CORRESPONDENCE/MEMORANDUM — State of Wisconsin

DATE: January 27, 1997 FILE REF: 3200

TO: Mike Berger - STS

FROM: Tom Janisch - WT/2 Tom Janisch

SUBJECT: Update of 1996 WDNR Sampling Of Kewaunee Marsh

We recently received results back from the SLOH where we had multiple parameter analysis (As, Al, Ca, Fe, Mg, and S) done on some of our samples from Kewaunee Marsh. I thought it would be a good time to summarize the sample data to date. The enclosed tables and figures summarize the 1996 sampling results for the various media. Each media that was sampled has a separate map figure that shows the sampling locations for that media. The base map used was traced from a map that has some but not all of the sampling sites correctly geographically located based on surveying in the sites. The table and figure numbers should correspond, e.g. the groundwater well locations that are shown on Figure 1 has the groundwater data summarized in Table 1.

I've placed on the maps an estimate of the locations of what I identify as the north and south sloughs. These are channels that originate in the wetland, generally to the west of the cyclone fence, and connect to the river to the east. They flow through the natural berm along the river made up of deposited material from the river overflow. The channel sizes are exaggerated on the map.

Although I have included figures for the location of our light traps along the edges of the capped area (Figure 6) used to collect invertebrates on the wing, and the small mammal traplines (Figure 7), we have not received analytical results back for tissue analysis for arsenic for either of these to date. We also need to have the results of our toxicity testing conducted on the soil and water samples collected earlier in the year evaluated for statistical significance.

The next step will be to start evaluating the collected data in an ecological context and to prepare a report. While doing this we will also get an idea of any additional data we may need and arrange for the sampling in the next work season.

We are in receipt of the preliminary *Geotrans, Inc.* groundwater modeling effort that they provided to you on Oct. 10, 1996. Ultimately, this effort will be an important component in evaluating the interim status of the capping project. Jim Killian of our office has been in contact with Jim Erickson of *GeoTrans* in regard to our site surveying and groundwater table elevation readings in all of the wells.

e should possibly think about setting up a meeting to discuss all the results collected to date and the groundwater modeling effort. If there is additional input data needed for the model, we could possibly include it in any sampling we do this coming summer.

Please call me if you have any comments or questions on the above.

cc: Lee Liebenstein - WT/2
Bob Strous - RR/3
Jim Killian - WT/2
Jim Reyburn - NE/Green Bay

Table 1. Arsenic Concentration In Groundwater Well Samples From Kewaunee Marsh

Sample No.	ug/L	Filtered/ Unfiltered	Sample Date	Comments
GW01	0.9	Filtered	04-08-96	South of RR
GW02	0.9	Filtered	04-08-96	South of RR
GW03	0.9	Filtered	04-08-96	South of RR
GW04	------	No Refill	04-08-96	South of RR
GW05-01	60	Filtered	05-21/22-96	South of RR
GW06-01	89	Filtered	05-21/22-96	North of Cap
GW06-02	220	Unfiltered	05-21/22-96	As above
GW07-01	91[1]	Filtered	05-21/22-96	NE of Cap
GW07-02	65	Filtered	05-21/22-96	As above
GW08-01	310[2]	Filtered	05-21/22-96	East of Cap
GW08-02	220[2]	Unfiltered	05-21/22-96	As above
GW09-01	28	Filtered	05-21/22-96	SE of Cap
GW10-01	310	Filtered	05-21/22-96	South of Cap
GW11-01	0.7[1]	Filtered	05-21/22-96	South of RR
GW12	------	------	------	S of RR GW Elevation
GW13	------	------	------	S of RR GW Elevation
GW14	------	------	------	S of RR GW Elevation
GW15	------	------	------	S of RR GW Elevation

1. Lab Sheets for Al, Ca, Fe, Mg, and S results in these samples is attached.
2. Apparent anomaly where filtered arsenic concentration in GW08 is greater than unfiltered concentration.

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMGW07-01 | County # 31 | Route Code WR00

Sample Location KEWAUNEE MARSH KMGW07-01

Start Date 052296 (MM DD YY) Time 1045 (HH MM) | End Date 000000 (MM DD YY) Time (HH MM)

Description ~~BETWEEN INNER & OUTER FENCE BETWEEN PONDS 12 & 6~~

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE MW
SAMPLE TYPE
MISC. CODES

Account Number WR282

LAB COMM.

Collected By ~~RUPPEL/JANISCH~~

~~REPORTED: 121796 LABSLIP- IC029296~~

Parameter	Result	
2 ALUMINUM DISSOLVED, ICP	ND	UG/L
1 ARSENIC DISS, AA FURNACE,	91.	UG/L
1 CALCIUM DISSOLVED, ICP	100.	MG/L
1 IRON DISSOLVED, ICP	2.2	MG/L
1 MAGNESIUM DISSOLVED, ICP	40.	MG/L
1 SULFUR	0.9	MG/L

INORGANIC

DEPARTMENT OF NATURAL RESOURCES

Labslip 12-92

ID Number | Point/Well# | Field No. KMGW11-01 | County # 31 | Route Code WR00

Sample Location: KEWAUNEE MARSH KWGW11

Start Date: 052196 (MM DD YY) Time: 1850 (HR MM)

End Date: 052196 (MM DD YY) Time: 1900 (HR MM)

Description: SOUTH OF RR TRACKS 100FT WEST OF RIVER 150FT

Send Report To:

JIM RUPPEL
DNR
MADISON

SOURCE CODE MW
SAMPLE TYPE
MISC. CODES

Account Number: WR282

LAB COMM.

