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Badger Army Ammunition Plant
Baraboo, WI 53913

Report DRXTH-FS

BADGER ARMY AMMUNITION PLANT
CONTAMINATION SURVEY

ENVIRODYNE ENGINEERS, INC.
12161 Lackland Road
St Louis, Missouri 63141

March 1981

FINAL REPORT

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Prepared For:

Badger Army Ammunition Plant
Baraboo, Wisconsin 53913

Commander
U.S. Army Toxic & Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010

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Environmental	Biota	GC/EC	Wells	Dibutylphthalate
Survey	Organics	Settling	Analysis	Nitroglycerin
Groundwater	Metals	Ponds	Sampling	Nitrocellulose
Soils	Propellants	Bay	Dinitrotoluene	
Sediments	GC/MS	Water	Diethylphthalate	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

From September 1979 through October 1980 a preliminary environmental survey of Badger Army Ammunition Plant, Baraboo, Wisconsin was conducted. The survey consisted of installing monitoring wells, collecting samples of groundwater, surface water, soils, sediments, and biota and analyzing them for suspected chemical contaminants. The report covers all procedures employed for installation of wells, sampling, analyzing, results of analyses, and interpretation of the results by the contractor.

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EXECUTIVE SUMMARY

From September 1979 through October 1980, Envirodyne Engineers, Inc. (EEI) conducted a preliminary contamination survey of the Badger Army Ammunition Plant (BAAP) in Baraboo, Wisconsin. The survey consisted of a geotechnical investigation and sampling and analysis program. Part of the geotechnical investigation included the installation of 33 groundwater monitoring wells and hydraulic testing of those wells. The sampling program included the collection of groundwater, surface water, sediment, surface soil and biological samples. These samples were analyzed by a variety of techniques including atomic absorption spectrophotometry (AAS), automated colorimetric analysis, gas chromatography with electron capture detection (GC/EC), and gas chromatography/mass spectrometry (GS/MS).

The purpose of the survey was to determine whether contaminants are migrating across the boundaries of BAAP and, if not, to determine the potential for contaminants to migrate in the future. Based on the survey results, it appears that no contaminants are presently migrating off site. Some contaminants (most notably nitrocellulose) have migrated off BAAP property in the past and are still present in high (though not necessarily harmful) concentrations in the sediments of Grubers Grove Bay of Lake Wisconsin. The nitrocellulose has apparently been decomposing to form ammonia, which is also present in high concentrations in the sediments.

Some contamination of the groundwater at BAAP appears to have resulted from operations at both the burning grounds and the sanitary landfill. The contaminated groundwater in the vicinity of the landfill is very close to the boundary of BAAP and is moving toward that boundary. The groundwater contamination in the vicinity of the burning grounds (chloroform and carbon tetrachloride) has apparently migrated at least 100 feet. Groundwater movement is slow in the vicinity of the burning grounds (1 to 3 feet per year). Between the burning grounds and the boundary of BAAP (in the direction of flow), groundwater movement ranges between 1 and 68 feet per year. The distance from the burning grounds to the BAAP boundary along the projected groundwater flow path is at least 1 mile.

CHAPTER 1

INTRODUCTION AND PURPOSE OF THE SURVEY

From September 1979 through October 1980, Envirodyne Engineers, Inc. (EEI) and its subcontractor, Warzyn Engineering, Inc., conducted a preliminary contamination survey of the Badger Army Ammunition Plant (BAAP) located near Baraboo, Wisconsin. BAAP is presently in "standby" status and is maintained by the Olin Corporation under contract with the U. S. Army. The contamination survey performed by EEI was conducted under Contract No. DAAK11-79-C-0117, issued by ARRADCOM and executed by ARRCOM Rock Island, Illinois. The contract was monitored technically by the U. S. Army Toxic and Hazardous Materials Agency (USATHAMA).

The primary objective of the survey was to determine whether contaminants are migrating outside the boundaries of BAAP and, if not, to determine the potential for migration. There were two secondary objectives. One was to answer some of the environmental questions that had been raised about the proposed dredging of Grubers Grove Bay, the receiving body for BAAP's wastewater discharge. The other secondary objective was to test the feasibility of tracing groundwater contamination through infrared photography of the vegetation.

This survey has successfully achieved the primary and the first of the two secondary objectives through a combination of geotechnical/hydrological analysis, water, biota, soil and sediment sampling, and chemical analysis of the samples. Correlation of groundwater contamination with vegetative stress could not be achieved because of the lack of significant widespread groundwater contamination and the great depth to the water table encountered over most of BAAP.

The drilling and installation of monitoring wells and the collection of deep soil and sediment samples were performed by EEI's subcontractor, Warzyn Engineering, Inc. located in Madison, Wisconsin. Warzyn subcontracted most of the actual well drilling to Ace Well Drilling, Wisconsin Dells, Wisconsin. Warzyn also performed most of the geotechnical analysis, and their report to EEI is included as Appendix G to this report.

EEI personnel conducted all water, biota, and surface soil sampling and supervised sediment sampling. All chemical analyses were performed by EEI. The USATHAMA Quality Assurance Program was used to establish detection limits for each analytical method utilized and to establish the precision and accuracy of quantitative data.

The BAAP survey was conducted in two phases: an initial qualitative screening phase followed by a quantitative verification phase. The screening phase was conducted to determine the presence or absence of contamination at and in the vicinity of certain suspected sources of contamination as well as to identify any previously unsuspected contaminants which might occur in these areas. The verification phase documented and quantified the concentrations of contaminants detected during the screening phase and determined if (or at what rate and direction) these contaminants are migrating.

Chapter 2 outlines the organization, management, storage and reporting of the vast amounts of data that were generated as part of this study. Chapter 3 contains a geotechnical summary. Portions of this summary were written by Warzyn, and these are included in their geotechnical report (Appendix G).

Chapter 4 contains a description of the potential sources of contamination that were previously identified at BAAP. It also includes sampling site locations and a detailed discussion of the sampling materials and methods employed. Chapter 5 outlines the analytical methods used, the problems that arose in using those methods, and the quality assurance program employed during the survey. In Chapter 6, the investigations conducted off-site in Grubers Grove Bay, Wiegands Bay, Lake Wisconsin and the Wisconsin River are discussed. This discussion includes sections on sampling, analysis, interpretation, and a summary of the results of the study.

In Chapter 7 the analytical results of the rest of the survey are summarized and interpreted with regard to the physical environment at BAAP. In Chapter 8 this summary is used to draw conclusions regarding the occurrence and migration of contaminants at BAAP.

CHAPTER 2

DATA MANAGEMENT

INTRODUCTION

During the environmental survey of BAAP, data was generated from field sampling, surveying, well installations, and chemical and physical analyses. Each piece of data has been recorded and formatted into one of the five existing IR Data Management System files, as specified in the BAAP Data Management Plan (1). These five files are listed below:

1) Geotechnical - Map File

2) Geotechnical - Field Drilling

3) Geotechnical - Physical Analysis

4) Chemical Analyses

5) Ecological Survey - Monitoring Program

The majority of the data is contained in the two analysis files; field survey results in the other three files represent a smaller portion of the total record.

DATA CAPTURE

Most of the data files have new entry codes which are not found in the IR Data Management User's Guide (2). New code names are proposed for those variables where code names do not currently exist. Examples include new genus/species codes for the Ecological Survey - Monitoring Program file, site types in the map file, and test names in the Chemical Analysis file. Appendix A includes a complete listing of the proposed code names.

The numbering system for sample numbers and site identifications (ID) includes alphabetic and numeric prefixes and sequences designed to show (generally) the location and type of sample referenced. The result or analysis indicates by itself the general site and sample type. Table 2-1 presents a more

TABLE 2-1

BAAP SAMPLE AND SITE NUMBERING SYSTEM

Site ID Numbering	Generalized Site Type
S0001-S0999	Biological sampling locations
S1100-S1199	Well
S1200-S1299	Settling ponds
S1300-S1399	Bays, rivers, lakes
S1400-S1499	Surface soils

Sample Number Prefixes	Generalized Sample Type
AXXXX[a]	Groundwater
WXXXX	Surface water
DXXXX	Soil or parent material
MXXXX	Sediment (deposited material)

NOTES: [a] Where X is numeric field of four digits.

detailed explanation of the system. Data from all of the files is related to the "Site ID" field, a unique location at BAAP. Thus, different types of samples obtained at the same location are readily identified and linked together by referencing the Site ID.

Quality control for data capture phases insured the accuracy of data entered onto magnetic tape from the coding forms. Inspection by attributes, as outlined in Military Standard 105D (3), was the procedure used. Inspection Level II was utilized in a multiple sampling plan designed to insure that the percent defective did not exceed 0.25 percent (AQL = 0.25). The unit of product was one record. All defects discovered were corrected and rejected batches were subjected to further manual inspection. All batches passed this quality control test before they were accepted.

Composite sample numbers were established for certain physical and chemical analyses pertaining to sediment and soil samples. The need for composited samples arises, for example, when numerous individual soil or sediment horizons are obtained at one site but only require a composited analysis for a particular parameter. Thus, composite samples and sample numbers were generated during initial sample log-in (or later when needed). Appendix B contains all composite sample numbers and associated individual sample numbers used for analysis during the survey. A character "C" in column 47 of the Chemical Analysis file denotes a composite sample. The characters "L", "U" and "S" in column 47 denote lower, upper and sediment horizons, respectively. These were used for defining a separate horizon sample from sample containers which were originally logged-in as one sample number in several containers and originally scheduled for composite analysis. Composite sample numbers in the Geotechnical Physical Analysis file are identified by the character "C" in column 27. Likewise, existing samples were composited for physical analysis when needed.

DATA FILES

The map file contains the coordinates of each site ID used at BAAP. The site IDs have grid coordinates. The site IDs for wells and settling ponds are coded with coordinates in the state planar. All other site IDs are in meters, representing the east and north distances from a point of origin located south and west of the physical plant. This origin has the following Universal Transverse Mercator (UTM) coordinates:

east: 275000
north: 4798500

Thus, UTM coordinates can ultimately be determined for those site IDs in meters by adding them to the origin point (in UTM). Appendix C contains a sample map file and code name explanations as well as a table explaining the "description" field for biology site IDs from S0001 to S0037. These further define the exact locations for terrestrial biological sampling points.

The Ecological Survey - Monitoring Program file contains aquatic and terrestrial survey data collected at BAAP. Site IDs (columns 20-29) for this file were originally assigned to numbers ranging between S0001 and S0999. In reality, however, the site IDs ranged from S0001 to less than S0060. Sample numbers for terrestrial samples fall within the range of B0001 through B0199 and aquatic biology samples range from B0200 through B9999 (Appendix D). In most cases, numerous samples were obtained at one site ID, and these can be keyed to the map file for exact locations.

The Geotechnical - Field Drilling file contains data related to well drilling, construction, and well testing at BAAP. Appendix E reveals the file format. Site IDs for the wells range between S1100 to S1199. Again, these are keyed to the map file for exact well locations.

Physical analyses were performed on only two site types, wells and river sediments. These results are contained in the Geotechnical - Physical Analysis file. Variables for this file, along with the format, are presented in Appendix F.

Results of chemical analyses are contained in the Chemical Analysis file (with the exception of GC/MS scans). Variables used in the file, such as test names and measurement units, were obtained from the most recent IR Data Management Guide, Series "B", changes and updates. For ease of data handling and field surveying, an abridged chemical analysis coding form was created and is included in the Appendix. Data from this field form was entered onto a scratch file containing information related to obtaining samples in the field. Laboratory personnel entered chemical results on the regular form containing analysis data (columns 35-80). This portion was also punched onto a scratch file. Using the sample number as the key between these two scratch files, a computer program then combined related data to create a complete Chemical Analysis file.

LIST OF REFERENCES FOR CHAPTER 2

(1) Envirodyne Engineers, Inc., 1979. Data Management Plan for Badger Army Ammunition Plant, Contract No. DAAK11-79-C-0117, U. S. Army, Aberdeen Proving Ground (Edgewood Area), Maryland.

(2) U. S. Army, 1978. Installation Restoration (IR) Data Management User's Guide, Chemical Systems Laboratory, Aberdeen Proving Ground, Maryland.

(3) U. S. Department of Defense, 1963. Sampling Procedures and Tables for Inspection by Attributes, MIL-STD-105D, Washington, DC: USGPO.

CHAPTER 3

GEOTECHNICAL SUMMARY

This chapter was taken from the Warzyn Engineering, Inc. report, which is included in its entirety as Appendix G.

REGIONAL GEOLOGIC SETTING

Glacial Geology

The following discussion of regional geology is primarily based on "Geology of the Baraboo District, Wisconsin," Wisconsin Geological and Natural History Survey Information Circular 14, 1970.

The surface morphology of the BAAP is basically the result of late Wisconsin Stage Glaciation. The terminus of the last major ice advance is situated in the west-central area of the site (see Figure 3-1). The eastern two-thirds of the site were under the direct influence of glacial ice, giving rise to an undulating topography characterized by knob and kettle type features. Several on-site kettle holes are currently occupied by small ponds. Due to differential melting of the ice front, the glacial deposits in the eastern areas are combined stratified outwash deposits and glacial till.

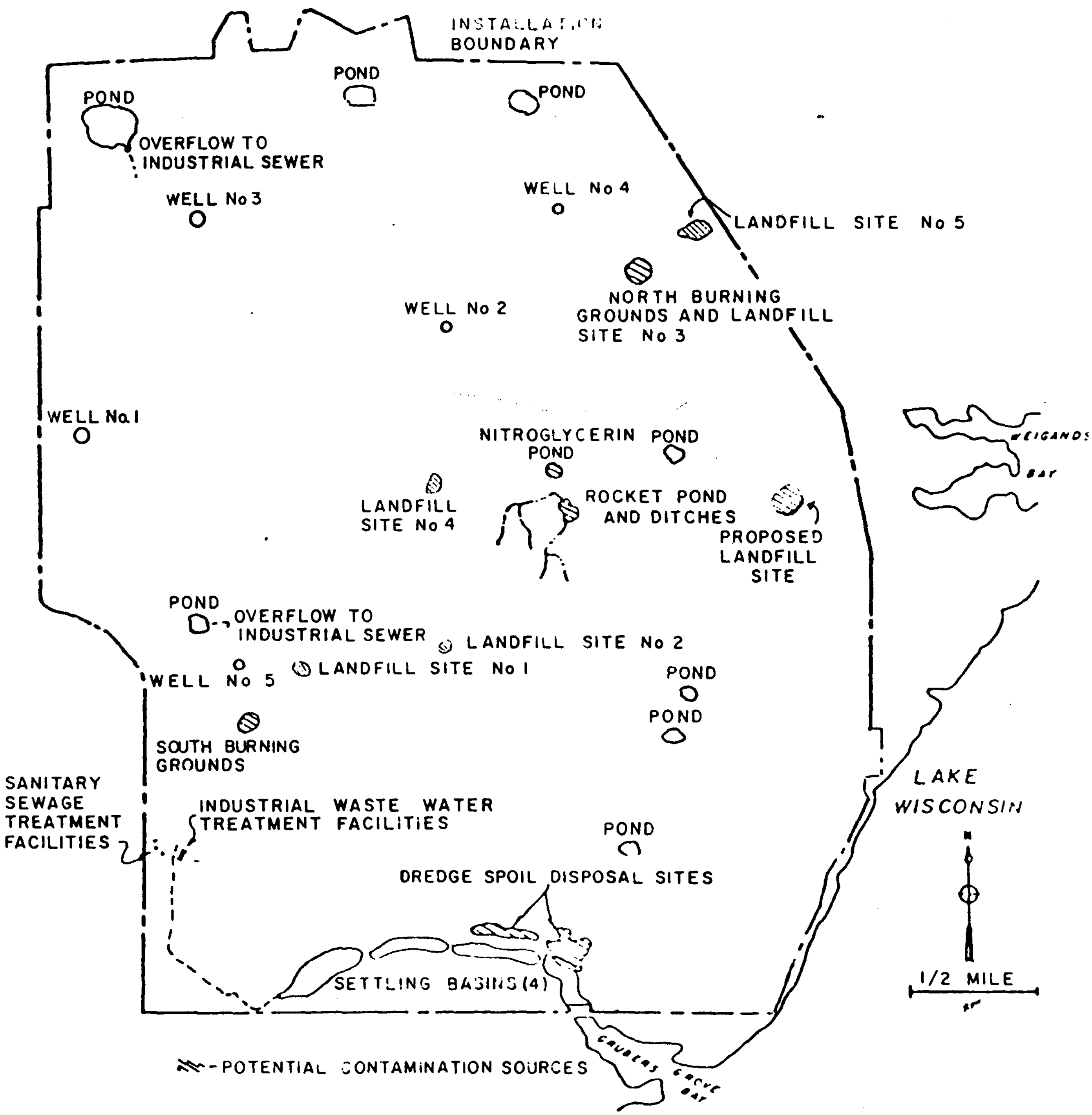
The western third of the site was not overlain by glacial ice and forms a flat glacial outwash plain. The plain is underlain by stratified sand and gravel with some minor silt or clay layers. The plain extends south of the plant area where it becomes part of the Wisconsin River Valley. The area east of the plant, on the eastern bank of Lake Wisconsin, is characterized by undifferentiated glacial till, lake and wind deposits, and recent river deposits. The northern boundary of the BAAP lies along the southern edge of the Baraboo hills. The hills reach elevations of over 1,400 feet north of the plant boundaries near Devil's Lake. Within BAAP boundaries, the highest bedrock elevation is approximately 1,140 feet above sea level near the water reservoirs upslope from the water treatment plant, along the northern site boundary.

Bedrock Geology

The bedrock around BAAP is characterized by Precambrian metamorphic rock and upper Cambrian to Ordovician sandstones, shales and dolomites (see Figure 3-1). The oldest rock unit which

FIGURE - 3B

LOCATIONS OF POTENTIAL CONTAMINATION AREAS



BADGER A. A. P.
TOTAL PLANT OPERATIONS EA

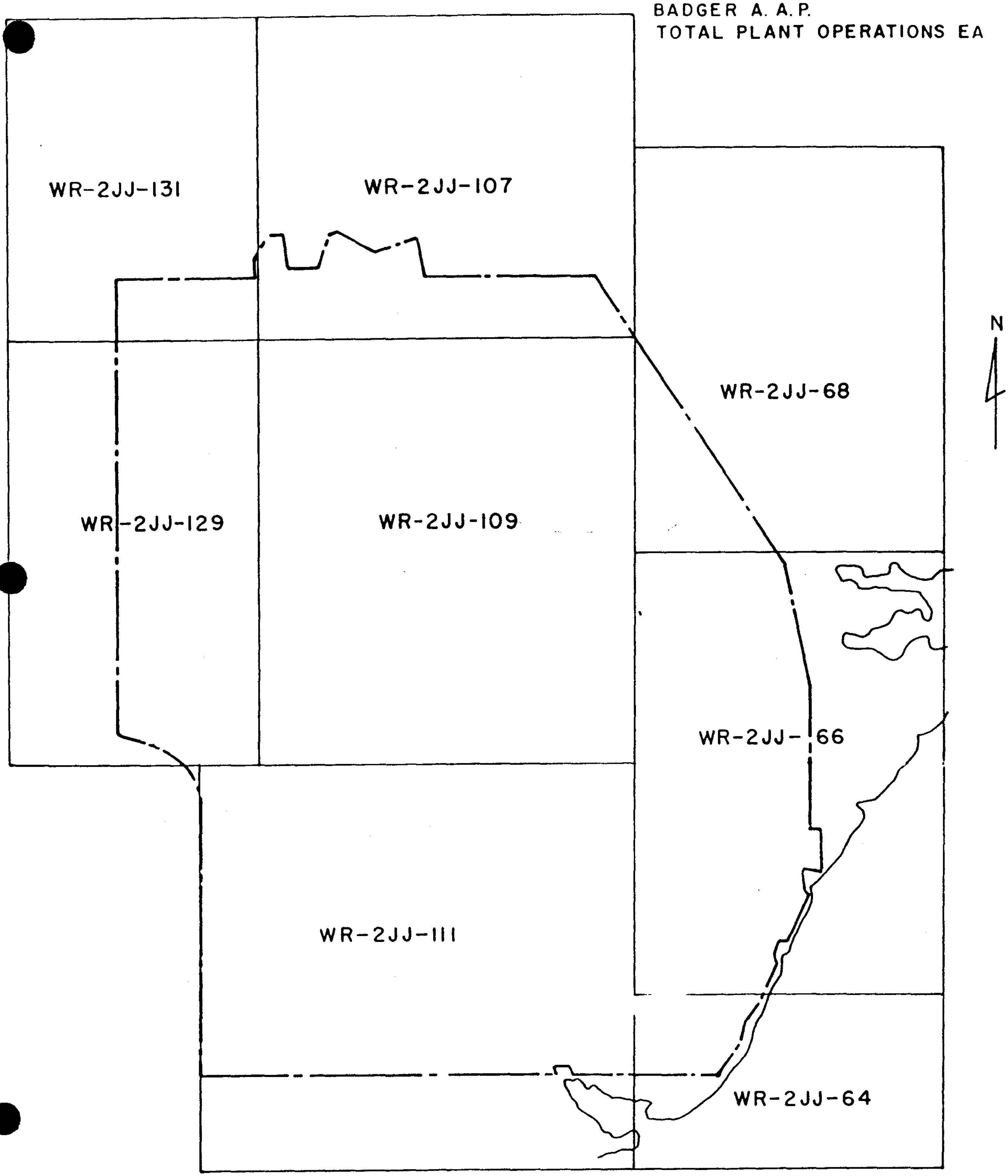


FIGURE - 4
PLANT SITE MAP - SOILS KEY

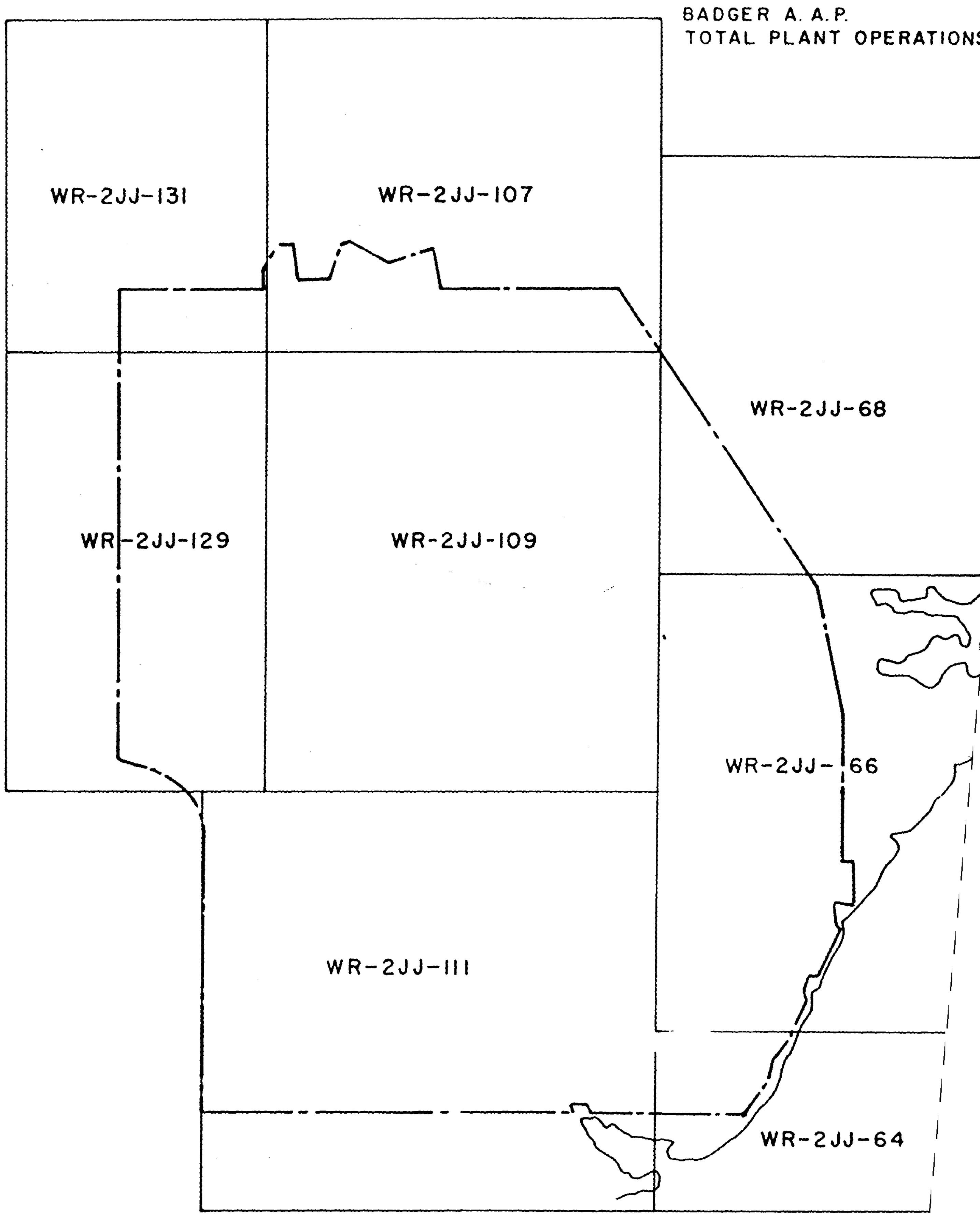


FIGURE – 4

PLANT SITE MAP – SOILS KEY [13]

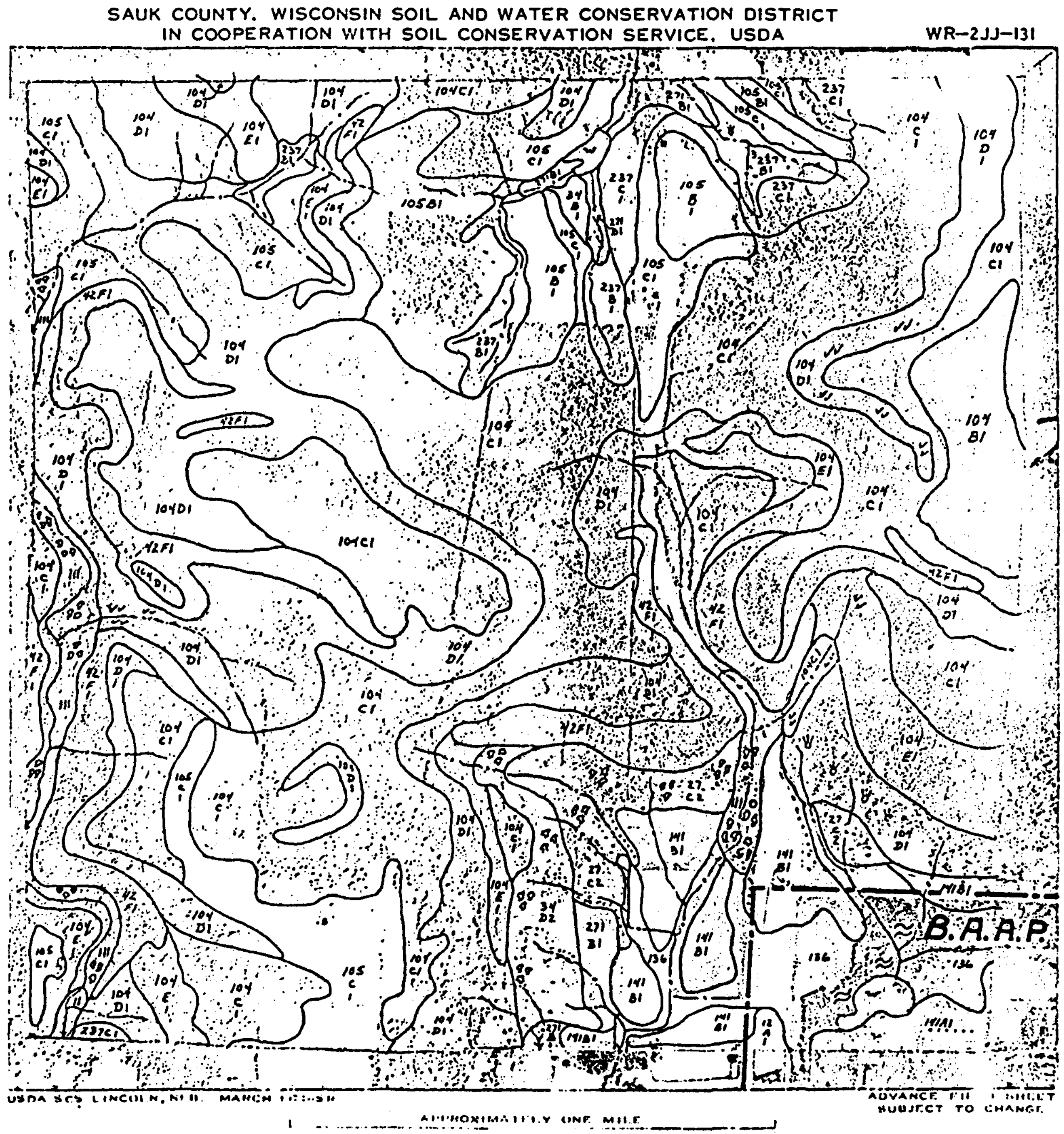
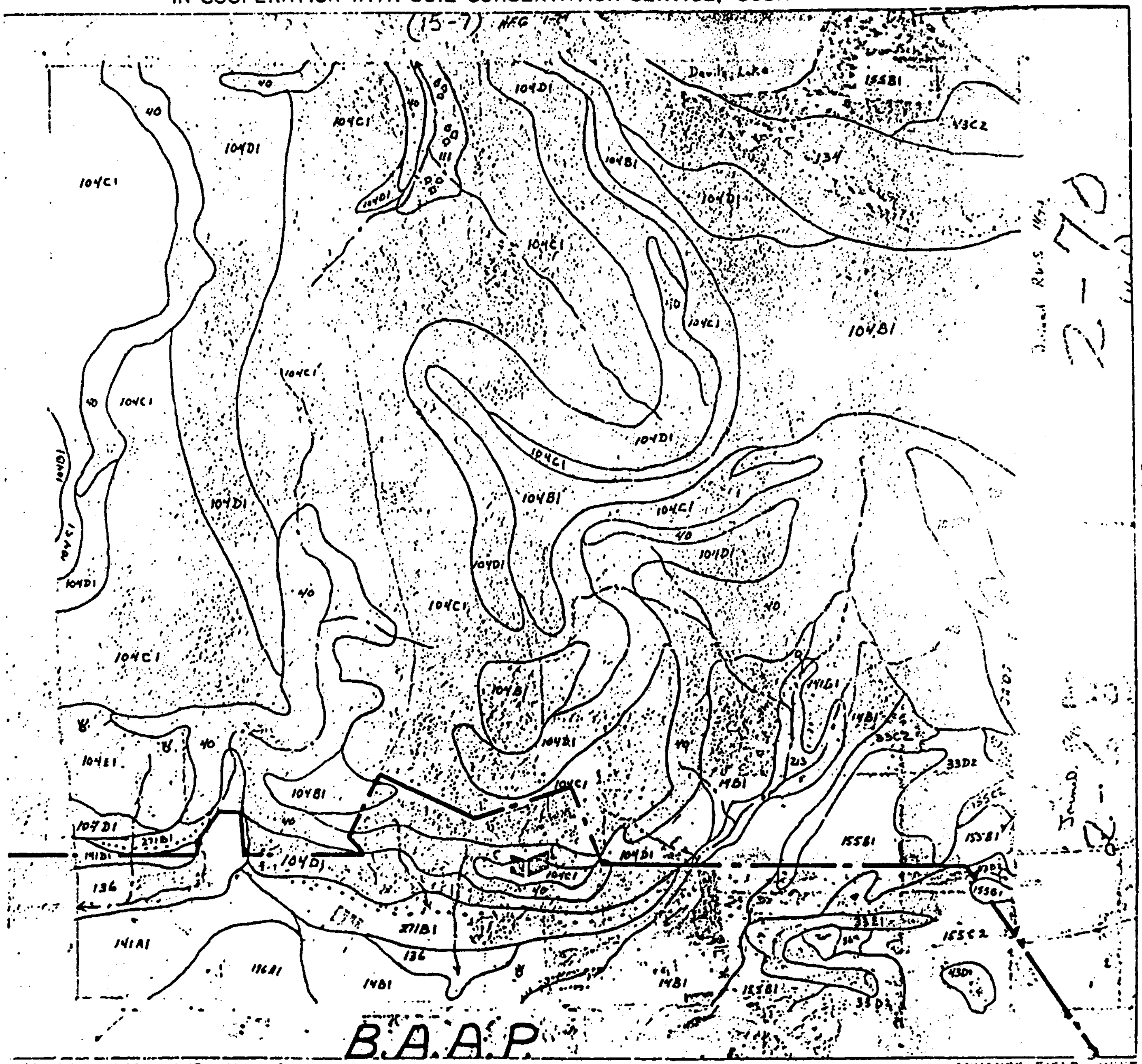


FIGURE 4-1
SOILS ANALYSIS KEY- SECTION WR-2JJ-131

BADGER A.A.P.
TOTAL PLANT OPERATIONS EA.

SAUK COUNTY, WISCONSIN SOIL AND WATER CONSERVATION DISTRICT
IN COOPERATION WITH SOIL CONSERVATION SERVICE, USDA

WR–2JJ–107



USDA SCS LINCOLN, NEB. JAN. 1976

APPROXIMATELY ONE MILE

ADVANCE FIELD SHEET
SUBJECT TO CHANGE

BADGER A.A.P.
TOTAL PLANT OPERATIONS EA

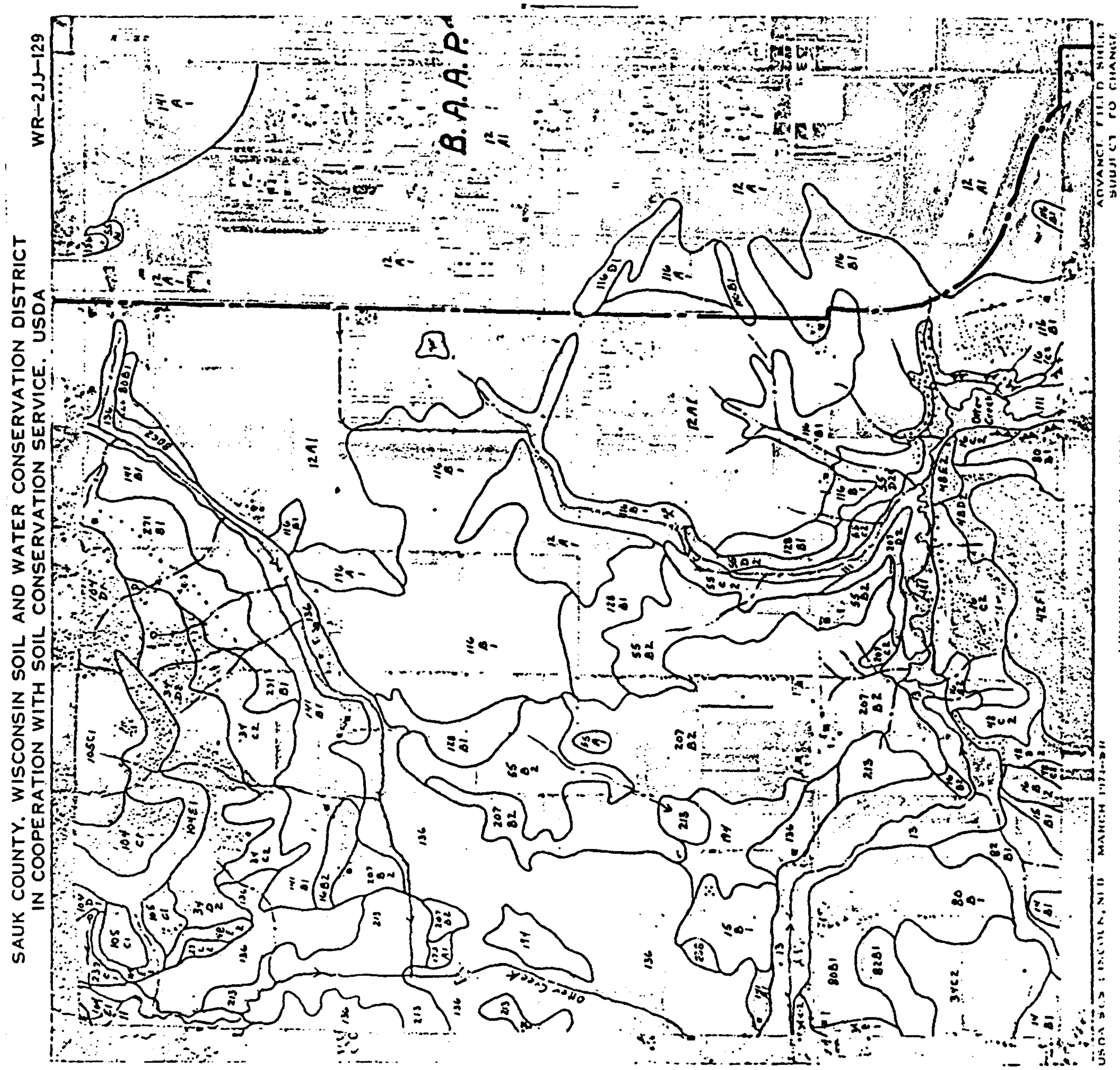
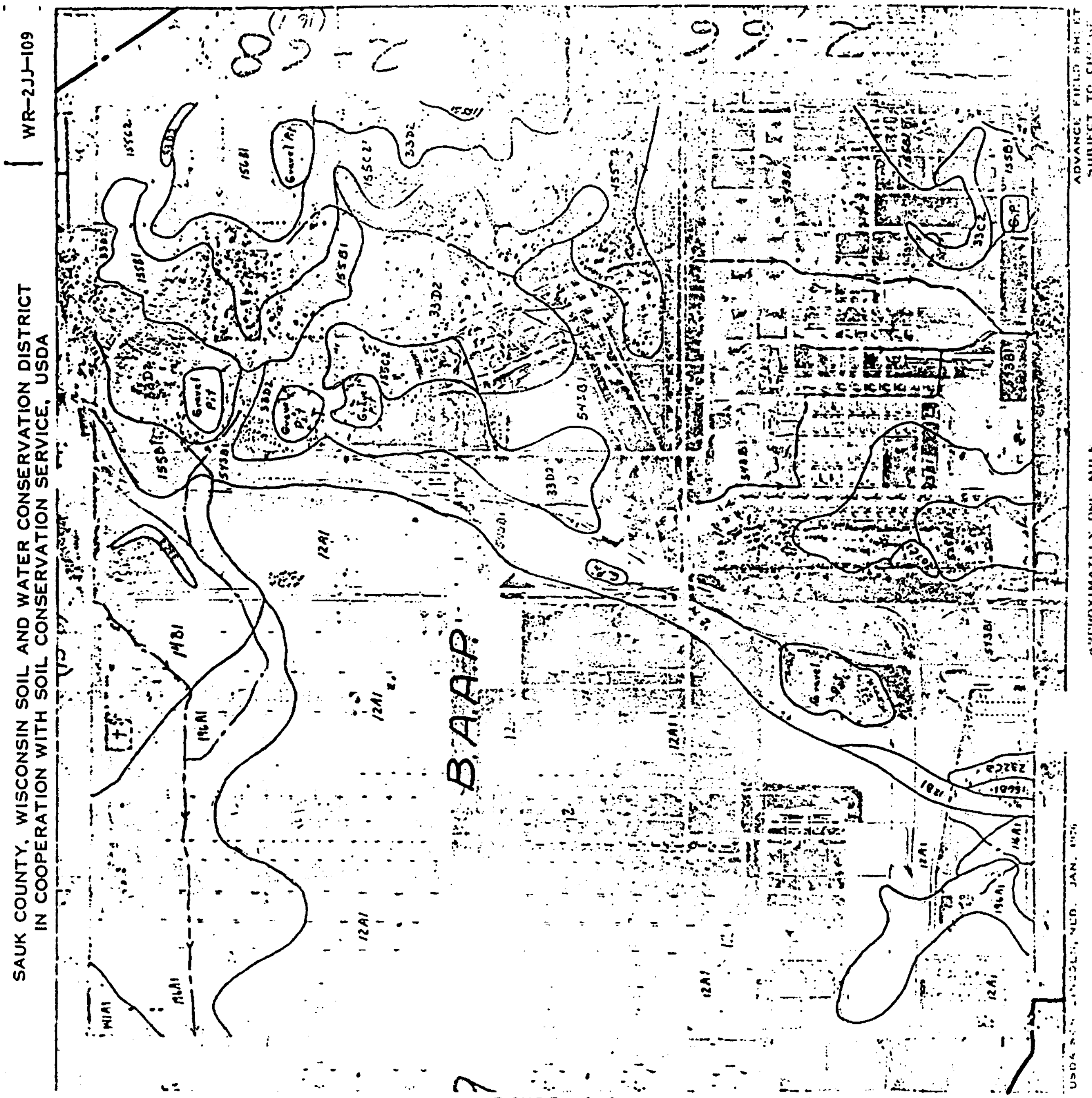


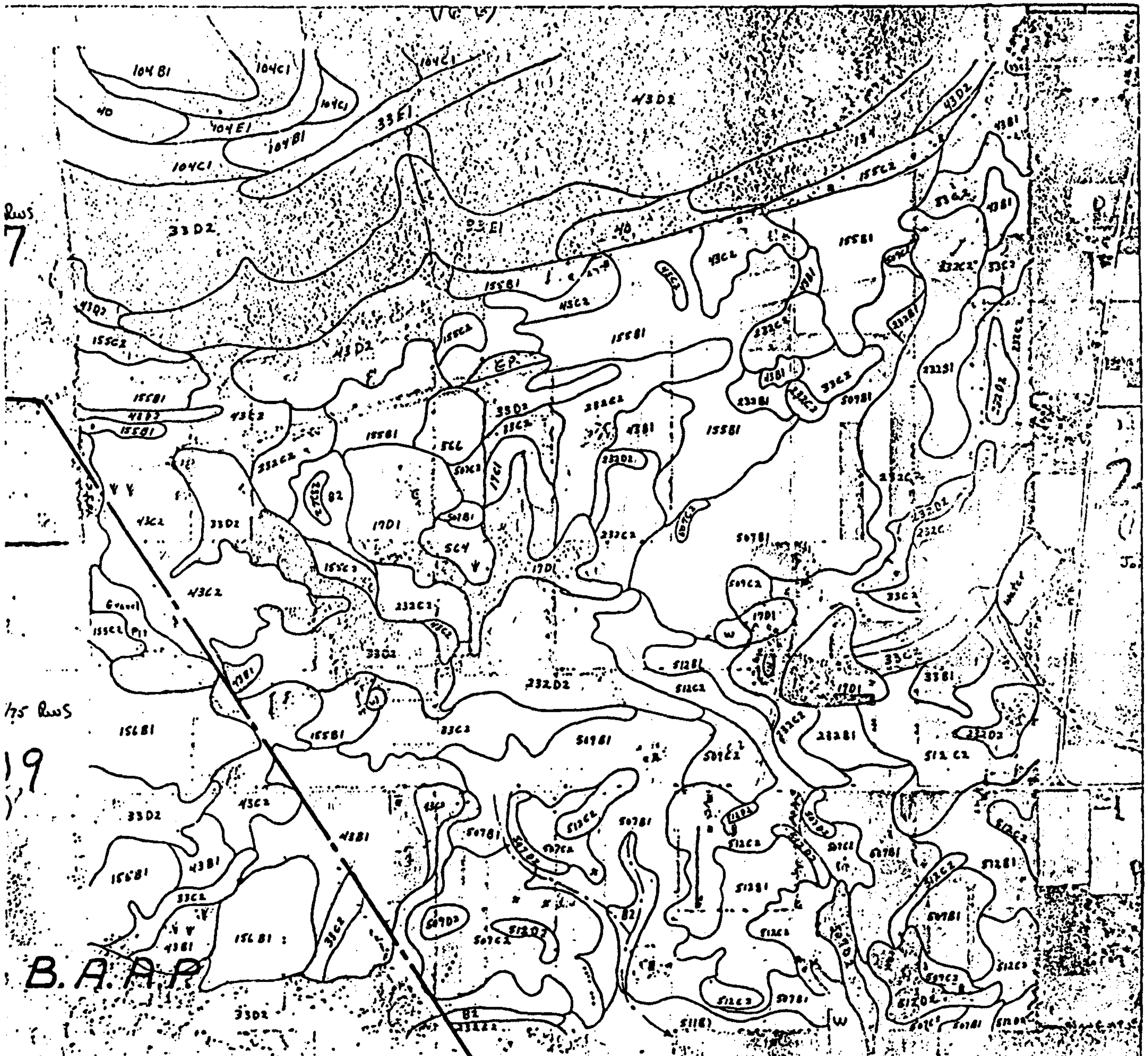
FIGURE 4-3
SOILS ANALYSIS KEY– SECTION WR-2JJ-129 (13)


SAUK COUNTY, WISCONSIN SOIL AND WATER CONSERVATION DISTRICT
IN COOPERATION WITH SOIL CONSERVATION SERVICE, USDA
WR-2JJ-109
BAAP

FIGURE— 4.4

SAUK COUNTY, WISCONSIN SOIL AND WATER CONSERVATION DISTRICT
IN COOPERATION WITH SOIL CONSERVATION SERVICE, USDA

WR-2JJ-68



USDA SCS LINCOLN, NEB. JAN. 1976

APPROXIMATELY ONE MILE

ADVANCE FIELD SHEET
SUBJECT TO CHANGE

FIGURE 4.5

BADGER A.A.P.
TOTAL PLANT OPERATIONS EA

BADGER A.A.P.
TOTAL PLANT OPERATIONS E.A.

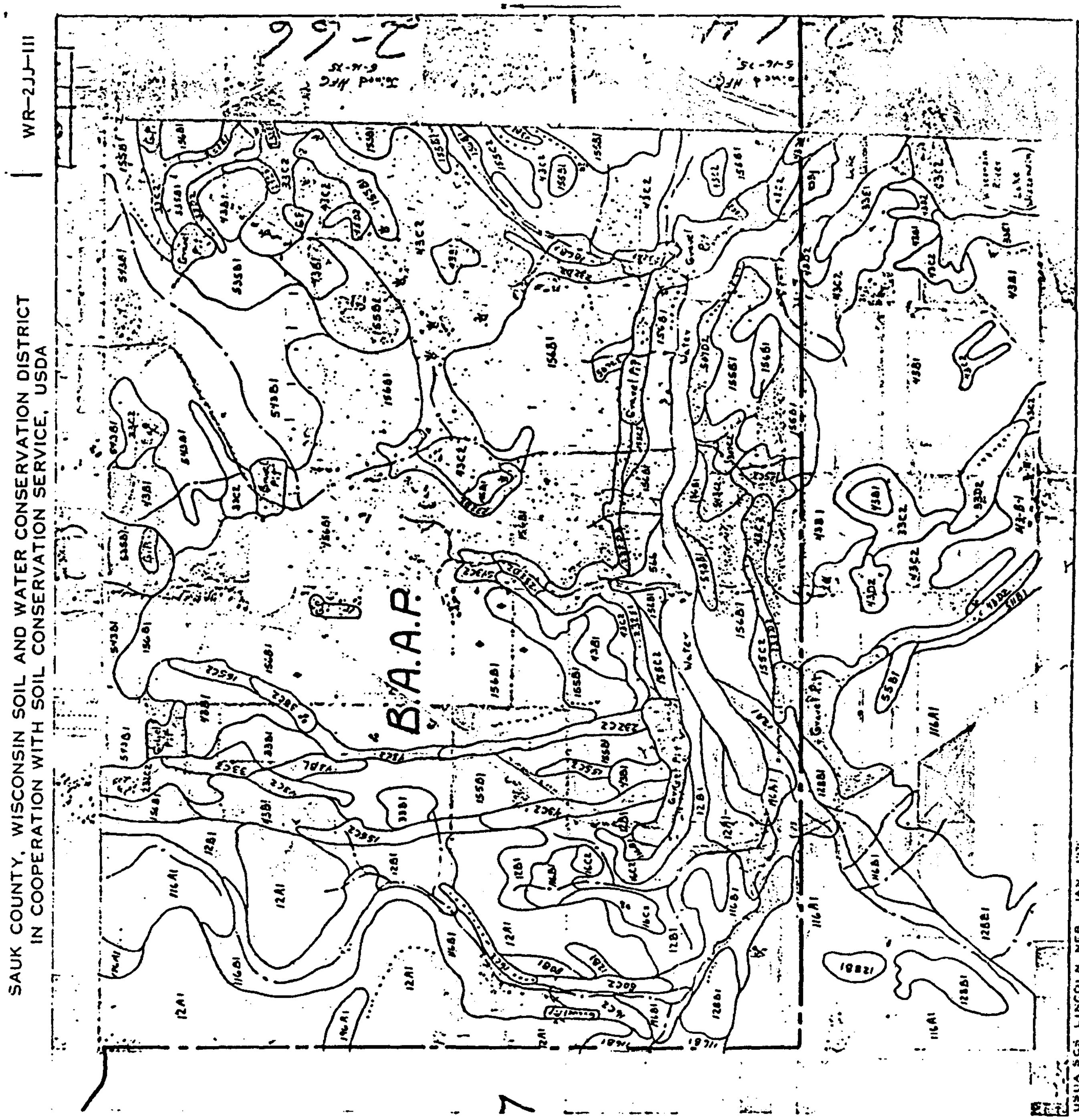


FIGURE 4-6

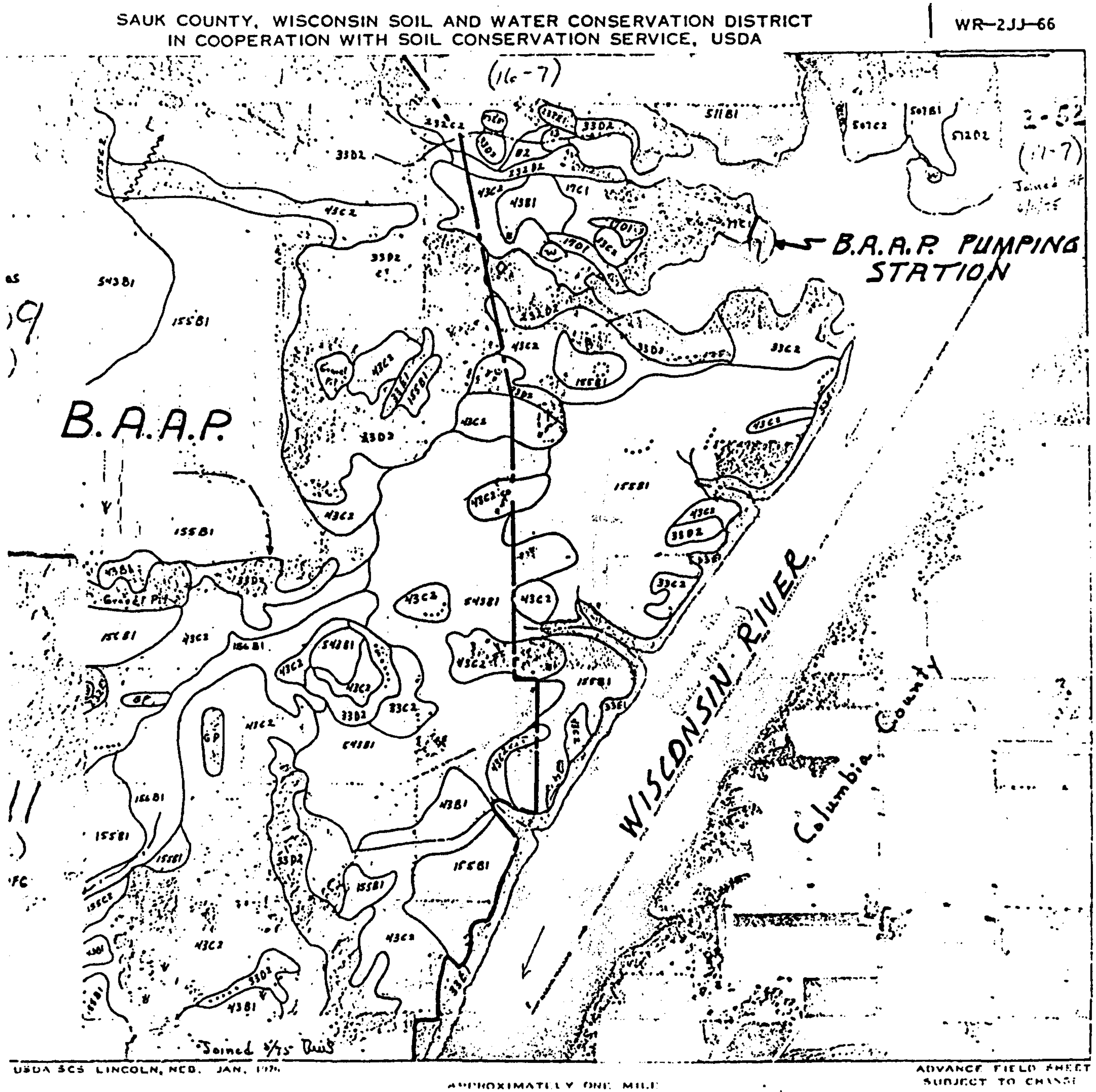
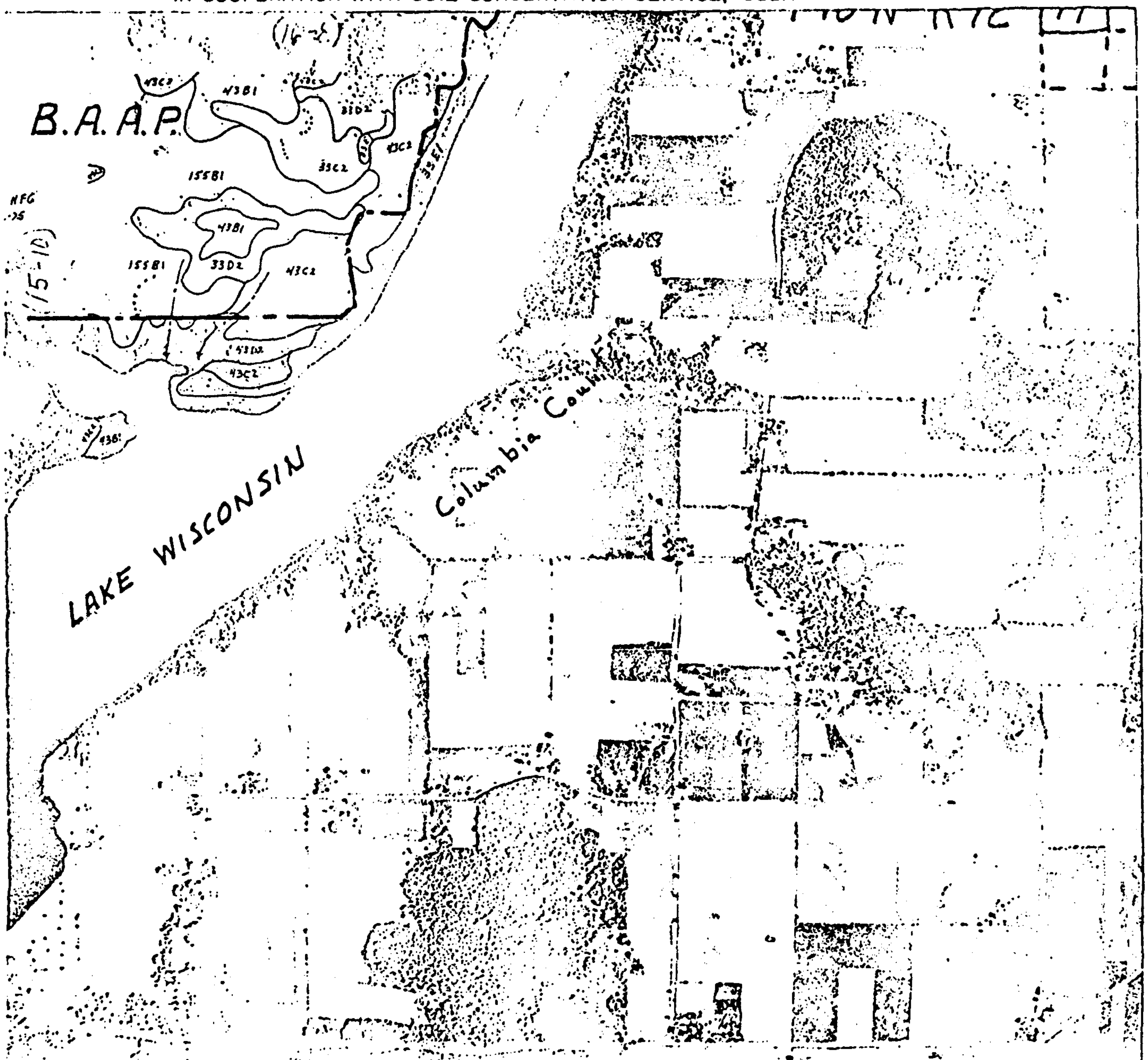


FIGURE 4-7

BADGER A.A.P.
TOTAL PLANT OPERATIONS E A

SAUK COUNTY, WISCONSIN SOIL AND WATER CONSERVATION DISTRICT
IN COOPERATION WITH SOIL CONSERVATION SERVICE, USDA

WR–2JJ–64



USDA SCS LINCOLN, NEB. JAN. 19..

APPROXIMATELY ONE MILE

ADVANCE FIELD SHEET
SUBJECT TO CHANGE

FIGURE 4.8

BADGER A.A.P.
TOTAL PLANT OPERATIONS EA

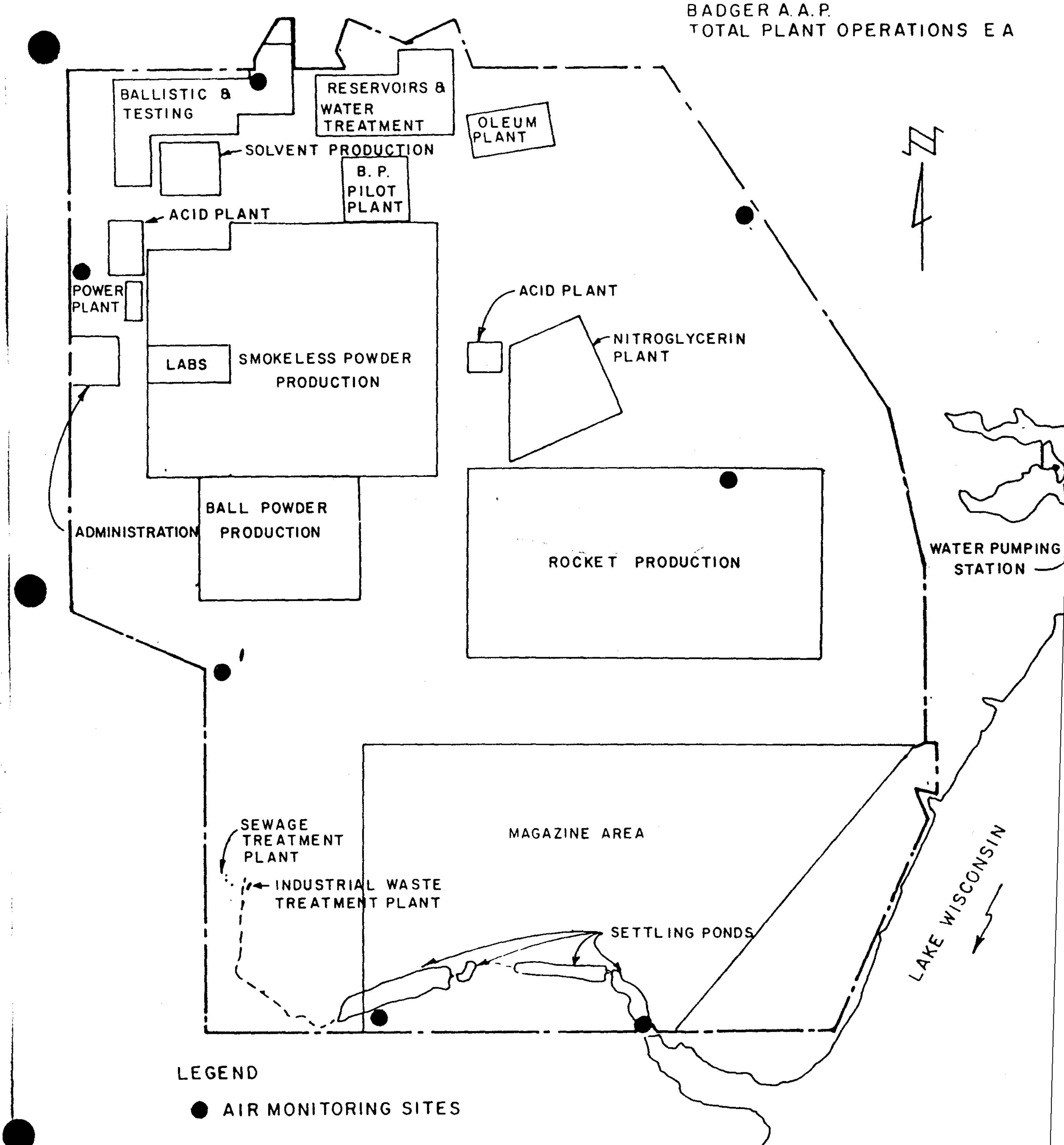


FIGURE 5—A
PLANT SITE MAP- AIR MONITORING SITES, BOILER PLANTS, AND PRODUCTION AREA LOCATIONS

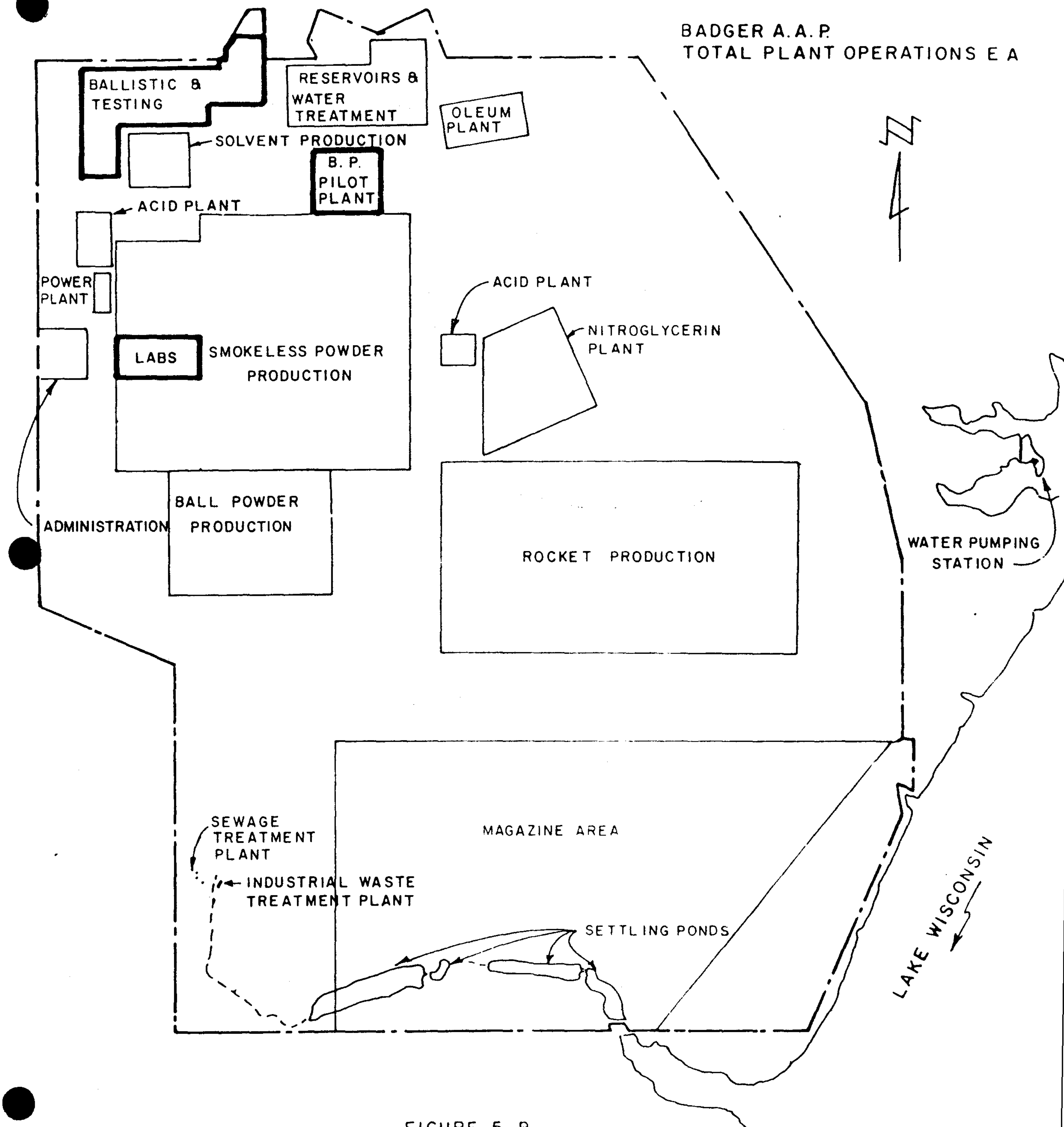


FIGURE 5-B
PLANT SITE MAP- TEST RANGES AND SITES

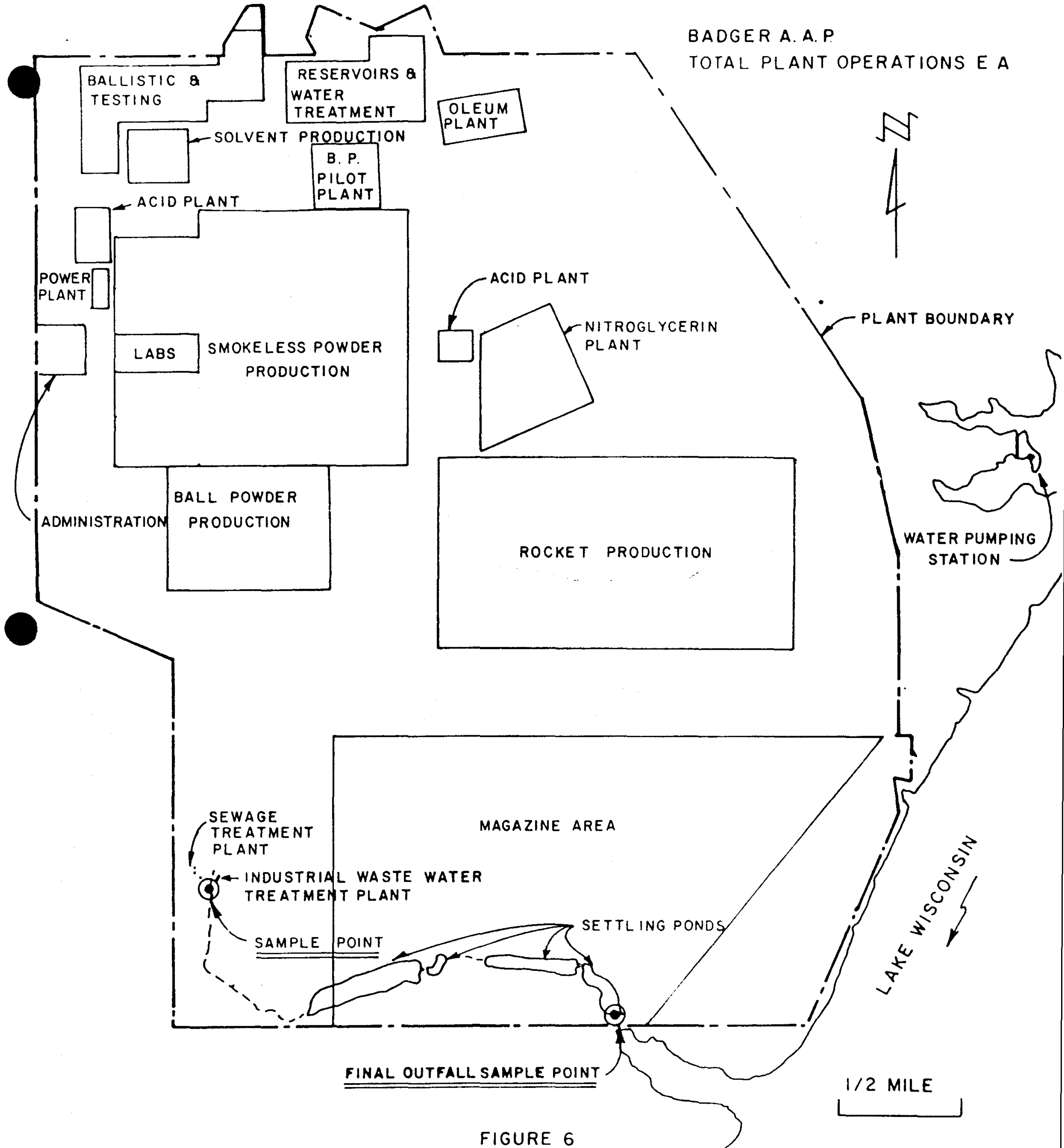


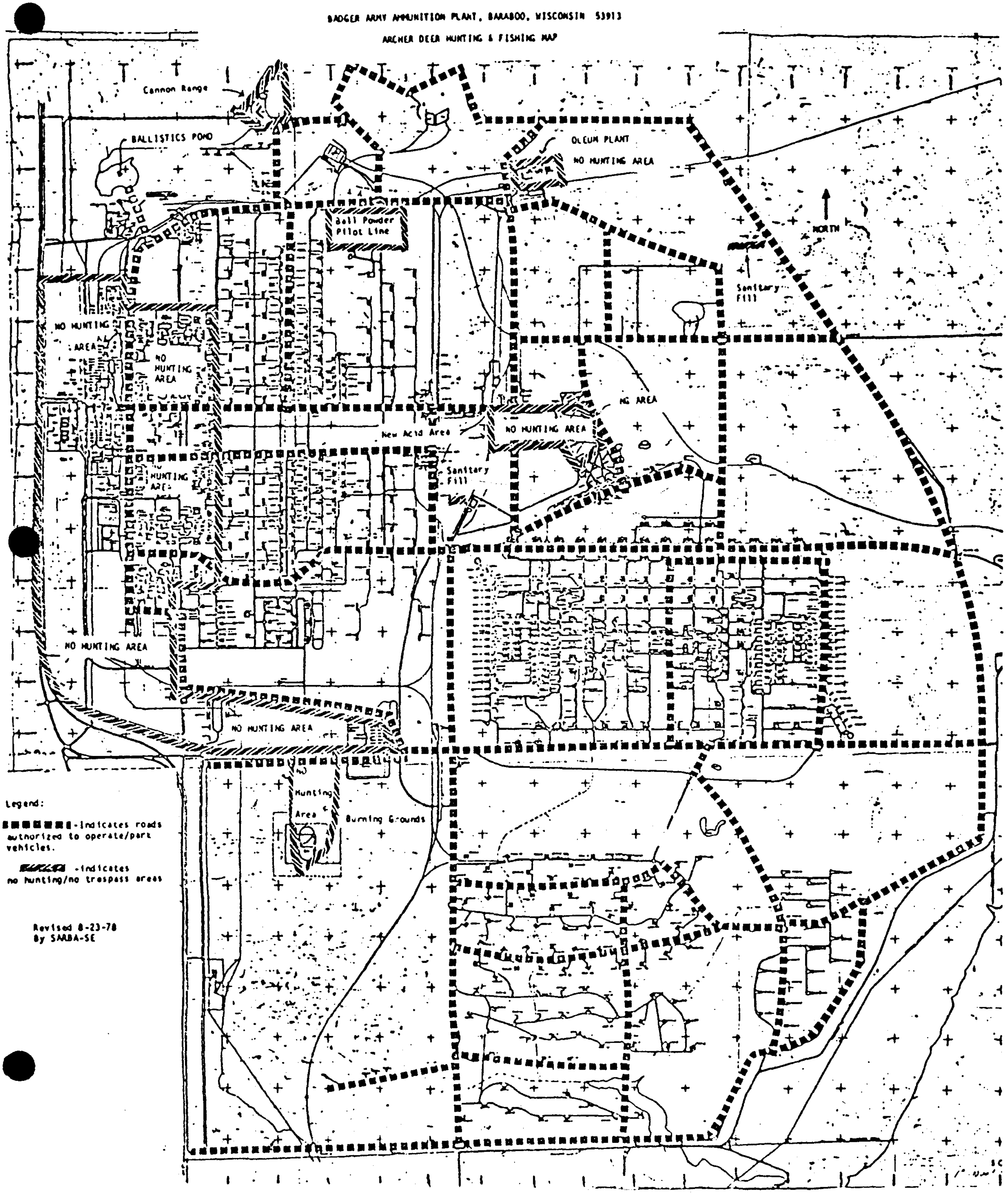
FIGURE 6

BADGER ARMY AMMUNITION PLANT

WATER SUPPLY, SEWAGE TREATMENT, INDUSTRIAL WASTE TREATMENT, AND THE INSTALLATION EFFLUENT AND MONITORING LOCATIONS

BADGER A.A.P.
TOTAL PLANT
OPERATIONS E A

FIGURE 7-B
PLANT SITE MAP—HUNTING AND FISHING AREAS



ENVIRONMENTAL ASSESSMENT

FOR

TOTAL PLANT OPERATIONS

TABLES

TABLE I-A

TYPICAL POLLUTANTS, EFFLUENTS, PRODUCTION RATES AND CAPACITIES

A. BREAKDOWN OF POLLUTANT BY AREA

	ESTIMATED Percent Contribution of Pollutant			
	Sulfate	Nitrate	Total Dissolved Solids	Total Suspended Solids
BALL POWDER	6.5	Negligible	2.6	Negligible
NITRIC ACID	2.0	Negligible	0.8	3.5
NITROCELLULOSE	90.3	99	96.0	96.5
TREATED WATER	1.2	Negligible	0.5	Negligible

B. EFFLUENT POLLUTANT CONCENTRATIONS AND NPDES PERMIT STANDARDS

	Effluent Characteristic				Applicable NPDES Limits***	
	1969*		1973**			
Monitored Parameter	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day
TOC/COD	36	8,817	10	660	40	7,500
Nitrate	72	17,632	27	1,807	10	1,875
Total Dissolved Solids	1428	349,717	533	35,076	1000	187,500
Total Suspended Solids	86	21,061	6	395	25	4,690
Sulfates	554	135,674	133	8,763	100	18,750

* Reference 3 in Bibliography
** Reference 4 in Bibliography
*** Reference 5 & 7 in Bibliography

WPDES Permit application filed on 29 June 1982, is under review and processing by the Wisconsin Department of Natural Resources.

TABLE I-A (cont'd)

C. PRODUCTION LEVELS AT TIME OF USAEHA-EA REPORTS

N Area	1969*	1973*
Nitric Acid	146 tons/day	25 tons/day
Nitrocellulose	201,000 lbs/day	17,000 lbs/day
Rocket	7,000 grains/day	5,000 grains/day
BALL POWDER	35,000 lbs/day	32,000 lbs/day

* Reference 3 and 4 of Bibliography

D. PLANT DESIGN CAPACITIES

Area	Production Rate (daily basis)
Nitric Acid (Old-Existing)	250 tons
Nitric Acid (New)	400 tons
Sulfuric Acid (Old-Existing)	200 tons
Sulfuric Acid (Old)	350 tons
Nitrocellulose	500,000 lbs
Rocket	28,000 grains
BALL POWDER	100,000 lbs
Smokeless Propellant	533,000 lbs.

TABLE 1-B

PRODUCTION AND SUPPORT CAPABILITY*

	Unit of Measurement	Existing Capacity	Modernized Capacity in Construction	Mobilization *** Requirement Existing Production Facilities	Mobilization *** Requirement Modern Production Facilities
Single Base (M1 and NACO)	1000 lb/mo	16,000 **	-	16,000	16,000
Ball Powder	1000 lb/mo	3,000 **	-	2,881	2,881
Extruded Solvent-less (2.75 Rkt Grain, 155 RAP)	1000 lb/mo	2,900	-	-	-
Weak Nitric Acid	TPM	7,500	10,800	8,961	7,359
Strong Nitric Acid	TPM	5,000	13,500	10,915	16,219
Oleum	TPM	7,500	10,980	7,713	7,289
Nitrocellulose	1000 lb/mo	16,600	-	16,298	16,298
Nitroglycerin	1000 lb/mo	1,100	1,620	317	317
Steam	1000 lb/hr	1,386	-	1,550	1,180
Electricity	MVA	30	-	40	124
Water - Raw	MGD	43	-	11	-
Water - Treated	MGD	48	-	78	26

* Production capacities are based on a 27 day operating month.

