DISSOLVED OXYGEN STUDY

of

Lake Wisconsin

Environmental Laboratory

Badger Army Ammunition Plant

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A STUDY OF DISSOLVED OXYGEN LEVELS IN LAKE WISCONSIN 1994 & 1995

INTRODUCTION

A study conducted by Mead & Hunt, Inc. (M&H) in 1992 and published in April of 1994, titled *"Prairie du Sac Hydroelectric Project"* , indicated that at several locations the Dissolved Oxygen levels in Lake Wisconsin have degraded to lower than 5 mg/L.

Badger Army Ammunition Plant (BAAP) is preparing to apply for a revised WPDES permit which would discharge to Lake Wisconsin. Based on the M&H study, the Wisconsin Department of Natural Resources has delayed any decision on a permit until additional data is provided to them.

Badger AAP has conducted these studies to provide additional information on Dissolved Oxygen (D. O.) levels in Lake Wisconsin. To have a more complete understanding of the lake, readings were taken from under the ice (see Appendix A) in March 1994 at 1° C. The D. O. readings were in the 10-11 mg/L range in cold water except for a reading taken at 1 or 2 inches from the bottom sludge.

More extensive investigations of 20 discrete sites were conducted in August of 1994 and 1995 when water temperatures are likely to be the greatest. D. O. readings, temperature, and surface pH were recorded at each site.

During the 1995 study, a representative from M&H simultaneously conducted a parallel study from the same boat. The M&H data are not complete due to a malfunction of their D. O. meter. Their representative was present for the entire study. Both sets of data are presented in this report, along with the 1994 BAAP data.

The data are tabulated in Table 1, starting on page 2. Site description and conditions are listed in Table 2, starting on page 19.

DESCRIPTION OF PROJECT

Badger Army Ammunition Plant is submitting a WPDES wastewater permit for discharging all plant wastewaters into Lake Wisconsin. Regulations do not allow discharges to reduce receiving water levels below 5 mg/L. A 1992 Wisconsin Power and Light (WP&L) study, the Prairie du Sac Hydroelectric Project F. E. R. C. No. 11162-000, has reported Lake Wisconsin Dissolved Oxygen (D. O.) levels below 5.0 mg/L. The purpose of this paper is to report the D. O. levels in the same locations cited in the WP&L Report and at additional channel locations during late August of 1994 and 1995 when the D. O. levels should be at their lowest. An earlier study was done by Badger on 7 March 1994 through the ice (see Appendix A).

The studies of dissolved oxygen, pH and temperature were performed in August 1994 and 1995. The measurements were taken at 20 sites (see maps) from a boat equipped with a bottom-locating sonar *(Hummingbird Model 101 with in-hull mounted transducers)* and electric trolling motor. The 1995 readings include three testing sites below the dam *(see map, page 31)*. The area in which the measurements were to be taken was surveyed using the sonar in order to locate the deepest spot in a given area and to provide an indication of the bottom contour. This information was used to select the particular location for the measurements. The electric trolling motor was used to keep the boat in the proper location while taking measurements. To obtain the best depth vs. dissolved oxygen data, it was important to make sure the cord to the D. O. probe remained vertical. During measurements taken in the deep channel locations, the boat was allowed to drift downstream at the speed of the current in order to keep the probe cord vertical. This resulted in the readings being taken over an approximate 100 foot stretch of river.

The boat was launched at Moon Valley Public Boat Launch and traveled upstream to begin the study. When a location was selected, the surface pH was first measured. The D. O. probe was then lowered into the water in increments.

The data are reported in tables by site number as found on the accompanying maps. The map titled *"Local Features"* shows the entire Lake Wisconsin area and shows the overall location of each of the sites. The following enlarged area maps illustrate the exact location of the measurements at each of the north river area, central area, south area and dam areas of the lake.

An Omega Model PH-63 portable pH meter (see Appendix B) was used to directly measure the pH of the surface of the water. The meter was calibrated at pH 7 - 10 in the lab prior to leaving. The meter was recalibrated in the field after every five sites.

A YSI Model 51B Dissolved Oxygen Meter with a 50 foot cable attachment to the measurement probe was used to measure dissolved oxygen and temperature at the various depths (see Appendix C). The meter was calibrated for dissolved oxygen in the lab the morning of the sampling.

TABLE 1: DATA FROM LAKE WISCONSIN STUDIES

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
1	INTERSTATE BRIDGE	SURFACE	7.5	7.3	7.1	20.0	24.5	24.9	7.8	7.1
		1	7.7			20.0				
		2		7.2	7.1		25.0	25.0		
		3	7.5			20.0				
		4		7.3	7.0		25.0	25.0		
		5	7.8			20.0				
		6		7.2	6.9		25.0	25.0		
		7	7.7			20.0				
		8	7.7	7.2	6.9	20.0	25.0	25.0		
		10	7.7	7.1	6.7	20.0	25.0	25.0		
2	TIPPERARY POINT	SURFACE	7.8	7.1	6.9	20.0	25.0	25.0	7.8	7.1
		2	7.6	7.1	7.0	20.0	25.0	25.0		
		3	7.5			20.0				
		4		7.3	6.8		25.0	25.0		
		5	7.6			20.0				
		6		7.4	6.6		25.0	25.0		
		7	7.6			20.0				
		8	7.6	7.3	6.6	20.0	25.0	25.0		
		10	7.5	7.2	6.4	20.0	25.0	25.0		
		11	7.5			20.0				
		12		7.1	6.4		25.0	25.0		
		13	7.4			20.0				
		14		6.9	5.8		25.0	25.0		
		15	5.8	6.7		20.0	25.0			

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
3	STONERS BAY	SURFACE	9.0	7.2	6.8	20.0	25.0	25.0	8.2	7.0
		2	8.7	7.1	6.9	21.0	25.0	25.0		
		3	6.4			19.0				
		4	3.2	5.5	5.4	19.0	24.5	24.5		
		5		2.2			24.5			
4	WHALENS BAY	SURFACE	8.3	7.4	7.0	20.0	25.2	26.5	8.2	7.8
		2	8.0	6.9	6.8	21.0	26.0	26.0		
		3	7.5			20.0				
		4		3.8	3.8		24.1	24.0		
		5	5.8			20.0				
		6		2.3	2.4		23.5	23.5		
		7	2.2			18.0				
		8	1.8	1.6	2.1	18.0	23.0	23.5		
		9	1.7			18.0				
5	STICKY BAY	SURFACE	8.3	5.4	5.6	21.0	24.5	24.8	8.7	6.8
		2	8.2	5.3	5.5	21.0	24.5	24.8		
		3	8.2			21.0				
		4		4.8	5.3		24.3	24.8		
		5	7.5			21.0				
		6		4.4	4.9		24.1	24.5		
		7	6.5			21.0				
		8		0.8	3.2		24.1	24.5		

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
6	PINE BLUFF	SURFACE	6.4	7.5	7.6	22.0	25.8	25.9	8.2	7.2
		2	6.4	7.5	7.5	22.0	25.8	25.8		
		3	6.3			22.0				
		4		7.4	7.5		25.8	25.8		
		5	6.3			22.0				
		6		7.2	7.3		25.7	25.8		
		7	6.2			22.0				
		8	6.2	6.3	7.1	22.0	25.5	25.8		
		10	3.0	4.8	5.6	22.0	25.0	25.0		
		12		4.6	5.1		25.0	25.0		
		13			3.2			24.9		
7	OKEE BAY	SURFACE	7.9	12.0	11.8	20.0	25.2	25.8	8.4	7.7
		2	7.7	11.4	11.2	21.0	25.1	25.5		
		3	7.8			21.0				
		4		10.0	10.4		25.0	25.3		
		5	7.9			21.0				
		6		11.0	8.7		25.0	25.2		
		7	7.5			21.0				
		8	7.4	8.2	5.8	20.0	24.5	24.5		
		10	7.3	2.9	5.0	20.0	23.0	23.9		
		11	7.3			20.0				
		12		1.8	3.5		22.5	22.9		
		13	6.8			20.0				
		14		1.2	2.4		22.5	22.5		

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
8	MERRIMAC FERRY	SURFACE	6.3	8.4	8.4	22.0	26.0	26.1	8.1	7.5
		2	6.3	8.4	8.4	22.0	26.0	26.1		
		3	6.3			22.0				
		4		8.3	8.2		26.0	26.1		
		5	6.2			22.0				
		6		8.1	8.2		25.8	26.1		
		7	6.2			22.0				
		8	6.0	6.8	7.6	22.0	25.5	25.8		
		10	6.0	5.6	7.1	22.0	25.1	25.0		
		11	6.0			22.0				
		12		5.5	6.1		25.0	24.9		
		13	6.0			22.0				
		14		5.2	5.5		24.9	24.9		
		15	6.0			22.0				
		16	5.0	5.4	5.4	22.0	24.8	24.9		
		18		4.8	5.1		24.8	24.9		
		20		4.7	5.0		24.8	24.9		
		21		4.2	4.4		24.8	24.9		
9	SUNSET BAY	SURFACE	8.2	9.0	8.3	21.0	25.9	26.0	8.7	7.6
		2	8.0	8.4	8.3	22.0	25.8	26.0		
		3	7.8			22.0				
		4		8.0	8.0		25.5	25.8		
		5	6.6			22.0				
		6		7.1	7.4		25.1	25.2		
		8		6.4	6.0		25.0	24.9		
		9		0.5	4.5		24.4	24.5		

