DRAFT 2008 Self-Monitoring Report
Baumberg Complex - Hayward, California
Eden Landing Ecological Reserve

Order Number: R2-2004-0018
WDID Number: 2 019438001

March, 2009

Prepared for:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Prepared by:

John Krause, Associate Wildlife Biologist
California Department of Fish and Game
Post Office Box 47
Yountville, CA 94599

With Assistance on E10 Applied Study from:

Kathleen Henderson, Wildlife Biologist
U. S. Geological Survey
San Francisco Bay Estuary Field Station
Post Office Box 2012
Vallejo, CA 94592

And

Tara S. Schraga, Oceanographer
U.S. Geological Survey
345 Middlefield Road MS496
Menlo Park, CA 94025

Table of Contents

Introduction

This annual self-monitoring report summarizes the results of the water quality monitoring and sediment sampling conducted at the Baumberg Complex, also known as the Eden Landing Ecological Reserve (ELER), in Hayward, California, April through November 2006. Data was collected by Department of Fish and Game (Department) staff in accordance with the waste discharge requirements. Water quality monitoring was performed using continuous data recorders at the locations described in the Self-Monitoring Program outlined in the Final Order. Previous nomenclature used the initial "B" for Baumberg Complex ponds, which has been subsequently changed to "E" for Eden Landing, as part of the South Bay Salt Ponds restoration project. For consistency with the SBSP nomenclature now commonly used, this report generally uses the "E" nomenclature, except where noted and older figures or references provided by others are not easily modified.

The Final Order for the South San Francisco Bay Low Salinity Salt Ponds covered 15,100 acres of ponds in Alameda, Santa Clara and San Mateo counties. This report covers ELER (Baumberg Complex) pond systems operated by the Department in 2008 and described in the Initial Stewardship Plan (ISP), including Systems E10 (B11 in ISP), E2, E2C and E9 (B8A in ISP). Continuous discharge monitoring for the entire season was conducted only in System E10, along with a more in-depth data collection and interpretation effort as part of an Applied Study as requested by the Regional Water Quality Control Board in May, 2008. All other pond systems were operated and managed with information gathered typically on a weekly basis, rather than with continuous monitoring devices, except System E6A, which was not operated in the 2008 to continue management activities necessary to provide suitable nesting habitat for the western snowy plover. The U.S. Fish and Wildlife Service (USFWS) submitted a report for the Alviso Ponds under separate cover.

The ponds are generally being operated as muted tidal systems, as described in the 2008 operations plans, augmenting flow-through systems described in the ISP. Bay water entered ponds via San Francisco Bay (SF Bay) and associated sloughs at high tides, flowed to one or more ponds, and discharged to sloughs and SF Bay at low tides. The ponds presumably discharge at tide stages lower than pond water elevations, generally 3.5' (NGVD), a duration ranging approximately 13 to16 hours per day, based on predicted tides and spring or neap tide cycle variation. Pond intake is presumed to occur at predicted tide stages which are at elevations assumed to be approximately 1 ½ feet or more above pond water levels due to required head (pressure) to allow in-flows. It is not known from interpreting the data whether discharge has a similar head requirement and discharge begins after a similar time-lag or when tide stages are just below pond water elevations. In 2008, intake and discharge in Ponds E10, E2, E2C and E9 occurred at the same water control structure (WCS), as in previous years. Pond systems E9 and E2 also have additional intake WCSs, as described in the ISP and operations plans.

The Final Order recognized two periods of discharges from the ponds: the Initial Release Period (IRP) when salinity levels in ponds were above 44 parts per thousand (ppt) and would decrease from the initial levels in the ponds, to a Continuous Circulation Period (CCP) thereafter, with salinities at or below the 44 ppt, which is the continuous discharge limit described in the Final Order. In 2008, operation of all systems was within parameters for CCP and water quality monitoring was conducted as described below.

As described in previous years, this SMR describes required reporting and best management practice (BMP) implementation for periods when the dissolved oxygen (DO) levels at the point of discharge falls below a 10th percentile of 3.3 mg/L (calculated on a calendar weekly basis). Low DO conditions are expected during extended periods of high air and water temperature. The 3.3 mg/L DO "trigger" was determined based on levels found in Artesian Slough in July 1997, during an extended period of high air temperatures, and appeared to be the most relevant representation of natural DO variations in sloughs or lagoon systems currently available. It has been documented that DO concentrations are observed in sloughs not affected by any discharge to contain DO levels below the Basin Plan standard of 5.0 mg/L, as well as periods below the 3.3 mg/L reporting trigger. Similarly, naturally occurring low DO waters have been observed during periods of intake into pond systems. These low DO discharges are within the natural range of variation in functional slough and lagoon environments of the South San Francisco Bay. Therefore, the low DO conditions observed in sloughs do not necessarily indicate a water quality signature of pond waters and discharges.

The RWQCB requested that additional information be provided in this Annual Self-Monitoring Report (ASMR), as described in their May, 2008 letter describing their review of the previous year's SMR. This ASMR also incorporates those suggested changes and requests for additional information, except as noted (i.e. discharge volumes, as discussed below). The Department has prepared this report as the Draft 2008 Self-Monitoring Report for the Eden Landing Ecological Reserve (Baumberg Complex). Additional analysis and interpretation of monitoring data may be completed to complement information presented in this report, and may be submitted for review by the RWQCB before being finalized.

2008 Annual Summary

The 2008 monitoring season evaluation for the ELER ponds (Baumberg Complex) indicates that a greater understanding of pond dynamics continues to inform pond management, and continued, targeted monitoring efforts should continue to address areas of uncertainty. Refer to the discussion below to relate pond management operations and intrinsic pond dynamics to compliance with the RWQCB Final Order in greater detail.

The water quality monitoring performed according to the Final Order for operation of the pond systems revealed periods of low DO again in 2008. In previous years (2004-07), low DO levels were observed in a number of the South Bay Salt Ponds (SBSP), including ELER ponds, notably in the late-summer/early-fall when seasonal temperatures, winds and evaporation were expected to be highest. However, low DO levels are observed throughout the monitoring period, not just during the latter part of the season as was anticipated. Low DO levels are more pronounced throughout 2008 in Pond E10 than previous years. Preliminary evaluation of 2008 monitoring information suggests such differences may be attributed to modified operations that maintained deeper water throughout the season. There appears to be some correlation with abiotic factors, such as spring and neap tide periods, weather conditions, and seasonal variations. It is likely that, biotic factors affect DO levels such as algal growth and growth and/or usage by pond invertebrates or larger animals, including fish. While only small localized areas of E10 had large, green algal mats, substantial macroalgae was observed in the water column and living and necrotic mats were observed on the pond bottom.

The Department completed additional analysis of 2007 data sets to attempt to determine correlations and provided a summary in 2007. However, this additional analysis did not provide any conclusive results. In 2005, RWQCB required that the time-period each day that ponds discharge, and an estimate of the quantity discharged, be included in the ASMR. It was understood that this information would be provided for particular periods of interest, rather than be provided in the form of a summary table for each actual discharge day. Estimates of discharge volume could provide useful information, which would be used for activities such as modifications to operations, and for evaluation and analysis, particularly for determining what effects, if any, discharges had on receiving waters, and determination of effectiveness of BMPs. RWQCB modified ASMR requirements similarly for the ponds operated by USFWS, whose staff is working collaboratively with the Department on the ISP and long-term restoration project for the SBSP. USFWS requested assistance from U.S. Geological Survey (USGS) in developing a methodology to estimate discharge volumes. USGS developed a "calculator" to estimate discharge from five Alviso Complex ponds for USFWS. Inputs to the calculator include the pond water surface elevation, the number of discharge culverts (48"), and the range of dates for discharge. Output would be the estimated volume of discharge over the data range. Tidal height is predicted in the calculator. Generalized use of this calculator for other ponds, including those managed by the Department, could be provided once site-specific calibration is performed. However, no funding for such a collaborative study has not been available from the Department or USGS. The Department may pursue the use of this tool if funding can be secured in the future.

Pond management activities and the observed, sustained salinity above 44ppt in 2007 were driven by drought conditions from the previous winter's below average rainfall. Anticipating similar conditions in 2008, another drought year, pond operations were altered. Larger volume discharges were sustained and were targeted during strong tide and rainfall events to maximize circulation and operation of ponds at elevations below normal winter water levels were attempts to circumvent elevated salinity during the 2008 monitoring season. Discharge salinity values were apparently improved in 2008 compared to 2007 by altering management operations, such that discharge was set at a consistently higher volume. Using BMP's described in this report and more fully in 2008 Operations Plans, discharges were periodically minimized to maintain water levels during neap tide periods with high air temperatures. Temporary suspension of discharge operations as was not performed in 2008, as was previously. The Increased Discharge BMP was implemented in 2007 and previous only for short periods during spring tide cycles and did not appreciably improve mixing and turnover. In reviewing 2008 data, the Increased Discharge BMP appears to be more successful in moderating salinity, especially when used more consistently over longer periods, depending on the size of the system.

The ELER site location is shown on Figure 1; sampling locations are shown on Figure 2.

System E2C:

Pond E2C was operated under Continuous Circulation protocol in 2008, similar to previous years, but was not monitored using a continuous monitoring device, as noted previously, based on the revisions to the Final Order made by RWQCB in May, 2008. Management of this system was performed as described in the Operations Plan and was informed by grab samples collected on an approximately weekly basis. Grab samples were collected with the same devices as were used to collect continuous data in previous years, and included temperature, pH, salinity and DO. This system presumably performed with continued low DO levels, as observed in 2005-7, but continued to provide good habitat conditions for waterbirds. The previous winter's low rainfall totals were successfully mitigated by allowing more consistent, higher volume discharges than were allowed in previous years; however, discharge was never greater than 25% of capacity. Therefore, no receiving water monitoring was required, as noted in RWQCB's May, 2008 letter and reflected in the revised Final Order. The operational practice (BMP) of periodically draining Pond E2C water into the adjacent seasonal ponds (E5C, E4C and E1C) to improve turnover of pond system water as a result of greater intake volumes was continued in 2008, which moderated salinity successfully, and may have also improved DO conditions.

System E2:

Pond E2 was operated under Continuous Circulation protocol in 2008, similar to previous years, but was not monitored using a continuous monitoring device, as noted previously, based on the revisions to the Final Order made by RWQCB in May, 2008. Management of this system was performed as described in the Operations Plan and was informed by grab samples collected on an approximately weekly basis. Grab samples were collected with the same devices as were used to collect continuous data in previous years, and included temperature, pH, salinity and DO. This system presumably performed with continued low DO levels, as observed in 2005-7, but continued to provide good habitat conditions for waterbirds. The previous winter's low rainfall totals were successfully mitigated by allowing more consistent, higher volume discharges than were allowed in previous years; however, discharge was never greater than 25% of capacity. The system was operated as muted tidal, with supplemental intake and system discharge to the Bay via Pond 2, while Pond 1 continued to operate as the primary intake pond with inflows during higher tides from Old Alameda Creek. As a Bay discharge, receiving water monitoring was not required. System E2 management included typical discharge operations via E2 for the winter season, including successful recirculation of the higher salinity "batch" ponds (E5 and E6).

System E6A:

This system was operated differently than previous years to accommodate construction activities that included replacement of existing water control structures as part of a North American Wetlands Conservation Act (NAWCA) grant funded project. This system was treated like a seasonal “batch” pond, with ponds flooded with higher salinity water from the System E2/2C “batch” ponds (E6 and E5) and were not allowed to draw down; rather, the ponds remain largely flooded in the first half of the year to preclude use by western snowy plovers (WSP), a federally threatened species. Movement of water between ponds was periodically conducted. This system provided good habitat conditions for waterbirds, including WSP during the latter half of the year.

System E9:

Pond System E9 was operated under Continuous Circulation protocol in 2008, similar to previous years, but was not monitored using a continuous monitoring device, as noted previously, based on the revisions to the Final Order made by RWQCB in May, 2008. Management of this system was performed as described in the Operations Plan and was informed by grab samples collected on an approximately weekly basis. Grab samples were collected with the same devices as were used to collect continuous data in previous years, and included temperature, pH, salinity and DO. This system presumably performed with continued low DO levels, as observed in 2005-7, but continued to provide good habitat conditions for waterbirds. The previous winter’s low rainfall totals were successfully mitigated by allowing more consistent, higher volume discharges than were allowed in previous years; however, discharge was never greater than 25% of capacity. The system was operated as muted tidal with primary intake/discharge via Pond E9 near the mouth of Mt. Eden Creek, with supplemental intake and system discharge via Pond E8A and North Creek. Pond E9 is considered a Bay discharge, therefore receiving water monitoring was not required. Furthermore, the ponds in System E9 will be part of the Phase 1 Actions undertaken by the Department as part of the SBSP project, and construction is scheduled to begin in August, 2009. These actions will require multiple years of construction and will alter operations, and will be more fully described later.

System E10:

Pond E10 operated as a managed pond in the 2008 monitoring season and was the subject of an Applied Study, as required by RWQCB in their May, 2008 letter. Pond E11 was operated as a seasonal pond in 2008, as described in the ISP and 2008 Operations Plan Continuous monitoring devices (Datasondes) were utilized in Pond E10, as per Continuous Circulation protocol; receiving water sampling was not required for this Bay-discharge system, as previously approved by RWQCB in 2005.

As requested by RWQCB, an Applied Study (AS) that provided more spatial and temporal information, particularly with respect to Dissolved Oxygen (DO) was conducted by the Department in addition to the continuous monitoring described above, which provided data from an intensive in-pond DO investigation in Pond E10 from three, 2-week cycles. RWQCB requested the three, two-week periods be during the following dates: July 7-18, September 8-19 and November 10-21. The dates of the AS actually completed at ELER were from July 7-18, September 11-21 and November 11-22, 2008, reflecting staff and equipment availability and valid data collected. These dates generally corresponded to a similar AS conducted by USGS for USFWS in Pond A14, in order to provide a comparison for the results.

<u>For all pond systems</u>:

To address water quality and to maintain summer operation water levels in the ponds, Systems B2, B2C, B11 and B8A WCS's were adjusted throughout the season. Management activity for the systems was relatively lower than in previous years, as adjustments were made less frequently based on having determined optimum pond discharge settings based on review of previous years data, and considering current or anticipated weather and predicted tidal conditions. While in previous years it was attempted to minimize discharge of pond waters not meeting water quality objectives (WQO's), including salinity and DO, a preliminary review of data indicates that more consistent, moderate volume discharges improved salinity conditions (lower salinity). A summary of discharge events is shown on Table 1.

Table 1 Summary of Intake/Discharge Activities

Complete notes of pond (system) conditions and management activities are available for review upon request. Continuous meter data (Datasondes) was provided to RWQCB staff during the season and are not included in the report due to large file size; Final Datasonde files are available upon request.
<u>NOTE:</u> Table 1 salinity values displayed are generally from field measurements using a Datasonde, except occasionally when a hand-held refractometer was utilized; Datasonde values differ slightly from refractometer values collected simultaneously. Datasonde values should be considered more accurate and are generally used for all graphs listed as Figures in this SMR. In some figures, previous nomenclature for ponds are used, as has been the convention. "B" & "E" are interchangeable (<u>B</u>aumberg aka <u>E</u>den Landing)

Pond	Location	Date	Salinity	Staff	Activity and notes
2C	E2c-14	4/1/2008	25	<3.4	1x48" discharge set to 5%, cont. transition to summer operations.
2C	E2c-14	5/6/2008	30	3.60	Increased 1x48" disch. to 15% to max. circulation during spring tides.
2C	E2c-14	5/15/2008	35	3.10	Reduced 1x48" disch. to 5% to maintain water levels, neap tide.
2C	E2C-14, *E2c-15*	5/27/2008	42	3.40	*Opened 1x36" 20% (B2C→5C) to increase B2C intake*.
2C	E2c-14	6/2/2008	33	3.35	Increased 1x48" disch. to 15% to max. circulation during spring tides.
2C	E2c-14	6/5/2008	39	3.65	Increased 1x48" disch. to 20% to max. circulation during spring tides.
2C	E2c-14	6/9/2008	44	3.30	Red.1x48" disch. to 5% for neap; maint. Water levels, salinity mgmt.
2C	E2c-14	6/13/2008	36	3.35	Increased 1x48" disch. to 15% to max. circulation during spring tides.
2C	E2c-14	6/20/2008	39	3.2	Red.1x48"disch.to 5% for neap; maint. Water levels, salinity mgmt.
2C	E2c-14	7/1/2008	39	3.70	Increased 1x48" disch. to 20%
2C	E2c-14	7/3/2008	37	3.8	Red.1x48"disch..to 5% for neap
2C	E2c-14	7/10/2008	42	*3.65*	Increased 1x48" disch. to 20%

