Welcome to Indiana

by the

Indiana Department of Natural Resources
Division of Reclamation
Abandoned Mine Lands Program

3/31/06

Today's Schedule of Events

8:50	Arrive at Gibson County Coal
9:00 - 11:00	Mine Safety Training and Underground Mine Tour
11:00 - 12:00	PowerPoint Presentation and Lunch
12:00 - 2:00	Enos Reclamation Project
2:00 - 3:00	Log Creek Church Reclamation Project
3:00 - 5:00	Weber Lake Reclamation Project

AML Sites 898, 978, 979 - ENOS

These Abandoned Mine Land Reclamation Projects were undertaken in order to address one of the largest remaining potential sources of acid mine drainage of the South Fork of the Patoka River watershed. The main problem at this area is a barren and eroding gob pile that is approximately 225 acres in size. This project is being conducted in three phases, with different AML Site numbers assigned to each phase as described below. Total project site will be approximately 375 acres.

AML Site 978 will consist of the reclamation of the gob pile itself. This will be accomplished by reprocessing much of the coal from the waste material. This will not only provide a commodity, but will also greatly reduce the amount of acid producing material to be buried on site. When all the coal is removed, the remaining material will be consolidated, covered with soil and revegetated. This portion of this project began in the summer of 2004 and will be completed in 5 – 10 years. There are no wetlands or other water bodies associated with this site.

AML Site 898 consisted of the construction of a large, off-site, passive water treatment wetland just north, and downstream of the gob pile. This multi-celled wetland system will provide passive treatment of any acid mine drainage that may continue to be produced during the reprocessing of the gob pile and after reclamation is complete. Acid seeps are common occurrences in gob pile reclamation projects, and passive wetland treatment systems, when properly designed, are effective controls for AMD production. The first cell in this wetland system will consist of a Vertical Flow Pond, which adds alkalinity and removes heavy metals. The remainder of this system will consist of conventional wetland cells. This project began on 1/20/05 and was completed by 9/02/05 at a total cost of $964,769.16.

AML Site 979 consisted of the construction of another large, linear passive water treatment wetland just to the east of the existing gob pile. This wetland system is designed to directly intercept the acid seeps that currently exist and begin the passive treatment system. All surface water from the gob pile will ultimately be directed into this wetland system. Upon completion, this wetland will then discharge directly into the wetland built as AML Site 898 mentioned above. Therefore, all water that flows off of or seeps out of the gob pile will pass through these two passive treatment wetlands. By doing so, it is anticipated that any perpetual acid mine drainage will be eliminated prior to entering the South Fork of the Patoka River. This project began on 4/25/05 and was completed by 10/11/05 at a total cost of $1,004,752.20.

The construction of these two passive treatment wetlands was very similar. Essentially, construction consisted of pushing up berms with in-situ soil material from the interior of the wetland cells. No additional off-site material was brought onto this project in order to create the berms. These cells were designed in order to force the water in a very circuitous route through the wetlands in order to increase retention time which allows greater water treatment. The berms were then vegetated with a variety of grasses and emergent wetland species. There are areas within the wetland cells that were not disturbed other than increasing water level 6" or less. The existing vegetation on these areas was also not disturbed.

AML Water Quality Database

AML Site **898**

Site Samples Data Sheet - Acidity + Report

Enos Gob Pile

Point ID	Sample Date	Sampling Organization	Flow Qualitative	pH Lab	pH Field	Acidity	Alkalinity	Al mg/L	Fe mg/L	Mn mg/L	SO4 mg/L	TSS mg/L	TDS mg/L
898A	9/23/2004	DOR	Normal	6.00		290	330	<0.20	109	8.97	2030	22	3400
	1/26/2005	DOR	High	6.24		250	310	0.12	31.5	5.74	2340	49	3590
	4/27/2005	DOR	Normal	6.24	6.6	150	320	0.364	43.1	6.90	855	44	3620
	7/19/2005	DOR	Normal	6.03	6.4	340	350	1.59	46.0	5.90	2040	42	3980
	10/18/2005	DOR	Normal	7.18	7.7	56	240	<0.10	0.38	6.37	862	14	3660
	1/24/2006	DOR	Normal	7.00	6.9	24	153	<0.10	<0.10	0.641	3560	10	2580
898B	9/23/2004	DOR	Low	5.78		101	32	0.94	37.4	19.6	1940	19	3050
	1/26/2005	DOR	Normal	5.62		95	45	1.81	24.4	15.3	1820	32	2710
	4/27/2005	DOR	Normal	5.59	6.3	70.0	30	1.29	27.0	16.8	1850	23	2710
	7/19/2005			4.93	5.8	140	<10	0.612	47.9	18.6	1440	29	3050
	10/18/2005	DOR	Low	3.19	3.7	240	<10	5.45	38.6	37.0	638	<5	3390
	1/24/2006	DOR	Normal	3.11	3.9	88	<10	6.67	4.50	17.8	3630	5	2160
898C	9/23/2004	DOR	Low	7.64		22	280	<0.10	0.17	0.269	2090	15	3290
	1/26/2005	DOR	High	6.92		82	390	<0.10	0.70	2.49	2170	7	3480
	4/27/2005	DOR	Normal	7.33	7.8	<10	350	<0.100	0.278	0.274	955	11	3350
	7/19/2005	DOR	Normal	7.55	8.0	35	220	<0.10	<0.10	0.129	1650	7	3540
	10/18/2005	DOR	Normal	7.21	7.6	60	290	<0.10	0.34	0.525	1960	7	3180
	1/24/2006	DOR	High	7.28	7.9	33	242	<0.10	0.47	0.287	3000	11	2520
898D	9/23/2004	DOR	N/A	2.82		270	<10	9.16	43.0	6.90	1860	<5	2890
	1/26/2005	DOR	Normal	3.22		80	<10	3.34	24.8	4.56	1380	6	1570
	4/27/2005	DOR	N/A	3.24	3.7	60.0	<10	2.39	15.6	6.94	922	5	2400
	7/19/2005	DOR	N/A	2.88	3.1	170	<10	4.28	19.2	8.76	1680	<5	3270
	10/18/2005	DOR	N/A	2.76	3.2	370	<10	8.22	66.5	9.03	1730	<5	2980
	1/24/2006	DOR	High	4.34	5.6	92	<10	0.84	35.7	4.66	2680	11	2140
898E	9/23/2004	DOR	None										
	1/26/2005	DOR	Normal	6.33		22	50	1.81	1.46	2.03	1180	45	1680
	4/27/2005	DOR	Normal	6.20	7.5	<10	70	0.650	1.18	4.74	898	27	2010