			UNITS: mg/L			degrees Celsius				
SITE	LOCATION	DEPTH (Ft.)	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
10	CHANNEL ACROSS	SURFACE	6.5	9.0	8.3	22.0	26.0	26.0	8.3	7.7
	FROM SUNSET BAY	2	6.5	8.9	8.3	22.0	26.0	26.0		
		3	6.4			22.0				
		4		8.7	8.4		26.0	26.0		
		5	6.4			22.0				
		6		8.5	8.3		25.2	25.9		
		7	6.4			22.0				
		8	6.3	5.7	6.5	22.0	25.0	25.1		
		10	6.4	5.4	6.0	22.0	25.0	25.0		
		11	6.4			22.0				
		12		5.2	5.6		25.0	25.0		
		13	6.4			22.0				
		14		5.0	5.4		25.0	25.0		
		15	6.3			22.0				
		16	6.1	4.9	5.2	22.0	25.0	25.0		
		18	5.0	4.9	5.2	22.0	25.0	25.0		
		20		4.9	5.1		25.0	25.0		
		22		4.4	1.8		25.0	24.9		
		23		0.7			25.0		8.4	8.0
11	MOON VALLEY BAY	SURFACE	7.5	10.2	10.3	22.0	26.5	26.5		
		2	7.3	8.9	10.5	22.0	26.6	26.6		
		3	7.3			22.0				
		4		8.9	10.2		26.7	26.6		
		5	7.2			22.0				
		6		9.9	10.0		26.4	26.5		
		7	7.1			22.0				
		8	7.1	9.7	9.8	22.0	26.2	26.3		
		10	6.0	8.8	9.4	22.0	26.2	26.2		
		12		2.9	6.2		25.1	25.9		
		14		1.9	3.6		24.8	25.0		
		15			2.5			24.9		

TABLE 1 (cont.)

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
12	WEIGAND'S BAY	SURFACE	7.6	9.5	8.5	22.0	26.4	26.5	8.6	7.8
		2	7.2	9.1	8.5	22.0	26.0	26.2		
		3	7.0			22.0				
		4		7.3	8.1		25.8	26.0		
		5	7.1			22.0				
		6		7.2	7.4		25.1	25.5		
		7	7.1			22.0				
		8	7.0	6.8	7.0	22.0	25.1	25.5		
		10	6.8	6.6	6.8	22.0	25.1	25.4		
		11	6.2			22.0				
		12		6.6	6.9		25.1	25.2		
		13	2.0			21.0				
		14		6.3	4.4		25.1	25.2		
		16		2.7	3.1		25.0	25.0		
		17			1.5			24.9		
		18		0.4			24.8			

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
13	CHANNEL OUT FROM WEIGAND'S BAY	SURFACE	5.6	8.9	8.8	22.0	26.0	26.2	8.2	7.6
		2	5.6	8.8	9.1	22.0	26.0	26.1		
		3	5.5			22.0				
		4		8.8	8.9		26.0	26.0		
		5	5.4			22.0				
		6		8.6	8.8		26.0	26.0		
		7	5.4			22.0				
		8	5.4	8.4	8.6	22.0	26.0	26.0		
		10	5.4	8.2	8.4	22.0	25.5	26.0		
		11	5.4			22.0				
		12		7.2	7.6		25.3	25.6		
		13	5.3			22.0				
		14		5.2	6.1		25.0	25.0		
		15	5.3			22.0				
		16	5.2	4.9	7.2	22.0	25.0	24.9		
		18	5.2	4.7	7.0	22.0	24.9	24.9		
		20	5.1	4.7	6.9	22.0	24.8	24.9		
		21	4.7			22.0				
		22		4.7	6.4		24.8	24.8		
		23	2.8			22.0				
		24	1.5	4.7	5.1	22.0	24.8	24.8		
		26		2.0	5.0		24.3	24.8		
		27		1.0	2.0		24.2	24.8		

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	*UNITS: mg/L* 94 BAAP	95 BAAP	95 M&H	*degrees Celsius* 94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
14	100 FEET UPSTREAM FROM IRM DISCHARGE	SURFACE	6.0			23.0			8.5	
		2	5.8			23.0				
		3	5.9			23.0				
		5	5.9			23.0				
		7	5.7			23.0				
		8	5.6			23.0				
		10	5.6			23.0				
		11	5.4			23.0				
		13	5.5			23.0				
		15	5.5			23.0				
		16	5.1			23.0				
		18	5.0			23.0				
		20	4.8			23.0				
		21	4.6			23.0				
		23	4.0			23.0				
		25	1.7			23.0				

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
14A	150 YARDS UPSTREAM FROM IRM DISCHARGE	SURFACE		9.1	9.1		26.0	26.2		7.6
		2		8.8	9.2		26.0	26.2		
		4		8.6	9.0		25.8	26.0		
		6		8.4	9.0		25.5	26.0		
		8		8.2	8.5		25.5	25.5		
		10		8.1	8.5		25.5	25.9		
		12		7.8	8.4		25.5	25.9		
		14		7.6	8.3		25.3	25.6		
		16		7.4	8.0		25.1	25.5		
		18		7.1	7.8		25.1	25.4		
		20		6.9	7.5		25.1	25.2		
		22		5.8	6.4		24.8	25.0		
		24		5.5	6.4		24.8	25.0		
		26		5.5	6.3		24.8	25.0		
		28		5.5	6.2		24.8	24.9		
		30		5.4	6.2		24.8	25.0		
		32		5.4	6.2		24.7	25.0		
		34		5.4	1.6		24.8	24.9		
		36		0.2	1.0		24.7	24.9		
		38			0.7			24.9		

TABLE 1 (Cont.)

SITE	LOCATION	DEPTH (Ft.)	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
15	IRM DISCHARGE SITE	SURFACE	6.5	9.0	8.2	23.0	25.1	26.2	8.5	7.6
		2	6.4	8.9	8.3	23.0	26.0	26.2		
		3	6.3			23.0				
		4		8.8	8.3		26.0	26.0		
		5	6.3			23.0				
		6		8.6	8.0		26.0	26.0		
		7	6.1			23.0				
		8	6.0	8.2	7.6	23.0	25.8	26.0		
		10	6.0	7.8	7.2	23.0	25.7	26.0		
		11	5.8			23.0				
		12		7.4	6.7		25.4			
		13	5.8			23.0				
		14		7.2	6.4		25.2			
		15	5.6			23.0				
		16	5.5	7.0	6.2	23.0	25.2			
		18	5.2	6.8	6.1	23.0	25.1			
		20	5.2	5.8	5.5	23.0	25.0			
		21	5.0			23.0				
		22		5.5	5.2		25.0			
		23	5.0			23.0				
		24		5.4	4.9		25.0			
		25	5.1			23.0				
		26	5.0	5.4	4.9	23.0	24.9			
		28	0.3	5.4	4.8	22.0	24.9			
		30	0.1	5.3	4.8	22.0	24.8			
		32		5.3	4.8		24.8			
		34		3.4	2.2		24.8			
		35		0.4	1.2		24.8			

TABLE 1 (Cont.)

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
16	IN CHANNEL, OUT FROM IRM DISCHARGE SITE	SURFACE	6.8	9.4	9.0	23.0	26.2	26.2	8.5	7.8
		2	6.7	9.2	9.1	23.0	26.2			
		3	6.7			23.0				
		4		9.2	9.0		26.1			
		5	6.5			23.0				
		6		9.0	8.8		26.0			
		7	6.5			23.0				
		8	6.3	8.8	8.6	23.0	26.0			
		10	5.9	8.5	8.4	23.0	26.0			
		11	6.0			23.0				
		12		8.6	8.2		25.9			
		13	5.8			23.0				
		14		5.3	6.5		24.9			
		15	5.8			23.0				
		16	5.8	5.2	6.0	23.0	24.6			
		18	5.7	5.1	5.2	23.0	24.5			
		20	5.2	5.0	5.2	23.0	24.6			
		21	5.3	5.0		23.0				
		22		5.0	5.1		24.6			
		23	5.3			23.0				
		24		5.0	5.0		24.6			
		25	5.3			23.0				
		26	4.2	4.9	5.0	22.0	24.6			
		28	3.4	0.2	5.0	22.0	24.6			
		29	2.0			22.0				
		30			1.4					
		32			0.8					

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
17	IN CHANNEL, OUT FROM GRUBERS GROVE	SURFACE	6.7	9.3		23.0	26.2		8.6	7.5
		2	6.7	9.2		23.0	26.2			
		3	6.7			23.0				
		4		8.9			26.2			
		5	6.3			23.0				
		6		9.0			26.0			
		7	6.2			23.0				
		8	6.2	8.5		23.0	26.0			
		10	6.2	8.2		23.0	26.0			
		11	6.2			23.0				
		12		8.4			24.8			
		13	6.2			23.0				
		14		8.0			24.8			
		15	6.2			23.0				
		16	5.3	5.9		23.0	25.0			
		18	5.3	5.6		23.0	24.9			
		20	5.2	5.3		23.0	24.9			
		21	5.2			23.0				
		22		5.3			24.9			
		23	5.2			22.0				
		24	3.1	5.3		22.0	24.8			
		26		5.2			24.9			
		28		5.2			24.9			
		29		0.3			24.8			

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
18	100 YARDS ABOVE DAM, WEST SIDE	SURFACE	7.2	9.0		23.0	26.5		8.6	NA
		2	7.2	8.7		23.0	26.2			
		3	7.2			23.0				
		4		8.6			26.0			
		5	7.1			23.0				
		6		8.3			26.0			
		7	6.8			23.0				
		8	6.7	8.2		23.0	26.0			
		10	6.4	8.0		23.0	26.0			
		11	6.4			23.0				
		12		6.6			25.2			
		13	6.3			23.0				
		14		6.3			25.1			
		15	6.3			23.0				
		16	6.2	6.0		23.0	25.0			
		18	6.2	5.2		23.0	25.0			
		20	6.1	5.1		23.0	25.0			
		21	6.1			23.0				
		22		5.2			24.9			
		23	6.1			23.0				
		24		5.2			24.9			
		25	6.1			23.0				
		26	6.0	5.1		23.0	24.9			
		28	6.0	5.1		23.0	24.9			
		30	5.7	5.1		23.0	24.9			
		31	5.2			23.0				
		32		5.1			24.9			
		33	4.5			22.0				
		34		5.1			24.9			
		36		4.9			24.9			
		38		0.4			24.8			

TABLE 1 (Cont.)