** Ball Powder and Single Base "E" Line use same finishing buildings. New Single Base finishing buildings can be constructed after M-Day and meet mobilization schedule.

*** Interim requirements above standby status are direct factors of mobilization requirements.

BAAP Solid Waste Disposal Sites*

Site** No.	Location	Status	Size (Approx)	Condition	Types of Material Disposed of/Remarks
1	NW 1/4 of NE 1/4 of Section 14, TION, R6E Township Sumpter Sauk Co, WI (N 9700 E 6500) Badger Coordinate System	Inactive/ closed (1942-1959)	300'x100'x20' ~volume ≈600,000 cf ~tons @35 lbs/cf ≈10,500 tons	Crowned & covered with 3' compacted soil	Structural timbers, asphalt shingles, cardboard, paper, office type refuse, etc. Open burning of propellant and extraction-waste (deterrent-dinitrotoluene, dibutylphthalate, diphenylamine), benzene and black powder were carried out at this site. No garbage or explosives-contaminated waste was burned at this site.
2	NW 1/4 of NW 1/4 of Section 13, TION, R6E Township Sumpter Sauk, Co (N 10100 E 9600) Badger Coordinate System	Inactive/ closed (1969-1974)	150'x150'x10' ~volume ≈225,000 cf ~tons @35 lbs/cf ≈3,938 tons	Crowned & covered with 3' of soil	Structural timbers. asphalt shingles, cardboard, paper, office refuse, etc. No explosive or propellant contaminated waste was buried at this site. No open burning of any kind was practiced at this site.
3	SW 1/4 of NE 1/4 of Section 1, TION, R6E Township Sumpter Sauk Co (N19000 E 13000) Badger Coordinate System	Inactive/ closed (1960-1972)	400'x400'x20' ~volume ≈3,200,000 cf	Crowned & covered with 3' compacted soil	This was an old site for open burning of structural timbers, asphalt shingles, cardboard, paper, office refuse, propellant & extraction waste. This waste, consisting of deterrent (dinitrotoluene, dibutylphthalate & diphenylamine), benzene and black powder was burned in 3 small areas located at the east end of the site. These extraction-wastes burning areas comprise less than 10% of the total site. Although open burning practices attempted to achieve complete destruction of the waste materials, combustion was not always complete, and some of these materials and/or combustion residuals remained. Action of melting snow & rainfall carried some of the residuals into the soil at the site. To prevent further surface water leaching & percolation, the deterrent burning area was covered with a heavy plastic membrane. This membrane was covered with 3' layer of soil to hold it in place and to protect it from weather & animal damage and to provide an additional barrier to water penetration. No explosive/propellant contaminated structural wastes or garbage were burned or buried at this site.
4	NE 1/4 of NE 1/4 of Section 11, TION, R6E Township Sumpter Sauk Co, WI (N15200 E 8300) Badger Coordinate System	Inactive/ closed (1969-1974)	600'x600'x25' ~volume ≈9,000,000 cf ~tons @35 lbs/cf ≈157,500 tons	Crowned & covered with 4' of soil	Uncontaminated wooden structural materials, asphalt shingles and other construction type debris were buried here. No explosives, propellants, explosive/propellant contaminated materials, or garbage were buried or burned at this site.

Site** No.	Location	Status	Size (Approx)	Condition	Types of Material Disposed of/Remarks
5	NW 1/4 of NW 1/4 of Section 6, T10N, R7E Township Merrimac Sauk Co, WI (N 20000 E 14200) Badger Coordinate System	Active (1972-)	1,000'x800'x20' ~volume ≈16,000,000 cf ~tons @35 lbs/cf and 40% fill ≈112,000 tons	40% of the potential volume is filled. The inactive portion is covered with 3' of soil. The active portion is operated using the fill, compaction and cover method with cell size dimensions varying according to daily activity.	Uncontaminated wooden structural materials, asphalt shingles, construction-type debris, cardboard, paper, office refuse, etc. No explosives, propellants, explosive/propellant contaminated materials or garbage have been buried or burned at this site. This site will continue as a solid waste disposal site for the disposal of materials similar to that noted above. At the current fill, compaction and cover rates, this site has an estimated life of 10 years. As the site is filled, it will be graded, crowned and covered with 2 feet of low permeable compacted soil and 6 inches of available top soil and seeded to hay grasses and crown vetch to prevent erosion and to reduce water infiltration and maximize evapotranspiration. A visual screen of white pine, multiflora rose and autumn olive will be developed approx. 50 feet from the edge of the plant road on the east side of the solid waste disposal site. This screen will also provide cover for existent wildlife.
6	E 1/2 of NW 1/4 of Section 14, T10N, R6E & the W 1/2 of NE 1/4 of Section 14, T10N, R6E Township Sumpter Sauk Co, WI (N 9600 E 5800) Badger Coordinate System	Active (1959-)		Burning Pads and Pits. No landfill.	Explosive/propellant contaminated materials (construction debris, cardboard, wood, etc.) are burned on the burning pads provided for this purpose. Waste explosives and/or propellant materials are burned on burning pads provided for this purpose. These sites will continue to be used for the disposal of explosives and propellants and contaminated waste until the proposed Contaminated Waste Processor (CWP) and Explosive Waste Incinerator (EWI) are constructed by the Corps of Engineers.

*All sites are owned by the United States Army and operated under contract by Olin Corporation. Olin Corporation is the authorized licensee for the operation of all solid waste disposal sites.

**Solid waste disposal sites are shown on Drawings -3394, Sheets 1-14.

OB-777 Rev. 4

MGD Discharged 2.5 Estimated

OLIN CORPORATION
WINCHESTER GROUP
AMMUNITION OPERATIONS
BADGER ARMY AMMUNITION PLANT
BARABOO, WISCONSIN

Date Reported: 31 December 1974

Date Received: 27 December 1974

LABORATORY ANALYSIS REPORT - FACILITY EFFLUENT WATER

ANALYSIS	EPA LIMITATION Average	EPA LIMITATION Maximum	Typical BAAP ANALYSIS		DISCHARGE lbs/24 Hours	DISCHARGE LIMITATION lbs/24 Hours Average	DISCHARGE LIMITATION lbs/24 Hours Maximum	REMARKS
Total Solids	No Requirement		647	mg/l		No Requirement		
Total Volatile Solids	No Requirement		97	mg/l		No Requirement		
Total Suspended Solids	75 mg/l	150 mg/l	17	mg/l	359	14,080	28,100	
Total Dissolved Solids	1250 mg/l	1750 mg/l	630	mg/l	13,167	234,000	328,000	
Settleable Solids	No Requirement		Trace	ml/l		No Requirement		
Dissolved Oxygen	5 mg/l Minimum*		11	mg/l	@ 4°C.	No Requirement		Grab Sample 12/26/74
Biochemical Oxygen Demand	No Requirement		13.3	mg/l		No Requirement		Grab Sample 12/26/74
Chemical Oxygen Demand	75 mg/l	150 mg/l	52.4	mg/l	1,095	14,080	28,100	
Nitrite-N	No Requirement		0.8	mg/l		No Requirement		
Nitrate-N	90 mg/l	135 mg/l	18.4	mg/l	385	16,800	25,200	
Sulfate-S	150 mg/l	250 mg/l	82	mg/l	1,714	28,100	46,800	
pH	Range - 6.0-9.0*		7.0	units	@ 21.7°F.	No Requirement		
Specific Conductance	No Requirement		880	µmhos	@ 21.7°F.	No Requirement		
Oil and Grease	-	10 mg/l	NR	mg/l		No Requirement		
TOC	No Requirement			mg/l		No Requirement		

*State Requirement

Distribution: D. O. Thurow
D. S. Nancarrow
R. E. Grames
R. J. Thiede
File

Prepared By: D. M. PETERSON

Approved By: J. A. HORMAN

TABLE II-A
FACILITY EFFLUENT WATER ANALYSES
TOTAL PLANT OPERATIONS EA

TABLE II-B

WATER EFFLUENT POLLUTANT CHARACTERISTICS COMPARISON

TYPE EMISSION	TYPICAL 1969 TYPICAL EMISSIONS		ESTIMATED EMISSIONS 50% MOBILIZATION		ESTIMATED EMISSIONS 75% MOBILIZATION		100% MOBILIZATION		EMISSION LIMITS 1 JULY 1977 NPDES	
	Mg/Liter	Lbs/Day	Mg/Liter	Lbs/Day	Mg/Liter	Lbs/Day	Mg/Liter	Lbs/Day	Mg/Liter	Lbs/Day
COD/TOC	36	660	36	11,000	36	16,500	36	22,000	40	7,500
Nitrate (N)	72	17,632	72	22,000	72	33,000	72	44,000	10	1,875
Total Suspended Solids	86	21,061	86	26,000	86	39,000	86	52,000	25	4,690
Total Dissolved Solids	1,428	349,717	1,428	436,000	1,428	654,000	1,428	872,000	1,000	187,500
Sulfates	554	135,674	554	169,000	554	254,000	554	338,000	100	18,750

Note: Effluent pollutant concentrations at mobilization and other rates are assumed to be the same as 1969 concentrations. Total emission in lbs/day is a straight line computation.

OLIN CORPORATION
WINCHESTER-WESTERN DIVISION
ENERGY SYSTEMS OPERATIONS
BADGER ARMY AMMUNITION PLANT
BARABOO, WISCONSIN

MGD - 0.07

Date Reported: 18 July 1978

Date Received: 13 July 1978

LABORATORY ANALYSIS REPORT

SANITARY TREATMENT PLANT

ANALYSIS	EPA LIMITATION EFFLUENT ONLY AVERAGE	EPA LIMITATION EFFLUENT ONLY MAXIMUM	INFLUENT	EFFLUENT	REMARKS
BOD	30 mg/l 5620 lb./24 Hr.	45 mg/l 8430 lb./24 Hr.	2.3 mg/l	0.6 mg/l 0.35 lb/24 Hr	
pH*			7.7 @ 18^{o}C	7.8 @ 18^{o}C	
Chlorine*			0.14 mg/l	0.28 mg/l	
Total Suspended Solids*			5.2 mg/l	8.4 mg/l	
Settleable Solids			Trace ml/l	Trace ml/l	
Fecal Coliform	200 Colonies/ 100 ml.	400 Colonies/ 100 ml.	NR /100 ml	<One Colony/100 ml	Sampled 7-12-78

SANITARY TREATMENT PLANT ANALYSIS

TABLE II-C

*State Requirement

Distribution: R. J. Thiede
D. S. Nancarrow
R. J. Priebe

Prepared By: D. M. KOENIG

Approved By: P. S. YOUNG

TABLE III-A

AIR POLLUTANTS AT BADGER ARMY AMMUNITION PLANT

SOURCE	POLLUTANT	EXISTING CONTROL	PROPOSED CONTROL	STATUS
Oleum Plant	SO_X Acid Mists	None Brinks Demister	New 350 tpd OV/SAR Plant	PEMA MOD FY72 - Under Construction
Nitric Acid Plant	NO_X	None	New 400 tpd AOP Plant	MCA (old) long range PEMA MOD FY71 - Under Construction
Nitric Acid Concentrator	NO_X Acid Mists	None Demister	2 Each New 250 tpd NAC/SAC	MCA (old) long range PEMA MOD FY71 - Under Construction
Nitrocellulose Lines	NO_X Acid Mists	Fume Scrubber	New Nitration Facility	MCA - long range PEMA MOD FY89
Powerhouse No. 1	Particulate Matter NO_X SO_X	Low efficiency cyclone None Use of #2 fuel oil	Powerhouse boilers converted to #2 fuel oil	MCA Project FY71 Project Completed MCA-long range Powerhouse No. 2
Burning Grounds	Particulate Matter	None	Install approved incinerator for explosive and contaminated wastes	Currently under study. MCA Projects FY80-longe range

TABLE IV-B

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Old Acid Area Production Facility Complex Storage Area	Chemical Agents 1. 62% Nitric Acid 2. 68% Sulfuric Acid 3. Oleum 4. Nitroglycerine Mixed Acid 5. NG Semi Con Mixed Acid 6. NG Con Mixed Acid 7. Con Mix Acid 8. 92% Sulfuric Acid 9. 80-20 Mixed Acid 10. Ammonia 11. Hydrated Lime 12. Soda Ash	(23) Outside Storage Tanks (6) Outside Ammonia Tanks (Approx. 2 acres total)	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(2) New Acid Area Production Facility Complex	Chemical Agent 1. 62% Nitric Acid 2. 68% Sulfuric Acid 3. Oleum 4. Nitroglycerine Mixed Acid 5. NG Semi Con Mixed Acid 6. NG Con Mix Acid 7. Con Mix Acid 8. 92% Sulfuric Acid 9. 80-20 Mixed Acid 10. Ammonia 11. Soda Ash 12. Sulfur 13. 98% Nitric Acid 14. Pyro Mixed Acid	About 40 various acid, ammonia, petroleum and sulfur storage tanks (Approx. 4 acres)	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(3) B-Line, C-Line, D-Line, E-Line, F-Line Nitrocellulose Production Area, Acid Storage Area(s)	Chemical Agents 1. Oleum 2. 80-20 Mixed Acid 3. Pyro Mixed 4. NC Spent Acid 5. NC Nitrating Mixed Acid(s) 6. 62% Nitric Acid 7. Pebble Lime 8. Caustic Soda 9. Soda Ash 10. Wood Pulp 11. Cotton Linters 12. In process and Finished Nitrocellulose	20-22 Acid Tanks Per Line 2-1/2 acres per line x 5 lines = 12-1/2 acres	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Nitroglycerin Production Areas (Old and New) Acid and Materials Storage Areas. Nitroglycerine is stored at each step of the production process.	1. Glycerine 2. Nitroglycerine Mixed Acid 3. NG Spent Acid 4. NG Semi-Con Mixed Acid 5. NG Con Mix Acid 6. Rock Salt 7. Sodium Silica Fluoride 8. Castor Oil	Glycerine and Storage Areas (Approx. 2 acres)	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Oleum Plant (old) Production Area, Storage Area	1. 80-20 Mixed Acid 2. 92% Sulfuric Acid 3. Oleum 4. Sulfur 5. Soda Ash	Sulfur tank and pit, Oleum tank, 92% sulfur tank, 80-20 tank Total size - about 1 acre	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) BALL POWDER Production Area, Storage Area and Auxiliary BALL POWDER Line Storage. BALL POWDER is stored at each of the production processes.	1. Benzene 2. Ethyl Acetate 3. Isopropyl Alcohol 4. Colloid 5. Diphenylamine 6. Sodium Sulphate 7. Calcium Carbonate 8. Ethyl Cellulose 9. Tin Dioxide 10. Potassium Nitrate 11. Graphite 12. Salvage Propellant 13. Nitroglycerine	<u>Auxiliary Line</u> 1. NG Storage Bldg. 8018 2. Tank F.rm, Bldg. 8009 3. Solvent Handling 8009 (One acre) <u>Main Line</u> 1. Eight (8) NG Storage Transfer Bldgs. 2. Solvent Tank Farm Bldg. 9546 3. Solvent Storage Bldg. 9502-1 thru 6 4. Powder Storage Pits Bldg. 9590 5. Solvent Receiving Bldg. 9594 (Total-Approx. 3-1/2 acres)	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Smokeless Production Complex (B, C, D & E Lsnes) Storage Areas, including Ether, Alcohol, Inert Gas Smokeless propellant is stored at each of the propellant production processes.	1. Alcohol 2. Ether 3. Caustic Soda 4. Propane 5. Dinitrotoluene (DNT) 6. Diphenylamine (DPA) 7. Potassium Sulfate 8. Ethyl Centralite 9. Lead Carbonate 10. Butyl Stearate 11. Nitrocellulose 12. In-process single base propellant	1. Alcohol-Ether Storage Production Area 39 Tanks (Approx. 6 acres) 2. Inert Gas - 9 Tanks (Approx. 1 acre) 3. Various Storage Tanks in each line (Approx. 1 acre/line x 4 lines = 4 acres)	No Alarm System

TABLE IV-3 (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Rocket Production Storage Area Rocket Double Base Propellant is stored at each step in the production process.	1. Diethylphthalate (DEP) 2. Lead Salicylate 3. 2-Nitrodiphenylamine 4. Candelilla Wax 5. Lead Hexoate 6. Butyl Acetate 7. Elba Solvent (Ethyl Lactate - Butyl Acetate) 8. Lead Stearate 9. Lead Beta Resorcylate 10. Di-Normal Propyl Adipate 11. Ethyl Centralite 12. Monobasic Copper Salicylate 13. Atomized Aluminum Powder 14. Nitrocellulose 15. Nitroglycerine 16. Double Base Propellant and Grains	Small storage farm in Paste Area (Approx. 1/2 acre)	None

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) Magazine Area	1. Various Single Base Smokeless Propellants 2. Various BALL POWDER Propellants 3. Various Double Base Rocket Propellants	123 Storage Magazines 2,329,308 sq. ft. of storage capacity 23,125 tons Propellant storage capacity (Approx. 6,000' x 9000' 1,240 acres)	No Alarm System Inspected by security personnel on an around the clock basis.

TABLE IV-B (Cont'd)

STORAGE AREAS

CHEMICAL AGENTS, EXPLOSIVES, AND PYROTECHNICS

CHEMICAL AGENT, EXPLOSIVE AND PYROTECHNIC STORAGE AREA	DESCRIPTION OF CHEMICAL AGENT, PYROTECHNIC OR EXPLOSIVE	SIZE IN ACRES	ALARM SYSTEM
(1) General Plant Support Facilities, including Filtration, Water Treatment, Sewage Disposal, Warehousing	1. Aluminum Sulphate 2. Ammonia Sulphate 3. Liqua Treat 4. Cat-Floc 5. Chlorine 6. Lime 7. Salt 8. Soda Ash	No specific tank farm as such; however, various tanks, cylinders, etc., stored as necessary to accomplish desired support elements.	None

TABLE V

FLORA AND FAUNA ON THE INSTALLATION

A. Mammals

Common Name	Scientific Name	Habitat	Population
Whitetail Deer	(*Odocoileus virginianus*)	Woodlands	Abundant
Raccoon	(*Procyon lotor*)	Woodlands	Abundant
Opossum	(*Didelphis virginiana*)	Woodlands	Abundant
Skunk	(*Mephitis nigra*)	Woodlands & open areas	Moderate
Badger	(*Taxidea taxus*)	Woodlands & open areas	Moderate
Red Fox	(*Vulpes fulva*)	Woodlands & open areas	Moderate
Grey Fox	(*Urucyn cinereoargenteus*)	Woodlands & open areas	Rare
Fox Squirrel	(*Scirurus niger*)	Woodlands	Abundant
Grey Squirrel	(*Scirurus carolinensis*)	Woodlands	Moderate
Woodchuck	(*Marmota monax*)	Woodlands & open areas	Moderate
Cottontail Rabbit	(*Sylvilagus floridanus*)	Woodlands & open areas	Moderate
Eastern Chipmunk	(*Tamias striatus*)	Open areas	Abundant
Deer Mouse	(*Peromyscus leocupus*)	Woodlands	Moderate
House Mouse	(*Mus musculus*)	Buildings	Moderate
Flying Squirrel	(*Glaucomys volans*)	Woodlands	Rare
Red Bat	(*Laisurus borealis*)		Moderate
Muskrat	(*Ondatra zibethicus*)	Ponds & streams	Moderate
Eastern Mole	(*Scalopus aquaticus*)	Underground	Moderate

TABLE V (Cont'd)

B. Birds

Common Name	Scientific Name	Population
Barn Swallow	(Hirundo rustica erythrogaster)	Moderate
Black & White Warbler	(Mniotilta varia)	Rare
Black Capped Chickadee	(Parus atricapillus)	Moderate
Bluebird	(Sialia sialis)	Rare
Blue Jay	(Cyanocitta cristata)	Abundant
Blue Winged Teal	(Anas discors)	Moderate
Bobolink	(Dolichonyx orizivorus)	Abundant
Bobwhite Quail	(Colinus virginianus)	Rare
Brewers Blackbird	(Euphagus cyanocephalus)	Moderate
Brown Creeper	(Certhia familiaris)	Moderate
Canada Goose	(Branta canadensis)	Migratory
Canvasback Duck	(Aythya valisineria)	Migratory
Cardinal	(Richmondena cardinalis)	Moderate
Cowbird	(Molothrus ater)	Moderate
Evening Grosbeak	(Hesperiphona vespertina)	Moderate
Golden Crowned Kinglet	(Regulus satrapa)	Moderate
Horned Lark	(Eremophila alpetris)	Moderate
Horned owl	(Bubo virginianus)	Rare
Junco	(Junco hyemalis)	Moderate
Kingbird	(Tyrannus tyrannus)	Moderate
Mallard	(Anas platyrhynchos)	Moderate
Meadowlark	(Sturnella magna)	Abundant
Mourning Dove	(Zenaidura microura)	Abundant
Pintail Duck	(Anas acuta tzitzihoa)	Migratory
Red Eyed Vireo	(Viero olivaceus)	Moderate
Red Tailed Hawk	(Buteo jamaicensis)	Moderate
Robin	(Turdus migratorius)	Abundant
Rose Breasted Grosbeak	(Pheucticus ludovicianus)	Rare
Ruby Throated Hummingbird	(Archilochus colubris)	Moderate
Ruffed Grouse	(Bonasa umbellus)	Moderate
Scarlet Tanger	(Piranga olivacea)	Rare
Starling	(Sturnus vulgaris)	Moderate
Tufted Titmouse	(Parus bicolor)	Moderate
Turkey vulture	(Cathartes aura)	Moderate
White Breasted Nuthatch	(Sitta carolinensis)	Moderate
Woodcock	(Scolopax rusticola)	Migratory
Wood Thrush	(Hylocichla mustelina)	Moderate
Brown Thrasher	(Toxostoma rumpum)	Moderate
Catbird	(Dumetella carolinensis)	Moderate
Killdeer	(Charadrius vociferues)	Abundant
Yellow Shafted Flicker	(Colaptes auratus)	Moderate
Great Blue Heron	(Ardea herodias)	Few
Wood Duck	(Aix sponsa)	Moderate
Sparrow Hawk	(Falco sparuerius)	Moderate
Ring Necked Pheasant	(Phasianus Colchicus)	Moderate
Common Nighthawk	(Chordeiles minor)	Moderate
Red Headed Woodpecker	(Malenerpes erythrocephalus)	Abundant
Yellow Bellied Sapsucker	(Sphyrapicus varius)	Moderate
Downy Woodpecker	(Dendrocopus pubescens)	Moderate
Tree Swallow	(Iridoprocne bicolor)	Moderate

TABLE V (Cont'd)

B. Birds (Cont'd)

Common Name	Scientific Name	Population
Crow	(*Corvus brachyrhynchos*)	Abundant
House Wren	(*Troglodytes aedon*)	Abundant
Ruby Crowned Kinglet	(*Regulus calendula*)	Moderate
Cedar Waxwing	(*Bombycilla cedrorum*)	Migratory
English Sparrow	(*Passer domesticus*)	Moderate
Baltimore Oriole	(*Icterus galbula*)	Moderate
Indigo Bunting	(*Passerina cyenea*)	Rare
American Goldfinch	(*Spinus tristis*)	Moderate
Purple Finch	(*Carpodacus purpureus*)	Migratory
Rufous Sided Towhee	(*Pipilo erythrophthalmus*)	Rare
Fox Sparrow	(*Passerella iliaca*)	Moderate

TABLE V (Cont'd)

C. Trees

Common Name	Scientific Name
Apple	(*Pyrus malus*)
Aspen	(*Populus*)
Basswood	(*Tilia americana*)
Birch	(*Betula*)
Box Elder	(*Acer negundo*)
Butternut	(*Juglans cinerea*)
Cedar, Red	(*Juniperus virginiana*)
Cedar, White	(*Thuja accidentalis*)
Cherry, Black	(*Prunus serotina*)
Cherry, Choke	(*Prunus virginiana*)
Cherry, Pin	(*Prunus pensylvanica*)
Cottonwood	(*Populus deltoides*)
Hackberry	(*Celtis occidentalis*)
Hickory, Bitternut	(*Carya cordiformis*)
Hickory, Shagbark	(*Carya ovata*)
Locust, Black	(*Robinia pseudoacacia*)
Maple, Sugar	(*Acer saccharum*)
Maple, Black	(*Acer nigrum*)
Mulberry, Red	(*Morus rubra*)
Oak, Black	(*Quercus velutina*)
Oak, Red	(*Quercus rubra*)
Oak, White	(*Quercus alba*)
Oak, Bur	(*Quercus macrocarpa*)
Pine, Red	(*Pinus resinosa*)
Pine, White	(*Pinus strobus*)
Prickly Ash	(*Xanthoxylum americanum*)
Spruce, White	(*Picea glauca*)
Walnut, Black	(*Juglans nigra*)
Willow, Black	(*Salix nigra*)
White Ash	(*Fraxinus americana*)
Elm, American	(*Ulmus americana*)

TABLE V (Cont'd)

D. Flowering Plants

Common Name	Scientific Name
Alfalfa	(Mediago sativa)
Asparagus	(Asparagus)
Bindweed	(Convolvulus)
Bittersweet	(Celastrus)
Blackberry	(Rubus alleg.)
Black Medic	(Medicago lup.)
Bracken Fern	(Pteridium)
Bush Honeysuckle	(Diervilla)
Butter and Eggs	(Linaria)
Butterflyweed	(Asclepias)
Carrion Flower	(Smilax)
Cattail	(Typha latifolia)
Chickory	(Cichorium)
Chickweed	(Cerastium stellaria)
Clover	(Trifolium)
Cocklebur	(Xanthium)
Coneflower	(Rudbeckia)
Cowslip	(Caltha)
Creeping Charlie	(Nepeta Hed.)
Dandelion	(Taraxacum officinale)
Daylily	(Hemerocallis)
Dutchman's-Breeches	(Dicentra cucullaria)
Elderberry	(Sambucus)
Evening Primrose	(Oenothera)
Flag Iris	(Iris versicolor Linnaeus)
Geranium	(Geranium)
Goatsbeard	(Tragopogon)
Grape	(Vitis)
Hawkweed	(Hieracium)
Hazelbrush	(Corylus)
Hemp	(Cannabis)
Hound's Tongue	(Cynogolossum)
Ironweed	(Vernonia)
Ivy, Poison	(Rhus radicans)
Jack-in-the-pulpit	(Arisaema)
Jewelweed	(Impatiens)
Knotweed	(Polygonum)
Lettuce, Wild	(Lactuca)
Lilac	(Syringa)
Mayapple	(Podophyllum peltatum)
Milkweed, Common	(Asclepias syriaca)
Mock Orange	(Philadelphus)
Mullein	(Verbascum)
Pepper Grass	(Lepidium)
Phlox	(Phlox)
Pigweed	(Chenopodium)
Plantain	(Plantago)
Queen Anne's Lace	(Daucus)

TABLE V (Cont'd)

D. Flowering Plants (Cont'd)

Common Name	Scientific Name
Ragweed	(*Ambrosia*)
Raspberry	(*Rubus occ. and id.*)
Rocket, Yellow	(*Barbarea*)
St. John's Wort	(*Hypericum*)
Smartweed	(*Polygonum*)
Solomon's Seal	(*Polygonatum*)
Sticktights	(*Bidens*)
Strawberry	(*Fragaria*)
Sumac	(*Rhus*)
Sweet Clover	(*Melilotus*)
Thorn Apple	(*Crataegus*)
Vervain	(*Verbena*)
Vetch	(*Lathyrus*)
Violet	(*Viola*)
Wintergreen	(*Gaultheria*)
Yarrow	(*Achillea*)
Cardinal Flower,-Red Lobelia	(*Lobelia cardinalis*)
Milkweed, Whorled	(*Asclepias verticillata*)

TABLE V (Cont'd)

E. Fish

Common Name	Scientific Name	Population
Bass	(*Micropterus*)	Moderate
Bluegill	(*Helioperca incisor*)	Abundant
Crappie	(*Pomoxis Annularis*)	Abundant

TABLE III-B

SUMMARY OF SOURCE SAMPLING MEASUREMENTS, PRODUCTION FACILITIES (1970)

BADGER ARMY AMMUNITION PLANT

SAMPLING LOCATION	PRODUCTION RATE	STACK PRESSURE (mm Hg)	STACK TEMPERATURE (°C)	STACK FLOW RATE (M^3/SEC)	SO_x CONCENTRATION AS SO_2 (PPM)	SO_x EMISSION RATE AS SO_2 (GM/SEC)	NO_x CONCENTRATION AS NO_2 (PPM)	NO_x EMISSION RATE AS NO_2 (GM/SEC)	TOTAL ACIDITY EMISSION RATE (GM/SEC)	ACID MIST EMISSION RATE (GM/SEC)	ACID MIST CONCENTRATION (MG/M^3)	PARTICULATES	
												LB PER DAY	CONCENTRATES (PPM/MBTU)
NC FUME EXHAUST SYSTEM	49 802 LB (P - 7) 8 HR	737	26.0	3.57			550	3.4	1.87	0.11 HNO 3	30.8		
LINE B	45.533 LB (P 11) 8 HR	736	26.0	2.44			480	2.1	0.53	0.14 HNO 3	57.4		
NC FUME EXHAUST SYSTEM	43 000 LB (P - 11) 8 HR	737	26.0	2.96			245	1.4	1.70	0.20 HNO	67.6		
LINE C	43.000 LB (P - 11) 8 HR	736	26.0	2.74			300	1.3	0.66	0.19 HNO	69.3		
	40.000 LB (L 7) 8 HR	736	26.0	3.14			365	1.5	1.43	0.29 HNO	92.4		
OLEUM STACK (BLDG NO 728 2)	250 T/DAY	733	37.7	7.22	2750	47				0.10 H_2SO	13.9		
AOP (BLDG NO 702) COMPRESSOR STACK NO 2	167 T/DAY 172 T/DAY 188 T/DAY	738 740 741	76.0 86.0 69.0	1.94 2.27 1.99			1730 1910 1370	6.5 8.3 4.7					
NAC (BLDG NO 703)	150 T/DAY	741	83.0	0.20			16200	6.2					
BOILERS STEAM GENERATING STACK	75000 LB/HR 150.000 LB/HR							5.14				55000	5.3 8.8
APSA EMISSION STANDERS					200		200				50		

Report No. 96020.007 - Army Munitions Plants Modernization Program, Pollution Abatement Review Final Report - Picatinny Arsenal

TABLE III-C

STATIONARY FUEL COMBUSTION UNITS - DESCRIPTION AND PARTICULATE EMISSIONS

Building Number	Fuel	Boilers	$\overline{M}$BTU/Hr. Boiler Capacity	Number of Stacks	Boilers per Stack	Stack Height Feet	Estimated Lb./$\overline{M}$BTU	Allowable Lb./$\overline{M}$BTU
400-1	No. 2 Oil	5	210	5	1	128	0.06	0.60**
400-1	No. 2 Oil	4	26	2	2	35	0.11	0.60**
6538	Bituminous Coal	4	120	4	1	133	5.94*	0.40

* Estimated emission based upon 8.8% Ash and 12,600 BTU/lb. Coal.

** Interpretation of APS-1 by the State of Wisconsin allows 0.60 lb./$\overline{M}$BTU for units burning fuel oil and for the size of the units described above.

The above information is taken from the U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground Report, Air Pollution Engineering General Survey No. 66, 0137-77, Badger Army Ammunition Plant (16-18 August 76).

TABLE III-D

ESTIMATE OF AIR POLLUTION EMISSIONS FROM BOILERS AT CAPACITY *

Building Number	Boiler Capacity	No. of Boilers	Pollutant Emission ** Total of All Boilers	Lbs/Hr.
400-1	210 $\overline{M}$BTU/Hr.	5	Particulates	112
	(Fuel: #2 Fuel Oil)		SO_x	432
			CO	30
			HC	22.5
			NO_x	600
400-1	26 $\overline{M}$BTU/Hr.	4	Particulates	11.2
	(Fuel: #2 Fuel Oil)		SO_x	42.9
			CO	2.98
			HC	2.23
			NO_x	59.5
6538	120 $\overline{M}$BTU/Hr.	4	Particulates	2848
	(Fuel: Coal Bituminous)		SO_x	2383
	(12,600 BTU/Lb.)		CO	5.7
	(3.3% Sulfur - 8.8% Ash)		HC	342.7
			NO_x	19.04
Not available at this time	210 $\overline{M}$BTU/HR. (oil fired)	1	Particulates	22.4
			SO_x	86.4
			CO	6.0
			HC	4.5
			NO_x	120.0
Not available at this time	210 $\overline{M}$BTU/HR. (coal fired)	1	Particulates	1246.0
			SO_x	1042.56
			CO	2.49
			HC	149.93
			NO_x	8.33

* NOTE: See ** note on Table III-E.

** Emissions noted are at full capacity and assumes mobilization schedule requirements. Intermediate requirements will vary according to production schedule and will be proportional to the mobilization rates.

TABLE III-E

ESTIMATE OF AIR POLLUTION EMISSIONS AT CAPACITY

FROM EXISTING OLD ACID AREA *

Building Number	Facility	Number of Units	Pollutant Emission Total of All Units	Lbs./Hr.
702	AOP	6	NO_x	460
703	NAC	16	NO_x	194
704	SAC	10	NO_x SO_x	1334 * 2990
728	Oleum	1	SO_x	391
Various	NC	5	NO_x	106.1

* The plant is in a standby condition at this time so no pollutants are being produced in the production area.

** This number is based on BAAP calculations made from data where judgemental considerations and theoretical conclusions have been used. The number is not based on measurements taken from actual operating conditions at BAAP, and must be considered as an order of magnitude number. Any conclusions drawn from the use of this number should be so qualified.

It is estimated that the pollutant emissions at mobilization will be as follows for the new Acid facilities:

400 Tons/Day Nitric Acid	NO_2	1200 Lbs/Day
500 Tons/Day Nitric Acid Concentrator	NO_2	1500 Lbs/Day
350 Tons/Day Oleum	SO_2	1400 Lbs/Day
500 Tons/Day Sulfuric Acid Concentrator	SO_2	2000 Lbs/Day
350 Tons/Day Oleum	Acid Mist	52.5 Lbs/Day

Emissions noted are at full capacity and assumes mobilization schedule requirements. Intermediate requirements will vary according to production schedules and will be proportional to the mobilization rates.

TABLE III-F

NOMINAL MOBILIZATION* LEVELS WHERE EMISSIONS ARE EXPECTED TO EXCEED PERMISSIBLE LEVELS

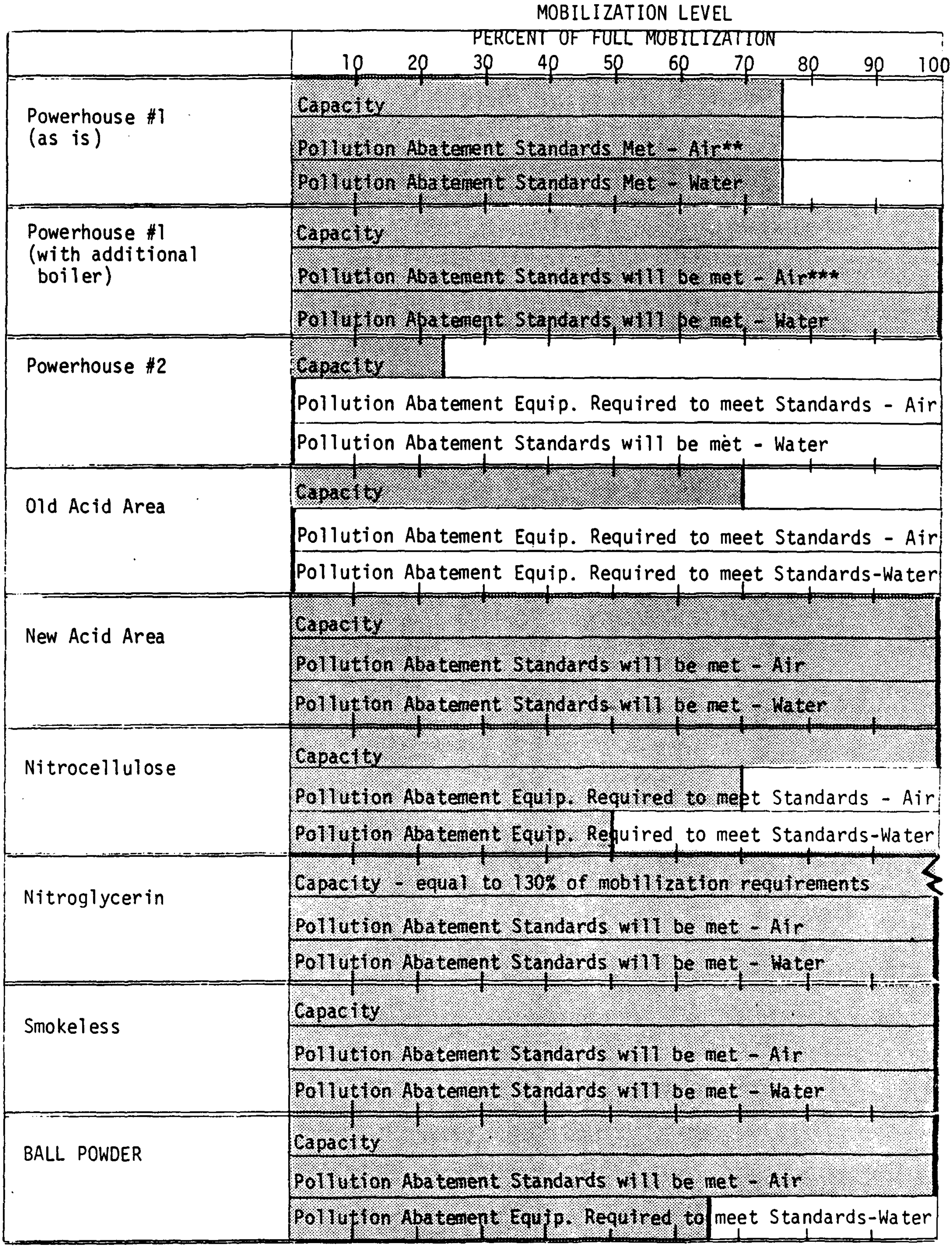


TABLE III-F (cont'd)

* Basis: Industrial Readiness Plan - September 1977.

** Assumes No. 2 Fuel Oil is burned to provide required steam.

*** Assumes current boilers fired with No. 2 Fuel Oil. Additional boiler is fired with coal, but is equipped with necessary pollution abatement equipment.

TABLE IV-A

STORAGE AREAS

PETROLEUM-TYPE PRODUCTS

LOCATION	NUMBER OF TANKS	(a) ABOVE GROUND/ BELOW GROUND	(b) CAPACITY GALLONS	(c) PRODUCT STORED	(d) DIKED	(e) EVAPORATION LOCK
Powerhouse #1	3	Above	825,000	#2 Fuel Oil	Yes	Yes
" 400-1	3	Below	17,000	#2 Fuel Oil	N/A	No
"	1	Below	11,000	#2 Fuel Oil	N/A	No
"	2	Above	10,000	#2 Fuel Oil	Yes	Yes
"	2	Below	10,000	#2 Fuel Oil	N/A	Yes
Pilot Plant (8014)	1	Below	16,000	#2 Fuel Oil	N/A	Yes
Filtration Plant (409-1)	1	Below	3,000	#2 Fuel Oil	N/A	No
River Pump (408)	1	Below	3,000	#2 Fuel Oil	N/A	No
Fire Station (222)	1	Below	3,000	#2 Fuel Oil	N/A	Yes
Filtration Plant (409)	5	Below	110	Gasoline	N/A	Yes
Tram Shop 522	1	Below	1,000	Gasoline	N/A	No
Forge & Weld Shop (520)	1	Below	3,000	Gasoline	N/A	No
Oleum 728-2	1	Below	1,000	#2 Fuel Oil	N/A	No
Fuel Oil Storage (933)	1	Above	11,000	#2 Fuel Oil	No	No
Gasoline Storage (935)	2	Above	11,000	Gasoline	Yes	Yes
Fuel Oil Storage (935)	1	Above	17,000	Gasoline	Yes	Yes

TABLE IV-A (Cont'd)
PETROLEUM-TYPE PRODUCTS

LOCATION	NUMBER OF TANKS	(a) ABOVE GROUND BELOW GROUND	(b) CAPACITY GALLONS	(c) PRODUCT STORED	(d) DIKED	(e) EVAPORATION LOCK
Road Oil Storage (937)	1	Above	52,000	Road Oil	No	No
Storage Tank (305)	2	Below	2,000	Gasoline	N/A	No
	1	Below	1,000	White Gas	N/A	No
Magazine Gas Tank (938)	1	Below	3,000	Gasoline	N/A	No
Magazine Fuel Oil Tank (1993-1)	1	Below	3,000	Fuel Oil	N/A	No
Tractor Garage Rocket (6529)	2	Below	700	Gasoline	N/A	No
Tractor Garage Rocket (6529)	1	Below	500	Waste Oil	N/A	No
Powerhouse #2 (6538)	2	Below	14,000	#2 Fuel Oil	N/A	Yes
Rocket Area Tram Shop (6586-1)	1	Below	500	Gasoline	N/A	No
Rocket Area Shop (6822)	1	Below	300	Gasoline	N/A	No
Garage 241-1	1	Below	11,500	Gasoline	N/A	Yes
Garage 241-1	2	Below	1,000	Gasoline	N/A	No
Garage 241-1	3	Below	2,000	Diesel	N/A	No
Garage 241-1	1	Below	2,000	White Gas	N/A	No
Garage 241-1	1	Below	1,000	Waste Oil	N/A	No

ENVIRONMENTAL ASSESSMENT

FOR

TOTAL PLANT OPERATIONS

Exhibit No.	Description
I-A	Military Construction Project, MCA Project No. M00400, Explosive Waste Incinerator (EWI)
I-B	Military Construction Project, MCA Project No. M1300, Old Acid Liquid Waste Treatment - Water Pollution Control
I-C	Military Construction Project, MCA Project No. M1400, B & C Nitrocellulose Lines Liquid Waste Treatment - Water Pollution Control
I-D	Military Construction Project, MCA Project No. M1500, D & E Nitrocellulose Lines Liquid Waste Treatment - Water Pollution Control
I-E	Military Construction Project, MCA Project No. M1700, Nitroglycerin Liquid Waste Treatment - Water Pollution Control
I-F	Military Construction Project, MCA Project No. M01800, Reline Effluent Ditches and Ponds
I-G	Military Construction Project, MCA Project No. M02500, BALL POWDER Wastewater Facility
I-H	Military Construction Project, MCA Project No. T02600, Close Existing/Open New Landfill - Solid Waste
I-I	Military Construction Project, MCA Project No. T02800, Convert Powerhouse No. 1 to Coal
I-J	Military Construction Project, MCA Project No. T03600, Old Acid Mist/Vapor
I-K	Military Construction Project, MCA Project No. T03700, Old Oleum Liquid Waste Treatment

ENVIRONMENTAL ASSESSMENT

FOR

TOTAL PLANT OPERATIONS

Exhibit No.	Description
I-L	Military Construction Project, MCA Project No. T03800, NO_x & SO_x Abatement Old Acid
I-M	Military Construction Project, MCA Project No. T04200, Solvent Conservation B Line
I-N	Military Construction Project, MCA Project No. T04300, Solvent Conservation C Line
I-O	Military Construction Project, MCA Project No. T04400, Solvent Conservation D Line
I-P	Military Construction Project, MCA Project No. T04700, Solvent Conservation E Line
I-Q	Military Construction Project, MCA Project No. T04900, Solvent Conservation BALL POWDER
I-R	Military Construction Project, MCA Project No. T05000, Old Acid Lime Silo and Feeders
I-S	Military Construction Project, MCA Project No. T05100, Old Acid Tank Farm Diking
I-T	Military Construction Project, MCA Project No. T05400, Tank Car Cleaning - Old Acid
I-U	Military Construction Project, MCA Project No. T05600, Modernize Powerhouse No. 2
II-A	Environmental Projects, Project No. TB-E-81-01, Develop Methods for Treatment and Disposal of Pollutant Contaminated Sludge/Sediment Deposits
II-B	Environmental Projects, Project No. TBW-E-80-2A, Divert Storm Water at Badger AAP to Off-Plant Drainage Systems: Part I - Preliminary Concept Design

ENVIRONMENTAL ASSESSMENT

FOR

TOTAL PLANT OPERATIONS

Exhibit No.	Description
II-C	Environmental Projects, Project No. TBTW-E-82-08, Evaluate Treatment Technology to Remove Phthalate Esters and Amines from Wastewater Streams
II-D	Environmental Projects, Project No. TBW-E-83-05, Diversion of Off-Site Generated Storm Water from the Thermal Treatment (Open Burning) Sites at the Burning Grounds
II-E	Environmental Projects, Project No. TBW-E-82-04, Removal of Accumulated Sludge and Neutralized Acid from the Pond Near the New Acid Complex
II-F	Environmental Projects, Project No. TB-E-81-02, BALL POWDER Wastewater Pollution Abatement Study
II-G	Environmental Projects, Project No. TBTW-E-82-07, Conduct a Study for Monitoring DNT, DPA, Phthalate Esters and Nitrosoamines in Wastewater Streams
II-H	Environmental Projects, Project No. TBA-E-83-03, Scrubbing of Nitroglycerin Vapors
II-I	Environmental Projects, Project No. TBW-E-82-11, Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Nitrocellulose Area
II-J	Environmental Projects, Project No. TBW-E-82-10, Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the BALL POWDER Area

ENVIRONMENTAL ASSESSMENT

FOR

TOTAL PLANT OPERATIONS

Exhibit No.	Description
II-K	Environmental Projects, Project No. TBW-E-82-09, Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Single Base Manufacturing Areas
II-L	Environmental Projects, Project No. TBW-E-82-12, Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Old Acid Complex
II-M	Environmental Projects, Project No. TBW-E-82-01, Installation of Impermeable Membrane on the Ground within the Acid Storage Diked Areas
II-N	Environmental Projects, Project No. TBW-E-82-04, Upgrade Laboratory Capability for WPDES Water Monitoring Compliance
II-O	Environmental Projects, Project No. TBW-E-83-02, Develop a Combined Treatment System for the Reduction of Nitrates, BOD's and COD's from the Nitrocellulose and BALL POWDER Production Areas
II-P	Environmental Projects, Project No. TBH-E-82-13, Excavate and Reline Existing Nitroglycerin Pond
II-Q	Environmental Projects, Project No. TBA-E-82-06, Install Stack Gas Monitoring Equipment in Powerhouse No. 1
II-R	Environmental Projects, Project No. TB-E-80-8, Conduct a Hazardous Materials and Pesticide Management/Control Study

FOR OFFICIAL USE ONLY (WHEN DATA IS ENTERED)

1. COMPONENT		2. DATE
ARMY	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 1
Badger Army Ammunition Plant Wisconsin	INCINERATOR EXPLOSIVE WASTE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	833 10		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT INCINERATOR	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT AN INCINERATION FACILITY CAPABLE OF DESTROYING WASTE PROPELLANT AND EXPLOSIVES (CLASSES 1.1 AND 1.3). DESIGN OF INCINERATOR SHALL BE BASED ON THE DEACTIVATION FURNACE USED AT TOOELE ARMY DEPOT. PROJECT INCLUDES SITE PREPARATIONS, WATER LINES, ELECTRIC SERVICE, LANDSCAPING , AND SECURITY FENCING. INCINERATOR TO BE LOCATED IN GENERAL AREA OF PRESENT EXPLOSIVE WASTE BURNING GROUNDS. SPACE IS AVAILABLE FOR ADDITIONAL INCINERATORS IF REQUIRED IN THE FUTURE.

11. REQUIREMENT: TN ADEQUATE: TN SUBSTD: TN

PROJECT :
CONSTRUCT AN INCINERATION FACILITY CAPABLE OF DESTROYING WASTE PROPELLANT AND EXPLOSIVES.

REQUIREMENT :
THE CURRENT OPEN BURNING INCINERATION DOES NOT MEET CURRENT FEDERAL, STATE AND LOCAL REQUIREMENTS.

CURRENT SITUATION :
PRESENTLY ALL PROPELLANT AND EXPLOSIVE WASTES AT BAAP ARE DISPOSED OF BY OPEN BURNING IN A CONTROLLED SITUATION. THIS METHOD OF DISPOSAL DOES NOT MEET CURRENT STANDARDS CONTAINED IN 40 FEDERAL REGISTER 13216, 25 MARCH 1975, WHICH REVOKED PART 76, TITLE 40 CFR. THE REVOKED REGULATION PROVIDED

1. COMPONENT ARMY	FY 19 8 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82

3. INSTALLATION AND LOCATION
Badger Army Ammunition Plant Wisconsin

4. PROJECT TITLE Mobilization Group 1 INCINERATOR EXPLOSIVE WASTE	5. PROJECT NUMBER

CURRENT SITUATION : (CONT)..

FOR OPEN BURNING OF EXPLOSIVES.

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BAAP WILL NOT BE IN COMPLIACE WITH PROVISIONS OF THE CLEAN AIR ACT OF 1970, AS AMENDED. THIS IS A GROUP I MOBILIZATION PROJECT.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS NOT REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1988	INDEX: 1710
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1988	INDEX: 1748
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1989	INDEX: 1786

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1. COMPONENT	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		21 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 Modernization OLD ACID LWT -WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL SYSTEM IN THE ACID PLANT EFFLUENT STREAM TO REMOVE NITRATES AND SULFATES FROM THE WASTE WATER GENERATED IN THE TWO ACID AREAS. THE INSTALLATION SHALL INCLUDE NECESSARY ACID WASTE WATER TRANSFER PIPING, PROCESS TANKS, PUMPS, BUILDINGS, UTILITIES, & OTHER NECESSARY SUPPORT FACILITIES. PROVIDE FACILITIES FOR RECYCLING TREATED WATER.

11. REQUIREMENT: KG ADEQUATE: KG SUBSTD: KG

PROJECT :
PROVIDE ACID LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO INSTALL WASTE WATER TREATMENT IN EXISTING ACID AREAS. THIS PROJECT IS REQUIRED TO ASSURE THAT NITRATES AND SULFATES CAN BE REMOVED FROM WASTE WATER GENERATED IN THE ACID AREAS FOR COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS. THIS PROJECT IS REQUIRED ONLY IF THE NEW ACID FACILITY MODERNIZATION DEFICIENCY CORRECTIONS ARE NOT COMPLETE BY MOBILIZATION.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER.

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 21 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 Modernization OLD ACID LWT -WPC		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1991	INDEX: 1950

EXHIBIT I-C

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT		2. DATE
ARMY	FY 19_10 MILITARY CONSTRUCTION PROJECT DATA	22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 B & C NITROCELLULOSE LVT - WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL FACILITY TO REMOVE NITRATES AND SULFATES FROM B & C NITROCELLULOSE MANUFACTURING AREA WASTE WATER STREAMS. FACILITY SHALL INCLUDE PROCESS TANKS, PUMPS, SUSPENDED MATTER FILTRATION EQUIPMENT, TREATED WATER RECYCLE EQUIPMENT, BUILDINGS, UTILITIES AND OTHER NECESSARY SUPPORT EQUIPMENT.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE NITROCELLULOSE MANUFACTURING LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE FACILITIES FOR WASTE WATER TREATMENT THAT WILL ASSURE COMPLIANCE WITH FEDERAL AND STATE REGULATIONS WHEN OPERATING B & C NITROCELLULOSE LINES AT FULL CAPACITY.THIS PROJECT IS REQUIRED TO ASSURE BADGER AAP WILL BE IN COMPLIANCE WHEN THESE LINES ARE REACTIVATED.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER. PRESENT WASTE WATER TREATMENT PROVIDES ONLY PH CONTROL AND THIS IS NOT SUFFICIENT TO MEET THE LAW.

1. COMPONENT	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		22 DEC 82

3. INSTALLATION AND LOCATION
Badger Army Ammunition Plant
Wisconsin

4. PROJECT TITLE Mobilization Group 2
B & C NITROCELLULOSE LWT - WPC

5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1991	INDEX: 1950

1. COMPONENT		2. DATE
ARMY	FY 19_90 MILITARY CONSTRUCTION PROJECT DATA	22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 D & E NITROCELLULOSE LWT -WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL FACILITY TO REMOVE NITRATES AND SULFATES FROM D & E NITROCELLULOSE MANUFACTURING AREA WASTE WATER STREAMS. FACILITY SHALL INCLUDE PROCESS TANKS, PUMPS, SUSPENDED MATTER FILTRATION EQUIPMENT, TREATED WATER RECYCLE EQUIPMENT, BUILDINGS, UTILITIES AND OTHER NECESSARY SUPPORT EQUIPMENT.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE NITROCELLULOSE MANUFACTURING LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE FACILITIES FOR WASTE WATER TREATMENT THAT WILL ASSURE COMPLIANCE WITH FEDERAL AND STATE REGULATIONS WHEN OPERATING D & E NITROCELLULOSE LINES AT FULL CAPACITY.THIS PROJECT IS REQUIRED TO ASSURE BADGER AAP WILL BE IN COMPLIANCE WHEN THESE LINES ARE REACTIVATED.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER. PRESENT WASTE WATER TREATMENT PROVIDES ONLY PH CONTROL AND THIS IS NOT SUFFICIENT TO MEET THE LAW.

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 22 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 D & E NITROCELLULOSE LWT -VPC		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1991	INDEX: 1950

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1. COMPONENT	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 NITROGLYCERIN LWT - WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT TREATMENT FACILITY	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT FACILITIES FOR TREATING WASTE WATER IN THE NITROGLYCERIN MANUFACTURING AREA. THIS INVOLVES INSTALLATION OF TANKS, PUMPS, TRANSFER LINES, ETC., TO PROVIDE CONTROLLED ADDITION OF LIME AND SODIUM SULFIDE TO THE WASTE WATER PRIOR TO DISCHARGING INTO THE POND PRESENTLY USED FOR COLLECTION.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE A NITROGLYCERIN PRODUCTION FACILITY LIQUID WASTE TREATMENT FACILITY.

REQUIREMENT :
THIS PROJECT PROVIDES MEANS OF NEUTRALIZING WASTE WATER AND DESTROYING ANY NITROGLYCERIN THAT MAY BE CONTAINED IN IT.

CURRENT SITUATION :
AT THE PRESENT, THE WASTE WATER FROM THE NITROGLYCERIN MANUFACTURING OPERATION IS DISCHARGED INTO A LANDLOCKED POND WITHOUT TREATMENT. RECENT REPORTS FROM USAEHA INDICATE THAT THERE IS CONTAMINATION OF THE GROUND RESULTING FROM THIS WATER PERCOLATING INTO THE UNDERLYING STRATA. HENCE, IT APPEARS THAT THIS WASTE WATER MUST BE TREATED PRIOR TO DISCHARGE INTO THIS POND

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 22 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 NITROGLYCERIN LWT - VPC		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, THE GROUND WILL CONTINUE TO BE EXPOSED TO CONTAMINATION DURING PERIODS WHEN NITROGLYCERIN IS MANUFACTURED.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL 1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER 1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL 1991	INDEX: 1950

1. COMPONENT	FY 19 84 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 1
Badger Army Ammunition Plant Wisconsin	EFFLUENT DITCHES & PONDS

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
EFFLUENT DITCHES & PONDS	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

EXCAVATE EXISTING EFFLUENT DITCHES AND SEDIMENTATION PONDS TO A DEPTH OF 4 FT, LANDSPREAD THE REMOVED SEDIMENT, AND LINE THE DITCHES WITH A 3 FT LAYER OF IMPERMEABLE CLAY COVERED WITH 1 FT OF GRANULAR PROTECTIVE COVER. THE CLAY LINER MUST EXTEND 5 FT BEYOND THE NORMAL TOPOGRAPHIC RIM OF THE EXISTING DITCHES AND PONDS

11. REQUIREMENG/GOTO 11.N LF ADEQUATE: LF SUBSTD: LF

REQUIREMENT :

THIS PROJECT IS REQUIRED TO PREVENT PERCOLATION OF PLANT EFFLUENT WATER THAT CONTAIN HIGH LEVELS OF NITRATES AND SULFATES INTO THE GROUNDWATER OF THE STATE OF WISCONSIN.

IMPACT IF NOT PROVIDED :

IF THIS PROJECT IS NOT APPROVED, BADGER AP WILL NOT MEET STATE OF WISCONSIN WPDES REQUIREMENTS PROJECTED FOR THE FUTURE. NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORICAL IMPACT AND COMPLIES WITH PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT

1. COMPONENT ARMY	FY 19 84 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 1 EFFLUENT DITCHES & PONDS		5. PROJECT NUMBER

HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITHTHE INTENT OF PL 91-190 AND AR 200-1. THIS IS A GROUP I MOBILIZATION PROJECT.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1986	INDEX: 1550
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1986	INDEX: 1602
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1987	INDEX: 1619

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1. COMPONENT		2. DATE
ARMY	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 1 BALL POWDER WASTE WATER FACILITY

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 13		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT WASTE TREATMENT FACILI	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT FACILITIES TO REMOVE AND CONCENTRATE COLLAGEN FOR REUSE, TO REMOVE AND CONCENTRATE SODIUM SULFATE FOR REUSE AND BIO-OXIDATION TREATMENT TO TREAT WASTE WATER FOR B.O.D. & C.O.D.

11. REQUIREMENT: ADEQUATE: SUBSTD:

PROJECT :
CONSTRUCT BALL POWDER WASTE WATER TREATMENT FACILITY.

REQUIREMENT :
FACILITIES ARE REQUIRED TO REMOVE AND CONCENTRATE COLLAGEN FOR REUSE, TO REMOVE AND CONCENTRATE SODIUM SULFATE FOR REUSE AND BIO-OXIDATION TREATMENT TO TREAT WASTE WATER FOR B.O.D. & C.O.D. SO BADGER AAP WILL NOT EXCEED WPDES LIMITS.

CURRENT SITUATION :
BALL POWDER WASTE WATER IS PARTIALLY TREATED IN EXISTING WASTE TREATMENT FACILITY, BUT THIS IS NOT ADEQUATE TO MEET WPDES PERMIT.

1. COMPONENT ARMY	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 1 BALL POWDER WASTE WATER FACILITY		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
THE CONSTRUCTION OF A MULTI FACETED UNIT TO TREAT THE DIFFERENT POLLUTANTS IN THE BALL POWDER MANUFACTURING AREA IS NECESSARY BECAUSE WITHOUT IT BAAP WILL EXCEED WPDES LIMITS. THIS IS A GROUP 1 MOBILIZATION PROJECT.

NATO INFRASTRUCTURE CATEGORY :
THIS PROJECT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT AN ENVIRON MENTAL IMPACT STATEMENT PURSUANT TO PL 91-190 IS NOT REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1988	INDEX: 1710
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1988	INDEX: 1748
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1989	INDEX: 1786

EXHIBIT I-H

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1. COMPONENT		2. DATE
ARMY	**FY 19 86 MILITARY CONSTRUCTION PROJECT DATA**	27 JAN 83 24 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
BADGER ARMY AMMUNITION PLANT WISCONSIN	MobilGroup 1 CLOSE EXIST/OPEN NEW LANDFILL-SW

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	871 90	CT0260	

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
Close Exist Landfill	LS			
Open New Landfill	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

A. CLOSE EXISTING 20 ACRE LANDFILL BY INSTALLING ONE FOOT OF COMPACTED CLAY. 18 INCHES OF GRANULAR SOIL. 24 INCHES OF COMPACTED CLAY AND 6 INCHES OF TOP SOIL AND SEED.

B. CONSTRUCT NEW SANITARY LANDFILL WITH A 5 FOOT COMPACTED CLAY LINER. 1 FOOT OF GRANULAR PROTECTIVE COVER OVER LINER. LEACHATE COLLECTION SYSTEM AND GAS COLLECTION SYSTEM. THE NEW LANDFILL WILL COVER 12 ACRES.

C. LANDFILL WORK WILL MEET THE REQUIREMENTS OF THE WISCONSIN ADMINISTRATIVE CODE NR180 SOLID WASTE MANAGEMENT

D. ACCESSABILITY FOR THE HANDICAPPED IS NOT REQUIRED FOR FUNCTIONAL REASONS.

11. REQUIREMENT: 12 ac ADEQUATE: 0 ac SUBSTD: 20 ac

PROJECT :
THIS PROJECT WILL PROVIDE A WISCONSIN DEPARTMENT OF NATURAL RESOURCES APPROVED LANDFILL AND CLOSE EXISTING SUBSTANDARD LANDFILL.

1. COMPONENT ARMY	FY 1986 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 26 JAN 83 24 JAN 83
3. INSTALLATION AND LOCATION BADGER ARMY AMMUNITION PLANT WISCONSIN		
4. PROJECT TITLE Mobilization Group 1 CLOSE EXIST/OPEN NEW LANDFILL-SW		5. PROJECT NUMBER CT02600

REQUIREMENT

THE EXISTING LANDFILL IS SUBSTANDARD. THIS PROJECT IS REQUIRED TO MINIMIZE ECOLOGICAL IMPACT OF THE LEACHATE BEING DEVELOPED BY THE EXISTING LANDFILL. HIGH SPECIFIC CONDUCTANCE AND DISSOLVED IRON VALUES IN THE GROUNDWATER SAMPLES TAKEN FROM MONITORING WELLS DOWNGRADIENT OF THE LANDFILL INDICATE THAT THE LEACHATE IS ENTERING THE AQUIFER. CONTINUED USE OF THIS UNLINED LANDFILL THAT IS LOCATED OVER A VERY POROUS SUBSOIL COULD RESULT IN EXCESSIVE CONTAMINATION OF THE GROUNDWATER. BADGER AAP HAS RECEIVED SPECIAL ORDER NO. 2A-78-1194 REQUIRING THAT THE EXISTING LANDFILL BE CLOSED AND/OR ACCEPTABLE PLAN FOR CONTINUED OPERATION BE PROVIDED.

CURRENT SITUATION :

THE SOLID WASTE DISPOSAL SITE CONTINUES TO BE USED UNDER A STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES (WDNR) LICENSE NO 2813 DATED 28 SEPTEMBER 1978 PENDING A FINAL REVIEW OF A FEASIBILITY REPORT SUBMITTED 1 MAY 1979. A SPECIAL ORDER NO. 2A-78-1194 WAS ISSUED BY THE WDNR, 20 SEPTEMBER 1978, REQUIRING THE PREPARATION OF THE FEASIBILITY REPORT AND PROVIDING EITHER AN ACCEPTABLE ABANDONMENT PLAN OR CONTINUED OPERATIONS PLAN BY 1 FEBRUARY 1980 WITH ACTUAL ABANDONMENT OR BRINGING THE SITE INTO COMPLIANCE BY 1 DECEMBER 1980. ALTHOUGH THERE HAS BEEN A SLIPPAGE OF INDICATED COMPLIANCE DATES, THE WDNR ORDER TO BAAP STILL STANDS. IN THE INTERIM PERIOD UNTIL 1986, IT IS PLANNED TO CONTINUE OPERATIONS AT THE EXISTING LANDFILL IN A MANNER SO AS TO MINIMIZE CONTAMINATION IN COORDINATION WITH WDNR.

IMPACT IF NOT PROVIDED :

IF THIS PROJECT IS NOT FUNDED AND CONSTRUCTION WORK COMPLETED WITH AN INDICATION OF PROGRESS IN THE INTERIM, BAAP COULD BE FORCED TO COMPLY WITH WDNR SPECIAL ORDER 2A-78-1194 TO CLOSE THE FACILITY. CLOSURE OF THIS SOLID WASTE LANDFILL SITE WOULD CAUSE THE CESSATION OF BARRICADE AND/OR BUILDING DEMOLITION PROJECT WORK SINCE ALL OF THE DEMOLITION DEBRIS IS CURRENTLY BEING DISPOSED OF IN THE EXISTING LANDFILL. SAUK COUNTY'S SOLID WASTE MANAGEMENT SITE, LOCATED APPROXIMATELY 18 MILES FROM BAAP, IS RAPIDLY FILLING WITH MUNICIPAL-TYPE GARBAGE AND INDUSTRIAL FIRMS ARE BEING ENCOURAGED TO FIND OTHER MEANS OF DISPOSAL.

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1. COMPONENT		2. DATE
ARMY	FY 1987 MILITARY CONSTRUCTION PROJECT DATA	01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	Conversion CONVERT POWERHOUSE NO 1 TO COAL

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	821 20		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONVERT POWERHOUSE	LS			
SUPPORTING FACILITY				
SITE PREPARATION	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL COAL HANDLING, COAL FIRING AND POLLUTION ABATEMENT EQUIPMENT ON 5 EXISTING OIL FIRED BOILERS, 175,000 LBS/HR EACH, 275 PSI. THE PROJECT SHALL INCLUDE, BUT NOT LIMITED TO, EQUIPMENT NECESSARY TO HANDLE AND FIRE COAL, COAL THAWING AND HANDLING, REPLACE COAL BUNKER BOTTOMS, COAL SCALES AND PLATFORMS, COAL AND OIL BURNERS, AIR HEATER TUBES, SAFETY VALVES, RELIEF VALVE BLOWDOWN HEAT EXCHANGER, BOILER FEED PUMPS, POLLUTION ABATEMENT EQUIPMENT, STACKS, ID FANS, ASH HANDLING SYSTEM, CONTROLS &INSTRUMENTATION BUILDING MODIFICATION WILL BE NECESSARY. THE ELECTRIC SWITCH GEAR, TRANSFORMER YARD AND ELECTRIC LINES MUST BE RELOCATED FOR THE POLLUTION ABATEMENT SYSTEM.

11. REQUIREMENT: MB ADEQUATE: MB SUBSTD: MB

PROJECT :
PROVIDE COAL HANDLING, COAL FIRING AND POLLUTION ABATEMENT EQUIPMENT ON 5 EXISTING OIL FIRED BOILERS.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE A CONTROLLABLE FUEL SOURCE DURING THE MOBILIZATION PERIODS. CONVERSION MUST BE ACCOMPLISHED PRIOR TO FULL MOB.

1. COMPONENT ARMY	FY 19 87 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Conversion CONVERT POWERHOUSE NO 1 TO COAL		5. PROJECT NUMBER

CURRENT SITUATION :
CURRENTLY THE BOILERS ARE OIL FIRED. IF NOT APPROVED, PRODUCTION MAY CEASE BECAUSE OF LACK OF FUEL.

IMPACT IF NOT PROVIDED :
IF NOT APPROVED, PRODUCTION MAY CEASE BECAUSE OF LACK OF FUEL. NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1987	INDEX: 1619
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1987	INDEX: 1673
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1988	INDEX: 1710

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1. COMPONENT	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 Conversion OLD ACID MIST/VAPOR

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
PURCHASE AND INSTALL	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

REMOVE EXISTING DEMISTER AT OLEUM PLANT AND REPLACE WITH MORE EFFICIENT UNIT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

EXHIBIT I-K

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1. COMPONENT		2. DATE
ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 OLD OLEUM LVT

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT A PH ADJUSTMENT BASIN TO TREAT WATER FOR PH CONTROL BEFORE DISCHARGING INTO RECEIVING POND.

11. REQUIREMENT: KG ADEQUATE: KG SUBSTD: KG

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1. COMPONENT	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 NOX,SOX ABATEMENT OLD ACID

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL SCRUBBING SYSTEMS FOR ALL NOX STACKS AT OLD ACID PLANT DESIGN AND INSTALL A SYSTEM CONSISTING OF THREE ABSORPTION TOWERS USING A RECIRCULATED CHILLED WATER/WEAK ACID AND AN OXIDIZER AS ABSORPTION MEDIUM TO REMOVE NOX FROM THE GASSES EMITTED FROM NINE AMMONIA OXIDATION PLANT STACKS. SYSTEM SHALL BE DESIGNED TO RECIRCULATE THE ABSORPTION WATER/ WEAK ACID AND TO TRANSFER IT TO THE ACID AREA FOR FURTHER CONCENTRATION.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION B LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO INSTALLATIONS OF NEW ABSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MAXIMUM RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS

MINIMIZE USEAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT		2. DATE
ARMY	FY 19 ⁸⁹ MILITARY CONSTRUCTION PROJECT DATA	05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION C LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO INSTALLATIONS OF NEW ABSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MINIMIZE USEAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT

MAXIMUM RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT		2. DATE
ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION D LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO, INSTALLATIONS OF NEW ADSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MINIMIZE USAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT		2. DATE
ARMY	FY 19_79 MILITARY CONSTRUCTION PROJECT DATA	06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION E LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

MAXIMUM RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

MINIMIZE USAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

DD FORM 1391, 1 DEC 76 — PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED — PAGE NO.

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FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19_??MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGROUP 3
Badger Army Ammunition Plant Wisconsin	SOLVENT CONSERVATION B.P.

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ENERGY RECOVERY

INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

SOLVENT RECOVERY

LARGE AMOUNTS OF SOLVENT IS DISCHARGED TO THE INDUSTRIAL FLOWAGE FROM THE HARDENING-SCREENING OPERATION OF THE BALL POWDER AREA, INCREASING B.O.D. & C.O.D. CONTENT OF BAAP'S DISCHARGE. A FACILITY WOULD BE BUILT IN ORDER TO RECOVER AND PURIFY THE SOLVENT FOR REUSE.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

DD FORM 1391, 1 DEC 76 — PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED — PAGE NO.

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1. COMPONENT		2. DATE
ARMY	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA	06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 OLD ACID LIME SILO AND FEEDERS

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

PURCHASE AND INSTALL ONE STEEL, GLASS LINED LIME SILO, 20'-0 DIA X 40'-0 HIGH, MOUNTED ON 16 POINTS OF STEEL SUPPORT SUSPENSION SYSTEM, SILO TO STORE 9,506 CUBIC FEET OF PEBBLE LIME. DISCHARGE SYSTEM, TWIN SCREW FEEDER CONVEYER HAVING 100 CUBIC FEET PER HOUR CAPACITY, CAPABLE OF CONTROLLED DISCHARGE INTO PRESENT AGITATION SYSTEM. PURCHASE AND INSTALL (2) LIME FEEDERS AND SHAKERS. ACCOUNT NO. 420-5

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT				2. DATE
ARMY	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA			06 JAN 83
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin			4. PROJECT TITLE MobilGROUP 3 OLD ACID TANK FARM DIKING	
5. PROGRAM ELEMENT	6. CATEGORY CODE 226 12	7. PROJECT NUMBER	8. PROJECT COST ($000)	

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10 00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL CONCRETE DIKES, MEETING FEDERAL REGULATION 40 CFR 112-7, PARAGRAPH (E) (2) (II), AROUND ALL TANKS. ACCOUNT 708 - TANKS 90,91, 722 - TANK 80; 711 - TANKS 70,71,72; 710 - TANKS 30,31,32,33; TANKS T-7, T-8, & T-9; 710 - TANKS 34,35,36,37; 723 - TANKS 50,51,52,53,54,55,56,57, 735 - TANKS 60,61, 62,63,64,65 IN THE OLD ACID AREA. THE OLEUM AREA (ACCOUNT 728) SHALL HAVE CONCRETE DIKE,ACCORDING TO FEDERAL REGULATION, AROUND THE ENTIRE AREA, FROM THE STORAGE TANKS ON THE EAST SIDE TO THE COOLING TOWER ON THE WEST SIDE AND SOUTH OF BUILDING 728 TO SOUTH OF UNLOADING STATIONS ON THE NORTH. THE AREA WILL HAVE VEHICLE RAMPS ON THE EAST AND WEST SIDES, WITH STILES TO UNLOADING DOCKS ON NORTH AND SOUTH.

11. REQUIREMENT SF ADEQUATE SF SUBSTD SF

EXHIBIT I-T

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 79 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUF 3 TANK CAR CLEANING-OLD ACID

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT (1) ACID TANK CAR CLEANING FACILITY (RAILROAD TYPE TANK CARS). FACILITY WILL INCLUDE A NEW BUILDING CAPABLE OF HOUSING ONE TANK CAR, SUMPS, PUMPS, CATWALKS, FUME COLLECTION SYSTEM, NEUTRALIZING MATERIALS AND OTHER EQUIPMENT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

EXHIBIT I-U

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19__ MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		26 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 Modernization MODERNIZE POWER HOUSE NO. 2

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	821 20		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL POLLUTION ABATEMENT ON FOUR (4) 100,000 /HR. COAL FIRED BOILERS AT POWERHOUSE NO. 2, BLDG. 6538. THIS WILL INCLUDE 4 SCRUBBERS, 4 FANS, 4 NEW STACKS AND ASSOCIATED DUCTWORK AND EQUIPMENT.

11. REQUIREMENT: MB ADEQUATE: MB SUBSTD: MB

EXHIBIT II-A

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TB-E-81-01

Title: Develop Methods for Treatment and Disposal of Pollutant Contaminated Sludge/Sediment Deposits

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   During the production of single base and double base propellants, areas that received contaminated process waters now contain accumulated sediments and sludges which need to be treated and safely disposed of.

   A number of the raw materials used in the manufacture of propellants at Badger AAP are listed as hazardous or toxic, and/or conventional contaminants. Continued leaching and washing action by surface waters could move any contaminants present into the groundwater system. Nitrate levels exceeding 10 ppm have been detected in one of the monitoring wells in this area.

   Project is required to comply with Wisconsin Administrative orders or permit conditions.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: Select and mark all sampling sites.

   SW-2: Determine the level of contamination by an in-depth soil sampling and analysis program.

   SW-3: Conduct a literature search for a review on the "State of the Art" in sediment and sludge disposal technology.

   SW-4: Select potential disposal methods for preliminary bench scale investigations.

3. Estimated schedule to perform work - tasks by months required:

Literature Search	- Three months
Laboratory Test	- Three months
Disposal Method Selection	- Three months
Disposal Method Investigation	- Twelve months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

Two year project funding will be required.

EXHIBIT II-B
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-80-2A

Title: Divert Storm WAter at Badger AAP to Off-Plant Drainage Systems:
Part I - Preliminary Concept Design

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Stormwater generated within BAAP's boundaries is collected and discharged through the General Purpose Sewer. The amount of this "clear water" entering the sewers must be minimized in order to allow proper treatment of the industrial wastewater. The General Purpose Sewer effluent must comply with provisions of the Federal Clean Water Act (PL 92-500) and with the State of Wisconsin WPDES permit.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

This project phase involves the preliminary survey and conceptual engineering design of the drainage channels within BAAP's boundaries and to develop the basis for a detailed design of diversion systems and a ROM cost estimate for the actual construction phase. This preliminary concept will be presented to the Wisconsin Department of Natural Resources for their review and/or approval and to initiate the first phase of necessary premit application.

3. Estimated schedule to perform work - tasks by months required:

Conduct on-Site Survey	- One month
Develop Preliminary Project Plans	- One month
Review Available Soil Borings	- One month
Preliminary Design & Report	- Two and one-half months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

This project will be conducted and administered by Olin Corporation Project Engineers. The preliminary and final reports will be accepted by Olin and COR Staff personnel.

5. Estimated overall project life: (One- or two-year funding)

This project will require one year project funding.

EXHIBIT II-C

ENVIRONMENTAL PROJECTS

Facility:

GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project:

Project No.: TBTW-E-82-08

Title: Evaluate Treatment Technology to Remove Phthalate Esters and Amines from Wastewater Streams

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

During production of Single Base and Double Base propellants, areas that received contaminated process water now contain accumulated sediments/sludges which need to be removed for treatment and/or disposal. The sediments/sludges may contain significant levels of toxic or hazardous phthalate esters and/or amines that were present in the plant wastewater during production periods that will continue to be leached into the groundwater of the State if the contaminated soil is not removed. The removal and proper disposal of contaminated sediment/sludges would prevent continued leaching into the subsoils, and permit lining of drainage ditches and sedimentation ponds prior to plant operation if reactivation is required. Treatment of wastewaters to remove the phthalates esters and amines during future production periods is essential to prevent contamination of the waters of the State of Wisconsin. The project is required to comply with Wisconsin Administrative orders or permit conditions.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The study would consist of:

SW-1: A literature search of disposal technology.

SW-2: Direct coordination with vendors to review installed and ongoing systems.

