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	SG	1	0.35	0.233		6.370		6.137	0.003	0.002	0.008	0.004	6.142	0.006	0.003
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	SG	2	0.36	0.238		6.380		6.142	0.003	0.002	0.008	0.004	6.142	0.006	0.003
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	SG	3	0.36	0.242		6.380		6.138	0.003	0.002	0.008	0.004	6.142	0.006	0.003
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	1	3.67	0.233	6.370		6.137		0.003	0.002	0.008	0.004	6.142	0.006	0.003
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	2	3.65	0.238	6.390		6.152		0.003	0.002	0.008	0.004	6.142	0.006	0.003
08-Feb-05	04-Mar-05	08-Feb-05	08-Feb-05	11/77	TOGP	10.04	TOGP	0	-1.96	2.06	Tape	3	3.65	0.242	6.390		6.148		0.003	0.002	0.008	0.004	6.142	0.006	0.003
BrI WL 05																									
Sensor SN: 40137																									
09-Dec-04	21-Dec-04	09-Dec-04	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Solinst	1	4.49	4.758	3.880		-0.878				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	09-Dec-04	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Solinst	2	4.48	4.753	3.890		-0.863				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	09-Dec-04	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Solinst	3	4.48	4.754	3.890		-0.864				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	21-Dec-04	09-Dec-04	10/26	TOGP	8.37	TOGP	0	0		Tape	1	5.18	3.91	3.190		-0.720				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	21-Dec-04	09-Dec-04	10/26	TOGP	8.37	TOGP	0	0		Tape	2	5.21	3.9	3.160		-0.740				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	21-Dec-04	09-Dec-04	10/26	TOGP	8.37	TOGP	0	0		Tape	3	5.21	3.896	3.160		-0.736				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	04-Jan-05	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Tape	1	2.055	7.022	6.315		-0.707				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	04-Jan-05	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Tape	2	2.05	7.02	6.320		-0.700				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	04-Jan-05	09-Dec-04	CalibS	TOGP	8.37	TOGP	0	0		Tape	3	2.055	7.02	6.315		-0.705				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	08-Feb-05	09-Dec-04	11/72	TOGP	8.37	TOGP	0	0		Tape	1	2.185	6.873	6.185		-0.688				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	08-Feb-05	09-Dec-04	11/72	TOGP	8.37	TOGP	0	0		Tape	2	2.18	6.878	6.190		-0.688				0.074	0.021	-0.749	0.074	0.021
09-Dec-04	21-Dec-04	08-Feb-05	09-Dec-04	11/72	TOGP	8.37	TOGP	0	0		Tape	3	2.18	6.883	6.190		-0.693				0.074	0.021	-0.749	0.074	0.021
Sensor SN: 40137																									
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/136	TSCP	7.10	TSCP	0	0		Tape	1	2.895	4.918	4.205		-0.713				0.003	0.001	-0.713	0.003	0.001
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/136	TSCP	7.10	TSCP	0	0		Tape	2	2.9	4.911	4.200		-0.711				0.003	0.001	-0.713	0.003	0.001
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/136	TSCP	7.10	TSCP	0	0		Tape	3	2.91	4.906	4.190		-0.716				0.003	0.001	-0.713	0.003	0.001
Sensor SN: 10650																									

Browns Island - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	*Calib End Date*	*Field Calib Date*	*Session Start Date*	*Field Bk/Pg*	*Srvy Pt ID*	*Srvy Pt Elev Ft-NAVD*	*Cal Pt Name*	*Cal Pt Offset Ft*	*Rel Hght TOSG Ft*	*SG Ft*	*Method*	*Rep*	*Field Value Ft*	*Corr Sensor Value*	*Sol-Tape WSE Ft-NAVD*	*SG WSE Ft-NAVD*	*Sol-Tape Sensor Offset Ft*	*SG Sensor Offset Ft*	*StDev SG Sensor Offset*	*StErr SG Sensor Offset*	*StDev SolTape-Sensor Offset*	*StErr SolTape-Sensor Offset*	*Avg Sensor Offset Ft*	*StDev Sensor Offset*	*StErr Sensor Offset*
20-Apr-05	23-Jun-05	20-Apr-05	20-Apr-05	10/137	TOGP	8.37	TOGP	0	0		Tape	1	4.19	4.93	4.180		-0.750				0.293	0.131	-1.071	0.293	0.131
20-Apr-05	23-Jun-05	20-Apr-05	20-Apr-05	10/137	TOGP	8.37	TOGP	0	0		Tape	2	4.181	4.94	4.189		-0.751				0.293	0.131	-1.071	0.293	0.131
20-Apr-05	23-Jun-05	23-Jun-05	20-Apr-05	12/12	TOGP	8.37	TOGP	0	0		Tape	1	3.665	5.998	4.705		-1.293				0.293	0.131	-1.071	0.293	0.131
20-Apr-05	23-Jun-05	23-Jun-05	20-Apr-05	12/12	TOGP	8.37	TOGP	0	0		Tape	2	3.66	5.993	4.710		-1.283				0.293	0.131	-1.071	0.293	0.131
20-Apr-05	23-Jun-05	23-Jun-05	20-Apr-05	12/12	TOGP	8.37	TOGP	0	0		Tape	3	3.648	6	4.722		-1.278				0.293	0.131	-1.071	0.293	0.131

Table 7.6

Sherman Lake - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
SL CTDS 01																									
Sensor SN: 4044408																									
30-Jan-04	16-Apr-04	19-Mar-04	30-Jan-04	2/154	TPBM	6.34	TOBM	0			Tape	1	0.86	7.85	5.480		-2.370				0.006	0.003	-2.367	0.006	0.003
30-Jan-04	16-Apr-04	19-Mar-04	30-Jan-04	2/154	TPBM	6.34	TOBM	0			Tape	2	0.87	7.83	5.470		-2.360				0.006	0.003	-2.367	0.006	0.003
30-Jan-04	16-Apr-04	19-Mar-04	30-Jan-04	2/154	TPBM	6.34	TOBM	0			Tape	3	0.89	7.82	5.450		-2.370				0.006	0.003	-2.367	0.006	0.003
Sensor SN: 10112																									
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	1	1.89	5.95	4.450		-1.500				0.009	0.004	-1.492	0.009	0.004
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	2	1.89	5.95	4.450		-1.500				0.009	0.004	-1.492	0.009	0.004
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	3	1.89	5.95	4.450		-1.500				0.009	0.004	-1.492	0.009	0.004
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	4	2.06	5.761	4.280		-1.481				0.009	0.004	-1.492	0.009	0.004
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	5	2.065	5.761	4.275		-1.486				0.009	0.004	-1.492	0.009	0.004
07-Oct-04	12-Nov-04	07-Oct-04	07-Oct-04	8/112	TPBM	6.34	TOBM	0			Tape	6	2.065	5.761	4.275		-1.486				0.009	0.004	-1.492	0.009	0.004
Sensor SN: 10112																									
12-Nov-04	09-Dec-04	09-Dec-04	12-Nov-04	10/6	TPBM	6.34	TOBM	0			Tape	1	0.9	7.662	5.440		-2.222				0.000	0.000	-2.222	0.000	0.000
12-Nov-04	09-Dec-04	09-Dec-04	12-Nov-04	10/6	TPBM	6.34	TOBM	0			Tape	2	0.9	7.662	5.440		-2.222				0.000	0.000	-2.222	0.000	0.000
12-Nov-04	09-Dec-04	09-Dec-04	12-Nov-04	10/6	TPBM	6.34	TOBM	0			Tape	3	0.9	7.662	5.440		-2.222				0.000	0.000	-2.222	0.000	0.000
Sensor SN: 10112																									
09-Dec-04	08-Feb-05	08-Feb-05	09-Dec-04	11/82	TPBM	6.34	TOBM	0			Tape	1	0.67	7.915	5.670		-2.245						-2.245		
Sensor SN: 10112																									
08-Feb-05	04-Mar-05	04-Mar-05	08-Feb-05	11/117	TPBM	6.34	TOBM	0			Tape	1	1.11	7.455	5.230		-2.225						-2.225		
Sensor SN: 10112																									
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/114	TPBM	6.34	TOBM	0			Tape	1	1.62	6.765	4.720		-2.045				0.003	0.002	-2.042	0.003	0.002
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/114	TPBM	6.34	TOBM	0			Tape	2	1.615	6.765	4.725		-2.040				0.003	0.002	-2.042	0.003	0.002
04-Mar-05	20-Apr-05	20-Apr-05	04-Mar-05	10/114	TPBM	6.34	TOBM	0			Tape	3	1.615	6.765	4.725		-2.040				0.003	0.002	-2.042	0.003	0.002
Sensor SN: 10112																									
20-Apr-05	23-Jun-05	20-Apr-05	20-Apr-05	10/132	TPBM	6.34	TOBM	0			Tape	1	1.68	6.45	4.660		-1.790				0.029	0.012	-1.811	0.029	0.012

Sherman Lake - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
20-Apr-05	23-Jun-05	20-Apr-05	20-Apr-05	10/132	TPBM	6.34	TOBM	0			Tape	2	1.685	6.45	4.655		-1.795				0.029	0.012	-1.811	0.029	0.012
20-Apr-05	23-Jun-05	20-Apr-05	20-Apr-05	10/132	TPBM	6.34	TOBM	0			Tape	3	1.685	6.45	4.655		-1.795				0.029	0.012	-1.811	0.029	0.012
20-Apr-05	23-Jun-05	21-Apr-05	20-Apr-05	10/147	TPBM	6.34	TOBM	0			Tape	1	2.04	6.09	4.300		-1.790				0.029	0.012	-1.811	0.029	0.012
20-Apr-05	23-Jun-05	23-Jun-05	20-Apr-05	12/4	TPBM	6.34	TOBM	0			Tape	1	3.55	4.638	2.790		-1.848				0.029	0.012	-1.811	0.029	0.012
20-Apr-05	23-Jun-05	23-Jun-05	20-Apr-05	12/4	TPBM	6.34	TOBM	0			Tape	2	3.55	4.638	2.790		-1.848				0.029	0.012	-1.811	0.029	0.012
Sensor SN: 10112																									
23-Jun-05	10-Aug-05	10-Aug-05	23-Jun-05	12/68	TPBM	6.34	TOBM	0			Tape	1	2.68	4.69	3.660		-1.030				0.000	0.000	-1.030	0.000	0.000
23-Jun-05	10-Aug-05	10-Aug-05	23-Jun-05	12/68	TPBM	6.34	TOBM	0			Tape	2	2.68	4.69	3.660		-1.030				0.000	0.000	-1.030	0.000	0.000
23-Jun-05	10-Aug-05	10-Aug-05	23-Jun-05	12/68	TPBM	6.34	TOBM	0			Tape	3	2.68	4.69	3.660		-1.030				0.000	0.000	-1.030	0.000	0.000
SL WL 01																									
Sensor SN: 4044402																									
19-Feb-04	16-Apr-04	19-Mar-04	19-Feb-04	1/144	TSCP	6.76	TSCP		0.4	2.06	SG	1	0.935	4.37		6.035		1.665	0.010	0.006			1.668	0.010	0.006
19-Feb-04	16-Apr-04	19-Mar-04	19-Feb-04	1/144	TSCP	6.76	TSCP		0.4	2.06	SG	2	0.93	4.35		6.030		1.680	0.010	0.006			1.668	0.010	0.006
19-Feb-04	16-Apr-04	19-Mar-04	19-Feb-04	1/144	TSCP	6.76	TSCP		0.4	2.06	SG	3	0.93	4.37		6.030		1.660	0.010	0.006			1.668	0.010	0.006
SL WL 02																									
Sensor SN: 4011557																									
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	1	1.455	1.08		5.515		4.435	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	2	1.455	1.05		5.515		4.465	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	3	1.44	1.05		5.500		4.450	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	4	1.36	0.98		5.420		4.440	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	5	1.35	0.97		5.410		4.440	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	25-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	1	1.75	1.39		5.810		4.420	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	25-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	2	1.745	1.38		5.805		4.425	0.016	0.006			4.437	0.016	0.006
05-Mar-04	16-Apr-04	25-Mar-04	05-Feb-04	3/62	TOCH	7.67	TOCH	0	-1.55	2.06	SG	3	1.73	1.37		5.790		4.420	0.016	0.006			4.437	0.016	0.006
Sensor SN: 16325																									
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/70	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	1	1.01	0.845		5.765		4.920	0.004	0.002			4.927	0.004	0.002
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/70	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	2	1.02	0.846		5.775		4.929	0.004	0.002			4.927	0.004	0.002
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/70	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	3	1.02	0.846		5.775		4.929	0.004	0.002			4.927	0.004	0.002

Sherman Lake - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/70	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	4	1.02	0.847		5.775		4.928	0.004	0.002			4.927	0.004	0.002
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/70	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	5	1.02	0.847		5.775		4.928	0.004	0.002			4.927	0.004	0.002
Sensor SN: 16325																									
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	1	0.99	0.802		5.745		4.943	0.003	0.002	0.003	0.002	4.916	0.028	0.011
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	2	0.99	0.808		5.745		4.937	0.003	0.002	0.003	0.002	4.916	0.028	0.011
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	3	1	0.813		5.755		4.942	0.003	0.002	0.003	0.002	4.916	0.028	0.011
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	1	0.395	0.802	5.695		4.893		0.003	0.002	0.003	0.002	4.916	0.028	0.011
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	2	0.395	0.808	5.695		4.887		0.003	0.002	0.003	0.002	4.916	0.028	0.011
07-Oct-04	09-Dec-04	09-Dec-04	07-Oct-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	3	0.385	0.813	5.705		4.892		0.003	0.002	0.003	0.002	4.916	0.028	0.011
Sensor SN: 16325																									
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	1	1.6	1.447		6.355		4.908	0.002	0.001	0.005	0.003	4.904	0.007	0.003
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	2	1.61	1.453		6.365		4.912	0.002	0.001	0.005	0.003	4.904	0.007	0.003
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	3	1.61	1.457		6.365		4.908	0.002	0.001	0.005	0.003	4.904	0.007	0.003
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	1	-0.26	1.447	6.350		4.903		0.002	0.001	0.005	0.003	4.904	0.007	0.003
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	2	-0.26	1.453	6.350		4.897		0.002	0.001	0.005	0.003	4.904	0.007	0.003
09-Dec-04	12-Jan-05	12-Jan-05	09-Dec-04	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	3	-0.26	1.457	6.350		4.893		0.002	0.001	0.005	0.003	4.904	0.007	0.003
Sensor SN: 16325																									
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	1	1.64	1.487		6.395		4.908	0.003	0.002	0.006	0.003	4.904	0.007	0.003
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	2	1.65	1.492		6.405		4.913	0.003	0.002	0.006	0.003	4.904	0.007	0.003
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	SG	3	1.65	1.496		6.405		4.909	0.003	0.002	0.006	0.003	4.904	0.007	0.003
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	1	-0.29	1.487	6.380		4.893		0.003	0.002	0.006	0.003	4.904	0.007	0.003
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	2	-0.3	1.492	6.390		4.898		0.003	0.002	0.006	0.003	4.904	0.007	0.003
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TOCH	7.67	TOGP	-1.58	-0.855	2.06	Tape	3	-0.31	1.496	6.400		4.904		0.003	0.002	0.006	0.003	4.904	0.007	0.003
Sensor SN: 16325																									
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	1	0.24	0.307		4.750		4.443	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	2	0.24	0.305		4.750		4.445	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	3	0.235	0.303		4.745		4.442	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	1	1.24	0.307	4.850		4.543		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	2	1.24	0.305	4.850		4.545		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	20-Apr-05	20-Apr-05	10/124	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	3	1.245	0.303	4.845		4.542		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	1	0.3	0.43		4.810		4.380	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	2	0.3	0.428		4.810		4.382	0.033	0.012	0.045	0.017	4.452	0.059	0.016

Sherman Lake - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	3	0.3	0.427		4.810		4.383	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	SG	4	0.3	0.426		4.810		4.384	0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	1	1.2	0.43	4.890		4.460		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	2	1.2	0.428	4.890		4.462		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	3	1.2	0.427	4.890		4.463		0.033	0.012	0.045	0.017	4.452	0.059	0.016
20-Apr-05	10-Aug-05	10-Aug-05	20-Apr-05	CS	TOCH	7.67	TOGP	-1.58	-1.1	2.06	Tape	4	1.21	0.426	4.880		4.454		0.033	0.012	0.045	0.017	4.452	0.059	0.016
SL WL 03																									
Sensor SN: 4011546																									
05-Feb-04	16-Apr-04	19-Mar-04	05-Feb-04	1/142	TPBM	6.57	TOBM		0.81	2.06	SG	1	0.45	0.31		5.770		5.460					5.460		
SL WL 04																									
Sensor SN: 4011559																									
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	1	1.2	0.93		5.840		4.910	0.009	0.004			4.920	0.009	0.004
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	2	1.2	0.93		5.840		4.910	0.009	0.004			4.920	0.009	0.004
05-Mar-04	16-Apr-04	05-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	3	1.195	0.92		5.835		4.915	0.009	0.004			4.920	0.009	0.004
05-Mar-04	16-Apr-04	19-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	1	1.398	1.11		6.038		4.928	0.009	0.004			4.920	0.009	0.004
05-Mar-04	16-Apr-04	19-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	2	1.385	1.1		6.025		4.925	0.009	0.004			4.920	0.009	0.004
05-Mar-04	16-Apr-04	19-Mar-04	05-Feb-04	3/60	TOCH	8.17	TOCH	0	-1.47	2.06	SG	3	1.38	1.09		6.020		4.930	0.009	0.004			4.920	0.009	0.004
Sensor SN: 16231																									
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/62	TOCH	8.17	TOCH	0.145	-1.125	2.06	SG	1	0.37	0.295		5.355		5.060	0.003	0.001			5.059	0.003	0.001
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/62	TOCH	8.17	TOCH	0.145	-1.125	2.06	SG	2	0.37	0.299		5.355		5.056	0.003	0.001			5.059	0.003	0.001
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/62	TOCH	8.17	TOCH	0.145	-1.125	2.06	SG	3	0.38	0.304		5.365		5.061	0.003	0.001			5.059	0.003	0.001
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/62	TOCH	8.17	TOCH	0.145	-1.125	2.06	SG	4	0.38	0.309		5.365		5.056	0.003	0.001			5.059	0.003	0.001
25-Jun-04	16-Sep-04	16-Sep-04	25-Jun-04	7/62	TOCH	8.17	TOCH	0.145	-1.125	2.06	SG	5	0.39	0.313		5.375		5.062	0.003	0.001			5.059	0.003	0.001
Sensor SN: 16391																									
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	SG	1	0.985	0.901		5.970		5.069	0.003	0.002	0.000	0.000	5.057	0.009	0.004
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	SG	2	0.98	0.901		5.965		5.064	0.003	0.002	0.000	0.000	5.057	0.009	0.004
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	SG	3	0.98	0.901		5.965		5.064	0.003	0.002	0.000	0.000	5.057	0.009	0.004
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	Tape	1	0.63	0.901	5.950		5.049		0.003	0.002	0.000	0.000	5.057	0.009	0.004
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	Tape	2	0.63	0.901	5.950		5.049		0.003	0.002	0.000	0.000	5.057	0.009	0.004
07-Oct-04	04-Jan-05	09-Dec-04	07-Oct-04	CalibS	TSCP	6.58	TSCP	0	0.465	2.06	Tape	3	0.63	0.901	5.950		5.049		0.003	0.002	0.000	0.000	5.057	0.009	0.004

Sherman Lake - Channel and Marsh Plain Water Level Offset Field Calibration Detail Sheet

Calib Start Date	Calib End Date	Field Calib Date	Session Start Date	Field Bk/Pg	Srvy Pt ID	Srvy Pt Elev Ft-NAVD	Cal Pt Name	Cal Pt Offset Ft	Rel Hght TOSG Ft	SG Ft	Method	Rep	Field Value Ft	Corr Sensor Value	Sol-Tape WSE Ft-NAVD	SG WSE Ft-NAVD	Sol-Tape Sensor Offset Ft	SG Sensor Offset Ft	StDev SG Sensor Offset	StErr SG Sensor Offset	StDev SolTape-Sensor Offset	StErr SolTape-Sensor Offset	Avg Sensor Offset Ft	StDev Sensor Offset	StErr Sensor Offset
Sensor SN: 16391																									
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	1	0.85	0.789		5.835		5.046	0.003	0.002	0.003	0.002	5.071	0.028	0.011
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	2	0.86	0.796		5.845		5.049	0.003	0.002	0.003	0.002	5.071	0.028	0.011
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	3	0.86	0.802		5.845		5.043	0.003	0.002	0.003	0.002	5.071	0.028	0.011
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	1	2.43	0.789	5.885		5.096		0.003	0.002	0.003	0.002	5.071	0.028	0.011
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	2	2.42	0.796	5.895		5.099		0.003	0.002	0.003	0.002	5.071	0.028	0.011
04-Jan-05	12-Jan-05	12-Jan-05	04-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	3	2.42	0.802	5.895		5.093		0.003	0.002	0.003	0.002	5.071	0.028	0.011
Sensor SN: 16391																									
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	1	0.95	0.892		5.935		5.043	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	2	0.95	0.896		5.935		5.039	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	3	0.955	0.9		5.940		5.040	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	1	2.33	0.892	5.985		5.093		0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	2	2.33	0.896	5.985		5.089		0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	12-Jan-05	12-Jan-05	CalibS	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	3	2.32	0.9	5.995		5.095		0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	1	0.96	0.906		5.945		5.039	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	2	0.94	0.893		5.925		5.032	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	3	0.935	0.884		5.920		5.036	0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	1	2.34	0.906	5.975		5.069		0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	2	2.36	0.893	5.955		5.062		0.004	0.002	0.014	0.006	5.059	0.024	0.007
12-Jan-05	08-Feb-05	08-Feb-05	12-Jan-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	3	2.36	0.884	5.955		5.071		0.004	0.002	0.014	0.006	5.059	0.024	0.007
Sensor SN: 16391																									
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	1	0.91	0.856		5.895		5.039	0.002	0.001	0.001	0.001	5.054	0.016	0.006
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	2	0.91	0.853		5.895		5.042	0.002	0.001	0.001	0.001	5.054	0.016	0.006
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	SG	3	0.9	0.847		5.885		5.038	0.002	0.001	0.001	0.001	5.054	0.016	0.006
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	1	2.39	0.856	5.925		5.069		0.002	0.001	0.001	0.001	5.054	0.016	0.006
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	2	2.395	0.853	5.920		5.067		0.002	0.001	0.001	0.001	5.054	0.016	0.006
08-Feb-05	10-Aug-04	08-Feb-05	08-Feb-05	11/81	TSCP	8.17	TOCH	0.145	-1.125	2.06	Tape	3	2.4	0.847	5.915		5.068		0.002	0.001	0.001	0.001	5.054	0.016	0.006

Table 8: Soil Analytes and Methods

Test Description	**SOP**	**Method**
Total Nitrogen	320	972.43. Official Methods of Analysis of AOAC International, 16th Edition (1997), AOAC International, Arlington, VA.
Total Carbon	320	972.43. Official Methods of Analysis of AOAC International, 16th Edition (1997), AOAC International, Arlington, VA.
pH	205	U.S. Salinity Laboratory Staff. 1954. pH reading of saturated soil paste. p. 102. *In:* L. A. Richards (ed.) Diagnosis and improvement of saline and alkali soils. USDA Agricultural Handbook 60. U.S. Government Printing Office, Washington, D.C
Estimated Soluble Salts (ECe)	215	Rhoades, J. D. 1982. Soluble salts. p. 167-179. *In:* A. L. Page et al. (ed.) Methods of soil analysis: Part 2: Chemical and microbiological properties. Monograph Number 9 (Second Edition). ASA, Madison, WI
Organic Matter	410	Nelson, D. W. and L. E. Sommers. 1982. Total carbon, organic carbon and organic matter. p. 539-579. *In:* A. L. Page et al. (ed.) Methods of soil analysis: Part 2. Chemical and microbiological properties. ASA Monograph Number 9.
Carbon Organic	410	Nelson, D. W. and L. E. Sommers. 1982. Total carbon, organic carbon and organic matter. p. 539-579. *In:* A. L. Page et al. (ed.) Methods of soil analysis: Part 2. Chemical and microbiological properties. ASA Monograph Number 9.
Particle Size (Sand/Silt/Clay)	470	Sheldrick, B. H. and Wang, C. 1993. Particle-size Distribution. pp. 499-511. In: Carter, M. R. (ed), Soil Sampling and Methods of Analysis, Canadian Society of Soil Science, Lewis Publishers, Ann Arbor, MI.
Bulk Density	480	Blake, G. R. and K. H. Hartge, 1986. Bulk density. p. 363-375. In: A. Klute et al. (ed.) Methods of soil analysis: Part 1: Physical and Mineralogical Methods. Monograph Number 9 (Second Edition). ASA, Madison, WI.

Notes:
The standard operating procedure (SOP) number is a reference to the laboratory method used. A description of methods is available at http://groups.ucanr.org/danranlab/Soil_Analysis/index.htm
Total nitrogen, total carbon, pH, and ECe analyses by UC Davis, Horwath soils laboratory.
Organic matter, percent organic carbon, and sand, silt and clay analyses by University of California, ANR laboratory.
Bulk Density analyses by University of San Francisco, Callaway laboratory.

Table 9
Integrated Regional Wetland Monitoring Pilot Project
Primary and Secondary Benchmark Survey Points

Site	Location	Station	Northin UTM Z10 Meters	Easting UTM Z10 Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
BrI														
BrI	CTDS_XS-01	PBM-01	4211127.81	599041.42	6.17	1	GPS_Static	GPS_Static	WWR	Tucker	05/13/04	PPT	BME	
BrI	CTDS_XS-01	PBM-01			6.17	2		Optical	WWR	Avent	08/10/05	PPT	BME	
BrI	CTDS_XS-01	SBM-01-TSCP	4211123.18	599011.23	7.10	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	CTDS_XS-01	SBM-01-TSCP			7.05	2		Optical	WWR	WWR	08/10/05	PPT	BME	
BrI	CTDS_XS-01	SBM-02-EPLB	4211132.38	599013.00	6.72	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	CTDS_XS-01	SBM-02-EPLB			6.67	2		Optical	WWR	Avent	08/10/05	PPT	BME	
BrI	CTDS_XS-01	SBM-03-EPRB	4211132.50	599041.02	7.20	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	CTDS_XS-01	SBM-03-EPRB			7.19	2		Optical	WWR	WWR	08/10/05	PPT	BME	
BrI	WL-01	SBM-12-TOGP	4211121.51	599391.85	11.27	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	WL-01	SBM-12-TOGP	4211121.50	599391.84	11.27	2	Total Station	Total Station	WWR	Kulpa	05/01/05	PPT	BME	
BrI	WL-01	SBM-13-TSCP	4211120.30	599391.14	8.65	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	WL-01	SBM-13-TSCP	4211120.30	599391.14	8.65	2	Total Station	Total Station	WWR	Kulpa	05/01/05	PPT	BME	
BrI	WL-02	SBM-14-TOGP	4211154.12	600009.03	7.99	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	WL-02	SBM-14-TOGP	4211154.12	600009.03	7.99	2	Total Station	Total Station	WWR	Kulpa	05/09/05	PPT	BME	
BrI	WL-02	SBM-15-TSCP	4211152.32	600007.36	6.99	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	WL-02	SBM-15-TSCP	4211152.32	600007.36	6.99	2	Total Station	Total Station	WWR	Kulpa	05/09/05	PPT	BME	
BrI	WL-03	PBM-03	4210601.83	599975.19	5.61	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BrI	WL-03	PBM-03	4210601.83	599975.19	5.23	2	Total Station	Total Station	WWR	Kulpa	05/23/05	PPT	BME	
BrI	WL-03	SBM-16-TOGP	4210572.73	600028.48	6.54	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
Brl	WL-03	SBM-16-TOGP	4210572.72	600028.47	6.54	2	Total Station	Total Station	WWR	Kulpa	05/23/05	PPT	BME	
Brl	WL-03	SBM-20-TSCP	4210572.71	600030.32	6.14	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-03	SBM-20-TSCP	4210572.71	600030.32	6.14	2	Total Station	Total Station	WWR	Kulpa	05/23/05	PPT	BME	
Brl	WL-04	SBM-17-TOGP	4210831.31	598974.88	10.04	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-04	SBM-17-TOGP	4210831.30	598974.87	10.04	2	Total Station	Total Station	WWR	Kulpa	05/01/05	PPT	BME	
Brl	WL-04	SBM-18-TSCP	4210833.96	598972.88	7.23	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-04	SBM-18-TSCP	4210833.96	598972.88	7.23	2	Total Station	Total Station	WWR	Kulpa	05/01/05	PPT	BME	
Brl	WL-05_XS-04	SBM-09-EPLB	4210728.96	600096.52	7.33	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-05_XS-04	SBM-10-EPRB	4210769.48	600089.09	6.65	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-05_XS-04	SBM-11-TSCP	4210770.23	600083.12	7.10	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	WL-05_XS-04	SBM-19-TOGP	4210765.22	600102.85	8.37	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-02	PBM-02	4210756.17	599182.43	5.73	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-02	SBM-04-EPLB	4210750.97	599182.34	6.51	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-02	SBM-05-EPRB	4210755.70	599208.69	7.54	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-03	SBM-06-EPLB	4210786.39	599573.91	6.31	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-03	SBM-07-EPRB	4210811.34	599559.15	7.69	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
Brl	XS-03	SBM-08-TSCP	4210811.79	599564.21	6.04	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/13/04	PPT	BME	
BuI														
Bul	CTDS_XS-01	PBM-04	4230486.54	560508.02	6.89	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	CTDS_XS-01	SBM-01-EPLB	4230488.06	560507.34	8.17	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	CTDS_XS-01	SBM-02-EPRB	4230502.46	560478.75	8.25	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	CTDS_XS-01	SBM-02-EPRB			8.25	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	PBM-01	PBM-01	4231133.00	560817.81	7.09	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	PBM-02	PBM-02	4230916.61	561037.84	9.19	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
Bul	PBM-03	PBM-03	4230335.44	561062.88	8.65	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-01	SBM-15-TOGP	4230945.38	560766.22	10.36	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-01	SBM-15-TOGP			10.30	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	WL-01	SBM-16-TSCP	4230947.70	560763.42	9.74	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-01	SBM-16-TSCP			9.73	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	WL-02	SBM-17-TOGP	4230777.54	560913.39	8.98	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-02	SBM-17-TOGP	4230777.57	560913.38	8.94	2	Total Station	Total Station	WWR	Kulpa	06/01/05	PPT	BME	
Bul	WL-02	SBM-18-TSCP	4230776.53	560913.85	7.46	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-03	SBM-19-TOGP	4230454.27	560755.54	9.71	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-03	SBM-19-TOGP			9.63	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	WL-03	SBM-20-TSCP	4230447.74	560753.65	8.29	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-03	SBM-20-TSCP			8.23	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	WL-04_XS-04	SBM-09-EPLB	4230874.04	561006.20	7.63	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-04_XS-04	SBM-10-EPRB	4230875.27	561001.79	8.40	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-04_XS-04	SBM-11-TSCP	4230865.22	561006.19	7.62	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	WL-04_XS-04	SBM-21-TOGP	4230876.80	561003.50	6.78	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-02	SBM-03-EPLB	4230639.79	560631.69	9.20	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-02	SBM-04-EPRB	4230650.35	560605.56	8.21	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-02	SBM-04-EPRB			8.19	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	XS-02	SBM-05-TSCP	4230650.61	560605.49	9.23	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-02	SBM-05-TSCP			9.21	2		Total Station	WWR	Kulpa	03/14/05	PPT	BME	
Bul	XS-03	SBM-06-EPLB	4230736.50	560861.84	8.88	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-03	SBM-07-EPRB	4230750.45	560854.86	7.56	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-05	SBM-12-EPLB	4230583.00	560836.91	8.36	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
Bul	XS-05	SBM-13-EPRB	4230604.37	560832.60	7.72	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
Bul	XS-05	SBM-14-TSCP	4230582.00	560832.83	7.90	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/06/04	PPT	BME	
CI														
CI	CTDS_XS-03	PBM-02	4227308.13	558942.71	6.90	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	CTDS_XS-03	PBM-02	4227308.27	558943.47	6.70	2	Total Station	Total Station	WWR	Kulpa	04/15/05	PPT	BME	
CI	CTDS_XS-03	SBM-04-EPLB	4227283.69	558955.26	7.87	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	CTDS_XS-03	SBM-04-EPLB			7.96	2		Optical	WWR	Kulpa	06/20/05	PPT	BME	
CI	CTDS_XS-03	SBM-05-EPRB	4227303.88	558945.63	8.69	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	CTDS_XS-03	SBM-05-EPRB			8.69	2		Optical	WWR	Kulpa	06/20/05	PPT	BME	
CI	PBM-04	PBM-04	4227721.49	559479.00	7.23	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	PBM-04	PBM-04	4227721.49	559478.99	7.23	2	Total Station	Total Station	WWR	Kulpa	03/31/05	PPT	BME	
CI	PBM-05	PBM-05	4228177.14	558755.65	7.88	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-01	SBM-15-TOGP	4227522.15	558856.88	7.92	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-01	SBM-16-TSCP	4227520.08	558858.24	6.58	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-02	PBM-03	4227042.39	559703.18	8.08	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-02	PBM-03	4227044.65	559703.43	7.95	2	Total Station	Total Station	WWR	Kulpa	04/15/05	PPT	BME	Very long distance survey shot.
CI	WL-02	SBM-17-TOGP	4227063.71	559540.15	8.38	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-02	SBM-20-TSCP	4227061.01	559543.95	7.51	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-03	SBM-18-TOGP	4228583.24	558941.83	7.62	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-03	SBM-18-TOGP	4228583.24	558941.83	7.62	2		Total Station	WWR	Kulpa	06/01/05	PPT	BME	
CI	WL-03	SBM-21-TSCP	4228582.38	558941.47	7.71	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	WL-04	SBM-19-TOGP	4227815.25	558963.70	6.99	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-02	SBM-01-EPRB	4228112.24	559019.52	8.56	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
CI	XS-02	SBM-02-EPLB	4228116.44	558987.78	8.13	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-02	SBM-03-TSCP	4228114.01	559022.25	8.06	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-04	SBM-06-EPLB	4227441.55	559110.85	7.71	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-04	SBM-07-EPRB	4227462.23	559109.69	8.98	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-05	SBM-09-EPLB	4227845.86	558904.68	8.97	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-05_XS-06	SBM-08-EPRB/LB	4227834.49	558927.49	7.34	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-06	SBM-11-EPRB	4227821.89	558924.60	9.78	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-06	SBM-12-TSCP	4227818.89	558918.82	6.75	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-06	SBM-12-TSCP	4227818.89	558918.82	6.75	2		Total Station	WWR	Kulpa	03/31/05	PPT	BME	
CI	XS-07	PBM-01	4228277.41	559051.43	6.87	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-07	SBM-13-EPRB	4228275.84	559047.33	7.67	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CI	XS-07	SBM-14-EPLB	4228313.00	559028.45	9.48	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/05/04	PPT	BME	
CM														
CM	AC-01	AC-01	4219784.99	543232.29	10.59	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-02	AC-02	4219652.49	543226.49	10.24	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-03	AC-03	4219540.44	543242.69	9.35	1	Total Station	Optical	WWR	Kulpa	03/11/04	PPT	GSE	
CM	AC-04	AC-04	4219487.69	543420.88	10.79	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-05	AC-05	4219236.14	543365.50	10.33	1	Total Station	Optical	WWR	Kulpa	03/11/04	PPT	GSE	
CM	AC-06	AC-06	4219144.46	543407.05	10.78	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-07	AC-07	4219042.61	543473.02	10.11	1	Total Station	Optical	WWR	Kulpa	03/11/04	PPT	GSE	
CM	AC-08	AC-08	4218990.72	543337.21	7.08	1	GPS_PPK	GPS_PPK	WWR	Tucker	07/19/05	PPT	GSE	
CM	AC-09	AC-09	4219242.40	543184.02	6.59	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-10	AC-10	4219129.02	543244.10	6.72	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-11	AC-11	4219347.31	543138.60	6.65	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
CM	AC-12	AC-12	4219446.40	543100.97	6.63	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-13	AC-13	4219556.47	543066.50	6.67	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-14	AC-14	4219661.23	543037.20	6.50	1	GPS_PPK	GPS_PPK	WWR	Tucker	07/19/05	PPT	GSE	
CM	AC-15	AC-15	4219838.70	543098.89	8.78	1	Total Station	Total Station	WWR	Siegel	08/01/99	PPT	GSE	
CM	AC-16	AC-16	4219331.19	543361.26	10.42	1	Total Station	Optical	WWR	Kulpa	03/11/04	PPT	GSE	
CM	AC-17	AC-17-TOGP	4219961.85	543161.36	10.71	1	GPS_PPK	GPS_PPK	WWR	Tucker	07/19/05	PPT	BME	
CM	CTDS_XS-02	SBM-04-TOAI	4219102.50	543402.81	8.95	1	Total Station	Total Station	WWR	Kulpa	01/14/04	PPT	BME	
CM	CTDS_XS-02	SBM-04-TOAI	4219102.59	543403.40	8.94	2	GPS_PPK	GPS_PPK	WWR	Tucker	02/15/05	PPT	BME	
CM	CTDS_XS-02	SBM-04-TOAI	4219102.50	543402.81	8.88	3	Total Station	Total Station	WWR	Avent	08/31/05	PPT	BME	WWR SBM719C held fixed; Survey loop not closed.
CM	PBM-01	PBM-01-Bridge	4218953.09	543532.97	7.72	1	Total Station	Total Station	WWR	Siegel	03/01/97	PPT	BME	
CM	WL-01	SBM-01-TOGP	4219464.10	543320.48	8.38	1	Total Station	Total Station	WWR	Kulpa	12/10/03	PPT	BME	
CM	WL-01	SBM-01-TOGP	4219462.77	543316.75	8.22	2	Total Station	Total Station	WWR	Kulpa	04/28/05	PPT	BME	
CM	WL-02	SBM-02-TOGP	4219687.00	543154.06	9.46	1	Total Station	Total Station	WWR	Kulpa	12/10/03	PPT	BME	
CM	WL-02	SBM-02-TOGP	4219687.00	543154.06	9.38	2	Total Station	Total Station	WWR	WWR	08/22/05	PPT	BME	
CM	WL-03_XS-05	SBM-03-TOAI	4219399.47	543317.03	9.10	1	Total Station	Total Station	WWR	Kulpa	12/10/03	PPT	BME	
CM	WL-03_XS-05	SBM-03-TOAI	4219399.47	543317.03	9.09	2	Total Station	Total Station	WWR	WWR	08/31/05	PPT	BME	WWR SBM719A held fixed
P2A														
P2A	CTDS_XS-03	PBM-01	4222918.00	559856.94	6.45	1	Total Station	Total Station	WWR	WWR	04/14/04	PPT	BME	
P2A	CTDS_XS-03	SBM-09-TSCP	4222917.69	559848.79	7.69	1	GPS_RTK	GPS_RTK	WWR	Newton	01/11/04	PPT	BME	
P2A	WL-01	SBM-13-TOGP	4222494.00	558991.69	7.90	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-01	SBM-13-TOGP	4222494.50	558989.17	7.93	2	Total Station	Total Station	WWR	Kulpa	05/27/05	PPT	BME	
P2A	WL-01	SBM-20-TSCP	4222494.00	558991.69	8.42	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-01	SBM-20-TSCP	4222494.54	558992.01	8.45	2	Total Station	Total Station	WWR	Kulpa	05/27/05	PPT	BME	

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
P2A	WL-02	SBM-15-TOGP	4222984.00	559324.00	7.72	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-02	SBM-15-TOGP	4222982.92	559322.91	7.68	2	Total Station	Total Station	WWR	Kulpa	05/27/05	PPT	BME	
P2A	WL-02	SBM-16-TSCP	4222981.54	559323.34	7.25	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-02	SBM-16-TSCP	4222982.04	559323.51	7.20	2	Total Station	Total Station	WWR	Kulpa	05/27/05	PPT	BME	
P2A	WL-03	SBM-17-TOGP	4222937.50	560189.06	8.35	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-03	SBM-19-TSCP	4222937.50	560189.06	6.99	1	GPS_GeoXT	Optical	WWR	WWR	04/14/04	PPT	BME	
P2A	WL-04_XS-01	SBM-01-TSCP	4222995.34	558783.81	7.74	1	GPS_RTK	GPS_RTK	WWR	Newton	01/11/04	PPT	BME	
P2A	WL-04_XS-01	SBM-18-Notch	4222986.50	558769.13	8.80	1	Total Station	Optical	WWR	WWR	04/07/04	PPT	BME	
P2A	XS-02	SBM-05-EPRB	4222766.90	559209.00	7.68	1	GPS_RTK	GPS_RTK	WWR	Newton	01/11/04	PPT	BME	
P2A	XS-02	SBM-05-EPRB	4222766.85	559208.96	7.65	2	Total Station	Total Station	WWR	Kulpa	05/27/05	PPT	BME	
P2A	XS-02	SBM-06-TSCP	4222763.29	559232.22	7.58	1	GPS_RTK	GPS_RTK	WWR	Newton	01/11/04	PPT	BME	
P2A	XS-02	SBM-06-TSCP	4222763.28	559232.26	7.60	2	Total Station	Total Station	WWR	Kupla	05/27/05	PPT	BME	
P2A	XS-04	PBM-02	4222648.00	560139.75	9.75	1	GPS_GeoXT	Total Station	WWR	WWR	04/14/04	PPT	BME	
SL														
SL	CTDS_XS-01	PBM-01	4211582.48	603988.17	6.34	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	CTDS_XS-01	SBM-01-EPLB-TSCP	4211585.22	603987.55	5.88	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	PBM-02	PBM-02	4211330.84	602939.10	5.60	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	PBM-04	PBM-04	4212905.20	602222.59	8.36	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/04/04	PPT	BME	
SL	WL-01_XS-04	SBM-10-EPLB-TSCP	4212093.98	603525.25	6.14	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-01_XS-04	SBM-11-EPRB	4212085.04	603519.84	5.70	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-01_XS-04	SBM-12-TSCP	4212085.85	603517.58	6.53	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-01_XS-04	SBM-14-TSCP	4212071.54	603560.68	6.76	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-02	SBM-15-TOCH	4211916.18	603830.44	7.67	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-02	SBM-15-TOCH	4211916.18	603830.44	9.13	2	Total Station	Total Station	WWR	Kulpa	05/23/05	PPT	BME	New WL setup

Site	Locatio	Station	Northin UTM Z10	Easting Meters	Elev.(ft) NAVD88	Rep	Horz. Method	Vert. Method	Org	Surveyor	Date	Team	Parameter	Notes
SL	WL-02	SBM-16-TSCP	4211915.89	603831.81	6.06	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-02	SBM-16-TSCP	4211915.89	603831.81	6.06	2	Total Station	Total Station	WWR	Kulpa	05/23/05	PPT	BME	
SL	WL-03	PBM-03	4212309.19	603398.37	6.57	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-03	SBM-17-TOSG	4212310.74	603393.64	8.82	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-04	SBM-18-TOCH	4211798.77	603692.04	8.17	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	WL-04	SBM-19-TSCP	4211798.52	603692.99	6.58	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	XS-02	SBM-04-EPLB	4211910.56	603685.01	4.80	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	XS-02	SBM-05-EPRB	4211897.88	603675.99	7.85	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	XS-02	SBM-06-TSCP	4211916.54	603687.97	7.18	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	XS-03	SBM-08-EPRB-TOGP	4212122.17	603621.10	6.83	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	
SL	XS-03	SBM-09-TSCP	4212116.77	603622.77	5.48	1	GPS_PPK	GPS_PPK	WWR	Tucker	05/12/04	PPT	BME	

Table 10. Vegetation-Elevation Transects Summary Statistics

		Elevation units = Ft NAVD88				
Site	Count	Minimum	Mean	Median	Maximum	StdDev
Carl's Marsh	302	2.91	5.47	5.52	7.65	0.47
Pond 2A	378	2.14	5.65	5.70	6.91	0.51
Coon Island	942	1.94	6.19	6.17	7.61	0.66
Bull Island	401	4.09	6.18	6.23	6.92	0.35
Browns Island	707	4.05	5.78	5.86	6.49	0.33
Sherman Lake	103	4.35	4.73	4.74	5.71	0.15

Note: Surveys conducted using a TopCon Total Station instrument

Table 11.1

Carl's Marsh
Channel Cross-Sections Survey Results

Cross Section 02

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4219125.56	543418.50	8.99	WWR	6	Left Bank at east PVC	3/11/2004	WWR	Total Station
XS	02	Ground surface	4219124.28	543416.70	7.23	WWR	7		3/11/2004	WWR	Total Station
XS	03	Ground surface	4219123.80	543415.74	6.27	WWR	8		3/11/2004	WWR	Total Station
XS	04	Ground surface	4219123.02	543414.55	6.10	WWR	9		3/11/2004	WWR	Total Station
XS	05	Ground surface	4219121.55	543412.11	5.82	WWR	10		3/11/2004	WWR	Total Station
XS	06	Ground surface	4219119.42	543408.72	4.64	WWR	11		3/11/2004	WWR	Total Station
XS	07	Ground surface	4219118.44	543407.39	3.09	WWR	12		3/11/2004	WWR	Total Station
XS	08	Ground surface	4219117.60	543406.12	2.35	WWR	13		3/11/2004	WWR	Total Station
XS	09	Ground surface	4219116.76	543405.13	1.98	WWR	14	Thalweg	3/11/2004	WWR	Total Station
XS	10	Ground surface	4219116.23	543403.83	2.39	WWR	15		3/11/2004	WWR	Total Station
XS	11	Ground surface	4219115.41	543402.75	2.63	WWR	16		3/11/2004	WWR	Total Station
XS	12	Ground surface	4219113.36	543399.53	3.78	WWR	17		3/11/2004	WWR	Total Station
XS	13	Ground surface	4219112.04	543397.87	4.78	WWR	18	Edge of cordgrass	3/11/2004	WWR	Total Station
XS	14	Ground surface	4219111.45	543396.90	5.40	WWR	19		3/11/2004	WWR	Total Station
XS	15	Ground surface	4219110.72	543395.92	5.73	WWR	20		3/11/2004	WWR	Total Station
XS	16	Ground surface	4219108.54	543392.61	6.08	WWR	21		3/11/2004	WWR	Total Station

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4218948.42	543371.64	6.57	WWR	34	Left bank	3/11/2004	WWR	Total Station
XS	02	Ground surface	4218950.73	543369.82	7.27	WWR	33		3/11/2004	WWR	Total Station
XS	03	Ground surface	4218952.18	543368.91	8.41	WWR	32		3/11/2004	WWR	Total Station
XS	04	Ground surface	4218953.96	543367.43	8.70	WWR	31		3/11/2004	WWR	Total Station
XS	05	Ground surface	4218954.33	543367.11	7.44	WWR	30		3/11/2004	WWR	Total Station
XS	06	Ground surface	4218954.92	543366.82	4.81	WWR	29		3/11/2004	WWR	Total Station
XS	07	Ground surface	4218955.81	543366.30	4.45	WWR	28		3/11/2004	WWR	Total Station
XS	08	Ground surface	4218957.01	543364.15	3.21	WWR	27		3/11/2004	WWR	Total Station
XS	09	Ground surface	4218959.36	543363.17	2.22	WWR	26		3/11/2004	WWR	Total Station
XS	10	Ground surface	4218962.31	543360.35	1.81	WWR	25		3/11/2004	WWR	Total Station
XS	11	Ground surface	4218963.63	543359.04	1.35	WWR	24		3/11/2004	WWR	Total Station
XS	12	Ground surface	4218964.85	543358.46	1.58	WWR	23		3/11/2004	WWR	Total Station
XS	13	Ground surface	4218965.94	543357.79	2.39	WWR	22		3/11/2004	WWR	Total Station
XS	14	Ground surface	4218966.53	543357.22	3.32	WWR	21		3/11/2004	WWR	Total Station
XS	15	Ground surface	4218967.29	543356.66	5.11	WWR	20		3/11/2004	WWR	Total Station
XS	16	Ground surface	4218967.30	543356.50	6.82	WWR	19		3/11/2004	WWR	Total Station
XS	17	Ground surface	4218969.21	543355.17	7.02	WWR	18	Right Bank	3/11/2004	WWR	Total Station

Table 11.1

Carl's Marsh
Channel Cross-Sections Survey Results

Cross Section 04

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4219711.23	543026.10	6.56	WWR	17	Left bank	3/11/2004	WWR	Total Station
XS	02	Ground surface	4219713.30	543026.16	6.32	WWR	18		3/11/2004	WWR	Total Station
XS	03	Ground surface	4219714.17	543026.21	5.92	WWR	19		3/11/2004	WWR	Total Station
XS	04	Ground surface	4219714.38	543026.20	4.97	WWR	20		3/11/2004	WWR	Total Station
XS	05	Ground surface	4219715.85	543026.53	4.34	WWR	21		3/11/2004	WWR	Total Station
XS	06	Ground surface	4219717.09	543026.40	3.82	WWR	22		3/11/2004	WWR	Total Station
XS	07	Ground surface	4219720.94	543026.42	2.26	WWR	23		3/11/2004	WWR	Total Station
XS	08	Ground surface	4219721.24	543026.35	2.35	WWR	24		3/11/2004	WWR	Total Station
XS	09	Ground surface	4219723.44	543026.49	2.57	WWR	25		3/11/2004	WWR	Total Station
XS	10	Ground surface	4219726.79	543026.59	3.99	WWR	26		3/11/2004	WWR	Total Station
XS	11	Ground surface	4219727.62	543026.60	4.07	WWR	27		3/11/2004	WWR	Total Station
XS	12	Ground surface	4219728.37	543026.63	4.42	WWR	28		3/11/2004	WWR	Total Station

Cross Section 05

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4219401.81	543336.52	5.47	WWR	43	Left bank	3/11/2004	WWR	Total Station
XS	02	Ground surface	4219402.60	543331.28	5.59	WWR	42		3/11/2004	WWR	Total Station
XS	03	Ground surface	4219403.73	543326.04	5.56	WWR	41		3/11/2004	WWR	Total Station
XS	04	Ground surface	4219404.36	543324.39	5.17	WWR	40	Edge of pickleweed	3/11/2004	WWR	Total Station
XS	05	Ground surface	4219404.59	543322.12	3.57	WWR	39		3/11/2004	WWR	Total Station
XS	06	Ground surface	4219404.65	543320.53	2.79	WWR	38		3/11/2004	WWR	Total Station
XS	07	Ground surface	4219404.91	543319.09	3.16	WWR	37		3/11/2004	WWR	Total Station
XS	08	Ground surface	4219405.49	543318.32	4.09	WWR	36		3/11/2004	WWR	Total Station
XS	09	Ground surface	4219405.79	543317.42	4.72	WWR	35	Edge of pickleweed	3/11/2004	WWR	Total Station
XS	10	Ground surface	4219406.12	543315.56	5.50	WWR	34		3/11/2004	WWR	Total Station
XS	11	Ground surface	4219406.87	543312.74	5.73	WWR	33		3/11/2004	WWR	Total Station
XS	12	Ground surface	4219407.61	543309.29	5.70	WWR	32	Right bank	3/11/2004	WWR	Total Station

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 11.2

Pond 2A
Channel Cross-Sections Survey Results

Cross Section 01

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	Srvy Date	Surveyor	Srvy Type
XS	01	Ground surface	4222936.16	558801.24	5.88	WWR	400	Left bank (east)	12/19/2003	WWR	Hydrographic
XS	02	Ground surface	4222936.53	558798.22	5.83	WWR	401		12/19/2003	WWR	Hydrographic
XS	03	Ground surface	4222936.50	558794.52	5.51	WWR			12/19/2003	WWR	Hydrographic
XS	04	Ground surface	4222937.19	558794.08	4.96	WWR	16		12/19/2003	WWR	Hydrographic
XS	05	Ground surface	4222937.23	558793.56	4.86	WWR	4		12/19/2003	WWR	Hydrographic
XS	06	Ground surface	4222937.33	558793.23	4.56	WWR	5		12/19/2003	WWR	Hydrographic
XS	07	Ground surface	4222937.31	558792.96	4.46	WWR	3		12/19/2003	WWR	Hydrographic
XS	08	Ground surface	4222937.39	558792.68	4.26	WWR	6		12/19/2003	WWR	Hydrographic
XS	09	Ground surface	4222937.43	558792.10	3.97	WWR	8		12/19/2003	WWR	Hydrographic
XS	10	Ground surface	4222937.54	558791.42	4.11	WWR	10		12/19/2003	WWR	Hydrographic
XS	11	Ground surface	4222937.60	558791.09	3.79	WWR	11		12/19/2003	WWR	Hydrographic
XS	12	Ground surface	4222937.65	558790.71	3.07	WWR	12		12/19/2003	WWR	Hydrographic
XS	13	Ground surface	4222937.74	558790.31	3.16	WWR	13		12/19/2003	WWR	Hydrographic
XS	14	Ground surface	4222937.70	558789.87	3.04	WWR	14		12/19/2003	WWR	Hydrographic
XS	15	Ground surface	4222937.81	558789.03	1.97	WWR	21		12/19/2003	WWR	Hydrographic
XS	16	Ground surface	4222937.92	558788.50	1.03	WWR	24		12/19/2003	WWR	Hydrographic
XS	17	Ground surface	4222938.02	558788.00	0.96	WWR	23		12/19/2003	WWR	Hydrographic
XS	18	Ground surface	4222938.11	558787.39	0.46	WWR	27		12/19/2003	WWR	Hydrographic
XS	19	Ground surface	4222938.20	558786.79	-0.09	WWR	29		12/19/2003	WWR	Hydrographic
XS	20	Ground surface	4222938.32	558785.46	-0.12	WWR	31		12/19/2003	WWR	Hydrographic
XS	21	Ground surface	4222938.59	558784.17	-0.17	WWR	32		12/19/2003	WWR	Hydrographic
XS	22	Ground surface	4222938.76	558782.91	-0.02	WWR	33		12/19/2003	WWR	Hydrographic
XS	23	Ground surface	4222938.86	558781.70	-0.39	WWR	34		12/19/2003	WWR	Hydrographic
XS	24	Ground surface	4222939.11	558780.52	-0.69	WWR	35		12/19/2003	WWR	Hydrographic
XS	25	Ground surface	4222939.25	558779.34	-0.27	WWR	36		12/19/2003	WWR	Hydrographic
XS	26	Ground surface	4222939.38	558778.24	0.18	WWR	38		12/19/2003	WWR	Hydrographic
XS	27	Ground surface	4222939.52	558777.17	0.33	WWR	40		12/19/2003	WWR	Hydrographic
XS	28	Ground surface	4222939.69	558776.17	0.61	WWR	41		12/19/2003	WWR	Hydrographic
XS	29	Ground surface	4222939.78	558775.27	0.86	WWR	44		12/19/2003	WWR	Hydrographic
XS	30	Ground surface	4222939.88	558774.59	0.83	WWR	39		12/19/2003	WWR	Hydrographic
XS	31	Ground surface	4222939.95	558774.19	1.23	WWR	42		12/19/2003	WWR	Hydrographic
XS	32	Ground surface	4222940.02	558773.93	1.56	WWR	43		12/19/2003	WWR	Hydrographic
XS	33	Ground surface	4222940.05	558773.50	1.88	WWR	46		12/19/2003	WWR	Hydrographic
XS	34	Ground surface	4222940.12	558773.05	2.16	WWR	51		12/19/2003	WWR	Hydrographic
XS	35	Ground surface	4222940.20	558772.59	2.56	WWR	53		12/19/2003	WWR	Hydrographic
XS	36	Ground surface	4222940.26	558772.22	2.61	WWR	57		12/19/2003	WWR	Hydrographic
XS	37	Ground surface	4222940.28	558771.84	2.66	WWR	59		12/19/2003	WWR	Hydrographic
XS	38	Ground surface	4222940.36	558771.49	2.83	WWR	60		12/19/2003	WWR	Hydrographic
XS	39	Ground surface	4222940.43	558770.88	3.03	WWR	66		12/19/2003	WWR	Hydrographic
XS	40	Ground surface	4222940.49	558770.54	2.98	WWR	67		12/19/2003	WWR	Hydrographic
XS	41	Ground surface	4222941.23	558768.85	5.55	WWR			12/19/2003	WWR	Hydrographic
XS	42	Ground surface	4222941.26	558765.17	6.03	WWR			12/19/2003	WWR	Hydrographic
XS	43	Ground surface	4222941.32	558763.17	6.1	WWR		Right bank - Flange (west)	12/19/2003	WWR	Hydrographic

Table 11.2

Pond 2A
Channel Cross-Sections Survey Results

Cross Section 02

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4222795.05	559218.19	5.67	WWR		endpoint north left bank	12/19/2003	WWR	Hydrographic
XS	02	Ground surface	4222793.40	559217.61	4.11	WWR		point on slope	12/19/2003	WWR	Hydrographic
XS	03	Ground surface	4222792.45	559217.36	3.11	WWR		top of bank north	12/19/2003	WWR	Hydrographic
XS	04	Ground surface	4222790.34	559216.63	1.21	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	05	Ground surface	4222789.68	559216.44	0.51	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	06	Ground surface	4222788.73	559216.06	0.11	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	07	Ground surface	4222786.89	559215.42	-1.37	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	08	Ground surface	4222785.44	559214.81	-1.94	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	09	Ground surface	4222783.89	559214.30	-2.13	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	10	Ground surface	4222782.51	559213.89	-2.33	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	11	Ground surface	4222781.81	559213.57	-1.88	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	12	Ground surface	4222780.60	559213.19	-1.18	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	13	Ground surface	4222779.31	559212.88	-0.42	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	14	Ground surface	4222778.10	559212.40	0.49	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	15	Ground surface	4222777.00	559211.88	3.39	WWR		in-channel	12/19/2003	WWR	Hydrographic
XS	16	Ground surface	4222774.79	559211.55	3.56	WWR		top of bank	12/19/2003	WWR	Hydrographic
XS	17	Ground surface	4222773.51	559211.32	4.76	WWR		second top of bank	12/19/2003	WWR	Hydrographic
XS	18	Ground surface	4222771.70	559210.13	5.81	WWR		marsh plain	12/19/2003	WWR	Hydrographic
XS	19	Ground surface	4222768.57	559209.14	6.22	WWR		endpoint south right bank	12/19/2003	WWR	Hydrographic

Table 11.2

Pond 2A
Channel Cross-Sections Survey Results

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4222886.04	559840.08	5.55	WWR	1	western endpoint	12/19/2003	WWR	Hydrographic
XS	02	Ground surface	4222890.00	559842.58	6.48	WWR	2	marsh plain	12/19/2003	WWR	Hydrographic
XS	03	Ground surface	4222889.99	559843.25	4.87	WWR	3	2nd toe of bank	12/19/2003	WWR	Hydrographic
XS	04	Ground surface	4222890.88	559843.75	3.97	WWR	4	top of bank	12/19/2003	WWR	Hydrographic
XS	05	Ground surface	4222891.96	559842.01	4.12	WWR	6	in-channel	12/19/2003	WWR	Hydrographic
XS	06	Ground surface	4222892.03	559841.94	4.23	WWR	7	in-channel	12/19/2003	WWR	Hydrographic
XS	07	Ground surface	4222892.04	559841.99	4.18	WWR	8	in-channel	12/19/2003	WWR	Hydrographic
XS	08	Ground surface	4222892.06	559842.04	4.12	WWR	9	in-channel	12/19/2003	WWR	Hydrographic
XS	09	Ground surface	4222892.34	559842.26	4.24	WWR	10	in-channel	12/19/2003	WWR	Hydrographic
XS	10	Ground surface	4222892.73	559842.59	4.19	WWR	11	in-channel	12/19/2003	WWR	Hydrographic
XS	11	Ground surface	4222893.12	559842.91	3.66	WWR	12	in-channel	12/19/2003	WWR	Hydrographic
XS	12	Ground surface	4222893.55	559843.29	1.19	WWR	13	in-channel	12/19/2003	WWR	Hydrographic
XS	13	Ground surface	4222893.99	559843.70	0.89	WWR	14	in-channel	12/19/2003	WWR	Hydrographic
XS	14	Ground surface	4222894.45	559844.12	0.63	WWR	15	in-channel	12/19/2003	WWR	Hydrographic
XS	15	Ground surface	4222895.01	559844.65	0.54	WWR	16	in-channel	12/19/2003	WWR	Hydrographic
XS	16	Ground surface	4222895.62	559845.37	-1.71	WWR	17	in-channel	12/19/2003	WWR	Hydrographic
XS	17	Ground surface	4222896.24	559846.13	-2.45	WWR	18	in-channel	12/19/2003	WWR	Hydrographic
XS	18	Ground surface	4222896.85	559846.90	-2.95	WWR	19	in-channel	12/19/2003	WWR	Hydrographic
XS	19	Ground surface	4222897.52	559847.74	-3.26	WWR	20	in-channel	12/19/2003	WWR	Hydrographic
XS	20	Ground surface	4222898.21	559848.55	-3.56	WWR	21	in-channel	12/19/2003	WWR	Hydrographic
XS	21	Ground surface	4222898.80	559849.41	-3.82	WWR	22	in-channel	12/19/2003	WWR	Hydrographic
XS	22	Ground surface	4222899.38	559850.25	-3.87	WWR	23	in-channel	12/19/2003	WWR	Hydrographic
XS	23	Ground surface	4222899.81	559851.02	-3.73	WWR	24	in-channel	12/19/2003	WWR	Hydrographic
XS	24	Ground surface	4222900.15	559851.83	-3.61	WWR	25	in-channel	12/19/2003	WWR	Hydrographic
XS	25	Ground surface	4222900.55	559852.50	-2.12	WWR	26	in-channel	12/19/2003	WWR	Hydrographic
XS	26	Ground surface	4222900.88	559853.13	-1.27	WWR	27	in-channel	12/19/2003	WWR	Hydrographic
XS	27	Ground surface	4222901.12	559853.66	-0.81	WWR	28	in-channel	12/19/2003	WWR	Hydrographic
XS	28	Ground surface	4222901.34	559854.15	0.12	WWR	29	in-channel	12/19/2003	WWR	Hydrographic
XS	29	Ground surface	4222901.57	559854.59	1.13	WWR	30	in-channel	12/19/2003	WWR	Hydrographic
XS	30	Ground surface	4222901.73	559854.99	2.93	WWR	31	in-channel	12/19/2003	WWR	Hydrographic
XS	31	Ground surface	4222902.01	559855.35	3.69	WWR	32	in-channel	12/19/2003	WWR	Hydrographic
XS	32	Ground surface	4222902.22	559855.64	3.46	WWR	33	in-channel	12/19/2003	WWR	Hydrographic
XS	33	Ground surface	4222902.23	559855.69	3.52	WWR	34	in-channel	12/19/2003	WWR	Hydrographic
XS	34	Ground surface	4222904.50	559854.50	3.52	WWR	35	toe of bank	12/19/2003	WWR	Hydrographic
XS	35	Ground surface	4222905.03	559854.88	6.14	WWR	36	top of bank east	12/19/2003	WWR	Hydrographic
XS	36	Ground surface	4222904.56	559856.08	6.28	WWR	37	marsh plain	12/19/2003	WWR	Hydrographic
XS	37	Ground surface	4222909.00	559857.92	6.21	WWR	38	easterly endpoint at pvc with flange	12/19/2003	WWR	Hydrographic

Table 11.2

Pond 2A
Channel Cross-Sections Survey Results

Cross Section 04

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4222560.55	560137.60	8.82	WWR	403	top of levee - south - LB endpoint	12/19/2003	WWR	Hydrographic
XS	02	Ground surface	4222563.78	560138.51	7.73	WWR	402		12/19/2003	WWR	Hydrographic
XS	03	Ground surface	4222565.81	560139.10	7.52	WWR	401		12/19/2003	WWR	Hydrographic
XS	04	Ground surface	4222567.02	560139.47	5.01	WWR	1		12/19/2003	WWR	Hydrographic
XS	05	Ground surface	4222568.37	560139.53	3.06	WWR	23		12/19/2003	WWR	Hydrographic
XS	06	Ground surface	4222569.19	560139.21	2.32	WWR	400		12/19/2003	WWR	Hydrographic
XS	07	Ground surface	4222569.58	560139.14	2.08	WWR	34		12/19/2003	WWR	Hydrographic
XS	08	Ground surface	4222569.66	560139.18	2.21	WWR	37		12/19/2003	WWR	Hydrographic
XS	09	Ground surface	4222569.72	560139.58	2.06	WWR	30		12/19/2003	WWR	Hydrographic
XS	10	Ground surface	4222570.29	560138.46	1.51	WWR	39		12/19/2003	WWR	Hydrographic
XS	11	Ground surface	4222570.85	560139.37	1.07	WWR	41		12/19/2003	WWR	Hydrographic
XS	12	Ground surface	4222571.40	560138.75	0.45	WWR	43		12/19/2003	WWR	Hydrographic
XS	13	Ground surface	4222571.81	560138.91	0.26	WWR	44		12/19/2003	WWR	Hydrographic
XS	14	Ground surface	4222572.25	560139.09	-0.18	WWR	46		12/19/2003	WWR	Hydrographic
XS	15	Ground surface	4222572.71	560139.30	-1.3	WWR	49		12/19/2003	WWR	Hydrographic
XS	16	Ground surface	4222573.20	560139.51	-2.92	WWR	50		12/19/2003	WWR	Hydrographic
XS	17	Ground surface	4222573.73	560139.74	-4.48	WWR	51		12/19/2003	WWR	Hydrographic
XS	18	Ground surface	4222574.31	560139.96	-5.38	WWR	56		12/19/2003	WWR	Hydrographic
XS	19	Ground surface	4222574.57	560139.90	-5.39	WWR	59		12/19/2003	WWR	Hydrographic
XS	20	Ground surface	4222575.78	560140.03	-6.67	WWR	63		12/19/2003	WWR	Hydrographic
XS	21	Ground surface	4222576.96	560140.11	-7.53	WWR	66		12/19/2003	WWR	Hydrographic
XS	22	Ground surface	4222578.15	560140.11	-8.24	WWR	69		12/19/2003	WWR	Hydrographic
XS	23	Ground surface	4222579.37	560140.08	-8.93	WWR	73		12/19/2003	WWR	Hydrographic
XS	24	Ground surface	4222580.63	560140.02	-9.07	WWR	76		12/19/2003	WWR	Hydrographic
XS	25	Ground surface	4222581.92	560139.99	-9.23	WWR	80		12/19/2003	WWR	Hydrographic
XS	26	Ground surface	4222583.22	560139.96	-8.99	WWR	83		12/19/2003	WWR	Hydrographic
XS	27	Ground surface	4222584.52	560139.95	-9	WWR	85		12/19/2003	WWR	Hydrographic
XS	28	Ground surface	4222585.81	560139.97	-9.22	WWR	88		12/19/2003	WWR	Hydrographic
XS	29	Ground surface	4222587.12	560139.97	-9.48	WWR	92		12/19/2003	WWR	Hydrographic
XS	30	Ground surface	4222588.43	560139.96	-9.73	WWR	95		12/19/2003	WWR	Hydrographic
XS	31	Ground surface	4222589.73	560139.94	-9.84	WWR	98		12/19/2003	WWR	Hydrographic
XS	32	Ground surface	4222591.05	560139.89	-9.89	WWR	102		12/19/2003	WWR	Hydrographic
XS	33	Ground surface	4222592.39	560139.87	-9.97	WWR	105		12/19/2003	WWR	Hydrographic
XS	34	Ground surface	4222593.72	560139.83	-10.37	WWR	109		12/19/2003	WWR	Hydrographic
XS	35	Ground surface	4222595.06	560139.78	-10.37	WWR	122		12/19/2003	WWR	Hydrographic
XS	36	Ground surface	4222596.41	560139.75	-9.78	WWR	129		12/19/2003	WWR	Hydrographic
XS	37	Ground surface	4222597.76	560139.71	-9.38	WWR	136		12/19/2003	WWR	Hydrographic
XS	38	Ground surface	4222599.11	560139.68	-9.44	WWR	142		12/19/2003	WWR	Hydrographic
XS	39	Ground surface	4222600.45	560139.61	-9.18	WWR	149		12/19/2003	WWR	Hydrographic
XS	40	Ground surface	4222601.76	560139.52	-8.5	WWR	155		12/19/2003	WWR	Hydrographic
XS	41	Ground surface	4222603.01	560139.43	-7.54	WWR	163		12/19/2003	WWR	Hydrographic
XS	42	Ground surface	4222604.15	560139.31	-6.04	WWR	168		12/19/2003	WWR	Hydrographic
XS	43	Ground surface	4222605.24	560139.22	-4.33	WWR	173		12/19/2003	WWR	Hydrographic
XS	44	Ground surface	4222606.28	560139.14	-2.58	WWR	180		12/19/2003	WWR	Hydrographic
XS	45	Ground surface	4222607.06	560139.16	-0.58	WWR	186		12/19/2003	WWR	Hydrographic
XS	46	Ground surface	4222607.79	560139.20	0.43	WWR	192		12/19/2003	WWR	Hydrographic
XS	47	Ground surface	4222608.42	560139.24	0.87	WWR	202		12/19/2003	WWR	Hydrographic
XS	48	Ground surface	4222609.04	560139.31	1.38	WWR	208		12/19/2003	WWR	Hydrographic

Table 11.2

Pond 2A
Channel Cross-Sections Survey Results

Cross Section 04 *continued*

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	49	Ground surface	4222609.58	560139.36	1.86	WWR	216		12/19/2003	WWR	Hydrographic
XS	50	Ground surface	4222609.87	560139.49	2.41	WWR	232		12/19/2003	WWR	Hydrographic
XS	51	Ground surface	4222610.42	560139.02	3.15	WWR	240		12/19/2003	WWR	Hydrographic
XS	52	Ground surface	4222610.86	560138.46	3.42	WWR	255		12/19/2003	WWR	Hydrographic
XS	53	Ground surface	4222611.12	560138.68	3.83	WWR	280		12/19/2003	WWR	Hydrographic
XS	54	Ground surface	4222611.46	560138.98	3.92	WWR	500		12/19/2003	WWR	Hydrographic
XS	55	Ground surface	4222611.63	560139.51	3.95	WWR	313		12/19/2003	WWR	Hydrographic
XS	56	Ground surface	4222611.86	560139.51	4.41	WWR	502		12/19/2003	WWR	Hydrographic
XS	57	Ground surface	4222612.02	560139.48	4.21	WWR	320		12/19/2003	WWR	Hydrographic
XS	58	Ground surface	4222612.12	560139.55	4.17	WWR	501		12/19/2003	WWR	Hydrographic
XS	59	Ground surface	4222613.05	560139.56	6.51	WWR			12/19/2003	WWR	Hydrographic
XS	60	Ground surface	4222613.60	560139.56	9.31	WWR			12/19/2003	WWR	Hydrographic

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 11.3

Coon Island
Channel Cross-Sections Survey Results

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4227283.992	558955.23	6.53	WWR	11	Southern endpt left bank	1/22/2004	Hydro
XS	02	Ground surface	4227286.465	558954.345	6.83	WWR	12	Marsh plain	1/22/2004	Hydro
XS	03	Ground surface	4227288.325	558953.412	6.38	WWR	13	Top of Bank	1/22/2004	Hydro
XS	04	Ground surface	4227288.546	558953.209	4.98	WWR	14	Toe	1/22/2004	Hydro
XS	05	Ground surface	4227289.526	558952.586	3.88	WWR	15	Toe	1/22/2004	Hydro
XS	06	Ground surface	4227291.313	558951.824	3.78	WWR	1	In-channel	1/22/2004	Hydro
XS	07	Ground surface	4227292.84	558950.68	2.1	WWR	21	In-channel	1/22/2004	Hydro
XS	08	Ground surface	4227293.74	558950.38	1.6	WWR	22	In-channel	1/22/2004	Hydro
XS	09	Ground surface	4227294.947	558950.051	1.18	WWR	2	In-channel	1/22/2004	Hydro
XS	10	Ground surface	4227296.684	558949.174	0.08	WWR	8	In-channel	1/22/2004	Hydro
XS	11	Ground surface	4227297.378	558948.803	0.58	WWR	3	In-channel	1/22/2004	Hydro
XS	12	Ground surface	4227299.735	558948.075	0.78	WWR	7	Toe	1/22/2004	Hydro
XS	13	Ground surface	4227301.415	558947.071	1.65	WWR	6	Toe	1/22/2004	Hydro
XS	14	Ground surface	4227301.769	558946.922	1.78	WWR	16	Point on slope	1/22/2004	Hydro
XS	15	Ground surface	4227302.162	558946.759	3.88	WWR	17	POS	1/22/2004	Hydro
XS	16	Ground surface	4227302.738	558946.608	4.78	WWR	18	POS	1/22/2004	Hydro
XS	17	Ground surface	4227304.267	558945.756	6.28	WWR	19	MP	1/22/2004	Hydro
XS	18	Ground surface	4227305.85	558944.53	6.5	WWR	20	Northern endpt right bank	1/22/2004	Hydro

Cross Section 04

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Point Description	SrvyDate	Surveyor	SrvyType
XS	02	Ground surface	4227462.20	559109.69	6.42	WWR	4	Marsh plain @ Nly endpt. Left Bank	12/4/2003	Total Station
XS	03	Ground surface	4227460.27	559109.80	6.61	WWR	5		12/4/2003	Total Station
XS	04	Ground surface	4227457.89	559109.93	5.97	WWR	6	pweed/scirpus/1st TOB	12/4/2003	Total Station
XS	05	Ground surface	4227457.56	559109.95	5.61	WWR	7	RH changed in TS	12/4/2003	Total Station
XS	06	Ground surface	4227456.35	559110.04	3.38	WWR	8		12/4/2003	Total Station
XS	07	Ground surface	4227455.61	559110.06	2.14	WWR	9		12/4/2003	Total Station
XS	08	Ground surface	4227454.45	559110.14	1.29	WWR	10		12/4/2003	Total Station
XS	09	Ground surface	4227453.22	559110.20	1.03	WWR	11		12/4/2003	Total Station
XS	10	Ground surface	4227452.19	559110.26	1.51	WWR	12		12/4/2003	Total Station
XS	11	Ground surface	4227450.15	559110.37	6.06	WWR	13		12/4/2003	Total Station
XS	12	Ground surface	4227445.88	559110.60	6.49	WWR	14		12/4/2003	Total Station
XS	13	Ground surface	4227441.55	559110.85	6.47	WWR	15	Sly Endpt of XS	12/4/2003	Total Station

Table 11.3

Coon Island
Channel Cross-Sections Survey Results

Cross Section 05

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4227845.97	558904.91	6.61	WWR	15	West endpoint	1/22/2004	Hydro
XS	02	Ground surface	4227844.48	558908.19	6.59	WWR	16	marsh plain	1/22/2004	Hydro
XS	03	Ground surface	4227843.71	558909.66	6.11	WWR	17	top of bank	1/22/2004	Hydro
XS	04	Ground surface	4227843.47	558910.12	3.51	WWR	18	toe of bank	1/22/2004	Hydro
XS	05	Ground surface	4227843.01	558912.17	2.21	WWR	13	in-channel	1/22/2004	Hydro
XS	06	Ground surface	4227841.18	558914.67	1.81	WWR	12	in-channel	1/22/2004	Hydro
XS	07	Ground surface	4227839.71	558916.87	2.11	WWR	11	in-channel	1/22/2004	Hydro
XS	08	Ground surface	4227839.35	558917.45	2.11	WWR	5	in-channel	1/22/2004	Hydro
XS	09	Ground surface	4227838.62	558918.76	2.51	WWR	10	in-channel	1/22/2004	Hydro
XS	10	Ground surface	4227837.70	558919.94	2.91	WWR	9	in-channel	1/22/2004	Hydro
XS	11	Ground surface	4227837.52	558920.39	2.61	WWR	6	in-channel	1/22/2004	Hydro
XS	12	Ground surface	4227837.34	558920.82	3.31	WWR	7	in-channel	1/22/2004	Hydro
XS	13	Ground surface	4227836.74	558922.83	3.51	WWR	20	point on slope	1/22/2004	Hydro
XS	14	Ground surface	4227835.77	558925.87	6.11	WWR	21	toe of bank	1/22/2004	Hydro
XS	15	Ground surface	4227835.42	558926.23	6.76	WWR	22	pickleweed marsh plain	1/22/2004	Hydro
XS	16	Ground surface	4227835.00	558927.54	6.91	WWR	23	East endpt XS-5, north endpt XS-6	1/22/2004	Hydro

Cross Section 06

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4227834.49	558927.50	6.34	WWR	3	Marsh plain @ Nly Endpt in pickleweed	1/22/2004	Total Station
XS	02	Ground surface	4227832.81	558927.08	6.29	WWR	4	Marsh plain	1/22/2004	Total Station
XS	03	Ground surface	4227831.78	558926.99	5.69	WWR	5	Top of bank	1/22/2004	Total Station
XS	04	Ground surface	4227831.54	558926.92	4.11	WWR	6	Toe	1/22/2004	Total Station
XS	05	Ground surface	4227830.75	558926.63	3.48	WWR	7	Point on slope	1/22/2004	Total Station
XS	06	Ground surface	4227830.67	558926.62	0.06	WWR	8	In Channel	1/22/2004	Total Station
XS	07	Ground surface	4227830.40	558926.64	-0.43	WWR	9	In Channel Toe Nly	1/22/2004	Total Station
XS	08	Ground surface	4227827.85	558925.90	-1.60	WWR	10	In Channel	1/22/2004	Total Station
XS	09	Ground surface	4227827.41	558925.89	-1.51	WWR	11	In Channel	1/22/2004	Total Station
XS	10	Ground surface	4227825.85	558925.52	-0.73	WWR	12	In Channel	1/22/2004	Total Station
XS	11	Ground surface	4227824.83	558925.28	-0.03	WWR	13	Toe Sly	1/22/2004	Total Station
XS	12	Ground surface	4227823.87	558924.98	5.80	WWR	14	Top of bank	1/22/2004	Total Station
XS	13	Ground surface	4227821.89	558924.61	5.97	WWR	15	Endpt S in Bullrush	1/22/2004	Total Station

Table 11.3

Coon Island
Channel Cross-Sections Survey Results

Cross Section 07

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4228313.03	559028.23	6.12	WWR	33	north endpoint Left Bank	1/22/2004	Hydro
XS	02	Ground surface	4228311.79	559028.72	6.07	WWR	32	marsh plain	1/22/2004	Hydro
XS	03	Ground surface	4228309.26	559029.05	5.32	WWR	31	marsh plain	1/22/2004	Hydro
XS	04	Ground surface	4228307.45	559029.60	4.92	WWR	30	point on slope	1/22/2004	Hydro
XS	05	Ground surface	4228306.77	559029.79	5.82	WWR	13	in-channel	1/22/2004	Hydro
XS	06	Ground surface	4228306.41	559030.95	4.72	WWR	14	in-channel	1/22/2004	Hydro
XS	07	Ground surface	4228305.67	559031.54	4.12	WWR	15	in-channel	1/22/2004	Hydro
XS	08	Ground surface	4228304.01	559032.43	4.12	WWR	16	in-channel	1/22/2004	Hydro
XS	09	Ground surface	4228301.80	559033.76	3.72	WWR	17	in-channel	1/22/2004	Hydro
XS	10	Ground surface	4228299.59	559034.80	2.52	WWR	18	in-channel	1/22/2004	Hydro
XS	11	Ground surface	4228297.01	559036.13	1.52	WWR	19	in-channel	1/22/2004	Hydro
XS	12	Ground surface	4228293.69	559037.91	1.22	WWR	20	in-channel	1/22/2004	Hydro
XS	13	Ground surface	4228290.93	559039.24	0.61	WWR	21	in-channel	1/22/2004	Hydro
XS	14	Ground surface	4228288.17	559040.58	0.22	WWR	4	in-channel	1/22/2004	Hydro
XS	15	Ground surface	4228286.51	559042.04	0.11	WWR	22	in-channel	1/22/2004	Hydro
XS	16	Ground surface	4228284.49	559043.37	0.11	WWR	23	in-channel	1/22/2004	Hydro
XS	17	Ground surface	4228281.91	559044.41	0.61	WWR	24	toe of bank south	1/22/2004	Hydro
XS	18	Ground surface	4228279.31	559045.22	6.22	WWR	28	top of bank south	1/22/2004	Hydro
XS	19	Ground surface	4228279.10	559045.42	6.41	WWR	27	marsh plain	1/22/2004	Hydro
XS	20	Ground surface	4228275.88	559047.23	6.44	WWR	26	South endpt Right Bank	1/22/2004	Hydro