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
19	100 YARDS ABOVE DAM, CENTER	SURFACE	6.5	9.0		23.0	26.8		8.5	7.8
		2	6.4	9.8		23.0	26.8			
		3	6.4			23.0				
		4		9.4			26.8			
		5	6.2			23.0				
		6		9.4			26.5			
		7	6.2			23.0				
		8	6.1	9.2		23.0	26.0			
		10	6.0	5.2		23.0	25.1			
		11	6.0			23.0				
		12		4.0			25.0			
		13	6.0			23.0				
		14		3.9			24.9			
		15	6.0			23.0				
		16	5.8	4.0		23.0	24.8			
		18	5.9	4.0		23.0	24.8			
		20	5.9	4.0		23.0	24.8			
		21	6.0			23.0				
		22		4.0			24.9			
		23	6.0			23.0				
		24		4.1			24.8			
		25	3.5			22.0				
		26		4.1			24.8			
		28		4.0			24.8			
		30		4.1			24.8			
		32		4.1			24.8			
		34		0.6			24.8			

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
20	100 YARDS ABOVE DAM, EAST SIDE	SURFACE	6.4	9.8		23.0	26.9		8.5	6.7
		2	6.2	9.9		23.0	26.8			
		3	6.2			23.0				
		4		9.5			26.8			
		5	6.1			23.0				
		6		9.2			26.5			
		7	6.1			23.0				
		8	6.1	8.8		23.0	26.0			
		10	6.1	5.4		23.0	25.1			
		11	6.1			23.0				
		12		4.0			24.9			
		13	6.1			23.0				
		14		3.9			24.8			
		15	6.1			23.0				
		16	3.5	3.9		23.0	24.8			
		18		3.9			24.8			
		20		3.8			24.8			
		22		3.8			24.8			
		23		0.3			24.8			

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
A	200 YARDS BELOW DAM, WEST SIDE	SURFACE		7.2	7.4		25.9	24.5		7.5
		2		7.1	7.2		25.8	24.5		
		4		7.1	7.2		25.9	24.5		
		6		7.1	7.2		26.0	24.5		
		8		7.1	7.1		25.9	24.5		
		10		7.1			25.9			
		12		7.1			25.9			
		14		7.1			26.0			
		16		7.1			25.8			
		18		7.1			25.9			
		20		7.1			25.9			
		22		7.1			25.9			
		24		7.1			25.9			
		26		7.1			25.9			
		28		7.1			25.9			
		30		7.1			25.9			
		32		7.1			25.9			
		34		7.1			25.9			
		36		7.0			25.9			
		38		6.9			25.9			
		40		7.0			25.9			
		42		6.9			25.9			

APPENDIX B

APPENDIX C

TABLE 1 *(Cont.)*

SITE	LOCATION	DEPTH (Ft.)	D.O. LEVELS *UNITS: mg/L*			TEMPERATURES *degrees Celsius*			pH LEVELS	
			94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP	95 M&H	94 BAAP	95 BAAP
B	BELOW DAM , ABOVE BOAT RAMP	SURFACE		7.2	7.4		25.7	24.5		7.6
		2		7.1	7.2		25.8	24.5		
		4		7.1	7.2		25.8	24.5		
		6		7.1	7.2		25.8	24.5		
		8		7.1	7.1		25.8	24.5		
		10		7.1			25.8	24.5		
		12		7.1			25.8	24.5		
		14		6.7			25.8	24.5		
C	HIGHWAY 60 BRIDGE	SURFACE		7.2	7.2		25.1	24.5		7.5
		2		7.3	7.2		25.3	24.5		
		4		7.2	7.1		25.1	24.5		
		6		7.2	7.1		25.1	24.5		
		8		7.2	7.1		25.1	24.5		
		10		7.2			25.2			
		12		7.2			25.2			
		14		7.2			25.2			
		16		7.2			25.2			
		17		7.0			25.2			

SITE:	LOCATION:	
1.	INTERSTATE BRIDGE	**94 BAAP 8/31/94 10:00 a.m.** Observations at the time of sampling: Light rain and windy; temperature was approximately 60° F. The depth varied from 4-5 feet with the sampling location just below a center pylon being about 10 feet long. **95 BAAP 8/23/95 08:45 a.m.** Strong current held probe out at an angle. Actual depths are somewhat lower. **95 M&H 8/23/95 08:45 a.m.** Depth measurements not accurate due to high velocities.
2.	TIPPERARY POINT	**94 BAAP 8/31/94 10:22 a.m.** Strong north wind and rain. Measurements were taken in center of the mouth of the river between Tipperary Point and the area directly opposite Tipperary Point forming the mouth of the river. The sampling point was the approximate center of the channel near a channel marker. The average depth of the channel coming from the river and the sampling area was approximately 12-14 feet. **95 BAAP 8/23/95 9:20 a.m.** Partly cloudy, windy. Probe at slight angle due to current. **95 M&H 8/23/95 9:20 a.m.** Depth measurements not accurate due to white-cap waves and high velocities.
3.	STONERS BAY	**94 BAAP 8/31/94 10:40 a.m.** Strong winds prevailed but area was sheltered and the surface was very calm. The depths indicated in the WP&L Report were not found in the area. The lake area along the north shore forming the cove area was five feet deep. Upon entering Stoners Bay, the bay itself was full of lily pads in the back half. The opening of Stoners Bay was clear of vegetation and actually deeper than the adjacent cove which shallows to 2-3 feet. The readings were taken between the two small points defining Stoners Bay at approximately 4 feet. **95 BAAP 8/23/95 9:45 a.m.** Sunny, moderate breeze, ripple on water -- nearly calm. **95 M&H 8/23/95 9:45 a.m.** Shallow bay protected from the wind and current; slight ripple on the surface.

TABLE 2 *(Cont.)*

SITE:	LOCATION:	
4.	WHALENS BAY	**94 BAAP 8/31/94 11:01 a.m.** Strong northerly winds and rain. The road bridge over the access to the back of Whalens Bay and Rowan Creek did not have enough clearance to pass under. The lake side of Whalens Bay was shallow and averaged 3 feet deep with a creek channel coming from the road bridge which was about 9 feet near the bridge and gets shallower towards the lake. The sample point was the area immediately west of the road bridge in the creek channel. **95 BAAP 8/23/95 10:00 a.m.** Sunny and breezy. Water choppy. **95 M&H 8/23/95 10:00 a.m.** Profile location in front of the bridge along Whalen Grade. Somewhat protected from wind.
5.	STICKY BAY	**94 BAAP 8/31/94 11:23 a.m.** A very strong wind blowing from the north into Sticky Bay caused waves 2-2½ feet. The water was very dark and muddy. Upon leaving the channel and entering the bay, the water immediately shallowed to 7 feet. At the halfway point into the bay, the water was at a constant 6 feet. **95 BAAP 8/23/95 10:20 a.m.** Strong breeze, partly cloudy, lightly choppy. **95 M&H 8/23/95 10:20 a.m.** Appears to be little mixing/communication with the primary river flows.
6.	PINE BLUFF	**94 BAAP 8/31/94 11:36 a.m.** A strong wind was blowing into Pine Bluff, causing two-foot waves. The river channel flows along the face of Pine Bluff, so readings represent the channel as well as Pine Bluff. The area of the sampling, about 50 yards from Pine Bluff near the west end, averaged 12 feet deep on the sonar. The 0.5 meter increments are probably slightly longer than 0.5 meters. **95 BAAP 8/23/95 10:20 a.m.** Overcast, windy, choppy. **95 M&H 8/23/95 10:20 a.m.** Choppy waves, profile located in the main river channel.

SITE:	LOCATION:	
7.	OKEE BAY	**94 BAAP 8/31/94 11:53 a.m.** A strong wind was blowing into the bay. The sample readings were taken in the channel about 100 feet from the road bridge on the Okee side. The rest of Okee Bay was about 4-6 feet deep. The bay itself was calm. **95 BAAP 8/23/95 10:40 a.m.** D.O. calibration checked when results didn't compare. Air calibration: 8:1. Actual: 8:24. No meter adjustments made. Sunny, light breeze, ripple on water. **95 M&H 8/23/95 10:40 a.m.** Profile location on the inside of Okee Bay bridge, protected from wind. Re-calibrated the D.O. meter.
8.	MERRIMAC FERRY	**94 BAAP 8/31/94 1:05 p.m.** Windy and 1-1½ foot waves. The sample readings were taken in the center of the lake approximately 300 feet from the bridge at the deepest location found. **95 BAAP 8/23/95 12:30 p.m.** Sunny, windy, choppy. **95 M&H 8/23/95 12:30 p.m.** Depth measurements not accurate due to high velocities.
9.	SUNSET BAY	**94 BAAP 8/31/94 1:17 p.m.** The wind was blowing into the bay. The measurements were taken at the center of the back of the bay. **95 BAAP 8/23/95 12:50 p.m.** Breezy, overcast, light chop. **95 M&H 8/23/95 12:50 p.m.** Protected from the wind. Apparently little communication or mixing with the main river.