Pond	Location	Date	Salinity	Staff	Activity and notes
2C	E2c-14	7/15/2008	49	3.30	Red.1x48" disch. to 10% for neap, water level, salinity mgmt.
2C	E2c-14	7/18/2008	37	3.35	Red.1x48" disch. to 5% for neap
2C	E2c-14	7/24/2008		3.6	Increased 1x48" disch. to 15%
2C	E2c-14	7/29/2008	44	3.55	Increased 1x48" disch. to 20% for springs, water level, salinity mgmt
2C	E2c-14	8/4/2008	44	3.55	Red.1x48" disch. to 10% for neap, water level, salinity mgmt
2C	E2c-14	8/20/2008	41	3.5	Increased 1x48" disch. to 20% for springs, salinity mgmt.
2C	E2c-14, *E2c-15?*	8/25/2008	45	3.35	Reduced 1x48" disch. to 10% for neap, water level, salinity mgmt. Closed B2c-15?
2C	*E2c-15 (2c-5c)*	*10/20/2008*	*37*	*3.55*	Increased *1x36" gate to 25% (B2C→5C)*
2C	*E2c-15*	*11/24/2008*	*31*		*Increased 1x36" gate to 100% open to max circ.*
9	E8a-1	4/1/2008	31	2.55	1x48" disch. set to 5%
9	E8a-1	5/6/2008	37	3.8	Increased 1x48" disch. to 25%.
9	E8a-1	5/13/2008	38	3.10	Reduced 1x48" disch. to 10% for neap, water level mgmt.
9	E8a-1	6/3/2008	35	3.55	Increased 1x48" disch. to 20% for springs
9	E8a-1	6/20/2008	33	3.15	Reduced 1x48" disch. to 5% for neap, heat
9	E8a-1	7/1/2008	37	3.75	Increased 1x48" disch. to 25% for springs
9	E8a-1	7/15/2008	38	3.55	Reduced 1x48" disch. to 15% for neap
9	E8a-1	7/18/2008	38	3.60	Reduced 1x48" disch. to 10% for neap.
9	E8a-1	8/4/2008	38	4.00	Increased 1x48" disch.to 35% to lower pond H20 elev. For WSP nest protection.
9	E8a-1	8/12/2008	36	3.30	Reduced 1x48"disch. to 15% for neap
9	E8a-1	8/22/2008	39	3.60	Increased 1x48" disch. to 20%
9	E8a-1	10/8/2008	38	3.00	Reduced 1x48" disch. to 10% for neap, maint. Pond H20 levels.
8A	*E8A-NC*	*Winter 2008*	27	0.2	Set1x48"disch.to 5%
8A	*E8A-NC*	5/6/2008	27	0.35	Increased 1x48"disch. to 25%
8A	*E8A-NC*	5/13/2008	*41*	*<0.0*	Red.1x48"disch. to 5% for neap
8A	*E8A-NC*	6/3/2008	31	0.15	Increased 1x48"disch. to 25% for springs

Pond	Location	Date	Salinity	Staff	Activity and notes
8A	*E8A-NC*	6/6/2008		0.3	Reduced 1x48" Intake to 50% to min. water level for SNPL nest protection.
8A	*E8A-NC*	6/20/2008	31	<0.0	Reduced 1x48"disch. to 5% for neap, heat
8A	*E8A-NC*	7/29/2008		0.55	Closed 1x48" intake (to prevent SNPL nest flooding)
8A	*E8A-NC*	8/12/2008		<0.0	Opened 1x48" Intake 25%
8A	*E8A-NC*	9/11/2008		<0.0	Opened 1x48" Intake 100% to reduce salinity, increase WQ & circulation
2	E2-10	4/24/2008	39	3.30	Increased 1x48" disch.to 25%, draw down b-4 springs (salinity control).
2	E2-10	5/15/2008	40	3.20	Reduced 1x48" disch. to 10% for neap, heat.
2	E2-10	6/13/2008	44	3.30	Increased 1x48"disch. to 25% for springs
2	E2-10	6/20/2008	43	3.35	Reduced 1x48"disch. to 5% for neap, heat
2	E2-10	6/26/2008	43	3.25	Increased 1x48” disch. to 15%
2	E2-10	7/1/2008	45	3.40	Increased 1x48"disch. to 25% to attempt salinity control.
2	E2-10	8/20/2008	42	3.40	Increased 1x48" disch. to 35%
2	E2-10	8/26/2008	44	3.35	Reduced 1x48" disch. to 25%.
2	E2-10	10/10/2008	42	2.90	Reduced 1x48"disch. to 5% to increase water levels.
2	E2-10	11/24/2008	38	3.80	Increased 1x48" disch. to 10%.
10	E11-1	4/15/2008	30	3.8	Reduced 1x48" disch. to 10%.
10	E11-1	5/8/2008	34	4.3	Increased 1x48" disch. to 25%.
10	E11-1	5/15/2008	34	3.35	Reduced 1x48"disch.. to 5% for neap, heat
10	E10-E11 Wood gates	5/15/2008	36		Opened 1x wood gate (10-->11)
10	E10-E11 Wood gates	5/16/2008			Closed 1x wood gate (10-/->11)
10	E11-1	6/3/2008	36	3.95	Increased 1x48" disch. to 20%
10	E11-1	6/16/2008	37	3.50	Increased 1x48"disch. to 25%
10	E11-1	6/20/2008	36	3.40	Reduced 1x48"disch. to 5% for neap, heat
10	E11-1	6/26/2008	40	3.40	Increased 1x48” disch. to 15%
10	E11-1	7/1/2008	36	3.95	Increased 1x48"disch. to 25% for springs
10	E11-1	7/3/2008	34	4.10	Reduced 1x48" disch. to 10% to maintain water level.
10	E11-1	7/10/2008		4.20	Increased 1x48" disch. to 20% for springs
10	E11-1	7/16/2008	38	3.90	Reduced 1x48"disch. to 5% for neap
10	E11-1	7/29/2008	40	4.30	Increased 1x48" disch. to 20% for

Pond	Location	Date	Salinity	Staff	Activity and notes
					springs
10	E11-1	8/26/2008	41	3.80	Reduced 1x48" disch. to 15% to maintain water level.
10	E11-1	9/9/2008	44	3.75	Reduced 1x48" disch. to 10% to maintain water level
10	E11-1	9/26/2008	41	4.10	Increased 1x48" disch. to 20%
10	E11-1	10/6/2008	43	3.50	Reduced 1x48" disch. to 15% to maintain water level during neap tide
10	E11-1	11/11/2008	36	3.55	Reduced 1x48" disch. to 5% to max water levels during springs, transition to winter ops
11	E11-3	5/15/2008		<0.0	Removed 1x wood weir board to increase intake
11	E10-E11 Wood gates	5/27/2008	37	<0.0	Opened 1x wood gate (10-->11)
11	E11-3	5/29/2008	42	<0.0	Added 1 weir board (3 total) since water level at top of 2nd.
11	E10-E11 Wood gates	6/10/2008	48		Closed 1x wood gate. 10-/->11

Water Quality Monitoring Requirements

Water quality monitoring was performed at the sampling stations shown in Figure 2. The water quality parameters are provided in the Final Order and are summarized below for reference:

Table 2 Continuous Circulation Period Discharge Limits

All pond waters discharging to the Bay or Sloughs shall meet the following limits:

Constituent	Instantaneous Maximum	Instantaneous Minimum	Units
Salinity (Continuous Circulation Period)	44	n/a	ppt
Dissolved Oxygen[1]	n/a	5.0	mg/L
pH[2]	8.5	6.5	

[1] = Limitation applies when receiving waters contain ≥ 5.0 mg/L of dissolved oxygen (DO). When receiving waters don't meet the Basin Plan objective, pond discharges must be ≥ DO receiving water level.

Dissolved Oxygen (DO) Trigger. At each pond discharge location, if the DO concentration is < 3.3 mg/L,calculated on a calendar weekly basis, values below the trigger shall be reported promptly to RWQCB, corrective measures shall be implemented in an attempt to increase DO concentrations, receiving waters shall be monitored and Operation Plans shall be revised, as appropriate, to minimize reoccurrence.

[2] = The Discharger may determine pH compliance at the discharge or in the receiving water.

Water Quality Monitoring Methodology

Continuous Pond Discharge Sampling:

The Department installed continuous monitoring devices (Hydrolab-Hach Company, Loveland, CO) called Datasondes in ponds E2, E2C, E9 and E10 in late April, 2008, prior to the 2008 discharge monitoring season to provide initial baseline data for the season. All pond systems were operated under Continuous Circulation Period protocol in 2008, with monitoring at the discharge point (E2, E2C, E9 and E10). The Datasondes measured pond water quality at the outflow of the discharge into San Francisco Bay or the connecting tidal slough. Intake water quality is interpreted based on values observed, although the device is located within the ponds. Datasondes were removed from Ponds E2, E2C and E9 in the beginning of May, 2008 because continuous monitoring was no longer necessary nor required by the Final Order, as modified by RWQCB. Datasondes were utilized for grab sample monitoring conducted approximately weekly in Ponds E2, E2C and E9 throughout the 2008 season. Pond E10 had at least one Datasonde deployed to collect continuous data through the majority of the season and into the transition to winter operations, as described below.

Datasondes were installed on the pond side of the WCS that discharged waters to the San Francisco Bay receiving waters using ABS plastic pipes as device holders mounted to the structure to allow for free water circulation around the sensors. For the Applied Study conducted in Pond E10, a second Datasonde was deployed near the middle of the pond, mounted on PVC sleeve attached to a free-standing galvanized pipe secured to the pond bottom. The devices were installed at a depth of at least 25cm to ensure that all sensors were submerged, and these depths were monitored and adjusted to maintain constant submersion as the pond water levels fluctuated. Datasondes were calibrated pre-deployment and maintained on a biweekly cleaning and calibration schedule unless they required additional maintenance. Spare data recorders were deployed to replace devices discovered to be malfunctioning during servicing periods.

Datasondes collected values for the following parameters: salinity, pH, temperature, and dissolved oxygen which were collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data were downloaded approximately weekly from Datasondes and the devices were serviced to check battery voltage and data consistency. The Datasondes were generally serviced biweekly to recalibrate and de-foul the units (service records available upon request). At various times during the season, a recently calibrated Datasonde was placed next to the deployed Datasonde in the pond at the same depth, and readings of the two instruments were compared, to ensure deployed units were collecting valid data. Any problems detected with the Datasonde were corrected through calibration or replacement of parts or instruments.

Device malfunctions that occurred resulted in generally brief gaps in data or questionable data accuracy and were mostly attributed to battery failure, corrosion, exposure, and bio-fouling. These episodes were corrected as soon as possible after being observed in the field or during review of data and occurred less frequently than in previous years. It is likely that malfunctions cannot be completely avoided due to staff and budget limitations and because the Datasondes are deployed in harsh saline environments. The devices periodically suffer significant bio-fouling and the data from the week between cleanings may be affected by the bio-fouling. Operator error in downloading and processing data and misunderstanding of Final Order requirements revised in 2008 resulted in some longer-term data gaps; however, grab sample monitoring was conducted during those periods and management operations were not adversely affected.

Discharge Time-Period and Volume Estimates:

Estimates of discharge volume could provide useful information, which would be used for activities such as modifications to operations, and for evaluation and analysis, particularly for determining what effects, if any, discharges had on receiving waters, and determination of effectiveness of BMPs. RWQCB modified ASMR requirements similarly for the ponds operated by USFWS. They contracted technical assistance from USGS, which used in-house budget and staff in developing a methodology to estimate discharge volumes using a calculation model (PONDCALC) to estimate discharge from five Alviso Complex ponds.

The Department is unable to secure funding to contract a similar effort with USGS, since there is no dedicated annual budget for ELER. The Department understands the usefulness of such a tool to provide discharge volume estimates and will continue to look for opportunities to acquire and use such tools. At this time, the Department does not anticipate funding will be available due to the State budget constraints.

Discharge time period information may be interpreted from continuous monitoring data and is available in the electronic data files and summarized in discussions herein. Table 1: Summary of Discharge Events, provides context for management operations; using discharge percentages, multiplied by discharge capacity described in ISP and Operations Plans, a generalized volume may be obtained. The time-period each day that a pond discharges is not specifically provided in this report. It should be noted that the daily discharge time-period information is based on predicted tidal elevations, not actual tide stages and time periods because there is currently no tide stage and other instrumentation installed to record actual discharge time-periods. Discharge periods in the ISP were assumed to be approximately 8 hours a day. For the initial evaluation of discharge time periods, it was assumed that discharge would occur once tide stage was below pond water elevations, which occurs for approximately 13-16 hours daily. This assumption may over-estimate discharge time periods (and volumes) because it disregards affects of head (pressure) which may affect discharge flows through culverts. Based on observed data, intake requires tide stages that are approximately 1 ½ to 2 feet higher than pond water elevations; therefore, discharge may have similar head requirements. Nonetheless, discharge event information is useful to contextualize management actions and BMP's implemented during ponds operations and provides information to complement the general information in the Operations Plans. Discharge quantity estimates, as noted above, will also complement this information.

Receiving Water Sampling (Continuous Circulation Period):

Receiving water was not monitored for Bay discharges, as approved by RWQCB in the revised Final Order in 2005. Bay discharge locations include Ponds E2, E9 and E10. Receiving water sampling to determine water quality measurements are required only for slough discharges, where a pond is discharged into a slough at a substantial distance from the main body of the San Francisco Bay (otherwise, Bay discharge receiving water monitoring is not required nor is practicable). Only one slough discharge occurs for ELER, based on 2008 operations. The slough discharge is from Pond E2C into Alameda Creek Flood Control Channel (ACFCC), also known as Coyote Hills Slough, near the southern boundary of ELER. Sampling requirements under the Final Order were modified by RWQCB in 2008, such that receiving water sampling needed only be conducted when water quality objectives in discharge locations were not met if pond waters are discharged at greater than 25% capacity from the E2C system.

Management operations for System E2C maintained discharge at or below 25% for the 2008 season. Therefore, no receiving water sampling was conducted by the Department along ACFCC.

Table 3 –Continuous Circulation Monitoring For Eden Landing Ponds

Sampling Station:	D.O.	pH	Temp	Salinity	Sample Function
E2-10	A	A	A	A	Discharge
E2C-1 (E2C-14)	A/B	A/B	A/B	A/B	Discharge
E2C-	C	C	C	C	Receiving Water
E2C-	C	C	C	C	Receiving Water
E2C-	C	C	C	C	Receiving Water
E2C-	C	C	C	C	Receiving Water
E2C-	C	C	C	C	Receiving Water
E9-1 (E8A-1)	A	A	A	A	Discharge
E10-1 (E11-1)	A/B	A/B	A/B	A/B	Discharge

LEGEND FOR TABLE 3

A = For time periods between May and October when the Discharger is not monitoring its discharge continuously in accordance with Table 2B and 4A/B, it shall collect weekly grab samples before pond water mixes with receiving water. For days it collects pond water samples or downloads continuous monitoring data, the Discharger shall also report standard observations, as described in Section D of the SMP. Additionally, the Discharger shall report the time of sample collection and alternate the time it collects weekly grab samples between the morning and the afternoon to the maximum extent practicable. Based on weekly grab samples and standard observations, the Discharger shall consider implementing continuous monitoring, as necessary, to help craft management decisions.

B = From July 7 to October 10, the Discharger shall monitor discharge pond E10 before pond water mixes with receiving water using a continuous monitoring device. The Discharger shall also continuously monitor discharges from Pond System E2C, between July 7 and October 10, if pond waters are discharging at greater than 25% of capacity.

C = Receiving water samples shall be collected at discrete locations near the surface and bottom from downstream to upstream of the discharge point. Receiving water slough samples shall be collected monthly from July through October as close to low tide as practicable, if pond waters are discharging at greater than 25% capacity from the E2C system. For days it collects receiving water samples, the Discharger shall also report standard observations, as described in Section D of the SMP, and document if it collect samples at flood tide, ebb tide, or slack tide. Additionally, the Discharger shall record a daily estimate of the quantity and time-period of discharge based on pond water levels and the strength of tides.

Calibration and Maintenance:

All the instruments used for sampling as part of the Self-Monitoring Program were calibrated and maintained according to the standard procedures previously developed and employed by USGS. Datasondes were calibrated pre-deployment and maintained on a generally biweekly cleaning and calibration schedule unless they required additional maintenance or staff availability occasionally required a slightly longer (3 week) cycle. During the cleaning and calibration procedure, simultaneous readings were generally collected with a recently calibrated Datasonde to confirm data consistency throughout the procedure (initial, de-fouled [post cleaning], and post calibration). The initial and de-fouled readings were also used to detect shifts in the data due to accumulation of biomaterials and sediment on the sensors. The problem of biofouling was minimized with the use of nylon stockings and copper mesh covering the Datasonde. This allowed for maximum water flow past the sensors. The Department reviewed data approximately biweekly during servicing, to determine if fouling caused detectable shifts in the data due to the accumulation of biomaterial and sediment on the sensors or if other malfunctions occurred, such as power loss. A calibration and maintenance log was maintained.

Two types of DO sensors were used, Clark Cell and Luminescent DO. There was no particular reason why one type was used over another; rather the devices were deployed as needed/available. When malfunctions occurred and meters required replacements, the available replacement units may have had a different sensor. Regardless of type, the salt pond environment results in corrosion and fouling and will continue to pose challenges to successful deployment of continuous monitoring devices.

