2004 Self-Monitoring Report-
Baumberg Complex- Hayward, California

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Introduction

This annual self-monitoring report summarizes the results of the water quality monitoring and sediment sampling conducted at the Baumberg Complex in Hayward, California, July through November 2004. Monitoring was performed using continuous data recorders at the locations described in the Self-Monitoring Program outlined in the Final Order. Data was collected by the USGS on behalf of the Department in accordance with the waste discharge requirements.

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 only covers Baumberg Pond Systems B10, and B2 operated by the Department. The US Fish and Wildlife Service will be submitting a report for the Alviso Ponds under a separate cover.

The ponds are generally being operated as flow-through systems with Bay waters entering an intake pond at high tides through a tide gate, passing through one or more ponds, and exiting the discharge pond to the bay at low tides. The ponds only discharge at low tides, generally about 6 or 8 hours per day.

The Final Order recognized two periods of discharges from the ponds: the Initial Release Period when salinity levels would decrease from the initial levels in the ponds and a Continuous Circulation period after salinities reached the 44 ppt salinity discharge limit. Different monitoring plans were identified in the Final Order for each specific period.

2004 Annual Summary

This section summarizes the activities performed during the 2004 calendar year at the Alviso/Baumberg Complex to comply with RWQCB Final Order. The site location is shown on Figure 1; sampling locations are shown on Figure 2.

A single existing 48” flap gate was opened from System 10 to the Bay on July 8, 2004. To maintain water levels in Pond 10, the gate was opened and shut several times; on August 24, 2004 the gate broke and the pond was operated as a continuous discharge muted tidal pond for the rest of the season. The new discharge culverts in Pond System 2 were opened to the Bay on August 11, 2004. The intake culverts were not yet constructed. To maintain water levels in the pond system the outlets were closed and opened several times during the season. Timing of discharge events is shown on Table 1.

Table 1. Summary of Discharge Events.

Note Pond B10 is shown in italic. Complete notes of pond conditions and management activities shown in Appendix A.

Pond	Location	Date	Salinity	Activity and notes
B10	*B11-6x*	*7/8/2004*	*40*	*BEGAN DISCHARGE (continuous circ) via retrofit of existing intake flap*
B10	*B10-0*	*7/13/2004*		*CLOSED DISCHARGE after taking staff reading. Intake only*
B10	*B10-0*	*8/2/2004*	*40*	*BEGAN DISCHARGE 3:30pm*
B10	*B11-6x*	*8/6/2004*	*41*	*CLOSED DISCHARGE*
B2	B2-10	8/11/2004	39	BEGAN DISCHARGE
B10	*B11-6x*	*8/24/2004*	*40*	*BROKEN GATE (hinge), CONTINUOUS DISCHARGE FOR REMAINDER OF THE SEASON (MUTED TIDAL)*
B1	B2-1	9/10/2004	35	OPENED INTAKE, intaking ar tide ~ 4.7' at 11:01; cont. discharge
B2	B2-10	9/13/2004	45	CLOSED DISCHARGE
B2	B2-10	9/16/2004	41	OPENED DISCHARGE 2X48" 1/2 OPEN
B2	B2-10			CLOSED DISCHARGE.
B2	B2-10	9/29/2004	39	OPENED DISCHARGE to 2' each
B2	B2-10	10/04/04		CLOSED DISCHARGE
B2	B2-10	10/14/04		OPENED DISCHARGE to 2' each. Hazy
B2	B2-10			CLOSED DISCHARGE.

Water Quality Monitoring Requirements

Water quality monitoring as performed at the Sampling Stations shown on Tables 2A and 2B (Baumberg Complex) of the SMP. The water quality parameters are provided in the Final Order and are summarized below for reference:

Table 2. Initial Discharge Salinity Limits.

For the initial discharge, ponds shall not discharge waters that exceed the following limits:

Pond System	Salinity (ppt) Instantaneous Maximum
B2	65
B2C	100
B6A	65[1]
B8A	65[1]
B11	65

[1] Pond System B6A will be transferred "dry". In modeling the initial release, the Discharger only considered discharges from Pond System B8A. Since both of these pond systems will discharge to Old Alameda Creek, the Discharger must either (a) stagger the initial releases so that the different time periods of initial release do not overlap, or (b) meter the flow to ensure that Old Alameda Creek contains at least 60% bay water (the percentage of bay water assumed in the Discharger's EIR for an initial release from Pond System B8A) during the initial release.

[2] The salinity limits for Alviso Ponds A19-A21 are conditional upon the water levels in these ponds being lowered to the maximum extent practicable by gravity before introduction of tidal action.

Table 3. Continuous Discharge Limits.

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

Constituent	Instantaneous Maximum	Instantaneous Minimum	Units
Continuous circulation salinity	44		ppt
Dissolved Oxygen[1]		5	mg/L
pH[2]	8.5	6.5	

[1] This limitation applies when receiving waters contain at least 5.0 mg/L of dissolved oxygen. In cases where receiving waters do not meet the Basin Plan objective, pond discharges must be at or above the dissolved oxygen level in the receiving water.

[2] The Discharger may determine compliance with the pH limitation at the point of discharge or in the receiving water.

3. Pond waters discharging to the Bay or Sloughs shall not exceed the natural temperature of the receiving waters by 20°F, or more.

4. Dissolved Oxygen Trigger. Within each pond, once the salinity levels at the discharge point are below 44 ppt, if the dissolved oxygen concentration falls below 1.0 mg/L, the Discharger shall implement corrective measures to increase dissolved oxygen concentrations to above 1.0 mg/L in the pond systems in question, and revise its Operation Plan as necessary to minimize reoccurrence.

Table 4. Proposed Maximum Salinities and Metals for Initial Discharge

Pond System	Modeled Salinity	Cr	Ni	Cu	Zn	As	Se	Ag	Cd	Hg	Pb
B2, B11	65	2.36	15.7	2.15	3.07	15.7	0.27	0.03	0.063	*32*	0.84
B2C	100	2.36	*18.1*	2.15	3.38	20.1	0.27	0.15	0.063	*44.5*	0.84
B8A	135	2.36	*21.8*	3.39	4.49	*56.2*	0.31	0.15	0.119	*49.7*	1.37
WQO[1]		11.4	16.3	4.6	58	36	5.0	2.3	0.27	25	3.2

[1] The water quality objectives north of Dumbarton Bridge apply to discharges from the Baumberg Ponds. The water quality objectives for chromium, cadmium, and lead are freshwater driven and based on a hardness of 100 mg/L. As the Discharger performed site-specific translators for copper and nickel, the values shown in Table represent site-specific water quality objectives. The initial release of highly saline waters from Baumberg Ponds will cause some receiving waters to contain salinity, nickel, arsenic, and mercury in excess of water quality objectives for a short duration.

Water Quality Monitoring Methodology

Continuous Pond Discharge Sampling:

USGS installed continuous monitoring Datasondes (Hydrolab-Hach Company, Loveland, CO) in Baumberg ponds B2, and B10, , prior to their initial release dates and through November 2004. Datasondes were installed on the inside of the water control structures at the discharge into the slough and/or San Francisco Bay using a PVC holder attached to a ground-mounted pole to allow for free water circulation around the sensors. 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.

Salinity, pH, temperature, and dissolved oxygen were collected at 15-minute intervals with a sensor and circulator warm-up period of 2 minutes. Data were downloaded weekly and sondes were serviced to check battery voltage and data consistency. A recently calibrated Hydrolab Minisonde was placed next to the Datasonde in the pond at the same depth, and readings of the two instruments were compared. Any problems detected with the Datasonde were corrected through calibration or replacement of parts or instruments. The sensors on the Datasonde were calibrated prior to deployment into the salt pond and were calibrated and cleaned on a biweekly schedule unless otherwise noted in service records. During the cleaning and calibration procedure, simultaneous readings were collected with a recently calibrated Hydrolab Minisonde to confirm data consistency throughout the procedure (initial, de-fouled, post cleaned, 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.

Receiving Water Sampling (Initial Release and Continuous Circulation):

Receiving quality measurements were collected after initial discharge and then monthly in San Francisco Bay outside the water control structure in ponds 2 and 10 from July 2004 until October 2004.

Sampling locations were marked using a GPS waypoint. USGS accessed slough sampling sites via boat from San Francisco Bay and used a GPS to navigate to sampling locations. When the boat was approximately 50-25 meters from the site, the engine would be cut or reduced to allow for drifting caused by current and wind to the site location. A recently calibrated Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was used to measure salinity, pH, turbidity, temperature, and dissolved oxygen at each location.

From July 2004 through September 2004, readings were collected only from the near-surface at a depth of approximately 25 cm. From October 2004 through November 2004, samples were collected from the near-bottom of the water column in addition to the near-surface at each sampling location. Depth readings of sample locations were collected at the completion of each Minisonde measurement to account for drift during the reading equilibration period. The specific gravity of each site was additionally measured with a hydrometer (Ertco, West Paterson, New Jersey) scaled for the appropriate range. This sample was collected concurrently with the near-surface Minisonde measurement. The majority of the samples were collected on the rising or high tide in order to gain access to the sampling sites, which were not accessible at tides less than 3.5 ft MLLW.. Standard observations were collected at each site. These were:

A) Observance of floating and suspended materials of waste origin.

B) Description of water condition including discoloration and turbidity.

C) Odor – presence or absence, characterization, source and wind direction.

D) Evidence of beneficial use, presence of wildlife, fisher people and other recreational activities

E) Hydrographic conditions – time and height of tides, and depth of water column and sampling depths.

F) Weather conditions – air temp, wind direction and velocity, and precipitation.

Pond Management Sampling (for Initial Release and Continuous Circulation):

USGS conducted water quality measurements twice monthly in Buamberg salt ponds B2 and B10 from May through July 2004 (i.e., two months prior to the initial release of ponds A2W, A3W, and A7). One sampling location was established for each salt pond and samples were collected between 0800 and 1000 hours (Appendix A). A Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was calibrated prior to use and measured salinity, pH, turbidity, temperature, and dissolved oxygen. Readings were collected from the near-surface at a depth of approximately 25cm. Because sondes may not measure salinity accurately at concentrations greater than 40 ppt, an additional method was used. USGS measured specific gravity of each pond (corrected for temperature and converted to salinity) with an appropriately-scaled hydrometer (Ertco, West Paterson, New Jersey) to a precision of 0.0005. At hypersaline ponds (>70 ppt), only hydrometers were used to measure salinity.

Chlorophyll-a sampling (for Continuous Circulation Monitoring):

USGS collected chlorophyll samples monthly in Baumberg salt ponds in September and October 2004. Two to three sampling locations were established for each salt pond and water quality measurements were collected between 0800 and 1000 hours of the same day or within one day of chlorophyll sample collection. A recently calibrated Hydrolab Minisonde (Hydrolab-Hach Company, Loveland, CO) was used to measure salinity, pH, turbidity, temperature, and dissolved oxygen at each location. Readings were collected from the near-surface at a depth of approximately 25cm.

USGS determined Chlorophyll-a levels using a TD700 fluorometer. Water samples were collected at 2-3 established sampling locations per pond using a water collection pole and 500ml dark Nalgene bottles. Samples were packed in ice for transport, and filtered by USGS staff in within 24 hours of collection. Samples were filtered with 25 mm Whatman GF/F (glass fiber filters) (Whatman International, Maidstone, England) and filters were frozen at least 24 hours. Extraction solvent (90% acetone) was then added to the filters at least 48 hours after filtration. Absorbance of the extracts was read using a TD700 fluorometer. Chlorophyll concentration was calculated using the Fluorometric equations for extracted chlorophyll-a and pheopigments (Holm-Hansen et al.1965).