AML Water Quality Database

AML Site **898**

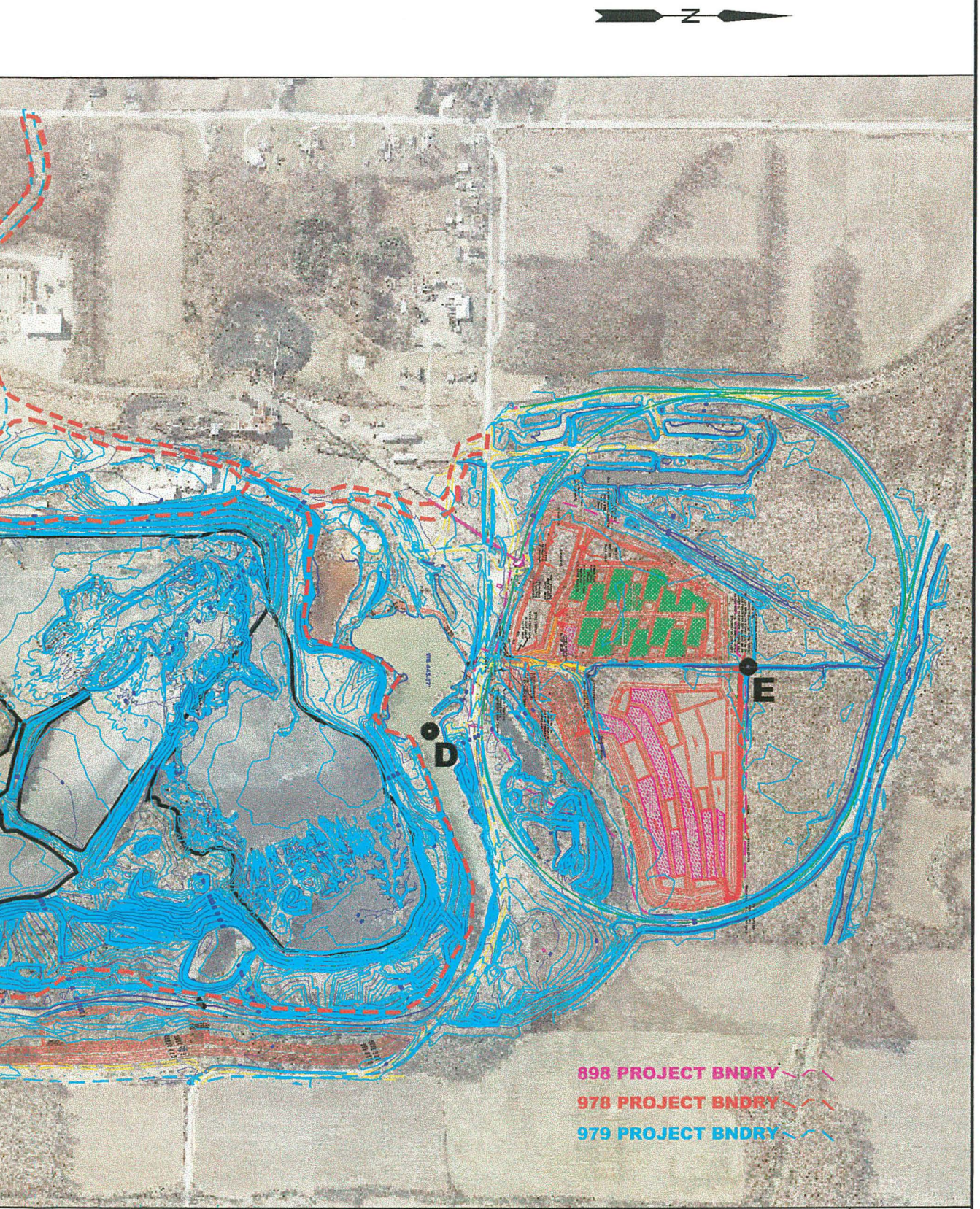
Site Samples Data Sheet - Acidity + Report

Enos Gob Pile

Point ID	Sample Date	Sampling Organization	Flow Qualitative	pH Lab	pH Field	Acidity	Alkalinity	Al mg/L	Fe mg/L	Mn mg/L	SO4 mg/L	TSS mg/L	TDS mg/L
898E	7/19/2005	DOR	Low	7.98	8.7	<10	56	0.146	0.104	0.117	489	<5	809
	10/18/2005	DOR	None										
	1/24/2006	DOR	None										
898F	9/23/2004	DOR	Low	2.32		3080	<10	54.0	961	11.6	4890	17	8030

The Site Samples Data Sheet displays common water quality parameters sampled by DOR at water sampling points. Contact AML personnel for information regarding other types of sample parameters. A blank field indicates that the parameter was not sampled on a given date. Note that if the flow is recorded as "None" for a given date, all other sample parameters will be blank.

SITE	PROJECT	DATE MADE	DESIGNED BY	SCALE	STATE OF IN
	898/978/979	2/10/04	DRHause	1"=300'	DEPARTMENT OF NA
		DATE REVISED 5/10/04	DRAWN BY DRHause		DIVISION OF RECL



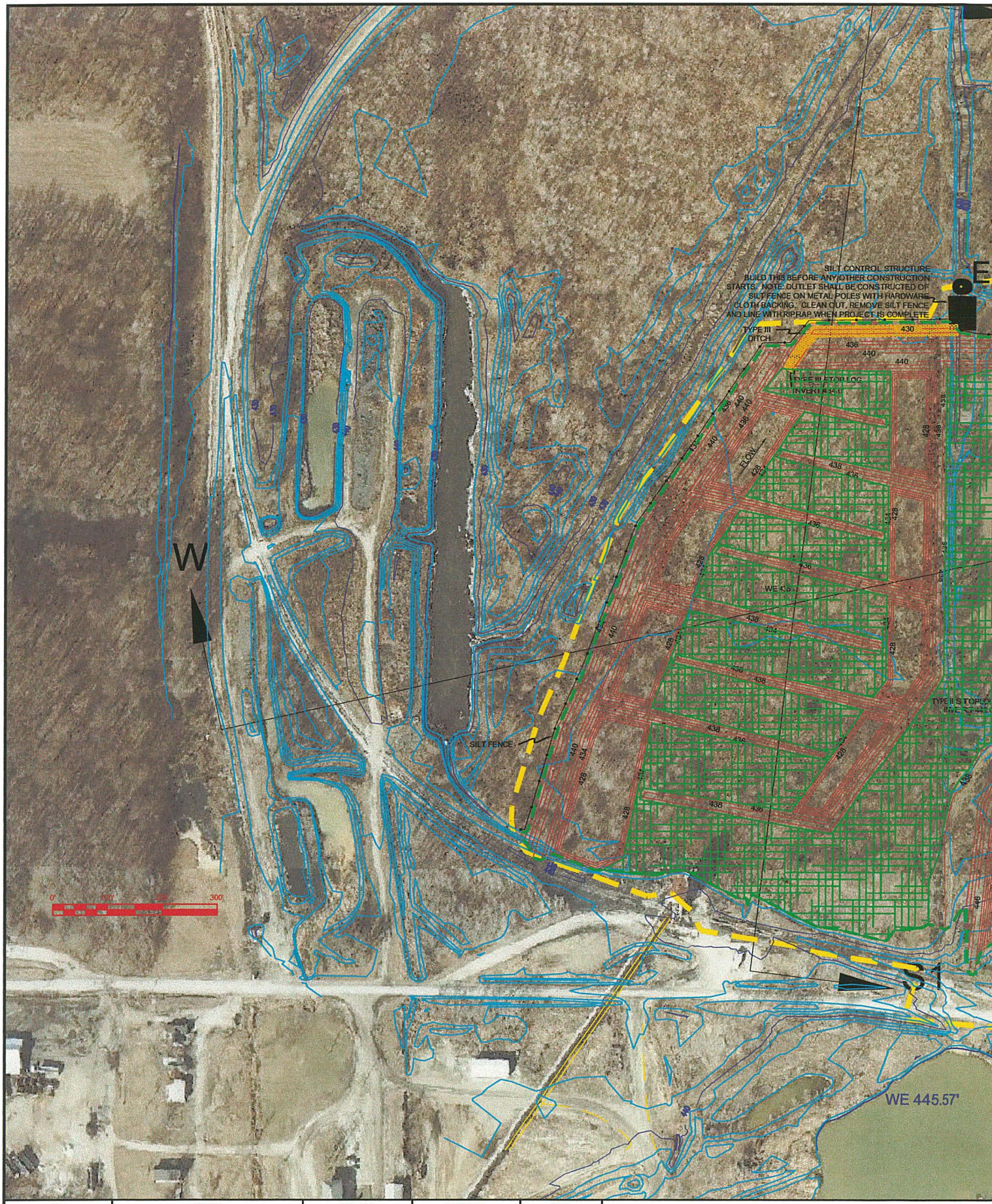
AL RESOURCES

TITLE

ENOS GOB PILE COMBINED

SHEET NO.