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 11.4

Bull Island
Channel Cross-Sections Survey Results

Cross Section 01

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4230488.57	560507.10	6.47	WWR	46	end pt east	1/21/2004	WWR	Hydro
XS	02	Ground surface	4230489.04	560506.13	6.32	WWR	47	marsh plain	1/21/2004	WWR	Hydro
XS	03	Ground surface	4230489.43	560505.37	5.47	WWR	48	marsh plain	1/21/2004	WWR	Hydro
XS	04	Ground surface	4230489.81	560504.56	2.62	WWR	50	toe of bank	1/21/2004	WWR	Hydro
XS	05	Ground surface	4230490.60	560502.99	1.32	WWR	54	in-channel	1/21/2004	WWR	Hydro
XS	06	Ground surface	4230491.59	560501.16	-0.14	WWR	53	in-channel	1/21/2004	WWR	Hydro
XS	07	Ground surface	4230492.74	560498.84	-0.19	WWR	52	in-channel	1/21/2004	WWR	Hydro
XS	08	Ground surface	4230493.75	560496.69	-1.59	WWR	35	in-channel	1/21/2004	WWR	Hydro
XS	09	Ground surface	4230495.20	560493.76	-3.59	WWR	36	in-channel	1/21/2004	WWR	Hydro
XS	10	Ground surface	4230496.07	560492.01	-3.29	WWR	22	in-channel	1/21/2004	WWR	Hydro
XS	11	Ground surface	4230497.06	560490.00	-2.59	WWR	23	in-channel	1/21/2004	WWR	Hydro
XS	12	Ground surface	4230497.41	560489.33	-2.99	WWR	37	in-channel	1/21/2004	WWR	Hydro
XS	13	Ground surface	4230497.65	560488.83	-2.89	WWR	13	in-channel	1/21/2004	WWR	Hydro
XS	14	Ground surface	4230498.32	560487.57	-1.49	WWR	31	in-channel	1/21/2004	WWR	Hydro
XS	15	Ground surface	4230498.78	560486.59	-0.78	WWR	38	in-channel	1/21/2004	WWR	Hydro
XS	16	Ground surface	4230499.69	560484.82	0.92	WWR	39	in-channel	1/21/2004	WWR	Hydro
XS	17	Ground surface	4230500.06	560483.97	0.92	WWR	6	in-channel	1/21/2004	WWR	Hydro
XS	18	Ground surface	4230500.22	560483.70	1.72	WWR	40	in-channel	1/21/2004	WWR	Hydro
XS	19	Ground surface	4230500.74	560482.63	5.37	WWR	44	top of bank	1/21/2004	WWR	Hydro
XS	20	Ground surface	4230501.73	560480.65	6.15	WWR	43	end pt w	1/21/2004	WWR	Hydro

Cross Section 02

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4230640.08	560631.80	6.61	WWR	34	east end point	1/21/2004	WWR	Hydro
XS	02	Ground surface	4230640.39	560631.21	6.51	WWR	35	marsh plain	1/21/2004	WWR	Hydro
XS	03	Ground surface	4230640.90	560629.80	5.51	WWR	36	point on slope	1/21/2004	WWR	Hydro
XS	04	Ground surface	4230641.61	560627.99	5.51	WWR	9	in-channel	1/21/2004	WWR	Hydro
XS	05	Ground surface	4230642.14	560626.56	0.61	WWR	27	in-channel	1/21/2004	WWR	Hydro
XS	06	Ground surface	4230642.75	560625.11	-1.19	WWR	26	in-channel	1/21/2004	WWR	Hydro
XS	07	Ground surface	4230643.46	560623.35	-3.29	WWR	25	in-channel	1/21/2004	WWR	Hydro
XS	08	Ground surface	4230644.23	560621.45	-2.99	WWR	12	in-channel	1/21/2004	WWR	Hydro
XS	09	Ground surface	4230644.59	560620.59	-4.89	WWR	24	in-channel	1/21/2004	WWR	Hydro
XS	10	Ground surface	4230645.38	560618.53	-5.59	WWR	23	in-channel	1/21/2004	WWR	Hydro
XS	11	Ground surface	4230646.62	560615.45	-4.89	WWR	22	in-channel	1/21/2004	WWR	Hydro
XS	12	Ground surface	4230647.02	560614.57	-5.49	WWR	14	in-channel	1/21/2004	WWR	Hydro
XS	13	Ground surface	4230647.27	560613.83	-5.19	WWR	6	in-channel	1/21/2004	WWR	Hydro
XS	14	Ground surface	4230648.12	560611.78	-3.59	WWR	15	in-channel	1/21/2004	WWR	Hydro
XS	15	Ground surface	4230648.36	560611.23	-3.09	WWR	7	in-channel	1/21/2004	WWR	Hydro
XS	16	Ground surface	4230648.59	560610.62	0.11	WWR	20	in-channel	1/21/2004	WWR	Hydro
XS	17	Ground surface	4230649.00	560609.58	1.81	WWR	31	toe of bank	1/21/2004	WWR	Hydro
XS	18	Ground surface	4230649.22	560609.11	4.31	WWR	32	top of bank	1/21/2004	WWR	Hydro
XS	19	Ground surface	4230649.64	560608.04	5.01	WWR	30	none	1/21/2004	WWR	Hydro
XS	20	Ground surface	4230649.73	560607.83	6.61	WWR	29	West end pt	1/21/2004	WWR	Hydro

Table 11.4

Bull Island
Channel Cross-Sections Survey Results

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4230736.50	560861.84	6.52	WWR	3	Begin XS Sly endpt/ marsh plain	12/12/2003	WWR	Total Station
XS	02	Ground surface	4230739.37	560860.47	6.48	WWR	4		12/12/2003	WWR	Total Station
XS	03	Ground surface	4230738.52	560860.67	6.21	WWR	5		12/12/2003	WWR	Total Station
XS	04	Ground surface	4230740.43	560859.84	2.18	WWR	6	In Channel	12/12/2003	WWR	Total Station
XS	05	Ground surface	4230741.93	560859.18	-1.06	WWR	7		12/12/2003	WWR	Total Station
XS	06	Ground surface	4230743.79	560858.27	-2.42	WWR	8		12/12/2003	WWR	Total Station
XS	07	Ground surface	4230744.49	560857.90	-2.40	WWR	9		12/12/2003	WWR	Total Station
XS	08	Ground surface	4230746.17	560857.10	-1.88	WWR	10		12/12/2003	WWR	Total Station
XS	09	Ground surface	4230746.75	560856.76	-0.42	WWR	11		12/12/2003	WWR	Total Station
XS	10	Ground surface	4230747.13	560856.49	5.04	WWR	12		12/12/2003	WWR	Total Station
XS	11	Ground surface	4230748.52	560855.81	6.35	WWR	13		12/12/2003	WWR	Total Station
XS	12	Ground surface	4230750.45	560854.86	6.42	WWR	14		12/12/2003	WWR	Total Station

Cross Section 05

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4230583.40	560837.24	6.63	WWR	16	south	1/21/2004	WWR	Hydro
XS	02	Ground surface	4230585.69	560836.61	6.54	WWR	17		1/21/2004	WWR	Hydro
XS	03	Ground surface	4230586.18	560836.56	4.64	WWR	18		1/21/2004	WWR	Hydro
XS	04	Ground surface	4230587.48	560836.29	3.44	WWR	19		1/21/2004	WWR	Hydro
XS	05	Ground surface	4230587.92	560836.19	1.54	WWR	8		1/21/2004	WWR	Hydro
XS	06	Ground surface	4230588.99	560835.90	0.44	WWR	9		1/21/2004	WWR	Hydro
XS	07	Ground surface	4230590.02	560835.74	-0.16	WWR	10		1/21/2004	WWR	Hydro
XS	08	Ground surface	4230590.97	560835.48	-0.36	WWR	5		1/21/2004	WWR	Hydro
XS	09	Ground surface	4230591.60	560835.24	-0.56	WWR	11		1/21/2004	WWR	Hydro
XS	10	Ground surface	4230594.69	560834.52	-0.66	WWR	12		1/21/2004	WWR	Hydro
XS	11	Ground surface	4230596.64	560834.22	0.04	WWR	13		1/21/2004	WWR	Hydro
XS	12	Ground surface	4230598.34	560833.72	1.04	WWR	14		1/21/2004	WWR	Hydro
XS	13	Ground surface	4230599.74	560833.44	1.89	WWR	2		1/21/2004	WWR	Hydro
XS	14	Ground surface	4230601.73	560832.90	1.54	WWR	21		1/21/2004	WWR	Hydro
XS	15	Ground surface	4230602.38	560832.78	2.54	WWR	22		1/21/2004	WWR	Hydro
XS	16	Ground surface	4230602.96	560832.65	5.94	WWR	23		1/21/2004	WWR	Hydro
XS	17	Ground surface	4230603.66	560832.48	6.34	WWR	24	north	1/21/2004	WWR	Hydro

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 11.5

Browns Island
Channel Cross-Sections Survey Results

Cross Section 01

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4211132.38	599013.00	6.1	WWR		endpoint WEST - leftbank	12/9/2004	WWR	Hydro
XS	02	Ground surface	4211132.11	599016.26	6.01	WWR			12/9/2004	WWR	Hydro
XS	03	Ground surface	4211132.07	599018.51	5.87	WWR			12/9/2004	WWR	Hydro
XS	04	Ground surface	4211132.07	599018.88	1	WWR			12/9/2004	WWR	Hydro
XS	05	Ground surface	4211131.90	599020.25	-1.6	WWR			12/9/2004	WWR	Hydro
XS	06	Ground surface	4211132.01	599021.82	-2.65	WWR			12/9/2004	WWR	Hydro
XS	07	Ground surface	4211131.96	599022.57	-3.45	WWR			12/9/2004	WWR	Hydro
XS	08	Ground surface	4211131.91	599023.30	-4.85	WWR			12/9/2004	WWR	Hydro
XS	09	Ground surface	4211131.86	599023.94	-6.95	WWR			12/9/2004	WWR	Hydro
XS	10	Ground surface	4211131.83	599024.45	-9.25	WWR			12/9/2004	WWR	Hydro
XS	11	Ground surface	4211131.78	599025.08	-8.85	WWR			12/9/2004	WWR	Hydro
XS	12	Ground surface	4211131.74	599025.65	-9.75	WWR			12/9/2004	WWR	Hydro
XS	13	Ground surface	4211131.70	599026.19	-10.75	WWR			12/9/2004	WWR	Hydro
XS	14	Ground surface	4211131.66	599026.77	-10.45	WWR			12/9/2004	WWR	Hydro
XS	15	Ground surface	4211131.60	599027.55	-10.25	WWR			12/9/2004	WWR	Hydro
XS	16	Ground surface	4211131.57	599028.06	-10.65	WWR			12/9/2004	WWR	Hydro
XS	17	Ground surface	4211131.53	599028.61	-10.05	WWR			12/9/2004	WWR	Hydro
XS	18	Ground surface	4211131.46	599029.49	-9.65	WWR			12/9/2004	WWR	Hydro
XS	19	Ground surface	4211131.41	599030.20	-9.15	WWR			12/9/2004	WWR	Hydro
XS	20	Ground surface	4211131.38	599030.73	-8.55	WWR			12/9/2004	WWR	Hydro
XS	21	Ground surface	4211131.34	599031.24	-8.05	WWR			12/9/2004	WWR	Hydro
XS	22	Ground surface	4211131.30	599031.78	-7.05	WWR			12/9/2004	WWR	Hydro
XS	23	Ground surface	4211131.26	599032.39	-7.05	WWR			12/9/2004	WWR	Hydro
XS	24	Ground surface	4211131.21	599033.13	-6.75	WWR			12/9/2004	WWR	Hydro
XS	25	Ground surface	4211131.17	599033.64	-5.45	WWR			12/9/2004	WWR	Hydro
XS	26	Ground surface	4211131.13	599034.16	-4.25	WWR			12/9/2004	WWR	Hydro
XS	27	Ground surface	4211131.09	599034.69	-2.65	WWR			12/9/2004	WWR	Hydro
XS	28	Ground surface	4211131.06	599035.23	-2.15	WWR			12/9/2004	WWR	Hydro
XS	29	Ground surface	4211131.01	599035.90	-0.35	WWR			12/9/2004	WWR	Hydro
XS	30	Ground surface	4211131.01	599036.24	5.36	WWR			12/9/2004	WWR	Hydro
XS	31	Ground surface	4211130.84	599038.67	6.11	WWR		endpoint EAST rightbank	12/9/2004	WWR	Hydro

Table 11.5

Browns Island
Channel Cross-Sections Survey Results

Cross Section 02

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4210749.93	599183.54	5.2	WWR		Left bank - South-west	12/9/2004	WWR	Hydro
XS	02	Ground surface	4210750.19	599185.02	4.8	WWR			12/9/2004	WWR	Hydro
XS	03	Ground surface	4210750.38	599186.15	4.5	WWR			12/9/2004	WWR	Hydro
XS	04	Ground surface	4210750.44	599186.27	1.2	WWR			12/9/2004	WWR	Hydro
XS	05	Ground surface	4210750.53	599186.67	0.5	WWR			12/9/2004	WWR	Hydro
XS	06	Ground surface	4210751.09	599188.4	-0.81	WWR			12/9/2004	WWR	Hydro
XS	07	Ground surface	4210751.13	599188.61	-1.01	WWR			12/9/2004	WWR	Hydro
XS	08	Ground surface	4210751.2	599188.95	-2.01	WWR			12/9/2004	WWR	Hydro
XS	09	Ground surface	4210751.27	599189.25	-2.71	WWR			12/9/2004	WWR	Hydro
XS	10	Ground surface	4210751.31	599189.46	-2.81	WWR			12/9/2004	WWR	Hydro
XS	11	Ground surface	4210751.36	599189.68	-3.21	WWR			12/9/2004	WWR	Hydro
XS	12	Ground surface	4210751.41	599189.91	-3.91	WWR			12/9/2004	WWR	Hydro
XS	13	Ground surface	4210751.45	599190.12	-4.01	WWR			12/9/2004	WWR	Hydro
XS	14	Ground surface	4210751.51	599190.39	-5.01	WWR			12/9/2004	WWR	Hydro
XS	15	Ground surface	4210751.56	599190.6	-4.81	WWR			12/9/2004	WWR	Hydro
XS	16	Ground surface	4210751.61	599190.87	-5.11	WWR			12/9/2004	WWR	Hydro
XS	17	Ground surface	4210751.66	599191.09	-5.31	WWR			12/9/2004	WWR	Hydro
XS	18	Ground surface	4210751.75	599191.49	-5.31	WWR			12/9/2004	WWR	Hydro
XS	19	Ground surface	4210751.81	599191.77	-6.51	WWR			12/9/2004	WWR	Hydro
XS	20	Ground surface	4210751.92	599192.29	-6.61	WWR			12/9/2004	WWR	Hydro
XS	21	Ground surface	4210751.97	599192.51	-7.21	WWR			12/9/2004	WWR	Hydro
XS	22	Ground surface	4210752.03	599192.8	-7.21	WWR			12/9/2004	WWR	Hydro
XS	23	Ground surface	4210752.21	599193.64	-7.51	WWR			12/9/2004	WWR	Hydro
XS	24	Ground surface	4210752.28	599193.97	-7.51	WWR			12/9/2004	WWR	Hydro
XS	25	Ground surface	4210752.34	599194.26	-7.61	WWR			12/9/2004	WWR	Hydro
XS	26	Ground surface	4210752.46	599194.81	-7.71	WWR			12/9/2004	WWR	Hydro
XS	27	Ground surface	4210752.55	599195.21	-7.51	WWR			12/9/2004	WWR	Hydro
XS	28	Ground surface	4210752.6	599195.47	-7.21	WWR			12/9/2004	WWR	Hydro
XS	29	Ground surface	4210752.65	599195.69	-7.31	WWR			12/9/2004	WWR	Hydro
XS	30	Ground surface	4210752.73	599196.07	-7.11	WWR			12/9/2004	WWR	Hydro
XS	31	Ground surface	4210752.8	599196.4	-7.31	WWR			12/9/2004	WWR	Hydro
XS	32	Ground surface	4210752.86	599196.66	-6.91	WWR			12/9/2004	WWR	Hydro
XS	33	Ground surface	4210752.91	599196.91	-6.81	WWR			12/9/2004	WWR	Hydro
XS	34	Ground surface	4210752.96	599197.15	-7.01	WWR			12/9/2004	WWR	Hydro
XS	35	Ground surface	4210753.01	599197.36	-6.71	WWR			12/9/2004	WWR	Hydro
XS	36	Ground surface	4210753.05	599197.59	-6.91	WWR			12/9/2004	WWR	Hydro
XS	37	Ground surface	4210753.14	599197.98	-6.91	WWR			12/9/2004	WWR	Hydro
XS	38	Ground surface	4210753.2	599198.27	-6.65	WWR			12/9/2004	WWR	Hydro
XS	39	Ground surface	4210753.26	599198.55	-6.46	WWR			12/9/2004	WWR	Hydro
XS	40	Ground surface	4210753.32	599198.84	-6.26	WWR			12/9/2004	WWR	Hydro
XS	41	Ground surface	4210753.37	599199.06	-6.12	WWR			12/9/2004	WWR	Hydro
XS	42	Ground surface	4210753.43	599199.34	-5.93	WWR			12/9/2004	WWR	Hydro
XS	43	Ground surface	4210753.49	599199.6	-5.73	WWR			12/9/2004	WWR	Hydro
XS	44	Ground surface	4210753.54	599199.87	-5.54	WWR			12/9/2004	WWR	Hydro
XS	45	Ground surface	4210753.64	599200.34	-5.51	WWR			12/9/2004	WWR	Hydro
XS	46	Ground surface	4210753.69	599200.57	-5.51	WWR			12/9/2004	WWR	Hydro
XS	47	Ground surface	4210753.76	599200.87	-5.41	WWR			12/9/2004	WWR	Hydro
XS	48	Ground surface	4210753.83	599201.2	-5.11	WWR			12/9/2004	WWR	Hydro
XS	49	Ground surface	4210753.89	599201.47	-5.31	WWR			12/9/2004	WWR	Hydro
XS	50	Ground surface	4210753.94	599201.72	-4.51	WWR			12/9/2004	WWR	Hydro
XS	51	Ground surface	4210753.99	599201.95	-4.41	WWR			12/9/2004	WWR	Hydro
XS	52	Ground surface	4210754.03	599202.15	-3.41	WWR			12/9/2004	WWR	Hydro
XS	53	Ground surface	4210754.09	599202.44	-3.21	WWR			12/9/2004	WWR	Hydro
XS	54	Ground surface	4210754.15	599202.72	-2.71	WWR			12/9/2004	WWR	Hydro
XS	55	Ground surface	4210754.13	599203.23	0.8	WWR			12/9/2004	WWR	Hydro
XS	56	Ground surface	4210754.18	599203.41	4.3	WWR			12/9/2004	WWR	Hydro
XS	57	Ground surface	4210754.41	599204.27	5.5	WWR		Right Bank - North-East	12/9/2004	WWR	Hydro

Table 11.5

Browns Island
Channel Cross-Sections Survey Results

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4210794.25	599579.74	4.8	WWR			12/9/2004	WWR	Hydro
XS	02	Ground surface	4210793.66	599580.21	3.5	WWR			12/9/2004	WWR	Hydro
XS	03	Ground surface	4210794.831	599579.093	2.8	WWR		southern endpoint, left bank	12/9/2004	WWR	Hydro
XS	04	Ground surface	4210795.313	599578.402	1.79	WWR			12/9/2004	WWR	Hydro
XS	05	Ground surface	4210795.672	599578.117	-0.21	WWR			12/9/2004	WWR	Hydro
XS	06	Ground surface	4210795.981	599577.876	-0.6	WWR			12/9/2004	WWR	Hydro
XS	07	Ground surface	4210797.046	599576.941	-3.25	WWR			12/9/2004	WWR	Hydro
XS	08	Ground surface	4210797.178	599576.914	-3.12	WWR			12/9/2004	WWR	Hydro
XS	09	Ground surface	4210797.651	599576.548	-4.04	WWR			12/9/2004	WWR	Hydro
XS	10	Ground surface	4210797.644	599575.987	-4.66	WWR			12/9/2004	WWR	Hydro
XS	11	Ground surface	4210798.423	599575.414	-6.55	WWR			12/9/2004	WWR	Hydro
XS	12	Ground surface	4210799.13	599574.696	-6.96	WWR			12/9/2004	WWR	Hydro
XS	13	Ground surface	4210799.969	599573.77	-7.9	WWR			12/9/2004	WWR	Hydro
XS	14	Ground surface	4210800.982	599572.729	-9.25	WWR			12/9/2004	WWR	Hydro
XS	15	Ground surface	4210802.276	599571.743	-9.79	WWR			12/9/2004	WWR	Hydro
XS	16	Ground surface	4210802.514	599571.284	-10.11	WWR			12/9/2004	WWR	Hydro
XS	17	Ground surface	4210802.807	599570.745	-10.36	WWR			12/9/2004	WWR	Hydro
XS	18	Ground surface	4210803.532	599569.7	-10.66	WWR			12/9/2004	WWR	Hydro
XS	19	Ground surface	4210803.922	599569.134	-10.66	WWR			12/9/2004	WWR	Hydro
XS	20	Ground surface	4210804.317	599568.577	-10.36	WWR			12/9/2004	WWR	Hydro
XS	21	Ground surface	4210805.225	599567.495	-9.29	WWR			12/9/2004	WWR	Hydro
XS	22	Ground surface	4210805.699	599566.953	-8.35	WWR			12/9/2004	WWR	Hydro
XS	23	Ground surface	4210806.172	599566.43	-7.88	WWR			12/9/2004	WWR	Hydro
XS	24	Ground surface	4210806.665	599565.923	-7.14	WWR			12/9/2004	WWR	Hydro
XS	25	Ground surface	4210807.156	599565.417	-5.76	WWR			12/9/2004	WWR	Hydro
XS	26	Ground surface	4210807.653	599564.92	-4.66	WWR			12/9/2004	WWR	Hydro
XS	27	Ground surface	4210808.464	599564.84	-2.41	WWR			12/9/2004	WWR	Hydro
XS	28	Ground surface	4210808.837	599564.695	-0.74	WWR			12/9/2004	WWR	Hydro
XS	29	Ground surface	4210809.581	599563.909	0.39	WWR			12/9/2004	WWR	Hydro
XS	30	Ground surface	4210810.45	599563.105	0.74	WWR			12/9/2004	WWR	Hydro
XS	31	Ground surface	4210810.759	599562.644	0.81	WWR			12/9/2004	WWR	Hydro
XS	32	Ground surface	4210810.899	599562.501	0.79	WWR			12/9/2004	WWR	Hydro
XS	33	Ground surface	4210811.586	599561.892	1.03	WWR			12/9/2004	WWR	Hydro
XS	34	Ground surface	4210813.316	599559.997	3.03	WWR			12/9/2004	WWR	Hydro
XS	35	Ground surface	4210814.285	599559.151	4.26	WWR		northern endpt; right bank	12/9/2004	WWR	Hydro

Table 11.5

Browns Island
Channel Cross-Sections Survey Results

Cross Section 04

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4210735.45	600099.62	4.272	WWR		South endpoint Left Bank	12/9/2004	WWR	Hydro
XS	02	Ground surface	4210737.96	600098.87	3.43	WWR			12/9/2004	WWR	Hydro
XS	03	Ground surface	4210738.93	600098.55	1.415	WWR			12/9/2004	WWR	Hydro
XS	04	Ground surface	4210739.44	600098.47	1.175	WWR			12/9/2004	WWR	Hydro
XS	05	Ground surface	4210739.71	600098.40	1.065	WWR			12/9/2004	WWR	Hydro
XS	06	Ground surface	4210740.35	600098.21	-0.225	WWR			12/9/2004	WWR	Hydro
XS	07	Ground surface	4210741.71	600097.82	-1.745	WWR			12/9/2004	WWR	Hydro
XS	08	Ground surface	4210742.19	600097.68	-2.525	WWR			12/9/2004	WWR	Hydro
XS	09	Ground surface	4210742.74	600097.51	-6.075	WWR			12/9/2004	WWR	Hydro
XS	10	Ground surface	4210743.37	600097.34	-8.595	WWR			12/9/2004	WWR	Hydro
XS	11	Ground surface	4210744.02	600097.15	-8.975	WWR			12/9/2004	WWR	Hydro
XS	12	Ground surface	4210744.53	600096.98	-9.315	WWR			12/9/2004	WWR	Hydro
XS	13	Ground surface	4210744.98	600096.86	-9.495	WWR			12/9/2004	WWR	Hydro
XS	14	Ground surface	4210745.49	600096.73	-9.745	WWR			12/9/2004	WWR	Hydro
XS	15	Ground surface	4210745.98	600096.56	-9.835	WWR			12/9/2004	WWR	Hydro
XS	16	Ground surface	4210746.50	600096.43	-9.915	WWR			12/9/2004	WWR	Hydro
XS	17	Ground surface	4210747.06	600096.26	-9.995	WWR			12/9/2004	WWR	Hydro
XS	18	Ground surface	4210747.68	600096.09	-10.035	WWR			12/9/2004	WWR	Hydro
XS	19	Ground surface	4210748.20	600095.93	-9.935	WWR			12/9/2004	WWR	Hydro
XS	20	Ground surface	4210748.79	600095.75	-9.675	WWR			12/9/2004	WWR	Hydro
XS	21	Ground surface	4210749.47	600095.54	-9.425	WWR			12/9/2004	WWR	Hydro
XS	22	Ground surface	4210749.99	600095.41	-9.185	WWR			12/9/2004	WWR	Hydro
XS	23	Ground surface	4210750.52	600095.26	-8.945	WWR			12/9/2004	WWR	Hydro
XS	24	Ground surface	4210751.09	600095.12	-8.715	WWR			12/9/2004	WWR	Hydro
XS	25	Ground surface	4210751.70	600094.89	-8.415	WWR			12/9/2004	WWR	Hydro
XS	26	Ground surface	4210752.12	600094.78	-8.215	WWR			12/9/2004	WWR	Hydro
XS	27	Ground surface	4210752.78	600094.60	-7.795	WWR			12/9/2004	WWR	Hydro
XS	28	Ground surface	4210753.40	600094.40	-7.445	WWR			12/9/2004	WWR	Hydro
XS	29	Ground surface	4210754.18	600094.19	-6.945	WWR			12/9/2004	WWR	Hydro
XS	30	Ground surface	4210754.64	600094.04	-6.625	WWR			12/9/2004	WWR	Hydro
XS	31	Ground surface	4210755.11	600093.90	-6.335	WWR			12/9/2004	WWR	Hydro
XS	32	Ground surface	4210755.61	600093.78	-6.025	WWR			12/9/2004	WWR	Hydro
XS	33	Ground surface	4210756.05	600093.65	-5.635	WWR			12/9/2004	WWR	Hydro
XS	34	Ground surface	4210756.67	600093.44	-5.215	WWR			12/9/2004	WWR	Hydro
XS	35	Ground surface	4210757.07	600093.32	-4.515	WWR			12/9/2004	WWR	Hydro
XS	36	Ground surface	4210757.75	600093.14	-1.715	WWR			12/9/2004	WWR	Hydro
XS	37	Ground surface	4210758.32	600092.97	1.265	WWR			12/9/2004	WWR	Hydro
XS	38	Ground surface	4210758.95	600092.80	1.475	WWR			12/9/2004	WWR	Hydro
XS	39	Ground surface	4210759.22	600092.80	0.705	WWR			12/9/2004	WWR	Hydro
XS	40	Ground surface	4210759.62	600092.58	-0.525	WWR			12/9/2004	WWR	Hydro
XS	41	Ground surface	4210760.01	600092.42	0.635	WWR			12/9/2004	WWR	Hydro
XS	42	Ground surface	4210760.38	600092.24	0.525	WWR			12/9/2004	WWR	Hydro
XS	43	Ground surface	4210760.73	600092.10	0.085	WWR			12/9/2004	WWR	Hydro
XS	44	Ground surface	4210761.14	600092.17	-1.545	WWR			12/9/2004	WWR	Hydro
XS	45	Ground surface	4210761.48	600091.85	-1.235	WWR			12/9/2004	WWR	Hydro
XS	46	Ground surface	4210761.84	600091.73	-1.045	WWR			12/9/2004	WWR	Hydro
XS	47	Ground surface	4210762.19	600091.62	-0.935	WWR			12/9/2004	WWR	Hydro

Table 11.5

Browns Island
Channel Cross-Sections Survey Results

Cross Section 04 - *continued*

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	48	Ground surface	4210762.56	600091.52	-0.785	WWR			12/9/2004	WWR	Hydro
XS	49	Ground surface	4210762.97	600091.40	0.425	WWR			12/9/2004	WWR	Hydro
XS	50	Ground surface	4210764.50	600091.30	1.605	WWR			12/9/2004	WWR	Hydro
XS	51	Ground surface	4210764.97	600091.16	2.265	WWR			12/9/2004	WWR	Hydro
XS	52	Ground surface	4210766.15	600090.75	3.265	WWR			12/9/2004	WWR	Hydro
XS	53	Ground surface	4210766.79	600090.58	3.575	WWR			12/9/2004	WWR	Hydro
XS	54	Ground surface	4210767.35	600090.42	3.415	WWR			12/9/2004	WWR	Hydro
XS	55	Ground surface	4210767.80	600090.29	3.405	WWR			12/9/2004	WWR	Hydro
XS	56	Ground surface	4210768.26	600090.10	3.345	WWR			12/9/2004	WWR	Hydro
XS	57	Ground surface	4210770.56	600089.44	5.317	WWR			12/9/2004	WWR	Hydro
XS	58	Ground surface	4210772.59	600088.84	5.357	WWR		North endpoint Right Bank	12/9/2004	WWR	Hydro

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 11.6

Sherman Lake
Channel Cross-Sections Survey Results

Cross Section 01

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4211578	603980	4.2	WWR		Left bank	12/18/2003	WWR	Hydro
XS	02	Ground surface	4211578	603980	3.5	WWR			12/18/2003	WWR	Hydro
XS	03	Ground surface	4211578	603980	1.2	WWR			12/18/2003	WWR	Hydro
XS	04	Ground surface	4211578	603979	0.04	WWR			12/18/2003	WWR	Hydro
XS	05	Ground surface	4211578	603979	-0.26	WWR			12/18/2003	WWR	Hydro
XS	06	Ground surface	4211578	603979	-0.06	WWR			12/18/2003	WWR	Hydro
XS	07	Ground surface	4211578	603978	-0.06	WWR			12/18/2003	WWR	Hydro
XS	08	Ground surface	4211578	603978	-0.36	WWR			12/18/2003	WWR	Hydro
XS	09	Ground surface	4211578	603978	-0.56	WWR			12/18/2003	WWR	Hydro
XS	10	Ground surface	4211578	603978	-1.06	WWR			12/18/2003	WWR	Hydro
XS	11	Ground surface	4211578	603977	-1.26	WWR			12/18/2003	WWR	Hydro
XS	12	Ground surface	4211578	603977	-1.46	WWR			12/18/2003	WWR	Hydro
XS	13	Ground surface	4211578	603977	-1.86	WWR			12/18/2003	WWR	Hydro
XS	14	Ground surface	4211578	603977	-2.16	WWR			12/18/2003	WWR	Hydro
XS	15	Ground surface	4211578	603976	-2.66	WWR			12/18/2003	WWR	Hydro
XS	16	Ground surface	4211578	603976	-2.56	WWR			12/18/2003	WWR	Hydro
XS	17	Ground surface	4211577	603976	-2.86	WWR			12/18/2003	WWR	Hydro
XS	18	Ground surface	4211577	603976	-3.26	WWR			12/18/2003	WWR	Hydro
XS	19	Ground surface	4211577	603975	-3.06	WWR			12/18/2003	WWR	Hydro
XS	20	Ground surface	4211577	603975	-3.06	WWR			12/18/2003	WWR	Hydro
XS	21	Ground surface	4211577	603975	-3.16	WWR			12/18/2003	WWR	Hydro
XS	22	Ground surface	4211577	603975	-3.46	WWR			12/18/2003	WWR	Hydro
XS	23	Ground surface	4211577	603974	-3.46	WWR			12/18/2003	WWR	Hydro
XS	24	Ground surface	4211577	603974	-3.46	WWR			12/18/2003	WWR	Hydro
XS	25	Ground surface	4211577	603974	-3.56	WWR			12/18/2003	WWR	Hydro
XS	26	Ground surface	4211577	603974	-3.76	WWR			12/18/2003	WWR	Hydro
XS	27	Ground surface	4211577	603973	-3.56	WWR			12/18/2003	WWR	Hydro
XS	28	Ground surface	4211577	603973	-3.66	WWR			12/18/2003	WWR	Hydro
XS	29	Ground surface	4211577	603973	-3.56	WWR			12/18/2003	WWR	Hydro
XS	30	Ground surface	4211577	603973	-3.66	WWR			12/18/2003	WWR	Hydro
XS	31	Ground surface	4211577	603972	-3.76	WWR			12/18/2003	WWR	Hydro
XS	32	Ground surface	4211577	603972	-3.96	WWR			12/18/2003	WWR	Hydro
XS	33	Ground surface	4211577	603972	-3.56	WWR			12/18/2003	WWR	Hydro
XS	34	Ground surface	4211577	603972	-3.56	WWR			12/18/2003	WWR	Hydro
XS	35	Ground surface	4211577	603971	-3.66	WWR			12/18/2003	WWR	Hydro
XS	36	Ground surface	4211577	603971	-3.66	WWR			12/18/2003	WWR	Hydro
XS	37	Ground surface	4211577	603971	-3.76	WWR			12/18/2003	WWR	Hydro
XS	38	Ground surface	4211577	603970	-3.66	WWR			12/18/2003	WWR	Hydro
XS	39	Ground surface	4211577	603970	-4.46	WWR			12/18/2003	WWR	Hydro
XS	40	Ground surface	4211576	603970	-4.76	WWR			12/18/2003	WWR	Hydro
XS	41	Ground surface	4211576	603969	-4.16	WWR			12/18/2003	WWR	Hydro
XS	42	Ground surface	4211576	603969	-4.16	WWR			12/18/2003	WWR	Hydro
XS	43	Ground surface	4211576	603969	-4.06	WWR			12/18/2003	WWR	Hydro
XS	44	Ground surface	4211576	603969	-4.06	WWR			12/18/2003	WWR	Hydro
XS	45	Ground surface	4211576	603968	-3.76	WWR			12/18/2003	WWR	Hydro
XS	46	Ground surface	4211576	603968	-3.96	WWR			12/18/2003	WWR	Hydro
XS	47	Ground surface	4211576	603968	-3.66	WWR			12/18/2003	WWR	Hydro
XS	48	Ground surface	4211576	603968	-3.46	WWR			12/18/2003	WWR	Hydro

Table 11.6

Sherman Lake
Channel Cross-Sections Survey Results

Cross Section 01 - *continued*

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	49	Ground surface	4211576	603967	-3.56	WWR			12/18/2003	WWR	Hydro
XS	50	Ground surface	4211576	603967	-3.06	WWR			12/18/2003	WWR	Hydro
XS	51	Ground surface	4211576	603966	-3.16	WWR			12/18/2003	WWR	Hydro
XS	52	Ground surface	4211576	603966	-2.56	WWR			12/18/2003	WWR	Hydro
XS	53	Ground surface	4211576	603966	-2.56	WWR			12/18/2003	WWR	Hydro
XS	54	Ground surface	4211576	603966	-2.56	WWR			12/18/2003	WWR	Hydro
XS	55	Ground surface	4211576	603965	-2.56	WWR			12/18/2003	WWR	Hydro
XS	56	Ground surface	4211576	603965	-2.46	WWR			12/18/2003	WWR	Hydro
XS	57	Ground surface	4211576	603965	-2.16	WWR			12/18/2003	WWR	Hydro
XS	58	Ground surface	4211576	603964	-2.06	WWR			12/18/2003	WWR	Hydro
XS	59	Ground surface	4211576	603964	-1.76	WWR			12/18/2003	WWR	Hydro
XS	60	Ground surface	4211576	603964	-2.16	WWR			12/18/2003	WWR	Hydro
XS	61	Ground surface	4211575	603964	-2.36	WWR			12/18/2003	WWR	Hydro
XS	62	Ground surface	4211575	603963	-2.06	WWR			12/18/2003	WWR	Hydro
XS	63	Ground surface	4211575	603963	-1.66	WWR			12/18/2003	WWR	Hydro
XS	64	Ground surface	4211575	603963	-1.26	WWR			12/18/2003	WWR	Hydro
XS	65	Ground surface	4211575	603963	-1.06	WWR			12/18/2003	WWR	Hydro
XS	66	Ground surface	4211575	603962	-1.26	WWR			12/18/2003	WWR	Hydro
XS	67	Ground surface	4211575	603962	-0.96	WWR			12/18/2003	WWR	Hydro
XS	68	Ground surface	4211575	603961	-0.56	WWR			12/18/2003	WWR	Hydro
XS	69	Ground surface	4211575	603961	-0.46	WWR			12/18/2003	WWR	Hydro
XS	70	Ground surface	4211575	603961	-0.16	WWR			12/18/2003	WWR	Hydro
XS	71	Ground surface	4211575	603960	-0.16	WWR			12/18/2003	WWR	Hydro
XS	72	Ground surface	4211575	603960	-0.16	WWR			12/18/2003	WWR	Hydro
XS	73	Ground surface	4211575	603960	0.14	WWR			12/18/2003	WWR	Hydro
XS	74	Ground surface	4211575	603960	0.64	WWR			12/18/2003	WWR	Hydro
XS	75	Ground surface	4211575	603959	0.74	WWR			12/18/2003	WWR	Hydro
XS	76	Ground surface	4211575	603959	0.94	WWR			12/18/2003	WWR	Hydro
XS	77	Ground surface	4211575	603959	0.84	WWR			12/18/2003	WWR	Hydro
XS	78	Ground surface	4211575	603959	1.04	WWR			12/18/2003	WWR	Hydro
XS	79	Ground surface	4211575	603958	1.14	WWR			12/18/2003	WWR	Hydro
XS	80	Ground surface	4211575	603958	0.84	WWR			12/18/2003	WWR	Hydro
XS	81	Ground surface	4211574	603958	1.14	WWR			12/18/2003	WWR	Hydro
XS	82	Ground surface	4211574	603958	1.04	WWR			12/18/2003	WWR	Hydro
XS	83	Ground surface	4211574	603957	1.34	WWR			12/18/2003	WWR	Hydro
XS	84	Ground surface	4211574	603957	1.14	WWR			12/18/2003	WWR	Hydro
XS	85	Ground surface	4211574	603957	1.24	WWR			12/18/2003	WWR	Hydro
XS	86	Ground surface	4211574	603956	2.24	WWR			12/18/2003	WWR	Hydro
XS	87	Ground surface	4211574	603956	4.1	WWR			12/18/2003	WWR	Hydro
XS	88	Ground surface	4211574	603956	4.2	WWR		Right bank	12/18/2003	WWR	Hydro

Table 11.6

Sherman Lake
Channel Cross-Sections Survey Results

Cross Section 02

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4211908	603683	2.11	WWR		Left bank	12/18/2003	WWR	Hydro
XS	02	Ground surface	4211907	603683	1.81	WWR			12/18/2003	WWR	Hydro
XS	03	Ground surface	4211907	603683	1.81	WWR			12/18/2003	WWR	Hydro
XS	04	Ground surface	4211907	603683	1.31	WWR			12/18/2003	WWR	Hydro
XS	05	Ground surface	4211907	603683	0.61	WWR			12/18/2003	WWR	Hydro
XS	06	Ground surface	4211906	603683	0.71	WWR			12/18/2003	WWR	Hydro
XS	07	Ground surface	4211906	603682	0.51	WWR			12/18/2003	WWR	Hydro
XS	08	Ground surface	4211906	603682	0.01	WWR			12/18/2003	WWR	Hydro
XS	09	Ground surface	4211905	603682	-0.19	WWR			12/18/2003	WWR	Hydro
XS	10	Ground surface	4211905	603682	-0.29	WWR			12/18/2003	WWR	Hydro
XS	11	Ground surface	4211905	603682	-0.49	WWR			12/18/2003	WWR	Hydro
XS	12	Ground surface	4211905	603682	-0.19	WWR			12/18/2003	WWR	Hydro
XS	13	Ground surface	4211904	603682	-0.29	WWR			12/18/2003	WWR	Hydro
XS	14	Ground surface	4211904	603681	-0.49	WWR			12/18/2003	WWR	Hydro
XS	15	Ground surface	4211904	603681	-0.49	WWR			12/18/2003	WWR	Hydro
XS	16	Ground surface	4211904	603681	-0.49	WWR			12/18/2003	WWR	Hydro
XS	17	Ground surface	4211903	603681	-0.29	WWR			12/18/2003	WWR	Hydro
XS	18	Ground surface	4211903	603681	-0.49	WWR			12/18/2003	WWR	Hydro
XS	19	Ground surface	4211903	603681	0.21	WWR			12/18/2003	WWR	Hydro
XS	20	Ground surface	4211903	603681	0.81	WWR			12/18/2003	WWR	Hydro
XS	21	Ground surface	4211903	603681	0.61	WWR			12/18/2003	WWR	Hydro
XS	22	Ground surface	4211902	603680	0.71	WWR			12/18/2003	WWR	Hydro
XS	23	Ground surface	4211902	603680	0.81	WWR			12/18/2003	WWR	Hydro
XS	24	Ground surface	4211902	603680	1.11	WWR			12/18/2003	WWR	Hydro
XS	25	Ground surface	4211901	603680	1.41	WWR			12/18/2003	WWR	Hydro
XS	26	Ground surface	4211901	603680	1.31	WWR			12/18/2003	WWR	Hydro
XS	27	Ground surface	4211901	603680	1.91	WWR			12/18/2003	WWR	Hydro
XS	28	Ground surface	4211900	603679	2.21	WWR			12/18/2003	WWR	Hydro
XS	29	Ground surface	4211900	603679	2.31	WWR			12/18/2003	WWR	Hydro
XS	30	Ground surface	4211900	603679	2.01	WWR			12/18/2003	WWR	Hydro
XS	31	Ground surface	4211899	603679	1.91	WWR			12/18/2003	WWR	Hydro
XS	32	Ground surface	4211899	603679	2.31	WWR			12/18/2003	WWR	Hydro
XS	33	Ground surface	4211899	603678	2.01	WWR			12/18/2003	WWR	Hydro
XS	34	Ground surface	4211899	603678	1.71	WWR			12/18/2003	WWR	Hydro
XS	35	Ground surface	4211898	603678	2.6	WWR			12/18/2003	WWR	Hydro
XS	36	Ground surface	4211897	603678	3.9	WWR		Right bank	12/18/2003	WWR	Hydro

Table 11.6

Sherman Lake
Channel Cross-Sections Survey Results

Cross Section 03

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4212130	603633	4.61	WWR	12		1/15/2004	Kulpa	Total Station
XS	02	Ground surface	4212129	603632	4.19	WWR	11		1/15/2004	Kulpa	Total Station
XS	03	Ground surface	4212129	603630	1.47	WWR	10		1/15/2004	Kulpa	Total Station
XS	04	Ground surface	4212128	603629	1.33	WWR	9		1/15/2004	Kulpa	Total Station
XS	05	Ground surface	4212127	603628	1.00	WWR	8		1/15/2004	Kulpa	Total Station
XS	06	Ground surface	4212126	603627	0.48	WWR	7		1/15/2004	Kulpa	Total Station
XS	07	Ground surface	4212125	603625	1.37	WWR	6		1/15/2004	Kulpa	Total Station
XS	08	Ground surface	4212124	603624	1.39	WWR	5		1/15/2004	Kulpa	Total Station
XS	09	Ground surface	4212124	603623	3.49	WWR	4		1/15/2004	Kulpa	Total Station
XS	10	Ground surface	4212123	603623	4.37	WWR	3		1/15/2004	Kulpa	Total Station

Cross Section 04

PointType	PointID	Srvy Pt Desc	Northing[1]	Easting[1]	Elevation[2]	Org	Sample ID	Point Description	SrvyDate	Surveyor	SrvyType
XS	01	Ground surface	4212094	603525	4.16	WWR	4	East endpoint - marsh plain	1/15/2004	Kulpa	Total Station
XS	02	Ground surface	4212093	603525	3.66	WWR	5	Top of bank	1/15/2004	Kulpa	Total Station
XS	03	Ground surface	4212093	603525	1.86	WWR	6	Toe of bank	1/15/2004	Kulpa	Total Station
XS	04	Ground surface	4212091	603523	1.48	WWR	7	in channel	1/15/2004	Kulpa	Total Station
XS	05	Ground surface	4212090	603523	1.11	WWR	8	in channel	1/15/2004	Kulpa	Total Station
XS	06	Ground surface	4212089	603522	1.96	WWR	9	Toe of bank	1/15/2004	Kulpa	Total Station
XS	07	Ground surface	4212087	603521	2.46	WWR	10	Top of bank	1/15/2004	Kulpa	Total Station
XS	08	Ground surface	4212087	603521	4.72	WWR	11	West endpoint - marsh plain	1/15/2004	Kulpa	Total Station

Notes:
1. Horizontal Coordinate Datum: NAD83, UTM Zone 10N, meters.
2. Vertical Datum: NAVD 88, Feet

Table 12.1

Inlet Channel Suspended Sediment Concentration (mg/L) Summary Statistics

		SSC in milligrams per liter			
Site	**Count**	**Minimum**	**Maximum**	**Mean**	**Median**
Carl's Marsh	29191	0.0	2034.1	94.6	70.5
P2A	44431	0.0	2028.2	42.8	31.3
Coon	25063	0.0	797.0	38.5	30.6
Bul	27772	0.0	1686.4	27.9	16.5
Bri	45279	0.0	854.8	12.5	8.3
Sherman Lake	---	---	---	---	---

Notes:
1. Suspended sediment data converted from NTU data recorded at CTDS station mooring located in inlet channel
2. Carl's Marsh and Coon Island instruments exposed during some low tides. Exposed values excluded.

Table 13.1 Summary Surface Water Salinity Statistics

		Practical Salinity Units (PSU)				
Site	**Count**	**Minimum**	**Maximum**	**Mean**	**Median**	**Period[1]**
Carl's Marsh	47558	1.58	29.18	15.40	14.56	Dec 2003 - Aug 2005
Pond 2A	56314	1.71	22.61	12.28	12.11	Feb 2004 - Aug 2005
Coon Island	30770	0.28	22.73	11.88	15.01	Mar 2004 - Apr 2005
Bull Island	43584	0.01	19.92	9.40	7.87	Mar 2004 - Jun 2005
Browns Island	45210	0.02	10.15	1.84	1.32	Feb 2004 - Apr 2005
Sherman Lake	15333	0.03	1.03	0.17	0.10	Mar-Apr 2004; Apr-Aug 2005

Table 13.2 Seasonal Surface Water Salinity Statistics

		Practical Salinity Units (PSU)			
Site	**Count**	**Minimum**	**Maximum**	**Mean**	**Quarter[2]**
Carl's Marsh	17438	1.58	14.4	6.5	Winter
	12824	3.19	28.0	16.8	Spring
	11091	14.41	29.2	24.2	Summer
	6205	1.82	29.1	21.9	Fall
Pond 2A	14243	1.71	10.79	6.51	Winter
	16276	1.73	19.14	9.35	Spring
	14766	7.02	21.93	16.64	Summer
	11029	8.38	22.61	18.21	Fall
Coon Island	9952	0.28	8.26	3.07	Winter
	4646	0.70	19.94	10.64	Spring
	7412	13.83	22.53	19.27	Summer
	8760	0.66	22.73	16.30	Fall
Bull Island	9734	0.08	7.54	1.59	Winter
	13384	0.01	17.25	4.53	Spring
	10411	5.45	19.92	17.73	Summer
	10055	0.15	19.75	14.84	Fall
Browns Island	12225	0.02	1.54	0.18	Winter
	12620	0.04	7.32	0.95	Spring
	10772	0.92	6.75	2.54	Summer
	9593	1.11	10.15	4.33	Fall
Sherman Lake	987	0.06	0.23	0.11	Winter
	6037	0.03	0.23	0.10	Spring
	8309	0.05	1.03	0.24	Summer
	--	--	--	--	Fall

Notes
1. Non-continuous data record, see Table 1.1-1.6 for exact date range and data gaps
2. Winter = Jan, Feb, Mar; Spring = Apr, May, Jun; Summer = Jul, Aug, Sep; Fall = Oct, Nov, Dec

Table 14.

Inlet Channel Temperature Summary Statistics

		Temperature in degrees Celsius			
Site	**Count**	**Minimum**	**Maximum**	**Mean**	**Median**
Carl's Marsh	30308	4.9	29.2	15.9	15.8
Pond 2A	45101	6.1	28.4	15.9	16.3
Coon Island	25479	6.6	26.0	15.8	15.7
Bull Island	42901	7.1	25.9	17.9	19.1
Browns Island	62867	9.3	24.1	16.8	16.9
Sherman Lake	29052	6.0	26.8	15.9	16.9

Notes:
1. Temperature data from CTDS station mooring located in inlet channel
2. Carl's Marsh and Coon Island instruments exposed during some low tides. Exposed values excluded.

Table 15.1

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
PRMA	1	6/16/2004	20.3		YSI EC300
PRMA	1	9/14/2004	33.4	33.3	YSI EC300
PRMA	1	2/11/2005	13.2	13.2	YSI EC300
PRMA	1	4/28/2005	12.6	12.6	YSI EC300
PRMA	1	8/22/2005	18.8	18.7	YSI EC300
PRMA	2	6/16/2004	19.9		YSI EC300
PRMA	2	9/14/2004	31.9	31.8	YSI EC300
PRMA	2	10/22/2004	26.6	26.6	YSI EC300
PRMA	2	2/11/2005	22.0	22.0	YSI EC300
PRMA	2	4/28/2005	13.7	13.7	YSI EC300
PRMA	2	8/22/2005	18.4	18.4	YSI EC300
PRMA	3	6/16/2004	12.0		YSI EC300
PRMA	3	10/22/2004	16.7	16.6	YSI EC300
PRMA	3	2/11/2005	10.9		YSI EC300
PRMA	3	4/28/2005	11.1	11.0	YSI EC300
PRMA	3	8/22/2005	21.0	21.0	YSI EC300
PRMA	4	6/16/2004	17.5		YSI EC300
PRMA	4	9/14/2004	23.6	23.6	YSI EC300
PRMA	4	2/11/2005	7.8	7.7	YSI EC300
PRMA	4	4/28/2005	8.4	8.4	YSI EC300
PRMA	4	8/22/2005	18.4	18.4	YSI EC300
PRMA	8	6/16/2004	19.5		YSI EC300
PRMA	8	9/14/2004	28.2	28.1	YSI EC300
PRMA	8	2/11/2005	10.9	10.9	YSI EC300
PRMA	8	4/28/2005	11.0	11.0	YSI EC300
PRMA	8	8/22/2005	20.1	20.1	YSI EC300

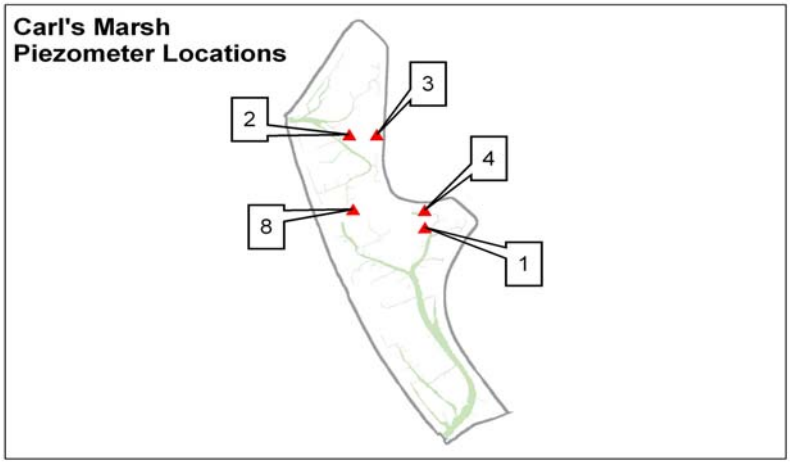
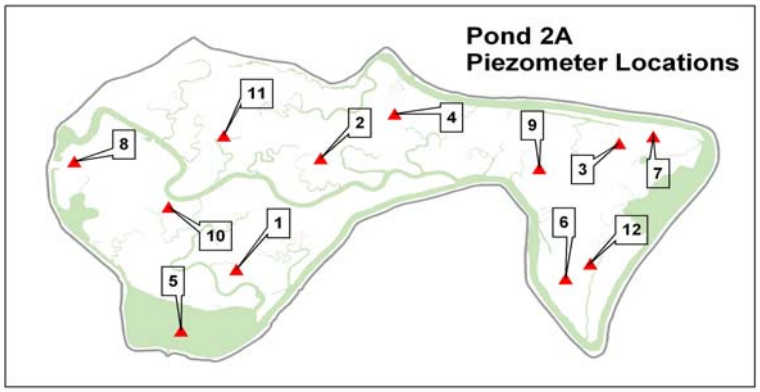


Table 15.2

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
PO2A	1	2/20/2004	13.0		Refractometer
PO2A	1	4/6/2004	7.0		Refractometer
PO2A	1	7/15/2004	18.5	18.4	YSI EC300
PO2A	1	7/28/2004	19.8	19.7	YSI EC300
PO2A	1	9/9/2004	20.4	20.3	YSI EC300
PO2A	1	10/25/2004	18.1	18.1	YSI EC300
PO2A	1	1/22/2005	13.0	13.0	YSI EC300
PO2A	1	4/19/2005	7.3	7.2	YSI EC300
PO2A	1	8/2/2005	13.0	13.0	YSI EC300
PO2A	2	2/20/2004	15.0		Refractometer
PO2A	2	4/6/2004	11.0		Refractometer
PO2A	2	7/15/2004	20.3	20.2	YSI EC300
PO2A	2	7/28/2004	16.8	16.7	YSI EC300
PO2A	2	9/9/2004	18.2	18.2	YSI EC300
PO2A	2	10/13/2004	20.0	19.9	YSI EC300
PO2A	2	10/25/2004	20.3	20.3	YSI EC300
PO2A	2	1/22/2005	14.5	14.5	YSI EC300
PO2A	2	4/19/2005	8.4	8.4	YSI EC300
PO2A	2	8/2/2005	14.7	14.5	YSI EC300
PO2A	3	4/6/2004	20.0		Refractometer
PO2A	3	7/15/2004	19.7	19.6	YSI EC300
PO2A	3	7/28/2004	20.2	20.2	YSI EC300
PO2A	3	10/25/2004	18.1	18.1	YSI EC300
PO2A	3	1/22/2005	10.9	10.9	YSI EC300
PO2A	3	4/19/2005	14.5	14.4	YSI EC300
PO2A	3	8/2/2005	18.6	18.5	YSI EC300
PO2A	4	4/6/2004	7.0		Refractometer
PO2A	4	7/15/2004	15.4	15.3	YSI EC300
PO2A	4	2/9/2005	6.2	6.1	YSI EC300
PO2A	4	4/19/2005	5.9	5.8	YSI EC300
PO2A	5	4/14/2004	13.0		Refractometer
PO2A	5	7/15/2004	18.4	18.3	YSI EC300
PO2A	5	10/25/2004	25.1	25.1	YSI EC300
PO2A	5	1/22/2005	10.2	10.2	YSI EC300
PO2A	5	8/2/2005	12.7	12.7	YSI EC300
PO2A	6	4/6/2004	24.0		Refractometer
PO2A	6	7/15/2004	16.5	16.4	YSI EC300
PO2A	6	10/25/2004	17.1	17.1	YSI EC300
PO2A	6	2/9/2005	19.8	19.9	YSI EC300
PO2A	6	4/19/2005	14.3	15.6	YSI EC300
PO2A	6	8/2/2005	13.8	13.8	YSI EC300
PO2A	7	4/6/2004	14.0		Refractometer
PO2A	7	7/15/2004	23.7	23.6	YSI EC300
PO2A	7	10/25/2004	26.4	26.4	YSI EC300
PO2A	7	1/22/2005	18.3	18.4	YSI EC300
PO2A	7	4/19/2005	13.7	13.7	YSI EC300
PO2A	7	8/2/2005	18.5	18.5	YSI EC300
PO2A	8	4/6/2004	21.0		Refractometer
PO2A	8	7/15/2004	21.7	21.6	YSI EC300
PO2A	8	10/25/2004	21.3	21.2	YSI EC300
PO2A	8	1/22/2005	19.1	19.2	YSI EC300
PO2A	8	4/19/2005	16.8	16.7	YSI EC300
PO2A	8	8/2/2005	15.8	15.7	YSI EC300
PO2A	9	4/6/2004	17.0		Refractometer
PO2A	9	7/15/2004	17.4	17.3	YSI EC300
PO2A	9	9/9/2004	19.5	19.4	YSI EC300
PO2A	9	10/14/2004	18.4	18.4	YSI EC300
PO2A	9	10/25/2004	24.3	24.1	YSI EC300
PO2A	9	1/22/2005	16.7	16.5	YSI EC300
PO2A	9	4/19/2005	9.0	9.0	YSI EC300
PO2A	9	8/2/2005	14.4	14.3	YSI EC300
PO2A	10	4/6/2004	24.0		Refractometer
PO2A	10	7/15/2004	27.9	27.8	YSI EC300
PO2A	10	10/25/2004	26.7	27.8	YSI EC300
PO2A	10	4/19/2005	7.9	7.9	YSI EC300
PO2A	10	8/2/2005	15.0	14.8	YSI EC300

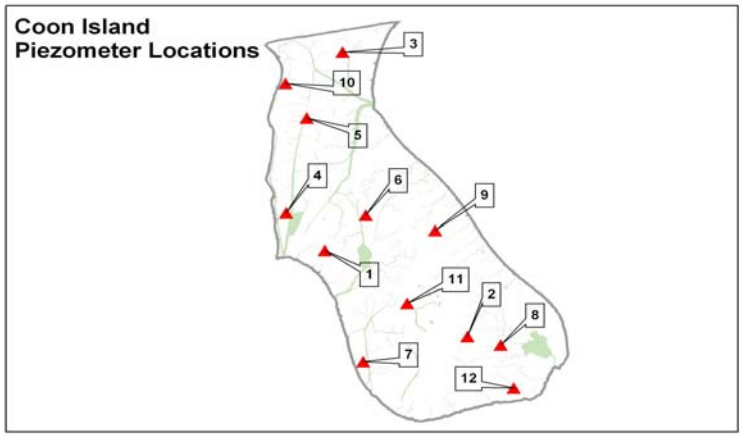


Site	Station	Date	PPT	PSU	Method
PO2A	11	4/6/2004	16.0		Refractometer
PO2A	11	7/15/2004	21.1	21.0	YSI EC300
PO2A	11	10/25/2004	20.9	20.9	YSI EC300
PO2A	11	1/22/2005	18.3	18.4	YSI EC300
PO2A	11	4/19/2005	12.2	12.2	YSI EC300
PO2A	11	8/2/2005	14.6	14.5	YSI EC300
PO2A	12	4/6/2004	10.0		Refractometer
PO2A	12	7/15/2004	18.7	18.6	YSI EC300
PO2A	12	10/13/2004	21.1	21.0	YSI EC300
PO2A	12	10/25/2004	19.0	19.0	YSI EC300
PO2A	12	2/9/2005	7.4	7.4	YSI EC300
PO2A	12	8/2/2005	14.2	14.1	YSI EC300

Table 15.3

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
COIS	1	4/30/2004	3.5		Refractometer
COIS	1	6/21/2004	10.4	10.3	YSI EC300
COIS	1	6/29/2004	14.2	14.2	YSI EC300
COIS	1	7/28/2004	18.4	18.4	YSI EC300
COIS	1	10/27/2004	18.4	18.4	YSI EC300
COIS	1	2/4/2005	7.7	7.6	YSI EC300
COIS	1	4/19/2005	3.7	3.7	YSI EC300
COIS	1	8/4/2005	8.6	8.5	YSI EC300
COIS	1	9/20/2005	13.2	13.1	YSI EC300
COIS	2	4/30/2004	20.0		Refractometer
COIS	2	6/29/2004	18.8	18.7	YSI EC300
COIS	2	7/22/2004	22.4	22.3	YSI EC300
COIS	2	7/28/2004	24.7	24.6	YSI EC300
COIS	2	9/9/2004	23.0	22.9	YSI EC300
COIS	2	10/14/2004	10.3	10.2	YSI EC300
COIS	2	10/27/2004	23.0	23.0	YSI EC300
COIS	2	11/15/2004	19.3	19.2	YSI EC300
COIS	2	2/4/2005	18.6	18.6	YSI EC300
COIS	2	4/7/2005	11.7	11.6	YSI EC300
COIS	2	8/4/2005	14.3	14.3	YSI EC300
COIS	2	9/20/2005	15.2	15.1	YSI EC300
COIS	3	6/29/2004	16.8	16.8	YSI EC300
COIS	3	7/22/2004	19.0	19.0	YSI EC300
COIS	3	8/9/2004	19.1	19.0	YSI EC300
COIS	3	9/9/2004	19.9	19.9	YSI EC300
COIS	3	10/14/2004	16.7	16.6	YSI EC300
COIS	3	10/27/2004	19.4	19.4	YSI EC300
COIS	3	2/4/2005	12.1	12.2	YSI EC300
COIS	3	4/7/2005	9.5	9.5	YSI EC300
COIS	3	8/4/2005	10.5	10.4	YSI EC300
COIS	3	9/20/2005	13.6	13.6	YSI EC300
COIS	4	7/28/2004	20.2	20.2	YSI EC300
COIS	4	10/27/2004	18.0	18.0	YSI EC300
COIS	4	2/4/2005	8.5	8.4	YSI EC300
COIS	4	8/4/2005	14.0	13.2	YSI EC300
COIS	4	9/20/2005	17.0	17.0	YSI EC300
COIS	5	4/30/2004	6.0		Refractometer
COIS	5	7/28/2004	18.0	17.9	YSI EC300
COIS	5	10/27/2004	17.7	17.6	YSI EC300
COIS	5	2/4/2005	13.1	13.1	YSI EC300
COIS	5	8/4/2005	11.7	11.7	YSI EC300
COIS	5	9/20/2005	15.9	15.9	YSI EC300
COIS	6	4/30/2004	25.0		Refractometer
COIS	6	7/28/2004	26.6	26.5	YSI EC300
COIS	6	10/27/2004	34.1	34.1	YSI EC300
COIS	6	2/4/2005	21.8	22.2	YSI EC300
COIS	6	4/19/2005	22.1	22.0	YSI EC300
COIS	6	8/4/2005	18.3	18.2	YSI EC300
COIS	6	9/20/2005	21.2	21.1	YSI EC300
COIS	7	4/30/2004	15.0		Refractometer
COIS	7	10/27/2004	17.1	17.1	YSI EC300
COIS	7	2/4/2005	14.2	14.2	YSI EC300
COIS	7	4/19/2005	10.5	10.4	YSI EC300
COIS	7	8/4/2005	9.9	9.8	YSI EC300
COIS	7	9/20/2005	12.3	12.3	YSI EC300
COIS	8	4/30/2004	10.0		Refractometer
COIS	8	8/9/2004	17.8	17.7	YSI EC300
COIS	8	10/27/2004	14.4	14.4	YSI EC300
COIS	8	2/4/2005	6.2	6.1	YSI EC300
COIS	8	4/7/2005	2.1	2.1	YSI EC300
COIS	8	8/4/2005	21.9		YSI EC300
COIS	8	9/20/2005	14.5	14.5	YSI EC300

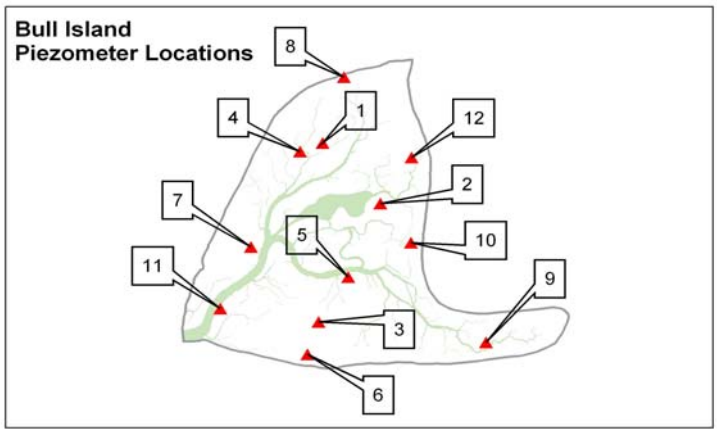


Site	Station	Date	PPT	PSU	Method
COIS	9	4/30/2004	12.0		Refractometer
COIS	9	8/9/2004	8.5	8.5	YSI EC300
COIS	9	10/27/2004	25.3	25.3	YSI EC300
COIS	9	2/4/2005	6.9	7.0	YSI EC300
COIS	9	4/19/2005	4.7	4.7	YSI EC300
COIS	9	8/4/2005	15.1	15.0	YSI EC300
COIS	9	9/20/2005	18.9	18.9	YSI EC300
COIS	10	4/30/2004	5.0		Refractometer
COIS	10	8/9/2004	21.1	21.1	YSI EC300
COIS	10	10/27/2004	21.7	21.7	YSI EC300
COIS	10	2/4/2005	9.5	9.4	YSI EC300
COIS	10	8/4/2005	11.8	11.8	YSI EC300
COIS	10	9/20/2005	17.9	17.8	YSI EC300
COIS	11	4/30/2004	21.0		Refractometer
COIS	11	10/27/2004	30.2	30.3	YSI EC300
COIS	11	2/4/2005	20.1	20.2	YSI EC300
COIS	11	4/19/2005	17.7	17.8	YSI EC300
COIS	11	8/4/2005	18.6	18.5	YSI EC300
COIS	11	9/20/2005	24.3	24.2	YSI EC300
COIS	12	4/30/2004	18.0		Refractometer
COIS	12	10/27/2004	16.7	16.7	YSI EC300
COIS	12	2/4/2005	10.5	10.5	YSI EC300
COIS	12	4/19/2005	4.9	4.7	YSI EC300
COIS	12	8/4/2005	13.3	13.2	YSI EC300
COIS	12	9/20/2005	12.9	12.9	YSI EC300

Table 15.4

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
BUIS	1	7/22/2004	17.9	17.8	YSI EC300
BUIS	1	10/14/2004	20.5	20.4	YSI EC300
BUIS	1	10/27/2004	17.4	17.3	YSI EC300
BUIS	1	2/3/2005	24.2		YSI EC300
BUIS	1	4/19/2005	3.3	3.3	YSI EC300
BUIS	1	7/26/2005	10.6	10.5	YSI EC300
BUIS	2	4/30/2004	4.0		Refractometer
BUIS	2	6/29/2004	14.3	14.2	YSI EC300
BUIS	2	10/13/2004	17.3	17.3	YSI EC300
BUIS	2	10/14/2004	17.3	17.3	YSI EC300
BUIS	2	10/14/2004	17.5	17.4	YSI EC300
BUIS	2	10/27/2004	17.0	16.9	YSI EC300
BUIS	2	2/3/2005	6.5	6.5	YSI EC300
BUIS	2	4/19/2005	0.8	0.8	YSI EC300
BUIS	2	7/26/2005	7.7	7.7	YSI EC300
BUIS	3	4/30/2004	dry		Refractometer
BUIS	3	6/29/2004	7.2	7.2	YSI EC300
BUIS	3	7/22/2004	17.8	17.7	YSI EC300
BUIS	3	9/10/2004	26.4		YSI EC300
BUIS	3	10/27/2004	18.9	18.8	YSI EC300
BUIS	3	2/3/2005	10.9	10.7	YSI EC300
BUIS	3	4/7/2005	3.4	3.3	YSI EC300
BUIS	3	7/26/2005	10.6	10.6	YSI EC300
BUIS	4	7/22/2004	7.8	7.7	YSI EC300
BUIS	4	10/27/2004	17.6	17.5	YSI EC300
BUIS	4	2/3/2005	9.5	9.3	YSI EC300
BUIS	4	4/19/2005	1.6	1.6	YSI EC300
BUIS	4	7/26/2005	9.6	9.5	YSI EC300
BUIS	5	7/22/2004	7.6	7.5	YSI EC300
BUIS	5	10/27/2004	16.2	16.2	YSI EC300
BUIS	5	2/3/2005	6.8	6.7	YSI EC300
BUIS	5	4/19/2005	0.2	0.2	YSI EC300
BUIS	5	7/26/2005	4.5	4.5	YSI EC300
BUIS	6	4/30/2004	dry		Refractometer
BUIS	6	6/29/2004	21.6	21.5	YSI EC300
BUIS	6	7/22/2004	20.8	20.8	YSI EC300
BUIS	6	9/10/2004	30.8		YSI EC300
BUIS	6	10/14/2004	24.5	24.5	YSI EC300
BUIS	6	10/27/2004	24.5	24.5	YSI EC300
BUIS	6	2/3/2005	18.8	18.7	YSI EC300
BUIS	6	4/7/2005	10.7	10.6	YSI EC300
BUIS	6	7/26/2005	8.7	8.7	YSI EC300
BUIS	7	4/30/2004	dry		Refractometer
BUIS	7	6/23/2004	13.4	13.4	YSI EC300
BUIS	7	7/22/2004	17.1	17.0	YSI EC300
BUIS	7	10/27/2004	19.0	18.9	YSI EC300
BUIS	7	2/3/2005	6.9	6.8	YSI EC300
BUIS	7	4/19/2005	2.7	2.7	YSI EC300
BUIS	7	7/26/2005	10.3	10.2	YSI EC300
BUIS	8	7/22/2004	11.6	11.5	YSI EC300
BUIS	8	10/27/2004	16.0	16.0	YSI EC300
BUIS	8	2/3/2005	11.3	11.3	YSI EC300
BUIS	8	7/26/2005	8.2	8.3	YSI EC300
BUIS	9	7/22/2004	16.9	17.7	YSI EC300
BUIS	9	10/27/2004	19.4	19.3	YSI EC300
BUIS	9	2/3/2005	13.7	13.7	YSI EC300
BUIS	9	4/19/2005	0.8	0.8	YSI EC300
BUIS	9	7/26/2005	10.4	10.3	YSI EC300
BUIS	10	6/23/2004	9.5	9.4	YSI EC300
BUIS	10	7/22/2004	16.1	16.1	YSI EC300
BUIS	10	10/27/2004	17.1	17.1	YSI EC300
BUIS	10	2/3/2005	6.6	6.5	YSI EC300
BUIS	10	4/19/2005	2.2	2.2	YSI EC300



Site	Station	Date	PPT	PSU	Method
BUIS	11	4/30/2004	dry		Refractometer
BUIS	11	6/23/2004	14.3	14.3	YSI EC300
BUIS	11	7/22/2004	17.1	17.0	YSI EC300
BUIS	11	10/13/2004	18.6	18.3	YSI EC300
BUIS	11	10/27/2004	18.9	18.9	YSI EC300
BUIS	11	2/3/2005	16.3	16.2	YSI EC300
BUIS	11	4/7/2005	8.7	7.8	YSI EC300
BUIS	11	4/19/2005	7.2	7.2	YSI EC300
BUIS	11	7/26/2005	13.0	12.9	YSI EC300
BUIS	12	4/30/2004	3.0		Refractometer
BUIS	12	7/22/2004	16.7	16.6	YSI EC300
BUIS	12	10/27/2004	18.0	18.0	YSI EC300
BUIS	12	4/19/2005	0.9	0.9	YSI EC300
BUIS	12	7/26/2005	7.9	7.8	YSI EC300

Table 15.5

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
BRIS	1	5/3/2004	dry		Refractometer
BRIS	1	7/14/2004	4.2		YSI EC300
BRIS	1	10/26/2004	5.3	5.3	YSI EC300
BRIS	1	1/26/2005	4.5	4.4	YSI EC300
BRIS	1	4/21/2005	3.2	3.1	YSI EC300
BRIS	1	8/10/2005	3.3	3.3	YSI EC300
BRIS	2	5/3/2004	0.0		Refractometer
BRIS	2	7/14/2004	2.6		YSI EC300
BRIS	2	10/26/2004	3.6	3.6	YSI EC300
BRIS	2	1/26/2005	1.3	1.3	YSI EC300
BRIS	2	4/21/2005	0.7	0.7	YSI EC300
BRIS	3	1/8/2004	5.0		Refractometer
BRIS	3	5/3/2004	7.5		Refractometer
BRIS	3	6/25/2004	1.0		YSI EC300
BRIS	3	7/14/2004	2.1		YSI EC300
BRIS	3	8/25/2004	1.3	1.3	YSI EC300
BRIS	3	10/1/2004	3.2	3.2	YSI EC300
BRIS	3	11/12/2004	3.4	3.3	YSI EC300
BRIS	3	1/26/2005	1.6	1.6	YSI EC300
BRIS	4	1/8/2004	5.0		Refractometer
BRIS	4	6/25/2004	5.4		YSI EC300
BRIS	4	7/14/2004	6.4		YSI EC300
BRIS	4	10/7/2004	11.5	11.5	YSI EC300
BRIS	4	11/12/2004	8.1	8.1	YSI EC300
BRIS	4	1/26/2005	4.7	4.7	YSI EC300
BRIS	4	4/21/2005	4.1	4.1	YSI EC300
BRIS	4	8/10/2005	12.4	12.4	YSI EC300
BRIS	5	1/15/2004	5.6		Refractometer
BRIS	5	10/26/2004	8.5	8.5	YSI EC300
BRIS	5	1/26/2005	4.7	4.7	YSI EC300
BRIS	5	4/21/2005	5.9	5.9	YSI EC300
BRIS	6	5/3/2004	5.5		Refractometer
BRIS	6	7/14/2004	8.5		YSI EC300
BRIS	6	10/26/2004	10.2	10.2	YSI EC300
BRIS	6	1/26/2005	8.9	8.9	YSI EC300
BRIS	6	4/21/2005	7.9	7.8	YSI EC300
BRIS	6	8/10/2005	6.6	6.6	YSI EC300
BRIS	8	10/26/2004	6.0	6.0	YSI EC300
BRIS	8	1/26/2005	3.7	3.6	YSI EC300
BRIS	8	4/21/2005	2.7	2.6	YSI EC300
BRIS	8	8/10/2005	2.3	2.3	YSI EC300
BRIS	9	5/3/2004	0.5		Refractometer
BRIS	9	7/14/2004	2.4		YSI EC300
BRIS	9	10/26/2004	4.0	4.0	YSI EC300
BRIS	9	1/26/2005	1.9	1.9	YSI EC300
BRIS	9	4/21/2005	0.9	0.9	YSI EC300
BRIS	10	1/8/2004	5.0		Refractometer
BRIS	10	6/25/2004	14.4		YSI EC300
BRIS	10	7/14/2004	7.2		YSI EC300
BRIS	10	8/25/2004	14.6	14.5	YSI EC300
BRIS	10	10/1/2004	15.6	15.5	YSI EC300
BRIS	10	11/12/2004	13.3	13.2	YSI EC300
BRIS	10	1/26/2005	11.6	11.6	YSI EC300
BRIS	10	4/21/2005	12.5	12.5	YSI EC300
BRIS	11	1/8/2004	17.0		Refractometer
BRIS	11	2/19/2004	13.0		Refractometer
BRIS	11	6/25/2004	12.5		YSI EC300
BRIS	11	7/14/2004	11.7		YSI EC300
BRIS	11	8/25/2004	12.5	12.4	YSI EC300
BRIS	11	10/1/2004	10.8	10.8	YSI EC300
BRIS	11	11/12/2004	11.0	11.0	YSI EC300
BRIS	11	4/21/2005	9.7	9.7	YSI EC300
BRIS	11	8/10/2005	10.6	10.6	YSI EC300
BRIS	12	10/26/2004	4.6	4.5	YSI EC300
BRIS	12	1/26/2005	1.5	1.5	YSI EC300
BRIS	12	4/21/2005	0.9	0.9	YSI EC300

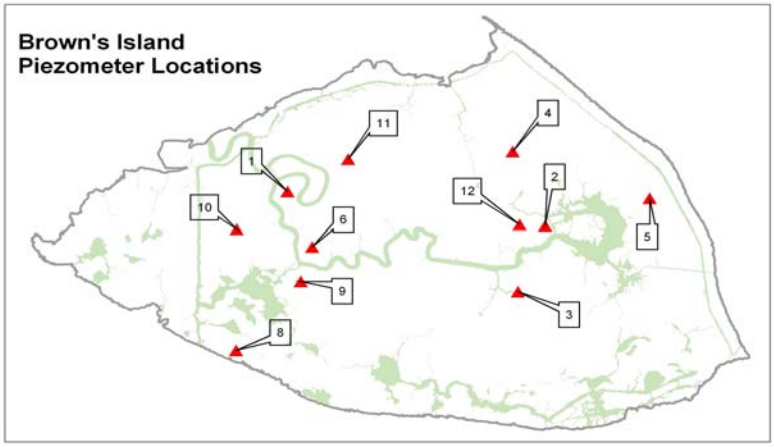
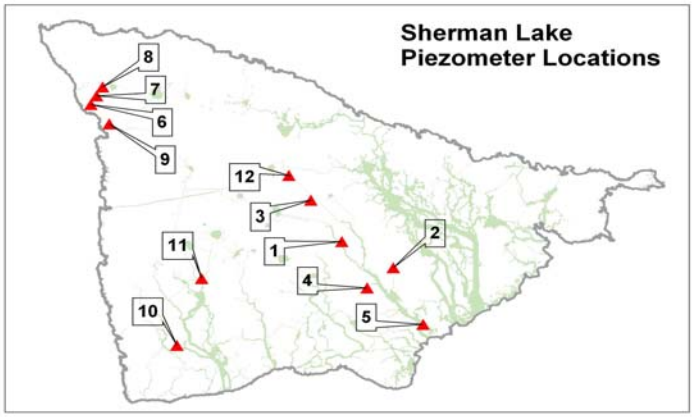


Table 15.6

Piezometer Pore Water Salinity Sampling Results

Site	Station	Date	PPT	PSU	Method
SHLA	1	6/25/2004	1.0		YSI EC300
SHLA	1	9/16/2004	1.6	1.6	YSI EC300
SHLA	1	1/4/2005	1.3	1.3	YSI EC300
SHLA	1	8/10/2005	0.5	0.5	YSI EC300
SHLA	1	9/6/2005	0.9	0.9	YSI EC300
SHLA	2	5/18/2004	0.0		Refractometer
SHLA	2	6/25/2004	0.8		YSI EC300
SHLA	2	7/14/2004	0.5		YSI EC300
SHLA	2	8/25/2004	1.0		YSI EC300
SHLA	2	9/16/2004	1.1	1.1	YSI EC300
SHLA	2	1/4/2005	1.0	1.0	YSI EC300
SHLA	2	4/20/2005	0.4	0.4	YSI EC300
SHLA	2	6/23/2005	0.2	0.3	YSI EC300
SHLA	2	8/10/2005	0.5	0.5	YSI EC300
SHLA	2	9/6/2005	0.9	0.9	YSI EC300
SHLA	3	5/18/2004	0.0		Refractometer
SHLA	3	6/25/2004	1.0		YSI EC300
SHLA	3	9/16/2004	1.4	1.3	YSI EC300
SHLA	3	1/4/2005	1.7	1.7	YSI EC300
SHLA	3	8/10/2005	0.5	0.4	YSI EC300
SHLA	3	9/6/2005	0.7	0.7	YSI EC300
SHLA	4	5/18/2004	0.0		Refractometer
SHLA	4	7/14/2004	1.1		YSI EC300
SHLA	4	8/25/2004	1.0		YSI EC300
SHLA	4	9/16/2004	1.5	1.5	YSI EC300
SHLA	4	1/4/2005	0.8	0.8	YSI EC300
SHLA	4	4/20/2005	0.3	0.3	YSI EC300
SHLA	4	6/23/2005	0.0	0.4	YSI EC300
SHLA	4	8/10/2005	0.5	0.5	YSI EC300
SHLA	4	9/6/2005	1.1	1.1	YSI EC300
SHLA	5	5/18/2004	0.0		Refractometer
SHLA	5	8/25/2004	0.9		YSI EC300
SHLA	5	10/7/2004	1.9	1.9	YSI EC300
SHLA	5	1/4/2005	1.2	1.2	YSI EC300
SHLA	5	4/21/2005	0.2	0.2	YSI EC300
SHLA	5	8/10/2005	0.6	0.6	YSI EC300
SHLA	5	9/6/2005	1.0	1.0	YSI EC300
SHLA	6	5/18/2004	dry		Refractometer
SHLA	6	6/25/2004	dry		YSI EC300
SHLA	6	9/16/2004	1.3	1.3	YSI EC300
SHLA	6	1/4/2005	5.9	5.9	YSI EC300
SHLA	7	5/18/2004	3.5		Refractometer
SHLA	7	6/25/2004	5.8		YSI EC300
SHLA	7	9/16/2004	3.0	3.1	YSI EC300
SHLA	7	1/4/2005	5.3	5.3	YSI EC300
SHLA	7	4/21/2005	0.6	0.6	YSI EC300
SHLA	8	5/18/2004	0.0		Refractometer
SHLA	8	6/25/2004	3.3		YSI EC300
SHLA	8	9/16/2004	6.2	6.2	YSI EC300
SHLA	8	1/4/2005	4.0	4.0	YSI EC300
SHLA	8	4/21/2005	0.5	0.5	YSI EC300
SHLA	8	8/10/2005	3.0	3.0	YSI EC300
SHLA	8	9/6/2005	3.6	3.5	YSI EC300
SHLA	9	5/18/2004	0.0		Refractometer
SHLA	9	6/25/2004	dry		YSI EC300
SHLA	9	9/16/2004	1.3	1.2	YSI EC300
SHLA	9	1/4/2005	3.9	3.9	YSI EC300
SHLA	9	4/21/2005	0.8	0.8	YSI EC300
SHLA	9	8/10/2005	0.7	0.7	YSI EC300
SHLA	10	5/18/2004	0.0		Refractometer
SHLA	10	6/25/2004	1.0		YSI EC300
SHLA	10	1/4/2005	1.4	1.4	YSI EC300
SHLA	10	4/21/2005	0.5	0.5	YSI EC300
SHLA	11	6/25/2004	0.6		YSI EC300
SHLA	11	10/7/2004	3.8	3.8	YSI EC300
SHLA	11	1/4/2005	1.1	1.1	YSI EC300
SHLA	11	8/10/2005	0.0	0.3	YSI EC300



Site	Station	Date	PPT	PSU	Method
SHLA	12	5/18/2004	0.0		Refractometer
SHLA	12	6/25/2004	0.9		YSI EC300
SHLA	12	1/4/2005	1.1	1.1	YSI EC300
SHLA	12	4/21/2005	0.8	0.8	YSI EC300
SHLA	12	8/10/2005	0.7	0.7	YSI EC300
SHLA	12	9/6/2005	0.9	0.9	YSI EC300

Appendix A
Instrument Specifications

Submersible Pressure Transmitter for Level Measurement
Model LS-10, standard version
Model LH-10, High Performance

WIKA Data Sheet PE 81.09

Applications

- Areas of application are e. g. hydrostatic level measurement in tanks, rivers, drinking water manholes, bore holes and waste water plants.