Pond Management Sampling:

As approved by RWQCB in 2005, the Department did not regularly conduct pond management sampling in 2008 in all ponds in each system. However, the Department did continue to collect data throughout the season for all ponds where the data would be useful in determining pond management operations and be useful in interpretation and analysis. Data include pond water elevation (staff gages), salinity (hand-held refractometer), wildlife (observations) and any items of note. Datasondes were used periodically to collect grab samples when more water quality data could be useful.

Chlorophyll-a Sampling:

Chlorophyll-a sampling in all ponds was not conducted due to limited analysis and applicability, as approved by RWQCB in 2005. The Department did collect in-pond chlorophyll-a samples in 2008 as part of the Applied Study in Pond E10 and that information is provided below.

Metals- Annual Water Column Sampling:

The Department did not collect water column samples in 2008. This sampling was discontinued, as approved by RWQCB in 2005, because analysis of previous year's data showed metals concentrations were within WQO's.

Sediment Monitoring

The Department did not conduct sediment sampling because analysis of previous year's data showed metals concentrations were within WQO's. In 2006, RWQCB supported redirection of monitoring efforts to address specific issues rather than generalized pond monitoring; accordingly, mercury studies shall be centered on areas of concern, such as the USFWS Alviso Pond Complex, in Pond A8 and Alviso Slough. USFWS will provide a report to the RWQCB when available and any relevant findings may be applicable to the Department's ponds at ELER.

Invertebrate Monitoring

Invertebrate monitoring was not conducted in 2008. Previous collections (2005-06) proved to be of limited use for analysis and had little applicability to pond operations.

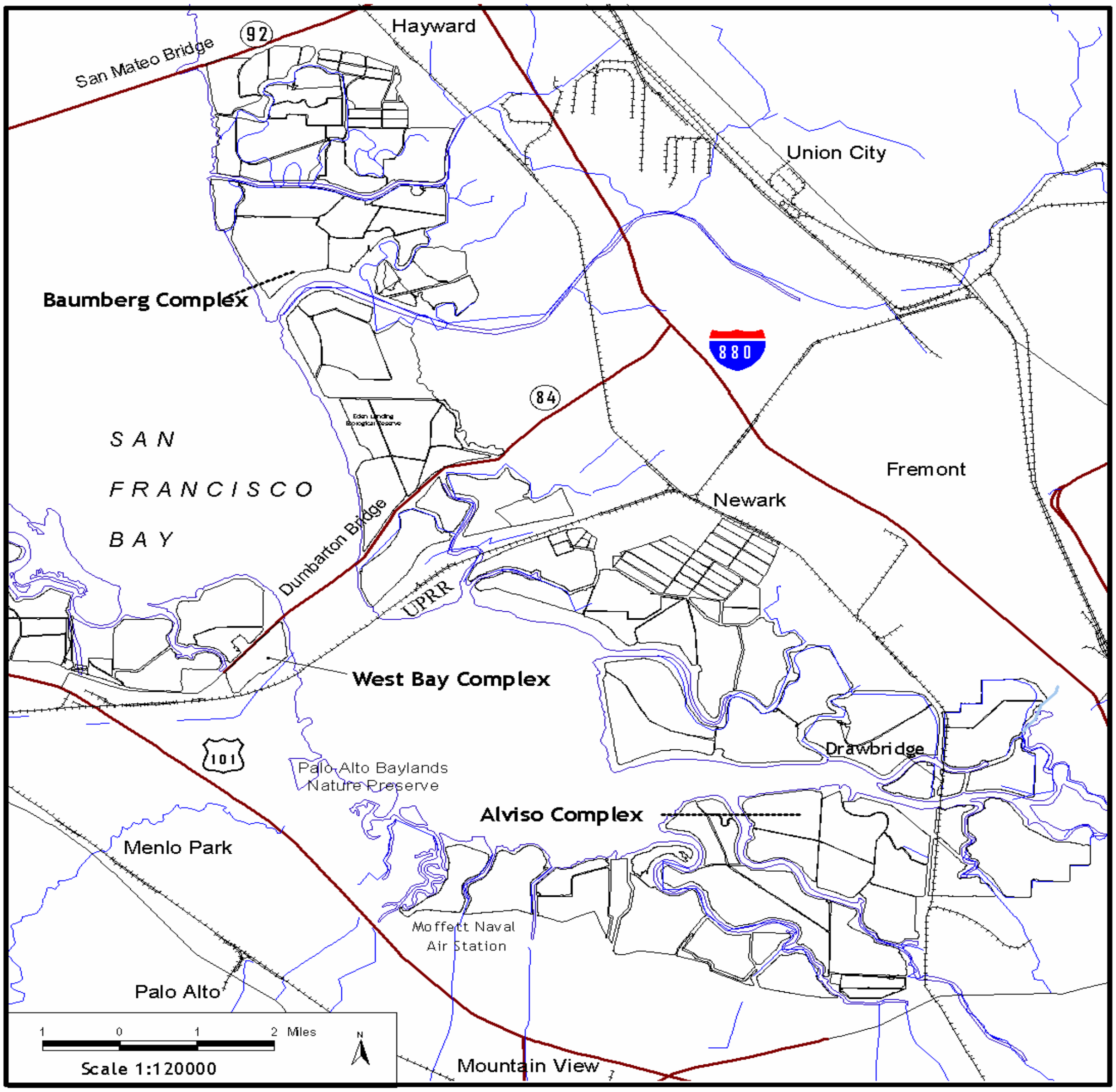


Figure 1. Vicinity Map of the Eden Landing Ecological Reserve (Baumberg Complex) Ponds

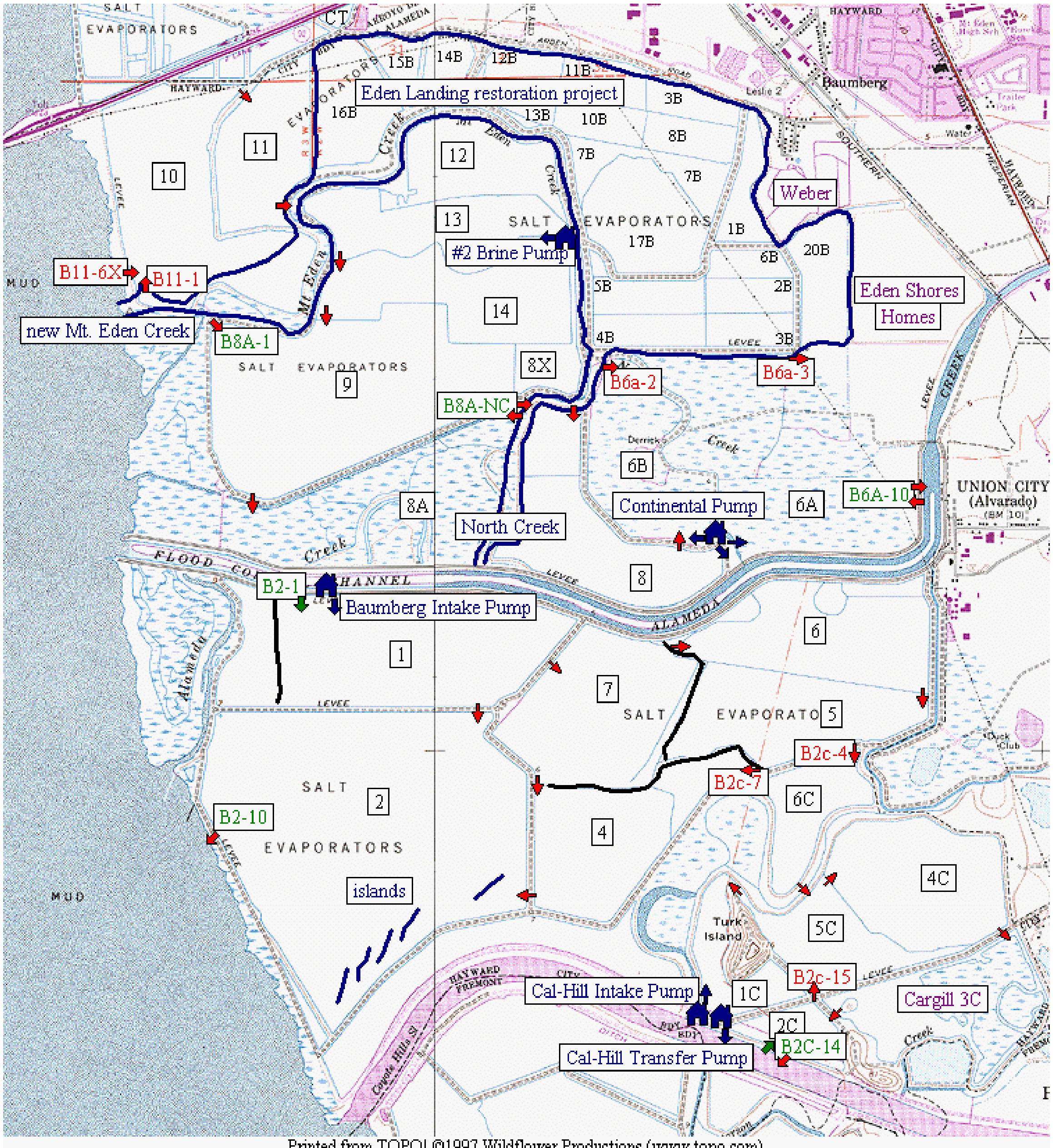


Figure 2. Eden Landing Ecological Reserve (Baumberg Complex) Ponds: Discharge and Intake Locations

Green text boxes note Intake and Discharge Locations, Red text boxes note other key pond operation and monitoring locations. ("B" nomenclature from water control structure names for ISP and "E" nomenclature from SBSP dropped on pond labels)

Water Quality Monitoring Results

Discharge and Receiving Waters

Results from the monitoring of pond waters at discharge locations are summarized below by parameter. It should be noted that, where the continuous data collection meter files show values below Basin Plan objectives and Final Order requirements, it does not necessarily indicate or reflect actual violations. Pond discharges do not occur continuously. Pond discharge data should be reviewed considering variation in tide stage and cycles, and operational activities which resulted in suspending or modifying discharges. Salinity, pH, temperature and DO appeared to continue within the typical patterns and ranges in 2008 as in previous years.

Data from 2008 were generally consistent with data collected during previous years on similar calendar dates. In Systems E9, E2, E2C, salinity during 2008 was somewhat lower than during previous years, and Systems E10 and E6A were slightly higher, which may be attributable to modified management operations. Although pH is highly variable during all years, it was somewhat higher in E10 than in previous years. Temperature has been generally consistent across years. Dissolved oxygen is more difficult to interpret and has been highly variable across years; however, calendar weekly 10th percentile and median values were lower in E10 than in previous years, and daily mean DO concentrations in E10 were lower than in previous years. Most E10 weekly 10th percentile values and median values were also often below the 3.3mg/L trigger value, and all were below the water quality objective of 5.0mg/L as described in Basin Plan.

Figures 8-11 show the daily means for salinity, pH, temperature, and DO for the pond water at the discharge location at E10. See Figures 3-7 and 12-23 for E10 AS data.

The 2008 pond water analytical results (continuous collection) and field observations are large files and are not included in this SMR. Rather, those data are provided in electronic format. Please contact the Department for requests to cite, distribute or utilize this information for purposes other than reviewing this report.

Salinity

Pond salinities were generally similar to previous years, although in 2008 management operations may have been more successful at maintaining salinity below the discharge limit of 44ppt. Similar to 2007, the low rainfall total for the winter season affected winter operations and resulted in management operations with reduced circulation. Winter pond discharge was more limited, and input of rainwater to dilute pond water was less than expected. Salinities were generally not above the 44 ppt required for Continuous Circulation Period operations, except for brief periods, especially during neap tide intervals when intake is extremely limited (refer to Instantaneous/daily mean salinity values). These periods show how with limited intake to promote mixing and dilution, combined with overall higher pond salinities, slightly higher salinity will be observed. This is especially true for drought years, exhibiting atypical water circulation patterns in pond operations. Only a portion of elevated daily mean periods were during actual discharge events, and values were only a few points above 44 ppt. Refer to Figure 8 for daily mean salinity in E10. The operating salinities for all system ponds are expected to remain under Continuous Circulation Period conditions in future normal rainfall years, and will continue to chiefly function as low-salinity systems, reflecting only relatively higher salinities than the intake waters from the Bay and sloughs. Differences in mean salinity between pond and Bay waters are more apparent during neap tide periods and higher salinity should be expected during drought years. Review of data collected to date indicates that management operations provide sufficient maintenance of salinities in seasonal or batch pond operations, where a limited number of ponds are allowed to reach moderate salinities, and do not prevent continued management of primarily low salinity ponds. Batch ponds are sufficiently mixing with system ponds before discharge.

<u>E2C:</u>
System E2C is operated as a muted tidal system, with supplemental intake and discharge at the same location, and salinity therefore varied depending on intake periods affected by spring and neap tide cycles. Grab samples obtained during routine pond operations prior to May showed values ranging from 16 to 37 ppt (29 to 43 ppt in 2007), and grab sample monitoring values during the monitoring season from May through October showed pond salinities from 30 to 44 ppt (27-49 ppt daily means in 2007, continuous data in 2007 ranged from 4 ppt to 52 ppt), except on two dates (7/15, 10/8), which had observed values of 49ppt and 51ppt, respectively. These periods coincided with similar observed salinities in Pond 3C, and were presumably brief episodes, as salinities observed in the days before and after were within the normal range of the season. While one observation (7/15) coincided with spring tides, the other (10/8) coincided with a neap tide, thus it is not immediately apparent that insufficient tidal mixing was the cause. Observed E2C salinity was generally below 44 ppt throughout the season with periodic implementation of the BMP begun in 2007, where Pond 2C water is allowed to drain into Pond 5C to increase intake at Pond 2C. Additional BMP’s such as weekly discharge timing and minimizing discharge volumes adequately protected receiving waters. The system was operated assuming Continuous Circulation Period conditions, and average salinity over the entire monitoring season (May through October) was 39 ppt (39ppt in 2007).

<u>E9:</u>
System E9 is operated as a muted tidal system primarily via Pond 9, with intake and discharge at the same location, E8A-1, adjacent to the historic mouth of MEC. Supplemental intake occurred in Pond 8A, via North Creek. This arrangement is now considered the normal operational mode, and is the reverse operation of years prior to 2007 (the first year such operation was feasible, after MEC was restored to full tidal action). The primary intake and discharge operational mode at Pond 9 was an effort to improve water quality values, presuming that primary operations via Pond 9 could improve water quality in the system because of greater mixing assumed based on the E8A-1 WCS being comprised of four-48” culverts, all of which can be used for intake, compared to the single-48” culvert in Pond B8A. It is unclear whether this mode of operation improved water quality, based on the review of 2007-8 data; meeting WQO’s in all pond systems was complicated by the previous low-rainfall winter. Receiving waters would likely be better protected, since Pond 9 is considered a Bay discharge,

while discharge from Pond 8A is into North Creek, which drains into Old Alameda Creek. Pond 8A discharge, therefore, would result in pond discharge water having greater residence time in lower volume sloughs before mixing with the greater Bay, while Pond 9 discharge is assumed to mix with the open Bay in one ebb tide period.

At the start of the 2008 monitoring season, mean discharge salinity from Pond 9 was approximately 32 ppt (37 ppt in 2007), considered a higher value at the start of summer operations. This indicated that the system was affected by low rainfall the previous winter. This system only briefly reached winter water depth target s, in mid-January, and thereafter operated more shallowly. Shallower water depths resulted from management operations allowing higher than typical discharge in the latter half of the winter, intended to reduce spring salinities by reducing overall salt mass balance by reduced pond volume. The system was operated for the summer monitoring season assuming Continuous Circulation Period conditions, as average salinity over the entire May-October monitoring season (from grab samples) was 37 ppt (41 ppt in 2007, continuous data). Sample salinities in 2008 were not above 42 ppt (46 ppt max daily mean in 2007).

The highest salinity value (from grab samples) in 2008 was 42ppt, on 7/15/08 (46 ppt, 9/22/07). Grab sample salinity ranged from 33ppt-42ppt in 2008 (in 2007, 28ppt-51 ppt, continuous data; daily mean salinity 35ppt-46ppt). Discharge salinity was actively managed in 2008 based on grab sample data and operations were implemented to minimize discharge values above 44ppt. Discharge operations were not temporarily suspended in 2008, in an attempt to lower salinity overall, considering salt mass balance. Review of 2007 data did not show an appreciable increase in water quality across all parameters using the temporary suspension of discharge BMP; therefore suspension of discharge was not utilized in 2008.

Periodic draining of Pond 9 waters to seasonal ponds (E14, E8X and E12/13), effectively increased intake of Bay water at the mouth of MEC, and presumably improved mixing. After periods of water transfers to E14, especially for periods of more than one day and during spring tide cycles, system salinities generally improved and operated under 44 ppt, within Continuous Circulation standards. When E9 water transfers occurred during neap tide cycles, salinities did not notably improve until intake increased during the following spring tide cycle. Higher salinity waters in Pond E9 appear to have been well mixed at the discharge location during spring tides with intake in E9, presumably because there was greater turnover. The use of the BMP allowing periodic draining to seasonal ponds was limited in 2008 by use of the seasonal ponds by nesting western snowy plovers (WSP), a threatened species. This BMP was used only after WSP nesting was completed, beginning in September and again in October, which provided shallowly flooded habitat used during the fall by migrating shorebirds.