1 of 1



SITE	PROJECT	DATE MADE	DESIGNED BY	SCALE	STATE OF INDIANA
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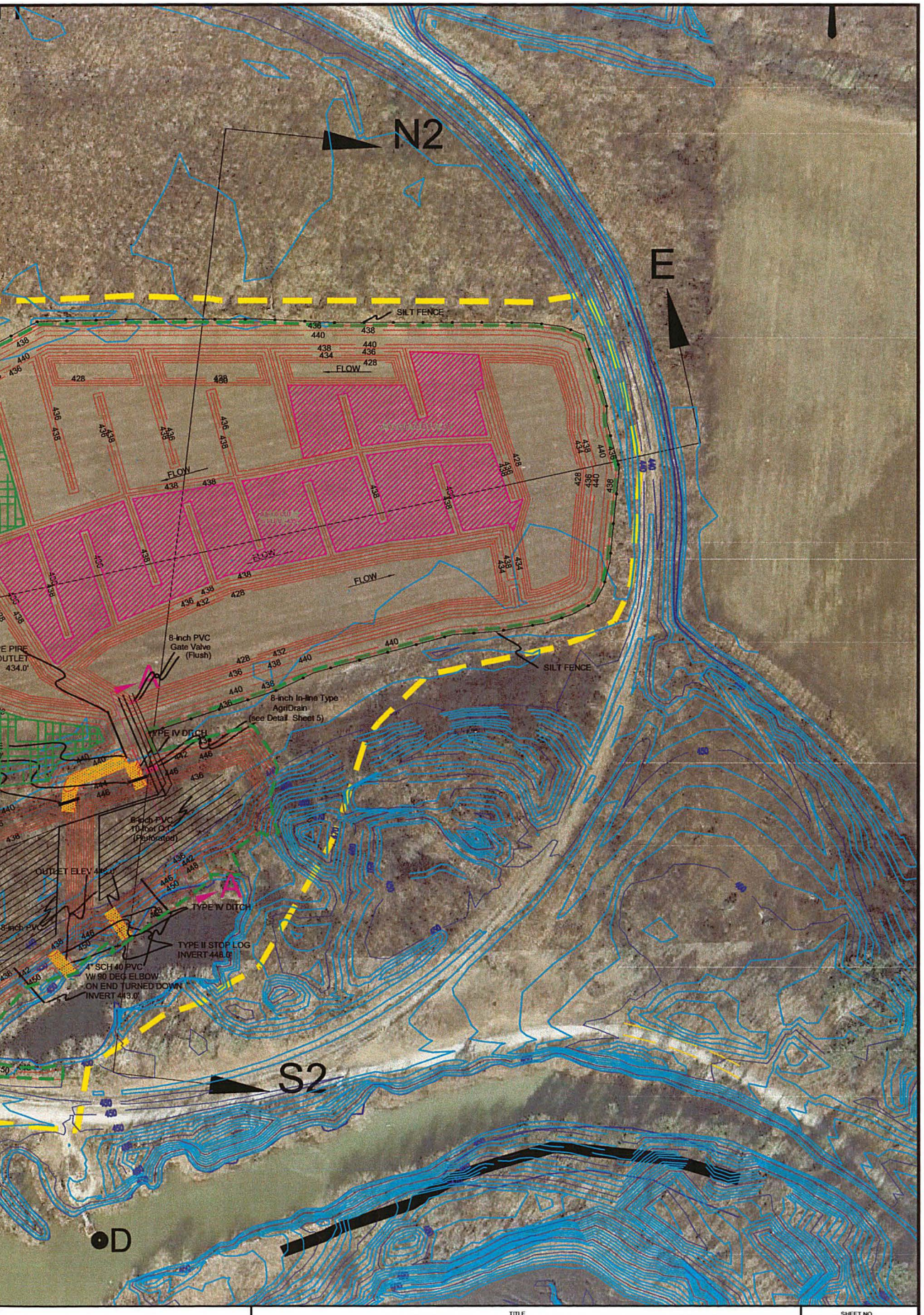
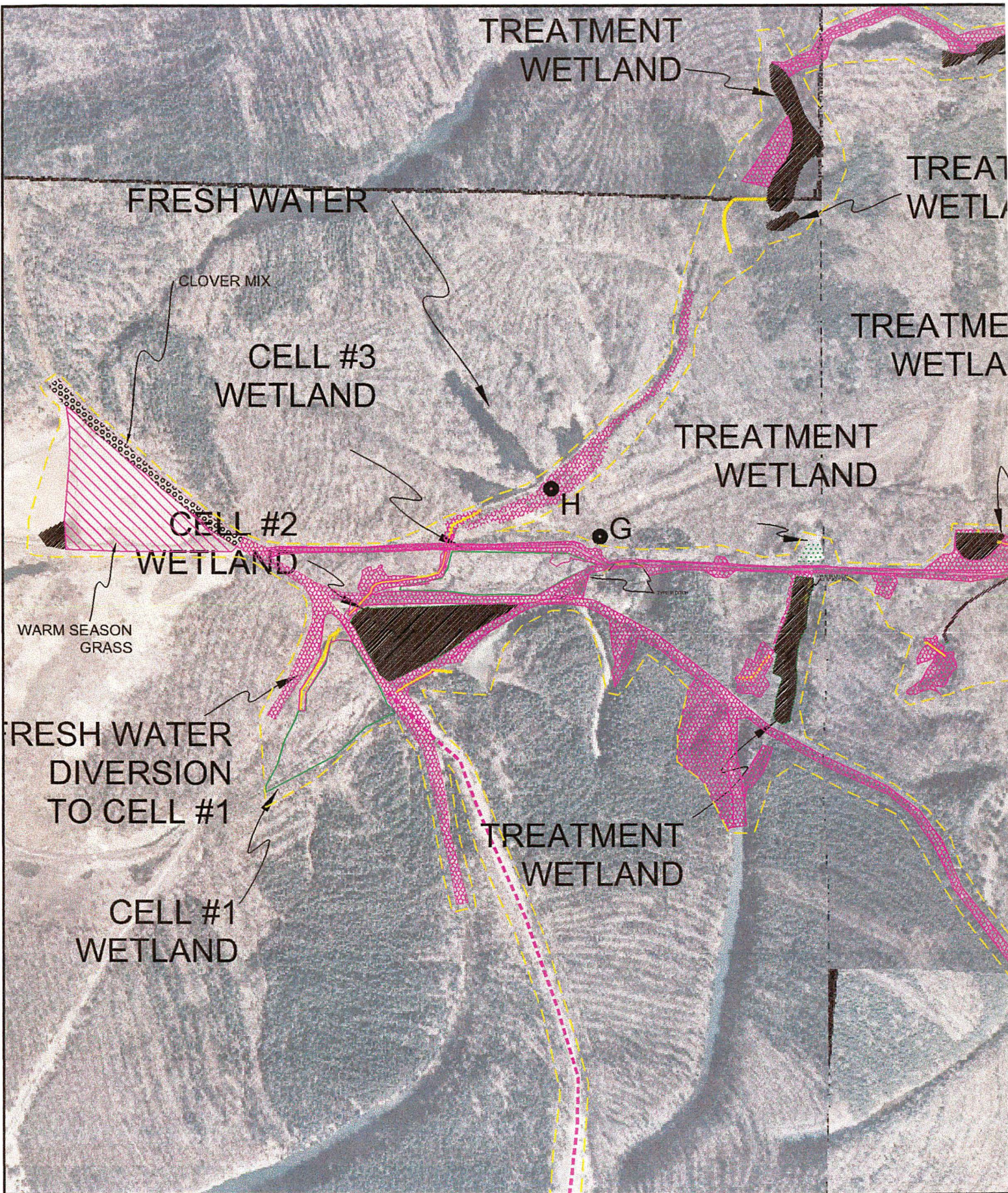
		DATE REVISED 9/1/04	DRAWN BY DRHause		DIVISION OF RECLAMATION