Collected By: RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029302

Parameter	Result	
2 ALUMINUM DISSOLVED, ICP	ND	UG/L
3 ARSENIC DISS, AA FURNACE,	0.7	UG/L
1 CALCIUM DISSOLVED, ICP	92.	MG/L
1 IRON DISSOLVED, ICP	2.7	MG/L
1 MAGNESIUM DISSOLVED, ICP	32.	MG/L
1 SULFUR	0.8	MG/L

FIGURE 1. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

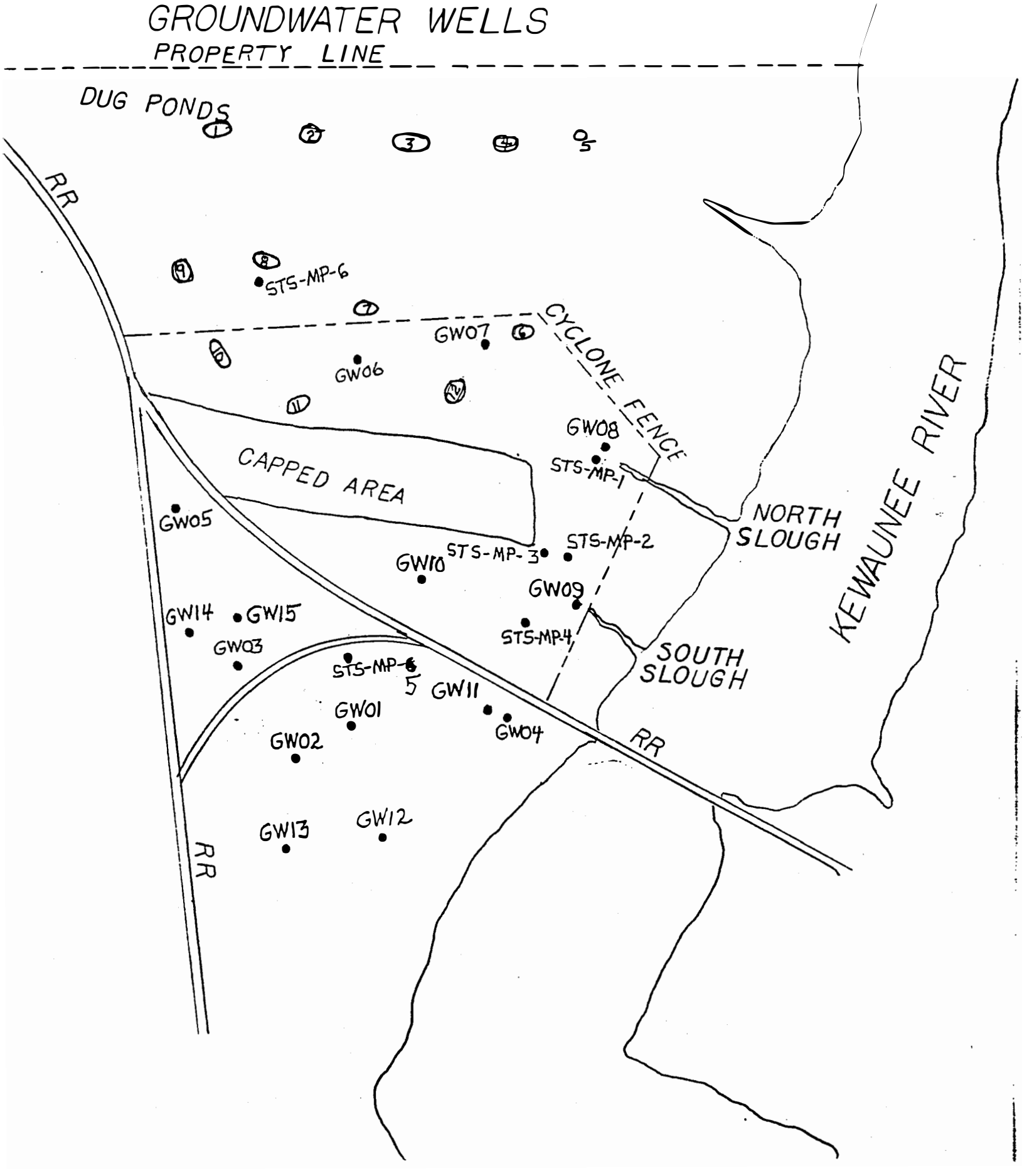

Table 2. Arsenic Concentrations In Surface Water Samples From Kewaunee Marsh

Sample Number	ug/L[1]	Sample Date	Comments
SW01-01	1.5	05-21/22-96	Pond 1
SW02-01	180	05-21/22-96	South of RR
SW03-01	360	05-21/22-96	Pond 10
SW04-01	2.4	05-21/22-96	River South of RR
SWSHK-4	8,100	04-08-96	SW of Cap
SW05-01	76	09-11-96	N Slough to River
SW06-01	60	09-11-96	Pond 6
SW07-01	110	09-11-96	Pond 7
SW08-01	4.6	09-11-96	S Slough to River
WT01-01	1.0	05-21/22-96	Tox Test Reference Site
WT02-01	8,300	05-21/22-96	Tox Test SW of Cap
WT03-01	1,400	05-21/22-96	Tox Test South of Cap
WT04-01	2,400	05-21/22-96	Tox Test SE of Cap
WT05-01	430	05-21/22-96	Tox Test S Slough to River
WT06-01	37	05-21/22-96	Tox Test South of RR