SITE:	LOCATION:	
10.	CHANNEL ACROSS FROM SUNSET BAY	**94 BAAP 8/31/94 2:08 p.m.** The measurements were taken from the channel out from the center of Sunset Bay one-third of the way across the lake from Sunset Bay. **95 BAAP 8/23/95 1:05 p.m.** Breezy, overcast, light chop. **95 M&H 8/23/95 1:05 p.m.** Choppy waves; profile located in the main river channel.
11.	MOON VALLEY BAY	**94 BAAP 8/31/94 1:30 p.m.** The bay was sheltered form the wind and was calm. The measurements were taken just south of the mouth of the back of the bay where the water was deeper. A "flat" is located in the mouth of the back of the bay, which is only about 5-6 feet deep. **95 BAAP 8/23/95 1:20 p.m.** Sunny, light breeze, ripple. **95 M&H 8/23/95 1:20 p.m.** Protected from the wind. A lot of boat traffic.
12.	WIEGANDS BAY (RIVER PUMP)	**94 BAAP 8/31/94 1:41 p.m.** The bay was sheltered from the wind. The measurements were taken approximately 200 feet off the river pumping station towards the body of the lake. **95 BAAP 8/23/95 1:40 p.m.** Sunny, calm, light ripple. **95 M&H 8/23/95 1:40 p.m.** *-- No comments provided --*
13.	MAIN CHANNEL OUT FROM WIEGANDS BAY	**94 BAAP 8/31/94 1:54 p.m.** The wind was not as strong as mid-morning, and the lake flows more north to south, so the wind is more down the lake. The measurements were taken at mid-lake, just below the south shore point. **95 BAAP 8/23/95 1:55 p.m.** *-- No comments provided --* **95 M&H 8/23/95 1:55 p.m.** Slight "chop" on the water. Suspect the D.O. meter is malfunctioning.

SITE:	LOCATION:
14.	100 FEET ABOVE IRM DISCHARGE SITE NEAR SHORE.....*(1994)*
14a.	150 YARDS UPSTREAM FROM IRM DISCHARGE.....*(1995)*

94 BAAP **8/31/94** **2:32 p.m.**
The measurements were taken approximately 100 feet above the discharge area at the end of the overhanging trees. The area is sheltered from the wind.

95 BAAP **8/23/95** **2:20 p.m.**
Sunny, breezy, light swell.

95 M&H **8/23/95** **2:20 p.m.**
About 30 yards out from the west riverbank. Ripple on the water's surface.

15. IRM DISCHARGE SITE

94 BAAP **8/31/94** **2:45 p.m.**
The measurements were taken approximately one-fourth of the way across the lake. A light north wind was blowing across and down the lake.

95 BAAP **8/23/95** **2:55 p.m.**
Sunny, light breeze, ripples.

95 M&H **8/23/95** **2:55 p.m.**
Due to equipment malfunction, temperature readings are not complete.

16. IN CHANNEL, OUT FROM IRM DISCHARGE

94 BAAP **8/31/94** **2:58 p.m.**
The wind was blowing down the lake and into the shore. The surface had six-inch waves.

95 BAAP **8/23/95** **3:20 p.m.**
Sunny, breezy, light swell.

95 M&H **8/23/95** **3:20 p.m.**
Due to equipment malfunction, temperature readings are not complete.

17. CHANNEL OUT FROM GRUBER'S GROVE

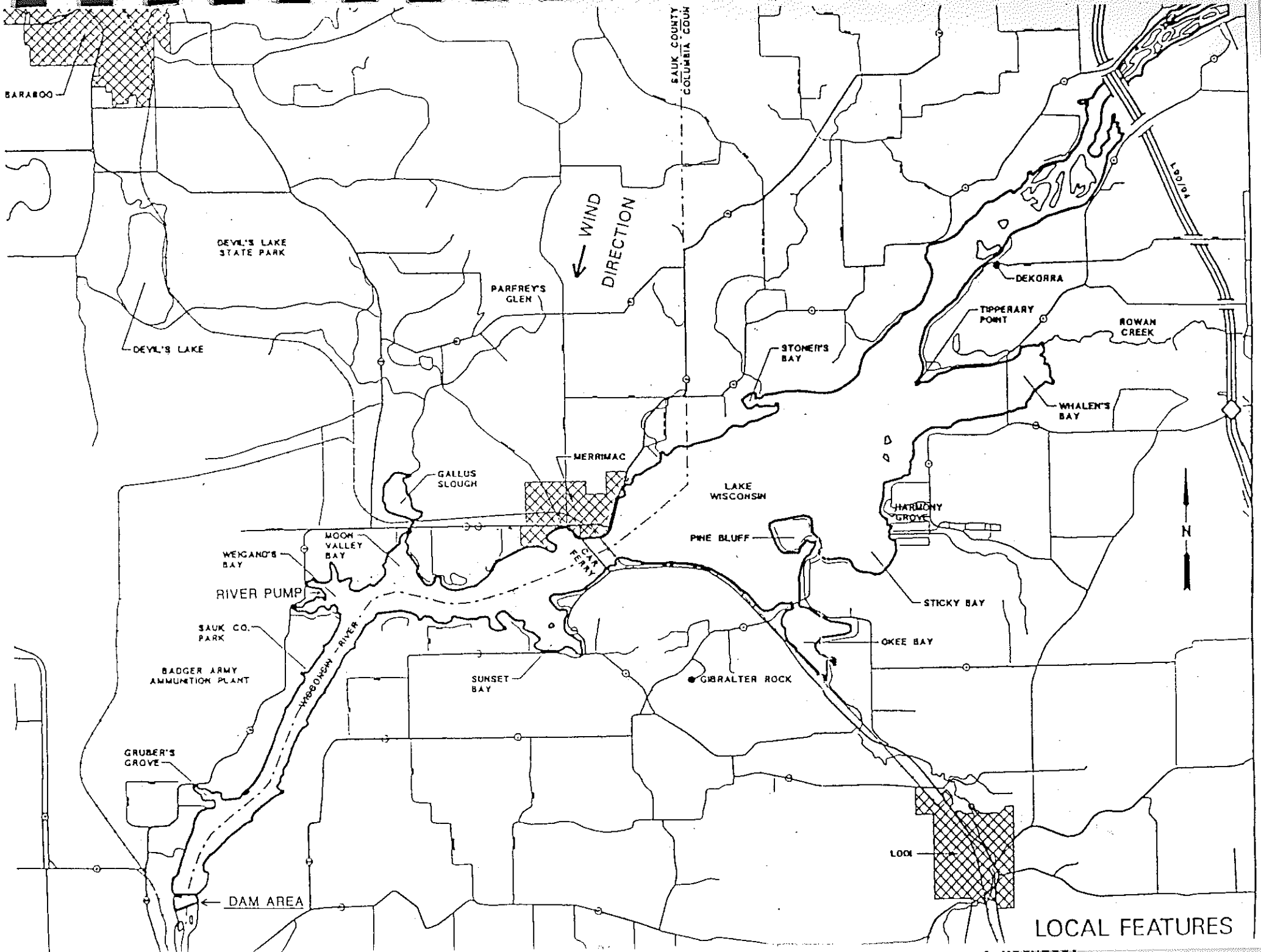
94 BAAP **8/31/94** **3:20 p.m.**
Measurements were taken from center of channel out from center of Gruber's Grove.

95 BAAP **8/23/95** **3:40 p.m.**
Sunny, breezy, smooth swells.

95 M&H **8/23/95** **3:40 p.m.**
-- No readings by M&H, due to equipment malfunction --

SITE:	LOCATION:	
18.	ABOVE DAM, 100 YARDS NORTH OF WP&L POWERHOUSE, WEST SIDE	**94 BAAP 8/31/94 3:36 p.m.** The wind was blowing into the dam and the lake had 1-1½ foot waves. **95 BAAP 8/23/95 4:35 p.m.** Sunny, calm. Cable at extreme angle. **95 M&H 8/23/95 4:35 p.m.** *-- No readings by M&H, due to equipment malfunction --*
19.	ABOVE DAM, CENTER	**94 BAAP 8/31/94 3:49 p.m.** The measurements were taken above power pole tower. The surface was choppy. **95 BAAP 8/23/95 4:20 p.m.** Sunny, calm. **95 M&H 8/23/95 4:20 p.m.** *-- No readings by M&H, due to equipment malfunction --*
20.	ABOVE DAM, EAST SIDE	**94 BAAP 8/31/94 3:55 p.m.** East end of the dam is not as deep as above the powerhouse. The water surface was choppy. The measurements were taken 100 feet above the southmost marker buoy. **95 BAAP 8/23/95 4:05 p.m.** Sunny, calm. **95 M&H 8/23/95 4:05 p.m.** *-- No readings taken by M&H, due to equipment malfunction --*
A.	100 YARDS BELOW DAM, WEST SIDE	**94 BAAP** *-- Not included in 1994 survey --* **95 BAAP 8/24/95 11:55 a.m.** Overcast; strong current, light breeze. Depth does not indicate actual depth due to the strong current. **95 M&H 8/24/95 11:55 a.m.** The D.O. meter cable only reached a depth of eight feet.

SITE:	LOCATION:	
B.	BELOW DAM, ABOVE BOAT RAMP	**94 BAAP** *-- Not included in 1994 survey --* **95 BAAP** **8/24/95** **12:15 p.m.** Overcast; calm, fairly strong current. **95 M&H** **8/24/95** **12:15 p.m.** The D.O. meter cable only reached a depth of eight feet.
C.	HIGHWAY 60 BRIDGE	**94 BAAP** *-- Not included in 1994 survey --* **95 BAAP** **8/24/95** **12:30 p.m.** Overcast; westerly breeze; water calm. **95 M&H** **8/24/95** **12:30 p.m.** The D.O. meter cable only reached a depth of eight feet.