SOURCES	TITLE **PLAN VIEW**	SHEET NO. **2 of 5**



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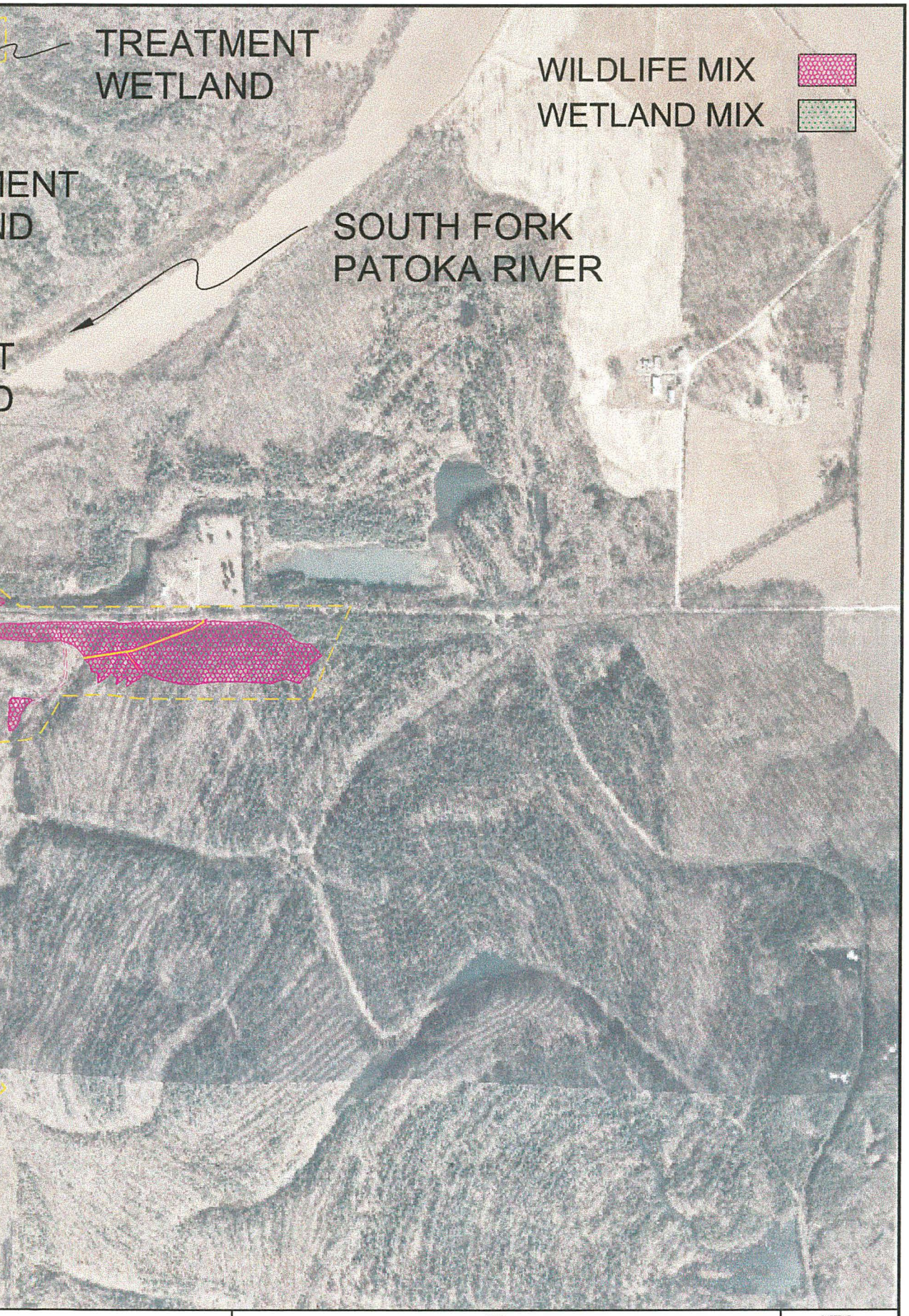
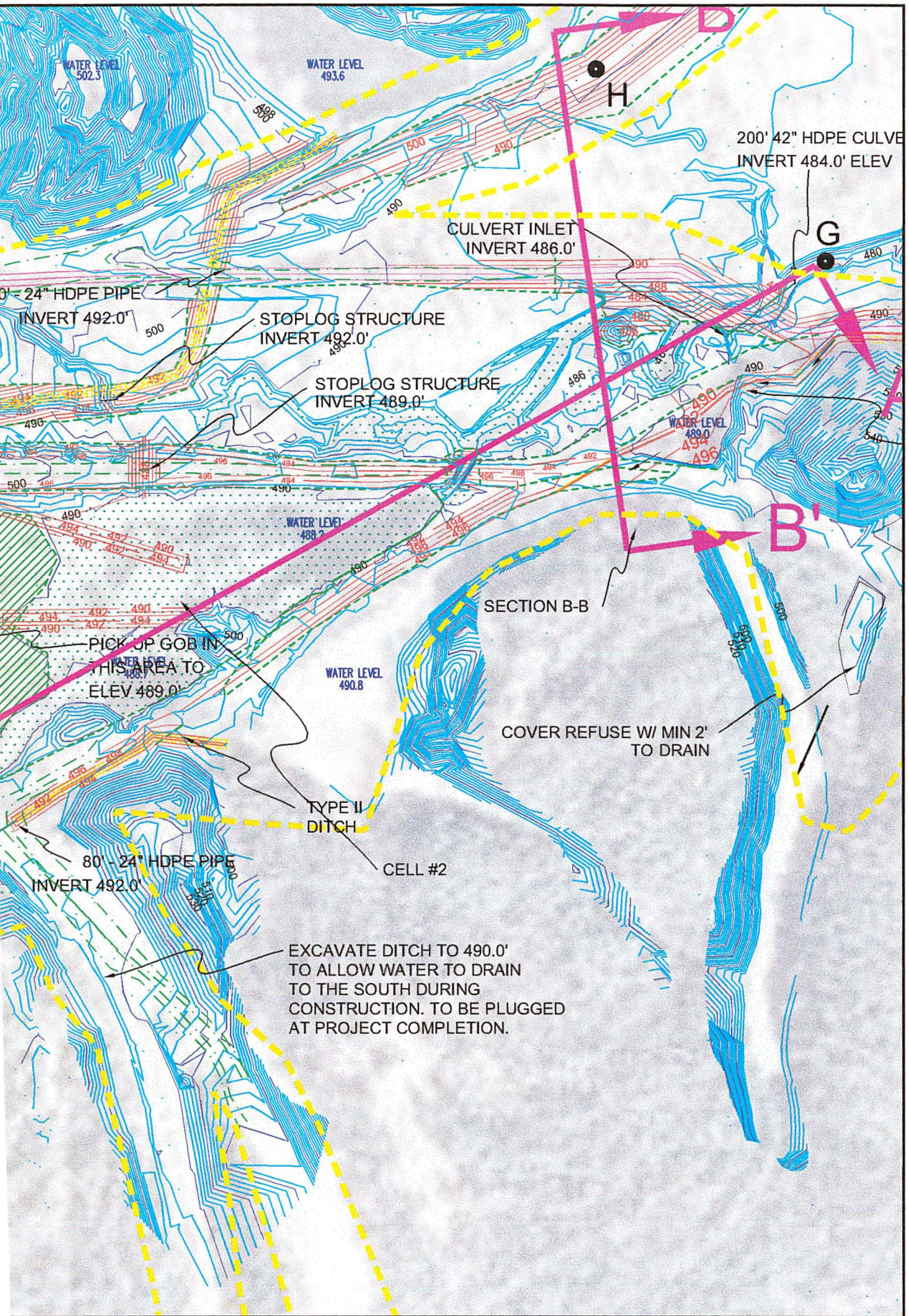
		DATE REVISED 12/21/05	DRAWN BY DRH		DIVISION OF RECLAMATION