Annual Water Column Sampling for Metals:

Water column samples were collected on 23 September 2004, following EPA method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels). Pre-cleaned sample containers conforming to EPA protocols were provided by ToxScan, Inc. Samples from ponds A2W and A3W were collected approximately 30 meters west of each pond's water control structure, whereas pond A7 was sampled 30 meters north of its water control structure. Salinity, temperature, pH, and dissolved oxygen were measured

concurrently with water column sample collection using a Hydrolab Minisonde (Hach Hydrolab, Loveland, CO). Collected samples were immediately stored on ice in a cooler and shipped overnight to ToxScan, Inc. (Watsonville, CA). Dissolved mercury samples were immediately filtered by ToxScan, Inc., and all mercury samples were shipped to Columbia Analytical Services, Inc. (Kelso, WA), where the samples were analyzed using EPA method 1631. ToxScan, Inc. analyzed total and dissolved chromium, nickel, copper, zinc, silver, cadmium, and lead using EPA method 200.8; total and dissolved selenium (EPA 270.3) and arsenic (EPA 206.3) were determined with more sensitive analyses recommended for those metals. Total Suspended Solids (TSS) samples were forwarded to Soil Control Lab (Watsonville, CA) for analysis. All labs reported that the samples arrived intact and were handled with the proper chain-of-custody procedures, and that appropriate QA/QC guidelines were employed during the analysis on a minimum 5% basis.

Calibration and Maintenance:

All the instruments used for sampling as part of the South Bay Salt Pond Initial Stewardship Plan's Self-Monitoring Program were calibrated and maintained according to the USGS standard procedures. Datasondes were calibrated pre-deployment and maintained on a biweekly cleaning and calibration schedule unless they required additional maintenance. Dissolved oxygen sensors were particularly problematic due to the addition of self-cleaning brush attachments on the equipment which tended to damage the surface of the membrane more frequently. The problem of algae and other substances interfering with the moving parts such as on the self-cleaning brush and circulator was improved with the use of nylon stockings. This allowed for maximum water flow past the sensor but stopped algae from wrapping around and binding the moving parts. Copper mesh and wire was used to inhibit growth in ponds with high concentrations of barnacles and hard algae, which could interfere with sensor function. We performed a biweekly fouling check to detect shifts in data due to the accumulation of biomaterial and sediment on the sensors. A calibration and maintenance log was maintained for each pond.

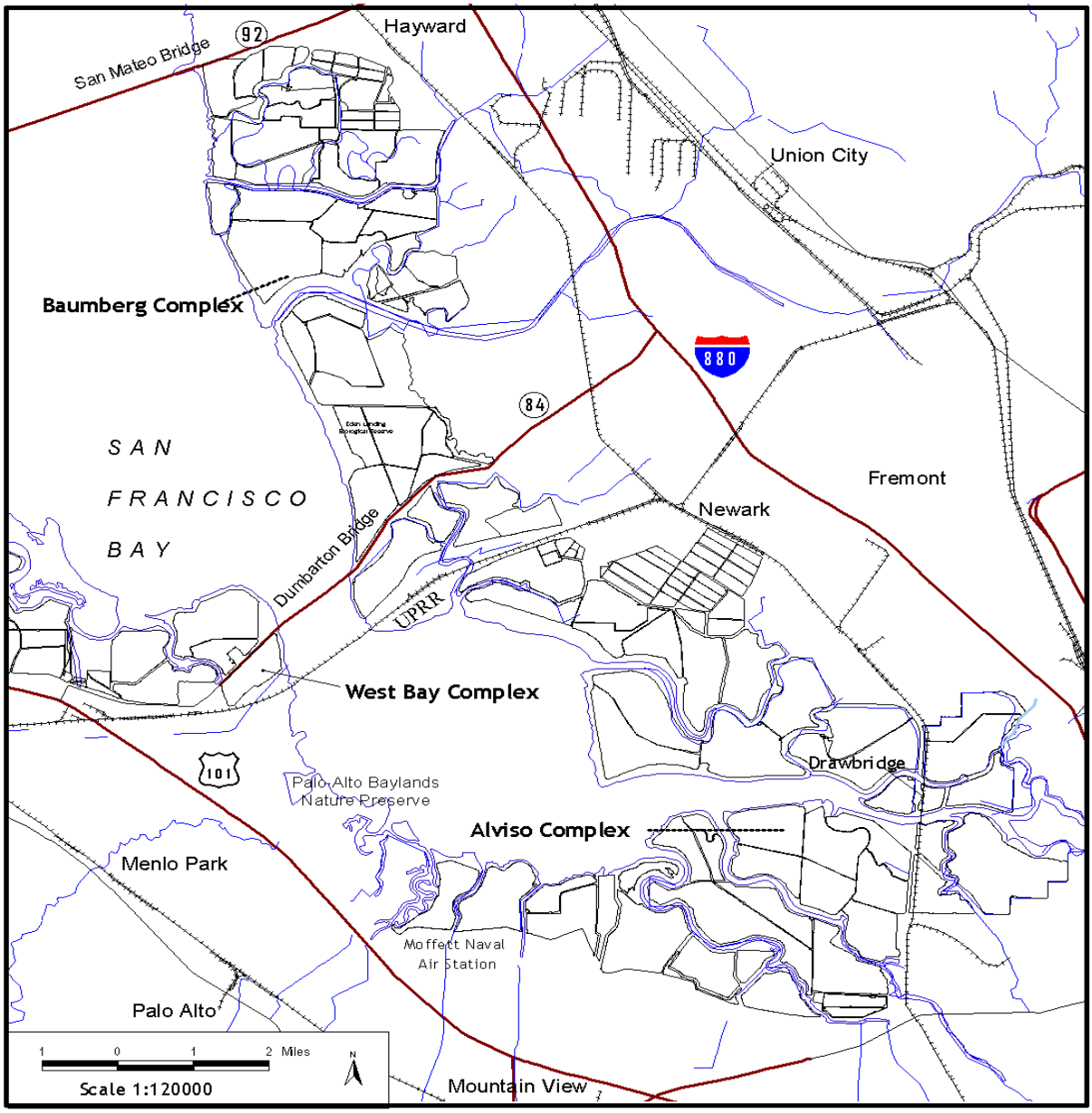

Figure 1. Vicinity Map of the Baumberg Complex Ponds

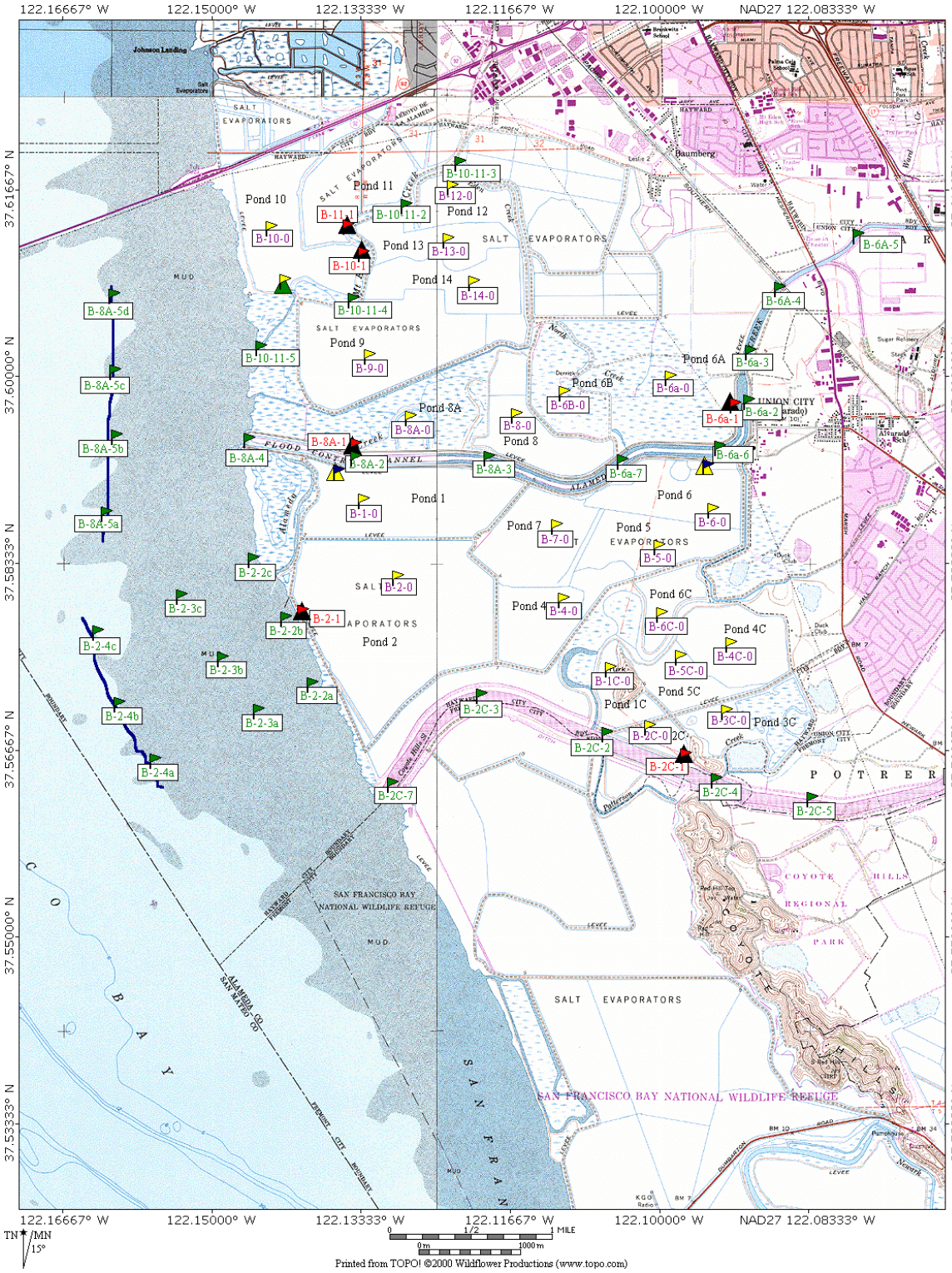

Figure 2. Baumberg Complex Water Quality Sampling Locations

Water Quality Monitoring Results

Discharge and Receiving Water Results

Results from the monitored parameters are summarized below. It should be noted that these results do not reflect actual violations. Due to management constraints, the ponds discharged for a limited time. These results do show what would have occurred if the discharges had been left open for the entire season. Figures 3-10 show the daily means for salinity, temperature, pH and DO for the discharge and receiving water at Ponds 2 and 10. Figures 11-19 illustrate the daily fluctuation of DO over a five day period of at the discharge point for ponds 2 and 10. The 2004 surface water analytical results and field observations are summarized in Appendix B.

The results of the 2004 sampling events indicate:

Salinity

- Neither of the pond systems was above the 44 ppt salinity required for Continuous Circulation. Salinities behaved as predicted. Salinity in the Pond 2 System dropped from a high of 43 to a range of 34 to 37 for September and the early part of October. By October 15, 2004 the salinity had dropped to 30 ppt. Pond 10 started out at 40 ppt; by August 24, 2004, when the pond was operated as a muted tidal system, it had dropped to below 35 ppt.

- The salinities for both systems now remain well below 44 ppt and generally reflect slightly higher salinities than the intake waters from the Bay and sloughs (See Figures 3 and 7).

Temperature

- Temperature levels in the ponds generally matched the temperature levels in the intake and receiving waters and therefore met the discharge limits of not exceeding natural temperatures of the receiving waters by 20^{o}F. (See Figures 5 and 9).

pH

- Levels of pH varied differently in each Pond System, but were generally less than 8.5. In B2, daily mean pH increased to above 8.6 within two weeks after the initial start of operations and then fell below 8.5 and leveled off until mid October when rains began and pH levels fell. Daily mean ph in Pond System 10 remained ranged around 8.0 and began to trend up in mid-September. (See Figures 4 and 8).