1. All surface water samples unfiltered prior to analysis.

FIGURE 2. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

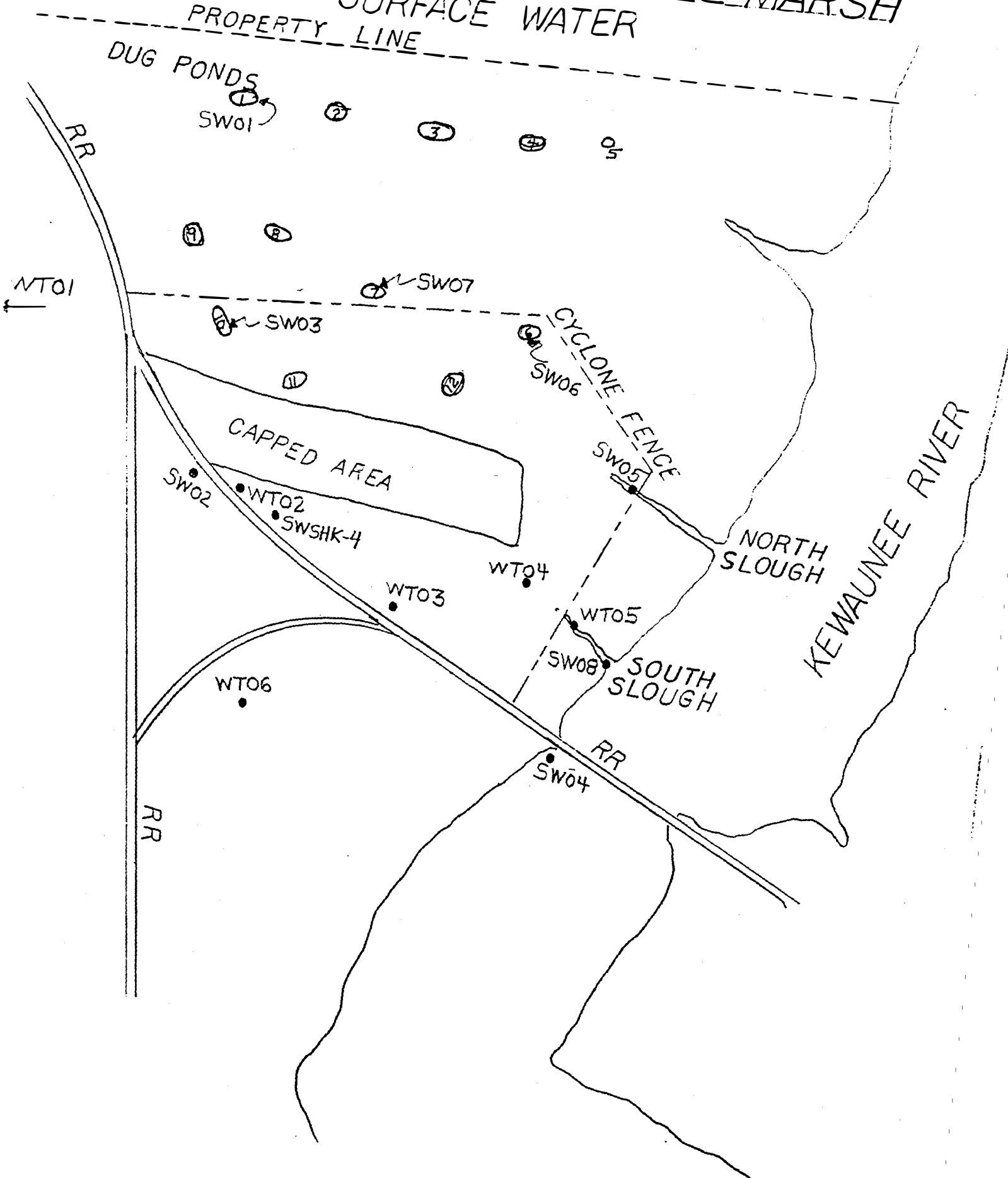

Table 3. Arsenic Concentrations In Kewaunee Marsh Soil/Sediment Samples[2].

Sample Number	mg/kg (dry Wt.)	Sample Date	Comments
S001-01	219.1	05-21/22-96	NW Capped Area
S002-01	39.2	05-21/22-96	NW Capped Area
S003-01	42	05-21/22-96	N of Capped Area
S004-01	22.2	05-21/22-96	NE Capped Area
S005-01	145.9[1]	05-21/22-96	W of Capped Area
S006-01	204.1[1]	05-21/22-96	W of Capped Area
S007-01	72.4[1]	05-21/22-96	SE Capped Area
S008-01	6.1	05-21/22-96	South of RR
S008-02	2.8	05-21/22-96	South of RR
S009-01	8.3	05-21/22-96	South of RR
S010-01	35.3[1]	05-21/22-96	South of RR
S011-01	239.2	05-21/22-96	SE Capped Area
S012-01	12.17	09-10-96	River Core
S012-02	9.35	09-10-96	River Core
S012-03	4.16	09-10-96	River Core
S013-01	692	09-11-96	"Hot" Se Area
S014-01	685	09-11-96	"Hot" Ct Area
S015-01	4.29	09-11-96	Reference Site
ST01	2.6	05-21/22-96	Soil Tox. Tests Reference Site
ST02	150	05-21/22-96	Soil Tox. Tests
ST03	220	05-21/22-96	Soil Tox Tests
ST04	220	05-21/22-96	Soil Tox Tests
ST05	67	05-21/22-96	Soil Tox Tests
ST06	2.2	05-21/22-96	Soil Tox Tests S of RR

1. Lab sheets for Al, Ca, Fe, Mg, and S results in these samples attached.
2. Soils sampled to a depth of 10 inches, composite of several shovel cores.