<u>E2:</u>

System E2 is operated as a circulating system, rather than a primarily muted tidal system as with all other ponds, but is augmented by muted tidal intake at the E2-10 discharge location on the Bay. Alternative discharge operations were not initiated at the E2-1 location in Pond 1 (low salinity “intake” pond), as had been undertaken in 2006. Since

2006, it has not feasible to implement the alternative E1 operation due to staff and budget constraints. Operation of E1 as the primary muted tidal intake and discharge requires substantial staff time, including conducting receiving water monitoring in Old Alameda Creek for a slough discharge. Receiving water monitoring for E2 (Bay discharge) operations is not required, as discussed above.

E2 salinity at the E2-10 discharge at the beginning of May, 2008 was approximately 39ppt (42ppt in 2007) and ranged from 38ppt-45ppt during the season (37ppt-54ppt in 2007). Grab sample salinities in E2 were below 45ppt for the entire season (daily mean above 44ppt, 135 of 190 days in 2007). The system was operated as if under Continuous Circulation Period conditions since the E2-10 discharge is located directly on the Bay and operates as muted tidal intake/discharge.

Grab sample salinities at E2-10 ranged from 33ppt-45ppt in 2008 (29ppt-56ppt instantaneous salinity values in 2007). Salinity for the majority of the 2008 season based on grab samples averaged 42ppt (daily means averaged 47ppt in 2007). Observed E2 discharge salinities (at E2-10) from May-October, 2008 from 45 grab samples ranged from 33ppt-45ppt, and were generally below 44ppt, except for 7 samples, which were approximately 45ppt (daily mean salinities in 2007 were typically above 44ppt from May 23 through September 26).

<u>E10:</u>
System E10 is operated as a muted tidal system in Pond 10, with intake and discharge at the same location at the mouth of MEC. Pond E11 is operated as a seasonal pond and is drawn down and dried during the summer. Salinity in E10 ranged from 32ppt-44ppt in 2008. At the start of the monitoring season in early-May, 2008 daily mean salinity in E10 was approximately 33ppt at the E11-1 discharge location (31ppt in 2007). Daily mean salinities were not above 44 ppt except on two consecutive dates toward the end of the evaporation season (10/9, 10/10) and the system operated under Continuous Circulation Period conditions (zero days where daily mean was above 44ppt in 2007).

Daily mean salinity ranged from 32ppt-46ppt during the 2008 season (31ppt- 44ppt in 2007), and the average daily mean salinity was 39ppt (36ppt in 2007). The highest recorded daily mean value in E10 was 46ppt on 10/10/08 (44ppt on 9/21/2007). There were two recorded daily mean salinity values exceeding 44ppt (zero in 2007). Instantaneous salinity values ranged from 28ppt-47ppt (8ppt-46ppt in 2007), and the season average was 39ppt (36ppt in 2007). Discharge was actively managed by operations to alter discharge volumes while avoiding large fluctuations in water levels or resulting in pond depths too shallow to conduct boat operations for the DO-AS.

Conversely to pond management operations in the other ELER systems, Pond 10 was operated at water levels deeper than typical and past year's operations. To allow access to the middle of the pond to deploy a Datasonde and to conduct the DO transects, deeper water was required to adequately operate a boat in E10. Deeper water was also presumed to have potential for improved water quality conditions; for example, deeper water was presumed to be better at moderating temperature and lowering high temperature values.

However, water quality may have been reduced overall, compared to 2007 and previous years. The increased depth reflected higher salt mass balance and pond water quality and dynamics may have been significantly affected. Pond discharge operations were different as well, compared to previous years.

System E10 provided good habitat conditions for numerous waterbirds in E10 despite periods of low DO conditions, and E11 provided seasonal habitat with conditions suitable for WSP and other shorebirds once the seasonal pond was drawn down. Pond operations did not result in flooding breeding bird nests on islands in E10.

pH

The pH values in the ponds were similar to previous years, with season averages in E9, E2, E2C and E10 of approximately 8.2, 8.22, 8.23 and 8.46, respectively. In 2008, sampled pH values ranged from a minimum of pH 7.74 to a maximum of 10.02 (E10, 5/1/08). While in-pond pH values were generally less than 8.5, during discharge periods it is expected that brief periods of elevated pH in-pond waters were readily mixed immediately after discharge and receiving waters were adequately protected, based on previous monitoring. Slough receiving water monitoring conducted in 2007 showed that receiving waters did not have a pond discharge “signal” away from the discharge, with pH values similar to ambient conditions typical of sloughs and the Bay. Compliance for pH levels was allowed in the Final Order to be measured in either the pond or receiving waters, as determined by the discharger. There was no apparent pattern in pH values as related to discharge operations. In E10, pH varied most extensively, with daily mean values ranging more than two points over the season. In other pond systems, pH ranged approximately one point over the season. Refer to Figure 9 for daily mean pH in E10**,** and to electronic files for pond management data for E9, E2 and E2C.

In Pond E2C, grab sample pH values ranged from approximately 8.62 to 7.74 during the 2008 season (8.3 to 7.7 in 2007) and pH averaged 8.23 (8.4 in 2007) through the season.

In Pond E9, grab sample pH values ranged from approximately 7.78 to 8.58 during the season (8.0 to 8.9 in 2007) and pH averaged 8.2 (8.4 in 2007) through the season.

In Pond E2, grab sample pH values ranged from approximately 7.83 to 8.67 during the 2008 season (8.2 to 8.6 in 2007) and averaged 8.22 pH (8.3 in 2007), through the season.

In pond B10, daily mean pH ranged from approximately 7.89 to 10.02 during the 2008 monitoring season and applied study periods (7.9 to 8.8 in 2007). Instantaneous values ranged from 7.76 to 10.29 pH, and averaged 8.39 pH, through the season (7.7 to 9.1, average 8.4 in 2007).

Temperature

Pond water temperatures were generally similar to ambient Bay and slough temperatures and were only slightly warmer during hot weather periods, especially for shallower ponds. The ponds easily met the discharge limits, not exceeding natural temperatures of the receiving waters by 20^{o}F in any case. For E2C, E9 and E2, season average grab sample temperature was 22.4^{o} F, 20^{o} F and 21^{o} F, respectively. For E10, the season average of daily mean temperature was 19.5^{o} F. Refer to Figures 10 for daily mean in E10 and to electronic files for pond management data for E9, E2 and E2C.

Dissolved Oxygen (DO)

For the 2008 season, pond dissolved oxygen values continued to be highly variable and there were periods of low or sustained depressed DO which showed that achieving compliance with the Final Order is problematic. Monitoring efforts showed that DO levels in the ponds generally continued to exhibit a strong diurnal pattern where lower DO is observed near dawn and higher DO is observed at mid-day. Substantial algal growth and decomposition in the ponds is assumed to be the cause of diurnal fluctuations of DO levels throughout the ELER Ponds during the summer.

Continuous monitoring DO values are discussed below for pond E10, including the DO-Applied Study (DO-AS) periods. Grab sample monitoring values for ponds E2C, E9 and E2 are also provided, but are less representative of variance over each day, week and the season, since those values are only from samples taken during the day; however, if any periods of sustained, depressed DO conditions had occurred in those ponds, grab samples should have reflected those periods. Management actions were implemented as appropriate. Evaluation of Pond E10 s is based on daily mean values recorded at the discharge location and on calendar-weekly 10th percentiles. Values are referenced with the Basin Plan water quality objectives (compliance limit of 5.0 mg/L) and reporting "trigger" values established by RWQCB (below 3.3 mg/L), as discussed herein. Calendar-weekly tenth percentile "trigger" values were below 3.3 mg/L for most of the season for E10, and notification of these conditions was made to RWQCB staff.

It should be noted that the summary data does not necessarily indicate or reflect actual violations of the Final Order. Pond discharges did not occur continuously nor in all of these periods, and variations in pond operations, including Best Management Practices (BMPs), were implemented to attempt to increase DO values, or to limit potential adverse affects. Refer to Figure 11 for daily mean DO in E10. For E2C, E9 and E2, mean DO of grab samples was 6.3, 5.7 and 6.3 mg/L, respectively.

Pond System 10: Monitoring data for Pond E10 was collected May 1 through November 26, 2008, representing 157 total recorded days (187 in 2007). For this discussion and for the figures, 53 days within the monitoring season have no data, because data was removed after review showed unreliable values due to device malfunctions or other errors, or because a file set up error resulted in lost data, or no data was recorded due to a misunderstanding of the changes to monitoring requirements in the Final Order for 2008. For E10, daily mean DO was below 5.0 mg/L on 140 days (31 days or 17% in 2007), and daily mean DO was below 3.3 mg/L on 90 days (no days in 2007). All of the 26 calendar week periods had tenth percentile "trigger" values below 3.3 mg/L (9 of 29 in 2007). For System E10, receiving waters were not monitored because it is a Bay discharge location, as discussed previously, and receiving waters were presumably not adversely affected since pond discharge volumes are negligible relative to volumes exchanged in tidal cycles at the mouth of Mt. Eden Creek and the open Bay.

E10 Applied Study

An applied study was conducted in Pond E10 during the summer through fall to examine both spatial and temporal variability of water quality parameters within the pond and across seasons. The sampling areas corresponded to intake, discharge and a mid-pond shallow area and included deployment of a Datasonde to provide continuous monitoring data in each location for a period of approximately two weeks during three periods. Similarly to continuous monitoring conducted for pond discharges, the Datasondes recorded: pH, temperature, salinity and dissolved oxygen every 15 minutes. During each sampling period dissolved oxygen transects, nutrient and chlorophyll a sampling was also conducted.

The Applied Study (AS) was conducted by the Department in addition to the continuous monitoring described above, which provided data from an intensive in-pond DO investigation in Pond E10 from three, 2-week cycles, with emphasis on DO. RWQCB requested the three, two-week periods be during the following dates: July 7-18, September 8-19 and November 10-21. The dates the DO-AS were actually completed at ELER were from July 7-18, September 11-21 and November 11-22, 2008, reflecting staff and equipment availability and dates that valid data was collected. These dates generally corresponded to a similar AS conducted by USGS for USFWS in Pond A14, in order to provide a comparison for the results.

For each of the approximate 2-week AS periods, data was collected as described below. Two Datasonde devices were installed within the pond to provide continuous monitoring of intake, discharge and pond interior (shallow water) water quality. Although RWQCB also requested a deep-water location be monitored, the only such location is at the intake/discharge location, which already has a representative sample, and the pond no longer has a continuous deep-water borrow ditch as do many other ponds in the salt pond system. This is because levee maintenance and construction has been conducted with land-based equipment with earthen material imported from elsewhere on-site (from levee lowering and removal) rather from within the pond by the floating dredge equipment (Cargill's Mallard) previously used more commonly. The Datasondes recorded salinity, pH, temperature, and DO at 15-minute intervals. Two DO transects were also to be conducted during each sample period to determine spatial and temporal variability throughout the pond; one transect was conducted pre-dawn, and the other was conducted during mid-day, to examine the affect of algal photosynthesis on pond DO conditions. These transects were conducted on the same day and a minimum of 20 data points were collected within the two perpendicular transects, except on 7/16/08, when only the pre-dawn (AM) sampling was conducted due to staff availability and only 9 readings were collected during the morning transect due to file set-up or instrument failure/ data collection errors.

Nutrient sampling was also conducted once during each sample period at various locations within the pond, such as where Datasondes were deployed and other locations along the DO transects. The nutrient samples were analyzed for NO3-N, NH4-N, and total and soluble phosphorus. Chlorophyll a samples were also collected once during each sample period and were filtered and analyzed for chlorophyll a and phaeopigments.

Table 4: Summarized Chlorophyll and Nutrient Values for Pond E10 (SF Bay Values outside of discharge included for reference). Refer to Figure 3 for a map of locations

Sampling Date	Location	CHL µg/L	PHEO µg/L	Nitrate + Nitrite (NO3 + NO2) µM	Ammonium (NH4) µM	DIN µM	Phosphate (PO4) µM
7/16/2008	B10 intake/discharge (AM only)	6.85	2.49	0	0.92	0.92	4.85
7/16/2008	B10 mid-pond shallow sonde (AM only)	10.40	2.99	0	0.95	0.95	5.35
7/16/2008	B10 shallow 1 (AM only)	6.80	3.89	0	1.18	1.18	2.14
7/16/2008	B10 shallow 2 (AM only)	8.74	4.15	0	1.17	1.17	0.01
7/16/08	**In-pond mean**	**8.20**	**3.38**	**0**	**1.06**	**1.06**	**3.09**
9/17/2008	B10-intake/discharge	58.50	3.82	0	1.42	1.42	3.84
9/17/2008	B10 mid-pond shallow sonde	61.31	1.41	0	2.43	2.43	2.86
9/17/2008	B10 shallow 1	33.17	3.58	0	1.71	1.71	1.97
9/17/2008	B10 shallow 2	357.04	6.97	0	4.34	4.34	8.6
9/17/2008	*B10 SF Bay*	77.77	5.49	*0*	*1.91*	*1.91*	*3.24*
9/17/08	**In-pond mean**	**117.56**	**4.25**	**0**	**2.36**	**2.36**	**4.10**
11/19/2008	B10-intake/discharge	19.08	3.25	1.04	4.06	5.10	4.67
11/19/2008	B10 mid-pond shallow sonde	33.39	2.08	0.26	0.66	0.92	2.8
11/19/2008	B10 shallow 1	175.28	8.54	0.52	0.68	1.20	3.79
11/19/2008	B10 shallow 2	311.84	9.71	0.41	0.70	1.11	3.33
11/19/2008	*B10 SF Bay*	18.93	4.20	*17.26*	*7.00*	*24.26*	*6.9*
11/19/08	**In-pond mean**	**111.70**	**5.56**	**0.56**	**1.52**	**2.08**	**3.65**

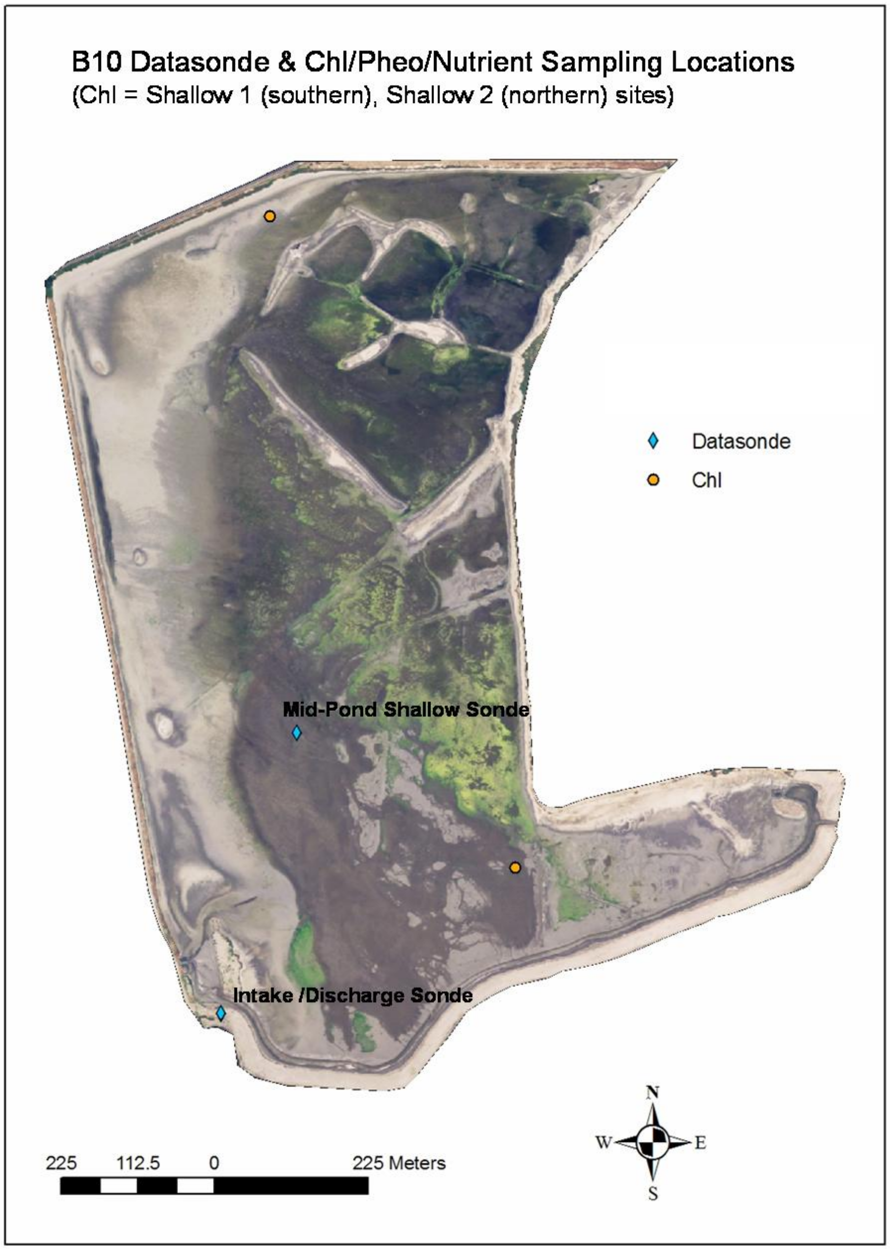


Figure 3: Pond E10 Applied Study Data Collection Stations

Data for meteorological measurements, including parameters such as wind speed and direction, air temperature, relative humidity, solar radiation were not collected at ELER. Rather, this information was collected at a permanent station nearby, in Union City, as part of the California Irrigation Management Information System (CIMIS) program in the Office of Water Use Efficiency (OWUE), California Department of Water Resources (DWR) which manages a network of automated weather stations in the state. CIMIS data is provided in this report in lieu of having a portable weather station deployed at ELER. A portable weather station was deployed by USGS at the Alviso Ponds for USFWS, and may be useful in providing a comparison or be used as an alternative.