Dissolved Oxygen

- Based on daily averages of our continuous monitoring for dissolved oxygen, discharges were below the 5.0 mg/L compliance limit as follows: Pond System 2: 90 total recorded days with 27 days below 5.0 mg/L and 0 below 3.4 mg/L; Pond System B10**:** 132 total recorded days, with 67 days below 5.0 mg/L, 3 below 3.0 mg/L and 0 below 1.0 mg/L. It should be noted that Pond 10 was managed as a muted tidal pond after the gate broke on August 24, 2004. The pond continued to discharge at DO below 5 mg/L. The 48" intake/discharge culvert may not have had sufficient capacity to establish a fully muted tidal regime in this pond.

- Monitoring efforts showed that dissolved oxygen levels in Ponds B2 and B10 exhibited a strong diurnal pattern (low dissolved oxygen near dawn and higher levels at mid-day) (See Figures 11-19).

Metals

- Annual water column sampling data indicated that levels of several metals in discharge waters for Baumberg ponds did not meet water quality objectives for San Francisco Bay receiving waters. (See Table 2).

Invertebrate Monitoring

Both of the discharges at the Baumberg Complex were Bay discharges. The waste discharge requirements did not require invertebrate monitoring for these discharges.

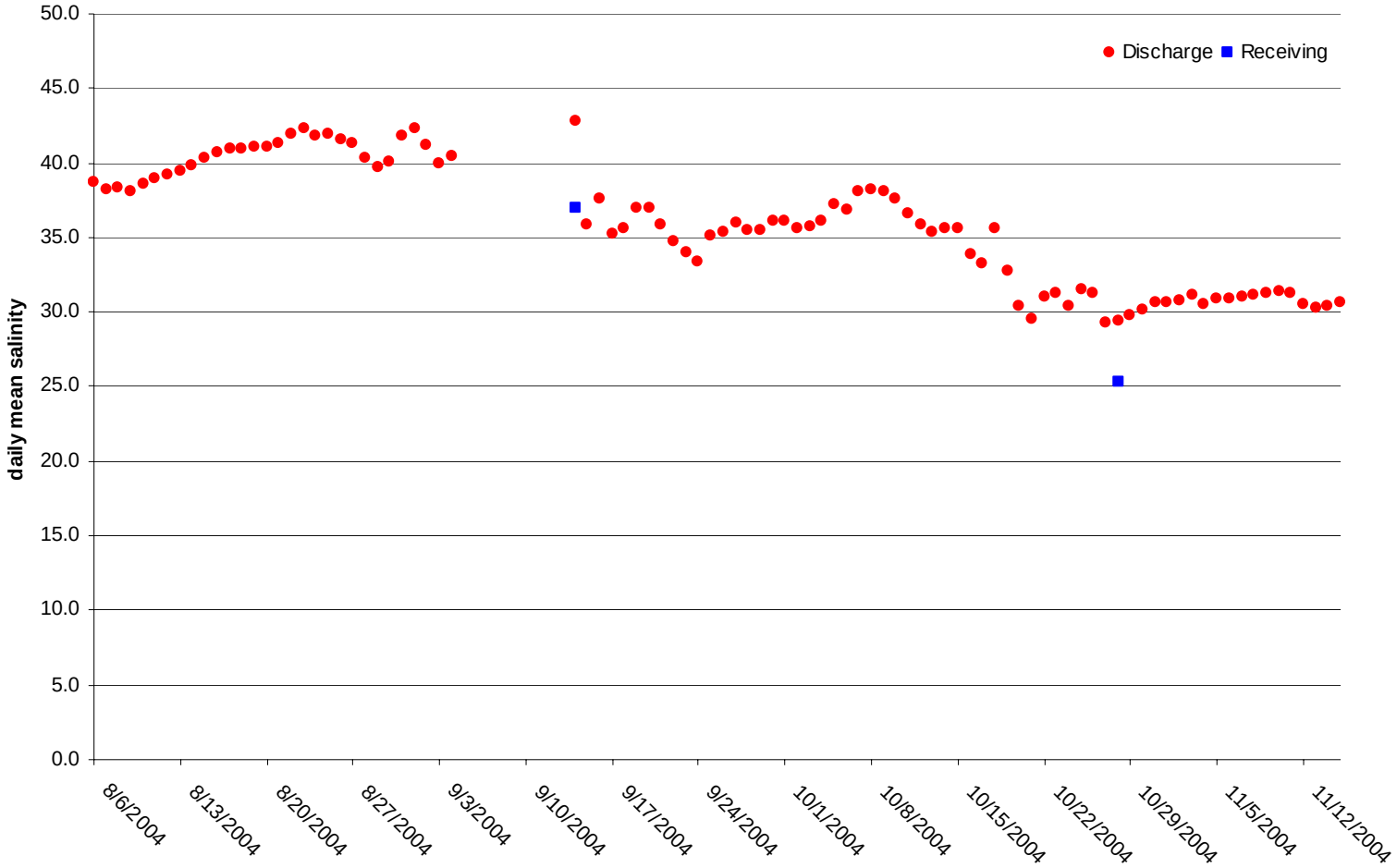

Figure 3. Pond B2
Daily Mean Salinity for Discharge and Receiving Water

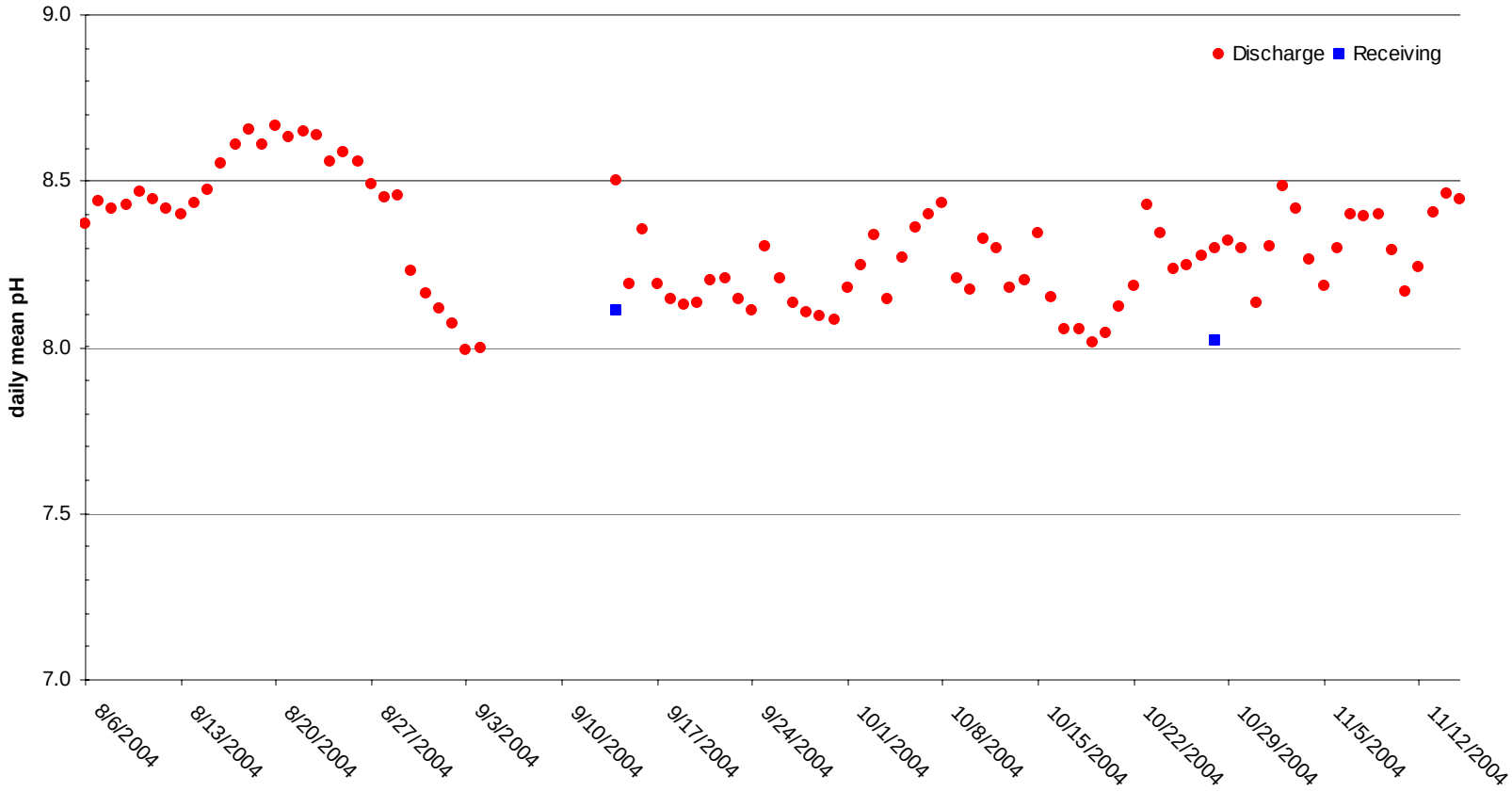

Figure 4. Pond B2
Daily Mean pH for Discharge and Receiving Water

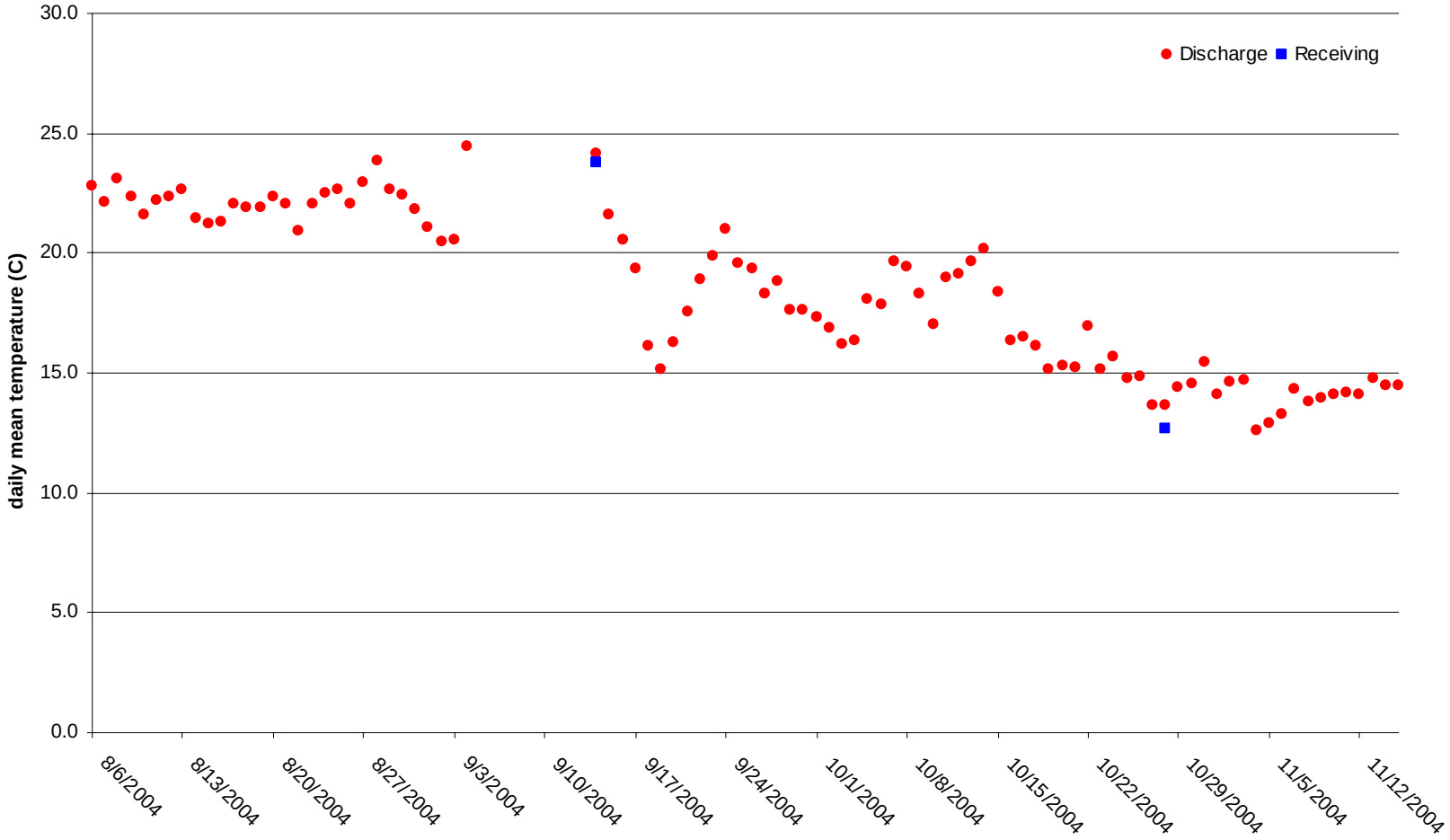

Figure 5. Pond B2
Daily Mean Temperature for Discharge and Receiving Water

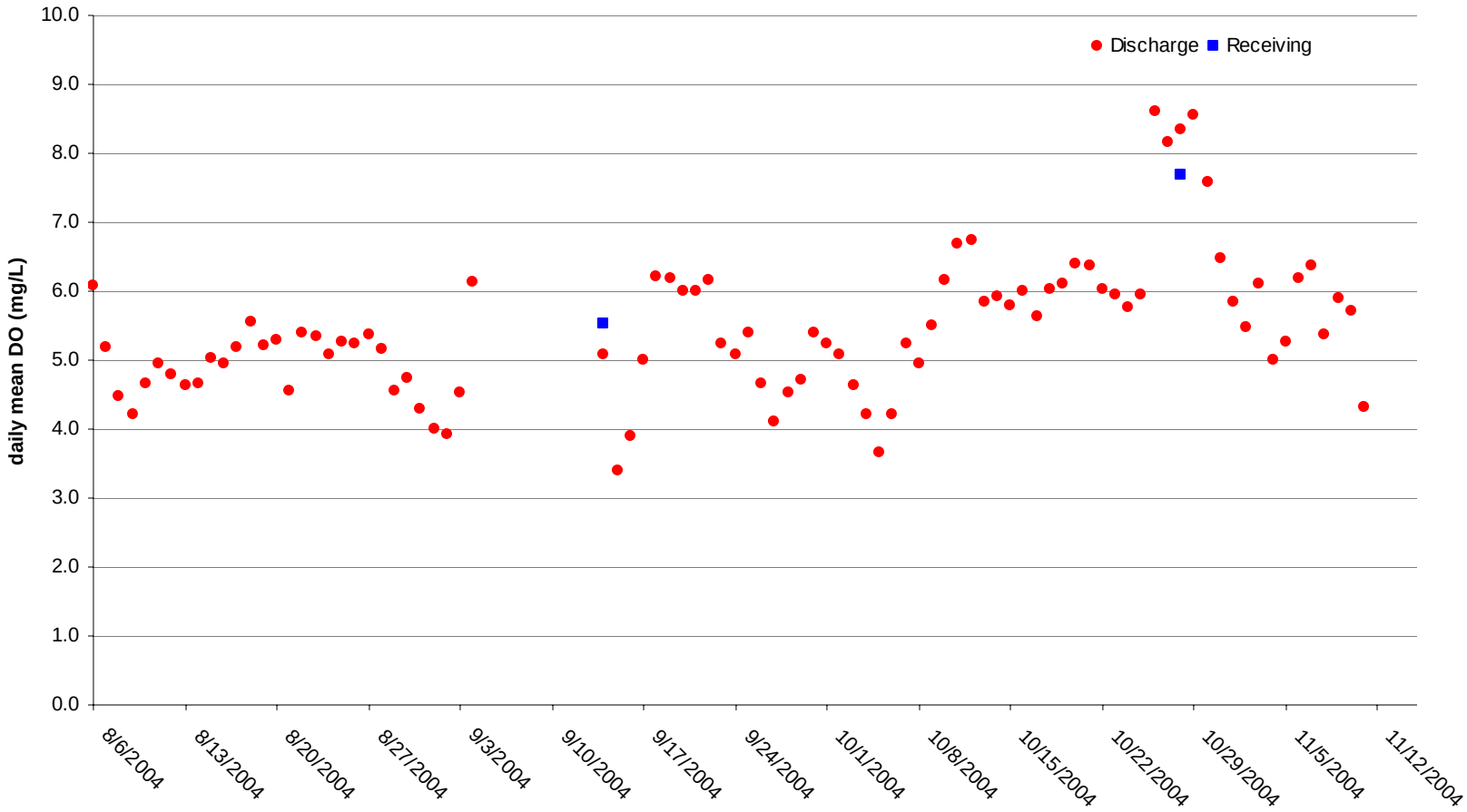

Figure 6. Pond B2
Daily Mean DO for Discharge and Receiving Water

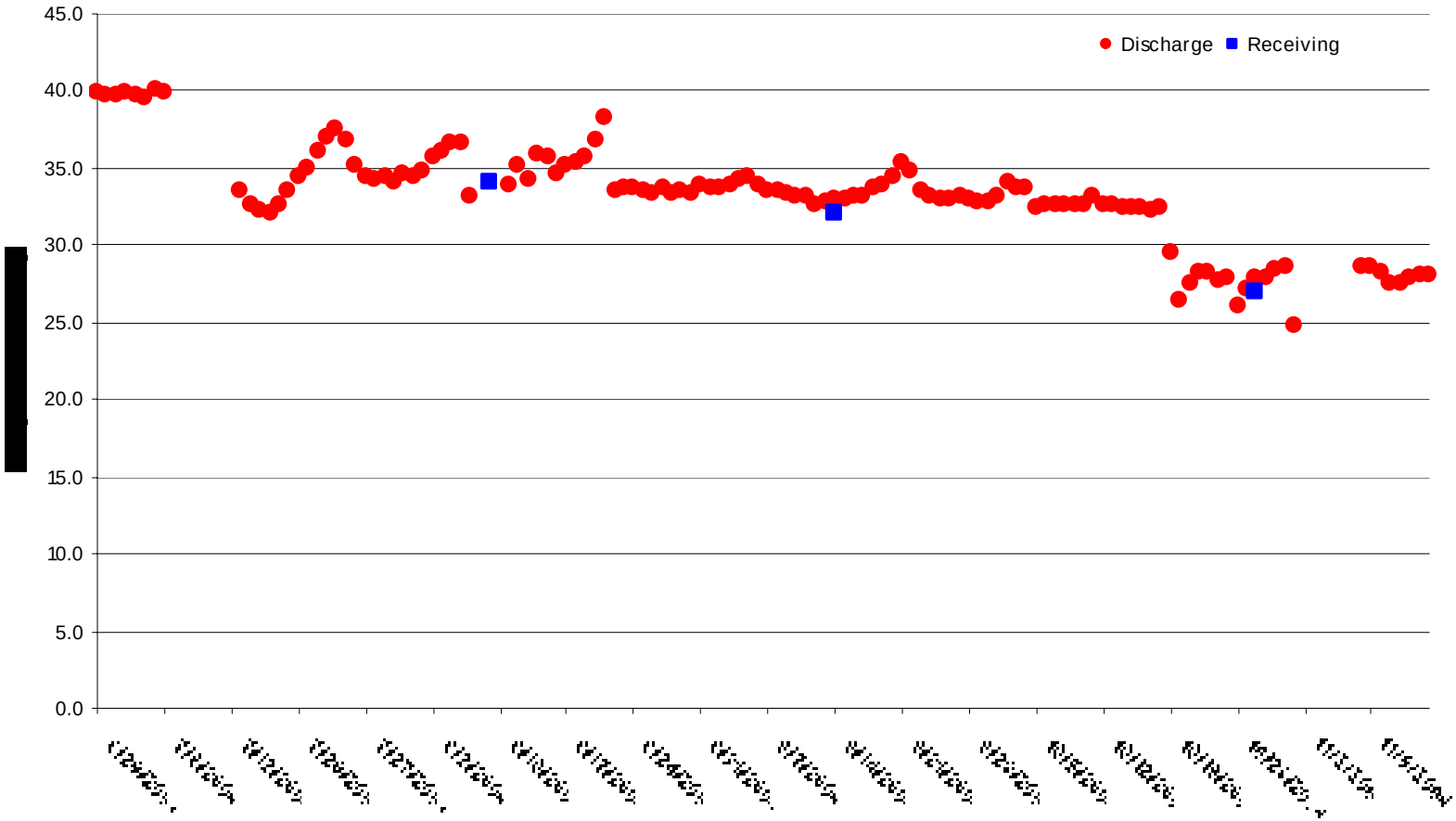

Figure 7. Pond B10
Daily Mean Salinity for Discharge and Receiving Water

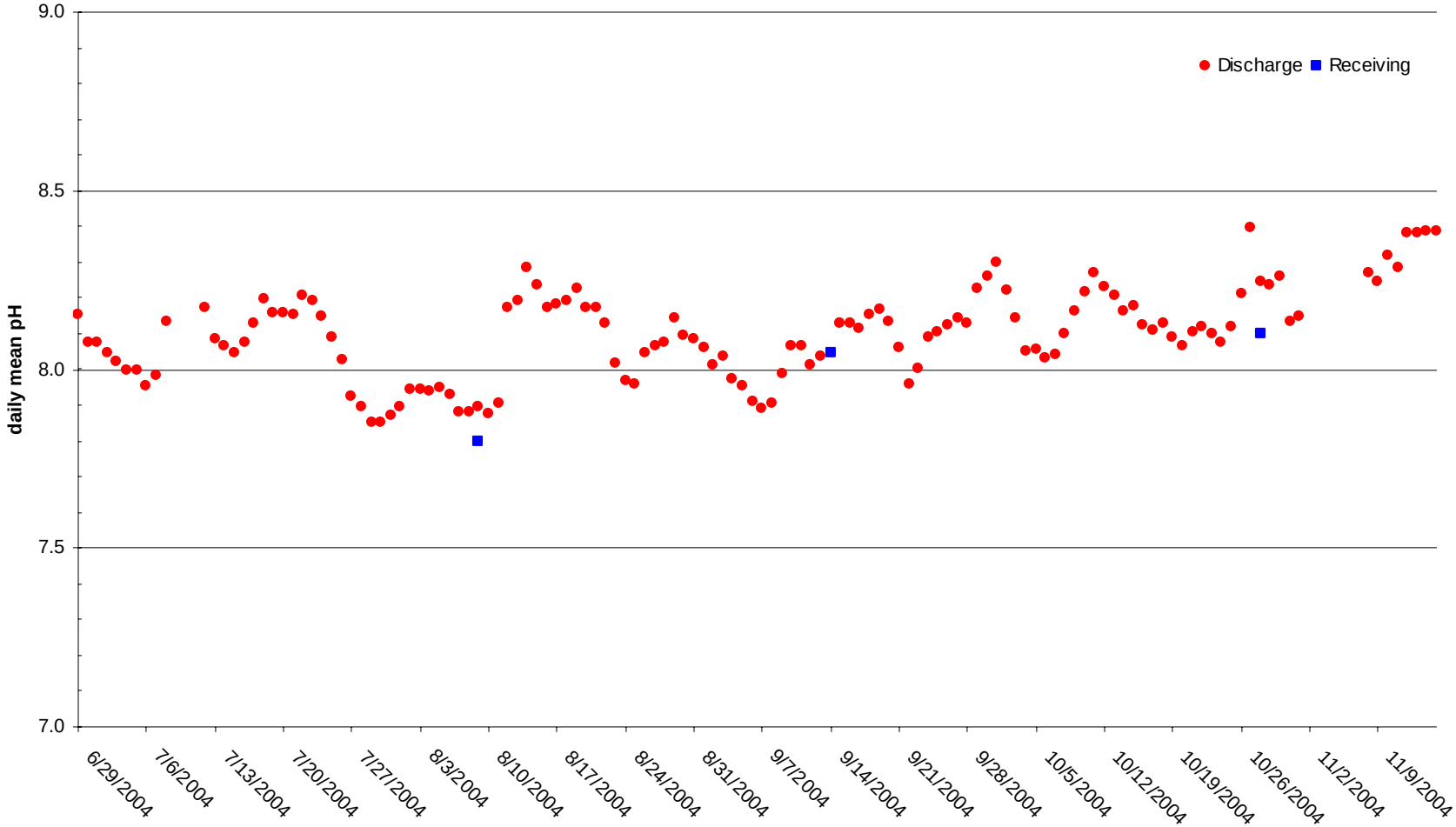

Figure 8. Pond B10
Daily Mean pH for Discharge and Receiving Water

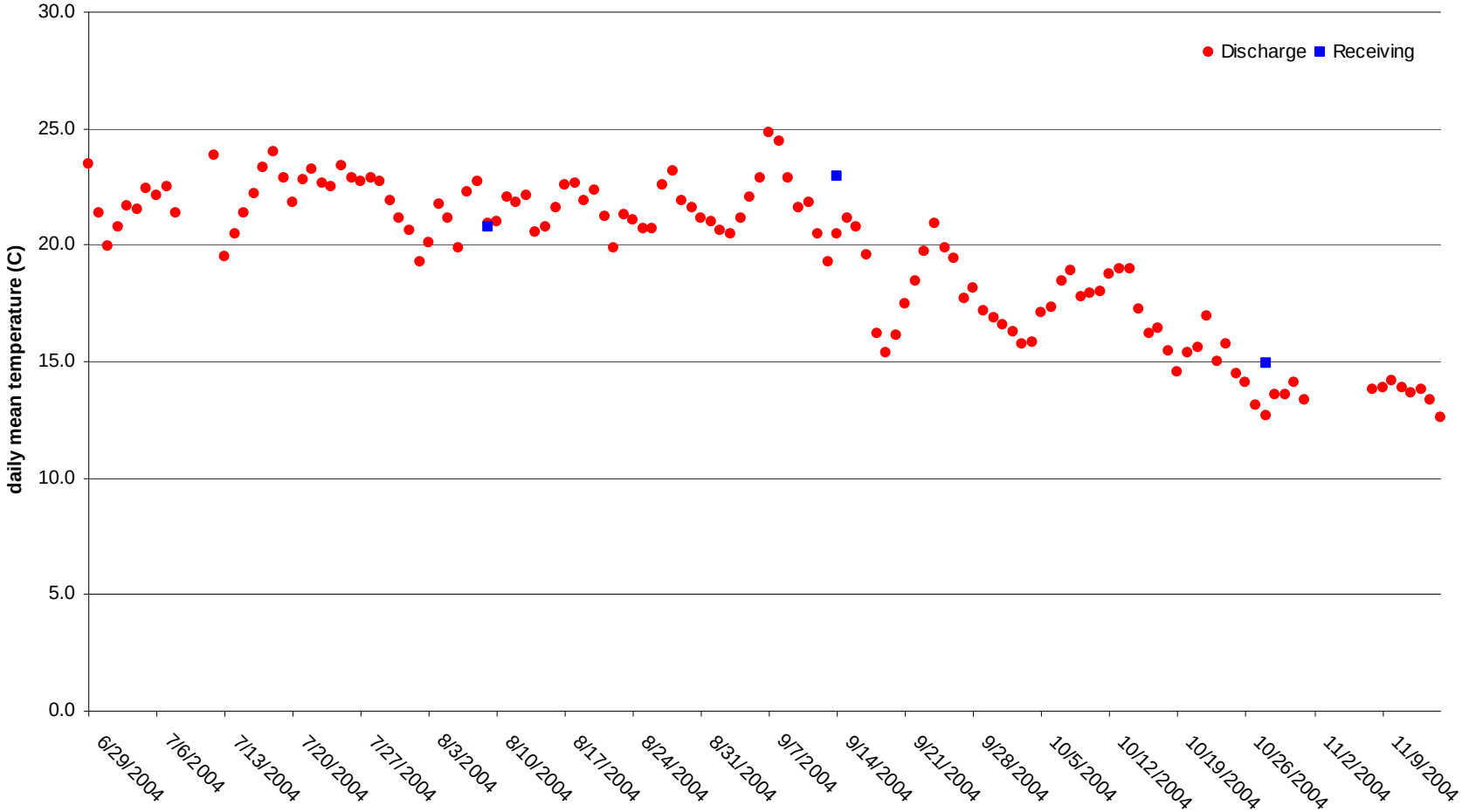

Figure 9. Pond B10
Daily Mean Temperature for Discharge and Receiving Water

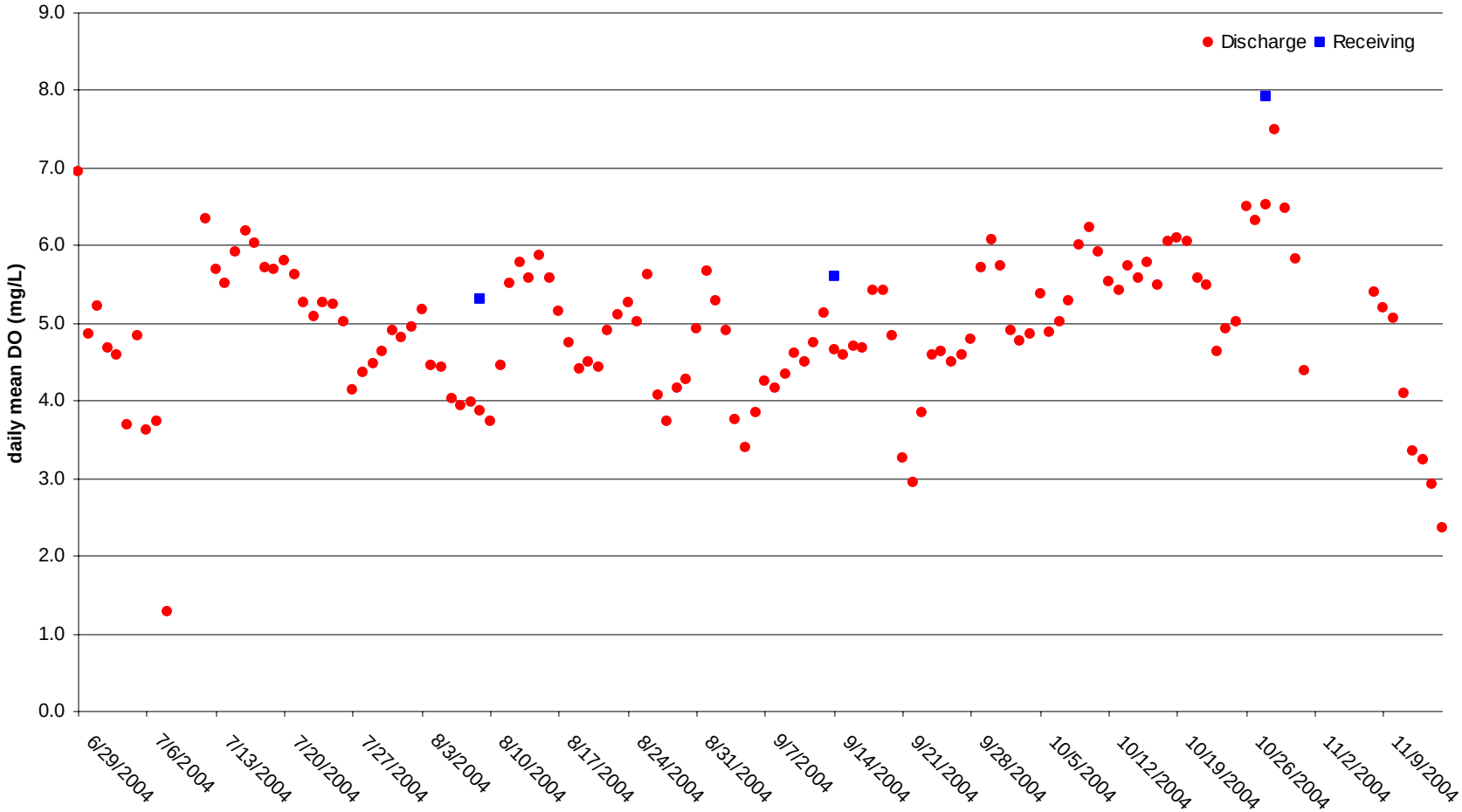

Figure 10. Pond B10