Special Features

- Pressure ranges from 0 ... 1 mH_2O to 0 ... 250 mH_2O
- Temperature measurement with integrated Pt 100 - element, 4-wire
- Surge protection (lightning protection)
- Maximum tensile strength of the cable 1000 N
- For aggressive media FEP-cable

Fig. left Level Probe LS-10
Fig. center Level Probe LH-10
Fig. right Level Probe LH-10 in Hastelloy

Description

Simple measuring tasks
The level probe model LS-10 has been designed for simple, inexpensive level measurements with values you can count on. The output signal is 4 ... 20 mA with an accuracy of 0.5%. The level probe can be operated in water up to a maximum of 100 m depth with an ingress protection of IP 68.

Special demands
With an accuracy better than 0.25 %, the High Performance Level Probe model LH-10 also offers several special options such as temperature measurement, lightning protection and special output signals.
It provides a signal output of 0.5 ... 4.5 V, 3-wire with a current consumption of approx. 2 mA only. For a mains independent service in the field, with batteries, the level probe can be manufactured to operate with a supply voltage of 5 DC V.

The maximum immersion depth of the LH-10 into water is 300 m with an ingress protection of IP 68.

An important advantage of this level transmitter is the longitudinal water resistance, supplied as standard, which guarantees that liquid cannot get into the transmitter even if the cable is damaged. In the case of cable damage, the transmitter will remain completely functional and only the cable needs to be exchanged.

Both probes offer a hermetically sealed, durable stainless steel case.

For hydrostatic pressure measurement the pressure compensation towards the atmosphere is done via the internally vented cable.

Level Probe intrinsic safe Model IL-10 see data sheet PE 81.23

WIKA
Part of your business

Specifications	Model LS-10 / LH-10													
Pressure ranges														
➢ LS-10 / {LH-10 with FEP cable}	bar [1]	0.25	0.4	0.6	1	1.6	2.5	4	6	10				
Over pressure safety	bar [1]	2	2	4	5	10	10	10	10	10				
Burst pressure	bar [1]	2.4	2.4	4.8	6	12	12	12	12	12				
Pressure ranges ➢ LH-10	bar [1]	0.1	0.16	0.25	0.4	0.6	1	1.6	2.5	4	6	10	16	25
Over pressure safety	bar [1]	1	1.5	2	2	4	5	10	10	17	35	35	35	35
Burst pressure	bar [1]	2	2	2.4	2.4	4.8	6	12	12	20.5	42	42	42	42
	[1] 1 bar = 10.2 mH_2O													

		Model LS-10	Model LH-10
Materials			
■ Wetted parts		Stainless steel	Stainless steel {Hastelloy}
■ Pressure connection/ flush diaphragm		Stainless steel	Stainless steel {Hastelloy}
■ Protection cap		PA	PA {Stainless steel} {Hastelloy}
■ Cable		PUR	PUR {FEP}
Power supply U_B	U_B in DC V	$10 < U_B \leq 30$	$10 < U_B \leq 30$
			(14 ... 30 with signal output 0 ... 10 V)
			(5 ... 30 with battery operation,
			signal output 0.5 ... 4.5 V)
Signal output		4 ... 20 mA, 2-wire	4 ... 20 mA, 2-wire
			0 ... 20 mA, 3-wire
			{0 ... 5 V, 3-wire}
			{0 ... 10 V, 3-wire}
			{0.5 ... 4.5 V, 3-wire
			with battery operation} [2]
			{Pt 100, 4-wire; IEC 60751}
	[2] For pressure ranges ≥ 0 ... 0.25 bar		
Pt 100 ➢ only model LH-10			
■ I max	mA		3
■ I mess	mA		1
Maximum load R_A	R_A in Ohm		
■ Current signal output	U_B in DC V	$R_A < (U_B - 10\ V) / 0.02\ A - (0.14\ Ohm \times cable\ length\ in\ m)$	
■ Voltage signal output		-	$R_A > 100$ kOhm
Dielectric strength	DC V	500 [3]	500 [3]
	[3] NEC Class 02 power supply (low voltage and low current max. 100 VA even under fault conditions)		
Accuracy	% of span	≤ 0.25 (BFSL)	≤ 0.125 (BFSL)
	% of span	≤ 0.5 [4]	≤ 0.25 [4]
	[4] Including non-linearity, hysteresis, non-repeatability, zero point and full scale error (corresponds to error of measurement per IEC 61298-2). Adjusted in vertical mounting position with lower pressure connection.		
Non-linearity	% of span	≤ 0.2 (BFSL) according to IEC 61298-2	
1-year stability	% of span	≤ 0.2 (at reference conditions)	≤ 0.2 (at reference conditions)
Permissible temperature of			
■ Medium [5]		-10 ... +50 °C | +14 ... +122 °F	-10 ... +50 °C | +14 ... +122 °F
			{-10 ... +85 °C with option FEP-cable}
			{+14 ... +185 °F with option FEP-cable}
■ Storage [5]		-30 ... +80 °C | -22 ... +176 °F	-30 ... +80 °C | -22 ... +176 °F
	[5] Also complies with EN 50178, Tab. 7, Operation (C) 4K4H, Storage (D) 1K4, Transport (E) 2K3		
Compensated temp. range		0 ... +50 °C | +32 ... +122 °F	0 ... +50 °C | +32 ... +122 °F
Temperature coefficients within compensated temp range			
■ Mean TC of zero	% of span	≤ 0.2 / 10 K (< 0.4 for pressure range 0 ... 0.1 and 0 ... 0.16 bar)	
■ Mean TC of range	% of span	≤ 0.2 / 10 K	≤ 0.2 / 10 K
CE-conformitiy		89/336/EWG interference emission and immunity see EN 61 326	
		Interference emission limit class A and B	
Wiring protection		Protected against reverse polarity, overvoltage and short circuiting	
		on the instrument side	
			{Lightning protection EN 61000-4-5; 1,2J}

Specifications		Model LS-10 / LH-10	
Mass			
■ Level Probe	kg	Approx. 0.18	Approx. 0.20
■ Cable	kg/m	Approx. 0.08	Approx. 0.08
■ Additional mass	kg	Approx. 0.50	Approx. 0.50

{ } Items in curved brackets are optional extras for additional price.

Dimensions in mm

Ingress Protection IP 68 per IEC 60 529

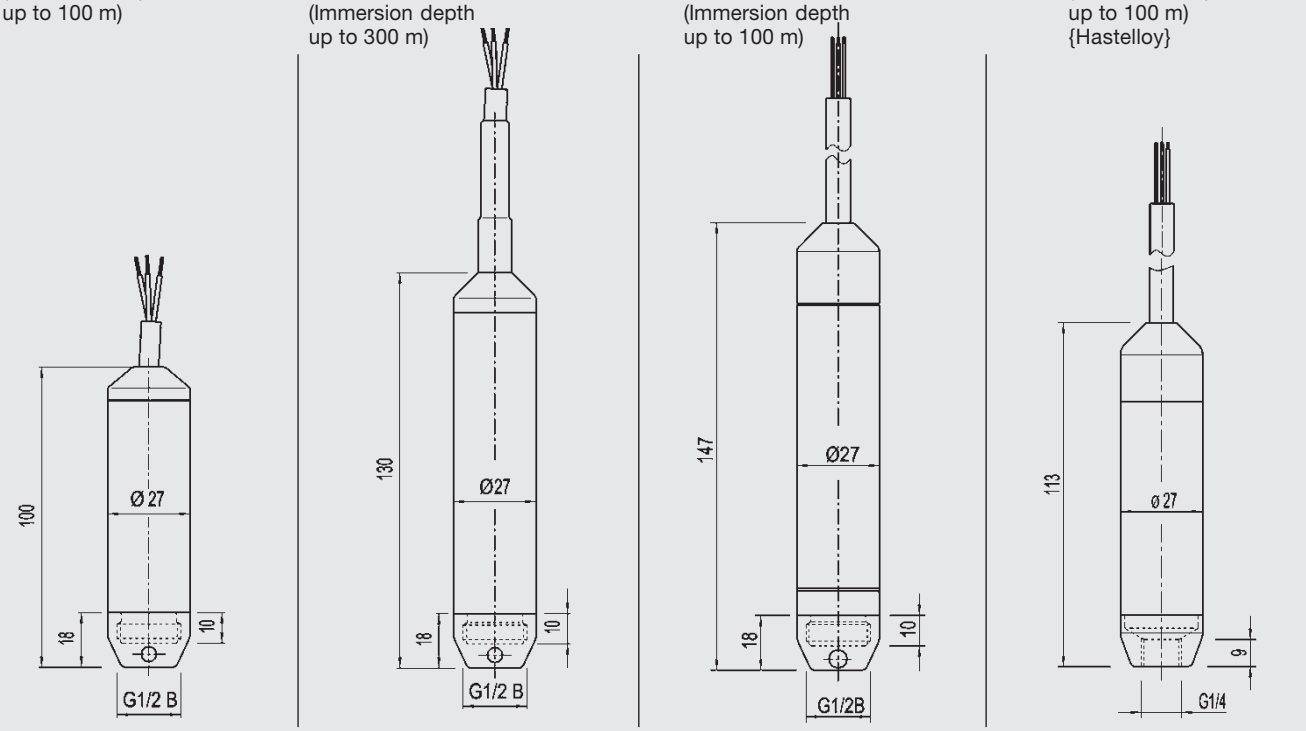
100 mm = 3.937 inch

LS -10
(Immersion depth
up to 100 m)

LH-10 with
PUR-cable *)
(Immersion depth
up to 300 m)

LH-10 with
FEP-cable *)
(Immersion depth
up to 100 m)

LH-10 with FEP-cable *)
(Immersion depth
up to 100 m)
{Hastelloy}



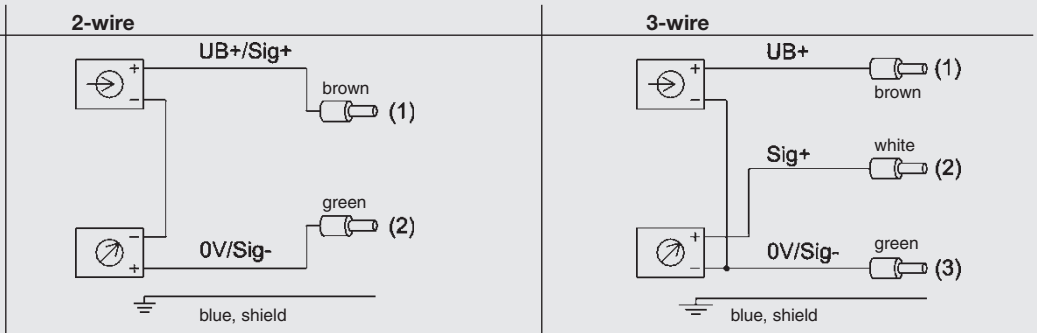
*) FEP-cable and lightning protection EN 61000-4-5; 1,2J on request

For mounting no additional strain relief required because the cable has a max. tensile strength of 1000 N (500 N with FEP-cable).

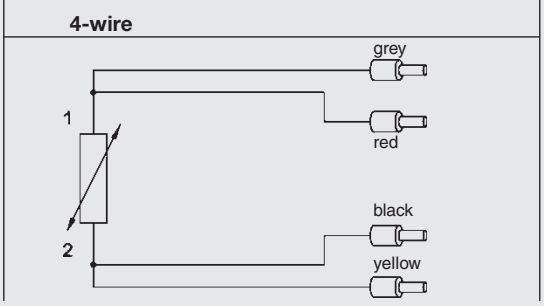
For installation and safety instructions see the operating instructions for this product.

Wiring details

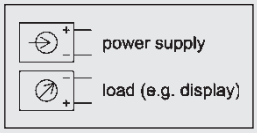
Vented PUR-cable
tensile strength 1000 N
(500 N with FEP-cable)



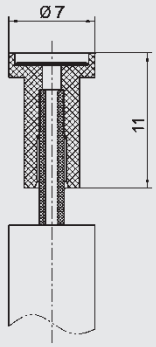
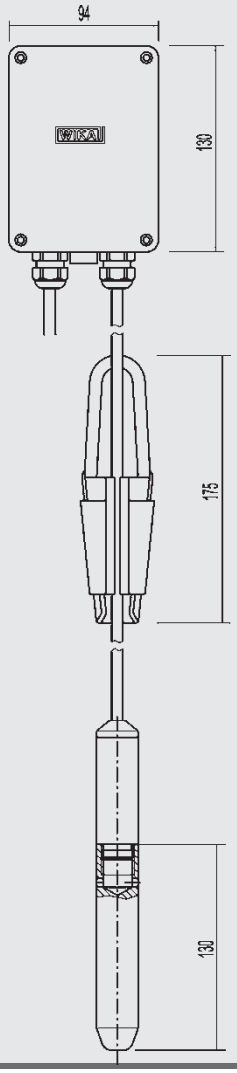
Pt 100-element



Legend:



Accessories (Dimensions in mm)

	Order-No.	
	**71 93 131**	The optional filter element for self-mounting avoids the ingress of pollution and water into the venting tube for the pressure compensation to the atmosphere.
	**24 59 686**	The optional cable box with venting element weather protection IP 67 (NEMA 4), is suitable for mounting outside of the shafts and tanks or directly in dry control boxes and for dinrail or wall mounting.
	20 74 257	For mechanical assembly of the level probe a cable straining clamp is optionally available.
	15 24 399	In order to increase the weight of the level probe an additional weight (approx. 500 g = 1.1 lb.) can be screwed on.

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

9066039 10/2005 GB

WIKA Alexander Wiegand GmbH & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Phone (+49) 93 72/132-0
Telefax (+49) 93 72/132-406
E-Mail support-tronic@wika.de
www.wika.de

In-Situ Inc.

miniTROLL

LEVEL · TEMPERATURE · DATA LOGGING

Introducing the leading instrument for water monitoring—the miniTROLL. Powerful, dependable, versatile, easy-to-use and small. The miniTROLL has become the instrument of choice for water professionals who need accurate, reliable data for water level and temperature monitoring applications.

Get connected with the world's most advanced submersible cable. Quick-ConnectTM cables available in Polyethalyne, Polyurethane or FEP. Or, suspend it with Teflon-coated wire using a sealed backshell.

2 AA batteries provide long-term operation. And they are user replaceable—slide them in, no tools required.

An internal data logger with 1MB of onboard memory can store more than 1-million data points. Think of all the possibilities!

Our pressure sensors set the standard for high-accuracy. NIST- traceable calibrations compensated across the ENTIRE temperature meet the most rigorous government standards.

SMALLEST DIAMETER AT ONLY 0.72"(18.3MM)

Now, 1-inch wells (25mm) can be monitored with room to spare! The miniTROLL packs a pressure/level sensor, temperature sensor, data logger, up to 1MB of memory (220,000 data points), real-time crystal clock, and internal power all into an industrial stainless steel housing with a diameter of only 0.72" (18.3mm). Sound extreme? We think so.

SIMPLE TO USE AND VERY POWERFUL

Since the miniTROLL houses everything needed to monitor, installation is easy. Just place it in water and have it collect data. Our intuitive Win-Situ software walks you through all the steps so you can start getting data fast and it's included with every purchase.

AUTOMATIC BAROMETRIC COMPENSATION

Why make things complicated and introduce inaccuracy into your test by using a separate barometer for compensation? With vented cable, the miniTROLL automatically compensates for barometric pressure so you don't have to. We also offer a low-cost 'BaroTROLL' unit to measure barometric pressure when using the units without cable.

SIMPLY THE MOST POWERFUL

ROBUST QUICK-CONNECT™ CABLE OR WIRE SUSPENSION

Our Quick-Connect cables are fully detachable and are available in FEP (Teflon equivalent), Polyurethane, or Polyethalyne. Or you can use the miniTROLL without cable. For this application, we offer low-cost Teflon®-coated stainless steel wire for suspension without cable as well as Direct-Read cables for programming.

FIELD-RUGGED POCKET PC READER

Why take an expensive and hard to handle laptop to the field when you can take the Pocket PC in your pocket? Our rugged ProfilerPlusTM system adds a hard case with watertight connections to make it extremely simple and reliableto use and with all of the power of a PDA. Only from In-Situ.

EXTREME ACCURACY

miniTROLLs are calibrated using NIST-traceable standards and compensated for temperature across the entire range. A calibration report is shipped with every unit offering extra assurance that your equipment meets or exceeds the rigid accuracyrequirements specified by many agencies.

USER REPLACEABLE BATTERIES

Insert two AA batteries. It's that simple. Replace your batteries virtually anywhere on earth. No need to send the instrument back to the factory or worse yet, no need to throw it away.

Accessories

Networking
Multiple unit installations are a snap using T-Boxes or Quad-Boxes. Create networks of up to 32 TROLL 9000s. Saves money!

Extreme power
Need more power? Try a long-lasting external battery pack. Up to 7 years of operation.

SDI-12
Now available with optional SDI-12 output. Connects to popular 3rd-party data loggers.

Reels, Well Docks and caps
Reels are available in three sizes in steel or ABS plastic. Well Docks make well installations a snap. A real asset!

Non-vented backshell
Use the miniTROLL with or without vented cable by attaching a stainless steel backshell.

Snap ring kit
Snap ring kit for non-vented miniTROLLs and BaroTROLL. Handy when changing batteries

Desiccants
High humidity? Try a MAXUM high-capacity desiccant. Screws right onto the cable!

Cables
Vented or non-vented Quick-Connect™ cables. Available in polyethylene, polyurethane or FEP (Teflon*).

miniTROLL

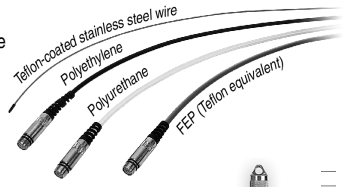
Sensor Specifications		VERSIONS:	Standard T	BaroTROLL	Low-Cost	Std A	Standard P	Advanced	Professional
Depth, Level, Pressure, Barometric	Principle	Integrated silicon strain-gauge pressure sensor							
	Sensor Type / Range								
	Depth / Pressure	3.5, 11, 21, 70, 210, 351m (11.5, 35, 69, 231, 692, 1153 ft / 5, 15, 30, 100, 300, 500 psi)	○	○	●	●	●	●	
	Barometric	30 psia (usable range is 16.5 psi)	○	●	○	○	○	○	
	Sensor venting options								
	Vented (gauged)		○	○	○	●	●	●	
	Non-vented (absolute)**		○	●	●	●	●	●	
	Accuracy	±0.05 at 15°C / ±0.1% across entire pressure and temperature range (3.5m / 11.5 ft / 5 psi sensor provides ±3mm (0.01 ft) accuracy)							
	Resolution	16-bit A-D converter: 1mm (0.00531% FS) for a 21m (30 psi) sensor							
	Pressure rating	2x range/3x burst (11 m = 3x range/5x burst)							
Temperature	Principle	Silicon temperature sensor	●	○*	○*	○*	○*	●	
Range	-5°C to 50°C (23°F to 122°F)	*(pressure readings are temperature compensated)							
Accuracy	±0.25°C								
Resolution	±0.001°C								

Hardware Specifications							
Data Logging	Number of programmable tests	1	16	1	1	2	16
	Logging Modes: linear (0.5 sec. minimum), linear average, true logarithmic or event						
Memory	Up to 1MB / Data points:	30K	220K	30K	30K	80K	220K
Power	Internal: 2 internal user-replaceable AA batteries Estimated battery life: 990K data points at a 1-sec interval or 1.5 years at a 20-min interval External: 6VDC						
SDI-12 communications (optional with SDI-12 Adapter)							
Dimensions	Internal Power: 18.3 mm (0.72 in) OD, 295.9 mm (11.65 in) long External Power: 18.3 mm (0.72 in) OD, 197.4 mm (7.77 in) long						
Weight	Internal Power: 0.31 kg (0.68 lb) with batteries (includes backshell) External Power: 0.22 kg (0.48 lb) (includes backshell)						
Wetted materials	316 stainless steel, Viton®, FEP**, polyurethane or polyethylene (cable), both models						

*The temperature sensor is used to compensate pressure, but its readings are not displayed
**5 & 15 psia (absolute) sensors not available

RuggedReader™ System
Say goodbye to that expensive and heavy handheld unit and say hello to the new, ultra-Rugged RuggedReader™ running Pocket-Situ! View and download data real-time, start and stop logging operations, manage your schedule, save contacts, and more. Pocket PC handheld option also available!

Quick-Connect Cables
Vented Quick-Connect cables are available in Polyurethane or FEP for contaminated sites. Vented cable allows for automatic atmospheric pressure correction! A Polyethalyne non-vented (direct read) cable is also available.



NEW!

RuggedReader Handheld

AND

Sealed backends with wire suspension
Since the miniTROLL contains everything needed to monitor, it can also be suspended using low-costTeflon-coated wire and sealed using a backshell.An external 'BaroTROLL' can be used to recordbarometric pressure for easy correction.

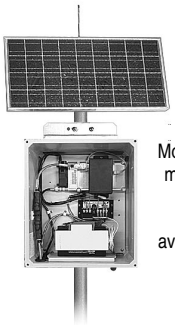
Purchase · Rent · Lease the miniTROLL Today!

In-Situ Inc.
The Standard for Water Quality & Level

221 East Lincoln Avenue • Fort Collins, CO 80524 USA
Telephone: 970 498 1500 • Fax: 970 498 1598

1-970-498-1500 · 1-800-4INSITU
(International and domestic calls) (toll-free in US and Canada)

www.in-situ.com



NEW! ETS Telemetry Systems
Modem, cellphone/ modem, radio and satellite telemetryoptions are available with solar or line power.

Due to continuing product development, this information is subject to change without notice.

Copyright © 2003 by In-Situ Inc. All rights reserved. In-Situ, miniTROLL, Win-Situ, Pocket-Situ, Digital D.O. and Quick-Connect (patents pending) are trademarks or registered trademarks of In-Situ Inc. Windows and Excel are registered trademarks of Microsoft Corporation. Teflon and Delrin are registered trademarks of E.I. DuPont de Nemours and Co. Viton is a registered trademark of DuPont Dow Elastomers.

*FEP (fluorinated ethylene propylene) is the generic equivalent of DuPont Teflon.

10/27/2004

In-Situ Inc.®

Helping monitor the earth's resources

TROLL

Model SP4000

Operator's Manual

April 1999

Specifications

General

Wetted materials	316 Stainless Steel, Viton®, Surlyn® or Teflon® (cable)
Dimensions	1.5" dia., 20" long (3.8 x 50 cm)
Weight	4.4 lb. (2 kg)
Operating temperature	0° to 50°C (32° to 122° F)
Storage temperature	-10° to 45°C (14° to 113° F) with alkaline battery -32° to 70°C (-25° to 158° F) with lithium battery

Accuracy

Pressure sensor	± 0.05% of full scale over operating temperature range
Temperature sensor	± 0.1ºC

Ranges

Standard	15 PSI (~35 ft., 11 m water, 103 kPa) 30 PSI (~69 ft. 21 m water, 207 kPa) 100 PSI (~231 ft. 70 m water, 690 kPa) 250 PSI (~577 ft. 176 m water, 1724 kPa)

Data Sampling

Number of channels	2
Memory type	Non-volatile
Capacity	208 Kilobytes (at least 100,000 data points)

Battery Options

Alkaline	Up to 250,000 (est.) data points or 2 years within the operating temperature range
Lithium	Up to 750,000 (est.) data points or 5 years within the operating temperature range
Clock/memory battery	5-year factory-replaceable long-life backup battery

External Power Input

Input voltage	12 to 15 V DC
Input current	50 mA typical, 120 mA peak, 15 µA when asleep

Communications

Type	RS232 or RS422
Hardware compatibility	IBM 9-pin or 25-pin
Baud rate	factory set at 9600 baud; software-selectable to 57.6 Kbaud
Parity	None
Data bits	8
Stop bits	1

Due to continuing product development this information is subject to change without notice.

www.coastal-usa.com

Coastal's MacroTide

Description: Coastal's MacroTide and MacroTide+ record pressure levels in aquatic environments for tidal measurements using either an ICS Strain Gauge Pressure Sensor or a high-precision Paroscientific Digiquartz Sensor.

Capacity: 200K standard
Optional (Compact Flash Cards): 8MB, 16MB, etc.

Housing: **Diameter** – 5.5 in.
Length – 14 in. (including handle)
Weight – 15 lbs. in air
Material – Stainless steel and UHMW plastic housing
MacroTide+ length is 15.5 in., weight is 17 lbs. in air

Power: User replaceable standard alkaline D cells

Interface: *Wizard* IBM PC compatible software
ASCII data files in engineering units
User controlled sampling parameters and sensor functions

Clock: Solid state real time, accuracy one minute per year

Standard: **Pressure, Standard** – ICS Strain Gauge
Temperature, Internal – YSI Thermister

Optional: Standard, MacroTide+ **Pressure, High Precision** – Paroscientific Digiquartz

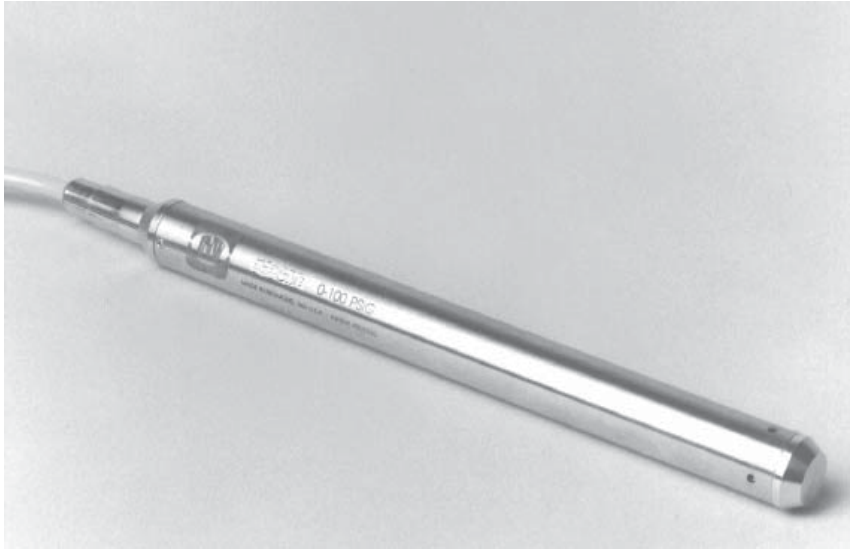
Optional: **Temperature, External –** YSI Thermister
Additional External Pressure – ICS Strain Gauge

Coastal MacroTide Exterior(above), Interior(below)

Function	Sensor (*optional)	Range	Accuracy	Resolution	Units
Pressure, Standard	IC Sensors Strain Gauge, piezoresistive	30, 50, 100, 250	0.1%	12 bit	psia
Temperature	Internal YSI Thermister	-5° to 35°	0.1°	.02 typ	°C
Pressure, High Precision	*Paroscientific Digiquartz	900<	0.015%	16 bit	psia

Coastal Leasing, Inc. 179 Sidney Street Cambridge MA 02139-4238
p 617.497.1122 f 617.497.1188 coastal@coastal-usa.com
© 2001 Coastal Leasing, Inc. Trademarks are property of their respective owners. Specifications subject to change without notice.

PT2X SUBMERSIBLE PRESSURE/TEMPERATURE SMART SENSOR WITH DATA LOGGING



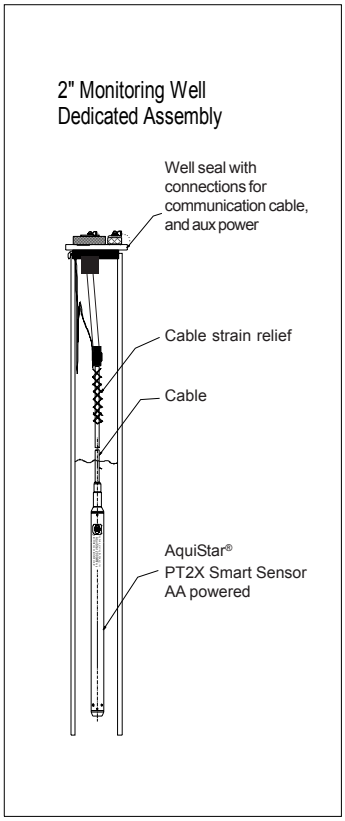
FEATURES

- RS485/RS232 interface
- Optional digital channel
- Small diameter
- Measures pressure, temperature & time
- 130,000+ records in non-volatile memory
- 316 stainless steel, Viton® and Teflon® construction
- Polyethylene, polyurethane and FEP Teflon® cable options
- MODBUS® protocol for RTU & PLC applications
- Easy export to spreadsheets & databases

DESCRIPTION

INW's patented AquiStar® PT2X submersible pressure transmitter represents the latest in state-of-the-art level measurement technology. Building on years of successful experience, this industry standard digital RS485 interface device offers great noise immunity, thermal performance and transient protection. In addition, this device stores over 130,000 records of pressure, temperature and time data, operates with low power, and features easy to use software with powerful features.

The transmitter's end cone is interchangeable with a 1/4" NPT inlet which allows for increased application use and easy hookup. The modular-designed AquiStar® PT2X can be factory serviced and repaired saving on future upgrade and repair costs.



OPERATION

The PT2X is powered internally with two AA batteries or with an auxiliary power supply for data intensive applications. INW offers alkaline, rechargeable, and other auxiliary power systems. At the rate of four measurements per hour, the unit will run for a year on its internal AA batteries.

The PT2X comes with powerful, easy-to-use, Windows®-based Aqua4Plus software, affording the user extensive control, including real time monitoring, flexible programming, easy field calibration, and a delayed start feature. Aqua4Palm is available for Palm®-based handhelds, allowing the user to create test sessions, examine data, and monitor real time readings with the convenience and portability of a PDA.

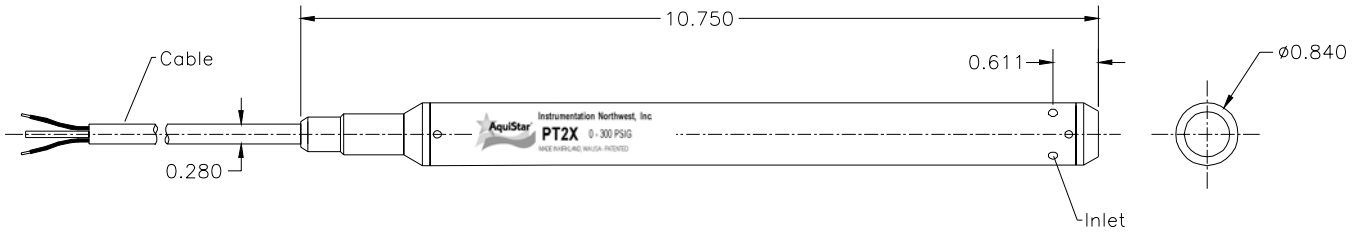
APPLICATIONS

Due to its rugged construction, proven reliability, and datalogging capability, the AquiStar® PT2X can be used to replace analog sensors with separate dataloggers. Units can be used to monitor groundwater, well, tank and tidal levels, as well as for pump testing and flow monitoring.

Printed on recycled paper.

PT2X SUBMERSIBLE PRESSURE/TEMPERATURE TRANSMITTER

DIMENSIONS AND SPECIFICATIONS



HOW TO ORDER

- Choose the transmitter with the required pressure range.
- Determine cable type and specify length.
- Contact INW for a full list of accessories.

PT2X SUBMERSIBLE PRESSURE TRANSMITTER RANGES

3C351	5 PSIG	**3C356**	50 PSIA
3C352	15 PSIG	**3C357**	100 PSIG
3C353	30 PSIG	**3C358**	100 PSIA
3C354	30 PSIA	**3C359**	300 PSIG
3C355	50 PSIG	**3C360**	300 PSIA

PT2X CABLE OPTIONS

6E540	Vented PU INW Label	**6E542**	Vented HDPE
6E543	Vented FEP INW Label		

PT2X MISCELLANEOUS OPTIONS

6E410	1/4"NPT adapter	**3B830**	RS485/RS232 adaptor w/Aqua4Plus software
6E517	Cable strain relief kit		
6E475	Desiccant tube refill	**3B835**	Interface cable
3P902	2" well seal adaptor	**6E520**	200' capacity reel
3P904	4" well seal adaptor	**6E525**	500' capacity reel
		6E530	1500' capacity reel

AQUA4PALM KIT - HANDHELD CONTROLLER

6D150	Aqua4Palm Kit w/ Palm® m130
6D151	Aqua4Palm Kit w/o Palm®

Information in this document is subject to change without notice.

MECHANICAL

TRANSMITTER

Body Material	316 stainless steel
Wire Seal Materials	Viton® and Teflon®
Desiccant	High- and standard-capacity packs available
Terminating Connector	Available
Weight	.80 lbs.

CABLE

OD	0.28" maximum
Break Strength	138 lbs.
Maximum Length	2000 feet
Weight	4 lbs. per 100 feet

ELECTRICAL

Pressure

Static Accuracy (B.F.S.L. 25° C)*	±0.1% FSO (maximum) ±0.06% FSO (typical) *0.06% available on request.*
Temperature Error (reference 25° C)	±0.5% FSO (maximum) ±0.25% FSO (typical)
Maximum Zero Offset at 25° C	±0.25% FSO
Resolution	16 bit
Over Range Protection	2x (except 300 PSIA)

Temperature

Accuracy	±0.75° C (maximum)
Resolution	0.1° C

Time

Accuracy	±4 min/yr (maximum) ±2 min/yr (typical)

Recommended Operating Temperature Range	0° C to 40° C

Contact factory for extended temperature ranges.

Sales and Service Locations
8902 122nd Avenue NE, Kirkland • Washington 98033 USA
(425) 822-4434 • (425) 822-8384 FAX • info@inwusa.com
4620 Northgate Boulevard, Suite 170 • Sacramento, California 95834
(916) 922-2900 • (916) 648-7766 FAX • inwsw@inwusa.com

Doc# 6D0015r4 05/03

©2003 Instrumentation Northwest, Inc. All rights reserved. INW and AquiStar are registered trademarks of Instrumentation Northwest. MODBUS is a registered trademark of Schneider Electric. Viton & Teflon are registered trademarks of DuPont Company. Windows is a registered trademark of Microsoft Corp. Palm is a registered trademark of Palm, Inc.

Data Sheet PRO-E3/1101
Supersedes PRO-E3/501

PRO-series Electrodeless Conductivity Transmitter

(Model PRO-E3 measures Conductivity, % Concentration, and Total Dissolved Solids)

Certified Compliant to
European Community Standards

■ **Multiple Measurements.**
The PRO-E3 transmitter can be selected to measure conductivity, % concentration or total dissolved solids (ppm). Measured parameter and temperature values can be displayed separately or together. The corresponding 4-20 mA analog output value can also be shown. (The PRO-E3 also provides an uncompensated conductivity readout for concentration measurement.)

■ **Built-in Concentration Tables.**
Built-in chemical tables represent the most commonly measured solutions in various concentration ranges. Simply select the table matching your solution type and range. For other solutions, you can create a custom concentration table of up to ten data points to define it.

■ **Versatile Hookup Capability.**
PRO-series transmitters can be wired in a two, three or four-wire hookup arrangement to meet your application requirement.

■ **Compact Size and NEMA 4X Universal Mounting.**
The compact PRO-series transmitter can be panel, wall, pipe or integral sensor mounted.

■ **Multiple Language Capability.**
All screens can be selected for display in English or Spanish. (Different languages such as French or German may also be substituted.)

■ **"Menu-guided" Operation.**
The simple keypad and logical menu structure make this transmitter easy to use. Menu screens guide you through setup, calibration, operation, and test/maintenance functions.

■ **Four Temperature Compensation Methods.**
Select from linear slope (% per °C), built-in natural water temperature properties table or, for special solution compensation requirements, create a custom temperature table of up to ten data points for accurate temperature-compensated measurements. A "no compensa-tion" mode is also available.

■ **Electromagnetic Conformance.**
All PRO-series transmitters exceed U.S. and meet European standards for EMI and RFI emissions and immunity.

■ **Simple Interactive Diagnostics.**
Built-in diagnostics continuously test transmitter and sensor operation.

■ **Multiple Calibration Methods.**
Two "wet" calibration methods are available for sensor offset of conductivity measurement. For % concentration, choose between methods to enter a concentration or conductivity value. TDS calibration requires entering a known reference solution or sample ppm value. Sensor zeroing (first time only) is available for all measurements.

■ **Isolated 4-20 mA Analog Output.**
The isolated 4-20 mA analog output can represent the selected measurement (conductivity, % concentration or TDS) or the measured temperature. During calibration, the analog output is automatically held at the last measured value and, upon completion, returned to its active state.

■ **Passcode-protected Access.**
For security, use the passcode feature to restrict configuration and calibration settings to only authorized personnel.

■ **OEM Versions Available.**
PRO-series transmitters can be packaged or configured to accommodate OEM-specific needs.

Specifications

Operational:

Display ..... Two-line by 16 character LCD

NOTE: *The measured value (conductivity, % concentration or TDS) and temperature can be displayed separately or shown together on a single screen. The corresponding 4-20 mA analog output value can also be shown. When measuring concentration, a readout of uncompensated conductivity is also provided.*

Measurement	Range(s)
Conductivity	µS/cm: 0-200.0 or 0-2000
	mS/cm: 0-2.000, 0-20.00, 0-200.0 or 0-2000
	S/cm: 0-2.000
% Concentration	0-99.99% or 0-200.0%
TDS	0-9999 ppm
Temperature	-20.0 to +200.0°C or -4.0 to 392.0°F
Analog Output	4.00-20.00 mA

Ambient Conditions ..... Operation: -4 to +140°F (-20 to +60°C); 0 to 95% relative humidity, non-condensing
Storage: -22 to +158°F (-30 to +70°C); 0 to 95% relative humidity, non-condensing

Temperature Compensation ..... Automatic from 14.0 to 392.0°F (-10.0 to +200.0°C) with selection for Pt 1000 ohm RTD temperature element, or manually fixed at a user-entered temperature

NOTE: *The selected measurement (conductivity, % concentration or TDS) determines which of the following temperature compensation methods are available:*

- *Linear % per °C slope*
- *Built-in natural water temperature properties table*
- *User-entered temperature table*
- *No compensation*

Sensor-to-Transmitter Distance ..... Maximum cable length is a function of the measuring range and allowable non-linearity. The following schedule is recommended:

Full-scale Range	Maximum Length
200 to 2000 µS/cm	200 ft. (61 m)
2000 to 2,000,000 µS/cm	300 ft. (91 m)

NOTE: *When measuring % concentration, convert the transmitter full-scale value to conductivity to determine the maximum distance.*

Power Requirements ..... Two-wire Hookup: 16-30 VDC; Three-wire Hookup: 14-30 VDC*; Four-wire Hookup: 12-30 VDC*
(Class 2 Power Supply) *16 VDC minimum with RS-485 serial communication.

Calibration Methods:

Sensor Zero (all measurements) ..... With the dry sensor in air, press keys to initiate automatic system zeroing

Sensor Offset: Conductivity ..... Cond Cal: Enter compensation reference temp., linear % per °C slope, and one reference solution value
Sample Cal: Enter one sample value (determined by laboratory analysis or comparison reading)

Concentration ..... Conc Cal: Enter one sample value (determined by laboratory analysis or comparison reading)
Cond Cal: Enter compensation reference temp., linear % per °C slope, and one reference solution value

TDS ..... TDS Cal: Enter one sample value (determined by laboratory analysis or comparison reading)

Analog Output ..... Isolated 4-20 mA output with 0.004 mA (12-bit) resolution

NOTE: *Output can represent the selected measurement (conductivity, % concentration or TDS) or measured temperature. Parameter values can be entered to define the endpoints at which the 4 mA and 20 mA analog output values are desired (range expand). During calibration, the analog output is automatically held at the last measured value and, upon completion, returned to its active state.*

Maximum Loop Load ..... Dependent on power supply voltage, transmitter hookup arrangement, and wire resistance:

Maximum Permissible Loads							
Transmitter Hookup Arrangement	Power Supply Voltage						
	12 VDC	14 VDC	16 VDC	20 VDC	24 VDC	28 VDC	30 VDC
Two-wire Hookup	- - - -	- - - -	100 ohms	300 ohms	500 ohms	700 ohms	800 ohms
Three-wire Hookup	- - - -	500 ohms	600 ohms	800 ohms	1000 ohms	1200 ohms	1300 ohms
Four-wire Hookup	400 ohms	500 ohms	600 ohms	800 ohms	1000 ohms	1200 ohms	1300 ohms

Memory (non-volatile) ..... All user settings are retained indefinitely without battery backup

EMI/RFI Conformance ..... Exceeds US and meets European standards for conducted and radiated emissions and immunity; certified CE compliant for applications as specified by EN 50081-2 for emissions and EN 50082-2 for immunity

Electrical Certifications:

General Purpose (pending) ..... UL, C-UL, FM, and CENELEC
Class 1, Division 2 (pending) ..... UL, C-UL and FM: Groups A, B, C, D, F, and G

Transmitter Performance (Electrical, Analog Output):

Accuracy** ..... ± 0.1% of span
Sensitivity** ..... ± 0.05% of span
Repeatability** ..... ± 0.05% of span
Temperature Drift** ..... Zero and Span: ± 0.02% of span per °C
Response Time ..... 1-60 seconds to 90% of value upon step change (with output filter setting of zero)

***These typical performance specifications are:*

1. *Based on 25°C with conductivity of 500 µS/cm and higher. Consult GLI for applications in which conductivity is less than 500 µS/cm.*
2. *De-rated above 100°C to the maximum displayed temperature of 200°C. Consult GLI for details.*

Specifications (continued)

Mechanical:

Enclosure ..... Polycarbonate; NEMA 4X general purpose; choice of included mounting hardware
Mounting Configurations ..... Panel, wall, pipe or integral sensor mounting
Dimensions ..... With Back Cover: 3.75 in. W x 3.75 in. H x 2.32 in. D (95 mm W x 95 mm H x 60 mm D)
Without Back Cover for Panel Mount: 3.75 in. W x 3.75 in. H x 0.75 in. D (95 mm W x 95 mm H x 19 mm D)
Net Weight ..... 10 oz. (280 g) approximately

Ordering Information

MODEL NUMBER (see Notes 1 and 3)

- **PRO-E3A** Electrodeless conductivity transmitter with wall/pipe/integral sensor mount kit (see Note 2)
- **PRO-E3B** Electrodeless conductivity transmitter with panel mount kit (includes gasket, retainer plate, and four screws)
- **PRO-E3C** Basic electrodeless conductivity transmitter (without mounting hardware -- electronics only)

RESERVED CATEGORY

EQUIPMENT TAGGING (specify tag data)

- **N** None
- **P** Paper
- **S** Stainless steel

1 **Product Number**

Choose item from each category.

Ordering Notes:

1. The standard on-screen languages for PRO-series transmitter operation are English and Spanish. A different language (French, German, etc.) may be substituted for Spanish. Please specify the desired language.
2. This mounting kit includes all hardware needed to wall, pipe or integral sensor mount the transmitter. When integrally mounting the transmitter onto a GLI convertible style electrodeless conductivity sensor, please specify the sensor part number with a “PRO2” suffix to ensure a correct sensor cable length. When integrally mounting the transmitter onto a GLI sanitary style sensor, please specify the sensor part number with a “PRO1” suffix to also include a coupling. When the coupling is not required for a replacement sanitary style sensor, please specify the sensor part number with a “PRO2” suffix.
3. Each transmitter is supplied with a CD-ROM con-taining operating manuals (in PDF-file format) for all of the PRO-series transmitters. Paper manuals are also available (see Accessories below).

Accessories (order separately):

- **Retrofit Wall/Pipe/Integral Sensor Mount Kit 1000A3457-001**

  This hardware kit enables an existing panel-mounted PRO-series transmitter to be wall, pipe or integral sensor mounted.

- **Retrofit Panel Mount Kit 1000A3455-001**

  This hardware kit enables an existing wall, pipe or integral sensor-mounted PRO-series transmitter to be panel mounted.

- **Couplings to Retrofit Transmitter onto Sensor**

Installed 3700E-series Sensor	Required Coupling	
	Part Number	Size
Convertible	None required	- - - -
Sanitary	1000F3465-001	5/8-11 UNC x 1/2-inch

- **Operating Manual No. PRO-E3**

  A paper booklet operating manual for the PRO-E3 electrodeless conductivity transmitter.

Electrodeless Conductivity Sensors

Refer to Data Sheet 3700E for sensor details.

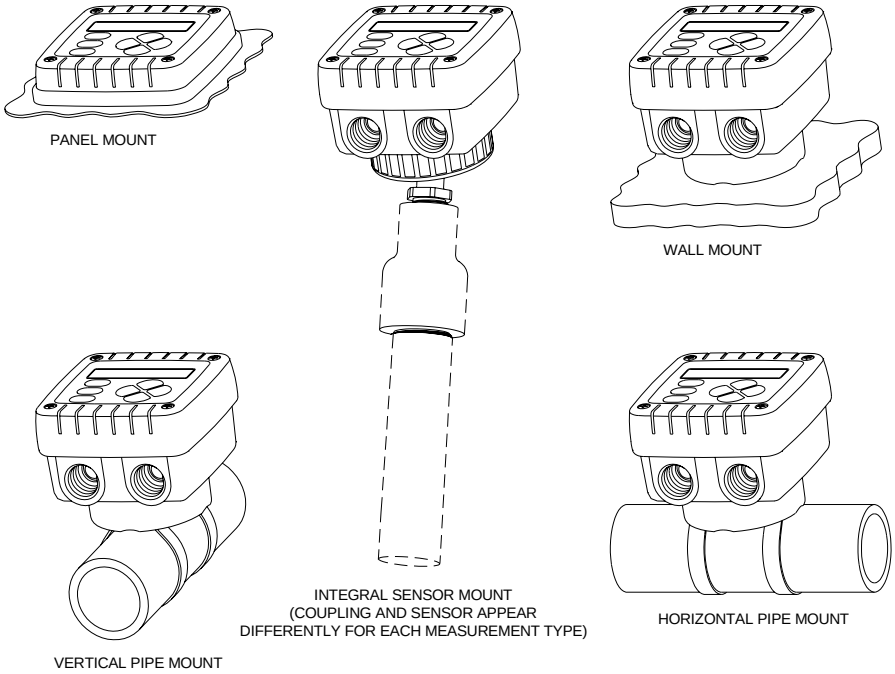
Engineering Specification

1. The microprocessor-based transmitter shall accept any GLI Model 3700E-series electrodeless conductivity sensor.
2. The transmitter shall measure the selected parameter (conductivity, % concentration or TDS) and process temperature.
3. The transmitter shall be operable in multiple languages.
4. The transmitter shall have a two-line by 16 character LCD. It shall display the measured value and temperature separately or together on a single screen. The corresponding 4-20 mA analog output value shall also be shown. When measuring concentration, a readout of uncompensated conductivity shall also be provided.
5. The transmitter shall have these calibration methods:
   a) Sensor Zero: With the dry sensor in air, press keys to initiate automatic system zeroing.
   b) Cond Cal: Enter compensation reference temperature, linear % per °C slope, and one conductivity reference solution value.
   c) Sample Cal: Enter one conductivity sample value (determined by laboratory analysis or comparison reading).
   d) Conc Cal: Enter one concentration sample value (determined by laboratory analysis or comparison reading).
   e) TDS Cal: Enter one TDS sample value (determined by laboratory analysis or comparison reading).
6. The transmitter shall have a passcode to restrict configuration and calibration settings to only authorized personnel.
7. The transmitter shall have built-in chemical tables representing the most commonly measured solutions in various concentration ranges. For other solutions, the transmitter shall enable the user to create a custom concentration table of up to ten data points to define the solution.
8. Depending on the selected parameter (conductivity, % concentration or TDS), the transmitter shall provide one or more of the following temperature compensation methods:
   a) Linear slope (% per °C).
   b) Built-in natural water properties table.
   c) User-defined temperature table of up to ten data points for special solution compensation requirements.
   d) No compensation.

Engineering Specification (continued)

9. The transmitter shall have user-test diagnostics for transmitter and sensor operation without requiring special test equipment.
10. The transmitter shall have an isolated 4-20 mA analog output that can be assigned to represent the selected parameter (conductivity, % concentration, or TDS) or measured temperature. Parameter values can be entered to define the endpoints at which the 4 mA and 20 mA analog output values are desired (range expand). During calibration, the analog output is automatically held at the last measured value and, upon completion, returned to its active state.
11. The transmitter shall be Hach Company GLI Model PRO-E3.

Mounting Configurations



Model 3700E-series Electrodeless Conductivity Sensors

(for use with PRO-E3 Transmitter)

For complete details and specifications, refer to Data Sheet 2465.

Worldwide Headquarters and Sales:

Hach Company
PO Box 389
Loveland, CO 80539-0389
U.S.A.

Phone: (800) 227-4224
Fax: (970) 669-2932
E-mail: orders@hach.com
Web: www.hach.com

Represented By:

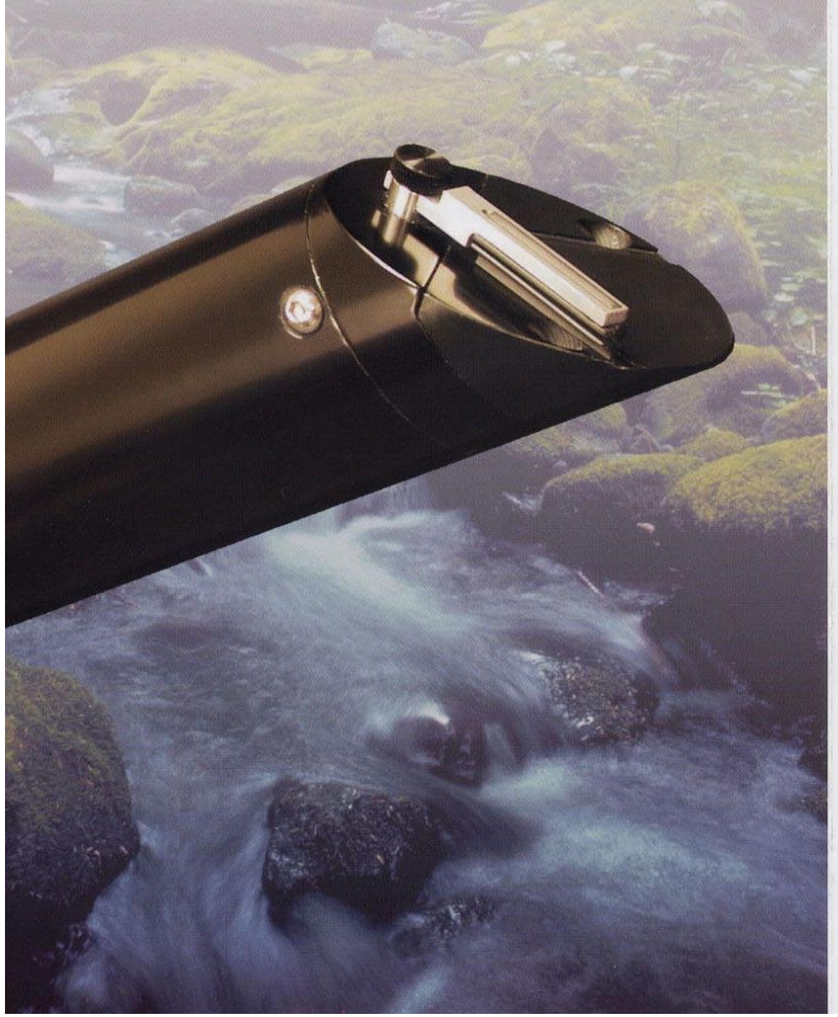
In the interest of improving and updating its equipment, Hach reserves the right to alter specifications to equipment at any time.

The Digital Advantage

- On-board statistical functions
- Long cable runs without signal degradation
- All calibration coefficients are stored in the sensor so datalogger reprogramming is not required when sensors are changed
- Compatible with all dataloggers that support the SDI-12 standard

Laser Based Optics

- The DTS-12 turbidity sensor uses optical backscatter technology with a 780-nm laser emitter with automatic power control.
- It measures suspended solids with an infrared measurement system incorporating optical feedback and synchronous detection to reject ambient light. The DTS-12 features high accuracy, excellent thermal and long-term stability, and nearly linear response over three orders of magnitude.



The DTS-12 is the result of four years of research, engineering development and product testing. Customer requests to build a durable, self cleaning, digital turbidity sensor effective in low water levels and sensitive to low levels of turbidity while still retaining a wide absolute range, have been the impetus behind the DTS-12 Turbidity Sensor from FTS.

Founded in 1980, FTS is a leading manufacturer of environmental sensors and remote site monitoring systems. The DTS-12 Turbidity Sensor was developed under the leadership of FTS in collaboration with D&A Instruments, a world leader for in-situ turbidity measurement, and the award winning Mechanical Engineering Department of the University of Victoria.

Technical Specifications

Range:	0 to 1600 NTU
Resolution	0.01 NTU
Accuracy - Turbidity:	
Accuracy	±2% (0-499), ±4% (500-1600)
Zero Offset	±0.2 NTU
Temp Coefficient(0-40°C)	<-0.3%/°C
Accuracy - Temperature:	±0.5 °C
Supply Voltage Range:	9.6 to 16V
Current Consumption(typical):	
Standby	< 0.5 mA
Operating	< 75 mA
Motor Wiping	< 250 mA
Depth Rating:	98ft (30m)
Wipe Time:	5 sec Nominal
Operating Temp:	+32° to +104° F (0° to +40°C)
Communications Protocol:	SDI-12 version 1.1
Measurements Returned:	Instantaneous Turbidity
Raw data consists of 16-bit samples taken 20 times per Second.	100 sample Mean and Variance 100 sample Median 100 sample BES 100 sample Min 100 sample Max
Dimensions:	length 12in (30.48cm) diameter 2in (5.08cm) shell thickness 0.129in (0.38cm)

Options Include:

- Titanium version for salt water deployment.
- Connectorized quick disconnnect cable.

Advanced Technology Engineered for the ***Real*** World

In the US: Suite F - 4131 Mitchell Way, Bellingham, WA, USA 98226
In Canada: 1065 Henry Eng Place, Victoria, BC, Canada V9B 6B2
Phone: 800-548-4264 or 250-478-5561 Fax: 250-478-8579
Email: info@ftsinc.com Webpage: www.ftsinc.com
An ISO 9001:2000 Certified Company

MAR-BRO-DTS12-131103

Advancing the science of turbidity measurement in streams and rivers.

- SDI-12 digital sensor
- Shallow water capability
- Superior accuracy
- Self-cleaning wiper
- Turbidity and Temperature

The DTS-12 Digital Turbidity Sensor from FTS

Self-cleaning wiper

The DTS-12 wiper system is the culmination of a comprehensive research and development program evaluating over 40 different cleaning technologies, lab and field tests, and years of field-based knowledge.

The humble wiper's combination of effectiveness, reliability, and low power requirements made it the best choice over more exotic approaches. However, traditional wipers have short life spans and can become soiled, repeatedly dragging abrasive materials and organic matter across the lens optics.

The DTS-12 wiper blade 'parks' in two grooves cut into the sensor face. These grooves extend the long term flexibility of the wiper, allow increased wiping pressure and clean the blade between wipes. Wiper changes are simple and inexpensive.

SDI-12 Protocol

The DTS-12's built-in microprocessor handles statistical data processing, eliminating complex data logger programming. In addition to instantaneous turbidity values, the sensor calculates and returns the values for Mean, Variance, Median, Min, Max, and BES based on 100 readings taken over 5 seconds, increasing your ability to obtain the most meaningful data from any water system.

The SDI-12 digital protocol provides easy connection to any SDI-12 compatible data logger and eliminates the need to enter calibration coefficients, simplifying sensor installation and maintenance. SDI-12 also supports long cables and assures your data integrity.

Shallow water capability

The DTS-12 was explicitly designed to avoid the viewing problems of other turbidity sensors. Some have large viewing volumes for a good water sampling average but are not capable of shallow-water deployment while others have shallow water capability but have a very small sampling volume.

The approximately tennis ball sized view of the DTS-12 provides a good sampling volume **and** near-bottom deployment.

Superior accuracy

The DTS-12 eliminates the frustrating trade-off between low end accuracy and wide dynamic range, with an accuracy of:
±2% (0-499 NTU)
±4% (500-1600 NTU)

The sensor also offers excellent thermal and long term stability and nearly linear response over three orders of magnitude.

Saltwater Rated version available

Featuring Titanium housing and hardware, the DTS-12*Ti* is designed for salt water conditions. Shown with optional quick-disconnect connector.

The Angled Head

The unusual geometry of the sensor head was designed after detailed analysis demonstrated significant advantages for an angled sensor face. Lab tests showed that an angled head did the best job of shedding the bubbles that can form on the face of a sensor and give false turbidity readings. The angled head also allowed us to combine 90° backscatter sensing technology and our target sampling volume with a downward looking 'view', thereby significantly simplifying mounting and siting requirements.

Sensor face showing optic lenses and wiper cleaning grooves

Built-in temperature sensor

The DTS-12 sensor includes a built-in temperature sensor accurate to +/- 0.5° C

Optical System

The optical system, lens face and wiper blades have been designed for extended field life, even in high abrasive-load waters. After accelerated wear testing simulating five years of operation in abrasive enriched waters, wiper function remained within factory specifications and sensor readings were offset by only 2.9%, requiring only a simple recalibration.

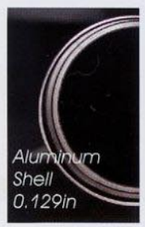
Quick disconnect option

A connectorized quick-disconnect version is available for convenient on-site service.

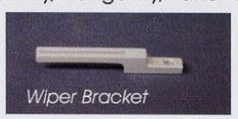
Constructed and Designed to Run 24/7 for Many Years

- Metal components are stainless steel, anodized aluminum, or titanium
- "O" ring sealed
- Extended duty cycle motor for many years of trouble free wiper operation
- Heavy duty miniature stainless steel universal joint for maximum life span
- Thick walled sensor housing designed to minimize damage from accidental blows or clamping pressure
- Depth rated to 98 feet
- Plastic components from Delrin™ or Noryl™, selected for field proven durability, longevity, and thermal stability

Stainless Steel Universal Joint



Aluminum Shell 0.129in



Wiper Bracket

ODOM

HYDROTRAC™

odom
HYDROGRAPHIC SYSTEMS

- IDEAL FOR SMALL BOATS AND HARSH CONDITIONS
- FREQUENCY AGILE
- HIGH RESOLUTION THERMAL PRINTER
- INTERNAL DGPS (OPTIONAL)
- WATERPROOF
- FLASH UPGRADEABLE
- SIDE SCAN OPTION

SINGLE FREQUENCY PORTABLE HYDROGRAHIC ECHO SOUNDER

ODOM

HYDROTRAC™

Specifically designed for work in less-than-ideal circumstances on small survey boats and inflatable watercraft, the **Hydrotrac™** offers compact portability and the confidence of knowing you're using an Odom product. It is completely waterproof and comes equipped with the same advanced features you've come to trust and depend on in Odom echo sounders.

Buy Odom – invest in your peace of mind.

SPECIFICATIONS

Environmental Operating Conditions:
- 0 – 50 C

Frequency Agile
- Operator selectable – 24, 33, 40, 200, 210 and 340 kHz

Output Power
- 600 watts

Power Requirement
- 11-28 V DC (standard)
- 110/220 V AC (optional)

Communication
- 2 RS232 or RS422 ports

Depth Range
- MAX = 600 m/1968 ft

Resolution
- 0.1 ft/0.01 m

Accuracy
- 8.5 in/216 mm thermal printer (fax paper)
- LCD display (1 in high)
- Sealed keypad controls

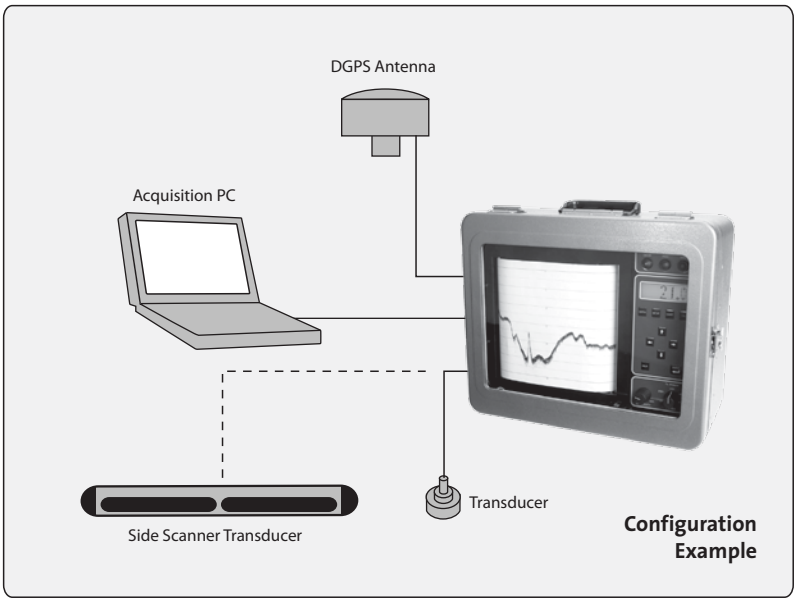
Weight
- (24.8 lbs/11.25 kg)

Dimensions
- (14.5 h x 16.5 w x 8 d in or 36.83 h x 41.91 w x 20.32 d cm)

Controls
- Sensitivity
- Chart on/off and advance
- Event mark (internal selectable timer)
- Transmit power (high/med/low)

Touch Pad Settings
- Draft, velocity and tide inputs
- Time and date
- Scale width and center
- Blanking
- Calibration gate
- Alarm filter
- Fix interval
- Chart speed
- HELP function (prints on chart)
- Current parameters (prints on chart)

Features
- Manual/remote mark command
- Auto scale change (phasing)
- GPS input
- Heave input from motion sensor
- Annotation printed on chart
- Auto pulse length, TVG
- Output: NMEA, ECHOTRAC, DESO 25, etc.
- Waterproof (with cover in place)
- Accuracy: 200 kHz – 1 cm 0.1% of depth value (corrected for sound velocity); 33 kHz – 10 cm 0.1% of depth value (corrected for sound velocity)
- Fix mark annotation: date, time, fix no., depth (and GPS if input)
- Optional 200 kHz or 340 kHz side scan transducer
- Optional built-in DGPS
- Optional remote display
- Flash memory upgradeable
- Built-in simulator
- Software included: Comlog
- Operation and installation manuals provided on CD



Configuration Example

odom
HYDROGRAPHIC SYSTEMS

1450 Seaboard Avenue
Baton Rouge, Louisiana 70810-6261 USA
E-mail: email@odomhydrographic.com
www.odomhydrographic.com

Appendix B
National Geodetic Survey Benchmark Datasheets
Browns Island and Sherman Lake Vicinity

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.19
1        National Geodetic Survey,   Retrieval Date = JUNE 16, 2005
 HS3615 ***********************************************************************
 HS3615  DESIGNATION -  M 563
 HS3615  PID         -  HS3615
 HS3615  STATE/COUNTY-  CA/CONTRA COSTA
 HS3615  USGS QUAD   -  ANTIOCH SOUTH (1980)
 HS3615
 HS3615                        *CURRENT SURVEY CONTROL
 HS3615
 HS3615* NAD 83(1986)-  37 58 46.     (N)    121 48 18.     (W)     SCALED
 HS3615* NAVD 88     -        57.24   (+/-2cm)     187.8    (feet)  VERTCON
 HS3615
 HS3615  GEOID HEIGHT-         -32.22  (meters)                     GEOID03
 HS3615
 HS3615  VERT ORDER  -  FIRST     CLASS II (See Below)
 HS3615
 HS3615.The horizontal coordinates were scaled from a topographic map and have
 HS3615.an estimated accuracy of +/- 6 seconds.
 HS3615
 HS3615.The NAVD 88 height was computed by applying the VERTCON shift value to
 HS3615.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HS3615.The vertical order pertains to the NGVD 29 superseded value.
 HS3615
 HS3615.The geoid height was determined by GEOID03.
 HS3615
 HS3615;                    North         East    Units  Estimated Accuracy
 HS3615;SPC CA 3     -   664,990.    1,885,360.      MT  (+/- 180 meters Scaled)
 HS3615
 HS3615                         SUPERSEDED SURVEY CONTROL
 HS3615
 HS3615  NGVD 29 (??/??/92)   56.482  (m)          185.31   (f) ADJ UNCH    1 2
 HS3615
 HS3615.Superseded values are not recommended for survey control.
 HS3615.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HS3615.See file dsdata.txt to determine how the superseded data were derived.
 HS3615
 HS3615_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH049042(NAD 83)
 HS3615_MARKER: DB = BENCH MARK DISK
 HS3615_SETTING: 66 = SET IN ROCK OUTCROP
 HS3615_SP_SET: ROCK OUTCROP
 HS3615_STAMPING: M 563 1957
 HS3615_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
 HS3615+STABILITY: POSITION/ELEVATION WELL
 HS3615_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 HS3615+SATELLITE: SATELLITE OBSERVATIONS - November 12, 2003
 HS3615
 HS3615  HISTORY     - Date     Condition        Report By
 HS3615  HISTORY     - 1957     MONUMENTED       CGS
 HS3615  HISTORY     - 1960     GOOD             NGS
 HS3615  HISTORY     - 1963     GOOD             NGS
 HS3615  HISTORY     - 20031112 GOOD             GEOCAC
 HS3615
 HS3615                         STATION DESCRIPTION
 HS3615
 HS3615'DESCRIBED BY NATIONAL GEODETIC SURVEY 1960
 HS3615'1.6 MI S FROM ANTIOCH.
 HS3615'0.15 MILE SOUTH ALONG A STREET FROM THE CROSSING OF THE
 HS3615'SOUTHERN PACIFIC RAILROAD AT ANTIOCH, THENCE 0.15 MILE SOUTHWEST
 HS3615'ALONG STATE HIGHWAY 4 AND 24 FREEWAY, THENCE 1.3 MILES SOUTH
```

```
HS3615'ALONG LONE TREE WAY, IN R2E T2N S31, ON THE NORTH SLOPE OF A
HS3615'HILL, IN THE TOP OF A 5-BY 15-FOOT OUTCROP, 141 1/2 FEET EAST
HS3615'OF THE CENTER LINE OF THE WAY, 120 FEET EAST OF A FENCE, 2.0
HS3615'FEET SOUTHEAST OF A WITNESS POST, AND ABOUT 15 FEET HIGHER THAN
HS3615'THE WAY.
HS3615
HS3615                          STATION RECOVERY (1963)
HS3615
HS3615'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1963
HS3615'RECOVERED IN GOOD CONDITION.
HS3615
HS3615                          STATION RECOVERY (2003)
HS3615
HS3615'RECOVERY NOTE BY GEOCACHING 2003 (CSB)
HS3615'DESCRIPTION IS ACCURATE EXCEPT FOR THE FOLLOWING. THE CURRENT ROADBED
HS3615'FOR LONE TREE WAY HAS BEEN RECONSTRUCTED AND REROUTED TO THE EAST OF
HS3615'THIS MARK. THE OLD LONE TREE WAY IS ABANDONED BUT STILL INTACT AND
HS3615'USED AS A RECREATIONAL TRAIL. THE OLD ROADBED CAN BE ACCESSED FROM THE
HS3615'WEST SIDE OF THE NEW LONE TREE WAY, ABOUT 290 FEET SOUTH OF THE
HS3615'INTERSECTION OF LONE TREE AND JAMES DONLON BLVD.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.19
1        National Geodetic Survey,   Retrieval Date = JUNE 16, 2005
 JS1894 ***********************************************************************
 JS1894  DESIGNATION -  H 1069
 JS1894  PID         -  JS1894
 JS1894  STATE/COUNTY-  CA/CONTRA COSTA
 JS1894  USGS QUAD   -  ANTIOCH NORTH (1978)
 JS1894
 JS1894                          *CURRENT SURVEY CONTROL
 JS1894  ______________________________________________________________________
 JS1894* NAD 83(1986)-  38 00 17.     (N)    121 49 11.     (W)     SCALED
 JS1894* NAVD 88     -        12.52   (+/-2cm)      41.1    (feet)  VERTCON
 JS1894  ______________________________________________________________________
 JS1894  GEOID HEIGHT-          -32.26  (meters)                     GEOID03
 JS1894
 JS1894  VERT ORDER  -  FIRST     CLASS II (See Below)
 JS1894
 JS1894.The horizontal coordinates were scaled from a topographic map and have
 JS1894.an estimated accuracy of +/- 6 seconds.
 JS1894
 JS1894.The NAVD 88 height was computed by applying the VERTCON shift value to
 JS1894.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 JS1894.The vertical order pertains to the NGVD 29 superseded value.
 JS1894
 JS1894.The geoid height was determined by GEOID03.
 JS1894
 JS1894;                     North         East    Units  Estimated Accuracy
 JS1894;SPC CA 3     -    667,810.    1,884,100.      MT  (+/- 180 meters Scaled)
 JS1894
 JS1894                          SUPERSEDED SURVEY CONTROL
 JS1894
 JS1894  NGVD 29 (??/??/92)   11.77   (m)           38.6    (f) COMPUTED    1 2
 JS1894
 JS1894.Superseded values are not recommended for survey control.
 JS1894.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 JS1894.See file dsdata.txt to determine how the superseded data were derived.
 JS1894
 JS1894_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH036069(NAD 83)
 JS1894_MARKER: DB = BENCH MARK DISK
 JS1894_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 JS1894_SP_SET: ABUTMENT
 JS1894_STAMPING: H 1069 1966
 JS1894_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 JS1894
 JS1894  HISTORY     - Date     Condition        Report By
 JS1894  HISTORY     - 1966     MONUMENTED       CGS
 JS1894  HISTORY     - 1989     GOOD             USPSQD
 JS1894
 JS1894                          STATION DESCRIPTION
 JS1894
 JS1894'DESCRIBED BY COAST AND GEODETIC SURVEY 1966
 JS1894'0.7 MI W FROM ANTIOCH.
 JS1894'0.7 MILE WEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM
 JS1894'THE CROSSING OF A STREET AT ANTIOCH, IN THE TOP AND 1.0 FOOT
 JS1894'SOUTH OF THE NORTH END OF THE EAST CONCRETE ABUTMENT OF A BRIDGE
 JS1894'OVER L STREET, 20.0 FEET NORTH OF THE NORTH RAIL, AND ABOUT 1 FOOT
 JS1894'LOWER THAN THE TRACK.
 JS1894
 JS1894                          STATION RECOVERY (1989)
 JS1894
```

```
JS1894'RECOVERY NOTE BY US POWER SQUADRON 1989 (VCD)
JS1894'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.19
1        National Geodetic Survey,   Retrieval Date = JUNE 16, 2005
 AA3823 ***********************************************************************
 AA3823  HT_MOD      -  This is a Height Modernization Survey Station.
 AA3823  DESIGNATION -  P3716+33.00 EBMUD
 AA3823  PID         -  AA3823
 AA3823  STATE/COUNTY-  CA/CONTRA COSTA
 AA3823  USGS QUAD   -  HONKER BAY (1980)
 AA3823
 AA3823                        *CURRENT SURVEY CONTROL
 AA3823
 AA3823* NAD 83(1998)-  38 01 19.49389(N)    121 56 29.83772(W)     ADJUSTED
 AA3823* NAVD 88     -        31.19   (meters)     102.3    (feet)  GPS OBS
 AA3823
 AA3823  EPOCH DATE  -        2000.86
 AA3823  X           -  -2,661,632.597 (meters)                     COMP
 AA3823  Y           -  -4,269,175.683 (meters)                     COMP
 AA3823  Z           -   3,907,374.565 (meters)                     COMP
 AA3823  LAPLACE CORR-          -1.54  (seconds)                    DEFLEC99
 AA3823  ELLIP HEIGHT-          -0.84  (meters)          (11/27/02) GPS OBS
 AA3823  GEOID HEIGHT-         -32.12  (meters)                     GEOID03
 AA3823
 AA3823  HORZ ORDER  -  B
 AA3823  ELLP ORDER  -  FOURTH    CLASS I
 AA3823
 AA3823.The horizontal coordinates were established by GPS observations
 AA3823.and adjusted by the National Geodetic Survey in November 2002.
 AA3823.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 AA3823.DATUM ITEM on the data sheet items page.
 AA3823.The horizontal coordinates are valid at the epoch date displayed above.
 AA3823.The epoch date for horizontal control is a decimal equivalence
 AA3823.of Year/Month/Day.
 AA3823
 AA3823.The orthometric height was determined by GPS observations and a
 AA3823.high-resolution geoid model using precise GPS observation and
 AA3823.processing techniques.
 AA3823
 AA3823.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA3823
 AA3823.The Laplace correction was computed from DEFLEC99 derived deflections.
 AA3823
 AA3823.The ellipsoidal height was determined by GPS observations
 AA3823.and is referenced to NAD 83.
 AA3823
 AA3823.The geoid height was determined by GEOID03.
 AA3823
 AA3823;                    North         East     Units Scale Factor Converg.
 AA3823;SPC CA 3     -   669,898.495 1,873,429.364   MT  0.99994033   -0 52 57.4
 AA3823;SPC CA 3     - 2,197,825.31  6,146,409.51   sFT  0.99994033   -0 52 57.4
 AA3823;UTM  10      - 4,208,793.559   592,896.214   MT  0.99970628   +0 39 07.1
 AA3823
 AA3823!             -  Elev Factor  x  Scale Factor =   Combined Factor
 AA3823!SPC CA 3     -   1.00000013  x   0.99994033  =   0.99994046
 AA3823!UTM  10      -   1.00000013  x   0.99970628  =   0.99970641
 AA3823
 AA3823                          SUPERSEDED SURVEY CONTROL
 AA3823
 AA3823  NAD 83(1992)-  38 01 19.49230(N)    121 56 29.83642(W) AD(1997.30) 1
 AA3823  ELLIP H (07/10/98)   -0.89   (m)                       GP(1997.30) 4 1
 AA3823  NAD 83(1992)-  38 01 19.49183(N)    121 56 29.83662(W) AD(1997.30) 1
```

```
AA3823  ELLIP H (03/20/98)   -0.80   (m)                          GP(1997.30) 3 2
AA3823  NAD 83(1992)-  38 01 19.48909(N)    121 56 29.83257(W) AD(1991.35) 1
AA3823  ELLIP H (09/29/94)   -0.79   (m)                          GP(1991.35) 4 2
AA3823
AA3823.Superseded values are not recommended for survey control.
AA3823.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3823.See file dsdata.txt to determine how the superseded data were derived.
AA3823
AA3823_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEH9289608794(NAD 83)
AA3823_MARKER: DD = SURVEY DISK
AA3823_SETTING: 40 = SET IN A LARGE STRUCTURE WITH DEEP FOUNDATIONS
AA3823_SP_SET: LARGE CONCRETE FOUNDATION
AA3823_STAMPING: P3716+33.00 1991
AA3823_MARK LOGO: EBMUD
AA3823_MAGNETIC: N = NO MAGNETIC MATERIAL
AA3823_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AA3823+STABILITY: POSITION/ELEVATION WELL
AA3823_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3823+SATELLITE: SATELLITE OBSERVATIONS - June 17, 2004
AA3823
AA3823  HISTORY     - Date     Condition        Report By
AA3823  HISTORY     - 1991     MONUMENTED       EBMUD
AA3823  HISTORY     - 19931021 GOOD             CADT
AA3823  HISTORY     - 20010116 GOOD             FRAME
AA3823  HISTORY     - 20040617 GOOD             CADWR
AA3823
AA3823                          STATION DESCRIPTION
AA3823
AA3823'DESCRIBED BY CALTRANS 1993 (DAN)
AA3823'THE STATION IS LOCATED NEAR THE INTERSECTION OF STATE HIGHWAY 4 AND
AA3823'BAILEY ROAD IN WEST PITTSBURG IN THE EAST BAY MUNICIPAL UTILITY
AA3823'DISTRICT (EBMUD) MOKELUMNE AQUEDUCT RIGHT-OF-WAY, ABOUT 6 MI (9.7 KM)
AA3823'NORTHEAST OF THE CITY OF CONCORD.
AA3823'
AA3823'TO REACH THE STATION FROM THE INTERSECTION OF STATE HIGHWAY 4 AND
AA3823'BAILEY ROAD, GO NORTH ON BAILEY ROAD FOR 0.15 MI (0.24 KM) TO THE
AA3823'INTERSECTION WITH CANAL ROAD. CONTINUE NORTH ON BAILEY ROAD FOR ABOUT
AA3823'200 FT (61.0 M) TO THE STATION ON THE RIGHT IN A LARGE CONCRETE
AA3823'STRUCTURE IN THE MOKELUMNE AQUEDUCT RIGHT-OF-WAY.
AA3823'
AA3823'THE STATION IS A 3 INCH BRASS DISK EPOXIED IN A DRILL HOLE IN A 7.3 FT
AA3823'(2.2 M) BY 7.3 FT (2.2 M) CONCRETE STRUCTURE WHICH IS FLUSH WITH THE
AA3823'GROUND. THE CONCRETE STRUCTURE IS TIED INTO A MASSIVE PIPE STRUCTURE
AA3823'MORE THAN 10 FT (3.0 M) BELOW THE SURFACE. IT IS ABOUT 201 FT (61.3 M)
AA3823'NORTHEAST OF THE INTERSECTION OF BAILEY ROAD AND CANAL ROAD, 93.9 FT
AA3823'(28.6 M) SOUTH OF A 6 FT (1.8 M) SOUNDWALL ON THE NORTH SIDE OF THE
AA3823'RIGHT-OF-WAY, 84.1 FT (25.6 M) NORTH OF A 6 FT (1.8 M) CHAIN LINK
AA3823'FENCE ON THE SOUTH SIDE OF THE RIGHT-OF-WAY, AND 27.5 FT (8.4 M) EAST
AA3823'OF THE BACK OF THE SIDEWALK ON THE EAST SIDE OF BAILEY ROAD.
AA3823'
AA3823'THIS STATION WAS OCCUPIED AS PART OF A CALIFORNIA HPGN DENSIFICATION
AA3823'SURVEY IN 1993.
AA3823
AA3823                          STATION RECOVERY (2001)
AA3823
AA3823'RECOVERY NOTE BY FRAME SURVEYING AND MAPPING 2001 (JHF)
AA3823'RECOVERED AS DESCRIBED.
AA3823
AA3823                          STATION RECOVERY (2004)
AA3823
AA3823'RECOVERY NOTE BY CA DEPT OF WATER RES 2004 (NRB)
AA3823'FOUND GOOD CONDITION (GPS ABLE)

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.19
1        National Geodetic Survey,   Retrieval Date = JUNE 16, 2005
 HT0142 ***********************************************************************
 HT0142  HT_MOD      -  This is a Height Modernization Survey Station.
 HT0142  DESIGNATION -  GPS CONTROL PT 15
 HT0142  PID         -  HT0142
 HT0142  STATE/COUNTY-  CA/CONTRA COSTA
 HT0142  USGS QUAD   -  WALNUT CREEK (1995)
 HT0142
 HT0142                        *CURRENT SURVEY CONTROL
 HT0142
 HT0142* NAD 83(1998)-  37 58 49.92104(N)    122 03 03.59721(W)     ADJUSTED
 HT0142* NAVD 88     -        10.26   (meters)      33.7    (feet)  GPS OBS
 HT0142
 HT0142  EPOCH DATE  -        2000.86
 HT0142  X           -  -2,671,275.604 (meters)                     COMP
 HT0142  Y           -  -4,266,479.419 (meters)                     COMP
 HT0142  Z           -   3,903,727.706 (meters)                     COMP
 HT0142  LAPLACE CORR-           1.76  (seconds)                    DEFLEC99
 HT0142  ELLIP HEIGHT-         -21.75  (meters)          (11/27/02) GPS OBS
 HT0142  GEOID HEIGHT-         -32.09  (meters)                     GEOID03
 HT0142
 HT0142  HORZ ORDER  -  B
 HT0142  VERT ORDER  -  FIRST     CLASS I (See Below)
 HT0142  ELLP ORDER  -  FOURTH    CLASS I
 HT0142
 HT0142.The horizontal coordinates were established by GPS observations
 HT0142.and adjusted by the National Geodetic Survey in November 2002.
 HT0142.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 HT0142.DATUM ITEM on the data sheet items page.
 HT0142.The horizontal coordinates are valid at the epoch date displayed above.
 HT0142.The epoch date for horizontal control is a decimal equivalence
 HT0142.of Year/Month/Day.
 HT0142
 HT0142.The orthometric height was determined by GPS observations and a
 HT0142.high-resolution geoid model using precise GPS observation and
 HT0142.processing techniques.
 HT0142.The vertical order pertains to the NGVD 29 superseded value.
 HT0142
 HT0142.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 HT0142
 HT0142.The Laplace correction was computed from DEFLEC99 derived deflections.
 HT0142
 HT0142.The ellipsoidal height was determined by GPS observations
 HT0142.and is referenced to NAD 83.
 HT0142
 HT0142.The geoid height was determined by GEOID03.
 HT0142
 HT0142;                    North         East     Units Scale Factor Converg.
 HT0142;SPC CA 3     -   665,441.268 1,863,750.717   MT  0.99993717   -0 56 58.5
 HT0142;SPC CA 3     - 2,183,201.89  6,114,655.48   sFT  0.99993717   -0 56 58.5
 HT0142;UTM  10      - 4,204,079.961   583,342.686   MT  0.99968555   +0 35 02.6
 HT0142
 HT0142!             -  Elev Factor  x  Scale Factor =   Combined Factor
 HT0142!SPC CA 3     -   1.00000341  x   0.99993717  =   0.99994058
 HT0142!UTM  10      -   1.00000341  x   0.99968555  =   0.99968896
 HT0142
 HT0142                          SUPERSEDED SURVEY CONTROL
 HT0142
 HT0142  NGVD 29 (??/??/92)    9.480  (m)           31.10    (f) ADJ UNCH    1 1
```

```
HT0142
HT0142.Superseded values are not recommended for survey control.
HT0142.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0142.See file dsdata.txt to determine how the superseded data were derived.
HT0142
HT0142_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEH8334304080(NAD 83)
HT0142_MARKER: DD = SURVEY DISK
HT0142_SETTING: 38 = SET IN THE ABUTMENT OR PIER OF A LARGE BRIDGE
HT0142_SP_SET: BRIDGE ABUTMENT
HT0142_STAMPING: 3137
HT0142_MARK LOGO: CA-013
HT0142_MAGNETIC: N = NO MAGNETIC MATERIAL
HT0142_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0142_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HT0142+SATELLITE: SATELLITE OBSERVATIONS - November 15, 2001
HT0142
HT0142  HISTORY     - Date     Condition        Report By
HT0142  HISTORY     - 1990     MONUMENTED       CA-013
HT0142  HISTORY     - 1969     GOOD             NGS
HT0142  HISTORY     - 1973     GOOD             NGS
HT0142  HISTORY     - 20011115 GOOD             FRAME
HT0142
HT0142                          STATION DESCRIPTION
HT0142
HT0142'DESCRIBED BY NATIONAL GEODETIC SURVEY 1969
HT0142'0.6 MI W FROM CONCORD.
HT0142'0.55 MILE WEST ALONG CONCORD AVENUE FROM THE JUNCTION OF
HT0142'MARKET STREET AT CONCORD, IN THE TOP OF THE NORTH CONCRETE
HT0142'SIDEWALK OF CONCRETE BRIDGE 3971C OVER WALNUT CREEK, 26.0
HT0142'FEET WEST OF THE EAST END OF THE SIDEWALK, 21 1/2 FEET NORTH
HT0142'OF THE CENTER LINE OF THE NORTH LANES OF THE AVENUE, 1.4 FEET
HT0142'NORTH OF THE SOUTH EDGE OF THE SIDEWALK, AND ABOUT 1 FOOT
HT0142'HIGHER THAN THE AVENUE.
HT0142
HT0142                          STATION RECOVERY (1973)
HT0142
HT0142'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1973
HT0142'RECOVERED IN GOOD CONDITION.
HT0142
HT0142                          STATION RECOVERY (2001)
HT0142
HT0142'RECOVERY NOTE BY FRAME SURVEYING AND MAPPING 2001 (RZ)
HT0142'THE STATION IS LOCATED ABOUT 5 MI (8.0 KM) SOUTHEAST OF MARTINEZ IN
HT0142'THE CITY OF CONCORD.  TO REACH THE STATION FROM THE INTERSECTION OF
HT0142'INTERSTATE HIGHWAY 680 AND CONCORD AVENUE IN CONCORD, GO EAST ON
HT0142'CONCORD AVENUE FOR ABOUT 0.85 MI (1.37 KM) TO THE STATION ON THE LEFT
HT0142'AT THE EAST END OF THE NORTH SIDE OF THE BRIDGE OVER WALNUT CREEK. THE
HT0142'STATION IS ABOUT 68.5 M (224.7 FT) WEST OF THE CENTERLINE OF STANWELL
HT0142'DRIVE, 11.4 M (37.4 FT) WEST OF THE CENTERLINE OF A PAVED HIKE AND
HT0142'BIKE PATH, 7.9 M (25.9 FT) WEST OF THE EAST END OF THE BRIDGE AND 0.4
HT0142'M (1.3 FT) NORTH OF THE NORTH CURB FACE OF CONCORD AVENUE.  THE DISK
HT0142'IS SET FLUSH AND IS STAMPED 3137.