Table 5: Summarized Weather Values by Study Period for Pond E10 (CIMAS data)

Sampling Period	Solar Radiation (Ly/day)	Net Rad. (Ly/day)	Temp (ºF)	Wind Speed (mph)	Wind Direction (degrees)	Precipitation (in.)	Relative Humidity (%)
July 7-18	563.24	329.73	65.19	4.66	295.43	0.00	70.15
Sep.11-21	404.71	209.40	61.11	3.59	264.17	0.00	72.96
Nov.11-22	221.72	76.59	56.76	1.80	194.01	0.00	75.65

Simultaneous readings at the two Datasonde deployment sites (intake/discharge and mid-pond) showed water quality values that were consistent, but the longevity of higher values differed. Daily mean, minimum and maximum values for the parameters varied more with tide cycles in the intake/discharge waters, though both sondes reached minimum and maximum values at similar time periods. The magnitude of the maximum values tended to differ the most, and there was a smaller range in the mid-pond location. As expected, dissolved oxygen was generally high at the intake/discharge location during intake when pond water was trending lower. Minimum DO values differed by location, and the Datasonde located in deeper water at the discharge point generally recorded lower, more depressed, long-term dissolved oxygen values. The Datasonde deployed in shallow water at the mid-pond location had more consistent, higher values, while the intake/discharge had consistently lower values.

Table 6: Summarized Water Quality Values (daily mean) by Sampling Period for Pond E10

Sampling Period	Location	Temp (ºC)	pH (Units)	Salinity (ppt)	Dissolved Oxygen (mg/L)	DO 10^{th} %-ile (mg/L)
July 7-18	Intake/Discharge	22.20	8.42	37.86	2.28	0.92
July 7-18	Mid-Pond	22.30	8.82	39.17	5.76	3.17
Sept 11-21	Intake/Discharge	19.70	8.51	41.25	3.46	1.27
Sept 11-21	Mid-Pond	20.17	9.10	42.83	6.48	2.81
Nov. 11-22	Intake/Discharge	15.50	8.03	34.56	1.28	0.31
Nov. 11-22	Mid-Pond	16.30	8.45	35.37	5.61	3.14

Biological Oxygen Dement (BOD) information was not available due to staff and budget constraints, and pore-water filters (non-metallic pore-water profilers) were not deployed in the pond due to staff and budget constraints. This data was not collected by water quality specialists at USGS in previous years for the ISP, and the collection of this data at the Alviso Ponds for USFWS was considered experimental in 2008. As this was the first year such data was collected, it's usefulness for management purposes and application in this study is not yet determined. Please refer to the USFWS ARMR regarding information on samples analyzed to determine the diffusive flux of oxygen either into or out of the sediments, and the strength of the sediment oxygen demand or supply. Meteorological measurements to be collected using a portable weather station was not competed at ELER due to staff and budget constraints; refer to the USFWS ARMR regarding meteorological information collected at Alviso Pond A7.

Discharge (flow) volume to measure inflow to the pond and outflow from the pond discharge and stage in the pond was not measured, as noted in previous reports, due to staff and funding constraints at ELER.

Table 7: Summarized Dissolved Oxygen Values by Location & Study Period for Pond E10

Calendar Week		10th %-ile DO, mg/L (B11-1 Intake/Discharge)	Median DO, mg/L (B11-1 Intake/Discharge)	Applied Study Data Start	Applied Study Data End	10th %-ile DO, mg/L (mid-pond)	Median DO, mg/L (mid-pond)
7/6/08	7/12/08	0.88	2.66	7/7/08		3.01	5.40
7/13/08	7/19/08	0.04	2.16			2.93	5.70
7/20/08	7/26/08	0.07	0.28		7/21/08	2.81	4.84
9/7/08	9/13/08	0.24	1.71	9/11/09		1.885	7.54
9/14/08	9/20/08	1.40	3.72			2.64	5.835
9/21/08	9/27/08	0.68	3.09		9/24/08	2.38	5.89
11/9/08	11/15/08	0.06	1.21	11/11/09		2.26	6.28
11/16/08	11/22/08	0.05	0.06			0.95	5.63
11/23/08	11/29/08	0.06	0.06		11/26/08	3.36	4.66

Dissolved Oxygen Transects

Dissolved oxygen transect data were collected to compare with stationary Datasonde locations and provide context for spatial and temporal variation in pond water quality parameters. For the first DO-AS period, only the pre-dawn DO transect was completed on July 16, 2008, due to staff availability. Only 9 valid readings from that date are presented below due to file set-up or instrument failure/ data collection errors. A map could not be produced, because the GPS-enabled Minisonde unit and Surveyor were not available on that date, and no data with coordinating GPS points was collected during the morning transect. The information presented in Table 7 does nonetheless provide some useful information in terms of spatial variability. In general, the morning transects included a majority of values that were less than 5.0 mg/L, while afternoon samples showed all values were greater than 5.0 mg/L. For the November 19 morning transect, however, the majority of pond showed samples were above 5.0 mg/L, the exceptions being nearest the intake/discharge where the greatest mixing was presumed to occur, and in the easternmost portion of the pond, where the least circulation was presumed.

Table 8: Pond E10 Boat Transect Water Quality Values for 7/16/08 AM Sampling Period

Date	Time	Temp	Sal	pH	DO
MMDDYY	HHMMSS	ºC	ppt	Units	mg/l
7/16/2008	6:12:00	18.17	43.49	8.64	3.15
7/16/2008	6:20:00	18.33	43.15	8.91	1.35
7/16/2008	6:32:00	18.26	40.54	8.72	5.22
7/16/2008	6:38:00	18.11	30.42	8.44	4.42
7/16/2008	6:56:00	18.14	38.91	8.48	3.98
7/16/2008	6:58:00	18.3	37.72	8.4	4.44
7/16/2008	7:14:00	18.35	40.24	9.08	2.16
7/16/2008	7:16:00	18.42	41.84	9.01	1.14
7/16/2008	7:18:00	18.86	42.12	9.24	1.24

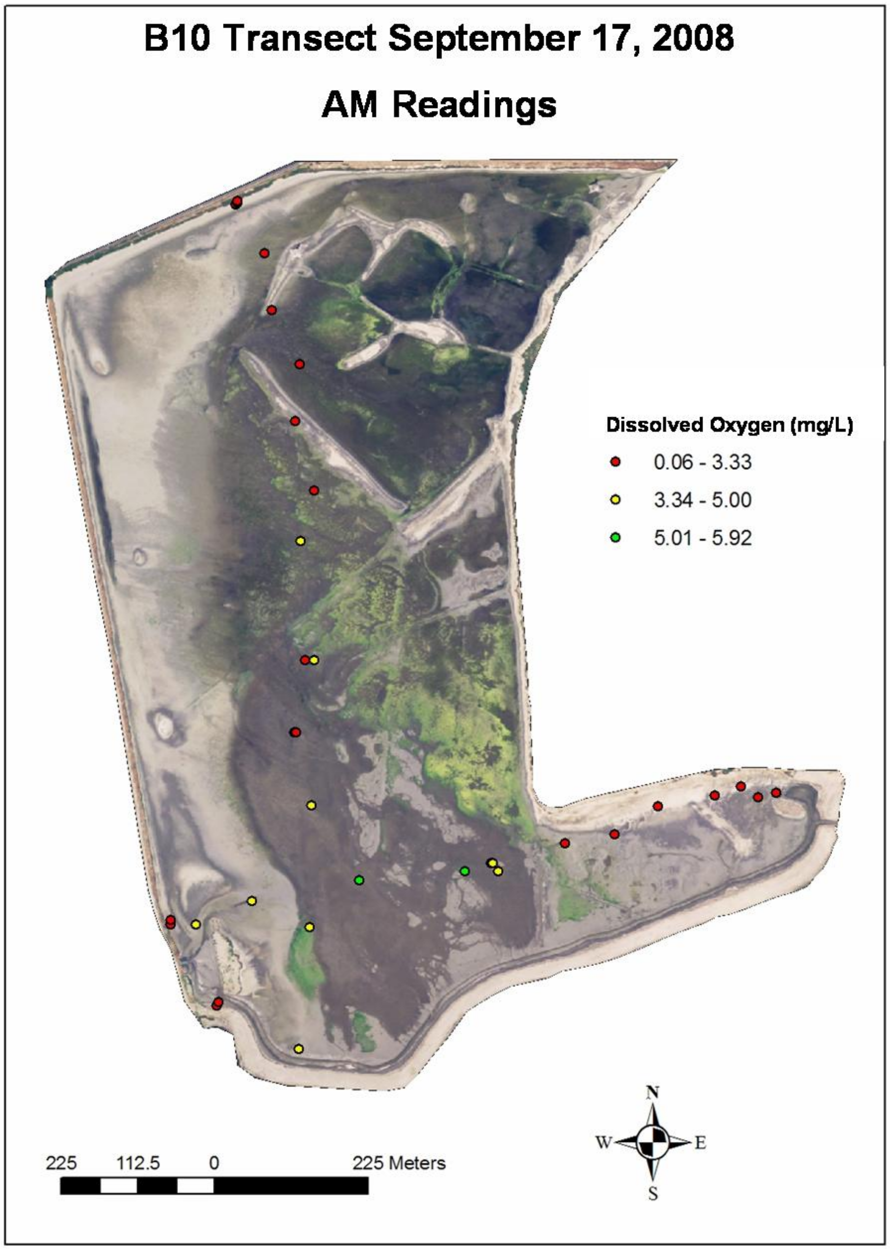


Figure 4: Pond E10 Applied Study Dissolved Oxygen Transect Values (AM)

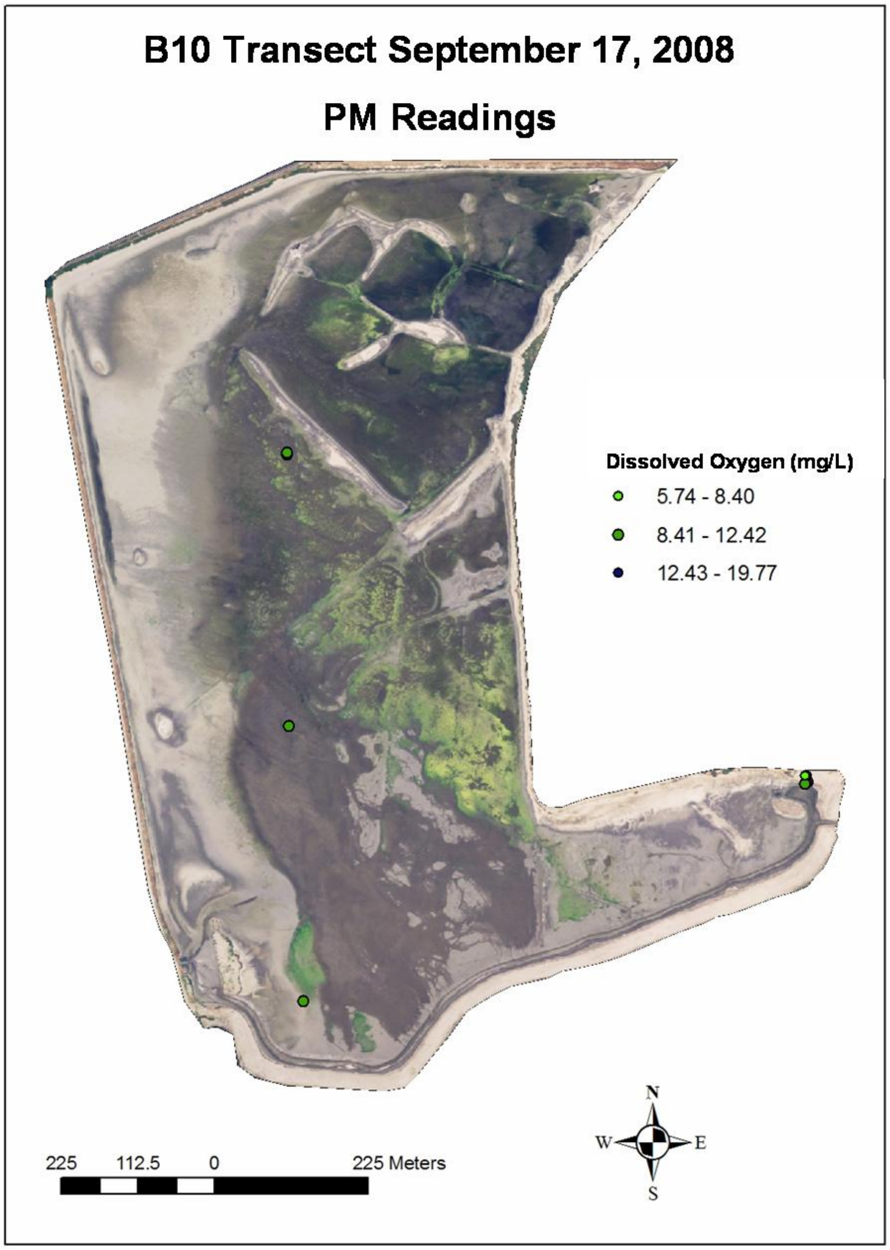


Figure 5: Pond E10 Applied Study Dissolved Oxygen Transect Values (PM)

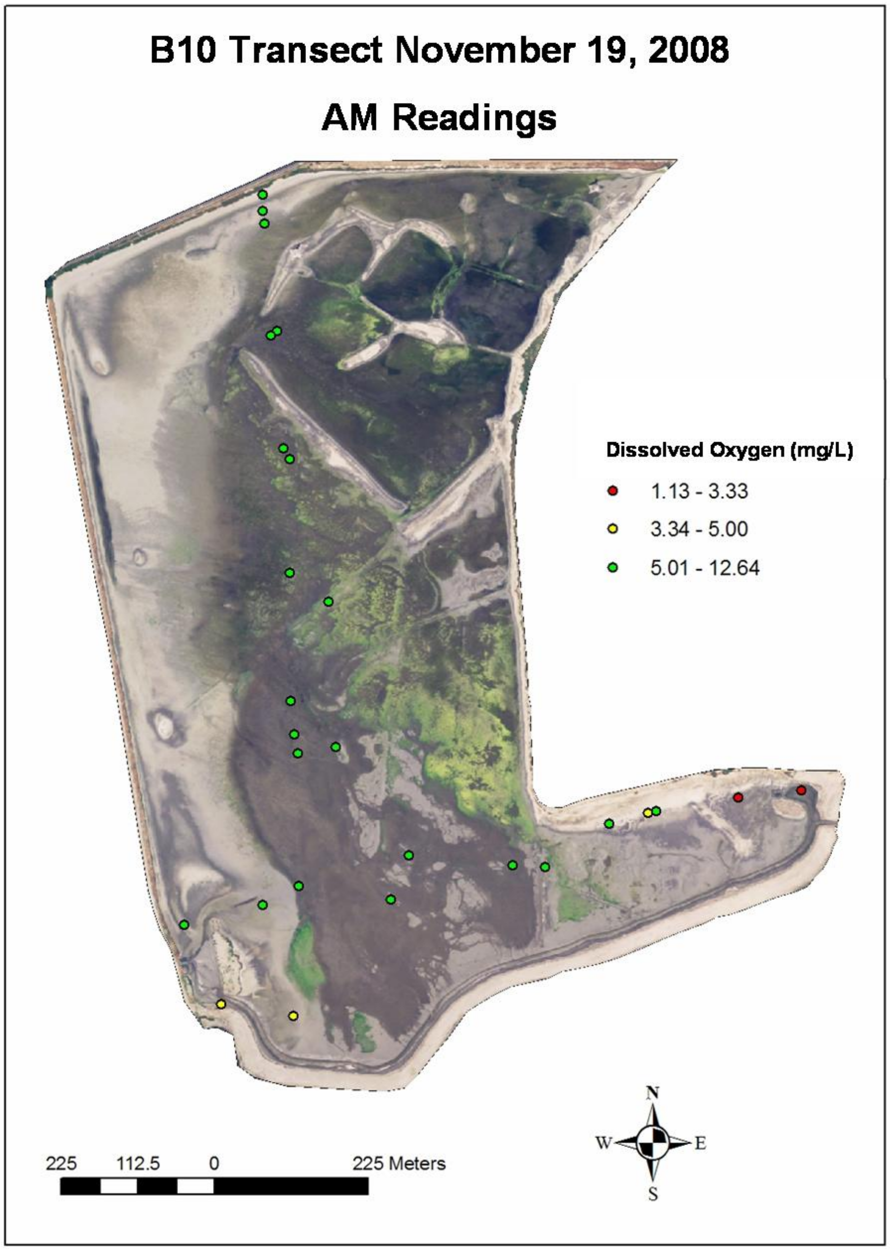


Figure 6: Pond E10 Applied Study Dissolved Oxygen Transect Values (AM)