URCES	TITLE VEGETATION PLAN	SHEET NO. 8 of 9

SITE	PROJECT	DATE MADE	DESIGNED BY	SCALE	STATE OF INDIANA
900	E008055	6/10/04	DRH/CW	1"=100'	DEPARTMENT OF NATURAL RI
		DATE REVISED 11/7/05	DRAWN BY DRH		DIVISION OF RECLAMATION



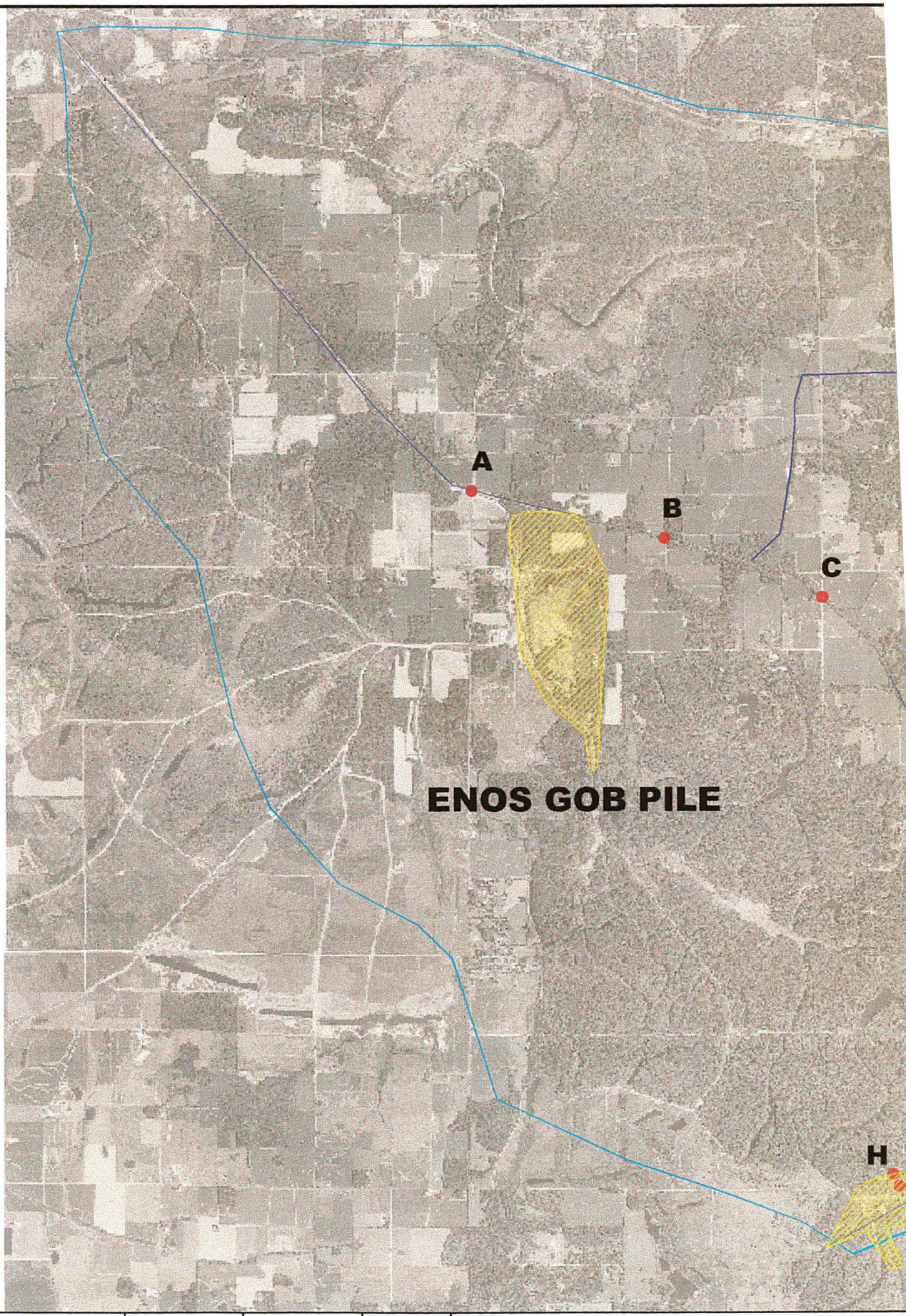
URCES

TITLE

WEST DISPOSAL AREA

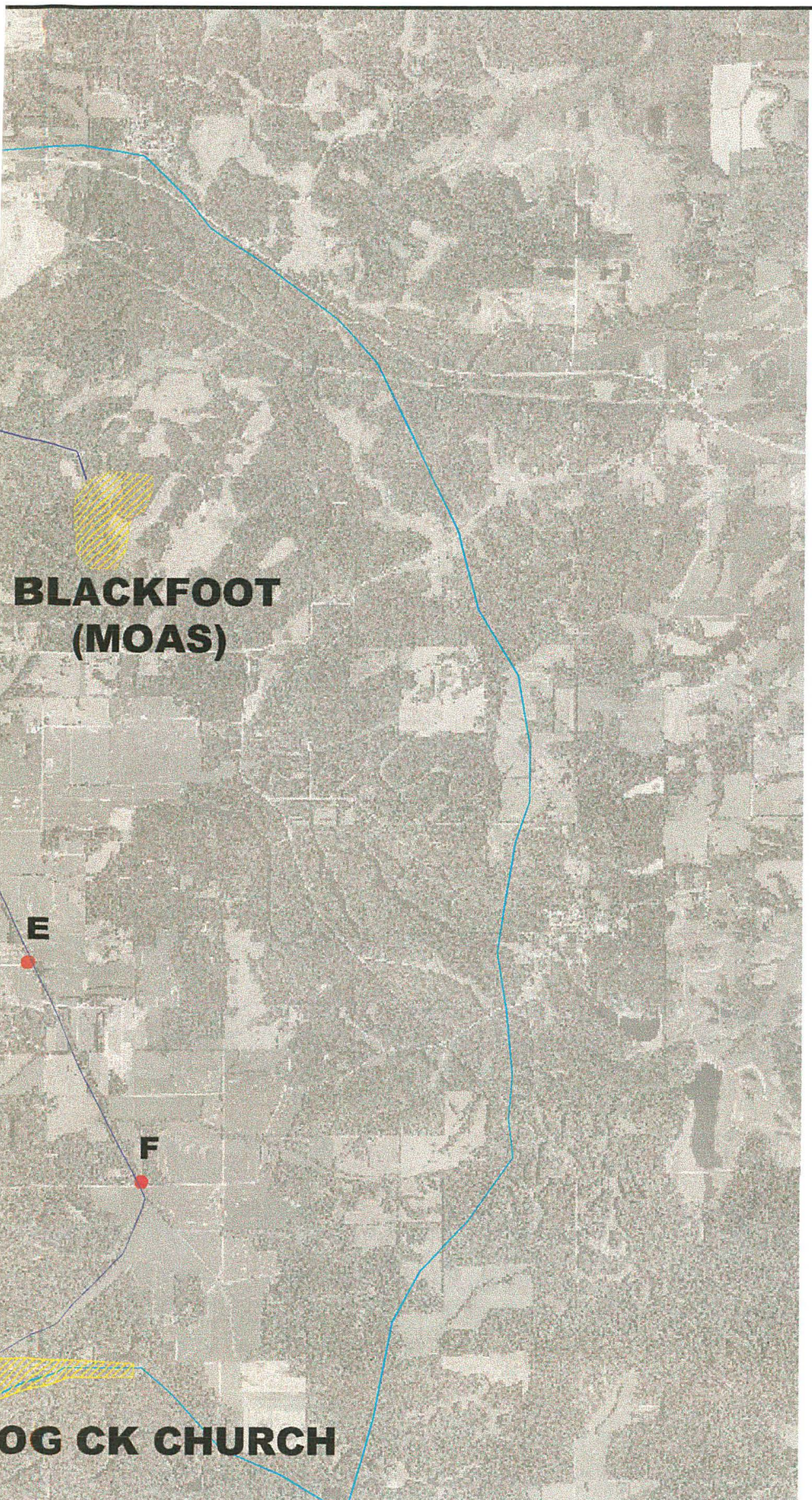
SHEET NO

3 of 8



SITE	PROJECT	DATE MADE	DESIGNED BY	SCALE	STATE OF INDIANA
		DATE REVISED	DRAWN BY		DEPARTMENT OF NATURAL

DIVISION OF RECLAMATION



SOURCES	TITLE SOUTH FORK PATOKA RIVER	SHEET NO.

AML Water Quality Database

AML Site **835**

Site Samples Data Sheet - Acidity + Report

SF Patoka River

Point ID	Sample Date	Sampling Organization	Flow Qualitative	pH Lab	pH Field	Acidity	Alkalinity	Al mg/L	Fe mg/L	Mn mg/L	SO4 mg/L	TSS mg/L	TDS mg/L
835A	10/30/2002	DOR	Normal	7.4	7.4	13	120	2.71	0.67	3.93	1700	17	2400
	1/27/2003	DOR	Normal	7.0	6.5	<20	180	4.17	4.99	6.94	2100	35	3000
	4/15/2003	DOR	Normal	7.6		<10	110	2.93	4.62	4.17	1600	23	2200
	7/17/2003	DOR	Normal	7.7	7.7	<10	150	1.08	0.275	4.04	2100	26	3100
	10/22/2003	DOR	Normal		7.9	16	210	0.25	0.12	3.58		10	2600
	2/3/2004	DOR	Normal	7.0		<10	42	1.34	1.45	0.935	310	33	560
	7/13/2004	DOR	Normal	7.67		<10	140	0.44	0.22	2.91	2490	11	2290
	10/13/2004	DOR	Low	7.32		16	180	0.717	0.378	2.83	918	17	1720
	1/24/2005	DOR	Normal	6.63		14	80	7.30	7.02	5.70	1420	48	2240
	4/27/2005	DOR	Normal	7.00	7.1	<10	90	2.77	2.18	3.99	682	19	1690
	8/2/2005	DOR	Low	7.43	8.1	29	210	0.281	0.337	2.03	585	<5	1510
	10/18/2005	DOR	Low	7.39	7.3	26	180	2.12	0.47	4.57	1500	33	3440
	1/24/2006	DOR	High	6.37	7.9	<10	47	1.76	1.69	2.15	796	24	809
835B	1/24/2005	DOR	Normal	5.46		28	21	9.04	9.13	6.63	1130	60	1690
	4/27/2005	DOR	Normal	5.83	6.1	<10	20	4.32	3.62	5.67	596	30	1360
	8/2/2005	DOR	Low	5.14	5.8	15	<10	2.50	0.483	8.92	1760	27	3170
	10/18/2005	DOR	Low	4.50	4.9	83	<10	11.1	0.90	12.9	1370	31	3340
	1/24/2006	DOR	High	5.76	7.4	<10	13	2.39	2.42	2.88	800	22	644
835C	1/24/2005	DOR	Normal	6.55		<10	49	2.12	2.01	2.75	809	21	1280
	4/27/2005	DOR	Normal	6.86	6.5	<10	40	0.432	0.374	2.56	353	6	990