*** retrieval complete.
Elapsed Time = 00:00:00
```

Appendix C
Tucker Associates Static GPS Data sheets Browns Island/Sherman Lake

Tucker & Associates- 1362 Lincoln Ave., Calistoga CA 94515

Wetlands and Water Resources- Browns Island/Sherman Lake Static GPS Survey.

TA#	PID or WWR#	Northing	Easting	Elevation	Constraints
0142	HT0142	4204079.961000	583342.686000	33.66	YX-h
1069	JS1894	4206980.963558	603623.201668	41.08	---h
3823	AA3823	4208793.559000	592896.214000	102.33	YX-h
BR1	BM1(BrnIsl)	4211127.809543	599041.417296	6.17	----
M563	HS3615	4204152.162229	604959.887937	187.79	---h
SBM4	BM4(ShnIsl)	4212905.202614	602222.594260	8.36	----

SYSTEM PARAMETERS

Network status = reduced computed adjusted
Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10
Vertical Datum = NAVD88
Linear units(Northing/Easting) = meter
Linear units(Elevation) = U.S. Survey Foot

SLBrIStaticCOVAR.LOG

SUMMARY OF COVARIANCES
NETWORK = WWRsuisn
TIME = Tue May 11 13:46:41 2004

Definition of precision (E x S)ý = Cý + Pý:
Horizontal:
Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted horizontal distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
3-Dimensional:
Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted slope distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
Using orthometric height errors

FROM/ TO	AZIMUTH/ DELTA H	1.00å 1.00å	DISTANCE/ DELTA h	1.00å 1.00å	HOR PREC/ 3-D PREC
0142	81ø51'34"	0.09"	20486.950m	0.0092m	1: 2226816
1069	+2.1035m	0.1304m	-**-	-**-	1: 2226816
0142	-**-	-**-	-**-	-**-	-**-
3823	+20.8541m	0.0848m	-**-	-**-	-**-
0142	65ø49'21"	0.08"	17208.205m	0.0068m	1: 2516357
BR1	-8.5576m	0.1328m	-8.3791m	0.0691m	1: 2516357
0142	89ø48'31"	0.09"	21617.323m	0.0098m	1: 2200142
M563	+46.8376m	0.1349m	-**-	-**-	1: 2200142
0142	64ø56'48"	0.08"	20840.725m	0.0085m	1: 2446403
SBM4	-7.9458m	0.1630m	-7.7126m	0.0953m	1: 2446403
1069	279ø35'27"	0.17"	10879.052m	0.0091m	1: 1190716
3823	+18.7506m	0.0728m	-**-	-**-	1: 1190716
1069	312ø08'51"	0.17"	6179.731m	0.0052m	1: 1196478
BR1	-10.6611m	0.0646m	-10.6391m	0.0691m	1: 1196478
1069	154ø42'29"	0.36"	3128.713m	0.0056m	1: 558254
M563	+44.7341m	0.0396m	-**-	-**-	1: 558254
1069	346ø41'54"	0.17"	6087.554m	0.0052m	1: 1177822
SBM4	-10.0493m	0.0813m	-9.9726m	0.0953m	1: 1177822
3823	69ø12'03"	0.21"	6573.602m	0.0068m	1: 962664
BR1	-29.4117m	0.0487m	-29.3091m	0.0691m	1: 962664
3823	111ø02'38"	0.16"	12925.741m	0.0097m	1: 1326400
M563	+25.9835m	0.1005m	-**-	-**-	1: 1326400
3823	66ø12'33"	0.17"	10192.496m	0.0085m	1: 1197082
SBM4	-28.7999m	0.0786m	-28.6426m	0.0953m	1: 1197082
BR1	139ø41'14"	0.14"	9148.112m	0.0062m	1: 1486035
M563	+55.3952m	0.1030m	+55.3591m	0.0691m	1: 1486035
BR1	60ø48'25"	0.20"	3644.038m	0.0036m	1: 1019392

SBM4	+0.6118m	0.0305m	+0.6665m	0.0605m	1: 1019392
M563	342ø38'03"	0.14"	9171.068m	0.0062m	1: 1484727
SBM4	-54.7834m	0.1203m	-54.6926m	0.0953m	1: 1484727

SLBrIStaticCOORDS.LOG

COORDINATE ADJUSTMENT SUMMARY
NETWORK = WWRsuisn
TIME = Tue May 11 13:46:40 2004

Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
4 fixed coordinates in h

POINT	NAME		OLD COORDS	ADJUST	NEW COORDS	1.00å
1	0142					
		Y=	4204079.9610	+0.0000	4204079.9610	FIXED
		X=	583342.6860	+0.0000	583342.6860	FIXED
		ELL HT=	-21.8268	+0.0031	-21.8236	0.099465m
		ORTHO HT=	10.2600	+0.0000	10.2600	FIXED
		GEOID HT=	-32.0868	+0.0031	-32.0836	0.099465m
2	1069					
		Y=	4206980.9637	-0.0001	4206980.9636	0.009141m
		X=	603623.2018	-0.0001	603623.2017	0.009172m
		ELL HT=	-19.7408	+0.0207	-19.7202	0.096771m
		ORTHO HT=	12.5200	+0.0000	12.5200	FIXED
		GEOID HT=	-32.2608	+0.0207	-32.2402	0.096771m
3	3823					
		Y=	4208793.5590	+0.0000	4208793.5590	FIXED
		X=	592896.2140	+0.0000	592896.2140	FIXED
		ELL HT=	-1.0157	+0.0461	-0.9696	0.091339m
		ORTHO HT=	31.1900	+0.0000	31.1900	FIXED
		GEOID HT=	-32.2057	+0.0461	-32.1596	0.091339m
4	BR1					
		Y=	4211127.8096	-0.0001	4211127.8095	0.006824m
		X=	599041.4173	+0.0000	599041.4173	0.006761m
		ELL HT=	-30.4474	+0.0662	-30.3812	0.115217m
		ORTHO HT=	1.8091	+0.0718	1.8809	0.069108m
		GEOID HT=	-32.2565	-0.0056	-32.2621	0.099329m
5	M563					
		Y=	4204152.1624	-0.0002	4204152.1622	0.009727m
		X=	604959.8881	-0.0002	604959.8879	0.009825m
		ELL HT=	25.0226	-0.0087	25.0139	0.099049m
		ORTHO HT=	57.2400	+0.0000	57.2400	FIXED
		GEOID HT=	-32.2174	-0.0087	-32.2261	0.099049m
6	SBM4					
		Y=	4212905.2027	-0.0001	4212905.2026	0.008511m
		X=	602222.5942	+0.0000	602222.5943	0.008423m
		ELL HT=	-29.8520	+0.0825	-29.7694	0.138756m
		ORTHO HT=	2.4681	+0.0793	2.5474	0.095258m
		GEOID HT=	-32.3201	+0.0033	-32.3168	0.099457m

SLBrIStaticCLOSURES.LOG
CLOSURES LOG
NETWORK = WWRsuisn
TIME = Tue May 11 13:46:40 2004

OBS#	TYPE	BACKSIGHT	INSTRUMENT	FORESIGHT	CLOSURE	TRANSFORM
1	hgoid		0142		0.002460m	0.000000m
2	hgoid		1069		0.022226m	0.000000m
3	hgoid		3823		-0.034728m	0.000000m
4	hgoid		BR1		-0.004454m	0.000000m
5	hgoid		M563		-0.008494m	0.000000m
6	hgoid		SBM4		0.004575m	0.000000m
7	gpsaz		SBM4	3823	-0.032724"	-0.407012"
8	gpsht		SBM4	3823	0.000740m	0.006314m
9	gpsds		SBM4	3823	0.003724m	0.007564m
10	gpsaz		SBM4	1069	-0.074715"	-0.406605"
11	gpsht		SBM4	1069	0.001712m	-0.018362m
12	gpsds		SBM4	1069	-0.001801m	0.004530m
13	gpsaz		SBM4	M563	0.060181"	-0.406632"
14	gpsht		SBM4	M563	-0.001555m	-0.028405m
15	gpsds		SBM4	M563	0.002443m	0.006831m
16	gpsaz		BR1	0142	-0.024348"	-0.407375"
17	gpsht		BR1	0142	-0.008931m	0.010291m
18	gpsds		BR1	0142	-0.004203m	0.012766m
19	gpsaz		BR1	3823	0.057486"	-0.406822"
20	gpsht		BR1	3823	-0.000457m	0.005150m
21	gpsds		BR1	3823	-0.003649m	0.004879m
22	gpsaz		BR1	1069	0.092760"	-0.406414"
23	gpsht		BR1	1069	-0.002195m	-0.019513m
24	gpsds		BR1	1069	0.000216m	0.004599m
25	gpsaz		BR1	M563	-0.076957"	-0.406441"
26	gpsht		BR1	M563	0.001924m	-0.029557m
27	gpsds		BR1	M563	-0.001209m	0.006815m
28	gpsaz		SBM4	0142	0.020625"	-0.407565"
29	gpsht		SBM4	0142	0.007962m	0.011473m
30	gpsds		SBM4	0142	0.004180m	0.015459m
31	gpsaz		SBM4	BR1	-0.032376"	-0.406678"
32	gpsht		SBM4	BR1	-0.006683m	0.001176m
33	gpsds		SBM4	BR1	-0.008023m	0.002706m

Appendix D
Tucker Associates PPK GPS Data sheets Browns Island

brppkcrd

Tucker & Associates, 1362 Lincoln Ave., Calistoga CA 94515

Wetlands and Water Resources- Browns Island PPK GPS survey.

TA#	WWR name	Northing(m)	Easting(m)	Elev.(ft.)
301	BM3	4210601.833022	599975.190848	5.61
302	WL3TOGP	4210572.725561	600028.475285	6.54
303	WL3TSCP	4210572.705024	600030.322004	6.14
304	WLCHTOGP	4210765.215436	600102.845628	8.37
305	XS4RB	4210769.476125	600089.092466	6.65
306	XS4TSCP	4210770.237624	600083.123225	7.10
307	XS4LB	4210728.955948	600096.517167	7.33
308	XS3RB	4210811.338555	599559.148138	7.69
309	XS3TSCP	4210811.791605	599564.211135	6.04
310	XS3LB	4210786.389976	599573.911693	6.31
311	XS2stake	4210750.978961	599182.217987	6.55
312	XS2WPVC	4210750.973176	599182.342599	6.51
313	XS2LBMP	4210753.758060	599184.414889	5.16
314	XS2RBMP	4210755.777159	599208.604115	5.42
315	XS2RBnew	4210755.697997	599208.693638	7.54
316	WL4TOGP	4210831.306710	598974.878478	10.04
317	WL4TSCP	4210833.958759	598972.884389	7.23
318	WL1TOGP	4211121.508352	599391.848303	11.27
320	WL2TOGP	4211154.122304	600009.031824	7.99
321	WL2TSCP	4211152.319047	600007.360853	6.99
322	WL1TSCP	4211120.304587	599391.138447	8.65
323	SX1TSCP	4211123.177869	599011.227285	7.10
324	XS1LBMP	4211132.524275	599013.020202	5.63

brppkcrd

325	XS1LBnew	4211132.375813	599013.002934	6.72
326	XS1RBrebar	4211132.632651	599040.313563	6.08
327	XS1RBnew	4211132.496996	599041.024576	7.20
BR1	BR1	4211127.809500	599041.417300	6.17
PBM2	PBM2	4210756.167000	599182.428100	5.73

SYSTEM PARAMETERS

Network status = reduced computed adjusted
Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10
Horizontal Linear units = meter
Vertical Linear units = U.S. Survey Foot
Vertical Datum = NAVD88

BRI_CL~1

CLOSURES LOG
NETWORK = brnppk2
TIME = Tue May 18 14:59:02 2004

OBS#	TYPE	BACKSIGHT	INSTRUMENT	FORESIGHT	CLOSURE	TRANSFORM
1	hgoid		300		-0.005489m	0.000000m
2	hgoid		301		-0.005490m	0.000000m
3	hgoid		302		-0.005545m	0.000000m
4	hgoid		303		-0.005541m	0.000000m
5	hgoid		304		-0.004183m	0.000000m
6	hgoid		305		-0.004168m	0.000000m
7	hgoid		306		-0.004170m	0.000000m
8	hgoid		307		-0.004438m	0.000000m
9	hgoid		308		-0.004700m	0.000000m
10	hgoid		309		-0.004679m	0.000000m
11	hgoid		310		-0.004987m	0.000000m
12	hgoid		311		-0.008255m	0.000000m
13	hgoid		312		-0.008256m	0.000000m
14	hgoid		313		-0.008260m	0.000000m
15	hgoid		314		-0.007935m	0.000000m
16	hgoid		315		-0.007935m	0.000000m
17	hgoid		316		-0.001728m	0.000000m
18	hgoid		317		-0.001626m	0.000000m
19	hgoid		318		0.001468m	0.000000m
20	hgoid		320		-0.001051m	0.000000m
21	hgoid		321		-0.001063m	0.000000m
22	hgoid		322		0.001453m	0.000000m
23	hgoid		323		0.007784m	0.000000m
24	hgoid		324		0.007982m	0.000000m
25	hgoid		325		0.007979m	0.000000m
26	hgoid		326		0.008263m	0.000000m
27	hgoid		327		0.008260m	0.000000m
28	hgoid		328		0.008263m	0.000000m
29	hgoid		BR1		0.008264m	0.000000m
30	hgoid		PBM2		-0.008264m	0.000000m
31	gpsaz		BR1	300	-0.378954"	-0.350744"
32	gpsht		BR1	300	-0.000214m	0.000170m
33	gpsds		BR1	300	0.002085m	0.005846m
34	gpsaz		BR1	328	-435.102218"	-0.350744"
35	gpsht		BR1	328	-0.000539m	0.000169m
36	gpsds		BR1	328	0.001986m	0.000031m
37	gpsaz		PBM2	300	0.309080"	-0.350744"
38	gpsht		PBM2	300	0.000218m	0.000169m
39	gpsds		PBM2	300	-0.002604m	0.004404m
40	gpsaz		PBM2	328	6.266082"	-0.350744"
41	gpsht		PBM2	328	0.000550m	0.000169m
42	gpsds		PBM2	328	-0.000683m	0.002203m
43	gpsaz		PBM2	301	0.522805"	-0.350744"
44	gpsht		PBM2	301	0.000865m	0.000167m
45	gpsds		PBM2	301	-0.003022m	0.004413m
46	gpsaz		PBM2	302	0.415871"	-0.350744"
47	gpsht		PBM2	302	-0.003124m	0.000166m
48	gpsds		PBM2	302	-0.004450m	0.004730m
49	gpsaz		PBM2	303	0.296674"	-0.350744"
50	gpsht		PBM2	303	-0.000757m	0.000166m
51	gpsds		PBM2	303	-0.004876m	0.004740m
52	gpsaz		PBM2	304	-0.091921"	-0.350744"
53	gpsht		PBM2	304	-0.004247m	0.000163m
54	gpsds		PBM2	304	-0.005327m	0.005029m
55	gpsaz		PBM2	305	0.286824"	-0.350744"
56	gpsht		PBM2	305	-0.003309m	0.000166m

57	gpsds	PBM2	305	-0.005356m	0.004954m
58	gpsaz	PBM2	306	0.471752"	-0.350744"
59	gpsht	PBM2	306	-0.003572m	0.000165m
60	gpsds	PBM2	306	-0.005529m	0.004921m
61	gpsaz	PBM2	307	0.274094"	-0.350744"
62	gpsht	PBM2	307	-0.001827m	0.000164m
63	gpsds	PBM2	307	-0.005634m	0.004996m
64	gpsaz	PBM2	308	-0.723607"	-0.350744"
65	gpsht	PBM2	308	-0.000864m	0.000163m
66	gpsds	PBM2	308	-0.005834m	0.002080m
67	gpsaz	PBM2	309	-0.271063"	-0.350744"
68	gpsht	PBM2	309	-0.001026m	0.000166m
69	gpsds	PBM2	309	-0.005545m	0.002108m
70	gpsaz	PBM2	310	-0.675986"	-0.350744"
71	gpsht	PBM2	310	-0.000158m	0.000166m
72	gpsds	PBM2	310	-0.005135m	0.002145m
73	gpsaz	PBM2	311	204.594263"	-0.350744"
74	gpsht	PBM2	311	0.000212m	0.000165m
75	gpsds	PBM2	311	0.000433m	0.000028m
76	gpsaz	PBM2	312	226.862846"	-0.350744"
77	gpsht	PBM2	312	-0.000541m	0.000165m
78	gpsds	PBM2	312	0.000653m	0.000028m
79	gpsaz	PBM2	313	315.399949"	-0.350744"
80	gpsht	PBM2	313	0.000406m	0.000168m
81	gpsds	PBM2	313	-0.001684m	0.000017m
82	gpsaz	PBM2	314	6.680268"	-0.350744"
83	gpsht	PBM2	314	-0.001159m	0.000167m
84	gpsds	PBM2	314	-0.006368m	0.000143m
85	gpsaz	PBM2	315	2.953392"	-0.350744"
86	gpsht	PBM2	315	-0.001638m	0.000164m
87	gpsds	PBM2	315	-0.005255m	0.000144m
88	gpsaz	PBM2	316	-1.350287"	-0.350744"
89	gpsht	PBM2	316	0.001234m	0.000159m
90	gpsds	PBM2	316	0.003973m	0.001206m
91	gpsaz	PBM2	317	-1.454259"	-0.350744"
92	gpsht	PBM2	317	0.000209m	0.000164m
93	gpsds	PBM2	317	0.003076m	0.001221m
94	gpsaz	PBM2	318	0.231866"	-0.350744"
95	gpsht	PBM2	318	-0.003297m	0.000158m
96	gpsds	PBM2	318	0.001326m	0.002301m
97	gpsaz	PBM2	320	0.802031"	-0.350744"
98	gpsht	PBM2	320	-0.000969m	0.000163m
99	gpsds	PBM2	320	0.004195m	0.005012m
100	gpsaz	PBM2	321	0.363456"	-0.350744"
101	gpsht	PBM2	321	-0.003313m	0.000165m
102	gpsds	PBM2	321	0.005826m	0.005000m
103	gpsaz	PBM2	322	3.159997"	-0.350744"
104	gpsht	PBM2	322	0.001472m	0.000162m
105	gpsds	PBM2	322	0.005532m	0.002293m
106	gpsaz	PBM2	323	5.454746"	-0.350744"
107	gpsht	PBM2	323	-0.002804m	0.000164m
108	gpsds	PBM2	323	-0.003679m	0.002213m
109	gpsaz	PBM2	324	5.210921"	-0.350744"
110	gpsht	PBM2	324	-0.003300m	0.000167m
111	gpsds	PBM2	324	-0.003962m	0.002255m
112	gpsaz	PBM2	325	5.505243"	-0.350744"
113	gpsht	PBM2	325	-0.004337m	0.000165m
114	gpsds	PBM2	325	-0.001521m	0.002254m
115	gpsaz	PBM2	326	5.683788"	-0.350744"
116	gpsht	PBM2	326	-0.002510m	0.000166m
117	gpsds	PBM2	326	-0.004170m	0.002198m
118	gpsaz	PBM2	327	6.040094"	-0.350744"
119	gpsht	PBM2	327	0.002393m	0.000164m

120	gpsds	PBM2	327	-0.002007m	0.002196m
121	gpsaz	BR1	PBM2	0.120875"	-0.350744"
122	gpsht	BR1	PBM2	-0.018910m	0.000167m
123	gpsds	BR1	PBM2	-0.000636m	0.002172m
124	gpsaz	BR1	301	-0.557002"	-0.350744"
125	gpsht	BR1	301	-0.000851m	0.000167m
126	gpsds	BR1	301	0.002221m	0.005855m
127	gpsaz	BR1	302	-0.550822"	-0.350744"
128	gpsht	BR1	302	0.003467m	0.000166m
129	gpsds	BR1	302	0.003761m	0.006187m
130	gpsaz	BR1	303	-0.479356"	-0.350744"
131	gpsht	BR1	303	0.000794m	0.000167m
132	gpsds	BR1	303	0.004304m	0.006196m
133	gpsaz	BR1	304	-0.255949"	-0.350744"
134	gpsht	BR1	304	0.004437m	0.000163m
135	gpsds	BR1	304	0.005161m	0.006128m
136	gpsaz	BR1	305	-0.558477"	-0.350744"
137	gpsht	BR1	305	0.003340m	0.000166m
138	gpsds	BR1	305	0.004616m	0.006049m
139	gpsaz	BR1	306	-0.714352"	-0.350744"
140	gpsht	BR1	306	0.003572m	0.000165m
141	gpsds	BR1	306	0.004502m	0.006017m
142	gpsaz	BR1	307	-0.545177"	-0.350744"
143	gpsht	BR1	307	0.001811m	0.000165m
144	gpsds	BR1	307	0.004932m	0.006163m
145	gpsaz	BR1	308	-0.921547"	-0.350744"
146	gpsht	BR1	308	0.000900m	0.000164m
147	gpsds	BR1	308	0.005354m	0.003315m
148	gpsaz	BR1	309	-1.058363"	-0.350744"
149	gpsht	BR1	309	0.001045m	0.000166m
150	gpsds	BR1	309	0.004607m	0.003338m
151	gpsaz	BR1	310	-0.675015"	-0.350744"
152	gpsht	BR1	310	0.000159m	0.000166m
153	gpsds	BR1	310	0.004875m	0.003456m
154	gpsaz	BR1	311	-2.519571"	-0.350744"
155	gpsht	BR1	311	-0.000214m	0.000165m
156	gpsds	BR1	311	0.001597m	0.002198m
157	gpsaz	BR1	312	-2.849560"	-0.350744"
158	gpsht	BR1	312	0.000551m	0.000165m
159	gpsds	BR1	312	0.001481m	0.002198m
160	gpsaz	BR1	313	-2.608475"	-0.350744"
161	gpsht	BR1	313	-0.000416m	0.000168m
162	gpsds	BR1	313	0.000076m	0.002188m
163	gpsaz	BR1	314	-3.114832"	-0.350744"
164	gpsht	BR1	314	0.001246m	0.000167m
165	gpsds	BR1	314	0.001934m	0.002228m
166	gpsaz	BR1	315	-2.486016"	-0.350744"
167	gpsht	BR1	315	0.001652m	0.000164m
168	gpsds	BR1	315	0.001900m	0.002229m
169	gpsaz	BR1	316	-2.782330"	-0.350744"
170	gpsht	BR1	316	-0.001157m	0.000159m
171	gpsds	BR1	316	-0.000918m	0.001660m
172	gpsaz	BR1	317	-2.223324"	-0.350744"
173	gpsht	BR1	317	-0.000211m	0.000164m
174	gpsds	BR1	317	-0.001176m	0.001649m
175	gpsaz	BR1	318	0.552435"	-0.350744"
176	gpsht	BR1	318	0.003328m	0.000158m
177	gpsds	BR1	318	-0.001060m	0.001915m
178	gpsaz	BR1	320	-0.328581"	-0.350744"
179	gpsht	BR1	320	0.000981m	0.000163m
180	gpsds	BR1	320	-0.005291m	0.005288m
181	gpsaz	BR1	321	0.203313"	-0.350744"
182	gpsht	BR1	321	0.002942m	0.000165m

		BRI_CL~1			
183	gpsds	BR1	321	-0.005944m	0.005279m
184	gpsaz	BR1	322	1.050450"	-0.350744"
185	gpsht	BR1	322	-0.001478m	0.000162m
186	gpsds	BR1	322	-0.008299m	0.001911m
187	gpsaz	BR1	323	3.483852"	-0.350744"
188	gpsht	BR1	323	0.002753m	0.000164m
189	gpsds	BR1	323	0.011301m	0.000167m
190	gpsaz	BR1	324	-17.620819"	-0.350744"
191	gpsht	BR1	324	0.003424m	0.000167m
192	gpsds	BR1	324	0.010905m	0.000157m
193	gpsaz	BR1	325	-34.355117"	-0.350744"
194	gpsht	BR1	325	0.004230m	0.000165m
195	gpsds	BR1	325	0.010012m	0.000157m
196	gpsaz	BR1	326	-481.830889"	-0.350744"
197	gpsht	BR1	326	0.002543m	0.000166m
198	gpsds	BR1	326	0.002637m	0.000027m
199	gpsaz	BR1	327	-518.739608"	-0.350744"
200	gpsht	BR1	327	-0.002250m	0.000164m
201	gpsds	BR1	327	-0.001262m	0.000026m

COORDINATE ADJUSTMENT SUMMARY
NETWORK = brnppk2
TIME = Tue May 18 14:59:02 2004

Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

POINT	NAME		OLD COORDS	ADJUST	NEW COORDS	1.00å
1	300					
		Y=	4210602.6022	-0.0013	4210602.6009	0.007014m
		X=	599973.6665	+0.0060	599973.6725	0.007019m
		ELL HT=	-30.9741	+0.0090	-30.9651	0.006697m
		ORTHO HT=	1.2902	+0.0145	1.3047	0.007829m
		GEOID HT=	-32.2643	-0.0055	-32.2698	0.006103m
2	301					
		Y=	4210601.8344	-0.0014	4210601.8330	0.007028m
		X=	599975.1848	+0.0060	599975.1908	0.007030m
		ELL HT=	-30.5679	+0.0090	-30.5589	0.006742m
		ORTHO HT=	1.6964	+0.0145	1.7109	0.007873m
		GEOID HT=	-32.2643	-0.0055	-32.2698	0.006103m
3	302					
		Y=	4210572.7270	-0.0014	4210572.7256	0.007217m
		X=	600028.4689	+0.0064	600028.4753	0.007219m
		ELL HT=	-30.2873	+0.0090	-30.2783	0.006687m
		ORTHO HT=	1.9774	+0.0146	1.9920	0.008056m
		GEOID HT=	-32.2647	-0.0055	-32.2703	0.006099m
4	303					
		Y=	4210572.7065	-0.0014	4210572.7050	0.007237m
		X=	600030.3156	+0.0064	600030.3220	0.007232m
		ELL HT=	-30.4083	+0.0090	-30.3993	0.006741m
		ORTHO HT=	1.8564	+0.0146	1.8710	0.008108m
		GEOID HT=	-32.2648	-0.0055	-32.2703	0.006099m
5	304					
		Y=	4210765.2157	-0.0003	4210765.2154	0.007414m
		X=	600102.8392	+0.0065	600102.8456	0.007341m
		ELL HT=	-29.7304	+0.0090	-29.7214	0.007191m
		ORTHO HT=	2.5383	+0.0132	2.5515	0.008626m
		GEOID HT=	-32.2688	-0.0042	-32.2729	0.006191m
6	305					
		Y=	4210769.4764	-0.0003	4210769.4761	0.007302m
		X=	600089.0861	+0.0064	600089.0925	0.007267m
		ELL HT=	-30.2555	+0.0090	-30.2465	0.006975m
		ORTHO HT=	2.0131	+0.0132	2.0262	0.008396m
		GEOID HT=	-32.2686	-0.0042	-32.2728	0.006192m
7	306					
		Y=	4210770.2379	-0.0003	4210770.2376	0.007378m
		X=	600083.1169	+0.0063	600083.1232	0.007286m
		ELL HT=	-30.1191	+0.0090	-30.1101	0.007348m

ORTHO HT=	2.1495	+0.0132	2.1626	0.008687m
GEOID HT=	-32.2685	-0.0042	-32.2727	0.006192m

8 307

Y=	4210728.9564	-0.0005	4210728.9559	0.007285m
X=	600096.5107	+0.0065	600096.5172	0.007289m
ELL HT=	-30.0463	+0.0090	-30.0373	0.006713m
ORTHO HT=	2.2218	+0.0134	2.2352	0.008222m
GEOID HT=	-32.2681	-0.0044	-32.2726	0.006176m

9 308

Y=	4210811.3395	-0.0009	4210811.3386	0.005989m
X=	599559.1447	+0.0034	599559.1481	0.005874m
ELL HT=	-29.9306	+0.0090	-29.9216	0.007440m
ORTHO HT=	2.3303	+0.0137	2.3440	0.006678m
GEOID HT=	-32.2609	-0.0047	-32.2656	0.006159m

10 309

Y=	4210811.7925	-0.0009	4210811.7916	0.005818m
X=	599564.2077	+0.0034	599564.2111	0.005807m
ELL HT=	-30.4352	+0.0090	-30.4262	0.006726m
ORTHO HT=	1.8258	+0.0137	1.8395	0.005898m
GEOID HT=	-32.2610	-0.0047	-32.2657	0.006160m

11 310

Y=	4210786.3910	-0.0010	4210786.3900	0.005877m
X=	599573.9082	+0.0035	599573.9117	0.005854m
ELL HT=	-30.3503	+0.0090	-30.3413	0.006806m
ORTHO HT=	1.9105	+0.0140	1.9245	0.006043m
GEOID HT=	-32.2608	-0.0050	-32.2658	0.006140m

12 311

Y=	4210750.9809	-0.0019	4210750.9790	0.005438m
X=	599182.2165	+0.0015	599182.2180	0.005422m
ELL HT=	-30.2752	+0.0090	-30.2662	0.006732m
ORTHO HT=	1.9789	+0.0173	1.9962	0.003528m
GEOID HT=	-32.2541	-0.0083	-32.2624	0.005831m

13 312

Y=	4210750.9751	-0.0019	4210750.9732	0.005421m
X=	599182.3411	+0.0015	599182.3426	0.005412m
ELL HT=	-30.2864	+0.0090	-30.2773	0.006675m
ORTHO HT=	1.9678	+0.0173	1.9850	0.003418m
GEOID HT=	-32.2541	-0.0083	-32.2624	0.005831m

14 313

Y=	4210753.7600	-0.0019	4210753.7581	0.005446m
X=	599184.4134	+0.0015	599184.4149	0.005427m
ELL HT=	-30.6984	+0.0090	-30.6894	0.006763m
ORTHO HT=	1.5558	+0.0173	1.5730	0.003568m
GEOID HT=	-32.2542	-0.0083	-32.2625	0.005830m

15 314

Y=	4210755.7790	-0.0018	4210755.7772	0.005432m
X=	599208.6025	+0.0016	599208.6041	0.005422m
ELL HT=	-30.6198	+0.0090	-30.6108	0.006688m
ORTHO HT=	1.6348	+0.0170	1.6518	0.003621m
GEOID HT=	-32.2546	-0.0079	-32.2625	0.005869m

16 315

Y=	4210755.6998	-0.0018	4210755.6980	0.005434m
X=	599208.6920	+0.0016	599208.6936	0.005424m
ELL HT=	-29.9741	+0.0090	-29.9651	0.006690m

ORTHO HT=	2.2805	+0.0169	2.2974	0.003628m
GEOID HT=	-32.2546	-0.0079	-32.2625	0.005869m

17 316

Y=	4210831.3085	-0.0018	4210831.3067	0.005468m
X=	598974.8783	+0.0002	598974.8785	0.005438m
ELL HT=	-29.2020	+0.0090	-29.1930	0.006838m
ORTHO HT=	3.0501	+0.0107	3.0609	0.004810m
GEOID HT=	-32.2522	-0.0017	-32.2539	0.006290m

18 317

Y=	4210833.9606	-0.0018	4210833.9588	0.005404m
X=	598972.8842	+0.0002	598972.8844	0.005398m
ELL HT=	-30.0582	+0.0090	-30.0492	0.006671m
ORTHO HT=	2.1940	+0.0106	2.2046	0.004575m
GEOID HT=	-32.2522	-0.0016	-32.2538	0.006292m

19 318

Y=	4211121.5079	+0.0005	4211121.5084	0.005565m
X=	599391.8463	+0.0020	599391.8483	0.005570m
ELL HT=	-28.8355	+0.0090	-28.8265	0.006665m
ORTHO HT=	3.4274	+0.0075	3.4349	0.005349m
GEOID HT=	-32.2628	+0.0015	-32.2614	0.006296m

20 320

Y=	4211154.1206	+0.0017	4211154.1223	0.007056m
X=	600009.0265	+0.0053	600009.0318	0.007037m
ELL HT=	-29.8460	+0.0090	-29.8370	0.006870m
ORTHO HT=	2.4266	+0.0101	2.4367	0.008149m
GEOID HT=	-32.2727	-0.0011	-32.2737	0.006303m

21 321

Y=	4211152.3174	+0.0017	4211152.3190	0.007066m
X=	600007.3556	+0.0053	600007.3609	0.007034m
ELL HT=	-30.1525	+0.0090	-30.1436	0.006913m
ORTHO HT=	2.1201	+0.0100	2.1301	0.008178m
GEOID HT=	-32.2726	-0.0011	-32.2737	0.006303m

22 322

Y=	4211120.3041	+0.0005	4211120.3046	0.006601m
X=	599391.1365	+0.0020	599391.1384	0.005945m
ELL HT=	-29.6331	+0.0090	-29.6241	0.008760m
ORTHO HT=	2.6297	+0.0075	2.6373	0.007801m
GEOID HT=	-32.2628	+0.0015	-32.2614	0.006296m

23 323

Y=	4211123.1780	-0.0002	4211123.1779	0.005474m
X=	599011.2274	-0.0001	599011.2273	0.005422m
ELL HT=	-30.0941	+0.0090	-30.0851	0.006750m
ORTHO HT=	2.1630	+0.0012	2.1642	0.003770m
GEOID HT=	-32.2571	+0.0078	-32.2493	0.005886m

24 324

Y=	4211132.5244	-0.0001	4211132.5243	0.005436m
X=	599013.0203	-0.0001	599013.0202	0.005417m
ELL HT=	-30.5425	+0.0090	-30.5335	0.006658m
ORTHO HT=	1.7148	+0.0010	1.7158	0.003596m
GEOID HT=	-32.2573	+0.0080	-32.2493	0.005863m

25 325

Y=	4211132.3759	-0.0001	4211132.3758	0.005524m
X=	599013.0031	-0.0001	599013.0029	0.005440m
ELL HT=	-30.2098	+0.0090	-30.2008	0.006827m

ORTHO HT=	2.0475	+0.0010	2.0485	0.003896m
GEOID HT=	-32.2573	+0.0080	-32.2493	0.005864m

26 326

Y=	4211132.6327	+0.0000	4211132.6327	0.005450m
X=	599040.3134	+0.0001	599040.3136	0.005413m
ELL HT=	-30.4041	+0.0090	-30.3950	0.006701m
ORTHO HT=	1.8536	+0.0007	1.8544	0.003470m
GEOID HT=	-32.2577	+0.0083	-32.2494	0.005830m

27 327

Y=	4211132.4971	-0.0001	4211132.4970	0.005470m
X=	599041.0244	+0.0001	599041.0246	0.005436m
ELL HT=	-30.0632	+0.0090	-30.0543	0.006808m
ORTHO HT=	2.1945	+0.0007	2.1952	0.003665m
GEOID HT=	-32.2577	+0.0083	-32.2494	0.005830m

28 328

Y=	4211132.9003	-0.0001	4211132.9002	0.005438m
X=	599038.8270	+0.0001	599038.8271	0.005420m
ELL HT=	-30.9281	+0.0090	-30.9191	0.006727m
ORTHO HT=	1.3296	+0.0007	1.3303	0.003521m
GEOID HT=	-32.2577	+0.0083	-32.2494	0.005830m

29 BR1

Y=	4211127.8095	+0.0000	4211127.8095	FIXED
X=	599041.4173	+0.0000	599041.4173	FIXED
ELL HT=	-30.3767	+0.0083	-30.3685	0.005830m
ORTHO HT=	1.8809	+0.0000	1.8809	FIXED
GEOID HT=	-32.2576	+0.0083	-32.2494	0.005830m

30 PBM2

Y=	4210756.1670	+0.0000	4210756.1670	FIXED
X=	599182.4281	+0.0000	599182.4281	FIXED
ELL HT=	-30.5245	+0.0094	-30.5151	0.005830m
ORTHO HT=	1.7474	+0.0000	1.7474	FIXED
GEOID HT=	-32.2719	+0.0094	-32.2625	0.005830m

Appendix E
Tucker Associates PPK GPS Data sheets Sherman Island

Sherman Lake
PPK files

shppkcrd

Tucker & Associates, 1362 Lincoln Ave., Calistoga CA 94515

Wetlands and Water Resources- Sherman Island PPK GPS values.

TA#	WWR name	Northing(m)	Easting(m)	Elev.(ft.)
201	BM3	4212309.186885	603398.374927	6.57
202	WL3GP	4212310.745760	603393.641961	8.82
205	XS3TSCP	4212116.770879	603622.776876	5.48
206	XS3RB	4212122.168143	603621.098693	6.83
207	XS4TSCP	4212085.857474	603517.586037	6.53
208	XS4RB	4212085.035498	603519.837958	5.70
209	XS4LB	4212093.975111	603525.254483	6.14
210	WLCHTSCP	4212071.544564	603560.680821	6.76
211	XS2RB	4211897.878639	603675.987463	7.85
213	XS2TSCP	4211916.547097	603687.972238	7.18
214	XS2LB	4211910.564419	603685.013073	4.80
215	WL4TOCH	4211798.771587	603692.038371	8.17
216	WL4TSCP	4211798.522497	603692.995602	6.58
217	WL2TOCH	4211916.177258	603830.436011	7.67
218	WL2TSCP	4211915.896813	603831.811285	6.06
219	BM1	4211582.479033	603988.165696	6.34
220	XS1LB	4211585.218114	603987.545354	5.88
BM2	BM2	4211330.835100	602939.098400	5.599
SBM4	BM4	4212905.202600	602222.594300	8.358

SYSTEM PARAMETERS

Network status = reduced computed adjusted
Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10
Vertical Datum = NAVD88

Horizontal Linear units = meter
Vertical Linear units = U.S. Survey Foot

SLPPKclosures.LOG
CLOSURES LOG
NETWORK = Shnppk2
TIME = Fri May 14 16:01:24 2004

OBS#	TYPE	BACKSIGHT	INSTRUMENT	FORESIGHT	CLOSURE	TRANSFORM
1	hgoid		200		-0.000257m	0.000000m
2	hgoid		201		-0.000256m	0.000000m
3	hgoid		202		-0.000252m	0.000000m
4	hgoid		205		-0.000610m	0.000000m
5	hgoid		206		-0.000603m	0.000000m
6	hgoid		207		-0.000628m	0.000000m
7	hgoid		208		-0.000629m	0.000000m
8	hgoid		209		-0.000618m	0.000000m
9	hgoid		210		-0.000658m	0.000000m
10	hgoid		211		-0.000905m	0.000000m
11	hgoid		213		-0.000882m	0.000000m
12	hgoid		214		-0.000890m	0.000000m
13	hgoid		215		-0.001029m	0.000000m
14	hgoid		216		-0.001029m	0.000000m
15	hgoid		217		-0.000887m	0.000000m
16	hgoid		218		-0.000887m	0.000000m
17	hgoid		219		-0.001217m	0.000000m
18	hgoid		220		-0.001215m	0.000000m
19	hgoid		221		-0.001859m	0.000000m
20	hgoid		BM2		-0.001868m	0.000000m
21	hgoid		SBM4		0.001868m	0.000000m
22	gpsaz		SBM4	200	0.066467"	0.620733"
23	gpsht		SBM4	200	-0.000379m	-0.000047m
24	gpsds		SBM4	200	-0.003956m	-0.002011m
25	gpsaz		SBM4	221	0.000001"	0.620733"
26	gpsht		SBM4	221	0.000000m	-0.000047m
27	gpsds		SBM4	221	0.000000m	-0.002631m
28	gpsaz		SBM4	201	0.342127"	0.620733"
29	gpsht		SBM4	201	-0.000611m	-0.000046m
30	gpsds		SBM4	201	-0.003423m	-0.002008m
31	gpsaz		SBM4	202	0.068037"	0.620733"
32	gpsht		SBM4	202	-0.000181m	-0.000045m
33	gpsds		SBM4	202	-0.003955m	-0.002000m
34	gpsaz		SBM4	205	-0.008822"	0.620733"
35	gpsht		SBM4	205	-0.000763m	-0.000047m
36	gpsds		SBM4	205	0.000436m	-0.002448m
37	gpsaz		SBM4	206	0.028443"	0.620733"
38	gpsht		SBM4	206	-0.003104m	-0.000046m
39	gpsds		SBM4	206	-0.001385m	-0.002441m
40	gpsaz		SBM4	207	0.073797"	0.620733"
41	gpsht		SBM4	207	-0.000726m	-0.000046m
42	gpsds		SBM4	207	-0.002144m	-0.002334m
43	gpsaz		SBM4	208	-0.184524"	0.620733"
44	gpsht		SBM4	208	0.003327m	-0.000047m
45	gpsds		SBM4	208	-0.000715m	-0.002338m
46	gpsaz		SBM4	209	0.006591"	0.620733"
47	gpsht		SBM4	209	0.002799m	-0.000047m
48	gpsds		SBM4	209	-0.001971m	-0.002338m
49	gpsaz		SBM4	210	0.005329"	0.620733"
50	gpsht		SBM4	210	-0.001121m	-0.000046m
51	gpsds		SBM4	210	-0.000246m	-0.002401m
52	gpsaz		SBM4	211	0.186411"	0.620733"
53	gpsht		SBM4	211	0.001032m	-0.000046m
54	gpsds		SBM4	211	0.001195m	-0.002694m
55	gpsaz		SBM4	213	0.051966"	0.620733"
56	gpsht		SBM4	213	-0.001696m	-0.000046m

57	gpsds	SBM4	213	0.000581m	-0.002693m
58	gpsaz	SBM4	214	0.077811"	0.620733"
59	gpsht	SBM4	214	-0.001407m	-0.000047m
60	gpsds	SBM4	214	0.000012m	-0.002694m
61	gpsaz	SBM4	215	-0.041284"	0.620733"
62	gpsht	SBM4	215	0.000901m	-0.000046m
63	gpsds	SBM4	215	0.000774m	-0.002802m
64	gpsaz	SBM4	216	-0.147971"	0.620733"
65	gpsht	SBM4	216	-0.001521m	-0.000047m
66	gpsds	SBM4	216	0.001586m	-0.002803m
67	gpsaz	SBM4	217	-0.283465"	0.620733"
68	gpsht	SBM4	217	0.000924m	-0.000046m
69	gpsds	SBM4	217	0.001911m	-0.002875m
70	gpsaz	SBM4	218	-0.164277"	0.620733"
71	gpsht	SBM4	218	-0.000280m	-0.000047m
72	gpsds	SBM4	218	0.000928m	-0.002877m
73	gpsaz	SBM4	219	-0.093317"	0.620733"
74	gpsht	SBM4	219	0.002923m	-0.000047m
75	gpsds	SBM4	219	0.004172m	-0.003360m
76	gpsaz	SBM4	220	-0.010651"	0.620733"
77	gpsht	SBM4	220	0.003039m	-0.000047m
78	gpsds	SBM4	220	0.005504m	-0.003357m
79	gpsaz	BM2	200	0.824454"	0.620733"
80	gpsht	BM2	200	0.001015m	-0.000047m
81	gpsds	BM2	200	0.000213m	-0.001649m
82	gpsaz	BM2	201	0.699992"	0.620733"
83	gpsht	BM2	201	0.000994m	-0.000046m
84	gpsds	BM2	201	0.002059m	-0.001646m
85	gpsaz	BM2	202	0.756863"	0.620733"
86	gpsht	BM2	202	0.000174m	-0.000045m
87	gpsds	BM2	202	0.000294m	-0.001645m
88	gpsaz	BM2	205	-0.081689"	0.620733"
89	gpsht	BM2	205	0.000795m	-0.000047m
90	gpsds	BM2	205	-0.000152m	-0.001587m
91	gpsaz	BM2	206	0.260077"	0.620733"
92	gpsht	BM2	206	0.003159m	-0.000046m
93	gpsds	BM2	206	0.000499m	-0.001591m
94	gpsaz	BM2	207	0.452705"	0.620733"
95	gpsht	BM2	207	0.000732m	-0.000046m
96	gpsds	BM2	207	0.000739m	-0.001449m
97	gpsaz	BM2	208	0.174810"	0.620733"
98	gpsht	BM2	208	-0.002950m	-0.000047m
99	gpsds	BM2	208	-0.001266m	-0.001450m
100	gpsaz	BM2	209	0.429414"	0.620733"
101	gpsht	BM2	209	-0.003267m	-0.000046m
102	gpsds	BM2	209	0.000209m	-0.001466m
103	gpsaz	BM2	210	0.049331"	0.620733"
104	gpsht	BM2	210	0.001254m	-0.000046m
105	gpsds	BM2	210	0.000084m	-0.001473m
106	gpsaz	BM2	211	-0.355096"	0.620733"
107	gpsht	BM2	211	-0.000865m	-0.000046m
108	gpsds	BM2	211	0.001128m	-0.001416m
109	gpsaz	BM2	213	-0.150032"	0.620733"
110	gpsht	BM2	213	0.001700m	-0.000046m
111	gpsds	BM2	213	0.000245m	-0.001448m
112	gpsaz	BM2	214	-0.044413"	0.620733"
113	gpsht	BM2	214	0.001313m	-0.000047m
114	gpsds	BM2	214	0.000625m	-0.001439m
115	gpsaz	BM2	215	-0.138636"	0.620733"
116	gpsht	BM2	215	-0.000794m	-0.000046m
117	gpsds	BM2	215	-0.000616m	-0.001350m
118	gpsaz	BM2	216	-0.232629"	0.620733"
119	gpsht	BM2	216	0.001523m	-0.000046m

120	gpsds	BM2	216	-0.001805m	-0.001351m
121	gpsaz	BM2	217	-0.122049"	0.620733"
122	gpsht	BM2	217	-0.001010m	-0.000046m
123	gpsds	BM2	217	-0.003200m	-0.001624m
124	gpsaz	BM2	218	-0.038607"	0.620733"
125	gpsht	BM2	218	0.000296m	-0.000047m
126	gpsds	BM2	218	-0.001764m	-0.001626m
127	gpsaz	BM2	219	-0.478941"	0.620733"
128	gpsht	BM2	219	-0.002638m	-0.000046m
129	gpsds	BM2	219	-0.003403m	-0.001643m
130	gpsaz	BM2	220	-0.815384"	0.620733"
131	gpsht	BM2	220	-0.003372m	-0.000047m
132	gpsds	BM2	220	-0.003615m	-0.001643m
133	gpsaz	SBM4	BM2	-0.062211"	0.620733"
134	gpsht	SBM4	BM2	-0.001742m	-0.000047m
135	gpsds	SBM4	BM2	0.000576m	-0.002635m

COORDS

SLPPKcoords.LOG

COORDINATE ADJUSTMENT SUMMARY
NETWORK = Shnppk2
TIME = Fri May 14 16:01:24 2004

Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10

Network Adjustment Constraints:
2 fixed coordinates in y
2 fixed coordinates in x
2 fixed coordinates in h

POINT	NAME	OLD COORDS	ADJUST	NEW COORDS	1.00å
1	200				
	Y=	4212309.9574	-0.0026	4212309.9548	0.002293m
	X=	603401.0764	-0.0036	603401.0729	0.002293m
	ELL HT=	-31.0412	+0.0019	-31.0393	0.002399m
	ORTHO HT=	1.2914	+0.0022	1.2936	0.002413m
	GEOID HT=	-32.3326	-0.0003	-32.3329	0.002223m
2	201				
	Y=	4212309.1895	-0.0026	4212309.1869	0.002278m
	X=	603398.3785	-0.0036	603398.3749	0.002282m
	ELL HT=	-30.3307	+0.0019	-30.3288	0.002351m
	ORTHO HT=	2.0018	+0.0022	2.0040	0.002363m
	GEOID HT=	-32.3326	-0.0003	-32.3328	0.002223m
3	202				
	Y=	4212310.7484	-0.0026	4212310.7458	0.002274m
	X=	603393.6455	-0.0036	603393.6420	0.002276m
	ELL HT=	-29.6452	+0.0019	-29.6433	0.002329m
	ORTHO HT=	2.6873	+0.0022	2.6895	0.002338m
	GEOID HT=	-32.3325	-0.0003	-32.3328	0.002224m
4	205				
	Y=	4212116.7739	-0.0030	4212116.7709	0.002301m
	X=	603622.7814	-0.0045	603622.7769	0.002300m
	ELL HT=	-30.6655	+0.0019	-30.6636	0.002310m
	ORTHO HT=	1.6686	+0.0025	1.6712	0.002401m
	GEOID HT=	-32.3341	-0.0006	-32.3347	0.002189m
5	206				
	Y=	4212122.1712	-0.0030	4212122.1681	0.002306m
	X=	603621.1032	-0.0045	603621.0987	0.002304m
	ELL HT=	-30.2545	+0.0019	-30.2525	0.002343m
	ORTHO HT=	2.0797	+0.0025	2.0822	0.002434m
	GEOID HT=	-32.3341	-0.0006	-32.3347	0.002190m
6	207				
	Y=	4212085.8601	-0.0027	4212085.8575	0.002290m
	X=	603517.5905	-0.0044	603517.5860	0.002287m
	ELL HT=	-30.3444	+0.0019	-30.3424	0.002315m
	ORTHO HT=	1.9882	+0.0026	1.9908	0.002330m
	GEOID HT=	-32.3326	-0.0006	-32.3332	0.002187m
7	208				
	Y=	4212085.0382	-0.0027	4212085.0355	0.002298m
	X=	603519.8424	-0.0044	603519.8380	0.002288m
	ELL HT=	-30.5981	+0.0019	-30.5961	0.002329m

ORTHO HT=	1.7345	+0.0026	1.7371	0.002344m
GEOID HT=	-32.3326	-0.0006	-32.3332	0.002187m

8 209

Y=	4212093.9778	-0.0027	4212093.9751	0.002285m
X=	603525.2589	-0.0044	603525.2545	0.002281m
ELL HT=	-30.4646	+0.0019	-30.4627	0.002268m
ORTHO HT=	1.8681	+0.0025	1.8706	0.002292m
GEOID HT=	-32.3327	-0.0006	-32.3333	0.002188m

9 210

Y=	4212071.5473	-0.0028	4212071.5446	0.002303m
X=	603560.6854	-0.0045	603560.6808	0.002292m
ELL HT=	-30.2744	+0.0019	-30.2725	0.002314m
ORTHO HT=	2.0586	+0.0026	2.0612	0.002353m
GEOID HT=	-32.3330	-0.0007	-32.3337	0.002182m

10 211

Y=	4211897.8815	-0.0028	4211897.8786	0.002329m
X=	603675.9927	-0.0052	603675.9875	0.002312m
ELL HT=	-29.9434	+0.0020	-29.9414	0.002325m
ORTHO HT=	2.3899	+0.0029	2.3927	0.002389m
GEOID HT=	-32.3332	-0.0009	-32.3341	0.002138m

11 213

Y=	4211916.5500	-0.0029	4211916.5471	0.002593m
X=	603687.9774	-0.0052	603687.9722	0.002423m
ELL HT=	-30.1470	+0.0019	-30.1451	0.003367m
ORTHO HT=	2.1865	+0.0028	2.1894	0.003422m
GEOID HT=	-32.3335	-0.0009	-32.3344	0.002143m

12 214

Y=	4211910.5673	-0.0029	4211910.5644	0.002329m
X=	603685.0183	-0.0052	603685.0131	0.002312m
ELL HT=	-30.8739	+0.0019	-30.8719	0.002354m
ORTHO HT=	1.4596	+0.0028	1.4624	0.002428m
GEOID HT=	-32.3335	-0.0009	-32.3343	0.002142m

13 215

Y=	4211798.7743	-0.0027	4211798.7716	0.002319m
X=	603692.0439	-0.0056	603692.0384	0.002312m
ELL HT=	-29.8459	+0.0019	-29.8440	0.002284m
ORTHO HT=	2.4868	+0.0030	2.4898	0.002337m
GEOID HT=	-32.3327	-0.0010	-32.3337	0.002111m

14 216

Y=	4211798.5252	-0.0027	4211798.5225	0.002325m
X=	603693.0012	-0.0056	603692.9956	0.002316m
ELL HT=	-30.3312	+0.0019	-30.3293	0.002307m
ORTHO HT=	2.0015	+0.0030	2.0045	0.002362m
GEOID HT=	-32.3327	-0.0010	-32.3337	0.002111m

15 217

Y=	4211916.1806	-0.0033	4211916.1773	0.002444m
X=	603830.4414	-0.0054	603830.4360	0.002406m
ELL HT=	-30.0016	+0.0019	-29.9997	0.002652m
ORTHO HT=	2.3337	+0.0028	2.3366	0.002812m
GEOID HT=	-32.3354	-0.0009	-32.3362	0.002142m

16 218

Y=	4211915.9002	-0.0033	4211915.8968	0.002347m
X=	603831.8167	-0.0054	603831.8113	0.002341m
ELL HT=	-30.4914	+0.0019	-30.4895	0.002301m

ORTHO HT=	1.8439	+0.0028	1.8468	0.002485m
GEOID HT=	-32.3354	-0.0009	-32.3363	0.002142m

17 219

Y=	4211582.4823	-0.0033	4211582.4790	0.002429m
X=	603988.1724	-0.0067	603988.1657	0.002410m
ELL HT=	-30.4048	+0.0019	-30.4028	0.002401m
ORTHO HT=	1.9301	+0.0032	1.9332	0.002642m
GEOID HT=	-32.3348	-0.0012	-32.3361	0.002061m

18 220

Y=	4211585.2214	-0.0033	4211585.2181	0.002399m
X=	603987.5520	-0.0067	603987.5454	0.002390m
ELL HT=	-30.5461	+0.0019	-30.5441	0.002298m
ORTHO HT=	1.7888	+0.0031	1.7919	0.002552m
GEOID HT=	-32.3349	-0.0012	-32.3361	0.002062m

19 221

Y=	4211335.0576	+0.0002	4211335.0578	0.003289m
X=	602942.4468	-0.0058	602942.4410	0.003288m
ELL HT=	-30.9329	+0.0018	-30.9311	0.002682m
ORTHO HT=	1.3855	+0.0037	1.3892	0.002097m
GEOID HT=	-32.3184	-0.0019	-32.3203	0.001811m

20 BM2

Y=	4211330.8351	+0.0000	4211330.8351	FIXED
X=	602939.0984	+0.0000	602939.0984	FIXED
ELL HT=	-30.6156	+0.0021	-30.6135	0.001806m
ORTHO HT=	1.7067	+0.0000	1.7067	FIXED
GEOID HT=	-32.3223	+0.0021	-32.3202	0.001806m

21 SBM4

Y=	4212905.2026	+0.0000	4212905.2026	FIXED
X=	602222.5943	+0.0000	602222.5943	FIXED
ELL HT=	-29.7740	+0.0019	-29.7721	0.001806m
ORTHO HT=	2.5474	+0.0000	2.5474	FIXED
GEOID HT=	-32.3214	+0.0019	-32.3195	0.001806m

Appendix F
Towill, Inc. Benchmark Datasheets
Napa Salt Pond Vicinity

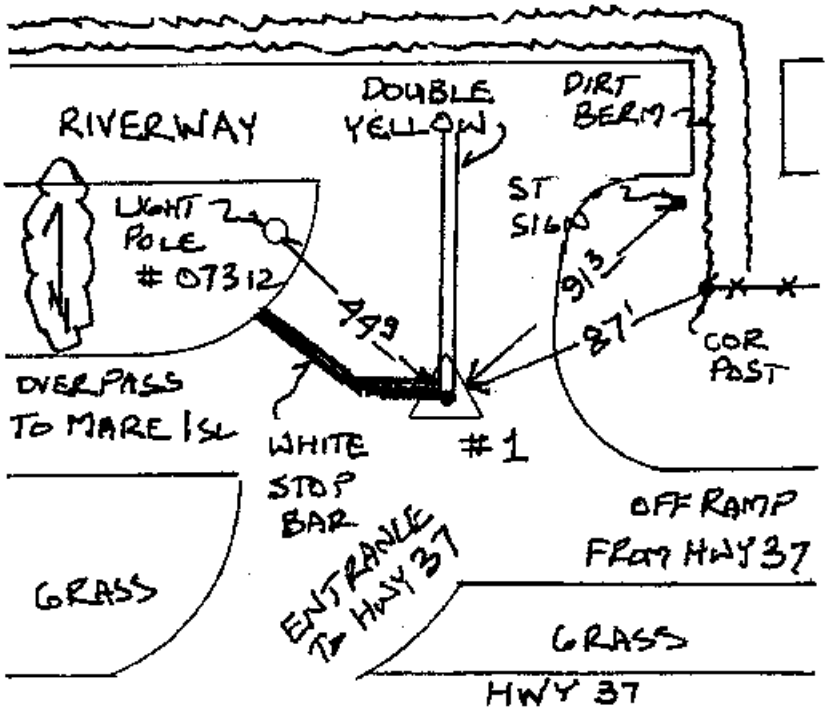
COUNTRY	TYPE OF MARK	STATION		
USA	Survey Spike	1		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh			9.283 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°07'05.77010"	122°17'14.69360"	NAD83	2.829 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,805,022.169 FT	6,478,972.860 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
550,171.857 M	1,974,794.877 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1 The station is located at the west end of the Highway 37 Bridge over the Napa River at the entrance to the Mare Island overpass. The station is in the south end of the double yellow centerline stripe on Riverway Road at the intersection with the STOP bar stripe. It is 44.9 feet southeast of light pole number 07312 and 87.1 feet west of the corner post for a highway fence. It is located 91.3 feet southwest of the street sign. The station is a survey spike set flush.



Final

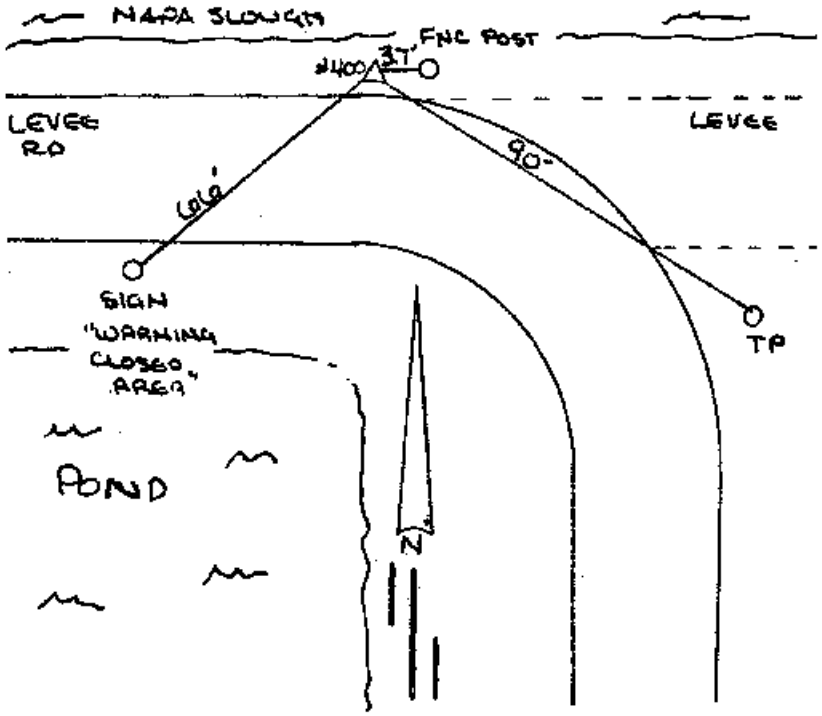
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	400		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	400	Towill, Inc.	10.086 FT	NAVD88
LATITUDE	LONGITUDE	DATUM	ELEVATION	DATUM
38°09'16.25728"	122°20'40.93932"	NAD83	3.074 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,818,279.911 FT	6,462,539.626 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
554,212.825 M	1,969,786.018 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTANCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

400 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set flush. It is stamped 400 and is located on the north side of a levee road. From the west end of the Highway 37 bridge over the Napa River, go west along Highway 37 for 3.5 miles to a turnout on the right and a levee road to Fish and Game land. Turn right and go north along the levee road 1.4 mile to the station on the right, where the levee road makes a 90-degree turn to the left, west. The station is 90 feet west-northwest of a telephone pole, 66 feet northeast of a sign that reads WARNING CLOSED AREA, and 3.7 feet west-northwest of a steel fence post.



DA FORM 1959 1 OCT 94 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC

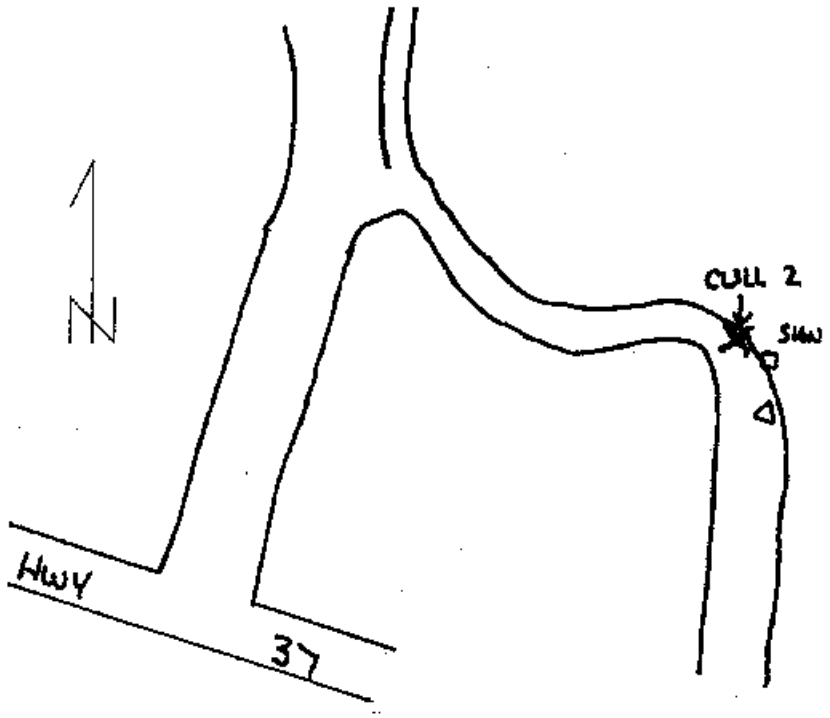
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	529		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	529	Towill, Inc.	9.572 FT	NAVD88
LATITUDE	LONGITUDE	DATUM	ELEVATION	DATUM
38°07'37.21110"	122°18'00.41767"	NAD83	2.918 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,808,214.644 FT	6,475,329.061 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
551,144.926 M	1,973,684.245 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) [MAGNETIC]	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

529 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set flush and stamped 529. It is located on the south levee of Dutch Slough. From the west end of the Highway 37 bridge over the Napa River, go west along Highway 37 for 1.50 mile to a dirt road on the right. Turn right and go north for 0.60 mile to the Dutch Slough and the southerly levee. Turn right and go southeast along the levee for 0.50 mile to a sharp turn bend to the right and the station. Station 529 is 35.07 feet south of Cull 2, a US Department of the Interior disk.



DA FORM 1959 1 OCT 94 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC

Base station

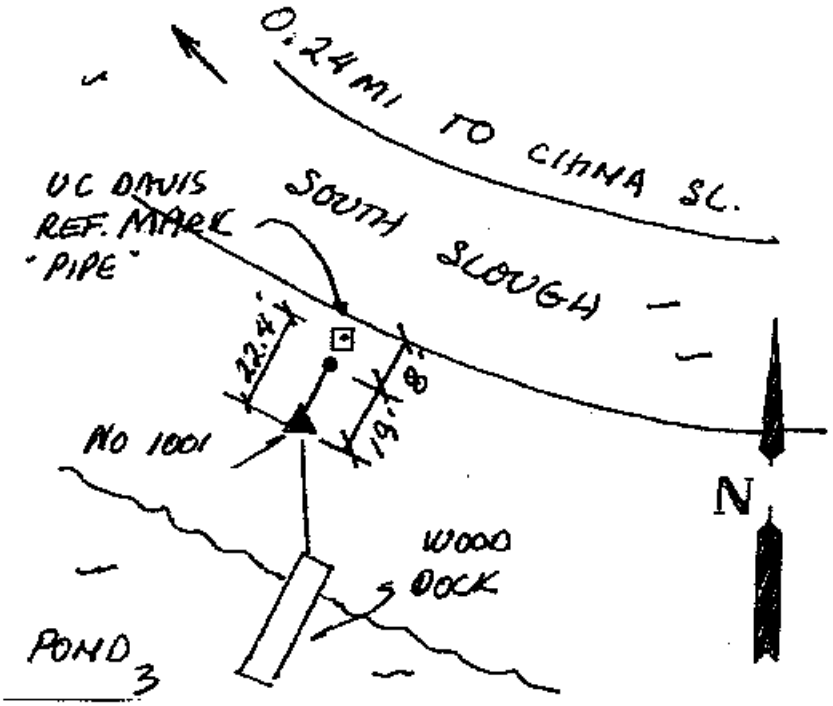
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1001		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1001	Towill, Inc.	9.66 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°08'28.36398"	122°18'25.39703"	NAD83	2.95 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,813,396.077 FT	6,473,350.419 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
552,724.230 M	1,973,081.154 M	CCS83(1992), Zone 2	5/99 / 3rd	GPS

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1001 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set 0.3 feet above ground and is stamped 1001. It is located on the top of the levee on the south-southwest side of South Slough, approximately 0.24 miles southeast of the junction with China Slough. The station is located 19 feet south-southwest of a Department of Fish and Game sign. The Fish and Game sign is set 8 feet back from the top of the bank. The station is 34 feet north-northwest of a foot platform/dock that is protruding into Pond 3 and is 22.4 feet south-southwest of UC Davis reference mark PIPE, which is a 3/4-inch rebar, located in front of the Department of Fish and Game sign.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC

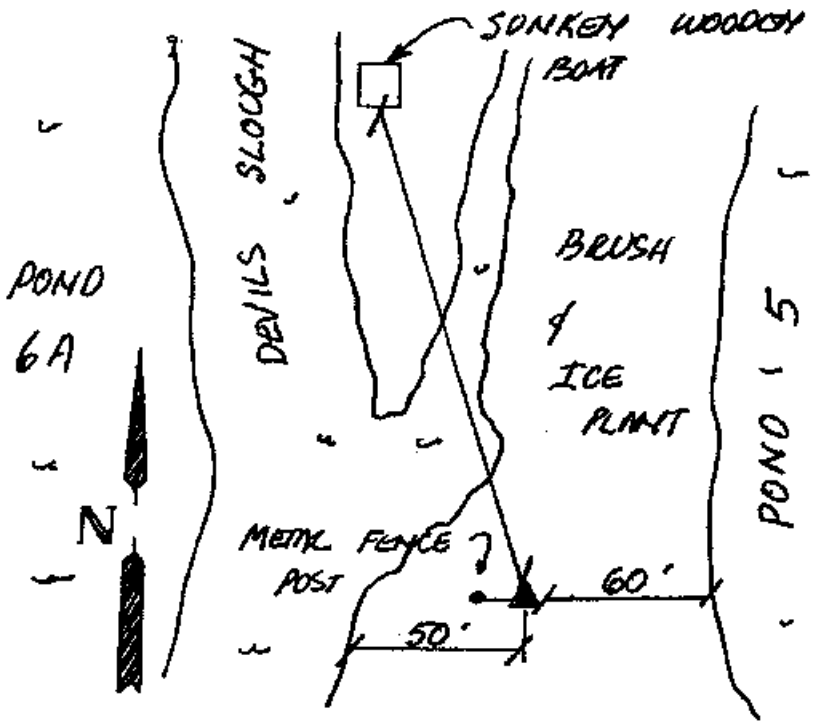
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1002		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1002	Towill, Inc.	10.83 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°10'57.51818"	122°20'07.03266"	NAD83	3.30 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,828,513.557 FT	6,465,285.894 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
557,332.047 M	1,970,623.082 M	CCS83(1992), Zone 2	5/99 / 3rd	GPS

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1002 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set 0.3 feet above ground and is stamped 1002. It is located at the top of a levee on the east side of Devils Slough at a small cut in the bank. It is 213 feet south-southeast of the cabin of an old wood, partially sunken boat and is 50 feet east of the edge of the slough. The station is located 60 feet west of the edge of Pond 5 and 1.5 feet east of a metal reference post.



DA FORM 1959 1 OCT 94 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC.

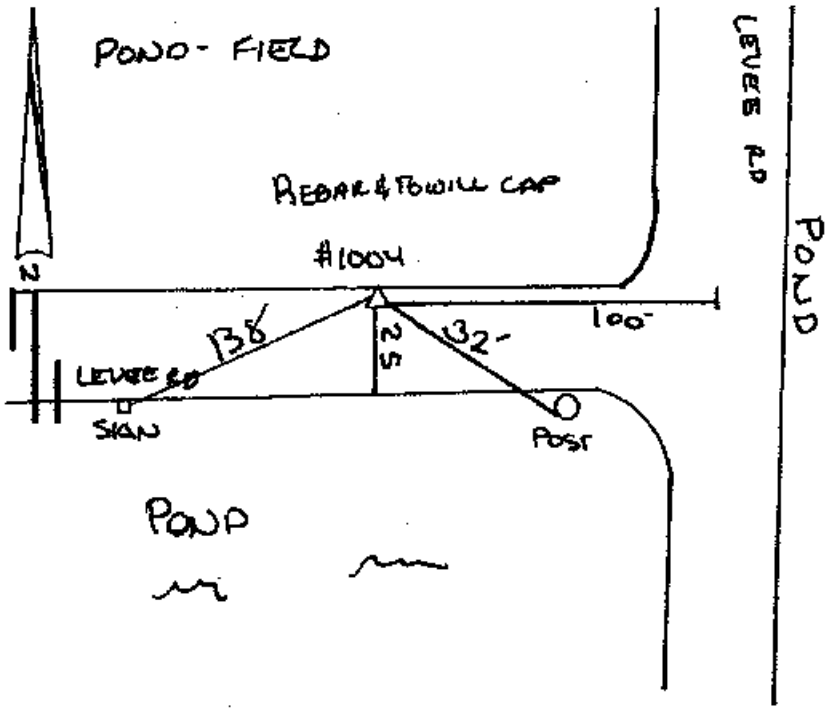
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1004		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1004	Towill, Inc.	8.837 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°12'30.05324"	122°19'56.16885"	NAD83	2.694 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,837,871.399 FT	6,466,187.584 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
560,184.323 M	1,970,897.917 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1004 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set 0.25 foot above the ground. From the intersection of Highway 12, go west and south on Duhig Road for 2.15 miles to Los Amigos Road on the left. Turn left and go east for 1.25 mile to Buchli Station Road on the right. Turn right and go south along Buchli Station Road for 1.15 miles to a Fish and Game gate. This area is called Huichica Creek Area. Continue through the gate along the levee road, south, for 0.45 mile to the station on the left. It is 0.7 feet northeast of a fence post and 138 feet northeast of a sign. It is located 32 feet north-northwest of a PVC post, 25 feet north of the top of the pond bank, and 100 feet east of the T intersection of the levee roads. A steel fence post references the station.



DA FORM 1959 1 OCT 94 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC

Found

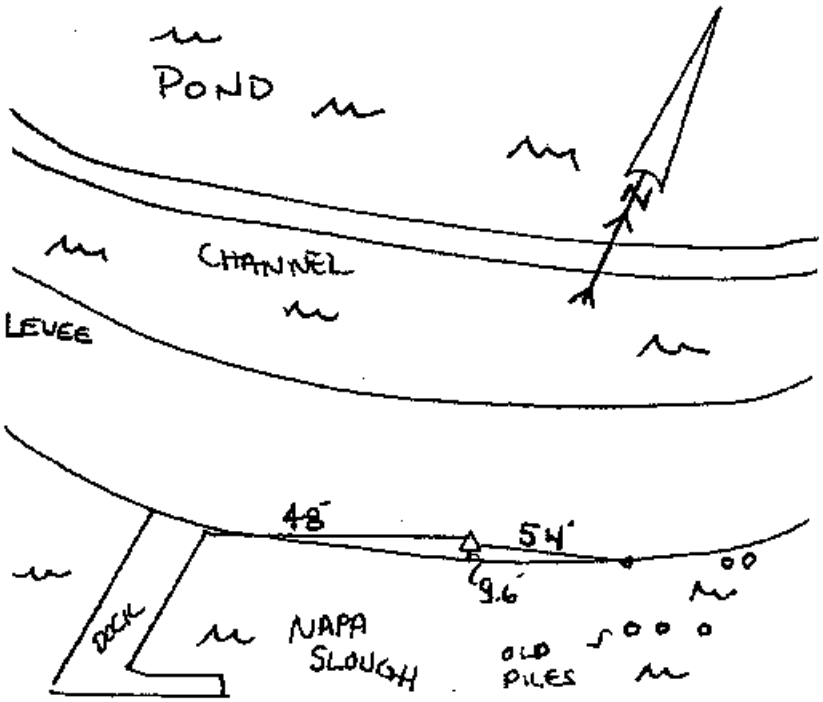
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1005		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1005	Towill, Inc.	8.996 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°11'35.69981"	122°19'51.89813"	NAD83	2.742 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,832,371.658 FT	6,466,508.443 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
558,507.998 M	1,970,995.715 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1005 The station is a 6-foot rebar and Towill cap, set 0.15 feet above the ground. It is stamped 1005 and is located on the southeast side of the levee road on the north side of the Napa Slough. From the intersection of Highway 12, go west and south on Duhig Road for 2.15 miles to Los Amigos Road on the left. Turn left and go east for 1.25 mile to Buchli Station Road on the right. Turn right go south along Buchli Station Road for 1.15 miles to a Fish and Game gate at an area called Huichica Creek Area. Continue through the gate, south along the levee road for 1.65 miles to the station on the left. The station is on the south side of the levee road at the Napa Slough and is 1.1 feet south of a reference steel fence post. It is 9.6 feet north the riverbank and 48 feet east of a dock on the river.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form, see TM 5-237; the proponent agency is TRADOC.

FOUND

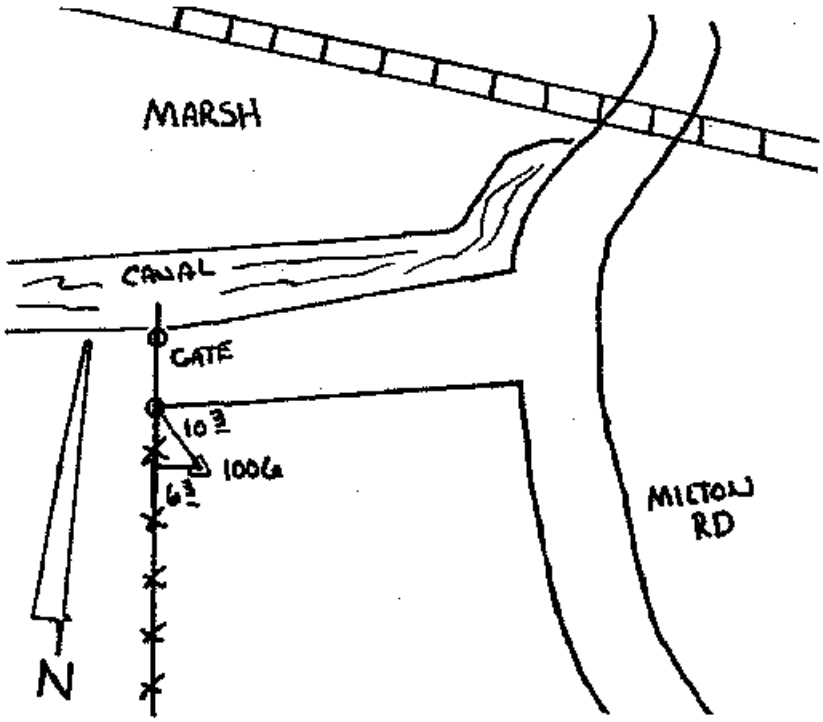
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1006		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1006	Towill, Inc.	6.964 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°12'32.13700"	122°18'35.29966"	NAD83	2.123 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,838,059.394 FT	6,472,643.315 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
560,241.624 M	1,972,865.628 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1006 From Highway 12, go southeast on Cuttings Wharf Road for 1.80 mile to Las Amigas Road. Continue on Las Amigas Road for 0.70 mile to Milton Road. Continue southeast on Milton Road for 1.70 mile to the Southern Pacific Railroad tracks and the Brazos Bridge. Continue on Milton Road for 300 feet to a dirt road right. Turn right and go 150 feet to a gate and the station on the left. The station is 6 foot rebar with a 2-inch Towill aluminum cap. It is stamped 1006 and is set flush. The station is located 10.3 feet southeast of a gatepost and 6.3 feet east of the fence. It is 1.0 foot south of a steel reference post.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form, see TM 5-237; the proponent agency is TRADOC.

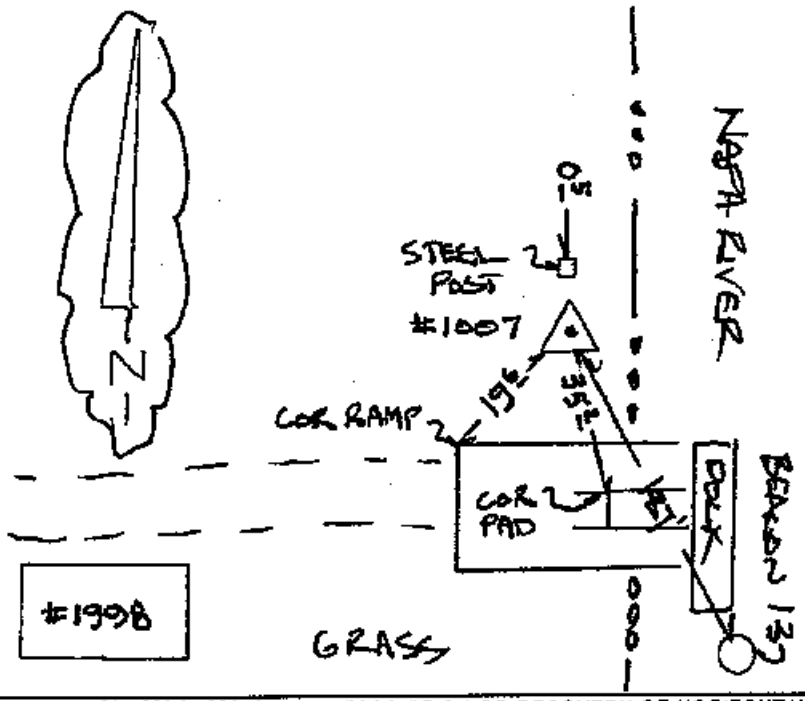
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1007		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1007	Towill, Inc.	10.894 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°11'34.56129"	122°18'52.19748"	NAD83	3.320 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,832,239.553 FT	6,471,274.378 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
558,467.733 M	1,972,448.375 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1007 The station is 6-foot rebar and Towill cap, set flush. From Highway 29 in southwest Napa County, California, go west on Highway 12 for 1.3 miles to Cuttings Wharf Road. Turn left and go southeast for 1.8 miles to Los Amigas Road. Bear right and go 0.7 mile to Milton Road. Turn left and go south for 1.7 miles to a railroad crossing. Continue for 1.3 miles to the end of the paved road at house number 1998. Follow the entrance road east for 0.10 mile to an old launch ramp and the station on the left. The station is 0.5 feet south of a steel fence post and 1.0 feet northwest of an eyebolt. It is 187 feet northwest of beacon number 13 and 35.2 feet northwest of the northeast corner of the concrete pad holding a gangway. It is located 19.6 feet north of the northwest concrete corner of the launch ramp and 305 feet east of the northeast corner of the house.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC.

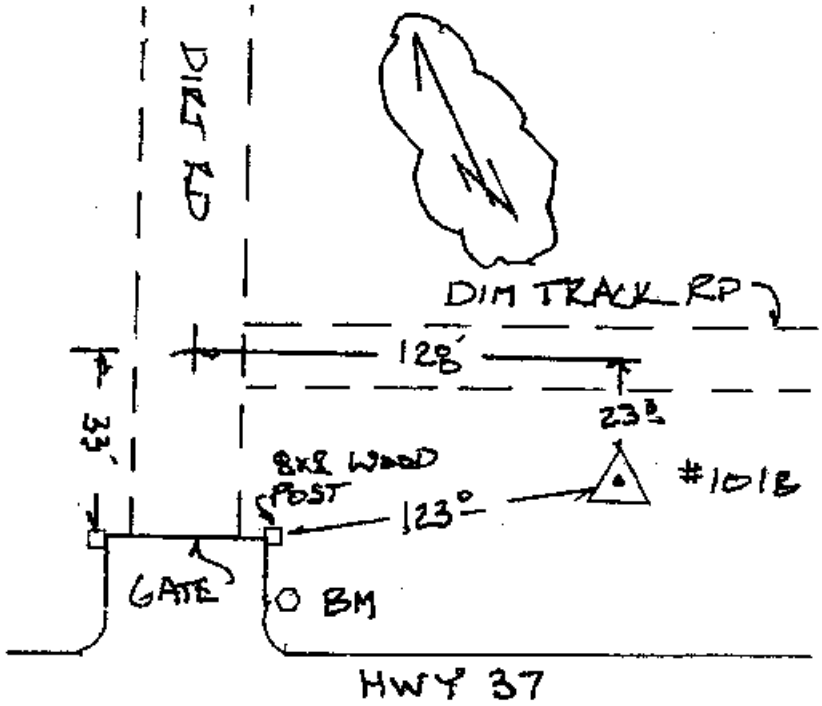
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1018		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1018	Towill, Inc.	2.254 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°07'20.19065"	122°18'46.16259"	NAD83	0.687 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,806,505.135 FT	6,471,667.611 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
550,623.866 M	1,972,568.233 M	CCS83(1992), Zone 2	5/99 / 2nd	Levels

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTANCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1018 The station is 6-foot rebar with a 2 1/2-inch Towill aluminum cap, set 0.20 above ground, stamped 1018. From the west end of the Highway 37 bridge over the Napa River, go west along Highway 37 for 1.50 mile to a dirt road on the right. Turn right and go north, passing through a gate for 33 feet to a dim track road on the right. Turn right and go east for 128 feet to the station on the right. The station is located 23.3 feet south of the centerline of the track road and is referenced by a steel post. The station is 123.0 feet east of the 8 by 8-inch corner gatepost on the east side of the gate.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form, see TM 5-237; the proponent agency is TRADOC.

Form

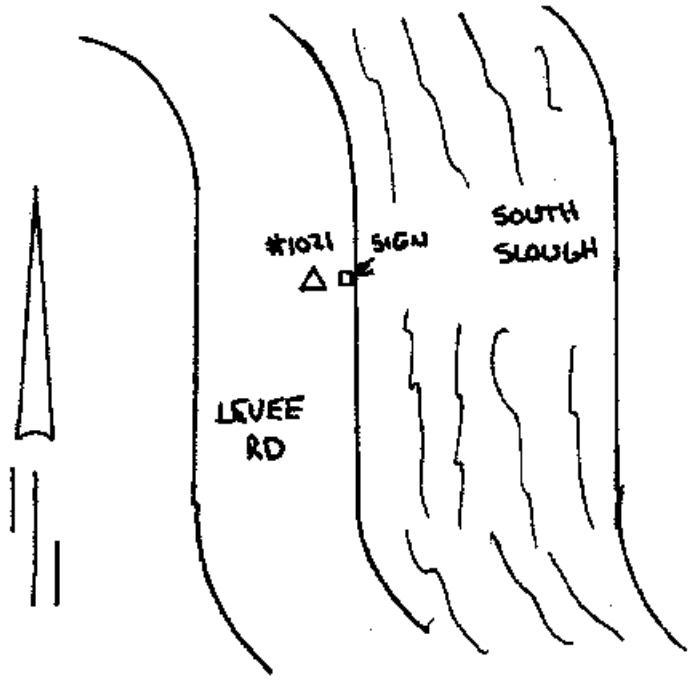
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1021		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1021	Towill, Inc.	10.49 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°08'48.36354"	122°20'03.42344"	NAD83	3.20 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,815,446.918 FT	6,465,526.026 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
553,349.327 M	1,970,696.274 M	CCS83(1992), Zone 2	5/99 / 3rd	GPS

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1021 The station is 6-foot rebar with a 2 1/2-inch Towill aluminum cap, set flush. It is stamped 1021 and is located on the east side of a levee road. It is 4.2 feet west of a wildlife refuge sign and 2.8 feet north of a 6-foot reference post. The station is on the west levee of South Slough, 2000 feet northwest of the intersection of Dutchman Slough. It is 2200 feet south-southeast of a tower line crossing, 2.0 miles east of the Can Duck Club, and 3.5 airline miles northwest of the Highway 37 crossing of the Napa River.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC.