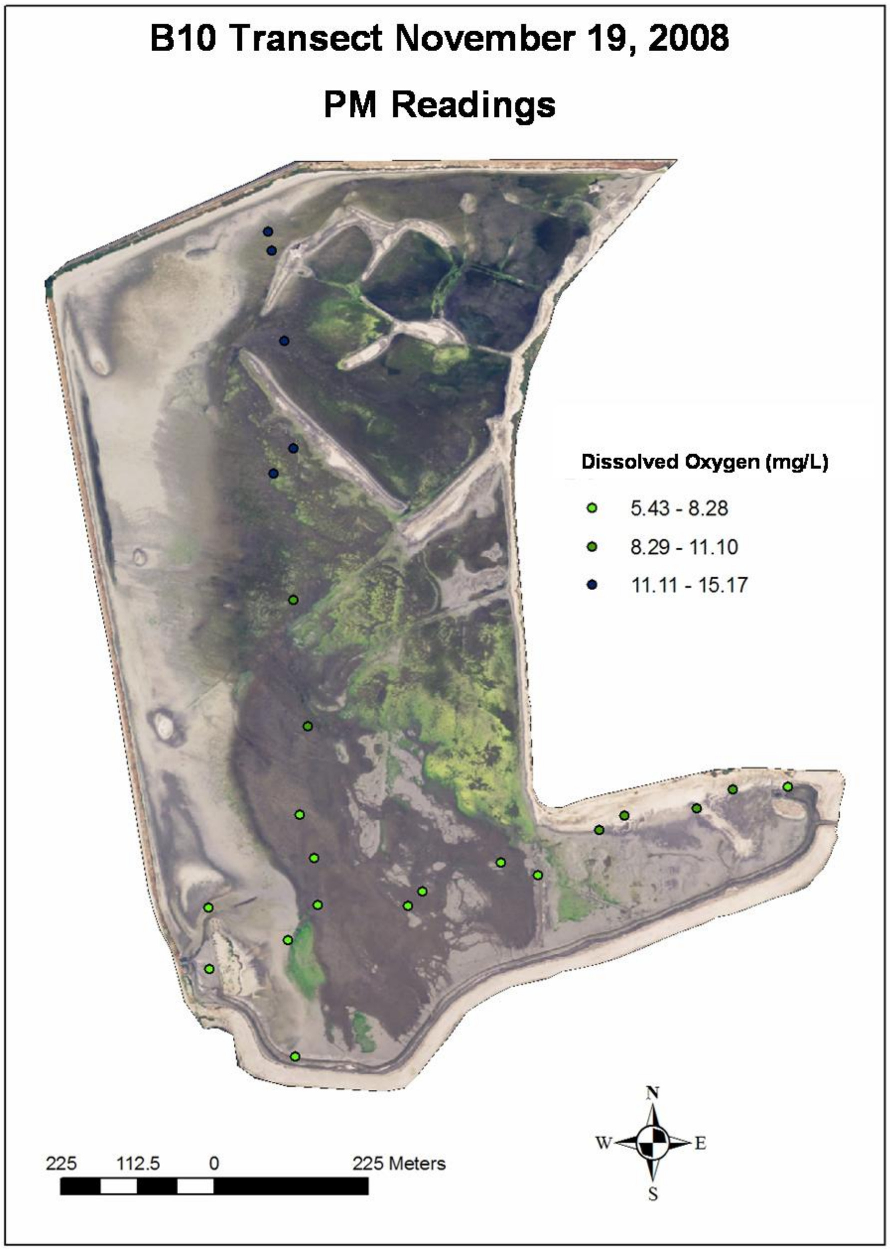


Figure 7: Pond E10 Applied Study Dissolved Oxygen Transect Values (PM)

Pond E10 Daily Mean and Applied Study Summary (Figures)

This page intentionally left blank. Figures follow on subsequent pages.

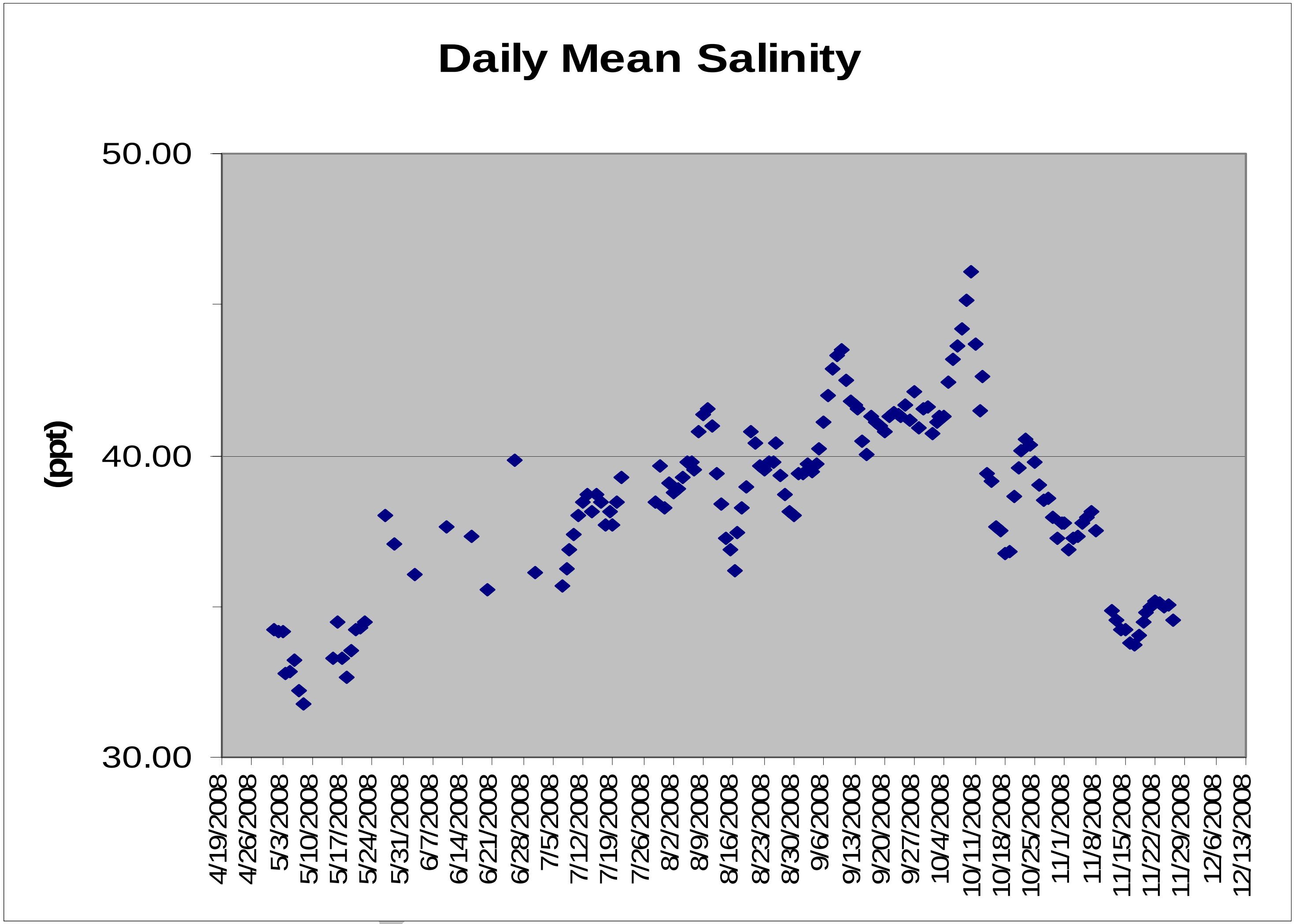


Figure 8: Pond E10- Daily Mean Salinity (Grab Samples only 5/7-7/1) at Intake/Discharge Location

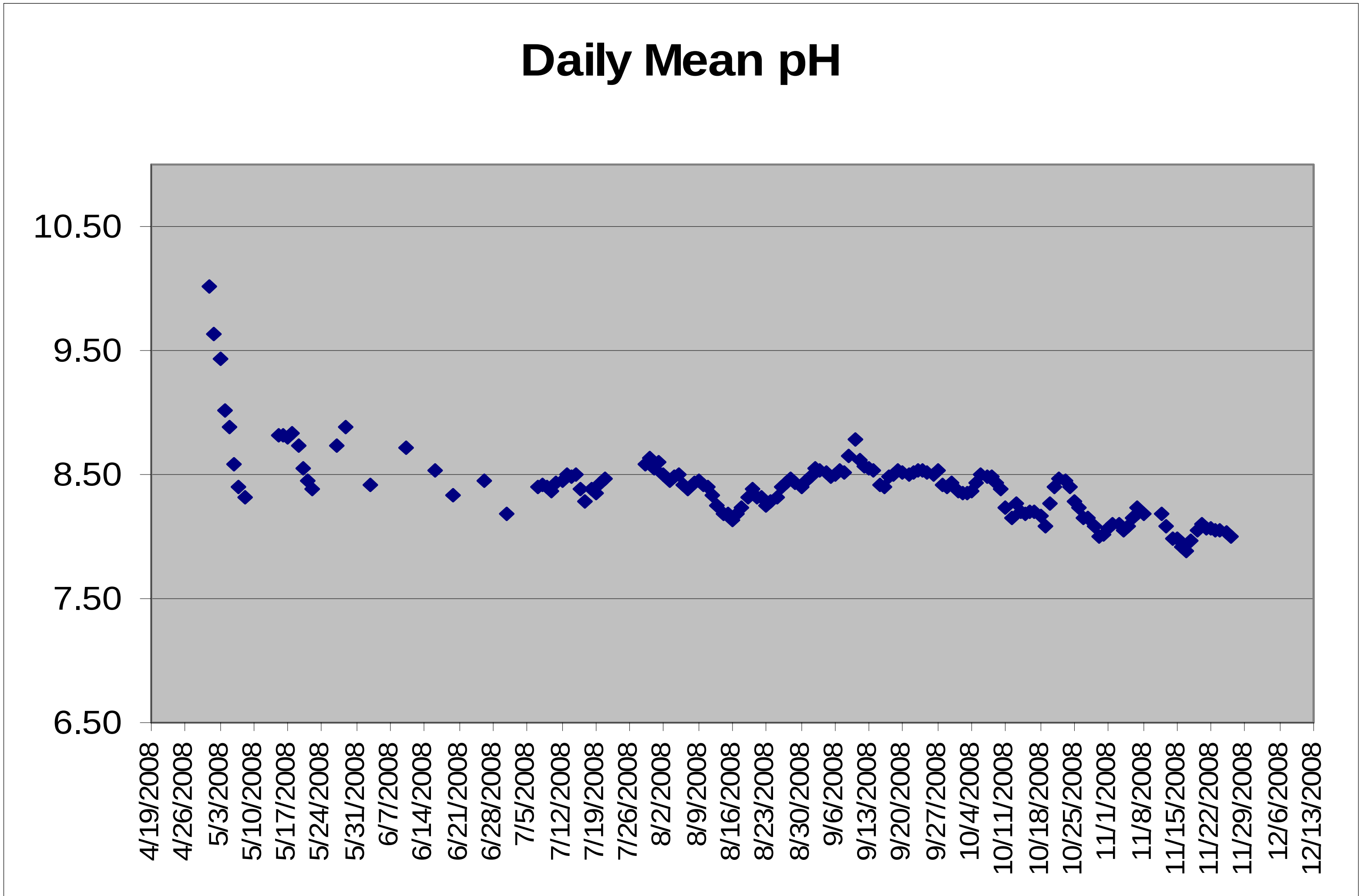


Figure 9: Pond E10- Daily Mean pH (Grab Samples only 5/7-7/1) at Intake/Discharge Location

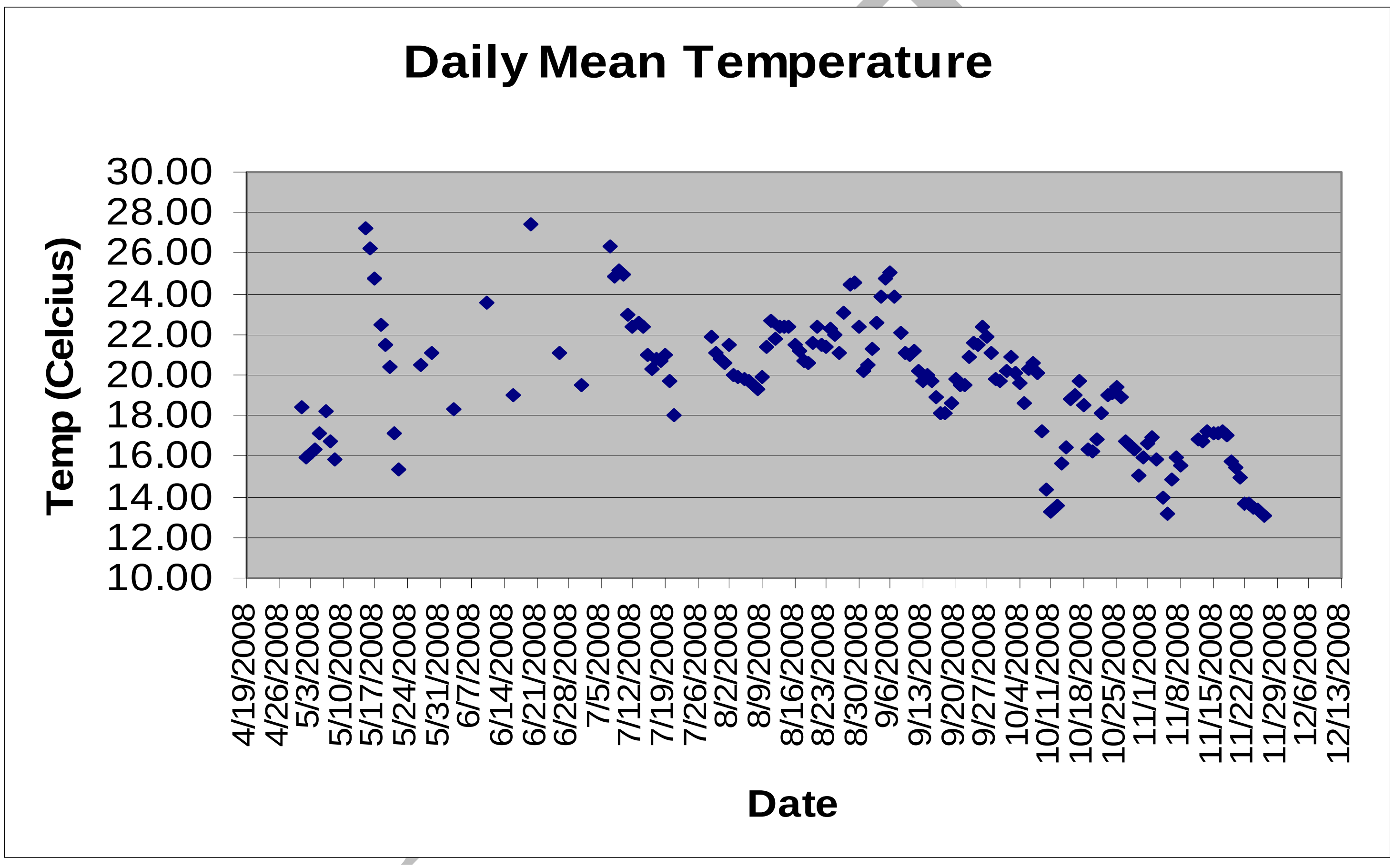


Figure 10: Pond E10- Daily Mean Temperature (Grab Samples only 5/7-7/1) at Intake/Discharge Location