SW-3: Bench scale evaluation of a system adaptable to BAAP's pollutants.

SW-4: Write a final report.

3. Estimated schedule to perform work - tasks by months required:

Literature Search	- Two months
Vendor Coordination	- Three months
Procurement Bench Scale Equipment	- Three months
Lab evaluation	- Thirteen months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The project will require two years of funding.

EXHIBIT II-D
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No: TBW-E-83-05

Title: Diversion of Off-Site Generated Storm Water from the Thermal Treatment (Open Burning) Sites at the Burning Grounds

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Storm water generated off-site flows across the Thermal Treatment sites at the Explosives and Propellant Burning Grounds dissolving soluble components from residuals remaining after treatment. The flow continues off-site and percolates into the ground and potentially may contaminate the groundwaters of the State of Wisconsin.

Both the Resource Conservation and Recovery Act (PL 95-580), and the State of Wisconsin Statutes Section 144.76(7)(c) and NR 181.44(10)(j),(k),(l) and (m) specify that "diversion structure shall be constructed such that surface water run-on..will be prevented from entering the site or facility".

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: The Subcontractor shall prepare an engineering analysis including a water balance to determine the worst condition flow situation and prepare a written report complete with topographic drawings of work to be performed in SW-2.

SW-2: The Subcontractor shall construct diversion ditches along the uphill slopes of the Burning Grounds to intercept storm generated surface water and drain the collected water to existing open fields below the treatment site.

SW-3: The Subcontractor shall uniformly smooth grade, fill, and compact all areas covered by this project and replace topsoil to a minimum depth of four inches. Before reseeding the disturbed areas, the topsoil shall be thoroughly tilled to a depth of three inches. The disturbed and reworked areas shall be reseeded with drill seeding equipment designed to fertilize and seed winter rye and grass seed on one pass. Mulching materials may be applied at the discretion of the Subcontractor to ensure seeding success and to minimize erosion.

2. SW-4: After completing the final grading and seeding, the Subcontractor shall remove all of his equipment and materials and restore the area to the general state of condition that existed before the start of the work. The Subcontractor shall maintain the area for a epriod of one year after seeding, during which time he shall restore crop eroded areas promptly and ressed in case of seeding failure.

   SW-5: The Subcontractor shall prepare a Final Report complete with "As-Build" drawings of the work performed.

3. Estimated schedule to perform work - tasks by months required:

Preliminary engineering	- One month
Prepare subcontract specifications	- One month
Request for quotations	- Two months
Evaluate quotations	- Two weeks
Award subcontract	- One month
Subcontractor mobilization	- Two weeks
Subcontractor on-site work	- Two months
Subcontractor Final Report	- Two months
BAAP review & acceptance of Final Report	- Two months
ELAPSED TIME	- Twelve months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and shall make necessary corrections and/or adjustments to the Subcontract as indicated by the daily inspections.

   All work shall be done in a manner consistent with good workmanship and technical expertise of the Engineering and Construction profession.

5. Estimated overall project life: (One- or two-year funding)

   Project work can be completed within two years of funding.

EXHIBIT II-E

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-04

Title: Removal of Accumulated Sludge and Neutralized Acid from the Pond Near the New Acid Complex

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

During the Startup and Proveout of the various acid production facilities in the New Acid Area, acidic wastes and spills were neutralized and stored in this unlined pond. The high nitrate and sulfate-laden wastes are leaching into the subsurface soil and reaching the groundwaters of the State of Wisconsin. Wisconsin Administrative Code NR 180 and 181 prohibit contamination of the groundwaters by hazardous wastes. Removal of this localized site of accumulated neutralized acids and sludges is required to prevent further contamination of the groundwaters of the state. The wastes can then be landspread in other areas of the plant where vegetation can make use of the chemicals present.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: The Subcontractor shall prepare and submit detailed before, during, and after topographic drawings of the wastewater pond and surrounding areas. Photographs (8" x 10") shall also be prepared of the subject area. These photographs shall be of such professional quality as to protray the actual restoration work that occurred.

SW-2: The Subcontractor shall excavate the dikes and accumulated sludge from the New Acid Complex Wastewater Pond to a depth of three (3) feet and landspread it in a designated area at a rate such that deposition of the sludge shall not exceed 150 pounds of NO_3-N per acre equivalent. Actual soil equivalent shall be specified by the U.S. Army Environmental Hygiene Agency (USAEHA) and/or the Wisconsin Department of Natural Resources (WDNR).

SW-3: The Subcontractor shall restore the topography of the area to its original status prior to the formation of the wastewater pond and its demolition as part of this subcontract. The restoration shall include back filling the area with available clay-type subsoils, compaction of the back-filled area to 90% vector, covering the site with light (8-inches) of compacted topsoil, and finish-graded to existing topography

SW-4: The Subcontractor shall reseed the restored area, using grass seed mix equivalent to Wisconsin Highway Department Mix No. 3, and a cover crop of winter rye to protect the seeding effort.

3. Estimated schedule to perform work - tasks by months required:

Prepare Subcontract Specifications	- One month
Request quotations	- One month
Evaluate quotations	- Two weeks
Award Subcontract	- One month
Subcontractor mobilization	- Two weeks
Subcontractor on-site work - demolition	- Two weeks
Subcontractor on-site work - restoration	- Two weeks
Subtotal - Elapsed time	- Five months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and make corrections and/or adjustments to the subcontract as needed as a result of field inspections and soil sampling.

The Project Engineer shall issue a Final Report covering the work done complete with before and after drawings and photographs.

5. Estimated overall project life:

Project work can be completed within one year of funding.

EXHIBIT II-F

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TB-E-81-02

Title: BALL POWDER Wastewater Pollution Abatement Study

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Phthalate esters are listed on the Toxic Pollutant List included in PL 92-500 under Part 307. Di-n-butyl phthalate (DBP), a phthalate ester, is used in the manufacture of BALL POWDER. Diphenylamine, utilized as a stabilizer in BALL POWDER, is toxic to aquatic organisms and reacts with degradation products of nitrate ester explosives to form N-Nitrosodiphenlyamine. The U.S. Environmental Protection Agency has designated N-Nitrosodiphenylamine a priority pollutant and is setting limits on the discharge levels permitted for these pollutants in wastewater, sludge, landfill leachate, etc. The contaminated wastewater stream generated in the production of BALL POWDER would contain these pollutants plus ethyl acetate, sodium sulfate, animal protein, nitroglycerin, and possibly dinitrotoluene. The Clean Water Act requires the application of the best available, economically achievable technology (BAT), which furthers the national goal of zero discharge of pollutants.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

This project will consist of the following tasks to be completed in a two year period beginning with receipt of funding.

a. A detailed review of related studies and surveys to characterize treatability of propellant waste streams conducted at Badger or other propellant processing plants will be completed to utilize any available data applicable to this study.

b. Characterize the BALL POWDER processing effluent to identify and determine specific concentration of individual propellant additives.

c. Determine effluent guidelines from current regulatory requirements.

d. Identify candidate treatment/recovery methodologies for potential testing by review of known biotreatment and physical/chemical processes, i.e., activated sludge, sedimentation, air stripping, ultrafiltration, reverse osmosis, ion exchange, activated carbon adsorption, polymeric resin adsorption, ozone oxidation, anaerobic/aerobic rotating biological contactor, biological denitrification.

2. Continued

   e. Select from task (d) the treatment systems for bench scale evaluations.

   f. Design, procure, install bench scale aparatus and conduct test program to evaluate selected technology.

   g. From results of task (f) select technologies for pilot scale evaluation.

   h. Design and construct selected pilot scale treatment facilities for evaluation of treatment/recovery methodologies and efficiencies.

   i. Conduct pilot scale testing to assess viability and optimum operating conditions for the prototype facilities.

   j. Perform economic feasibility analysis on those systems that functioned successfully.

   k. Perform a hazard analysis on systems selected in task (j).

3. Estimated schedule to perform work - tasks by months required:

   a. Characterize Effluent and Select Candidate Treatment/Recovery Methodologies — 4 months
      (1) Literature Search
      (2) Effluent Characterization
      (3) Identify Candidate Methodologies
      (4) Develop Bench Scale Test and Evaluation Plan

   b. Bench Scale Evaluations of Selected Treatment/Recovery Methodologies — 14 months
      (1) Design, Procure and Install Bench Scale Test Apparatus
      (2) Conduct Bench Scale Tests
      (3) Select Technologies for Pilot Plant Scale Evaluation
      (4) Conduct Safety Site Submission and Hazard Analysis

   c. Pilot Scale Evaluation of Selected Treatment/Recovery Technologies — 18 months
      (1) Design, Procure and Install Pilot Scale Equipment
      (2) Operate Pilot Plant
      (3) Evaluate Treatment/Recovery Technologies and Economic Analysis
      (4) Final Report and Recommendations

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   Project work can be completed in three years.

EXHIBIT II-G

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBTW-E-82-07

Title: Conduct a Study for Monitoring DNT, DPA, Phthalate Esters and Nitrosoamines in Wastewater Streams

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Phthalate esters are listed on the Toxic Pollutant List included in PL 92-500 under Part 307. Di-n-butyl phthalate (DBP), a phthalate ester, is used in the manufacture of BALL POWDER. Diphenylamine, utilized as a stabilizer in BALL POWDER, is toxic to aquatic organisms and reacts with degradation products of nitrate ester explosives to form n-nitrosodiphenlyamine. The U.S. Environmental Protection Agency has designated n-nitrosodiphenylamine a priority pollutant and is setting limits on the discharge levels permitted for these pollutants in wastewater, sludge, landfill leachate, etc. The ability to quantitatively measure the level of these pollutants is required to permit the application of the most economical treatment technology while assuring compliance with applicable discharge permit limits. The discharge of propellant production wastewater may be prohibited by the State of Wisconsin unless pollutant levels can be continuously monitored.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: Conduct a survey of monitoring technologies.

   SW-2: Select small dedicated sensors for lab evaluations.

   SW-3: Conduct Laboratory Studies to evaluate candidate monitoring systems.

   SW-4: Write Final Report.

3. Estimated schedule to perform work - tasks by months required:

Literature search	- Two months
Select and procure equipment	- Three months
Conduct laboratory studies	- Ten-sixteen months
Write Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The project will require two year funding.

EXHIBIT II-H

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBA-E-83-03

Title: Scrubbing of Nitroglycerin Vapors

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

The Sweetie Barrel operation emits vapors that contain nitroglycerin (NG) and iso-propyl alcohol (IPA) in concentrations that are not environmentally acceptable especially in light of the more restrictive OSHA and Clean Air Act regulations. Also as far as safety is concerned, NG condenses in low spots and IPA is static sensitive, so there is a potential for explosion. Therefore, in order to reactivate this operation in compliance with all applicable regulations, a study is needed to find out the best method to control or eliminate NG and IPA vapors from the exhaust stream.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: Design and procure a bench scale scrubbing unit that will not only control/eliminate NG and IPA vapors, but also separate these from each other.

SW-2: Find a scrubbing medium or media that will adsorb one or the other (i.e., either NG or IPA) but not both, and evaluate the effectiveness.

SW-3: Evaluate methods to dispose of the separate waste streams in an environmentally acceptable manner or possibly even to reuse/recycle the collected NG or IPA.

SW-4: Prepare Final Report

The effectiveness of the scrubbing operation can be judged through emission measurements or material balance equations.

3. Estimated schedule to perform work - tasks by months required:

Equipment Procurement	- Eight months
Laboratory Study	- Seven months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

This project will require two year funding.

EXHIBIT II-I

ENVIRONMENTAL PROJECTS

Facility:

GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project:

Project No.: TBW-E-82-11

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Nitrocellulose Area

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

The nitrocellulose area now consumes 19.7 MGD when operating at full capacity. Water consumption can be reduced by 9.8 MGD by recirculating non-contact cooling water in the nitrating area; recirculating pump water in the beater, poacher and blender operation; and making process changes in the acid neutralization procedure and the boiling tub process.

The Clean Water Act requires the application of the best available, economically achievable technology (BAT) which furthers the national goal of zero discharge.

The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Perform a preliminary design for reuse of non-contact cooling requirements.

   2. Prepare preliminary design of process water system to utilize cooling water.

   3. Prepare preliminary design of acid neutralization water reuse system.

   4. Prepare a concept design package for a water recycle/reuse system for the nitrocellulose areas.

3. Estimated schedule to perform work - tasks by months required:

Task 1 - Three months
Task 2 - Three months
Task 3 - Three months
Task 4 - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how) Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year project funding will be required.

EXHIBIT II-J
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-10

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the BALL POWDER Area

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Preliminary results from the Point Source Project indicate that the amount of wastewater can be reduced from 3.72 MGD to 0.31 MGD at full capacity when new nitrocellulose is used in the feedstock. This reduction would be recirculating propellant pumping water, recirculating propellant screening spray water, and by improved propellant washing equipment.

   The Clean Water Act requires the application of the best available economically achievable technology (BAT) which furthers the national goal of zero discharge of pollutants.

   The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   Prepare a preliminary design package for reuse of non-contact cooling water requirements.

   Prepare design package for water reuse throughout area.

   Prepare design package for removal of organics and sulfate from effluent water and to develop reuse/recycle characteristics.

   Prepare final concept design package for water reuse/recycle in the BALL POWDER Area.

3. Estimated schedule to perform work - tasks by months required:

   This is a single task project requiring twelve months.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   One year project funding is required.

EXHIBIT II-K

ENVIRONMENTAL PROJECTS

Facility: **GSA Inventory No.:** WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: **Project No.:** TBW-E-82-09

Title: Design a Water Reuse/Recycling System to Implement the Point Source Engineering Studies in the Single Base Manufacturing Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Preliminary results from the Point Source project indicate that approximately 120,000 GPD of process water can be recycled by utilizing a closed recirculation system for the required spray water and propellant flushing operations. One pass cooling water consumption could be reduced by approximately eight million GPD by installing on-site cooling tower systems. This is based on a 1.0 million pound/month Single Base production schedule. By reducing the quantity of wastewater discharged, those discharges that are required can be more effectively and economically treated.

   The Clean Water Act requires the application of the best available economically achievable technology (BAT) which furthers the national goal of zero discharge of pollutants. The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Prepare preliminary design for reuse/recycle of non-contact cooling water equipment.

   2. Prepare preliminary design of process cooling water cooling system.

   3. Prepare preliminary design of system for reclaim/recycle/reuse of water-dry system water.

   4. Prepare concept design for implementation of water reuse/recycle system.

3. Estimated schedule to perform work - tasks by months required:

   Engineering - Process water recycling system at six months.

   Engineering - Cooling water recycle system at six months.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   One year project funding will be required.

EXHIBIT II-L

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-12

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Old Acid Complex

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Approximately 10.7 MGD of wastewater is generated in the Old Acid Area, with 10.4 MGD of this wastewater stream coming from non-contact cooling water. The cooling water can be cooled and recirculated or used as adsorption water.

The Clean Water Act requires the application of the best available, economically achievable, technology (BAT) which furthers the national goal of zero discharge of pollutants. The State of Wisconsin WPDES permit limits the level of pollutants to Primary and Secondary Drinking Water Standards.

The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Perform preliminary design of non-contact cooling equipment.

   2. Preliminary design of cooling water cooling system.

   3. Preliminary design of system to use cooling water as adsorption water.

   4. Concept design package of water recycle/reuse throughout the acid area.

3. Estimated schedule to perform work - tasks by months required:

Task 1 - Three months
Task 2 - Three months
Task 3 - Three months
Task 4 - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year of project funding will be required.

EXHIBIT II-M

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-01

Title: Installation of Impermeable Membrane on the Ground within the Acid Storage Diked Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Acid storage tank areas in the New Acid Complex are diked to contain acid spills up to and including complete tank rupture. Dike walls are constructed mostly of concrete but some are earthen. The ground within diked areas is not impermeable and therefore will not prevent migration of hazardous acid components into the groundwater.

Acid storage tank spills have contaminated the soil in diked areas and acid migration has resulted in pollution of the groundwater such that primary and secondary drinking water standards are exceeded. The State of Wisconsin requires that proper construction of the diked areas be implemented prior to mobilization to prevent future impact and/or degradation of the groundwaters of the State.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The existing earthen diking will be replaced with concrete and the ground within the diked areas be similarly covered. The existing drain system, consisting of individual tank drain lines leading to collection sumps located below grade, would be used to drain acid spills occurring within the diked areas. Existing catch basins located under individual tank outlets would be removed and the concrete floor sloped to these drains. The ehader drain line would be valved closed except when removing a spill or rain water. The acid or rain water drained to existing sumps would be moved with existing pumps and piping to storage/neutralization tanks or to the General Purpose Sewer in the case of rain water.

There are eight acid and one caustic soda storage diked areas which require modification.

Account	Type
758	Spent Acid Store
759	Weak Nitric Store
760	Semi Con Mix Store
671	93% Sulfuric Store
772	Oleum Store
773	mixed Acid Store

2.

Account	Type
777	93% Sulfuric Hold Store
785	NGMA Store
420-8	Caustic Soda Store

3. Estimated schedule to perform work - tasks by months required:

All work will be subcontracted. All construction work can be completed in six months with the total project completed within one year of funding.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Subcontract work will be administered, supervised, inspected and approved by Olin facilities engineering personnel.

5. Estimated overall project life: (One- or two-year funding)

One year of funding is required.

EXHIBIT II-N

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-83-04

Title: Upgrade Laboratory Capability for WPDES Water Monitoring Compliance

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Wastewater from the BALL POWDER, Nitrocellulose, and other production areas is discharged to the General Purpose Sewer causing high levels of BOD. BAAP's WPDES permit allows a limited amount of BOD discharge and requires its monitoring under current discharge permit conditions.

   The testing for BOD is done on a weekly basis for a 24 hour composite sample. This allows six days a week of non-monitored waste discharge.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   The proposed study would investigate:

   SW-1: The use of a Respirometer® which would monitor BOD levels on a continual basis.

   SW-2: Determine whether a Respirometer® should be used at Point Source at the several manufacturing areas or at the general discharge area.

3. Estimated schedule to perform work - tasks by months required:

Procurement	- Two months
Study	- Four months
Report	- Two months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year project funding will be required.

EXHIBIT II-O

ENVIRONMENTAL PROJECTS

Facility: **GSA Inventory No.:** WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: **Project No.:** TBW-E-83-02

Title: Develop a Combined Treatment System for the Reduction of Nitrates, BOD's and COD's from the Nitrocellulose and BALL POWDER Production Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Process waste from the Nitrocellulose and BALL POWDER Manufacturing Areas are discharged in the General Purpose Sewer, increasing the BOD, COD, NO_3-N, and sulfate pollutants to levels exceeding the WPDES permits. This project proposes the reduction of all four pollutants by a combined treatment system. As the carbon compounds in the BALL POWDER waste stream are consumed in support of the biological denitrification of the nitrocellulose effluent, the levels of BOD and COD would also be reduced.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: Design and procure an anaerobic and aerobic bench scale digestion system.

   SW-2: Evaluate the anaerobic treatment of high level NO_2 (500-1000 ppm) wastewaters.

   SW-3: Evaluate aerobic treatment of colloid and ethyl acetate.

   SW-4: Write Final Report.

3. Estimated schedule to perform work - tasks by months required:

Equipment procurement	- Three months
Lab evaluation	- Twelve-eighteen months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The study will require two year funding.

EXHIBIT II-P

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBH-E-82-13

Title: Excavate and Reline Existing Nitroglycerin Pond

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   This project involves cleaning out and lining the existing Nitroglycerin (NG) Pond. The permeable sediments accumulated in the bottom of the pond are contaminated with nitrates and sulfates that were present in the wastewater effluents from the NG Manufacturing Facilities during previous production periods. These contaminants percolate into the groundwater of the State of Wisconsin such that the primary and secondary drinking water standards will be exceeded. The work is required to eliminate the percolation of contaminants into the groundwater of the State and to meet the expected requirements of the Wisconsin Pollutant Discharge Elimination System permit and the Federal Clean Water Act.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   The design and development phase of this project involves detailed drainage and subsoil engineering studies and obtaining State approval for the project.

   Construction work on this project involves excavating and properly disposing of contaminated soil in the bottom of the pond and lining the pond with an acid resistant reinforced polyethylene bottom liner with a foot of sand to protect it. The work also involves reshaping the sides of the pond to control surface erosion and rebuilding the pond water elevation control structure to allow more effective operation of the wastewater treatment system.

3. Estimated schedule to perform work - tasks by months required:

Project Bidding Process	2 months
Development of Final Plans	4 months
Wisconsin State Approvals	6 months
Construction Bidding	2 months
Project Construction	10 months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

The project will be inspected and administrated by Olin Corporation, Project Engineers. Assistance will be required by Olin Administration and COR Government staff to support the project during public hearings and State approvals. Final project acceptance will be by Badger AAP - COR Industrial Engineer.

5. Estimated overall project life: (One- or two-year funding)

This project will require two years funding to complete.

EXHIBIT II-Q

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agnecy Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBA-E-82-06

Title: Install Stack Gas Monitoring/Analysis Equipment in Powerhouse No. 1

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Powerhouse No. 1 currently burns No. 6 Residual Fuel Oil in its oil-fired boilers to provide steam for the heating of active accounts throughout Badger AAP. The Clean Air Act (PL 95-95) and Wisconsin Department of Natural Resources (WDNR) Air Pollution Control Rules (NR 154/155) require that sources of air contamination maintain emissions into the ambient air below established limitations and to prevent significant deterioration of the ambient air quality. The existing boilers are not equipped with monitoring equipment with which to monitor emissions (gas flow rate, sulfur oxides, nitrogen oxides, and carbon monoxide) from each boiler and from combined streams that are discharged into the atmosphere.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: The Subcontractor shall engineer and design an on-site flue-gas monitoring/sampling/analytical/and microprocessing system for installation in a nine-boiler complex at Badger AAP. Such engineering and design shall be in such detail that craftsman skilled in the art will be able to read, understand, and to install such equipment and supporting hardware as will be required.

SW-2: The Subcontractor will provide an on-site monitoring/sampling/analytical/and microprocessing equipment for nine oil-fired boilers capable of monitoring and receiving flue gas emissions that will meet and/or exceed all requirements of federal and state regulations for emission monitoring and recording of data.

SW-3: The Subcontractor shall install, commission, and calibrate all of the equipment in Powerhouse No. 1 specified in SW-2 above. He shall be totally responsible for the quality, workmanship, and operational capability of all equipment supplied and for the installation of said equipment. The Subcontractor shall provide for an approved detailed list of equipment to be used in the project within 30 days of contract award. Monitoring and analytical equipment supplied shall provide instantaneous reading accurracy of 0.5% of full-scale and have a resolution capability of 0.1% of full scale.

2. SW-4: The Subcontractor shall provide a complete package of "As-Built" drawings for all elements of the project including all wiring and spool drawings as applicable.

   SW-5: The Subcontractor shall provide a detailed technical report covering the engineering, procurement, construction, installation, commission, and calibration efforts of the project.

3. Estimated schedule to perform work - tasks by months required:

Preliminary engineering	- Two months
Prepare subcontract specifications	- Two months
Request for Technical Proposal	- Two months
Evaluation of quotation	- One month
Award subcontract	- One month
Subcontractor mobilization	- Two months
Subcontractor on-site work, construction	- Three months
Subcontractor on-site work, commissioning	- One month
Subcontractor on-site work, Technical Report	- Two month
BAAP review of Technical Report	- Two months
ELAPSED TIME	- Eighteen months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and make corrections and/or adjustments to the subcontract as needed as a result of field inspections.

   All work shall be done in a manner and expertise as specified by the applicable Wisconsin Administrative Codes and/or ASME Code Certification.

5. Estimated overall project life: (One-or two-year funding)

   Project work can be completed within two years of funding.

EXHIBIT II-R

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TB-E-80-8

Title: Conduct a Hazardous Materials and Pesticide Management/Control Study

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

AR 200-1 [10-6, subparagraph (7)(a)5] provides for special studies to be undertaken to define sources of pollution and develop remedial measures. During normal operations and agricultural leasings over the past forty-plus years, many potential toxic and/or hazardous chemicals and/or pesticides have been used within Badger AAP's boundaries. No accurate records exist as to type or quantities that may have found their way into the environment.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

A systematic soil sampling and analysis study shall be conducted for all areas at Badger AAP. This study shall review all materials that may have been used in specific areas and a coordinate grid system developed for soil sampling.

SW-1: A computer program shall be developed to collect, analyze, store, and develop environmental management reports, permit renewals, etc., as required by various state and federal regulatory agencies and to support the soil sampling and analysis program.

SW-2: A systematic review of land use and possible chemicals that could have been applied during the time of occupancy by the U.S. Army shall be undertaken utilizing a grid control system to identify each area.

SW-3: Preliminary soil and monitoring well samples shall be taken from each plant area in a systematic manner so as to reflect possible patterns for further studies if potential problems are determined. Soil samples shall be taken and preserved in an approved manner so as to maintain their integrity throughout the analysis/evaluation program.

2. SW-4: All samples shall be analyzed for those items specified in the EPA's EP Toxicity List and for those materials suspected to be present as a result of prior plant operations. Significant results shall trigger an in-depth soil survey of the affected area to pinpoint the source of the pollution.

   SW-5: All data generated by the soils sampling survey and laboratory analyses shall be compiled by the computer and an in-depth report issued.

3. Estimated schedule to perform work - tasks by months required:

   Computer program - Six months
   Soil sampling grid - Three months
   Soil sampling - Eighteen months
   Soils Analysis - Eighteen months
   Evaluation of data - Three months
   Final Report - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   All work shall be accomplished under the direction of Olin's assigned Project Engineer who shall evaluate progress and data developed and modify the ongoing program in accordance with the results of the study developed at that point.

5. Estimated overall project life: (One- or two-year funding)

   Project work can be completed within two years of funding.

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATE ARMY ARMAMENT,
MUNITIONS, AND CHEMICAL COMMAND

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT FOR
TOTAL PLANT OPERATIONS

BADGER ARMY AMMUNITION PLANT
JULY 1983

Prepared by:

L. P. HELLEWELL
Project Engineer
Olin Corporation
Operating Contractor

Reviewed by:

for J. R. MATTEI
Plant Manager
Olin Corporation
Operating Contractor

Approved by:

KENNETH R. TESCH
OPSEC Review
Badger AAP

Approved by:

DAVID C. FORDHAM
Commander's Representative
Badger AAP

Approved by:

for COLONEL VINCENT LO PRESTI
Installation Commander
Badger AAP

It is assumed that these new facilities will operate at mobilization at their design rates of 400 tons/day of nitric, 350 tons/day of oleum, and 500 tons/day NAC/SAC. (See Table I and III-E.)

(3) Nitrocellulose Facilities (See Table I-A)

There are no current standards for either old or new nitrocellulose facilities. The new modernized cellulose nitration facilities are designed for emissions of less than 200 ppm nitrogen oxides (as NO_2) in their exhausts to the atmosphere, but the first unit is now programmed for FY 86. If mobilization occurs after that point in time, whatever pollutant emission standards existing at that time will be met.

If mobilization occurs before that point in time, the existing facilities will be used and pollutant emissions will probably exceed the current WDNR ambient air limits. Three MCA projects submitted to minimize any problems in the existing lines have been deferred to long range (See Section B.5.a, b & c).

(4) Burning Grounds

Open air burning was employed at Badger Army Ammunition Plant for disposition of explosive and propellant wastes and of explosive-contaminated wastes because it was the only known method for economical accomplishment of this operation. The burning ground area is located at sufficient distance from other plant operations and from adjacent private land so that the amount of particulate matter reaching these locations is minimal. However, since open burning is in conflict with Federal and State goals of preventing air pollution emissions, two MCA project submissions made by Badger include installation of facilities for incineration of explosive and propellant waste of explosive-contaminated waste (See Section B.5.d & e).

Open burning terminated during the spring and summer of 1978, resumed in October 1978 after a WDNR permit/license was received form the State of Wisconsin.

(5) Regulations satisfied by the monitoring program:

Under standby status, there are no emissions from inactive production facilities and maintenance activities of a magnitude for which permits/licenses are required. Under mobilization conditions, the implementation of the air monitoring sites would allow data accumulation for use in assessing the impact of the emissions from the various operations at BAAP on the ambient air, and compliance with Wisconsin Administrative Code Chapter NR 154.

b. Incineration

Figure 3-A shows the site of the present incinerator which is in standby, inoperative, and noncomplying. The MCA project for the construction startup, proveout and operation of the Contaminated Waste processor-Small Unit is scheduled for completion during 1982. This unit will be used to dispose of combustible waste that is or may be contaminated with Propellants Explosives and/or Pyrotechnics (PEP). A MCA project submitted for the installation startup, proveout, and operation of an Explosive Waste Incinerator is in the outyear program. The use of these incinerators will reduce the amount of particulate matter and oxides of nitrogen released to the atmosphere during open burning. Amounts and types of materials to be incinerated are directly related to operational status and plant mission assignment.

c. Open Burning

(1) Figure 3-A shows the current site where open burning is carried out to dispose of waste explosives and propellants and explosive-contaminated wastes because it was the only known method for safe and economical disposal of these materials. However, this method does not comply with current EPA standards. MCA projects submitted by BAAP for the installation of facilities for the incineration of explosive and propellant wastes and explosive contaminated waste are described in 4.b. above. Table I-C describes the location, contents, and status of land disposal sites at BAAP.

(2) The Burning Grounds are operated by BAAP's Maintenance Department.

(3) During standby operations through full mobilization, approximately 65 tons of material per year are accumulated at the Burning Grounds for disposal. These materials include waste explosives and propellant as well as roofing and structural items that are contaminated with explosives and/or propellant.

(4) Normally, material is burned once per month depending on rate of accumulation. Ignition is accomplished with excelsior, fuel oil and a match.

(5) Restrictions regarding operation of the Burning Grounds depend on the quantity of material to be burned, the wind factor and humidity. All operations of the Burning Grounds are covered by the Burning Grounds SOP.

(6) No unusual burning operations are expected or anticipated to occur.

(7) All "burns" are restricted to daylight hours.

(8) Applicable SOP's/regulations for Burning Grounds are Standing Operating Procedure - Burning Grounds.

(9) The MCA incinerator programs should eliminate most of the requirements for open burning and make the currently used area available for other propellant related activities.

(10) Authorized accounts (buildings, barricades, facilities, etc.) may be burned on-site because of a high exposure risk to personnel to propellant, explosive, and/or pyrotechnics (PEP) items present in the accounts scheduled for demolition and/or removal.

d. Demil Operations

(1) Figure 3-A shows the location of propellant Demil Operations. Demil Operations at Badger AAP generally involve the salvaging of obsolete powder and/or propellants that no longer meet required ballistic characteristics. Those items that cannot be salvaged and are by-products of the salvage operation (deterrent, bags, etc.) are rendered as innocuous as possible and then burned on the burning pads.

(2) Types of munitions demilled:

(a) Obsolete small arms, rifle and cannon powders, with and without, ignitor trains.

(b) Rocket grain propellant.

(c) BALL POWDER.

(d) Nitrated cotton and/or woodpulps.

(3) No neutralization/treatment is required and/or expected all by-products are recycled in the salvage system, recovered and/or burned as necessary at the Burning Grounds. The installation of an explosives incinerator, and an incinerator for explosive contaminated waste will eliminate the use of the open burning previously practiced on a decontaminateion pad.

(4) Demil Operations are carried out in the Burning Grounds under applicable SOP's. It is expected that the MCA incineration programs will replace the current procedure for demilling. operations.

e. Recycling Operations

(1) Official recycling efforts - scrap property sale.

Recycling of scrap and unserviceable items is accomplished at BAAP on an official continuing basis. The recycling activity is coordinated by the Olin Corporation Property Department, and all recycling events are reviewed and approved by Olin management and the Government. In most cases, the recycled materials are stored and sold from the corporation yard; however, depending upon the items being recycled, the items may be stored and sold from varying locations of the plant. The scrapped, recycled materials evolve from construction, maintenance and production activities of the plant.

All vehicles are checked regularly for their compliance with existing standards.

Contractors, vendors, Corps of Engineers personnel and Corps of Engineers contractors have authorized entry on the installation on an as needed basis.

d. There is one vehicle washing station and one inactive laundry facility at BAAP. Wastewater from the laundry goes to a sump for removal of propellant contaminants before entering the general purpose (GP) sever. The wastewaters from these facilities go to the industrial waste sewer for treatment and aeration. Vehicle washing is accomplished periodically as necessary.

No records are available as to the volume or quality of the wastewater leaving these facilities.

e. Effects of Solid Wastes

Settleable solids were removed periodically from the settling pond areas of the BAAP effluent discharge stream and placed in nearby natural land depressions on the plant site. The carriage water is allowed to evaporate, percolate into the ground, and/or return to the effluent stream. Other nonexplosive solid wastes resulting from plant operations are placed in a licensed solid waste disposal area on the plant site. Additional suitable locations for future use are available on site.

No problems have been encountered with current solid waste disposal procedures, and none are presently anticipated for the future. U.S. Army Toxic & Hazardous Materials Agency (USATHAMA) has conducted a survey of BAAP landfill operation during 1979/1980 to determine what, if any, changes are necessary for complete compliance with EPA and Wisconsin standards.

f. Effects of Hazardous and Toxic Substance

Disposal of explosive and propellant wastes and explosive-contaminated inert wastes resulting from the production and manitenance operations at this plant was by approved open burning methods. Development work is being carried out for Department of the Army on a suitable safe and pollution free method for incineration of these wastes. Table I-C describes the location, contents, and status of land disposal sites at BAAP.

MCA Projects T00400 & T00600 were submitted for the installation of an Explosive Waste Incinerator (EWI) and a Contaminated Waste Processor (CWP). The CWP has been constructed and is scheduled for proveout in October 1982. The EWI has been deferred to long-range or reactivation of BAAP.

EXHIBIT I-A

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 1 INCINERATOR EXPLOSIVE WASTE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	833 10		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT INCINERATOR	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT AN INCINERATION FACILITY CAPABLE OF DESTROYING WASTE PROPELLANT AND EXPLOSIVES (CLASSES 1.1 AND 1.3). DESIGN OF INCINERATOR SHALL BE BASED ON THE DEACTIVATION FURNACE USED AT TOOELE ARMY DEPOT. PROJECT INCLUDES SITE PREPARATIONS, WATER LINES, ELECTRIC SERVICE, LANDSCAPING , AND SECURITY FENCING. INCINERATOR TO BE LOCATED IN GENERAL AREA OF PRESENT EXPLOSIVE WASTE BURNING GROUNDS. SPACE IS AVAILABLE FOR ADDITIONAL INCINERATORS IF REQUIRED IN THE FUTURE.

11. REQUIREMENT: TN ADEQUATE: TN SUBSTD: TN

PROJECT :
CONSTRUCT AN INCINERATION FACILITY CAPABLE OF DESTROYING WASTE PROPELLANT AND EXPLOSIVES.

REQUIREMENT :
THE CURRENT OPEN BURNING INCINERATION DOES NOT MEET CURRENT FEDERAL, STATE AND LOCAL REQUIREMENTS.

CURRENT SITUATION :
PRESENTLY ALL PROPELLANT AND EXPLOSIVE WASTES AT BAAP ARE DISPOSED OF BY OPEN BURNING IN A CONTROLLED SITUATION. THIS METHOD OF DISPOSAL DOES NOT MEET CURRENT STANDARDS CONTAINED IN 40 FEDERAL REGISTER 13216, 25 MARCH 1975, WHICH REVOKED PART 76, TITLE 40 CFR. THE REVOKED REGULATION PROVIDED

1. COMPONENT ARMY	FY 19_8_ MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 1 INCINERATOR EXPLOSIVE WASTE	5. PROJECT NUMBER	

CURRENT SITUATION : (CONT)..

FOR OPEN BURNING OF EXPLOSIVES.

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BAAP WILL NOT BE IN COMPLIACE WITH PROVISIONS OF THE CLEAN AIR ACT OF 1970, AS AMENDED. THIS IS A GROUP I MOBILIZATION PROJECT.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS NOT REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1988	INDEX: 1710
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1988	INDEX: 1748
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1989	INDEX: 1786

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		21 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 Modernization OLD ACID LWT -VFC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL SYSTEM IN THE ACID PLANT EFFLUENT STREAM TO REMOVE NITRATES AND SULFATES FROM THE WASTE WATER GENERATED IN THE TWO ACID AREAS. THE INSTALLATION SHALL INCLUDE NECESSARY ACID WASTE WATER TRANSFER PIPING, PROCESS TANKS, PUMPS, BUILDINGS, UTILITIES, & OTHER NECESSARY SUPPORT FACILITIES. PROVIDE FACILITIES FOR RECYCLING TREATED WATER.

11. REQUIREMENT: KG ADEQUATE: KG SUBSTD: KG

PROJECT :
PROVIDE ACID LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO INSTALL WASTE WATER TREATMENT IN EXISTING ACID AREAS. THIS PROJECT IS REQUIRED TO ASSURE THAT NITRATES AND SULFATES CAN BE REMOVED FROM WASTE WATER GENERATED IN THE ACID AREAS FOR COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS. THIS PROJECT IS REQUIRED ONLY IF THE NEW ACID FACILITY MODERNIZATION DEFICIENCY CORRECTIONS ARE NOT COMPLETE BY MOBILIZATION.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER.

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 21 DEC 82

3. INSTALLATION AND LOCATION
Badger Army Ammunition Plant
Wisconsin

4. PROJECT TITLE Mobilization Group 2 Modernization OLD ACID LWT -WPC	5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL 1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER 1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL 1991	INDEX: 1950

EXHIBIT I-C

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19_90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 B & C NITROCELLULOSE LWT - WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL FACILITY TO REMOVE NITRATES AND SULFATES FROM B & C NITROCELLULOSE MANUFACTURING AREA WASTE WATER STREAMS. FACILITY SHALL INCLUDE PROCESS TANKS, PUMPS, SUSPENDED MATTER FILTRATION EQUIPMENT, TREATED WATER RECYCLE EQUIPMENT, BUILDINGS, UTILITIES AND OTHER NECESSARY SUPPORT EQUIPMENT.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE NITROCELLULOSE MANUFACTURING LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE FACILITIES FOR WASTE WATER TREATMENT THAT WILL ASSURE COMPLIANCE WITH FEDERAL AND STATE REGULATIONS WHEN OPERATING B & C NITROCELLULOSE LINES AT FULL CAPACITY.THIS PROJECT IS REQUIRED TO ASSURE BADGER AAP WILL BE IN COMPLIANCE WHEN THESE LINES ARE REACTIVATED.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER. PRESENT WASTE WATER TREATMENT PROVIDES ONLY PH CONTROL AND THIS IS NOT SUFFICIENT TO MEET THE LAW.

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 12 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 B & C NITROCELLULOSE LWT - WPC		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL 1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER 1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL 1991	INDEX: 1950

EXHIBIT I-D

FOR OFFICIAL USE ONLY (WHEN DATA IS ENTERED)

1. COMPONENT	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 2
Badger Army Ammunition Plant Wisconsin	D & E NITROCELLULOSE LWT -WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
WATER TREATMENT UNIT	LS			
SUPPORTING FACILITY				
SUPPORT FACILITIES	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

DESIGN AND INSTALL FACILITY TO REMOVE NITRATES AND SULFATES FROM D & E NITROCELLULOSE MANUFACTURING AREA WASTE WATER STREAMS. FACILITY SHALL INCLUDE PROCESS TANKS, PUMPS, SUSPENDED MATTER FILTRATION EQUIPMENT, TREATED WATER RECYCLE EQUIPMENT, BUILDINGS, UTILITIES AND OTHER NECESSARY SUPPORT EQUIPMENT.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE NITROCELLULOSE MANUFACTURING LIQUID WASTE TREATMENT FACILITIES.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE FACILITIES FOR WASTE WATER TREATMENT THAT WILL ASSURE COMPLIANCE WITH FEDERAL AND STATE REGULATIONS WHEN OPERATING D & E NITROCELLULOSE LINES AT FULL CAPACITY.THIS PROJECT IS REQUIRED TO ASSURE BADGER AAP WILL BE IN COMPLIANCE WHEN THESE LINES ARE REACTIVATED.

CURRENT SITUATION :
THERE ARE NO FACILITIES CURRENTLY EXISTING TO REMOVE NITRATES & SULFATES FROM WASTE WATER. PRESENT WASTE WATER TREATMENT PROVIDES ONLY PH CONTROL AND THIS IS NOT SUFFICIENT TO MEET THE LAW.

1. COMPONENT ARMY	FY 1990 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 22 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 D & E NITROCELLULOSE LWT -VPC	5. PROJECT NUMBER	

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, BADGER AAP WILL NOT BE IN COMPLIANCE WITH FEDERAL & STATE WATER POLLUTION REGULATIONS DURING PERIODS OF FULL PRODUCTION.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1991	INDEX: 1950

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1. COMPONENT		2. DATE
ARMY	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	22 DEC 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGroup 2 NITROGLYCERIN LWT - WPC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT TREATMENT FACILITY	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT FACILITIES FOR TREATING WASTE WATER IN THE NITROGLYCERIN MANUFACTURING AREA. THIS INVOLVES INSTALLATION OF TANKS, PUMPS, TRANSFER LINES, ETC., TO PROVIDE CONTROLLED ADDITION OF LIME AND SODIUM SULFIDE TO THE WASTE WATER PRIOR TO DISCHARGING INTO THE POND PRESENTLY USED FOR COLLECTION.

11. REQUIREMENT: GA ADEQUATE: GA SUBSTD: GA

PROJECT :
PROVIDE A NITROGLYCERIN PRODUCTION FACILITY LIQUID WASTE TREATMENT FACILITY.

REQUIREMENT :
THIS PROJECT PROVIDES MEANS OF NEUTRALIZING WASTE WATER AND DESTROYING ANY NITROGLYCERIN THAT MAY BE CONTAINED IN IT.

CURRENT SITUATION :
AT THE PRESENT, THE WASTE WATER FROM THE NITROGLYCERIN MANUFACTURING OPERATION IS DISCHARGED INTO A LANDLOCKED POND WITHOUT TREATMENT. RECENT REPORTS FROM USAEHA INDICATE THAT THERE IS CONTAMINATION OF THE GROUND RESULTING FROM THIS WATER PERCOLATING INTO THE UNDERLYING STRATA. HENCE, IT APPEARS THAT THIS WASTE WATER MUST BE TREATED PRIOR TO DISCHARGE INTO THIS POND

1. COMPONENT ARMY	FY 19 90 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 22 DEC 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group 2 NITROGLYCERIN LWT - WPC		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED :
IF THIS PROJECT IS NOT APPROVED, THE GROUND WILL CONTINUE TO BE EXPOSED TO CONTAMINATION DURING PERIODS WHEN NITROGLYCERIN IS MANUFACTURED.

NATO INFRASTRUCTURE CATEGORY :
NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED. THIS IS A GROUP 2 MOBILIZATION PROJECT. COST DATA IS ON A FY85 BASIS.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM
GS-13
COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1990	INDEX: 1867
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1990	INDEX: 1908
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1991	INDEX: 1950

EXHIBIT I-F

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 84 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 1
Badger Army Ammunition Plant Wisconsin	EFFLUENT DITCHES & PONDS

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
EFFLUENT DITCHES & PONDS	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

EXCAVATE EXISTING EFFLUENT DITCHES AND SEDIMENTATION PONDS TO A DEPTH OF 4 FT, LANDSPREAD THE REMOVED SEDIMENT, AND LINE THE DITCHES WITH A 3 FT LAYER OF IMPERMEABLE CLAY COVERED WITH 1 FT OF GRANULAR PROTECTIVE COVER. THE CLAY LINER MUST EXTEND 5 FT BEYOND THE NORMAL TOPOGRAPHIC RIM OF THE EXISTING DITCHES AND PONDS

11. REQUIREMENG/GOTO 11.N LF ADEQUATE: LF SUBSTD: LF

REQUIREMENT :

THIS PROJECT IS REQUIRED TO PREVENT PERCOLATION OF PLANT EFFLUENT WATER THAT CONTAIN HIGH LEVELS OF NITRATES AND SULFATES INTO THE GROUNDWATER OF THE STATE OF WISCONSIN.

IMPACT IF NOT PROVIDED :

IF THIS PROJECT IS NOT APPROVED, BADGER AP WILL NOT MEET STATE OF WISCONSIN WPDES REQUIREMENTS PROJECTED FOR THE FUTURE. NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORICAL IMPACT AND COMPLIES WITH PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT

1. COMPONENT ARMY	FY 19 86 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Mobilization Group I EFFLUENT DITCHES & PONDS		5. PROJECT NUMBER

HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITHTHE INTENT OF PL 91-190 AND AR 200-1. THIS IS A GROUP I MOBILIZATION PROJECT.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1986	INDEX: 1550
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1986	INDEX: 1602
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1987	INDEX: 1619

~~FOR OFFICIAL USE ONLY~~ *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 1
Badger Army Ammunition Plant Wisconsin	BALL POWDER WASTE WATER FACILITY

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 13		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCT WASTE TREATMENT FACILI	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT FACILITIES TO REMOVE AND CONCENTRATE COLLAGEN FOR REUSE, TO REMOVE AND CONCENTRATE SODIUM SULFATE FOR REUSE AND BIO-OXIDATION TREATMENT TO TREAT WASTE WATER FOR B.O.D. & C.O.D.

11. REQUIREMENT: ADEQUATE: SUBSTD:

PROJECT :
CONSTRUCT BALL POWDER WASTE WATER TREATMENT FACILITY.

REQUIREMENT :
FACILITIES ARE REQUIRED TO REMOVE AND CONCENTRATE COLLAGEN FOR REUSE, TO REMOVE AND CONCENTRATE SODIUM SULFATE FOR REUSE AND BIO-OXIDATION TREATMENT TO TREAT WASTE WATER FOR B.O.D. & C.O.D. SO BADGER AAP WILL NOT EXCEED WPDES LIMITS.

CURRENT SITUATION :
BALL POWDER WASTE WATER IS PARTIALLY TREATED IN EXISTING WASTE TREATMENT FACILITY, BUT THIS IS NOT ADEQUATE TO MEET WPDES PERMIT.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION

Badger Army Ammunition Plant
Wisconsin

4. PROJECT TITLE	5. PROJECT NUMBER
Mobilization Group 1 BALL POWDER WASTE WATER FACILITY	

IMPACT IF NOT PROVIDED :
THE CONSTRUCTION OF A MULTI FACETED UNIT TO TREAT THE DIFFERENT POLLUTANTS IN THE BALL POWDER MANUFACTURING AREA IS NECESSARY BECAUSE WITHOUT IT BAAP WILL EXCEED WPDES LIMITS. THIS IS A GROUP 1 MOBILIZATION PROJECT.

NATO INFRASTRUCTURE CATEGORY :
THIS PROJECT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT AN ENVIRON MENTAL IMPACT STATEMENT PURSUANT TO PL 91-190 IS NOT REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1988	INDEX: 1710
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1988	INDEX: 1748
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1989	INDEX: 1786

FOR OFFICIAL USE ONLY *(WHEN DATA IS ENTERED)*

1. COMPONENT	FY 19 86 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		27 JAN 83 24 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGroup 1
BADGER ARMY AMMUNITION PLANT WISCONSIN	CLOSE EXIST/OPEN NEW LANDFILL-SV

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	871 90	CT0260	

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
Close Exist Landfill	LS			
Open New Landfill	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

A. CLOSE EXISTING 20 ACRE LANDFILL BY INSTALLING ONE FOOT OF COMPACTED CLAY. 18 INCHES OF GRANULAR SOIL. 24 INCHES OF COMPACTED CLAY AND 6 INCHES OF TOP SOIL AND SEED.

B. CONSTRUCT NEW SANITARY LANDFILL WITH A 5 FOOT COMPACTED CLAY LINER. 1 FOOT OF GRANULAR PROTECTIVE COVER OVER LINER. LEACHATE COLLECTION SYSTEM AND GAS COLLECTION SYSTEM. THE NEW LANDFILL WILL COVER 12 ACRES.

C. LANDFILL WORK WILL MEET THE REQUIREMENTS OF THE WISCONSIN ADMINISTRATIVE CODE NR180 SOLID WASTE MANAGEMENT

D. ACCESSABILITY FOR THE HANDICAPPED IS NOT REQUIRED FOR FUNCTIONAL REASONS.

11. REQUIREMENT: 12 ac ADEQUATE: 0 ac SUBSTD: 20 ac

PROJECT :
THIS PROJECT WILL PROVIDE A WISCONSIN DEPARTMENT OF NATURAL RESOURCES APPROVED LANDFILL AND CLOSE EXISTING SUBSTANDARD LANDFILL.

1. COMPONENT ARMY	FY 19 86 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 26 JAN 83 24 JAN 83
3. INSTALLATION AND LOCATION BADGER ARMY AMMUNITION PLANT WISCONSIN		
4. PROJECT TITLE Mobilization Group 1 CLOSE EXIST/OPEN NEW LANDFILL-SW		5. PROJECT NUMBER CT02600

REQUIREMENT

THE EXISTING LANDFILL IS SUBSTANDARD. THIS PROJECT IS REQUIRED TO MINIMIZE ECOLOGICAL IMPACT OF THE LEACHATE BEING DEVELOPED BY THE EXISTING LANDFILL. HIGH SPECIFIC CONDUCTANCE AND DISSOLVED IRON VALUES IN THE GROUNDWATER SAMPLES TAKEN FROM MONITORING WELLS DOWNGRADIENT OF THE LANDFILL INDICATE THAT THE LEACHATE IS ENTERING THE AQUIFER. CONTINUED USE OF THIS UNLINED LANDFILL THAT IS LOCATED OVER A VERY POROUS SUBSOIL COULD RESULT IN EXCESSIVE CONTAMINATION OF THE GROUNDWATER. BADGER AAP HAS RECEIVED SPECIAL ORDER NO. 2A-78-1194 REQUIRING THAT THE EXISTING LANDFILL BE CLOSED AND/OR ACCEPTABLE PLAN FOR CONTINUED OPERATION BE PROVIDED.

CURRENT SITUATION :

THE SOLID WASTE DISPOSAL SITE CONTINUES TO BE USED UNDER A STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES (WDNR) LICENSE NO 2813 DATED 28 SEPTEMBER 1978 PENDING A FINAL REVIEW OF A FEASIBILITY REPORT SUBMITTED 1 MAY 1979. A SPECIAL ORDER NO. 2A-78-1194 WAS ISSUED BY THE WDNR, 20 SEPTEMBER 1978, REQUIRING THE PREPARATION OF THE FEASIBILITY REPORT AND PROVIDING EITHER AN ACCEPTABLE ABANDONMENT PLAN OR CONTINUED OPERATIONS PLAN BY 1 FEBRUARY 1980 WITH ACTUAL ABANDONMENT OR BRINGING THE SITE INTO COMPLIANCE BY 1 DECEMBER 1980. ALTHOUGH THERE HAS BEEN A SLIPPAGE OF INDICATED COMPLIANCE DATES, THE WDNR ORDER TO BAAP STILL STANDS. IN THE INTERIM PERIOD UNTIL 1986, IT IS PLANNED TO CONTINUE OPERATIONS AT THE EXISTING LANDFILL IN A MANNER SO AS TO MINIMIZE CONTAMINATION IN COORDINATION WITH WDNR.

IMPACT IF NOT PROVIDED :

IF THIS PROJECT IS NOT FUNDED AND CONSTRUCTION WORK COMPLETED WITH AN INDICATION OF PROGRESS IN THE INTERIM, BAAP COULD BE FORCED TO COMPLY WITH WDNR SPECIAL ORDER 2A-78-1194 TO CLOSE THE FACILITY. CLOSURE OF THIS SOLID WASTE LANDFILL SITE WOULD CAUSE THE CESSATION OF BARRICADE AND/OR BUILDING DEMOLITION PROJECT WORK SINCE ALL OF THE DEMOLITION DEBRIS IS CURRENTLY BEING DISPOSED OF IN THE EXISTING LANDFILL. SAUK COUNTY'S SOLID WASTE MANAGEMENT SITE, LOCATED APPROXIMATELY 18 MILES FROM BAAP, IS RAPIDLY FILLING WITH MUNICIPAL-TYPE GARBAGE AND INDUSTRIAL FIRMS ARE BEING ENCOURAGED TO FIND OTHER MEANS OF DISPOSAL.

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1. COMPONENT	FY 1987 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		01 SEP 82

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	Conversion CONVERT POWERHOUSE NO 1 TO COAL

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	821 20		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONVERT POWERHOUSE	LS			
SUPPORTING FACILITY				
SITE PREPARATION	LS			
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL COAL HANDLING, COAL FIRING AND POLLUTION ABATEMENT EQUIPMENT ON 5 EXISTING OIL FIRED BOILERS, 175,000 LBS/HR EACH, 275 PSI. THE PROJECT SHALL INCLUDE, BUT NOT LIMITED TO, EQUIPMENT NECESSARY TO HANDLE AND FIRE COAL, COAL THAWING AND HANDLING, REPLACE COAL BUNKER BOTTOMS, COAL SCALES AND PLATFORMS, COAL AND OIL BURNERS, AIR HEATER TUBES, SAFETY VALVES, RELIEF VALVE BLOWDOWN HEAT EXCHANGER, BOILER FEED PUMPS, POLLUTION ABATEMENT EQUIPMENT, STACKS, ID FANS, ASH HANDLING SYSTEM, CONTROLS &INSTRUMENTATION BUILDING MODIFICATION WILL BE NECESSARY. THE ELECTRIC SWITCH GEAR, TRANSFORMER YARD AND ELECTRIC LINES MUST BE RELOCATED FOR THE POLLUTION ABATEMENT SYSTEM.

11. REQUIREMENT: MB ADEQUATE: MB SUBSTD: MB

PROJECT :
PROVIDE COAL HANDLING, COAL FIRING AND POLLUTION ABATEMENT EQUIPMENT ON 5 EXISTING OIL FIRED BOILERS.

REQUIREMENT :
THIS PROJECT IS REQUIRED TO PROVIDE A CONTROLLABLE FUEL SOURCE DURING THE MOBILIZATION PERIODS. CONVERSION MUST BE ACCOMPLISHED PRIOR TO FULL MOB.

1. COMPONENT ARMY	FY 19 87 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 01 SEP 82
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		
4. PROJECT TITLE Conversion CONVERT POWERHOUSE NO 1 TO COAL		5. PROJECT NUMBER

CURRENT SITUATION :
CURRENTLY THE BOILERS ARE OIL FIRED. IF NOT APPROVED, PRODUCTION MAY CEASE BECAUSE OF LACK OF FUEL.

IMPACT IF NOT PROVIDED :
IF NOT APPROVED, PRODUCTION MAY CEASE BECAUSE OF LACK OF FUEL. NO DISPOSAL OF PRESENT ASSETS IS INVOLVED IN THIS PROJECT. THIS PROJECT HAS BEEN REVIEWED FOR HISTORIC IMPACT AND COMPLIES WITH THE INTENT OF PL 89-655 AND EXECUTIVE ORDER 11593. THIS PROJECT HAS BEEN REVIEWED FOR ENVIRONMENTAL IMPACT AND COMPLIES WITH THE INTENT OF PL 91-190. AN ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED.

/S/ DAVID C. FORDHAM
DAVID C. FORDHAM

COMMANDER'S REPRESENTATIVE

ESTIMATED CONSTRUCTION START:	APRIL	1987	INDEX: 1619
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCTOBER	1987	INDEX: 1673
ESTIMATED CONSTRUCTION COMPLETION:	APRIL	1988	INDEX: 1710

EXHIBIT I-J

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1. COMPONENT ARMY	FY 19 77 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 Conversion OLD ACID MIST/VAPOR

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
PURCHASE AND INSTALL	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

REMOVE EXISTING DEMISTER AT OLEUM PLANT AND REPLACE WITH MORE EFFICIENT UNIT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT	FY 19_99 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		05 JAN 81

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 OLD OLEUM LVT

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	831 90		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT A PH ADJUSTMENT BASIN TO TREAT WATER FOR PH CONTROL BEFORE DISCHARGING INTO RECEIVING POND.

11. REQUIREMENT: KG ADEQUATE: KG SUBSTD: KG

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EXHIBIT I-L

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1. COMPONENT ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	2. DATE 05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 NOX,SOX ABATEMENT OLD ACID

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL SCRUBBING SYSTEMS FOR ALL NOX STACKS AT OLD ACID PLANT DESIGN AND INSTALL A SYSTEM CONSISTING OF THREE ABSORPTION TOWERS USING A RECIRCULATED CHILLED WATER/WEAK ACID AND AN OXIDIZER AS ABSORPTION MEDIUM TO REMOVE NOX FROM THE GASSES EMITTED FROM NINE AMMONIA OXIDATION PLANT STACKS. SYSTEM SHALL BE DESIGNED TO RECIRCULATE THE ABSORPTION WATER/ WEAK ACID AND TO TRANSFER IT TO THE ACID AREA FOR FURTHER CONCENTRATION.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT			2. DATE
ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA		05 JAN 83
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		4. PROJECT TITLE MobilGROUP 3 SOLVENT CONSERVATION B LINE	
5. PROGRAM ELEMENT	6. CATEGORY CODE 226 80	7. PROJECT NUMBER	8. PROJECT COST ($000)

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO INSTALLATIONS OF NEW ABSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MAXIMUM RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS

MINIMIZE USEAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT		2. DATE
ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	05 JAN 63

3. INSTALLATION AND LOCATION	4. PROJECT TITLE MobilGROUP 3
Badger Army Ammunition Plant Wisconsin	SOLVENT CONSERVATION C LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO INSTALLATIONS OF NEW ABSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MINIMIZE USEAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT

MAXIMUM RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

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1. COMPONENT	FY 19_?? MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		05 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION D LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ACTIVATED CARBON REGENERATION FACILITIES ENLARGED
INCREASE CAPACITY OF THE ACTIVATED CARBON RECOVERY PLANT TO MORE EFFICIENTLY REMOVE AND RECOVER THE ALCOHOL-ETHER VAPORS THAT EVAPORATE FROM THE POWDER DURING PROCESSING IN THE GREEN POWDER AREA. THE MODIFICATIONS WOULD INCLUDE, BUT NOT BE LIMITED TO, INSTALLATIONS OF NEW ADSORBERS, CONDENSERS, BLOWERS, DUCT WORK AND ACCESSORIES.

MINIMIZE USAGE
CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT	FY 19 [?] MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 SOLVENT CONSERVATION E LINE

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

MAXIMUM RECOVERY

INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

MINIMIZE USAGE

CONSTRUCT REQUIRED BLOWER AND VAPOR DUCT SYSTEM TO CONNECT DEHY PRESS POWDER OPERATIONS AREA TO EXISTING ACTIVATED CARBON RECOVERY PLANT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

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1. COMPONENT ARMY	FY 19 ?? MILITARY CONSTRUCTION PROJECT DATA	2. DATE 06 JAN 83
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin	4. PROJECT TITLE MobilGROUP 3 SOLVENT CONSERVATION B P.	

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 80		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

ENERGY RECOVERY
INSTALL HEAT RECOVERY SYSTEM TO SOLVENT CONDENSERS IN THE ENLARGED ACTIVATED CARBON RECOVERY PLANT TO REDUCE ENERGY REQUIREMENTS.

SOLVENT RECOVERY
LARGE AMOUNTS OF SOLVENT IS DISCHARGED TO THE INDUSTRIAL FLOWAGE FROM THE HARDENING-SCREENING OPERATION OF THE BALL POWDER AREA, INCREASING B.O.D. & C.O.D. CONTENT OF BAAP'S DISCHARGE. A FACILITY WOULD BE BUILT IN ORDER TO RECOVER AND PURIFY THE SOLVENT FOR REUSE.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD SF

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1. COMPONENT	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 OLD ACID LIME SILO AND FEEDERS

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

PURCHASE AND INSTALL ONE STEEL, GLASS LINED LIME SILO, 20'-0 DIA X 40'-0 HIGH, MOUNTED ON 16 POINTS OF STEEL SUPPORT SUSPENSION SYSTEM, SILO TO STORE 9,506 CUBIC FEET OF PEBBLE LIME. DISCHARGE SYSTEM, TWIN SCREW FEEDER CONVEYER HAVING 100 CUBIC FEET PER HOUR CAPACITY, CAPABLE OF CONTROLLED DISCHARGE INTO PRESENT AGITATION SYSTEM. PURCHASE AND INSTALL (2) LIME FEEDERS AND SHAKERS. ACCOUNT NO. 420-5

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

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1. COMPONENT	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
ARMY		06 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 OLD ACID TANK FARM DIKING

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	226 12		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10 00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL CONCRETE DIKES, MEETING FEDERAL REGULATION 40 CFR 112-7, PARAGRAPH (E) (2) (II), AROUND ALL TANKS, ACCOUNT 708 - TANKS 90,91, 722 - TANK 80; 711 - TANKS 70,71,72; 710 - TANKS 30,31,32,33; TANKS T-7, T-8, & T-9; 710 - TANKS 34,35,36,37; 723 - TANKS 50,51,52,53,54,55,56,57, 735 - TANKS 60,61, 62,63,64,65 IN THE OLD ACID AREA. THE OLEUM AREA (ACCOUNT 728) SHALL HAVE CONCRETE DIKE,ACCORDING TO FEDERAL REGULATION, AROUND THE ENTIRE AREA, FROM THE STORAGE TANKS ON THE EAST SIDE TO THE COOLING TOWER ON THE WEST SIDE AND SOUTH OF BUILDING 728 TO SOUTH OF UNLOADING STATIONS ON THE NORTH. THE AREA WILL HAVE VEHICLE RAMPS ON THE EAST AND WEST SIDES, WITH STILES TO UNLOADING DOCKS ON NORTH AND SOUTH.

11. REQUIREMENT SF ADEQUATE SF SUBSTD SF

EXHIBIT I-T

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1. COMPONENT ARMY	FY 19 79 MILITARY CONSTRUCTION PROJECT DATA		2. DATE 06 JAN 83
3. INSTALLATION AND LOCATION Badger Army Ammunition Plant Wisconsin		4. PROJECT TITLE MobilGROUP 3 TANK CAR CLEANING-OLD ACID	
5. PROGRAM ELEMENT	6. CATEGORY CODE 226 12	7. PROJECT NUMBER	8. PROJECT COST ($000)

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

CONSTRUCT (1) ACID TANK CAR CLEANING FACILITY (RAILROAD TYPE TANK CARS). FACILITY WILL INCLUDE A NEW BUILDING CAPABLE OF HOUSING ONE TANK CAR, SUMPS, PUMPS, CATWALKS, FUME COLLECTION SYSTEM, NEUTRALIZING MATERIALS AND OTHER EQUIPMENT.

11. REQUIREMENT: SF ADEQUATE: SF SUBSTD: SF

EXHIBIT I-U

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1. COMPONENT		2. DATE
ARMY	FY 19 99 MILITARY CONSTRUCTION PROJECT DATA	26 JAN 83

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Badger Army Ammunition Plant Wisconsin	MobilGROUP 3 Modernization MODERNIZE POWER HOUSE NO. 2

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	821 20		

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITY				
CONSTRUCTION	LS			
SUPPORTING FACILITY				
SUBTOTAL				
CONTINGENCY PERCENT (10.00%)				
TOTAL CONTRACT COST				
SUPERVISION INSP & OHEAD (5.00%)				
TOTAL REQUEST				
INSTALLED EQUIPMENT-OTHER APPROP				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALL POLLUTION ABATEMENT ON FOUR (4) 100,000 /HR. COAL FIRED BOILERS AT POWERHOUSE NO. 2, BLDG. 6538. THIS WILL INCLUDE 4 SCRUBBERS, 4 FANS, 4 NEW STACKS AND ASSOCIATED DUCTWORK AND EQUIPMENT.

11. REQUIREMENT: MB ADEQUATE: MB SUBSTD: MB

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EXHIBIT II-A

ENVIRONMENTAL PROJECTS

Facility:

GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project:

Project No.: TB-E-81-01

Title: Develop Methods for Treatment and Disposal of Pollutant Contaminated Sludge/Sediment Deposits

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

During the production of single base and double base propellants, areas that received contaminated process waters now contain accumulated sediments and sludges which need to be treated and safely disposed of.

A number of the raw materials used in the manufacture of propellants at Badger AAP are listed as hazardous or toxic, and/or conventional contaminants. Continued leaching and washing action by surface waters could move any contaminants present into the groundwater system. Nitrate levels exceeding 10 ppm have been detected in one of the monitoring wells in this area.

Project is required to comply with Wisconsin Administrative orders or permit conditions.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: Select and mark all sampling sites.

SW-2: Determine the level of contamination by an in-depth soil sampling and analysis program.

SW-3: Conduct a literature search for a review on the "State of the Art" in sediment and sludge disposal technology.

SW-4: Select potential disposal methods for preliminary bench scale investigations.

3. Estimated schedule to perform work - tasks by months required:

Literature Search	- Three months
Laboratory Test	- Three months
Disposal Method Selection	- Three months
Disposal Method Investigation	- Twelve months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

Two year project funding will be required.

EXHIBIT II-B
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-80-2A

Title: Divert Storm WAter at Badger AAP to Off-Plant Drainage Systems: Part I - Preliminary Concept Design

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Stormwater generated within BAAP's boundaries is collected and discharged through the General Purpose Sewer. The amount of this "clear water" entering the sewers must be minimized in order to allow proper treatment of the industrial wastewater. The General Purpose Sewer effluent must comply with provisions of the Federal Clean Water Act (PL 92-500) and with the State of Wisconsin WPDES permit.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

This project phase involves the preliminary survey and conceptual engineering design of the drainage channels within BAAP's boundaries and to develop the basis for a detailed design of diversion systems and a ROM cost estimate for the actual construction phase. This preliminary concept will be presented to the Wisconsin Department of Natural Resources for their review and/or approval and to initiate the first phase of necessary premit application.

3. Estimated schedule to perform work - tasks by months required:

Conduct on-Site Survey	- One month
Develop Preliminary Project Plans	- One month
Review Available Soil Borings	- One month
Preliminary Design & Report	- Two and one-half months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

This project will be conducted and administered by Olin Corporation Project Engineers. The preliminary and final reports will be accepted by Olin and COR Staff personnel.

5. Estimated overall project life: (One- or two-year funding)

This project will require one year project funding.

EXHIBIT II-C

ENVIRONMENTAL PROJECTS

Facility:

GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project:

Project No.: TBTW-E-82-08

Title: Evaluate Treatment Technology to Remove Phthalate Esters and Amines from Wastewater Streams

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

During production of Single Base and Double Base propellants, areas that received contaminated process water now contain accumulated sediments/sludges which need to be removed for treatment and/or disposal. The sediments/sludges may contain significant levels of toxic or hazardous phthalate esters and/or amines that were present in the plant wastewater during production periods that will continue to be leached into the groundwater of the State if the contaminated soil is not removed. The removal and proper disposal of contaminated sediment/sludges would prevent continued leaching into the subsoils, and permit lining of drainage ditches and sedimentation ponds prior to plant operation if reactivation is required. Treatment of wastewaters to remove the phthalates esters and amines during future production periods is essential to prevent contamination of the waters of the State of Wisconsin. The project is required to comply with Wisconsin Administrative orders or permit conditions.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The study would consist of:

SW-1: A literature search of disposal technology.

SW-2: Direct coordination with vendors to review installed and ongoing systems.

SW-3: Bench scale evaluation of a system adaptable to BAAP's pollutants.

SW-4: Write a final report.

3. Estimated schedule to perform work - tasks by months required:

Literature Search	- Two months
Vendor Coordination	- Three months
Procurement Bench Scale Equipment	- Three months
Lab evaluation	- Thirteen months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The project will require two years of funding.

EXHIBIT II-D
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No: TBW-E-83-05

Title: Diversion of Off-Site Generated Storm Water from the Thermal Treatment (Open Burning) Sites at the Burning Grounds

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Storm water generated off-site flows across the Thermal Treatment sites at the Explosives and Propellant Burning Grounds dissolving soluble components from residuals remaining after treatment. The flow continues off-site and percolates into the ground and potentially may contaminate the groundwaters of the State of Wisconsin.

   Both the Resource Conservation and Recovery Act (PL 95-580), and the State of Wisconsin Statutes Section 144.76(7)(c) and NR 181.44(10)(j),(k),(l) and (m) specify that "diversion structure shall be constructed such that surface water run-on will be prevented from entering the site or facility".

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: The Subcontractor shall prepare an engineering analysis including a water balance to determine the worst condition flow situation and prepare a written report complete with topographic drawings of work to be performed in SW-2.

   SW-2: The Subcontractor shall construct diversion ditches along the uphill slopes of the Burning Grounds to intercept storm generated surface water and drain the collected water to existing open fields below the treatment site.

   SW-3: The Subcontractor shall uniformly smooth grade, fill, and compact all areas covered by this project and replace topsoil to a minimum depth of four inches. Before reseeding the disturbed areas, the topsoil shall be thoroughly tilled to a depth of three inches. The disturbed and reworked areas shall be reseeded with drill seeding equipment designed to fertilize and seed winter rye and grass seed on one pass. Mulching materials may be applied at the discretion of the Subcontractor to ensure seeding success and to minimize erosion.

2. SW-4: After completing the final grading and seeding, the Subcontractor shall remove all of his equipment and materials and restore the area to the general state of condition that existed before the start of the work. The Subcontractor shall maintain the area for a epriod of one year after seeding, during which time he shall restore crop eroded areas promptly and ressed in case of seeding failure.

SW-5: The Subcontractor shall prepare a Final Report complete with "As-Build" drawings of the work performed.

3. Estimated schedule to perform work - tasks by months required:

Preliminary engineering	- One month
Prepare subcontract specifications	- One month
Request for quotations	- Two months
Evaluate quotations	- Two weeks
Award subcontract	- One month
Subcontractor mobilization	- Two weeks
Subcontractor on-site work	- Two months
Subcontractor Final Report	- Two months
BAAP review & acceptance of Final Report	- Two months
ELAPSED TIME	- Twelve months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and shall make necessary corrections and/or adjustments to the Subcontract as indicated by the daily inspections.

All work shall be done in a manner consistent with good workmanship and technical expertise of the Engineering and Construction profession.

5. Estimated overall project life: (One- or two-year funding)

Project work can be completed within two years of funding.

EXHIBIT II-E
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-04

Title: Removal of Accumulated Sludge and Neutralized Acid from the Pond Near the New Acid Complex

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   During the Startup and Proveout of the various acid production facilities in the New Acid Area, acidic wastes and spills were neutralized and stored in this unlined pond. The high nitrate and sulfate-laden wastes are leaching into the subsurface soil and reaching the groundwaters of the State of Wisconsin. Wisconsin Administrative Code NR 180 and 181 prohibit contamination of the groundwaters by hazardous wastes. Removal of this localized site of accumulated neutralized acids and sludges is required to prevent further contamination of the groundwaters of the state. The wastes can then be landspread in other areas of the plant where vegetation can make use of the chemicals present.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: The Subcontractor shall prepare and submit detailed before, during, and after topographic drawings of the wastewater pond and surrounding areas. Photographs (8" x 10") shall also be prepared of the subject area. These photographs shall be of such professional quality as to protray the actual restoration work that occurred.

   SW-2: The Subcontractor shall excavate the dikes and accumulated sludge from the New Acid Complex Wastewater Pond to a depth of three (3) feet and landspread it in a designated area at a rate such that deposition of the sludge shall not exceed 150 pounds of NO_3-N per acre equivalent. Actual soil equivalent shall be specified by the U.S. Army Environmental Hygiene Agency (USAEHA) and/or the Wisconsin Department of Natural Resources (WDNR).

   SW-3: The Subcontractor shall restore the topography of the area to its original status prior to the formation of the wastewater pond and its demolition as part of this subcontract. The restoration shall include back filling the area with available clay-type subsoils, compaction of the back-filled area to 90% vector, covering the site with light (8-inches) of compacted topsoil, and finish-graded to existing topography

   SW-4: The Subcontractor shall reseed the restored area, using grass seed mix equivalent to Wisconsin Highway Department Mix No. 3, and a cover crop of winter rye to protect the seeding effort.

3. Estimated schedule to perform work - tasks by months required:

Prepare Subcontract Specifications	- One month
Request quotations	- One month
Evaluate quotations	- Two weeks
Award Subcontract	- One month
Subcontractor mobilization	- Two weeks
Subcontractor on-site work - demolition	- Two weeks
Subcontractor on-site work - restoration	- Two weeks
Subtotal - Elapsed time	- Five months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and make corrections and/or adjustments to the subcontract as needed as a result of field inspections and soil sampling.

The Project Engineer shall issue a Final Report covering the work done complete with before and after drawings and photographs.

5. Estimated overall project life:

Project work can be completed within one year of funding.

EXHIBIT II-F

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TB-E-81-02

Title: BALL POWDER Wastewater Pollution Abatement Study

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Phthalate esters are listed on the Toxic Pollutant List included in PL 92-500 under Part 307. Di-n-butyl phthalate (DBP), a phthalate ester, is used in the manufacture of BALL POWDER. Diphenylamine, utilized as a stabilizer in BALL POWDER, is toxic to aquatic organisms and reacts with degradation products of nitrate ester explosives to form N-Nitrosodiphenlyamine. The U.S. Environmental Protection Agency has designated N-Nitrosodiphenylamine a priority pollutant and is setting limits on the discharge levels permitted for these pollutants in wastewater, sludge, landfill leachate, etc. The contaminated wastewater stream generated in the production of BALL POWDER would contain these pollutants plus ethyl acetate, sodium sulfate, animal protein, nitroglycerin, and possibly dinitrotoluene. The Clean Water Act requires the application of the best available, economically achievable technology (BAT), which furthers the national goal of zero discharge of pollutants.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

This project will consist of the following tasks to be completed in a two year period beginning with receipt of funding.

a. A detailed review of related studies and surveys to characterize treatability of propellant waste streams conducted at Badger or other propellant processing plants will be completed to utilize any available data applicable to this study.

b. Characterize the BALL POWDER processing effluent to identify and determine specific concentration of individual propellant additives.

c. Determine effluent guidelines from current regulatory requirements.

d. Identify candidate treatment/recovery methodologies for potential testing by review of known biotreatment and physical/chemical processes, i.e., activated sludge, sedimentation, air stripping, ultrafiltration, reverse osmosis, ion exchange, activated carbon adsorption, polymeric resin adsorption, ozone oxidation, anaerobic/aerobic rotating biological contactor, biological denitrification.

2. Continued

   e. Select from task (d) the treatment systems for bench scale evaluations.

   f. Design, procure, install bench scale aparatus and conduct test program to evaluate selected technology.

   g. From results of task (f) select technologies for pilot scale evaluation.

   h. Design and construct selected pilot scale treatment facilities for evaluation of treatment/recovery methodologies and efficiencies.

   i. Conduct pilot scale testing to assess viability and optimum operating conditions for the prototype facilities.

   j. Perform economic feasibility analysis on those systems that functioned successfully.

   k. Perform a hazard analysis on systems selected in task (j).

3. Estimated schedule to perform work - tasks by months required:

   a. Characterize Effluent and Select Candidate Treatment/ Recovery Methodologies — 4 months
      (1) Literature Search
      (2) Effluent Characterization
      (3) Identify Candidate Methodologies
      (4) Develop Bench Scale Test and Evaluation Plan

   b. Bench Scale Evaluations of Selected Treatment/ Recovery Methodologies — 14 months
      (1) Design, Procure and Install Bench Scale Test Apparatus
      (2) Conduct Bench Scale Tests
      (3) Select Technologies for Pilot Plant Scale Evaluation
      (4) Conduct Safety Site Submission and Hazard Analysis

   c. Pilot Scale Evaluation of Selected Treatment/Recovery Technologies — 18 months
      (1) Design, Procure and Install Pilot Scale Equipment
      (2) Operate Pilot Plant
      (3) Evaluate Treatment/Recovery Technologies and Economic Analysis
      (4) Final Report and Recommendations

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   Project work can be completed in three years.