Daily Mean DO for Discharge and Receiving Water

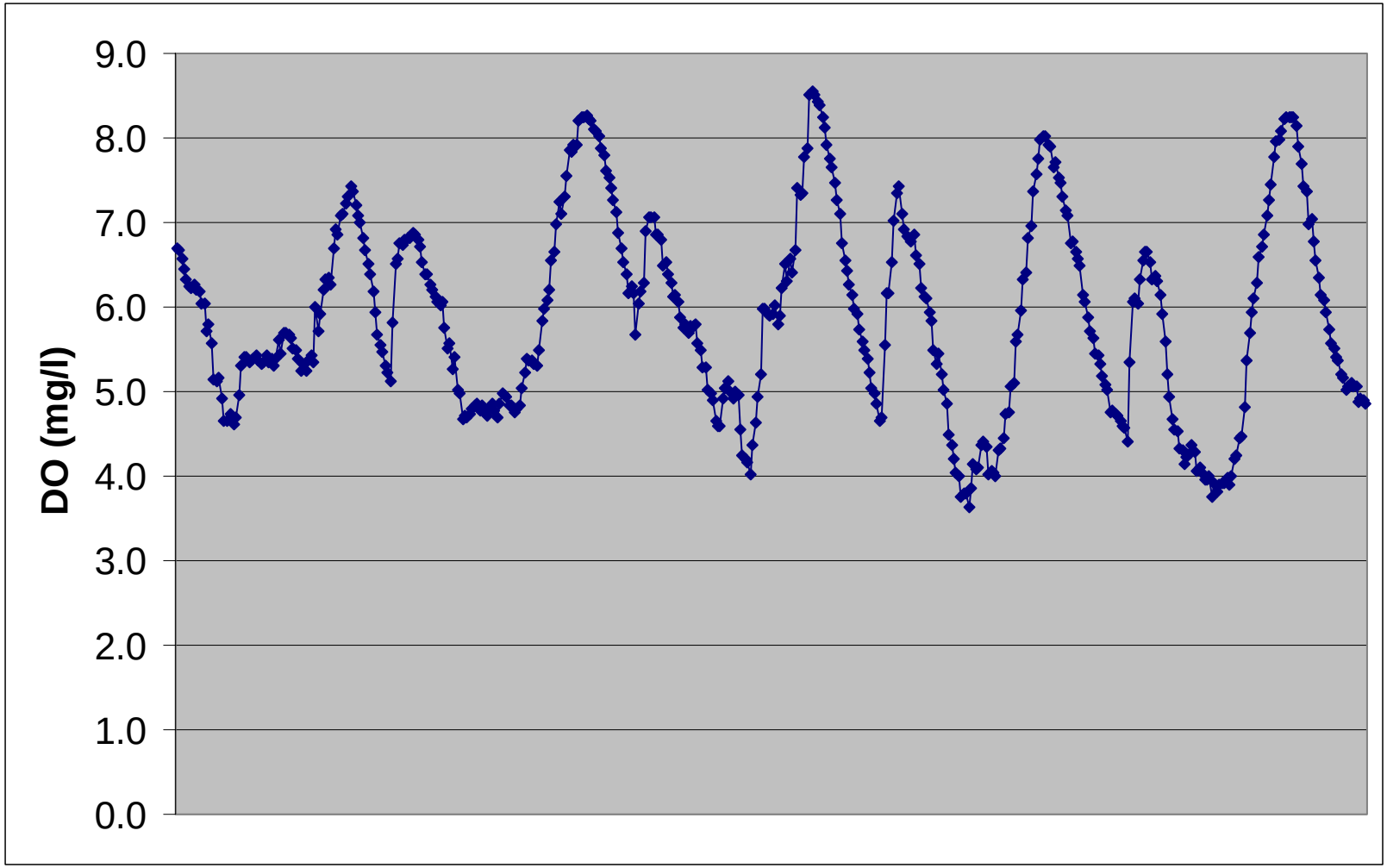

Figure 11. Pond B10
DO Levels for 7/15/04 – 7/19/04

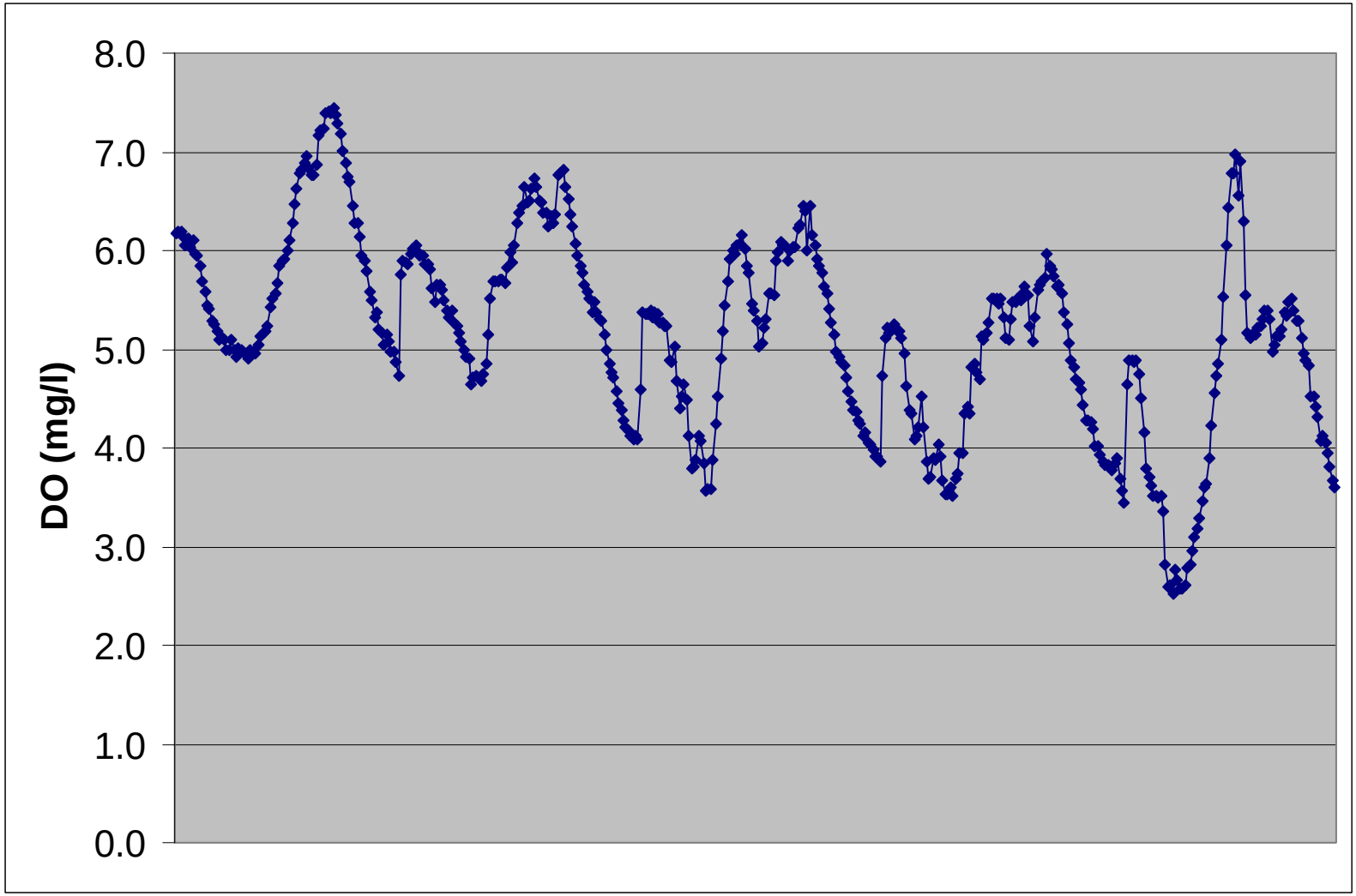

Figure 12. Pond B10
DO Level for 8/15/04 – 8/19/04

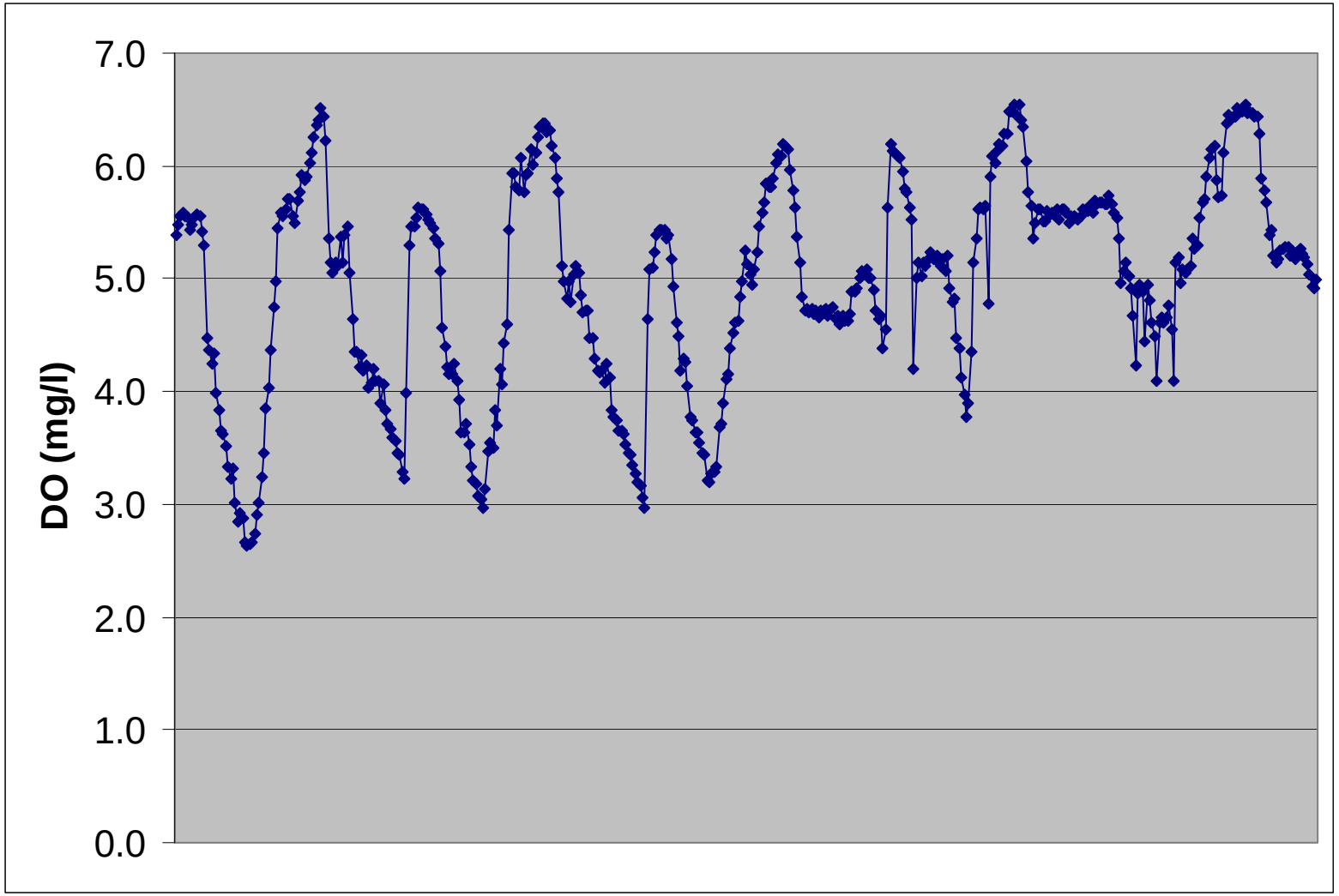

Figure 13. Pond B10
DO Level for 9/15/04 – 9/19/04

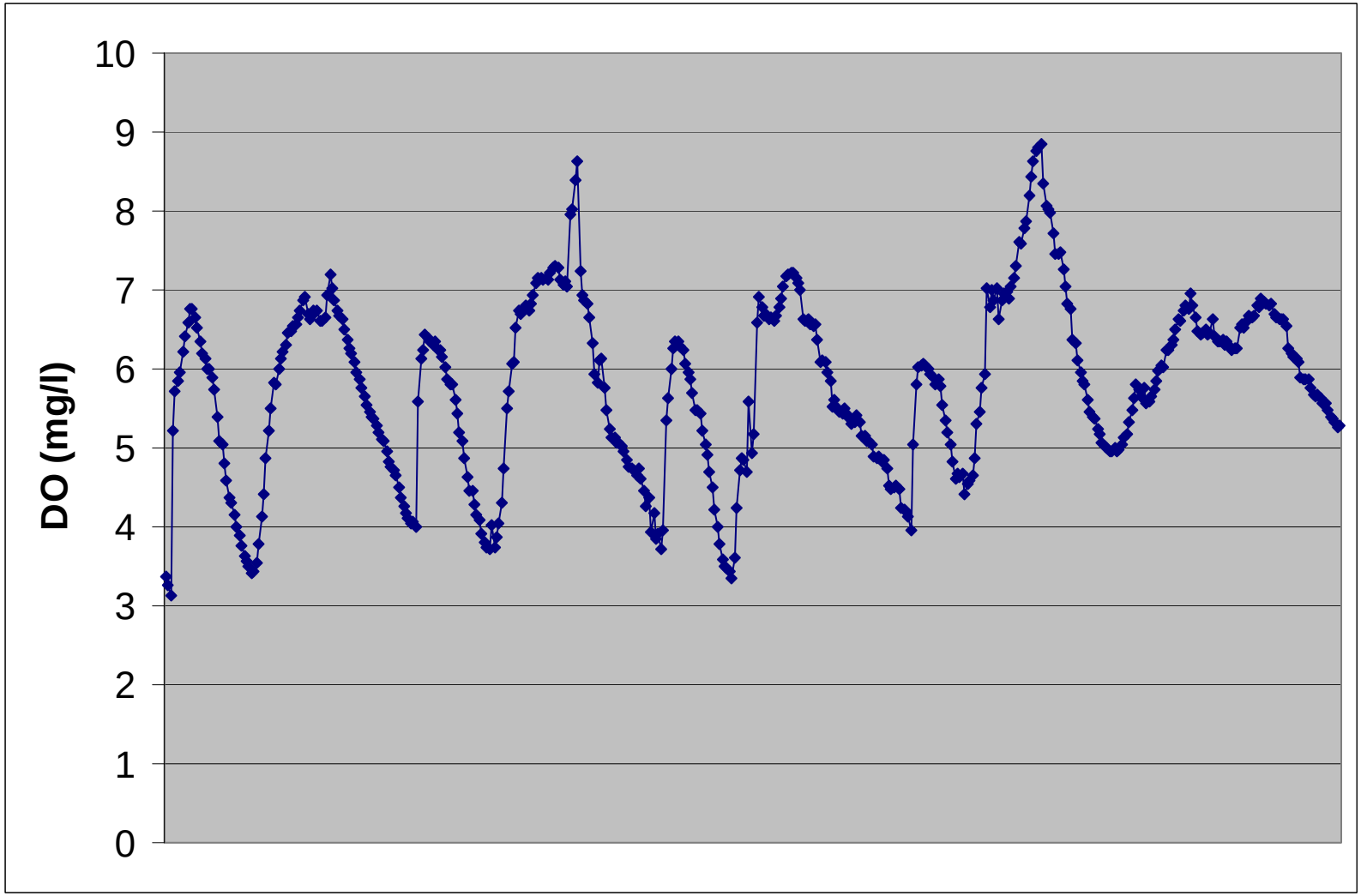

Figure 14. Pond B10
DO Level for 10/15/04 – 10/19/04

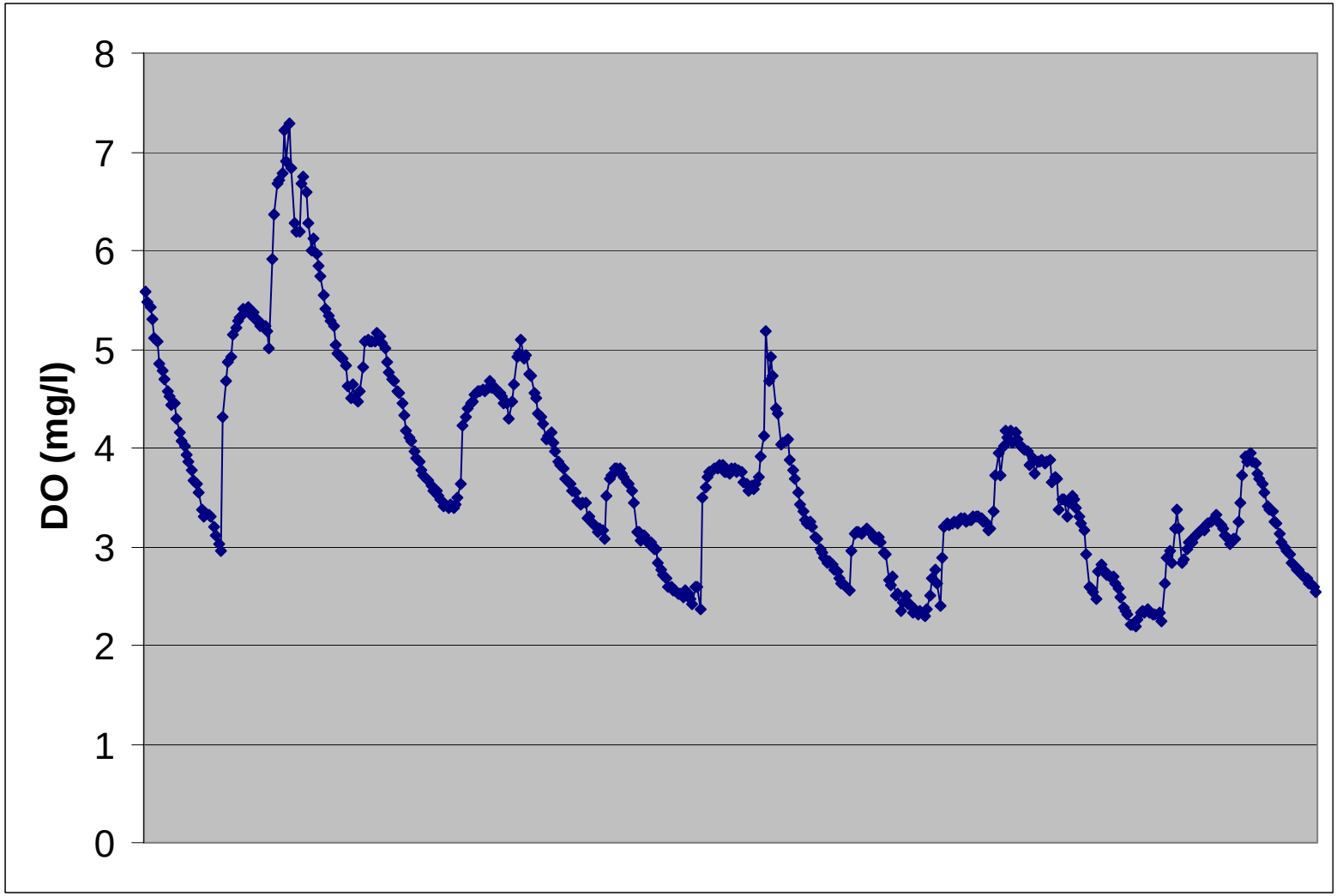

Figure 15. Pond B10
DO Levels for 11/10/04 – 11/14/04

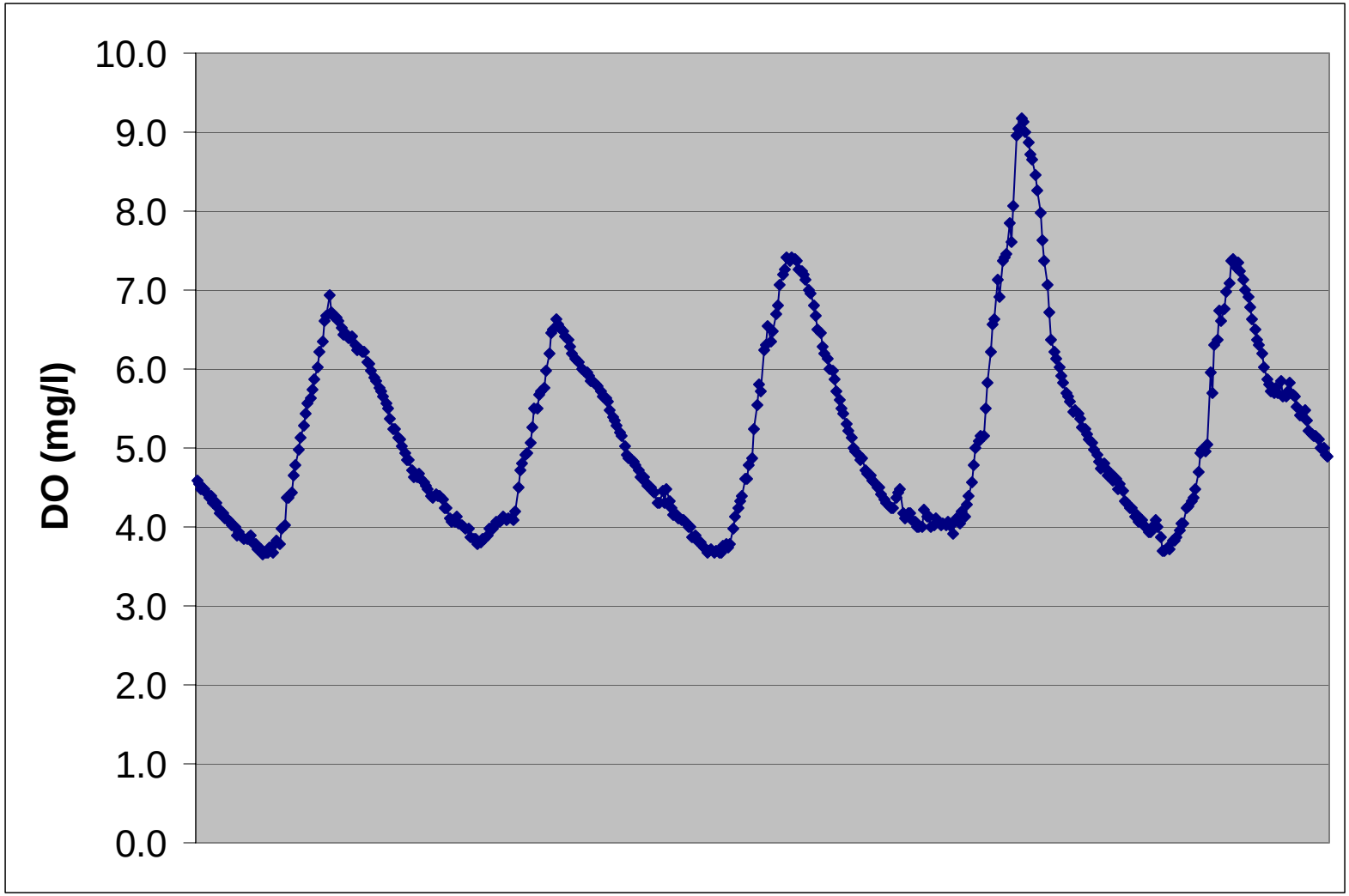

Figure 16. Pond B2
DO Levels for 8/15/19 – 8/19/04

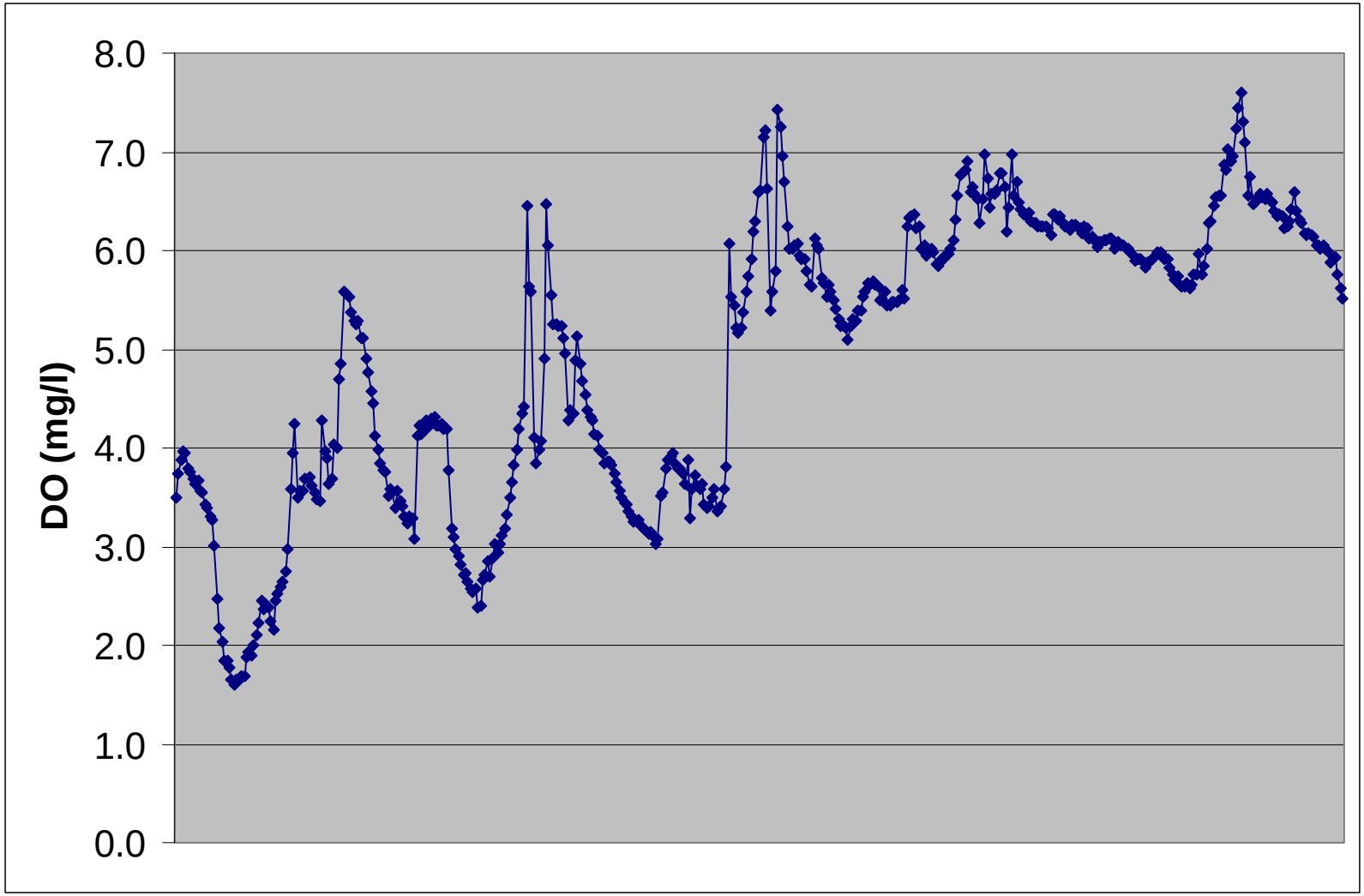

Figure 17. Pond B2
DO Levels for 9/15/04 – 9/19/04

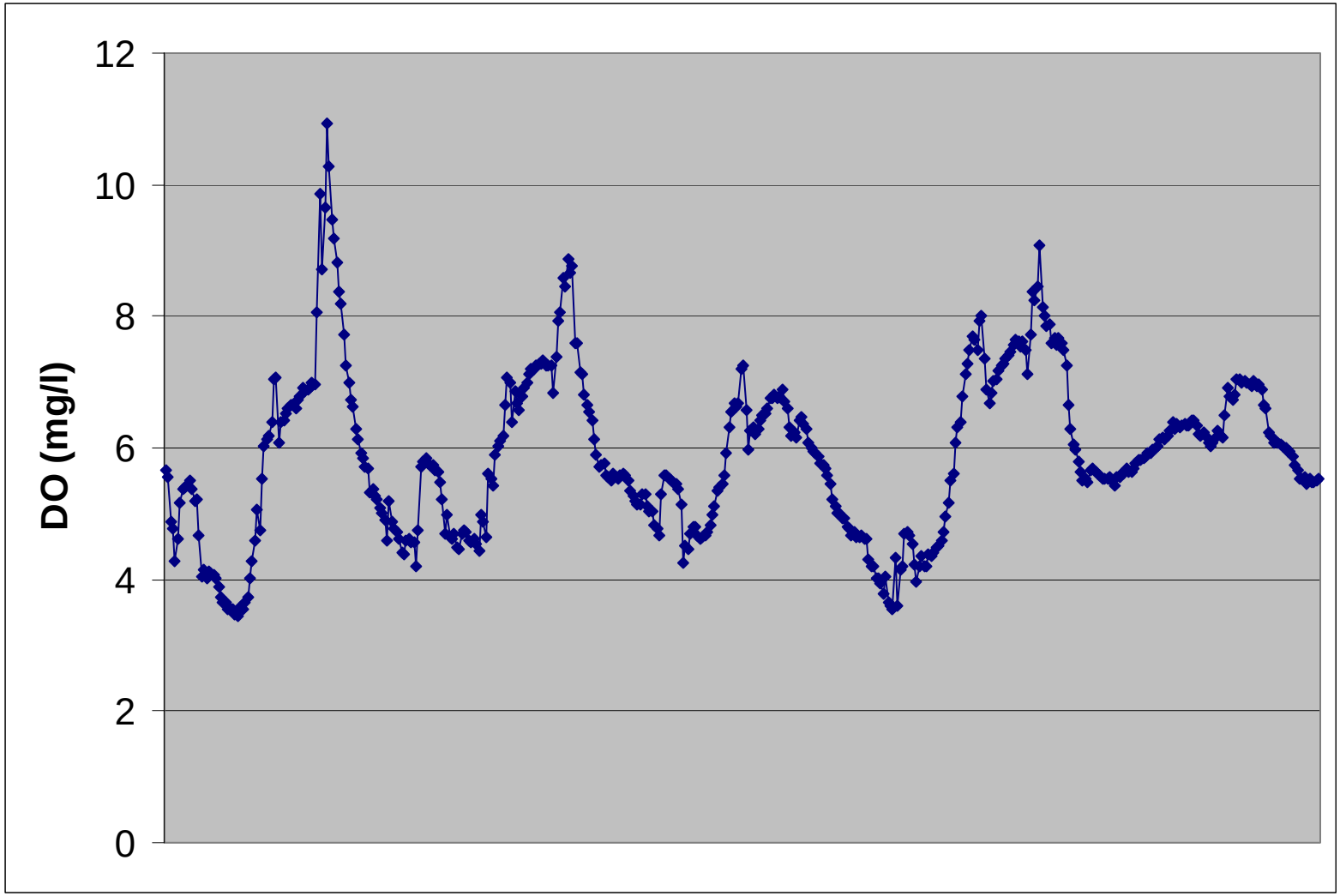

Figure 18. Pond B2
DO Levels for 10/15/04 – 10/19/04

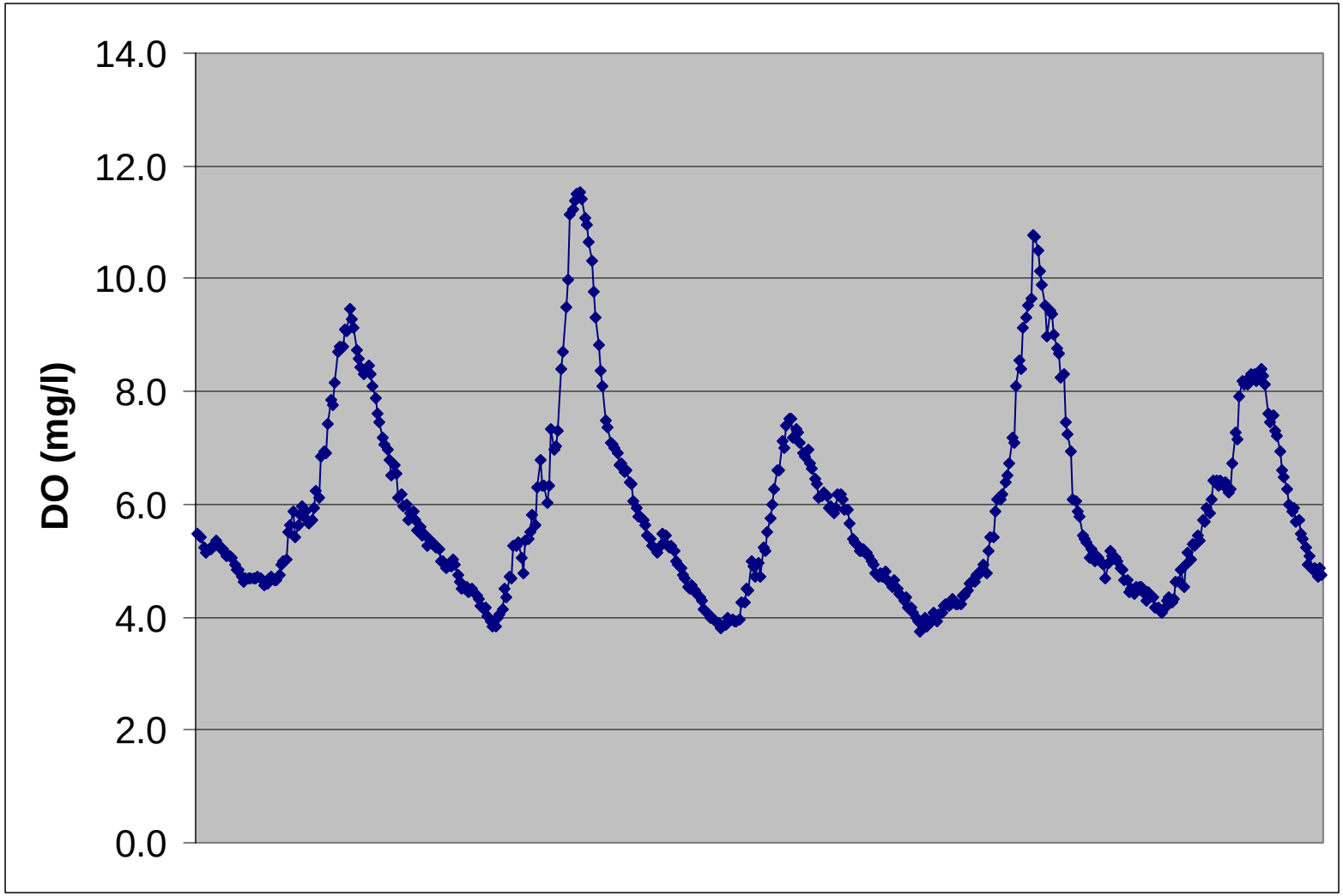

Figure 19. Pond B2
DO Levels for 11/6/04 – 11/10/04

Metals and Total Dissolved Solids Results:

The results of the metals and total dissolved solids analyses are shown on Table 5. Metals and total dissolved solids. These data show levels in excess of the Water Quality Objectives for several metals.