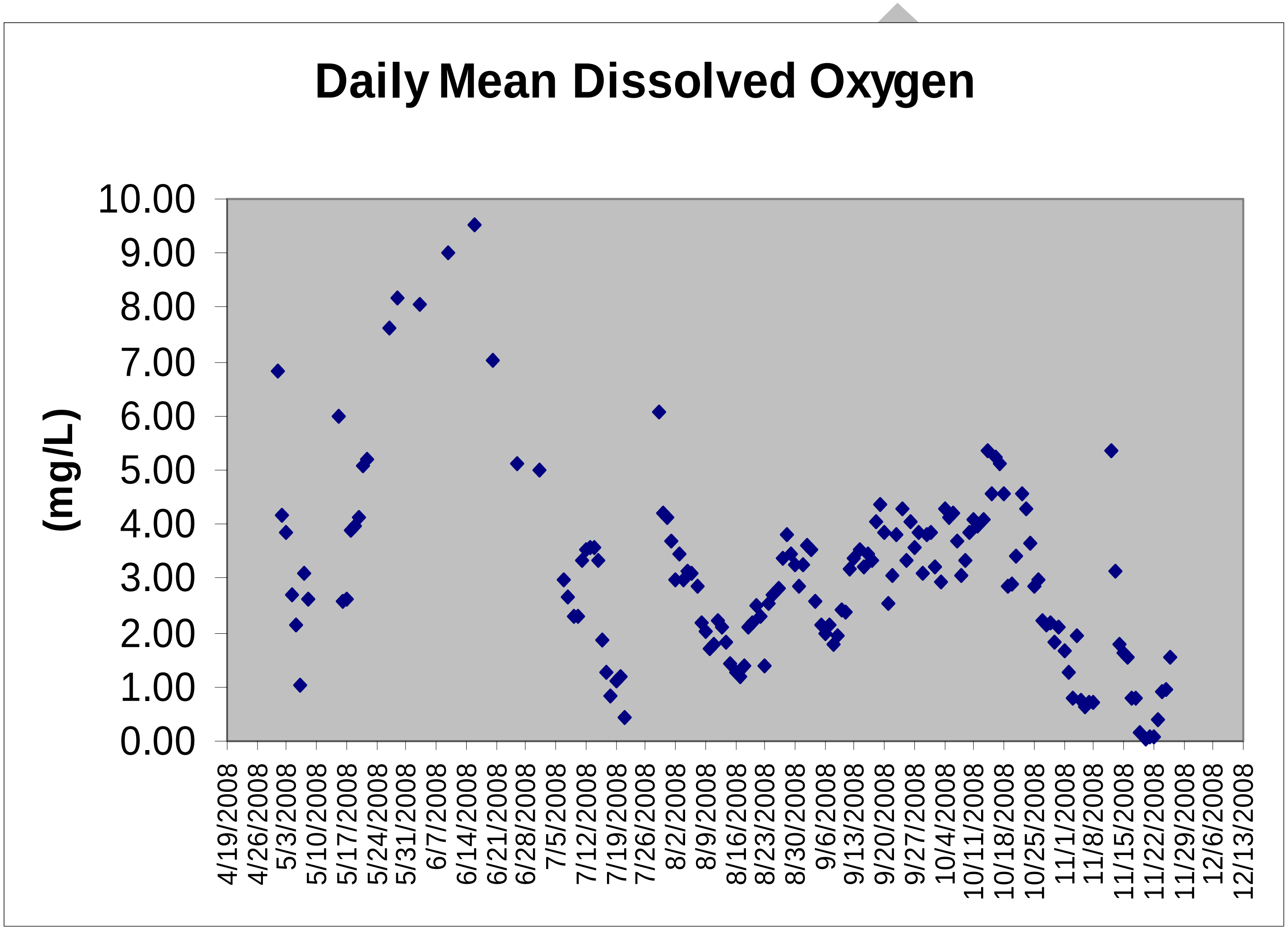
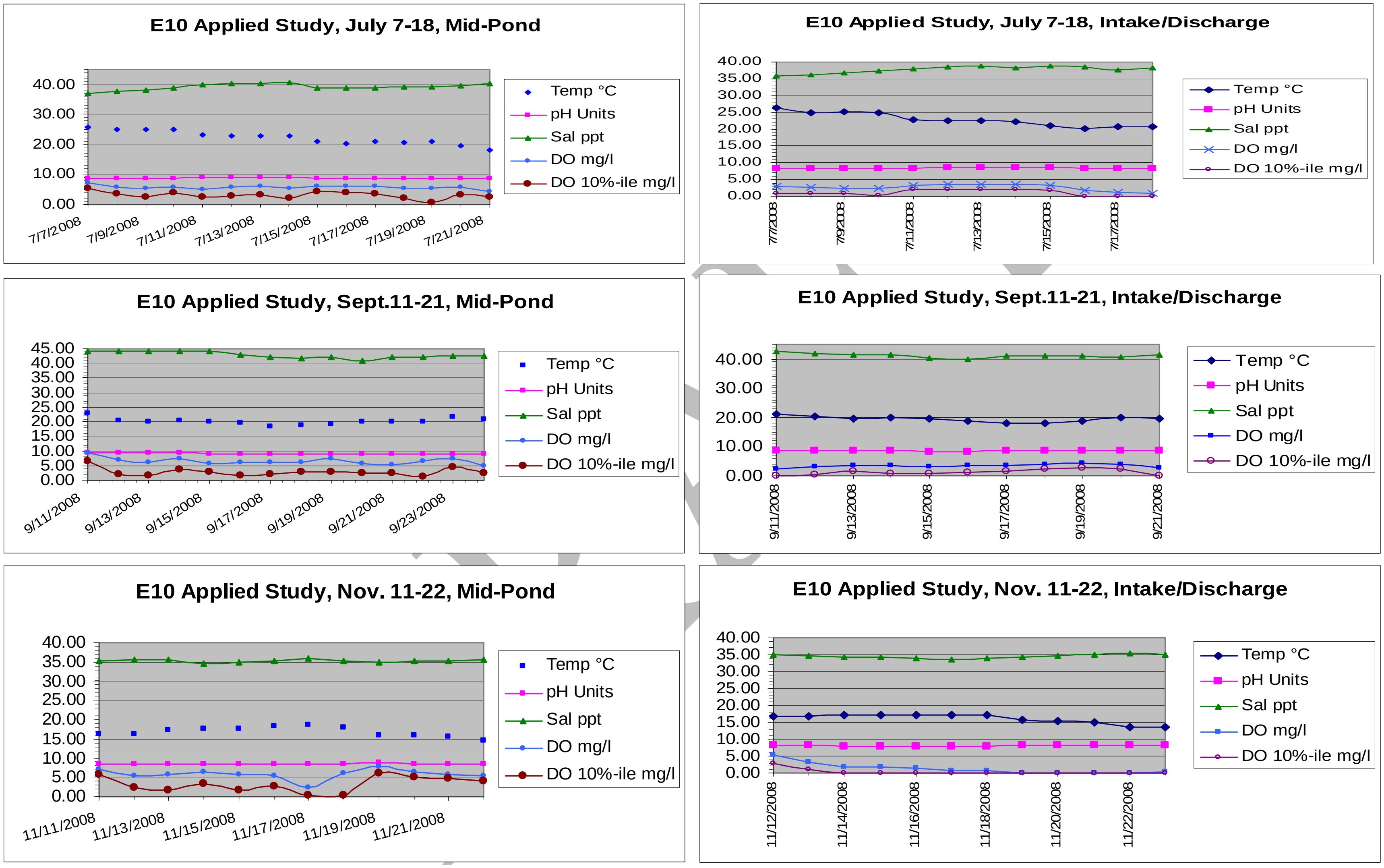


Figure 11: Pond E10- Daily Mean DO (Grab Samples only 5/7-7/1) at Intake/Discharge Location



Figures 12-17: E10 Applied Study Daily Mean and DO 10th Percentile values by Location.