BARABOO
SAUK COUNTY
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I-90/94
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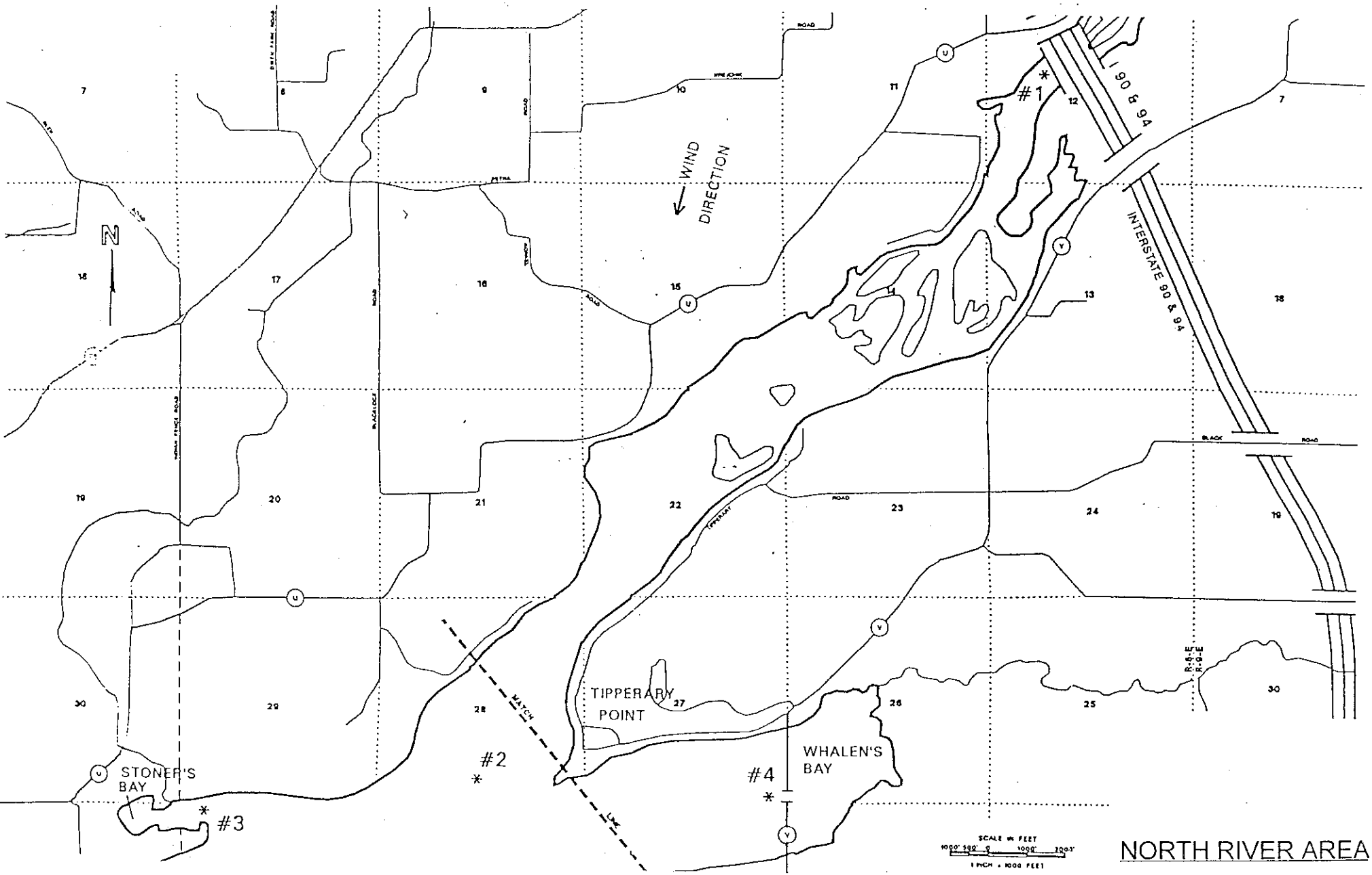
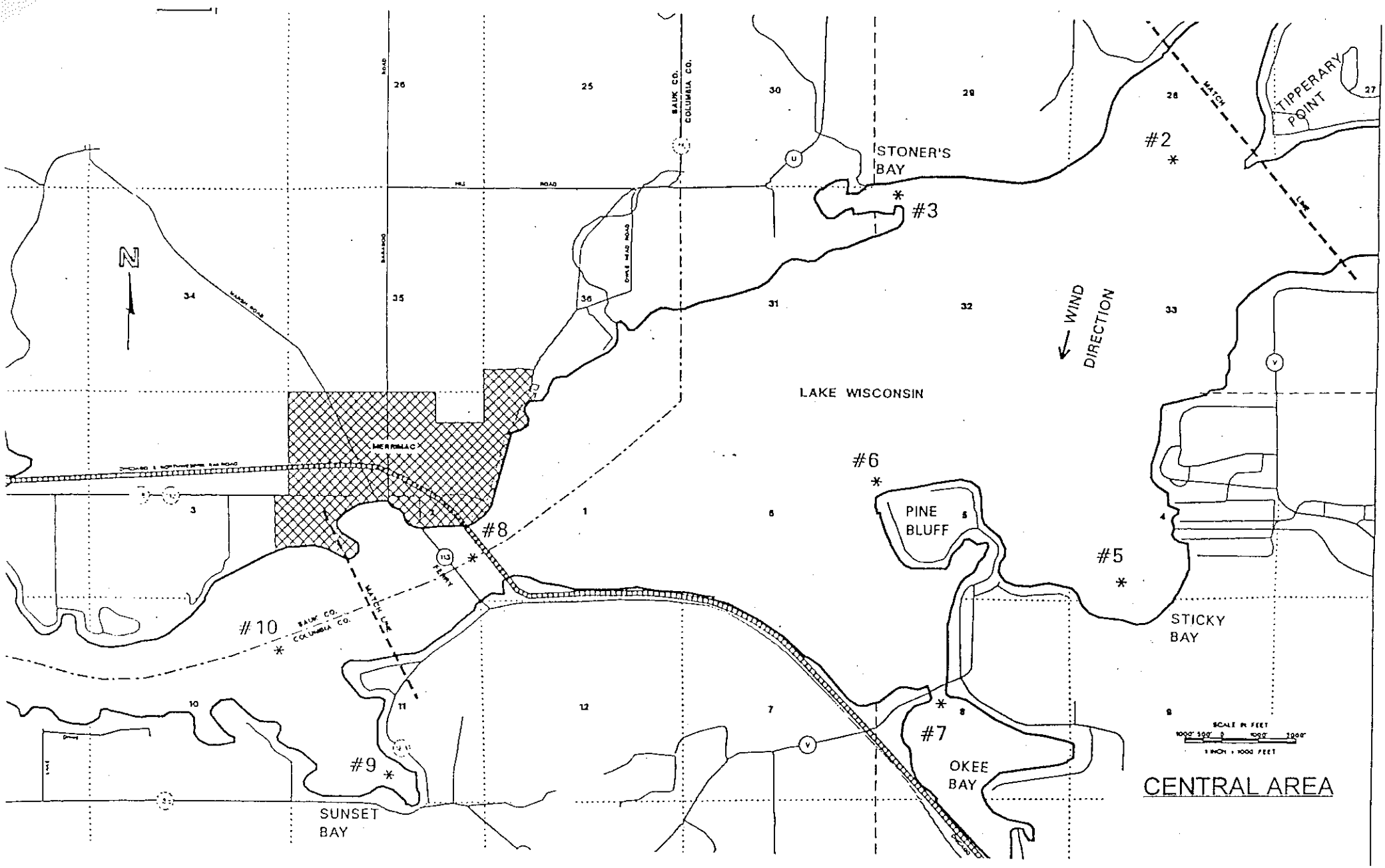
DEKORRA
TIPPERARY
POINT
ROWAN
CREEK
STONER'S
BAY
WHALEN'S
BAY
MERRIMAC
GALLUS
SLOUGH
LAKE
WISCONSIN
HARMONY
GROVE
PINE BLUFF
N
MOON
VALLEY
BAY
WEIGAND'S
BAY
CAR
FERRY
RIVER PUMP
STICKY BAY
SAUK CO.
PARK
OKEE BAY
BADGER ARMY
AMMUNITION PLANT
WISCONSIN RIVER
SUNSET
BAY
GIBRALTER ROCK
GRUBER'S
GROVE
LODI
DAM AREA
LOCAL FEATURES