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMS005-01 | County # 31 | Route Code WR00

Sample Location: KEWAUNEE MARSH KMS005

Start Date: 052296 (MM DD YY) Time: 1030 (HR MM) | End Date: 000000 (MM DD YY) Time: (HH MM)

Description: NE CORNER INSIDE CHAIN LINK FENCE

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number: WR282

LAB COMM.

Collected By: RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029262

Parameter	Result	
1 ALUMINUM, ICP, DRY WT	3300.	MG/KG
1 ARSENIC, AA FURNACE, DRY	145.9	MG/KG
1 CALCIUM DRY WT, ICP	22000.	MG/KG
1 IRON DRY WT, ICP	5400.	MG/KG
1 MAGNESIUM, ICP, DRY WT	3400.	MG/KG
0 SULFUR ICP DRY WEIGHT	*5581	MG/KG

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMS006-01 | County # 31 | Route Code WR00

Sample Location: KEWAUNEE MARSH KMS006

Start Date: 052296 (MM DD YY) Time: 0900 (HH MM) | End Date: 000000 (MM DD YY) Time: (HH MM)

Description: INSIDE CHAIN LINK FENCE CLOSEST TO RIVERSIDE OF FENCED AREA

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number: WR282

LAB COMM.

Collected By: RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029263

	Parameter	Result	
1	ALUMINUM, ICP, DRY WT	3100.	MG/KG
1	ARSENIC, AA FURNACE, DRY	204.1	MG/KG
1	CALCIUM DRY WT, ICP	21000.	MG/KG
1	IRON DRY WT, ICP	5100.	MG/KG
1	MAGNESIUM, ICP, DRY WT	3500.	MG/KG
0	SULFUR ICP DRY WEIGHT	*5539	MG/KG

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/ Well# | Field No. KMS007-01 | County # 31 | Route Code WR00

Sample Location KEWAUNEE MARSH KMS007

Start Date 052296 (MM DD YY) Time 1000 (HH MM) | End Date 000000 (MM DD YY) Time (HH MM)

Description SOUTHEAST CORNER INSIDE CHAIN LINK FENCE

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number WR282

LAB COMM.

Collected By RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029264

Parameter	Result	
1 ALUMINUM, ICP, DRY WT	4300.	MG/KG
1 ARSENIC, AA FURNACE, DRY	72.4	MG/KG
1 CALCIUM DRY WT, ICP	23000.	MG/KG
1 IRON DRY WT, ICP	6400.	MG/KG
1 MAGNESIUM, ICP, DRY WT	3500.	MG/KG
0 SULFUR ICP DRY WEIGHT	*5713	MG/KG

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMS010-01 | County # 31 | Route Code WR00

Sample Location KEWAUNEE MARSH KMS010

Start Date 052196 (MM DD YY) Time 1652 (HR MM) | End Date 000000 (MM DD YY) Time (HH MM)

Description INSIDE CORNER BETWEEN RR TRACKS AND SPUR

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number WR282

LAB COMM.

Collected By RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029268

Parameter	Result	
1 ALUMINUM, ICP, DRY WT	2100.	MG/KG
1 ARSENIC, AA FURNACE, DRY	35.3	MG/KG
1 CALCIUM DRY WT, ICP	40000.	MG/KG
1 IRON DRY WT, ICP	4900.	MG/KG
1 MAGNESIUM, ICP, DRY WT	4100.	MG/KG
0 SULFUR ICP DRY WEIGHT	*4118	MG/KG