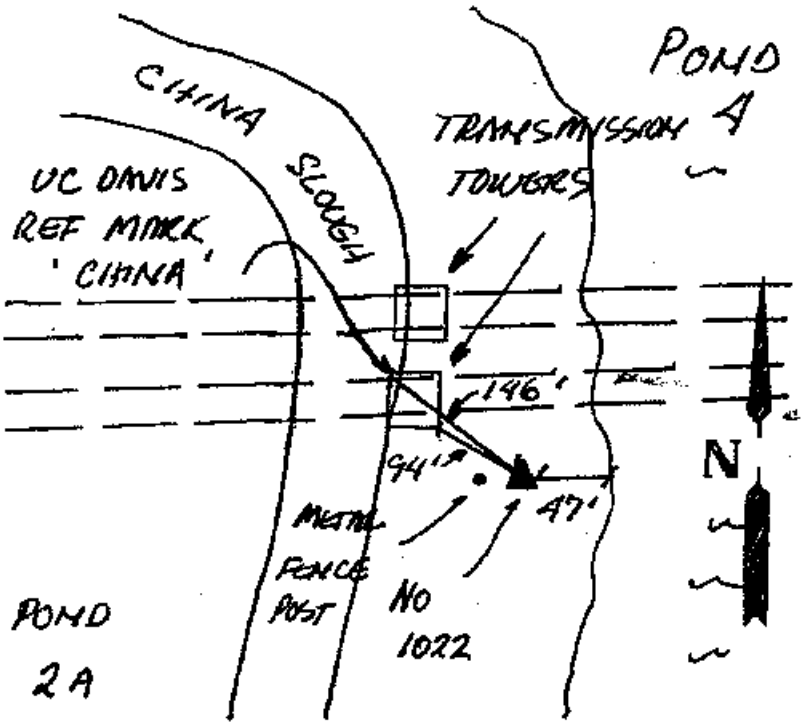
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1022		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1022	Towill, Inc.	12.02 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°09'13.45849"	122°18'14.23672"	NAD83	3.66 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,817,954.957 FT	6,474,257.332 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
554,113.779 M	1,973,357.582 M	CCS83(1992), Zone 2	5/99 / 3rd	GPS

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTANCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1022 The station is 6 foot rebar with a 2 1/2 inch Towill aluminum cap, set 0.1 foot above ground and is stamped 1022. It is located on the top of the levee on the east side of China Slough, underneath the southerly of two east-west running tower lines. The station is 94 feet east-southeast form the southeast leg of the southerly of two transmission towers, 47 feet west of the shoreline of Pond 4, and 1.0 feet east-southeast of a metal reference post. Note: UC Davis reference mark CHINA is the top of the curb at the northwest corner of the support for the northwest leg of the southerly transmission tower and is 146 feet northwest of Towill station 1022.



DA FORM 1 OCT 94 1959 REPLACES DA FORMS 1959 AND 1960, 1 FEB 57, WHICH ARE OBSOLETE.

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION

For use of this form, see TM 5-237; the proponent agency is TRADOC.

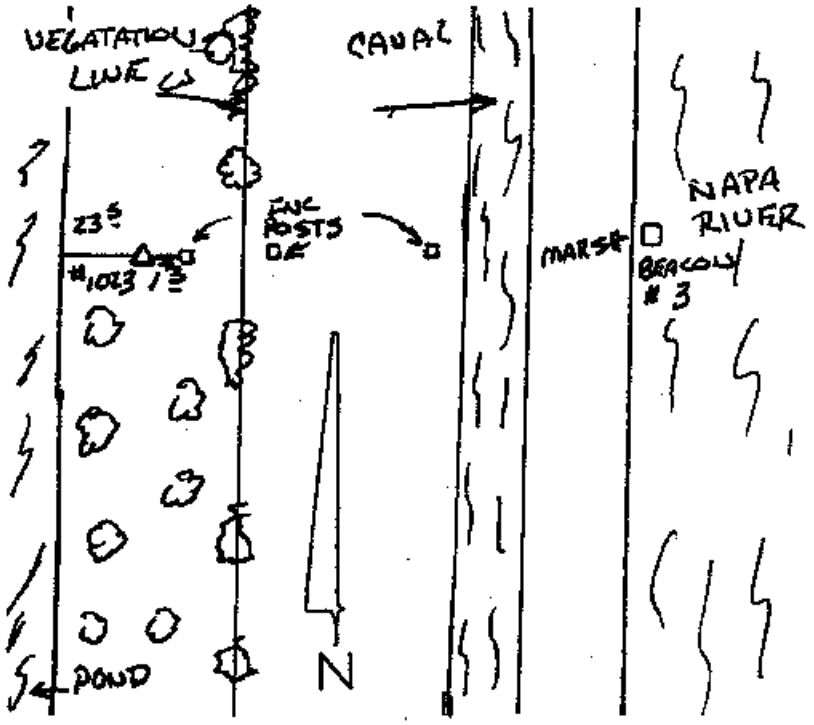
COUNTRY	TYPE OF MARK	STATION		
USA	Rebar & Cap	1023		
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARKS)	ELEVATION	DATUM
Napa Salt Marsh	1023	Towill, Inc.	11.93 FT	NAVD88
LATITUDE	LONGTITUDE	DATUM	ELEVATION	DATUM
38°10'21.58930"	122°17'55.12609"	NAD83	3.64 M	NAVD88
NORTHING	EASTING	GRID AND ZONE	ESTABLISHD BY (AGENCY)	
1,824,842.174 FT	6,475,806.563 FT	CCS83(1992), Zone 2	SF District USACE	
NORTHING	EASTING	GRID AND ZONE	DATE / ORDER	TYPE
556,213.007 M	1,973,829.788 M	CCS83(1992), Zone 2	5/99 / 3rd	GPS

TO OBTAIN GRID AZIMUTH, ADD ° ' " TO THE GEODETIC AZIMUTH

TO OBTAIN GRID AZ. (ADD) (SUB.) ° ' " TO THE GEODETIC AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC) (GRID) (MAGNETIC)	BACK AZIMUTH	GEOD DISTA NCE (METERS) (FEET)	GRID DISTANCE (METERS) (FEET)
	° ' "	° ' "		

1023 The station is a 6-foot rebar and 2 1/2-inch Towill cap, set 0.2 foot above ground and stamped 1023. The only access to this station is by boat. It is west of Beacon Number 3 on the Napa River. The station is approximately 4 river miles north of the Highway 37 bridge over the Napa River and 1.3 miles north of the power line crossing over the Napa River at Slaughter House Point. It is 1 mile south of Good Luck Point. The station is 23.5 feet east of the pond edge and 1.3 foot west of a steel reference post. From the Napa River side, there are two steel posts that are on a line to the station. The station is on the west side of the pond levee.



Appendix G
Tucker Associates PPK GPS Data sheets Coon Island

Tucker & Associates- 1362 Lincoln Ave, Calistoga CA 94515

Wetlands and Water Resources- Coon Island PPK GPS survey values.

TA#	WWR #	Northing	Easting	Elevation
1	PBM2	4227308.131059	558942.712586	6.90
10	XS5LB	4227845.858011	558904.678194	8.97
1006	1006	4229221.425400	560425.261600	6.964
11	XS2RB[1]	4228112.237104	559019.521425	8.56
12	XS2TSCP	4228114.006487	559022.253288	8.06
13	XS2LB[1]	4228116.443372	558987.780261	8.13
14	PBM1	4228277.413533	559051.429774	6.87
15	XS7RB[2]	4228275.835140	559047.326774	7.67
16	XS7LB[2]	4228313.001877	559028.449095	9.48
17	BM5	4228177.139212	558755.645786	7.88
18	WL3TOGP	4228583.241021	558941.832117	7.62
19	WL3TSCP	4228582.378948	558941.468902	7.71
2	XS3RB	4227303.882777	558945.631199	8.69
20	PBM4	4227721.493858	559478.995968	7.23
21	BM3	4227042.384775	559703.180694	8.08
22	WL2TOGP	4227063.705239	559540.147986	8.38
23	WL2TSCP	4227061.007064	559543.952805	7.51

24	WL1TOGP	4227522.152429	558856.883520	7.92
25	WL1TSCP	4227520.084342	558858.237770	6.58
3	XS3LB	4227283.690619	558955.268619	7.87
4	XS4RB	4227462.237512	559109.695763	8.98
5	XS4LB	4227441.554219	559110.854760	7.71
6	WL4TOGP	4227815.252345	558963.707526	6.99
7	XS6RB	4227821.890578	558924.606947	9.78
8	XS6TSCP	4227818.889111	558918.817004	6.75
9	XS6LB	4227834.493045	558927.498161	7.34

SYSTEM PARAMETERS

Network status = computed
Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10
Vertical Datum = NAVD88
Linear units(Northings/Eastings) = meter
Linear units(Elevations) = U.S. Survey Foot

Notes:
1) TA# 11 and 13, initially assigned WWR# with incorrect RB and LB designation. Correct as shown in this document.
2) TA# 15 and 16, initially assigned WWR# with incorrect RB and LB designation. Correct as shown in this document.

CoonCOORDS_20040505.LOG

COORDINATE ADJUSTMENT SUMMARY
NETWORK = coon1006
TIME = Fri May 7 15:36:35 2004

Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in h

POINT	NAME		OLD COORDS	ADJUST	NEW COORDS	1.00å
1	1					
		Y=	4227308.1311	+0.0000	4227308.1311	0.021240m
		X=	558942.7126	+0.0000	558942.7126	0.021240m
		ELL HT=	-29.8227	+0.0000	-29.8227	0.018416m
		ORTHO HT=	2.1029	+0.0000	2.1029	0.024085m
		GEOID HT=	-31.9256	+0.0000	-31.9256	0.017768m
2	10					
		Y=	4227845.8580	+0.0000	4227845.8580	0.021261m
		X=	558904.6782	+0.0000	558904.6782	0.021230m
		ELL HT=	-29.1740	+0.0000	-29.1740	0.018439m
		ORTHO HT=	2.7345	+0.0000	2.7345	0.022267m
		GEOID HT=	-31.9085	+0.0000	-31.9085	0.017768m
3	1006					
		Y=	4229221.4254	+0.0000	4229221.4254	FIXED
		X=	560425.2616	+0.0000	560425.2616	FIXED
		ELL HT=	-29.7290	+0.0000	-29.7290	0.017768m
		ORTHO HT=	2.1230	+0.0000	2.1230	FIXED
		GEOID HT=	-31.8520	+0.0000	-31.8520	0.017768m
4	11					
		Y=	4228112.2371	+0.0000	4228112.2371	0.021310m
		X=	559019.5214	+0.0000	559019.5214	0.021247m
		ELL HT=	-29.2906	+0.0000	-29.2906	0.018584m
		ORTHO HT=	2.6087	+0.0000	2.6087	0.021011m
		GEOID HT=	-31.8993	+0.0000	-31.8993	0.017768m
5	12					
		Y=	4228114.0065	+0.0000	4228114.0065	0.021272m
		X=	559022.2533	+0.0000	559022.2533	0.021233m
		ELL HT=	-29.4438	+0.0000	-29.4438	0.018451m
		ORTHO HT=	2.4554	+0.0000	2.4554	0.020875m
		GEOID HT=	-31.8992	+0.0000	-31.8992	0.017768m
6	13					
		Y=	4228116.4434	+0.0000	4228116.4434	0.021295m
		X=	558987.7803	+0.0000	558987.7803	0.021241m
		ELL HT=	-29.4221	+0.0000	-29.4221	0.018508m
		ORTHO HT=	2.4772	+0.0000	2.4772	0.021067m
		GEOID HT=	-31.8993	+0.0000	-31.8993	0.017768m
7	14					
		Y=	4228277.4135	+0.0000	4228277.4135	0.021278m
		X=	559051.4298	+0.0000	559051.4298	0.021228m
		ELL HT=	-29.8003	+0.0000	-29.8003	0.018413m

ORTHO HT=	2.0934	+0.0000	2.0934	0.020167m
GEOID HT=	-31.8937	+0.0000	-31.8937	0.017768m

8 15

Y=	4228275.8351	+0.0000	4228275.8351	0.021275m
X=	559047.3268	+0.0000	559047.3268	0.021228m
ELL HT=	-29.5551	+0.0000	-29.5551	0.018435m
ORTHO HT=	2.3386	+0.0000	2.3386	0.020211m
GEOID HT=	-31.8937	+0.0000	-31.8937	0.017768m

9 16

Y=	4228313.0019	+0.0000	4228313.0019	0.021491m
X=	559028.4491	+0.0000	559028.4491	0.021280m
ELL HT=	-29.0024	+0.0000	-29.0024	0.018962m
ORTHO HT=	2.8902	+0.0000	2.8902	0.020665m
GEOID HT=	-31.8926	+0.0000	-31.8926	0.017768m

10 17

Y=	4228177.1392	+0.0000	4228177.1392	0.021236m
X=	558755.6458	+0.0000	558755.6458	0.021225m
ELL HT=	-29.4955	+0.0000	-29.4955	0.018367m
ORTHO HT=	2.4026	+0.0000	2.4026	0.021784m
GEOID HT=	-31.8981	+0.0000	-31.8981	0.017768m

11 18

Y=	4228583.2410	+0.0000	4228583.2410	0.021258m
X=	558941.8321	+0.0000	558941.8321	0.021251m
ELL HT=	-29.5606	+0.0000	-29.5606	0.018635m
ORTHO HT=	2.3233	+0.0000	2.3233	0.020073m
GEOID HT=	-31.8839	+0.0000	-31.8839	0.017768m

12 19

Y=	4228582.3789	+0.0000	4228582.3789	0.021283m
X=	558941.4689	+0.0000	558941.4689	0.021272m
ELL HT=	-29.5336	+0.0000	-29.5336	0.018852m
ORTHO HT=	2.3503	+0.0000	2.3503	0.020279m
GEOID HT=	-31.8839	+0.0000	-31.8839	0.017768m

13 2

Y=	4227303.8828	+0.0000	4227303.8828	0.021283m
X=	558945.6312	+0.0000	558945.6312	0.021279m
ELL HT=	-29.2761	+0.0000	-29.2761	0.018645m
ORTHO HT=	2.6497	+0.0000	2.6497	0.024268m
GEOID HT=	-31.9258	+0.0000	-31.9258	0.017768m

14 20

Y=	4227721.4939	+0.0000	4227721.4939	0.021299m
X=	559478.9960	+0.0000	559478.9960	0.021277m
ELL HT=	-29.7065	+0.0000	-29.7065	0.019251m
ORTHO HT=	2.2032	+0.0000	2.2032	0.021512m
GEOID HT=	-31.9097	+0.0000	-31.9097	0.017768m

15 21

Y=	4227042.3848	+0.0000	4227042.3848	0.021249m
X=	559703.1807	+0.0000	559703.1807	0.021235m
ELL HT=	-29.4662	+0.0000	-29.4662	0.018769m
ORTHO HT=	2.4641	+0.0000	2.4641	0.023759m
GEOID HT=	-31.9303	+0.0000	-31.9303	0.017768m

16 22

Y=	4227063.7052	+0.0000	4227063.7052	0.021292m
X=	559540.1480	+0.0000	559540.1480	0.021257m
ELL HT=	-29.3758	+0.0000	-29.3758	0.019317m

ORTHO HT=	2.5549	+0.0000	2.5549	0.024367m
GEOID HT=	-31.9307	+0.0000	-31.9307	0.017768m

17 23

Y=	4227061.0071	+0.0000	4227061.0071	0.021303m
X=	559543.9528	+0.0000	559543.9528	0.021262m
ELL HT=	-29.6427	+0.0000	-29.6427	0.019438m
ORTHO HT=	2.2880	+0.0000	2.2880	0.024468m
GEOID HT=	-31.9307	+0.0000	-31.9307	0.017768m

18 24

Y=	4227522.1524	+0.0000	4227522.1524	0.021253m
X=	558856.8835	+0.0000	558856.8835	0.021229m
ELL HT=	-29.5043	+0.0000	-29.5043	0.018516m
ORTHO HT=	2.4148	+0.0000	2.4148	0.023642m
GEOID HT=	-31.9191	+0.0000	-31.9191	0.017768m

19 25

Y=	4227520.0843	+0.0000	4227520.0843	0.021290m
X=	558858.2378	+0.0000	558858.2378	0.021248m
ELL HT=	-29.9122	+0.0000	-29.9122	0.018705m
ORTHO HT=	2.0070	+0.0000	2.0070	0.023793m
GEOID HT=	-31.9192	+0.0000	-31.9192	0.017768m

20 3

Y=	4227283.6906	+0.0000	4227283.6906	0.021262m
X=	558955.2686	+0.0000	558955.2686	0.021239m
ELL HT=	-29.5226	+0.0000	-29.5226	0.018446m
ORTHO HT=	2.4039	+0.0000	2.4039	0.024164m
GEOID HT=	-31.9265	+0.0000	-31.9265	0.017768m

21 31

Y=	4227415.2500	+0.0000	4227415.2500	0.021463m
X=	558829.6741	+0.0000	558829.6741	0.021297m
ELL HT=	-30.4824	+0.0000	-30.4824	0.019173m
ORTHO HT=	1.4403	+0.0000	1.4403	0.024620m
GEOID HT=	-31.9227	+0.0000	-31.9227	0.017768m

22 4

Y=	4227462.2375	+0.0000	4227462.2375	0.021259m
X=	559109.6958	+0.0000	559109.6958	0.021234m
ELL HT=	-29.1835	+0.0000	-29.1835	0.018441m
ORTHO HT=	2.7365	+0.0000	2.7365	0.023011m
GEOID HT=	-31.9200	+0.0000	-31.9200	0.017768m

23 5

Y=	4227441.5542	+0.0000	4227441.5542	0.021257m
X=	559110.8548	+0.0000	559110.8548	0.021232m
ELL HT=	-29.5719	+0.0000	-29.5719	0.018435m
ORTHO HT=	2.3488	+0.0000	2.3488	0.023086m
GEOID HT=	-31.9207	+0.0000	-31.9207	0.017768m

24 6

Y=	4227815.2523	+0.0000	4227815.2523	0.021243m
X=	558963.7075	+0.0000	558963.7075	0.021225m
ELL HT=	-29.7777	+0.0000	-29.7777	0.018380m
ORTHO HT=	2.1315	+0.0000	2.1315	0.022103m
GEOID HT=	-31.9092	+0.0000	-31.9092	0.017768m

25 7

Y=	4227821.8906	+0.0000	4227821.8906	0.021957m
X=	558924.6069	+0.0000	558924.6069	0.021492m
ELL HT=	-28.9272	+0.0000	-28.9272	0.020940m

ORTHO HT=	2.9819	+0.0000	2.9819	0.024386m
GEOID HT=	-31.9092	+0.0000	-31.9092	0.017768m

26 8

Y=	4227818.8891	+0.0000	4227818.8891	0.021258m
X=	558918.8170	+0.0000	558918.8170	0.021230m
ELL HT=	-29.8519	+0.0000	-29.8519	0.018435m
ORTHO HT=	2.0574	+0.0000	2.0574	0.022304m
GEOID HT=	-31.9093	+0.0000	-31.9093	0.017768m

27 9

Y=	4227834.4930	+0.0000	4227834.4930	0.021239m
X=	558927.4982	+0.0000	558927.4982	0.021223m
ELL HT=	-29.6715	+0.0000	-29.6715	0.018363m
ORTHO HT=	2.2372	+0.0000	2.2372	0.022157m
GEOID HT=	-31.9088	+0.0000	-31.9088	0.017768m

28 99

Y=	4227305.5972	+0.0000	4227305.5972	0.021227m
X=	558936.7192	+0.0000	558936.7192	0.021227m
ELL HT=	-30.5114	+0.0000	-30.5114	0.018349m
ORTHO HT=	1.4144	+0.0000	1.4144	0.024061m
GEOID HT=	-31.9257	+0.0000	-31.9257	0.017768m

Appendix H
Tucker Associates PPK GPS Data sheets Bull Island

Tucker & Associates- 1362 Lincoln Ave., Calistoga CA 94515

Wetlands and Water Resources - Bull Island PPK GPS survey values.

TA#	WWR#	Northing	Easting	Elevation
1006	1006	4229221.430000	560425.261000	6.964
101	PBM1	4231132.996204	560817.814296	7.09
102	BM3	4230335.436775	561062.882267	8.65
103	XS5LB	4230583.000002	560836.913239	8.36
104	XS5TSCP	4230581.997281	560832.833973	7.90
105	XS5RB	4230604.366494	560832.603364	7.72
106	XS2RB	4230650.352098	560605.559638	8.21
107	XS2TSCP	4230650.609914	560605.487876	9.23
108	XS2LB	4230639.792665	560631.688003	9.20
109	XS3LB	4230736.496920	560861.843241	8.88
110	XS3RB	4230750.446245	560854.860354	7.56
111	WL2TOGP	4230777.539533	560913.394179	8.98
112	WL2TSCP	4230776.530934	560913.852199	7.46
113	WL4TOGP	4230876.809738	561003.503659	6.78
114	XS4LB	4230874.041342	561006.204094	7.63
115	XS4RB	4230875.273573	561001.789788	8.40

116	XS4TSCP	4230865.216700	561006.188680	7.62
117	PBM2	4230916.610943	561037.841308	9.19
118	WL3TOGP	4230454.273555	560755.544021	9.71
119	WL3TSCP	4230447.742074	560753.649474	8.29
120	WL1TOGP	4230945.375785	560766.220522	10.36
121	WL1TSCP	4230947.703873	560763.421901	9.74
122	PBM4	4230486.535879	560508.020888	6.89
123	XS1LB	4230488.057510	560507.341606	8.17
124	XS1RB	4230502.463400	560478.747803	8.25

SYSTEM PARAMETERS

Network status = reduced computed adjusted
Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10
Vertical Datum = NAVD88
Linear units(Northings/Eastings) = meter
Linear units(Elevations) = U.S. Survey Foot

Bull COORDS_20040506.LOG
COORDINATE ADJUSTMENT SUMMARY
NETWORK = Bull1006
TIME = Mon May 10 13:59:02 2004

Datum = NAD-83
Coordinate System = Universal Transverse Mercator
Zone = 10

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in h

POINT	NAME		OLD COORDS	ADJUST	NEW COORDS	1.00å
1	100					
		Y=	4231135.7497	+0.0046	4231135.7543	0.014154m
		X=	560817.8413	-0.0006	560817.8407	0.014150m
		ELL HT=	-29.3431	-0.1290	-29.4721	0.014487m
		ORTHO HT=	2.4415	-0.1290	2.3125	0.018937m
		GEOID HT=	-31.7846	+0.0000	-31.7846	0.012598m
2	1006					
		Y=	4229221.4300	+0.0000	4229221.4300	FIXED
		X=	560425.2610	+0.0000	560425.2610	FIXED
		ELL HT=	-29.6000	-0.1290	-29.7290	0.012598m
		ORTHO HT=	2.1230	+0.0000	2.1230	FIXED
		GEOID HT=	-31.7230	-0.1290	-31.8520	0.012598m
3	101					
		Y=	4231132.9916	+0.0046	4231132.9962	0.014153m
		X=	560817.8149	-0.0006	560817.8143	0.014149m
		ELL HT=	-29.4947	-0.1290	-29.6237	0.014482m
		ORTHO HT=	2.2900	-0.1290	2.1609	0.018922m
		GEOID HT=	-31.7847	+0.0000	-31.7847	0.012598m
4	102					
		Y=	4230335.4322	+0.0046	4230335.4368	0.014161m
		X=	561062.8829	-0.0006	561062.8823	0.014157m
		ELL HT=	-29.0444	-0.1290	-29.1735	0.014498m
		ORTHO HT=	2.7644	-0.1290	2.6354	0.015919m
		GEOID HT=	-31.8088	+0.0000	-31.8088	0.012598m
5	103					
		Y=	4230582.9954	+0.0046	4230583.0000	0.014165m
		X=	560836.9139	-0.0006	560836.9132	0.014171m
		ELL HT=	-29.1245	-0.1290	-29.2535	0.014549m
		ORTHO HT=	2.6781	-0.1290	2.5491	0.016636m
		GEOID HT=	-31.8026	+0.0000	-31.8026	0.012598m
6	104					
		Y=	4230581.9927	+0.0046	4230581.9973	0.014156m
		X=	560832.8346	-0.0006	560832.8340	0.014158m
		ELL HT=	-29.2661	-0.1290	-29.3951	0.014511m
		ORTHO HT=	2.5366	-0.1290	2.4076	0.016593m
		GEOID HT=	-31.8027	+0.0000	-31.8027	0.012598m
7	105					
		Y=	4230604.3619	+0.0046	4230604.3665	0.014162m
		X=	560832.6040	-0.0006	560832.6034	0.014165m
		ELL HT=	-29.3198	-0.1290	-29.4488	0.014540m

ORTHO HT=	2.4821	-0.1290	2.3531	0.016719m
GEOID HT=	-31.8019	+0.0000	-31.8019	0.012598m

8 106

Y=	4230650.3475	+0.0046	4230650.3521	0.014168m
X=	560605.5603	-0.0006	560605.5596	0.014169m
ELL HT=	-29.1712	-0.1290	-29.3002	0.014563m
ORTHO HT=	2.6310	-0.1290	2.5020	0.016733m
GEOID HT=	-31.8022	+0.0000	-31.8022	0.012598m

9 107

Y=	4230650.6053	+0.0046	4230650.6099	0.014314m
X=	560605.4885	-0.0006	560605.4879	0.014315m
ELL HT=	-28.8613	-0.1290	-28.9903	0.015209m
ORTHO HT=	2.9409	-0.1290	2.8119	0.017298m
GEOID HT=	-31.8022	+0.0000	-31.8022	0.012598m

10 108

Y=	4230639.7881	+0.0046	4230639.7927	0.014387m
X=	560631.6886	-0.0006	560631.6880	0.014281m
ELL HT=	-28.8693	-0.1290	-28.9983	0.015170m
ORTHO HT=	2.9331	-0.1290	2.8041	0.017231m
GEOID HT=	-31.8024	+0.0000	-31.8024	0.012598m

11 109

Y=	4230736.4923	+0.0046	4230736.4969	0.014272m
X=	560861.8439	-0.0006	560861.8432	0.014205m
ELL HT=	-28.9623	-0.1290	-29.0913	0.014853m
ORTHO HT=	2.8350	-0.1290	2.7060	0.017606m
GEOID HT=	-31.7973	+0.0000	-31.7973	0.012598m

12 110

Y=	4230750.4416	+0.0046	4230750.4462	0.014193m
X=	560854.8610	-0.0006	560854.8604	0.014164m
ELL HT=	-29.3639	-0.1290	-29.4929	0.014609m
ORTHO HT=	2.4329	-0.1290	2.3039	0.017453m
GEOID HT=	-31.7968	+0.0000	-31.7968	0.012598m

13 111

Y=	4230777.5349	+0.0046	4230777.5395	0.014735m
X=	560913.3948	-0.0006	560913.3942	0.014371m
ELL HT=	-28.9298	-0.1290	-29.0588	0.016272m
ORTHO HT=	2.8657	-0.1290	2.7366	0.019044m
GEOID HT=	-31.7954	+0.0000	-31.7954	0.012598m

14 112

Y=	4230776.5263	+0.0046	4230776.5309	0.014189m
X=	560913.8528	-0.0006	560913.8522	0.014160m
ELL HT=	-29.3939	-0.1290	-29.5229	0.014595m
ORTHO HT=	2.4016	-0.1290	2.2725	0.017628m
GEOID HT=	-31.7955	+0.0000	-31.7955	0.012598m

15 113

Y=	4230876.8051	+0.0046	4230876.8097	0.014190m
X=	561003.5043	-0.0006	561003.5037	0.014159m
ELL HT=	-29.5973	-0.1290	-29.7263	0.014593m
ORTHO HT=	2.1941	-0.1290	2.0651	0.018169m
GEOID HT=	-31.7914	+0.0000	-31.7914	0.012598m

16 114

Y=	4230874.0367	+0.0046	4230874.0413	0.014193m
X=	561006.2047	-0.0006	561006.2041	0.014160m
ELL HT=	-29.3361	-0.1290	-29.4651	0.014602m

ORTHO HT=	2.4553	-0.1290	2.3263	0.018169m
GEOID HT=	-31.7914	+0.0000	-31.7914	0.012598m

17 115

Y=	4230875.2690	+0.0046	4230875.2736	0.014540m
X=	561001.7904	-0.0006	561001.7898	0.014283m
ELL HT=	-29.1014	-0.1290	-29.2304	0.015574m
ORTHO HT=	2.6900	-0.1290	2.5610	0.018958m
GEOID HT=	-31.7914	+0.0000	-31.7914	0.012598m

18 116

Y=	4230865.2121	+0.0046	4230865.2167	0.014481m
X=	561006.1893	-0.0006	561006.1887	0.014261m
ELL HT=	-29.3390	-0.1290	-29.4680	0.015379m
ORTHO HT=	2.4527	-0.1290	2.3237	0.018765m
GEOID HT=	-31.7917	+0.0000	-31.7917	0.012598m

19 117

Y=	4230916.6063	+0.0046	4230916.6109	0.014345m
X=	561037.8419	-0.0006	561037.8413	0.014191m
ELL HT=	-28.8601	-0.1290	-28.9891	0.014892m
ORTHO HT=	2.9297	-0.1290	2.8007	0.018619m
GEOID HT=	-31.7897	+0.0000	-31.7897	0.012598m

20 118

Y=	4230454.2689	+0.0046	4230454.2736	0.014338m
X=	560755.5447	-0.0006	560755.5440	0.014241m
ELL HT=	-28.7192	-0.1290	-28.8482	0.015111m
ORTHO HT=	3.0884	-0.1290	2.9594	0.016445m
GEOID HT=	-31.8076	+0.0000	-31.8076	0.012598m

21 119

Y=	4230447.7375	+0.0046	4230447.7421	0.014179m
X=	560753.6501	-0.0006	560753.6495	0.014161m
ELL HT=	-29.1535	-0.1290	-29.2825	0.014579m
ORTHO HT=	2.6544	-0.1290	2.5254	0.015924m
GEOID HT=	-31.8078	+0.0000	-31.8078	0.012598m

22 120

Y=	4230945.3712	+0.0046	4230945.3758	0.014772m
X=	560766.2212	-0.0006	560766.2205	0.014569m
ELL HT=	-28.5040	-0.1290	-28.6330	0.017612m
ORTHO HT=	3.2871	-0.1290	3.1581	0.020687m
GEOID HT=	-31.7911	+0.0000	-31.7911	0.012598m

23 121

Y=	4230947.6993	+0.0046	4230947.7039	0.014967m
X=	560763.4225	-0.0006	560763.4219	0.014839m
ELL HT=	-28.6919	-0.1290	-28.8209	0.019426m
ORTHO HT=	3.0991	-0.1290	2.9701	0.022258m
GEOID HT=	-31.7910	+0.0000	-31.7910	0.012598m

24 122

Y=	4230486.5313	+0.0046	4230486.5359	0.014186m
X=	560508.0215	-0.0006	560508.0209	0.014177m
ELL HT=	-29.5801	-0.1290	-29.7091	0.014824m
ORTHO HT=	2.2283	-0.1290	2.0993	0.016140m
GEOID HT=	-31.8084	+0.0000	-31.8084	0.012598m

25 123

Y=	4230488.0529	+0.0046	4230488.0575	0.014207m
X=	560507.3422	-0.0006	560507.3416	0.014190m
ELL HT=	-29.1905	-0.1290	-29.3195	0.015081m

ORTHO HT=	2.6179	-0.1290	2.4889	0.016384m
GEOID HT=	-31.8084	+0.0000	-31.8084	0.012598m

26 124

Y=	4230502.4588	+0.0046	4230502.4634	0.014590m
X=	560478.7484	-0.0006	560478.7478	0.014438m
ELL HT=	-29.1638	-0.1290	-29.2928	0.019078m
ORTHO HT=	2.6443	-0.1290	2.5153	0.020174m
GEOID HT=	-31.8081	+0.0000	-31.8081	0.012598m

27 125

Y=	4230507.4712	+0.0046	4230507.4758	0.014299m
X=	560484.1928	-0.0006	560484.1922	0.014231m
ELL HT=	-30.0271	-0.1290	-30.1561	0.016154m
ORTHO HT=	1.7808	-0.1290	1.6518	0.017458m
GEOID HT=	-31.8079	+0.0000	-31.8079	0.012598m

Appendix I
Newton/Field Designs RTK GPS Data sheet Pond 2A

NAPA-1.CR5 01/11/04 18:36:36

CA State Plane Zone 2 NAVD 88

Point	Northing	Easting	Elevation	Description
1	1,805,022.1832	6,478,972.8600	9.28	PT. 1- ADJUST
2	1,813,396.0745	6,473,350.4111	9.66	PT. 1001-ADJUST
3	1,815,446.9114	6,465,526.0329	10.49	PT. 1021-ADJUST
4	1,808,506.1432	6,471,667.6056	2.25	PT. 1018-ADJUST
5	1,817,954.9453	6,474,257.3214	12.02	PT. 1022-ADJUST
6	1,818,279.8987	6,462,539.6389	10.09	PT. 400-ADJUST
7	1,808,214.6518	6,475,329.0483	9.57	PT. 529-ADJUST
20	1,808,214.6828	6,475,328.9759	9.62	529 CHECK
21	1,808,212.5294	6,475,337.0719	6.95	XS 3 Wt
22	1,808,139.4630	6,475,773.2954	6.65	XS 3 et
23	1,808,138.3489	6,475,776.4807	11.21	XS 3 tob E
24	1,811,611.0464	6,471,222.9934	10.48	xs 4 so. rebar
25	1,811,613.6696	6,471,223.7438	9.92	xs 4 tob so.
26	1,811,867.0638	6,471,277.5289	10.07	xs 4 tob no.
27	1,811,853.6093	6,471,272.9324	10.87	xs 4 toe no..
28	1,811,367.3214	6,467,257.1725	9.83	xs 5 west rebar.
29	1,814,116.3712	6,467,482.2112	10.65	xs 9 so. rebar
30	1,819,359.6701	6,465,436.0471	10.49	xs 7 west. rebar
31	1,814,878.1296	6,472,111.5576	10.78	xs 11 no. rebar
32	1,816,147.1168	6,469,028.7611	6.59	xs 10 no. pvc
33	1,817,684.2800	6,467,034.3250	7.73	pond 2a bm xs 3
34	1,817,684.2822	6,467,034.2973	7.75	check 33
35	1,816,919.4046	6,468,421.6594	7.68	pond 2 xs 2 bm
36	1,816,919.3950	6,468,421.6449	7.67	check 35
37	1,816,906.7028	6,468,497.7115	7.58	pond 2 xs 2a bm
38	1,816,906.6800	6,468,497.6975	7.58	check 37
39	1,817,391.4907	6,470,526.7731	7.71	pond 2a xs 1 bm
40	1,817,391.4908	6,470,526.7739	7.67	check 39
101	1,805,022.1690	6,478,972.8600	9.28	PT.1 - TOWILL
102	1,813,396.0770	6,473,350.4190	9.66	PT. 1001-TOWILL
103	1,815,446.9180	6,465,526.0260	10.49	PT. 1021-TOWILL
105	1,817,957.9570	6,474,257.3320	12.02	PT. 1022-TOWILL
106	1,818,279.9110	6,462,539.6260	10.09	PT. 400-TOWILL
107	1,808,214.6440	6,475,329.0610	9.57	PT. 529-TOWILL

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-01	VET_T1_11	4211128.545	599378.681	6.07	5/2/2005
BRIS	WL-01	VET_T1_13	4211131.532	599375.115	6.07	5/2/2005
BRIS	WL-01	VET_T1_16	4211134.473	599371.879	5.99	5/2/2005
BRIS	WL-01	VET_T1_19	4211137.421	599368.453	6.12	5/2/2005
BRIS	WL-01	VET_T1_24	4211140.145	599364.675	6.08	5/2/2005
BRIS	WL-01	VET_T1_26	4211143.339	599361.464	6.06	5/2/2005
BRIS	WL-01	VET_T1_28	4211146.24	599359.258	6.00	5/2/2005
BRIS	WL-01	VET_T1_30	4211147.704	599358.023	6.08	5/2/2005
BRIS	WL-01	VET_T1_33	4211151.059	599353.525	6.09	5/2/2005
BRIS	WL-01	VET_T1_37	4211154.535	599348.36	6.05	5/2/2005
BRIS	WL-01	VET_T1_38	4211157.612	599343.19	5.91	5/2/2005
BRIS	WL-01	VET_T1_41	4211160.437	599338.364	6.10	5/2/2005
BRIS	WL-01	VET_T1_45	4211163.328	599333.877	6.09	5/2/2005
BRIS	WL-01	VET_T1_47	4211166.929	599329.025	6.04	5/2/2005
BRIS	WL-01	VET_T1_50	4211170.237	599323.955	6.08	5/2/2005
BRIS	WL-01	VET_T1_52	4211173.947	599318.994	6.02	5/2/2005
BRIS	WL-01	VET_T1_55	4211177.038	599314.068	6.09	5/2/2005
BRIS	WL-01	VET_T1_58	4211180.985	599309.648	6.05	5/2/2005
BRIS	WL-01	VET_T1_6	4211123.533	599385.963	6.06	5/2/2005
BRIS	WL-01	VET_T1_61	4211184.313	599304.026	6.05	5/2/2005
BRIS	WL-01	VET_T1_63	4211187.516	599298.922	6.10	5/2/2005
BRIS	WL-01	VET_T1_65	4211190.529	599293.862	6.14	5/2/2005
BRIS	WL-01	VET_T1_68	4211193.775	599290.795	6.20	5/2/2005
BRIS	WL-01	VET_T1_7	4211126.042	599382.387	6.09	5/2/2005
BRIS	WL-01	VET_T1_71	4211196.24	599286.511	6.07	5/2/2005
BRIS	WL-01	VET_T1_73	4211200.839	599283.045	6.16	5/2/2005
BRIS	WL-01	VET_T2_10	4211110.895	599384.988	6.04	5/2/2005
BRIS	WL-01	VET_T2_12	4211106.025	599382.387	6.07	5/2/2005
BRIS	WL-01	VET_T2_15	4211101.549	599379.367	6.11	5/2/2005
BRIS	WL-01	VET_T2_18	4211096.229	599376.853	5.96	5/2/2005
BRIS	WL-01	VET_T2_21	4211091.164	599374.249	5.97	5/2/2005
BRIS	WL-01	VET_T2_23	4211086.393	599371.828	6.03	5/2/2005
BRIS	WL-01	VET_T2_25	4211080.882	599368.512	5.92	5/2/2005
BRIS	WL-01	VET_T2_29	4211075.512	599365.312	5.92	5/2/2005
BRIS	WL-01	VET_T2_32	4211069.906	599362.305	6.03	5/2/2005
BRIS	WL-01	VET_T2_34	4211066.056	599360.574	5.89	5/2/2005
BRIS	WL-01	VET_T2_36	4211060.842	599358.294	5.90	5/2/2005
BRIS	WL-01	VET_T2_39	4211055.653	599355.773	5.92	5/2/2005
BRIS	WL-01	VET_T2_43	4211050.345	599354.661	5.96	5/2/2005
BRIS	WL-01	VET_T2_46	4211049.27	599352.207	4.05	5/2/2005
BRIS	WL-01	VET_T2_49	4211053.462	599349.879	5.94	5/2/2005
BRIS	WL-01	VET_T2_5	4211116.154	599388.036	6.09	5/2/2005
BRIS	WL-01	VET_T2_53	4211048.615	599351.133	5.37	5/2/2005
BRIS	WL-01	VET_T2_56	4211043.538	599349.108	5.86	5/2/2005
BRIS	WL-01	VET_T2_59	4211039.723	599347.099	5.88	5/2/2005
BRIS	WL-01	VET_T2_64	4211034.975	599344.856	5.87	5/2/2005
BRIS	WL-01	VET_T2_66	4211031.664	599343.765	5.82	5/2/2005
BRIS	WL-01	VET_T2_69	4211027.966	599341.784	5.79	5/2/2005
BRIS	WL-01	VET_T2_72	4211023.269	599339.827	5.75	5/2/2005
BRIS	WL-01	VET_T2_76	4211017.83	599337.491	5.90	5/2/2005
BRIS	WL-01	VET_T3_14	4211140.017	599401.613	6.00	5/2/2005
BRIS	WL-01	VET_T3_17	4211145.165	599403.495	5.99	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-01	VET_T3_20	4211150.258	599405.427	6.00	5/2/2005
BRIS	WL-01	VET_T3_22	4211154.772	599407.959	6.02	5/2/2005
BRIS	WL-01	VET_T3_27	4211159.631	599410.046	6.03	5/2/2005
BRIS	WL-01	VET_T3_31	4211164.628	599412.191	6.00	5/2/2005
BRIS	WL-01	VET_T3_35	4211169.522	599415.502	6.02	5/2/2005
BRIS	WL-01	VET_T3_4	4211125.529	599394.323	6.08	5/2/2005
BRIS	WL-01	VET_T3_40	4211174.196	599417.893	5.98	5/2/2005
BRIS	WL-01	VET_T3_42	4211174.414	599418.004	6.01	5/2/2005
BRIS	WL-01	VET_T3_44	4211179.451	599420.515	5.83	5/2/2005
BRIS	WL-01	VET_T3_48	4211184.178	599421.894	6.01	5/2/2005
BRIS	WL-01	VET_T3_51	4211189.165	599423.416	6.10	5/2/2005
BRIS	WL-01	VET_T3_54	4211193.868	599425.996	5.91	5/2/2005
BRIS	WL-01	VET_T3_57	4211198.457	599428.086	5.99	5/2/2005
BRIS	WL-01	VET_T3_60	4211202.677	599429.078	5.92	5/2/2005
BRIS	WL-01	VET_T3_62	4211207.902	599430.64	5.81	5/2/2005
BRIS	WL-01	VET_T3_67	4211212.292	599432.322	5.78	5/2/2005
BRIS	WL-01	VET_T3_70	4211217.182	599434.217	5.65	5/2/2005
BRIS	WL-01	VET_T3_74	4211221.66	599436.042	5.86	5/2/2005
BRIS	WL-01	VET_T3_77	4211225.919	599438.017	5.87	5/2/2005
BRIS	WL-01	VET_T3_8	4211130.009	599397.049	6.07	5/2/2005
BRIS	WL-01	VET_T3_9	4211135.131	599399.605	6.01	5/2/2005
BRIS	WL-01	VET_T4_100	4211186.097	599373.921	5.95	5/2/2005
BRIS	WL-01	VET_T4_102	4211180.226	599375.917	6.06	5/2/2005
BRIS	WL-01	VET_T4_104	4211175.053	599377.73	6.15	5/2/2005
BRIS	WL-01	VET_T4_105	4211170.066	599379.315	6.09	5/2/2005
BRIS	WL-01	VET_T4_108	4211164.226	599380.936	6.06	5/2/2005
BRIS	WL-01	VET_T4_111	4211158.073	599382.128	5.94	5/2/2005
BRIS	WL-01	VET_T4_112	4211153.29	599384.126	5.98	5/2/2005
BRIS	WL-01	VET_T4_118	4211147.952	599385.939	6.05	5/2/2005
BRIS	WL-01	VET_T4_121	4211142.15	599387.441	5.97	5/2/2005
BRIS	WL-01	VET_T4_123	4211136.426	599388.447	5.99	5/2/2005
BRIS	WL-01	VET_T4_127	4211130.736	599389.391	6.04	5/2/2005
BRIS	WL-01	VET_T4_129	4211125.032	599389.897	6.12	5/2/2005
BRIS	WL-01	VET_T4_78	4211240.839	599363.801	6.23	5/2/2005
BRIS	WL-01	VET_T4_80	4211234.94	599364.774	6.09	5/2/2005
BRIS	WL-01	VET_T4_82	4211229.032	599365.638	6.06	5/2/2005
BRIS	WL-01	VET_T4_85	4211223.153	599366.925	6.07	5/2/2005
BRIS	WL-01	VET_T4_87	4211217.61	599366.907	6.11	5/2/2005
BRIS	WL-01	VET_T4_89	4211212.602	599368.291	6.06	5/2/2005
BRIS	WL-01	VET_T4_92	4211207.121	599369.09	5.96	5/2/2005
BRIS	WL-01	VET_T4_93	4211202.356	599370.949	6.05	5/2/2005
BRIS	WL-01	VET_T4_96	4211196.829	599372.136	5.94	5/2/2005
BRIS	WL-01	VET_T4_98	4211191.967	599372.975	5.88	5/2/2005
BRIS	WL-01	VET_T5_106	4211099.706	599304.085	5.37	5/2/2005
BRIS	WL-01	VET_T5_109	4211100.312	599309.133	5.74	5/2/2005
BRIS	WL-01	VET_T5_113	4211101.998	599312.936	5.84	5/2/2005
BRIS	WL-01	VET_T5_115	4211102.52	599316.616	5.82	5/2/2005
BRIS	WL-01	VET_T5_117	4211103.908	599320.217	5.87	5/2/2005
BRIS	WL-01	VET_T5_119	4211104.277	599324.239	5.99	5/2/2005
BRIS	WL-01	VET_T5_122	4211104.604	599328.686	5.96	5/2/2005
BRIS	WL-01	VET_T5_124	4211105.067	599332.948	5.93	5/2/2005
BRIS	WL-01	VET_T5_126	4211105.66	599338.535	5.96	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-01	VET_T5_130	4211106.195	599342.713	5.93	5/2/2005
BRIS	WL-01	VET_T5_131	4211107.294	599347.303	5.93	5/2/2005
BRIS	WL-01	VET_T5_133	4211108.248	599351.819	5.96	5/2/2005
BRIS	WL-01	VET_T5_134	4211108.844	599356.881	6.04	5/2/2005
BRIS	WL-01	VET_T5_135	4211109.95	599361.118	5.98	5/2/2005
BRIS	WL-01	VET_T5_136	4211110.859	599366.156	6.03	5/2/2005
BRIS	WL-01	VET_T5_138	4211112.26	599371.497	6.09	5/2/2005
BRIS	WL-01	VET_T5_139	4211113.819	599376.045	6.02	5/2/2005
BRIS	WL-01	VET_T5_141	4211115.887	599381.347	6.06	5/2/2005
BRIS	WL-01	VET_T5_143	4211118.128	599386.489	6.04	5/2/2005
BRIS	WL-01	VET_T5_91	4211093.573	599295.044	4.87	5/2/2005
BRIS	WL-01	VET_T5_95	4211095.235	599296.193	5.27	5/2/2005
BRIS	WL-01	VET_T5_99	4211097.849	599300.351	5.35	5/2/2005
BRIS	WL-01	VET_T6_101	4211164.497	599448.41	6.02	5/2/2005
BRIS	WL-01	VET_T6_103	4211161.439	599444.855	5.98	5/2/2005
BRIS	WL-01	VET_T6_107	4211158.347	599441.025	5.94	5/2/2005
BRIS	WL-01	VET_T6_110	4211155.906	599437.533	6.05	5/2/2005
BRIS	WL-01	VET_T6_114	4211152.77	599433.889	6.07	5/2/2005
BRIS	WL-01	VET_T6_116	4211149.934	599430.385	5.99	5/2/2005
BRIS	WL-01	VET_T6_120	4211147.246	599427.135	5.80	5/2/2005
BRIS	WL-01	VET_T6_125	4211144.056	599423.834	5.89	5/2/2005
BRIS	WL-01	VET_T6_128	4211141.05	599420.352	5.95	5/2/2005
BRIS	WL-01	VET_T6_132	4211137.643	599416.027	6.01	5/2/2005
BRIS	WL-01	VET_T6_137	4211135.524	599412.749	6.09	5/2/2005
BRIS	WL-01	VET_T6_140	4211132.357	599408.787	6.01	5/2/2005
BRIS	WL-01	VET_T6_142	4211129.33	599404.798	5.99	5/2/2005
BRIS	WL-01	VET_T6_144	4211126.154	599400.198	6.03	5/2/2005
BRIS	WL-01	VET_T6_145	4211123.612	599395.565	6.07	5/2/2005
BRIS	WL-01	VET_T6_79	4211194.1	599481.888	5.96	5/2/2005
BRIS	WL-01	VET_T6_81	4211190.414	599477.987	5.86	5/2/2005
BRIS	WL-01	VET_T6_83	4211187.075	599474.748	6.00	5/2/2005
BRIS	WL-01	VET_T6_84	4211183.631	599471.372	5.91	5/2/2005
BRIS	WL-01	VET_T6_86	4211179.8	599467.481	5.93	5/2/2005
BRIS	WL-01	VET_T6_88	4211176.494	599463.38	5.94	5/2/2005
BRIS	WL-01	VET_T6_90	4211172.639	599458.909	5.97	5/2/2005
BRIS	WL-01	VET_T6_94	4211169.865	599455.265	5.99	5/2/2005
BRIS	WL-01	VET_T6_97	4211167.768	599452.463	5.94	5/2/2005
BRIS	WL-01	VET_T7_147	4211114.756	599394.327	6.09	5/2/2005
BRIS	WL-01	VET_T7_150	4211109.208	599396.708	6.03	5/2/2005
BRIS	WL-01	VET_T7_152	4211103.982	599399.299	6.01	5/2/2005
BRIS	WL-01	VET_T7_155	4211098.831	599402.439	6.05	5/2/2005
BRIS	WL-01	VET_T7_158	4211093.642	599406.219	6.02	5/2/2005
BRIS	WL-01	VET_T7_160	4211088.652	599409.243	5.95	5/2/2005
BRIS	WL-01	VET_T7_163	4211084.382	599412.179	5.99	5/2/2005
BRIS	WL-01	VET_T7_164	4211079.115	599415.061	5.98	5/2/2005
BRIS	WL-01	VET_T7_167	4211074.364	599418.576	6.01	5/2/2005
BRIS	WL-01	VET_T7_169	4211069.601	599421.85	6.03	5/2/2005
BRIS	WL-01	VET_T7_174	4211065.095	599424.71	5.77	5/2/2005
BRIS	WL-01	VET_T7_177	4211061.279	599428.471	5.88	5/2/2005
BRIS	WL-01	VET_T7_179	4211056.606	599431.789	6.02	5/2/2005
BRIS	WL-01	VET_T7_184	4211051.829	599434.787	6.13	5/2/2005
BRIS	WL-01	VET_T7_187	4211046.536	599437.289	5.90	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-01	VET_T7_193	4211040.44	599439.456	6.01	5/2/2005
BRIS	WL-01	VET_T7_194	4211035.143	599442.607	6.07	5/2/2005
BRIS	WL-01	VET_T7_199	4211029.833	599445.074	6.09	5/2/2005
BRIS	WL-01	VET_T7_200	4211024.588	599449.236	6.03	5/2/2005
BRIS	WL-01	VET_T7_204	4211019.461	599453.354	5.90	5/2/2005
BRIS	WL-01	VET_T7_207	4211014.022	599456.532	6.06	5/2/2005
BRIS	WL-01	VET_T7_209	4211009.709	599460.219	5.97	5/2/2005
BRIS	WL-01	VET_T7_211	4211004.478	599463.203	5.82	5/2/2005
BRIS	WL-01	VET_T7_214	4210999.739	599466.514	5.97	5/2/2005
BRIS	WL-01	VET_T7_217	4210995.31	599470.337	6.02	5/2/2005
BRIS	WL-01	VET_T7_220	4210990.608	599473.894	6.10	5/2/2005
BRIS	WL-01	VET_T7_221	4210986.035	599477.324	5.96	5/2/2005
BRIS	WL-01	VET_T7_224	4210981.699	599480.926	6.06	5/2/2005
BRIS	WL-01	VET_T8_148	4211117.084	599390.635	6.04	5/2/2005
BRIS	WL-01	VET_T8_151	4211109.637	599390.643	6.05	5/2/2005
BRIS	WL-01	VET_T8_153	4211104.128	599391.072	6.08	5/2/2005
BRIS	WL-01	VET_T8_156	4211098.397	599391.16	6.03	5/2/2005
BRIS	WL-01	VET_T8_159	4211093.311	599392.233	6.04	5/2/2005
BRIS	WL-01	VET_T8_162	4211088.093	599392.172	6.07	5/2/2005
BRIS	WL-01	VET_T8_166	4211080.769	599393.015	6.18	5/2/2005
BRIS	WL-01	VET_T8_170	4211075.17	599394.397	6.12	5/2/2005
BRIS	WL-01	VET_T8_172	4211069.414	599395.783	6.01	5/2/2005
BRIS	WL-01	VET_T8_176	4211064.077	599396.664	5.95	5/2/2005
BRIS	WL-01	VET_T8_178	4211058.209	599396.58	6.04	5/2/2005
BRIS	WL-01	VET_T8_181	4211053.212	599396.299	6.03	5/2/2005
BRIS	WL-01	VET_T8_182	4211046.091	599396.136	6.08	5/2/2005
BRIS	WL-01	VET_T8_186	4211039.427	599396.173	5.98	5/2/2005
BRIS	WL-01	VET_T8_188	4211033.3	599396.04	6.06	5/2/2005
BRIS	WL-01	VET_T8_190	4211026.969	599396.5	6.08	5/2/2005
BRIS	WL-01	VET_T8_192	4211020.084	599396.654	6.03	5/2/2005
BRIS	WL-01	VET_T8_195	4211014.503	599396.755	6.10	5/2/2005
BRIS	WL-01	VET_T8_197	4211008.579	599396.842	5.94	5/2/2005
BRIS	WL-01	VET_T8_201	4211003.604	599396.695	6.04	5/2/2005
BRIS	WL-01	VET_T8_203	4210998.11	599396.087	6.08	5/2/2005
BRIS	WL-01	VET_T8_206	4210992.213	599396.494	5.92	5/2/2005
BRIS	WL-01	VET_T8_210	4210986.625	599397.074	6.11	5/2/2005
BRIS	WL-01	VET_T8_213	4210980.844	599396.876	6.08	5/2/2005
BRIS	WL-01	VET_T8_216	4210974.062	599396.944	5.97	5/2/2005
BRIS	WL-01	VET_T8_218	4210968.447	599397.632	6.15	5/2/2005
BRIS	WL-01	VET_T8_223	4210962.503	599397.908	6.00	5/2/2005
BRIS	WL-01	VET_T9_146	4211119.962	599397.922	6.03	5/2/2005
BRIS	WL-01	VET_T9_149	4211119.037	599403.697	6.01	5/2/2005
BRIS	WL-01	VET_T9_154	4211117.964	599408.742	5.98	5/2/2005
BRIS	WL-01	VET_T9_157	4211116.369	599413.254	5.97	5/2/2005
BRIS	WL-01	VET_T9_161	4211115.141	599417.62	6.00	5/2/2005
BRIS	WL-01	VET_T9_165	4211113.928	599421.57	6.11	5/2/2005
BRIS	WL-01	VET_T9_168	4211112.524	599426.811	5.96	5/2/2005
BRIS	WL-01	VET_T9_171	4211111.105	599431.988	6.00	5/2/2005
BRIS	WL-01	VET_T9_173	4211109.576	599437.1	5.93	5/2/2005
BRIS	WL-01	VET_T9_175	4211108.387	599441.331	5.96	5/2/2005
BRIS	WL-01	VET_T9_180	4211107.927	599446.018	6.11	5/2/2005
BRIS	WL-01	VET_T9_185	4211106.496	599451.052	6.01	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-01	VET_T9_189	4211105.948	599455.742	5.95	5/2/2005
BRIS	WL-01	VET_T9_191	4211105.187	599460.357	5.92	5/2/2005
BRIS	WL-01	VET_T9_196	4211104.416	599465.212	5.81	5/2/2005
BRIS	WL-01	VET_T9_198	4211102.797	599470.538	5.94	5/2/2005
BRIS	WL-01	VET_T9_202	4211101.546	599475.887	5.92	5/2/2005
BRIS	WL-01	VET_T9_205	4211100.154	599481.386	5.86	5/2/2005
BRIS	WL-01	VET_T9_208	4211098.829	599487.012	5.90	5/2/2005
BRIS	WL-01	VET_T9_212	4211097.513	599492.083	5.94	5/2/2005
BRIS	WL-01	VET_T9_215	4211096.626	599495.996	5.90	5/2/2005
BRIS	WL-01	VET_T9_219	4211095.577	599501.071	5.98	5/2/2005
BRIS	WL-01	VET_T9_222	4211093.796	599507.175	5.93	5/2/2005
BRIS	WL-01	VET_T9_225	4211091.874	599513.314	5.93	5/2/2005
BRIS	WL-02	VET_T1_100	4211072.617	600110.312	5.62	5/9/2005
BRIS	WL-02	VET_T1_11	4211149.466	600024.714	5.76	5/9/2005
BRIS	WL-02	VET_T1_17	4211147.348	600030.378	5.77	5/9/2005
BRIS	WL-02	VET_T1_19	4211145.543	600035.913	5.70	5/9/2005
BRIS	WL-02	VET_T1_22	4211143.629	600041.538	5.66	5/9/2005
BRIS	WL-02	VET_T1_24	4211142.187	600046.895	5.60	5/9/2005
BRIS	WL-02	VET_T1_27	4211140.453	600051.608	5.61	5/9/2005
BRIS	WL-02	VET_T1_30	4211138.475	600057.032	5.67	5/9/2005
BRIS	WL-02	VET_T1_32	4211136.445	600063.63	5.77	5/9/2005
BRIS	WL-02	VET_T1_35	4211134.592	600069.815	5.72	5/9/2005
BRIS	WL-02	VET_T1_39	4211132.498	600075.638	5.81	5/9/2005
BRIS	WL-02	VET_T1_40	4211130.52	600080.897	5.74	5/9/2005
BRIS	WL-02	VET_T1_44	4211129.063	600086.841	5.65	5/9/2005
BRIS	WL-02	VET_T1_48	4211127.039	600092.174	5.56	5/9/2005
BRIS	WL-02	VET_T1_5	4211152.258	600013.638	5.77	5/9/2005
BRIS	WL-02	VET_T1_52	4211125.338	600097.666	5.55	5/9/2005
BRIS	WL-02	VET_T1_55	4211122.872	600103.556	5.67	5/9/2005
BRIS	WL-02	VET_T1_58	4211120.736	600108.261	5.68	5/9/2005
BRIS	WL-02	VET_T1_60	4211119.145	600112.425	5.55	5/9/2005
BRIS	WL-02	VET_T1_62	4211117.069	600116.825	5.61	5/9/2005
BRIS	WL-02	VET_T1_64	4211115.898	600121.443	5.49	5/9/2005
BRIS	WL-02	VET_T1_66	4211114.344	600124.74	5.63	5/9/2005
BRIS	WL-02	VET_T1_70	4211114.115	600125.429	5.41	5/9/2005
BRIS	WL-02	VET_T1_73	4211112.668	600129.599	5.44	5/9/2005
BRIS	WL-02	VET_T1_75	4211110.933	600134.58	5.55	5/9/2005
BRIS	WL-02	VET_T1_79	4211108.797	600138.832	5.56	5/9/2005
BRIS	WL-02	VET_T1_8	4211151.225	600018.982	5.75	5/9/2005
BRIS	WL-02	VET_T1_81	4211106.568	600142.991	5.44	5/9/2005
BRIS	WL-02	VET_T1_84	4211105.474	600147.511	5.57	5/9/2005
BRIS	WL-02	VET_T1_86	4211103.813	600152.484	5.47	5/9/2005
BRIS	WL-02	VET_T1_94	4211063.823	600120.237	5.52	5/9/2005
BRIS	WL-02	VET_T1_97	4211067.926	600115.999	5.53	5/9/2005
BRIS	WL-02	VET_T10_226	4211157.217	600168.721	5.75	5/9/2005
BRIS	WL-02	VET_T10_228	4211157.01	600162.672	5.51	5/9/2005
BRIS	WL-02	VET_T10_230	4211156.964	600156.702	5.65	5/9/2005
BRIS	WL-02	VET_T10_231	4211156.693	600151.452	5.77	5/9/2005
BRIS	WL-02	VET_T10_232	4211156.492	600146.677	5.72	5/9/2005
BRIS	WL-02	VET_T10_233	4211156.345	600140.046	5.48	5/9/2005
BRIS	WL-02	VET_T10_234	4211156.315	600134.741	5.50	5/9/2005
BRIS	WL-02	VET_T10_236	4211155.355	600127.443	5.49	5/9/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-02	VET_T10_238	4211154.943	600121.782	5.52	5/9/2005
BRIS	WL-02	VET_T10_239	4211154.712	600115.134	5.65	5/9/2005
BRIS	WL-02	VET_T10_241	4211154.547	600108.845	5.63	5/9/2005
BRIS	WL-02	VET_T10_243	4211154.413	600103.091	5.59	5/9/2005
BRIS	WL-02	VET_T10_245	4211154.492	600097.576	5.72	5/9/2005
BRIS	WL-02	VET_T10_247	4211153.843	600092.09	5.56	5/9/2005
BRIS	WL-02	VET_T10_249	4211153.837	600087.662	5.71	5/9/2005
BRIS	WL-02	VET_T10_250	4211153.861	600083.199	5.49	5/9/2005
BRIS	WL-02	VET_T10_252	4211153.995	600077.237	5.69	5/9/2005
BRIS	WL-02	VET_T10_254	4211153.849	600071.106	5.57	5/9/2005
BRIS	WL-02	VET_T10_256	4211154.215	600065.062	5.67	5/9/2005
BRIS	WL-02	VET_T10_258	4211154.099	600058.776	5.66	5/9/2005
BRIS	WL-02	VET_T10_260	4211154.471	600052.518	5.51	5/9/2005
BRIS	WL-02	VET_T10_262	4211154.642	600046.518	5.53	5/9/2005
BRIS	WL-02	VET_T10_264	4211154.715	600041.311	5.61	5/9/2005
BRIS	WL-02	VET_T10_266	4211154.922	600035.706	5.58	5/9/2005
BRIS	WL-02	VET_T10_267	4211154.831	600030.426	5.69	5/9/2005
BRIS	WL-02	VET_T10_269	4211154.928	600023.479	5.72	5/9/2005
BRIS	WL-02	VET_T10_271	4211154.718	600016.483	5.73	5/9/2005
BRIS	WL-02	VET_T2_103	4211073.702	600108.815	5.54	5/9/2005
BRIS	WL-02	VET_T2_106	4211076.741	600105.84	5.57	5/9/2005
BRIS	WL-02	VET_T2_108	4211079.575	600102.628	5.50	5/9/2005
BRIS	WL-02	VET_T2_111	4211083.535	600097.996	5.59	5/9/2005
BRIS	WL-02	VET_T2_114	4211086.555	600094.571	5.67	5/9/2005
BRIS	WL-02	VET_T2_115	4211089.481	600091.019	5.55	5/9/2005
BRIS	WL-02	VET_T2_118	4211092.834	600087.482	5.54	5/9/2005
BRIS	WL-02	VET_T2_120	4211097.437	600083.124	5.71	5/9/2005
BRIS	WL-02	VET_T2_123	4211100.658	600079.112	5.62	5/9/2005
BRIS	WL-02	VET_T2_124	4211103.822	600074.954	5.66	5/9/2005
BRIS	WL-02	VET_T2_128	4211107.586	600070.763	5.69	5/9/2005
BRIS	WL-02	VET_T2_131	4211111.793	600065.996	5.62	5/9/2005
BRIS	WL-02	VET_T2_132	4211115.813	600061.509	5.69	5/9/2005
BRIS	WL-02	VET_T2_134	4211120.458	600056.483	5.63	5/9/2005
BRIS	WL-02	VET_T2_136	4211124.003	600052.446	5.71	5/9/2005
BRIS	WL-02	VET_T2_138	4211127.466	600048.015	5.66	5/9/2005
BRIS	WL-02	VET_T2_140	4211131.806	600043.105	5.69	5/9/2005
BRIS	WL-02	VET_T2_143	4211135.506	600038.744	5.74	5/9/2005
BRIS	WL-02	VET_T2_146	4211138.822	600034.488	5.81	5/9/2005
BRIS	WL-02	VET_T2_149	4211142.191	600030.259	5.73	5/9/2005
BRIS	WL-02	VET_T2_152	4211145.345	600026.4	5.75	5/9/2005
BRIS	WL-02	VET_T2_154	4211148.052	600021.896	5.72	5/9/2005
BRIS	WL-02	VET_T2_157	4211150.896	600016.655	5.81	5/9/2005
BRIS	WL-02	VET_T2_159	4211152.639	600013.342	5.80	5/9/2005
BRIS	WL-02	VET_T3_172	4211144.038	600004.353	5.60	5/9/2005
BRIS	WL-02	VET_T3_174	4211138.81	600002.363	5.64	5/9/2005
BRIS	WL-02	VET_T3_177	4211133.626	599999.994	5.65	5/9/2005
BRIS	WL-02	VET_T3_179	4211128.862	599998.412	5.70	5/9/2005
BRIS	WL-02	VET_T3_181	4211123.509	599997.017	5.64	5/9/2005
BRIS	WL-02	VET_T3_183	4211118.099	599995.817	5.61	5/9/2005
BRIS	WL-02	VET_T3_186	4211111.662	599994.384	5.53	5/9/2005
BRIS	WL-02	VET_T3_188	4211105.791	599993.625	5.62	5/9/2005
BRIS	WL-02	VET_T3_191	4211100.701	599992.563	5.49	5/9/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-02	VET_T3_193	4211095.437	599991.061	5.49	5/9/2005
BRIS	WL-02	VET_T3_195	4211090.783	599989.549	5.44	5/9/2005
BRIS	WL-02	VET_T3_197	4211085.991	599988.277	5.49	5/9/2005
BRIS	WL-02	VET_T3_199	4211081.651	599987.484	5.44	5/9/2005
BRIS	WL-02	VET_T3_204	4211076.856	599986.709	5.49	5/9/2005
BRIS	WL-02	VET_T3_205	4211072.245	599986.59	5.46	5/9/2005
BRIS	WL-02	VET_T3_207	4211068.913	599985.902	5.40	5/9/2005
BRIS	WL-02	VET_T3_209	4211064.753	599985.528	5.57	5/9/2005
BRIS	WL-02	VET_T3_211	4211058.892	599984.462	5.43	5/9/2005
BRIS	WL-02	VET_T3_213	4211054.316	599983.777	5.46	5/9/2005
BRIS	WL-02	VET_T3_214	4211050.348	599983.298	5.53	5/9/2005
BRIS	WL-02	VET_T3_217	4211045.261	599982.087	5.40	5/9/2005
BRIS	WL-02	VET_T3_220	4211040.204	599980.93	5.46	5/9/2005
BRIS	WL-02	VET_T3_221	4211035.577	599980.441	5.35	5/9/2005
BRIS	WL-02	VET_T3_223	4211031.679	599979.096	5.32	5/9/2005
BRIS	WL-02	VET_T3_224	4211026.11	599978.169	5.37	5/9/2005
BRIS	WL-02	VET_T3_225	4211022.861	599977.159	5.39	5/9/2005
BRIS	WL-02	VET_T3_227	4211018.554	599976.813	5.29	5/9/2005
BRIS	WL-02	VET_T3_229	4211014.714	599976.83	5.36	5/9/2005
BRIS	WL-02	VET_T4_235	4211069.773	599916.454	5.61	5/9/2005
BRIS	WL-02	VET_T4_237	4211073.656	599920.111	5.65	5/9/2005
BRIS	WL-02	VET_T4_240	4211077.234	599923.42	5.70	5/9/2005
BRIS	WL-02	VET_T4_242	4211081.441	599927.281	5.61	5/9/2005
BRIS	WL-02	VET_T4_244	4211085.601	599931.229	5.59	5/9/2005
BRIS	WL-02	VET_T4_246	4211089.295	599935.175	5.70	5/9/2005
BRIS	WL-02	VET_T4_248	4211093.593	599939.419	5.68	5/9/2005
BRIS	WL-02	VET_T4_251	4211097.071	599943.553	5.62	5/9/2005
BRIS	WL-02	VET_T4_253	4211101.015	599947.336	5.65	5/9/2005
BRIS	WL-02	VET_T4_255	4211105.102	599951.429	5.57	5/9/2005
BRIS	WL-02	VET_T4_257	4211107.986	599956.289	5.61	5/9/2005
BRIS	WL-02	VET_T4_259	4211111.96	599960.558	5.54	5/9/2005
BRIS	WL-02	VET_T4_261	4211115.356	599964.838	5.64	5/9/2005
BRIS	WL-02	VET_T4_263	4211119.254	599968.89	5.62	5/9/2005
BRIS	WL-02	VET_T4_265	4211123.034	599973.305	5.52	5/9/2005
BRIS	WL-02	VET_T4_268	4211126.329	599977.731	5.65	5/9/2005
BRIS	WL-02	VET_T4_270	4211130.242	599982.19	5.62	5/9/2005
BRIS	WL-02	VET_T4_272	4211134.244	599986.585	5.60	5/9/2005
BRIS	WL-02	VET_T4_273	4211138.338	599991.003	5.62	5/9/2005
BRIS	WL-02	VET_T4_274	4211142.959	599996.317	5.64	5/9/2005
BRIS	WL-02	VET_T4_275	4211147.162	600000.707	5.67	5/9/2005
BRIS	WL-02	VET_T5_12	4211152.075	599994.74	5.63	5/9/2005
BRIS	WL-02	VET_T5_14	4211151.52	599990.461	5.60	5/9/2005
BRIS	WL-02	VET_T5_16	4211150.908	599986.171	5.67	5/9/2005
BRIS	WL-02	VET_T5_20	4211150.64	599976.023	5.56	5/9/2005
BRIS	WL-02	VET_T5_23	4211150.612	599971.83	5.70	5/9/2005
BRIS	WL-02	VET_T5_25	4211150.161	599967.077	5.73	5/9/2005
BRIS	WL-02	VET_T5_28	4211150.752	599963.108	5.86	5/9/2005
BRIS	WL-02	VET_T5_31	4211150.627	599959.054	5.77	5/9/2005
BRIS	WL-02	VET_T5_34	4211150.713	599955.609	5.72	5/9/2005
BRIS	WL-02	VET_T5_36	4211150.807	599951.226	5.64	5/9/2005
BRIS	WL-02	VET_T5_37	4211150.655	599946.491	5.64	5/9/2005
BRIS	WL-02	VET_T5_41	4211150.749	599942.304	5.63	5/9/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
BRIS	WL-02	VET_T5_43	4211151.008	599937.146	5.70	5/9/2005
BRIS	WL-02	VET_T5_46	4211150.725	599933.095	5.40	5/9/2005
BRIS	WL-02	VET_T5_49	4211150.588	599929.568	5.59	5/9/2005
BRIS	WL-02	VET_T5_51	4211150.387	599925.882	5.45	5/9/2005
BRIS	WL-02	VET_T5_53	4211150.502	599921.77	5.67	5/9/2005
BRIS	WL-02	VET_T5_6	4211152.825	600003.482	5.72	5/9/2005
BRIS	WL-02	VET_T5_65	4211149.844	599917.779	5.50	5/9/2005
BRIS	WL-02	VET_T5_67	4211149.326	599914.196	5.62	5/9/2005
BRIS	WL-02	VET_T5_69	4211148.597	599910.312	5.59	5/9/2005
BRIS	WL-02	VET_T5_72	4211148.165	599906.088	5.55	5/9/2005
BRIS	WL-02	VET_T5_76	4211147.93	599902.034	5.54	5/9/2005
BRIS	WL-02	VET_T5_80	4211148.536	599898.113	5.62	5/9/2005
BRIS	WL-02	VET_T5_82	4211148.753	599893.635	5.61	5/9/2005
BRIS	WL-02	VET_T5_85	4211148.497	599889.88	5.69	5/9/2005
BRIS	WL-02	VET_T5_87	4211148.594	599884.893	5.64	5/9/2005
BRIS	WL-02	VET_T5_9	4211152.493	599998.172	5.66	5/9/2005
BRIS	WL-02	VET_T5_90	4211148.287	599880.2	5.47	5/9/2005
BRIS	WL-02	VET_T6_101	4211192.214	599915.413	5.66	5/9/2005
BRIS	WL-02	VET_T6_105	4211191.044	599919.2	5.69	5/9/2005
BRIS	WL-02	VET_T6_109	4211189.206	599923.753	5.68	5/9/2005
BRIS	WL-02	VET_T6_112	4211187.158	599927.374	5.57	5/9/2005
BRIS	WL-02	VET_T6_116	4211184.594	599931.456	5.76	5/9/2005
BRIS	WL-02	VET_T6_119	4211183.204	599934.628	5.78	5/9/2005
BRIS	WL-02	VET_T6_122	4211181.866	599938.83	5.78	5/9/2005
BRIS	WL-02	VET_T6_125	4211180.489	599942.793	5.93	5/9/2005
BRIS	WL-02	VET_T6_127	4211179.084	599946.843	5.82	5/9/2005
BRIS	WL-02	VET_T6_129	4211177.035	599951.83	5.77	5/9/2005
BRIS	WL-02	VET_T6_133	4211175.304	599956.474	5.75	5/9/2005
BRIS	WL-02	VET_T6_137	4211173.103	599961.414	5.69	5/9/2005
BRIS	WL-02	VET_T6_139	4211171.278	599966.453	5.65	5/9/2005
BRIS	WL-02	VET_T6_142	4211169.836	599970.749	5.63	5/9/2005
BRIS	WL-02	VET_T6_144	4211168.364	599974.297	5.57	5/9/2005
BRIS	WL-02	VET_T6_147	4211166.718	599979.135	5.64	5/9/2005
BRIS	WL-02	VET_T6_150	4211164.889	599983.354	5.64	5/9/2005
BRIS	WL-02	VET_T6_153	4211162.188	599989.305	5.71	5/9/2005
BRIS	WL-02	VET_T6_156	4211159.643	599994.831	5.68	5/9/2005
BRIS	WL-02	VET_T6_160	4211156.665	600000.753	5.65	5/9/2005
BRIS	WL-02	VET_T6_95	4211193.848	599907.761	5.73	5/9/2005
BRIS	WL-02	VET_T6_98	4211193.059	599911.722	5.76	5/9/2005
BRIS	WL-02	VET_T7_10	4211167.428	600010.192	5.60	5/9/2005
BRIS	WL-02	VET_T7_13	4211171.128	600010.51	5.62	5/9/2005
BRIS	WL-02	VET_T7_15	4211175.84	600010.817	5.77	5/9/2005
BRIS	WL-02	VET_T7_21	4211181.696	600011.263	5.73	5/9/2005
BRIS	WL-02	VET_T7_26	4211187.78	600011.733	5.77	5/9/2005
BRIS	WL-02	VET_T7_29	4211192.007	600011.941	5.70	5/9/2005
BRIS	WL-02	VET_T7_33	4211196.753	600012.358	5.81	5/9/2005
BRIS	WL-02	VET_T7_38	4211200.359	600012.589	5.77	5/9/2005
BRIS	WL-02	VET_T7_4	4211158.891	600009.34	5.75	5/9/2005
BRIS	WL-02	VET_T7_42	4211205.647	600013.165	5.70	5/9/2005
BRIS	WL-02	VET_T7_45	4211209.524	600013.37	5.72	5/9/2005
BRIS	WL-02	VET_T7_47	4211214.123	600013.722	5.70	5/9/2005
BRIS	WL-02	VET_T7_50	4211219.631	600014.201	5.81	5/9/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-02	VET_T7_54	4211224.926	600014.576	5.77	5/9/2005
BRIS	WL-02	VET_T7_56	4211230.897	600015.031	5.83	5/9/2005
BRIS	WL-02	VET_T7_59	4211235.222	600015.146	5.93	5/9/2005
BRIS	WL-02	VET_T7_61	4211239.288	600015.529	5.88	5/9/2005
BRIS	WL-02	VET_T7_63	4211243.677	600015.744	5.83	5/9/2005
BRIS	WL-02	VET_T7_68	4211249.938	600016.025	5.82	5/9/2005
BRIS	WL-02	VET_T7_7	4211163.328	600009.566	5.70	5/9/2005
BRIS	WL-02	VET_T7_71	4211254.467	600016.039	5.77	5/9/2005
BRIS	WL-02	VET_T7_74	4211260.392	600016.228	5.75	5/9/2005
BRIS	WL-02	VET_T7_77	4211265.903	600016.75	5.75	5/9/2005
BRIS	WL-02	VET_T7_78	4211271.182	600017.031	5.87	5/9/2005
BRIS	WL-02	VET_T7_83	4211275.91	600017.343	5.83	5/9/2005
BRIS	WL-02	VET_T7_88	4211281.301	600017.61	5.80	5/9/2005
BRIS	WL-02	VET_T8_102	4211267.284	600092.688	5.95	5/9/2005
BRIS	WL-02	VET_T8_104	4211263.913	600090.348	5.92	5/9/2005
BRIS	WL-02	VET_T8_107	4211260.676	600088.406	6.00	5/9/2005
BRIS	WL-02	VET_T8_110	4211257.375	600086.081	6.04	5/9/2005
BRIS	WL-02	VET_T8_113	4211254.147	600083.833	5.97	5/9/2005
BRIS	WL-02	VET_T8_117	4211249.898	600081.477	6.04	5/9/2005
BRIS	WL-02	VET_T8_121	4211246.292	600078.885	5.89	5/9/2005
BRIS	WL-02	VET_T8_126	4211241.76	600075.479	5.73	5/9/2005
BRIS	WL-02	VET_T8_130	4211237.883	600072.715	5.68	5/9/2005
BRIS	WL-02	VET_T8_135	4211233.558	600069.386	5.80	5/9/2005
BRIS	WL-02	VET_T8_141	4211229.031	600065.842	5.74	5/9/2005
BRIS	WL-02	VET_T8_145	4211226.02	600061.48	5.77	5/9/2005