NORTH RIVER AREA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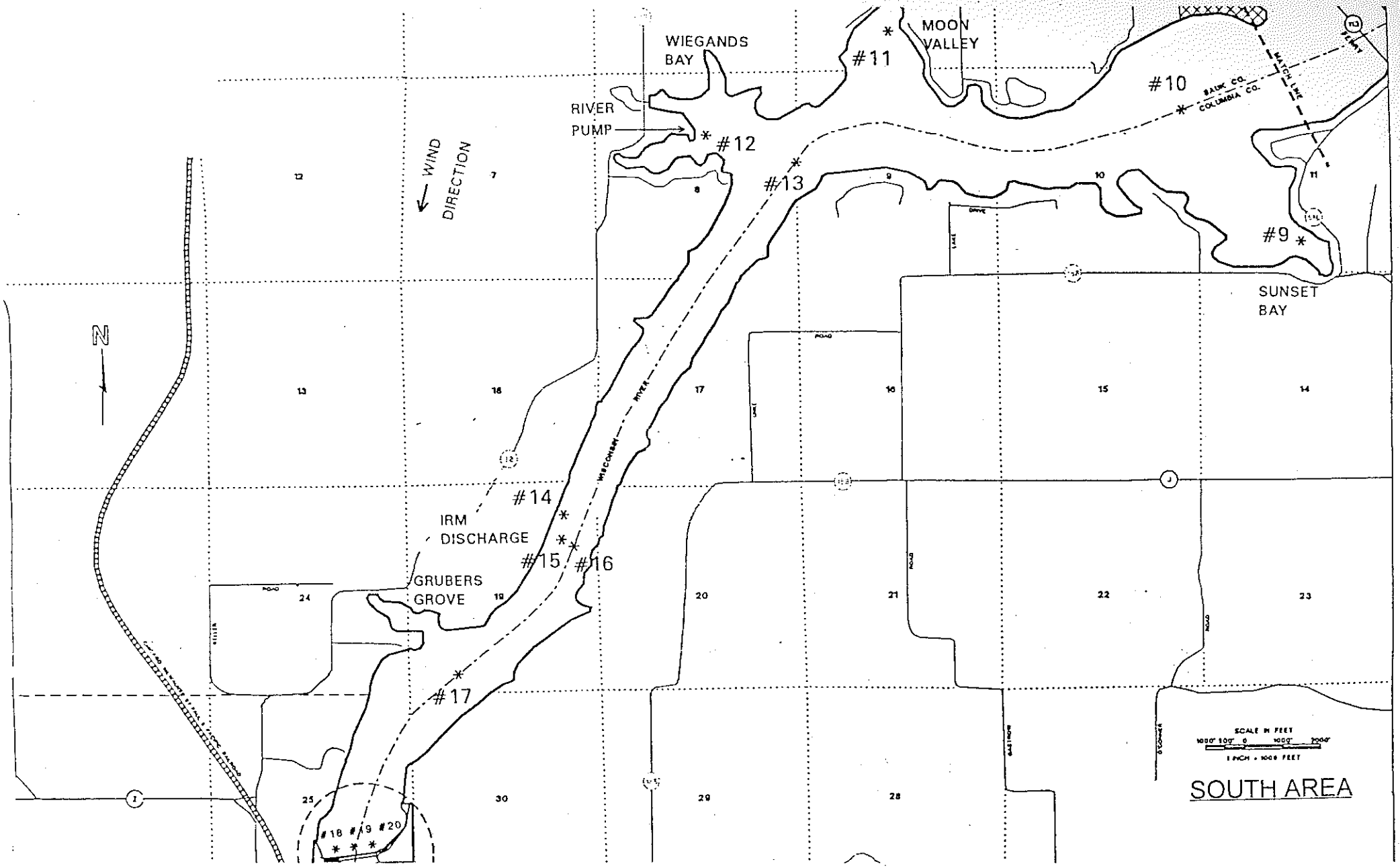
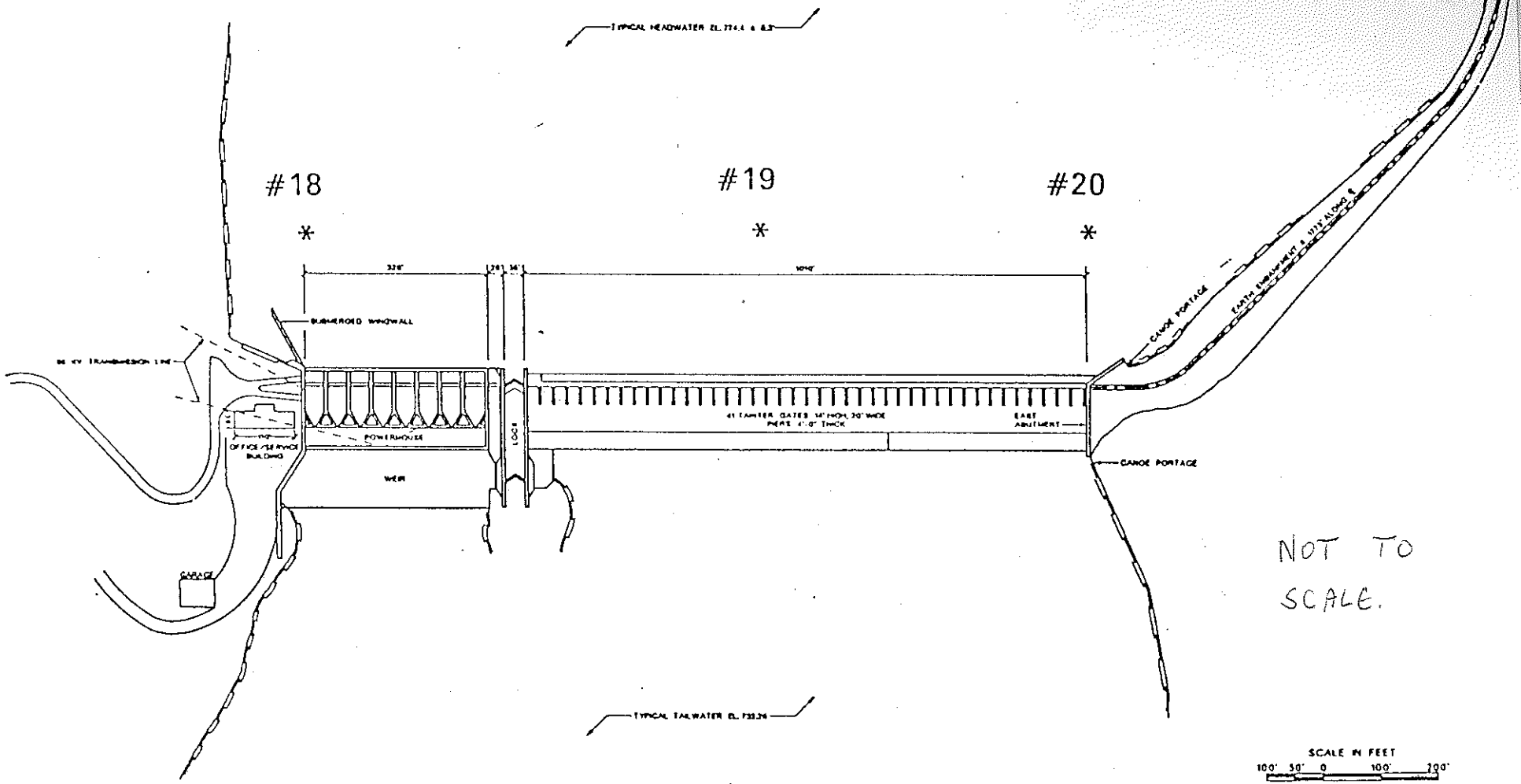
#3
#2
TIPPERARY POINT
MATCH LINE
WIND DIRECTION
LAKE WISCONSIN
#6
PINE BLUFF
#5
STICKY BAY
#8
#10
#7
OKEE BAY
#9
SUNSET BAY
CENTRAL AREA
SCALE IN FEET
1 INCH = 1000 FEET


WIEGANDS BAY
MOON VALLEY
#11
#10
#12
RIVER PUMP
WIND DIRECTION
#13
#9
SUNSET BAY
N
#14
IRM DISCHARGE
#15
#16
GRUBERS GROVE
#17
#18
#19
#20
SCALE IN FEET
SOUTH AREA