FIGURE 3. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

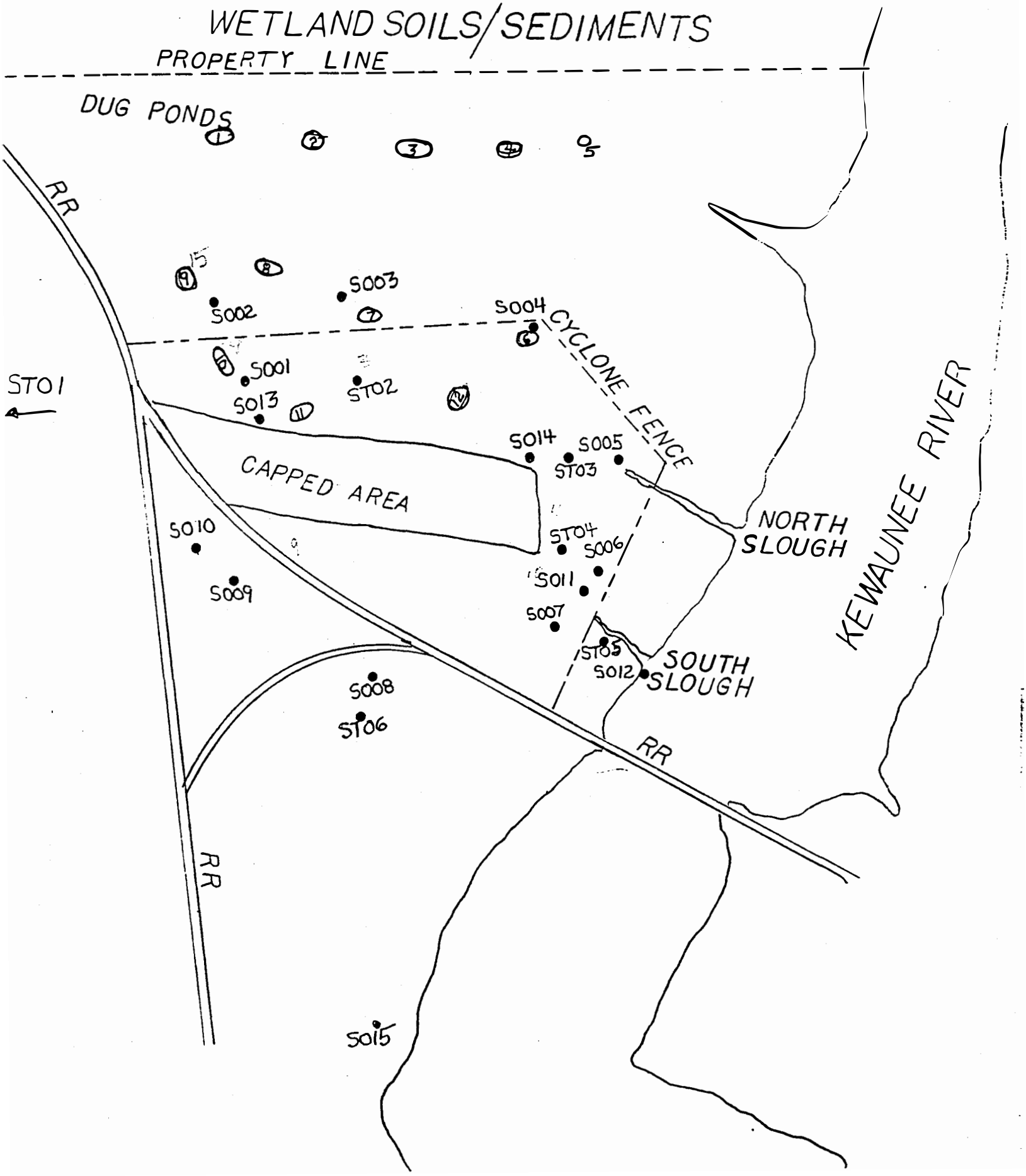

Table 4A. Arsenic Concentrations In the Water Collected From Dug Pits On the Kewaunee Marsh

Sample Number	ug/L	Filtered/Unfiltered	Associated Pit Soil As Concentration mg/kg	Comments
PW01-01	7.6	Unfiltered 05-21-96	5.4	South of RR
PW01-02	1.4	Filtered 05-21-96	------	
PW01-03	1.6	Unfiltered 05-23-96	------	Sampled 2 Days Later
PW02-01	8,500	Unfiltered 05-21-96	427	S of Capped Area
PW02-02	9,900	Unfiltered 05-23-96	------	Sampled 2 Days Later
PW03-01	2,400[1]	Unfiltered 05-22-96	63	NE of Capped Area
PW03-02	1,900	Filtered 05-22-96	------	
PW03-03	3,000	Unfiltered 05-23-96	------	
PW04-01	3.7	Unfiltered 09-11-96	4.29 @S015-01	Reference Site South of RR

1. Lab Sheet for Al, Ca, Fe, Mg, and S results for this sample is attached.

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMPW03-01 | County # 31 | Route Code WR00

Sample Location: KEWAUNEE MARSH KMPW03

Start Date (MM DD YY): 052296 Time (HH MM): 1115

End Date (MM DD YY): 000000 Time (HH MM):

Description: BTWN PONDS 12 & 6 BEWTEEN CHAIN LINK & SNOW FENCE

Send Report To:

JIM RUPPEL
DNR
MADISON

SOURCE CODE SU
SAMPLE TYPE
MISC. CODES

Account Number: WR282

LAB COMM.

Collected By: RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IG029280

Parameter		Result	
1	ALUMINUM, TOTAL RECOVERAB	1700.	UG/L
1	ARSENIC, TOTAL REC, AA FU	2400.	UG/L
1	CALCIUM, TOTAL RECOVERABL	93.	MG/L
1	IRON, TOTAL RECOVERABLE,	4.6	MG/L
1	MAGNESIUM, TOTAL RECOVERA	35.	MG/L
1	SULFUR	4.2	MG/L

Table 4B. Arsenic Concentrations In Kewaunee Marsh Pit Soil Samples

Sample Number	mg/kg (Dry Wt.)	Sample Date	Comments
PS01-01	4.14[1.]	05-21-96	S of RR
PS01-02	5.4	05-21-96	Duplicate of PS01-01
PS02-01	427[1.]	05-21-96	S of Capped Area
PS03-01	63[1.]	05-22-96	NE Capped Area
PS03-02	40	05-22-96	Duplicate of PS03-01

1. Lab sheets for Al, Ca, Fe, Mg, and S results in these samples attached.
2. Pits dug to a depth of 10 inches. Removed soils composited for a sample.