BRIS	WL-02	VET_T8_148	4211221.942	600059.121	5.79	5/9/2005
BRIS	WL-02	VET_T8_151	4211217.254	600055.911	5.85	5/9/2005
BRIS	WL-02	VET_T8_155	4211212.124	600052.629	5.70	5/9/2005
BRIS	WL-02	VET_T8_158	4211207.363	600048.596	5.49	5/9/2005
BRIS	WL-02	VET_T8_161	4211202.556	600044.722	5.58	5/9/2005
BRIS	WL-02	VET_T8_162	4211198.81	600042.135	5.54	5/9/2005
BRIS	WL-02	VET_T8_163	4211193.629	600038.339	5.72	5/9/2005
BRIS	WL-02	VET_T8_164	4211187.938	600034.087	5.69	5/9/2005
BRIS	WL-02	VET_T8_165	4211182.702	600030.231	5.74	5/9/2005
BRIS	WL-02	VET_T8_166	4211177.654	600026.041	5.73	5/9/2005
BRIS	WL-02	VET_T8_167	4211172.357	600022.133	5.65	5/9/2005
BRIS	WL-02	VET_T8_168	4211167.166	600018.182	5.66	5/9/2005
BRIS	WL-02	VET_T8_169	4211162.771	600015.114	5.64	5/9/2005
BRIS	WL-02	VET_T8_170	4211158.869	600011.785	5.74	5/9/2005
BRIS	WL-02	VET_T8_93	4211276.294	600103.236	5.98	5/9/2005
BRIS	WL-02	VET_T8_96	4211274.114	600097.633	6.01	5/9/2005
BRIS	WL-02	VET_T8_99	4211270.387	600094.556	5.88	5/9/2005
BRIS	WL-02	VET_T9_173	4211155.004	600013.681	5.77	5/9/2005
BRIS	WL-02	VET_T9_175	4211157.787	600018.91	5.75	5/9/2005
BRIS	WL-02	VET_T9_176	4211160.055	600024.432	5.71	5/9/2005
BRIS	WL-02	VET_T9_178	4211162.359	600029.867	5.63	5/9/2005
BRIS	WL-02	VET_T9_180	4211165.017	600035.048	5.59	5/9/2005
BRIS	WL-02	VET_T9_182	4211167.455	600040.82	5.68	5/9/2005
BRIS	WL-02	VET_T9_184	4211169.641	600045.508	5.64	5/9/2005
BRIS	WL-02	VET_T9_185	4211171.869	600051.02	5.65	5/9/2005
BRIS	WL-02	VET_T9_187	4211174.091	600056.418	5.69	5/9/2005
BRIS	WL-02	VET_T9_189	4211176.353	600061.999	5.64	5/9/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-02	VET_T9_190	4211178.867	600067.668	5.54	5/9/2005
BRIS	WL-02	VET_T9_192	4211181.034	600072.576	5.60	5/9/2005
BRIS	WL-02	VET_T9_194	4211183.799	600078.347	5.54	5/9/2005
BRIS	WL-02	VET_T9_196	4211186.07	600083.355	5.69	5/9/2005
BRIS	WL-02	VET_T9_198	4211188.871	600089.288	5.63	5/9/2005
BRIS	WL-02	VET_T9_200	4211191.577	600095.551	5.67	5/9/2005
BRIS	WL-02	VET_T9_202	4211194.394	600101.812	5.67	5/9/2005
BRIS	WL-02	VET_T9_203	4211197	600108.019	5.67	5/9/2005
BRIS	WL-02	VET_T9_206	4211199.987	600115.016	5.79	5/9/2005
BRIS	WL-02	VET_T9_208	4211202.788	600121.204	5.83	5/9/2005
BRIS	WL-02	VET_T9_210	4211205.388	600127.36	5.73	5/9/2005
BRIS	WL-02	VET_T9_212	4211207.982	600133.052	5.82	5/9/2005
BRIS	WL-02	VET_T9_215	4211210.243	600139.097	5.79	5/9/2005
BRIS	WL-02	VET_T9_216	4211212.849	600144.736	6.09	5/9/2005
BRIS	WL-02	VET_T9_218	4211215.364	600150.63	5.93	5/9/2005
BRIS	WL-02	VET_T9_219	4211217.257	600155.411	6.01	5/9/2005
BRIS	WL-02	VET_T9_222	4211219.393	600160.019	6.01	5/9/2005
BRIS	WL-03	VET_T1_11	4210609.552	599963.0536	4.36	5/23/2005
BRIS	WL-03	VET_T1_13	4210611.335	599959.4548	4.87	5/23/2005
BRIS	WL-03	VET_T1_14	4210611.993	599958.1198	4.58	5/23/2005
BRIS	WL-03	VET_T1_7	4210604.025	599969.7844	4.90	5/23/2005
BRIS	WL-03	VET_T1_8	4210607.014	599966.6095	4.18	5/23/2005
BRIS	WL-03	VET_T2_16	4210605.813	599980.9788	5.12	5/23/2005
BRIS	WL-03	VET_T2_18	4210608.104	599984.5084	5.09	5/23/2005
BRIS	WL-03	VET_T2_20	4210610.291	599988.6968	5.19	5/23/2005
BRIS	WL-03	VET_T2_21	4210611.835	599992.5239	5.23	5/23/2005
BRIS	WL-03	VET_T2_23	4210613.631	599996.3226	5.26	5/23/2005
BRIS	WL-03	VET_T2_25	4210615.523	600000.6737	5.24	5/23/2005
BRIS	WL-03	VET_T2_27	4210617.742	600004.9451	5.21	5/23/2005
BRIS	WL-03	VET_T2_29	4210619.413	600009.5476	5.23	5/23/2005
BRIS	WL-03	VET_T2_31	4210621.205	600013.6051	5.32	5/23/2005
BRIS	WL-03	VET_T2_32	4210622.66	600017.9293	5.40	5/23/2005
BRIS	WL-03	VET_T2_34	4210624.696	600022.292	5.37	5/23/2005
BRIS	WL-03	VET_T2_35	4210626.473	600026.3331	5.22	5/23/2005
BRIS	WL-03	VET_T2_37	4210628.18	600030.7755	5.33	5/23/2005
BRIS	WL-03	VET_T2_39	4210629.846	600035.6796	5.27	5/23/2005
BRIS	WL-03	VET_T2_41	4210631.137	600040.9885	5.17	5/23/2005
BRIS	WL-03	VET_T2_45	4210632.42	600045.6464	5.19	5/23/2005
BRIS	WL-03	VET_T2_46	4210633.941	600050.2823	5.29	5/23/2005
BRIS	WL-03	VET_T2_48	4210635.82	600054.6321	5.22	5/23/2005
BRIS	WL-03	VET_T2_49	4210636.955	600058.8988	5.25	5/23/2005
BRIS	WL-03	VET_T2_51	4210638.218	600063.7491	5.20	5/23/2005
BRIS	WL-03	VET_T2_53	4210641.096	600068.4095	5.10	5/23/2005
BRIS	WL-03	VET_T2_55	4210641.93	600072.8231	5.17	5/23/2005
BRIS	WL-03	VET_T2_56	4210642.464	600078.4047	5.15	5/23/2005
BRIS	WL-03	VET_T2_58	4210643.242	600083.4974	5.24	5/23/2005
BRIS	WL-03	VET_T2_59	4210643.888	600088.1674	5.17	5/23/2005
BRIS	WL-03	VET_T2_60	4210644.404	600093.0047	5.13	5/23/2005
BRIS	WL-03	VET_T3_10	4210585.983	599971.4358	4.75	5/23/2005
BRIS	WL-03	VET_T3_12	4210583.151	599970.944	4.45	5/23/2005
BRIS	WL-03	VET_T3_6	4210594.332	599971.5224	4.77	5/23/2005
BRIS	WL-03	VET_T3_9	4210590.172	599971.5149	4.79	5/23/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-03	VET_T4_15	4210598.844	599980.7899	5.23	5/23/2005
BRIS	WL-03	VET_T4_17	4210597.827	599986.1323	5.07	5/23/2005
BRIS	WL-03	VET_T4_19	4210596.771	599991.2454	5.12	5/23/2005
BRIS	WL-03	VET_T4_22	4210594.999	599996.156	5.10	5/23/2005
BRIS	WL-03	VET_T4_24	4210592.617	600001.136	5.02	5/23/2005
BRIS	WL-03	VET_T4_26	4210590.3	600006.1375	4.87	5/23/2005
BRIS	WL-03	VET_T4_28	4210588.007	600010.5161	4.99	5/23/2005
BRIS	WL-03	VET_T4_30	4210585.594	600014.6795	5.08	5/23/2005
BRIS	WL-03	VET_T4_33	4210582.611	600018.7983	4.99	5/23/2005
BRIS	WL-03	VET_T4_36	4210580.142	600024.4935	5.02	5/23/2005
BRIS	WL-03	VET_T4_38	4210577.469	600028.2113	5.09	5/23/2005
BRIS	WL-03	VET_T4_42	4210576.683	600032.2358	6.13	5/23/2005
BRIS	WL-03	VET_T4_43	4210576.535	600030.4686	6.49	5/23/2005
BRIS	WL-03	VET_T4_44	4210576.498	600030.5365	5.06	5/23/2005
BRIS	WL-03	VET_T4_47	4210574.849	600035.6932	4.95	5/23/2005
BRIS	WL-03	VET_T4_50	4210573.125	600040.0512	4.94	5/23/2005
BRIS	WL-03	VET_T4_52	4210570.961	600043.2515	4.73	5/23/2005
BRIS	WL-03	VET_T4_54	4210569.035	600046.8213	4.96	5/23/2005
BRIS	WL-03	VET_T5_57	4210589.114	600058.2205	5.35	5/23/2005
BRIS	WL-03	VET_T5_61	4210591.502	600052.872	5.29	5/23/2005
BRIS	WL-03	VET_T5_62	4210591.824	600047.6738	5.26	5/23/2005
BRIS	WL-03	VET_T5_63	4210592.624	600042.1406	5.18	5/23/2005
BRIS	WL-03	VET_T5_64	4210592.641	600038.1976	4.88	5/23/2005
BRIS	WL-03	VET_T5_65	4210593.435	600032.9466	4.87	5/23/2005
BRIS	WL-03	VET_T5_66	4210593.811	600027.2363	5.15	5/23/2005
BRIS	WL-03	VET_T5_67	4210594.762	600022.3974	5.13	5/23/2005
BRIS	WL-03	VET_T5_68	4210596.518	600017.0073	5.17	5/23/2005
BRIS	WL-03	VET_T5_69	4210597.235	600011.1838	5.16	5/23/2005
BRIS	WL-03	VET_T5_70	4210597.975	600005.7377	5.12	5/23/2005
BRIS	WL-03	VET_T5_71	4210598.753	600000.8778	5.15	5/23/2005
BRIS	WL-03	VET_T5_72	4210599.398	599995.6668	5.17	5/23/2005
BRIS	WL-03	VET_T5_73	4210600.015	599990.2585	5.09	5/23/2005
BRIS	WL-03	VET_T5_74	4210600.309	599985.0809	5.07	5/23/2005
BRIS	WL-03	VET_T5_75	4210600.737	599981.8854	5.06	5/23/2005
BRIS	WL-04	VET_T1_229	4210829.924	598980.838	6.08	5/2/2005
BRIS	WL-04	VET_T1_232	4210828.617	598986.5	5.99	5/2/2005
BRIS	WL-04	VET_T1_234	4210827.335	598992.115	6.09	5/2/2005
BRIS	WL-04	VET_T1_237	4210824.731	598996.793	6.05	5/2/2005
BRIS	WL-04	VET_T1_240	4210822.161	599000.332	6.00	5/2/2005
BRIS	WL-04	VET_T1_243	4210819.762	599004.796	5.98	5/2/2005
BRIS	WL-04	VET_T1_246	4210818.685	599009.805	5.78	5/2/2005
BRIS	WL-04	VET_T1_248	4210817.69	599015.217	5.85	5/2/2005
BRIS	WL-04	VET_T1_251	4210816.861	599020.638	6.02	5/2/2005
BRIS	WL-04	VET_T1_253	4210815.807	599025.793	6.06	5/2/2005
BRIS	WL-04	VET_T1_256	4210815.068	599030.574	6.12	5/2/2005
BRIS	WL-04	VET_T1_259	4210813.732	599035.833	6.03	5/2/2005
BRIS	WL-04	VET_T1_261	4210812.953	599040.734	6.07	5/2/2005
BRIS	WL-04	VET_T1_264	4210811.94	599045.818	6.07	5/2/2005
BRIS	WL-04	VET_T1_267	4210810.337	599050.849	6.00	5/2/2005
BRIS	WL-04	VET_T1_269	4210809.334	599055.869	6.18	5/2/2005
BRIS	WL-04	VET_T1_272	4210808.706	599061.179	6.13	5/2/2005
BRIS	WL-04	VET_T1_275	4210807.661	599066.624	6.04	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-04	VET_T1_278	4210806.333	599071.785	6.12	5/2/2005
BRIS	WL-04	VET_T1_280	4210805.491	599077.283	6.06	5/2/2005
BRIS	WL-04	VET_T1_282	4210804.556	599082.96	6.07	5/2/2005
BRIS	WL-04	VET_T1_285	4210803.546	599087.619	5.86	5/2/2005
BRIS	WL-04	VET_T1_287	4210802.454	599093.067	6.05	5/2/2005
BRIS	WL-04	VET_T1_288	4210800.706	599098.174	5.88	5/2/2005
BRIS	WL-04	VET_T1_291	4210798.818	599103.109	5.79	5/2/2005
BRIS	WL-04	VET_T1_292	4210796.645	599108.241	5.94	5/2/2005
BRIS	WL-04	VET_T1_294	4210794.84	599113.326	6.00	5/2/2005
BRIS	WL-04	VET_T1_296	4210793.258	599118.151	5.74	5/2/2005
BRIS	WL-04	VET_T2_230	4210832.501	598969.992	6.05	5/2/2005
BRIS	WL-04	VET_T2_233	4210832.993	598963.965	6.04	5/2/2005
BRIS	WL-04	VET_T2_236	4210833.439	598958.039	6.11	5/2/2005
BRIS	WL-04	VET_T2_238	4210833.804	598952.014	6.12	5/2/2005
BRIS	WL-04	VET_T2_241	4210834.138	598946.156	6.17	5/2/2005
BRIS	WL-04	VET_T2_244	4210834.522	598939.966	6.08	5/2/2005
BRIS	WL-04	VET_T2_247	4210835.158	598934.652	6.07	5/2/2005
BRIS	WL-04	VET_T2_249	4210835.428	598928.44	6.06	5/2/2005
BRIS	WL-04	VET_T2_252	4210835.462	598923.208	6.11	5/2/2005
BRIS	WL-04	VET_T2_255	4210835.468	598918.805	6.28	5/2/2005
BRIS	WL-04	VET_T2_258	4210836.228	598913.884	6.09	5/2/2005
BRIS	WL-04	VET_T2_260	4210836.096	598909.249	6.02	5/2/2005
BRIS	WL-04	VET_T2_263	4210835.901	598904.59	6.14	5/2/2005
BRIS	WL-04	VET_T2_265	4210836.573	598899.732	6.06	5/2/2005
BRIS	WL-04	VET_T2_268	4210837.523	598895.231	5.94	5/2/2005
BRIS	WL-04	VET_T2_270	4210837.806	598890.112	5.81	5/2/2005
BRIS	WL-04	VET_T2_273	4210838.535	598884.728	5.64	5/2/2005
BRIS	WL-04	VET_T2_276	4210838.721	598881.167	5.62	5/2/2005
BRIS	WL-04	VET_T2_279	4210839.025	598878.479	5.97	5/2/2005
BRIS	WL-04	VET_T2_283	4210839.099	598875.156	5.93	5/2/2005
BRIS	WL-04	VET_T2_286	4210839.222	598871.341	5.57	5/2/2005
BRIS	WL-04	VET_T2_290	4210839.799	598867.226	5.31	5/2/2005
BRIS	WL-04	VET_T2_293	4210840.008	598864.41	5.13	5/2/2005
BRIS	WL-04	VET_T2_297	4210840.208	598861.288	5.05	5/2/2005
BRIS	WL-04	VET_T2_299	4210839.761	598858.115	5.04	5/2/2005
BRIS	WL-04	VET_T3_228	4210840.923	598974.473	6.10	5/2/2005
BRIS	WL-04	VET_T3_231	4210845.712	598974.972	6.15	5/2/2005
BRIS	WL-04	VET_T3_235	4210850.646	598974.722	6.09	5/2/2005
BRIS	WL-04	VET_T3_239	4210856.726	598975.139	6.11	5/2/2005
BRIS	WL-04	VET_T3_242	4210861.365	598975.138	6.19	5/2/2005
BRIS	WL-04	VET_T3_245	4210866.574	598975.22	6.10	5/2/2005
BRIS	WL-04	VET_T3_250	4210871.423	598975.231	5.97	5/2/2005
BRIS	WL-04	VET_T3_254	4210876.663	598975.106	6.19	5/2/2005
BRIS	WL-04	VET_T3_257	4210881.648	598975.213	6.02	5/2/2005
BRIS	WL-04	VET_T3_262	4210886.952	598974.956	5.99	5/2/2005
BRIS	WL-04	VET_T3_266	4210891.813	598975.02	5.96	5/2/2005
BRIS	WL-04	VET_T3_271	4210895.952	598975.716	6.05	5/2/2005
BRIS	WL-04	VET_T3_274	4210900.753	598975.448	6.05	5/2/2005
BRIS	WL-04	VET_T3_277	4210905.941	598975.225	6.06	5/2/2005
BRIS	WL-04	VET_T3_281	4210911.176	598974.734	5.96	5/2/2005
BRIS	WL-04	VET_T3_284	4210916.395	598975.021	6.00	5/2/2005
BRIS	WL-04	VET_T3_289	4210921.719	598975.26	6.15	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-04	VET_T3_295	4210926.468	598975.519	6.20	5/2/2005
BRIS	WL-04	VET_T3_298	4210931.14	598976.138	6.12	5/2/2005
BRIS	WL-04	VET_T3_302	4210937.073	598976.204	6.06	5/2/2005
BRIS	WL-04	VET_T3_304	4210941.438	598976.287	6.03	5/2/2005
BRIS	WL-04	VET_T3_307	4210947.474	598975.931	6.14	5/2/2005
BRIS	WL-04	VET_T3_309	4210952.966	598975.8	6.05	5/2/2005
BRIS	WL-04	VET_T3_313	4210957.237	598975.701	6.12	5/2/2005
BRIS	WL-04	VET_T3_315	4210961.678	598974.607	6.09	5/2/2005
BRIS	WL-04	VET_T4_303	4210765.949	599054.092	6.16	5/2/2005
BRIS	WL-04	VET_T4_305	4210769.251	599050.859	6.19	5/2/2005
BRIS	WL-04	VET_T4_306	4210772.278	599047.21	5.90	5/2/2005
BRIS	WL-04	VET_T4_308	4210774.268	599042.331	5.96	5/2/2005
BRIS	WL-04	VET_T4_310	4210777.921	599038.379	6.12	5/2/2005
BRIS	WL-04	VET_T4_311	4210781.465	599035.038	6.05	5/2/2005
BRIS	WL-04	VET_T4_312	4210785.397	599030.729	6.00	5/2/2005
BRIS	WL-04	VET_T4_314	4210788.853	599026.491	6.02	5/2/2005
BRIS	WL-04	VET_T4_317	4210792.633	599022.213	5.96	5/2/2005
BRIS	WL-04	VET_T4_318	4210795.794	599019.076	6.02	5/2/2005
BRIS	WL-04	VET_T4_319	4210798.72	599014.959	5.92	5/2/2005
BRIS	WL-04	VET_T4_321	4210801.622	599010.882	5.84	5/2/2005
BRIS	WL-04	VET_T4_324	4210805.16	599006.331	6.04	5/2/2005
BRIS	WL-04	VET_T4_327	4210807.953	599003.065	5.87	5/2/2005
BRIS	WL-04	VET_T4_330	4210811.495	598998.981	5.96	5/2/2005
BRIS	WL-04	VET_T4_332	4210814.751	598994.666	5.92	5/2/2005
BRIS	WL-04	VET_T4_333	4210818.339	598991.746	5.84	5/2/2005
BRIS	WL-04	VET_T4_336	4210822.069	598987.167	5.91	5/2/2005
BRIS	WL-04	VET_T4_338	4210825.793	598983.313	5.91	5/2/2005
BRIS	WL-04	VET_T4_341	4210828.989	598978.171	6.23	5/2/2005
BRIS	WL-04	VET_T5_316	4210723.169	598904.701	6.15	5/2/2005
BRIS	WL-04	VET_T5_320	4210727.767	598907.256	6.17	5/2/2005
BRIS	WL-04	VET_T5_323	4210731.123	598908.797	6.13	5/2/2005
BRIS	WL-04	VET_T5_326	4210735.974	598910.657	6.14	5/2/2005
BRIS	WL-04	VET_T5_328	4210740.354	598912.073	6.08	5/2/2005
BRIS	WL-04	VET_T5_331	4210744.398	598915.104	6.22	5/2/2005
BRIS	WL-04	VET_T5_334	4210747.89	598917.428	6.05	5/2/2005
BRIS	WL-04	VET_T5_337	4210751.426	598919.57	6.01	5/2/2005
BRIS	WL-04	VET_T5_340	4210754.677	598922.6	5.96	5/2/2005
BRIS	WL-04	VET_T5_342	4210758.479	598925.91	5.96	5/2/2005
BRIS	WL-04	VET_T5_344	4210761.723	598928.971	6.12	5/2/2005
BRIS	WL-04	VET_T5_345	4210764.363	598931.906	6.01	5/2/2005
BRIS	WL-04	VET_T5_347	4210767.391	598934.952	6.10	5/2/2005
BRIS	WL-04	VET_T5_348	4210770.169	598938.169	6.00	5/2/2005
BRIS	WL-04	VET_T5_350	4210773.647	598941.089	6.02	5/2/2005
BRIS	WL-04	VET_T5_352	4210776.998	598942.906	6.00	5/2/2005
BRIS	WL-04	VET_T5_354	4210780.373	598944.754	6.01	5/2/2005
BRIS	WL-04	VET_T5_355	4210783.917	598946.803	5.90	5/2/2005
BRIS	WL-04	VET_T5_357	4210786.841	598948.254	6.06	5/2/2005
BRIS	WL-04	VET_T5_359	4210790.316	598949.992	6.10	5/2/2005
BRIS	WL-04	VET_T5_361	4210793.395	598951.685	6.16	5/2/2005
BRIS	WL-04	VET_T5_363	4210797.559	598953.409	6.01	5/2/2005
BRIS	WL-04	VET_T5_365	4210802.766	598956.365	6.18	5/2/2005
BRIS	WL-04	VET_T5_367	4210807.722	598958.196	6.12	5/2/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BRIS	WL-04	VET_T5_370	4210812.398	598960.866	6.16	5/2/2005
BRIS	WL-04	VET_T5_372	4210816.954	598964.081	6.10	5/2/2005
BRIS	WL-04	VET_T5_374	4210820.916	598967.017	6.12	5/2/2005
BRIS	WL-04	VET_T5_376	4210825.398	598970.71	6.16	5/2/2005
BRIS	WL-04	VET_T5_377	4210829.027	598973.606	6.03	5/2/2005
BRIS	WL-04	VET_T6_322	4210939.234	599030.743	5.81	5/2/2005
BRIS	WL-04	VET_T6_325	4210935.804	599029.286	5.88	5/2/2005
BRIS	WL-04	VET_T6_329	4210933.034	599027.364	6.04	5/2/2005
BRIS	WL-04	VET_T6_335	4210928.622	599025	6.06	5/2/2005
BRIS	WL-04	VET_T6_339	4210923.105	599022.606	6.05	5/2/2005
BRIS	WL-04	VET_T6_343	4210918.151	599019.898	6.09	5/2/2005
BRIS	WL-04	VET_T6_346	4210913.034	599017.494	5.98	5/2/2005
BRIS	WL-04	VET_T6_349	4210909.911	599015.546	5.99	5/2/2005
BRIS	WL-04	VET_T6_351	4210905.71	599013.339	6.05	5/2/2005
BRIS	WL-04	VET_T6_353	4210901.848	599011.227	6.10	5/2/2005
BRIS	WL-04	VET_T6_356	4210898.085	599009.076	5.97	5/2/2005
BRIS	WL-04	VET_T6_358	4210895.051	599007.095	5.91	5/2/2005
BRIS	WL-04	VET_T6_360	4210891.576	599004.762	6.03	5/2/2005
BRIS	WL-04	VET_T6_362	4210887.478	599002.458	6.07	5/2/2005
BRIS	WL-04	VET_T6_364	4210883.565	598999.855	6.07	5/2/2005
BRIS	WL-04	VET_T6_366	4210879.503	598997.482	6.11	5/2/2005
BRIS	WL-04	VET_T6_368	4210875.562	598995	6.03	5/2/2005
BRIS	WL-04	VET_T6_369	4210871.467	598992.996	6.09	5/2/2005
BRIS	WL-04	VET_T6_371	4210867.322	598990.517	6.05	5/2/2005
BRIS	WL-04	VET_T6_373	4210863.036	598988.711	6.07	5/2/2005
BRIS	WL-04	VET_T6_375	4210858.738	598986.527	6.03	5/2/2005
BRIS	WL-04	VET_T6_378	4210853.772	598983.812	6.10	5/2/2005
BRIS	WL-04	VET_T6_379	4210849.31	598981.553	6.09	5/2/2005
BRIS	WL-04	VET_T6_380	4210849.252	598981.433	6.07	5/2/2005
BRIS	WL-04	VET_T6_381	4210845.112	598978.521	6.07	5/2/2005
BRIS	WL-04	VET_T6_382	4210840.147	598976.267	6.15	5/2/2005
BUIS	WL-01	VET__294	4230936.335	560807.199	6.07	4/22/2005
BUIS	WL-01	VET__300	4231041.418	560753.898	5.83	4/22/2005
BUIS	WL-01	VET__302	4231041.199	560753.209	5.10	4/22/2005
BUIS	WL-01	VET__311	4231035.563	560813.188	5.88	4/22/2005
BUIS	WL-01	VET_T1_244	4230945.296	560766.483	6.29	4/22/2005
BUIS	WL-01	VET_T1_247	4230942.507	560772.761	6.32	4/22/2005
BUIS	WL-01	VET_T1_251	4230940.276	560778.67	6.08	4/22/2005
BUIS	WL-01	VET_T1_254	4230937.902	560785.227	5.80	4/22/2005
BUIS	WL-01	VET_T1_259	4230935.177	560792.192	5.63	4/22/2005
BUIS	WL-01	VET_T1_262	4230932.358	560798.151	5.79	4/22/2005
BUIS	WL-01	VET_T1_265	4230930.157	560803.988	6.13	4/22/2005
BUIS	WL-01	VET_T1_267	4230927.999	560809.465	6.11	4/22/2005
BUIS	WL-01	VET_T1_270	4230926.341	560815.624	6.27	4/22/2005
BUIS	WL-01	VET_T1_272	4230924.253	560822.034	6.31	4/22/2005
BUIS	WL-01	VET_T1_275	4230922.772	560828.379	6.53	4/22/2005
BUIS	WL-01	VET_T1_278	4230921.147	560832.803	6.63	4/22/2005
BUIS	WL-01	VET_T1_281	4230920.992	560832.925	5.20	4/22/2005
BUIS	WL-01	VET_T1_284	4230920.412	560833.643	4.49	4/22/2005
BUIS	WL-01	VET_T10_339	4230985.939	560833.729	6.46	4/22/2005
BUIS	WL-01	VET_T10_341	4230982.473	560830.531	6.21	4/22/2005
BUIS	WL-01	VET_T10_344	4230972.856	560830.819	5.94	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-01	VET_T10_347	4230969.013	560827.925	5.99	4/22/2005
BUIS	WL-01	VET_T10_351	4230963.185	560823.055	6.03	4/22/2005
BUIS	WL-01	VET_T10_354	4230959.653	560818.147	5.90	4/22/2005
BUIS	WL-01	VET_T10_357	4230953.288	560812.124	5.91	4/22/2005
BUIS	WL-01	VET_T10_360	4230952.31	560805.141	6.00	4/22/2005
BUIS	WL-01	VET_T10_363	4230951.758	560800.16	5.88	4/22/2005
BUIS	WL-01	VET_T10_366	4230952.804	560793.662	6.04	4/22/2005
BUIS	WL-01	VET_T10_369	4230952.535	560787.758	6.12	4/22/2005
BUIS	WL-01	VET_T10_372	4230951.469	560781.424	6.21	4/22/2005
BUIS	WL-01	VET_T10_375	4230949.679	560775.097	6.30	4/22/2005
BUIS	WL-01	VET_T2_299	4230964.947	560857.44	6.37	4/22/2005
BUIS	WL-01	VET_T2_303	4230964.322	560852.39	6.34	4/22/2005
BUIS	WL-01	VET_T2_305	4230963.725	560847.279	6.16	4/22/2005
BUIS	WL-01	VET_T2_307	4230963.292	560842.542	6.23	4/22/2005
BUIS	WL-01	VET_T2_309	4230962.067	560837.409	6.01	4/22/2005
BUIS	WL-01	VET_T2_313	4230960.753	560833.129	5.86	4/22/2005
BUIS	WL-01	VET_T2_315	4230960.174	560831.214	5.89	4/22/2005
BUIS	WL-01	VET_T2_318	4230959.643	560826.757	4.80	4/22/2005
BUIS	WL-01	VET_T2_320	4230959.555	560822.956	5.94	4/22/2005
BUIS	WL-01	VET_T2_322	4230957.845	560817.138	5.86	4/22/2005
BUIS	WL-01	VET_T2_324	4230955.794	560811.961	5.98	4/22/2005
BUIS	WL-01	VET_T2_326	4230954.081	560806.253	5.99	4/22/2005
BUIS	WL-01	VET_T2_329	4230952.737	560802.042	5.97	4/22/2005
BUIS	WL-01	VET_T2_331	4230951.914	560796.643	5.80	4/22/2005
BUIS	WL-01	VET_T2_334	4230951.234	560791.372	6.05	4/22/2005
BUIS	WL-01	VET_T2_336	4230950.335	560786.047	5.74	4/22/2005
BUIS	WL-01	VET_T2_338	4230949.957	560780.331	6.35	4/22/2005
BUIS	WL-01	VET_T2_342	4230949.155	560774.681	6.33	4/22/2005
BUIS	WL-01	VET_T2_345	4230948.643	560770.139	6.37	4/22/2005
BUIS	WL-01	VET_T3_349	4230947.747	560759.527	6.30	4/22/2005
BUIS	WL-01	VET_T3_352	4230946.534	560754.331	6.29	4/22/2005
BUIS	WL-01	VET_T3_355	4230945.647	560750.454	6.31	4/22/2005
BUIS	WL-01	VET_T3_358	4230945.202	560746.129	6.26	4/22/2005
BUIS	WL-01	VET_T3_361	4230944.141	560740.659	6.23	4/22/2005
BUIS	WL-01	VET_T3_364	4230942.703	560736.326	6.23	4/22/2005
BUIS	WL-01	VET_T3_367	4230941.563	560730.679	6.14	4/22/2005
BUIS	WL-01	VET_T3_370	4230939.926	560725.6	6.24	4/22/2005
BUIS	WL-01	VET_T3_373	4230939.325	560722.247	6.11	4/22/2005
BUIS	WL-01	VET_T4_242	4230948.229	560768.327	6.35	4/22/2005
BUIS	WL-01	VET_T4_245	4230952.255	560772.223	6.22	4/22/2005
BUIS	WL-01	VET_T4_248	4230955.41	560775.968	6.07	4/22/2005
BUIS	WL-01	VET_T4_249	4230956.568	560777.321	5.87	4/22/2005
BUIS	WL-01	VET_T4_252	4230960.744	560781.06	6.21	4/22/2005
BUIS	WL-01	VET_T4_255	4230964.581	560783.723	6.24	4/22/2005
BUIS	WL-01	VET_T4_257	4230968.452	560785.583	6.22	4/22/2005
BUIS	WL-01	VET_T4_258	4230975.414	560793.091	6.26	4/22/2005
BUIS	WL-01	VET_T4_260	4230979.19	560797.158	6.08	4/22/2005
BUIS	WL-01	VET_T4_261	4230982.138	560799.616	6.12	4/22/2005
BUIS	WL-01	VET_T4_263	4230984.869	560802.05	6.14	4/22/2005
BUIS	WL-01	VET_T4_264	4230988.112	560804.783	6.07	4/22/2005
BUIS	WL-01	VET_T4_266	4230991.815	560808.775	6.14	4/22/2005
BUIS	WL-01	VET_T4_268	4230995.107	560812.038	6.06	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-01	VET_T4_273	4230992.15	560813.637	6.12	4/22/2005
BUIS	WL-01	VET_T4_276	4230998.755	560815.59	6.06	4/22/2005
BUIS	WL-01	VET_T4_279	4231002.642	560819.753	6.14	4/22/2005
BUIS	WL-01	VET_T4_282	4231006.308	560823.141	6.15	4/22/2005
BUIS	WL-01	VET_T4_285	4231009.292	560825.628	6.10	4/22/2005
BUIS	WL-01	VET_T4_287	4231012.657	560829.716	6.08	4/22/2005
BUIS	WL-01	VET_T4_289	4231016.263	560833.856	6.06	4/22/2005
BUIS	WL-01	VET_T4_291	4231019.872	560837.946	6.25	4/22/2005
BUIS	WL-01	VET_T4_296	4231024.334	560840.725	6.25	4/22/2005
BUIS	WL-01	VET_T4_298	4231027.998	560844.468	6.02	4/22/2005
BUIS	WL-01	VET_T5_301	4231001.584	560753.129	5.93	4/22/2005
BUIS	WL-01	VET_T5_304	4231004.059	560750.685	5.91	4/22/2005
BUIS	WL-01	VET_T5_306	4231001.624	560747.983	6.02	4/22/2005
BUIS	WL-01	VET_T5_308	4230994.671	560748.308	6.00	4/22/2005
BUIS	WL-01	VET_T5_310	4230990.233	560747.944	6.22	4/22/2005
BUIS	WL-01	VET_T5_312	4230985.634	560750.057	6.29	4/22/2005
BUIS	WL-01	VET_T5_314	4230980.483	560750.042	4.09	4/22/2005
BUIS	WL-01	VET_T5_316	4230980.519	560751.798	6.11	4/22/2005
BUIS	WL-01	VET_T5_317	4230977.867	560754.409	5.61	4/22/2005
BUIS	WL-01	VET_T5_319	4230976.962	560753.947	5.86	4/22/2005
BUIS	WL-01	VET_T5_321	4230973.975	560754.984	6.05	4/22/2005
BUIS	WL-01	VET_T5_323	4230970.235	560756.595	6.04	4/22/2005
BUIS	WL-01	VET_T5_325	4230966.907	560757.351	6.04	4/22/2005
BUIS	WL-01	VET_T5_327	4230965.514	560758.357	6.03	4/22/2005
BUIS	WL-01	VET_T5_328	4230964.023	560758.854	6.04	4/22/2005
BUIS	WL-01	VET_T5_330	4230961.466	560759.412	6.06	4/22/2005
BUIS	WL-01	VET_T5_332	4230956.873	560760.751	6.17	4/22/2005
BUIS	WL-01	VET_T5_333	4230954.312	560760.759	6.22	4/22/2005
BUIS	WL-01	VET_T5_335	4230952.41	560762.612	6.19	4/22/2005
BUIS	WL-01	VET_T6_337	4230941.139	560766.385	6.39	4/22/2005
BUIS	WL-01	VET_T6_340	4230935.214	560767.117	6.32	4/22/2005
BUIS	WL-01	VET_T6_343	4230931.516	560767.838	5.79	4/22/2005
BUIS	WL-01	VET_T6_346	4230931.074	560767.704	6.25	4/22/2005
BUIS	WL-01	VET_T6_348	4230928.822	560767.643	6.16	4/22/2005
BUIS	WL-01	VET_T6_350	4230927.825	560768.662	4.69	4/22/2005
BUIS	WL-01	VET_T6_353	4230929.794	560771.129	5.85	4/22/2005
BUIS	WL-01	VET_T6_356	4230928.197	560771.198	4.25	4/22/2005
BUIS	WL-01	VET_T7_359	4230931.138	560774.434	4.90	4/22/2005
BUIS	WL-01	VET_T7_362	4230931.693	560773.485	5.92	4/22/2005
BUIS	WL-01	VET_T7_365	4230934.915	560771.837	6.26	4/22/2005
BUIS	WL-01	VET_T7_368	4230937.92	560769.872	6.39	4/22/2005
BUIS	WL-01	VET_T7_371	4230940.526	560768.656	6.40	4/22/2005
BUIS	WL-01	VET_T7_374	4230942.843	560767.302	6.43	4/22/2005
BUIS	WL-01	VET_T7_376	4230944.562	560769.306	6.38	4/22/2005
BUIS	WL-01	VET_T8_243	4230949.814	560759.019	6.25	4/22/2005
BUIS	WL-01	VET_T8_246	4230952.365	560754.459	6.24	4/22/2005
BUIS	WL-01	VET_T8_250	4230955.626	560749.982	6.07	4/22/2005
BUIS	WL-01	VET_T8_253	4230960.116	560744.084	6.02	4/22/2005
BUIS	WL-01	VET_T8_256	4230963.578	560739.003	6.07	4/22/2005
BUIS	WL-01	VET_T9_269	4230954.352	560762.61	6.20	4/22/2005
BUIS	WL-01	VET_T9_271	4230960.954	560762.584	6.11	4/22/2005
BUIS	WL-01	VET_T9_274	4230966.453	560762.989	6.01	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-01	VET_T9_277	4230972.515	560762.878	6.00	4/22/2005
BUIS	WL-01	VET_T9_280	4230978.523	560763.705	6.06	4/22/2005
BUIS	WL-01	VET_T9_283	4230983.125	560761.657	6.07	4/22/2005
BUIS	WL-01	VET_T9_286	4230988.273	560759.948	5.97	4/22/2005
BUIS	WL-01	VET_T9_288	4230994.318	560759.29	5.94	4/22/2005
BUIS	WL-01	VET_T9_290	4230997.999	560759.35	5.87	4/22/2005
BUIS	WL-01	VET_T9_292	4231001.883	560758.907	5.92	4/22/2005
BUIS	WL-01	VET_T9_293	4231007.817	560757.337	6.07	4/22/2005
BUIS	WL-01	VET_T9_295	4231012.682	560755.566	5.87	4/22/2005
BUIS	WL-01	VET_T9_297	4231018.775	560752.61	5.87	4/22/2005
BUIS	WL-02	VET_T1_11	4230757.978	560905.624	5.83	6/1/2005
BUIS	WL-02	VET_T1_13	4230753.296	560903.597	5.85	6/1/2005
BUIS	WL-02	VET_T1_15	4230749.493	560902.335	5.97	6/1/2005
BUIS	WL-02	VET_T1_17	4230745.091	560900.052	6.10	6/1/2005
BUIS	WL-02	VET_T1_20	4230741.126	560897.784	6.13	6/1/2005
BUIS	WL-02	VET_T1_22	4230737.578	560896.039	5.89	6/1/2005
BUIS	WL-02	VET_T1_5	4230772.228	560911.355	5.73	6/1/2005
BUIS	WL-02	VET_T1_7	4230768.604	560909.922	5.92	6/1/2005
BUIS	WL-02	VET_T1_9	4230762.648	560908.096	5.82	6/1/2005
BUIS	WL-02	VET_T2_25	4230754.717	560889.871	5.98	6/1/2005
BUIS	WL-02	VET_T2_27	4230758.024	560891.713	6.08	6/1/2005
BUIS	WL-02	VET_T2_28	4230762.312	560892.16	5.10	6/1/2005
BUIS	WL-02	VET_T2_29	4230765.869	560895.62	6.10	6/1/2005
BUIS	WL-02	VET_T2_31	4230767.08	560899.022	5.90	6/1/2005
BUIS	WL-02	VET_T2_33	4230769.67	560902.862	5.86	6/1/2005
BUIS	WL-02	VET_T2_35	4230773.154	560908.217	5.62	6/1/2005
BUIS	WL-02	VET_T3_38	4230781.771	560913.171	5.87	6/1/2005
BUIS	WL-02	VET_T3_40	4230785.739	560913.969	5.76	6/1/2005
BUIS	WL-02	VET_T3_43	4230789.61	560915.056	5.91	6/1/2005
BUIS	WL-02	VET_T3_46	4230795.764	560915.364	6.08	6/1/2005
BUIS	WL-02	VET_T3_48	4230800.836	560916.963	6.03	6/1/2005
BUIS	WL-02	VET_T3_50	4230804.338	560918.752	5.45	6/1/2005
BUIS	WL-02	VET_T4_53	4230797.944	560905.078	6.03	6/1/2005
BUIS	WL-02	VET_T4_56	4230792.591	560907.145	6.15	6/1/2005
BUIS	WL-02	VET_T4_57	4230788.08	560909.037	5.90	6/1/2005
BUIS	WL-02	VET_T4_59	4230783.792	560912.221	5.88	6/1/2005
BUIS	WL-02	VET_T5_10	4230758.124	560917.875	5.90	6/1/2005
BUIS	WL-02	VET_T5_12	4230753.738	560918.633	6.02	6/1/2005
BUIS	WL-02	VET_T5_14	4230750.718	560919.384	5.96	6/1/2005
BUIS	WL-02	VET_T5_16	4230747.944	560920.247	6.00	6/1/2005
BUIS	WL-02	VET_T5_18	4230745.213	560921.616	6.09	6/1/2005
BUIS	WL-02	VET_T5_19	4230742.534	560922.853	6.18	6/1/2005
BUIS	WL-02	VET_T5_21	4230740.062	560924.179	6.12	6/1/2005
BUIS	WL-02	VET_T5_23	4230737.441	560925.043	6.14	6/1/2005
BUIS	WL-02	VET_T5_24	4230734.054	560925.543	6.19	6/1/2005
BUIS	WL-02	VET_T5_26	4230730.976	560924.548	6.21	6/1/2005
BUIS	WL-02	VET_T5_4	4230773.035	560915.183	5.85	6/1/2005
BUIS	WL-02	VET_T5_6	4230768.009	560915.57	5.82	6/1/2005
BUIS	WL-02	VET_T5_8	4230763.51	560916.692	5.81	6/1/2005
BUIS	WL-02	VET_T6_30	4230737.474	560936.631	5.99	6/1/2005
BUIS	WL-02	VET_T6_32	4230740.69	560934.54	6.02	6/1/2005
BUIS	WL-02	VET_T6_34	4230744.933	560933.695	6.00	6/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-02	VET_T6_36	4230748.478	560932.626	5.94	6/1/2005
BUIS	WL-02	VET_T6_37	4230752.894	560930.81	5.91	6/1/2005
BUIS	WL-02	VET_T6_39	4230756.863	560929.816	5.80	6/1/2005
BUIS	WL-02	VET_T6_41	4230760.639	560926.294	5.85	6/1/2005
BUIS	WL-02	VET_T6_42	4230764.605	560922.839	5.85	6/1/2005
BUIS	WL-02	VET_T6_44	4230768.119	560919.479	5.83	6/1/2005
BUIS	WL-02	VET_T6_45	4230771.426	560917.246	5.82	6/1/2005
BUIS	WL-02	VET_T7_47	4230781.359	560914.631	5.82	6/1/2005
BUIS	WL-02	VET_T7_49	4230785.523	560917.205	5.92	6/1/2005
BUIS	WL-02	VET_T7_51	4230789.208	560920.941	5.96	6/1/2005
BUIS	WL-02	VET_T7_52	4230792.686	560924.494	6.07	6/1/2005
BUIS	WL-02	VET_T7_54	4230795.752	560928.178	6.05	6/1/2005
BUIS	WL-02	VET_T7_55	4230797.846	560932.171	6.01	6/1/2005
BUIS	WL-02	VET_T7_58	4230800.178	560934.872	6.32	6/1/2005
BUIS	WL-03	VET__113	4230534.715	560727.046	5.64	4/22/2005
BUIS	WL-03	VET__137	4230543.923	560831.582	6.19	4/22/2005
BUIS	WL-03	VET_T1_26	4230454.333	560755.543	6.02	4/22/2005
BUIS	WL-03	VET_T1_30	4230459.728	560754.9	5.98	4/22/2005
BUIS	WL-03	VET_T1_33	4230464.263	560754.756	5.91	4/22/2005
BUIS	WL-03	VET_T1_36	4230469.686	560753.971	5.94	4/22/2005
BUIS	WL-03	VET_T1_39	4230475.151	560753.343	5.92	4/22/2005
BUIS	WL-03	VET_T1_42	4230480.469	560752.281	5.87	4/22/2005
BUIS	WL-03	VET_T1_45	4230485.252	560751.613	5.88	4/22/2005
BUIS	WL-03	VET_T1_48	4230489.589	560750.811	5.90	4/22/2005
BUIS	WL-03	VET_T1_51	4230494.173	560750.201	5.90	4/22/2005
BUIS	WL-03	VET_T1_54	4230498.69	560749.573	5.61	4/22/2005
BUIS	WL-03	VET_T1_57	4230503.256	560749.094	5.76	4/22/2005
BUIS	WL-03	VET_T1_60	4230508.27	560748.329	5.80	4/22/2005
BUIS	WL-03	VET_T1_63	4230513.571	560747.582	5.67	4/22/2005
BUIS	WL-03	VET_T1_66	4230518.286	560747.11	5.72	4/22/2005
BUIS	WL-03	VET_T1_69	4230523.986	560747.06	5.75	4/22/2005
BUIS	WL-03	VET_T1_72	4230529.344	560746.294	5.77	4/22/2005
BUIS	WL-03	VET_T1_75	4230534.645	560745.746	5.84	4/22/2005
BUIS	WL-03	VET_T1_78	4230539.796	560745.157	5.91	4/22/2005
BUIS	WL-03	VET_T1_81	4230545.355	560744.594	5.82	4/22/2005
BUIS	WL-03	VET_T1_84	4230550.293	560744.162	6.19	4/22/2005
BUIS	WL-03	VET_T1_87	4230555.95	560743.187	6.07	4/22/2005
BUIS	WL-03	VET_T1_90	4230560.821	560742.269	6.19	4/22/2005
BUIS	WL-03	VET_T1_93	4230566.533	560741.792	6.11	4/22/2005
BUIS	WL-03	VET_T1_96	4230570.782	560741.759	6.09	4/22/2005
BUIS	WL-03	VET_T1_99	4230571.815	560741.674	6.06	4/22/2005
BUIS	WL-03	VET_T2_134	4230583.468	560827.636	6.62	4/22/2005
BUIS	WL-03	VET_T2_140	4230577.366	560824.102	6.82	4/22/2005
BUIS	WL-03	VET_T2_143	4230574.01	560822.572	5.69	4/22/2005
BUIS	WL-03	VET_T2_146	4230566.966	560818.129	6.32	4/22/2005
BUIS	WL-03	VET_T2_152	4230561.86	560814.308	6.51	4/22/2005
BUIS	WL-03	VET_T2_155	4230556.225	560810.709	6.49	4/22/2005
BUIS	WL-03	VET_T2_157	4230550.717	560807.257	6.57	4/22/2005
BUIS	WL-03	VET_T2_159	4230548.656	560805.755	5.60	4/22/2005
BUIS	WL-03	VET_T2_163	4230546.791	560803.6	5.00	4/22/2005
BUIS	WL-03	VET_T2_166	4230546.264	560802.931	6.63	4/22/2005
BUIS	WL-03	VET_T2_169	4230540.527	560798.809	6.48	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-03	VET_T2_172	4230534.882	560795.159	6.36	4/22/2005
BUIS	WL-03	VET_T2_175	4230529.817	560791.733	6.35	4/22/2005
BUIS	WL-03	VET_T2_178	4230524.891	560788.49	6.28	4/22/2005
BUIS	WL-03	VET_T2_180	4230519.965	560784.608	6.40	4/22/2005
BUIS	WL-03	VET_T2_182	4230513.443	560779.555	6.29	4/22/2005
BUIS	WL-03	VET_T2_186	4230508.218	560775.44	6.46	4/22/2005
BUIS	WL-03	VET_T2_189	4230503.448	560773.121	6.41	4/22/2005
BUIS	WL-03	VET_T2_192	4230498.27	560769.277	6.45	4/22/2005
BUIS	WL-03	VET_T2_195	4230493.073	560766.344	6.49	4/22/2005
BUIS	WL-03	VET_T2_198	4230487.419	560763.444	6.52	4/22/2005
BUIS	WL-03	VET_T2_199	4230481.85	560759.584	6.40	4/22/2005
BUIS	WL-03	VET_T2_202	4230475.849	560757.564	6.38	4/22/2005
BUIS	WL-03	VET_T2_205	4230469.554	560756.319	6.40	4/22/2005
BUIS	WL-03	VET_T2_208	4230463.023	560755.838	6.35	4/22/2005
BUIS	WL-03	VET_T2_211	4230456.549	560754.159	6.47	4/22/2005
BUIS	WL-03	VET_T3_100	4230443.372	560752.385	6.43	4/22/2005
BUIS	WL-03	VET_T3_102	4230451.01	560754.771	6.46	4/22/2005
BUIS	WL-03	VET_T3_103	4230454.275	560755.529	6.47	4/22/2005
BUIS	WL-03	VET_T3_31	4230333.723	560719.239	6.80	4/22/2005
BUIS	WL-03	VET_T3_34	4230338.652	560720.988	6.58	4/22/2005
BUIS	WL-03	VET_T3_37	4230343.803	560722.51	6.52	4/22/2005
BUIS	WL-03	VET_T3_40	4230349.414	560723.104	6.69	4/22/2005
BUIS	WL-03	VET_T3_43	4230354.721	560724.481	6.75	4/22/2005
BUIS	WL-03	VET_T3_46	4230360.719	560727.841	6.69	4/22/2005
BUIS	WL-03	VET_T3_49	4230366.163	560729.635	6.78	4/22/2005
BUIS	WL-03	VET_T3_52	4230370.708	560730.799	6.74	4/22/2005
BUIS	WL-03	VET_T3_55	4230374.752	560731.661	6.73	4/22/2005
BUIS	WL-03	VET_T3_58	4230379.748	560733.102	6.58	4/22/2005
BUIS	WL-03	VET_T3_61	4230385.503	560734.709	6.56	4/22/2005
BUIS	WL-03	VET_T3_64	4230390.575	560736.222	6.48	4/22/2005
BUIS	WL-03	VET_T3_67	4230395.689	560738.503	6.59	4/22/2005
BUIS	WL-03	VET_T3_70	4230399.673	560740.256	6.50	4/22/2005
BUIS	WL-03	VET_T3_73	4230404.669	560742.094	6.46	4/22/2005
BUIS	WL-03	VET_T3_76	4230409.871	560743.423	6.44	4/22/2005
BUIS	WL-03	VET_T3_79	4230414.797	560744.64	6.46	4/22/2005
BUIS	WL-03	VET_T3_82	4230419.662	560744.987	6.40	4/22/2005
BUIS	WL-03	VET_T3_85	4230423.594	560746.261	6.39	4/22/2005
BUIS	WL-03	VET_T3_88	4230427.3	560747.117	6.34	4/22/2005
BUIS	WL-03	VET_T3_91	4230431.275	560748.508	6.36	4/22/2005
BUIS	WL-03	VET_T3_94	4230435.551	560749.888	6.38	4/22/2005
BUIS	WL-03	VET_T3_97	4230440.059	560751.288	6.37	4/22/2005
BUIS	WL-03	VET_T4_105	4230451.931	560751.113	6.41	4/22/2005
BUIS	WL-03	VET_T4_107	4230447.313	560746.256	6.43	4/22/2005
BUIS	WL-03	VET_T4_109	4230443.098	560743.041	6.56	4/22/2005
BUIS	WL-03	VET_T4_111	4230437.986	560739.475	6.43	4/22/2005
BUIS	WL-03	VET_T4_114	4230443.765	560735.582	6.40	4/22/2005
BUIS	WL-03	VET_T4_116	4230446.704	560737.855	6.39	4/22/2005
BUIS	WL-03	VET_T4_118	4230434.054	560737.593	6.28	4/22/2005
BUIS	WL-03	VET_T4_120	4230429.717	560734.388	6.33	4/22/2005
BUIS	WL-03	VET_T4_122	4230424.935	560731.307	6.33	4/22/2005
BUIS	WL-03	VET_T4_124	4230420.765	560728.333	6.29	4/22/2005
BUIS	WL-03	VET_T4_126	4230416.632	560725.261	6.38	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-03	VET_T4_128	4230412.106	560722.22	6.43	4/22/2005
BUIS	WL-03	VET_T4_130	4230407.57	560719.091	6.42	4/22/2005
BUIS	WL-03	VET_T4_132	4230407.729	560715.805	6.52	4/22/2005
BUIS	WL-03	VET_T4_135	4230408.978	560711.882	6.56	4/22/2005
BUIS	WL-03	VET_T4_138	4230418.427	560704.764	6.48	4/22/2005
BUIS	WL-03	VET_T4_141	4230402.965	560715.088	6.49	4/22/2005
BUIS	WL-03	VET_T4_144	4230398.204	560712.19	6.49	4/22/2005
BUIS	WL-03	VET_T4_147	4230393.479	560709.197	6.55	4/22/2005
BUIS	WL-03	VET_T4_150	4230390.529	560710.161	6.65	4/22/2005
BUIS	WL-03	VET_T4_153	4230386.487	560711.515	6.70	4/22/2005
BUIS	WL-03	VET_T4_156	4230378.264	560711.58	6.92	4/22/2005
BUIS	WL-03	VET_T4_158	4230382.714	560707.372	6.73	4/22/2005
BUIS	WL-03	VET_T4_161	4230388.307	560706.169	6.60	4/22/2005
BUIS	WL-03	VET_T4_164	4230383.25	560702.383	6.61	4/22/2005
BUIS	WL-03	VET_T4_167	4230381.507	560701.579	6.77	4/22/2005
BUIS	WL-03	VET_T4_170	4230379.017	560699.225	6.72	4/22/2005
BUIS	WL-03	VET_T4_173	4230376.609	560698.156	6.78	4/22/2005
BUIS	WL-03	VET_T4_176	4230374.143	560696.697	6.83	4/22/2005
BUIS	WL-03	VET_T4_184	4230374.472	560692.104	6.73	4/22/2005
BUIS	WL-03	VET_T4_187	4230369.269	560688.472	6.65	4/22/2005
BUIS	WL-03	VET_T4_190	4230364.02	560685.393	6.72	4/22/2005
BUIS	WL-03	VET_T4_193	4230358.939	560680.225	6.63	4/22/2005
BUIS	WL-03	VET_T4_196	4230353.151	560675.735	6.55	4/22/2005
BUIS	WL-03	VET_T5_200	4230433.369	560631.531	6.35	4/22/2005
BUIS	WL-03	VET_T5_203	4230432.262	560627.864	6.45	4/22/2005
BUIS	WL-03	VET_T5_206	4230430.915	560623.063	6.36	4/22/2005
BUIS	WL-03	VET_T5_209	4230435.039	560634.429	6.36	4/22/2005
BUIS	WL-03	VET_T5_212	4230435.828	560638.68	6.31	4/22/2005
BUIS	WL-03	VET_T6_215	4230482.807	560667.068	6.36	4/22/2005
BUIS	WL-03	VET_T6_217	4230480.89	560671.396	6.32	4/22/2005
BUIS	WL-03	VET_T6_219	4230479.08	560673.68	6.35	4/22/2005
BUIS	WL-03	VET_T6_221	4230477.51	560677.105	6.31	4/22/2005
BUIS	WL-03	VET_T6_223	4230475.843	560679.866	6.31	4/22/2005
BUIS	WL-03	VET_T6_225	4230475.001	560682.279	6.33	4/22/2005
BUIS	WL-03	VET_T6_226	4230473.124	560687.194	6.35	4/22/2005
BUIS	WL-03	VET_T6_227	4230470.932	560691.436	6.39	4/22/2005
BUIS	WL-03	VET_T6_228	4230469.192	560695.726	6.46	4/22/2005
BUIS	WL-03	VET_T6_229	4230466.589	560700.192	6.54	4/22/2005
BUIS	WL-03	VET_T6_230	4230463.001	560709.986	6.35	4/22/2005
BUIS	WL-03	VET_T6_231	4230460.846	560715.575	6.30	4/22/2005
BUIS	WL-03	VET_T6_232	4230459.082	560720.578	6.30	4/22/2005
BUIS	WL-03	VET_T6_233	4230458.121	560724.245	6.32	4/22/2005
BUIS	WL-03	VET_T6_234	4230456.372	560728.82	6.35	4/22/2005
BUIS	WL-03	VET_T6_235	4230454.263	560734.125	6.36	4/22/2005
BUIS	WL-03	VET_T6_236	4230454.122	560738.315	6.35	4/22/2005
BUIS	WL-03	VET_T6_237	4230454.055	560740.869	6.41	4/22/2005
BUIS	WL-03	VET_T6_238	4230453.05	560745.57	6.38	4/22/2005
BUIS	WL-03	VET_T6_239	4230451.955	560750.035	6.46	4/22/2005
BUIS	WL-03	VET_T7_27	4230373.759	560820.929	6.27	4/22/2005
BUIS	WL-03	VET_T7_32	4230361.548	560819.516	6.28	4/22/2005
BUIS	WL-03	VET_T7_35	4230365.52	560816.89	6.40	4/22/2005
BUIS	WL-03	VET_T7_38	4230369.888	560815.205	6.44	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-03	VET_T7_41	4230372.853	560811.357	6.34	4/22/2005
BUIS	WL-03	VET_T7_44	4230376.618	560808.763	6.32	4/22/2005
BUIS	WL-03	VET_T7_47	4230380.041	560806.063	6.35	4/22/2005
BUIS	WL-03	VET_T7_50	4230384.21	560803.391	6.35	4/22/2005
BUIS	WL-03	VET_T7_53	4230388.072	560800.914	6.37	4/22/2005
BUIS	WL-03	VET_T7_56	4230392.489	560797.936	6.41	4/22/2005
BUIS	WL-03	VET_T7_59	4230396.805	560795.091	6.28	4/22/2005
BUIS	WL-03	VET_T7_62	4230400.889	560792.867	6.44	4/22/2005
BUIS	WL-03	VET_T7_65	4230405.117	560789.788	6.44	4/22/2005
BUIS	WL-03	VET_T7_68	4230409.393	560787.148	6.35	4/22/2005
BUIS	WL-03	VET_T7_71	4230413.578	560784.315	6.21	4/22/2005
BUIS	WL-03	VET_T7_74	4230417.36	560781.525	6.32	4/22/2005
BUIS	WL-03	VET_T7_77	4230420.741	560778.14	6.30	4/22/2005
BUIS	WL-03	VET_T7_80	4230424.072	560775.261	6.20	4/22/2005
BUIS	WL-03	VET_T7_83	4230427.519	560772.154	6.26	4/22/2005
BUIS	WL-03	VET_T7_86	4230431.464	560769.229	6.36	4/22/2005
BUIS	WL-03	VET_T7_89	4230435.2	560765.954	6.30	4/22/2005
BUIS	WL-03	VET_T7_92	4230439.239	560762.493	6.45	4/22/2005
BUIS	WL-03	VET_T7_95	4230442.613	560759.517	6.49	4/22/2005
BUIS	WL-03	VET_T7_98	4230445.009	560757.114	6.51	4/22/2005
BUIS	WL-03	VET_T8_101	4230449.072	560758.156	6.67	4/22/2005
BUIS	WL-03	VET_T8_104	4230451.157	560762.888	6.44	4/22/2005
BUIS	WL-03	VET_T8_106	4230452.931	560767.627	6.31	4/22/2005
BUIS	WL-03	VET_T8_108	4230454.677	560772.584	6.45	4/22/2005
BUIS	WL-03	VET_T8_110	4230454.933	560774.905	6.41	4/22/2005
BUIS	WL-03	VET_T8_112	4230452.553	560778.574	6.47	4/22/2005
BUIS	WL-03	VET_T8_115	4230453.833	560784.499	6.43	4/22/2005
BUIS	WL-03	VET_T8_117	4230454.915	560789.412	6.55	4/22/2005
BUIS	WL-03	VET_T8_119	4230456.073	560794.962	6.49	4/22/2005
BUIS	WL-03	VET_T8_121	4230457.463	560799.78	6.46	4/22/2005
BUIS	WL-03	VET_T8_123	4230458.777	560804.899	6.31	4/22/2005
BUIS	WL-03	VET_T8_125	4230460.883	560808.866	6.27	4/22/2005
BUIS	WL-03	VET_T8_127	4230461.861	560810.886	6.24	4/22/2005
BUIS	WL-03	VET_T8_131	4230463.309	560814.514	6.23	4/22/2005
BUIS	WL-03	VET_T8_133	4230464.601	560817.005	6.21	4/22/2005
BUIS	WL-03	VET_T8_136	4230468.924	560819.285	6.23	4/22/2005
BUIS	WL-03	VET_T8_139	4230471.441	560820.31	6.30	4/22/2005
BUIS	WL-03	VET_T8_142	4230475.288	560823.176	6.22	4/22/2005
BUIS	WL-03	VET_T8_145	4230477.933	560828.072	6.13	4/22/2005
BUIS	WL-03	VET_T8_148	4230479.131	560834.967	6.11	4/22/2005
BUIS	WL-03	VET_T8_151	4230479.866	560841.347	6.00	4/22/2005
BUIS	WL-03	VET_T8_154	4230483.545	560845.273	6.11	4/22/2005
BUIS	WL-03	VET_T9_160	4230520.795	560822.14	6.21	4/22/2005
BUIS	WL-03	VET_T9_162	4230518.121	560817.365	6.26	4/22/2005
BUIS	WL-03	VET_T9_165	4230516.149	560815.53	6.36	4/22/2005
BUIS	WL-03	VET_T9_168	4230514.951	560815.387	6.04	4/22/2005
BUIS	WL-03	VET_T9_171	4230513.306	560815.32	6.55	4/22/2005
BUIS	WL-03	VET_T9_174	4230512.678	560813.767	6.79	4/22/2005
BUIS	WL-03	VET_T9_177	4230511.507	560812.109	5.64	4/22/2005
BUIS	WL-03	VET_T9_179	4230511.577	560811.315	6.41	4/22/2005
BUIS	WL-03	VET_T9_181	4230509.663	560806.773	6.35	4/22/2005
BUIS	WL-03	VET_T9_183	4230506.752	560802.507	6.37	4/22/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
BUIS	WL-03	VET_T9_185	4230506.542	560801.117	6.34	4/22/2005
BUIS	WL-03	VET_T9_188	4230503.683	560796.481	6.18	4/22/2005
BUIS	WL-03	VET_T9_191	4230501.482	560791.896	6.42	4/22/2005
BUIS	WL-03	VET_T9_194	4230499.477	560785.773	6.26	4/22/2005
BUIS	WL-03	VET_T9_197	4230496.429	560782.009	5.91	4/22/2005
BUIS	WL-03	VET_T9_201	4230496.398	560780.929	6.04	4/22/2005
BUIS	WL-03	VET_T9_204	4230493.167	560776.393	6.21	4/22/2005
BUIS	WL-03	VET_T9_207	4230488.135	560773.789	6.39	4/22/2005
BUIS	WL-03	VET_T9_210	4230483.837	560772.063	6.41	4/22/2005
BUIS	WL-03	VET_T9_213	4230478.683	560769.743	6.38	4/22/2005
BUIS	WL-03	VET_T9_214	4230474.791	560767.368	6.34	4/22/2005
BUIS	WL-03	VET_T9_216	4230469.753	560765.043	6.38	4/22/2005
BUIS	WL-03	VET_T9_218	4230465.665	560762.508	6.41	4/22/2005
BUIS	WL-03	VET_T9_220	4230461.517	560759.737	6.42	4/22/2005
BUIS	WL-03	VET_T9_222	4230460.618	560757.8	6.42	4/22/2005
BUIS	WL-03	VET_T9_224	4230454.802	560758.303	6.48	4/22/2005
COIS	WL-01	VET__84	4227503.787	558771.274	5.74	4/15/2005
COIS	WL-01	VET_T1_100	4227669.376	558813.363	5.74	4/15/2005
COIS	WL-01	VET_T1_25	4227526.759	558856.359	5.76	4/15/2005
COIS	WL-01	VET_T1_28	4227532.56	558855.645	5.79	4/15/2005
COIS	WL-01	VET_T1_31	4227537.555	558854.036	5.70	4/15/2005
COIS	WL-01	VET_T1_34	4227546.072	558851.461	5.79	4/15/2005
COIS	WL-01	VET_T1_37	4227552.738	558848.885	5.78	4/15/2005
COIS	WL-01	VET_T1_40	4227558.468	558846.718	5.69	4/15/2005
COIS	WL-01	VET_T1_43	4227565.747	558844.834	5.92	4/15/2005
COIS	WL-01	VET_T1_46	4227571.19	558843.249	5.96	4/15/2005
COIS	WL-01	VET_T1_49	4227578.332	558840.457	5.85	4/15/2005
COIS	WL-01	VET_T1_52	4227584.888	558838.439	5.77	4/15/2005
COIS	WL-01	VET_T1_55	4227591.383	558836.406	5.79	4/15/2005
COIS	WL-01	VET_T1_58	4227596.641	558834.483	5.61	4/15/2005
COIS	WL-01	VET_T1_61	4227602.899	558832.785	5.81	4/15/2005
COIS	WL-01	VET_T1_64	4227608.827	558831.389	5.94	4/15/2005
COIS	WL-01	VET_T1_67	4227615.167	558829.411	6.00	4/15/2005
COIS	WL-01	VET_T1_70	4227621.552	558827.357	5.96	4/15/2005
COIS	WL-01	VET_T1_73	4227628.502	558825.031	5.95	4/15/2005
COIS	WL-01	VET_T1_76	4227635.756	558823.172	5.75	4/15/2005
COIS	WL-01	VET_T1_79	4227641.733	558821.471	5.88	4/15/2005
COIS	WL-01	VET_T1_82	4227647.573	558819.932	5.91	4/15/2005
COIS	WL-01	VET_T1_85	4227654.072	558817.914	5.82	4/15/2005
COIS	WL-01	VET_T1_88	4227659.936	558816.491	6.20	4/15/2005
COIS	WL-01	VET_T1_91	4227665.047	558814.369	6.25	4/15/2005
COIS	WL-01	VET_T1_94	4227666.767	558813.897	5.76	4/15/2005
COIS	WL-01	VET_T1_97	4227668.068	558813.741	3.54	4/15/2005
COIS	WL-01	VET_T2_103	4227662.579	558861.303	5.78	4/15/2005
COIS	WL-01	VET_T2_106	4227656.528	558861.05	5.70	4/15/2005
COIS	WL-01	VET_T2_109	4227649.225	558860.598	5.54	4/15/2005
COIS	WL-01	VET_T2_112	4227643.01	558860.44	5.54	4/15/2005
COIS	WL-01	VET_T2_115	4227638.359	558859.998	5.03	4/15/2005
COIS	WL-01	VET_T2_118	4227631.766	558859.596	5.59	4/15/2005
COIS	WL-01	VET_T2_121	4227626.167	558859.251	5.45	4/15/2005
COIS	WL-01	VET_T2_124	4227620.376	558859.239	5.57	4/15/2005
COIS	WL-01	VET_T2_126	4227614.158	558858.977	5.65	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-01	VET_T2_128	4227604.831	558858.093	5.92	4/15/2005
COIS	WL-01	VET_T2_130	4227598.863	558857.3	6.12	4/15/2005
COIS	WL-01	VET_T2_133	4227590.094	558865.036	6.10	4/15/2005
COIS	WL-01	VET_T2_135	4227588.418	558865.686	5.94	4/15/2005
COIS	WL-01	VET_T2_137	4227589.39	558867.283	6.09	4/15/2005
COIS	WL-01	VET_T2_139	4227593.032	558855.395	5.97	4/15/2005
COIS	WL-01	VET_T2_141	4227586.531	558855.03	5.83	4/15/2005
COIS	WL-01	VET_T2_143	4227579.167	558854.944	5.92	4/15/2005
COIS	WL-01	VET_T2_145	4227572.693	558854.755	5.79	4/15/2005
COIS	WL-01	VET_T2_148	4227566.067	558854.774	5.78	4/15/2005
COIS	WL-01	VET_T2_151	4227560.641	558854.853	5.79	4/15/2005
COIS	WL-01	VET_T2_154	4227554.35	558855.335	5.73	4/15/2005
COIS	WL-01	VET_T2_157	4227548.294	558855.569	5.71	4/15/2005
COIS	WL-01	VET_T2_159	4227542.917	558855.822	5.49	4/15/2005
COIS	WL-01	VET_T2_163	4227538.33	558855.783	5.68	4/15/2005
COIS	WL-01	VET_T2_165	4227531.097	558857.142	5.74	4/15/2005
COIS	WL-01	VET_T3_102	4227487.532	558753.921	6.20	4/15/2005
COIS	WL-01	VET_T3_105	4227486.2	558750.614	6.04	4/15/2005
COIS	WL-01	VET_T3_108	4227485.764	558749.197	5.65	4/15/2005
COIS	WL-01	VET_T3_111	4227484.243	558745.734	5.27	4/15/2005
COIS	WL-01	VET_T3_114	4227482.667	558741.552	5.26	4/15/2005
COIS	WL-01	VET_T3_117	4227481.045	558736.353	4.98	4/15/2005
COIS	WL-01	VET_T3_120	4227479.71	558732.991	4.52	4/15/2005
COIS	WL-01	VET_T3_123	4227478.388	558729.665	3.52	4/15/2005
COIS	WL-01	VET_T3_24	4227516.302	558851.031	5.77	4/15/2005
COIS	WL-01	VET_T3_27	4227514.769	558845.112	5.86	4/15/2005
COIS	WL-01	VET_T3_30	4227513.214	558839.601	5.93	4/15/2005
COIS	WL-01	VET_T3_33	4227511.852	558834.968	5.89	4/15/2005
COIS	WL-01	VET_T3_36	4227510.511	558829.768	6.05	4/15/2005
COIS	WL-01	VET_T3_39	4227509.727	558825.507	5.94	4/15/2005
COIS	WL-01	VET_T3_42	4227506.38	558823.013	5.91	4/15/2005
COIS	WL-01	VET_T3_45	4227507.853	558819.539	5.96	4/15/2005
COIS	WL-01	VET_T3_48	4227507.027	558816.664	5.84	4/15/2005
COIS	WL-01	VET_T3_51	4227506.057	558813.397	5.97	4/15/2005
COIS	WL-01	VET_T3_54	4227505.457	558811.891	5.53	4/15/2005
COIS	WL-01	VET_T3_57	4227504.985	558807.853	5.88	4/15/2005
COIS	WL-01	VET_T3_60	4227503.899	558804.216	5.56	4/15/2005
COIS	WL-01	VET_T3_63	4227503.293	558803.686	5.04	4/15/2005
COIS	WL-01	VET_T3_66	4227503.631	558801.537	5.28	4/15/2005
COIS	WL-01	VET_T3_69	4227501.443	558797.267	5.70	4/15/2005
COIS	WL-01	VET_T3_72	4227499.644	558791.607	5.79	4/15/2005
COIS	WL-01	VET_T3_75	4227498.255	558786.754	5.82	4/15/2005
COIS	WL-01	VET_T3_78	4227497.276	558781.573	5.98	4/15/2005
COIS	WL-01	VET_T3_81	4227495.972	558775.94	6.13	4/15/2005
COIS	WL-01	VET_T3_87	4227493.545	558770.073	6.09	4/15/2005
COIS	WL-01	VET_T3_90	4227492.457	558767.122	6.06	4/15/2005
COIS	WL-01	VET_T3_93	4227491.32	558763.833	6.07	4/15/2005
COIS	WL-01	VET_T3_96	4227489.927	558760.249	5.72	4/15/2005
COIS	WL-01	VET_T3_99	4227487.891	558755.96	5.93	4/15/2005
COIS	WL-01	VET_T4_144	4227409.067	558818.454	6.11	4/15/2005
COIS	WL-01	VET_T4_147	4227413.514	558820.849	6.23	4/15/2005
COIS	WL-01	VET_T4_150	4227416.37	558823.245	6.01	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-01	VET_T4_153	4227421.926	558824.291	6.19	4/15/2005
COIS	WL-01	VET_T4_156	4227427.184	558825.677	5.90	4/15/2005
COIS	WL-01	VET_T4_158	4227427.739	558826.153	5.62	4/15/2005
COIS	WL-01	VET_T4_161	4227432.369	558827.378	5.93	4/15/2005
COIS	WL-01	VET_T4_164	4227437.828	558829.167	5.95	4/15/2005
COIS	WL-01	VET_T4_167	4227442.997	558830.661	6.01	4/15/2005
COIS	WL-01	VET_T4_169	4227448.822	558833.108	5.87	4/15/2005
COIS	WL-01	VET_T4_171	4227453.104	558834.587	5.80	4/15/2005
COIS	WL-01	VET_T4_173	4227457.759	558836.589	5.98	4/15/2005
COIS	WL-01	VET_T4_175	4227461.258	558838.723	5.98	4/15/2005
COIS	WL-01	VET_T4_177	4227466.119	558840.747	5.99	4/15/2005
COIS	WL-01	VET_T4_179	4227471.045	558842.176	5.91	4/15/2005
COIS	WL-01	VET_T4_181	4227475.391	558843.734	5.99	4/15/2005
COIS	WL-01	VET_T4_182	4227480.29	558845.712	5.79	4/15/2005
COIS	WL-01	VET_T4_184	4227485.395	558847.282	5.86	4/15/2005
COIS	WL-01	VET_T4_186	4227487.462	558847.934	5.92	4/15/2005
COIS	WL-01	VET_T4_188	4227490.086	558848.516	5.86	4/15/2005
COIS	WL-01	VET_T4_190	4227495.17	558850.01	5.62	4/15/2005
COIS	WL-01	VET_T4_192	4227499.446	558850.625	5.73	4/15/2005
COIS	WL-01	VET_T4_194	4227503.75	558852.21	5.65	4/15/2005
COIS	WL-01	VET_T4_196	4227508.036	558854.384	5.88	4/15/2005
COIS	WL-01	VET_T4_198	4227512.809	558856.365	5.70	4/15/2005
COIS	WL-01	VET_T4_200	4227517.225	558856.98	5.67	4/15/2005
COIS	WL-01	VET_T5_12	4227372.808	558919.269	6.07	4/15/2005
COIS	WL-01	VET_T5_13	4227377.941	558917.261	6.06	4/15/2005
COIS	WL-01	VET_T5_14	4227382.58	558915.554	5.85	4/15/2005
COIS	WL-01	VET_T5_15	4227387.444	558913.426	5.75	4/15/2005
COIS	WL-01	VET_T5_16	4227391.757	558911.653	5.73	4/15/2005
COIS	WL-01	VET_T5_17	4227396.981	558909.668	5.77	4/15/2005
COIS	WL-01	VET_T5_18	4227401.215	558907.785	5.77	4/15/2005
COIS	WL-01	VET_T5_19	4227405.781	558905.779	5.76	4/15/2005
COIS	WL-01	VET_T5_20	4227410.088	558904.179	5.83	4/15/2005
COIS	WL-01	VET_T5_21	4227415.062	558901.929	5.84	4/15/2005
COIS	WL-01	VET_T5_23	4227419.756	558900.076	5.88	4/15/2005
COIS	WL-01	VET_T5_26	4227424.042	558897.9	5.75	4/15/2005
COIS	WL-01	VET_T5_29	4227428.775	558896.059	5.88	4/15/2005
COIS	WL-01	VET_T5_32	4227433.445	558894.13	5.86	4/15/2005
COIS	WL-01	VET_T5_35	4227438.434	558892.185	5.86	4/15/2005
COIS	WL-01	VET_T5_38	4227443.339	558890.423	5.94	4/15/2005
COIS	WL-01	VET_T5_41	4227446.521	558889.006	6.11	4/15/2005
COIS	WL-01	VET_T5_44	4227449.447	558887.866	5.71	4/15/2005
COIS	WL-01	VET_T5_47	4227449.959	558887.305	3.54	4/15/2005
COIS	WL-01	VET_T5_50	4227450.879	558886.671	6.01	4/15/2005
COIS	WL-01	VET_T5_53	4227453.51	558885.635	6.04	4/15/2005
COIS	WL-01	VET_T5_56	4227455.482	558884.644	5.97	4/15/2005
COIS	WL-01	VET_T5_59	4227460.362	558882.517	5.87	4/15/2005
COIS	WL-01	VET_T5_62	4227465.29	558880.657	5.87	4/15/2005