	8/2/2005	DOR	Low	7.12	7.8	12	90	<0.10	<0.10	0.170	1360	17	2520
	10/18/2005	DOR	Low	7.29	7.2	<10	71	<0.10	<0.10	0.092	1650	14	2640
	1/24/2006	DOR	High	6.18	7.8	<10	22	1.12	1.31	1.55	516	15	493
835D	1/24/2005	DOR	Normal	6.60		<10	46	1.74	1.16	2.39	983	12	1550
	4/27/2005	DOR	Normal	6.93	7.1	<10	40	0.364	0.263	2.15	542	<5	1290
	8/2/2005	DOR	Low	7.33	7.8	13	120	<0.10	<0.10	0.227	1660	21	3080
	10/18/2005	DOR	Low	7.44	7.3	<10	110	<0.10	<0.10	0.602	1870	22	3100

AML Water Quality Database

AML Site **835**

Site Samples Data Sheet - Acidity + Report

SF Patoka River

Point ID	Sample Date	Sampling Organization	Flow Qualitative	pH Lab	pH Field	Acidity	Alkalinity	Al mg/L	Fe mg/L	Mn mg/L	SO4 mg/L	TSS mg/L	TDS mg/L
835E	1/24/2005	DOR	Normal	6.70		<10	48	1.60	1.48	2.37	1020	15	1610
	4/27/2005	DOR	Normal	6.86	7.4	<10	40	0.306	0.200	2.01	460	5	1320
	8/2/2005	DOR	Low	7.58	8.1	21	170	<0.10	<0.10	0.057	1870	25	3710
	10/18/2005	DOR	Low	7.58	7.3	18	190	<0.10	<0.10	0.030	1130	27	3800
	1/24/2006	DOR	High	5.37	7.8	<10	<10	1.19	2.03	1.15	581	25	508
835F	1/24/2005	DOR	Normal	6.62		12	112	1.64	1.82	2.64	1120	15	1860
	4/27/2005	DOR	Normal	6.70	7.3	<10	40	1.25	0.680	2.66	829	12	1580
	8/2/2005	DOR	Low	7.54	8.0	36	200	<0.10	0.146	0.159	1910	24	3850
	10/18/2005	DOR	Low	7.55	7.7	22	230	0.19	0.21	0.185	1410	14	3980
	1/24/2006	DOR	High	4.88	7.5	11	<10	2.13	3.20	1.49	621	44	560
835G	1/24/2005	DOR	Normal	4.64		74	<10	6.33	11.2	6.22	1640	14	2400
	4/27/2005	DOR	Normal	3.08	3.7	150	<10	12.0	18.1	7.93	1620	14	2510
	8/2/2005	DOR	Low	2.77	3.1	280	<10	14.3	28.7	8.64	2060	35	3980
	10/18/2005	DOR	Low	2.63	3.1	730	<10	29.3	96.2	11.7	1490	30	4570
	1/24/2006	DOR	Normal	2.81	3.7	230	<10	13.7	33.6	7.99	2090	19	1650
835H	1/24/2005	DOR	Normal	7.37		31	242	<0.10	0.320	0.306	2150	19	3470
	4/27/2005	DOR	Normal	7.58	8.0	<10	170	<0.100	0.315	0.153	1310	20	3520
	8/2/2005	DOR	Low	7.35	7.6	32	190	<0.10	1.04	1.45	3250	28	4010
	10/18/2005	DOR	Low	7.52	7.8	21	180	0.17	0.69	0.059	890	29	3790
	1/24/2006	DOR	Normal	7.39	7.5	25	176	<0.10	0.42	0.454	3190	10	3010