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMPS01-01 | County # 31 | Route Code WR00

Sample Location KEWAUNEE MARSH KMPS01

Start Date 052196 (MM DD YY) Time 1830 (HH MM) | End Date 000000 (MM DD YY) Time (HH MM)

Description SOUTH OF RR TRACKS 100FT WEST OF RIVER 150FT

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number WR282

LAB COMM.

Collected By RUPPEL/JANISCH

REPORTED: 121796 LABSLIP- IG029270

Parameter	Result	
1 ALUMINUM, ICP, DRY WT	2400.	MG/KG
1 ARSENIC, AA FURNACE, DRY	4.14	MG/KG
1 CALCIUM DRY WT, ICP	17000.	MG/KG
1 IRON DRY WT, ICP	5000.	MG/KG
1 MAGNESIUM, ICP, DRY WT	2100.	MG/KG
0 SULFUR ICP DRY WEIGHT	*4206	MG/KG

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number — Point/Well# — Field No. KMPS02-01 — County # 31 — Route Code WR00

Sample Location KEWAUNEE MARSH KMPS02-01

Start Date 052196 (MM DD YY) Time 1420 (HH MM) — End Date 000000 (MM DD YY) Time (HH MM)

Description DUG PIT - CENTER OF DISTURBED AREA NOT CAPPED

Send Report To:
JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number WR282

LAB COMM.

Collected By RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IC029272

Parameter		Result	
1	ALUMINUM, ICP, DRY WT	4700.	MG/KG
1	ARSENIC, AA FURNACE, DRY	427.0	MG/KG
1	CALCIUM DRY WT, ICP	27000.	MG/KG
1	IRON DRY WT, ICP	6900.	MG/KG
1	MAGNESIUM, ICP, DRY WT	3500.	MG/KG
0	SULFUR ICP DRY WEIGHT	*5255	MG/KG

DEPARTMENT OF NATURAL RESOURCES

INORGANIC

Labslip 12-92

ID Number | Point/Well# | Field No. KMPS03-01 | County # 31 | Route Code WR00

Sample Location: KEWAUNEE MARSH KMPS03

Start Date (MM DD YY): 052296 Time (HH MM): 1115

End Date (MM DD YY): 000000 Time (HH MM):

Description: BETWEEN PONDS 12 AND 6

Send Report To:

JIM RUPPEL
DNR
MADISON

SOURCE CODE SO
SAMPLE TYPE
MISC. CODES

Account Number: WR282

LAB COMM.

Collected By: RUPPEL/JANISCH

REPORTED: 121796 LABSLIP= IC029273

Parameter		Result	
1	ALUMINUM, ICP, DRY WT	2200.	MG/KG
1	ARSENIC, AA FURNACE, DRY	63.0	MG/KG
1	CALCIUM DRY WT, ICP	36000.	MG/KG
1	IRON DRY WT, ICP	4900.	MG/KG
1	MAGNESIUM, ICP, DRY WT	4200.	MG/KG
0	SULFUR ICP DRY WEIGHT	*4507	MG/KG