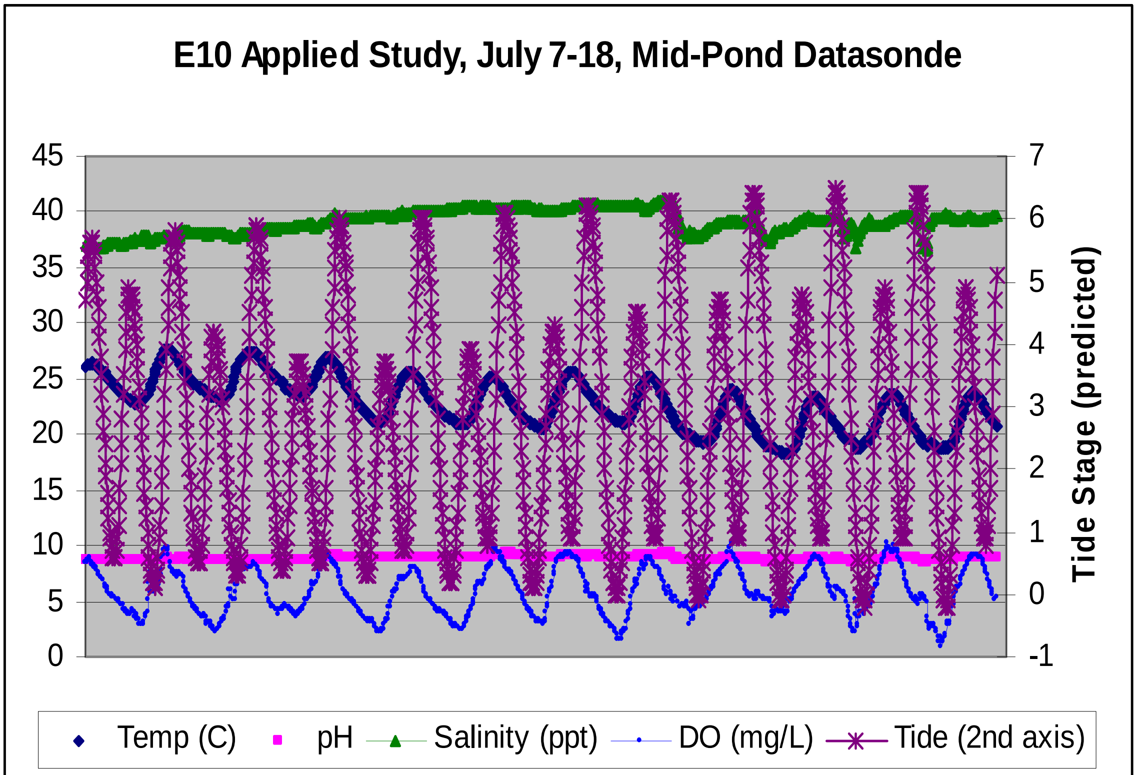


Figure 18: E10 Mid-Pond Datasonde, July 7-18, 2008

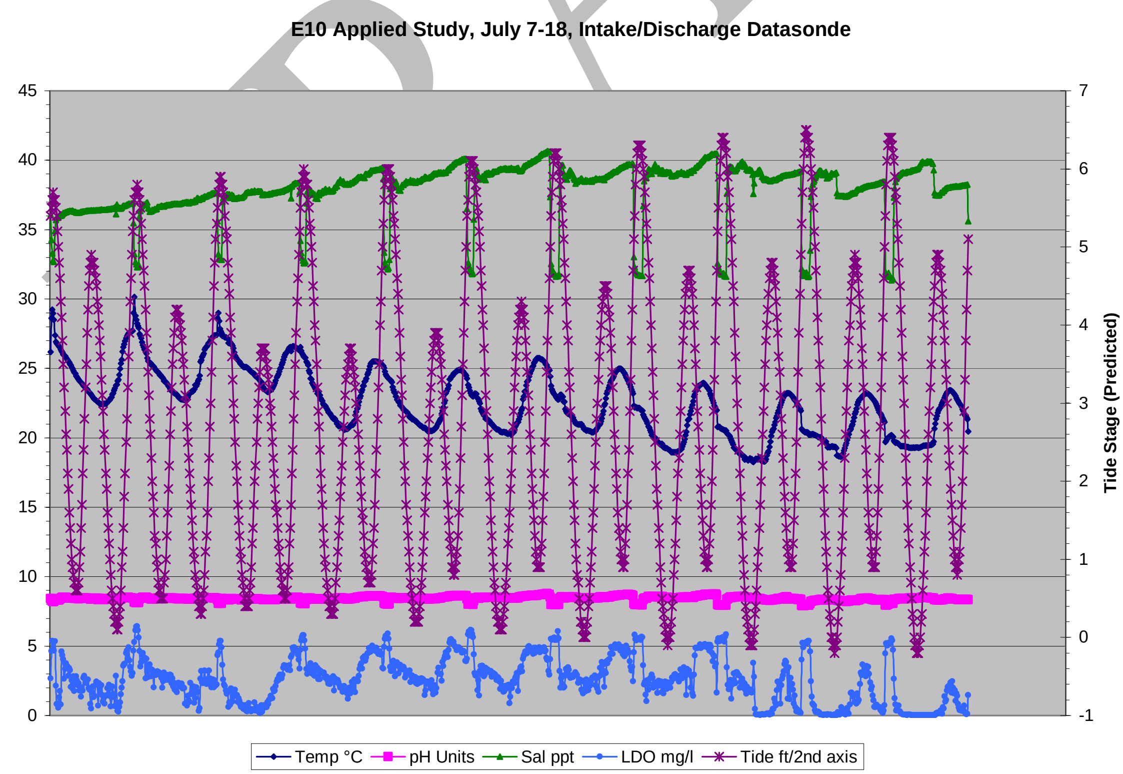


Figure 19: E10 Intake/Discharge Datasonde, July 7-18, 2008

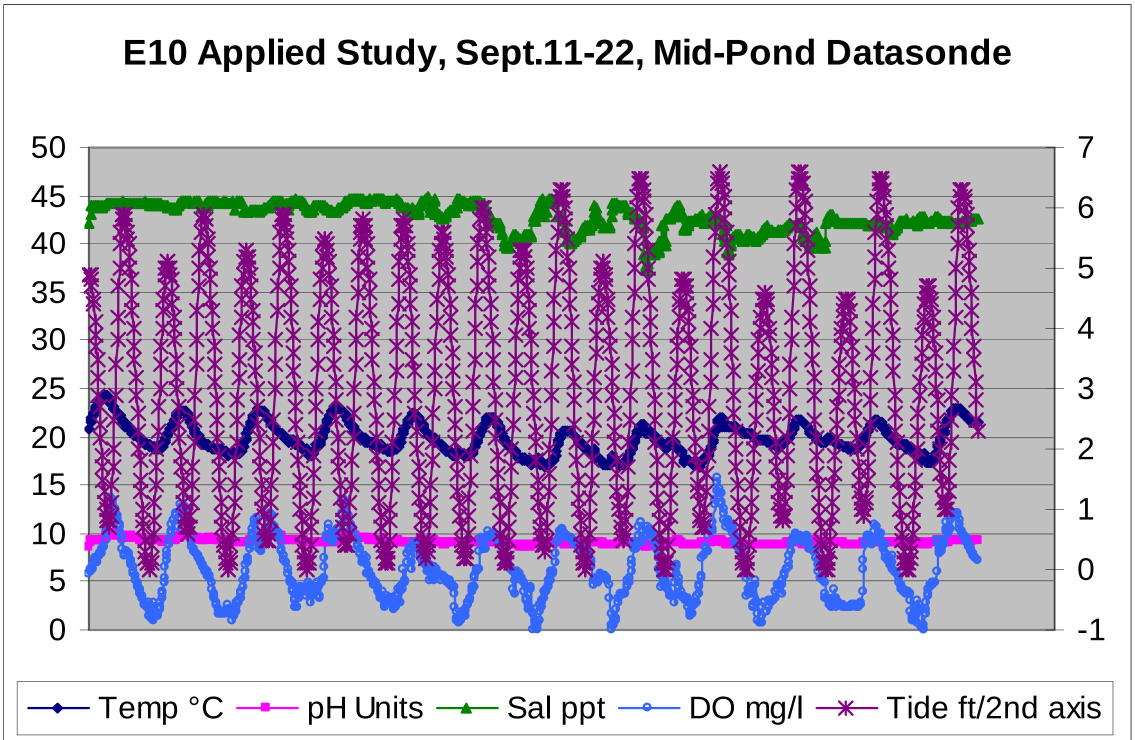


Figure 20: E10 Mid-Pond Datasonde, Sept. 11-22, 2008

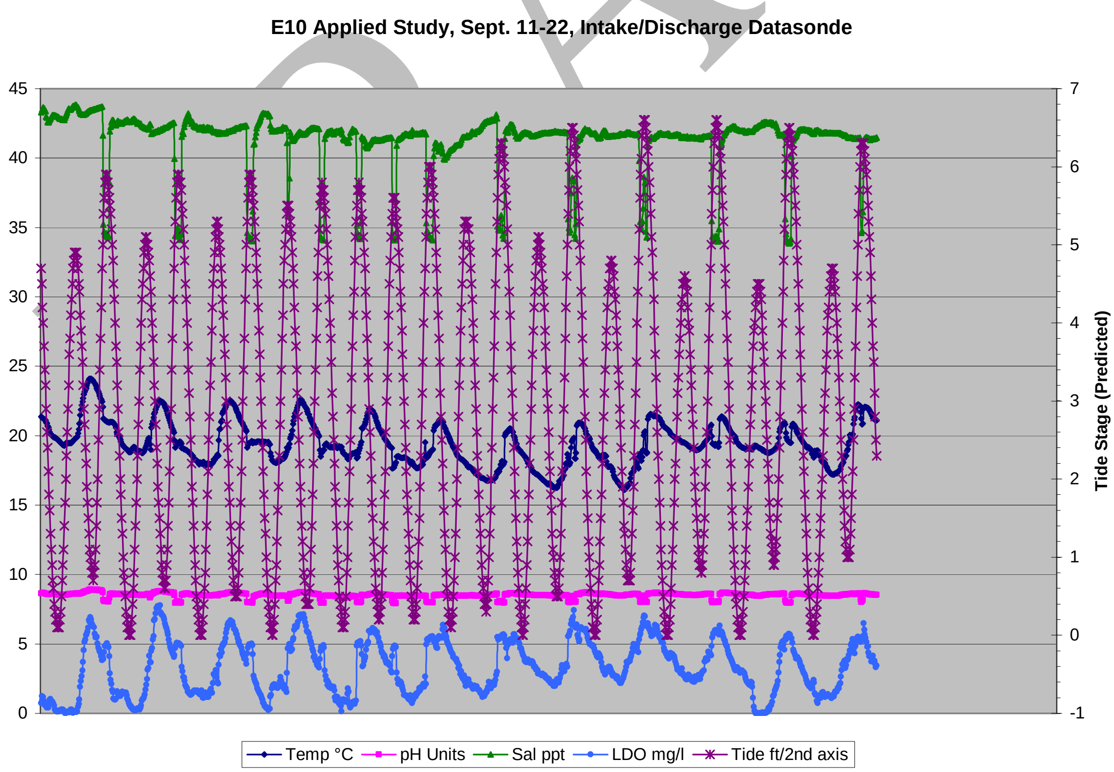


Figure 21: E10 Intake/Discharge Datasonde, Sept. 11-22, 2008

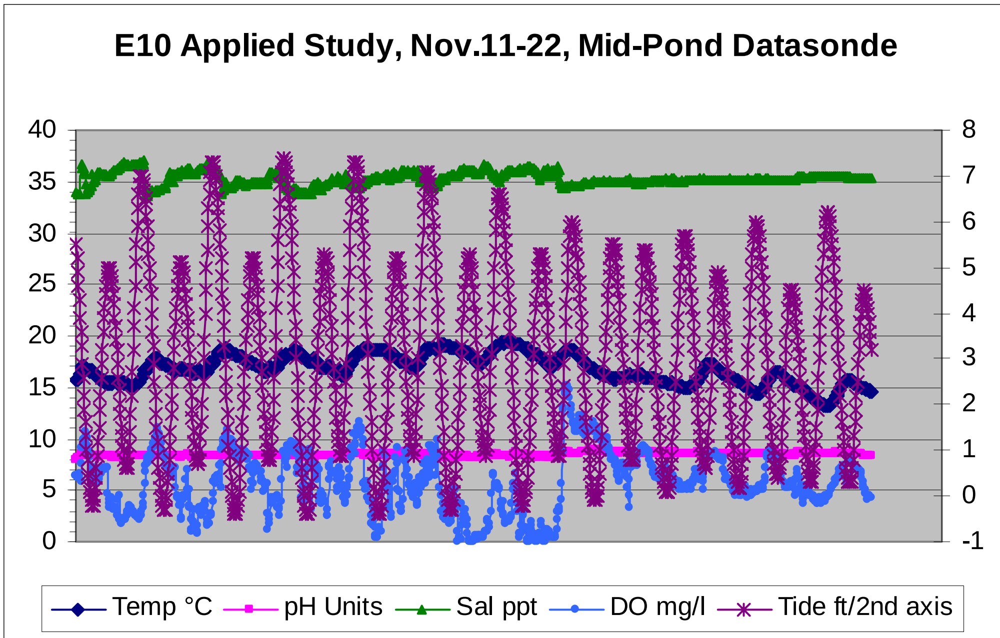


Figure 22: E10 Mid-Pond Datasonde, Nov. 11-22, 2008

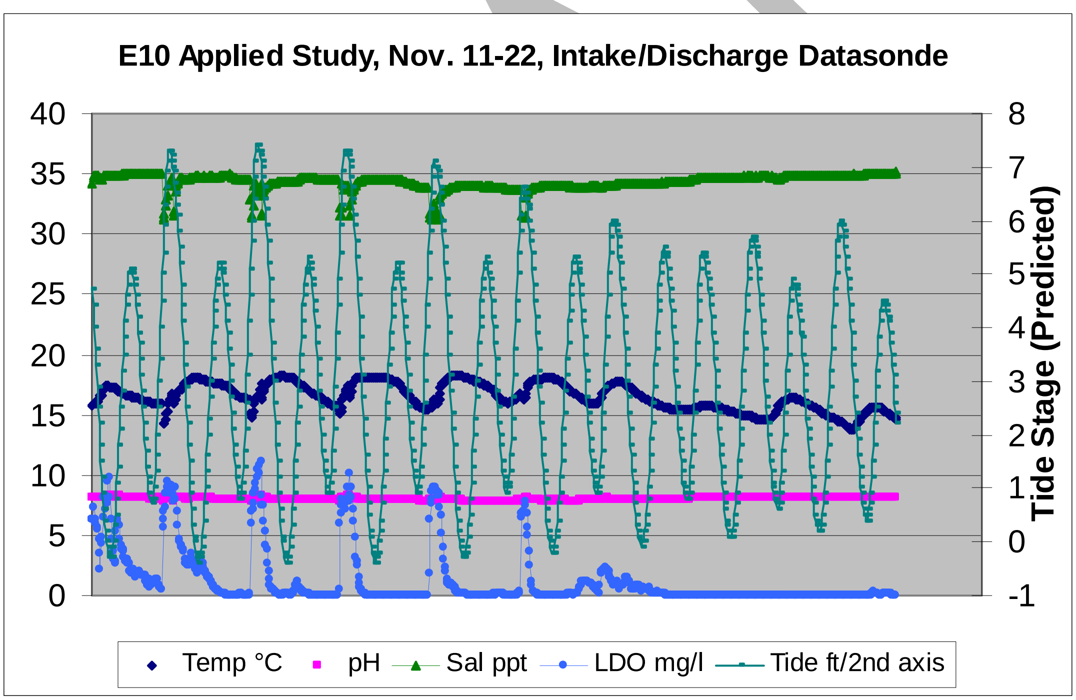


Figure 23: E10 Intake/Discharge Datasonde, Nov. 11-22, 2008

E10 Applied Study Discussion

As expected, dissolved oxygen was the most variable parameter, and no consistent pattern or trend within a parameter was apparent in each period or season. Overall pond temperature declined from the first study period to the last; however, no other consistent temporal trends were noted. One notable exception was the November sampling period, when the Intake/Discharge location was nearly anoxic except during periods of intake, while the Mid-Pond location showed a spike in DO and had thereafter remained higher. This higher DO trend was generally between 4-10 mg/L. Refer to Figures 12-17 and 18-23.

Pond E10 salinity was noticeably affected by tide height, such that neap periods of lower higher-high tides trended toward static to increased salinity, while spring tides with higher-high tides showed trends toward static to decreased salinity (Figures 18-23). Salinity overall increased from July to September, and decreased from September to November. Spatial variability was most apparent during the September 11-22 study period, when pond salinity was at its highest around the peak of the evaporation season (Figures 20-21). One notable inverse relationship between trends that appears consistent across study periods is that of temperature and salinity. When temperature tended to increase, salinity tended to decrease, while increasing salinity trends corresponded to decreasing temperature trends (Figures 12-17, 18-19, 22-23). This apparent relationship is contrary to what was expected, since higher temperatures would be expected during warmer weather periods and evaporation would be expected to increase and would presumably result in increased salinity. During September, intake salinity was highest corresponding to the peak in the evaporation season.

The pH at the Mid-Pond location was approximately one-half point higher than the Intake/Discharge location across study periods, showing that there was consistent spatial variability in pH with consistently higher mean values recorded at the Mid-Pond (shallow) locations while values closer to water quality objectives, Bay and slough ambient conditions and Final Order limits were recorded at the deeper Intake/Discharge location. It is unclear whether the lower pH values were associated with deeper water or greater turnover and mixing at the Intake/Discharge location.

Temperatures cycled most consistently with sunlight and weather patterns than with tidal cycles. The Intake/Discharge location was generally slightly lower overall and was more variable than the Mid-Pond location, presumably because of affects from intake of Bay waters compared to more static in-pond conditions.

Mean meteorological data showed consistent, decreasing values for most weather parameters from the first study period in July to the third study period in November, except for relative humidity, which increased slightly (Table 5). The hourly meteorological data were relatively consistent during and across study periods, with no precipitation and wind primarily from the west or northwest. The decline in mean air temperature through study periods was consistent with the observed decline in mean pond water temperature. While solar radiation and net radiation were variable during the study periods, they consistently declined, presumably due to decreasing day length.

Effectiveness of Dissolved Oxygen BMPs for Pond Management

It is recognized that it will not be feasible for a well-operated lagoon/pond system to continuously meet an instantaneous DO limitation of 5.0 mg/L as specified in the Basin Plan, which is based on the national criteria published by the U.S. Environmental Protection Agency (USEPA). It is also understood that a stringent interpretation of this limit is not necessary to protect water quality, based on review of monitoring data in the Bay, site-specific standards work in recent years in the Everglades and Virginian Province (Cape Cod, MA to Cape Hatteras, NC), and data collected by USGS in Newark Slough in 2005, 2006 and 2007. The Department maintains that DO levels lower than 5.0 mg/l naturally occur in estuaries and lower values therefore do no necessarily implicate pond discharges. In 2005, the Final Order was modified such that RWQCB required a "trigger" for reporting and action if, at the point of discharge, the calendar weekly 10^{th} percentile falls below 3.3 mg/L. RWQCB required that DO corrective measures (BMPs) be implemented, such as minimizing discharges if the 3.3 mg/L trigger values are observed, unless a more effective alternative can be implemented.

To address the excursions from the DO limit, several operational strategies or Best Management Practices (BMPs) were implemented, as described herein and in the individual system operations plans. The Department evaluated BMPs such as closure of the discharges during periods of time when the data indicates that DO would be below the 3.3 mg/L trigger. For example, ceasing discharge from approximately 10 pm to 10 am because there is a strong diurnal pattern to DO levels would avoid most periods of low DO and achieved standards described the Final Order. However, as stated in previous SMR's, a daily discharge timing BMP is not practicable due to staff and budget constraints. The Department did, however, use a weekly discharge timing BMP, which is expected to minimize discharge of low DO waters during trigger value periods. Weekly discharge timing entails setting discharges at greater volumes when DO conditions are low and that period correspond with periods when daytime tides are lowest, resulting in the majority of volume discharged during the day when photosynthesis increases DO.

During particularly weak (neap) tide periods, intake is limited and pond water has the least turnover. Substantially reducing the discharge volume for an extended duration minimizes potential affects on receiving waters but does not improve pond water quality because of lower turnover and higher residence time. Reviewing 2004-7 data, it appears that ceasing discharge for prolong periods of depressed DO levels may even degrade water quality further, because of less circulation and less mixing of in-pond waters. Reducing residence time of water in the ponds appears to improve overall DO levels; therefore, maintaining discharge, even at reduced volumes, provides for increased circulation and mixing. Muted tidal intake/discharge provides for the greatest circulation and mixing and is generally implemented in all ponds.

For most of 2008, the Department set discharge gates to allow increased discharge volumes, even when the ponds are at or below the trigger value, rather than having reduced discharge settings, as done more frequently in previous years. Gates were set at approximately 15-20 percent open on average for extended periods rather than more frequent adjustments (increases and reductions) because of staff limitations. Where possible, the Department continued the BMP developed in 2007, whereby system pond waters were periodically drained into the adjacent seasonal ponds, where applicable, to improve turnover of pond system water as a result of greater intake volumes. This BMP generally moderated salinity successfully, but there was no clear pattern with respect to DO conditions.

Refer to Table 1 for a full summary of discharge events and gate settings in 2008.

Compliance Evaluation Summary

Maintaining dissolved oxygen levels in the ponds within water quality objectives and Final Order requirements has been the most notable management challenge discovered during operation of the ponds as part of the Initial Stewardship Plan. A number of BMPs were developed and evaluated to determine if they are sufficient as corrective actions that can be effectively implemented, beginning in 2005 and continuing through 2008, in an attempt to raise dissolved oxygen levels in the ponds. Some of the BMPs appear to be more effective than others, but it is still uncertain if the BMPs consistently improved DO levels. Improved DO may be the result of a combination of factors, both biotic and abiotic, as well as management actions, that are the driving factors in DO dynamics. Based on the results of monitoring and data evaluation, management operations for 2009 will continue to be modified as appropriate to attempt to determine which methods of operation most improves water quality objective and Final Order compliance.

Previously, RWQCB suggested using some of the BMPs implemented by USFWS which appear to be successful in the Alviso Pond Complex, including installation of baffles, which direct water from portions of ponds expected to have higher DO values and block off lower DO waters with substantial algal mats, to help improve DO values at the discharge. The Department considered the use of baffles again in ELER pond systems in 2008, but installation of baffles was not implemented because they were not expected to improve DO levels at E10. As discussed previously, deep borrow ditches do not generally surround ELER ponds, and the ponds are more consistently shallow than the Alviso Ponds due to operations and maintenance and land-use practices. Improvements that would be more appropriate than baffles may be implemented as part of future actions, such as changes in pond topography or geometry that could address deficiencies in achieving water quality objectives.

Strong diurnal patterns to DO levels are known to occur, however, ceasing discharge on a daily basis is not a practicable means to avoid discharge of low DO waters, nor is such management operation likely to improve water quality; conversely, it may decrease water quality. BMPs such as weekly discharge timing, reduced discharge gate settings and draining system waters to seasonal ponds to increase intake were implemented to address low DO values and appear to be sufficiently protective of receiving waters. For all systems operated in 2008, except B2C, pond water is discharged to the open Bay and quickly dispersed and at lower tides the discharge is spread over extensive mudflats. In

2008, discharge gates were generally set to allow increased discharge volumes compared to previous years, to decrease residence time and improve mixing. More continuous operational periods, rather than intermittent operations, appear to help raise water quality values, at least with respect to salinity, and may be affective for other parameters.

The BMP in which large volumes of system pond waters are drained into adjacent seasonal ponds (for systems which have dry ponds to efficiently receive system water) appears to have successfully lowered salinity in systems which were near or above 44 ppt, by improving turnover of pond system water as a result of greater intake volumes.

Data, Collection, Evaluation, and Communication

In 2008, only few gaps in the data sets were caused by malfunctioning meters. Some instances of data gaps were caused by battery failure. While malfunctioning meters resulted in a few days of data gaps, there were no days when low water conditions resulted in full day data gaps, as occurred in previous years. It should be noted that pond operations were monitored as often as possible, given staff limitations, and efforts were made to retrieve data a service devices whenever possible to prevent down-time of the continuous data recorders. In the future the Department will seek to continue to minimize data gaps that result from management operations. Spare Datasondes are available to replace the operating units to address data continuity.

In 2008, the Department continued to make data available to the RWQCB staff on an as needed basis. The Department conducted its own monitoring in 2008. With the same Department staff conducting monitoring and reviewing and interpreting data, the Department has generally been able effectively consider and implement operational and management decisions. Raw data was evaluated by Department staff for accuracy and erroneous readings, and was provided to the RWQCB.

Final Order requirements regarding communication of compliance to the RWQCB continued to be satisfactory in 2008. The Department reviewed data and contacted RWQCB to discuss DO “trigger” conditions. Communications were typically made via telephone and/or email. Additionally, the Department provided the data to RWQCB by posting files to its ftp site. This continued dialogue is helpful in addressing concerns and conversations and other written communications between the Department and RWQCB staff are useful in determining appropriate pond management operations.

Requests for Revisions to SMP:

In the Final Order for the ISP, Finding #63 stated no intake to Pond 1C shall occur from December through April to protect migrating salmonids in Alameda Creek (steelhead entrainment in ponds). While the Initial Stewardship Plan (ISP) described intake to Pond 1C by the Cal Hill Intake Pump, management of the pond system since 2004 (when Cargill met the transfer of operations standard) is by passive intake at Pond 2C, and the system as operated does not require pumped Pond 1C intake from Alameda Creek. Pond 1C is operated as a seasonal ponds and it gets water primarily in the winter from rainfall, and from passive, gravity flow from linked “C system” ponds rather than Alameda Creek. Pumping costs are prohibitive, thus passive filling via linked ponds is the preferred management and provides seasonal pond habitat for migrating waterbirds. There were no restrictions described for Pond 2C, which is the system pond operated year-round as open water (as well as Pond 3C, which is directly connected to Pond 2C, and the Department manages for Cargill).

In 2008, discussions with NOAA Fisheries staff for the SBSP Phase 1 Actions and Operations and Maintenance in preparation of issuance of the Biological Opinion did not restrict intake from Alameda Creek until 2011 when a viable run is presumably going to be reestablished. After that point, pond management activities and operational flexibility would be severely limited by intake restrictions to the Pond 2C system in absence of fish screen installation at the intake location. In 2008, after a winter of low rainfall amounts, salinities in the Pond 2C system were near the upper end of discharge limitations (44 parts per thousand), thus management of the system during the summer evaporation season would continue to be constrained. In order to maintain overall water quality, especially during the summer, it will be important to allow intake to Pond 2C from Alameda Creek during the winter and spring.

Operations and Maintenance activities starting in 2009 are more appropriately covered under the Final Order for the SBSPRP. The Department will review the new Final Order with respect to the 2008 monitoring results and proposed 2009 operations, and will make requests for alterations to the new Final Order as appropriate in future reports.