EXHIBIT II-G

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBTW-E-82-07

Title: Conduct a Study for Monitoring DNT, DPA, Phthalate Esters and Nitroso-amines in Wastewater Streams

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Phthalate esters are listed on the Toxic Pollutant List included in PL 92-500 under Part 307. Di-n-butyl phthalate (DBP), a phthalate ester, is used in the manufacture of BALL POWDER. Diphenylamine, utilized as a stabilizer in BALL POWDER, is toxic to aquatic organisms and reacts with degradation products of nitrate ester explosives to form n-nitrosodiphenlyamine. The U.S. Environmental Protection Agency has designated n-nitrosodiphenylamine a priority pollutant and is setting limits on the discharge levels permitted for these pollutants in wastewater, sludge, landfill leachate, etc. The ability to quantitatively measure the level of these pollutants is required to permit the application of the most economical treatment technology while assuring compliance with applicable discharge permit limits. The discharge of propellant production wastewater may be prohibited by the State of Wisconsin unless pollutant levels can be continuously monitored.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: Conduct a survey of monitoring technologies.

   SW-2: Select small dedicated sensors for lab evaluations.

   SW-3: Conduct Laboratory Studies to evaluate candidate monitoring systems.

   SW-4: Write Final Report.

3. Estimated schedule to perform work - tasks by months required:

Literature search	- Two months
Select and procure equipment	- Three months
Conduct laboratory studies	- Ten-sixteen months
Write Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The project will require two year funding.

EXHIBIT II-H

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBA-E-83-03

Title: Scrubbing of Nitroglycerin Vapors

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

The Sweetie Barrel operation emits vapors that contain nitroglycerin (NG) and iso-propyl alcohol (IPA) in concentrations that are not environmentally acceptable especially in light of the more restrictive OSHA and Clean Air Act regulations. Also as far as safety is concerned, NG condenses in low spots and IPA is static sensitive, so there is a potential for explosion. Therefore, in ord to reactivate this operation in compliance with all applicable regulations, a study is needed to find out the best method to control or eliminate NG and IPA vapors from the exhaust stream.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: Design and procure a bench scale scrubbing unit that will not only cont eliminate NG and IPA vapors, but also separate these from each other.

SW-2: Find a scrubbing medium or media that will adsorb one or the other (i.e. either NG or IPA) but not both, and evaluate the effectiveness.

SW-3: Evaluate methods to dispose of the separate waste streams in an environmentally acceptable manner or possibly even to reuse/recycle the collec NG or IPA.

SW-4: Prepare Final Report

The effectiveness of the scrubbing operation can be judged through emission measurements or material balance equations.

3. Estimated schedule to perform work - tasks by months required:

Equipment Procurement	- Eight months
Laboratory Study	- Seven months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

This project will require two year funding.

EXHIBIT II-I

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-11

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Nitrocellulose Area

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

The nitrocellulose area now consumes 19.7 MGD when operating at full capacity. Water consumption can be reduced by 9.8 MGD by recirculating non-contact cooling water in the nitrating area; recirculating pump water in the beater, poacher and blender operation; and making process changes in the acid neutralization procedure and the boiling tub process.

The Clean Water Act requires the application of the best available, economically achievable technology (BAT) which furthers the national goal of zero discharge.

The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Perform a preliminary design for reuse of non-contact cooling requirements.

   2. Prepare preliminary design of process water system to utilize cooling water.

   3. Prepare preliminary design of acid neutralization water reuse system.

   4. Prepare a concept design package for a water recycle/reuse system for the nitrocellulose areas.

3. Estimated schedule to perform work - tasks by months required:

   Task 1 - Three months
   Task 2 - Three months
   Task 3 - Three months
   Task 4 - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)
   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   One year project funding will be required.

EXHIBIT II-J
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-10

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the BALL POWDER Area

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Preliminary results from the Point Source Project indicate that the amount of wastewater can be reduced from 3.72 MGD to 0.31 MGD at full capacity when new nitrocellulose is used in the feedstock. This reduction would be recirculating propellant pumping water, recirculating propellant screening spray water, and by improved propellant washing equipment.

The Clean Water Act requires the application of the best available economically achievable technology (BAT) which furthers the national goal of zero discharge of pollutants.

The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharge limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

Prepare a preliminary design package for reuse of non-contact cooling water requirements.

Prepare design package for water reuse throughout area.

Prepare design package for removal of organics and sulfate from effluent water and to develop reuse/recycle characteristics.

Prepare final concept design package for water reuse/recycle in the BALL POWDER Area.

3. Estimated schedule to perform work - tasks by months required:

   This is a single task project requiring twelve months.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

   One year project funding is required.

EXHIBIT II-K

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-09

Title: Design a Water Reuse/Recycling System to Implement the Point Source Engineering Studies in the Single Base Manufacturing Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Preliminary results from the Point Source project indicate that approximately 120,000 GPD of process water can be recycled by utilizing a closed recirculation system for the required spray water and propellant flushing operations. One pass cooling water consumption could be reduced by approximately eight million GPD by installing on-site cooling tower systems. This is based on a 1.0 million pound/month Single Base production schedule. By reducing the quantity of wastewater discharged, those discharges that are required can be more effectively and economically treated.

   The Clean Water Act requires the application of the best available economically achievable technology (BAT) which furthers the national goal of zero discharge of pollutants. The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters be eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priority pollutants list issued by the EPA could impose stringent discharg limitations.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Prepare preliminary design for reuse/recycle of non-contact cooling water equipment.

   2. Prepare preliminary design of process cooling water cooling system.

   3. Prepare preliminary design of system for reclaim/recycle/reuse of water-dry system water.

   4. Prepare concept design for implementation of water reuse/recycle system.

3. Estimated schedule to perform work - tasks by months required:

Engineering - Process water recycling system at six months.

Engineering - Cooling water recycle system at six months.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year project funding will be required.

EXHIBIT II-L
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-12

Title: Design a Water Reuse/Recycling System to Implement Point Source Engineering Study Recommendations in the Old Acid Complex

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Approximately 10.7 MGD of wastewater is generated in the Old Acid Area, with 10.4 MGD of this wastewater stream coming from non-contact cooling water. The cooling water can be cooled and recirculated or used as adsorption water.

   The Clean Water Act requires the application of the best available, economicall achievable, technology (BAT) which furthers the national goal of zero discharg of pollutants. The State of Wisconsin WPDES permit limits the level of pollutants to Primary and Secondary Drinking Water Standards.

   The Federal Water Pollution Control Act Amendment of 1972 directs the country into a national goal "that the discharge of pollutants into navigable waters b eliminated." In addition, EPA Region V and the Wisconsin DNR have imposed on BAAP discharge limit guidelines for biological oxygen demand (BOD), suspended solids (SS), dissolved solids (DS), and dissolved oxygen (DO). The toxic priorit pollutants list issued by the EPA could impose stringent discharge limitations

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   1. Perform preliminary design of non-contact cooling equipment.

   2. Preliminary design of cooling water cooling system.

   3. Preliminary design of system to use cooling water as adsorption water.

   4. Concept design package of water recycle/reuse throughout the acid area.

3. Estimated schedule to perform work - tasks by months required:

Task 1 - Three months
Task 2 - Three months
Task 3 - Three months
Task 4 - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year of project funding will be required.

EXHIBIT II-M

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-82-01

Title: Installation of Impermeable Membrane on the Ground within the Acid Storage Diked Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Acid storage tank areas in the New Acid Complex are diked to contain acid spills up to and including complete tank rupture. Dike walls are constructed mostly of concrete but some are earthen. The ground within diked areas is not impermeable and therefore will not prevent migration of hazardous acid components into the groundwater.

Acid storage tank spills have contaminated the soil in diked areas and acid migration has resulted in pollution of the groundwater such that primary and secondary drinking water standards are exceeded. The State of Wisconsin requires that proper construction of the diked areas be implemented prior to mobilization to prevent future impact and/or degradation of the groundwaters of the State.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The existing earthen diking will be replaced with concrete and the ground within the diked areas be similarly covered. The existing drain system, consisting of individual tank drain lines leading to collection sumps located below grade, would be used to drain acid spills occurring within the diked areas. Existing catch basins located under individual tank outlets would be removed and the concrete floor sloped to these drains. The ehader drain line would be valved closed except when removing a spill or rain water. The acid or rain water drained to existing sumps would be moved with existing pumps and piping to storage/neutralization tanks or to the General Purpose Sewer in the case of rain water.

There are eight acid and one caustic soda storage diked areas which require modification.

Account	Type
758	Spent Acid Store
759	Weak Nitric Store
760	Semi Con Mix Store
671	93% Sulfuric Store
772	Oleum Store
773	mixed Acid Store

2.

Account	Type
777	93% Sulfuric Hold Store
785	NGMA Store
420-8	Caustic Soda Store

3. Estimated schedule to perform work - tasks by months required:

All work will be subcontracted. All construction work can be completed in six months with the total project completed within one year of funding.

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Subcontract work will be administered, supervised, inspected and approved by Olin facilities engineering personnel.

5. Estimated overall project life: (One- or two-year funding)

One year of funding is required.

EXHIBIT II-N
ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-83-04

Title: Upgrade Laboratory Capability for WPDES Water Monitoring Compliance

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Wastewater from the BALL POWDER, Nitrocellulose, and other production areas is discharged to the General Purpose Sewer causing high levels of BOD. BAAP's WPDES permit allows a limited amount of BOD discharge and requires its monitoring under current discharge permit conditions.

The testing for BOD is done on a weekly basis for a 24 hour composite sample. This allows six days a week of non-monitored waste discharge.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The proposed study would investigate:

SW-1: The use of a Respirometer® which would monitor BOD levels on a continual basis.

SW-2: Determine whether a Respirometer® should be used at Point Source at the several manufacturing areas or at the general discharge area.

3. Estimated schedule to perform work - tasks by months required:

Procurement	- Two months
Study	- Four months
Report	- Two months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

One year project funding will be required.

EXHIBIT II-O

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBW-E-83-02

Title: Develop a Combined Treatment System for the Reduction of Nitrates, BOD's and COD's from the Nitrocellulose and BALL POWDER Production Areas

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

   Process waste from the Nitrocellulose and BALL POWDER Manufacturing Areas are discharged in the General Purpose Sewer, increasing the BOD, COD, NO_3-N, and sulfate pollutants to levels exceeding the WPDES permits. This project proposes the reduction of all four pollutants by a combined treatment system. As the carbon compounds in the BALL POWDER waste stream are consumed in support of the biological denitrification of the nitrocellulose effluent, the levels of BOD and COD would also be reduced.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

   SW-1: Design and procure an anaerobic and aerobic bench scale digestion system.

   SW-2: Evaluate the anaerobic treatment of high level NO_2 (500-1000 ppm) wastewaters.

   SW-3: Evaluate aerobic treatment of colloid and ethyl acetate.

   SW-4: Write Final Report.

3. Estimated schedule to perform work - tasks by months required:

Equipment procurement	- Three months
Lab evaluation	- Twelve-eighteen months
Final Report	- Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

Acceptance of this project will be based on review and acceptance by the technical representative on behalf of the contracting officer.

5. Estimated overall project life: (One- or two-year funding)

The study will require two year funding.

EXHIBIT II-P

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TBH-E-82-13

Title: Excavate and Reline Existing Nitroglycerin Pond

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

This project involves cleaning out and lining the existing Nitroglycerin (NG) Pond. The permeable sediments accumulated in the bottom of the pond are contaminated with nitrates and sulfates that were present in the wastewater effluents from the NG Manufacturing Facilities during previous production periods. These contaminants percolate into the groundwater of the State of Wisconsin such that the primary and secondary drinking water standards will be exceeded. The work is required to eliminate the percolation of contaminants into the groundwater of the State and to meet the expected requirements of the Wisconsin Pollutant Discharge Elimination System permit and the Federal Clean Water Act.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

The design and development phase of this project involves detailed drainage and subsoil engineering studies and obtaining State approval for the project.

Construction work on this project involves excavating and properly disposing of contaminated soil in the bottom of the pond and lining the pond with an acid resistant reinforced polyethylene bottom liner with a foot of sand to protect it. The work also involves reshaping the sides of the pond to control surface erosion and rebuilding the pond water elevation control structure to allow more effective operation of the wastewater treatment system.

3. Estimated schedule to perform work - tasks by months required:

Project Bidding Process	2 months
Development of Final Plans	4 months
Wisconsin State Approvals	6 months
Construction Bidding	2 months
Project Construction	10 months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

The project will be inspected and administrated by Olin Corporation, Project Engineers. Assistance will be required by Olin Administration and COR Government staff to support the project during public hearings and State approvals. Final project acceptance will be by Badger AAP - COR Industrial Engineer.

5. Estimated overall project life: (One- or two-year funding)

This project will require two years funding to complete.

EXHIBIT II-Q

ENVIRONMENTAL PROJECTS

Facility:

GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agnecy Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project:

Project No.: TBA-E-82-06

Title: Install Stack Gas Monitoring/Analysis Equipment in Powerhouse No. 1

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

Powerhouse No. 1 currently burns No. 6 Residual Fuel Oil in its oil-fired boilers to provide steam for the heating of active accounts throughout Badger AAP. The Clean Air Act (PL 95-95) and Wisconsin Department of Natural Resources (WDNR) Air Pollution Control Rules (NR 154/155) require that sources of air contamination maintain emissions into the ambient air below established limitations and to prevent significant deterioration of the ambient air quality. The existing boilers are not equipped with monitoring equipment with which to monitor emissions (gas flow rate, sulfur oxides, nitrogen oxides, and carbon monoxide) from each boiler and from combined streams that are discharged into the atmosphere.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

SW-1: The Subcontractor shall engineer and design an on-site flue-gas monitoring/sampling/analytical/and microprocessing system for installation in a nine-boiler complex at Badger AAP. Such engineering and design shall be in such detail that craftsman skilled in the art will be able to read, understand, and to install such equipment and supporting hardware as will be required.

SW-2: The Subcontractor will provide an on-site monitoring/sampling/analytical/and microprocessing equipment for nine oil-fired boilers capable of monitoring and receiving flue gas emissions that will meet and/or exceed all requirements of federal and state regulations for emission monitoring and recording of data.

SW-3: The Subcontractor shall install, commission, and calibrate all of the equipment in Powerhouse No. 1 specified in SW-2 above. He shall be totally responsible for the quality, workmanship, and operational capability of all equipment supplied and for the installation of said equipment. The Subcontractor shall provide for an approved detailed list of equipment to be used in the project within 30 days of contract award. Monitoring and analytical equipment supplied shall provide instantaneous reading accuracy of 0.5% of full-scale and have a resolution capability of 0.1% of full scale.

2. SW-4: The Subcontractor shall provide a complete package of "As-Built" drawings for all elements of the project including all wiring and spool drawings as applicable.

   SW-5: The Subcontractor shall provide a detailed technical report covering the engineering, procurement, construction, installation, commission, and calibration efforts of the project.

3. Estimated schedule to perform work - tasks by months required:

Preliminary engineering	- Two months
Prepare subcontract specifications	- Two months
Request for Technical Proposal	- Two months
Evaluation of quotation	- One month
Award subcontract	- One month
Subcontractor mobilization	- Two months
Subcontractor on-site work, construction	- Three months
Subcontractor on-site work, commissioning	- One month
Subcontractor on-site work, Technical Report	- Two month
BAAP review of Technical Report	- Two months
ELAPSED TIME	- Eighteen months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   All work shall be inspected on a daily basis by Olin's assigned Project Engineer who shall maintain a daily log of progress and make corrections and/or adjustments to the subcontract as needed as a result of field inspections.

   All work shall be done in a manner and expertise as specified by the applicable Wisconsin Administrative Codes and/or ASME Code Certification.

5. Estimated overall project life: (One-or two-year funding)

   Project work can be completed within two years of funding.

EXHIBIT II-R

ENVIRONMENTAL PROJECTS

Facility: GSA Inventory No.: WI-2138-20054

Name: Badger Army Ammunition Plant
Address: Baraboo, Wisconsin 53913
Agency Contact: Donald L. Hartmann, Industrial Engineer
AV 825-3660/(608)356-5525

Project: Project No.: TB-E-80-8

Title: Conduct a Hazardous Materials and Pesticide Management/Control Study

Scope of Work:

1. Background: (Why work is required - specific need, regulations, etc.)

AR 200-1 [10-6, subparagraph (7)(a)5] provides for special studies to be undertaken to define sources of pollution and develop remedial measures. During normal operations and agricultural leasings over the past forty-plus years, many potential toxic and/or hazardous chemicals and/or pesticides have been used within Badger AAP's boundaries. No accurate records exist as to type or quantities that may have found their way into the environment.

2. Statement of Work to be performed: (Specific tasks to be performed and the type and quality of workmanship)

A systematic soil sampling and analysis study shall be conducted for all areas at Badger AAP. This study shall review all materials that may have been used in specific areas and a coordinate grid system developed for soil sampling.

SW-1: A computer program shall be developed to collect, analyze, store, and develop environmental management reports, permit renewals, etc., as required by various state and federal regulatory agencies and to suppor the soil sampling and analysis program.

SW-2: A systematic review of land use and possible chemicals that could have been applied during the time of occupancy by the U.S. Army shall be undertaken utilizing a grid control system to identify each area.

SW-3: Preliminary soil and monitoring well samples shall be taken from each plant area in a systematic manner so as to reflect possible patterns fo further studies if potential problems are determined. Soil samples shall be taken and preserved in an approved manner so as to maintain their integrity throughout the analysis/evaluation program.

2. SW-4: All samples shall be analyzed for those items specified in the EPA's EP Toxicity List and for those materials suspected to be present as a result of prior plant operations. Significant results shall trigger an in-depth soil survey of the affected area to pinpoint the source of the pollution.

   SW-5: All data generated by the soils sampling survey and laboratory analyses shall be compiled by the computer and an in-depth report issued.

3. Estimated schedule to perform work - tasks by months required:

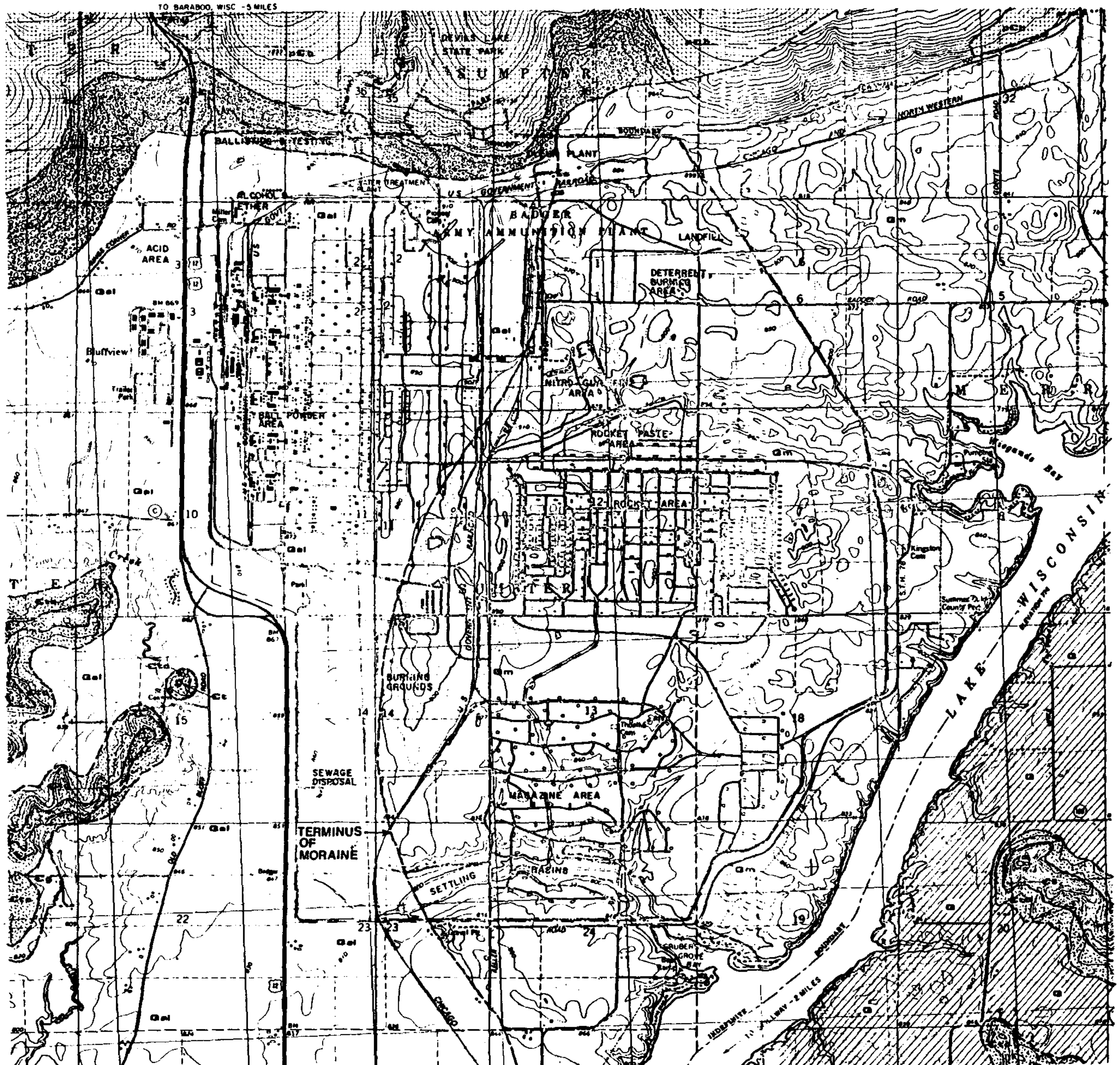
   Computer program - Six months
   Soil sampling grid - Three months
   Soil sampling - Eighteen months
   Soils Analysis - Eighteen months
   Evaluation of data - Three months
   Final Report - Three months

4. Inspection/Acceptance Criteria for work completion: (Who, what, and how)

   All work shall be accomplished under the direction of Olin's assigned Project Engineer who shall evaluate progress and data developed and modify the ongoing program in accordance with the results of the study developed at that point.

5. Estimated overall project life: (One- or two-year funding)

   Project work can be completed within two years of funding.



NOTES

1. TOPOGRAPHIC BASE MAP IS AN ENLARGEMENT OF UNITED STATES GEOLOGICAL SURVEY, NORTH FREEDOM, WISCONSIN (1958) AND BARABOO, WISCONSIN (1959) 15 MINUTE TOPOGRAPHIC MAP QUADRANGLES.
2. GEOLOGIC INFORMATION OBTAINED FROM "GEOLOGY OF THE BARABOO DISTRICT, WISCONSIN", WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, INFORMATION CIRCULAR NUMBER 14, NOVEMBER, 1970.

FIGURE 3-1

REGIONAL GEOLOGY

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC.
JDP
DBW
C 8742- 2

8a

outcrops in the vicinity is the late Precambrian Baraboo Quartzite. The Baraboo Syncline, which borders BAAP to the north is composed almost entirely of quartzite. Precambrian granites underlie the site area and are somewhat older than the Baraboo Quartzite. Granitic rocks are not exposed at the surface but were encountered in plant wells.

The upper Cambrian Dresbach Group (including the Mt. Simon, Eau Claire, and Galesville Formations), Tunnel City Group, Trempeleau Group, and the Ordovician Oneota Formation were deposited unconformably on the flanks of the Baraboo Syncline. The Mt. Simon and Eau Claire sandstones are not exposed at the surface in the area but were encountered at depth beneath the plant at several of the plant wells. Based on the plant production well logs, the combined thickness of the Eau Claire and Mt. Simon sandstones ranges between 105 and 321 feet.

The Galesville Formation, Tunnel City Group, Trempeleau Group and Oneota formations are exposed at the surface as erosional remnants to the east, south and west of BAAP and form the characteristic highlands of the area south of the Baraboo Hills. These formations have not been encountered in deep borings within the confines of the BAAP.

Undifferentiated Cambrian Quartzite Conglomerate was deposited along the flanks of the Baraboo Hills and has a limited areal extent. The conglomerate outcrops along the northern edge of BAAP near the water reservoirs.

Hydrogeology

There are two major aquifers underlying BAAP. The upper sand and gravel (outwash) aquifer exhibits water table conditions throughout the area. In areas where the outwash aquifer is thick, well yields over 1,000 gallons per minute can be obtained. Plant Well No. 4, the only plant well finished in the outwash aquifer, has been pump tested at well over 1,000 gallons per minute with little associated drawdown. The underlying sandstone aquifer is under water table conditions and hydraulically connected to the upper sand and gravel aquifer over the majority of the site area, except where overlain by relatively impermeable glacial till or where shaley members are present in the bedrock. In these areas, the sandstone aquifer may be influenced by semi-confined conditions. All plant wells (except Well No. 4) fully penetrate the sandstone aquifer. Well capacities of production wells at BAAP range between 700 and 1,500 gallons per minute. The underlying Precambrian granites and quartzites are relatively impermeable and do not constitute an aquifer in this area. Due to the low permeability of these rocks, they mark the lower limit of groundwater movement.

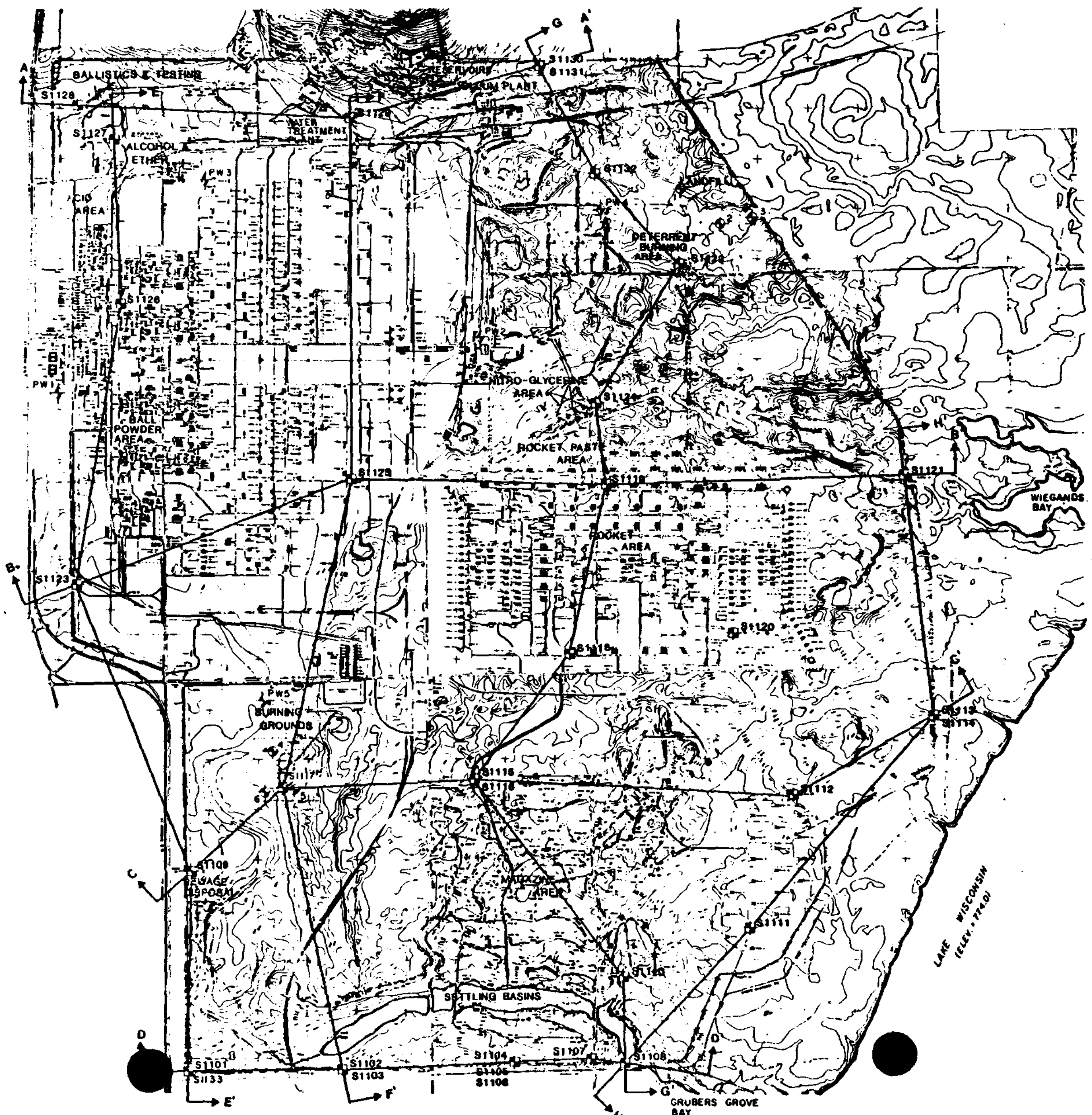
Recharge to the water table aquifer is from infiltration due to precipitation over most of the plant area, except near Lake Wisconsin. Before Lake Wisconsin was dammed at Prairie du Sac (approximately 2 miles south of Badger), shallow groundwater from the upper water table system discharged into the then existing Wisconsin River along its entire length. Based on an 1885 edition of the USGS 15 minute topographic series map of the Baraboo Quadrangle, the elevation of the former Wisconsin River in the vicinity of BAAP was approximately 745, USGS datum. The present spillway elevation at the dam (and the elevation of Lake Wisconsin) is maintained at 774.0 USGS datum. Elevated lake levels have caused a reversal in groundwater flow directions adjacent to the Lake, with the Lake acting as a recharge zone for the adjacent water table aquifer. The reversal of groundwater flow directions has caused a linear depression (reversal) in the water table surface along the southeastern edge of BAAP forcing groundwater flow in this area to the south. Groundwater discharges directly into the Wisconsin River below the dam at Prairie du Sac.

SUBSOILS

Introduction

The subsoils at BAAP consist of unconsolidated, glacially derived sediments which were deposited as a result of late Pleistocene, Wisconsin Stage Glaciation. Unconsolidated sediments exhibit a thickness of at least 260 feet, as indicated by the well log for plant production well No. 2. The sediments consist mainly of clean outwash sands and stratified outwash sand and gravel with lesser amounts of interbedded glacial till. Wind-blown deposits (loess) blanket the majority of the area.

A detailed description of the various soil strata is presented in the following sections. Geologic cross-section locations are shown on Figure 3-2. Geologic cross-sections based on soil borings performed during the present investigation are presented in Figures 3-3 through 3-6. The results of the in-field permeability testing program are also included on the cross-sections. The field data for the permeability tests is contained in Appendix G including an explanation of methods used to reduce the field data. Soil gradation curves of representative samples of the various subsoil units are also presented in Appendix G.



LEGEND

- PW2 — HIGH CAPACITY PLANT PRODUCTION WELL
- 3 — PREVIOUSLY INSTALLED GROUNDWATER MONITORING WELL
- S1104 — GROUNDWATER MONITORING WELL INSTALLED DURING THE CURRENT INVESTIGATION
- A — A' — GEOLOGIC CROSS SECTION LOCATION
- ● — EXISTING OR ABANDONED PRIVATE WELLS
- SURFACE WATER POND

NOTES

1) TOPOGRAPHIC BASE MAP SUPPLIED BY OLIN CORPORATION DATED 7/10/78, REVISED [illegible]
2) PLANT PRODUCTION WELLS PW1 [illegible] PW5 WERE INSTALLED BY LAYNE NORTHWEST CO. DURING 1942
3) GROUNDWATER MONITORING WELLS [illegible] WERE INSTALLED DURING FEBRUARY 1979 BY THE MOBILE DISTRICT OF THE ARMY CORPS OF ENGINEERS
4) GROUNDWATER MONITORING WELLS S1101 - S1133 WERE INSTALLED DURING THE PERIOD OCTOBER, 1979 - FEBRUARY 1980 UNDER THE SUPERVISION OF WARZYN ENGINEERING, INC.
5) MONITORING WELL LOCATIONS AND ELEVATIONS DETERMINED BY LAND SURVEY DURING THE PERIOD NOVEMBER 1979 - FEBRUARY, 1980 BY WARZYN ENGINEERING, INC
6) WELL LOCATIONS DENOTED BY DUAL NUMBERS INDICATE PIEZOMETER NESTS WITH THE LOWEST NUMBERED WELL AT EACH NEST BEING A WATER TABLE WELL. THE HIGHEST NUMBERED WELL(S) AT EACH NEST WERE INSTALLED AS PIEZOMETERS
7) GEOLOGIC CROSS SECTIONS ARE PRESENTED ON DRAWINGS C8242-5, 6, 7, AND 8

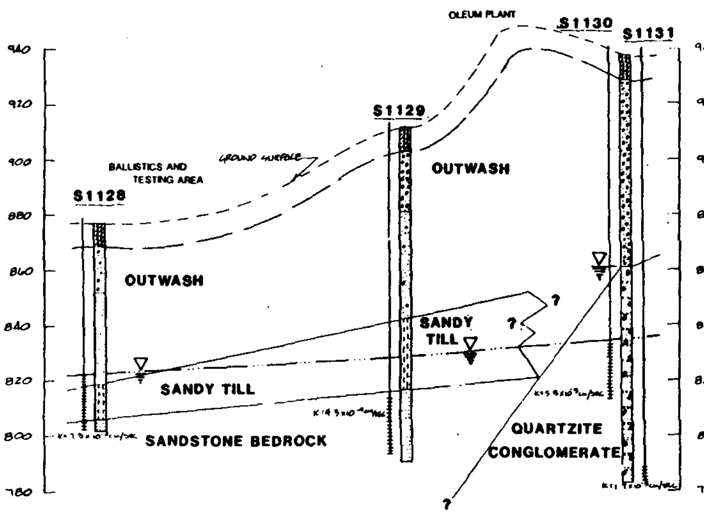
FIGURE 3-2

NO.	BY	DATE	REVISION	APP'D

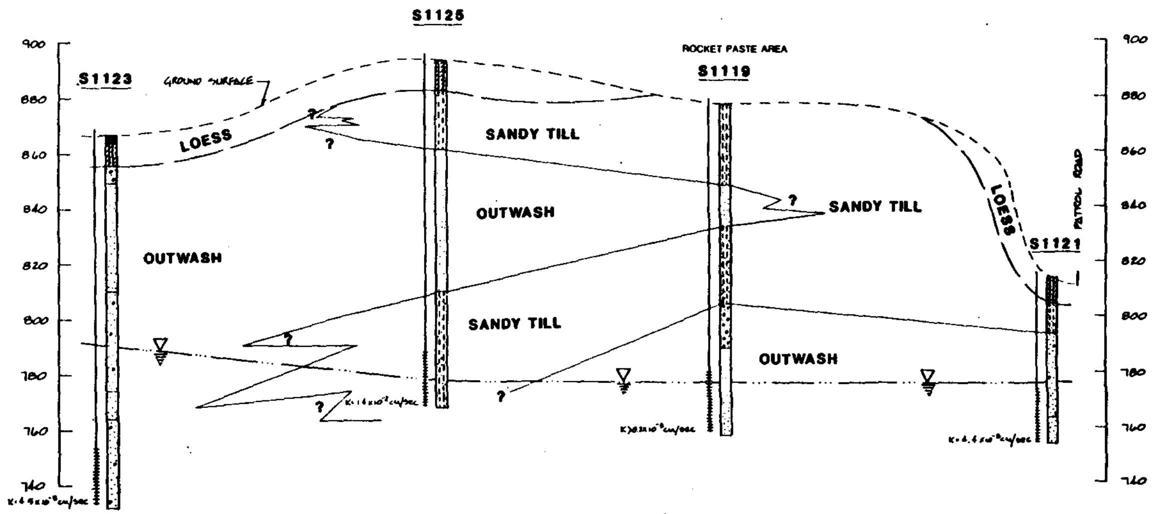
CROSS SECTION LOCATIONS

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN	DRAWN JDP	SCALE 1" = 1000'	SHEET 9 OF 8
	CHECKED VAW	DATE 7-1-80	DRAWING NO.
	APPROVED [illegible]		[illegible]



SECTION A-A'



SECTION B-B'

LEGEND

- TOPSOIL, BROWN TO BLACK CLAYEY SILT, TRACE FINE TO MEDIUM SAND (CL-ML, CL)
- FILL MATERIAL, BROWN SILTY CLAY, SOME SAND AND GRAVEL
- BROWN TO REDDISH BROWN CLAYEY SILT, TRACE TO LITTLE FINE SAND (CL, CL-ML) [LOESS]
- TAN TO BROWN, FINE TO MEDIUM SAND, TRACE TO LITTLE FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY (SP, SP-SM) [CLEAN SAND OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, AND TO SOME FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY, OCCASIONAL COBBLES AND BOULDERS (SP, SP-SM, SW-SM) [STRATIFIED OUTWASH]
- BROWN, FINE TO COARSE GRAVEL, AND TO SOME FINE TO COARSE SAND, OCCASIONAL COBBLES AND BOULDERS (GP-GM) [GRAVEL OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, LITTLE TO SOME SILT AND CLAY, LITTLE TO SOME GRAVEL, OCCASIONAL COBBLES AND BOULDERS (SM) [SANDY TILL]
- TAN TO BROWN CLAYEY SILTY SAND, LITTLE TO SOME GRAVEL (SC) [CLAYEY TILL]
- BROWN CLAYEY SILT, LITTLE TO SOME FINE SAND, TRACE GRAVEL (ML)(REEF SILT)
- SANDSTONE, CALCITIC, WELL SORTED, FINE GRAINED, CALCITIC CEMENT WEATHERS TO A WHITE SILT
- QUARTZITE CONGLOMERATE, YELLOW BROWN SANDSTONE AND RED CLAY MATRIX, QUARTZITE COBBLES AND BOULDERS UP TO 15 FEET IN DIAMETER

NOTES

1) REFERENCE DRAWING C8742-4 FOR LOCATION OF GEOLOGIC CROSS SECTIONS.
2) GEOLOGIC CROSS SECTIONS ARE INTERPRETIVE IN NATURE AND DO NOT PURPORT TO BE AN EXACT REPRESENTATION OF SUBSURFACE CONDITIONS BETWEEN INDIVIDUAL BORINGS
3) AT EACH WELL(S) LOCATION, THE SOIL BORING LOG IS ACCURATELY LOCATED. WELL DEPTHS AND SCREEN INTERVALS ARE SHOWN FOR ILLUSTRATIVE PURPOSES. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR WELL CONSTRUCTION DETAILS.
4) PERMEABILITY VALUES SHOWN AT EACH WELL LOCATION WERE DETERMINED BY IN-FIELD PERMEABILITY TESTING METHODS. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR RAW DATA AND DATA REDUCTION METHODS.
5) POSITION OF WATER TABLE SURFACE (▽) DETERMINED FROM WATER LEVEL MEASUREMENTS OBTAINED ON FEBRUARY 26, 1980 AND TRANSFERRED FROM WATER TABLE MAP, DRAWING 8742-9.
6) SUBSEQUENT WATER LEVELS, OBTAINED DURING MARCH AND APRIL, 1980, INDICATE S 30 MAY NOT BE "PERCHED" IN THAT WATER LEVELS IN S1130 AND S1131 ARE SIMILAR.

FIGURE 3-3

SCALE:
VERTICAL 1"=20'
HORIZONTAL 1"=1000'
VERTICAL EXAGGERATION 50X

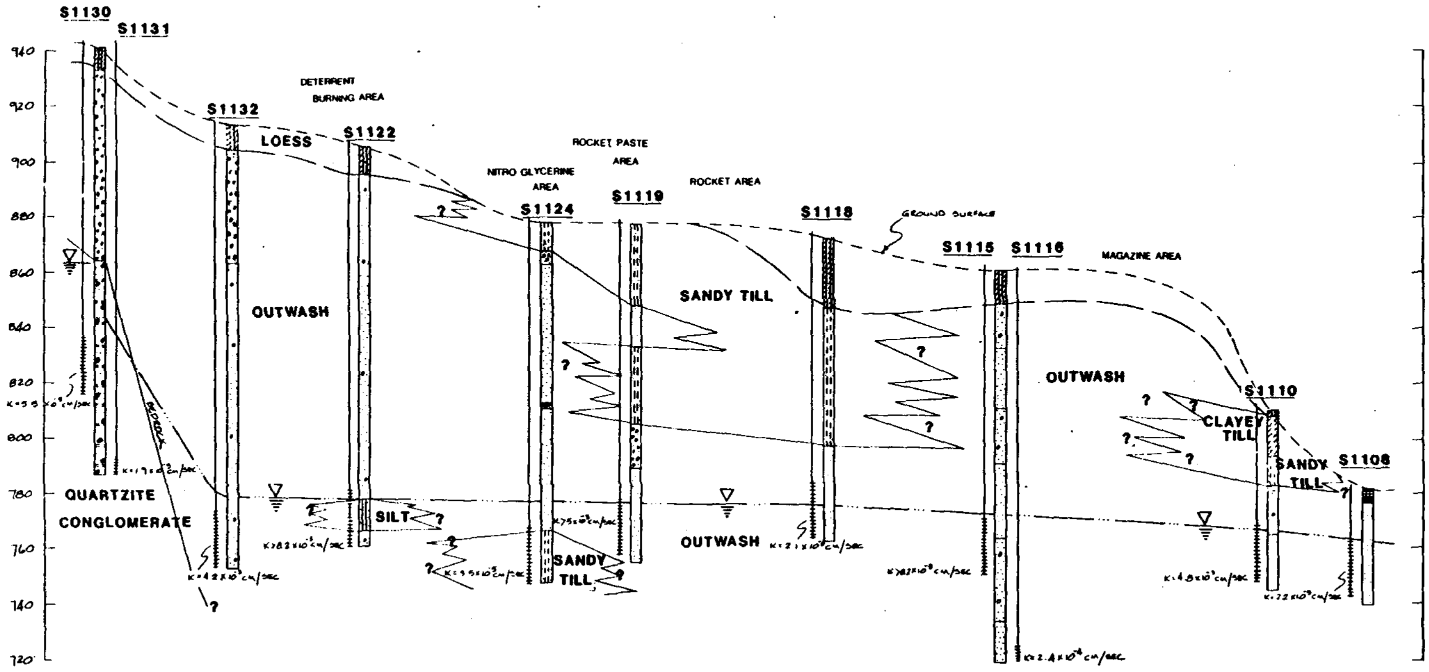
NO	BY	DATE	REVISION	APPD

GEOLOGIC CROSS SECTIONS

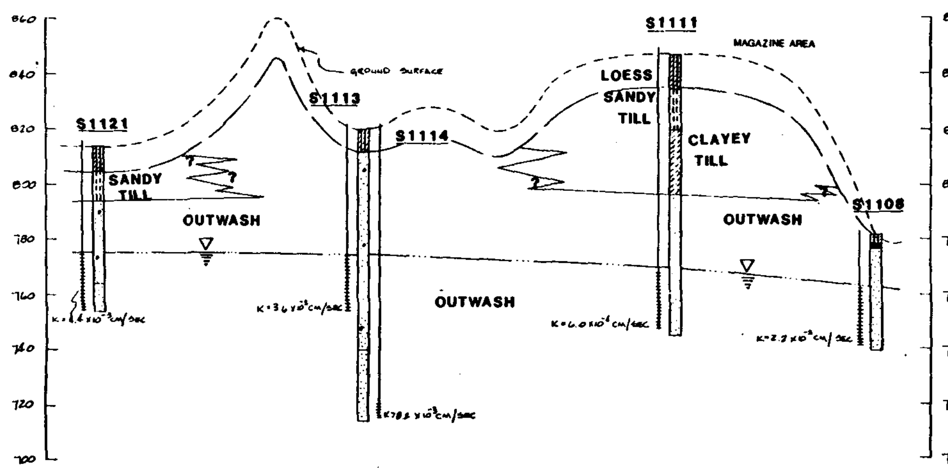
PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC	DRAWN JDP	SCALE AS SHOWN	SHEET 4 OF 8
	CHECKED DAW	DATE 9-7-80	DRAWING NO C8742-5
	APPROVED Daniel R. Viste		
	REFERENCE		

11-2



SECTION G-G'



SECTION H-H'

LEGEND

- TOPSOIL, BROWN TO BLACK CLAYEY SILT, TRACE FINE TO MEDIUM SAND (CL-ML, CL)
- FILL MATERIAL, BROWN SILTY CLAY, SOME SAND AND GRAVEL
- BROWN TO REDDISH BROWN CLAYEY SILT TRACE TO LITTLE FINE SAND (CL, CL-ML) [LOESS]
- TAN TO BROWN, FINE TO MEDIUM SAND, TRACE TO LITTLE FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY (SP, SP-SM) [CLEAN SANDY OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, AND TO SOME FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY, OCCASIONAL COBBLES AND BOULDERS (SP, SP-SM, SW-SM) [STRATIFIED OUTWASH]
- BROWN, FINE TO COARSE GRAVEL, AND TO SOME FINE TO COARSE SAND, OCCASIONAL COBBLES AND BOULDERS (GP-GM) [GRAVEL OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, LITTLE TO SOME SILT AND CLAY, LITTLE TO SOME GRAVEL, OCCASIONAL COBBLES AND BOULDERS (SM) [SANDY TILL]
- TAN TO BROWN CLAYEY SILTY SAND, LITTLE TO SOME GRAVEL (SC) [CLAYEY TILL]
- BROWN CLAYEY SILT, LITTLE TO SOME FINE SAND, TRACE GRAVEL (ML) (DEEP SILT)
- SANDSTONE, CALCITIC, WELL SORTED, FINE GRAINED, CALCITIC CEMENT WEATHERS TO A WHITE SILT
- QUARTZITE CONGLOMERATE, YELLOW BROWN SANDSTONE AND RED CLAY MATRIX, QUARTZITE COBBLES AND BOULDERS UP TO 15 FEET IN DIAMETER

SCALE:
VERTICAL 1" = 20'
HORIZONTAL 1" = 1000'
VERTICAL EXAGGERATION = 50X

NOTES

1) REFERENCE DRAWING C8742-6 FOR LOCATION OF GEOLOGIC CROSS SECTIONS.
2) GEOLOGIC CROSS SECTIONS ARE INTERPRETIVE IN NATURE AND DO NOT PURPORT TO BE AN EXACT REPRESENTATION OF SUBSURFACE CONDITIONS BETWEEN INDIVIDUAL WELLS.
3) AT EACH WELL(S) LOCATION, THE SOIL BORING LOG IS ACCURATELY LOCATED. WELL DEPTHS AND SCREEN INTERVALS ARE SHOWN FOR ILLUSTRATIVE PURPOSES. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR WELL CONSTRUCTION DETAILS.
4) PERMEABILITY VALUES SHOWN AT EACH WELL LOCATION WERE DETERMINED BY IN-FIELD PERMEABILITY TESTING METHODS. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR RAW DATA AND DATA REDUCTION METHODS
5) POSITION OF WATER TABLE SURFACE (▽) DETERMINED FROM WATER LEVEL MEASUREMENTS OBTAINED ON FEBRUARY 26, 1980 AND TRANSFERRED FROM WATER TABLE MAP DRAWING 8742-9
6) SUBSEQUENT WATER LEVELS OBTAINED DURING MARCH AND APRIL, 1980, INDICATE S1130 MAY NOT BE "PERCHED" IN THAT WATER LEVELS IN S1130 AND S1131 ARE SIMILAR

FIGURE 3-6

NO	BY	DATE	REVISION	APP'D

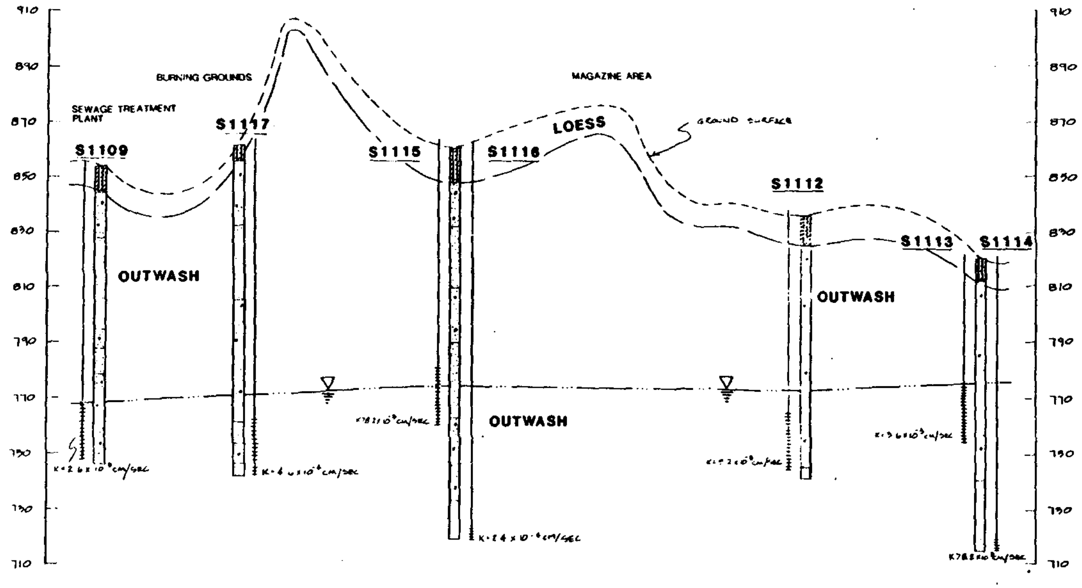
GEOLOGIC CROSS SECTIONS

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

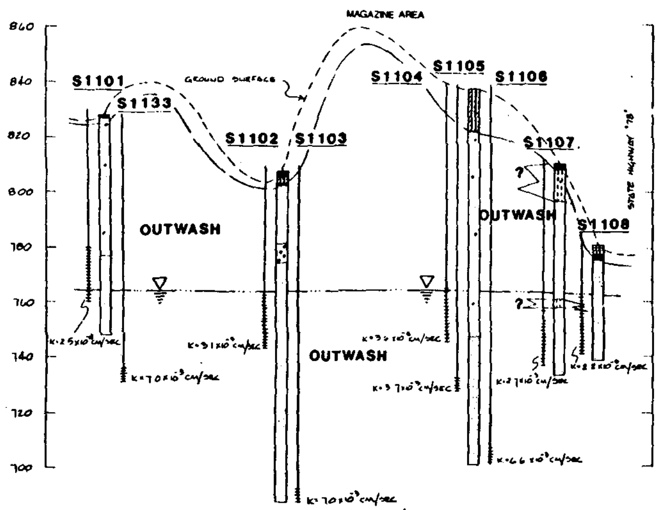
WARZYN ENGINEERING INC

DRAWN JDP	SCALE AS SHOWN SHEET 7 OF 8
CHECKED DAW	DATE 9-1-80
APPROVED Daniel R. Viste	DRAWING NO C 8742 - 8
REFERENCE	PRINTED

11a



SECTION C-C'



SECTION D-D'

LEGEND

- TOPSOIL, BROWN TO BLACK CLAYEY SILT, TRACE FINE TO MEDIUM SAND (CL-ML, CL)
- FILL MATERIAL, BROWN SILTY CLAY, SOME SAND AND GRAVEL
- BROWN TO REDDISH BROWN CLAYEY SILT, TRACE TO LITTLE FINE SAND (CL, CL-ML) [LOESS]
- TAN TO BROWN, FINE TO MEDIUM SAND, TRACE TO LITTLE FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY (SP, SP-SM) [CLEAN SAND OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, AND TO SOME FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY, OCCASIONAL COBBLES AND BOULDERS (SP, SP SM, SW-SM) [STRATIFIED OUTWASH]
- BROWN, FINE TO COARSE GRAVEL, AND TO SOME FINE TO COARSE SAND, OCCASIONAL COBBLES AND BOULDERS (GP-GM) [GRAVEL OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, LITTLE TO SOME SILT AND CLAY, LITTLE TO SOME GRAVEL, OCCASIONAL COBBLES AND BOULDERS (SM) [SANDY TILL]
- TAN TO BROWN CLAYEY SILTY SAND, LITTLE TO SOME GRAVEL (SC) [CLAYEY TILL]
- BROWN CLAYEY SILT, LITTLE TO SOME FINE SAND, TRACE GRAVEL (ML)(DEEP SILT)
- SANDSTONE, CALCITIC, WELL SORTED, FINE GRAINED, CALCITIC CEMENT WEATHERS TO A WHITE SILT
- QUARTZITE CONGLOMERATE, YELLOW BROWN SANDSTONE AND RED CLAY MATRIX, QUARTZITE COBBLES AND BOULDERS UP TO 15 FEET IN DIAMETER

NOTES

1) REFERENCE DRAWING C8742-4 FOR LOCATION OF GEOLOGIC CROSS SECTIONS
2) GEOLOGIC CROSS SECTIONS ARE INTERPRETIVE IN NATURE AND DO NOT PURPORT TO BE AN EXACT REPRESENTATION OF SUBSURFACE CONDITIONS BETWEEN INDIVIDUAL BORINGS.
3) AT EACH WELL(S) LOCATION, THE SOIL BORING LOG IS ACCURATELY LOCATED. WELL DEPTHS AND SCREEN INTERVALS ARE SHOWN FOR ILLUSTRATIVE PURPOSES. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR WELL CONSTRUCTION DETAILS.
4) PERMEABILITY VALUES SHOWN AT EACH WELL LOCATION WERE DETERMINED BY IN-FIELD PERMEABILITY TESTING METHODS. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR RAW DATA AND DATA REDUCTION METHODS.
5) POSITION OF WATER TABLE SURFACE (▽) DETERMINED FROM WATER LEVEL MEASUREMENTS OBTAINED ON FEBRUARY 26, 1980 AND TRANSFERRED FROM WATER TABLE MAP, DRAWING 8742-5
6) SUBSEQUENT WATER LEVELS OBTAINED DURING MARCH AND APRIL, 1980, INDICATE S1133 MAY NOT BE "PERCHED" IN THAT WATER LEVELS IN S1130 AND S1131 ARE SIMILAR

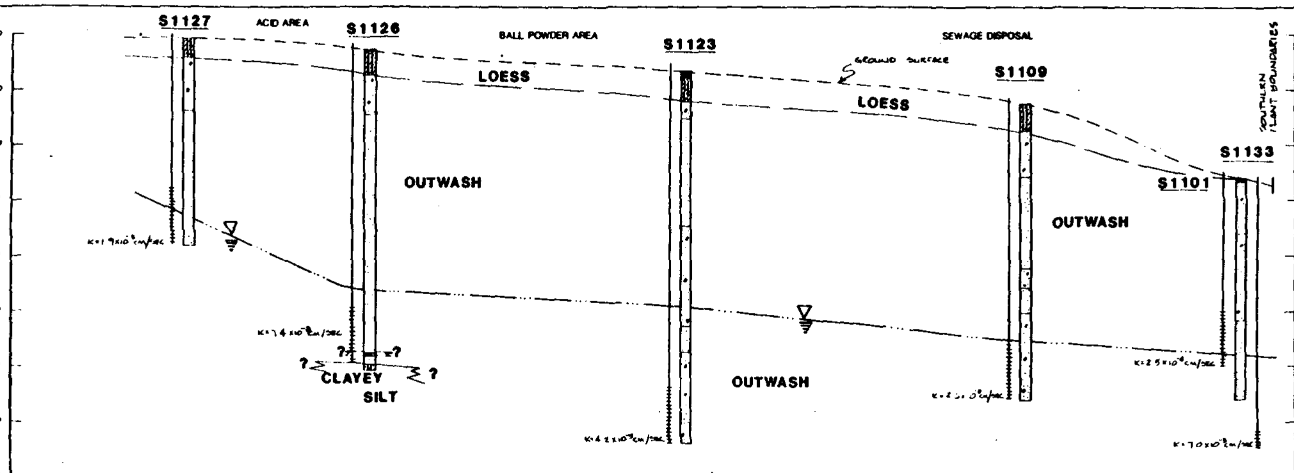
FIGURE 3-4

SCALE
VERTICAL 1" = 20'
HORIZONTAL 1" = 1000'
VERTICAL EXAGGERATION = 50×

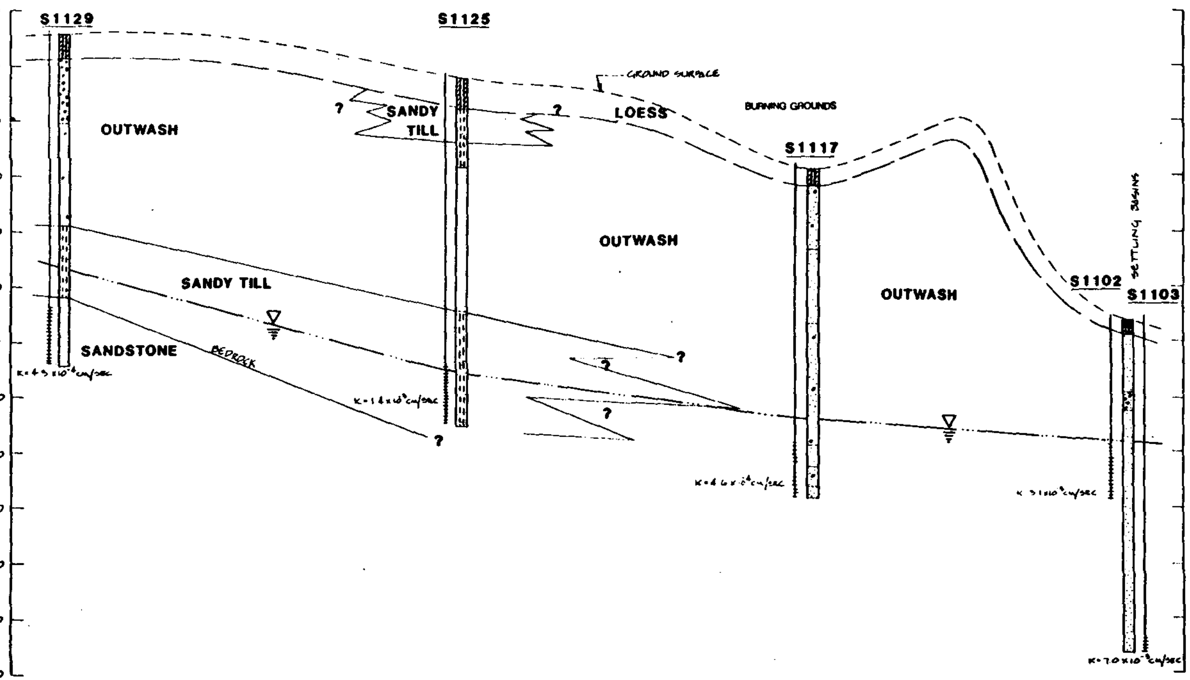
GEOLOGIC CROSS SECTIONS

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC.
DRAWN JDP | SCALE AS SHOWN | SHEET 3 OF 8
CHECKED TAW | DATE 9-7-80 | DRAWING NO. C 8742-6



SECTION E-E'



SECTION F-F'

LEGEND

- TOPSOIL, BROWN TO BLACK CLAYEY SILT, TRACE FINE TO MEDIUM SAND (CL-ML, CL)
- FILL MATERIAL, BROWN SILTY CLAY, SOME SAND AND GRAVEL
- BROWN TO REDDISH BROWN CLAYEY SILT, TRACE TO LITTLE FINE SAND (CL, CL-ML) [LOESS]
- TAN TO BROWN, FINE TO MEDIUM SAND, TRACE TO LITTLE FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY (SP, SP-SM) [CLEAN SAND OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, AND TO SOME FINE TO COARSE GRAVEL, TRACE TO LITTLE SILT AND CLAY, OCCASIONAL COBBLES AND BOULDERS (SP, SP-SM, SW, SM) [STRATIFIED OUTWASH]
- BROWN, FINE TO COARSE GRAVEL, AND TO SOME FINE TO COARSE SAND, OCCASIONAL COBBLES AND BOULDERS (GP-GM) [GRAVEL OUTWASH]
- TAN TO BROWN, FINE TO COARSE SAND, LITTLE TO SOME SILT AND CLAY, LITTLE TO SOME GRAVEL, OCCASIONAL COBBLES AND BOULDERS (SM) [SANDY TILL]
- TAN TO BROWN CLAYEY SILTY SAND, LITTLE TO SOME GRAVEL (SC) [CLAYEY TILL]
- BROWN CLAYEY SILT, LITTLE TO SOME FINE SAND, TRACE GRAVEL (ML)
- SANDSTONE, CALCITIC, WELL SORTED, FINE GRAINED, CALCITE CEMENT WEATHERS TO A WHITE SILT
- QUARTZITE CONGLOMERATE, YELLOW BROWN SANDSTONE AND RED CLAY MATRIX, QUARTZITE COBBLES AND BOULDERS UP TO 2 FEET IN DIAMETER

NOTES

1) REFERENCE DRAWING C8742-6 FOR LOCATION OF GEOLOGIC CROSS SECTIONS.
2) GEOLOGIC CROSS SECTIONS ARE INTERPRETIVE IN NATURE AND DO NOT PURPORT TO BE AN EXACT REPRESENTATION OF SUBSURFACE CONDITIONS BETWEEN INDIVIDUAL BORINGS
3) AT EACH WELL(S) LOCATION, THE SOIL BORING LOG IS ACCURATELY LOCATED. WELL DEPTHS AND SCREEN INTERVALS ARE SHOWN FOR ILLUSTRATIVE PURPOSES. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR WELL CONSTRUCTION DETAILS.
4) PERMEABILITY VALUES SHOWN AT EACH WELL LOCATION WERE DETERMINED BY IN-FIELD PERMEABILITY TESTING METHODS. REFERENCE ACCOMPANYING TEXT MANUSCRIPT FOR RAW DATA AND DATA REDUCTION METHODS.
5) POSITION OF WATER TABLE SURFACE (∇) DETERMINED FROM WATER LEVEL MEASUREMENTS OBTAINED ON FEBRUARY 26, 1980 AND TRANSFERRED FROM WATER TABLE MAP, DRAWING 8742-9
6) SUBSEQUENT WATER LEVELS OBTAINED DURING MARCH AND APRIL 1980, INDICATE S1130 MAY NOT BE 'PERCHED' IN THAT WATER LEVELS IN S1130 AND S1131 ARE SIMILAR

FIGURE 3-5

SCALE:
VERTICAL 1" = 20'
HORIZONTAL 1" = 1000'
VERTICAL EXAGGERATION = 50X

NO.	BY	DATE	REVISION	APP'D

GEOLOGIC CROSS SECTIONS

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC

DRAWN JDP	SCALE AS SHOWN	SHEET 6 OF 8
CHECKED DAW	DATE 9-7-80	DRAWING NO.
APPROVED David R. Viste		C8742-7
REFERENCE		

11d

Physical Properties

Loesial Deposits - Loess deposits blanket the majority of the site, reaching a maximum thickness of 22 feet at S1118. Texturally, the loess is a brown to reddish brown clayey silt, some fine sand, trace to little fine gravel (CL, CL-ML). The results of three soil gradations and other physical tests of the material are presented in Table 3-1.

At several of the boring locations, the silty deposits graded into the underlying sandy soils though at most locations there was a distinct change between the loess and underlying sand. Sample D0077 obtained at S1126 is representative of the gradational material. The average soil gradation is 5 percent gravel, 26 percent sand, 46 percent silt, and 23 percent clay with a liquid limit of 33 and plasticity index of 15.

As previously mentioned, the loesial deposits blanket the site, except in the vicinity of the rocket paste area. At Wells S1119 and S1124, the upper loess is absent and appears to have been excavated during plant construction activities.

A thin veneer of topsoil has developed on the loess, as noted during several of the borings. The topsoil is generally a black to brown clayey silt with a trace of fine to medium sand. The topsoil is similar in texture to the underlying loess but is organically enriched. It should be noted that the loesial silts were not encountered at Well S1108. Well S1108 is located along a plant access road at the southern end of the settling basin. This area appears to have been built up with earth fill to facilitate road construction.

Outwash Deposits - Glacial outwash material is the predominant unconsolidated deposit underlying BAAP. The outwash ranges from a clean sand to stratified sand and gravel to sandy gravel. Clean sand and stratified sand and gravel were differentiated on the boring logs based on the presence of gravel and cobbles zones within clean outwash sands and further differentiated on the basis of laboratory grain size analysis.

Clean Outwash Sands - The clean outwash sands consist of fine to medium sand, trace to little fine to coarse gravel, trace to little silt and clay (SP, SP-SM). At Borings S1123 and S1124, the clean sand appeared to be laminated with thin seams of silty sand. The soil testing results of representative samples of the clean outwash sands are presented in Table 3-2. The soil gradations generally ranged from 0 to 10 percent gravel, 75 to 98 percent sand, and 2 to 9 percent silt and clay (P200 material). The average soil gradation was 3 percent gravel, 92 percent sand, and 5 percent silt and clay.

TABLE 3-1

LOESS DEPOSITS

Well	Sample Number	Depth (feet)	Percent Gravel	Percent Sand	Percent Silt	Percent Clay	L.L.	P.I.	USCS
S1109	D0021	5	0	18	58	24	33.3	11.6	CL
S1126	D0077	8.5	8	48	31	13	22.7	9.6	SC
S1129	D0088	5	6	12	48	34	42.8	24.0	CL
Average Gradation			5	26	46	23	32.9	15.1	

TABLE 3-2

CLEAN OUTWASH SAND

Well	Sample Number	Depth	Percent Gravel[a]	Percent Sand[a]	Percent P200[a]	USCS
S1101	D0003	80	1	94	5	SP-SM
S1103	D0004	15	4	90	6	SP-SM
S1103	D0006	50	0	96	4	SP
S1103	D0009	101	1	95	4	SP
S1106	D0014	91	0	97	3	SP
S1106	D0015	116	2	96	2	SP
S1107	D0016	27	0	95	5	SP-SM
S1107	D0017	55	0	96	4	SP
S1107	D0018	77	0	96	4	SP
S1108	D0020	42	0	97	3	SP
S1109	D0022	28	0	94	6	SP-SM
S1110	D0026	49	10	85	5	SP-SM
S1110	D0027	66	0	93	7	SP-SM
S1111	D0030	67	1	92	7	SP-SM
S1111	D0031	101	0	96	4	SP
S1112	D0034	95	0	97	3	SP
S1114	D0037	106	0	97	3	SP
S1116	D0039	95	5	91	4	SP
S1117	D0044	121	0	98	2	SP
S1118	D0047	90	3	95	2	SP
S1119	D0050	29	0	94	6	SP-SM
S1119	D0051	103	13	84	3	SP
S1121	D0058	60	0	91	9	SP-SM
S1123[b]	D0063	29	10	75	15	SM
S1123	D0065	99	1	94	5	SP-SM
S1124	D0069	70	3	91	6	SP-SM
S1124[b]	D0070	100	7	70	23	SM
S1125	D0073	32	4	94	2	SP
S1126	D0079	48	6	92	2	SP
S1127	D0081	28	0	98	2	SP
S1127	D0082	48	19	77	4	SP
S1127	D0083	66	0	96	4	SP
S1128	D0086	56	0	97	3	SP
Average Gradation:			3	92	5	

NOTES: [a] Percentages of gravel, sand and P200 presented in this table were obtained from the soil gradation curves, Appendix G.

[b] Represents a clean outwash sand with minor silt laminations.

Stratified Outwash - Texturally, the stratified outwash deposits can be described as tan to brown, fine to coarse sand interbedded with fine to coarse gravel, some sand, little silt and clay, occasional cobbles and boulders (SP, SP-SM, SW-SM). Coarse gravel and cobble zones ranging in thickness between 1 and 5 feet were commonly encountered in the stratified outwash deposits. For the purposes of this report, coarse gravel and cobble zones have been differentiated from boulders based on the action of the drill rig while advancing the bore hole. In areas of coarse gravel and cobbles, the drill rig would typically "chatter" whereas when a boulder was encountered, the rig would act as though drilling through consolidated rock. At several well locations, substantial water losses occurred in coarse gravel zones in stratified outwash material. Reference boring logs, Appendix G for depths and locations of water losses.

The results of laboratory testing of samples of stratified outwash deposits are presented in Table 3-3. Soil gradations on tested samples resulted in 11 to 47 percent gravel, 48 to 81 percent sand and 1 to 10 percent silt and clay with an average gradation of 23 percent gravel, 70 percent sand, and 7 percent silt and clay. In thinly stratified soils, the gradation will be representative of the interval over which the split spoon sample was obtained and will not be representative of the individual laminae.

Gravel Outwash - Sandy gravel outwash was encountered at S1119, S1128, S1129 and S1130. The gravelly outwash probably represents areas where stratified outwash has been reworked by active glacial melt waters which effectively removed a significant portion of the sand fraction. Gravel outwash can be texturally described as a brown, fine to coarse gravel and some fine to coarse sand, little silt and clay (GP-GM). Soil gradation analyses were performed on three representative samples of the gravel outwash and are presented in Table 3-4. The average grain size is 53 percent gravel, 39 percent sand, and 8 percent silt and clay.

TABLE 3-4

GRAVEL OUTWASH

Well	Sample Number	Depth	Percent Gravel	Percent Sand	Percent P200	USCS
S1129	D0089	28	53	38	9	GP-GM
S1131	D0092	47	51	41	8	GP-GM
S1132	D0094	48	55	39	6	GP-GM
	Average Grain Size		53	39	8	

TABLE 3-3

STRATIFIED OUTWASH

Well	Sample Number	Depth	Percent Gravel	Percent Sand	Percent P200	USCS
S1101	D0001	23	44	48	8	SP-SM
S1101	D0002	49	23	70	7	SP-SM
S1106	D0012	42	14	81	5	SP-SM
S1106	D0013	51	23	72	5	SP-SM
S1109[a]	D0023	87	5	92	3	SP
S1110	D0025	28	12	82	6	SP-SM
S1112	D0033	52	17	70	13	SM
S1114	D0035	21	19	73	8	SP-SM
S1114	D0036	71	47	49	4	SP
S1116	D0040	116	40	54	6	SP-SM
S1117	D0042	28	20	76	4	SP
S1117	D0042	69	40	54	6	SP-SM
S1120	D0054	69	22	68	10	SP-SM
S1120	D0055	124	36	58	6	SP-SM
S1121	D0056	28	14	79	7	SP-SM
S1121[a]	D0057	48	6	88	6	SP-SM
S1122	D0060	34	11	79	10	SP-SM
S1122	D0061	89	22	71	7	SP-SM
S1123	D0064	69	44	49	7	SW-SM
S1126	D0078	9	20	72	8	SP-SM
S1132[a]	D0095	128	0	89	11	SP-SM
S1132	D0096	149	24	75	1	SP
Average Gradation:			23	70	7	

NOTES: [a] Represents sample taken in clean sand between sand and gravel layers.

Baildown Test Results for Outwash Deposits - The results of the baildown permeability testing of wells screened in outwash deposits are presented in Table 3-5. As noted in Table 3-5, the rate of recovery to static water level in several wells was too rapid to accurately measure. Generally speaking, the wells would recover from a drawdown of 15 to 25 feet in less than 2 minutes. Due to the air pumping methodology utilized in baildown tests, accurate pumping rates could not be determined. The maximum recordable permeability of wells screened in outwash material approached 8.3×10^{-3} centimeters per second (cm/sec). Measured permeabilities range between 8.2×10^{-3} cm/sec to 4.5×10^{-5} cm/sec, with an average permeability of 3.5×10^{-3} cm/sec.

No attempt has been made to differentiate between wells screened in different types of outwash. The major controlling factor on permeability is the percent of silt and clay (matrix) not the amount of sand versus gravel. Since the soil gradations for the various types of outwash indicate similar P200 (silt and clay) contents, it is assumed permeabilities are similar between the various outwash deposits. It is expected that the permeability in coarse layers is greater than the permeability in finer layers of stratified deposits.

Glacial Till - Two categories of glacial till were encountered during the subsurface exploration programs: 1) sandy till and 2) clayey till. The sandy till is a tan to brown, fine to coarse sand, little to some silt and clay, little to some gravel, occasional cobbles and boulders (SM). The clayey till can be described as a tan to brown clayey silty sand, little to some gravel (SC). The results of the soil testing of samples of glacial till indicate an average gradation of the sandy till of 14 percent gravel, 68 percent sand, and 18 percent P200 material (Table 3-6). A sample of clayey till from S1111 indicates a soil gradation of 10 percent gravel, 45 percent sand, and 45 percent P200 material with a liquid limit of 25.9 and a plasticity index of 9.0. The high plasticity index indicates a significant portion of the P200 fraction is clay.

Three wells at BAAP are screened in sandy till material; S1124, S1125 and S1128. Measured permeabilities were 3.5×10^{-5} cm/sec, 1.4×10^{-2} cm/sec and 7.3×10^{-4} cm/sec at S1124, S1125 and S1128, respectively. Wells S1124 and S1128 appear to display typical permeabilities for sandy till. The reason for the high permeability at S1125 is not clear at this time. There were no wells screened in the clayey till. The estimated permeability of the clayey till is 10^{-5} to 10^{-7} cm/sec.

Deep Silt - At S1122 and S1126, a silt layer was encountered at 127 and 109 feet, respectively. In comparison to the other soil groups encountered at the site, the deep silt is a minor

TABLE 3-5

SUMMARY OF BAILDOWN PERMEABILITY TESTS

Well Number	Coefficient of Permeability (cm/sec)	Geologic Unit	Well Number	Coefficient of Permeability (cm/sec)	Geologic Unit
S1101	2.5×10^{-4}	Outwash	S1121	4.4×10^{-3}	Outwash
S1102	3.1×10^{-3}	Outwash	S1122	(a,b)	Outwash & Silt
S1103	7.0×10^{-3}	Outwash			
S1104	3.6×10^{-3}	Outwash	S1123	4.2×10^{-5}	Outwash
S1105	3.7×10^{-3}	Outwash	S1124	3.5×10^{-5}	Sandy Till
			S1125	1.4×10^{-2}	Sandy Till
S1106	6.6×10^{-3}	Outwash			
S1107	2.7×10^{-3}	Outwash	S1126	7.4×10^{-3}	Outwash
S1108	2.2×10^{-3}	Outwash	S1127	1.9×10^{-3}	Outwash
S1109	2.6×10^{-3}	Outwash	S1128	7.3×10^{-4}	Sandy Till
S1110	4.8×10^{-3}	Outwash	S1129	4.3×10^{-4}	Sandstone
			S1130	5.5×10^{-5}	Quartzite Conglomerate
S1111	7.0×10^{-4}	Outwash			
S1112	8.2×10^{-3}	Outwash			
S1113	3.6×10^{-3}	Outwash	S1131	1.9×10^{-5}	Quartzite Conglomerate
S1114	(a)	Outwash			
S1115	(a)	Outwash	S1132	4.2×10^{-3}	Outwash
			S1133	7.0×10^{-3}	Outwash
S1116	2.4×10^{-4}	Outwash			
S1117	4.6×10^{-4}	Outwash			
S1118	2.1×10^{-3}	Outwash			
S1119	(a)	Outwash			
S1120	(a)	Outwash			

NOTES: [(a)] Recovery of water too rapid to measure; permeability greater than 8.2×10^{-3} cm/sec.

[(b)] Well partially screened in outwash, partially screened in deep silt.

TABLE 3-6

SANDY AND CLAYEY TILLS

Sandy Till

Well Number	Sample Number	Depth	Percent Gravel	Percent Sand	Percent P200	LL	PI	USCS
S1111	D0028	27	8	79	13			SM
S1118	D0046	30	11	73	16			SM
S1119[(a)]	D0049	28	0	42	58	17.7	2.2	ML
S1120	D0053	29	1	84	15			SM
S1124	D0071	130	34	53	13			SM
S1125	D0076	126	16	51	33			SM
Average Gradation			14	68	18			
Clayey Till								
S1111	D0029	27	10	45	45	25.9	9.0	SC

NOTES: (a) Represents thin clayey silt layer in sandy till (not included in average gradation).

unit. Two samples from S1122 and S1126 of the deep silt exhibited soil gradations of 0 and 3 percent gravel, 3 and 16 percent sand, 75 and 81 percent silt, and 6 and 16 percent clay. A sample from S1122 exhibited a liquid limit of 21.9 and a plasticity index of 2.5. The USCS classification is ML.

Summary - Subsoils

Collectively, the various outwash deposits are the dominant soil type at the BAAP. As evident from the geologic cross-sections, the entire western boundary and the majority of the southern boundary are underlain by outwash materials. The central areas of the plant in the vicinity of the rocket paste area, rocket area, and nitroglycerin area are underlain by interbedded outwash and till (see Cross-sections B-B' and G-G'). The southeast portion of the magazine area (see Cross-sections G-G' and H-H') is also underlain by interbedded till and outwash. The till deposits were encountered at the surface (or directly below the surficial loess) at S1110, S1111, S1107, S1119, S1121 and S1125. At the other wells in these areas, tills were interbedded between glacial outwash deposits.

The interbedded nature of the till and outwash deposits are the result of an undulating ice front. Glacial outwash deposits were laid down in front of the glacial terminus. As the ice advanced over BAAP, glacial till (morainal deposits) were deposited over outwash material. As the ice retreated, outwash sand and gravel generally blanketed the morainal deposits.