4A
4B

FIGURE MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

DUG PIT SOILS AND WATER

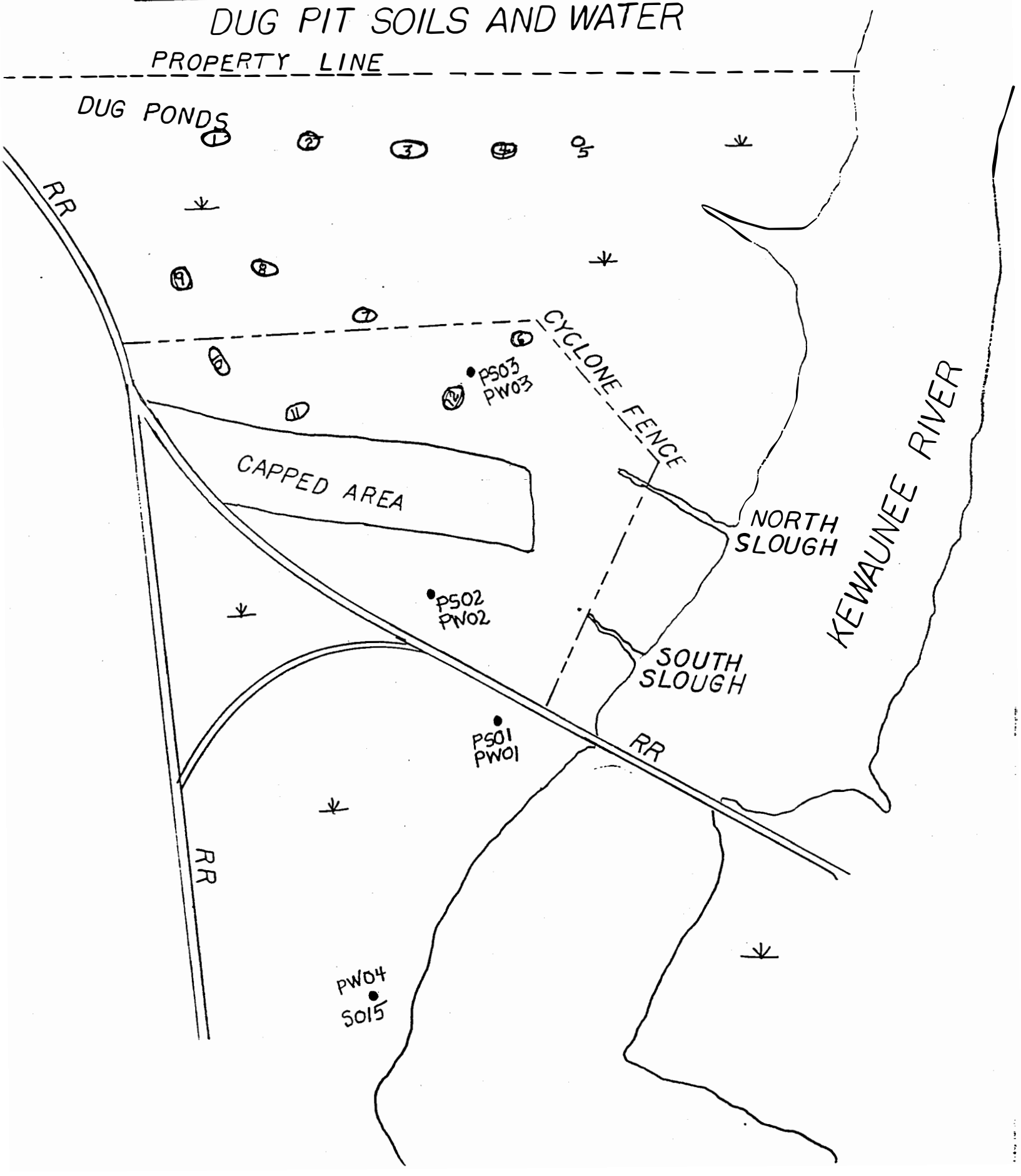

Table 5. Results Of Sedge and Cattail Plant Tissue[1,] Analysis For Arsenic From Areas of Kewaunee Marsh With Varying Levels of Arsenic in the Associated Soils

Relative As Soil Level	Plant Site Sample No.	Soil Site Sample No.	As Concentration In Plant Tissue mg/kg	As Concentration In Soils mg/kg
Sedge (*Carex* sp.)				
Reference Site	SE01	S015	< 0.1	4.29
Low	SE02	S002	0.7	39.2
Medium	SE03	S001	1.2	219.1
High	SE04	S013	1.6	692
Cattail (*Typha* sp.)				
Reference Site	CT01	S015	< 0.1	4.29
Low	CT02	S003	< 0.1	42
Medium	CT03	S001	0.4	219.1
High	CT04	S014	0.4	685