COIS	WL-01	VET_T5_65	4227469.966	558878.768	5.96	4/15/2005
COIS	WL-01	VET_T5_68	4227471.207	558878.39	6.06	4/15/2005
COIS	WL-01	VET_T5_71	4227475.809	558876.582	5.93	4/15/2005
COIS	WL-01	VET_T5_74	4227480.661	558874.424	5.99	4/15/2005
COIS	WL-01	VET_T5_77	4227485.188	558872.653	6.06	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-01	VET_T5_80	4227489.9	558871.029	5.88	4/15/2005
COIS	WL-01	VET_T5_83	4227492.524	558869.047	6.03	4/15/2005
COIS	WL-01	VET_T5_86	4227497.27	558867.179	5.98	4/15/2005
COIS	WL-01	VET_T5_89	4227500.641	558865.804	5.95	4/15/2005
COIS	WL-01	VET_T5_92	4227501.854	558865.326	5.17	4/15/2005
COIS	WL-01	VET_T5_95	4227506.201	558863.546	5.73	4/15/2005
COIS	WL-01	VET_T6_101	4227521.27	558869.651	5.81	4/15/2005
COIS	WL-01	VET_T6_104	4227522.492	558874.034	5.61	4/15/2005
COIS	WL-01	VET_T6_107	4227524.544	558877.75	5.64	4/15/2005
COIS	WL-01	VET_T6_110	4227524.669	558879.347	5.75	4/15/2005
COIS	WL-01	VET_T6_113	4227525.367	558883.522	5.75	4/15/2005
COIS	WL-01	VET_T6_116	4227526.141	558888.832	5.79	4/15/2005
COIS	WL-01	VET_T6_119	4227527.305	558893.864	5.52	4/15/2005
COIS	WL-01	VET_T6_122	4227528.789	558899.18	5.67	4/15/2005
COIS	WL-01	VET_T6_125	4227528.747	558900.384	5.70	4/15/2005
COIS	WL-01	VET_T6_127	4227530.259	558905.584	5.83	4/15/2005
COIS	WL-01	VET_T6_129	4227531.307	558910.336	5.82	4/15/2005
COIS	WL-01	VET_T6_131	4227532.843	558915.53	5.64	4/15/2005
COIS	WL-01	VET_T6_132	4227535.443	558920.992	5.70	4/15/2005
COIS	WL-01	VET_T6_134	4227537.132	558926.164	5.78	4/15/2005
COIS	WL-01	VET_T6_136	4227538.607	558930.91	5.68	4/15/2005
COIS	WL-01	VET_T6_138	4227538.881	558932.397	5.65	4/15/2005
COIS	WL-01	VET_T6_140	4227539.994	558937.972	5.75	4/15/2005
COIS	WL-01	VET_T6_142	4227540.43	558941.919	5.77	4/15/2005
COIS	WL-01	VET_T6_146	4227540.445	558944.041	5.81	4/15/2005
COIS	WL-01	VET_T6_149	4227541.268	558947.052	5.79	4/15/2005
COIS	WL-01	VET_T6_152	4227543.005	558950.783	5.91	4/15/2005
COIS	WL-01	VET_T6_155	4227544.313	558952.578	5.34	4/15/2005
COIS	WL-01	VET_T6_162	4227546.834	558955.343	5.52	4/15/2005
COIS	WL-01	VET_T6_98	4227519.359	558865.917	5.81	4/15/2005
COIS	WL-01	VET_T7_166	4227518.384	558951.786	5.74	4/15/2005
COIS	WL-01	VET_T7_168	4227518.737	558946.311	5.63	4/15/2005
COIS	WL-01	VET_T7_170	4227518.487	558943.91	5.68	4/15/2005
COIS	WL-01	VET_T7_172	4227517.92	558938.393	5.84	4/15/2005
COIS	WL-01	VET_T7_174	4227517.823	558933.437	5.91	4/15/2005
COIS	WL-01	VET_T7_176	4227518.262	558929.456	5.67	4/15/2005
COIS	WL-01	VET_T7_178	4227518.765	558925.076	5.63	4/15/2005
COIS	WL-01	VET_T7_180	4227519.557	558924.917	3.18	4/15/2005
COIS	WL-01	VET_T7_183	4227515.628	558913.835	5.65	4/15/2005
COIS	WL-01	VET_T7_185	4227516.064	558909.19	5.42	4/15/2005
COIS	WL-01	VET_T7_187	4227516.576	558904.033	5.33	4/15/2005
COIS	WL-01	VET_T7_189	4227517.149	558898.955	5.59	4/15/2005
COIS	WL-01	VET_T7_191	4227517.643	558893.09	5.73	4/15/2005
COIS	WL-01	VET_T7_193	4227517.792	558889.055	5.60	4/15/2005
COIS	WL-01	VET_T7_195	4227517.222	558885.296	5.44	4/15/2005
COIS	WL-01	VET_T7_197	4227517.381	558880.59	5.43	4/15/2005
COIS	WL-01	VET_T7_199	4227517.335	558875.369	5.86	4/15/2005
COIS	WL-01	VET_T7_201	4227518.475	558870.718	5.68	4/15/2005
COIS	WL-02	VET__219	4227014.512	559365.549	7.29	4/15/2005
COIS	WL-02	VET__260	4227055.032	559462.141	7.05	4/15/2005
COIS	WL-02	VET__263	4227056.568	559462.403	7.31	4/15/2005
COIS	WL-02	VET__266	4227056.214	559463.857	7.00	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET__269	4227054.578	559463.689	6.98	4/15/2005
COIS	WL-02	VET__301	4227150.767	559497.348	6.94	4/15/2005
COIS	WL-02	VET__305	4227157.021	559505.038	6.96	4/15/2005
COIS	WL-02	VET__320	4227104.992	559526.987	6.90	4/15/2005
COIS	WL-02	VET__323	4227104.952	559525.439	6.94	4/15/2005
COIS	WL-02	VET__326	4227103.209	559525.393	6.89	4/15/2005
COIS	WL-02	VET__329	4227103.465	559526.902	6.91	4/15/2005
COIS	WL-02	VET__340	4227016.023	559527.694	6.90	4/15/2005
COIS	WL-02	VET__343	4227014.499	559528.209	6.90	4/15/2005
COIS	WL-02	VET__346	4227015.261	559529.752	6.92	4/15/2005
COIS	WL-02	VET__380	4226957.2	559515.097	6.93	4/15/2005
COIS	WL-02	VET__383	4226957.136	559513.5	6.76	4/15/2005
COIS	WL-02	VET__386	4226958.727	559513.411	6.88	4/15/2005
COIS	WL-02	VET__389	4226958.864	559515.106	6.80	4/15/2005
COIS	WL-02	VET__391	4227125.182	559476.829	6.77	4/15/2005
COIS	WL-02	VET__394	4227125.169	559475.174	6.75	4/15/2005
COIS	WL-02	VET__397	4227123.591	559475.22	6.74	4/15/2005
COIS	WL-02	VET__400	4227123.603	559476.725	6.80	4/15/2005
COIS	WL-02	VET__413	4226919.975	559523.832	6.82	4/15/2005
COIS	WL-02	VET__416	4226915.488	559533.196	6.88	4/15/2005
COIS	WL-02	VET__419	4226912.486	559535.72	6.83	4/15/2005
COIS	WL-02	VET__424	4226930.993	559495.803	6.40	4/15/2005
COIS	WL-02	VET__427	4226930.048	559494.203	6.81	4/15/2005
COIS	WL-02	VET__430	4226931.542	559493.465	6.84	4/15/2005
COIS	WL-02	VET__432	4227189.348	559465.103	6.77	4/15/2005
COIS	WL-02	VET__433	4226932.316	559495.065	6.62	4/15/2005
COIS	WL-02	VET__435	4227189.092	559463.503	6.88	4/15/2005
COIS	WL-02	VET__438	4227187.489	559463.954	6.77	4/15/2005
COIS	WL-02	VET__441	4227187.574	559465.71	6.65	4/15/2005
COIS	WL-02	VET__457	4227106.406	559379.549	6.62	4/15/2005
COIS	WL-02	VET__460	4227104.918	559379.537	6.79	4/15/2005
COIS	WL-02	VET__463	4227104.949	559381.009	6.64	4/15/2005
COIS	WL-02	VET__466	4227106.339	559381.125	6.67	4/15/2005
COIS	WL-02	VET__471	4227068.906	559399.647	6.75	4/15/2005
COIS	WL-02	VET__474	4227067.474	559399.352	6.84	4/15/2005
COIS	WL-02	VET__477	4227067.574	559401.144	6.75	4/15/2005
COIS	WL-02	VET__480	4227069.007	559400.912	6.85	4/15/2005
COIS	WL-02	VET_T1_223	4227023.829	559395.051	6.96	4/15/2005
COIS	WL-02	VET_T1_227	4227026.655	559402.01	7.10	4/15/2005
COIS	WL-02	VET_T1_230	4227025.606	559409.745	7.09	4/15/2005
COIS	WL-02	VET_T1_232	4227027.959	559416.155	6.98	4/15/2005
COIS	WL-02	VET_T1_235	4227029.666	559424.175	6.83	4/15/2005
COIS	WL-02	VET_T1_239	4227031.763	559429.484	6.97	4/15/2005
COIS	WL-02	VET_T1_241	4227034.54	559435.797	6.97	4/15/2005
COIS	WL-02	VET_T1_245	4227035.701	559441.856	7.15	4/15/2005
COIS	WL-02	VET_T1_248	4227037.929	559447.952	6.99	4/15/2005
COIS	WL-02	VET_T1_251	4227040.054	559454.417	7.00	4/15/2005
COIS	WL-02	VET_T1_254	4227041.404	559458.791	7.02	4/15/2005
COIS	WL-02	VET_T1_257	4227042.59	559463.421	7.03	4/15/2005
COIS	WL-02	VET_T1_272	4227043.821	559469.27	6.96	4/15/2005
COIS	WL-02	VET_T1_275	4227045.851	559475.217	6.98	4/15/2005
COIS	WL-02	VET_T1_278	4227047.555	559481.243	7.02	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET_T1_281	4227049.161	559487.375	7.06	4/15/2005
COIS	WL-02	VET_T1_284	4227050.545	559493.328	7.03	4/15/2005
COIS	WL-02	VET_T1_287	4227051.673	559499.028	7.00	4/15/2005
COIS	WL-02	VET_T1_290	4227053.02	559504.148	6.97	4/15/2005
COIS	WL-02	VET_T1_293	4227054.62	559510.001	7.02	4/15/2005
COIS	WL-02	VET_T1_296	4227055.355	559514.963	6.93	4/15/2005
COIS	WL-02	VET_T1_300	4227056.312	559518.828	6.89	4/15/2005
COIS	WL-02	VET_T1_303	4227058.058	559524.317	6.93	4/15/2005
COIS	WL-02	VET_T1_306	4227059.47	559529.895	6.89	4/15/2005
COIS	WL-02	VET_T1_308	4227059.451	559534.04	6.92	4/15/2005
COIS	WL-02	VET_T10_487	4227110.161	559395.828	6.68	4/15/2005
COIS	WL-02	VET_T10_490	4227107.902	559401.632	6.84	4/15/2005
COIS	WL-02	VET_T10_493	4227105.921	559407.085	6.97	4/15/2005
COIS	WL-02	VET_T10_496	4227103.138	559413.863	6.96	4/15/2005
COIS	WL-02	VET_T10_499	4227100.788	559419.917	6.95	4/15/2005
COIS	WL-02	VET_T10_502	4227098.188	559426.683	6.92	4/15/2005
COIS	WL-02	VET_T10_505	4227096.034	559432.362	6.97	4/15/2005
COIS	WL-02	VET_T10_508	4227093.315	559438.784	7.06	4/15/2005
COIS	WL-02	VET_T10_511	4227090.989	559445.029	7.08	4/15/2005
COIS	WL-02	VET_T10_512	4227089.462	559450.293	7.01	4/15/2005
COIS	WL-02	VET_T10_513	4227087.67	559455.898	7.08	4/15/2005
COIS	WL-02	VET_T10_514	4227086.067	559461.144	7.08	4/15/2005
COIS	WL-02	VET_T10_515	4227083.963	559467.478	7.18	4/15/2005
COIS	WL-02	VET_T10_516	4227082.135	559473.473	6.96	4/15/2005
COIS	WL-02	VET_T10_517	4227079.971	559479.731	6.98	4/15/2005
COIS	WL-02	VET_T10_518	4227078.13	559485.894	6.90	4/15/2005
COIS	WL-02	VET_T10_519	4227075.962	559491.469	6.88	4/15/2005
COIS	WL-02	VET_T10_520	4227073.78	559496.995	6.84	4/15/2005
COIS	WL-02	VET_T10_521	4227072.283	559502.518	7.02	4/15/2005
COIS	WL-02	VET_T10_522	4227070.141	559509.616	6.95	4/15/2005
COIS	WL-02	VET_T10_523	4227068.522	559515.091	6.90	4/15/2005
COIS	WL-02	VET_T10_524	4227066.824	559521.248	6.85	4/15/2005
COIS	WL-02	VET_T10_525	4227065.361	559527.712	6.86	4/15/2005
COIS	WL-02	VET_T10_526	4227064.182	559532.501	6.91	4/15/2005
COIS	WL-02	VET_T10_527	4227062.984	559537.237	6.98	4/15/2005
COIS	WL-02	VET_T2_315	4227055.093	559540.612	6.96	4/15/2005
COIS	WL-02	VET_T2_319	4227048.28	559540.365	6.96	4/15/2005
COIS	WL-02	VET_T2_322	4227043.065	559539.551	6.92	4/15/2005
COIS	WL-02	VET_T2_325	4227036.93	559535.585	6.98	4/15/2005
COIS	WL-02	VET_T2_328	4227031.8	559533.126	6.87	4/15/2005
COIS	WL-02	VET_T2_331	4227026.734	559531.108	7.02	4/15/2005
COIS	WL-02	VET_T2_334	4227020.693	559529.538	6.96	4/15/2005
COIS	WL-02	VET_T2_337	4227016.511	559529.243	6.87	4/15/2005
COIS	WL-02	VET_T2_349	4227009.778	559528.545	6.81	4/15/2005
COIS	WL-02	VET_T2_352	4227003.048	559527.514	6.87	4/15/2005
COIS	WL-02	VET_T2_356	4226997.504	559527.216	6.87	4/15/2005
COIS	WL-02	VET_T2_362	4226991.222	559526.679	6.82	4/15/2005
COIS	WL-02	VET_T2_365	4226984.312	559525.475	6.80	4/15/2005
COIS	WL-02	VET_T2_368	4226978.161	559525.725	6.76	4/15/2005
COIS	WL-02	VET_T2_371	4226972.528	559525.247	6.82	4/15/2005
COIS	WL-02	VET_T2_374	4226966.237	559524.326	6.84	4/15/2005
COIS	WL-02	VET_T2_377	4226960.443	559525.527	6.76	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET_T2_392	4226953.935	559524.683	6.80	4/15/2005
COIS	WL-02	VET_T2_395	4226947.477	559524.421	6.82	4/15/2005
COIS	WL-02	VET_T2_398	4226941.076	559523.665	6.75	4/15/2005
COIS	WL-02	VET_T2_401	4226933.642	559522.293	6.82	4/15/2005
COIS	WL-02	VET_T2_404	4226927.47	559522.555	6.63	4/15/2005
COIS	WL-02	VET_T2_407	4226926.141	559521.485	6.38	4/15/2005
COIS	WL-02	VET_T2_410	4226921.736	559522.424	6.81	4/15/2005
COIS	WL-02	VET_T3_436	4226957.343	559461.763	7.26	4/15/2005
COIS	WL-02	VET_T3_439	4226959.379	559463.82	7.19	4/15/2005
COIS	WL-02	VET_T3_442	4226961.796	559465.954	7.18	4/15/2005
COIS	WL-02	VET_T3_444	4226966.478	559468.855	7.27	4/15/2005
COIS	WL-02	VET_T3_446	4226970.462	559473.178	7.01	4/15/2005
COIS	WL-02	VET_T3_448	4226973.845	559476.384	7.18	4/15/2005
COIS	WL-02	VET_T3_450	4226976.585	559481.069	7.21	4/15/2005
COIS	WL-02	VET_T3_452	4226981.145	559485.174	6.94	4/15/2005
COIS	WL-02	VET_T3_454	4226985.254	559488.317	6.99	4/15/2005
COIS	WL-02	VET_T3_456	4226989.283	559490.045	7.16	4/15/2005
COIS	WL-02	VET_T3_459	4226994.498	559492.237	6.99	4/15/2005
COIS	WL-02	VET_T3_462	4226998.738	559486.68	7.20	4/15/2005
COIS	WL-02	VET_T3_465	4227001.472	559488.774	7.31	4/15/2005
COIS	WL-02	VET_T3_468	4227003.094	559490.304	7.61	4/15/2005
COIS	WL-02	VET_T3_470	4226999.61	559495.169	7.16	4/15/2005
COIS	WL-02	VET_T3_473	4227004.88	559498.711	7.04	4/15/2005
COIS	WL-02	VET_T3_476	4227009.702	559502.304	6.91	4/15/2005
COIS	WL-02	VET_T3_479	4227013.887	559505.227	7.03	4/15/2005
COIS	WL-02	VET_T3_482	4227017.736	559506.965	6.72	4/15/2005
COIS	WL-02	VET_T3_484	4227021.312	559510.159	7.06	4/15/2005
COIS	WL-02	VET_T3_486	4227025.195	559513.707	6.99	4/15/2005
COIS	WL-02	VET_T3_489	4227029.496	559517.026	6.93	4/15/2005
COIS	WL-02	VET_T3_492	4227033.107	559520.211	6.96	4/15/2005
COIS	WL-02	VET_T3_495	4227037.664	559523.549	6.93	4/15/2005
COIS	WL-02	VET_T3_498	4227042.002	559527.173	6.80	4/15/2005
COIS	WL-02	VET_T3_501	4227046.031	559530.477	6.96	4/15/2005
COIS	WL-02	VET_T3_504	4227050.073	559534.034	6.96	4/15/2005
COIS	WL-02	VET_T3_507	4227053.392	559537.487	6.89	4/15/2005
COIS	WL-02	VET_T3_510	4227057.089	559540.593	6.96	4/15/2005
COIS	WL-02	VET_T4_214	4227092.595	559711.69	5.71	4/15/2005
COIS	WL-02	VET_T4_215	4227090.328	559706.932	6.13	4/15/2005
COIS	WL-02	VET_T4_216	4227089.352	559701.025	6.13	4/15/2005
COIS	WL-02	VET_T4_217	4227089.282	559700.976	6.07	4/15/2005
COIS	WL-02	VET_T4_218	4227088.926	559699.187	6.16	4/15/2005
COIS	WL-02	VET_T4_220	4227088.292	559694.137	6.34	4/15/2005
COIS	WL-02	VET_T4_221	4227087.472	559689.211	6.26	4/15/2005
COIS	WL-02	VET_T4_222	4227086.893	559683.722	6.22	4/15/2005
COIS	WL-02	VET_T4_224	4227086.344	559678.385	6.23	4/15/2005
COIS	WL-02	VET_T4_226	4227085.957	559673.48	6.13	4/15/2005
COIS	WL-02	VET_T4_228	4227085.042	559668.076	6.31	4/15/2005
COIS	WL-02	VET_T4_231	4227084.216	559662.41	6.46	4/15/2005
COIS	WL-02	VET_T4_234	4227083.137	559656.503	6.28	4/15/2005
COIS	WL-02	VET_T4_237	4227081.793	559650.965	6.26	4/15/2005
COIS	WL-02	VET_T4_240	4227080.69	559645.28	6.22	4/15/2005
COIS	WL-02	VET_T4_243	4227080.114	559639.733	6.28	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET_T4_246	4227079.583	559634.847	6.21	4/15/2005
COIS	WL-02	VET_T4_249	4227078.608	559629.702	6.16	4/15/2005
COIS	WL-02	VET_T4_252	4227078.328	559626.047	6.17	4/15/2005
COIS	WL-02	VET_T4_255	4227077.566	559621.948	6.14	4/15/2005
COIS	WL-02	VET_T4_258	4227076.804	559617.299	6.17	4/15/2005
COIS	WL-02	VET_T4_261	4227075.792	559612.596	6.17	4/15/2005
COIS	WL-02	VET_T4_264	4227074.792	559606.674	6.27	4/15/2005
COIS	WL-02	VET_T4_267	4227073.689	559601.157	6.38	4/15/2005
COIS	WL-02	VET_T4_270	4227072.454	559595.555	6.43	4/15/2005
COIS	WL-02	VET_T4_273	4227071.363	559590.114	6.47	4/15/2005
COIS	WL-02	VET_T4_276	4227070.333	559584.664	6.52	4/15/2005
COIS	WL-02	VET_T4_279	4227069.135	559578.98	6.52	4/15/2005
COIS	WL-02	VET_T4_282	4227067.882	559573.606	6.45	4/15/2005
COIS	WL-02	VET_T4_285	4227066.794	559568.595	6.54	4/15/2005
COIS	WL-02	VET_T4_288	4227066.072	559563.408	6.70	4/15/2005
COIS	WL-02	VET_T4_291	4227064.999	559558.72	6.74	4/15/2005
COIS	WL-02	VET_T4_294	4227063.716	559553.986	6.80	4/15/2005
COIS	WL-02	VET_T4_297	4227062.274	559548.61	6.83	4/15/2005
COIS	WL-02	VET_T5_299	4227068.004	559549.061	6.75	4/15/2005
COIS	WL-02	VET_T5_302	4227072.652	559551.703	6.76	4/15/2005
COIS	WL-02	VET_T5_304	4227077.139	559554.425	6.71	4/15/2005
COIS	WL-02	VET_T5_307	4227081.894	559557.589	6.69	4/15/2005
COIS	WL-02	VET_T5_311	4227086.411	559561.088	6.65	4/15/2005
COIS	WL-02	VET_T5_313	4227091.172	559564.301	6.65	4/15/2005
COIS	WL-02	VET_T5_316	4227096.04	559567.081	6.58	4/15/2005
COIS	WL-02	VET_T5_318	4227100.636	559570.25	6.61	4/15/2005
COIS	WL-02	VET_T5_321	4227105.318	559573.756	6.56	4/15/2005
COIS	WL-02	VET_T5_324	4227109.862	559577.307	6.46	4/15/2005
COIS	WL-02	VET_T5_327	4227114.657	559580.632	6.29	4/15/2005
COIS	WL-02	VET_T5_330	4227117.281	559586.481	6.14	4/15/2005
COIS	WL-02	VET_T5_332	4227118.647	559590.709	6.22	4/15/2005
COIS	WL-02	VET_T5_335	4227124.215	559591.013	6.33	4/15/2005
COIS	WL-02	VET_T5_338	4227128.013	559593.598	6.31	4/15/2005
COIS	WL-02	VET_T5_341	4227131.357	559598.28	6.27	4/15/2005
COIS	WL-02	VET_T5_344	4227134.679	559602.392	6.15	4/15/2005
COIS	WL-02	VET_T5_347	4227137.136	559605.973	5.74	4/15/2005
COIS	WL-02	VET_T5_350	4227140.102	559609.64	6.17	4/15/2005
COIS	WL-02	VET_T5_353	4227142.817	559613.108	6.03	4/15/2005
COIS	WL-02	VET_T5_355	4227145.366	559616.864	6.06	4/15/2005
COIS	WL-02	VET_T5_358	4227067.385	559543.903	6.79	4/15/2005
COIS	WL-02	VET_T6_360	4227078.343	559544.818	6.68	4/15/2005
COIS	WL-02	VET_T6_363	4227083.921	559545.647	6.73	4/15/2005
COIS	WL-02	VET_T6_366	4227089.636	559546.47	6.74	4/15/2005
COIS	WL-02	VET_T6_369	4227095.488	559547.119	6.66	4/15/2005
COIS	WL-02	VET_T6_372	4227101.538	559547.284	6.72	4/15/2005
COIS	WL-02	VET_T6_375	4227107.592	559547.96	6.68	4/15/2005
COIS	WL-02	VET_T6_378	4227113.176	559548.771	6.48	4/15/2005
COIS	WL-02	VET_T6_381	4227118.811	559549.411	6.63	4/15/2005
COIS	WL-02	VET_T6_384	4227124.59	559549.932	6.63	4/15/2005
COIS	WL-02	VET_T6_387	4227130.558	559550.905	6.68	4/15/2005
COIS	WL-02	VET_T6_390	4227136.465	559552.545	6.59	4/15/2005
COIS	WL-02	VET_T6_393	4227141.872	559554.233	6.62	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET_T6_396	4227147.31	559555.218	6.61	4/15/2005
COIS	WL-02	VET_T6_399	4227152.836	559555.788	6.61	4/15/2005
COIS	WL-02	VET_T6_402	4227158.323	559556.016	6.55	4/15/2005
COIS	WL-02	VET_T6_405	4227163.004	559556.803	6.52	4/15/2005
COIS	WL-02	VET_T6_408	4227168.122	559557.388	6.48	4/15/2005
COIS	WL-02	VET_T6_411	4227173.438	559558.467	6.54	4/15/2005
COIS	WL-02	VET_T6_414	4227178.83	559558.93	6.54	4/15/2005
COIS	WL-02	VET_T6_417	4227184.599	559559.747	6.48	4/15/2005
COIS	WL-02	VET_T6_420	4227190.122	559560.43	6.50	4/15/2005
COIS	WL-02	VET_T6_423	4227194.886	559561.481	6.36	4/15/2005
COIS	WL-02	VET_T6_425	4227200.251	559563.511	6.41	4/15/2005
COIS	WL-02	VET_T6_428	4227213.525	559568.501	5.89	4/15/2005
COIS	WL-02	VET_T7_431	4227219.06	559543.556	6.55	4/15/2005
COIS	WL-02	VET_T7_434	4227214.29	559543.099	6.47	4/15/2005
COIS	WL-02	VET_T7_437	4227208.77	559542.745	6.54	4/15/2005
COIS	WL-02	VET_T7_440	4227203.296	559542.767	6.57	4/15/2005
COIS	WL-02	VET_T7_443	4227197.989	559542.895	6.48	4/15/2005
COIS	WL-02	VET_T7_445	4227192.808	559543.297	6.56	4/15/2005
COIS	WL-02	VET_T7_447	4227187.504	559543.242	6.50	4/15/2005
COIS	WL-02	VET_T7_449	4227181.451	559543.212	6.55	4/15/2005
COIS	WL-02	VET_T7_451	4227175.233	559543.266	6.60	4/15/2005
COIS	WL-02	VET_T7_453	4227169.856	559543.26	6.62	4/15/2005
COIS	WL-02	VET_T7_458	4227159.92	559543.288	6.64	4/15/2005
COIS	WL-02	VET_T7_461	4227154.863	559543.529	6.71	4/15/2005
COIS	WL-02	VET_T7_464	4227149.133	559543.76	6.69	4/15/2005
COIS	WL-02	VET_T7_467	4227144.287	559543.693	6.69	4/15/2005
COIS	WL-02	VET_T7_469	4227139.276	559543.516	6.64	4/15/2005
COIS	WL-02	VET_T7_472	4227134.106	559543.489	6.69	4/15/2005
COIS	WL-02	VET_T7_475	4227128.842	559543.425	6.73	4/15/2005
COIS	WL-02	VET_T7_478	4227123.514	559543.477	6.69	4/15/2005
COIS	WL-02	VET_T7_481	4227117.915	559543.937	6.64	4/15/2005
COIS	WL-02	VET_T7_483	4227112.563	559544.096	6.73	4/15/2005
COIS	WL-02	VET_T7_485	4227107.451	559544.345	6.69	4/15/2005
COIS	WL-02	VET_T7_488	4227102.245	559544.382	6.76	4/15/2005
COIS	WL-02	VET_T7_491	4227096.792	559544.571	6.67	4/15/2005
COIS	WL-02	VET_T7_494	4227091.657	559544.699	6.72	4/15/2005
COIS	WL-02	VET_T7_497	4227087.063	559544.723	6.77	4/15/2005
COIS	WL-02	VET_T7_500	4227081.799	559544.562	6.65	4/15/2005
COIS	WL-02	VET_T7_503	4227076.502	559544.498	6.71	4/15/2005
COIS	WL-02	VET_T7_506	4227070.869	559544.181	6.76	4/15/2005
COIS	WL-02	VET_T7_509	4227066.3	559543.952	6.76	4/15/2005
COIS	WL-02	VET_T8_229	4227277.96	559507.108	6.54	4/15/2005
COIS	WL-02	VET_T8_233	4227265.838	559508.172	6.69	4/15/2005
COIS	WL-02	VET_T8_236	4227259.992	559509.821	6.67	4/15/2005
COIS	WL-02	VET_T8_238	4227252.975	559511.07	6.70	4/15/2005
COIS	WL-02	VET_T8_242	4227247.141	559512.323	6.70	4/15/2005
COIS	WL-02	VET_T8_244	4227240.579	559513.774	6.67	4/15/2005
COIS	WL-02	VET_T8_247	4227234.087	559515.31	6.55	4/15/2005
COIS	WL-02	VET_T8_250	4227227.357	559515.77	6.77	4/15/2005
COIS	WL-02	VET_T8_253	4227221.517	559516.868	6.75	4/15/2005
COIS	WL-02	VET_T8_256	4227215.009	559517.703	6.77	4/15/2005
COIS	WL-02	VET_T8_259	4227208.487	559518.477	6.84	4/15/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-02	VET_T8_262	4227202.665	559519.087	6.83	4/15/2005
COIS	WL-02	VET_T8_265	4227197.014	559519.41	6.81	4/15/2005
COIS	WL-02	VET_T8_268	4227191.54	559519.913	6.83	4/15/2005
COIS	WL-02	VET_T8_271	4227185.346	559521.394	6.82	4/15/2005
COIS	WL-02	VET_T8_274	4227179.314	559522.625	6.85	4/15/2005
COIS	WL-02	VET_T8_277	4227172.587	559523.433	6.79	4/15/2005
COIS	WL-02	VET_T8_280	4227166.11	559524.271	6.78	4/15/2005
COIS	WL-02	VET_T8_283	4227159.307	559524.951	6.77	4/15/2005
COIS	WL-02	VET_T8_286	4227153.601	559525.737	6.69	4/15/2005
COIS	WL-02	VET_T8_289	4227147.298	559526.271	6.69	4/15/2005
COIS	WL-02	VET_T8_292	4227141.988	559526.64	6.81	4/15/2005
COIS	WL-02	VET_T8_295	4227136.002	559527.606	6.66	4/15/2005
COIS	WL-02	VET_T8_298	4227129.187	559528.724	6.76	4/15/2005
COIS	WL-02	VET_T8_309	4227123.584	559529.66	6.68	4/15/2005
COIS	WL-02	VET_T8_312	4227116.577	559530.572	6.76	4/15/2005
COIS	WL-02	VET_T8_314	4227108.966	559531.556	6.81	4/15/2005
COIS	WL-02	VET_T8_317	4227103.263	559532.797	6.81	4/15/2005
COIS	WL-02	VET_T8_333	4227098.228	559533.991	6.81	4/15/2005
COIS	WL-02	VET_T8_336	4227092.534	559534.918	6.86	4/15/2005
COIS	WL-02	VET_T8_339	4227086.036	559536.277	6.86	4/15/2005
COIS	WL-02	VET_T8_342	4227078.727	559538.341	6.86	4/15/2005
COIS	WL-02	VET_T8_345	4227071.241	559540.41	6.81	4/15/2005
COIS	WL-02	VET_T8_348	4227065.803	559542.136	6.89	4/15/2005
COIS	WL-02	VET_T9_351	4227065.24	559539.014	6.85	4/15/2005
COIS	WL-02	VET_T9_354	4227070.068	559535.442	6.94	4/15/2005
COIS	WL-02	VET_T9_361	4227075.737	559530.468	7.00	4/15/2005
COIS	WL-02	VET_T9_364	4227082.077	559525.021	6.82	4/15/2005
COIS	WL-02	VET_T9_367	4227087.139	559519.925	6.88	4/15/2005
COIS	WL-02	VET_T9_370	4227093.007	559514.39	6.89	4/15/2005
COIS	WL-02	VET_T9_373	4227098.204	559509.345	6.78	4/15/2005
COIS	WL-02	VET_T9_376	4227103.794	559504.075	6.83	4/15/2005
COIS	WL-02	VET_T9_379	4227109.314	559499.14	6.79	4/15/2005
COIS	WL-02	VET_T9_382	4227114.507	559494.099	6.93	4/15/2005
COIS	WL-02	VET_T9_385	4227120.613	559488.646	6.83	4/15/2005
COIS	WL-02	VET_T9_388	4227125.569	559483.513	6.67	4/15/2005
COIS	WL-02	VET_T9_403	4227130.086	559478.886	6.55	4/15/2005
COIS	WL-02	VET_T9_406	4227135.264	559475.147	6.60	4/15/2005
COIS	WL-02	VET_T9_409	4227140.784	559471.849	6.77	4/15/2005
COIS	WL-02	VET_T9_412	4227144.576	559470.126	6.74	4/15/2005
COIS	WL-02	VET_T9_415	4227149.377	559465.807	6.74	4/15/2005
COIS	WL-02	VET_T9_418	4227153.891	559462.403	6.66	4/15/2005
COIS	WL-02	VET_T9_421	4227157.103	559460.074	6.24	4/15/2005
COIS	WL-02	VET_T9_422	4227160.852	559456.932	6.66	4/15/2005
COIS	WL-02	VET_T9_426	4227165.531	559452.283	6.61	4/15/2005
COIS	WL-02	VET_T9_429	4227170.679	559448.092	6.56	4/15/2005
COIS	WL-03	VET_T1_10	4228583.592	558932.186	6.36	6/1/2005
COIS	WL-03	VET_T1_12	4228583.29	558926.178	6.24	6/1/2005
COIS	WL-03	VET_T1_14	4228583.579	558920.074	6.18	6/1/2005
COIS	WL-03	VET_T1_16	4228583.509	558914.107	6.13	6/1/2005
COIS	WL-03	VET_T1_18	4228583.342	558909.032	6.17	6/1/2005
COIS	WL-03	VET_T1_20	4228582.964	558903.023	6.13	6/1/2005
COIS	WL-03	VET_T1_21	4228582.238	558898.068	6.10	6/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-03	VET_T1_23	4228581.031	558892.775	6.18	6/1/2005
COIS	WL-03	VET_T1_26	4228580.208	558887.61	6.05	6/1/2005
COIS	WL-03	VET_T1_28	4228579.077	558882.947	6.11	6/1/2005
COIS	WL-03	VET_T1_30	4228578.456	558878.434	6.13	6/1/2005
COIS	WL-03	VET_T1_32	4228577.352	558873.926	6.11	6/1/2005
COIS	WL-03	VET_T1_34	4228576.301	558869.557	6.17	6/1/2005
COIS	WL-03	VET_T1_36	4228574.96	558864.353	6.09	6/1/2005
COIS	WL-03	VET_T1_39	4228573.871	558858.965	5.96	6/1/2005
COIS	WL-03	VET_T1_41	4228572.5	558854.465	5.91	6/1/2005
COIS	WL-03	VET_T1_43	4228571.357	558848.866	6.10	6/1/2005
COIS	WL-03	VET_T1_46	4228570.537	558844.372	6.18	6/1/2005
COIS	WL-03	VET_T1_48	4228569.406	558838.241	6.23	6/1/2005
COIS	WL-03	VET_T1_9	4228583.064	558938.133	6.26	6/1/2005
COIS	WL-03	VET_T2_50	4228621.17	558887.838	5.98	6/1/2005
COIS	WL-03	VET_T2_52	4228617.699	558892.177	6.08	6/1/2005
COIS	WL-03	VET_T2_53	4228614.434	558895.447	6.08	6/1/2005
COIS	WL-03	VET_T2_55	4228610.96	558898.231	6.07	6/1/2005
COIS	WL-03	VET_T2_57	4228608.567	558902.301	6.11	6/1/2005
COIS	WL-03	VET_T2_58	4228606.424	558906.964	6.09	6/1/2005
COIS	WL-03	VET_T2_61	4228604.135	558911.343	6.08	6/1/2005
COIS	WL-03	VET_T2_64	4228601.474	558915.927	6.09	6/1/2005
COIS	WL-03	VET_T2_66	4228598.362	558920.152	6.16	6/1/2005
COIS	WL-03	VET_T2_68	4228594.851	558924.82	6.27	6/1/2005
COIS	WL-03	VET_T2_70	4228591.891	558929.361	6.27	6/1/2005
COIS	WL-03	VET_T2_72	4228588.596	558933.589	6.44	6/1/2005
COIS	WL-03	VET_T2_74	4228585.948	558936.942	6.31	6/1/2005
COIS	WL-03	VET_T3_101	4228633.506	558943.646	5.97	6/1/2005
COIS	WL-03	VET_T3_102	4228637.874	558943.954	6.13	6/1/2005
COIS	WL-03	VET_T3_103	4228641.104	558943.591	6.12	6/1/2005
COIS	WL-03	VET_T3_105	4228642.479	558942.564	6.12	6/1/2005
COIS	WL-03	VET_T3_108	4228647.917	558944.897	6.18	6/1/2005
COIS	WL-03	VET_T3_110	4228650.029	558945.972	6.24	6/1/2005
COIS	WL-03	VET_T3_112	4228650.931	558946.443	4.92	6/1/2005
COIS	WL-03	VET_T3_84	4228586.832	558941.235	6.21	6/1/2005
COIS	WL-03	VET_T3_86	4228592.446	558941.395	6.30	6/1/2005
COIS	WL-03	VET_T3_88	4228598.063	558941.663	6.22	6/1/2005
COIS	WL-03	VET_T3_89	4228602.608	558941.489	6.29	6/1/2005
COIS	WL-03	VET_T3_91	4228608.107	558941.408	6.13	6/1/2005
COIS	WL-03	VET_T3_93	4228613.014	558941.766	6.07	6/1/2005
COIS	WL-03	VET_T3_95	4228618.025	558942.475	6.10	6/1/2005
COIS	WL-03	VET_T3_97	4228622.844	558942.389	6.05	6/1/2005
COIS	WL-03	VET_T3_99	4228627.919	558942.649	5.78	6/1/2005
COIS	WL-03	VET_T4_114	4228614.767	558996.119	4.96	6/1/2005
COIS	WL-03	VET_T4_115	4228614.462	558995.379	5.82	6/1/2005
COIS	WL-03	VET_T4_116	4228612.551	558990.876	6.21	6/1/2005
COIS	WL-03	VET_T4_117	4228610.283	558986.682	6.12	6/1/2005
COIS	WL-03	VET_T4_119	4228607.646	558982.836	5.89	6/1/2005
COIS	WL-03	VET_T4_122	4228607.247	558980.802	4.27	6/1/2005
COIS	WL-03	VET_T4_125	4228605.68	558977.786	5.95	6/1/2005
COIS	WL-03	VET_T4_127	4228603.26	558973.568	6.24	6/1/2005
COIS	WL-03	VET_T4_129	4228600.651	558968.972	6.13	6/1/2005
COIS	WL-03	VET_T4_131	4228598.167	558965.261	6.18	6/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
COIS	WL-03	VET_T4_133	4228595.052	558960.607	6.08	6/1/2005
COIS	WL-03	VET_T4_135	4228592.342	558956.484	6.26	6/1/2005
COIS	WL-03	VET_T4_137	4228589.749	558952.509	6.15	6/1/2005
COIS	WL-03	VET_T4_139	4228587.929	558949.983	6.20	6/1/2005
COIS	WL-03	VET_T4_140	4228585.448	558946.425	6.24	6/1/2005
COIS	WL-03	VET_T5_118	4228590.209	558945.939	6.05	6/1/2005
COIS	WL-03	VET_T5_120	4228594.226	558948.981	6.09	6/1/2005
COIS	WL-03	VET_T5_121	4228599.243	558951.957	6.23	6/1/2005
COIS	WL-03	VET_T5_123	4228604.035	558955.685	6.15	6/1/2005
COIS	WL-03	VET_T5_124	4228607.253	558959.454	6.13	6/1/2005
COIS	WL-03	VET_T5_126	4228611.31	558962.004	6.04	6/1/2005
COIS	WL-03	VET_T5_128	4228615.727	558965.008	6.13	6/1/2005
COIS	WL-03	VET_T5_130	4228619.195	558965.977	4.60	6/1/2005
COIS	WL-03	VET_T5_132	4228622.374	558967.062	6.05	6/1/2005
COIS	WL-03	VET_T5_136	4228627.583	558969.916	6.20	6/1/2005
COIS	WL-03	VET_T6_11	4228572	558937.029	6.20	6/1/2005
COIS	WL-03	VET_T6_13	4228567.675	558933.42	6.14	6/1/2005
COIS	WL-03	VET_T6_15	4228562.694	558929.791	5.94	6/1/2005
COIS	WL-03	VET_T6_17	4228557.946	558926.356	5.94	6/1/2005
COIS	WL-03	VET_T6_19	4228553.563	558922.792	5.91	6/1/2005
COIS	WL-03	VET_T6_22	4228549.271	558920.191	5.19	6/1/2005
COIS	WL-03	VET_T6_24	4228544.601	558916.312	5.93	6/1/2005
COIS	WL-03	VET_T6_25	4228539.926	558912.401	6.09	6/1/2005
COIS	WL-03	VET_T6_27	4228536.003	558908.509	6.13	6/1/2005
COIS	WL-03	VET_T6_29	4228532.144	558904.351	6.17	6/1/2005
COIS	WL-03	VET_T6_31	4228528.243	558900.76	6.11	6/1/2005
COIS	WL-03	VET_T6_33	4228523.997	558896.282	6.10	6/1/2005
COIS	WL-03	VET_T6_35	4228520.37	558891.947	6.18	6/1/2005
COIS	WL-03	VET_T6_37	4228516.615	558887.253	6.11	6/1/2005
COIS	WL-03	VET_T6_38	4228513.536	558883.882	6.15	6/1/2005
COIS	WL-03	VET_T6_40	4228509.674	558879.645	6.16	6/1/2005
COIS	WL-03	VET_T6_42	4228505.023	558875.404	6.17	6/1/2005
COIS	WL-03	VET_T6_44	4228500.232	558871.231	6.09	6/1/2005
COIS	WL-03	VET_T6_45	4228495.151	558867.294	6.06	6/1/2005
COIS	WL-03	VET_T6_47	4228491.1	558863.286	6.13	6/1/2005
COIS	WL-03	VET_T6_8	4228577.319	558939.779	6.22	6/1/2005
COIS	WL-03	VET_T7_49	4228525.143	558828.097	5.98	6/1/2005
COIS	WL-03	VET_T7_51	4228529.852	558832.666	6.08	6/1/2005
COIS	WL-03	VET_T7_54	4228533.97	558837.767	5.39	6/1/2005
COIS	WL-03	VET_T7_56	4228537.219	558843.568	6.07	6/1/2005
COIS	WL-03	VET_T7_59	4228541.392	558855.679	5.99	6/1/2005
COIS	WL-03	VET_T7_62	4228543.51	558861.373	6.08	6/1/2005
COIS	WL-03	VET_T7_63	4228544.903	558866.436	6.01	6/1/2005
COIS	WL-03	VET_T7_65	4228546.702	558871.855	6.05	6/1/2005
COIS	WL-03	VET_T7_67	4228548.064	558877.018	6.07	6/1/2005
COIS	WL-03	VET_T7_69	4228549.478	558882.364	5.95	6/1/2005
COIS	WL-03	VET_T7_71	4228550.722	558886.934	6.13	6/1/2005
COIS	WL-03	VET_T7_73	4228552.417	558892.485	6.18	6/1/2005
COIS	WL-03	VET_T7_75	4228554.081	558898.423	6.35	6/1/2005
COIS	WL-03	VET_T7_76	4228555.248	558903.815	6.22	6/1/2005
COIS	WL-03	VET_T7_77	4228557.363	558909.085	6.06	6/1/2005
COIS	WL-03	VET_T7_78	4228560.875	558913.94	6.08	6/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-03	VET_T7_79	4228563.965	558918.081	6.04	6/1/2005
COIS	WL-03	VET_T7_80	4228567.084	558922.526	5.95	6/1/2005
COIS	WL-03	VET_T7_81	4228569.93	558927.139	5.97	6/1/2005
COIS	WL-03	VET_T7_82	4228573.359	558931.747	6.23	6/1/2005
COIS	WL-03	VET_T8_100	4228596.6	558992.078	5.44	6/1/2005
COIS	WL-03	VET_T8_83	4228585.533	558948.756	6.07	6/1/2005
COIS	WL-03	VET_T8_85	4228587.761	558953.981	6.10	6/1/2005
COIS	WL-03	VET_T8_87	4228588.173	558959.26	6.08	6/1/2005
COIS	WL-03	VET_T8_90	4228588.52	558964.291	6.02	6/1/2005
COIS	WL-03	VET_T8_92	4228589.118	558970.249	6.20	6/1/2005
COIS	WL-03	VET_T8_94	4228590.821	558977.959	6.20	6/1/2005
COIS	WL-03	VET_T8_96	4228592.958	558983.061	6.17	6/1/2005
COIS	WL-03	VET_T8_98	4228595.454	558987.845	6.05	6/1/2005
COIS	WL-03	VET_T9_104	4228558.339	558963.454	6.67	6/1/2005
COIS	WL-03	VET_T9_106	4228562.24	558960.187	6.60	6/1/2005
COIS	WL-03	VET_T9_107	4228566.87	558957.67	4.97	6/1/2005
COIS	WL-03	VET_T9_109	4228570.4	558954.809	5.99	6/1/2005
COIS	WL-03	VET_T9_111	4228574.185	558951.646	6.23	6/1/2005
COIS	WL-03	VET_T9_113	4228577.215	558947.45	6.24	6/1/2005
COIS	WL-04	VET__10	4227920.633	558981.594	6.35	4/1/2005
COIS	WL-04	VET__11	4227920.004	558981.018	3.09	4/1/2005
COIS	WL-04	VET__12	4227625.597	559103.008	6.32	4/1/2005
COIS	WL-04	VET__16	4227919.479	558980.504	6.37	4/1/2005
COIS	WL-04	VET__17	4227628.328	559107.456	6.78	4/1/2005
COIS	WL-04	VET__18	4227908.636	558976.653	6.45	4/1/2005
COIS	WL-04	VET__19	4227892.266	558964.479	6.74	4/1/2005
COIS	WL-04	VET__20	4227631.341	559111.389	6.68	4/1/2005
COIS	WL-04	VET__21	4227887.562	558948.785	3.24	4/1/2005
COIS	WL-04	VET__7	4227930.414	558979.851	3.38	4/1/2005
COIS	WL-04	VET__8	4227930.424	558980.27	5.98	4/1/2005
COIS	WL-04	VET__9	4227927.18	558982.984	6.33	4/1/2005
COIS	WL-04	VET_T1_102	4227822.268	559068.032	6.52	4/1/2005
COIS	WL-04	VET_T1_104	4227821.904	559073.338	6.65	4/1/2005
COIS	WL-04	VET_T1_106	4227822.253	559077.783	6.19	4/1/2005
COIS	WL-04	VET_T1_108	4227823.224	559078.28	3.96	4/1/2005
COIS	WL-04	VET_T1_110	4227823.459	559078.784	6.00	4/1/2005
COIS	WL-04	VET_T1_112	4227823.121	559083.908	6.72	4/1/2005
COIS	WL-04	VET_T1_114	4227822.918	559088.92	6.68	4/1/2005
COIS	WL-04	VET_T1_120	4227822.732	559094.016	6.72	4/1/2005
COIS	WL-04	VET_T1_122	4227823.373	559099.574	6.57	4/1/2005
COIS	WL-04	VET_T1_125	4227822.762	559104.515	6.25	4/1/2005
COIS	WL-04	VET_T1_127	4227821.625	559109.779	6.41	4/1/2005
COIS	WL-04	VET_T1_129	4227820.712	559114.709	6.66	4/1/2005
COIS	WL-04	VET_T1_31	4227832.871	558985.925	5.35	4/1/2005
COIS	WL-04	VET_T1_34	4227832.67	558988.595	5.78	4/1/2005
COIS	WL-04	VET_T1_37	4227832.696	558993.448	6.56	4/1/2005
COIS	WL-04	VET_T1_40	4227832.03	558998.966	6.64	4/1/2005
COIS	WL-04	VET_T1_42	4227831.518	559004.216	6.60	4/1/2005
COIS	WL-04	VET_T1_44	4227831.041	559009.313	6.76	4/1/2005
COIS	WL-04	VET_T1_47	4227830.88	559014.774	6.78	4/1/2005
COIS	WL-04	VET_T1_50	4227830.776	559020.185	6.72	4/1/2005
COIS	WL-04	VET_T1_53	4227830.247	559025.636	6.65	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T1_55	4227827.071	559025.864	7.02	4/1/2005
COIS	WL-04	VET_T1_59	4227830.04	559027.87	6.58	4/1/2005
COIS	WL-04	VET_T1_63	4227830.305	559030.956	6.49	4/1/2005
COIS	WL-04	VET_T1_66	4227830.196	559033.045	6.39	4/1/2005
COIS	WL-04	VET_T1_73	4227828.733	559034.931	5.60	4/1/2005
COIS	WL-04	VET_T1_76	4227827.735	559040.566	6.56	4/1/2005
COIS	WL-04	VET_T1_78/80	4227827.505	559045.765	6.49	4/1/2005
COIS	WL-04	VET_T1_82	4227827.009	559049.897	6.38	4/1/2005
COIS	WL-04	VET_T1_86	4227827.226	559051.924	5.99	4/1/2005
COIS	WL-04	VET_T1_89	4227826.035	559055.93	6.54	4/1/2005
COIS	WL-04	VET_T1_93	4227823.943	559059.067	6.37	4/1/2005
COIS	WL-04	VET_T1_95	4227823.837	559061.499	6.00	4/1/2005
COIS	WL-04	VET_T1_97	4227822.489	559063.142	6.73	4/1/2005
COIS	WL-04	VET_T10_286	4227769.517	558900.236	2.89	4/1/2005
COIS	WL-04	VET_T10_290	4227770.622	558900.636	4.21	4/1/2005
COIS	WL-04	VET_T10_294	4227771.157	558900.712	5.53	4/1/2005
COIS	WL-04	VET_T10_297	4227773.061	558901.592	5.99	4/1/2005
COIS	WL-04	VET_T10_301	4227773.89	558902.097	6.48	4/1/2005
COIS	WL-04	VET_T10_305	4227777.521	558904.408	6.07	4/1/2005
COIS	WL-04	VET_T10_308	4227783.11	558907.802	5.80	4/1/2005
COIS	WL-04	VET_T10_311	4227790.797	558911.057	5.79	4/1/2005
COIS	WL-04	VET_T10_315	4227795.828	558913.437	5.83	4/1/2005
COIS	WL-04	VET_T10_318	4227798.955	558915.065	5.86	4/1/2005
COIS	WL-04	VET_T10_322	4227799.319	558915.581	5.43	4/1/2005
COIS	WL-04	VET_T10_323	4227799.693	558915.921	5.62	4/1/2005
COIS	WL-04	VET_T10_326	4227802.474	558918.648	5.97	4/1/2005
COIS	WL-04	VET_T10_328	4227806.714	558920.98	5.87	4/1/2005
COIS	WL-04	VET_T10_330	4227812.277	558923.076	5.84	4/1/2005
COIS	WL-04	VET_T10_332	4227814.176	558923.775	5.95	4/1/2005
COIS	WL-04	VET_T10_334	4227815.727	558924.251	6.04	4/1/2005
COIS	WL-04	VET_T10_336	4227823.848	558925.202	5.90	4/1/2005
COIS	WL-04	VET_T10_338	4227824.348	558925.37	4.01	4/1/2005
COIS	WL-04	VET_T2_134	4227767.688	559101.515	6.69	4/1/2005
COIS	WL-04	VET_T2_136	4227768.374	559099.251	6.43	4/1/2005
COIS	WL-04	VET_T2_139	4227768.612	559098.407	5.80	4/1/2005
COIS	WL-04	VET_T2_142	4227768.862	559097.286	6.41	4/1/2005
COIS	WL-04	VET_T2_148	4227770.143	559093.252	6.32	4/1/2005
COIS	WL-04	VET_T2_150	4227771.38	559088.331	6.66	4/1/2005
COIS	WL-04	VET_T2_153	4227773.81	559083.791	6.40	4/1/2005
COIS	WL-04	VET_T2_155	4227773.907	559083.112	4.39	4/1/2005
COIS	WL-04	VET_T2_158	4227775.28	559077.817	6.21	4/1/2005
COIS	WL-04	VET_T2_161	4227776.386	559073.632	6.41	4/1/2005
COIS	WL-04	VET_T2_164	4227776.729	559072.272	6.46	4/1/2005
COIS	WL-04	VET_T2_166	4227777.501	559067.773	6.47	4/1/2005
COIS	WL-04	VET_T2_168	4227778.757	559063.06	6.70	4/1/2005
COIS	WL-04	VET_T2_171	4227779.723	559058.539	6.62	4/1/2005
COIS	WL-04	VET_T2_172	4227780.779	559053.795	6.75	4/1/2005
COIS	WL-04	VET_T2_174	4227782.048	559048.547	6.70	4/1/2005
COIS	WL-04	VET_T2_177	4227783.51	559043.373	6.70	4/1/2005
COIS	WL-04	VET_T2_179	4227784.665	559038.174	6.72	4/1/2005
COIS	WL-04	VET_T2_181	4227785.399	559032.801	6.85	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T2_183	4227787.082	559027.501	6.64	4/1/2005
COIS	WL-04	VET_T2_185	4227788.584	559022.281	6.57	4/1/2005
COIS	WL-04	VET_T2_187	4227790.172	559017.571	5.68	4/1/2005
COIS	WL-04	VET_T2_189	4227790.858	559016.616	4.10	4/1/2005
COIS	WL-04	VET_T2_193	4227792.263	559014.117	5.35	4/1/2005
COIS	WL-04	VET_T2_196	4227793.82	559008.968	5.88	4/1/2005
COIS	WL-04	VET_T2_198	4227795.75	559004.371	5.83	4/1/2005
COIS	WL-04	VET_T2_200	4227797.499	558999.841	5.92	4/1/2005
COIS	WL-04	VET_T2_202	4227799.38	558995.121	5.90	4/1/2005
COIS	WL-04	VET_T2_204	4227800.804	558989.973	5.95	4/1/2005
COIS	WL-04	VET_T2_206	4227802.485	558984.97	6.00	4/1/2005
COIS	WL-04	VET_T2_208	4227804.346	558980.139	6.00	4/1/2005
COIS	WL-04	VET_T2_211	4227805.575	558975.719	6.04	4/1/2005
COIS	WL-04	VET_T2_213	4227807.138	558970.779	6.11	4/1/2005
COIS	WL-04	VET_T2_215	4227807.661	558969.328	6.16	4/1/2005
COIS	WL-04	VET_T2_218	4227808.08	558968.295	4.97	4/1/2005
COIS	WL-04	VET_T2_221	4227808.495	558965.829	2.84	4/1/2005
COIS	WL-04	VET_T2_223	4227808.073	558965.056	1.94	4/1/2005
COIS	WL-04	VET_T3_227	4227787.483	558980.204	6.10	4/1/2005
COIS	WL-04	VET_T3_230	4227784.806	558983.857	6.17	4/1/2005
COIS	WL-04	VET_T3_232	4227781.185	558987.553	6.21	4/1/2005
COIS	WL-04	VET_T3_235	4227778.043	558991.505	6.13	4/1/2005
COIS	WL-04	VET_T3_238	4227774.306	558995.859	5.96	4/1/2005
COIS	WL-04	VET_T3_240	4227771.354	558999.917	5.91	4/1/2005
COIS	WL-04	VET_T3_242	4227768.688	559004.418	5.85	4/1/2005
COIS	WL-04	VET_T3_249	4227767.529	559006.712	6.18	4/1/2005
COIS	WL-04	VET_T3_251	4227767.126	559007.289	5.92	4/1/2005
COIS	WL-04	VET_T3_254	4227766.27	559008.459	3.43	4/1/2005
COIS	WL-04	VET_T3_258	4227765.123	559011.379	5.91	4/1/2005
COIS	WL-04	VET_T3_262	4227761.054	559016.101	5.84	4/1/2005
COIS	WL-04	VET_T3_264	4227757.514	559020.29	5.94	4/1/2005
COIS	WL-04	VET_T3_267	4227755.355	559022.951	6.17	4/1/2005
COIS	WL-04	VET_T3_270	4227752.613	559025.255	6.76	4/1/2005
COIS	WL-04	VET_T3_273	4227749.72	559029.529	6.83	4/1/2005
COIS	WL-04	VET_T3_275	4227746.071	559033.895	6.82	4/1/2005
COIS	WL-04	VET_T3_276	4227742.892	559038.152	6.83	4/1/2005
COIS	WL-04	VET_T3_278	4227739.264	559042.322	6.90	4/1/2005
COIS	WL-04	VET_T3_280	4227739.389	559047.691	6.90	4/1/2005
COIS	WL-04	VET_T3_283	4227732.557	559051	6.75	4/1/2005
COIS	WL-04	VET_T3_285	4227728.561	559055.355	6.77	4/1/2005
COIS	WL-04	VET_T3_287	4227724.495	559059.898	6.86	4/1/2005
COIS	WL-04	VET_T3_289	4227720.41	559064.328	6.77	4/1/2005
COIS	WL-04	VET_T3_293	4227716.45	559069.155	6.80	4/1/2005
COIS	WL-04	VET_T3_296	4227712.99	559074.174	6.81	4/1/2005
COIS	WL-04	VET_T3_298	4227709.368	559079.209	6.78	4/1/2005
COIS	WL-04	VET_T3_300	4227705.828	559083.892	6.84	4/1/2005
COIS	WL-04	VET_T3_302	4227702.801	559087.019	6.76	4/1/2005
COIS	WL-04	VET_T3_304	4227699.711	559090.418	6.89	4/1/2005
COIS	WL-04	VET_T3_306	4227696.145	559093.981	6.85	4/1/2005
COIS	WL-04	VET_T3_309	4227693.281	559097.833	6.82	4/1/2005
COIS	WL-04	VET_T3_312	4227690.014	559101.676	6.70	4/1/2005
COIS	WL-04	VET_T3_314	4227686.756	559105.786	6.79	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T3_319	4227683.841	559109.9	6.06	4/1/2005
COIS	WL-04	VET_T3_321	4227683.543	559110.647	3.36	4/1/2005
COIS	WL-04	VET_T4_100	4227897.429	559012.879	5.87	4/1/2005
COIS	WL-04	VET_T4_101	4227899.996	559017.431	6.48	4/1/2005
COIS	WL-04	VET_T4_103	4227903.003	559022.027	6.76	4/1/2005
COIS	WL-04	VET_T4_105	4227906.036	559026.681	6.53	4/1/2005
COIS	WL-04	VET_T4_107	4227908.511	559031.3	6.55	4/1/2005
COIS	WL-04	VET_T4_109	4227911.303	559035.815	6.64	4/1/2005
COIS	WL-04	VET_T4_111	4227914.457	559040.162	6.33	4/1/2005
COIS	WL-04	VET_T4_113	4227917.377	559044.659	6.22	4/1/2005
COIS	WL-04	VET_T4_123	4227920.959	559049.365	6.01	4/1/2005
COIS	WL-04	VET_T4_126	4227923.766	559053.361	6.11	4/1/2005
COIS	WL-04	VET_T4_130	4227925.052	559055.811	6.55	4/1/2005
COIS	WL-04	VET_T4_132	4227926.424	559057.532	6.73	4/1/2005
COIS	WL-04	VET_T4_135	4227929.962	559062.633	6.73	4/1/2005
COIS	WL-04	VET_T4_138	4227933.371	559067.672	6.73	4/1/2005
COIS	WL-04	VET_T4_141	4227936.914	559072.722	6.59	4/1/2005
COIS	WL-04	VET_T4_145	4227940.038	559076.88	6.65	4/1/2005
COIS	WL-04	VET_T4_147	4227942.833	559080.668	6.61	4/1/2005
COIS	WL-04	VET_T4_151	4227945.633	559084.405	6.60	4/1/2005
COIS	WL-04	VET_T4_154	4227949.688	559087.761	6.57	4/1/2005
COIS	WL-04	VET_T4_157	4227953.418	559092.406	6.62	4/1/2005
COIS	WL-04	VET_T4_160	4227956.768	559097.567	6.75	4/1/2005
COIS	WL-04	VET_T4_162	4227960.588	559102.089	6.71	4/1/2005
COIS	WL-04	VET_T4_165	4227963.947	559107.312	6.62	4/1/2005
COIS	WL-04	VET_T4_169	4227966.569	559112.338	6.65	4/1/2005
COIS	WL-04	VET_T4_29	4227829.756	558930.356	3.52	4/1/2005
COIS	WL-04	VET_T4_33	4227831.024	558930.812	4.40	4/1/2005
COIS	WL-04	VET_T4_35	4227833.265	558932.6	6.15	4/1/2005
COIS	WL-04	VET_T4_38	4227835.279	558934.332	6.15	4/1/2005
COIS	WL-04	VET_T4_41	4227838.454	558938.178	5.98	4/1/2005
COIS	WL-04	VET_T4_43	4227842.357	558941.759	5.87	4/1/2005
COIS	WL-04	VET_T4_46	4227845.41	558944.145	5.62	4/1/2005
COIS	WL-04	VET_T4_49	4227847.103	558945.019	5.97	4/1/2005
COIS	WL-04	VET_T4_52	4227851.898	558950.786	5.94	4/1/2005
COIS	WL-04	VET_T4_56	4227857.389	558957.962	6.04	4/1/2005
COIS	WL-04	VET_T4_58	4227859.856	558960.361	5.85	4/1/2005
COIS	WL-04	VET_T4_60	4227864.244	558965.279	6.16	4/1/2005
COIS	WL-04	VET_T4_62	4227867.657	558969.876	6.08	4/1/2005
COIS	WL-04	VET_T4_65	4227870.827	558973.895	6.04	4/1/2005
COIS	WL-04	VET_T4_67	4227872.898	558975.947	6.14	4/1/2005
COIS	WL-04	VET_T4_69	4227875.432	558979.523	6.12	4/1/2005
COIS	WL-04	VET_T4_71	4227877.59	558983.114	6.10	4/1/2005
COIS	WL-04	VET_T4_74	4227878.588	558984.702	6.29	4/1/2005
COIS	WL-04	VET_T4_77	4227879.954	558986.689	6.21	4/1/2005
COIS	WL-04	VET_T4_81	4227881.101	558988.733	6.09	4/1/2005
COIS	WL-04	VET_T4_84	4227884.061	558992.773	6.07	4/1/2005
COIS	WL-04	VET_T4_87	4227887.31	558997.593	6.04	4/1/2005
COIS	WL-04	VET_T4_90	4227889.342	559000.737	6.03	4/1/2005
COIS	WL-04	VET_T4_92	4227891.791	559004.642	6.01	4/1/2005
COIS	WL-04	VET_T4_94	4227894.009	559008.06	6.12	4/1/2005
COIS	WL-04	VET_T4_98	4227895.58	559010.547	5.84	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T5_175	4227968.178	559065.73	6.72	4/1/2005
COIS	WL-04	VET_T5_178	4227964.811	559061.797	6.68	4/1/2005
COIS	WL-04	VET_T5_182	4227961.452	559058.327	6.77	4/1/2005
COIS	WL-04	VET_T5_186	4227957.159	559054.251	6.54	4/1/2005
COIS	WL-04	VET_T5_188	4227954.508	559050.779	6.51	4/1/2005
COIS	WL-04	VET_T5_190	4227953.123	559049.318	6.37	4/1/2005
COIS	WL-04	VET_T5_192	4227951.491	559047.018	6.01	4/1/2005
COIS	WL-04	VET_T5_195	4227948.556	559042.964	6.13	4/1/2005
COIS	WL-04	VET_T5_199	4227945.778	559040.118	6.25	4/1/2005
COIS	WL-04	VET_T5_203	4227943.689	559037.83	6.10	4/1/2005
COIS	WL-04	VET_T5_210	4227942.462	559036.642	6.46	4/1/2005
COIS	WL-04	VET_T5_214	4227938.343	559034.279	6.19	4/1/2005
COIS	WL-04	VET_T5_217	4227935.338	559031.327	6.17	4/1/2005
COIS	WL-04	VET_T5_220	4227931.615	559028.055	6.32	4/1/2005
COIS	WL-04	VET_T5_224	4227927.71	559025.928	6.19	4/1/2005
COIS	WL-04	VET_T5_228	4227924.58	559022.73	6.09	4/1/2005
COIS	WL-04	VET_T5_229	4227921.139	559019.639	5.82	4/1/2005
COIS	WL-04	VET_T5_233	4227919.564	559018.244	5.26	4/1/2005
COIS	WL-04	VET_T5_236	4227918.187	559016.328	6.03	4/1/2005
COIS	WL-04	VET_T5_239	4227917.454	559016.898	5.71	4/1/2005
COIS	WL-04	VET_T5_243	4227912.98	559013.867	6.09	4/1/2005
COIS	WL-04	VET_T5_250	4227909.092	559011.541	6.12	4/1/2005
COIS	WL-04	VET_T5_253	4227905.747	559008.79	6.10	4/1/2005
COIS	WL-04	VET_T5_256	4227901.906	559005.781	4.85	4/1/2005
COIS	WL-04	VET_T5_259	4227898.172	559003.115	6.17	4/1/2005
COIS	WL-04	VET_T5_261	4227894.004	559000.074	6.17	4/1/2005
COIS	WL-04	VET_T5_265	4227890.529	558997.34	5.96	4/1/2005
COIS	WL-04	VET_T5_268	4227887.324	558994.731	6.12	4/1/2005
COIS	WL-04	VET_T5_271	4227883.278	558991.805	6.15	4/1/2005
COIS	WL-04	VET_T5_274	4227879.035	558988.281	6.22	4/1/2005
COIS	WL-04	VET_T5_277	4227875.253	558985.747	6.10	4/1/2005
COIS	WL-04	VET_T5_282	4227871.69	558981.774	5.98	4/1/2005
COIS	WL-04	VET_T5_284	4227867.963	558978.765	6.04	4/1/2005
COIS	WL-04	VET_T5_288	4227865.221	558975.368	5.93	4/1/2005
COIS	WL-04	VET_T5_292	4227862.256	558972.435	5.94	4/1/2005
COIS	WL-04	VET_T5_295	4227858.957	558969.417	5.64	4/1/2005
COIS	WL-04	VET_T5_299	4227857.966	558968.304	5.48	4/1/2005
COIS	WL-04	VET_T5_303	4227855.012	558965.926	5.80	4/1/2005
COIS	WL-04	VET_T5_307	4227851.399	558962.845	5.84	4/1/2005
COIS	WL-04	VET_T5_310	4227847.259	558959.786	5.86	4/1/2005
COIS	WL-04	VET_T5_313	4227843.459	558957.037	5.72	4/1/2005
COIS	WL-04	VET_T5_316	4227842.195	558955.867	5.76	4/1/2005
COIS	WL-04	VET_T5_320	4227840.119	558954.464	5.74	4/1/2005
COIS	WL-04	VET_T5_324	4227839.38	558953.443	5.61	4/1/2005
COIS	WL-04	VET_T5_325	4227836.93	558951.466	6.02	4/1/2005
COIS	WL-04	VET_T5_327	4227833.042	558948.234	6.11	4/1/2005
COIS	WL-04	VET_T5_329	4227830.295	558945.645	6.18	4/1/2005
COIS	WL-04	VET_T5_331	4227829.568	558942.526	4.96	4/1/2005
COIS	WL-04	VET_T5_333	4227828.103	558941.355	3.58	4/1/2005
COIS	WL-04	VET_T5_335	4227827.974	558941.387	3.59	4/1/2005
COIS	WL-04	VET_T5_337	4227826.445	558940.929	2.79	4/1/2005
COIS	WL-04	VET_T6_23	4227818.844	558929.867	6.14	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T6_24	4227813.462	558934.545	5.84	4/1/2005
COIS	WL-04	VET_T6_25	4227808.09	558938.401	5.89	4/1/2005
COIS	WL-04	VET_T6_26	4227802.795	558942.758	5.69	4/1/2005
COIS	WL-04	VET_T6_27	4227797.167	558946.074	5.66	4/1/2005
COIS	WL-04	VET_T6_28	4227793.072	558947.91	5.54	4/1/2005
COIS	WL-04	VET_T6_30	4227789.107	558949.652	5.80	4/1/2005
COIS	WL-04	VET_T6_32	4227784.106	558952.926	5.77	4/1/2005
COIS	WL-04	VET_T6_36	4227779.016	558956.357	5.89	4/1/2005
COIS	WL-04	VET_T6_39	4227773.034	558959.387	5.89	4/1/2005
COIS	WL-04	VET_T6_45	4227767.041	558963.01	5.78	4/1/2005
COIS	WL-04	VET_T6_48	4227761.41	558966.659	5.88	4/1/2005
COIS	WL-04	VET_T6_51	4227755.602	558970.337	5.80	4/1/2005
COIS	WL-04	VET_T6_54	4227750.457	558974.135	5.79	4/1/2005
COIS	WL-04	VET_T6_57	4227745.098	558977.371	5.73	4/1/2005
COIS	WL-04	VET_T6_61	4227738.001	558981.529	5.77	4/1/2005
COIS	WL-04	VET_T6_64	4227736.17	558982.189	5.84	4/1/2005
COIS	WL-04	VET_T6_68	4227731.232	558985.315	5.79	4/1/2005
COIS	WL-04	VET_T6_70	4227727.673	558988.198	5.84	4/1/2005
COIS	WL-04	VET_T6_72	4227725.403	558990.177	5.94	4/1/2005
COIS	WL-04	VET_T6_75	4227720.043	558993.146	6.03	4/1/2005
COIS	WL-04	VET_T6_79	4227714.079	558995.74	5.83	4/1/2005
COIS	WL-04	VET_T6_83	4227708.998	558997.862	6.14	4/1/2005
COIS	WL-04	VET_T6_85	4227702.654	559001.251	6.10	4/1/2005
COIS	WL-04	VET_T6_88	4227696.621	559004.829	6.10	4/1/2005
COIS	WL-04	VET_T6_91	4227691.628	559007.882	6.16	4/1/2005
COIS	WL-04	VET_T6_96	4227684.74	559012.105	5.77	4/1/2005
COIS	WL-04	VET_T6_99	4227683.118	559013.094	4.21	4/1/2005
COIS	WL-04	VET_T7_115	4227653.676	558945.758	5.88	4/1/2005
COIS	WL-04	VET_T7_118	4227659.855	558945.162	5.78	4/1/2005
COIS	WL-04	VET_T7_121	4227666.004	558945.076	5.81	4/1/2005
COIS	WL-04	VET_T7_124	4227673.499	558943.477	6.45	4/1/2005
COIS	WL-04	VET_T7_128	4227681.899	558945.669	5.93	4/1/2005
COIS	WL-04	VET_T7_131	4227688.696	558945.971	5.96	4/1/2005
COIS	WL-04	VET_T7_133	4227692.227	558945.963	6.00	4/1/2005
COIS	WL-04	VET_T7_137	4227698.596	558946.793	6.15	4/1/2005
COIS	WL-04	VET_T7_140	4227704.177	558946.781	6.17	4/1/2005
COIS	WL-04	VET_T7_143	4227709.636	558946.684	5.33	4/1/2005
COIS	WL-04	VET_T7_146	4227711.234	558948.174	5.45	4/1/2005
COIS	WL-04	VET_T7_149	4227713.463	558950.294	6.21	4/1/2005
COIS	WL-04	VET_T7_152	4227715.626	558952.041	6.23	4/1/2005
COIS	WL-04	VET_T7_156	4227724.229	558950.742	6.17	4/1/2005
COIS	WL-04	VET_T7_159	4227725.369	558950.574	6.03	4/1/2005
COIS	WL-04	VET_T7_163	4227730.91	558949.108	5.72	4/1/2005
COIS	WL-04	VET_T7_167	4227736.334	558948.161	6.26	4/1/2005
COIS	WL-04	VET_T7_170	4227742.217	558946.777	5.95	4/1/2005
COIS	WL-04	VET_T7_173	4227747.242	558946.597	5.65	4/1/2005
COIS	WL-04	VET_T7_176	4227753.745	558946.444	5.91	4/1/2005
COIS	WL-04	VET_T7_180	4227759.842	558945.146	6.03	4/1/2005
COIS	WL-04	VET_T7_184	4227768.742	558944.044	5.93	4/1/2005
COIS	WL-04	VET_T8_191	4227757.213	558928.446	3.42	4/1/2005
COIS	WL-04	VET_T8_194	4227758.818	558929.564	5.32	4/1/2005
COIS	WL-04	VET_T8_197	4227760.429	558930.58	6.39	4/1/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
COIS	WL-04	VET_T8_201	4227763.594	558932.674	6.22	4/1/2005
COIS	WL-04	VET_T8_205	4227767.268	558934.485	5.89	4/1/2005
COIS	WL-04	VET_T8_209	4227773.14	558937.274	5.82	4/1/2005
COIS	WL-04	VET_T8_212	4227779.274	558939.835	5.68	4/1/2005
COIS	WL-04	VET_T8_216	4227782.547	558942.035	5.69	4/1/2005
COIS	WL-04	VET_T8_219	4227790.142	558949.685	5.76	4/1/2005
COIS	WL-04	VET_T8_222	4227802.653	558962.159	6.04	4/1/2005
COIS	WL-04	VET_T8_225	4227803.811	558963.916	5.70	4/1/2005
COIS	WL-04	VET_T9_234	4227812.536	558957.788	4.12	4/1/2005
COIS	WL-04	VET_T9_237	4227812.019	558957.518	5.10	4/1/2005
COIS	WL-04	VET_T9_241	4227811.453	558957.136	6.15	4/1/2005
COIS	WL-04	VET_T9_244	4227810.523	558956.562	6.35	4/1/2005
COIS	WL-04	VET_T9_247	4227809.154	558954.87	6.20	4/1/2005
COIS	WL-04	VET_T9_248	4227807.927	558953.95	5.99	4/1/2005
COIS	WL-04	VET_T9_252	4227805.914	558952.142	5.84	4/1/2005
COIS	WL-04	VET_T9_255	4227802.556	558948.511	5.78	4/1/2005
COIS	WL-04	VET_T9_257	4227801.771	558947.769	5.72	4/1/2005
COIS	WL-04	VET_T9_260	4227797.508	558939.652	5.71	4/1/2005
COIS	WL-04	VET_T9_263	4227790.657	558932.072	5.65	4/1/2005
COIS	WL-04	VET_T9_266	4227783.322	558921.597	5.60	4/1/2005
COIS	WL-04	VET_T9_269	4227775.102	558912.298	5.99	4/1/2005
COIS	WL-04	VET_T9_272	4227770.931	558909.9	6.33	4/1/2005
COIS	WL-04	VET_T9_281	4227768.25	558909.359	5.49	4/1/2005
PO2A	WL-01	VET__280	4222545.082	559065.723	5.49	5/27/2005