There is no indication from the soils encountered in this investigation of the presence of a buried bedrock valley beneath the eastern boundary of BAAP. An expanded soil boring program (deeper borings) would be necessary to confirm or deny the existence of a buried bedrock valley.

BEDROCK DEPOSITS

Two bedrock units were encountered during the subsurface exploration program: sandstone and quartzite conglomerate. Sandstone was encountered along the northern site boundary at S1128 and S1129 at Elevations 805 and 820, respectively. Based on wash samples obtained during the drilling operation, the sandstone is a calcitic, well sorted, fine grained sandstone. Calcite cement appears to weather to a white silt-like material. Based on the bedrock logged on the plant production well logs, the sandstone is part of the Upper Cambrian Dresbach Group, either the Mount Simon or Eau Claire Members. There were no significant water losses while drilling through the sandstone which indicates the sandstone at these locations is relatively unfractured. The permeability testing result at S1129 was 4.3 x 10^{-4} cm/sec. The well screen is located entirely within the sandstone unit.

Undifferentiated Cambrian quartzite conglomerate was encountered at S1130. The quartzite particles range in size from pebble size to boulders over 15 feet in diameter. The matrix of the conglomerate is primarily sandstone, though a red clay matrix (possibly weathered shaley members) was encountered.

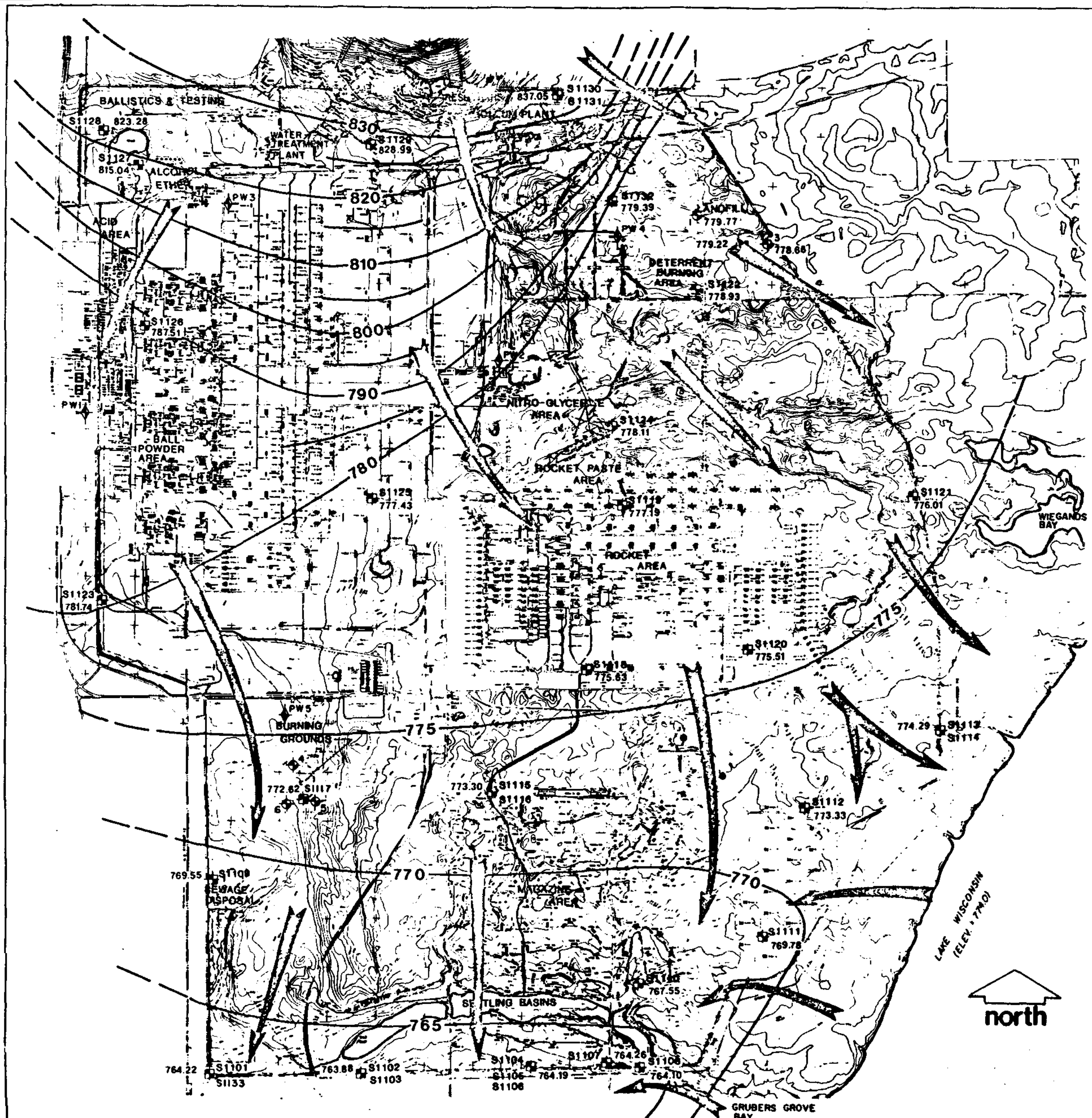
The upper surface of the conglomerate is sufficiently weathered such that a split spoon sample was obtained. The sample consisted of 52 percent gravel (mostly quartzite), 25 percent sand, and 23 percent silt and clay. The permeability of the conglomerate as measured at S1130 and S1131 is 5.5 x 10^{-5} cm/sec and 1.9 x 10^{-5} cm/sec, respectively. We would expect the permeability to decrease with depth.

GROUNDWATER FLOW

A groundwater contour map indicating the configuration of the water table surface and groundwater flow directions is shown on Figure 3-7. The contours are based on groundwater elevation measurements obtained on February 26, 1980 (Table 3-7). At piezometer nests, the water table elevation is based on the shallowest monitoring well within the nest, except at S1130 which appears to monitor perched water table conditions. Well S1131 was used at this location.

The direction of groundwater movement within the plant area dictates the potential migration direction of contaminants within the groundwater flow system. As the water table map indicates, groundwater flow across the site is primarily in a southerly direction. In the southern half of the site, the water table elevations range from approximately 781 at S1123 to approximately 764 along the southern plant boundary. The depth of water ranges between approximately 20 feet at S1108 to over 105 feet at S1120. The horizontal hydraulic gradient of water table surface beneath the burning grounds, magazine area, and settling basins is approximately 0.002 feet per feet to the south.

The influence of Lake Wisconsin is evident in the southeastern corner of this site. Groundwater flow is from the lake (Elevation 774.0) towards Wells S1112, S1111 and S1108 located in the east and southeast portion of the magazine area. The component of flow from the lake then becomes southerly in the vicinity of S1107, S1104 and S1110. As discussed in the



LEGEND

PW2	HIGH CAPACITY PLANT PRODUCTION WELL.
3	PREVIOUSLY INSTALLED GROUNDWATER MONITORING WELL.
S1104	GROUNDWATER MONITORING WELL INSTALLED DURING THE CURRENT INVESTIGATION.
—800—	WATERTABLE CONTOUR (SEE NOTE 7 BELOW)
(arrow)	GROUNDWATER FLOW DIRECTION
776.93	WATER TABLE ELEVATION (2/26/80)
(outline)	SURFACE WATER POND
●	EXISTING OR ABANDONED PRIVATE WELLS

1" = 800'

NOTES

1) TOPOGRAPHIC BASE MAP SUPPLIED BY OLIN CORPORATION, DATED 7/10/78, REVISED 10/10/78

2) PLANT PRODUCTION WELLS PW1 - PW5 WERE INSTALLED BY LAYNE - NORTHWEST CO. DURING 1942.

3) GROUNDWATER MONITORING WELLS #1 - #6 WERE INSTALLED DURING FEBRUARY, 1979 BY THE MOBILE DISTRICT OF THE ARMY CORPS OF ENGINEERS.

4) GROUNDWATER MONITORING WELLS S1101 - S1133 WERE INSTALLED DURING THE PERIOD OCTOBER, 1979 - FEBRUARY 1980 UNDER THE SUPERVISION OF WARZYN ENGINEERING, INC.

5) MONITORING WELL LOCATIONS AND ELEVATIONS DETERMINED BY LAND SURVEY DURING THE PERIOD NOVEMBER 1979 - FEBRUARY, 1980 BY WARZYN ENGINEERING, INC.

6) WELL LOCATIONS DENOTED BY DUAL NUMBERS INDICATE PIEZOMETER NESTS WITH THE LOWEST NUMBERED WELL AT EACH NEST BEING A WATER TABLE WELL. THE HIGHEST NUMBERED WELL(S) AT EACH NEST WERE INSTALLED AS PIEZOMETERS.

7) THE WATER TABLE MAP WAS DEVELOPED FROM WATER LEVELS OBTAINED ON FEBRUARY 26, 1980. CONTOUR INTERVAL IS FIVE (5) FEET IN THE SOUTHERN HALF OF THE SITE. DUE TO THE STEEP WATERTABLE SURFACE IN THE NORTHERN HALF OF THE SITE, A TEN (10) FOOT CONTOUR INTERVAL WAS UTILIZED IN THIS AREA.

FIGURE 3-7

NO	BY	DATE	REVISION	APP'D

WATER TABLE MAP

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC	DRAWN JDP	SCALE 1" = 1000'	SHEET 8 OF 8
	CHECKED DAW	DATE 5-7-80	DRAWING NO C8742-9
	APPROVED [signature]		
	REFERENCE		PRINTED

TABLE 3-7

SUMMARY OF MONITORING WELL DATA

Well Number	Date Installed	Depth (cm below ground surface)	Screen Length (cm)	Ground Surface Elevation (cm above sea level)	1980 Water Elevations (cm above sea level) January 11	February 19	February 26	March 6	April 11
S1101	12/14/79	2072.6	609.6	25244.7	23307.8	23294.6	23293.4	23295.3	23294.0
S1102	11/5/79	1969.0	609.6	24615.0	23279.7	23283.4	23283.1	23282.1	23255.2
S1103	11/2/79	3660.9	153.9	24616.6	23283.4	23285.8	23285.5	23284.6	[illegible]
S1104	11/7/79	2850.5	606.3	25527.3	23297.4	23290.1	23292.5	23289.5	23298.9
S1105	11/15/79	3337.6	154.5	25522.7	23294.3	23289.5	23291.6	23288.9	23293.9
S1106	11/14/79	4136.7	151.2	25540.4	23284.6	23289.8	23292.8	[illegible]	[illegible]
S1107	1/10/80	2236.3	621.5	[illegible]		23293.7	23294.6	23292.2	[illegible]
S1108	12/28/79	1196.3	622.1	23816.2	23288.2	23288.2	23269.8	23286.4	23292.5
S1109	2/14/80	3271.7	621.2	26050.6		23455.9	23455.9	23456.2	23455.0
S1110	1/15/80	1889.8	616.9	24703.4		23391.0	23394.9	23390.6	[illegible]
S1111	1/2180	3013.5	616.9	25801.0	23448.6	23455.9	23462.9	23457.4	[illegible]
S1112	1/4/80	2795.0	617.5	25488.3	23558.6	23559.5	23571.1	23559.5	[illegible]
S1113	11/23/79	2015.6	616.6	24991.2	23599.4	23600.1	23600.4	23599.7	23353.7
S1114	11/20/79	3211.1	153.0	24986.0	23599.4	23600.7	23600.7	23599.7	[illegible]
S1115	12/14/79	3352.8	621.5	26263.7	23554.6	23594.9	23570.2	23562.9	[illegible]
S1116	12/13/79	4309.8	159.1	26225.3	[illegible]	[illegible]	23563.2	[illegible]	[illegible]
S1117	2/13/80	3629.3	616.3	26292.4		23546.4	23549.4	23547.3	[illegible]
S1118	11/30/79	3394.0	616.6	26604.2	23630.3	23636.9	23641.2	23636.9	23639.1
S1119	1/22/80	3647.2	611.7	26751.4		23683.3	23688.8	23684.4	[illegible]
S1120	1/17/80	3743.2	615.0	26732.8		23633.3	23637.5	23633.6	23634.2
S1121	1/18/80	1807.5	615.4	24808.6		23652.2	23652.8	23650.9	23651.8
S1122	1/25/80	4389.1	615.0	27580.4		23736.9	23741.8	23694.2	23736.9
S1123	12/28/79	4094.1	622.4	26427.1	23824.1	23827.7	23827.4	23828.6	[illegible]
S1124	12/19/79	3924.9	614.5	26761.7	23722.6	23768.9	23716.8	23713.7	[illegible]
S1125	12/27/79	3849.6	616.3	27275.6	23751.5	23694.2	23696.0	[illegible]	[illegible]
S1126	2/11/80	3461.0	605.3	26660.9		24002.1	24003.3	24000.6	[illegible]
S1127	2/8/80	2281.1	617.2	26770.9		24842.1	24842.4	24833.9	24832.4
S1128	12/19/79	2268.6	621.5	26736.8	25127.1	25093.3	25093.6	25081.7	[illegible]
S1129	2/7/80	3595.4	609.9	27765.8		25272.2	25267.6	25253.6	25216.7
S1130	12/17/79	3792.9	617.2	28625.9	26269.8	26235.1	26233.2	25436.2	[illegible]
S1131	12/6/79	4678.4	158.4	29678.6	25527.6	25520.6	25513.3	25515.7	[illegible]
S1132	2/4/80	4804.9	618.4	27818.2		23749.1	23755.8	23747.9	[illegible]
S1133	2/19/80	2956.6	157.3	25239.3		23274.8	23292.8	23293.4	[illegible]
S1134[a]					23752.1		23750.6	23755.2	[illegible]
S1135[a]					23737.2		23739.7	23736.9	23734.7
S1136[a]					23751.6		23767.4	[illegible]	[illegible]

NOTES: [a] Wells S1134, S1135 and S1136 were not drilled as part of this study.

regional groundwater section of this chapter, the damming of the Wisconsin River to form Lake Wisconsin has caused a reversal in groundwater flow directions near the lake. The trough in the water table surface in the southeastern plant area is the result of recharge from Lake Wisconsin meeting the regional flow towards the lake.

Based on the surface water elevation at Gruber's Grove Bay (Elevation 774.0) and the water table elevation at S1108 (Elevation 764.10), located at the end of the bay, it appears the back bay portion of Gruber's Grove Bay is perched. Previous deposition of sediment from plant waste disposal activities has effectively sealed the bottom of the bay, creating a perched condition. Towards the mouth of the bay, the water table surface probably resumes its regional attitude.

In the vicinity of the nitroglycerin area, rocket paste area, rocket area, and deterrent burning area, the water table surface is quite flat with an associated horizontal hydraulic gradient of 0.001 feet per feet. Groundwater flow along the eastern plant boundary between Well S1113 and landfill wells Nos. 1 through 3 is leaving the plant boundaries to the east. In this area, flow is towards Lake Wisconsin. The area in the vicinity of Wells S1112, S1113 and S1114 is where a reversal of groundwater gradients occurs from toward (north) Lake Wisconsin to away from Lake Wisconsin (south). Based on the water elevations at S1121 (776.01) and Wiegands Bay (774'), the Bay does not appear to be perched as does Gruber's Grove Bay.

The horizontal hydraulic gradient in the vicinity of the ballistics and testing area, alcohol and ether areas, and acid area is approximately 0.01 feet per feet to the south-southwest. Water table elevations in this area range between 828 USGS datum at S1128 to 787 USGS datum at S1126. The water table flattens between S1129 and S1125. The average horizontal gradient between these two wells is approximately 0.007 feet per feet to the south. Water table conditions are complex in the vicinity of S1130, S1131 and S1132. The water level at S1130 was approximately 860 feet whereas the elevation at S1131 and S1132 are 837 and 779 feet, respectively. It appears there was a localized perched water table system in the upper quartzite conglomerate. As noted in the bedrock section of this report, clayey layers were encountered in the conglomerate and apparently caused perched conditions. Therefore, the water level at piezometer S1131 has been utilized as a water table elevation in this area.

Between the February and March water level measurements, Well S1130 was sampled. As part of this procedure, over 160 gallons of water were bailed from the well. This may have dewatered the perched aquifer. Water level measurements taken as late as July 1980 showed water levels in Well S1130 similar to those in Well S1131. Continued monitoring of this nest is necessary to confirm whether S1130 actually was perched. The water table surface drops roughly 60 feet between S1130 and S1132 (horizontal gradient of 0.03 feet per feet) then becomes flat towards S1122.

The steep horizontal gradients in the northern plant area and the relatively flat water table surface in the central and southern plant areas are probably the result of differential recharge in different areas of the site. Assuming similar surficial soil types throughout the site, recharge from direct precipitation should be approximately equal throughout the entire site area with precipitation being the only source of recharge in the central and southern areas (except from the localized recharge from Lake Wisconsin in the southeast portion of the magazine area). The Baraboo Hills along the northern plant boundaries are composed of relatively impermeable quartzite. Precipitation falling on the southern flanks of the hills will not infiltrate but will run off, downslope, until it infiltrates into the glacial soils at the foot of the hills. Runoff from the hills results in substantially greater volumes of water which are available to infiltrate into the subsoils along the northern site area. Therefore, groundwater mounds up along the northern site boundary then flattens to the south.

Based on groundwater elevations and surface water elevations of the various ponds at BAAP, it appears as though many, if not all, of the ponds are perched (not hydraulically connected to the groundwater system) and act as catchment/infiltration basins for local surface water runoff. Listed below are the surface water elevations and projected water table elevations beneath each pond. The elevation of the surface water in the ponds in Table 3-8 is estimated from topographic base maps and/or inferred from nearby survey points with the water table elevation obtained from the water table map, Figure 3-7.

TABLE 3-8

SURFACE WATER ELEVATIONS OF PONDS AT BAAP

Pond	Surface Water Elevations	Groundwater Elevations
Nitroglycerin Area	880	778
Ballistics and Testing Area	870	820
Oleum Area	884	820
Magazine Area	844	773
Western Settling Pond	800	765

As previously mentioned in the regional setting section, many of the ponds occupy kettle holes, a depression left when a buried glacial ice block melts. It would appear that the surficial locss deposits which blanket the majority of the site have effectively sealed the bottom of the ponds from the groundwater system.

The following discussion of vertical groundwater flow is based on water levels obtained on March 8, 1980. Other rounds of water levels, included in Table 3-7, indicate similar trends though the values of calculated gradients may vary slightly. Piezometer nests installed during this survey allow for the determination of vertical groundwater flow. Darcy's Law states that water flows from high water levels to low water levels, or from high potential to low potential. This is analogous to stream flow, where water will flow from a high elevation (upstream) to a lower elevation (downstream). With wells screened at different depths, any variation in head between wells within a given nest indicates a vertical difference in head and thus vertical flow. Decreasing head with depth indicates downward movement or recharge whereas increasing head with depth indicates upward movement or discharge.

At Well Nests S1104/S1105/S1106, S1113/S1114 and S1115/S116, the difference in water levels is less than or equal to 0.02 feet. The accuracy of water level measurements is ±0.01 feet. Therefore, the difference in water levels is within the accuracy of measurement and flow at these nests is essentially horizontal. The vertical gradient between S1102 and S1103 is upward or discharge, at a value of 0.001 feet per feet. AT S1101/S1133, the gradient is downward, or recharge conditions at a value of 0.002 feet per feet. Due to the perched water table conditions at S1130/S1131, vertical gradients cannot be calculated at this nest.

POTENTIAL CONTAMINANT MIGRATION

In addition to providing information on groundwater flow velocities (direction and speed), the wells at BAAP were also installed for the purpose of monitoring groundwater quality. Toward that purpose, many of the wells were installed adjacent to and on the apparent downgradient side of suspected sources of contamination. Once the water table map was prepared and the baildown tests were completed, estimates of groundwater flow velocities could be made.

Table 3-9 summarizes, by potential source of contamination, groundwater flow velocities (direction and speed) at each source, and indicates which, if any, of the monitoring wells are within the theoretical contaminant plume. Figure 3-8 is a graphic presentation of this table.

TABLE 3-9

GROUNDWATER FLOW VELOCITIES

Source	Flow Velocities Direction	Flow Velocities Speed (ft/yr)	Distance Traveled Since 1942 (ft)	Wells Within Distance Traveled	Coefficient of Permeability (k)(ft/yr)	Well Number	Water Table Gradient (ft/ft)	Assumed Porosity
Settling Ponds (West End)								
MAXIMUM	S	68	2,580	S1102 & S1103	7,316	S1103	1.39×10^{-3}	0.15
MINIMUM	S	11	435	S1102 & S1103	3,300	S1102	1.39×10^{-3}	0.40
Settling Ponds (middle)								
MAXIMUM	S	64	2,450	S1104, S1105, S1106	6,959	S1106	1.39×10^{-3}	0.15
MINIMUM	S	13	490	None	3,732	S1104	1.39×10^{-3}	0.40
Settling Ponds (East End)								
MAXIMUM	SW	43	1,640	S1108 & S1107	2,281	S1108	2.83×10^{-3}	0.15
MINIMUM	SW	10	370	S1108	2,796	S1107	1.39×10^{-3}	0.40
Burning Grounds								
MAXIMUM	S	3	130	S1117	480	S1117	1.04×10^{-3}	0.15
MINUMUM	S	1	50	None	480	S1117	1.04×10^{-3}	0.40
Nitroglycerine Pond								
MAXIMUM	SE	30	1,140	S1124	8,620	S1119	5.2×10^{-4}	0.15
MINIMUM	SE	<0.1	2	None	37	S1124	4.9×10^{-4}	0.40
Deterrent Burning Area								
MAXIMUM	SE	27	1,010	S1122	8,620	S1122	4.63×10^{-4}	0.15
MINIMUM	SE	7	380	None	8,620	S1122	4.63×10^{-4}	0.40
Sanitary Landfill								
MAXIMUM	SE	27	1,010	?	8,620	S1122	4.63×10^{-4}	0.15
MINIMUM	SE	7	380	None	8,620	S1122	4.63×10^{-4}	0.40
Oleum Pond								
MAXIMUM	SE	13	510	None	37	S1130 & S1132	4.63×10^{-4}	0.15
MINIMUM	SE		190	None	37	S1130 & S1132	4.63×10^{-4}	0.40
Ballistics Pond								
MAXIMUM	SSW	141	5,350	S1127 & S1126*	2,029	S1127	1.04×10^{-2}	0.15
MINIMUM	SSW	20	760	S1127	770	S1128	1.04×10^{-2}	0.40

NOTE: *Groundwater flow direction is not well defined in the vicinity of Well S1126.

Flow velocities were calculated in the following manner. The flow directions were determined from the water table map (Figure 3-7). Water table gradients were also measured from this map and were selected from the vicinity of the potential sources in question. Where data points used to determine the location of water table contours were sparse, the two extremes of the possible water table configuration were used. The two values of porosity represent extreme estimated values for effective porosity (0.15) and total porosity (0.40) for all categories of subsoils encountered during the geotechnical investigation. The coefficients of permeability used for each pair of calculations were the coefficients of permeability measured in wells near the potential source in question. The two extreme values were used.

The formula utilized to calculate speeds for groundwater flow is as follows:

$$S = \frac{ki}{n}$$

where S = flow speed
k = coefficient of permeability
n = porosity
i = water table gradient

Since the measured vertical gradients throughout most of the site were so low, horizontal flow is assumed. The "distance travelled since 1942" was calculated by multiplying the speed (in feet per year) by 38 years. The time required for contaminants to migrate from the ground surface to the water table was not considered, thus assuming a "worst-case" condition.

SETTLING BASINS

The locations of the soil borings in the settling basins are shown in Figure 3-9. Boring logs are included in Appendix G. Figure 3-10 shows a longitudinal profile of the settling basins based on these borings and adjacent monitoring wells. The western basin is underlain by recent sediment ranging in thickness from 3 inches at S1201 and increasing to 5 feet at S1204. At S1201, S1202 and S1204, the sediment is underlain by a silty clay unit. The clay appears to be texturally similar to wind-blown loess deposits which cover the plant area. At S1203, the silty clay has apparently been removed during previous dredging operations. The entire western basin is underlain by a clean sand and gravel outwash deposit with depth. The central two basins, as defined by S1205 and S1206, are directly underlain by clean sand and gravel deposits.

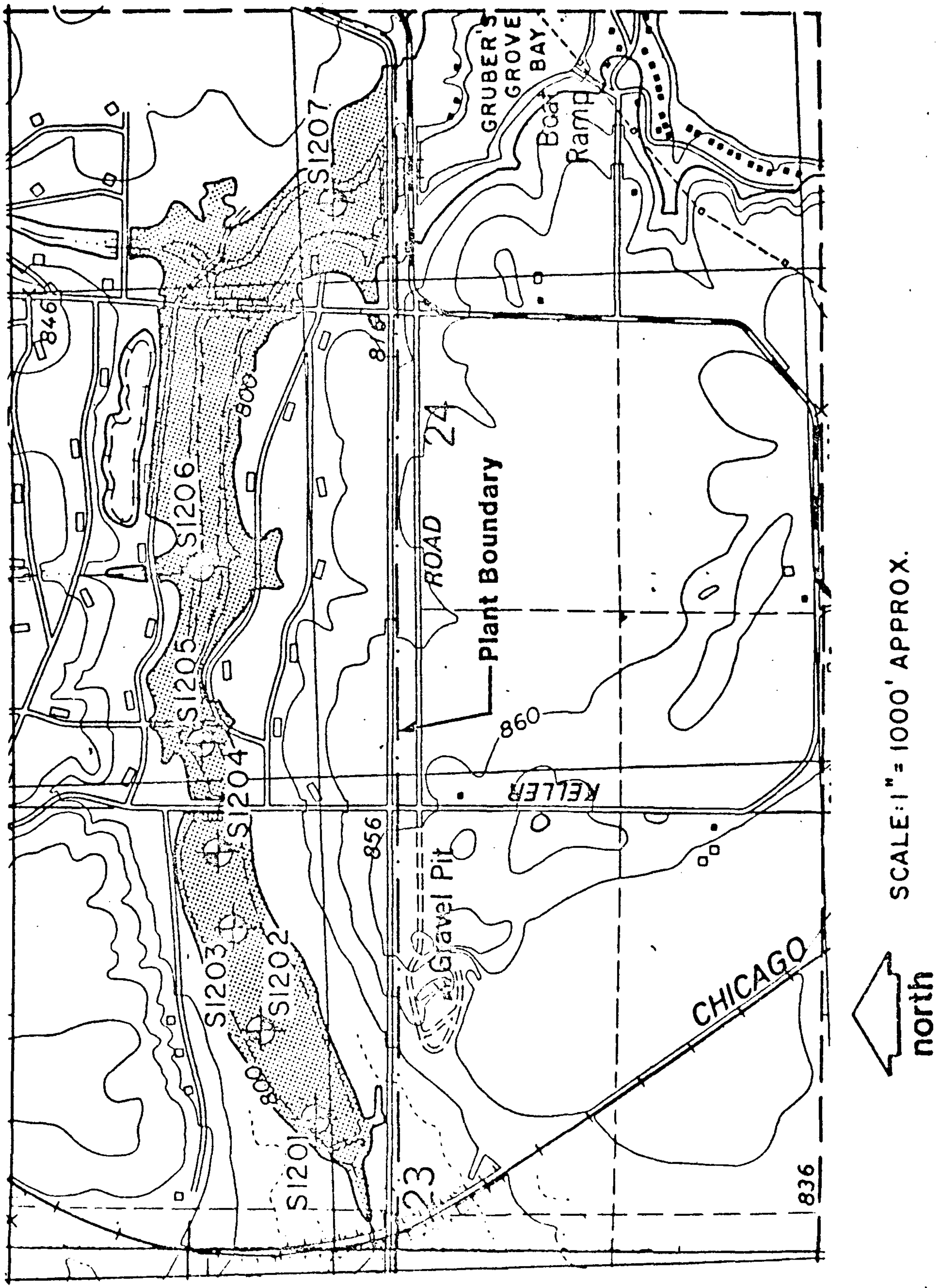


FIGURE 3-9. BORING LOCATIONS - SETTLING BASINS

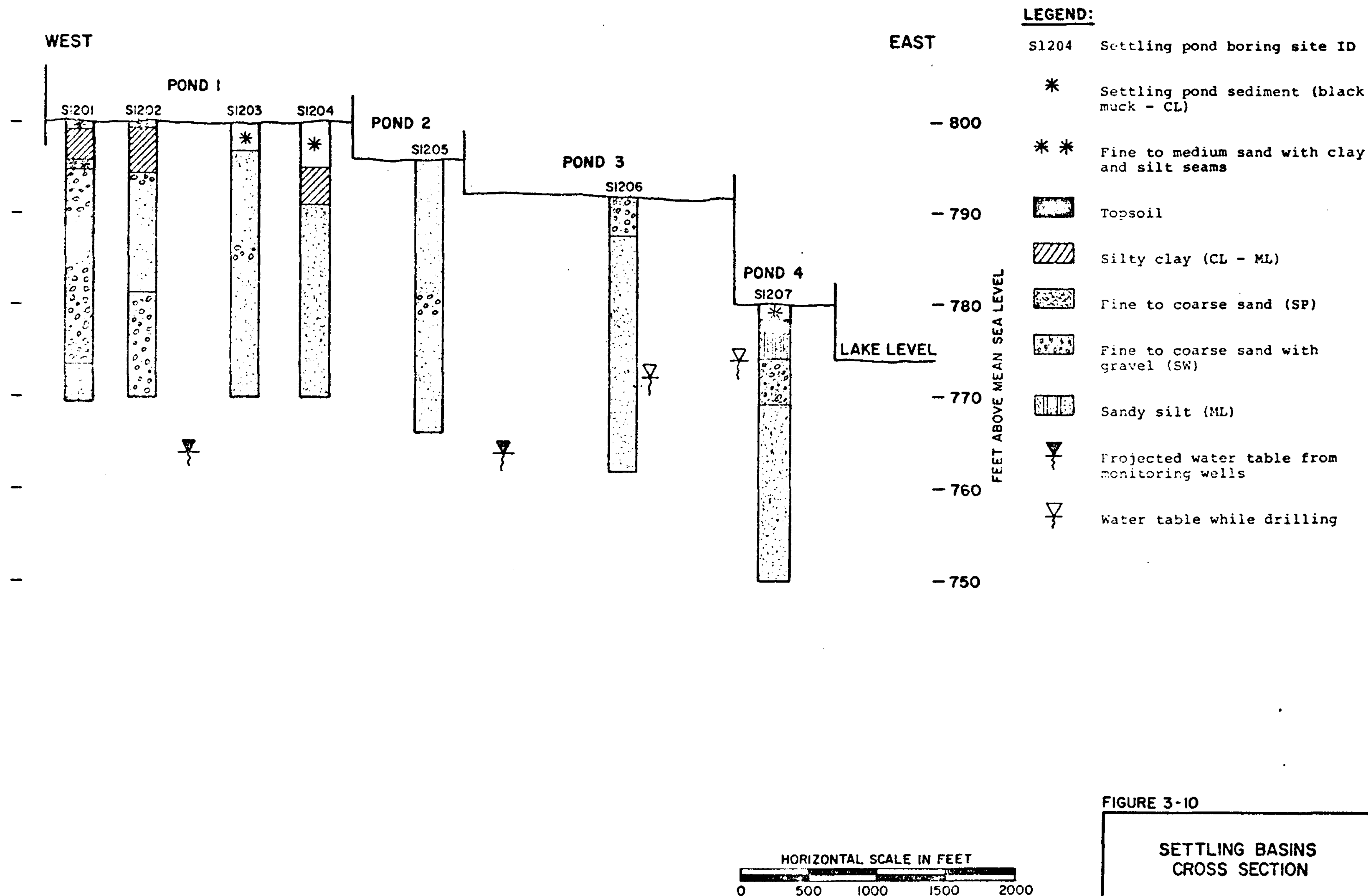


FIGURE 3-10

SETTLING BASINS CROSS SECTION

It appears the upper silty clay unit and any previously deposited sediment has been removed. At S1207, located in the eastern basin near Gruber's Grove Bay, approximately 18 inches of recent sediment underlain by a thin layer of topsoil was encountered. Beneath the topsoil, 3 feet of sandy silt is underlain by clean sand and gravel deposits.

Hydrometer analyses of the recent sediment from shelby tube samples obtained at S1203 and S1207 indicate the sediment range between 68 to 70 percent silt and 28 to 32 percent clay (reference Appendix G for soil gradation curves). The liquid limits of the two samples are 32 and 31 with associated plasticity indices of 10 and 15. The USCS classification for both samples would be CL. The results of falling head permeability testing performed on shelby tube sampling from S1203 and S1207 were 6.0×10^{-5} cm/sec and 1.2×10^{-7} cm/sec, respectively.

PROBLEMS ENCOUNTERED DURING THE SUBSURFACE INVESTIGATION

The soils at BAAP proved to be very challenging to drill and sample. The primary cause of the problems encountered was the combination of a wide range in grain size (clay to boulder) and the need to install 4-inch diameter wells. In order to drill a hole large enough to accommodate a 4-inch well, a water well drilling rig had to be used (Ingersoll Rand Cyclone TH100). A soil boring rig such as the CME 750 used at three of the wells (S1101, S1123 and S1124) was not sufficiently powerful to drill a straight hole in the gravelly, cobbly soils large enough to accommodate the 4-inch wells. The TH100, though fully capable of drilling and installing 4-inch wells in the soils at BAAP, was not designed to collect split spoon soil samples. Soil sampling with the TH100, especially at depth, was extremely time consuming. This problem was never satisfactorily overcome.

One of the aspects of split spoon sampling that added to the delays was related to the size of the mud tank (see photos in Appendix G). With the large hole size, a large quantity of drilling mud circulated at high speeds was needed to entrain gravel size particles in the hole. Even though the largest commercially available mud tank was used, the resultant residence time in the tank at this high flow rate was not sufficient to allow the fine sand to settle out. Therefore, in order to clean the hole of both gravel size particles and fine sand prior to sampling, a lengthy period of mud circulation was required after hole advancement had stopped. During this period of mud circulation, initial high mud flow rates were required in order to bring the gravel up out of the hole, followed by slower flow rates to allow the fine sand to settle out in the mud tank.

At a typical water well installation where these high mud flow rates are common, a portable mud tank is not used. Instead, a pit is excavated adjacent to the well location. This pit is sized to allow a long residence time (so that the find sand can settle out) at mud flow rates high enough to entrain gravel. Because the surface soils at the monitoring well locations might be contaminated, the use of an excavated pit was not allowed.

This problem of cleaning out the hole before split spoon sampling was never overcome, although two possible solutions were identified. One of these was to decrease the size of the well to allow a reduction in the size of the hole being drilled. This would have had the effect of allowing a lower mud circulation flow rate (gallons per minute) while maintaining high mud velocities within the hole. If the flow rate were lower, the residence time in the mud tank would increase, thereby allowing the fine sand to settle out. This possible solution was not acceptable to USATHAMA.

The other possible solution was to use a larger mud tank. Since a larger tank would have had to have been specially fabricated, and would have been very awkward to transport, this solution was never tried.

CHAPTER 4

SAMPLING

The sampling program conducted at BAAP was divided into five categories:

1) Surface Soils and Drainageways

2) Settling Pond Sediments

3) Groundwater

4) Terrestrial Vegetation

5) Grubers Grove Bay

These categories were chosen on the basis of similar sampling techniques required, types of material sampled, or sampling purpose similarities.

Detailed descriptions of the first three sampling categories are included in this chapter. The sampling and analysis of Grubers Grove Bay was treated as a separate study and is described in Chapter 6.

A description of the terrestrial vegetation sampling program is provided in Appendix H. The terrestrial vegetation sampling was conducted to determine whether aerial infrared (I.R.) photography would be a useful tool for tracking groundwater contamination. This sampling was conducted very early in the investigation at BAAP. Once the preliminary information regarding groundwater occurrence and movement was collected, it became obvious that there was no correlation between the aerial I.R. photography and groundwater contamination; as a result, the sampled vegetation was not analyzed.

POTENTIAL SOURCES OF CONTAMINATION

Most of the sampling activities conducted at BAAP by EEI were related to one or more potential sources of groundwater and/or surface water contamination. Figure 4-1 illustrates the specific areas at BAAP that were identified by BAAP and USATHAMA personnel as potential sources of surface water or groundwater contamination.

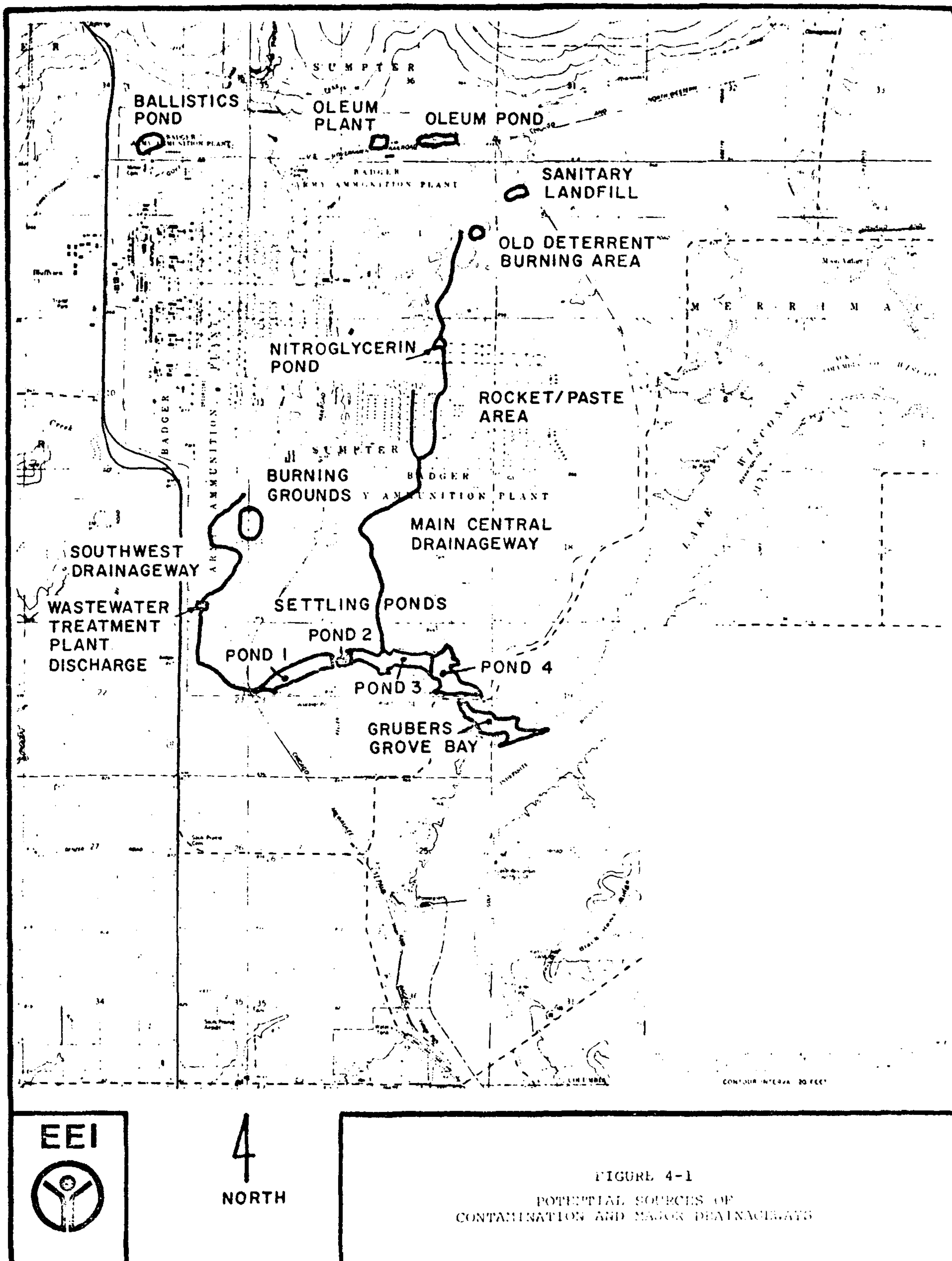


FIGURE 4-1
POTENTIAL SOURCES OF CONTAMINATION AND MAJOR DRAINAGEWAYS

The Ballistics Pond is a closed drainage pond (no surface outlet) which receives the backflush water from the water treatment plant. Alum is used in the water treatment process and is the primary contaminant of concern at the Ballistics Pond. Since the pond has no surface outlet, the only route for contaminant migration would be through groundwater flow. The pond presently contains water.

The Oleum Plant was the manufacturing site for oleum - essentially concentrated sulfuric acid. Part of the manufacuring process involved burning elemental sulfur. A sulfur storage area was located on the west end of the plant and there is still sulfur residue in the area. It has been partially eroded into a small, low lying marshy area immediately north of the concrete storage pad. Scattered traces of elemental sulfur were also noted throughout the vicinity of the Oleum Plant. Since surface drainage in the vicinity of the Oleum Plant is poorly defined, the most likely potential route for contaminant migration would be through leaching and groundwater flow.

Another aspect of the oleum manufacturing process produced a sulfuric acid wastewater. This wastewater was neutralized with calcium carbonate and discharged to the Oleum Pond. This pond is also a closed drainage pond. According to BAAP personnel, the discharge during peak production activities was quite high, and yet the pond never completey filled. The pond is now dry. Since there usually is no significant net annual evaporation (precipitation ≃ evaporation) in this part of Wisconsin, this implies that most of the discharged wastewater recharged the underlying aquifer.

One of the neutralization products that was generated by the treatment process was gypsum ($CaSO_4 \cdot 2H_2O$). Gypsum is moderately soluble in water. Therefore the primary contaminant of concern at the Oleum Pond is sulfate and the only possible route for migration would be through groundwater flow.

The Sanitary Landfill has been in operation since BAAP was built. It has handled essentially all of the non-contaminated solid waste generated at BAAP. The primary contaminant of concern from this potential source would be leachate from a general refuse landfill, and the primary migration route would be through groundwater flow.

Some of the contaminated combustible material and off-specification deterrent generated at BAAP was disposed of at the Old Deterrent Burning Area. The method of disposal involved open burning in what was apparently an old gravel pit. This area is no longer being used. Because of the variety of materials handled at this site, almost any of the industrial compounds used at BAAP could be found here. Since the site is in a closed depression, leaching/groundwater flow is the only potential contaminant transport mechanism.

Part of the process used at BAAP to produce nitroglycerin generated a wastewater which contained trace amounts of nitroglycerin. This wastewater was discharged to the Nitroglycerin Pond. This pond is part of the major drainageway which drains the central manufacturing and storage areas of BAAP. There is a large, low-lying area immediately to the east of the Nitroglycerin Pond which appears to have received some of the overflow from the pond, possibly during a heavy rainfall event. The primary contaminant of concern at the Nitroglycerin Pond is nitroglycerin. Two potential mechanisms for contaminant migration exist at this site: leaching/groundwater flow and surface runoff. The pond currently contains water.

All of the contaminated (by explosives) refuse that is generated at BAAP is now taken to the Burning Grounds. If the refuse is non-combustible, it is flashed to decontaminate it and then hauled off-site for disposal or salvage. If the refuse is combustible, it is burned at one of the burning pads (graveled pad) or burning pits (deep, narrow excavations). Because of the variety of materials handled at this site, any of the industrial compounds used at BAAP may be present. Because of the topography of the site, surface runoff would probably not be an effective contaminant transport mechanism. Leaching/groundwater flow is a more likely means of transporting contaminants from this site.

The industrial Wastewater Treatment Plant received wastewater discharges from the acid area and the ball powder area. Treatment consisted of neutralization with calcium carbonate, followed by discharge to the Settling Ponds, and ultimately Grubers Grove Bay and Lake Wisconsin. The primary contaminants of concern from these sites would be sulfate, nitrocellulose, diethylpthalate (DEP), di-n-butylphthate (DBP), diphenylamine (DPA), and 2,4-DNT. Both surface runoff and leaching/groundwater flow are potential mechanisms for contaminant migration from these sources. The settling ponds are now almost completely dry.

The main central drainageway is partially fed by a series of drainage ditches in the Rocket/Paste Area. Though no wastewater was generated in this area, a deluge system to control fires was operated and runoff from this system emptied into the drainage ditches. Lead salts were reportedly visible in the bottoms of these ditches at one time, and therefore the primary contaminant of concern in these ditches is lead.

The primary mechanism for contaminant migration is surface runoff.

SURFACE SOILS AND DRAINAGEWAY SAMPLING

Purpose and Location

Sampling in this category had two main purposes: 1) to sample the potential sources of contamination in order to verify the presence of suspected contaminants of concern and to identify any other contaminants present; 2) to trace any contaminant migration from a suspected source along surface water runoff routes.

Figure 4-2 shows the locations of the sampling sites for this category. Table 4-1 indicates which of these sites is located directly within a suspected source of contamination. Site S1403 is located in the large low-lying area to the east of the Nitroglycerin Pond which may have received overflow from the pond during periods of flooding. Site S1406 is located in a small pond directly downstream from the Nitroglycerin Pond. Sites S1405, S1407-S1409, S1415 and S1417 are in the Main Central Drainageway and in ditches within the Rocket/Paste Area that feed this drainageway. These sites were positioned so that any contaminants migrating via surface water runoff from either the Nitroglycerin Pond or the Rocket/Paste Area could be traced. Site S1412 is located away from the main drainageway in a small, closed depression that was devoid of vegetation. Site S1414 is located in the Southwest Drainageway downstream from the Wastewater Treatment Plants and upstream from the Settling Ponds. This site was located to trace contaminant migration from the Wastewater Treatment Plant to the Settling Ponds.

Sampling Procedure

This category of sampling consisted primarily of the collection of surface soil samples or soil/sediment samples in dry drainageways or ponds. At four of the sites in this category there was water present during sampling. These sites were S1404, S1406, S1413 and S1414.

The water samples at sites S1404 and S1413 were taken as grab samples during the July, 1980 sampling trip. They were collected by submerging the sample containers and allowing them to fill completely. This was done before collection of the sediment samples at these sites. At site S1413 the stream was very narrow (less than one meter wide) and

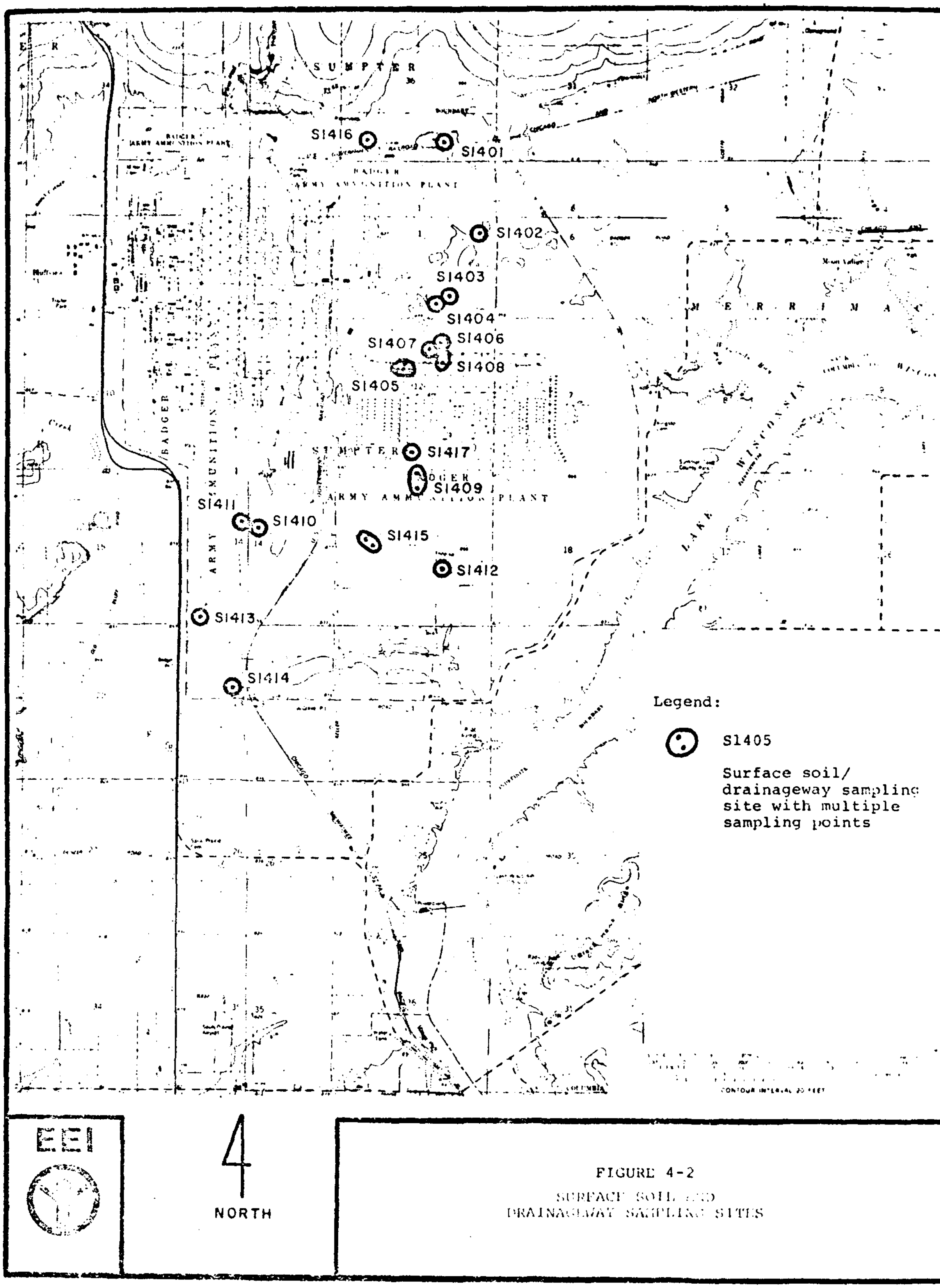


FIGURE 4-2
SURFACE SOIL AND
DRAINAGEWAY SAMPLING SITES

TABLE 4-1

POTENTIAL SOURCES OF CONTAMINATION

Potential Source	Site IDs of Samples Collected Directly from Source
Ballistics Pond	None collected
Oleum Pond	S1401
Oleum Plant	S1416
Old Deterrent Burning Area	S1402
Sanitary Landfill	None collected
Nitroglycerin Pond	S1404
Burning Grounds	S1410, S1411
Settling Ponds	All S1200 samples (shown on Figure 4-4)
Wastewater Treatment Plants	S1413

flowing strongly. The sample was collected from the center of the stream. At site S1404 (Nitroglycerin Pond), the sampling crew carefully waded out into the pond, trying to avoid disturbing the sediment, to approximately waist deep water. The sample containers were then filled from below the thermocline which had developed at a depth of about 60 centimeters.

The soil and sediment samples were all collected using a shelby tube sampler (see Figure 4-3), except at site S1404 (Nitroglycerin Pond) where a soil spade was used. The 30-inch long (76 cm), 2-inch diameter (5 cm) shelby tubes were cut in half to produce sampling tubes approximately 15 inches long (38 cm), thus allowing 12-inch (30 cm) cores to be collected at each site. The shelby tubes and all sample containers were cleaned in EEI's laboratory according to USATHAMA specifications prior to shipment to BAAP. A different shelby tube was used at each site.

All of these soil/sediment samples were composites of three to five subsamples collected at each sampling site. The orientation of these subsampling locations was sketched in the sampling log. The number and orientation of the subsamples was determined in the field by the geologist/soil scientist collecting the sample and was based on an attempt to achieve a composite which was representative of the sample site locale. The samples were visually classified and described in the sampling log.

The subsamples were partially composited in the field. A porcelain-lined tub and stainless steel spoon were used for compositing. The tub and spoon were cleaned with potable water between sampling at each site.

SETTLING POND SEDIMENT SAMPLING

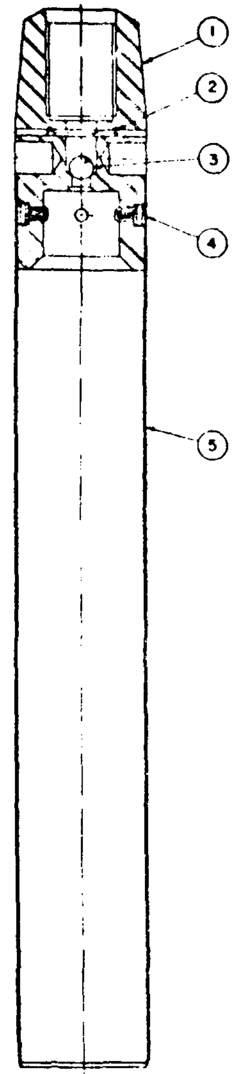
Purpose and Location

The Settling Ponds were constructed to settle out the suspended particulate matter from the wastewater discharged by the industrial treatment plant. According to BAAP personnel, the settled sediment was removed from some of the ponds several years ago. A dragline was used and the excavated sediment was piled along the north and south edges of the ponds. This excavated sediment and the sediment still remaining in the ponds were suspected of containing several contaminants.

• thin wall tube sampler

****(Meets ASTM–ASCE–DCDMA–AASHO Standards)**

This sampler is designed to take undisturbed samples in cohesive type soils and clays . . . The thin steel tube containing the sample may be removed from the sampler head and used as a container to transport sample to laboratory thus avoiding any damage to sample or costly delays in operation. In practice several replacement tubes are carried by crew to minimize disturbance, preserve moisture and cut down on delays in sampling procedure. The thin wall tube is made available in either steel or brass and in varying lengths. This sampler is also commonly called a "Shelby" or "Chicago" thin wall sampler. The procedure for taking samples is outlined under ASTM Standard Procedures, whereby the sampler is pressed into the undisturbed clay or silts by hydraulic force of drilling rig or by a rig "pull down" method. The sampler head features vent holes and a ball check to release pressure within the tube during pressing of sample and to prevent wash water from re-entering tube on recovery of sample from the bore hole.



THIN WALL TUBE SAMPLER

Size	*Length of Steel Tube Inches	MM	Rod Conn.	Part No.	Weight Lbs.	Kg.
2" O.D. x 1-7/8" I.D. •• (50.8 x 47.₁mm)	30" 36" 54"	762 914 1371	AW	22007-8 22007-10 22007-12	7.0 8.0 10.0	3.1 3.6 4.5
2½" O.D. x 2-3/8" I.D. (63.5 x 60.3mm)	30" 36" 54"	762 914 1371	AW	22027-8 22027-10 22027-12	11.0 12.0 14.0	4.9 5.4 6.3
3" O.D. x 2-7/8" I.D. •• (76.2 x 72.0mm)	30" 36" 54"	762 914 1371	NW	22012-8 22012-10 22012-12	16.0 16.5 19.0	7.2 7.4 8.6
3½" O.D. x 3-3/8" I.D. (88.9 x 84.6mm)	30" 36" 54"	762 914 1371	NW	22058-8 22058-10 22058-12	20.0 21.0 23.0	9.0 9.5 10.4
4½" O.D. x 4-3/8" I.D. (113.7 x 110.5mm)	30" 36" 54"	762 914 1371	NW	22032-8 22032-10 22032-12	24.0 27.0 31.0	10.8 12.2 14.0
5" O.D. x 4-7/8" I.D. •• (127.0 x 105.9mm)	30" 36" 54"	762 914 1371	NW	22035-8 22035-10 22035-12	36.5 39.0 43.0	16.5 17.6 19.4
2-1/8" O.D. x 2" I.D. •• (53.9 x 50.8mm)	30" 36" 54"	762 914 1371	AW	22110-8 22110-10 22110-12	7.5 8.5 10.5	3.4 3.8 4.7

*Sample length is 2½" (63.5 mm) shorter than tube length . . .

OPTIONAL AND SPARE PARTS FOR THIN WALL SAMPLER

Item No.	Diameter and Head Thread Conn. / Name of Part	2" O.D. AW Part No.	Wgt. Lbs. Kg.	2-1/2" O.D. AW Part No.	Wgt. Lbs. Kg.	3" O.D. NW Part No.	Wgt. Lbs. Kg.	3-1/2" O.D. NW Part No.	Wgt. Lbs. Kg.	4-1/2" O.D. NW Part No.	Wgt. Lbs. Kg.	5" O.D. NW Part No.	Wgt. Lbs. Kg.	2-1/8" O.D. AW Part No.	Wgt. Lbs. Kg.
1.	Head Assembly "W"	22033-3	4.0 1.8	22033-7	7.0 3.1	22033-5	11.0 4.9	22033-23	13.0 5.8	22033-11	17.0 7.7	22033-16	21.0 9.5	22033-37	7.0 3.1
2.	Ball	90213-18	* *	90213-18	* *	90213-18	* *	90213-18	* *	90213-18	* *	90213-18	* *	90213-18	* *
3.	Rollpin	90107-251	* *	90107-251	* *	90107-251	* *	90107-251	* *	90107-251	* *	90107-368	* *	90107-251	* *
4.	Cap Screw (4 Req'd)	120660	* *	120652	* *	120652	* *	120652	* *	120652	* *	120652	* *	120660	* *
5.	Steel Tube - 30"	120021-4	3.0 1.3	120086-4	4.0 1.8	120037-4	5.0 2.2	120093-11	7.0 3.1	120095-4	7.0 3.1	120109-4	8.5 3.8	120629-4	4.0 1.8
5.	Steel Tube--36"	120021-5	4.0 1.8	120086-5	5.0 2.2	120037-5	5.0 2.2	120093-12	8.0 3.6	120095-5	10.0 4.5	120109-5	12.0 5.4	120629-5	5.0 2.2
5.	Steel Tube- 54"	120021-6	6.0 2.7	120086-6	7.0 3.1	120037-6	9.0 4.0	120093-13	10.0 4.5	120095-6	13.0 5.8	120109-6	15.0 6.7	120629-6	7.0 3.1
5.	Brass Tube--30"	120022-4	4.0 1.8	120085-4	4.0 1.8	120038-4	6.0 2.7	120092-10	7.0 3.1	120094-4	7.0 3.1	120108-6	8.0 3.6	--	-- ..

Note: Sample length is 2½" shorter than tube length.
*Less than one pound or .45 kilogram.

FIGURE 4-3. SHELBY TUBE SAMPLER

As described in Chapter 3, these settling ponds are "perched", i.e. the ponds are above the water table. This condition would tend to encourage the leaching of contaminants out of the sediments and into the underlying aquifer. Since these ponds (now essentially dry year round, except during periods of heavy runoff) still drain into Grubers Grove Bay, contaminated sediment in the ponds could be eroded and washed out into the bay during flooding.

The locations of the sampling sites in the Settling Ponds are shown on Figure 4-4. The surface grab sample locations were positioned in areas where the excavated sediment had been placed. The borings were taken from the bottoms of the ponds in order to determine the depths to which contaminants had leached.

Sampling Procedure

Settling pond boring samples were collected by Warzyn Engineering, Inc. personnel under the direction of EEI field sampling teams. The samples were collected to a depth of 30-feet and were split into three sample fractions. The upper, fine-grained sediments were collected as the first fraction. These sediments consisted of material deposited after the settling ponds had been constructed and were easily discerned from the coarse, gravelly underlying soils. The sediments ranged in thickness from 0 to 5 feet. The soils collected from the rest of the 30 foot depth were split into an upper and a lower fraction of approximately equal intervals. Table 4-2 shows the approximate depths from which each fraction was collected.

The samples were collected using either a 3-inch split spoon sampler or a 4-inch diameter section of drill casing with a coring bit. The type of sampler used was recording in the boring log. Copies of the boring logs are included in Appendix G.

At a given boring location, each of the three fractions was composited into a separate container in the field. The type of container selected depended on the amount of sample collected and was either a wide-mouth quart amber glass jar, a wide-mouth one-gallon clear glass jar, or a wide-mouth clear 2-1/2-gallon jar. The jar lids all contained teflon liners, and jars and lids were cleaned according to USATHAMA sample container cleaning procedures in EEI's laboratory prior to shipment to BAAP.

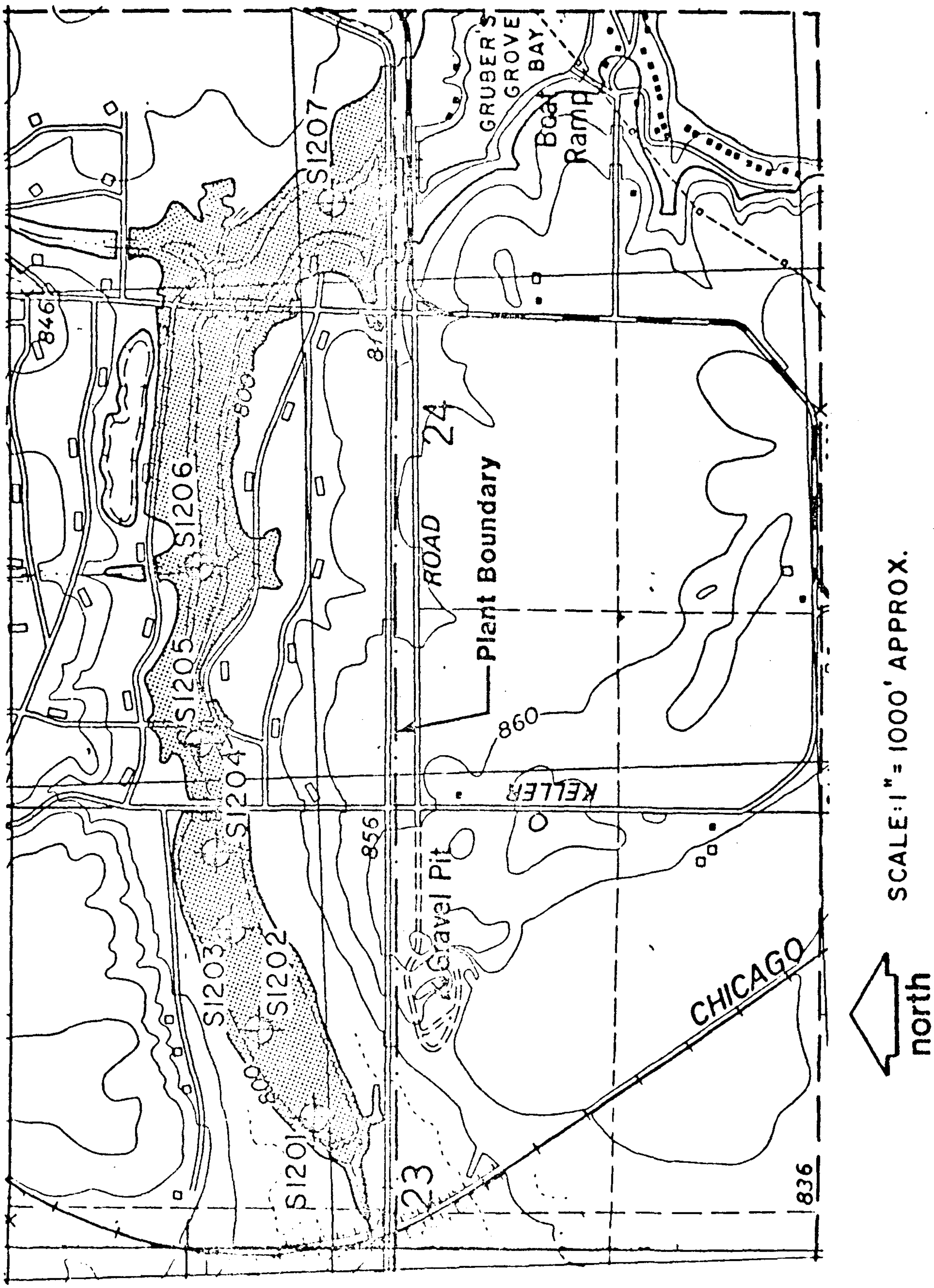


FIGURE 4-4. BORING LOCATIONS - SETTLING BASINS

TABLE 4-2

SETTLING POND SEDIMENT THICKNESSES

Pond No.	Site ID	Sample No.	Depth Interval (feet)	Soil or Sediment
1	S1201	D5018	0-2	Sediment
1	S1201	D5019U	2-16	Soil
1	S1201	D5019L	16-30	Soil
1	S1202	M0001	0-2	Sediment
1	S1202	D5020, D5020U, D5020S	2-16	Soil
1	S1202	D5021	16-30	Soil
1	S1203	M0002	0-3	Sediment
1	S1203	D5022	3-16	Soil
1	S1203	D5023	16-30	Soil
1	S1204	M0003	0-5	Sediment
1	S1204	D5024C	5-19	Soil
1	S1204	D5026	19-30	Soil
2	S1205	D5027	0-15	Soil
2	S1205	D5028	15-30	Soil
3	S1206	D5029	0-15	Soil
3	S1206	D5030	15-30	Soil
4	S1207	M0004	0-2	Sediment
4	S1207	D5031	2-15	Soil
4	S1207	D5032	15-30	Soil
N-Side of Pond 2	S1205	M0050	0-1	Sediment & Soil
N-Side of Pond 3	S1206	M0051	0-1	Sediment & Soil

GROUNDWATER SAMPLING

Purpose and Location

Groundwater samples were collected from 29 wells (Table 4-3), including 25 wells which were drilled specifically for this project, three monitoring wells which the U. S. Army Corps of Engineers drilled at the request of the Wisconsin Department of Natural Resources, and one deep production well which is part of the BAAP water supply system (Figure 4-5).

The locations where well samples were collected were chosen on the basis of two criteria. Certain samples were collected from areas upgradient from any potential sources. These samples were used as controls, or as a point of reference against which the analytical results of the other samples could be compared. These control samples are listed in Table 4-4, and their locations are shown on Figure 4-5.

The rest of the sample sites were selected for their hydrologic relation to suspected sources of contamination. Conceptually, these sites were in the most probable downgradient direction along the potential pathways for migration.

Sampling Procedure

The groundwater sampling program consisted of three phases: the purging of the wells prior to sampling, redevelopment, and the actual collection of samples.

Purging - When a well is drilled, installed, and developed, the groundwater environment is disturbed for some unknown distance around the well. By removing some of the soil, replacing it with a different type of soil (in this case, a filter sand), injecting drilling mud into the aquifer through drilling, and mixing and aerating the well through development procedures, the water chemistry in the aquifer is undoubtedly altered. Purging a well consists of removing a large quantity of water from the well prior to collecting a sample. The intent is to remove this altered water so that the sample collected is representative of the surrounding, undisturbed water.

Because the amount of water that has been altered is unknown, it is generally believed that the more thoroughly a well is purged before sampling, the more representative the sample will be. There are certain exceptions to this general rule, but within the limits of this study and for the types of aquifers encountered at BAAP, EEI believes that this rule holds true.

TABLE 4-3

AMOUNT OF WATER PURGED FROM WELLS

Well No. S11xx	Pumped or Bailed/Date		Quantity of Water Purged (Gallons)
02	P	2/20/80	382
02	P	6/30/80	227
03	P/B	6/30/80	461
04	P	2/20/80	369
04	P	7/1/80	331
05	P/B	7/2/80	288
06	P	7/1/80	390
07	P	2/25/80	377
07	P	7/2/80	336
08	P	2/25/80	416
08	P	7/2/80	479
09	P	2/26/80	372
09	P	7/3/80	474
11	P	2/27/80	87
11	P	7/2/80	123
12	P	2/26/80	441
13	P	7/7/80	198
15	P	2/26/80	384
17	P	2/27/80	217
17	B	7/11/80	111
19	P	2/27/80	238
21	P	2/27/80	573
21	P	7/7/80	264
22	P	2/21/80	342
22	P	7/3/80	195
23	B	2/22/80	150
23	B	7/8/80	111

TABLE 4-3

AMOUNT OF WATER PURGED FROM WELLS
(Continued)

Well No. S11xx	Pumped or Bailed/Date		Quantity of Water Purged (Gallons)
24	B	7/9/80	44[d]
25	P/B	2/27/80	42[a]
27	P	2/21/80	313
28	P	7/7/80	294
30	B	2/28/80	161
30	B	7/9/80	111
31	B	7/9/80	120
32	P	7/7/80	325
33	P	2/28/80	415
33	P	7/3/80	346
34	B	2/29/80	4.2[b]
34	B	7/11/80	11.2[b]
35	B	7/10/80	8.8[b]
36	B	7/12/80	21[b]
37	P	7/8/80	Not Calculated[c]

NOTES:

(a) Well S1125 had only 10.4 feet of water in it at the time of sampling.

(b) Wells S1134, S1135 and S1136 are 2-1/2 inch diameter wells installed by the Corps of Engineers, also shown as DNR Well Nos. 2, 3 and 1, respectively, on same figures.

(c) BAAP production well. Pump had been operating for several hours prior to time of sample collection.

(d) Well S1124 has a very low specific capacity. The amount of water purged shown above does not include the amount of water surged and immediately removed during the attempt to redevelop the well.

(e) Amount of water purged does not include the amount removed during development.

TABLE 4-4

CONTROL SAMPLES

Site ID	Category	Remarks
S1123	Groundwater	All Parameters - Outwash Well
S1128	Groundwater	All Parmeters - Bedrock Well
S1130	Groundwater	All Parameters - Bedrock Well
S1131	Groundwater	All Parameters - Bedrock Well

EEI proposed to purge a minimum of 65 gallons of water from the water table wells (five pipe volumes) and somewhat more than 65 gallons from the piezometers to account for the greater amount of stagnant water in the piezometer casings. Table 4-3 compares these minimum amounts to the amount of water actually purged before sampling. Wherever feasible, more than the minimum amount of water was purged in an effort to obtain a better sample.

Two methods of purging the wells were employed at BAAP. For those wells with a high enough specific capacity, a standard, deep well submersible pump was used. The discharge line consisted of 200 feet of 5/8-inch ID reinforced neoprene garden hose. The hose was taped to the power cable, and both were wound on a large wooden spool. The pumps were lowered and raised by a power winch. Two different pumps were used - a 3-inch REDA, and a 4-inch TEEL. The REDA pump was preferred, since the 4-inch (nominal) diameter TEEL pump was a snug fit inside the 4-inch diameter wells.

For those wells with low specific capacities, a bailer was used to purge the wells. For all of the 4-inch diameter wells having low specific capacities (23, 24, 25, 30 and 31), a 3-inch diameter TIMCO bailer was used. This is an all-PVC bailer with a ball-type check valve and comes in 15-inch sections (flush-joint threaded couplings), which enables it to be thoroughly cleaned and of variable length. Well 17 was purged with a TIMCO bailer on the second sampling trip due to mechanical problems with the pumps. For purging the three 2-1/2-inch "DNR" wells (34, 35, 36), a 1-1/2-inch PVC bailer was used. This bailer had a galvanized reducing bushing and one-inch brass foot valve.

For purging, the TIMCO bailer was lowered and raised on a braided polypropylene rope which was run through a snatch block on a tripod. The rope was attached to a van and the van was driven back and forth to lower and raise the bailer. Using this system, a bailing rate of approximately 1-1/2 to 2 gallons per minute was achieved. In several instances, this exceeded the production capacity of the well. The 1-1/2-inch bailer was lowered and raised on a braided polypropylene rope by hand for wells 34 and 36, and by van for well 35.

<u>Redeveloping</u> - Four of the monitoring wells at BAAP had unexpectedly low yields. These were wells S1124, S1134, S1135 and S1136. Well S1124 was installed by Warzyn Engineering, Inc. as part of this study, and wells S1134-S1136 were installed earlier by the U. S. Army Corps of Engineers.

Because these wells had unexpectedly low yields, they may not have been completely developed when they were installed. Therefore an attempt was made during the July, 1980 sampling trip to redevelop these wells through swabbing and surging.

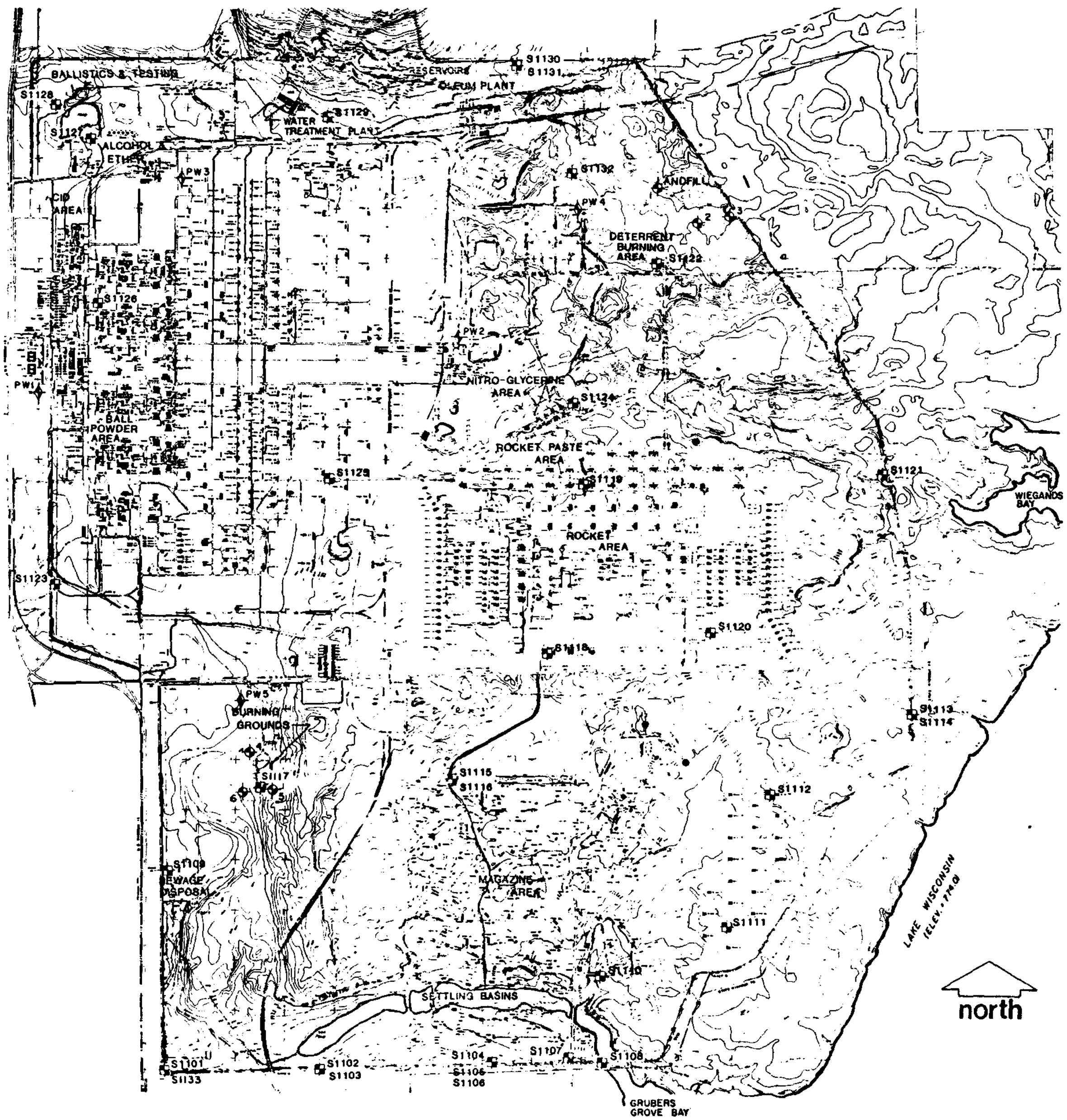
For swabbing the wells a heavily weighted, snug fitting sealed bailer was used. It was violently raised and lowered throughout the screened section of the well to create strong turbulence. This turbulence tends to loosen some of the fine grained material which may be plugging the screen.

Surging the wells consisted of rapidly pouring clean water from the BAAP potable water supply or water which had been bailed from the well back into the well in an effort to create a strong backpressure. The added water was then quickly removed by bailing. This combination of swabbing/surging/swabbing appeared to be only marginally effective at wells S1124, S1134 and S1136, where no noticeable increase in yield was obtained. At well S1135, a distinct increase in yield was noticed between the initial baildown and the post-development purging operations.

Sampling - All of the 4-inch diameter wells (except wells 6, 28 and 32) were sampled with a 3-inch diameter TIMCO bailer. Samples from wells 6, 28 were collected directly from the discharge hose of the pump since these samples were analyzed for inorganic constituents only. Samples from wells 34, 35 and 36 ("DNR" wells 2, 3 and 1, respectively) were collected using the 1-1/2-inch diameter bailer.