1. Plant tissue analyzed included only above ground leaves and stems.
2. Plant tissues collected 09/10/96.

FIGURE 5. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

CATTAIL AND SEDGE PLANTS

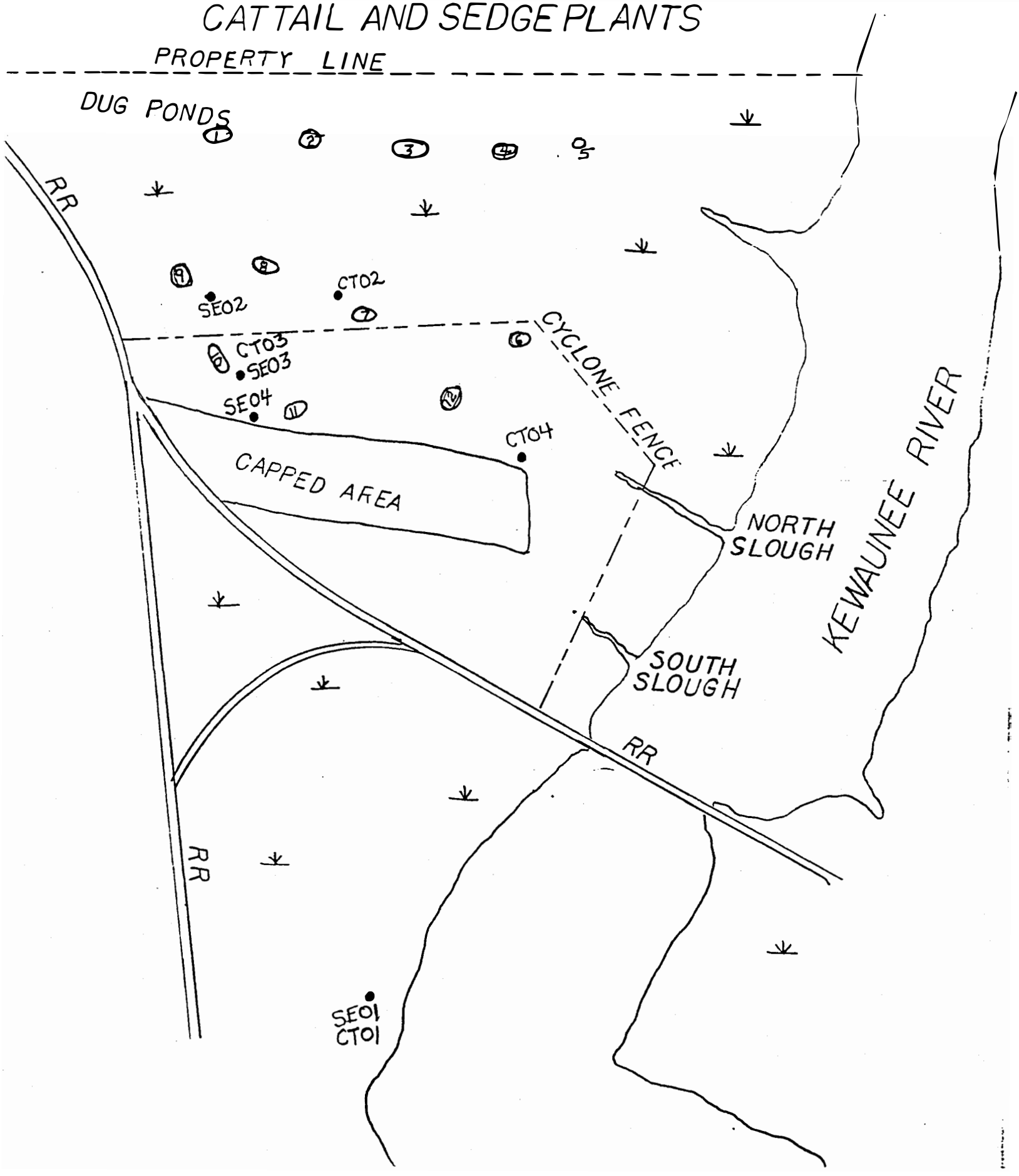

FIGURE 6. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH

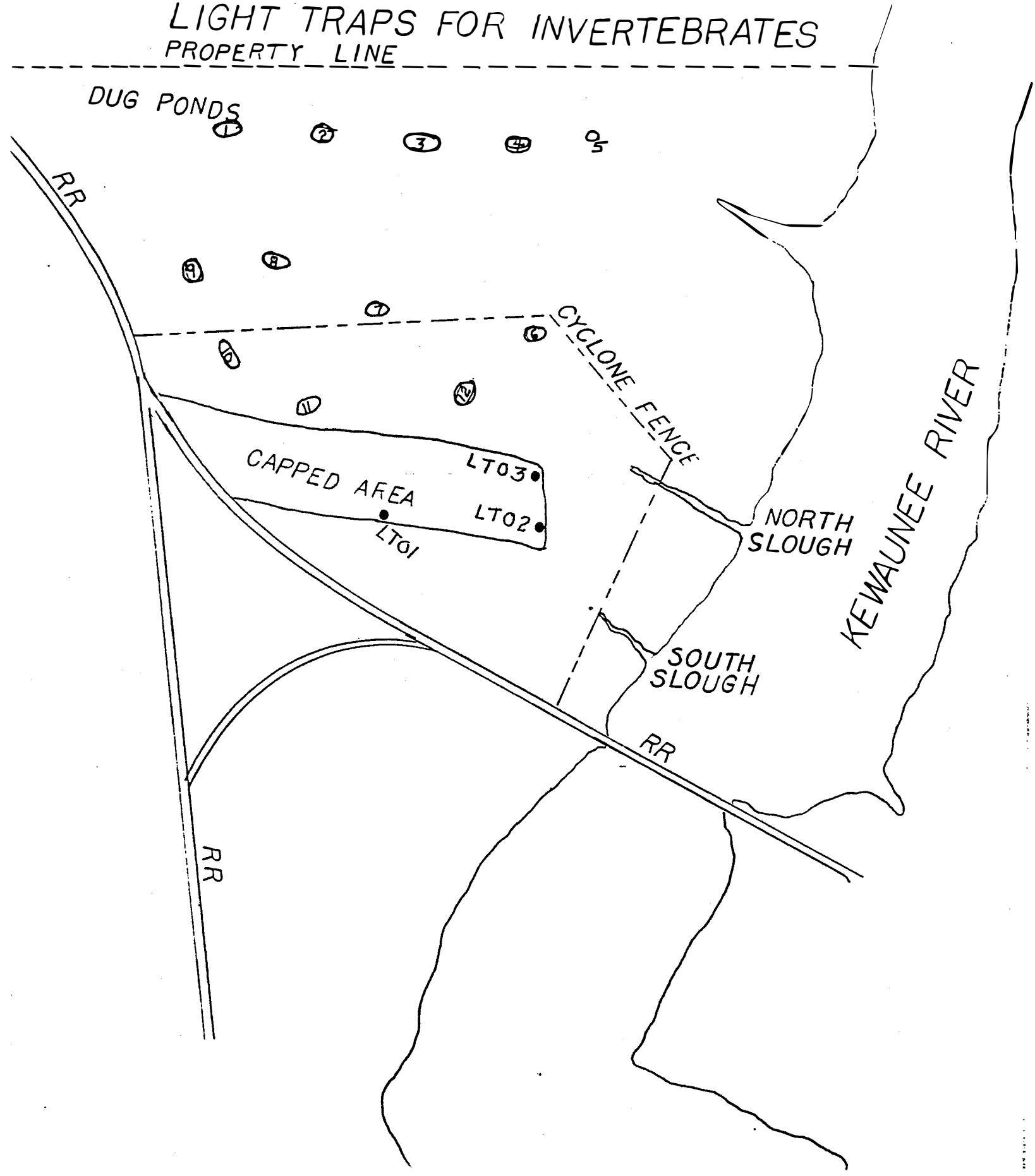

FIGURE 7. MEDIA SAMPLING SITES FOR 1996 ON KEWAUNEE MARSH