PO2A	WL-01	VET__282	4222548.244	559070.998	5.66	5/27/2005
PO2A	WL-01	VET__284	4222551.564	559076.193	5.74	5/27/2005
PO2A	WL-01	VET__286	4222553.646	559079.613	5.66	5/27/2005
PO2A	WL-01	VET__289	4222526.666	559086.646	5.68	5/27/2005
PO2A	WL-01	VET__290	4222525.547	559082.357	5.74	5/27/2005
PO2A	WL-01	VET__292	4222523.74	559076.481	5.65	5/27/2005
PO2A	WL-01	VET__294	4222522.332	559071.42	5.49	5/27/2005
PO2A	WL-01	VET__296	4222522.322	559067.265	5.64	5/27/2005
PO2A	WL-01	VET__298	4222521.236	559061.688	5.63	5/27/2005
PO2A	WL-01	VET__300	4222519.125	559055.857	5.63	5/27/2005
PO2A	WL-01	VET_OffTransect_304	4222442.455	559012.761	6.34	5/27/2005
PO2A	WL-01	VET_OffTransect_306	4222443.567	559013.902	6.34	5/27/2005
PO2A	WL-01	VET_OffTransect_310	4222430.426	558989.338	6.30	5/27/2005
PO2A	WL-01	VET_OffTransect_312	4222432.869	558989.575	6.34	5/27/2005
PO2A	WL-01	VET_T1_167	4222499.086	558990.23	5.81	5/27/2005
PO2A	WL-01	VET_T1_169	4222504.522	558988.893	5.82	5/27/2005
PO2A	WL-01	VET_T1_171	4222510.932	558987.196	5.89	5/27/2005
PO2A	WL-01	VET_T1_173	4222516.906	558985.609	5.71	5/27/2005
PO2A	WL-01	VET_T1_175	4222520.946	558984.105	5.72	5/27/2005
PO2A	WL-01	VET_T1_177	4222525.349	558984.296	5.32	5/27/2005
PO2A	WL-01	VET_T1_179	4222529.238	558983.667	5.18	5/27/2005
PO2A	WL-01	VET_T1_180	4222533.554	558983.068	5.65	5/27/2005
PO2A	WL-01	VET_T1_182	4222537.759	558982.151	5.89	5/27/2005
PO2A	WL-01	VET_T1_183	4222542.727	558981.04	5.78	5/27/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PO2A	WL-01	VET_T1_186	4222547.058	558981.497	5.66	5/27/2005
PO2A	WL-01	VET_T1_188	4222550.797	558980.238	5.23	5/27/2005
PO2A	WL-01	VET_T1_190	4222556.309	558977.972	5.82	5/27/2005
PO2A	WL-01	VET_T1_193	4222559.859	558977.113	5.78	5/27/2005
PO2A	WL-01	VET_T1_194	4222563.865	558975.371	5.60	5/27/2005
PO2A	WL-01	VET_T1_197	4222567.682	558974.09	5.71	5/27/2005
PO2A	WL-01	VET_T1_199	4222572.371	558972.432	5.61	5/27/2005
PO2A	WL-01	VET_T1_201	4222576.36	558970.562	5.35	5/27/2005
PO2A	WL-01	VET_T1_205	4222589.055	558957.788	5.32	5/27/2005
PO2A	WL-01	VET_T1_206	4222593.618	558956.278	5.17	5/27/2005
PO2A	WL-01	VET_T10_317	4222437.913	559029.13	3.57	5/27/2005
PO2A	WL-01	VET_T10_319	4222440.091	559027.495	5.99	5/27/2005
PO2A	WL-01	VET_T10_321	4222444.315	559023.52	6.30	5/27/2005
PO2A	WL-01	VET_T10_322	4222448.89	559019.685	6.37	5/27/2005
PO2A	WL-01	VET_T10_323	4222454.668	559015.474	5.91	5/27/2005
PO2A	WL-01	VET_T10_324	4222459.062	559011.309	5.83	5/27/2005
PO2A	WL-01	VET_T10_325	4222463.635	559007.177	5.81	5/27/2005
PO2A	WL-01	VET_T10_326	4222468.449	559003.912	5.74	5/27/2005
PO2A	WL-01	VET_T10_327	4222473.167	558999.865	5.69	5/27/2005
PO2A	WL-01	VET_T10_328	4222477.978	558996.558	5.58	5/27/2005
PO2A	WL-01	VET_T10_329	4222483.048	558994.331	5.78	5/27/2005
PO2A	WL-01	VET_T10_330	4222488.65	558991.872	5.66	5/27/2005
PO2A	WL-01	VET_T2_209	4222587.1	558924.022	5.34	5/27/2005
PO2A	WL-01	VET_T2_211	4222582.584	558927.193	5.39	5/27/2005
PO2A	WL-01	VET_T2_213	4222578.496	558930.247	5.56	5/27/2005
PO2A	WL-01	VET_T2_214	4222575.333	558932.758	5.41	5/27/2005
PO2A	WL-01	VET_T2_216	4222573.144	558934.908	5.19	5/27/2005
PO2A	WL-01	VET_T2_218	4222569.399	558938.764	5.41	5/27/2005
PO2A	WL-01	VET_T2_220	4222566.286	558940.783	5.53	5/27/2005
PO2A	WL-01	VET_T2_222	4222562.845	558942.9	5.78	5/27/2005
PO2A	WL-01	VET_T2_224	4222559.573	558945.303	5.42	5/27/2005
PO2A	WL-01	VET_T2_226	4222556.327	558947.359	5.84	5/27/2005
PO2A	WL-01	VET_T2_228	4222553.356	558949.513	5.78	5/27/2005
PO2A	WL-01	VET_T2_230	4222550.304	558951.079	5.83	5/27/2005
PO2A	WL-01	VET_T2_232	4222546.471	558953.066	5.84	5/27/2005
PO2A	WL-01	VET_T2_234	4222543.025	558955.482	5.89	5/27/2005
PO2A	WL-01	VET_T2_238	4222540.096	558958.385	5.78	5/27/2005
PO2A	WL-01	VET_T2_241	4222536.886	558961.382	5.81	5/27/2005
PO2A	WL-01	VET_T2_242	4222532.009	558964.03	5.80	5/27/2005
PO2A	WL-01	VET_T2_243	4222527.832	558967.149	5.87	5/27/2005
PO2A	WL-01	VET_T2_244	4222522.878	558970.75	4.95	5/27/2005
PO2A	WL-01	VET_T2_245	4222518.94	558971.515	5.15	5/27/2005
PO2A	WL-01	VET_T2_246	4222515.469	558974.507	5.80	5/27/2005
PO2A	WL-01	VET_T2_247	4222510.7	558978.604	5.68	5/27/2005
PO2A	WL-01	VET_T2_248	4222505.732	558982.349	5.30	5/27/2005
PO2A	WL-01	VET_T2_249	4222500.386	558986.731	5.67	5/27/2005
PO2A	WL-01	VET_T3_251	4222499.254	558997.465	5.48	5/27/2005
PO2A	WL-01	VET_T3_253	4222502.795	559002.654	5.70	5/27/2005
PO2A	WL-01	VET_T3_255	4222506.008	559007.376	5.74	5/27/2005
PO2A	WL-01	VET_T3_257	4222509.254	559011.923	5.70	5/27/2005
PO2A	WL-01	VET_T3_259	4222512.765	559016.85	5.72	5/27/2005
PO2A	WL-01	VET_T3_260	4222516.223	559021.633	5.57	5/27/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PO2A	WL-01	VET_T3_262	4222519.59	559026.497	5.58	5/27/2005
PO2A	WL-01	VET_T3_264	4222522.564	559031.836	5.31	5/27/2005
PO2A	WL-01	VET_T3_266	4222525.387	559037.059	5.57	5/27/2005
PO2A	WL-01	VET_T3_268	4222528.805	559041.877	5.71	5/27/2005
PO2A	WL-01	VET_T3_270	4222532.727	559047.57	5.58	5/27/2005
PO2A	WL-01	VET_T3_272	4222535.51	559052.638	5.60	5/27/2005
PO2A	WL-01	VET_T3_274	4222537.243	559055.654	5.40	5/27/2005
PO2A	WL-01	VET_T3_277	4222540.681	559060.357	5.26	5/27/2005
PO2A	WL-01	VET_T4_302	4222517.32	559050.738	5.54	5/27/2005
PO2A	WL-01	VET_T4_303	4222515.798	559045.39	5.25	5/27/2005
PO2A	WL-01	VET_T4_305	4222514.146	559039.513	5.56	5/27/2005
PO2A	WL-01	VET_T4_307	4222512.542	559033.513	5.59	5/27/2005
PO2A	WL-01	VET_T4_309	4222510.898	559028.654	5.66	5/27/2005
PO2A	WL-01	VET_T4_311	4222508.916	559023.616	5.63	5/27/2005
PO2A	WL-01	VET_T4_313	4222507.11	559018.641	5.59	5/27/2005
PO2A	WL-01	VET_T4_314	4222504.665	559013.234	5.64	5/27/2005
PO2A	WL-01	VET_T4_315	4222502.037	559007.913	5.57	5/27/2005
PO2A	WL-01	VET_T4_316	4222499.72	559002.5	5.71	5/27/2005
PO2A	WL-01	VET_T4_318	4222497.397	558997.576	5.63	5/27/2005
PO2A	WL-01	VET_T5_168	4222493.367	558984.64	5.43	5/27/2005
PO2A	WL-01	VET_T5_170	4222493.365	558980.198	5.58	5/27/2005
PO2A	WL-01	VET_T5_172	4222492.468	558974.544	5.77	5/27/2005
PO2A	WL-01	VET_T5_174	4222490.754	558968.5	5.64	5/27/2005
PO2A	WL-01	VET_T5_176	4222489.033	558962.209	5.75	5/27/2005
PO2A	WL-01	VET_T5_178	4222487.09	558955.707	5.79	5/27/2005
PO2A	WL-01	VET_T5_181	4222485.317	558950.257	5.63	5/27/2005
PO2A	WL-01	VET_T5_184	4222485.732	558949.072	5.28	5/27/2005
PO2A	WL-01	VET_T5_185	4222485.401	558944.421	5.71	5/27/2005
PO2A	WL-01	VET_T5_187	4222484.088	558938.261	5.83	5/27/2005
PO2A	WL-01	VET_T5_189	4222482.583	558934.148	5.52	5/27/2005
PO2A	WL-01	VET_T5_191	4222481.4	558930.148	5.61	5/27/2005
PO2A	WL-01	VET_T5_192	4222479.912	558924.847	5.87	5/27/2005
PO2A	WL-01	VET_T5_195	4222478.954	558920.608	5.97	5/27/2005
PO2A	WL-01	VET_T5_196	4222476.357	558915.862	6.22	5/27/2005
PO2A	WL-01	VET_T5_198	4222474.827	558911.169	5.83	5/27/2005
PO2A	WL-01	VET_T5_200	4222473.946	558908.943	5.65	5/27/2005
PO2A	WL-01	VET_T5_202	4222473.323	558908.023	4.92	5/27/2005
PO2A	WL-01	VET_T5_203	4222473.087	558907.426	3.53	5/27/2005
PO2A	WL-01	VET_T5_204	4222472.943	558906.623	2.14	5/27/2005
PO2A	WL-01	VET_T6_207	4222446.577	558914.804	2.37	5/27/2005
PO2A	WL-01	VET_T6_208	4222447.355	558916.742	5.92	5/27/2005
PO2A	WL-01	VET_T6_210	4222449.624	558921.711	6.16	5/27/2005
PO2A	WL-01	VET_T6_212	4222451.422	558925.912	6.03	5/27/2005
PO2A	WL-01	VET_T6_215	4222454.411	558930.658	5.85	5/27/2005
PO2A	WL-01	VET_T6_217	4222457.08	558935.644	5.65	5/27/2005
PO2A	WL-01	VET_T6_219	4222459.335	558940.728	5.53	5/27/2005
PO2A	WL-01	VET_T6_221	4222461.774	558945.642	5.66	5/27/2005
PO2A	WL-01	VET_T6_223	4222464.421	558951.404	5.77	5/27/2005
PO2A	WL-01	VET_T6_225	4222467.384	558956.721	5.52	5/27/2005
PO2A	WL-01	VET_T6_227	4222469.383	558960.227	5.57	5/27/2005
PO2A	WL-01	VET_T6_229	4222471.404	558962.438	5.49	5/27/2005
PO2A	WL-01	VET_T6_231	4222475.026	558965.984	5.54	5/27/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PO2A	WL-01	VET_T6_233	4222479.361	558969.475	5.42	5/27/2005
PO2A	WL-01	VET_T6_235	4222483.152	558973.719	5.58	5/27/2005
PO2A	WL-01	VET_T6_236	4222487.507	558977.51	5.76	5/27/2005
PO2A	WL-01	VET_T6_237	4222489.941	558981.343	5.45	5/27/2005
PO2A	WL-01	VET_T6_239	4222491.322	558983.339	3.96	5/27/2005
PO2A	WL-01	VET_T6_240	4222493.542	558986.93	5.60	5/27/2005
PO2A	WL-01	VET_T7_250	4222493.15	558995.192	5.70	5/27/2005
PO2A	WL-01	VET_T7_252	4222492.783	558999.298	5.70	5/27/2005
PO2A	WL-01	VET_T7_254	4222493.165	559003.455	5.68	5/27/2005
PO2A	WL-01	VET_T7_256	4222492.732	559007.134	5.73	5/27/2005
PO2A	WL-01	VET_T7_258	4222492.746	559011.369	5.66	5/27/2005
PO2A	WL-01	VET_T7_261	4222492.532	559013.403	5.49	5/27/2005
PO2A	WL-01	VET_T7_263	4222492.579	559014.297	5.26	5/27/2005
PO2A	WL-01	VET_T8_265	4222484.626	559010.257	5.54	5/27/2005
PO2A	WL-01	VET_T8_267	4222485.559	559007.484	5.71	5/27/2005
PO2A	WL-01	VET_T8_269	4222486.625	559004.62	5.76	5/27/2005
PO2A	WL-01	VET_T8_271	4222488.541	559000.832	5.81	5/27/2005
PO2A	WL-01	VET_T8_273	4222490.782	558996.988	5.79	5/27/2005
PO2A	WL-01	VET_T8_275	4222492.243	558993.844	5.73	5/27/2005
PO2A	WL-01	VET_T9_276	4222491.591	558992.712	5.73	5/27/2005
PO2A	WL-01	VET_T9_278	4222486.687	558994.009	5.69	5/27/2005
PO2A	WL-01	VET_T9_279	4222480.905	558994.812	5.80	5/27/2005
PO2A	WL-01	VET_T9_281	4222474.675	558996.258	5.74	5/27/2005
PO2A	WL-01	VET_T9_283	4222469.715	558996.956	5.73	5/27/2005
PO2A	WL-01	VET_T9_285	4222463.848	558998.361	5.96	5/27/2005
PO2A	WL-01	VET_T9_287	4222457.433	558999.299	5.90	5/27/2005
PO2A	WL-01	VET_T9_288	4222451.283	559000.44	5.76	5/27/2005
PO2A	WL-01	VET_T9_291	4222445.404	559002.217	6.07	5/27/2005
PO2A	WL-01	VET_T9_293	4222439.008	559003.528	6.36	5/27/2005
PO2A	WL-01	VET_T9_295	4222434.491	559005.028	5.84	5/27/2005
PO2A	WL-01	VET_T9_297	4222432.945	559005.636	4.87	5/27/2005
PO2A	WL-01	VET_T9_299	4222432.609	559005.723	3.95	5/27/2005
PO2A	WL-01	VET_T9_301	4222432.184	559005.917	3.29	5/27/2005
PO2A	WL-02	VET__368	4222983.061	559322.789	5.75	5/27/2005
PO2A	WL-02	VET_T1_343	4222884.824	559299.757	5.73	5/27/2005
PO2A	WL-02	VET_T1_345	4222888.66	559301.556	5.73	5/27/2005
PO2A	WL-02	VET_T1_347	4222893.202	559303.126	5.61	5/27/2005
PO2A	WL-02	VET_T1_349	4222897.957	559304.679	5.64	5/27/2005
PO2A	WL-02	VET_T1_351	4222902.989	559306.189	5.52	5/27/2005
PO2A	WL-02	VET_T1_353	4222907.723	559307.988	5.61	5/27/2005
PO2A	WL-02	VET_T1_355	4222913.268	559309.775	5.54	5/27/2005
PO2A	WL-02	VET_T1_357	4222917.584	559311.647	5.64	5/27/2005
PO2A	WL-02	VET_T1_359	4222923.083	559313.464	5.62	5/27/2005
PO2A	WL-02	VET_T1_361	4222928.1	559314.897	5.70	5/27/2005
PO2A	WL-02	VET_T1_363	4222932.247	559316.826	5.69	5/27/2005
PO2A	WL-02	VET_T1_365	4222937.388	559317.776	5.67	5/27/2005
PO2A	WL-02	VET_T1_367	4222942.214	559318.579	5.70	5/27/2005
PO2A	WL-02	VET_T1_369	4222947.034	559318.866	5.66	5/27/2005
PO2A	WL-02	VET_T1_371	4222951.748	559319.432	5.73	5/27/2005
PO2A	WL-02	VET_T1_373	4222957.022	559319.276	5.35	5/27/2005
PO2A	WL-02	VET_T1_375	4222961.497	559320.047	5.64	5/27/2005
PO2A	WL-02	VET_T1_377	4222967.445	559318.709	5.74	5/27/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PO2A	WL-02	VET_T1_379	4222972.379	559320.614	5.63	5/27/2005
PO2A	WL-02	VET_T1_381	4222980.425	559322.861	5.64	5/27/2005
PO2A	WL-02	VET_T2_374	4222983.154	559318.533	5.60	5/27/2005
PO2A	WL-02	VET_T2_376	4222982.607	559313.623	5.71	5/27/2005
PO2A	WL-02	VET_T2_378	4222981.873	559307.979	5.69	5/27/2005
PO2A	WL-02	VET_T2_380	4222982.01	559301.979	5.57	5/27/2005
PO2A	WL-02	VET_T2_382	4222982.375	559296.996	5.76	5/27/2005
PO2A	WL-02	VET_T2_384	4222982.529	559290.641	5.60	5/27/2005
PO2A	WL-02	VET_T2_386	4222983.063	559284.972	5.55	5/27/2005
PO2A	WL-02	VET_T2_388	4222983.291	559279.311	5.70	5/27/2005
PO2A	WL-02	VET_T3_395	4223018.078	559316.668	5.65	5/27/2005
PO2A	WL-02	VET_T3_397	4223020.28	559338.63	5.74	5/27/2005
PO2A	WL-02	VET_T3_399	4223014.818	559335.668	5.67	5/27/2005
PO2A	WL-02	VET_T3_401	4223009.644	559332.583	5.68	5/27/2005
PO2A	WL-02	VET_T3_403	4223004.007	559330.525	5.44	5/27/2005
PO2A	WL-02	VET_T3_405	4222999.26	559329.815	5.33	5/27/2005
PO2A	WL-02	VET_T3_407	4222992.551	559327.041	5.49	5/27/2005
PO2A	WL-02	VET_T3_409	4222986.721	559324.505	6.31	5/27/2005
PO2A	WL-02	VET_T4_383	4222986.592	559323.566	5.55	5/27/2005
PO2A	WL-02	VET_T4_385	4222991.285	559322.404	5.53	5/27/2005
PO2A	WL-02	VET_T4_387	4222995.017	559321.563	5.32	5/27/2005
PO2A	WL-02	VET_T4_389	4223001.776	559319.3	5.64	5/27/2005
PO2A	WL-02	VET_T4_391	4223007.628	559319.209	5.59	5/27/2005
PO2A	WL-02	VET_T4_393	4223013.059	559317.809	5.69	5/27/2005
PO2A	WL-02	VET_T5_337	4222893.031	559273.747	6.00	5/27/2005
PO2A	WL-02	VET_T5_338	4222899.376	559277.666	5.72	5/27/2005
PO2A	WL-02	VET_T5_339	4222904.946	559279.92	5.58	5/27/2005
PO2A	WL-02	VET_T5_340	4222909.963	559283.065	5.52	5/27/2005
PO2A	WL-02	VET_T5_341	4222915.036	559285.057	5.36	5/27/2005
PO2A	WL-02	VET_T5_342	4222920.705	559288.494	5.60	5/27/2005
PO2A	WL-02	VET_T5_344	4222926.268	559290.929	5.54	5/27/2005
PO2A	WL-02	VET_T5_346	4222931.739	559293.185	5.54	5/27/2005
PO2A	WL-02	VET_T5_348	4222937.999	559295.76	5.63	5/27/2005
PO2A	WL-02	VET_T5_350	4222942.898	559298.122	5.69	5/27/2005
PO2A	WL-02	VET_T5_352	4222948.068	559300.676	5.69	5/27/2005
PO2A	WL-02	VET_T5_354	4222953.425	559302.978	5.71	5/27/2005
PO2A	WL-02	VET_T5_356	4222958.325	559305.514	5.77	5/27/2005
PO2A	WL-02	VET_T5_358	4222964.668	559309.052	5.90	5/27/2005
PO2A	WL-02	VET_T5_360	4222969.546	559311.685	5.75	5/27/2005
PO2A	WL-02	VET_T5_362	4222974.361	559314.835	5.77	5/27/2005
PO2A	WL-02	VET_T5_364	4222976.413	559316.336	5.43	5/27/2005
PO2A	WL-02	VET_T5_366	4222980.928	559319.897	5.74	5/27/2005
PO2A	WL-02	VET_T6_390	4222983.476	559273.735	5.57	5/27/2005
PO2A	WL-02	VET_T6_392	4222983.73	559269.373	5.58	5/27/2005
PO2A	WL-02	VET_T6_394	4222983.604	559263.475	5.72	5/27/2005
PO2A	WL-02	VET_T6_396	4222983.695	559258.629	5.65	5/27/2005
PO2A	WL-02	VET_T6_398	4222978.631	559261.101	5.48	5/27/2005
PO2A	WL-02	VET_T6_400	4222973.156	559261.467	5.74	5/27/2005
PO2A	WL-02	VET_T6_402	4222967.062	559260.775	5.73	5/27/2005
PO2A	WL-02	VET_T6_404	4222961.895	559259.921	5.70	5/27/2005
PO2A	WL-02	VET_T6_406	4222956.447	559260.334	5.66	5/27/2005
PO2A	WL-02	VET_T6_408	4222950.682	559260.518	5.70	5/27/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
PO2A	WL-02	VET_T6_410	4222944.872	559261.209	6.05	5/27/2005
PO2A	WL-02	VET_T6_411	4222939.242	559260.601	5.37	5/27/2005
PO2A	WL-02	VET_T6_412	4222933.973	559260.699	5.35	5/27/2005
PO2A	WL-04	VET_ProdPlot_129	4222989.574	558809.566	6.13	5/13/2005
PO2A	WL-04	VET_ProdPlot_130	4222989.662	558807.953	6.22	5/13/2005
PO2A	WL-04	VET_ProdPlot_133	4222991.744	558808.098	6.08	5/13/2005
PO2A	WL-04	VET_ProdPlot_135	4222991.631	558809.696	6.05	5/13/2005
PO2A	WL-04	VET_T1_14	4222997.938	558767.284	3.74	5/13/2005
PO2A	WL-04	VET_T1_17	4222999.062	558769.145	5.34	5/13/2005
PO2A	WL-04	VET_T1_19	4223000.019	558770.595	5.83	5/13/2005
PO2A	WL-04	VET_T1_21	4223002.948	558772.751	6.36	5/13/2005
PO2A	WL-04	VET_T1_22	4223008.337	558776.777	6.26	5/13/2005
PO2A	WL-04	VET_T1_23	4223012.327	558781.589	6.00	5/13/2005
PO2A	WL-04	VET_T1_24	4223016.073	558785.787	6.05	5/13/2005
PO2A	WL-04	VET_T1_25	4223020.002	558790.214	5.74	5/13/2005
PO2A	WL-04	VET_T1_27	4223024.58	558794.282	5.87	5/13/2005
PO2A	WL-04	VET_T1_29	4223027.906	558798.159	5.71	5/13/2005
PO2A	WL-04	VET_T1_32	4223030.963	558800.537	5.71	5/13/2005
PO2A	WL-04	VET_T1_35	4223034.544	558803.95	5.84	5/13/2005
PO2A	WL-04	VET_T1_37	4223038.823	558808.066	5.80	5/13/2005
PO2A	WL-04	VET_T1_39	4223043.054	558811.514	5.86	5/13/2005
PO2A	WL-04	VET_T1_41	4223043.953	558812.694	5.38	5/13/2005
PO2A	WL-04	VET_T1_44	4223048.601	558814.937	6.16	5/13/2005
PO2A	WL-04	VET_T1_47	4223053.597	558818.562	6.12	5/13/2005
PO2A	WL-04	VET_T1_87	4223106.913	558783.184	5.65	5/13/2005
PO2A	WL-04	VET_T1_89	4223108.656	558783.161	5.39	5/13/2005
PO2A	WL-04	VET_T1_91	4223110.994	558782.845	5.46	5/13/2005
PO2A	WL-04	VET_T1_93	4223112.546	558782.481	5.41	5/13/2005
PO2A	WL-04	VET_T2_51	4223015.238	558661.665	5.84	5/13/2005
PO2A	WL-04	VET_T2_53	4223054.597	558819.529	6.21	5/13/2005
PO2A	WL-04	VET_T2_55	4223060.943	558815.872	5.89	5/13/2005
PO2A	WL-04	VET_T2_57	4223066.039	558814.463	6.07	5/13/2005
PO2A	WL-04	VET_T2_58	4223018.493	558650.758	5.87	5/13/2005
PO2A	WL-04	VET_T2_60	4223078.969	558808.887	5.61	5/13/2005
PO2A	WL-04	VET_T2_62	4223084.562	558805.8	5.67	5/13/2005
PO2A	WL-04	VET_T2_64	4223089.993	558802.223	5.51	5/13/2005
PO2A	WL-04	VET_T2_66	4223095.318	558799.724	5.62	5/13/2005
PO2A	WL-04	VET_T2_68	4223101.661	558796.232	5.54	5/13/2005
PO2A	WL-04	VET_T2_70	4223103.874	558805.777	5.27	5/13/2005
PO2A	WL-04	VET_T2_72	4223103.862	558803.941	5.38	5/13/2005
PO2A	WL-04	VET_T2_74	4223104.084	558801.676	5.69	5/13/2005
PO2A	WL-04	VET_T2_76	4223104.322	558799.167	5.60	5/13/2005
PO2A	WL-04	VET_T2_78	4223105.118	558795.259	5.59	5/13/2005
PO2A	WL-04	VET_T2_80	4223105.55	558791.411	5.61	5/13/2005
PO2A	WL-04	VET_T2_82	4223104.694	558787.135	5.52	5/13/2005
PO2A	WL-04	VET_T2_84	4223105.084	558783.388	5.68	5/13/2005
PO2A	WL-04	VET_T3_101	4223127.618	558792.685	5.63	5/13/2005
PO2A	WL-04	VET_T3_94	4223107.882	558795.336	5.46	5/13/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PO2A	WL-04	VET_T3_96	4223112.917	558796.305	5.47	5/13/2005
PO2A	WL-04	VET_T3_97	4223120.169	558795.469	5.59	5/13/2005
PO2A	WL-04	VET_T3_99	4223124.451	558793.736	5.76	5/13/2005
PO2A	WL-04	VET_T4_104	4223090.396	558750.572	3.60	5/13/2005
PO2A	WL-04	VET_T4_106	4223090.094	558751.341	6.91	5/13/2005
PO2A	WL-04	VET_T4_108	4223089.265	558753.249	6.37	5/13/2005
PO2A	WL-04	VET_T4_110	4223090.676	558760.372	6.20	5/13/2005
PO2A	WL-04	VET_T4_112	4223091.554	558766.416	5.88	5/13/2005
PO2A	WL-04	VET_T4_114	4223092.359	558771.531	5.87	5/13/2005
PO2A	WL-04	VET_T4_117	4223091.85	558779.012	5.87	5/13/2005
PO2A	WL-04	VET_T4_119	4223092.651	558785.246	5.64	5/13/2005
PO2A	WL-04	VET_T4_120	4223093.944	558792.166	5.63	5/13/2005
PO2A	WL-04	VET_T4_121	4223095.023	558797.12	5.64	5/13/2005
PO2A	WL-04	VET_T4_122	4223095.736	558801.575	5.26	5/13/2005
PO2A	WL-04	VET_T4_123	4223096.858	558803.771	5.39	5/13/2005
PO2A	WL-04	VET_T5_124	4223092.511	558801.893	5.48	5/13/2005
PO2A	WL-04	VET_T5_125	4223087.217	558801.321	5.70	5/13/2005
PO2A	WL-04	VET_T5_126	4223081.142	558800.371	5.73	5/13/2005
PO2A	WL-04	VET_T5_127	4223074.948	558799.581	5.76	5/13/2005
PO2A	WL-04	VET_T5_128	4223068.813	558799.522	5.91	5/13/2005
PO2A	WL-04	VET_T5_131	4223063.619	558798.531	5.94	5/13/2005
PO2A	WL-04	VET_T5_132	4223058.904	558796.835	6.03	5/13/2005
PO2A	WL-04	VET_T5_134	4223053.03	558796.033	5.87	5/13/2005
PO2A	WL-04	VET_T5_136	4223047.818	558795.077	5.76	5/13/2005
PO2A	WL-04	VET_T5_137	4223042.719	558794.035	5.91	5/13/2005
PO2A	WL-04	VET_T5_138	4223036.406	558792.496	5.81	5/13/2005
PO2A	WL-04	VET_T5_139	4223032.029	558792.085	5.78	5/13/2005
PO2A	WL-04	VET_T5_141	4223026.887	558790.969	5.81	5/13/2005
PO2A	WL-04	VET_T5_143	4223020.916	558790.132	5.84	5/13/2005
PO2A	WL-04	VET_T5_144	4223016.351	558789.258	5.85	5/13/2005
PO2A	WL-04	VET_T5_145	4223011.248	558788.316	6.08	5/13/2005
PO2A	WL-04	VET_T5_147	4223005.161	558787.324	6.15	5/13/2005
PO2A	WL-04	VET_T5_149	4223000.72	558786.002	6.28	5/13/2005
PO2A	WL-04	VET_T6_15	4222981.689	558756.91	3.34	5/13/2005
PO2A	WL-04	VET_T6_16	4222980.052	558754.969	3.92	5/13/2005
PO2A	WL-04	VET_T6_18	4222977.421	558753.707	5.47	5/13/2005
PO2A	WL-04	VET_T6_20	4222974.507	558750.021	6.13	5/13/2005
PO2A	WL-04	VET_T7_26	4222993.646	558744.601	4.17	5/13/2005
PO2A	WL-04	VET_T7_28	4222994.856	558739.27	5.78	5/13/2005
PO2A	WL-04	VET_T7_30	4222996.532	558734.033	5.96	5/13/2005
PO2A	WL-04	VET_T7_31	4222998.322	558728.296	6.39	5/13/2005
PO2A	WL-04	VET_T7_33	4223000.477	558723.154	6.32	5/13/2005
PO2A	WL-04	VET_T7_34	4223001.763	558717.639	6.30	5/13/2005
PO2A	WL-04	VET_T7_36	4223002.513	558713.094	6.23	5/13/2005
PO2A	WL-04	VET_T7_38	4223004.597	558707.033	6.18	5/13/2005
PO2A	WL-04	VET_T7_40	4223006.015	558702.517	6.24	5/13/2005
PO2A	WL-04	VET_T7_42	4223007.249	558696.483	6.20	5/13/2005
PO2A	WL-04	VET_T7_43	4223008.331	558690.533	6.03	5/13/2005
PO2A	WL-04	VET_T7_45	4223010.2	558685.107	6.17	5/13/2005
PO2A	WL-04	VET_T7_46	4223011.474	558678.549	6.02	5/13/2005
PO2A	WL-04	VET_T7_48	4223012.336	558674.08	5.81	5/13/2005
PO2A	WL-04	VET_T7_49	4223014.077	558668.857	5.87	5/13/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
PO2A	WL-04	VET_T7_50	4223015.186	558663.955	5.94	5/13/2005
PO2A	WL-04	VET_T7_52	4223048.611	558821.502	5.44	5/13/2005
PO2A	WL-04	VET_T7_54	4223016.018	558654.282	5.76	5/13/2005
PO2A	WL-04	VET_T7_56	4223013.857	558653.876	5.80	5/13/2005
PO2A	WL-04	VET_T7_59	4223071.919	558811.516	5.87	5/13/2005
PO2A	WL-04	VET_T7_61	4223019.277	558648.724	5.85	5/13/2005
PO2A	WL-04	VET_T7_63	4223015.985	558645.069	5.93	5/13/2005
PO2A	WL-04	VET_T7_65	4223020.02	558647.11	5.88	5/13/2005
PO2A	WL-04	VET_T7_67	4223021.752	558642.327	5.84	5/13/2005
PO2A	WL-04	VET_T8_100	4223029.585	558698.099	6.20	5/13/2005
PO2A	WL-04	VET_T8_102	4223025.741	558702.442	6.08	5/13/2005
PO2A	WL-04	VET_T8_103	4223023.001	558705.895	6.08	5/13/2005
PO2A	WL-04	VET_T8_105	4223017.942	558710.235	5.95	5/13/2005
PO2A	WL-04	VET_T8_107	4223014.93	558714.458	5.98	5/13/2005
PO2A	WL-04	VET_T8_109	4223010.175	558719.348	6.08	5/13/2005
PO2A	WL-04	VET_T8_111	4223005.25	558725.844	5.99	5/13/2005
PO2A	WL-04	VET_T8_113	4223002.738	558729.189	5.93	5/13/2005
PO2A	WL-04	VET_T8_115	4222999.577	558733.41	5.85	5/13/2005
PO2A	WL-04	VET_T8_116	4222996.807	558737.242	5.57	5/13/2005
PO2A	WL-04	VET_T8_118	4222994.371	558741.539	4.93	5/13/2005
PO2A	WL-04	VET_T8_69	4223062.866	558647.771	4.68	5/13/2005
PO2A	WL-04	VET_T8_71	4223059.98	558651.005	5.39	5/13/2005
PO2A	WL-04	VET_T8_73	4223058.008	558654.446	5.57	5/13/2005
PO2A	WL-04	VET_T8_75	4223056.624	558655.709	6.18	5/13/2005
PO2A	WL-04	VET_T8_77	4223054.932	558658.023	6.17	5/13/2005
PO2A	WL-04	VET_T8_79	4223053.067	558660.56	6.19	5/13/2005
PO2A	WL-04	VET_T8_81	4223049.476	558664.784	6.18	5/13/2005
PO2A	WL-04	VET_T8_83	4223046.303	558669.419	6.21	5/13/2005
PO2A	WL-04	VET_T8_85	4223044.182	558674.067	6.17	5/13/2005
PO2A	WL-04	VET_T8_86	4223041.372	558677.812	6.21	5/13/2005
PO2A	WL-04	VET_T8_88	4223038.567	558682.167	6.25	5/13/2005
PO2A	WL-04	VET_T8_90	4223035.181	558687.014	6.28	5/13/2005
PO2A	WL-04	VET_T8_92	4223040.655	558691.73	5.09	5/13/2005
PO2A	WL-04	VET_T8_95	4223009.282	558666.188	5.85	5/13/2005
PO2A	WL-04	VET_T8_98	4223031.795	558693.836	6.22	5/13/2005
PO2A	WL-04	VET_T9_140	4222966.994	558814.544	3.72	5/13/2005
PO2A	WL-04	VET_T9_142	4222966.619	558814.848	5.55	5/13/2005
PO2A	WL-04	VET_T9_146	4222965.126	558815.821	5.68	5/13/2005
PO2A	WL-04	VET_T9_148	4222962.48	558817.584	6.07	5/13/2005
PO2A	WL-04	VET_T9_150	4222957.045	558822.594	5.89	5/13/2005
PO2A	WL-04	VET_T9_151	4222953.159	558826.734	5.83	5/13/2005
PO2A	WL-04	VET_T9_152	4222949.877	558831.183	5.69	5/13/2005
PO2A	WL-04	VET_T9_153	4222946.557	558835.589	5.80	5/13/2005
PO2A	WL-04	VET_T9_154	4222942.875	558840.532	5.75	5/13/2005
PO2A	WL-04	VET_T9_155	4222939.138	558844.65	5.72	5/13/2005
PRMA	VET_Levee	VET_Levee_11	4218994.52	543341.7258	6.72	4/28/2005
PRMA	VET_T1	VET_T1_13	4219020.99	543320.8969	6.43	4/28/2005
PRMA	VET_T1	VET_T1_15	4219026.533	543324.0749	5.43	4/28/2005
PRMA	VET_T1	VET_T1_17	4219030.303	543326.7045	5.62	4/28/2005
PRMA	VET_T1	VET_T1_19	4219034.461	543329.8127	5.74	4/28/2005
PRMA	VET_T1	VET_T1_21	4219038.423	543333.4399	5.62	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PRMA	VET_T1	VET_T1_23	4219043.821	543336.442	5.50	4/28/2005
PRMA	VET_T1	VET_T1_25	4219049.773	543338.916	5.47	4/28/2005
PRMA	VET_T1	VET_T1_27	4219053.936	543340.9404	5.33	4/28/2005
PRMA	VET_T10	VET_T10_100	4219201.929	543360.3755	5.54	4/28/2005
PRMA	VET_T10	VET_T10_102	4219199.513	543356.3161	5.23	4/28/2005
PRMA	VET_T10	VET_T10_104	4219198.481	543354.8916	4.69	4/28/2005
PRMA	VET_T10	VET_T10_94	4219205.497	543369.5249	7.00	4/28/2005
PRMA	VET_T10	VET_T10_96	4219204.839	543367.5646	5.68	4/28/2005
PRMA	VET_T10	VET_T10_98	4219203.548	543363.6485	5.41	4/28/2005
PRMA	VET_T11	VET_T11_112	4219275.554	543352.991	6.76	4/28/2005
PRMA	VET_T11	VET_T11_114	4219274.184	543350.7522	5.30	4/28/2005
PRMA	VET_T11	VET_T11_115	4219273.066	543346.9757	5.37	4/28/2005
PRMA	VET_T11	VET_T11_117	4219271.639	543342.6566	5.54	4/28/2005
PRMA	VET_T11	VET_T11_119	4219271.081	543338.9053	5.28	4/28/2005
PRMA	VET_T11	VET_T11_121	4219281.641	543314.0032	5.41	4/28/2005
PRMA	VET_T12	VET_T12_122	4219282.942	543317.7635	5.56	4/28/2005
PRMA	VET_T12	VET_T12_124	4219283.382	543323.9492	5.61	4/28/2005
PRMA	VET_T12	VET_T12_126	4219284.921	543330.8003	5.66	4/28/2005
PRMA	VET_T12	VET_T12_128	4219285.276	543335.2136	5.45	4/28/2005
PRMA	VET_T12	VET_T12_131	4219284.789	543339.0828	5.33	4/28/2005
PRMA	VET_T12	VET_T12_133	4219285.32	543343.8441	5.39	4/28/2005
PRMA	VET_T12	VET_T12_135	4219285.474	543347.7824	5.20	4/28/2005
PRMA	VET_T12	VET_T12_137	4219285.937	543349.3946	5.19	4/28/2005
PRMA	VET_T12	VET_T12_139	4219286.426	543351.9438	5.54	4/28/2005
PRMA	VET_T12	VET_T12_141	4219286.27	543353.6668	7.65	4/28/2005
PRMA	VET_T13	VET_T13_154	4219378.27	543369.6827	6.86	4/28/2005
PRMA	VET_T13	VET_T13_156	4219379.677	543368.4639	5.04	4/28/2005
PRMA	VET_T13	VET_T13_158	4219383.31	543365.5944	4.88	4/28/2005
PRMA	VET_T13	VET_T13_159	4219387.461	543361.8597	5.07	4/28/2005
PRMA	VET_T13	VET_T13_161	4219393.069	543357.4493	5.08	4/28/2005
PRMA	VET_T13	VET_T13_163	4219398.09	543354.3442	5.16	4/28/2005
PRMA	VET_T13	VET_T13_165	4219403.71	543351.0543	5.30	4/28/2005
PRMA	VET_T13	VET_T13_167	4219408.013	543348.019	5.26	4/28/2005
PRMA	VET_T13	VET_T13_169	4219413.404	543345.2896	5.29	4/28/2005
PRMA	VET_T13	VET_T13_171	4219418.751	543341.4629	5.34	4/28/2005
PRMA	VET_T13	VET_T13_173	4219424.068	543338.2024	5.33	4/28/2005
PRMA	VET_T13	VET_T13_175	4219428.978	543334.8967	5.38	4/28/2005
PRMA	VET_T13	VET_T13_177	4219432.819	543332.2542	5.48	4/28/2005
PRMA	VET_T13	VET_T13_179	4219436.233	543330.2215	4.73	4/28/2005
PRMA	VET_T13	VET_T13_181	4219436.855	543329.6827	2.91	4/28/2005
PRMA	VET_T1b	VET_T1b_34	4219054.665	543351.367	4.72	4/28/2005
PRMA	VET_T1b	VET_T1b_36	4219059.96	543355.1942	5.44	4/28/2005
PRMA	VET_T1b	VET_T1b_38	4219062.689	543358.507	5.37	4/28/2005
PRMA	VET_T1b	VET_T1b_40	4219066.357	543361.7218	5.47	4/28/2005
PRMA	VET_T1b	VET_T1b_41	4219070.509	543364.4247	5.75	4/28/2005
PRMA	VET_T1b	VET_T1b_43	4219073.846	543367.5365	5.64	4/28/2005
PRMA	VET_T1b	VET_T1b_46	4219077.669	543371.2279	5.61	4/28/2005
PRMA	VET_T1b	VET_T1b_48	4219080.864	543375.1652	5.53	4/28/2005
PRMA	VET_T1b	VET_T1b_50	4219085.963	543376.1925	5.58	4/28/2005
PRMA	VET_T1b	VET_T1b_51	4219090.537	543379.1834	5.61	4/28/2005
PRMA	VET_T1b	VET_T1b_52	4219093.957	543382.2924	5.67	4/28/2005
PRMA	VET_T1b	VET_T1b_54	4219098.087	543384.7615	5.65	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PRMA	VET_T1b	VET_T1b_56	4219103.236	543386.5763	5.72	4/28/2005
PRMA	VET_T1b	VET_T1b_58	4219105.71	543387.8202	5.76	4/28/2005
PRMA	VET_T1b	VET_T1b_59	4219107.725	543387.6693	5.75	4/28/2005
PRMA	VET_T1b	VET_T1b_61	4219111.47	543389.0559	5.63	4/28/2005
PRMA	VET_T1b	VET_T1b_63	4219116.422	543390.3728	5.27	4/28/2005
PRMA	VET_T2	VET_T2_101	4219066.986	543299.2473	5.48	4/28/2005
PRMA	VET_T2	VET_T2_103	4219065.526	543296.0188	5.30	4/28/2005
PRMA	VET_T2	VET_T2_105	4219063.357	543290.3622	6.32	4/28/2005
PRMA	VET_T2	VET_T2_106	4219062.089	543287.3453	6.55	4/28/2005
PRMA	VET_T2	VET_T2_66	4219125.976	543384.3927	5.20	4/28/2005
PRMA	VET_T2	VET_T2_69	4219122.432	543380.861	5.57	4/28/2005
PRMA	VET_T2	VET_T2_70	4219117.718	543377.0721	5.63	4/28/2005
PRMA	VET_T2	VET_T2_71	4219114.527	543373.5571	5.69	4/28/2005
PRMA	VET_T2	VET_T2_73	4219111.393	543370.1098	5.56	4/28/2005
PRMA	VET_T2	VET_T2_76	4219105.443	543360.5108	5.54	4/28/2005
PRMA	VET_T2	VET_T2_78	4219102.645	543356.4778	5.49	4/28/2005
PRMA	VET_T2	VET_T2_80	4219099.773	543351.4665	5.58	4/28/2005
PRMA	VET_T2	VET_T2_82	4219093.523	543346.7793	5.44	4/28/2005
PRMA	VET_T2	VET_T2_84	4219090.245	543342.8798	5.52	4/28/2005
PRMA	VET_T2	VET_T2_86	4219087.837	543339.3308	5.43	4/28/2005
PRMA	VET_T2	VET_T2_88	4219084.898	543333.6144	5.54	4/28/2005
PRMA	VET_T2	VET_T2_89	4219082.014	543328.2126	5.31	4/28/2005
PRMA	VET_T2	VET_T2_90	4219081.369	543324.73	4.64	4/28/2005
PRMA	VET_T2	VET_T2_91	4219078.768	543320.3857	5.00	4/28/2005
PRMA	VET_T2	VET_T2_92	4219078.315	543314.34	5.49	4/28/2005
PRMA	VET_T2	VET_T2_93	4219081.614	543312.6252	5.49	4/28/2005
PRMA	VET_T2	VET_T2_95	4219076.537	543310.2473	5.52	4/28/2005
PRMA	VET_T2	VET_T2_97	4219073.594	543307.8066	5.41	4/28/2005
PRMA	VET_T2	VET_T2_99	4219069.924	543303.0025	5.61	4/28/2005
PRMA	VET_T3	VET_T3_107	4219083.892	543276.0319	6.50	4/28/2005
PRMA	VET_T3	VET_T3_108	4219086.295	543280.1785	5.30	4/28/2005
PRMA	VET_T3	VET_T3_110	4219088.165	543283.3378	5.27	4/28/2005
PRMA	VET_T3	VET_T3_111	4219090.347	543285.5487	5.60	4/28/2005
PRMA	VET_T3	VET_T3_113	4219093.128	543289.4615	5.55	4/28/2005
PRMA	VET_T3	VET_T3_116	4219096.518	543292.9953	5.45	4/28/2005
PRMA	VET_T3	VET_T3_118	4219098.334	543295.312	5.48	4/28/2005
PRMA	VET_T3	VET_T3_120	4219101.202	543298.9137	4.51	4/28/2005
PRMA	VET_T3	VET_T3_123	4219104.373	543302.7133	5.03	4/28/2005
PRMA	VET_T3	VET_T3_125	4219105.74	543304.8007	5.55	4/28/2005
PRMA	VET_T3	VET_T3_127	4219108.302	543308.7982	5.57	4/28/2005
PRMA	VET_T3	VET_T3_129	4219109.336	543311.4172	5.56	4/28/2005
PRMA	VET_T3	VET_T3_130	4219110.657	543314.4465	5.61	4/28/2005
PRMA	VET_T3	VET_T3_132	4219112.011	543318.6638	5.46	4/28/2005
PRMA	VET_T3	VET_T3_134	4219112.363	543321.4224	5.50	4/28/2005
PRMA	VET_T3	VET_T3_136	4219113.624	543324.2191	5.52	4/28/2005
PRMA	VET_T3	VET_T3_138	4219115.051	543326.8852	5.57	4/28/2005
PRMA	VET_T3	VET_T3_140	4219117.766	543333.2404	5.44	4/28/2005
PRMA	VET_T3	VET_T3_142	4219119.88	543337.5657	5.72	4/28/2005
PRMA	VET_T3	VET_T3_143	4219121.643	543342.3721	5.63	4/28/2005
PRMA	VET_T3	VET_T3_144	4219123.547	543347.6553	5.55	4/28/2005
PRMA	VET_T3	VET_T3_145	4219125.273	543350.6511	5.60	4/28/2005
PRMA	VET_T3	VET_T3_146	4219127.502	543356.3706	5.66	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PRMA	VET_T3	VET_T3_147	4219130.245	543361.0675	5.67	4/28/2005
PRMA	VET_T3	VET_T3_148	4219133.306	543367.3948	5.73	4/28/2005
PRMA	VET_T3	VET_T3_149	4219135.237	543371.6215	5.76	4/28/2005
PRMA	VET_T3	VET_T3_150	4219138.141	543375.7431	5.12	4/28/2005
PRMA	VET_T4	VET_T4_155	4219349.251	543274.2259	5.48	4/28/2005
PRMA	VET_T4	VET_T4_157	4219346.304	543267.5075	5.77	4/28/2005
PRMA	VET_T4	VET_T4_160	4219345.151	543264.3196	5.72	4/28/2005
PRMA	VET_T4	VET_T4_162	4219344.075	543259.7339	5.70	4/28/2005
PRMA	VET_T4	VET_T4_164	4219342.06	543253.3255	5.64	4/28/2005
PRMA	VET_T4	VET_T4_166	4219340.184	543248.2473	5.60	4/28/2005
PRMA	VET_T4	VET_T4_168	4219335.664	543239.7129	5.61	4/28/2005
PRMA	VET_T4	VET_T4_170	4219334.35	543235.4816	5.61	4/28/2005
PRMA	VET_T4	VET_T4_172	4219330.691	543227.7545	5.60	4/28/2005
PRMA	VET_T4	VET_T4_174	4219330.645	543221.252	5.49	4/28/2005
PRMA	VET_T4	VET_T4_176	4219328.87	543214.3404	5.54	4/28/2005
PRMA	VET_T4	VET_T4_178	4219324.913	543209.4547	5.51	4/28/2005
PRMA	VET_T4	VET_T4_180	4219321.469	543203.7037	5.45	4/28/2005
PRMA	VET_T4	VET_T4_182	4219319.113	543200.0956	5.26	4/28/2005
PRMA	VET_T4	VET_T4_183	4219318.49	543199.848	4.22	4/28/2005
PRMA	VET_T4	VET_T4_184	4219318.571	543198.6961	5.28	4/28/2005
PRMA	VET_T4	VET_T4_185	4219316.908	543194.3294	5.45	4/28/2005
PRMA	VET_T4	VET_T4_186	4219314.32	543191.2594	5.42	4/28/2005
PRMA	VET_T4	VET_T4_190	4219312.059	543185.7532	5.37	4/28/2005
PRMA	VET_T4	VET_T4_192	4219310.141	543182.044	5.35	4/28/2005
PRMA	VET_T4	VET_T4_194	4219307.784	543175.747	5.27	4/28/2005
PRMA	VET_T4	VET_T4_196	4219306.039	543170.515	5.18	4/28/2005
PRMA	VET_T4	VET_T4_198	4219304.606	543167.0261	5.23	4/28/2005
PRMA	VET_T4	VET_T4_200	4219304.31	543164.3809	5.21	4/28/2005
PRMA	VET_T5	VET_T5_213	4219408.674	543173.496	5.13	4/28/2005
PRMA	VET_T5	VET_T5_214	4219408.242	543177.4686	5.44	4/28/2005
PRMA	VET_T5	VET_T5_215	4219408.875	543181.1572	5.14	4/28/2005
PRMA	VET_T5	VET_T5_217	4219409.123	543184.5715	5.52	4/28/2005
PRMA	VET_T5	VET_T5_219	4219408.393	543190.0907	5.68	4/28/2005
PRMA	VET_T5	VET_T5_221	4219408.012	543195.5592	5.62	4/28/2005
PRMA	VET_T5	VET_T5_223	4219406.594	543200.3305	5.61	4/28/2005
PRMA	VET_T5	VET_T5_225	4219406.188	543205.7697	5.62	4/28/2005
PRMA	VET_T5	VET_T5_227	4219405.933	543209.6467	5.66	4/28/2005
PRMA	VET_T5	VET_T5_229	4219404.795	543215.4241	5.56	4/28/2005
PRMA	VET_T5	VET_T5_231	4219402.771	543220.8591	5.58	4/28/2005
PRMA	VET_T5	VET_T5_233	4219401.279	543226.1097	5.54	4/28/2005
PRMA	VET_T5	VET_T5_235	4219399.956	543230.5691	5.69	4/28/2005
PRMA	VET_T5	VET_T5_237	4219399.186	543238.5005	5.56	4/28/2005
PRMA	VET_T5	VET_T5_239	4219397.445	543245.4428	5.60	4/28/2005
PRMA	VET_T5	VET_T5_241	4219397.245	543250.3166	5.64	4/28/2005
PRMA	VET_T5	VET_T5_243	4219395.814	543257.5862	5.61	4/28/2005
PRMA	VET_T5	VET_T5_245	4219394.402	543262.3729	5.59	4/28/2005
PRMA	VET_T5	VET_T5_247	4219394.2	543267.764	5.60	4/28/2005
PRMA	VET_T5	VET_T5_248	4219393.059	543273.5	5.66	4/28/2005
PRMA	VET_T5	VET_T5_250	4219391.131	543279.7886	5.77	4/28/2005
PRMA	VET_T5	VET_T5_252	4219390.152	543286.1125	5.71	4/28/2005
PRMA	VET_T5	VET_T5_254	4219388.513	543292.5632	5.63	4/28/2005
PRMA	VET_T5	VET_T5_257	4219387.644	543296.848	5.62	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PRMA	VET_T5	VET_T5_259	4219386.566	543300.5903	5.70	4/28/2005
PRMA	VET_T5	VET_T5_261	4219385.647	543305.4593	4.42	4/28/2005
PRMA	VET_T6	VET_T6_269	4219401.478	543312.7722	5.00	4/28/2005
PRMA	VET_T6	VET_T6_273	4219404.63	543310.4676	5.70	4/28/2005
PRMA	VET_T6	VET_T6_275	4219403.192	543309.0184	5.70	4/28/2005
PRMA	VET_T6	VET_T6_278	4219408.08	543304.2919	5.60	4/28/2005
PRMA	VET_T6	VET_T6_281	4219410.741	543298.5256	5.61	4/28/2005
PRMA	VET_T6	VET_T6_284	4219412.15	543292.0372	5.62	4/28/2005
PRMA	VET_T6	VET_T6_286	4219414.532	543286.3226	5.52	4/28/2005
PRMA	VET_T6	VET_T6_288	4219416.105	543280.942	5.57	4/28/2005
PRMA	VET_T6	VET_T6_290	4219418.668	543275.7054	5.56	4/28/2005
PRMA	VET_T6	VET_T6_293	4219419.915	543267.7869	5.46	4/28/2005
PRMA	VET_T6	VET_T6_295	4219421.865	543262.2594	5.41	4/28/2005
PRMA	VET_T6	VET_T6_297	4219425.098	543255.1119	5.41	4/28/2005
PRMA	VET_T6	VET_T6_300	4219427.23	543247.1265	5.38	4/28/2005
PRMA	VET_T6	VET_T6_303	4219430.052	543240.9224	5.37	4/28/2005
PRMA	VET_T6	VET_T6_306	4219431.776	543233.4237	5.46	4/28/2005
PRMA	VET_T6	VET_T6_308	4219431.424	543228.0066	4.95	4/28/2005
PRMA	VET_T6	VET_T6_311	4219433.148	543223.8486	5.32	4/28/2005
PRMA	VET_T6	VET_T6_313	4219434.515	543221.5911	3.37	4/28/2005
PRMA	VET_T7	VET_T7_12	4219009.018	543455.2259	6.47	4/28/2005
PRMA	VET_T7	VET_T7_14	4219010.039	543455.0465	5.99	4/28/2005
PRMA	VET_T7	VET_T7_16	4219011.932	543453.2782	5.62	4/28/2005
PRMA	VET_T7	VET_T7_18	4219013.126	543451.365	5.65	4/28/2005
PRMA	VET_T7	VET_T7_20	4219015.881	543449.7361	5.65	4/28/2005
PRMA	VET_T7	VET_T7_22	4219018.402	543447.2402	5.74	4/28/2005
PRMA	VET_T7	VET_T7_24	4219021.077	543444.3622	5.69	4/28/2005
PRMA	VET_T7	VET_T7_28	4219023.622	543440.9003	5.70	4/28/2005
PRMA	VET_T7	VET_T7_29	4219026.398	543437.6447	5.75	4/28/2005
PRMA	VET_T7	VET_T7_30	4219029.489	543434.1546	5.85	4/28/2005
PRMA	VET_T7	VET_T7_31	4219031.959	543430.3719	5.75	4/28/2005
PRMA	VET_T7	VET_T7_32	4219033.65	543426.9737	5.76	4/28/2005
PRMA	VET_T7	VET_T7_33	4219035.352	543424.8241	5.67	4/28/2005
PRMA	VET_T7	VET_T7_35	4219037.138	543423.1434	5.64	4/28/2005
PRMA	VET_T7	VET_T7_37	4219037.384	543422.3983	4.71	4/28/2005
PRMA	VET_T8	VET_T8_39	4219046.768	543424.2494	4.78	4/28/2005
PRMA	VET_T8	VET_T8_42	4219045.697	543427.3895	5.84	4/28/2005
PRMA	VET_T8	VET_T8_44	4219042.821	543431.8174	5.88	4/28/2005
PRMA	VET_T8	VET_T8_45	4219040.756	543436.0939	5.83	4/28/2005
PRMA	VET_T8	VET_T8_47	4219038.54	543439.6095	5.80	4/28/2005
PRMA	VET_T8	VET_T8_49	4219035.993	543443.0282	5.75	4/28/2005
PRMA	VET_T8	VET_T8_53	4219034.481	543447.3405	5.74	4/28/2005
PRMA	VET_T8	VET_T8_55	4219032.634	543451.2257	5.67	4/28/2005
PRMA	VET_T8	VET_T8_57	4219030.26	543456.0315	5.65	4/28/2005
PRMA	VET_T8	VET_T8_60	4219027.777	543461.1675	5.67	4/28/2005
PRMA	VET_T8	VET_T8_62	4219026.104	543465.6921	5.62	4/28/2005
PRMA	VET_T8	VET_T8_64	4219024.297	543469.3872	5.50	4/28/2005
PRMA	VET_T8	VET_T8_65	4219023.38	543472.5794	5.45	4/28/2005
PRMA	VET_T8	VET_T8_67	4219022.608	543476.4242	6.07	4/28/2005
PRMA	VET_T8	VET_T8_68	4219023.115	543478.9274	7.06	4/28/2005
PRMA	VET_T9	VET_T9_72	4219061.26	543452.7764	6.77	4/28/2005
PRMA	VET_T9	VET_T9_74	4219060.458	543450.282	5.78	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
PRMA	VET_T9	VET_T9_75	4219109.102	543365.4029	5.67	4/28/2005
PRMA	VET_T9	VET_T9_77	4219058.85	543442.5789	5.68	4/28/2005
PRMA	VET_T9	VET_T9_79	4219057.797	543437.4366	5.81	4/28/2005
PRMA	VET_T9	VET_T9_81	4219056.765	543433.2167	5.88	4/28/2005
PRMA	VET_T9	VET_T9_83	4219055.76	543428.6848	5.92	4/28/2005
PRMA	VET_T9	VET_T9_85	4219055.223	543426.6627	5.78	4/28/2005
PRMA	VET_T9	VET_T9_87	4219055.176	543425.7986	4.85	4/28/2005
PRMA	WL-01	VET_near_16_282	4219429.242	543261.3975	5.36	4/28/2005
PRMA	WL-01	VET_T14_187	4219472.741	543421.165	6.24	4/28/2005
PRMA	WL-01	VET_T14_188	4219473.52	543419.3187	4.80	4/28/2005
PRMA	WL-01	VET_T14_189	4219473.268	543414.6304	4.72	4/28/2005
PRMA	WL-01	VET_T14_191	4219473.528	543410.6997	4.75	4/28/2005
PRMA	WL-01	VET_T14_193	4219473.177	543405.1073	4.81	4/28/2005
PRMA	WL-01	VET_T14_195	4219473.397	543403.5798	3.61	4/28/2005
PRMA	WL-01	VET_T14_197	4219473.763	543401.7155	4.75	4/28/2005
PRMA	WL-01	VET_T14_199	4219473.188	543395.0257	5.10	4/28/2005
PRMA	WL-01	VET_T14_201	4219472.271	543388.2298	5.13	4/28/2005
PRMA	WL-01	VET_T14_202	4219472.734	543383.9113	5.14	4/28/2005
PRMA	WL-01	VET_T14_203	4219472.147	543378.6234	4.99	4/28/2005
PRMA	WL-01	VET_T14_204	4219471.236	543371.1552	5.26	4/28/2005
PRMA	WL-01	VET_T14_205	4219470.409	543364.9464	5.24	4/28/2005
PRMA	WL-01	VET_T14_207	4219469.587	543359.0316	5.18	4/28/2005
PRMA	WL-01	VET_T14_208	4219468.664	543353.9419	5.29	4/28/2005
PRMA	WL-01	VET_T14_209	4219468.537	543348.4843	5.33	4/28/2005
PRMA	WL-01	VET_T14_210	4219467.591	543344.2365	5.53	4/28/2005
PRMA	WL-01	VET_T14_211	4219466.18	543339.4095	5.47	4/28/2005
PRMA	WL-01	VET_T14_212	4219466.622	543336.8248	4.82	4/28/2005
PRMA	WL-01	VET_T14_236	4219463.061	543317.041	5.49	4/28/2005
PRMA	WL-01	VET_T14_238	4219463.645	543320.2219	5.61	4/28/2005
PRMA	WL-01	VET_T14_240	4219464.728	543324.6986	5.63	4/28/2005
PRMA	WL-01	VET_T14_242	4219466.986	543325.623	5.66	4/28/2005
PRMA	WL-01	VET_T14_244	4219464.654	543328.2273	5.76	4/28/2005
PRMA	WL-01	VET_T14_246	4219465.94	543332.4303	5.33	4/28/2005
PRMA	WL-01	VET_T15_216	4219493.429	543323.904	5.22	4/28/2005
PRMA	WL-01	VET_T15_218	4219489.116	543322.8977	5.33	4/28/2005
PRMA	WL-01	VET_T15_220	4219484.829	543321.8179	5.40	4/28/2005
PRMA	WL-01	VET_T15_222	4219482.914	543321.005	5.42	4/28/2005
PRMA	WL-01	VET_T15_224	4219478.676	543320.0894	5.48	4/28/2005
PRMA	WL-01	VET_T15_226	4219474.247	543318.6013	5.67	4/28/2005
PRMA	WL-01	VET_T15_228	4219470.043	543317.5342	5.61	4/28/2005
PRMA	WL-01	VET_T15_230	4219466.491	543316.9142	5.56	4/28/2005
PRMA	WL-01	VET_T16_262	4219457.729	543311.6898	5.56	4/28/2005
PRMA	WL-01	VET_T16_263	4219455.496	543308.3756	5.52	4/28/2005
PRMA	WL-01	VET_T16_264	4219452.908	543303.5704	5.51	4/28/2005
PRMA	WL-01	VET_T16_266	4219450.907	543300.3487	5.65	4/28/2005
PRMA	WL-01	VET_T16_267	4219447.875	543295.8623	5.55	4/28/2005
PRMA	WL-01	VET_T16_270	4219445.198	543291.6221	5.54	4/28/2005
PRMA	WL-01	VET_T16_271	4219441.521	543286.821	5.45	4/28/2005
PRMA	WL-01	VET_T16_272	4219438.405	543281.363	5.47	4/28/2005
PRMA	WL-01	VET_T16_274	4219435.275	543276.4348	5.47	4/28/2005
PRMA	WL-01	VET_T16_276	4219432.542	543271.0122	5.38	4/28/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
PRMA	WL-01	VET_T16_277	4219429.482	543265.8132	5.39	4/28/2005
PRMA	WL-01	VET_T16_279	4219426.274	543262.0911	5.38	4/28/2005
PRMA	WL-01	VET_T17_283	4219454.178	543254.0295	5.21	4/28/2005
PRMA	WL-01	VET_T17_285	4219454.649	543257.022	5.27	4/28/2005
PRMA	WL-01	VET_T17_287	4219455.177	543259.3067	5.29	4/28/2005
PRMA	WL-01	VET_T17_289	4219456.922	543263.7084	5.30	4/28/2005
PRMA	WL-01	VET_T17_291	4219458.563	543268.8825	5.33	4/28/2005
PRMA	WL-01	VET_T17_292	4219459.459	543273.8818	5.36	4/28/2005
PRMA	WL-01	VET_T17_294	4219460.467	543278.6532	5.41	4/28/2005
PRMA	WL-01	VET_T17_296	4219461.22	543283.6907	5.39	4/28/2005
PRMA	WL-01	VET_T17_298	4219461.963	543288.4164	5.46	4/28/2005
PRMA	WL-01	VET_T17_299	4219463.031	543293.2898	5.47	4/28/2005
PRMA	WL-01	VET_T17_301	4219463.679	543299.1278	5.49	4/28/2005
PRMA	WL-01	VET_T17_302	4219463.871	543302.8554	5.51	4/28/2005
PRMA	WL-01	VET_T17_304	4219463.656	543307.974	5.54	4/28/2005
PRMA	WL-01	VET_T17_305	4219463.39	543312.4375	5.57	4/28/2005
PRMA	WL-01	VET_T17_307	4219463.025	543315.5834	5.56	4/28/2005
PRMA	WL-01	VET_T18_309	4219466.722	543315.7881	5.57	4/28/2005
PRMA	WL-01	VET_T18_310	4219472.092	543315.4523	5.63	4/28/2005
PRMA	WL-01	VET_T18_312	4219477.324	543314.8228	5.48	4/28/2005
PRMA	WL-01	VET_T18_314	4219482.468	543314.732	5.41	4/28/2005
PRMA	WL-01	VET_T18_315	4219487.657	543314.3841	5.38	4/28/2005
PRMA	WL-01	VET_T18_316	4219492.807	543314.292	5.27	4/28/2005
PRMA	WL-01	VET_T18_317	4219495.196	543314.2835	3.61	4/28/2005
PRMA	WL-01	VET_T18_318	4219496.177	543314.1356	4.70	4/28/2005
PRMA	WL-01	VET_T18_319	4219498.823	543314.6348	4.70	4/28/2005
PRMA	WL-01	VET_T18_320	4219501.158	543314.3848	4.79	4/28/2005
PRMA	WL-01	VET_T18_321	4219503.045	543314.5629	4.95	4/28/2005
PRMA	WL-01	VET_T18_322	4219507.013	543314.7332	4.89	4/28/2005
PRMA	WL-01	VET_T18_323	4219510.881	543315.6477	5.33	4/28/2005
PRMA	WL-01	VET_T18_324	4219513.605	543316.1092	6.63	4/28/2005
PRMA	WL-01	VET_T19_249	4219448.235	543327.2743	3.68	4/28/2005
PRMA	WL-01	VET_T19_251	4219448.891	543326.6368	5.14	4/28/2005
PRMA	WL-01	VET_T19_253	4219451.698	543324.2149	5.80	4/28/2005
PRMA	WL-01	VET_T19_256	4219454.945	543321.8493	5.77	4/28/2005
PRMA	WL-01	VET_T19_258	4219459.224	543318.4864	5.65	4/28/2005
PRMA	WL-01	VET_T19_260	4219461.985	543316.2858	5.54	4/28/2005
SHLA	WL-02	VET_T1_11	4211911.519	603811.533	4.80	5/23/2005
SHLA	WL-02	VET_T1_12	4211910.364	603808.143	4.74	5/23/2005
SHLA	WL-02	VET_T1_14	4211910.416	603804.151	4.78	5/23/2005
SHLA	WL-02	VET_T1_15	4211908.679	603799.846	4.90	5/23/2005
SHLA	WL-02	VET_T1_17	4211907.24	603796.421	4.88	5/23/2005
SHLA	WL-02	VET_T1_20	4211905.832	603792.87	4.70	5/23/2005
SHLA	WL-02	VET_T1_22	4211904.655	603790.109	4.79	5/23/2005
SHLA	WL-02	VET_T1_24	4211902.9	603786.692	4.90	5/23/2005
SHLA	WL-02	VET_T1_26	4211900.973	603783.677	4.89	5/23/2005
SHLA	WL-02	VET_T1_28	4211899.013	603780.216	4.89	5/23/2005
SHLA	WL-02	VET_T1_3	4211916.924	603826.034	4.78	5/23/2005
SHLA	WL-02	VET_T1_5	4211914.997	603822.486	4.74	5/23/2005
SHLA	WL-02	VET_T1_7	4211913.936	603818.726	4.83	5/23/2005
SHLA	WL-02	VET_T1_9	4211912.595	603814.682	4.79	5/23/2005
SHLA	WL-02	VET_T2_30	4211890.659	603793.42	4.85	5/23/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting	Elevation NAVD88 feet	SrvyDate
SHLA	WL-02	VET_T2_32	4211894.469	603795.233	4.93	5/23/2005
SHLA	WL-02	VET_T2_34	4211897.13	603798.784	4.86	5/23/2005
SHLA	WL-02	VET_T2_36	4211899.937	603802.671	4.90	5/23/2005
SHLA	WL-02	VET_T2_39	4211902.909	603806.376	4.83	5/23/2005
SHLA	WL-02	VET_T2_41	4211905.911	603810.424	4.82	5/23/2005
SHLA	WL-02	VET_T2_43	4211907.581	603814.476	4.87	5/23/2005
SHLA	WL-02	VET_T2_45	4211909.721	603818.976	4.77	5/23/2005
SHLA	WL-02	VET_T2_46	4211912.288	603824.253	4.73	5/23/2005
SHLA	WL-02	VET_T2_48	4211914.247	603828.268	4.82	5/23/2005
SHLA	WL-02	VET_T3_52	4211911.562	603836.84	4.77	5/23/2005
SHLA	WL-02	VET_T3_54	4211909.212	603840.399	4.82	5/23/2005
SHLA	WL-02	VET_T3_56	4211907.335	603844.07	4.84	5/23/2005
SHLA	WL-02	VET_T3_59	4211905.122	603847.948	4.83	5/23/2005
SHLA	WL-02	VET_T3_60	4211903.528	603852.446	4.88	5/23/2005
SHLA	WL-02	VET_T3_62	4211902.68	603856.9	4.73	5/23/2005
SHLA	WL-02	VET_T3_64	4211902.074	603862.083	4.77	5/23/2005
SHLA	WL-02	VET_T3_67	4211902.641	603866.532	4.84	5/23/2005
SHLA	WL-02	VET_T3_69	4211904.116	603871.342	4.75	5/23/2005
SHLA	WL-02	VET_T3_71	4211905.094	603875.967	5.71	5/23/2005
SHLA	WL-02	VET_T3_73	4211905.652	603880.623	4.76	5/23/2005
SHLA	WL-02	VET_T3_75	4211906.688	603885.401	4.81	5/23/2005
SHLA	WL-02	VET_T3_78	4211907.914	603889.369	4.75	5/23/2005
SHLA	WL-02	VET_T3_80	4211909.742	603894.074	4.80	5/23/2005
SHLA	WL-02	VET_T4_83	4211882.124	603856.221	4.65	5/23/2005
SHLA	WL-02	VET_T4_86	4211886.605	603854.548	4.67	5/23/2005
SHLA	WL-02	VET_T4_88	4211891.403	603853.411	4.75	5/23/2005
SHLA	WL-02	VET_T4_90	4211895.88	603851.76	4.81	5/23/2005
SHLA	WL-02	VET_T4_91	4211900.409	603850.2	4.90	5/23/2005
SHLA	WL-02	VET_T4_93	4211904.497	603845.521	4.84	5/23/2005
SHLA	WL-02	VET_T4_95	4211909.166	603840.51	4.75	5/23/2005
SHLA	WL-02	VET_T4_97	4211912.031	603836.748	4.78	5/23/2005
SHLA	WL-02	VET_T5_10	4211931.569	603824.309	4.44	5/23/2005
SHLA	WL-02	VET_T5_13	4211934.91	603822.14	4.78	5/23/2005
SHLA	WL-02	VET_T5_16	4211938.759	603820.569	4.35	5/23/2005
SHLA	WL-02	VET_T5_18	4211942.963	603818.279	4.70	5/23/2005
SHLA	WL-02	VET_T5_19	4211946.94	603817.529	4.62	5/23/2005
SHLA	WL-02	VET_T5_21	4211950.93	603816.378	4.64	5/23/2005
SHLA	WL-02	VET_T5_23	4211955.158	603814.29	4.64	5/23/2005
SHLA	WL-02	VET_T5_25	4211959.169	603811.573	4.58	5/23/2005
SHLA	WL-02	VET_T5_27	4211963.101	603809.94	4.65	5/23/2005
SHLA	WL-02	VET_T5_29	4211966.978	603807.595	4.61	5/23/2005
SHLA	WL-02	VET_T5_4	4211920.337	603830.132	4.76	5/23/2005
SHLA	WL-02	VET_T5_6	4211924.111	603828.068	4.73	5/23/2005
SHLA	WL-02	VET_T5_8	4211927.713	603826.285	4.64	5/23/2005
SHLA	WL-02	VET_T6_31	4211952.287	603792.355	4.72	5/23/2005
SHLA	WL-02	VET_T6_33	4211949.129	603795.612	4.68	5/23/2005
SHLA	WL-02	VET_T6_35	4211945.544	603797.895	4.70	5/23/2005
SHLA	WL-02	VET_T6_37	4211941.359	603800.918	4.64	5/23/2005
SHLA	WL-02	VET_T6_38	4211938.144	603804.107	4.62	5/23/2005
SHLA	WL-02	VET_T6_40	4211935.053	603807.121	4.81	5/23/2005
SHLA	WL-02	VET_T6_42	4211931.743	603811.003	4.77	5/23/2005
SHLA	WL-02	VET_T6_44	4211928.597	603814.813	4.65	5/23/2005

IRWM Vegetation-Elevation Transect Elevations

Site	Location	StationID	Northing UTM Zone 10 meters	Easting UTM Zone 10 meters	Elevation NAVD88 feet	SrvyDate
SHLA	WL-02	VET_T6_47	4211925.623	603818.302	4.55	5/23/2005
SHLA	WL-02	VET_T6_49	4211922.882	603821.898	4.43	5/23/2005
SHLA	WL-02	VET_T6_50	4211920.27	603825.877	4.75	5/23/2005
SHLA	WL-02	VET_T7_51	4211922.511	603839.17	4.69	5/23/2005
SHLA	WL-02	VET_T7_53	4211926.625	603842.398	4.67	5/23/2005
SHLA	WL-02	VET_T7_55	4211930.1	603845.93	4.76	5/23/2005
SHLA	WL-02	VET_T7_57	4211934.069	603848.664	4.68	5/23/2005
SHLA	WL-02	VET_T7_58	4211938.595	603851.608	4.67	5/23/2005
SHLA	WL-02	VET_T7_61	4211942.826	603853.872	4.66	5/23/2005
SHLA	WL-02	VET_T7_63	4211946.282	603857.635	4.62	5/23/2005
SHLA	WL-02	VET_T7_65	4211948.787	603861.278	4.56	5/23/2005
SHLA	WL-02	VET_T7_66	4211950.979	603866.266	4.59	5/23/2005
SHLA	WL-02	VET_T7_68	4211953.43	603870.315	4.56	5/23/2005
SHLA	WL-02	VET_T7_70	4211956.654	603873.747	4.62	5/23/2005
SHLA	WL-02	VET_T7_72	4211959.971	603876.849	4.51	5/23/2005
SHLA	WL-02	VET_T7_74	4211963.759	603880.193	4.54	5/23/2005
SHLA	WL-02	VET_T7_76	4211966.313	603883.43	4.42	5/23/2005
SHLA	WL-02	VET_T7_77	4211968.633	603888.012	4.50	5/23/2005
SHLA	WL-02	VET_T7_79	4211970.739	603891.838	4.38	5/23/2005
SHLA	WL-02	VET_T8_100	4211931.197	603868.156	4.70	5/23/2005
SHLA	WL-02	VET_T8_101	4211931.021	603863.552	4.70	5/23/2005
SHLA	WL-02	VET_T8_102	4211928.981	603857.899	4.71	5/23/2005
SHLA	WL-02	VET_T8_103	4211926.339	603852.5	4.81	5/23/2005
SHLA	WL-02	VET_T8_104	4211923.398	603847.079	4.71	5/23/2005
SHLA	WL-02	VET_T8_105	4211921.422	603842.209	4.61	5/23/2005
SHLA	WL-02	VET_T8_81	4211952.674	603915.06	4.61	5/23/2005
SHLA	WL-02	VET_T8_82	4211949.132	603912.059	4.63	5/23/2005
SHLA	WL-02	VET_T8_84	4211946.376	603907.938	4.77	5/23/2005
SHLA	WL-02	VET_T8_85	4211943.124	603904.432	4.68	5/23/2005
SHLA	WL-02	VET_T8_87	4211940.503	603901.072	4.72	5/23/2005
SHLA	WL-02	VET_T8_89	4211935.785	603898.177	4.75	5/23/2005
SHLA	WL-02	VET_T8_92	4211933.913	603893.014	4.68	5/23/2005
SHLA	WL-02	VET_T8_94	4211932.35	603888.424	4.73	5/23/2005
SHLA	WL-02	VET_T8_96	4211931.1	603883.806	4.79	5/23/2005
SHLA	WL-02	VET_T8_98	4211930.966	603878.782	4.68	5/23/2005
SHLA	WL-02	VET_T8_99	4211930.566	603873.681	4.77	5/23/2005