Well sampling was conducted during winter and summer. The winter sampling procedure differed slightly from the summer procedure. During the winter trip, for those wells purged using a submersible pump, the bailer was cleaned between wells using water from the BAAP potable water supply system. For those wells purged by bailing (during both winter and summer sampling), the bailer was not cleaned between wells. The purging procedure alone effectively prevented any cross contamination between wells, as confirmed in all cases by the analytical results. During the summer sampling trip, for those wells purged with a submersible pump, part of the discharge from the pump was collected in a 50-gallon nalgene drum. The bailer was then cleaned using water from the well to be sampled.

The type, size, and number of sample containers filled at each well varied according to the required analyses. Most well samples required at least some organic analyses, and quart amber glass bottles with Teflon lid liners were used for these



LEGEND

- PW2 — HIGH CAPACITY PLANT PRODUCTION WELL.
- 3 — PREVIOUSLY INSTALLED GROUNDWATER MONITORING WELL.
- S1104 — GROUNDWATER MONITORING WELL INSTALLED DURING THE CURRENT INVESTIGATION
- ● — EXISTING OR ABANDONED PRIVATE WELLS
- (outline) — SURFACE WATER POND

NOTES

1) TOPOGRAPHIC BASE MAP SUPPLIED BY OLIN CORPORATION, DATED 7/10/68, REVISED [illegible]
2) PLANT PRODUCTION WELLS PW1 - PW5 WERE INSTALLED BY LAYNE - NORTHWEST CO. DURING 1942.
3) GROUNDWATER MONITORING WELLS #1 - #6 WERE INSTALLED DURING FEBRUARY, 1979 BY THE MOBILE DISTRICT OF THE ARMY CORPS OF ENGINEERS.
4) GROUNDWATER MONITORING WELLS S1101 - S1133 WERE INSTALLED DURING THE PERIOD OCTOBER, 1979 - FEBRUARY 1980 UNDER THE SUPERVISION OF WARZYN ENGINEERING, INC.
5) MONITORING WELL LOCATIONS AND ELEVATIONS DETERMINED BY LAND SURVEY DURING THE PERIOD NOVEMBER 1979 - FEBRUARY, 1980 BY WARZYN ENGINEERING, INC.
6) WELL LOCATIONS DENOTED BY DUAL NUMBERS INDICATE PIEZOMETER NESTS WITH THE LOWEST NUMBERED WELL AT EACH NEST BEING A WATER TABLE WELL. THE HIGHEST NUMBERED WELL(S) AT EACH NEST WERE INSTALLED AS PIEZOMETERS.

FIGURE 4-5

NO	BY	DATE	REVISION	APP'D

SITE TOPOGRAPHY AND WELL LOCATIONS

PRELIMINARY ENVIRONMENTAL SURVEY
BADGER ARMY AMMUNITION PLANT
BARABOO, SAUK COUNTY, WISCONSIN

WARZYN ENGINEERING INC	DRAWN JDP	SCALE 1"=1000'	SHEET 2 OF 8
	CHECKED DAW	DATE 9-7-80	DRAWING NO
	APPROVED Daniel R. Viste		C8742-3
	REFERENCE		PRINTED

samples. Other containers typically used were pint plastic bottles, quart cubitainers, and 40 milliliter screw top, septum seal vials. The containers were cleaned according to USATHAMA specifications in EEI's laboratory prior to shipment to BAAP.

Because of the volume of sample desired, two or three retrieves of the bailer were usually required to fill all of the containers. The quart amber glass bottles were filled first from the bailer, and the plastic containers and 40 milliliter vials were then filled from the quart amber glass bottles. The amber glass bottles were then refilled from subsequent retrieves of the bailer.

The bailers were lowered and raised by a variety of methods. These methods included using the van, the power winch, and manual (hand) retrieval. The method selected depended on depth to water, method of purging the well, size of the bailer, and how fatigued the sampling crew was at the time. Each method used was recorded in the sampling log.

After the sample containers were filled, they were placed in Coleman coolers and iced. The samples were kept on ice (or refrigerated) until they were packed for shipment. The samples were packed for shipment in Coleman coolers, iced, and shipped by air freight to EEI's laboratory at least every two days. The samples collected on the final day of each sampling trip were transported by van to EEI's laboratory (an eight hour trip).

CHAPTER 5
CHEMICAL ANALYSIS

ANALYTICAL METHODOLOGY

The analytical methods employed during this survey are summarized in Table 5-1 and are included in Appendix I. Whenever possible, EEI tried to utilize standard EPA or Army methodology and thus avoid methods development. Methods modification was required, however, for the analysis of 2,4-DNT and nitroglycerin in water and soil and for nitrocellulose in soil.

During the GC/MS analyses of soil and sediment samples, some problems occurred with the high background in the samples which necessitated reruns at dilutions of the original extract. The soil and sediment samples also proved difficult to handle during the GC analysis. Interferences were encountered with the diethyl phthalate peak. The presence of extraneous (interference) peaks reduced the sensitivity of the explosives (2,4-DNT and nitroglycerin) methods on soils and sediments. It was difficult to establish the correct GC conditions for the analysis of the explosives due to the instability of the compounds in the injection port and the necessity to lower injection port temperatures.

One of the problems encountered was the formation of a cellulose-like film after extraction of high-level soil samples for nitrocellulose analyses. This film formed in the extracts after they had been standing for a period of time. Analysts found that filtering the samples after the film appeared lowered results even in the standards. Filtering immediately and using smaller sample aliquots after extraction, however, appeared to solve the problems. Initial experiments to determine the detection limit of nitrocellulose in water also had to be repeated because the initial spiking levels (based on an assumed detection limit) were too low. The detection limit was found to be in the ppm rather than the ppb range.

Despite extensive cleanup using gel permeation chromatography, fish tissue samples showed a large number of extraneous peaks.

There was some difficulty in determining the detection limit for nitroglycerin and phthalates as well as endrin and β-BHC due to poor recovery of blank water spikes at low concentrations. Values were eventually obtained by spiking at higher concentration levels for all parameters except diethylphthalate (DEP). The problems with this and other parameters were discussed during a meeting with USATHAMA personnel. Instructions received from

TABLE 5-1

ANALYTICAL METHODOLOGY

Parameter	Code	Method[a]
Alkalinity	ALK	Method 310.1[b]-titrimetric
Carbon tetrachloride	CCL4	EPA - Fed. Reg. Vol. 44, No. 231, 68683-68690- Liquid - Liquid Extraction + GC/EC
Chemical Oxygen Demand	COD	Method 410.1[b]-titrimetric
Conductance	COND	Method 120.1[b]-meter
Hardness	HARD	Method 130.2[b]-titrimetric
Ammonia	HN3N2	Ammonia nitrogen in bottom sediments, compiled by Great Lakes Region Committee on Analytical Methods, EPA December 1969, pp. 28-31, with color development according to EPA 350.2, section 7.4.
Nitrate	NO3	Method 353.2[b] [c]-
Nitrite	NO2	Colorimetric, Automated
pH	PH	Method 150.1[b]-electrometric
Sulfate	SO4	Method 375.2[b] [c]-Colorimetric, Automated
Sulfide	SULFID	Method 376.1[b]-titrimetric
Total Kjeldahl nitrogen	N2KJEL	Method 351.3[b]-Colorimetric
Cation Exchange capacity	CEC	Method 57-2.1, Methods of Soil Analysis, No. 9, American Society of Agronomy, 1965.
Pesticides and PCB's		Water - Method for organo-chlorine pesticides in industrial effluents - Fed. Reg., 38, No. 75, Pt. II. Soils and sediments - Method for analysis of PCB's, pesticides, and phthalates in soils and bottom sediments- EPA Region V, CRL Method No. 2.198 thru 207.
α-BHC	ABHC	
β-BHC	BBHC	
δ-BHC	DBHC	
Chlordane	CLDAN	
Dieldrin	OLDRN	
Endrin	ENDRIN	
δ-endosulfan	AENSLF	
β-endosulfan	BENSLF	
Heptachlor	HPCL	
Lindane	LIN	
4,4'-DDD	PPDDD	
4,4'-DDE	PPDDE	
4,4'-DDT	PPDDT	
Toxaphene	TXPHEN	
PCB-1016	PCB016	
PCB-1221	PCB221	
PCB-1232	PCB232	
PCB-1242	PCB242	
PCB-1248	PCB248	
PCB-1254	PCB254	
PCB-1260	PCB260	
Dibutyl phthalate	DBP	Phthalate esters -
Diethyl phthalate	DEP	USEPA Method 606 - GC
2,4-dinitrotoluene	2,4-DNT	EPA Method 609 with
nitroglycerine	NG	modification - GC-EC
nitrocellulose	NC	Army NC-WA-01 with sample preparation - Automated/Colormetric
Metals[d]		
Silver	AG	Method 272.2[b] -AA
Aluminum	AL	Method 202.1[b], 202.2[b] -AA
Arsenic	AS	Method 206.2[b] -AA
Beryllium	BE	Method 210.2[b] -AA
Cadmium	CD	Method 213.2[b] -AA
Chromium	CR	Method 218.2[b] -AA
Copper	CU	Method 220.2[b] -AA
Iron	FE	Method 236.1[b] -AA
Mercury	HG	Method 245.1[b] -AA
Nickel	NI	Method 249.2[b] -AA
Lead	PB	Method 239.1[b], 239.2[b] -AA
Antimony	SB	Method 204.2[b] -AA
Selenium	SE	Method 270.2[b] -AA
Tin	SN	Method 282.1[b], 282.2[b] -AA
Thallium	TL	Method 279.2[b] -AA
Zinc	ZN	Method 289.2[b] -AA

TABLE 5-1

ANALYTICAL METHODOLOGY
(Continued)

Parameter	Code	Method[a]
Gas Chromatography/ Mass Spectrometry	-	Volatile organics analysis (VOA) by GC-MS EPA Method 624 Non-volatile organics by GC-MS EPA Method 625 Fish tissue by GC/MS Cleanup by gel permeation as in Chapter 3, Section 4, EPA Manual for Organics Analysis Using GC-MS. Analysis by EPA Method 625

NOTES: [a] See methods included as Appendix I.

[b] Method as it appears in "Methods for the Chemical Analysis of Water and Wastes", USEPA, 1979.

[c] Soil and sediment samples prepared using "Preparation of Soils and Sediments for the Analysis of Nitrate, Nitrite, and Sulfate" (See Appendix J).

[d] Where two methods are specified, the flame method was used for high levels and the furnace technique for low levels. Samples were prepared for analysis using the EPA methods included in Appendix I.

USATHAMA for completion of the project did not, however, include reanalysis for DEP detection limit determination.

Problems were also encountered during the initial attempts to determine a detection limit for aluminum in water. This was also reported to USATHAMA, but was not mentioned in the instructions received for completion of the quality control portion of the project.

In addition to the problems discussed above, nitroglycerin analyses proved to be difficult due to the apparent instability of the compound in extracts as observed with standards in the laboratory. Therefore, values obtained for samples during the screening phase were considered minimum levels of the pollutant. In order to confirm these levels, some sites were resampled during verification with arrangements made for immediate extraction and subsequent analysis by the laboratory.

Results

Appendix I presents a summary of the analytical results of the survey. The data in these tables is presented in two formats - by parameter and by site. The numbers presented in these tables are expressed in micrograms per liter for water samples and micrograms per gram for soils and sediments (unless otherwise indicated). The symbol "<" followed by a numerical value indicates that the reported value is less than the detection limit as determined by the method of Hubaux and Vos, taking into account the dilution (if any) of the sample.

The results of the GC/MS scans present qualitative results of the screening of samples for unspecified compounds. The tables of data summarizing the GC/MS library searches (identifications of unknowns) contain a column entitled "Similarity Index". The values reported in this column give an idea of how well the mass spectrum of the corresponding compound as recorded in the library matches that of the unknown. A perfect match would have an assigned value of 1.0000. For water samples, three fractions were analyzed: a volatile fraction, an acidic extract and a base-neutral extract. For soil and sediment samples, a volatile fraction was not analyzed. The compounds identified are listed in order of increasing retention time on the GC. For a few compounds (generally priority pollutants), the existence of standards and calibration curves, generated through previous USEPA contracts, has allowed for a semi-quantitative concentration to be presented. This concentration data is presented for informational purposes. Such data was not a contractual requirement and the detection limit criteria are those of USEPA and not of USATHAMA. An indication of the concentration range of the other peaks identified is also given in the data tables. These concentration estimates were calculated assuming that the compound observed gives a response equivalent to that of the internal standard, i.e., that the response factor is 1.0. A more quantitative value cannot be reported unless standards of each compound are obtained and run on the system.

QUALITY ASSURANCE/QUALITY CONTROL

Introduction

The quality assurance measures employed for the BAAP survey were drawn directly from the "Quality Assurance Program for the U.S. Army Toxic and Hazardous Materials Agency", (May 1979). Some of the required quality control information was already available, having been collected in connection with work conducted for USATHAMA during the Milan Army Ammunition Plant Contamination Survey. Some changes were incorporated into the program after consultation with USATHAMA and will be evident from the discussion which follows.

Determination of Detection Limits

The method of Hubaux and Vos was employed in determining detection limits. Standards prepared from SARMS (Standard Analytical Reference Materials as defined in USATHAMA QA Program) or reagents traceable to SARMS, were used to cover the entire linear working range of the method. Response was plotted vs. target (true) values. In most cases, response was recorded in concentration units. The responses of check standards were plotted vs. target (true) concentration. Check standards were identical in composition to calibration standards, but were analyzed as unknowns after prior calibration.

All raw data on responses of standards vs. target (true) concentration, together with graphical representations of the Hubaux and Vos detection limits, are included in the quality assurance supplement. Tables 5-2 and 5-3 summarize the detection limits for waters and soils, respectively.

Where only detection limits were of interest, one analysis was made at each concentration level. If precision and accuracy as specified in the USATHAMA program were also of interest, four repetitive analyses were made at each concentration level. In general, the following concentration levels were chosen; blank, 0.5 D.L., D.L., 2 D.L., 5 D.L. and 10 D.L. It is important to note that D.L. refers to the required detection limit.

TABLE 5-2

SUMMARY OF DETECTION LIMITS IN DEIONIZED WATER

Pesticides[a]		Metals	
Parameter	Concentration	Parameter	Concentration
chlordane	0.11 μg/l	antimony	5.5 μg/l
toxaphene	8.9 μg/l	arsenic	6.3 μg/l
α-BHC	0.17 μg/l	beryllium	47 μg/l
γ-BHC	0.028 μg/l	cadmium	1.2 μg/l
δ-BHC	0.026 μg/l	chromium	4.4 μg/l
β-BHC	0.035 μg/l	copper	5.0 μg/l
heptachlor	0.12 μg/l	lead	1.7 μg/l
aldrin	0.033 μg/l	mercury	0.47 μg/l
DDE	0.11 μg/l	nickel	8.1 μg/l
DDD	0.063 μg/l	selenium	2.0 μg/l
DDT	0.092 μg/l	thallium	2.9 μg/l
endrin	0.030 μg/l	silver	2.5 μg/l
dieldrin	0.16 μg/l	zinc	15 μg/l
endosulfan I	0.025 μg/l	tin	17.5 μg/l
endosulfan II	0.064 μg/l		

PCB's[a]		Other Compounds of Interest	
Parameter	Concentration	Parameter	Concentration
Arochlor 1016	1.1 μg/l	nitrocellulose	2.05 mg/l
Arochlor 1221	3.0 μg/l	nitroglycerin	11 μg/l [a]
Arochlor 1232	2.4 μg/l	2,4-DNT	0.13 μg/l [c] & [a]
Arochlor 1242	1.3 μg/l	nitrate	0.36 mg/l
Arochlor 1254	2.4 μg/l	nitrite	0.25 mg/l
Arochlor 1248	0.70 μg/l	sulfate	5.7 mg/l
Arochlor 1260	2.3 μg/l	DBP	2.34 μg/l [b]
		DPA	2.35 μg/l [a]
		benzene	7.06 μg/l [a]
		ethyl acetate	9.5 μg/l [a]
		chloroform	2.28 μg/l [a]
		carbon tetrachloride	0.26 μg/l [a]

[a] Detection limits determined by gas chromatography

[b] Detection limits determined by GC/MS

[c] From Milan AAP program

TABLE 5-3

SUMMARY OF DETECTION LIMITS IN SOIL

Parameter	Concentration
2,4-DNT	8.86 ng/g
nitrate	0.83 μg/g
nitrite	0.63 μg/g
sulfate	9.92 μg/g
DBP	2.8 μg/g
DEP	3.6 μg/g

As indicated in Tables 5-2 and 5-3, the detection limits for most organic parameters were in the low ppb range for waters and the low ppm range for soils. Nitrocellulose was an exception, showing a detection limit in the ppm range for waters. As indicated in the tables, the detection limits for inorganic parameters were in the low ppb range for metals in water, while for anions the detection limits were in the low ppm range on both waters and soils.

In all cases, the detection limits were found to be low enough to meet the requirements of the project and to allow for measurements which adequately defined the extent of pollution.

Precision and Accuracy

Precision and accuracy data were also generated according to the USATHAMA procedure by repetitive analysis of standards at several levels of concentration as described above. These standards were added to blank water (i.e. deionized, organic-free water) or blank soil according to the type of precision and accuracy data sought. The "blank" soil was prepared by soxhlet extracting a low background soil with methylene chloride for 24 hours and air-drying. Analyses were performed by the same procedures used for samples.

The precision and accuracy data have been used to calculate two values based on a Hubaux and Vos plot of the data. Statistical calculations described below were facilitated by a program written for the computer. Accuracy is characterized by the slope of the regression line when plotting found values vs. target (true) values. When these slope values have been available, data have been corrected by dividing found values by the slope. Precision is characterized by means of the standard deviation (obtained by taking the square root of the variance as it appears on the Hubaux and Vos plot). For individual data values, these standard deviations are used to calculate relative standard deviations (equal to standard deviation divided by found value and multiplied by 100). Accuracy and precision for individual parameters are summarized in Table 5-4. Precision and accuracy data for parameters not included on this table was not requested by USATHAMA.

Additional Quality Control

In addition to the determination of detection limits and the measurement of precision and accuracy as specified by USATHAMA, other quality control measures were employed. These included the analysis of duplicates and spikes as a control on samples analyses. These results are summarized in Tables 5-5, 5-6 and 5-7.

TABLE 5-4

PRECISION AND ACCURACY IN WATER AND SOIL

Parameter	Accuracy (Slope of Hubaux and Vos Regression Line Plot)	Precision (Standard Deviation of Hubaux and Vos Regression Line Plot)
Water:		
lead	1.04	.82
tin	1.18	8.95
nitrocellulose	0.997	0.365
nitroglycerin	0.550	1.31
2,4-DNT	1.01	0.182
nitrate	1.64	0.196
nitrite	1.06	0.130
sulfate	0.705	1.71
DBP	0.457	0.0539
DPA	0.807	0.340
chloroform	0.972	0.299
carbon tetrachloride	1.00	1.37
mercury	0.9854	0.0860
Soil:		
2,4-DNT	0.576	2.46
nitrate	0.934	0.299
nitrite	0.088	2.03
sulfate	0.988	3.69

TABLE 5-5
RESULTS OF DUPLICATE ANAYSES - METALS

Parameter	Site No.	Sample No.	Analysis No. 1	Analysis No. 2
aluminum	S1102	A001	2.52 mg/l	2.70 mg/l – water
aluminum	S1409	D5009	6,500 μg/g	6,880 μg/g – soil
aluminum	S1414	D5014	6,700 μg/g	5,750 μg/g – water
aluminum	S1122	A0011	0.23 mg/l	0.20 mg/l – soil
antimony	S1133	A0061	<5.5 μg/l	<5.5 μg/l
arsenic	S1133	A0061	<1 μg/l	1 μg/l
beryllium	S1133	A0061	<1 μg/l	<1 μg/l
cadmium	S1133	A0061	<5 μg/l	<5 μg/l
chromium	S1133	A0061	84 μg/l	60 μg/l
chromium	S1133	A0061	5.9 μg/l	6.0 μg/l
copper	S1133	A0061	25 μg/l	27 μg/l
iron	S1121	A0056	0.43 mg/l	0.54 mg/l
lead	S1414	D5014	1.64 μg/g	1.59 μg/g
lead	S1409	D5009	83.0 μg/g	85.5 μg/g
lead	S1102	A0001	10.4 μg/l	10.6 μg/l
lead	S1122	A0011	2.83 μg/l	3.67 μg/l
lead	S1133	A0061	10.2 μg/l	12.9 μg/l
mercury	S1123	A0052	<0.3 μg/l	<0.3 μg/l
nickel	S1133	A0061	<5 μg/l	<5 μg/l
selenium	S1133	A0061	<2 μg/l	<2 μg/l
silver	S1133	A0061	<3 μg/l	<3 μg/l
tin	S1414	D5014	0.35 μg/g	0.60 μg/g
tin	S1122	A0011	<1 μg/l	7 μg/l
tin	S1409	D5009	2.5 μg/g	1.8 μg/g
tin	S1107	A0063	7.7 μg/l	1.4 μg/l
tin	S1102	A0001	6.8 μg/l	<1 μg/l
thallium	S1133	A0061	<1 μg/l	<1 μg/l
zinc	S1133	A0061	99 μg/l	93 μg/l
zinc	S1121	A0056	<10 μg/l	<10 μg/l

NOTE: The following samples which are not from BAAP were run as duplicates in sets containing BAAP samples:

mercury		29507	<0.3 μg/l	<0.3 μg/l
mercury		29507	0.4 μg/l	<0.3 μg/l
mercury		29237	<0.3 μg/l	<0.3 μg/l

Tin (Sn) Florida + Minnesota drinking water guidelines: 4.2 mg/l (4,200 ug/l) + 4.0 mg/l (4,000 ug/l)

p.44 map?

TABLE 5-6

RESULTS OF DUPLICATE ANALYSES - ORGANICS AND NON-METALS

Parameter	Site No.	Sample No.	Analysis No.1	Analysis No. 2
COD	51311	D5064	70,500 mg/kg	56,500 mg/kg
COD	51301	D5035	43,700 mg/kg	43,700 mg/kg
COD	51123	A0052	2 mg/l	4 mg/l
ammonia	51113	D5065	172 mg/kg	150 mg/kg
ammonia	51303	D5041	348 mg/kg	310 mg/kg
nitrite	51108	A0064	0.376 mg/l	0.374 mg/l
nitrate	51321		0.73 mg/l	0.73 mg/l
kjeldahl-N	51123	A0052	<0.5 mg/l	<0.5 mg/l
percent solids	51305	M0012	6.53%	6.64%
alkalinity	51136 (DNR 3)	A0072	335 mg/l	337 mg/l
sulfate	51132	A0058	3 mg/l	2.4 mg/l
carbon tetrachloride	51117	A0050	64 μg/l	68 μg/l
chloroform	51117	A0050	12 μg/l	13 μg/l
2,4-DNT	51202	D5020	403 mg/l	381 mg/l
nitrocellulose	51321		0.002 mg/l as NO_2^-	0.043 mg/l as NO_2^-

NOTE: The following samples which are not from BAAP were run as duplicates in sets containing BAAP samples:

COD	29052		51 mg/l	23 mg/l
COD	28463		19 mg/l	20 mg/l
alkalinity	28389		370 mg/l	368 mg/l

TABLE 5-7

RESULTS OF SPIKED SAMPLE ANALYSES[a]

Parameter	Site No.	Sample No.	Conc. Sample	Value of Spike	Calc'd Sample and Spike	Found Sample and Spike	Percent Recovery
antimony	S1107	A0063	<3 μg/l	15 μg/l	16.5 μg/l	13.08 μg/l	77%
lead	S1133	A0061	12.9 μg/l	7.5 μg/l	20.4 μg/l	20.5 μg/l	101%
lead	S1133	A0061	12.9 μg/l	15 μg/l	27.9 μg/l	31.9 μg/l	127%
nickel	S1133	A0061	<5 μg/l	20 μg/l	22.5 μg/l	18.6 μg/l	81%
nickel	S1108	A0064	<5 μg/l	20 μg/l	22.5 μg/l	21.4 μg/l	95%
thallium	S1133	A0061	<1 μg/l	5 μg/l	5.5 μg/l	3.28 μg/l	56%
thallium	S1133	A0061	<1 μg/l	10 μg/l	10.5 μg/l	8.12 μg/l	76%
zinc	S1136 (DNR 3)	A0072	202 g/l	1,000 g/l	1,202 g/l	1,100 g/l	90%

NOTE: [a] For the purpose of calculating recoveries, values less than the detection limit were taken to be one-half the detection limit (i.e., for nickel <5 μg/l, value taken as 2.5 μg/l).

Discussion of Quality Assurance

The procedures used in conducting the quality assurance aspects of this project were based on the concepts and approach developed by USATHAMA. The results from analyses performed under the quality assurance program provide a basis for judging the overall data reliablity. In particular, one can be confident that the low levels of contaminants reported are reliable, due to the extensive preliminary QA work on detection levels.

It should be noted, however, that the detection levels determined by the Hubaux and Vos procedure are conservative estimates.

CHAPTER 6

GRUBERS GROVE BAY

An investigation of Grubers Grove Bay was conducted in conjunction with the overall study of potential groundwater and/or surface water contamination at BAAP. This investigation was initiated at the request of the Wisconsin DNR to determine whether the sediment in the bay should be removed. A previous investigation indicated that some of the sediment had originated from past manufacturing operations at BAAP. Removal of these contaminated sediments through dredging had been proposed, but questions arose concerning the benefits of dredging versus the detrimental impacts. Discussions among USATHAMA, BAAP, Wisconsin DNR and EEI personnel resulted in the implementation of the sampling and analysis program described in the following section. This program was designed to answer the questions:

1) Are the sediments in Grubers Grove Bay contaminated with materials discharged during manufacturing operations at BAAP?

2) If the sediments are contaminated, what is the nature and extent of the contamination?

3) If the sediments are contaminated, are they having a measurable adverse impact on the aquatic ecosystem in the bay?

4) Would the sediments, if left in place, have any long term adverse effect on the environment?

5) Would dredging the sediments tend to release contaminants into the water that currently are trapped in the sediments?

This sampling and analysis program contained two main elements. Samples of water, sediment, and fish were collected and analyzed to document and quantify the extent of contamination, and to determine whether this contamination was being transferred up the food chain to fish species consumed by man. The second main element consisted of determining the ecological health of Grubers Bay by comparing the macroinvertebrate organisms in the bay sediments with those in an uncontaminated, but morphologically similar, bay in Lake Wisconsin - Wiegands Bay. The information from these two elements of the investigation were then used to assess the potential impacts of the proposed dredging.

WATER SAMPLING

Seventeen locations were identified for the collection of both surface water and sediment samples. Twelve were in Grubers Grove Bay, two in Wiegands Bay, one in Lake Wisconsin just above the dam and two in the Wisconsin River below the dam (see Figures 6-1, 6-2 and 6-3). The first set of samples was collected by an EEI field sampling team during November, 1979, just before the ice formed on the bays. A second partial set of samples was collected through the ice in February, 1980.

The first samples were collected from a small boat using the apparatus shown in Figure 6-3. This aspirator-type system allowed for the collection of the sample in a 1-gallon glass jar. The samples were depth integrated throughout the water column at each site. After a sufficient amount of sample had been collected, the sample was poured-off into different sample containers, e.g. amber glass quart jars, pint and quart plastic bottles, and 40 milliliter septum seal volatile organic analysis (VOA) vials. A different 1-gallon glass jar was used for each site. All glass containers had Teflon-lined lids, and were cleaned in EEI's laboratory according to USATHAMA procedures before shipment to BAAP.

The sampling apparatus that was used has a number of advantages and disadvantages. It is readily portable, easily cleaned, and capable of obtaining either vertically integrated samples or samples collected at a discreet depth. The sample contacts only Teflon and glass which minimizes the potential for cross contamination and sorption/desorption problems associated with other sampling systems. It is also capable of collecting the relatively large sample volumes required for the multiple analyses requested and can be used successfully in relatively rapidly flowing water. Its primary disadvantage is that the partial vacuum generated in the 1-gallon glass jar may tend to strip some of the volatiles from the water sample.

The water samples taken in February, 1980 were collected through the ice in Grubers Grove Bay. This partial set of samples (sites S1301, S1307 and S1312) was collected on a grab sample basis by holding the open containers under water and allowing them to fill.

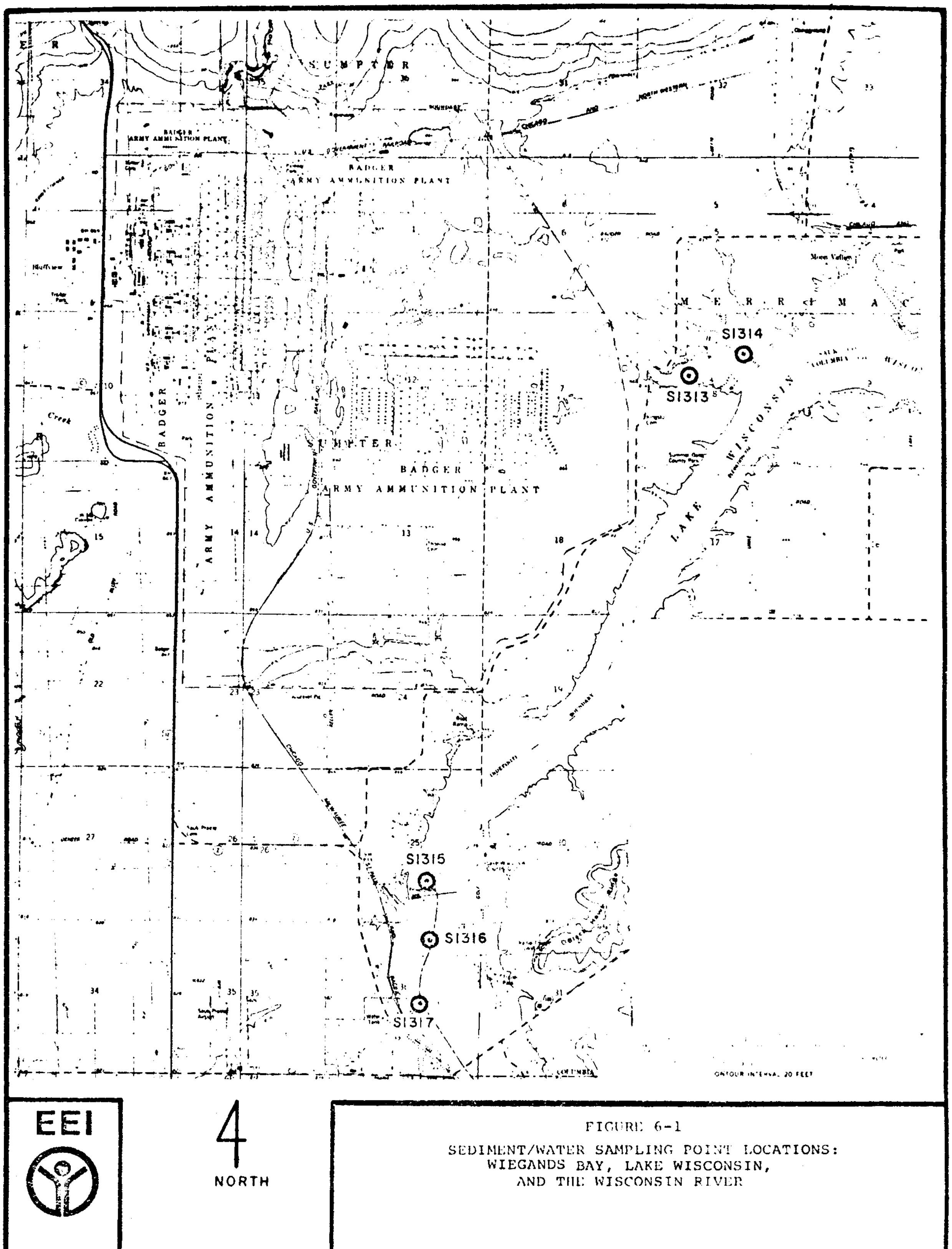
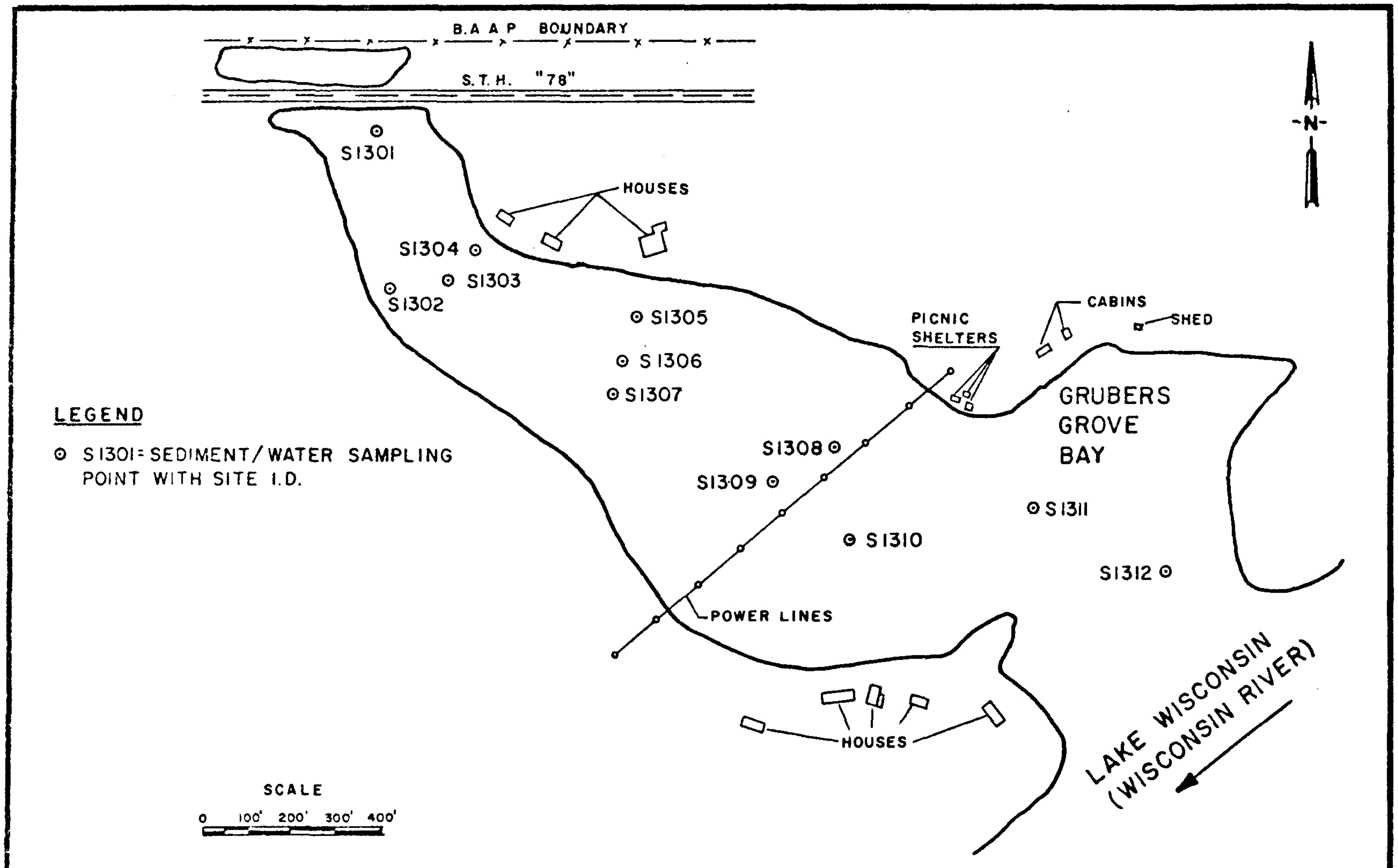


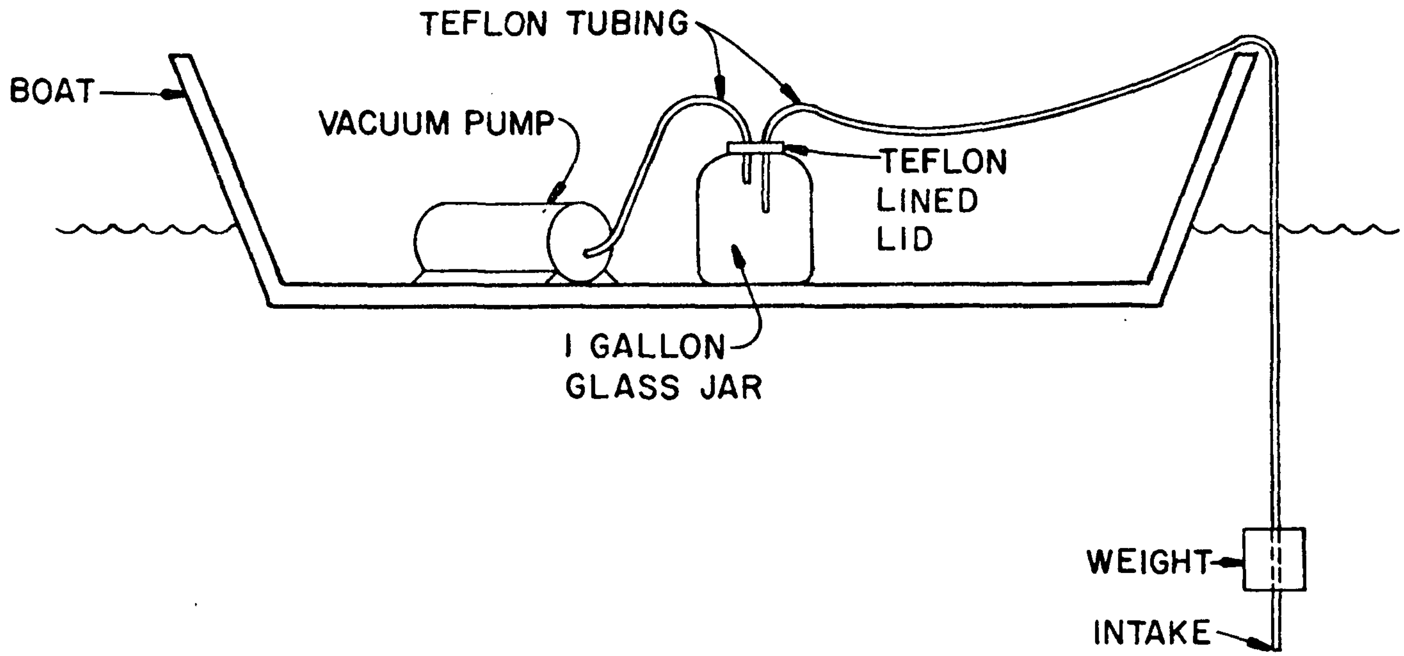
FIGURE 6-1
SEDIMENT/WATER SAMPLING POINT LOCATIONS:
WIEGANDS BAY, LAKE WISCONSIN,
AND THE WISCONSIN RIVER



EEI

FIGURE 6-2

SEDIMENT/WATER SAMPLING POINTS: GRUBERS GROVE BAY



EEI

FIGURE 6-3
SURFACE WATER SAMPLING SYSTEM

SEDIMENT SAMPLING

Sediment samples were collected at each of the seventeen water sampling sites. The sediment samples at sites S1313 through S1317 were collected by EEI personnel from a small boat in November, 1979, at the same time the first set of water samples was collected. These samples were collected by using a standard Ekman dredge (see Figure 6-4). After each retrieval of the sampler, the sample was emptied into a stainless steel mixing bowl at each site until a sufficient quantity of sample had been collected. The sample was blended in the field and placed into amber quart jars with Teflon lid liners. The jars had been pre-cleaned according to USATHAMA sample container cleaning procedures.

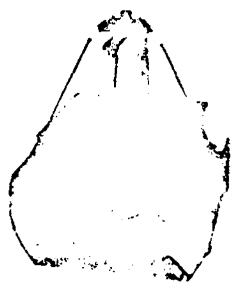
The Ekman sampler was cleaned with lake water at each site after the water sample had been collected and before collecting the sediment sample.

The sediment samples at sites S1301-S1312 were collected in February, 1980 by Warzyn Engineering, Inc. personnel under EEI supervision. The samples were collected through the ice with the aid of a drilling rig. The samples were collected in 2-foot thick increments to a variable depth (depth depended on the thickness of the sediments). The entire thickness of sediments was sampled at each location and one 2-foot sample was taken of the underlying granular soils (Table 6-1). The sediments were easily distinguished from the soils by color, texture and odor. Sediments were a black organic silt or muck, and the soils were a brown sand or silty sand. The original topsoil was distinguishable at some locations (silty sand, with some humus and roots).

The samples were collected using 3-inch diameter shelby tubes through use of an osterberg piston sampler (Figure 6-5). Each of the shelby tube samples was emptied into a porcelain-lined mixing bowl and blended in the field before placing the sample into several (three to five) amber glass wide-mouth quart jars. These jars had Teflon lid liners. The number of jars per sample varied depending on the amount of sample recovered. The mixing bowl and stainless steel mixing spoon were washed with snow and water from the bay between each retrieval of the sampler.

The sample jars were kept cold (less than 40°F) and dark until packed for shipment via air freight to EEI's laboratory. The samples were packed in Coleman coolers and iced for shipment.

EKMAN DREDGE (Bottom Sampler)



Various sizes of Ekman Dredges are available for taking samples of mud from the bottoms of water bodies. The sampling dredge is lowered to the bottom with the jaws in open position. A release mechanism is lowered down the support line to close the jaws. The jaws are spring mounted, causing them to bite into the mud to obtain a sample. This type of sampler can only be operated in soft material. It is usually used in taking mud samples for quantitative studies of lake muds, vegetable debris and bottom fauna.

Ekman dredges are solid brass construction with stainless steel springs and cables. Both models include a marine plywood carrying case with a polyurethane finish.

Available in 2 sizes:

Model	*Description*	*Shipping Wt.*
DR-1007	6" x 6" sq. (152 mm x 152 mm sq.) Ekman Dredge Chamber Volume: 216 cu. in. (3,540 cu. cm)	15 lbs. (7 kg.)
DR-1008	9" x 9" sq. (229 mm x 229 mm sq.) Ekman Dredge Chamber Volume: 729 cu. in. (11,950 cu. cm)	28 lbs. (13 kg.)

Model DR-1008 was used at BAAP

EEI

FIGURE 6-4

STANDARD EKMAN DREDGE

TABLE 6-1
SEDIMENT SAMPLE KEY

Sample Point	Depth Interval (feet)	EEI Lab Number	Sample Number	Composite Sample Numbers	
S1301	0-2	26422	M0005	D5036C	
S1301	2-4	26423	D5034	D5036C	
S1301	4-8	26424	D5035	D5036C	
S1302	0-2	26425	M0006	D5039C	
S1302	2-4	26426	D5037	D5039C	
S1302	4-6	26427	D5038	D5039C	
S1303	0-2	26428	M0007	M0789C	D5042C
S1303	2-4	26429	M0008	M0789C	D5042C
S1303	4-6	26430	M0009	M0789C	D5042C
S1303	6-8	26515	D5040		D5042C
S1303	9-10	26516	D5041	D5141	D5042C
S1304	0-2	26517	M0010	M1011C	D5045C
S1304	2-4	26518	M0011	M1011C	D5045C
S1304	4-6	26519	D5043		D5045C
S1304	6-8	26520	D5044		D5045C
S1305	0-2	26521	M0012	D5048C	
S1305	2-4	26522	D5046	D5048C	
S1305	4-6	26523	D5047	D5048C	
S1306	0-2	26524	M0013	M1013C	D5051C
S1306	2-4	26525	M0014	M1013C	D5051C
S1306	4-6	26526	D5049		D5051C
S1306	6-8	26527	D5050		D5051C
S1307	0-2	26528	M0015	D5054C	
S1307	2-4	26529	M0016	D5054C	
S1307	4-6	26530	D5052	D5054C	
S1307	6-8	26531	D5053	D5054C	
S1308	0-2	26543	D5055		D5057C
S1308	2-4	26544	D5056	D5156	D5057C
S1309	0-2	26545	D5058	D5060C	
S1309	2-4	26546	D5059	D5060C	
S1310	0-2	26547	D5061	D5063C	
S1310	2-4	26548	D5062	D5063C	
S1311	0-2	26549	D5064	D5066C	
S1311	2-4	26550	D5065	D5066C	
S1312	0-2	26551	D5067	D5069C	
S1312	2-4	26552	D5068	D5069C	
S1313	0-1		M0018		
S1314	0-1	26792	M0017		
S1315	0-1				
S1316	0-1	Not Analyzed			
S1317	0-1				

Osterberg Piston Sampler, new model

The new, streamlined design Osterberg Sampler has been found to be unusually successful in obtaining full recovery on samples of both sands and clays. A major advantage of this sampler over the usual fixed piston type is that only one string of rods is needed to operate it. In addition, the pushing is done hydraulically and it is impossible to overdrive.

How it Operates:

The sampler is lowered into a previously drilled and cleaned-out hole. When water pressure is applied through the drill rod, a piston to which a thin walled sampling tube is attached is forced out of the pressure cylinder. A second piston — the fixed piston inside the sampling tube — is connected to the sampler head by a hollow rod. As the piston is forced down in the pressure cylinder, air in the sample tube escapes through the hollow rod and ball check. The reaction for the pushing is obtained by clamping the drill rod either to the casing or to the drill rig.

When the piston has reached its full stroke and the sampling tube penetrated its full depth in the soil, water pressure is automatically relieved by allowing circulation through a hole in the hollow piston rod and through ball check. The sampler is then turned 1½ revolutions (the inside tube being held to the outside tube by means of a friction clutch) to break off the soil at the bottom of the tube. The sampler is then ready for removal from the drill hole.

The sampler is furnished complete with one sample tube and a kit of spare parts. Sampler tubes are polished inside.

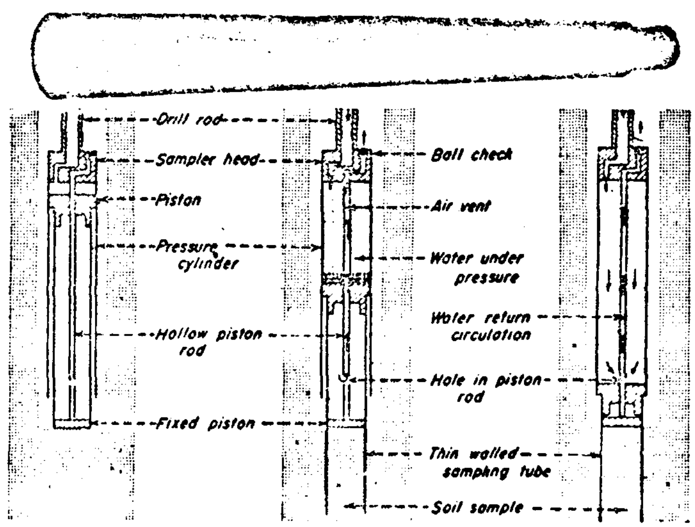


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FIGURE 6-5

OSTERBERG PISTON SAMPLER

Appendix E includes boring logs of the sampling operations. These logs were used to generate the contours shown in Figure 6-6. Because the sediments were very soft, it was not necessary to maintain an open hole to take deeper samples. The osterberg sampler was merely forced into the sediment to the desired depth in the closed position. Once the desired depth was reached, the sampler was activated and then retrieved. This method worked extremely well until sandy subsoil was encountered at each sampling site. The sand provided a much greater resistance to the operation of the sampler, and sampler penetration into this unit was sometimes poor (5 to 20 centimeters).

FISH SAMPLING

Ten species of fish were collected from Grubers Grove Bay (Table 6-2) including the sport and rough fish most commonly sought by anglers and commercial fishermen. A total of 13 "net days" (net set in place for 24 hours = 1 net day) were required to obtain the desired variety of species from Grubers Grove Bay. Wiegands Bay yielded ten of the desired species in 8 net days (Table 6-2). Fish collections were also made in Lake Wisconsin proper by the Wisconsin Department of Natural Resources. This sampling produced carp, channel catfish and sturgeon which were all found to be over 5 years old and contained large deposits of fatty tissues.

Samples selected for analysis included composites of predator-sport fish, pan fish and rough fish from both Grubers Grove and Wiegands Bay. A large carp and lake sturgeon were selected for analysis from Lake Wisconsin.

The area and depth of the surface waters to be sampled allowed for the use of gill nets as collecting devices. The nets were 100 feet long with panels 4 feet by 25 feet. Mesh sizes were 3/8-inch, 1-inch, 1-1/2 inch and 2-1/2 inch, composed of either multifilament or monofilament twins.

The nets were set parallel to prevailing winds with a 25 pound anchor on the windward end. This technique allowed the net to be cleaned and replaced without lifting both anchors. Black and white striped buoys marked both ends of the nets along with triangular white flags containing collectors' permit numbers. The small variable sized mesh produced fewer fish of large size. The fish that remained alive in the net which were not needed for analysis were released unharmed. Others were field dressed and returned to the local Department of Conservation agent in Sauk City.

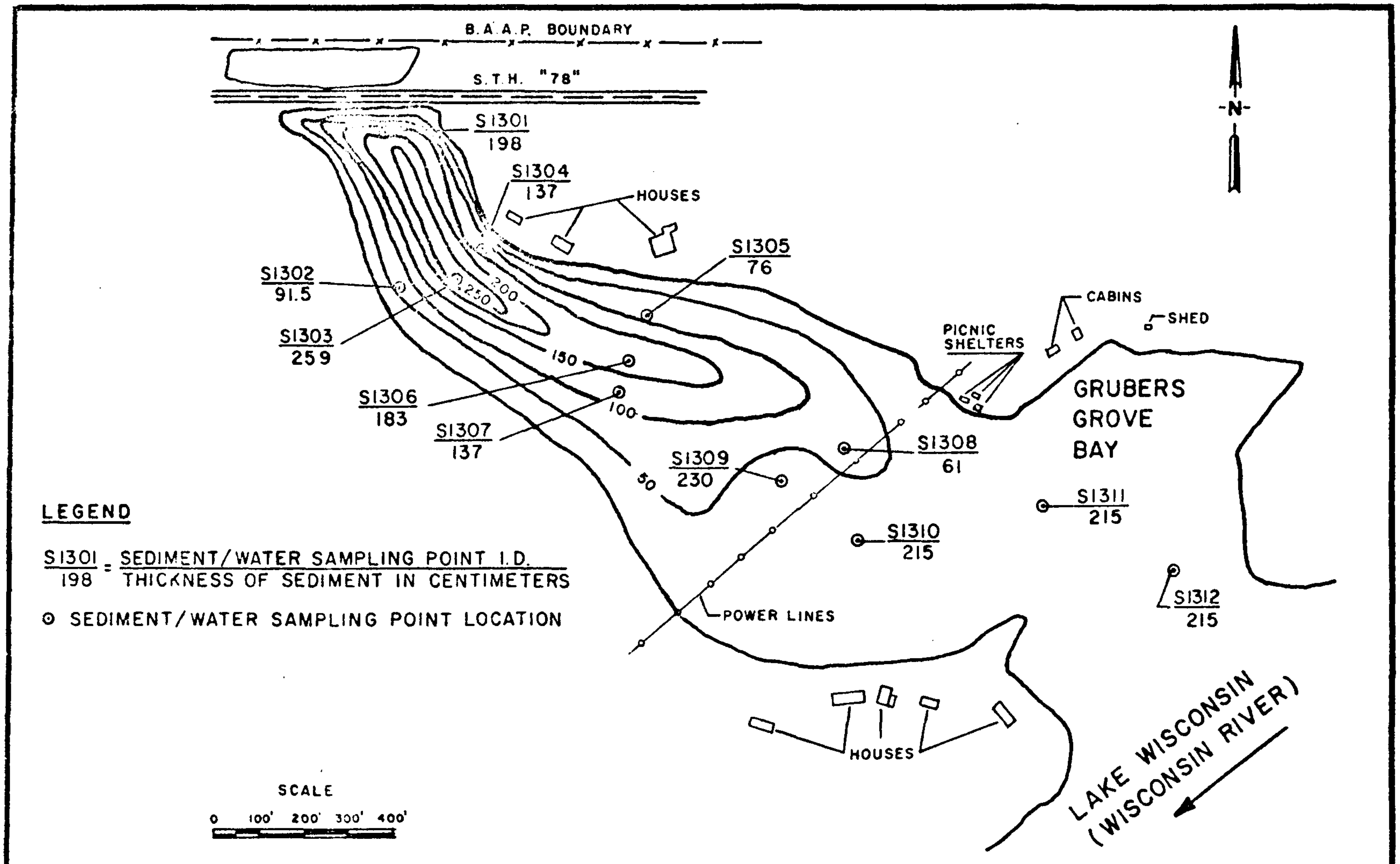

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FIGURE 6-6

RECENT SEDIMENT THICKNESS
GRUBERS GROVE BAY

TABLE 6-2
FISH COLLECTION

Sample Number	Common Name	Genus Species	Age (years)
Grubers Grove Bay			
B0201	Sauger	Stizostedion canadense	2.5
B0202			2.5
B0211			2.5
B0212			2.5
B0203	Carp	Cyprinus carpio	2.5
B0214			2.5
B0214			5.5
B0216			5.5
B0204	Redear sunfish	Lepomis microlophus	1.5
B0219			1.5
B0205	Yellow perch	Perca flavescens	2.5
B0206			2.5
B0207	White bass	Morone chrysops	0.8
B0222			0.8
B0233			
B0208	Northern pike	Esox lucius	3.5
B0209			3.5
B0210	Walleye	Stizostedion vitreum	2.5
B0218			2.5
B0213	Brown bullhead	Ictalurus nebulosus	1.5
B0220			1.5
B0227			1.5
B0228			1.5
B0223	White sucker	Catostomus commersoni	3.5
B0221	White crappie	Poxomis annularis	0.8
B0226	Rock bass	Ambloplites rupestris	2.5
Wiegands Bay			
B0235	Sauger	Stizostedion canadense	1.5
B0236			1.5
B0237			1.5
B0240	Carp	Cyprinus carpio	5.5
B0241			4.5
B0229	Yellow perch	Perca flavescens	2.5
B0248			2.5
B0232	White Bass	Morone chrysops	3.0
B0233			1.0
B0238	Northern pike	Esox lucius	1.5
B0239			2.5
B0245	Walleye	Stizostedion vitreum	2.5
B0246			1.5
B0234			4.5
B0231	White crappie	Poxomis annularis	0.8
B0247			1.5
B0230	Black crappie	Poxomis nigromaculatus	1.5
B0242	Channel catfish	Ictalurus punctatus	9.0
Wisconsin River			
B0217	Lake sturgeon	Acipenser fulvescens	10.0
B0225			14.0
B0224	Channel catfish	Ictalurus punctatus	11.0
B0243	Carp	Cyprinus carpio	10.5
B0244			8.5

Fish that were retained for analysis were placed on ice and taken to the BAAP for cleaning. The fish were identified, weighed, measured and logged with sample numbers. The skinless lateral line and stomach tissues were removed and placed in clean quart amber bottles and immediately frozen. Fish were transported frozen to the EEI laboratory for analysis.

Scales were removed for age determination from those fish taken for tissue analysis. The scales were prepared in glycerin and annuli were counted under a dissecting microscope to determine the number of years of growth.

Pectoral spines were taken from catfish and pectoral fin rays were removed from lake sturgeon also for the purpose of aging. These were sectioned with a jewelers saw and growth rings were counted to determine the years of growth.

CHEMICAL ANALYSIS

The number of samples and the types of analyses performed on them for each category of sample (water, sediment and fish) are shown in Table 6-3. The samples were analyzed according to the same methods and procedures described in Chapter 5. The QA/QC procedures described in Chapter 5 were also applied to these samples. The analytical results for these samples are included in Appendix I by both site ID and test name.

DATA INTERPRETATION

Screening Phase

Grubers Grove Bay was the initial receiving body for all industrial wastewater discharges from BAAP. The GC/MS analyses performed on the water and sediment samples from Grubers Grove Bay (sites S1301-S1312) and from Wiegands Bay (S1314) were conducted during the screening phase of this investigation. A summary of the results of these analyses is shown in Table 6-4. Several other parameters (Al, Nc, NO_2, NO_3, Pb, Sn, and SO_4) were also checked as part of the screening phase.

The GC/MS analyses were performed in order to determine the presence of any organic contaminants which may have originated from operations at BAAP. The results of these analyses are included in Appendix I. Those compounds identified in the samples which EEI believes may have originated from BAAP manufacturing operations are shown in Table 6-4.

TABLE 6-3

ANALYSES PERFORMED ON SEDIMENT

	Number of Samples Analyzed For:											
Sample Type	Al	CEC	COD	NH_3	NC	NO_3	NO_2	Pb	pH	Sn	SO_4	GC/MS
Water	3	NA	0	0	4	3	3	3	0	4	2	4
Sediment	13	22	26	25	3	12	0	13	26	13	13	4
Fish	0	0	0	0	0	0	0	0	0	0	0	3

NOTES: NA - Not an appropriate test

TABLE 6-4

SUMMARY OF POSITIVE GC/MS RESULTS:
GRUBERS GROVE BAY AND WIEGANDS BAY[a]

Site ID	Sample Number	DEP[b]	DBP[b]	DPA[b]	S/W/F[b]
S1301	D5036C	0.31	3.1	3.1	S
S1307	D5054C	0.23	17	24	S
S1312	D5069C	140	0.61	91	S
S1314	M0017	1.4	0.23		S
S1301	W0016	6	3		W
S1307	W0017	2	1		W
S1312	W0018	1	<1		W
S1314	W0019	<1	<1		W
B0210/B0218 (Walleye)		0.02	0.1		F
B0216 (Carp		0.03	0.1		F
B205/B0206 (Perch)		0.02	0.1		F

NOTES: (a) All results reported as either µg/g or µg/l for solids and water, respectively.

(b) DEP = Diethylphthalate
DBP = Dibutylphthalate
DPA = Diphenylamine
S/W/F = Sediment/Water/Fish

The sediment sample from site S1312 had higher concentrations of diethylpthalate (DEP) and diphenylamine (DPA) than that found in the background sediment sample from Wiegands Bay (site S1314). Site S1312 is at the mouth of Grubers Grove Bay, and the sediment there may be strongly influenced by Lake Wisconsin. Although DEP and DPA are used at BAAP, they are commonly used in many industrial operations and they are probably not unique to BAAP. Therefore, their presence in the sediment at site S1312 is not necessarily due to the operations at BAAP.

The sediment sample at site S1307 (near the middle of Grubers Grove Bay) had a higher concentration of di-n-butylpthalate (DBP - another commonly used industrial chemical) than that found in the background sample (site S1314 - Wiegands Bay). Since BAAP is the only industrial operation draining into this bay, the DBP in the sediment at this site probably originated in the manufacturing operations at BAAP. However, the concentration of DBP in this sample (at site S1307) is so low that it does not constitute a threat to man or the environment.

The three water samples collected from Grubers Grove Bay also contained slightly elevated concentrations of DBP and DEP, but still at the "trace" level and of no great concern. None of the other suspected organic contaminants (such as 2, 4-DNT) were detected in either the sediment or water samples from Grubers Grove Bay.

Nitrocellulose (Nc) was manufactured at BAAP in large quantites and is not a common industrial compound. Though explosively combustible when completely dehydrated, it is highly hygroscopic and will readily absorb enough moisture from the air to render it inexplosive. It is very insoluble in water. It is not considered toxic; however, it will slowly decompose in the environment under anaerobic conditions to form ammonia.

With these properties, Nc was considered a good indicator for contaminated sediment. It was found in high concentrations in two of the three sediment samples from Grubers Grove Bay that were analyzed for it as part of the screening phase of this study (see Table 6-5). Because it was found in such high concentrations, it was decided to test the sediments for ammonia (one of the degradation products) and chemical oxygen demand (COD) during the verification phase. It was also decided that, since the sediments were contaminated, three of the fish samples should be given a general screening for organics via GC/MS.

TABLE 6-5

SUMMARY OF POSITIVE ANALYTICAL RESULTS BY SITE ID

S1300 SERIES : SOIL/SEDIMENT

Site ID	Sample Number	Depth (cm)	NC (%)	Pb (µg/g)	HN_3N_2 (µg/g)
S1301	D5036C	0	4	10	70
S1303	M00076	0	NA	NA	2000
S1305	M0012	0	NA	NA	3000
S1306	D5051C	0	NA	300	NA
	D5050	183	NA	NA	600
	M0013C	0	NA	NA	3000
S1307	D5053	183	NA	NA	1000
	D5054C	0	17	90	1000
S1310	D5061	0	NA	NA	1000
	D5062	61	NA	NA	600

NOTES: NA = Not Analyzed

Sediment sample D5051C from site S1306 (middle of Grubers Grove Bay - see Figure 6-2) contained a slightly elevated concentration of lead (300ug/g). According to the manual Quality Criteria for Water (USEPA - July, 1976) "the usual range of lead-in-soil concentrations is 2-200 ppm." If it is assumed that this range is also typical for lake sediments, then the lead content of sample D5051C indicates some degree of contamination. However, since none of the other 13 sediment samples tested for lead had high concentrations, any lead contamination present in the sediments is not very extensive.

Verification Phase

The results of the COD and ammonia analyses of the sediment samples are included in Appendix I. As summarized in Table 6-3, high concentrations of ammonia were found in many of the sediment samples in Grubers Grove Bay. Though the COD content of the samples was also very high, it was not significantly higher than that of the two control samples from Wiegands Bay (S1313 and S1314).

The high COD and ammonia concentrations in the sediments indicate that nitrocellulose contamination is extensive throughout most of the bay. It is also apparent that the Nc is decomposing and releasing ammonia.

The results of the GC/MS analyses performed on the three fish samples are included in Appendix I, and summarized in Table 6-4. As shown in this table, DEP and DBP were detected in the fish, but not at concentrations significantly above the blank analysis. None of the other suspected contaminants from BAAP operations (e.g. 2, 4-DNT) were detected. Though there is no reason to believe they originated from BAAP, several other contaminants of environmental and human health concern were detected in the fish samples. These contaminants are also listed in Table 6-4.

MACROINVERTEBRATE STUDY

EEI surveyed benthic macroinvertebrates in two bays of Lake Wisconsin in order to assess the differences, if any, between them. The study was designed as a single phase investigation that could provide qualitative data on gross community differences. The study included determination of the optimum number of sampling points, location of points, collection of organisms and relevant field data, and analysis of information. The single phase (one-time collection) nature of this investigation precluded any in-depth analysis of the biological community structure; the limited data have therefore been interpreted on the basis of prior experience with similar ecosystems.

Materials and Methods

Benthic macroinvertebrates were collected at five sampling stations in each of both Grubers Grove Bay and Wiegands Bay (see Figures 6-7 and 6-8). The stations in Grubers Grove Bay were chosen by a stratified random method that was designed to provide information on the variations in physical habitats from the mouth of the bay to its back. The sampling stations in Wiegands Bay were selected in a similar manner and were paired with the stations in Grubers Grove Bay. The a priori selection of stations in Wiegands Bay proved to be satisfactory to the extent that the pooled data for each bay could be analyzed on a comparative basis.

Benthic grab samples were taken with a tall version of the standard Ekman bottom sampler. The tall version was used because of the extremely soft sediments encountered. Five grab samples were composited at each sampling station. Material was removed from the Ekman sampler and washed in the field through a standard No. 30 sieve bucket. The material that was retained by the sieve was placed into one-half gallon jars and preserved with either 70 percent ethyl alcohol or 5 percent formalin depending on the amount of organic debris in the sample.

Depth of water, temperature of the water at the bottom, the dissolved oxygen at the bottom and secchi disc depth were also measured at each sampling station before taking bottom samples (Table 6-6).

Benthic samples were sorted to remove all organisms. The actual time required to sort each sample varied directly with the amount of debris; the time spent varied from 30 minutes to over 3 hours for individual samples. Organisms were transferred to 70 percent ethyl alcohol for storage. Identification of organisms was aided by the use of both dissecting and light transmittance microscopy. Larvae of the chironomidae were cleared by heating in a 5 percent solution of potassium hydroxide prior to mounting on microscope slides in glycerin jelly. All organisms were identified to the lowest possible taxonomic level for which reliable identification characters have been established.

Zooplankton and phytoplankton samples were also collected at six of the sampling stations (see Table 6-7). Zooplankton was concentrated from 45 liters of surface water by using a Wisconsin-style plankton net with detachable plankton bucket.

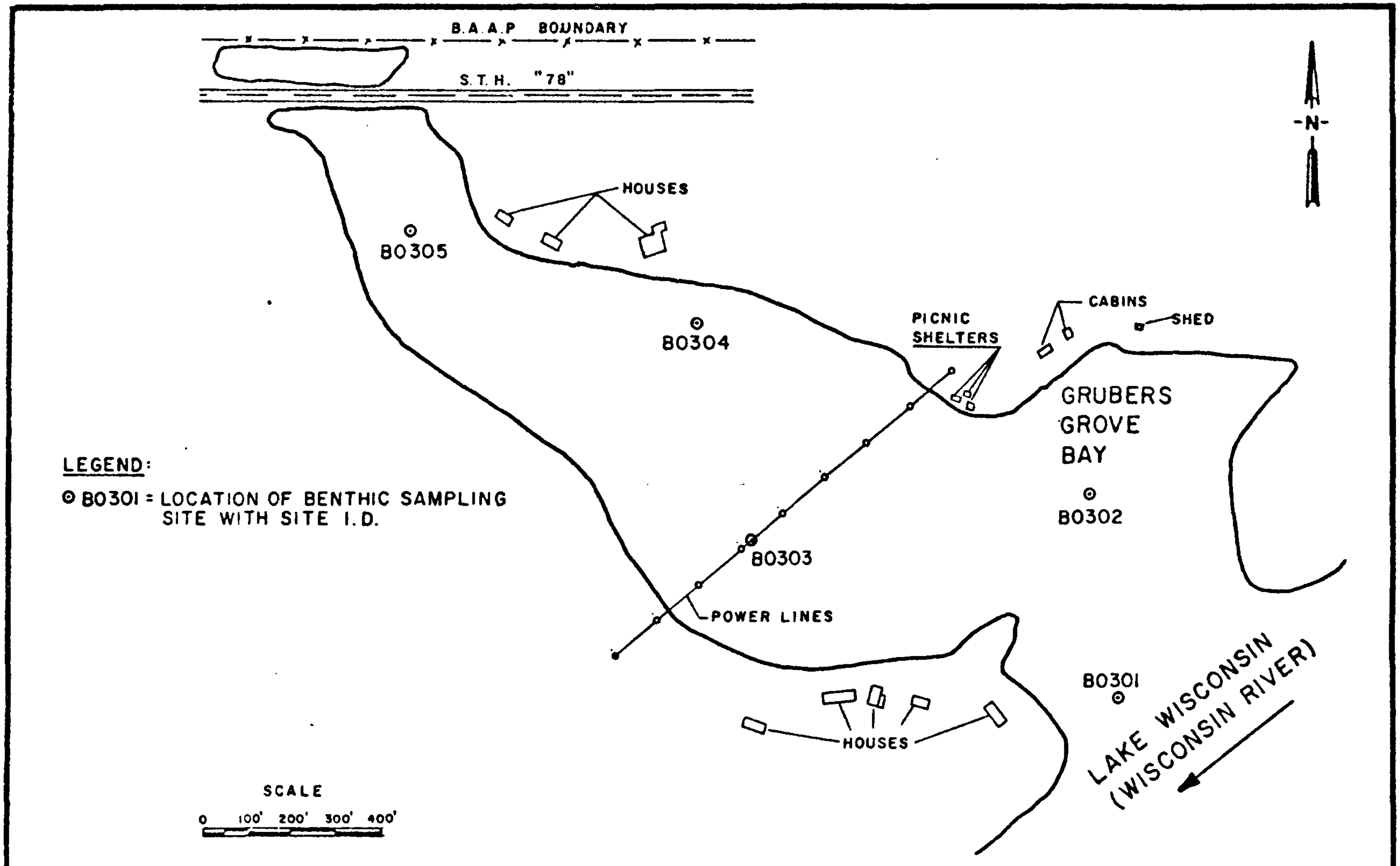

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FIGURE 6-7

LOCATION OF BENTHIC SAMPLING SITES IN GRUBERS GROVE BAY

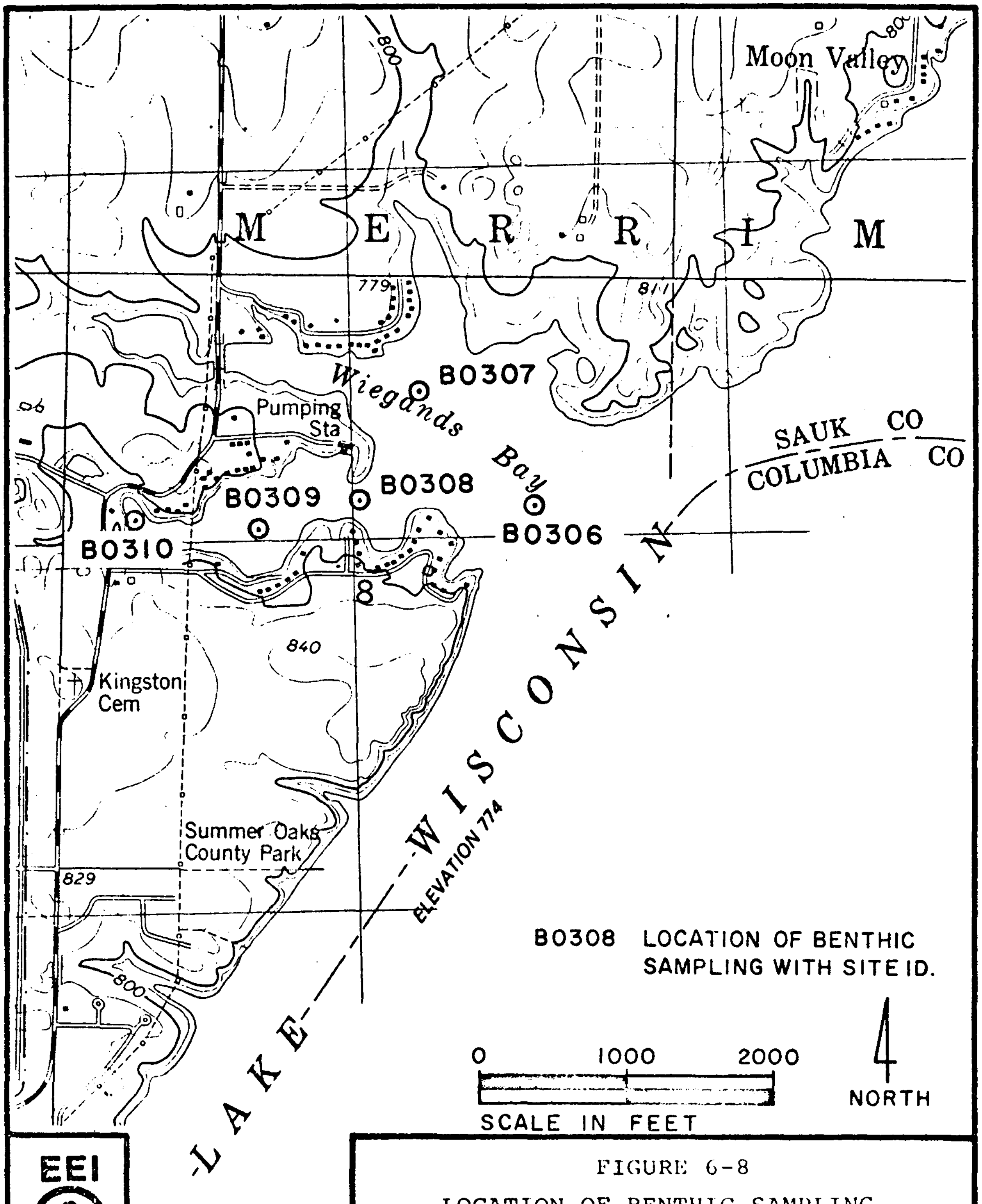

FIGURE 6-8

LOCATION OF BENTHIC SAMPLING SITES IN WIEGANDS BAY

TABLE 6-6

FIELD DATA FROM BIOLOGICAL COLLECTION
(NOVEMBER 5-7, 1979)

Sample Station	Depth (meters)	Dissolved Oxygen[a] (mg/l)	Temperature (°C) Surface	Temperature (°C) Bottom	Secchi Disc Depth (cm)	Water Volume for Zooplankton (liters)	Water Volume for Phytoplankton (liters)
B0301	6.1	10.4	8	7	120	45	3
B0302	4.0	10.6	ND[b]	7	100	NS[c]	NS
B0303	3.7	11.4	8	7	105	45	3
B0304	2.1	10.6	ND	7	105	NS	NS
B0305	0.8	11.4	ND	6	80	45	3
B0306	6.7	10.5	7	6	100	45	3
B0307	4.3	11.0	ND	6	120	NS	NS
B0308	5.5	11.5	8	6	130	45	3
B0309	4.6	11.2	ND	6.5	130	NS	NS
B0310	1.8	11.8	7	7	130	45	3

NOTES:

[a] measured approximately 0.1 meters from bottom

[b] ND = No data

[c] NS = No sample

TABLE 6-7

BENTHIC MACROINVERTEBRATE ORGANISMS COLLECTED AT TEN SAMPLING POINTS IN LAKE WISCONSIN

	Grubers Grove Bay					Wiegands Bay				
	B0301	B0302	B0303	B0304	B0305	B0306	B0307	B0308	B0309	B0310
Oligochaeta										
Lumbriculidae						9				
Peloscolex		9								
Limnodrilus	181	164	9		60	43	26	9	9	215
Ilyodrilus	138	43	60	34	43		43			9
Tubifex tubifex		9								
Gastropoda										
Lymnaea						9				
Physa					9					17
Valvata	26	17					9			
Pelecypoda										
Sphaerium	17			9		17	43			
Crustacea										
Asellus occidentalis						9				
Hyalella azteca			9							
Ephemeroptera										
Hexagenia rigida	34	9	9			26	77			
Odonata										
Tetragoneuria				9	9					
Hemiptera										
Corixidae (imm.)						9				
Megaloptera										
Sialis	17	26	52				17		9	
Trichoptera										
Oecetis eddlestoni										9
Diptera										
Chaoborus	146	86	60	86	112	9	34	34	723	52
Palpomyia	103	189	112	34	172	34	95	77		9
Procladius	370	577	258	112	69	189	215	17	26	34
Coelotanypus	9		9	86	52	77				
Prodiamesa						9				
Pseudosmittia										9
Chironomus	9	95	26	9	77	706	43	26	9	9
Cryptochironomus		9	9		17					
Number of Taxa	11	12	11	8	10	13	10	5	5	9
Total Organisms/m^2	1,050	1,233	613	379	620	1,146	602	163	776	363
Diversity Index (decits) H'	.81	.73	.77	.75	.87	.60	.85	.59	.14	.61

NOTE: Density of each organism at each station is given as the number of organisms per square meter (m^2) of bottom area.

Zooplankton samples were preserved and stored for future analysis. Phytoplankton was collected just below the water surface, preserved with Lugol's solution, and concentrated by settling in accordance with USEPA guidelines (1). These samples were also stored for future analysis. Surface water temperature was recorded at the sampling stations where plankton was collected (Table 6-6).

Statistical analysis of the benthic community structure was limited to an analysis of select populations from each bay examined. The five dominant taxa from each bay were tested separately for similarity of population size and variability by using the Mann-Whitney-U test for differences between small samples. This non-parametric test was chosen because of the small sample size (number of stations per bay = n = 5) and because it could not be assumed that the samples of each species were normally distributed (2). This same procedure was used to analyze the data on the number of taxa and total density at each station. Other statistical methods employed were simple descriptive statistics.

Results

Benthic macroinvertebrates collected from two bays in Lake Wisconsin were categorized into 24 distinct taxa. The number of taxa collected at each sampling station varied from five (B0308, B0309) to thirteen (B0306). The dominant faunal types were aquatic Oligochaetes (16 percent of all organisms collected) and Diptera larvae (76 percent of all organisms collected). The Diptera larvae were composed of 59 percent Chironomidae, 25 percent *Chaoborus* and 16 percent *Palpomyia* (Ceratopoganidae). The results of the benthic sampling are presented in Table 6-7 as the number of organisms per square meter of bottom area.