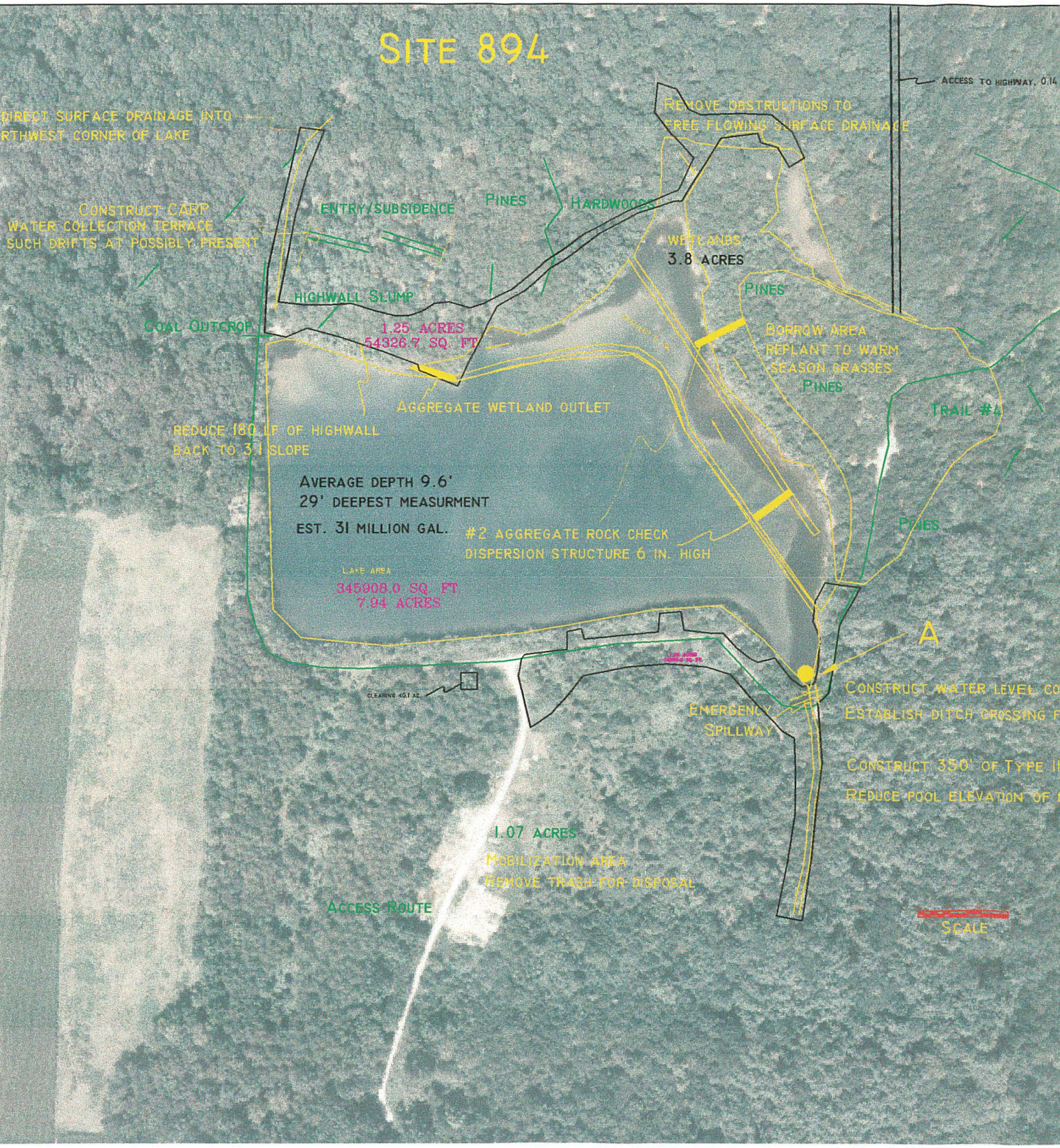
The Site Samples Data Sheet displays common water quality parameters sampled by DOR at water sampling points. Contact AML personnel for information regarding other types of sample parameters. A blank field indicates that the parameter was not sampled on a given date. Note that if the flow is recorded as "None" for a given date, all other sample parameters will be blank.

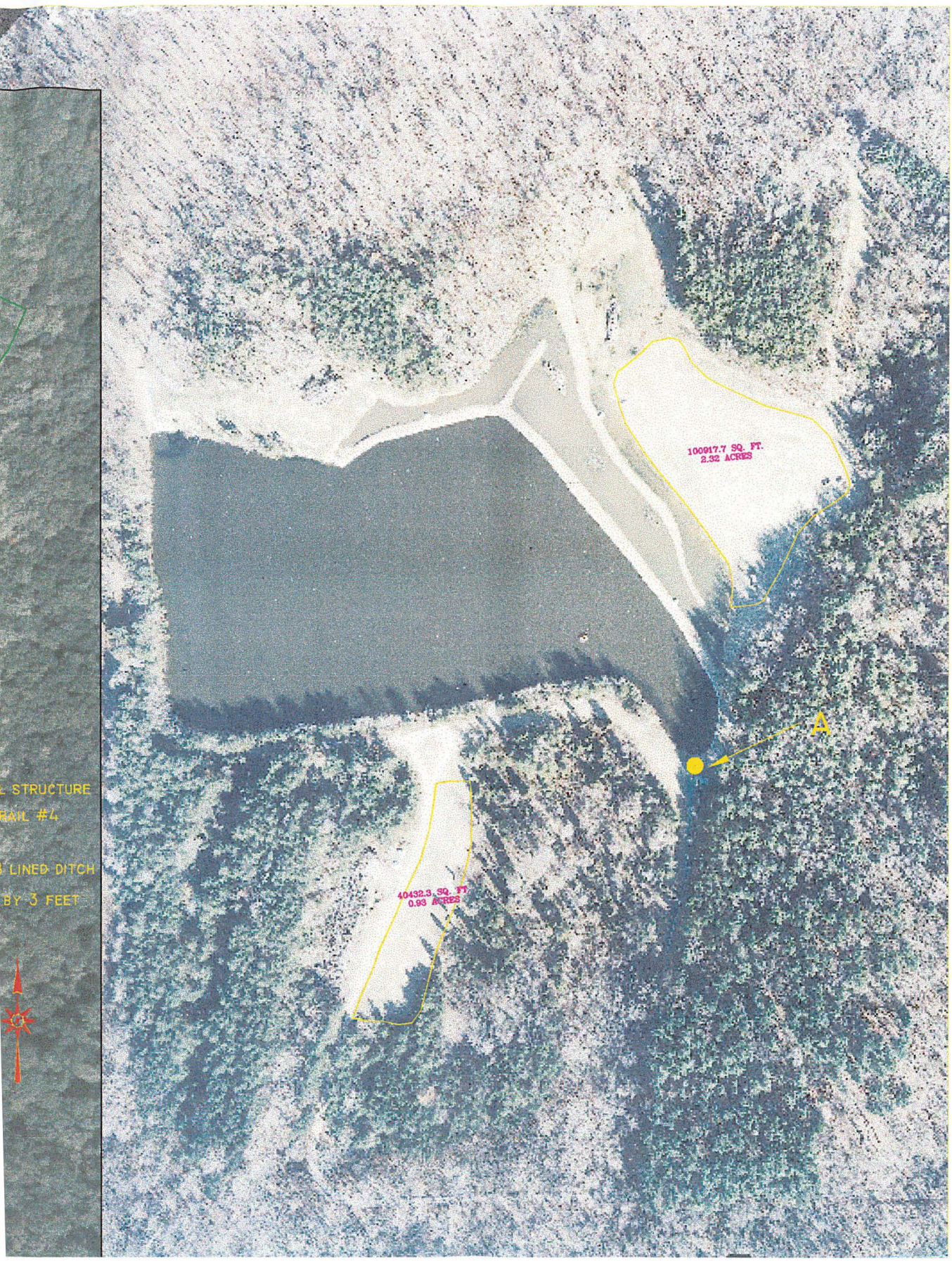
AML Site 894 – Weber Lake

This site, located within Lincoln State Park, was a small strip mine that was abandoned in the 1950's and consisted primarily of an eight acre acid impoundment surrounded by well vegetated spoils and a short highwall. The impoundment itself, referred to as Weber Lake, contained approximately 31,000,000 gallons of acid water with a pH of as low as 3.8. This environmentally degraded area was a portion of the Park that was not only being underutilized but also did not fit into the "natural environment" that is typically portrayed in our State Parks.