It should also be noted, that Columbia Analytical Services included the following statement with its results: "The samples for Dissolved Mercury were filtered by ToxScan, Inc. prior to shipment to Columbia Analytical Services, Inc. (Kelso, WA). The Filter Blank prepared at ToxScan showed a relatively high level of Mercury. The data suggests that background contamination was introduced during the filtration process at ToxScan, Inc. No other anomalies associated with the analysis of these samples were observed."

Table 5. Baumberg Complex in Pond Metals and Total Suspended Solids and Water Quality Objectives.

	Ag		Cd		Cr		Cu		Ni		Pb		Zn		As		Hg		Se		
Pond	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	Tot. µg/L	Dis. µg/L	TSS mg/L
B2	ND	ND	ND	ND	27.00	ND	14.00	4.90	6.30	NCD	9.10	ND	9.90	5.20	4.20	3.80	4.80	1.30	ND	ND	26
B10	ND	ND	ND	ND	27.00	2.10	14.00	5.40	6.30	ND	9.10	ND	30.00	5.50	6.40	4.60	27.60	1.20	ND	ND	150
WQOs	**2.3**		**0.27**		**11.4**		**4.6**		**16.3**		**3.2**		**58**		**36**		**25**		**5.0**		

POND	Date	Time	Temp. (°C)	pH	DO (mg/L)	Salinity (ppt)	Weather
B2	9/23/2004	14:31	23.51	8.04	7.21	35.23	8%cc, sunny, warm, wind >6 mph NW
B10	9/23/2004	16:12	28.12	7.93	5.17	36.47	8%cc, sunny, warm, wind >6 mph NW

Note: Sample Methodology

Metal	EPA Method
Arsenic(Dis.)	206.3D
Arsenic(Tot.)	206.3TR
Mercury(Dis &Tot)	1631.00
Metals(Tot&Dis)	200.80
Selenium(Tot&Dis)	270.30
Total Suspended Solids	160.20

Note: All results are in micrograms/L except for total suspended solids which is reported mg/L.

ND refers to no detected level.

Sediment Monitoring

Analysis of the 2004 sediment samples will not be completed until mid-February. As soon as the data is available, we will forward it to the RWQCB staff. A summary of the USGS sediment sampling and analysis is shown in Appendix C.

Compliance Evaluation Summary

The summary includes: each parameter for which discharge limits are specified in the Order, the number of samples taken during the monitoring period, and the