Each taxon collected was classified as tolerant or intolerant of organic pollution on the basis of published information (1), (3), (4), (5). Most of the benthic organisms were classified as facultative, having adapted to some organic pollution; the remainder were either tolerant of organic pollution or not classified. The USEPA (1) defines tolerant species as organisms frequently associated with gross organic contamination which are generally capable of thriving under anaerobic conditions. Facultative organisms have a wide range of tolerance and frequently are associated with moderate levels of organic contamination.

Figure 6-9 illustrates the percentage of organisms (not species) collected at five stations in Grubers Grove Bay that were tolerant, to some degree, of organic pollution. A mean of 75.3 percent of all organisms collected in Grubers Bay were facultative (standard deviation = S_x = 8.1) and a mean of

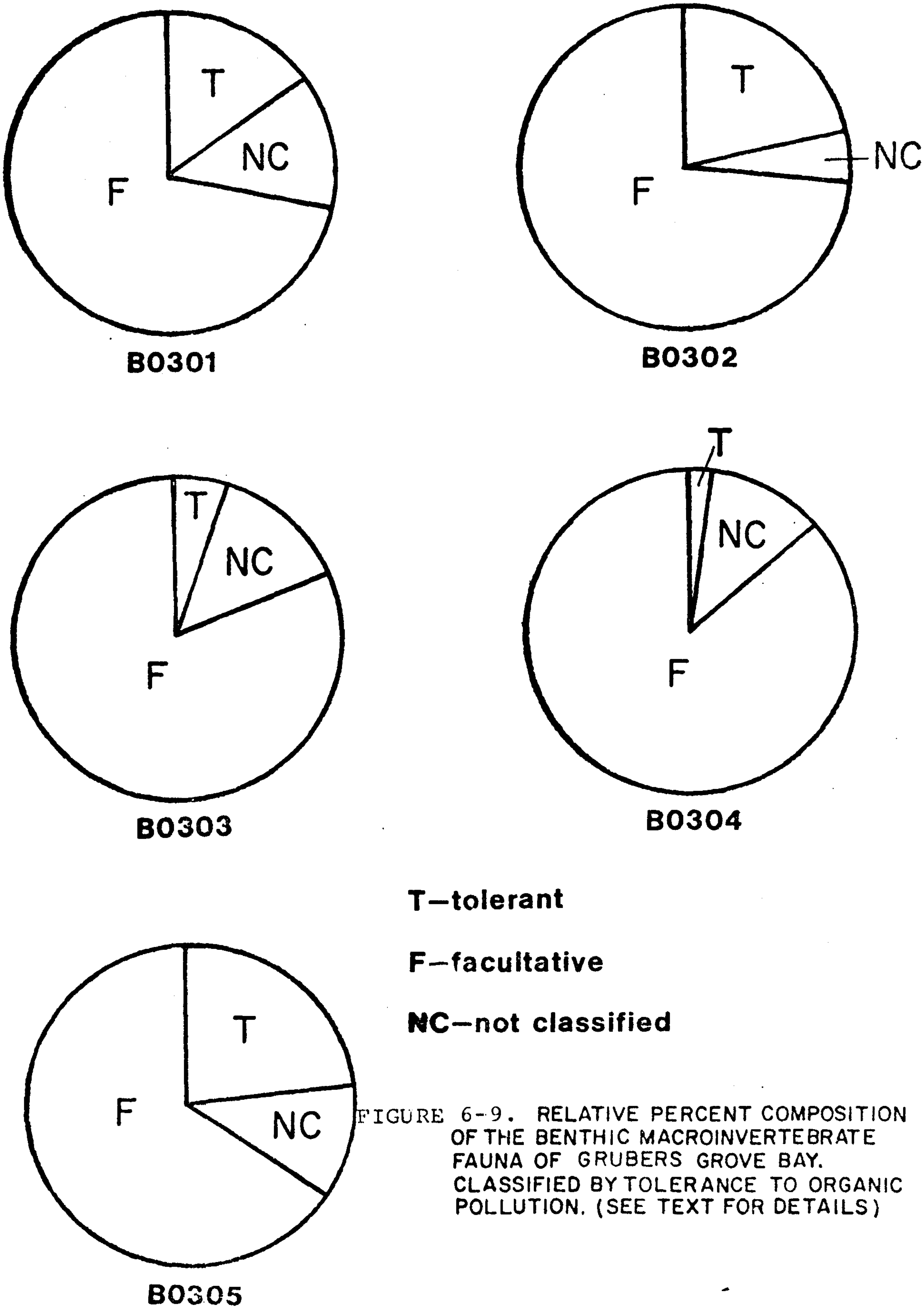

FIGURE 6-9. RELATIVE PERCENT COMPOSITION OF THE BENTHIC MACROINVERTEBRATE FAUNA OF GRUBERS GROVE BAY. CLASSIFIED BY TOLERANCE TO ORGANIC POLLUTION. (SEE TEXT FOR DETAILS)

14.3 percent (S_x = 8.6) were tolerant. Figure 6-10 provides similar data for Wiegands Bay with the mean percent of facultative forms 63.9 (S_x = 27.7) and of tolerant forms 33.6 (S_x = 27.4).

In Table 6-8, the species from each station are divided into the same pollution tolerant categories. This table deals with the number of species and not with organism density as in Figures 6-9 and 6-10. A significant difference in the species composition of Grubers Grove and Wiegands Bay is evident upon examination of the ratio of tolerant to facultative species in each bay. Grubers Grove Bay has an average ratio of tolerant:facultative species of 0.397; the ratio for Wiegands Bay is 0.540. The significance of this variation is apparent when one considers that, of the 24 species collected, 12 were obtained from both bays, five were taken only from Grubers Grove Bay, and seven were taken only from Wiegands Bay (Table 6-7).

Specific information on statistical differences in selected populations was obtained using the Mann-Whitney-U test. The procedure for this test employed the null hypotheses (H_O) of no difference between the values of the two bays. If the null hypothesis could not be rejected after performing the required analysis, there would be no differences between the two bays. Rejection of H_O indicated a significant difference between the bays. The test statistics and results of the Mann-Whitney-U analyses are summarized in Table 6-9.

Discussion

The composition and structure of the benthic invertebrate communities in these two bays were investigated to determine the relative quality of the available habitats in Grubers Grove Bay. The presence of a large quantity of allochothonous sediment in Grubers Grove Bay, derived in part from precipitates of the water, wastewater and sanitary waste treatment processes of the Badger Army Ammunition Plant, may have affected the ability of this bay to sustain a healthy, diverse community of benthic invertebrates. In order to properly assess the current biological community, the composition, distribution and diversity of the community were determined and these factors were analyzed in relation to a background or "control" area.

Grubers Grove Bay yielded a mean 779 organisms per square meter at the five sampling stations. This compares favorably with the mean density of Wiegands Bay which was 610 organisms per square meter. Seventeen species were taken in samples from Grubers Grove Bay while 19 species were taken in Wiegands Bay.

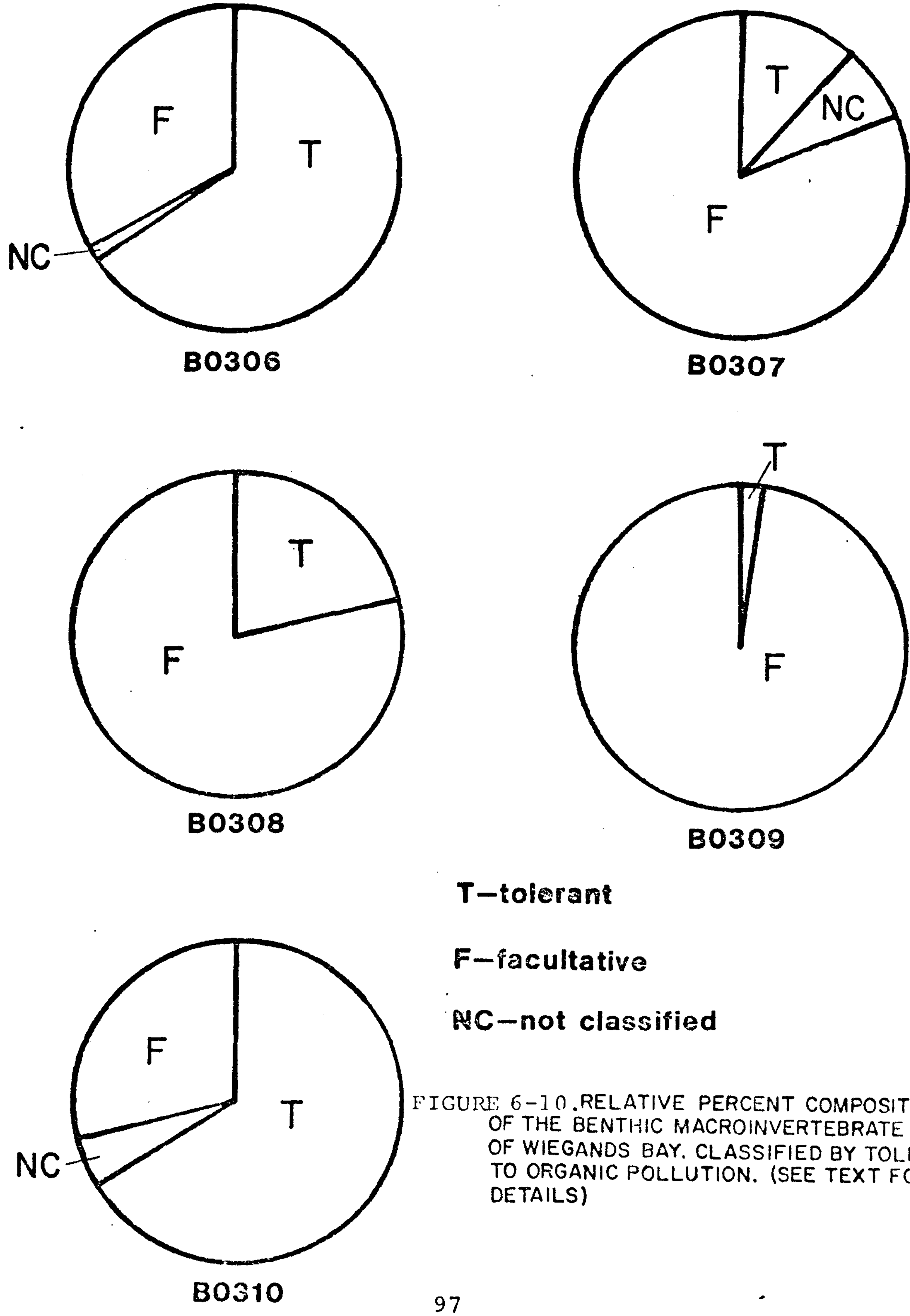

FIGURE 6-10. RELATIVE PERCENT COMPOSITION OF THE BENTHIC MACROINVERTEBRATE FAUNA OF WIEGANDS BAY. CLASSIFIED BY TOLERANCE TO ORGANIC POLLUTION. (SEE TEXT FOR DETAILS)

TABLE 6-8

NUMBER OF SPECIES FROM EACH SAMPLING STATION AND THEIR CLASSIFICATION BASED ON TOLERANCE TO ORGANIC POLLUTION

	Tolerant	Facultative	Not Classified
B0301	2	8	1
B0302	3	6	3
B0303	2	7	2
B0304	1	5	2
B0305	3	4	3
B0306	3	9	1
B0307	2	7	1
B0308	2	3	0
B0309	2	3	0
B0310	3	4	2

TABLE 6-9

MANN-WHITNEY-U TEST STATISTICS FOR THE NULL HYPOTHESIS (Ho) OF NO DIFFERENCE IN THE POPULATION IN GRUBERS GROVE BAY AND WEIGANDS BAY

	$n_1 - n_2$	α	Probability	Reject Ho
Limnodrilus	5	0.1	>0.1	No
Chaoborus	5	0.1	>0.1	No
Palpomyia	5	0.1	<0.1	Yes
Procladius	5	0.1	<0.1	Yes
Chironomus	5	0.1	>0.1	No
Number of Taxa	5	0.1	>0.1	No
Density	5	0.1	>0.1	No

NOTE: Mann-Whitney-U test statistics for the null hypothesis (Ho) of no difference in the populations in Grubers Grove Bay and Wiegands Bay. n_1 and n_2 are the number of sample points in the two bays; α is the arbitrary level of significance; rejection of Ho indicates a statistically significant difference between the values of the test parameters of the two bays. Values for each n-parameter were taken from Table 6-7.

Both the mean density and the number of species present indicate that the two bays were mesotrophic to slightly eutrophic. This trophic classification is reinforced by the relative percentages of the two dominant organism types, larvae of the Chironomidae and Oligochaetes (6).

Examination of the data presented in Figures 6-9 and 6-10 must be prefaced by the following qualifications. The basis for classifying a species as either tolerant or facultative was published information derived from diverse geographic locations. The limited level of taxonomic identification of these organisms prevented an absolute classification. Also, it must be remembered that this classification system was devised in conjunction with organic pollutants only, usually sanitary waste. The classification system was employed for comparative purposes in this study because it deals only with qualitative information on a gross community level.

The graphs in Figure 6-10 illustrate the high diversity of both tolerant and facultative organisms in Wiegands Bay. The overall physical and biological quality of the bay coupled with this diversity indicates a basically healthy, moderately diverse habitat range. The wide fluctuation in the percentage of pollution tolerant forms is probably an indication of localized stress that could result from a variety of indeterminate factors. Greater fluctuation in species composition/pollution tolerance indicates a more heterogeneous, patchy environment. The more heterogeneous the area, the more stable and therefore healthy the biological community (7)(8). Figure 6-9 indicates that Grubers Grove Bay lacks some of the variability that is found in Wiegands Bay. The relative stability of the proportions of facultative and pollution tolerant organisms is indicative of a more homogeneous environment, or less patchiness in the available habitat types.

The data presented in Table 6-8 and the ratios of tolerant: facultative species discussed previously (Results) help to reinforce the impression of differences in habitat patchiness. The overlapping ecological niches of pollution tolerant and facultative forms prohibit interpretation of qualitative differences between habitats in the two bays.

Statistical analyses of the five dominant species present in both Grubers Grove and Wiegands Bays must be interpreted with some knowledge of the ecology of the species examined. *Palpomyia* is a biting midge whose larval stage is essentially littoral. The preferred habitat of this genus is in floating mats of algae with overwintering accomplished by dispersion across the sediments in the areas of normal summer habitation.

As indicated in Table 6-7, this species was found in significantly higher density in Grubers Grove Bay than in Wiegands Bay. Two possible explanations for this disparity are that Grubers Grove Bay is more stagnant during summer months and therefore accumulates a greater quantity of floating algal mats, or that the probability of finding algal mats at the sampling stations chosen in each bay was not equal. The date of sampling prevented assessment of these possibilities because cold weather and frost had killed off floating algae and the *Palpomyia* had already retreated to their overwintering benthic habitat. Although there was a significant difference in the populations of *Palpomyia* between the two bays, it was not possible to determine whether this was the result of true environmental difference or just an artifact of the sampling program.

There is a significant difference in the density of *Procladius* between the two bays with a larger population occurring in Grubers Grove Bay. The limited information on the ecology of *Procladius* and the physical/chemical characteristics of each bay do not allow for an explanation of this significant difference in populations. Additional information on the seasonal changes in some chemical parameters, especially dissolved oxygen and dissolved organics, would probably provide the necessary key to understanding the local biology of *Procladius*.

Additional efforts made to determine differences between the two bays (Table 6-9) included examination of three additional species and two calculated measures of community size. The inability to reject the null hypothesis in these few cases indicated a lack of significant differences between the bays.

These analyses therefore support the descriptive statistics discussed earlier that deal with the density and number of species in each bay. They underline the lack of real differences between the benthic biota of the two bays at both the organismal and community density levels.

Summary

The intent of the benthic invertebrate investigation was to provide the information needed to draw general conclusions on the effects of contamination. No gross differences in the biotas investigated were found and those that were apparent were a matter of degree and not composition. The reliability of the data interpretation was seriously impaired by the lack of any data on seasonal changes. The large changes in water chemistry that accompany the change of seasons also produce major changes in the faunal composition. During different seasons the parameters that limit growth change markedly. Examples of these potentially limiting parameters are temperature, dissolved oxygen, turbulence due to wave action and/or currents, turbidity, nutrient availability, light intensity, and light penetration. The presence of contaminants in the sediments or water may affect only a few of these parameters. If the faunal community is examined during a season where the affected parameters are not limiting, there may be no observable impact on the fauna. If that same location is examined during a season where the affected parameters are limiting, significant impacts on the faunal community may be observed. Therefore, the lack of data concerning seasonal variability within each of the two bays limits the conclusions which can be drawn from the results of this study to those outlined below.

Conclusions of the Macroinvertebrate Study

1) Mean density, the number of species obtained and the proportional composition of the major taxa indicate that both bays are mesotrophic and similar in community structure.

2) Although it must be viewed with caution, the pollution tolerance classification system applied to both organism density and number of species indicates a strong possibility of decreased habitat patchiness and increased homogeneity of the benthic environment in Grubers Grove Bay when compared to Wiegands Bay.

3) Mann-Whitney-U analyses failed to demonstrate any significant differences between the benthic invertebrate fauna of Grubers Grove Bay and Wiegands Bay. The paradox presented by *Procladius* is probably the result of insufficient data on the chemical and physical ecology and may or may not represent a significant difference between the biotas in relation to the sediment quality.

SUMMARY DISCUSSION OF THE RESULTS OF THE INVESTIGATIONS IN GRUBERS GROVE BAY

The primary purpose of the investigation conducted in Grubers Grove Bay and Wiegands Bay was to try to answer some of the questions that had arisen about the impacts of proposed dredging in Grubers Grove Bay. The questions which this investigation attempted to answer are:

1) Are the sediments in Grubers Grove Bay contaminated with materials discharged during manufacturing operations at BAAP?

2) If the sediments are contaminated, what is the nature and extent of the contamination?

3) If the sediments are contaminated, are they having a measurable adverse impact on the aquatic ecosystem in the bay?

4) Would the sediments, if left in place, have any long term adverse effect on the environment?

5) Would dredging the sediments tend to release contaminants into the water that presently are trapped in the sediments?

The following discussion answers these questions on the basis of study results.

1) The sediments in Grubers Grove Bay appear to be contaminated with nitrocellulose discharged during manufacturing operations at BAAP. There appears to be a slightly higher concentration of di-n-butylpthalate (DBP) in the sediment in Grubers Grove Bay than in the sediment in Wiegands Bay. This compound may possibly have originated from BAAP. A high concentration of lead was found in one out of the eleven sediment samples from Grubers Grove Bay that were analyzed for lead.

2) Nitrocellulose contamination is widespread throughout the sediments in Grubers Grove Bay, as indicated both by analyses conducted specifically for nitrocellulose and by analyses for ammonia, one of its degradation products. High ammonia concentrations and a high COD are associated with the nitrocellulose contamination. DBP contamination, which may not have been derived from BAAP, is present only in very low concentrations. Lead contamination, if actually present, is not extensive.

3) The macroinvertebrate study indicated that there is no significant difference in the late fall benthos of Grubers Grove Bay and that of Wiegands Bay. The fish tissue analyses indicated that none of the BAAP - related organic compounds had accumulated in the five fish (three samples) tested.

4) As noted in Chapter 2 of this report, the water in the upper portion of Grubers Grove Bay is in a perched condition with respect to the underlying aquifer, and water from Grubers Grove Bay is recharging this aquifer. The apparently perched condition of the upper end of the bay indicates that the sediments in this area have a

low coefficient of permeability. Chemical analyses of these sediments revealed that they have a very high ammonia content. Therefore, it is likely that water containing a high concentration of ammonia may be slowly recharging the underlying aquifer, thereby contaminating the groundwater. This assumption has not been investigated. Since groundwater in this area is moving very slowly to the west - southwest (tens of feet per year), groundwater contamination, if present, will not have migrated very far in the 39 years since BAAP started manufacturing operations.

5) The sediment in Grubers Grove Bay has a high concentration of ammonia. Based on the perched condition of the bay with respect to groundwater and the results of nitrate anaylses of water samples collected in Grubers Grove Bay, it appears that this ammonia is not currently being released into the bay in significant concentrations. However, if the contaminated sediments are disturbed through dredging, this disturbance would certainly release some of the ammonia. Unless the return flow from the dredging operation was treated for ammonia removal (a very expensive treatment), the return flow would probably contain very high concentrations of ammonia. This release of ammonia would have a very detrimental, though short term, impact on the aquatic fauna in Grubers Grove Bay and the surrounding portions of Lake Wisconsin.

LIST OF REFERENCES FOR CHAPTER 6

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CHAPTER 7

INTERPRETATION OF THE SURVEY DATA

The interpretation of the analytical results is presented in two sections - the screening phase and the verification phase - so that the discussion corresponds to the format of the survey, which was also divided into these two phases. The screening phase relied heavily on the use of GC/MS for qualitative screening of organic contaminants. Other parameters included in the screening phase as quantitative analyses included aluminum, lead, tin, nitrocellulose, nitrite, nitrate and sulfate. During the verification phase, samples were selectively subjected to quantitative analyses for parameters identified during the screening phase.

INTERPRETATION OF SCREENING PHASE DATA

Interpretation of the results of the screening phase is best accomplished by relating the screening data with the potential pollution sources (Figure 7-1). For the data generated in this study, the pollutants observed in soil samples (see Tables 2-1 and 4-1) should be correlated with pollutants observed in the down gradient groundwater samples or the downstream water and sediment samples. This type of correlation is made in the following summary of the screening results. The analytical data on which this summary is based is included in Appendices I and K.

Certain parameters, especially the pthalates, are widespread environmental contaminants, and are often detected at trace levels even in very clean samples. BEHP (Bis(2-ethylhexyl) pthalate) was detected at widely varying concentrations in essentially every GC/MS run. Since this compound was not specifically used in manufacturing operations at BAAP, the BEHP results are not considered meaningful. Diethylpthalate and dibutylpthalate are commonly used compounds, and were also usually detected in at least trace amounts in the GC/MS runs. Since both of these compounds were used at BAAP, the higher concentrations of these compounds detected in the samples cannot be ignored. Generally, low (less than 10) ppm concentrations in soils/sediments, and low ppb concentrations in water are believed to be "background" concentrations, and not indicative of actual contamination.

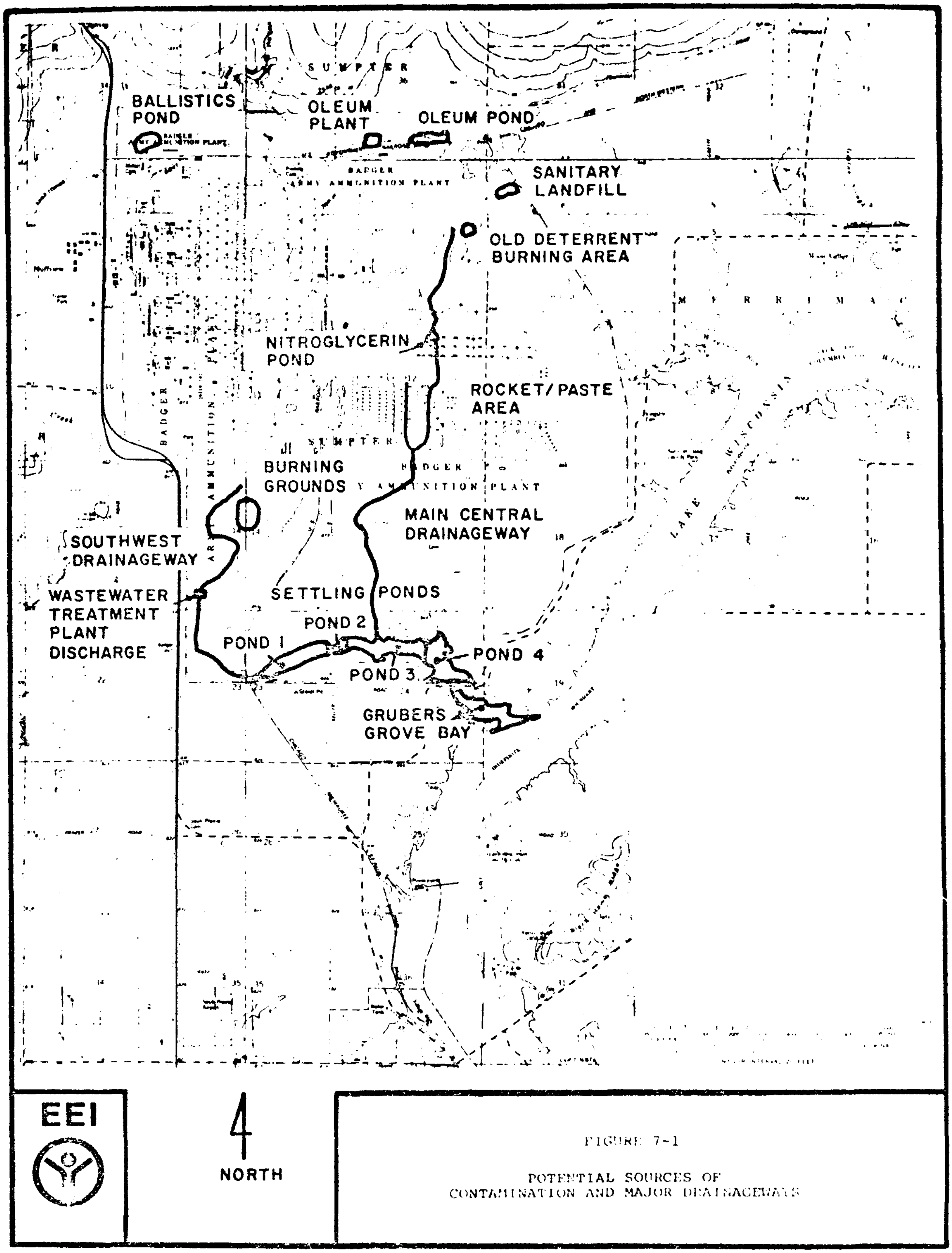

FIGURE 7-1

POTENTIAL SOURCES OF CONTAMINATION AND MAJOR DRAINAGEWAYS

Source: Ballistics Pond; Sites Downgradient/Downstream: Well S1127

Well S1127 is downgradient from the Ballistics Pond. The contaminant of concern from the Ballistics Pond is aluminum. The concentration of aluminum in the sample collected from Well S1127 was less than (L.T.) 0.3 mg/l.

Source: Deterrent Burning Area (Soil Site S1402); Sites Downgradient/Downstream: Well S1122

The sample taken from Well S1122 is downgradient from an old burning area on the plant grounds at which a variety of materials was handled. Soil sample site S1402 is located within this burning area. Dinitrotoluene (DNT) was observed in this soil sample, but was not observed in the well sample.

Source: Oleum Plant (Soil Site S1416)

This site was considered a potential source of sulfate contamination for groundwater. Since the oxidation of elemental sulfur in nature is a very slow process, and since such limited quantities of sulfur were observed during the sampling trip, this site is no longer considered to pose a significant threat to groundwater, and no samples were analyzed.

Source: Oleum Pond (Soil Site S1416); Sites Downgradient/Downstream: Well S1132

This potential source was not investigated during the screening phase.

Source: Sanitary Landfill; Sites Downgradient/Downstream: Well S1134

During purging operations conducted just before collecting the sample from Well S1134 (see Chapter 4), two unanticipated problems were noted. The first of these was the extreme turbidity of the water being removed; it felt greasy, similar to drilling mud. The second problem was the extremely low yield of the well. Approximately 16 feet of water was in the well before purging. The well was quickly bailed down to less than 1 foot of water. Approximately 18 hours later, the water in the well had still not risen to its original level (reached equilibrium). At that point it contained approximately 12 feet of water. By comparison, a measurable drawdown could not be achieved by bailing in most of the wells at BAAP. Except for the wells at the landfill (not installed as part of this study), the well with the lowest yield reached equilibrium within 2 hours after being bailed essentially dry. The extremely low yield for Well S1134 could not be attributed solely to the small well diameter (2-1/2 inches, vs. 4 inches for the wells installed as part of this study).

No well construction or well development details were located for the three wells around the landfill (S1134, S1135 and S1136). Because the water which was purged from Well S1134 had the color (gray) and feel of drilling mud, it was assumed that one of the following had occurred. Either the drilling mud had not been completely flushed out from around the well, or the grout, which normally contains some bentonite (the major non-aqueous component of drilling mud), had seeped down around the outside of the well screen/perforated pipe during grouting operations. Either of these two situations might cause the screen and/or aquifer to become partially plugged, and might account for the low well yield.

The low well yield meant that the well could not be thoroughly purged before sampling (Table 4-3). As a result of this, and the obvious turbidity of the sample, the sample may not have been representative of the groundwater outside the immediate vicinity of the well.

The results of the screening phase analyses of this sample showed that it contained relatively high amounts of sulfate (237 mg/l), several hydrocarbons typical of fuel oil components, and dioxolone. The presence of dioxolone may have been a result of the glue used during well installation. The sulfate and hydrocarbons could have come from either the drilling and well installation procedures and materials or from the landfill. These results indicated that another well should be sampled during the verification phase to more accurately assess whether there was leaching from the landfill.

Source: Nitroglycerin Pond (Soil Site S1404); Sites Downgradient/ Downstream: Soil Sites S1406, S1408 and S1409

A trace amount of nitroglycerin (NG) was detected in the sediment sample collected from the Nitroglycerin Pond on the first sampling trip. Nitroglycerin was not specifically analyzed for in any of the other samples. Since it is so readily degradable in the environment, its presence in the sediment of the pond was surprising. It was recommended that additional samples be checked for the presence of nitroglycerin during the verification phase.

Source: Burning Ground (Soil Sites S1410 & S1411); Sites Downgradient/Downstream: Well S1117

Soil site S1410 was essentially clean. Soil site S1411 contained DNT in the ppm range, DEP at ∿240 ppm, DBP at ∿311 ppm, diphenylamine at 28 ppm and nitrodiphenylamine, as well as 1.6 percent lead, and 0.1 percent tin. The presence of nitrodiphenylamine at BAAP was not anticipated, but is not entirely surprising in view of the diphenylamine and nitric acid used at the site. Well S1117 was relatively clean, but did appear to contain carbon tetrachloride and chloroform. Since these compounds are common laboratory contaminants which are sometimes introduced during sample handling, it was recommended that Well S1117 be resampled during the verification phase and checked for the presence of these compounds.

Source: Wastewater Treatment Plant (Soil Sites S1413 and S1414) and Settling Ponds (Sites S1201-S1207); Downgradient/Downstream Sites: Wells S1133 and S1102-S1108

Nitrocellulose, lead, the DNTs, diphenylamine, and DBP, were found in the S1413 - S1414 sediment samples in high ppm levels. Nitrodiphenylamine was also found at these sites. The higher levels of pollutants observed at S1414 were surprising, but may be due to the washing action of a sanitary waste outfall located near S1413.

Sediment sampling Site S1201 is located on the upstream portion of the first settling pond and had high ppm levels of 2,6-DNT, 2,4-DNT, diphenylamine (DPA), and DBP as well as nitrodiphenylamine, nitrocellulose (6 percent), and sulfate (0.1 percent). S1204 (which is at the downstream end of the first pond) had lower (but still ppm ranges) of 2,4-DNT, DPA and DBP as well as a few natural product compounds and 336 ppm of nitrocellulose. S1206 (settling pond 3 sediment) had high molecular weight alcohols and a compound that appears to be a carbamoylpyrazoline. The latter compound has no apparent source and does not appear to be environmentally significant.

The sediment sample at site S1207, which is in pond 4, had high molecular weight alcohols, 0.46 ppm DPA, 2.6 ppm DBP, 0.22 ppm of 2,6-DNT, and 0.1 percent nitrocellulose.

It should be noted that the sampling locations for S1204, S1206 and S1207 were in areas where most of the recent sediment had been removed (Chapter 4). The point at which S1201 was sampled was slightly to the side where not all of the material had been removed. The concentrations of compounds (higher at S1201 than at the other locations) are consistent with this observation.

Well S1133 (upgradient from the settling ponds and downgradient from the treatment plant outfall) was clean. Well S1107 showed traces of DEP (possibly at concentrations high enough to indicate actual contamination - 8 mg/l). Well S1108 showed traces of DPA as well as an oxygen-containing compound of unknown origin.

Source: Rocket/Paste Area; Downgradient/Downstream
Sites: Soil Sites S1408, S1409, and S1415

The soil/sediment samples at Sites S1408 - S1415 showed little evidence of organic contamination. Some DNT was observed at S1415. Natural esters were seen at S1408 and S1409. S1409 also showed several hydrocarbons and S1415 had nitrodiphenylamine. S1408 contained 0.1 percent lead.

Wells Sampled During the Screening Phase Not Related To Suspected Sources Of Contamination

Other wells screened during the survey included S1112, S1123, S1109, S1111, S1115, S1119, S1121, S1125, S1127 and S1130. Significant observations at these sites are discussed below:

1) S1112 - Benzothiazol, methyl ethyl ketone and cyclohexanone were tentatively identified at this site.

2) S1123 - High molecular weight carboxylic acids typical of greases were observed. This well was installed by Warzyn (as were S1124 and S1101) in lower permeability soil than other wells. Greases and oils are sometimes used by drillers quite liberally. Since the well had a relatively low yield, it was not purged as thoroughly as many of the other wells (see Table 4-3). Grease from the drilling tools may not have been completely flushed and purged from the area around the well prior to sampling.

3) S1111 - This site is located next to a bunker. DEP (at 3 ppb), ketone and cyclohexanone were identified at the site.

4) S1119 - This site had methyl ethyl ketone and hydrocarbons typical of a fuel oil. The oil may have been introduced during drilling, or may have come from a fuel oil spill.

5) S1109, S1115, S1121, S1125, S1127, S1130 - These wells were found to be clean.

Based upon a review of the screening data, USATHAMA requested the following tasks as the verification portion of the survey:

1) Groundwater samples (S1100 Series)

   a) Quantification of nitrates and nitrites at wells 2, 3, 5, 6, 7, 8, 13, and 33 after re-sampling the wells.

   b) Quantification of sulfate at wells 30, 31 and 32 after re-sampling.

   c) Quantification of nitroglycerin at well 24, the nitroglycerin pond water and the nitroglycerin pond sediment. The sites were to be re-sampled and the analyses expedited to avoid nitroglycerin decomposition which may have occurred during screening. The results were intended as verification of the presence of nitroglycerin, not as quantification of the levels.

   d) Quantification of 2,4-DNT at wells 2, 3, 4, 5, 7, 8, 9, 11, 13, 21, 22, 23, 30 and 33 after re-sampling.

2) Settling Ponds (S1200 Series)

   a) Screening for DBP and DEP using gas chromatography-electron capture in sediments of sites 2, 3, and 5. Previously collected sediments were to be used for sites 2 and 3. Site 5 has no sediment in the lagoon because sediments were previously bull-dozed out. Two samples of removed sediment were, therefore, to be collected from the spoils pile near site 5 for this analysis.

   b) Quantification of 2,4-DNT using gas chromatography-electron capture in the samples collected for DBP and DEP analysis.

   c) Analysis for DBP, DEP and 2,4-DNT in the subsoils of all borings (1 - 7). Collection of a sediment for site 6 was to be done in the same manner as for site 5 discussed above.

3) Grubers Grove Bay (S1300 Series)

   Additional analyses were requested for samples collected as part of the study on Grubers Grove Bay (see Chapter 6).

In addition to the verification analyses originally agreed upon, the following items were requested at a later date:

1) Quantification of chloroform and carbon tetrachloride in wells 2, 4, 7, 8, 9, 17, 21, 23, 30 and 33 because of screening results indicating levels of these pollutants at or slightly above background (laboratory blank) levels.

2) Analysis of seven wells - three AEHA/DNR wells (34, 35 and 36), 17, 21, 23 and 28 for COD, pH, conductivity, alkalinity, hardness, iron, TKN, sulfide, and nitrate on fresh samples after re-developing DNR wells and re-sampling all the wells.

3) Analysis of eight groundwater samples (2, 4, 7, 8, 21, 23, 28 and 33) for the priority pollutant metals: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. All groundwater samples were to be recollected.

4) Analysis of groundwater samples (2, 4, 7, 23 and BAAP No. 4) and one surface water sample (STP outfall) for pesticides and PCBs using EPA Method 608 after resampling.

The verification samples are summarized in Table 7-1.

INTERPRETATION OF VERIFICATION PHASE DATA

Results of the verification phase are presented in the same manner as the screening phase results. These results are first discussed in relation to potential sources of contamination followed by a general discussion of results.

Tables 7-2, 7-3 and 7-4 summarize the analyses conducted on the different categories of samples. The results of the analyses are shown in Appendix I. Figure 7-1 indicates the location of the ten suspected sources of contamination. These sources include:

1) Ballistics Pond
2) Oleum Plant
3) Oleum Pond
4) Sanitary Landfill
5) Deterrent Burning Area
6) Nitroglycerin Pond
7) Burning Grounds
8) Wastewater Treatment Plant
9) Rocket/Paste Area
10) Settling Ponds

TABLE 7-1

SUMMARY OF VERIFICATION SAMPLES

	Water	Sediment	Fish	Total
Nitrates	8	2	-	10
Nitrites	8	-	-	8
Sulfate	3	2	-	5
Nitroglycerin	2	1	-	3
2,4-DNT	14	24	-	38
GC/EC DBP/DEP	-	20	-	20
GC/MS Screen	3	-	3	6
Pesticides/PCB	-	-	3	3
Grain Size	-	22	-	22
pH	-	27	-	27
COD	-	27	-	27
Cation Exchange Capacity	-	23	-	23
Ammonia	-	24	-	24
Lead	-	2	-	2
Tin	-	2	-	2
Aluminum	-	2	-	2

Does not include QA/QC samples.

TABLE 7-2

PARAMETERS ANALYZED IN
SURFACE SOILS

S14XX (Sample Point)	Sample Number	Aluminum, Lead and Tin	Nitrate/ Nitrite	Sulfate	Nitroglycerine	Nitrocellulose	GC/MS	Pesticides/PCBs
02	D5002	X	X	X			X	
04	D5033	X			X			
	M0054				X			
08	D5008	X	X	X			X	
09	D5009	X	X	X			X	
10	D5010	X		X		X	X	
11	D5011	X	X	X			X	
13	D5013	X		X		X	X	
	W0051							X
14	D5014	X	X	X			X	
15	D5015	X	X	X		X	X	

TABLE 7-3

PARAMETERS ANALYZED IN SETTLING POND SEDIMENTS

Site ID	Depth Interval (feet)	Sample Number	Nitrocellulose	GC/MS Screen	Lead, Tin and Aluminum	DNT	Nitrite/ Nitrate	Sulfate	DEP	DBP
1201	0-2	D5018	X	X			X	X		
1201	2-16	D5019U				X			X	X
1201	16-30	D5019L				X			X	X
1202	0-2	M0001			X			X		
1202	2-16	D5020,U,S				X			X	X
1202	16-30	D5021				X			X	X
1203	0-3	M0002			X	X		X	X	X
1203	3-16	D5022				X			X	X
1203	16-30	D5023				X			X	X
1204	0-5	M0003	X	X	X		X	X		
1204	5-19	D5024C				X			X	X
1204	19-30	D5026				X			X	X
1205	0-15	D5027			X	X	X	X	X	X
1205	15-30	D5028				X			X	X
1206	0-15	D5029	X	X	X	X	X	X	X	X
1206	15-30	D5030				X			X	X
1207	0-2	M0004	X	X	X		X	X		
1207	2-15	D5031				X			X	X
1207	15-30	D5032				X			X	X
N-side Pond 2 "S1205"	0-1	M0050				X			X	X
N-side Pond 3 "S1206"	0-1	M0051				X			X	X

TABLE 7-4

ANALYSES PERFORMED ON GROUNDWATER SAMPLES

Site ID	Carbon Tetr./ Chloroform	GC/MS Screen	Metals I[a]	Metals II[a]	Pesticides/ PCBs	DNT	Nitrite/ Nitrate	Sulfate	Nitroglycerin	Hardness, Alkalinity, Sulfide, TKN, pH, COD, Conductivity, Iron, Nitrate
S1102	X	X	X	X	X	X	X	X		
S1103						X	X			
S1104	X	X	X	X	X	X	X	X		
S1105						X	X			
S1106							X			
S1107	X	X	X	X	X	X	X	X		
S1108	X	X	X	X		X	X	X		
S1109	X	X	X			X	X	X		
S1111		X	X			X	X	X		
S1112		X	X				X	X		
S1113		X				X	X			
S1115		X	X				X	X		
S1117	X	X	X				X	X		X
S1119		X	X				X	X		
S1121	X	X	X	X		X	X	X		X
S1122		X	X			X	X	X	X	
S1123	X	X	X	X	X	X	X	X		X
S1124		X							X	
S1125		X	X				X			
S1127		X	X				X	X		
S1128				X			X			X
S1130	X	X	X			X	X	X		
S1131								X		
S1132								X		
S1133	X	X	X	X		X	X	X		
S1134=DNR-2		X	X				X	X		X
S1135=DNR-3		X								X
S1136=DNR-1										X
S1137=BAAP-4					X					

NOTES: (a) Metals I = Aluminum, Lead and Tin
Metals II = Ag, As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Te, Zn

Many parameters were found to be either below the analytical detection limit or at a concentration of less than 1.5 times the concentration in background samples for all of the samples checked. These parameters are judged to be absent or at environmentally insignificant levels and will, therefore, not be further discussed. Table 7-5 lists these parameters, detection limits, and background concentrations.

Several of the remaining parameters were found to be of concern in only one or two categories of samples (e.g. nitrocellulose in the S1200s and S1400s, but not in the wells - S1100s). Tables 7-6 through 7-11 contain only those samples within a given category that were found to contain at least one parameter at or above a concentration which might indicate some degree of contamination. These limits of concern are provided in Table 7-12. The GC/MS results (Tables 7-9 through 7-11) report only those compounds which EEI believes could conceivably have come from operations at BAAP.

For any given sample which appears in Tables 7-6 through 7-8, results for all of the parameters shown in the table have been listed, regardless of whether the concentrations were at or above the limits shown in Table 7-12. This was done in order to show whether there were any additional parameters beyond those which indicated the need for sampling that may be close to the limits in Table 7-12.

Source: Ballistics Pond

No additional analyses were conducted regarding the Ballistics Pond beyond those performed during the screening phase.

Source: Oleum Pond

The suspected groundwater contaminant originating from the Oleum Pond was sulfate. Well S1132 is downgradient from the Oleum Pond. Water from well S1132 was examined for sulfate, and the sulfate content was found to be below the detection limit of 6 mg/l.

Source: Oleum Plant

No additional analyses were conducted regarding the Oleum Plant.

TABLE 7-5

PARAMETERS FOUND NOT TO BE OF CONCERN AT BAAP
(NOT DETECTED OR LESS THAN 1.5 TIMES BACKGROUND)

Parameter	Detection Limit[a]	Background Concentration	Background Site Reference
Silver	3	ND[b]	-
Arsenic	6	ND	-
Beryllium	47	ND	-
Cadmium	1	ND	-
Chromium	4	11	Well 23
Mercury	0.5	ND	-
Selenium	2	ND	-
Antimony	6	ND	-
Thallium	3	ND	-
Zinc	(c)	69	Well 23
Sulfide (mg/l)	1	ND	-
pH (units)	(c)	6.2-7.6	Total Range Found
TKN (mg/l)	1	ND	-
Aldrin	0.03	ND	-
α-BHC	0.17	ND	-
β-BHC	0.03	ND	-
Chlordane	0.11	ND	-
Dieldrin	0.16	ND	-
α-Endosulfan	0.02	ND	-
β-Endosulfan	0.06	ND	-
Heptachlor	0.12	ND	-
PPDDD	0.06	ND	-
PPDDE	0.11	ND	-
PPDDT	0.09	ND	-
Toxaphene	8.9	ND	-
PCBs:			
A1016	1.1	ND	-
A1221	3.0	ND	-
A1242	1.3	ND	-
A1248	0.7	ND	-
A1254	2.4	ND	-
A1260	2.3	ND	-

NOTES: (a) All parameters in μg/l unless otherwise noted.
(b) ND = Not Detected
(c) Not detected above 1.5 times background concentration shown.

TABLE 7-6

SUMMARY OF POSITIVE ANALYTICAL RESULTS: WELLS
(S1100 SERIES)

Southern Site boundary

Site I. D. No.	Sample No.	NO3 (ug/l)	CUTOT[a] (ug/l)	LIN[b] (ug/l)	SO4 (mg/l)	CCL4 (ug/l)	CHCl3 (ug/l)	ALK[c] (mg/l)	Hard[d] (mg/l)	COD (mg/l)	Fe (mg/l)	Pb (ug/l)	COND[e] (UMHO)
S1102	A0001	16	NA	NA	140	NA	NA	NA	NA	NA	NA	10	NA
	A0066	8.2	30	.07	NA	ND	ND	NA	NA	NA	NA	NA	NA
S1108	A0004	ND	NA	NA	160	NA	NA	NA	NA	NA	NA	ND	NA
S1117	A0050	2.2	NA	NA	NA	10	70	300	400	5	1	NA	500
S1121	A0056	.33	ND	NA	NA	ND	ND	200	300	50	.5	.6	400
S1123	A0052	3.9	10	ND	NA	ND	ND	200	300	ND	2	10	300
S1133	A0061	2.9	10	NA	NA	.7	ND	NA	NA	NA	NA	10	NA
S1134	A0022	1.3	NA	NA	240	NA	NA	NA	NA	NA	NA	20	NA
	A0070	2.5	NA	NA	NA	NA	NA	300	1000	10	1	NA	1000
S1135	A0071	1	NA	NA	NA	NA	NA	400	700	6	6	NA	600
S1136	A0072	5.3	NA	NA	NA	NA	NA	300	300	9	2	NA	500

NOTES: NA = Not Analyzed
ND = Not Detected
(a)CUTOT = Total Copper
(b)LIN = Lindane
(c)ALK = Alkalinity
(d)Hard = Hardness
(e)COND = Conductivity

TABLE 7-7

SUMMARY OF POSITIVE ANALYTICAL RESULTS:
SETTLING PONDS (S1200 SERIES)

Site I.D. No.	Sample No.	Depth (cm)	NC[a] (%)	DEP[b] (ug/g)	24DNT (ug/g)	SO4 (%)
S1201	D5018	0	6	NA	NA	0.13
	D5019L	457	NA	ND	0.1	NA
	D5019u	457	NA	ND	0.1	NA
S1202	D50205	91	NA	1300	0.7	NA
S1203	D5022	91	NA	100	17	NA
	D5023	488	NA	11	0.3	NA
	M0002	0	NA	460	170	.066
S1204	M0003	0	0.03	NA	NA	.0058
	D5024C	152	NA	5	0.7	NA
	D5026	579	NA	ND	.02	NA
S1205	D5027	0	NA	ND	40	.0020
	D5028	457	NA	ND	ND	NA
	M0050	18	NA	1375	8	NA
S1206	D5029	0	.0002	ND	.06	.0015
	D5030	457	NA	ND	ND	NA
	M0051	18	NA	40	3	NA
S1207	M0004	0	.1	NA	NA	.018

NOTES: NA = Not Analyzed
ND = Not Detected
(a) NC = Nitrocellulose
(b) DEP = Diethylpthalate

TABLE 7-8

SUMMARY OF POSITIVE ANALYTICAL RESULTS:
SURFACE SOILS AND DRAINAGEWAYS
(S1400 SERIES)

Site I. D. No.	Sample No.	Depth (cm)	NG[a] (ug/g)	NC[b] (%)	24DNT (ug/g)	S04 (%)	Pb (ug/g)	Pb (ug/l)	NO3 (ug/g)	Sn (ug/g)	ENDRN[c] (ug/l)
S1402	D5002	0	NA	NA	NA	.025	600	-	ND	8.5	NA
S1404	D5003	0	4	NA	NA	NA	NA	-	NA	3.0	NA
	W0020	45	ND	NA	NA	NA	-	200	ND	ND	NA
S1408	D5008	0	NA	NA	NA	.003	1000	-	2.5	6.6	NA
S1411	D5011	0	NA	NA	NA	.003	20,000	-	1.4	1200	NA
S1413	D5013	0	NA	3	NA	.047	400	-	NA	2.4	NA
	W0051	10	NA	NA	NA	NA	NA	-	NA	NA	.06

NOTES: NA = Not Analyzed
ND = Not Detected
"-" = Inappropriate units for that sample
(a) NG = Nitroglycerin
(b) NC = Nitrocellulose
(c) ENDRN - Endrin

TABLE 7-9

SUMMARY OF GC/MS RESULTS: WELLS
(S1100 SERIES)

Site I.D. No.	DPA[b] (ug/l)	DEP[c] (ug/l)	MEK[a] (ug/l)	Hydrocarbons (a)	Cyclohexanone (ug/l)	Ketones (ug/l)
S1107		8				
S1108	1					
S1111		3				16
S1112			27		11	
S1119			14	X		
S1134				X		
S1135				X		

NOTES: [a] Several different hydrocarbons at different concentrations
[b] DPA = Diphenylamine
[c] DEP = Diethylpthalate
[d] MEK = Methyl ethyl ketone

TABLE 7-10

SUMMARY OF GC/MS RESULTS:
SETTLING PONDS (S1200 SERIES)

Site I.D. No.	Sample No.	2,6-DNT (ug/g)	2,4-DNT (ug/g)	DPA[a] (ug/g)	DBP[b] (ug/g)	Nitrodiphenylamine (ug/g)
S1201	D5018	138	998	470	>1300	28
S1204	M0003		1	1.8	29	
S1206	D5029				0.14	
S1207	M0004	0.5		1.1	5.9	

NOTES: (a) DPA = Diphenylamine
(b) DBP = Dibutylpthalate

TABLE 7-11

SUMMARY OF GC/MS RESULTS:
SURFACE SOIL AND DRAINAGEWAYS
(S1400 SERIES)

Site I.D. No.	2,6-DNT (ug/g)	2,4-DNT (ug/g)	DPA[a] (ug/g)	DBP[b] (ug/g)	DEP[c] (ug/g)	NDPA[d] (ug/g)
S1402	2	9				
S1411	12	118	35	389	295	X[e]
S1413	46	697	318	887		2
S1414	35	954	255	520	1	11
S1415	4	36				1

NOTES:
(a) DPA = Diphenylamine
(b) DBP = Dibutylpthalate
(c) DEP = Diethylpthalate
(d) NDPA = Nitrodiphenylamine
(e) X = Not Quantified

TABLE 7-12

CRITERIA FOR INCLUSION IN TABLES 7-6 THROUGH 7-8

Analyte	In Water	In Soil/Sediment
ALK	250 mg/l	-
AL	5 mg/l	5%
CCL4	DL	NA
CHCL3	DL	NA
COD	5 mg/l	-
COND	500 UMHC	-
CUTOT	10 ug/l	NA
DEP	NIC	DL
2,4-DNT	DL	DL
ENDRN	DL	NA
FE	0.1 mg/l	NA
HARD	250 mg/l	-
LIN	DL	NA
NC	NIC	0.01%
NG	DL	DL
NO3	10 mg/l	1 ug/g
PB	10 ug/l	200 ug/g
SN	DL	10 ug/g
SO4	150 mg/l	0.1%

All others: 1.5 times background concentration or DL, whichever is greater.

NOTES: DL = Detection Limit
"-" = Not appropriate for this medium, or inclusion in these tables

Source: Sanitary Landfill

Wells S1134, S1135 and S1136 are in the immediate vicinity of the sanitary landfill. These wells are in an area which has an extremely low water table gradient. Therefore, the direction of groundwater flow is not well defined. Wells S1134 and S1135 are in the most likely downgradient direction from the landfill, but landfilling operations may have altered the local flow patterns.

The parameters of conductivity, hardness, and iron found in samples from wells S1134 and S1135 are significantly higher than those from samples from the rest of the wells. However, very little is known concerning the drilling procedures used or the construction of the wells. Problems identical to those discussed regarding the sampling of Well S1134 during the screening phase were also encountered at Wells S1134 and S1136 during the verification phase. At Well S1135, turbid, greasy feeling water was encountered; however, after redeveloping the well through swabbing and surging, the yield increased noticeably to the point where it could not be bailed dry using the materials and methods described in Chapter 4. Though thoroughly purged, the sample from this well was still fairly turbid.

Because of the problems encountered in sampling these wells, it is not apparent whether the characteristics of the sample relate to contamination from the landfill or represent an artifact of well construction.

Source: Deterrent Burning Area

DEP, DBP and DNTs were found in soils within the burning area during the screening phase. Well S1122 was resampled during the verification phase and analyzed for the presence of DNT because the quantitative method for DNT has a lower detection limit than the screening method. No DNT was detected.

Source: Nitroglycerin Pond

Well S1124 is directly downgradient from the nitroglycerin pond. The sediment sample collected from the pond during the screening phase contained a small amount of nitroglycerin.

Sediments and water in the pond, and water from well S1124, were collected during the verification phase and analyzed for the presence of nitroglycerin. No nitroglycerin was detected. However, the sediment sample collected during the verification phase was taken from the center of the pond (or close to the center). The sample collected during the screening phase was a composite of subsamples taken from several locations around the edge of the pond. The absence of nitroglycerin in the verification sample is interpreted to be a result of a non-homogeneous occurance of low levels of nitroglycerin in the sediments, rather than a failure to confirm the screening results.

Source: Burning Grounds

Well S1117 is directly downgradient from the burning grounds. Samples collected and analyzed via GC/MS from this well during the screening phase indicated the possible presence of chloroform and carbon tetrachloride in trace amounts. The well was resampled during the verification phase and analyzed for the presence of chloroform and carbon tetrachloride using a more sensitive GC method. Carbon tetrachloride was detected at a concentration of 12 μg/l; chloroform was detected at a concentration of 66 μg/l. Both concentrations are significantly higher than the detection limits (carbon tetrachloride equals 0.3 μg/l; chloroform equals 2.3 μg/l). Chloroform was not detected in the nine other wells checked for this compound, and only a trace amount of carbon tetrachloride was detected in one of the ten wells checked (S1133: 0.7 μg/l). The analytical significance of this value is questionable in that the precision of the method (precision was not determined during this survey) makes 0.7 μg/l potentially indistinguishable from 0.3 μg/l. As a point of reference, proposed water quality criteria (Federal Register, November 28, 1980) set limits for the protection of human health at 1.9 μg/l and 4 μg/l for chloroform and carbon tetrachloride respectively.

The presence of these chlorinated compounds in the groundwater in association with the burning ground is plausible if halogenated solvents were used in past burning activities.

Source: Wastewater Treatment Plant

During the screening phase, several contaminants were detected in sediments from the drainageway which leads into the settling ponds. Water in the drainageway at site S1413 was sampled during the verification phase and analyzed using a GC technique for the presence of certain pesticides and PCBs (Table 7-2). Two pesticides were detected; endrin and Δ-BHC. The concentrations of these pesticides were 0.066 μg/l and 0.14 μg/l, respectively. Detection limits for these compounds were 0.03 μg/l and 0.026 μg/l, respectively. The sources of water in this drainageway (at the point sampled) are dominated by sanitary and industrial wastewater treatment plant discharges. An estimated 10 percent of the flow at the time of sampling originated from upstream of the two discharges. The most likely source of these pesticides is agricultural runoff.

Source: Rocket/Paste Area

No additional analyses were conducted during the verification phase regarding this potential source.

Source: Settling Ponds

Results of the screening analyses indicated that the sediments (and at least the upper layer of soil in the settling ponds) were contaminated with DNT, phthalates, and nitrocellulose. The deeper soils and sediment samples (that had not previously been analyzed) were analyzed for DNT, DBP and DEP using quantitative GC methods. Of these compounds, only DBP was not detected.

Two of the sediment samples that were analyzed, M0050 and M0051, were collected from areas along the north sides of ponds 2 and 3, respectively. These were collected from areas where sediments from the ponds had been deposited during a draglining operation to remove the sediments from the ponds. Therefore, these two samples (and their high concentrations of DNT and DEP) are probably more representative of the sediments originally in the ponds than are the soils actually sampled in the ponds.

The verification analyses generally confirmed the presence of highly variable concentrations of DNT and DEP in the sediments. The concentrations of these parameters seem to decrease sharply within the top few feet of soil and typically approached (or were below) the detection limit in the 15 to 30 foot deep composite samples.

Wells S1102 - S1108 are directly downgradient from the settling ponds, and all except S1106 were analyzed for the presence of DNT using a GC method. None was detected.

GENERAL DISCUSSION

Sediment and surface soil samples collected from many of the suspected sources of contamination contained high concentrations of various contaminants. With the exception of wells in the vicinity of the sanitary landfill and well S1117 (burning grounds), the groundwater samples showed no evidence of significant contamination. The sample from well S1117 had significant concentrations of chloroform and carbon tetrachloride. The degree to which the well samples collected in the vicinity of the sanitary landfill are representative of the groundwater quality is somewhat questionable, but the results do indicate that the groundwater may be contaminated.

CHAPTER 8

CONCLUSIONS

The conclusions regarding groundwater contamination are based in part on results of the geotechnical investigation and in part on the results of the sampling and analysis program. One important aspect of the geotechnical investigation was the information obtained on groundwater flow directions and speed. Table 8-1 contains a summary of groundwater flow velocities (direction and speed) at each potential source of contamination and indicates which, if any, of the monitoring wells are within the theoretical contaminant plume. Figure 8-1 illustrates this data. The results of the study are discussed for each suspected source of contamination in this section.

SOURCE: BALLISTICS POND

Well S1127 is well within the theoretical migration distance for contaminants originating in this pond. Because of the low level of aluminum (the contaminant of concern) found in the water of this well, it can be concluded that contamination of groundwater is not occurring from this source.

SOURCE: OLEUM PLANT

The contaminant of concern at the Oleum Plant is sulfur. Elemental sulfur was visibly evident on the ground surface throughout the immediate vicinity of the plant, but only as scattered localized small "spills". Only one small (less than 1 acre) area was observed where sulfur was evident in more than scattered, small amounts. The sulfur found in this low lying area was distributed evenly, but was still evident in only scattered patches.

The exposed sulfur is probably being slowly oxidized to sulfate, which would then leach into the soil. However, because of the relatively small total quantity of sulfur at the Oleum Plant, and the slow rate of oxidation of sulfur at ambient temperatures, it can be concluded that, even if sulfate is leaching into the ground, it would have very little potential for significant contamination of the groundwater at BAAP.

TABLE 8-1

GROUNDWATER FLOW VELOCITIES

Source	Flow Velocities Direction	Speed (ft/yr)	Distance Traveled Since 1942 (ft)	Wells Within Distance Traveled	Coefficient of Permeability (k)(ft/yr)	Well Number	Water Table Gradient (ft/ft)	Assumed Porosity
Settling Ponds (West End)								
MAXIMUM	S	68	2,580	S1102 & S1103	7,316	S1103	1.39×10^{-3}	0.15
MINIMUM	S	11	435	S1102 & S1103	3,300	S1102	1.39×10^{-3}	0.40
Settling Ponds (Middle)								
MAXIMUM	S	64	2,450	S1104, S1105, S1106	6,959	S1106	1.39×10^{-3}	0.15
MINIMUM	S	13	490	None	3,732	S1104	1.39×10^{-3}	0.40
Settling Ponds (East End)								
MAXIMUM	SW	43	1,640	S1108 & S1107	2,281	S1108	2.83×10^{-3}	0.15
MINIMUM	SW	10	370	S1108	2,796	S1107	1.39×10^{-3}	0.40
Burning Grounds								
MAXIMUM	S	3	130	S1117	480	S1117	1.04×10^{-3}	0.15
MINIMUM	S	1	50	None	480	S1117	1.04×10^{-3}	0.40
Nitroglycerine Pond								
MAXIMUM	SE	30	1,140	S1124	8,620	S1119	5.2×10^{-4}	0.15
MINIMUM	SE	<0.1	2	None	37	S1124	4.9×10^{-4}	0.40
Deterrent Burning Area								
MAXIMUM	SE	27	1,010	S1122	8,620	S1122	4.63×10^{-4}	0.15
MINIMUM	SE	7	380	None	8,620	S1122	4.63×10^{-4}	0.40
Sanitary Landfill								
MAXIMUM	SE	27	1,010	3	8,620	S1122	4.63×10^{-4}	0.15
MINIMUM	SE	7	380	None	8,620	S1122	4.63×10^{-4}	0.40
Oleum Pond								
MAXIMUM	SE	13	510	None	37	S1130 & S1132	4.63×10^{-4}	0.15
MINIMUM	SE		190	None	37	S1130 & S1132	4.63×10^{-4}	0.40
Ballistics Pond								
MAXIMUM	SSW	141	5,350	S1127 & S1126*	2,029	S1127	1.04×10^{-2}	0.15
MINIMUM	SSW	29	760	S1127	770	S1128	1.04×10^{-2}	0.40

NOTE: *Groundwater flow direction is not well defined in the vicinity of Well S1126.

SOURCE: OLEUM POND

The Oleum Pond was used for disposal of lime-neutralized sulfuric acid wastewater. This wastewater, therefore, contained significant concentrations of gypsum ($CaSO_4.2H_2O$) which is moderately soluble in water. The sediment deposits in the Oleum Pond (now dry) are fairly extensive.

Table 8-1 indicates that the groundwater flow velocity in the vicinity of the Oleum Pond is very slow. It also indicates that the nearest down gradient well (S1132) is too far from the pond to detect any contamination originating at the pond. This was confirmed by the fact that sulfate in the water of Well S1132 is less than the detection limit of 6 mg/l. It can, therefore, be concluded that, if the sediments in the Oleum Pond are contributing sulfate to the groundwater, the contaminants are not migrating rapidly.

SOURCE: SANITARY LANDFILL

The sanitary landfill is located near the northeast corner of BAAP and is very close to the eastern boundary of the plant. As shown in Table 8-1, groundwater is flowing to the southeast in this vicinity at a rate of between 7 and 27 feet per year; "DNR" Well 3 (S1135) is possibly within the theoretical contaminant plume. "DNR" Well 2 (S1134) may also be within this theoretical plume.

Samples from Wells S1134 and S1135 contained elevated levels of COD, sulfate, hardness and iron, all classical indicators of landfill leachate. Fuel oil type compounds were also present. Little is known of the well installation and development procedures used for these wells, and some compounds and parameters (oils, COD, sulfate and hardness) may have been introduced during drilling, well installation, and/or initial development. The low yield of well S1134 prevented proper purging before sampling. Well S1135 was thoroughly purged before sampling and EEI believes that the sample from this well is more representative of ambient groundwater quality.

Because of the elevated levels of COD, sulfate, hardness and iron found in Well S1135, it can be concluded that the landfill is probably contributing contaminants to the groundwater and that these contaminants are very near (and moving toward) the boundary of BAAP.

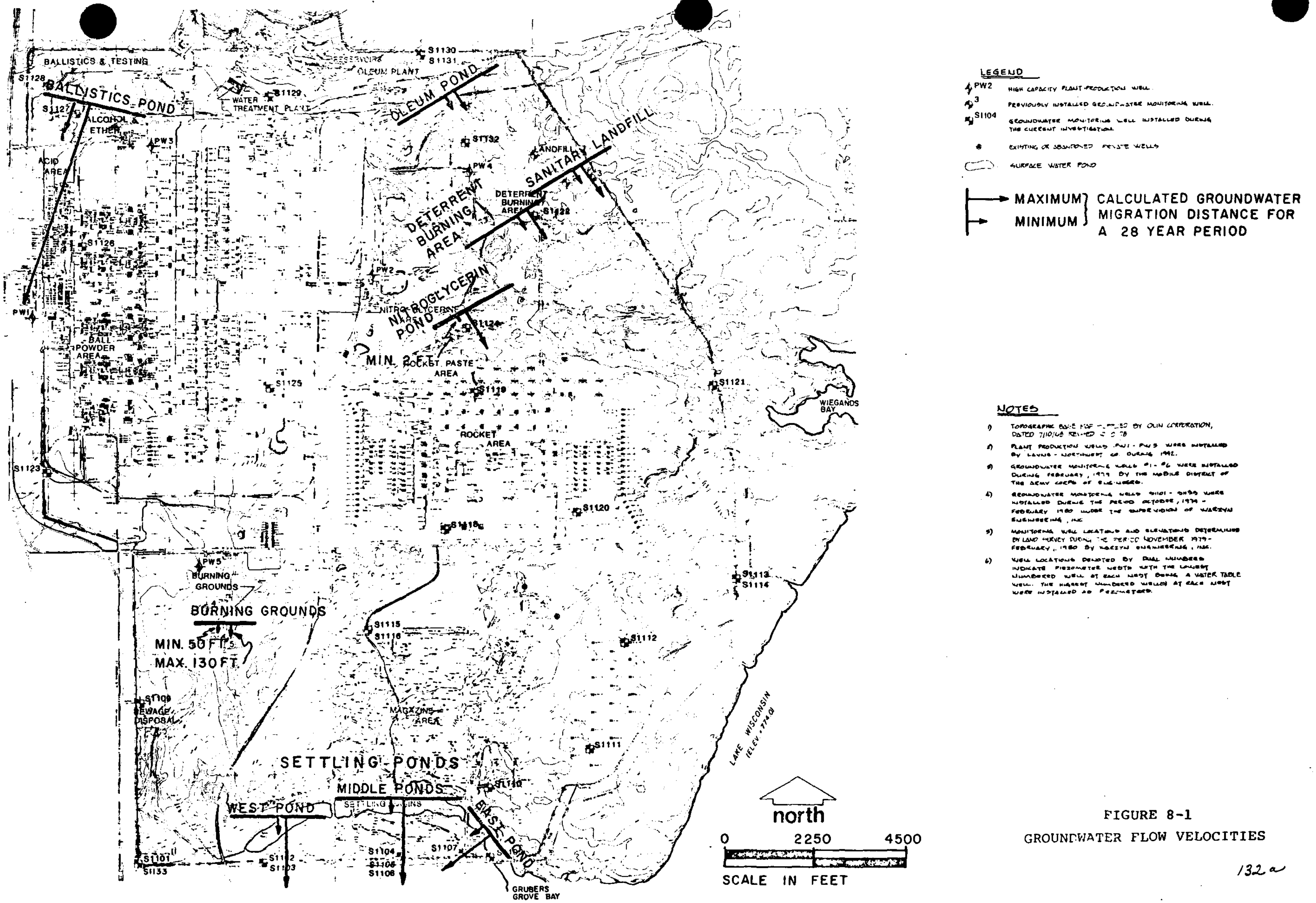

FIGURE 8-1
GROUNDWATER FLOW VELOCITIES

SOURCE: DETERRENT BURNING AREA

The Deterrent Burning Area is located southwest of the Sanitary Landfill. Screening phase samples indicated the presence of DNT, diethyl and dibutyl phthalate (DEP and DBP) in the soils within the burning area. Table 8-1 indicates that Well S1122 is within the theoretical contaminant migration area around the burning ground. None of these compounds were present above the detection limits in the groundwater samples from Well S1122. Therefore, although they occur in the surface soils, they have not apparently migrated to the groundwater.

SOURCE: NITROGLYCERIN POND

Sediment samples from the nitroglycerin pond were collected at two different morphologic locations in the pond. The screening phase sample was a composite of subsamples collected near the edge of the pond. This composite sample contained a low concentration of nitroglycerin (S1404, sample number D5033). Sample number M0054 was collected from the center of the pond during the verification phase, and nitroglycerin was not detected in this sample. Therefore, it can be concluded that nitroglycerin is present in the sediments in the pond, but in localized deposits and in low concentrations.

Well S1124 is directly down gradient from the pond and is probably within the theoretical contaminant migration distance (Table 8-1). Geologic cross section G-G' in Chapter 3 (Figure 3-6) illustrates the relationship between the water table, the sandy till, the outwash, and the well screen in Well S1124. The maximum groundwater flow velocity shown in Table 8-1 is probably representative of flow in the outwash, and the minimum velocity is probably representative of the flow in the sandy till. The very top of the screen in Well S1124 is within the outwash whereas the rest of it is within the sandy till. The outwash is much more permeable than the till. As a result, water in the outwash is probably within the theoretical contaminant migration plume, whereas water in the till is probably not. Even though most of the screened section of Well S1124 is within the till, most of the water in the sample collected from the well probably came from the outwash due to its great permeability. This sample, therefore should be representative of water within the theoretical contaminant migration plume. It can be concluded that even though the sediments in the pond contain some nitroglycerin, it is not currently leaching into the groundwater.

SOURCE: BURNING GROUNDS

The burning grounds are located in the southwest portion of BAAP. Groundwater in this area is moving slowly through a very thick section of moderately to highly permeable outwash deposits. Table 8-1 indicates a flow velocity of between one and three feet per year. Well S1117 may, therefore, be within the theoretical contaminant migration distance from the burning grounds.

Carbon tetrachloride and chloroform were detected in samples from Well S1117 in both screening and verification phases. These compounds were commonly used as industrial solvents before their toxicity was fully recognized and could probably have been used at BAAP. Flammable liquids are commonly used as combustion aids at the burning grounds. Although carbon tetrachloride and chloroform are not flammable, it is hypothesized that they may have at one time been inadvertently mixed with flammable waste solvents and the mixture used as a combustion aid at the burning grounds. Because of their high specific gravity and inflammability, if used in one of the burning pits, they would have readily soaked into the ground. Less than one gallon of each compound would have been more than enough to account for the concentrations found in the samples from Well S1117. Therefore, it can be concluded that groundwater in the vicinity of Well S1117 has been contaminanted with chloroform and carbon tetrachloride, which probably originated from their use at the burning grounds.

Several other compounds of concern, both organic and inorganic, were detected in high concentrations in soil samples at the burnings grounds. These include DEP, DBP, DNT, diphenylamine, nitrodiphenylamine, lead and tin. None of these compounds were detected in the samples from Well S1117. Therefore it can be concluded that these compounds, if leaching at all, have not yet migrated the short distance (less than 200 feet) from the burning ground to Well S1117.

SOURCE: ROCKET/PASTE AREA

The Main Central Drainageway consists of a series of ditches which drain runoff from the Rocket/Paste Area of BAAP south to the middle of settling pond number 3 (Figure 8-1). Several soil samples were collected from along this drainageway. Three of these, S1408, S1409 and S1415, were analyzed for the presence of lead. The lead content of the soil sample from Site S1408 was over 1,000 ppm. Lead contents at Sites S1409 and S1415 were less than 100 ppm (background). Lead concentrations in soil of over 600 ppm are considered excessive based on the phytoxicology guidelines published by the Ontario Ministry of the Environment (1).

Therefore, it can be concluded that significant lead contamination has occurred in the soils in the ditches at some locations within the manufacturing areas. It can also be concluded that, since samples at Sites S1409 and S1415 contained only background concentrations of lead, contamination has not migrated throughout the entire system of ditches.

SOURCE: WASTEWATER TREATMENT PLANT

The wastewater treatment plants (industrial and sanitary) are located in the southwest area of BAAP (Figure 8-1). The discharges from these plants empty into an unlined drainage ditch which flows south and east into the settling ponds. Two sampling sites, S1413 and S1414, were located along this ditch (Figure 8-1).

The sediments in this ditch contain significant concentrations of nitrocellulose, lead, sulfate, DNTs, DPA, DEP and DBP. The water flowing in the ditch contains very low concentrations of commonly used agricultural pesticides.

The ditch does not cover a large area. Sulfate is the only contaminant found in the sediment that is readily leachable. Well S1133 is down gradient from the upper portion of the ditch, and the ditch passes close enough to this well to be within the theoretical contaminant migration distance. Since the sulfate concentration in the sample from Well S1133 is less than the background level (from Well S1123), it can be concluded that contaminants found in the sediments in the ditch have not presently contaminated the groundwater and are not a significant potential source of groundwater contamination. The pesticides found in the water in the ditch are probably the result of agricultural runoff and were not at a high enough concentration to represent a threat to groundwater quality.

SOURCE: SETTLING PONDS

The settling ponds located along the southern boundary of BAAP received the industrial wastewater flow from manufacturing operations. The sediments and underlying soils within these ponds (now dry) were sampled.

The sediments from most areas of the ponds have been removed from the ponds through a combination of draglining and bulldozing operations. Samples of the sediments from both the perimeter and interior areas contain high (percent to high parts per million range) concentrations of nitrocellulose, DNT, phthalates and sulfate. The concentrations of these parameters decrease rapidly in the underlying soils and are less than (or approach) the detection limits within a depth of 30 feet.

The water table is below the bottom of these dry ponds, at a depth of between 10 and 45 feet. Groundwater flow is generally to the south. Most of the monitoring wells along the southern boundary of BAAP (S1102-S1108) are probably within the theoretical contaminant migration distance (Table 8-1) from the settling ponds. DNT was not detected in samples from these wells and nitrates, nitrites and sulfates were all at or below background concentrations. DEP was detected at 8 ug/l in Well S1107, but the significance of this concentration is questionable. Therefore, the following conclusions can be reached.

Contaminants, which are present at high concentrations in the sediments in and around the settling ponds, have not contaminated groundwater along the southern boundary (exit point) of BAAP and probably have not yet been leached into the groundwater directly beneath the ponds. However, some vertical (downward) migration of the contaminants seems to have occurred within the soils above the water table.

The sediments in Grubers Grove Bay (receiving body for the wastewater discharge from the ponds) contain very high (up to 17 percent by dry weight) concentrations of nitrocellulose. The nitrocellulose has apparently been decomposing and forming ammonia, as evidenced by high ammonia concentrations in the sediments.

Because Lake Wisconsin is a man-made lake and the dam which creates the lake is near the southern boundary of BAAP, water from Grubers Grove Bay is flowing down through the sediments and recharging groundwater. Flow within the groundwater flow system is toward the south-southwest. Although no wells outside of the BAAP boundaries were installed or sampled as part of this survey, it seems probable that ammonia from sediments in the bay may be leaching into the groundwater. No reliable estimate of the potential rate of movement or concentration of the possible contaminants can be made based on the results of this survey. However, it should be noted that the apparent hydraulic gradient (the driving force) in the groundwater in the vicinity of the bay is greater than in most of the areas at BAAP.

Dredging to remove these sediments from the bay has been considered. The high ammonia content of the sediments would make this operation undesirable since the ammonia would then be released into Lake Wisconsin via the return flow from the dredge. The return flow could be treated to remove the ammonia, but this would be an extremely costly procedure.

Two categories of compounds were found in the perch and carp samples which most probably did not originate at BAAP but which are cause for some concern. Both pentachlorophenol and several of the polynuclear aromatic hydrocarbons were found in both the carp and the perch. They were present only in trace amounts in the perch, but in higher concentrations in the carp.

REFERENCES

(1) Linzon, S. N. et al. 1976. "Lead Contamination of Urban Soils and Vegetation by Emissions from Secondary Lead Industries" in _JAPCA_, 26:7, July.