Reclamation consisted of reducing the highwall, treating the existing acid water in the impoundment, and creating a passive wetland treatment cell to intercept all incoming acid mine drainage, both surface and subsurface, and treating it before it enters Weber Lake. Reclamation construction at this site began on 8/13/01 and was completed by 11/12/01 at a total cost of $166, 012.86.

As a separate project, we decided that this site created a perfect opportunity to provide an educational experience for the public in regards to coal mining and reclamation in Indiana. Therefore, we developed an interpretive panel and self-guided hiking trail in and around the reclamation project. These interpretive panels emphasize three main themes: coal formation, historic coal mining, and the reclamation process. Enjoy.


SITE 894
ACCESS TO HIGHWAY, 0.14
DIRECT SURFACE DRAINAGE INTO
RTHWEST CORNER OF LAKE
REMOVE OBSTRUCTIONS TO
FREE FLOWING SURFACE DRAINAGE
CONSTRUCT CARP
WATER COLLECTION TERRACE
SUCH DRIFTS AT POSSIBLY PRESENT
ENTRY/SUBSIDENCE
PINES
HARDWOODS
WETLANDS
3.8 ACRES
PINES
HIGHWALL SLUMP
COAL OUTCROP
1.25 ACRES
54326.7 SQ. FT
BORROW AREA
REPLANT TO WARM
SEASON GRASSES
PINES
AGGREGATE WETLAND OUTLET
TRAIL #4
REDUCE 180 LF OF HIGHWALL
BACK TO 3:1 SLOPE
AVERAGE DEPTH 9.6'
29' DEEPEST MEASURMENT
EST. 31 MILLION GAL.
#2 AGGREGATE ROCK CHECK
DISPERSION STRUCTURE 6 IN. HIGH
PINES
LAKE AREA
345908.0 SQ. FT
7.94 ACRES
A
CLEARING 40.1 AC.
CONSTRUCT WATER LEVEL CO
ESTABLISH DITCH CROSSING F
EMERGENCY
SPILLWAY
CONSTRUCT 350' OF TYPE I
REDUCE POOL ELEVATION OF
1.07 ACRES
MOBILIZATION AREA
REMOVE TRASH FOR DISPOSAL
ACCESS ROUTE
SCALE


100917.7 SQ. FT.
2.32 ACRES
A
40432.3 SQ. FT.
0.93 ACRES
L STRUCTURE
RAIL #4
LINED DITCH
BY 3 FEET

AML Site 900 – Log Creek Church

This Abandoned Mine Land Reclamation Project is being undertaken in order to address one of the largest remaining sources of acid mine drainage of the South Fork Patoka River watershed. This AML site exists within the remains of the headwaters of the South Fork Patoka River, which has been heavily impacted by past coal mining activities. The actual headwaters no longer exist, at least not in a natural state. Currently, this area consists of barren, eroded coal refuse, dangerous highwalls and a series of acidic impoundments that flow directly into the South Fork Patoka River. Water quality in the South Fork Patoka River at this point is heavily impacted: pH – 2.96, Acidity – 190 mg/l, Sulfate – 1050 mg/l, Aluminum – 12 mg/l, Iron – 30.8 mg/l, Manganese – 6.81 mg/l. This project will consist of the excavation, consolidation and burial of all coal refuse, backfilling of the highwalls, and creation of a complex passive wetland treatment system where the existing acidic headwater impoundments now exist. This passive treatment system is designed to drastically improve water quality entering the South Fork Patoka River.

In order to build the passive wetland treatment system and improve water quality in the South Fork Patoka River, a series of berms, ditches, culverts and wetland cells will be built in the acidic headwater impoundments. Currently, three "freshwater" impoundments located just north and east of the acidic headwater impoundments drain directly into the South Fork Patoka River. This freshwater source will be redirected to the southwest by a berm/ditch system to add alkalinity to the head end of the passive wetland treatment system. Then, a series of passive treatment wetland cells will be constructed within the existing acidic headwater impoundments. On another portion of this project, a final cut impoundment will be drained and backfilled in order to eliminate a dangerous highwall that surrounds the Log Creek Church and Cemetery. Also, scattered throughout the project area are numerous small acidic impoundments that will eliminated, improved or transformed into wetland treatment cells.

AML Water Quality Database

AML Site **894**

Site Samples Data Sheet - Acidity + Report

Weber Lake

Point ID	Sample Date	Sampling Organization	Flow Qualitative	pH Lab	pH Field	Acidity	Alkalinity	Al mg/L	Fe mg/L	Mn mg/L	SO4 mg/L	TSS mg/L	TDS mg/L
894A	6/12/2000			3.8				0.73	0.24	2.4	99	<5	160
	4/26/2001			4.1		<10	<1	0.47	0.48	2.5	62	24	120
	7/11/2001			7.0		<10	40	<0.10	0.29	0.912	85	<5	150
	10/3/2001	DOR	N/A	8.5	8.9	<100	80	<0.10	0.227	<0.010	130	<5	230
	11/5/2001	DOR	N/A	7.4	7.4	<10	74	1.67	1.52	0.312	110	20	220
	1/3/2002	DOR	N/A	8.1		<10	61	0.144	0.429	0.203	120	<5	220
	4/23/2002	DOR	Normal	7.2		<10	86	0.14	1.1	0.46	72	15	210
	7/25/2002	DOR	Low	8.3	8.4	<10	90	0.21	0.45	0.101	56	24	220
	10/30/2002	DOR	None										
	1/27/2003	DOR	Low	6.6	6.0	23	230	0.428	6.29	4.00	170	34	500
	4/28/2003	DOR	Normal	8.8		<10	70	0.132	0.512	0.905	98	20	250
	7/17/2003	DOR	None										
	10/30/2003	DOR	None										
	2/3/2004	DOR	Normal	7.5		<10	74	<0.10	0.36	0.408	93	<5	240
	4/22/2004	DOR	None										
	7/27/2004	DOR	N/A	7.30		<10	25	<0.10	0.325	0.286	75.4	6	209
	7/27/2004	DOR	None										
	10/25/2004	DOR	None										
	1/26/2005	DOR	Low	7.46		<10	68	<0.10	0.25	0.105	97.1	<5	196
	4/19/2005	DOR	Low	7.09	8.2	<10	60	<0.100	0.143	0.092	62.9	9	195
	7/20/2005	DOR	None										

The Site Samples Data Sheet displays common water quality parameters sampled by DOR at water sampling points. Contact AML personnel for information regarding other types of sample parameters. A blank field indicates that the parameter was not sampled on a given date. Note that if the flow is recorded as "None" for a given date, all other sample parameters will be blank.