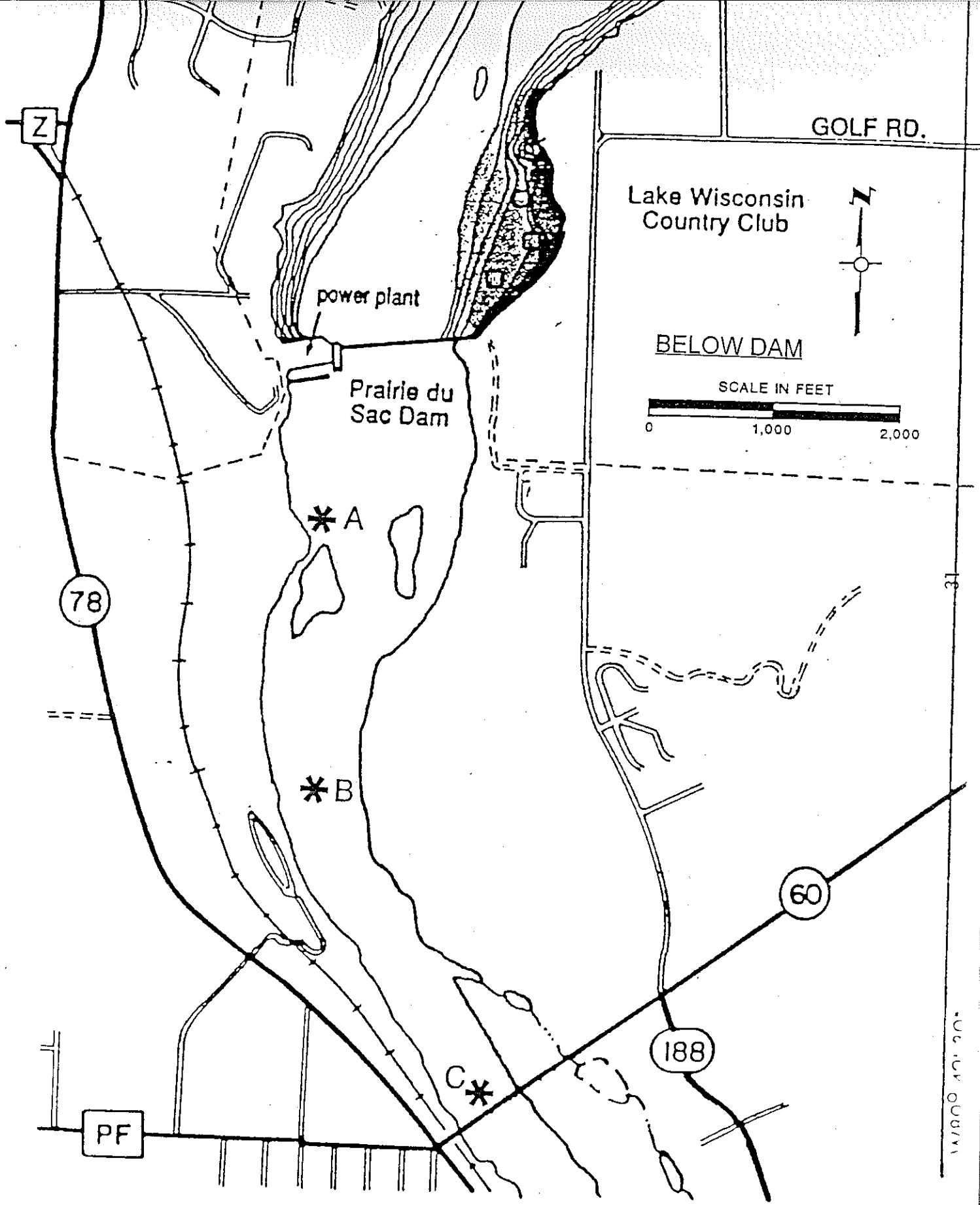
APPENDIX B

DAM AREA



DATUM USED FOR THESE DRAWINGS CORRESPONDS TO CURRENT U.S.G.S DATUM.

APPENDIX B



PRAIRIE du SAC

APPENDIX B

APPENDIX C

FORM OM-10000 REV. 961

APPENDIX A

INTER OFFICE MEMO Olin

TO L. M. UNVERZAGT AT

DATE 16 MARCH 1994

FROM G. K. SHALABI AT

COPY TO J. P. HANSEN
J. R. MATTEI
D. C. FORDHAM

SUBJECT DISSOLVED OXYGEN (D.O.) READINGS AT LAKE WISCONSIN

On the 7th of March 1994, dissolved oxygen (D.O.) readings were taken through the ice at three different locations on Lake Wisconsin, marked as locations # 1, # 2, and # 3 on the attached map. Six readings were taken at location # 1 and two readings each at locations # 2 and # 3. The temperature was also taken in all cases and in all cases was 1° Centigrade. The depth of water readings were started at the bottom of the ice layer and were recorded along with each dissolved oxygen reading as shown in the attached table.

Location # 1

Six holes starting at 30 and then 60, 90, 120, 150 and 270 feet from the bank were bored through the ice. The bores were parallel to the dam at approximately 300 yards away. The depth of the water ranged from 1 to 12 feet and D.O. readings taken ranged from 6.5 to 11.0 mg/L.

The lower D.O level of 6.5 mg/L was taken where the water was 1 foot deep at bore #1 and could be attributed to the biological activity in the sludge. See the table for the remaining results which are all above 10.4 mg/L.

Location # 2

The second location on the map was at Gruber's Grove Bay. The ice did not seem to be as solid as it was above the dam because of Badger's run off during the warm spell which was obvious during sample time. Two holes were bored as shown on the map, one at 30 feet and one at 60 feet from shore in the center directly south of Badger's effluent (See table for results).

Location # 3

The third location on the map was at Summer Oaks boat landing. Again two holes were bored. One at 30 feet from shore and the second at 60 feet (as shown on the map). The 60 foot bore was clearly in the river current (See table for results).

The D.O. level of an additional water sample taken from Summer Oaks boat landing and read at the laboratory on a different meter was 10.6 mg/L. The sample was taken 60 feet from the bank. A water sample taken from Summer Oaks boat landing on 12 January 1994 was 30 feet from the bank had a reading of 10.5 mg/L on the same laboratory meter.

Higher dissolved oxygen readings are normally experienced in the winter months when the water temperature has a higher capacity for dissolved oxygen. Additional readings will be taken during summer months when the water temperature is at its highest and has a lower capacity for dissolved oxygen.

G. K. SHALABI
Chief Engineer
Labs & Special Projects

GKS/asr
Attachments: as stated

16 March 1994

TABLE OF DISSOLVED OXYGEN READINGS AND LOCATIONS

LOCATION # 1 – 300 YARDS NORTH OF PRAIRIE DU SAC DAM

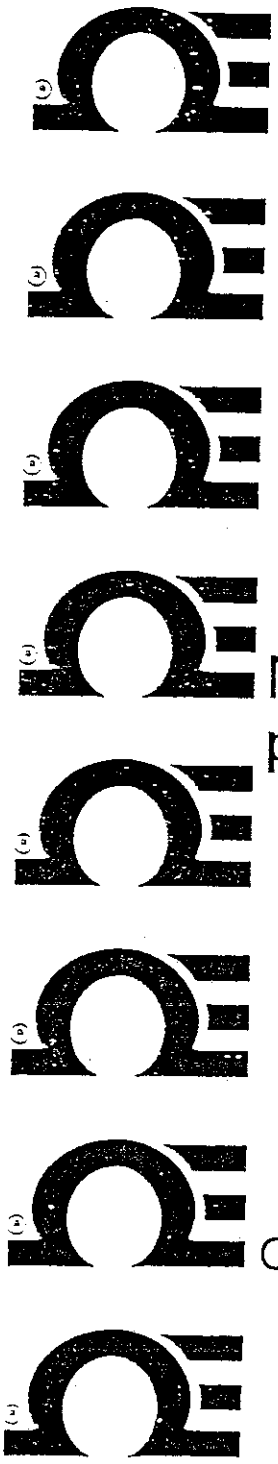
BORE #	DISTANCE FROM BANK Ft.	DEPTH OF READING Ft.	D.O. READING mg/L
1	30	Bottom of ice	6.5
	"	+ 1 ft. 2" off bottom	6.5
2	60	Bottom of ice	10.4
	"	+ 1 ft.	10.8
	"	+ 2 ft.	10.8
	"	Lake bottom	No Reading
3	90	Bottom of ice	10.9
	"	+ 1 ft.	10.9
	"	+ 2 ft.	10.9
	"	+ 3 ft. (2" off bottom)	10.9
4	120	Bottom if ice	10.9
	"	+ 1 ft.	10.9
	"	+ 2 ft.	10.9
	"	+ 3 ft.	10.9
	"	+ 4 ft. (2 " off bottom)	10.0
5	150	Bottom of ice	11.0
	"	+ 1 ft.	10.9
	"	+ 2 ft.	10.9
	"	+ 3 ft.	10.8
	"	+ 4 ft.	10.8
	"	+ 4.5 ft. (2 " off bottom)	10.4
6	270	Bottom of ice	11.0
	"	+ 1 ft.	10.8
	"	+ 2 ft.	10.8
	"	+ 3 ft.	10.8
	"	+ 4 ft.	10.8
	"	+ 5 ft.	10.8
	"	+ 6 ft.	10.8
	"	+ 7 ft.	10.7
	"	+ 8 ft.	10.7
	"	+ 9 ft.	10.7
	"	+ 10 ft.	10.8
	"	- 11 ft.	10.7
	"	- 12 ft. (2" off bottom)	10.7

LOCATION # 2 – GRUBER'S GROVE BAY DIRECTLY SOUTH OF BAAP EFFLUENT

BORE #	DISTANCE FROM BANK Ft.	DEPTH OF READING Ft.	D.O. READING mg/L
1	30	Bottom of ice	11.0
	"	+ 1 ft. (2" off bottom)	10.0
2	60	Bottom of ice	11.0
	"	+ 1 ft. (2" off bottom)	10.2

LOCATION # 3 – SUMMER OAKS BOAT LANDING

BORE #	DISTANCE FROM BANK Ft.	DEPTH OF READING Ft.	D.O. READING mg/L
1	30	Bottom of ice	10.8
	"	+ 1 ft.	10.7
	"	+ 2 ft.	10.7
	"	+ 3 ft.	10.7
	"	+ 4 ft.	10.7
	"	+ 5 ft.	10.8
	"	+ 5.5 ft.	Bottom - No Reading
2	60 River Current	Bottom of ice	10.9
	"	+ 1 ft.	10.8
	"	+ 2 ft.	10.8
	"	+ 3 ft.	10.8
	"	+ 4 ft.	10.8
	"	+ 5 ft.	10.8
	"	+ 6 ft.	10.8
	"	+ 7 ft.	10.7
	"	+ 8 ft.	10.7
	"	+ 9 ft.	10.7
	"	+ 10 ft.	10.8
	"	+ 11 ft.	10.7
	"	+ 12 ft.	10.7
	"	+ 12.5 ft.	Bottom – No Reading



OMEGA
ENGINEERING, INC.
An OMEGA Technologies Company

MODEL PHH-63
pH METER

Operator's Manual

4.2 CHARGING THE BATTERIES

The internal rechargeable batteries of the PHH-63 can be charged with a 115V or 230V adapter/charger. Check the label on the AC adapter/charger supplied with the instrument to make sure that the AC line voltage is correct. If the wrong AC adapter is supplied, notify OMEGA Customer Service Department at (203) 359-1660.

The instrument must be recharged once the LO BAT annunciator starts to flash. It can continue to operate when the batteries are being charged. If AC power is not available to charge the instrument, stop operation immediately to avoid measurement errors. Make sure that the LED lamp on the adapter/charger is on, indicating that the instrument is being charged.

When charging the instrument, pressing the CLEAR key will reset the microprocessor. This feature is used to bring the microprocessor up and running.

When the instrument is not in use, press the ON/OFF key to turn off the instrument. Unplugging the AC adapter/charger from the instrument or from the AC line does not turn off the instrument. The instrument will continue to operate on the internal batteries.