number of samples in violation of applicable discharge limits. The compliance evaluation summaries are shown on Tables 6 and 7. Table 6 shows the instantaneous violations and Table 7 shows the days that the daily mean was in violation.

Table 6. Compliance Evaluation Summary. Data recorded every 15 minutes.

Pond	Parameter	Total Number of Samples	Number of Samples in Violation	Number of Samples in Specified Categories	Number of Samples in Specified Categories
B2	DO	8,182	3,520< 5.0 mg/L	218 < 3.0 mg/L	0 < 1 mg/L
B2	pH	8,596	1,353 pH > 8.5	0 pH> 9.0	
B10	DO	11,521	5,636 ,5.0 mg/L	1,167 < 3.0 mg/L	53 < 1 mg/L
B10	pH	11,522	175 pH > 8.5	6 pH> 9.0	0 pH > 9.3

Table 7. Compliance Evaluation Summary. Data shown as the daily mean.

Pond	Parameter	Total Number Days	Number of Days in Violation	Number of Samples in Specified Categories	Number of Samples in Specified Categories
B2	DO	90 days	27 days < 5mg/L	0 days <3.4.mg/L	
B2	pH	94 days	11 > 8.5	0 pH> 8.7	
B10	DO	132 days	67 days < 5.0 mg/L	3 days < 3.0 mg/L	0 days < 1.0 mg/L
B10	pH	132 days	0	0	0