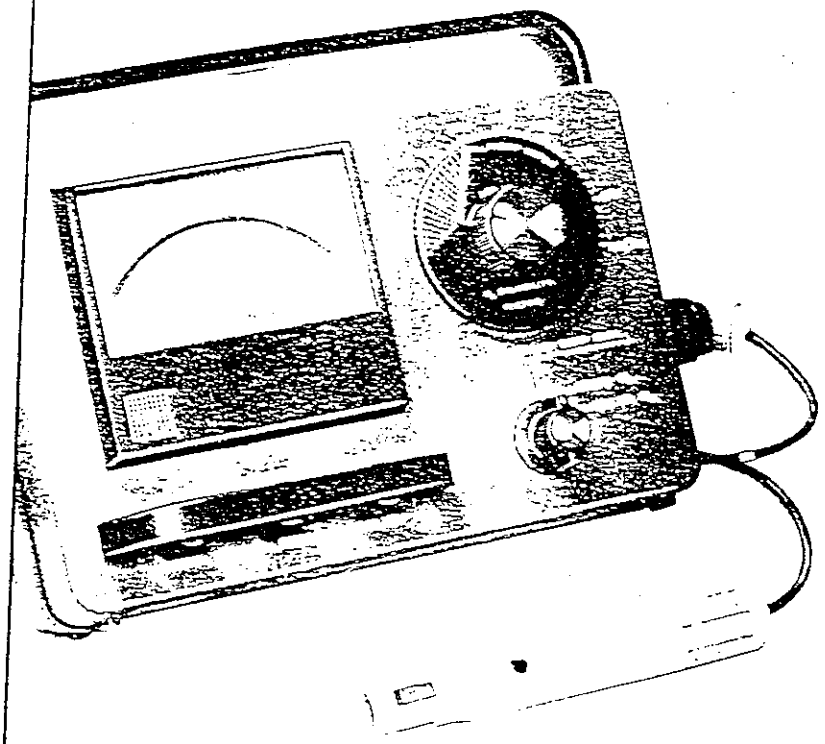
SECTION 5 SPECIFICATIONS

RANGE:	pH −2.00 to 16.00, mV ±999, temperature 0 to 99.9°C
RESOLUTION:	pH 0.01, mV 1, temperature 0.1°C
ACCURACY:	pH ±0.1%, mV ±0.1%, temperature ± 0.5°C
INPUT IMPEDANCE:	$> 10^{12}$ ohms
TEMPERATURE COMPENSATION:	Manual or automatic 0 to 99.9°C
CONNECTION:	"3 in 1" triaxial electrode connector (may be used BNC if provided adapter is used)
POWER:	Rechargeable batteries
DIMENSIONS:	6.7" x 3" x 1.2"
WEIGHT:	0.64 lb

APPENDIX C

YSI MODEL 51B

Dissolved Oxygen Meter Instructions



YSI Incorporated
Yellow Springs, Ohio 45387 USA

DESCRIPTION

The YSI Model 51B Dissolved Oxygen Meter is intended for dissolved oxygen and temperature measurement in water and wastewater applications, but is also suitable for use in certain other liquids. Dissolved Oxygen is indicated in mg/L (milligrams per liter) on a 0-15 mg/L scale. Temperature is indicated in °C on a -5° to +45°C scale. The dissolved oxygen range is automatically temperature compensated for permeability of the probe membrane, and manually by direct dial for changes in water temperature.

The probes use Clark-type membrane covered polarographic sensors with built-in thermistors for temperature measurement and compensation. A thin, permeable membrane stretched over the sensor isolates the sensor elements from the environment, but allows oxygen and certain other gases to enter. When a polarizing voltage is applied across the sensor, oxygen that has passed through the membrane reacts at the cathode, causing a current to flow.

The membrane passes oxygen at a rate proportional to the pressure difference across it. Since oxygen is rapidly consumed at the cathode, it can be assumed that the oxygen pressure inside the membrane is zero. Hence, the force causing the oxygen to diffuse through the membrane is proportional to the absolute pressure of oxygen outside the membrane. If the oxygen pressure increases, more oxygen diffuses through the membrane and more current flows through the sensor. A lower pressure results in less current.

SPECIFICATIONS

Oxygen Measurement

Range: 0-15 mg/L

Accuracy: Better than ±0.2 mg/L when calibrated within ±5°C of actual sample temperature.

Readability: Better than 0.1 mg/L

Temperature Measurement

Range: -5°C to +45°C

Accuracy: ±0.7°C, including probe

Readability: 0.25°C

Compensation

Temperature compensation for oxygen probe membrane coefficient is automatic.

Temperature compensation for oxygen solubility is manual by direct dial from 0°C to 45°C for fresh water and -5°C to +37°C for sea water.

Altitude compensation is manual by direct dial from 0 to 11,000 feet.

Salinity compensation is manual by direct dial from fresh water to sea water of 20,000 mg/L chloride concentration.

System Response Time

Typical response for temperature and DO readings is 90% in 10 seconds at constant temperature of 30°C.

DO response at low temperature and low DO is typically 90% in 30 seconds.

If response time under any operating conditions exceeds two minutes, probe service is needed.

Ambient Range

Satisfactory operation from -5°C to +45°C.

Power Supply

Power is supplied by four C size batteries, providing approximately 1000 hours of operation.

Calibration Tables

Table I shows the amount of oxygen in mg/L that is dissolved in air saturated fresh water at sea level (760 mmHg atmospheric pressure) as temperature varies from 0° to 45°C.

Table I - Solubility of Oxygen in Fresh Water

Temp °C	Solubility mg/L	Temp °C	Solubility mg/L	Temp °C	Solubility mg/L
0	14.62	17	9.67	34	7.07
1	14.22	18	9.47	35	6.95
2	13.83	19	9.28	36	6.84
3	13.46	20	9.09	37	6.73
4	13.11	21	8.92	38	6.62
5	12.77	22	8.74	39	6.52
6	12.45	23	8.58	40	6.41
7	12.14	24	8.42	41	8.31
8	11.84	25	8.26	42	6.21
9	11.56	26	8.11	43	6.12
10	11.29	27	7.97	44	6.02
11	11.03	28	7.83	45	5.93
12	10.78	29	7.69	46	5.84
13	10.54	30	7.56	47	5.74
14	10.31	31	7.43	48	5.65
15	10.08	32	7.31	49	5.56
16	9.87	33	7.18	50	5.47

Derived from 17th Edition, *Standard Methods for the Examination of Water and Wastewater.*

Table II shows the correction factor that should be used to compensate for the effects of variation in atmospheric pressure or altitude. Find true atmospheric pressure in the left hand column and read across to the right hand column to determine the correction factor. (Note that "true" atmospheric pressure is as read on a barometer. Weather Bureau reporting of atmospheric pressure is corrected to sea level.) If atmospheric pressure is unknown, the local altitude may be substituted. Select the altitude in the center column and read across to the right hand column for the correction factor.

Table II - Altitude Correction Factors

Pressure in inches Hg	mm Hg	kPa	Altitude in Feet	Meters	Correction Factor (%)
30.23	768	102.3	-276	-84	101
29.92	760	101.3	0	0	100
29.33	745	99.3	558	170	98
28.74	730	97.3	1126	343	96
28.11	714	95.2	1703	519	94
27.52	699	93.2	2290	698	92
26.93	684	91.2	2887	880	90
26.34	669	89.2	3496	1066	88
25.75	654	87.1	4115	1254	86
25.12	638	85.1	4747	1447	84
24.53	623	83.1	5391	1643	82
23.94	608	81.1	6047	1843	80
23.35	593	79.0	6717	2047	78
22.76	578	77.0	7401	2256	76
22.13	562	75.0	8100	2469	74
21.54	547	73.0	8815	2687	72
20.94	532	70.9	9545	2909	70
20.35	517	68.9	10293	3137	68
19.76	502	66.9	11058	3371	66

The temperature/solubility relationship of oxygen in sea water is not the same as that in fresh water.. Oxygen solubility in sea water is shown in Table III.

Table III - Solubility of Oxygen in Sea Water

(Chloride concentration 20,000 mg/L)

Temp. °C	Solubility mg/L	Temp. °C	Solubility mg/L	Temp. °C	Solubility mg/L
0	11.41	11	8.77	21	7.20
1	11.11	12	8.58	22	7.07
2	10.83	13	8.41	23	6.95
3	10.56	14	8.24	24	6.83
4	10.30	15	8.07	25	6.71
5	10.05	16	7.91	26	6.60
6	9.82	17	7.78	27	6.49
7	9.59	18	7.61	28	6.38
8	9.37	19	7.47	29	6.28
9	9.16	20	7.33	30	6.18
10	8.96				

Derived from 15th Edition, *Standard Methods for the Examination of Water and Wastewater.*

PACKING LIST

YSI MODEL 5739

DISSOLVED OXYGEN PROBE

ITEM NUMBER	QUANTITY	ITEM DESCRIPTION
057087	1	5739 DISSOLVED OXYGEN PROBE
098094	1	5775 MEMBRANE KCl KIT
077000	1	AIR SAMPLER (BOTTLE)
004506	1	CAUTION LABEL
004483	1	5700 INSTRUCTION SHEET
062091	1	CLEANING CERTIFICATE
005130	1	WARRANTY CARD
065699	1	O-RING/DIAPHRAGM PACK
057085	1	PROBE GUARD
065524	1	PACKING LIST
070056	1	DARK ANODE SHEET

Yellow Springs Instrument Co., Inc.
Yellow Springs, Ohio 45387 USA • Phone 513 767-7241 • 800 343-HELP • Fax 513 767-9353 • Telex 205437