APPENDIX A

IR DATA CODE
ADDITIONS OR CHANGES

Variable	Columns	New Code	Description
Chemical Analysis File:			
Site Type	16-19	BAY	bay of water
Lab	40-41	EE	Envirodyne Engineers
		WZ	Warzyn Engineering
		AC	Ace Well Drilling Company
Test Name	48-53	SN	tin
		CEC	cation exchange capacity
		TXPHEN	toxaphene
		BBHC	beta-BHC
		ABHC	alpha-BHC
		DBHC	delta-BHC
		AENSLF	alpha-endosulfan
		BENSLF	beta-endosulfan
		PCB016	PCB 1016
		PCB221	PCB 1221
		PCB232	PCB 1232
		PCB242	PCB 1242
		PCB248	PCB 1248
		PCB254	PCB 1254
		PCB260	PCB 1260
		SULFID	sulfide
		NI	nickel
		TL	thallium
Measurement Units	66-69	MEQG	milliequivelants per 100 grams
Ecological Monitoring File:			
Site Type	16-19	BAY	bay of water
Genus-Species	31-36	QUEMAC	Quercus macrocarpa
		POPDEL	Populus deltoides
		CORSTO	Cornus stolonifera
		MORRUB	Morus rubrum
		GRASS	mixed grasses
		RHUTYP	Rhus typhina
		STICAN	Stizostedion canadense
		STIVIT	Stizostedion vitreum
		LEPMIC	Lepomis microlophus
		MORCHR	Morone chrysops
		ICTNEB	Ictalurus nebulosus
		ACIFUL	Acipenser fulvescens
		POMANN	Pomoxis annularis
		CATCOM	Catostomus commersoni
		AMBRUP	Ambloplites rupestris

Variable	Columns	New Code	Description
Map File:			
Site Type	8-11	BAY	bay of water
Physical Analysis File:			
Site Type	8-11	BORE	bay of water
Lab	49-50	EE	Envirodyne Engineers
		WZ	Warzyn Engineering
		AC	Ace Well Drilling Company
Test Name	51-55	G001	Grain size, hydrometer, % finer than 0.001 mm
		G003	Grain size, hydrometer, % finer than 0.003 mm
		G006	Grain size, hydrometer, % finer than 0.006 mm
		G009	Grain size, hydrometer, % finer than 0.009 mm
		G020	Grain size, hydrometer, % finer than 0.02 mm
		G030	Grain size, hydrometer, % finer than 0.03 mm
		GS020	Grain size, No. 2 sieve, % finer

APPENDIX B

COMPOSITE SAMPLE NUMBERS

Site ID	Composite Sample Number	Sample Numbers Contained in Composite
S1301	D5036C	M0005
		D5034
		D5035
S1302	D5039C	M0006
		D5037
		D5038
S1303	D5042C	M0007
		M0008
		M0009
		D5040
		D5041
S1304	D5045C	M0010
		M0011
		D5043
		D5044
S1305	D5048C	M0012
		D5046
		D5047
S1306	D5051C	M0013
		M0014
		D5049
		D5050
S1307	D5054C	M0015
		M0016
		D5052
		D5053
S1308	D5057C	D5055
		D5056
S1309	D5060C	D5058
		D5059
S1310	D5063C	D5061
		D5062
S1311	D5066C	D5064
		D5065
S1312	D5069C	D5067
		D5068

Site ID	Composite Sample Number	Sample Numbers Contained in Composite	
S1204	D5024C	D5024 } D5025 }	for 24DNT analysis only
S1201	D5019L (lower parent) D5019U (upper parent)	D5019 separated for DBP, DEP and 24DNT analysis (sample D5019 was in different bottles originally, by horizon)	
S1202	D5020U (upper parent) D5020S (sediment)	D5020 for 24DNT, DBP and DEP analysis (originally in separate jar)	
S1303	M0789C	M0007 } M0008 } M0009 }	for various physical/chemical analyses
S1303	D5141	D5041	for various physical/chemical analyses
S1304	M1011C	M0011 } M0010 }	for various physical/chemical analyses
S1306	M1013C	M0013 } M0014 }	for various physical/chemical analyses
S1308	D5156	D5056	for various physical/chemical analyses

APPENDIX C

INSTALLATION RESTORATION
SAMPLING AND ANALYSIS
GEOTECHNICAL-MAP FILE

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS-GEOTECHNICAL-MAP FILE

GANG PUNCH

INS	FA	T	FIL
1	3	6	7
BA	SA	G	MA

1	8 SITE TYPE	12 SITE IDENTIFICATION	22 GRID COORDINATES EAST NORTH	32 GRID COORDINATES EAST NORTH	42 GRID COORDINATES EAST NORTH	52 GRID COORDINATES EAST NORTH	62 AC	64 DESCRIPTION	80 CN

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE
AC = ACCURACY CODE
CN = CARD NUMBER

REVISED 1-78

CDIR Form 13-4.3, 1 Sep 78

SAMPLING AND ANALYSIS - GEOTECHNICAL - MAP FILE

Variable	Description	Possible Entries
1.-4. Identification (Col. 1-7)	Plant/File	BASAGMA
5. Site Type (Col. 8-11)	4 letter abbreviation of type of landmark, feature, or construction being identified. This description/identification will have grid coordinates associated with it.	AREA (area of land portion of a site) BASE (basic map of installation boundaries and landmarks) BASN (basin) BLDG (building) BLUF (bluff) BNCH (site benchmark) BORE (borehole) CREK (creek) DTCH (ditch, drainage) FELD (field) FENC (fence) ISLE (island) LAKE MAXP (maximum X and Y of installation) PENI (peninsula) PIT (pit-tree, spade) PLUG (shovel sample) POND PPLT (pilot plant) ROAD RR (railroad) RVER (river) SILO SMPT (sample point) STRM (stream) STWA (standing water) SURF (surface-general) SURW (surface-water) TANK (storage tank) TWER (tower) WASS (solid waste) WASW (waste water) WELL
6. Sample Point (Col. 12-16)	Biology Hydrogeology	S0001 thru S0999 S1000 thru S1999
7. Grid Location(s) (Col. 22-61)	East coordinate North coordinate	00000 thru 99999
8. Accuracy (Col. 62-63)	2 character abbreviation to indicate measurement accuracy as follows: one (1) alpha character S = surveyed M = read from MAP one (1) numeric character 0 = 1 meter 1 = 10 meters 2 = 100 meters 3 = 1000 meters	S0 thru S9 or M0 thru M9
9. Description (Col. 64-79)	Sixteen (16) characters, letters or numbers, used to better describe the landmark (site type) located by the entry.	
10. Card Number (Col. 80)	One (1) number used when multiple cards are needed.	1 thru 9

Site ID[a]	Description
S0019	North of and downgrade from the Oleum plant, stressed.
S0020	West side of burning area off waste powder pads 1 and 2, not cited.
S0021	East side of burning area next to debagger pit 2 and wet plate burner, not cited.
S0022	Rocket ditch, east drainage, low area, stressed.
S0023	East-central area of plant on high ground, BKG, healthy.
S0024	West of Oleum plant, sulfur pad runoff, not cited.
S0025	Northwest corner of plant, fishing area, moisture stress.
S0026	North-central part of plant, stress from wind exposure.
S0027	Southeast part of plant, north of settling ponds, high ground, BKG, healthy.
S0028	Railroad tracks south of Oleum plant, drought stress.
S0029	2,000 feet northeast of burning ground, moisture stress.
S0030	Central part of plant, levee area, stress from uprooting.
S0031	North part of plant west of water reservoirs, stress from exposure or air pollution.
S0032	Northeast of plant, acid pond area, not cited.
S0033	North-central part of plant, open field, BKG, healthy.
S0034	North part of the plant, north of water reservoirs, BKG, healthy.
S0035	North-central edge of plant, BKG, healthy.
S0036	Central part of plant, BKG, healthy.
S0037	Northeast of burning ground, healthy.

NOTES: [a] Last character to the right in the description field refers to the citation in the infrared photo-interpretation report.

Detailed Map File Descriptions for Biology - Site IDs S0001 through S0037

Site ID[a]	Description
S0001	South side of settling ponds, inflow from process sewer, stressed.
S0002	South side of settling ponds downgrade from S0001, stressed.
S0003	South side of settling ponds downgrade from S0002, stressed.
S0004	North side of settling ponds downgrade from S0001, stressed.
S0005	North side of settling ponds, midway down group of of ponds, inflow from process sewer and rocket area drainage, stressed.
S0006	Rocket ditch drainage just upgrade from S0005, stressed.
S0007	Borrow pit downgrade from S0005, stressed.
S0008	South side of settling ponds downgrade from S0003, stressed.
S0009	North side of settling ponds at southeast corner of plant near outflow to Wiegands Bay, stressed.
S0010	Nitro pond area; inflow to ponded area, stressed.
S0011	Nitro pond area; ponded area itself, not cited.
S0012	150 feet below process sewer outfall, not cited.
S0013	500 feet below process sewer outfall, not cited.
S0014	Rocket area ditch on north end, not cited.
S0015	Rocket area ditch downgrade from S14 in bunker area, not cited.
S0016	Deterrent burning pit, stressed.
S0017	North central edge of plant, BKG, healthy.
S0018	Old landfill east of the deterrent burning pit, stressed.

APPENDIX D

INSTALLATION RESTORATION
SAMPLING AND ANALYSIS
ECOLOGICAL SURVEY-MONITORING PROGRAM

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS
ECOLOGICAL SURVEY-MONITORING PROGRAM

CARD PUNCH

1 INS	3 FR	5 T	7 FIL
PA	SH	E	MP

1	9 SAMPLE DATE	13 OBS	16 SITE TYPE	20 SITE IDENTIFICATION	30 TX	GENUS	34 SPEC-IES	37 TL	AG	39 EC	C	41 PT	PH	43 COLOR	46 DEPTH	50 AREA/VOLUME	56 NR. SPEC	59 WEIGHT	63 TIS-SUE	66 SS	SAMPLE NUMBER	73 COMPOSITE SAMPLE NR	78 STAT CODE 80

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE
OBS = OBSERVER

TL = TAXON LEVEL
AG = AGE CODE
EC = ECTOPARASITE
TX = TAXON
NR = NUMBER

C = CONDITION
P T = PLANT TYPE
PH = PHENOLOGY
S S = SAMPLE SUBPROGRAM

REVISED 1-78

CDIR Form 13-3.6, 1 Sep 78

SAMPLING AND ANALYSIS ECOLOGICAL SURVEY - MONITORING PROGRAM

Variable	Description	Possible Entries
1.-4. Identification (Col. 1-7)	Plant/File	BASAEMP
5. Sample Data (Col. 8-12)	5 digit Julian date sample is taken.	79274 thru 79365 80001 thru 80090
6. Observer (OBS) (Col. 13-15)	3 letter initials of individual responsible for sampling.	AAA-ZZZ
7. Site Type (Col. 16-19)	4 characters:	
	A. General Area - 1 letter used to indicate the stratum from which data was collected.	A-Z NOTE: Enter X if not applicable
	B. Habitat - 2 or 3 letter code describing the dominant habitation characteristic	<u>Field Areas</u> BF (bare field) CF (corn field) SF (sorghum field) WF (wheat field) OF (other field crop) CR (commercial/residents area) IA (industrial area) PL (planted lawn) <u>Prairie Vegetation Areas</u> BG (blue gramma) CW (crested wheat) NT (needle-&-thread) RT (red threeawn) SD (sand dropseed) WT (weedy type) WW (western wheat) <u>Wet Areas</u> CC (creek or canal) LK (lake) MT (marshy type) PD (pond) <u>Woodland Vegetation Area</u> CD (coniferous - deciduous woodland) CN (coniferous woodland) DW (deciduous woodland) LT (locust thicket) <u>Combination Areas (XX Selected from Above List)</u> BXX (shrubs w/xx) CXX (coniferous woodland surrounded by XX) DXX (deciduous woodland surrounded by XX) EXX (coniferous-deciduous woodland surrounded by XX) LXX (locust thicket surrounded by xx) Nxx (3 or less coniferous trees w/xx) Pxx (prairie dog town w/xx) Rxx (rabbitbrush w/xx) Sxx (sagebrush w/xx) Txx (3 or less deciduous trees w/xx) Yxx (yucca w/xx)

SAMPLING AND ANALYSIS ECOLOGICAL SURVEY - MONITORING PROGRAM (Continued)

Variable	Description	Possible Entries
8. Sampling Point	Biology	S0001 thru S0999
9. Taxon (TX) (Col. 30)	1 letter designation for Taxon that contains the observed organism (animals only)	A (amphibian) B (bird) F (fish) I (invertebrate) M (mammal) R (reptile) P (plant)
10. Genus (Col. 31-33)	3 letters denoting the genus. Refer to species note below.	See Appendix A Temporary species code used until proper identification.
11. Species (Col. 34-36)	3 letters denoting the species. NOTE: If a Genus and/or species is not identified at the time of sampling, then enter a 3 digit random number for each entry that is unknown. These 3 digit numbers will be used to find a specific unknown entry should the Genus and/or Species become known at a later date.	See Appendix A
12. Taxon Level (TL) (Col. 37)	1 letter abbreviation indicating the taxon level to which a 3 letter entry in the species column refers. When the genus and species is indicated in the Species column. Taxon column will be blank.	F (family) O (order) C (class) BLANK
13. Age (AG) (Col. 38)	1 letter abbreviation indicating the relative age of the animal specimen.	J (juvenile) A (adult) BLANK (if plant)
14. ECTO (EC) (Col. 39)	1 letter abbreviation denoting the relative number of ectoparasites obtained from a bird or mammal specimen (animal only).	N (none) F (few) M (many) BLANK (if plant)
15. Condition (C) (Col. 40)	1 digit number denoting the condition of the plant or animal specimen.	1 (normal) 2 (stunted) 3 (wilted [plants only]) 4 (robust [plants only]) 5 (sick [animals only]) 6 (dead) 7 (unknown)
16. Plant Type (PT) (Col. 41)	1 digit number denoting the type of plant the specimen is (plants only).	1 (annual) 2 (biannual) 3 (perennial) 4 (aquatic) 5 (mix of annual and perennial) BLANK (for animals)

SAMPLING AND ANALYSIS ECOLOGICAL SURVEY - MONITORING PROGRAM
(Continued)

	Variable	Description	Possible Entries
17.	Phenology (PH) (Col. 42)	2 digit number denoting the phenology of the plant specimen (plants only).	1 (first visible growth) 2 (first leaves fully expanded) 3 (floral buds developing) 4 (mature floral buds or open flowers) 5 (green or ripe fruit) 6 (dispensing seeds) 7 (beginning dormancy) 8 (fall growth [winter annuals]) 9 (winter dormancy) 0 (standing dead) BLANK
18.	Color (Col. 43-45)	3 digits indicating the color of a plant specimen (plants only).	See appendix for codes BLANK (for animals) See Appendix C
19.	Depth (Col. 46-49)	4 numeric or alpha-numeric characters denoting the depth of the sample. The 4 digits will indicate the average depth, in centimeters, at which the sample was obtained. In the case of root samples, alphabetic X (in position 49) will denote the roots emerged from the soil plug at the depth, in centimeters, indicated by the first 3 numeric digits.	0001 thru 9999 001X thru 000X BLANK
20.	Area/Volume (Col. 50-55)	6 digits indicating the volume in cubic centimeters or 5 digits followed by alphabetic A indicating the area in square centimeters of the space sampled.	00001A thru 00000A 000001 thru 999999
21.	NR Spec (Col. 56-58)	3 digit number indicating the number of specimens making up the sample.	001 thru 999
22.	Weight (Col. 59-62)	4 digit number indicating the weight (in grams) of the sample preparation.	0001 thru 9999
23.	Tissue (Col. 63-65)	3 character field used to denote the type of plant or animal tissue the sample contains.	BEA (beak) BEF (beak and feet [including legs]) BLO (blood) BOF (body fat) BRA (brain) FAT (visceral and body fat) FEA (feathers) FEE (feet) FIL (filet) FLO (flowers) FRU (fruit) FHU (femurs and humeri) HAI (hair) HEA (heart) HXA (hexane-acetone rinse [50%]) INT (internal organs [heart, liver, lungs, spleen and kidneys]) KID (kidney) LEA (leaves) LEG (legs)

TABLE H-1

SUMMARY OF VEGETATION SAMPLING

Sampling Area[a]	Corresponding IR Site No.	IR Citation	
1	None	None	Treatment outfall ditch
2	1,2	Stressed	Settling ponds/treatment outfall ditch
3	None	None	Rocket ditch
4	3,4,5,6	Stressed	Settling ponds/rocket ditch
5	12.1	Stressed	Rocket ditch
6	9.2	Healthy	No probable stress-BKG
7	14	None	Burning ground
8	14.1	Healthy	NE of brng. grd.-BKG
9	13.4	Healthy	BKG near center of site
10	24.1	Stress from uprooting	Made land-uprooting on levee
11	None	None	Higher ground near center of site-BKG
12	26.1	Stressed	Nitro pond
13	27C.2	Stressed	Deterrent burning pit
14	27C.4	Stress from wind	Wind stress
15	27D.1	Stressed	Old landfill
16	21.4	Drought stress	Drought stress
17	21.1	Healthy	BKG
18	29.5	Stressed	Downgrade from oleum plant
19	None	None	Oleum plant pad runoff
20	None	None	Downgrade from acid pond
21	20.2	Stress from air pollution or exposure	
22	29	Healthy	No probable stress
23	19	Moisture stress-drowned trees	Moisure stress

NOTES: [a] For sampling areas refer to Figure 3-6.

ANALYTICAL DATA
SUMMARIZED BY SITE TYPE

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: WELLS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80084	AL		2.500	+03	UGL		
S1102	A0001	1370	80051	80056	NO2	LT	2.500	-01	MGL		
S1102	A0001	1370	80051	80056	NO3		1.600	+01	MGL	-10	2
S1102	A0001	1370	80051	80084	PB		9.600	+00	UGL	-0.4	8
S1102	A0001	1370	80051	80084	SN	LT	1.800	+01	UGL		
S1102	A0001	1370	80051	80059	SO4		1.420	+02	MGL	42	2
S1102	A0066	1674	80183	80225	AG	LT	3.000	+00	UGL		
S1102	A0066	1674	80183	80197	ALDRN	LT	3.300	-02	UGL		
S1102	A0066	1674	80183	80225	AS	LT	6.000	+00	UGL		
S1102	A0066	1674	80183	80197	PCB016	LT	1.100	+00	UGL		
S1102	A0066	1674	80183	80197	PCB221	LT	3.000	+00	UGL		
S1102	A0066	1674	80183	80197	PCB232	LT	2.400	+00	UGL		
S1102	A0066	1674	80183	80197	PCB242	LT	1.300	+00	UGL		
S1102	A0066	1674	80183	80197	PCB248	LT	7.000	-01	UGL		
S1102	A0066	1674	80183	80197	PCB254	LT	2.400	+00	UGL		
S1102	A0066	1674	80183	80197	PCB260	LT	2.300	+00	UGL		
S1102	A0066	1674	80183	80225	BE	LT	4.700	+01	UGL		
S1102	A0066	1674	80183	80197	ABHC	LT	1.700	-01	UGL		
S1102	A0066	1674	80183	80197	BBHC	LT	3.500	-02	UGL		
S1102	A0066	1674	80183	80197	DBHC	LT	2.600	-02	UGL		
S1102	A0066	1674	80183	80197	CCL4	LT	3.000	-01	UGL		
S1102	A0066	1674	80183	80225	CD	LT	1.000	+00	UGL		
S1102	A0066	1674	80183	80197	CHCL3	LT	2.300	+00	UGL		
S1102	A0066	1674	80183	80197	CLDAN	LT	1.100	-01	UGL		
S1102	A0066	1674	80183	80225	CR	LT	4.000	+00	UGL		
S1102	A0066	1674	80183	80225	CUTOT		3.400	+01	UGL		
S1102	A0066	1674	80183	80197	DLDRN	LT	1.600	-01	UGL		
S1102	A0066	1674	80183	80197	ENDRN	LT	3.000	-02	UGL		
S1102	A0066	1674	80183	80197	AENSLF	LT	2.500	-02	UGL		
S1102	A0066	1674	80183	80197	BENSLF	LT	6.400	-02	UGL		
S1102	A0066	1674	80183	80200	HGTOT	LT	5.000	-01	UGL		
S1102	A0066	1674	80183	80197	HPCL	LT	1.200	-01	UGL		
S1102	A0066	1674	80183	80197	LIN		6.700	-02	UGL		
S1102	A0066	1674	80183	80225	NI		1.300	+01	UGL		
S1102	A0066	1674	80183	80192	NO2	LT	2.500	-01	MGL		
S1102	A0066	1674	80183	80192	NO3		8.160	+00	MGL	-5.2	29
S1102	A0066	1674	80183	80225	PB	LT	1.700	+00	UGL		
S1102	A0066	1674	80183	80197	PPDDD	LT	6.300	-02	UGL		
S1102	A0066	1674	80183	80197	PPDDE	LT	1.100	-01	UGL		
S1102	A0066	1674	80183	80197	PPDDT	LT	9.200	-02	UGL		
S1102	A0066	1674	80183	80225	SB	LT	5.000	+00	UGL		
S1102	A0066	1674	80183	80225	SE	LT	2.000	+00	UGL		
S1102	A0066	1674	80183	80225	TL	LT	3.000	+00	UGL		
S1102	A0066	1674	80183	80197	TXPHEN	LT	8.900	+00	UGL		
S1102	A0066	1674	80183	80225	ZN		5.500	+01	UGL		

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	24DNT	LT	1.300	-01	UGL		
S1103	A0067	3586	80182	80192	NO2	LT	2.500	-01	MGL		
S1103	A0067	3586	80182	80192	NO3		3.320	+00	MGL	-2.1	36
S1103	A0067	3586	80182	80197	24DNT	LT	1.300	-01	UGL		
S1104	A0002	2283	80051	80084	AL		4.000	+02	UGL		
S1104	A0002	2283	80051	80056	NO2	LT	2.500	-01	MGL		
S1104	A0002	2283	80051	80056	NO3		3.400	+00	MGL	-2.2	40
S1104	A0002	2283	80051	80084	PB	LT	1.700	+00	UGL		
S1104	A0002	2283	80051	80084	SN	LT	1.800	+01	UGL		
S1104	A0002	2283	80051	80059	SO4		9.200	+01	MGL	27	3
S1104	A0068	2543	80183	80225	AG	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80197	ALDRN	LT	3.300	-02	UGL		
S1104	A0068	2543	80183	80225	AS	LT	6.000	+00	UGL		
S1104	A0068	2543	80183	80197	PCB016	LT	1.100	+00	UGL		
S1104	A0068	2543	80183	80197	PCB221	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80197	PCB232	LT	2.400	+00	UGL		
S1104	A0068	2543	80183	80197	PCB242	LT	1.300	+00	UGL		
S1104	A0068	2543	80183	80197	PCB248	LT	7.000	-01	UGL		
S1104	A0068	2543	80183	80197	PCB254	LT	2.400	+00	UGL		
S1104	A0068	2543	80183	80197	PCB260	LT	2.300	+00	UGL		
S1104	A0068	2543	80183	80225	BE	LT	4.700	+01	UGL		
S1104	A0068	2543	80183	80197	ABHC	LT	1.700	-01	UGL		
S1104	A0068	2543	80183	80197	BBHC	LT	3.500	-02	UGL		
S1104	A0068	2543	80183	80197	DBHC		6.900	-02	UGL		
S1104	A0068	2543	80183	80197	CCL4	LT	3.000	-01	UGL		
S1104	A0068	2543	80183	80225	CD	LT	1.000	+00	UGL		
S1104	A0068	2543	80183	80197	CHCL3	LT	2.300	+00	UGL		
S1104	A0068	2543	80183	80197	CLDAN	LT	1.100	-01	UGL		
S1104	A0068	2543	80183	80225	CR	LT	4.000	+00	UGL		
S1104	A0068	2543	80183	80225	CUTOT		1.000	+01	UGL		
S1104	A0068	2543	80183	80197	DLDRN	LT	1.600	-01	UGL		
S1104	A0068	2543	80183	80197	ENDRN	LT	3.000	-02	UGL		
S1104	A0068	2543	80183	80197	AENSLF	LT	2.500	-02	UGL		
S1104	A0068	2543	80183	80197	BENSLF	LT	6.400	-02	UGL		
S1104	A0068	2543	80183	80200	HGTOT	LT	5.000	-01	UGL		
S1104	A0068	2543	80183	80197	HPCL	LT	1.200	-01	UGL		
S1104	A0068	2543	80183	80197	LIN	LT	2.800	-02	UGL		
S1104	A0068	2543	80183	80225	NI	LT	8.000	+00	UGL		
S1104	A0068	2543	80183	80197	PPDDD	LT	6.300	-02	UGL		
S1104	A0068	2543	80183	80197	PPDDE	LT	1.100	-01	UGL		
S1104	A0068	2543	80183	80197	PPDDT	LT	9.200	-02	UGL		
S1104	A0068	2543	80183	80225	SB	LT	6.000	+00	UGL		
S1104	A0068	2543	80183	80225	SE	LT	2.000	+00	UGL		
S1104	A0068	2543	80183	80225	TL	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80197	TXPHEN	LT	8.900	+00	UGL		

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1104	A0068	2543	80183	80225	ZN		7.800	+01	UGL		
S1104	A0068	2543	80183	80197	24DNT	LT	1.300	-01	UGL		
S1105	A0062	3265	80184	80192	NO2	LT	2.500	-01	MGL		
S1105	A0062	3265	80184	80192	NO3		2.480	+00	MGL	-1.6	48
S1105	A0062	3265	80184	80197	24DNT	LT	1.300	-01	UGL		
S1106	A0069	4062	80183	80192	NO2	LT	2.500	-01	MGL		
S1106	A0069	4062	80183	80192	NO3		1.970	+00	MGL	-1.3	60
S1107	A0003	1453	80056	80086	AL	LT	3.000	+02	UGL		
S1107	A0003	1453	80056	80060	NO2	LT	2.500	-01	MGL		
S1107	A0003	1453	80056	80060	NO3		6.000	-01	MGL	-.38	20
S1107	A0003	1453	80056	80088	PB		7.700	+00	UGL	-0.3	10
S1107	A0003	1453	80056	80086	SN	LT	1.800	+01	UGL		
S1107	A0003	1453	80056	80059	SO4		1.600	+01	MGL	5.0	16
S1107	A0063	1936	80184	80225	AG	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80197	ALDRN	LT	3.300	-02	UGL		
S1107	A0063	1936	80184	80225	AS	LT	6.000	+00	UGL		
S1107	A0063	1936	80184	80197	PCB016	LT	1.100	+00	UGL		
S1107	A0063	1936	80184	80197	PCB221	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80197	PCB232	LT	2.400	+00	UGL		
S1107	A0063	1936	80184	80197	PCB242	LT	1.300	+00	UGL		
S1107	A0063	1936	80184	80197	PCB248	LT	7.000	-01	UGL		
S1107	A0063	1936	80184	80197	PCB254	LT	2.400	+00	UGL		
S1107	A0063	1936	80184	80197	PCB260	LT	2.300	+00	UGL		
S1107	A0063	1936	80184	80225	BE	LT	4.700	+01	UGL		
S1107	A0063	1936	80184	80197	ABHC	LT	1.700	-01	UGL		
S1107	A0063	1936	80184	80197	BBHC	LT	3.500	-02	UGL		
S1107	A0063	1936	80184	80197	DBHC	LT	2.600	-02	UGL		
S1107	A0063	1936	80184	80197	CCL4	LT	3.000	-01	UGL		
S1107	A0063	1936	80184	80225	CD	LT	1.000	+00	UGL		
S1107	A0063	1936	80184	80197	CHCL3	LT	2.300	+00	UGL		
S1107	A0063	1936	80184	80197	CLDAN	LT	1.100	-01	UGL		
S1107	A0063	1936	80184	80225	CR	LT	4.000	+00	UGL		
S1107	A0063	1936	80184	80225	CUTOT		1.000	+01	UGL		
S1107	A0063	1936	80184	80197	DLDRN	LT	1.600	-01	UGL		
S1107	A0063	1936	80184	80197	ENDRN	LT	3.000	-02	UGL		
S1107	A0063	1936	80184	80197	AENSLF	LT	2.500	-02	UGL		
S1107	A0063	1936	80184	80197	BENSLF	LT	6.400	-02	UGL		
S1107	A0063	1936	80184	80200	HGTOT	LT	5.000	-01	UGL		
S1107	A0063	1936	80184	80197	HPCL	LT	1.200	-01	UGL		
S1107	A0063	1936	80184	80197	LIN	LT	2.800	-02	UGL		
S1107	A0063	1936	80184	80225	NI	LT	8.000	+00	UGL		
S1107	A0063	1936	80184	80192	NO2	LT	2.500	-01	MGL		
S1107	A0063	1936	80184	80192	NO3		4.300	-01	MGL	-2.8	55
S1107	A0063	1936	80184	80225	PD	LT	1.700	+00	UGL		
S1107	A0063	1936	80184	80197	PPDDD	LT	6.300	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: WELLS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1107	A0063	1936	80184	80197	PPDDE	LT	1.100	-01	UGL		
S1107	A0063	1936	80184	80197	PPDDT	LT	9.200	-02	UGL		
S1107	A0063	1936	80184	80225	SB	LT	6.000	+00	UGL		
S1107	A0063	1936	80184	80225	SE	LT	2.000	+00	UGL		
S1107	A0063	1936	80184	80225	TL	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80197	TXPHEN	LT	8.900	+00	UGL		
S1107	A0063	1936	80184	80225	ZN		3.300	+01	UGL		
S1107	A0063	1936	80184	80197	24DNT	LT	1.300	-01	UGL		
S1108	A0004	575	80056	80084	AL	LT	3.000	+02	UGL		
S1108	A0004	575	80056	80060	NO2	LT	2.500	-01	MGL		
S1108	A0004	575	80056	80060	NO3	LT	3.600	-01	MGL		
S1108	A0004	575	80056	80083	PB	LT	1.700	+00	UGL		
S1108	A0004	575	80056	80084	SN	LT	1.300	+01	UGL		
S1108	A0004	575	80056	80059	SO4		1.560	+02	MGL	46	2
S1108	A0064	886	80184	80225	AG	LT	3.000	+00	UGL		
S1108	A0064	886	80184	80225	AS	LT	6.000	+00	UGL		
S1108	A0064	886	80184	80225	BE	LT	4.700	+01	UGL		
S1108	A0064	886	80184	80197	CCL4	LT	3.000	-01	UGL		
S1108	A0064	886	80184	80225	CD	LT	1.000	+00	UGL		
S1108	A0064	886	80184	80197	CHCL3	LT	2.300	+00	UGL		
S1108	A0064	886	80184	80225	CR	LT	4.000	+00	UGL		
S1108	A0064	886	80184	80225	CUTOT		7.000	+00	UGL		
S1108	A0064	886	80184	80225	HGTOT	LT	5.000	-01	UGL		
S1108	A0064	886	80184	80225	NI	LT	8.000	+00	UGL		
S1108	A0064	886	80184	80192	NO2		3.600	-01	MGL	-0.2	34
S1108	A0064	886	80184	80192	NO3		4.000	-01	MGL	-2.6	C3
S1108	A0064	886	80184	80225	PB	LT	1.700	+00	UGL		
S1108	A0064	886	80184	80225	SB	LT	6.000	+00	UGL		
S1108	A0064	886	80184	80225	SE	LT	2.000	+00	UGL		
S1108	A0064	886	80184	80225	TL	LT	3.000	+00	UGL		
S1108	A0064	886	80184	80225	ZN		6.900	+01	UGL		
S1108	A0064	886	80184	80197	24DNT	LT	1.300	-01	UGL		
S1109	A0065	2650	80057	80084	AL	LT	3.000	+02	UGL		
S1109	A0065	2650	80057	80060	NO2	LT	2.500	-01	MGL		
S1109	A0065	2650	80057	80060	NO3		6.000	+00	MGL	-4	C2
S1109	A0065	2650	80057	80084	PB	LT	1.700	+00	UGL		
S1109	A0065	2650	80057	80084	SN	LT	1.800	+01	UGL		
S1109	A0065	2650	80057	80059	SO4		2.800	+01	MGL	8	9
S1109	A0066	2961	80185	80197	CCL4	LT	3.000	-01	UGL		
S1109	A0066	2961	80185	80197	CHCL3	LT	2.300	+00	UGL		
S1109	A0066	2961	80185	80197	24DNT	LT	1.300	-01	UGL		
S1111	A0008	2411	80058	80084	AL	LT	3.000	+02	UGL		
S1111	A0008	2411	80058	80060	NO2	LT	2.500	-01	MGL		
S1111	A0008	2411	80058	80060	NO2	LT	2.500	-01	MGL		
S1111	A0008	2411	80058	80060	NO3		7.000	-01	MGL	-.50	16

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: WELLS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	RESULTS EXP	RESULTS UNIT	RESULTS ACRY	RESULTS PREC
S1111	A0008	2411	80058	80060	NO3		7.000	-01	MGL	-.50	16
S1111	A0008	2411	80058	80084	PB	LT	1.700	+00	UGL		
S1111	A0008	2411	80058	80084	SN	LT	1.800	+01	UGL		
S1111	A0008	2411	80058	80078	SO4		1.700	+01	MGL	+5	14
S1111	A0065	2709	80184	80197	24DNT	LT	1.300	-01	UGL		
S1112	A0006	1981	80057	80084	AL	LT	3.000	+02	UGL		
S1112	A0006	1981	80057	80060	NO2	LT	2.500	-01	MGL		
S1112	A0006	1981	80057	80060	NO3		1.000	+00	MGL	-0.7	12
S1112	A0006	1981	80057	80088	PB	LT	1.700	+00	UGL		
S1112	A0006	1981	80057	80086	SN	LT	1.800	+01	UGL		
S1112	A0006	1981	80057	80059	SO4		3.300	+01	MGL	10	7
S1113	A0055	1708	80189	80192	NO2	LT	2.500	-01	MGL		
S1113	A0055	1708	80189	80192	NO3		1.920	+00	MGL	-1.2	62
S1113	A0055	1708	80189	80197	24DNT	LT	1.300	-01	UGL		
S1115	A0007	2747	80057	80084	AL	LT	3.000	+02	UGL		
S1115	A0007	2747	80057	80060	NO2	LT	2.500	-01	MGL		
S1115	A0007	2747	80057	80060	NO3		1.900	+00	MGL	-1.2	60
S1115	A0007	2747	80057	80088	PB	LT	1.700	+00	UGL		
S1115	A0007	2747	80057	80084	SN	LT	1.800	+01	UGL		
S1115	A0007	2747	80057	80059	SO4		1.800	+01	MGL	5	13
S1115	A0007	2747	30057	80059	SO4		1.800	+01	MGL	5	13
S1117	A0009	2799	80058	80084	AL	LT	3.000	+02	UGL		
S1117	A0009	2799	80058	80060	NO2	LT	2.500	-01	MGL		
S1117	A0009	2799	80058	80060	NO3		3.000	+00	MGL	-2	C4
S1117	A0009	2799	80058	80084	PB		7.700	+00	UGL	-0.3	10
S1117	A0009	2799	80058	80084	SN	LT	1.800	+01	UGL		
S1117	A0009	2799	80058	80078	SO4		4.030	+01	MGL	+12	6
S1117	A0050	3321	80193	80197	CCL4		1.200	+01	UGL		
S1117	A0050	3321	80193	80197	CHCL3		6.600	+01	UGL		
S1117-WBNR	A0050	3321	80193	80198	ALK		3.390	+02	MGL		
S1117-WBNR	A0050	3321	80193	80197	COD		5.000	+00	MGL		
S1117-WBNR	A0050	3321	80193	80197	COND		5.500	+02	UMHC		
S1117-WBNR	A0050	3321	80193	80197	FE		9.600	-01	MGL		
S1117-WBNR	A0050	3321	80193	80197	HARD		4.350	+02	MGL		
S1117-WBNR	A0050	3321	80193	80199	NO3		2.180	+00	MGL	-1.4	55
S1117-WBNR	A0050	3321	80193	80196	N2KJEL	LT	1.000	+00	MGL		
S1117-WBNR	A0050	3321	80193	80198	PH		7.100	+00			
S1117-WBNR	A0050	3321	80193	80224	SULFID	LT	1.000	+00	MGL		
S1119	A0010	3129	80058	80084	AL		5.000	+02	UGL		
S1119	A0010	31[illegible]	80058	800[illegible]	NO[illegible]	LT	2.500	-01	MGL		
S1119	A0010	31[illegible]	80058	80060	NO3		1.500	+00	MGL	-0.9	80
S1119	A0010	[illegible]	80058	80084	PB		2.900	+00	UGL	-0.1	27
S1119	A0010	31[illegible]	80058	80084	SN	LT	1.800	+01	UGL		
S1119	A0010	31[illegible]	80058	80078	SO4		3.900	+01	MGL	+12	6
S1121	A[illegible]	1[illegible]	80058	80084	AL	LT	3.000	+02	UGL		

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1121	A0014	1206	80058	80060	NO2	LT	2.500	-01	MGL		
S1121	A0014	1206	80058	80060	NO3		2.700	-01	MGL	-.17	44
S1121	A0014	1206	80058	80084	PB		3.800	+00	UGL	-0.2	20
S1121	A0014	1206	80058	80084	SN	LT	1.800	+01	UGL		
S1121	A0014	1206	80058	80078	SO4		2.000	+01	MGL	+6	12
S1121	A0056	1500	80189	80225	AG	LT	3.000	+00	UGL		
S1121	A0056	1500	80189	80225	AS	LT	5.000	+00	UGL		
S1121	A0056	1500	80189	80225	BE	LT	4.700	+01	UGL		
S1121	A0056	1500	80189	80197	CCL4	LT	3.000	-01	UGL		
S1121	A0056	1500	80189	80225	CD	LT	1.000	+00	UGL		
S1121	A0056	1500	80189	80197	CHCL3	LT	2.300	+00	UGL		
S1121	A0056	1500	80189	80225	CR		5.000	+00	UGL		
S1121	A0056	1500	80189	80225	CUTOT	LT	5.000	+00	UGL		
S1121	A0056	1500	80189	80200	HGTOT	LT	5.000	-01	UGL		
S1121	A0056	1500	80189	80225	NI	LT	8.000	+00	UGL		
S1121	A0056	1500	80189	80225	PB		5.800	+00	UGL	-0.2	14
S1121	A0056	1500	80189	80225	SB	LT	6.000	+00	UGL		
S1121	A0056	1500	80189	80225	SE	LT	2.000	+00	UGL		
S1121	A0056	1500	80189	80225	TL	LT	3.000	+00	UGL		
S1121	A0056	1500	80189	80225	ZN	LT	1.500	+01	UGL		
S1121	A0056	1500	80189	80197	24DNT	LT	1.300	-01	UGL		
S1121-WDNR	A0056	1500	80189	80196	ALK		2.200	+02	MGL		
S1121-WDNR	A0056	1500	80189	80197	COD		4.700	+01	MGL		
S1121-WDNR	A0056	1500	80189	80197	COND		3.880	+02	UMHC		
S1121-WDNR	A0056	1500	80189	80197	FE		4.800	-01	MGL		
S1121-WDNR	A0056	1500	80189	80197	HARD		2.570	+02	MGL		
S1121-WDNR	A0056	1500	80189	80192	NO3		3.300	-01	MGL	-2.1	72
S1121-WDNR	A0056	1500	80189	80196	N2KJEL	LT	1.000	+00	MGL		
S1121-WDNR	A0056	1500	80189	80196	PH		7.200	+00			
S1121-WDNR	A0056	1500	80189	80192	SULFID	LT	1.000	+00	MGL		
S1122	A0011	3914	80052	80084	AL	LT	3.000	+02	UGL		
S1122	A0011	3914	80052	80086	NG	LT	1.100	+01	UGL		
S1122	A0011	3914	80052	80060	NO2	LT	2.500	-01	MGL		
S1122	A0011	3914	80052	80060	NO3		2.500	-01	MGL	-.16	65
S1122	A0011	3914	80052	80088	PB		2.900	+00	UGL	-0.1	27
S1122	A0011	3914	80052	80084	SN	LT	1.800	+01	UGL		
S1122	A0011	3914	80052	80059	SO4		4.000	+01	MGL	12	6
[illegible]	[illegible]	[illegible]	80185	[illegible]	24DNT	LT	1.300	-01	UGL		
[illegible]	[illegible]	[illegible]	80053	80084	AL	LT	3.000	[illegible]	UGL		
[illegible]	[illegible]	[illegible]	[illegible]	80060	NO2	LT	2.500	-01	MGL		
[illegible]	[illegible]	[illegible]	80053	[illegible]	NO3		7.000	+00	MGL	-5	02
[illegible]	[illegible]	[illegible]	80053	80088	PB	LT	1.700	+00	UGL		
[illegible]	[illegible]	[illegible]	80053	80084	SN	LT	1.800	+01	UGL		
[illegible]	[illegible]	[illegible]	80053	[illegible]	SO4		2.800	+01	MGL	8	9
[illegible]	[illegible]	[illegible]	80196	[illegible]	AG	[illegible]	3.000	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: WELLS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1123	A0052	3782	80190	80197	ALDRN	LT	3.300	-02	UGL		
S1123	A0052	3782	80190	80225	AS	LT	6.000	+00	UGL		
S1123	A0052	3782	80190	80197	PCB016	LT	1.100	+00	UGL		
S1123	A0052	3782	80190	90197	PCB221	LT	3.000	+00	UGL		
S1123	A0052	3782	80190	80197	PCB232	LT	2.400	+00	UGL		
S1123	A0052	3782	80190	80197	PCB242	LT	1.300	+00	UGL		
S1123	A0052	3782	80190	80197	PCB248	LT	7.000	-01	UGL		
S1123	A0052	3782	80190	80197	PCB254	LT	2.400	+00	UGL		
S1123	A0052	3782	80190	80197	PCB260	LT	2.300	+00	UGL		
S1123	A0052	3782	80190	80225	BE	LT	4.700	+01	UGL		
S1123	A0052	3782	80190	80197	ABHC	LT	1.700	-01	UGL		
S1123	A0052	3782	80190	80197	BBHC	LT	3.500	-02	UGL		
S1123	A0052	3782	80190	80197	DBHC	LT	2.600	-02	UGL		
S1123	A0052	3782	80190	80197	CCL4	LT	3.000	-01	UGL		
S1123	A0052	3782	80190	80225	CD	LT	1.000	+00	UGL		
S1123	A0052	3782	80190	80197	CHCL3	LT	2.300	+00	UGL		
S1123	A0052	3782	80190	80197	CLDAN	LT	1.100	-01	UGL		
S1123	A0052	3782	80190	80225	CR		1.100	+01	UGL		
S1123	A0052	3782	80190	80225	CUTOT		1.000	+01	UGL		
S1123	A0052	3782	80190	80197	DLDRN	LT	1.600	-01	UGL		
S1123	A0052	3782	80190	80197	ENDRN	LT	3.000	-02	UGL		
S1123	A0052	3782	80190	80197	AENSLF	LT	2.500	-02	UGL		
S1123	A0052	3782	80190	80197	BENSLF	LT	6.400	-02	UGL		
S1123	A0052	3782	80190	80200	HGTOT	LT	5.000	-01	UGL		
S1123	A0052	3782	80190	80197	HPCL	LT	1.200	-01	UGL		
S1123	A0052	3782	80190	80197	LIN	LT	2.800	-02	UGL		
S1123	A0052	3782	80190	80225	NI	LT	8.000	+00	UGL		
S1123	A0052	3782	80190	80225	PB		1.400	+01	UGL	-1	5
S1123	A0052	3782	80190	80197	PPDDD	LT	6.300	-02	UGL		
S1123	A0052	3782	80190	80197	PPDDE	LT	1.100	-01	UGL		
S1123	A0052	3782	80190	80197	PPDDT	LT	9.200	-02	UGL		
S1123	A0052	3782	80190	80225	SB	LT	6.000	+00	UGL		
S1123	A0052	3782	80190	80225	SE	LT	2.000	+00	UGL		
S1123	A0052	3782	80190	80225	TL	LT	3.000	+00	UGL		
S1123	A0052	3782	80190	80197	TXPHEN	LT	8.900	+00	UGL		
S1123	A0052	3782	80190	80225	ZN		6.900	+01	UGL		
S1123	A0052	3782	80190	80197	24DNT	LT	1.300	-01	UGL		
S1123 WIAR	A0052	3782	80190	80196	ALK		2.320	+02	MGL		
S1123 WIAR	A0052	3782	80190	80197	COD	LT	5.000	+00	MGL		
S1123 WIAR	A0052	3782	80190	80197	COND		3.47[illegible]	+02	UMHC		
S1123 WIAR	A0052	3782	80190	80197	FE		1.540	+00	MGL		
S1123 WIAR	A0052	3782	80190	80197	HARD		3.410	+02	MGL		
S1123 WIAR	A0052	3782	80190	80192	NO3		3.910	+00	MGL	-2.5	61
S1123 WIAR	A0052	3782	80190	80196	N2NJEL	LT	1.000	+00	MGL		
S1123 WIAR	A0052	3782	80190	80196	PH		7.000	+00			

SAMPLING AND ANALYSIS ECOLOGICAL SURVEY - MONITORING PROGRAM
(Continued)

Variable	Description	Possible Entries
23. Cont'd		LIV (liver) LUN (lung) MUS (muscle) OTH (other) ROO (roots) SEE (seeds) SFR (skin and fur) SFT (skin and feathers) SKI (skin) SOI (indicates a soil sample associated with the organism in the SPECIES column SPL (spleen) STE (stems) TEE (teeth) VIF (visceral fat) FIX (viscera [total]) VIX (viscera, except internal organs) WAA (whole body, except skin, fur, feathers and viscera) WAT (indicates a rinse-water sample associated with the organism in the SPECIES column) WAX (whole body, except skin, fur, feathers, viscera and brain) SCC (stomach and crop contents) SIC (stomach and intestines with contents) SKE (skeletal) STO (stomach) WBB (whole body, except skin, feathers, legs, feet, beak, viscera and brain) WHB (whole body, except viscera) WHO (whole body [plant or animal]) WHP (whole plant, except roots) WRE (whole body, except stomach, intestines, femurs, humeri, kidneys and skin) WSF (whole body, except stomach, crop contents, external parts and kidneys WSX (whole body except shell) WXK (whole body except skin, stomach, kidneys and feet)
24. Sample Subprogram (Col. 66)	1 character denoting the type of data for which the sample was collected.	S (special study) M (sample taken in the ecological monitoring program) C (sample taken in the comprehensive survey) G (general observation) P (preliminary survey)
25. Sample Number (Col. 67-72)	Terrestrial Biology Aquatic Biology	B0001 thru B0199 B0200 thru B9999
26. Composite Sample NR (Col. 73-77)	5 alphanumeric field denoting one sample made up of aliquots of two or more individual samples.	EC001 thru EC999
27. Stat Code (Col. 78-80)	3 digit code used in providing additional information pertaining to the organism	See Appendix B

APPENDIX E

INSTALLATION RESTORATION
SAMPLING AND ANALYSIS
GEOTECHNICAL-FIELD DRILLING

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS - GEOTECHNICAL-FIELD DRILLING

GANG PUNCH

INS (1)	FA (3)	T (5)	FIL (7)
BA	GA	G	FD

SITE TYPE (8)	SITE IDENTIFICATION (12)	ELEVATION (22)	DATE (29)	BORE HOLE • (34)	ORG (39)	INSP. (41)	DEPTH - TOP OF INTERVAL (44)	INTERVAL THICKNESS (50)	ACTION/ MEA (55)	MTH (60)	VALUE (62)	DRI UNITS (68)	ENTRY (71)	SOH (77)	CN (80)

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE

ORG = ORGANIZATION
INSP. = INSPECTOR
MTH = METHOD
SOH = STATUS OF HOLE

CN = CARD NUMBER
DRI = DRILLING
MEA = MEASUREMENT

REVISED 12-77

CDIR Form 13-4.1, 1 Sep 78

SAMPLING AND ANALYSIS - GEOTECHNICAL - FIELD DRILLING FILE

Variable	Description	Possible Entries
1.-4. Identification (Col. 1-7)	Plant/file	BASAGFD
5. Site Type (Col 8-11)	4 letter abbreviation of type of landmark, feature, or construction being identified. This description/identification will have grid coordinates associable with it; however, grid coordinates will be entered in map file.	BASN (basin) BLDG (building) BORE (bore hole) CREK (creek) DTCH (ditch, drainage) LAKE PIT (pit/tree spade) PLUG (shovel sample) POND PPLT (pilot plant) RVER (river) SILO SPRG (spring) STRM (stream) STWA (standing water) SURF (surface-general) TWER (tower) WELL
6. Sample Point (Col. 12-16)	Hydrogeology	S1000 thru S1999
7. Elevation (Col. 22-28)	7 number recording of elevation of ground surface above mean sea level - in centimeters.	0000000 thru 9999999
8. Date (Col. 29-33)	5 number Julian date that boring was started	79302 thru 79365 80001 thru 80090
9. Bore Hole Number (Col. 34-38)	5 character identifier	H0001 thru H0999
10. Organization (ORG) (Col. 39-40)	2 character abbreviation of organization doing boring	WZ AC
11. Inspector (INSP) (Col. 41-43)	3 letter initials of the individual responsible for boring data	AAA thru ZZZ
12. Sample Depth - Top of Interval (Col. 44-49)	6 numbers - right justify to designate depth from topographic surface to top of sample interval - in centimeters (Record Depth to Bedrock under VALUE)	000000 thru 999999
13. Thickness of Interval (Col. 50-54)	5 number thickness of interval for which this measurement or action was taken in centimeters	00000 thru 99999
14. Action/Measurement (MEA) (Col. 55-59)	5 letter name of action or measurement taken on this interval	

Meaning	Entry-Abbrev.
a. Advance auger down hole	ADVAU
b. Color	COLOR
c. Compaction of strata during sampling (only when sample and sample interval are measured)	COMPT
d. Consistency	CONSS
e. Depth to Bedrock	DBRK
f. Length of sampler pushed into the substratum	DRIVE
g. Black fill of hole	FILL
h. Ground water @ time of drilling	GRDWT

SAMPLING AND ANALYSIS - GEOTECHNICAL - FIELD DRILLING FILE
(Continued)

Variable	Description: Meaning	Possible Entries: Entry-Abbrv.
14. Cont'd	i. Ground water level (stabilized)	GRDWS
	j. Interval filled with neat cement	GROUT
	k. Hammer blower per foot of drive	HABLO
	l. Hydraulic pressure in psig	HYPRS
	m. Lithology	LITHL
	n. Modification	MODIF
	o. Interval retained for test and analysis	SAMPL
	p. Length of screen or well point (top of screen and length of screen shown in variables 11 & 12)	SCREN
	q. Length of sand filter	SFILT
	r. Silt trap (below screen)	SITRP
	s. Length of PVC riser	STKUP
	t. Surface	SURF
	u. Time of drive, sec.	TIME
	v. Topographic setting	TOPO
	w. Unified soil class	USCS
15. Method (MTH) (Col. 60-61)	2 character designation of method employed to establish value or entry.	01 thru 09
16. Value (Col. 62-67)	6 number (5 digits plus decimal) value of hammer blows, hydraulic pressure, or other measurement to be determined i.e., Depth to Bedrock, reference from above: (h), (i), (e).	000.00 thru 999.99
17. Drilling Units of Measurements (DRI UNITS) (Col. 68-70)	3 letter abbreviation of units of measure for the value.	PSI (pound per square inch) BL (blows) L (liter) CM (centimeters) LPM (liters-minutes)
18. Entry (Col. 71-76)	Up to a 6 letter abbreviation of consistency, color, unified soil class, topographic setting, modifications, lithology or surface	Consistency CONSS (d) VSO (very soft) M (medium) ST (stiff) VST (very stiff) H (hard) VL (very loose) L (loose) MD (medium dense) D (dense) VD (very dense) Color COLOR (b) Munsel Colors examples: 5 YR 4/5 7.5 YR 4/5 (decimel and slashes are implied)

SAMPLING AND ANALYSIS - GEOTECHNICAL - FIELD DRILLING FILE
(Continued)

Variable	Description	Possible Entries
		Unified Soil Class USCS (w)
18. Cont'd		CH (fat clay, inorganic clay of high plasticity) CL (lean clay, sandy clay, silty clay, of low to medium plasticity) GC (clayey gravel, gravel-sand-clay mxitures) GM (silty gravel, gravel-sand-silt mixtures) GP (gravel, poorly graded, gravel-sand mixtures, little or no fines) GW (well graded gravel-sand mixture, little or no fines) ML (silt & very fine sand, silty or clayey fine sand or clayey silt with slight plasticity) MH (silt, fine sandy or silty soil with high plasticity) OH (organic clays of medium to high plasticity, organic silts) OL (organic silts and organic silty clays of low plasticity) PT (peat or another highly organic soil) SC (clayey sand, sand-clay mixtures) SI (shells) SM (silty-sand, sand-silt mixtures) SP (sand, poorly-graded, gravelly sands) SW (sand, well-graded, gravelly sands) WD (wood)
		Topographic Setting TOPO (v)
		DEPR (local depression) DUNE (dunes FLAT (flat surface) HLTP (hilltop) WTLD (lake, swamp, or marsh) PDMT (pediment) DTCH (drainage ditch) HLSD (hillside [slope]) TER (alluvial or marine terrace) UNDL (undulating) VALY (valley flat - valleys of all sizes) DRAW (upland draw)
		Modifications MODIF (n)
		B (boulders) CC (concretions) CS (clay strata or lenses) FILL (disturbed soil) IRNST (ironstained) LIG (lignite fragments) O (organic matter) ODOR (odiferous) OX (oxidized) PCEM (poorly cemented) ROUND (rounded) RT (rootlets) SDL (sandstone lenses) SDS (sandstone fragments) SH (shale fragments) SIS (silt strata or lenses)

SAMPLING AND ANALYSIS - GEOTECHNICAL - FIELD DRILLING FILE
(Continued)

Variable	Description	Possible Entries
		Modifications MODIF (n)
18. Cont'd		SL (slickensides)
		SLF (shell fragments)
		SS (sand strata of lenses)
		WD (wood)
		C (coarse)
		F (fine)
		FC (fine to coarse)
		FM (fine to medium)
		G (gravelly)
		LG (large)
		M (medium)
		ML (silty)
		S (sandy)
		SM (small)
		FECC (iron concretions)
		MNCC (manganese concretions)
		MOT (mottled)
		MANMD (manmade or man-altered material)
		TR (trace)
		TRCL (trace of clay)
		TRG (trace of gravel)
		TRS (trace of sand)
		TRML (trace of silt)
		WCL (with clay)
		WML (with silt)
		WS (with sand)
		WG (with gravel)
		DRY (dry)
		LM (little moisture)
		MM (medium moisture)
		M (moist)
		VM (very moist)
		WET (wet)

Lithology

Abbrev.	Rock Term
ALVM	(alluvium)
ANDR	(anhydrite)
ARKS	(arkose)
BSLT	(basalt)
BNTN	(bentonite)
BRCC	(breccia
CLCT	(calcite)
CHLK	(chalk)
CLAY	(clay)
CLSN	(claystone)
COAL	(coal)
CGLM	(conglomerate)
CQUN	(coquina)
DORT	(diorite)
DLMT	(dolomite)
DRFT	(drift)
EVPR	(evaporite)
GBBR	(gabbro)
GLCL	(clacial - undifferentiated)
GNSS	(gneiss)
GRNT	(granite)
GRVL	(gravel)
GRCK	(graywacke)
GPSM	(gypsum)
ASH	(ash)
DRLMSN	(drushed limestone)
RUBBLE	(rubble or demolition fill)
RESID	(residium)

SAMPLING AND ANALYSIS - GEOTECHNICAL - FIELD DRILLING FILE
(Continued)

Variable	Description	Possible Entries
		Lithology
		Abbrev. Rock Term
18. Cont'd		IGNS (igneous - undifferentiated) LGNT (lignite) LMSN (limestone) LOSS (loess) MRBL (marble) MARL (marl) MRLS (marlstone) MMPC (metamorphis - undifferentiated) SHLE (shale) SILT (silt) SLSN (siltstone) SLTE (slate) SYNT (syenite) TILL (till) TRVR (travertine) TUFF (tuff) VLCC (volcanic - undifferentiated)
		Surface
		WOODED (wooded) GRASS (grass) BARE (bare)
19. Status of Hole (SOH) (Col. 77-78)	2 letter abbreviation for status of hole.	OL (open lysimeter installed) O (open) FC (filled concrete) FS (filled soil) OP (open piezometer) FD (filled bentonite)
20. Comments (Col. 79)	1 character left over (spare)	
21. Card Number (CN) (Col. 80)	Blank in cc means parent card. A "1" means to look for trailing card(s). All cards belonging to parent card have been found when another blank or 1 is encountered. Cards to be numbered in sequence 1, 2, 3...	1 thru 9

APPENDIX F

INSTALLATION RESTORATION
SAMPLING AND ANALYSIS
GEOTECHNICAL-PHYSICAL ANALYSIS

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS - GEOTECHNICAL-PHYSICAL ANALYSIS

CARD PUNCH

INS (1)	FA (3)	T (6)	FIL (7)
BA	SA	G	PA

1	8	12	22	28	34	39	44	49	51	56	58	64	67	71	77	80
	SITE TYPE	SITE IDENTIFICATION	SAMPLE NUMBER	DEPTH - TOP OF INTERVAL	INTERVAL THICKNESS	SAMPLE DATE	ANALYSIS DATE	LAB	PHYS TEST NAME	MTH	PHYS MEA MANTISSA	MEA EXPON	PHYS UNITS	VALUE	ANAL-LYST	CN

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE

MTH = METHOD
EXPON = EXPONENT
PHYS = PHYSICAL
MEA = MEASUREMENT

CN = CARD NUMBER

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SAMPLING AND ANALYSIS - GEOTECHNICAL - PHYSICAL ANALYSIS FILE

	Variable	Description	Possible Entries
1.-4.	Identification (Col. 1-7)	Plant/File	BASAGPA
5.	Site Type (Col. 8-11)	4 letter abbreviation of type of landmark, feature, or construction being identified. This description/identification will have grid coordinates associable with it; however, grid coordinates will be entered in map file.	BASN (basin) BLDG (building) BORE (bore hole) CREK (creek) DTCH (ditch, drainage) LAKE (lake) PIT (pit/tree spade) PLUG (shovel sample) POND (pond) RVER (river) SPRG (spring) STRM (stream) STWA (standing water) SURF (surface-general) TWER (tower) WELL (well)
6.	Sample Point (Col. 12-16)	Hydrogeology	S1000 thru S1999
7.	Sample Number (Col. 22-66)	Soils or Parent Material Sediment	D0001 thru D9999 M0001 thru M9999
8.	Sample Depth - top of interval (Col. 28-33)	6 numbers - right justify to designate depth from topographic surface to top of sample interval.	000000 thru999999
9.	Sample Interval - Thickness (Col. 34-38)	5 numbers - right justify to designate the thickness of interval for which this measurement was taken.	00000 thru 99999
10.	Sampling Date (Col. 39-43)	5 number Julian date when sample was taken.	79300 thru 79365 80001 thru 80120
11.	Analysis Date (Col. 44-48)	5 number Julian date when this measurement of the sample was taken.	79300 thru 79365 80001 thru 80120
12.	Laboratory (LAB) (Col. 49-50)	2 letter abbreviation of organization doing analysis.	WZ (Warzyn) EE (EEI)
13.	Physical Test Name (Col. 51-55)	Up to 5 character abbreviation (numbers or letters) to identify the parameter being measured:	

Parameter	Abbrev.
Atterberg Liquid Limit	ATTLL
Atterberg Plastic Limit	ATTPL
Colors	COLOR
Density, dry	DENSD
Density, wet	DENSW
*Grain sizes - see listing @ end -	
Water content	MOISC
Permeability	PERM
Specific, gravity	SPCGR

SAMPLING AND ANALYSIS - GEOTECHNICAL - PHYSICAL ANALYSIS FILE
(Continued)

Variable	Description	Possible Entries
	Parameter	
13. Cont'd.	United Soil Classification System	USCS
	Porosity	POROS
	Void Ratio	VOIDR
	*(Grain size, hydrometer, percent finer than 0.05 mm)	G050
	(Grain size, hydrometer, percent finer than 0.01 mm)	G010
	(Grain size, hydrometer, percent than 0.0075 mm)	G0075
	(Grain size, hydrometer, percent finer than 0.005 mm)	G005
	(Grain size, hydrometer, percent finer than 0.002 mm)	G002
	(Grain size, 3/8" sieve, percent finer)	GS.37
	(Grain size, 1/2" sieve, percent finer)	GS.50
	(Grain size, 3/4" sieve, percent finer)	GS.75
	(Grain size, 1-1/2" sieve, percent finer)	GS1.5
	(Grain size, No. 3 sieve, percent finer)	GS003
	(Grain size, No. 4 sieve, percent finer)	GS004
	(Grain size, No. 6 sieve, percent finer)	GS006
	(Grain size, No. 8 sieve, perdent finer)	GS008
	(Grain size, No. 10 sieve, percent finer)	GS010
	(Grain size, No. 16 sieve, percent finer)	GS016
	(Grain size, No. 18 sieve, percent finer)	GS018
	(Grain size, No. 30 sieve, percent finer)	GS030
	(Grain size, No. 35 sieve, percent finer)	GS035
	(Grain size, No. 40 sieve, percent finer)	GS040
	(Grain size, No. 50 sieve, percent finer)	GS050
	(Grain size, No. 60 sieve, percent finer)	GS060
	(Grain size, No. 80 sieve, percent finer)	GS080
	(Grain size, No. 100 sieve, percent finer)	GS100
	(Grain size, No. 140 sieve, percent finer)	GS140
	(Grain size, No. 200 sieve, percent finer)	GS200
	(Grain size, No. 325 sieve, percent finer)	GS325
14. Method (MTH) (Col. 56-57)	2 number designation of the method used to generate this datum and is described in the methods file.	01 thru 99
15. Physical Measurement (MEA) Mantissa (Col. 58-63)	6 number (5 digit plus decimal) for normal scientific notation.	0.0001 thru 9.9999
16. Measurement Exponent (MEA EXPON)	3 number (+ or - sign plus 2 digits) exponent to base 10.	-99 to +99
17. Physical Units of Measurement (Col. 67-70)	4 letter abbreviation of physical units of measure.	CMSC (cm/sec) GMCC (grams/cc) PC (percent)
18. Value (Col. 71-76)	6 letter abbreviation of standard classification including: Unified soils classes as shown	CH (fat clay, inorganic clay of high plasticity) CL (lean clay, sandy clay, silty slay, of low to medium plasticity) GC (clay gravel, gravel-sand-clay mixtures) GM (silty gravel, gravel-sand-silt mixtures) GP (gravel, poorly graded, gravel-sand mixtures, little or no fines)

Variable	Description	Possible Entries
18. Cont'd.		GW (well graded gravel-sand mixture, little or no fines) ML (silt and very fine sand, silty or clayey fine sand or clayey silt with slight plasticity) MH (silt, fine sandy or silty soil with high plasticity) OH (organic clays of medium to high plasticity, organic silts) OL (organic silts and organic silty clays of low plasticity) PT (peat or other highly organic soil) SC (clayey sand, sand-silt mixtures) SI (shells) SM (silty-sand, sand-silt mixtures) SP (sand, poorly-graded, gravelly sands) SW (sand, well-graded, gravelly sands) WD (wood)
	Hues that have values that are not integers will be truncated to an integer... e.g., $\frac{\text{HUE}}{\text{5R}}$ $\frac{\text{VALUE}}{2.5}$ $\frac{\text{COLOR}}{6}$ = >5R26 NOTE: Only HUES 5R, 7.5R, 10R, 2.5R, 2,5YR, 5 YR, and 5Y will be affected.	Color Munsel Colors
19. Analyst (Col. 77-79)	3 letter initials of individual responsible for measurement.	AAA thru ZZZ as defined
20. Card Number	One (1) number used to indicate additional cards containing associated information and/or descriptions. Cards should be numbered serially since data will be connected in sequence.	1 thru 9

APPENDIX H

TERRESTRIAL VEGETATION SAMPLING

INTRODUCTION

Badger Army Ammunition Plant was selected as a test site for determining the extent to which interpretation of infrared aerial photography of vegetation is a useful tool for tracking underground contamination. An aerial color IR report prepared for BAAP(1) identified areas of "stressed" vegetation and indicated suspected causes of stress, including moisture, wind, and suspected groundwater contamination. The approach taken in the "follow-up" program (the subject of this appendix) was direct sampling of vegetation for chemical analysis to determine the correlations, if any, between actual and suspected vegetation contamination as indicated by the IR report.

SAMPLING APPROACH

In order to provide a pool of specimens which could be analyzed to produce comparative chemical data, sampling was planned for the following types of areas:

1) Areas of vegetation stress identified in the infrared (IR) report where the suspected cause was groundwater contamination.

2) Areas cited in the IR report as showing vegetation stress attributable to causes other than groundwater contamination (i.e., cited in the report as "moisture stress", "wind stress", etc.)

3) Areas cited in the IR report as supporting "healthy" vegetation or "no stress"

4) Areas where groundwater contamination was suspected but which were not cited as "stressed" in the IR report

Vegetation types prepared for sampling in these areas were as follows:

1) Species or types specifically cited in the IR report (chiefly tress; trees were often "flagged" during the IR field check, making it possible to sample many of the individual plants cited as "stressed")

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(1) Rome Research Corporation. Aerial Color Infrared Photography Interpretation, BAAP, Contract No. DAAK11-78-C-0137, Data Items A004 and A005.

2) Types with shallower root systems in same areas (thus providing for data on the vertical extent of any contamination)

3) The predominant vegetation in areas where no specific types were cited as "stressed" or "healthy", or where no IR citation exists

SAMPLING SITES

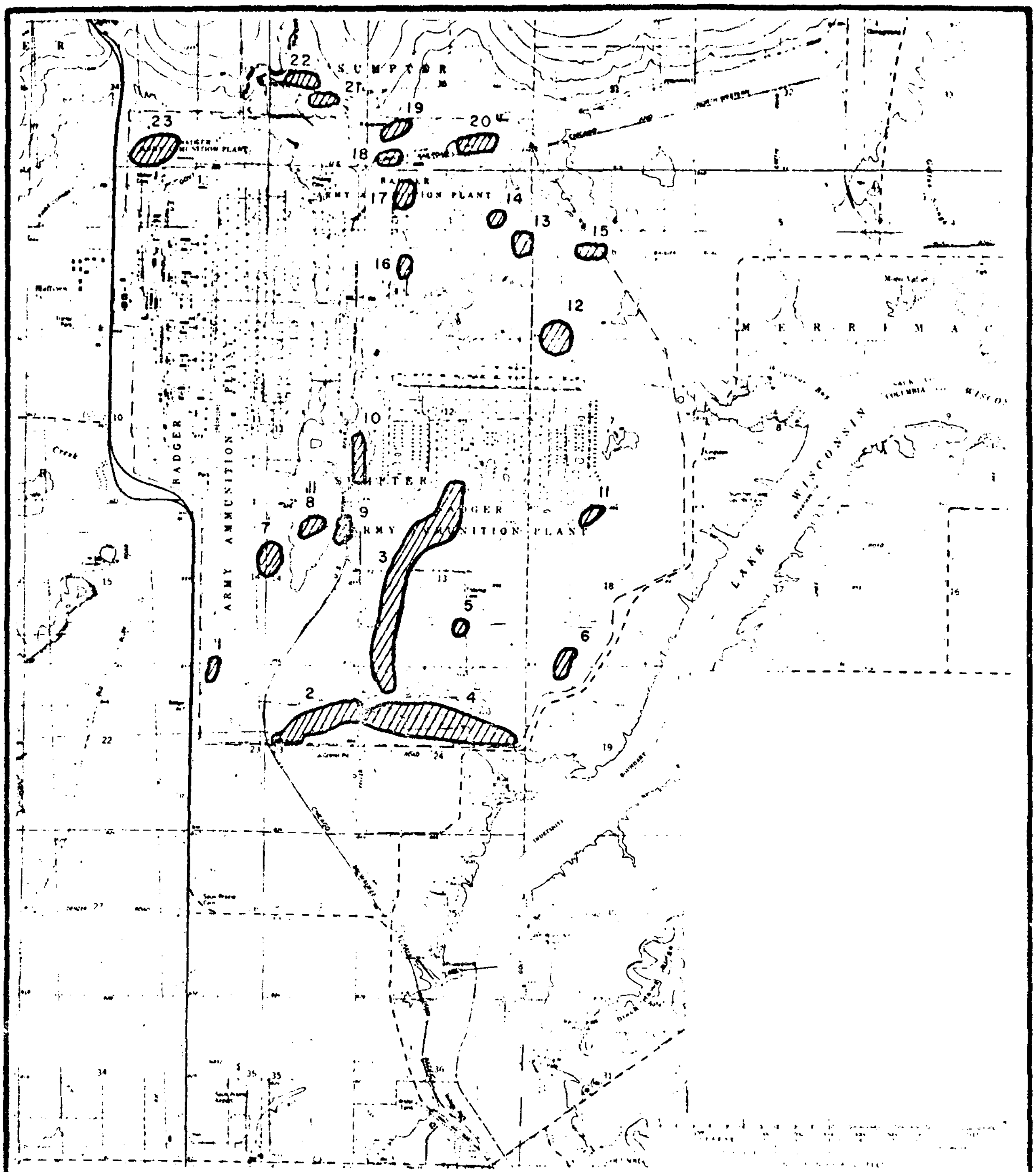
Based on an examination of the IR report, a preliminary site reconnaissance, and discussions with Army and Olin personnel, approximately 23 sampling areas were selected to represent the four site categories listed above. These areas are indicated on Figure H-1. Specific sampling sites within these areas, selected on the basis of vegetation distribution, are shown on Figure H-2. Table H-1 summarizes the overall sampling plan and indicates the relationship of the plan to citations in the IR report.

SAMPLES TAKEN

Approximately 100 specimens were required to produce an adequate sampling "pool" from these areas. The predominant tree species sampled were Acer negundo, Populus deltoides, Quercus macrocarpo, Juniperus virginiana, Ulmus americana, and Prunis virginiana. The predominant shallow-rooted species sampled were Solidago canadensis, Erigeron annuus, and grasses (chiefly Muhlenbergia sp. and Poa sp. Tissue types sampled included tree leaves and whole herbaceous plants except for roots. For each sample, a sufficient amount of tissue was collected to allow for any subsequent analyses. Specimens were placed in wide-mouthed amber glass bottles with Teflon cap liners, refrigerated immediately, and sent back to EEI's St. Louis laboratory.

STUDY CONCLUSION

The results of the screening analyses of groundwater samples indicated that little, if any, contamination of groundwater was present at BAAP. Therefore, no correlation could be drawn between groundwater contamination and contaminant levels in the vegetation samples, and vegetation analyses were deleted from the analytical program.

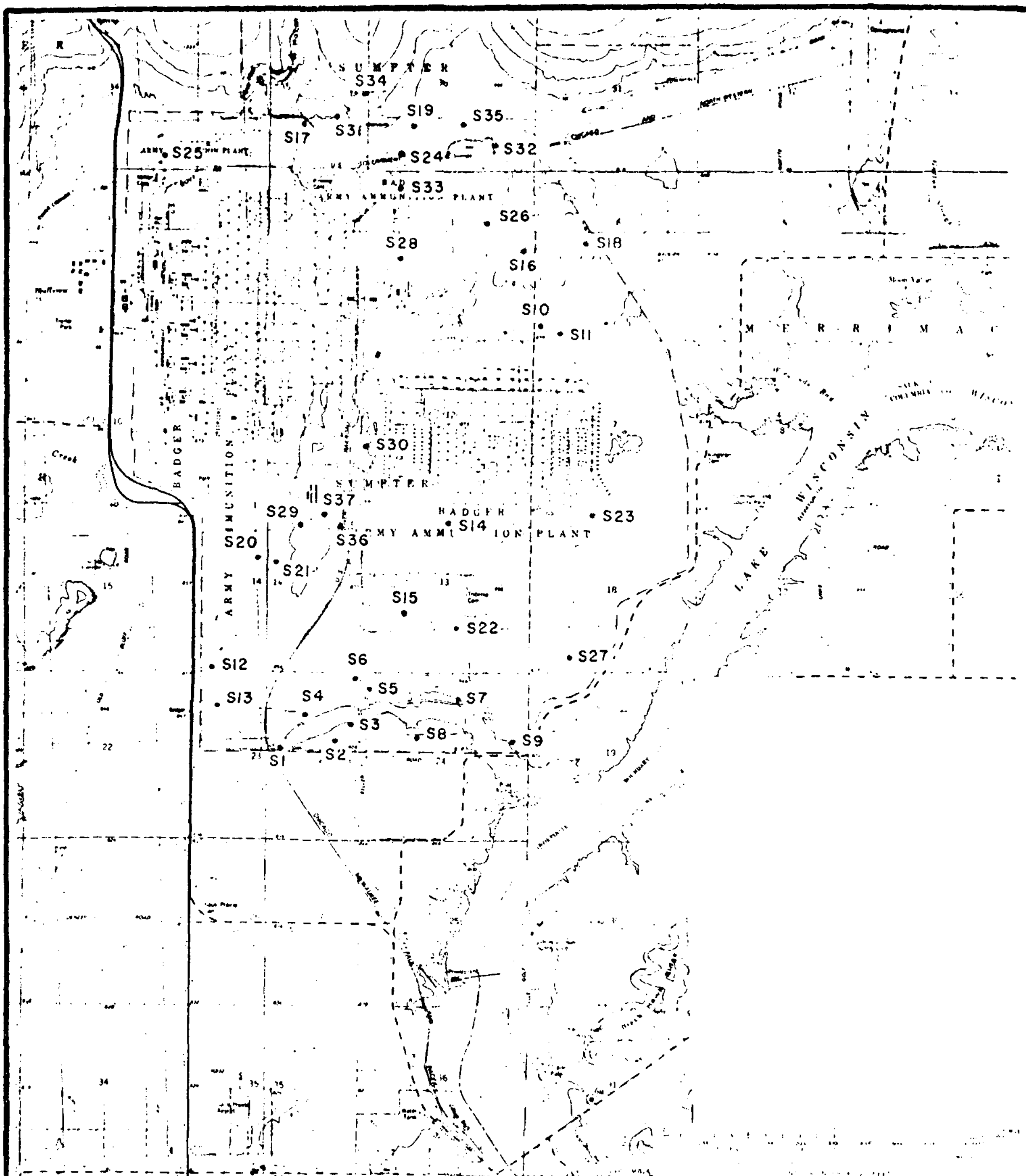


EEI

NORTH

FIGURE II-1

VEGETATION SAMPLING AREAS



EEI

4 NORTH

FIGURE II-2
VEGETATION SAMPLING SITES

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: WELLS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1135-WDNR	A0071	4633	80194	80197	COD		6.000	+00	MGL		
S1135-WDNR	A0071	4633	80194	80197	COND		6.300	+02	UMHC		
S1135-WDNR	A0071	4633	80194	80197	FE		5.710	+00	MGL		
S1135-WDNR	A0071	4633	80194	80197	HARD		6.980	+02	MGL		
S1135-WDNR	A0071	4633	80194	80199	NO3		8.900	-01	MGL	-5.7	C1
S1135-WDNR	A0071	4633	80194	80196	N2KJEL	LT	1.000	+00	MGL		
S1135-WDNR	A0071	4633	80194	80198	PH		6.700	+00			
S1135-WDNR	A0071	4633	80194	80224	SULFID	LT	1.000	+00	MGL		
S1136-WDNR	A0072	4572	80194	80198	ALK		3.360	+02	MGL		
S1136-WDNR	A0072	4572	80194	80197	COD		9.000	+00	MGL		
S1136-WDNR	A0072	4572	80194	80197	COND		4.800	+02	UMHC		
S1136-WDNR	A0072	4572	80194	80197	FE		2.360	+00	MGL		
S1136-WDNR	A0072	4572	80194	80197	HARD		3.390	+02	MGL		
S1136-WDNR	A0072	4572	80194	80199	NO3		5.250	+00	MGL	-3.4	22
S1136-WDNR	A0072	4572	80194	80196	N2KJEL		1.100	+00	MGL		
S1136-WDNR	A0072	4572	80194	80198	PH		7.200	+00			
S1136-WDNR	A0072	4572	80194	80224	SULFID	LT	1.000	+00	MGL		
S1137	A0073	5456	80190	80197	ALDRN	LT	3.300	-02	UGL		
S1137	A0073	5456	80190	80197	PCB016	LT	1.100	+00	UGL		
S1137	A0073	5456	80190	80197	PCB221	LT	3.000	+00	UGL		
S1137	A0073	5456	80190	80197	PCB232	LT	2.400	+00	UGL		
S1137	A0073	5456	80190	80197	PCB242	LT	1.300	+00	UGL		
S1137	A0073	5456	80190	80197	PCB248	LT	7.000	-01	UGL		
S1137	A0073	5456	80190	80197	PCB254	LT	2.400	+00	UGL		
S1137	A0073	5456	80190	80197	PCB260	LT	2.300	+00	UGL		
S1137	A0073	5456	80190	80197	ABHC	LT	1.700	-01	UGL		
S1137	A0073	5456	80190	80197	BBHC	LT	3.500	-02	UGL		
S1137	A0073	5456	80190	80197	DBHC	LT	2.600	-02	UGL		
S1137	A0073	5456	80190	80197	CLDAN	LT	1.100	-01	UGL		
S1137	A0073	5456	80190	80197	ENDRN	LT	3.000	-02	UGL		
S1137	A0073	5456	80190	80197	AENSLF	LT	2.500	-02	UGL		
S1137	A0073	5456	80190	80197	BENSLF	LT	6.400	-02	UGL		
S1137	A0073	5456	80190	80197	HPCL	LT	1.200	-01	UGL		
S1137	A0073	5456	80190	80197	LIN	LT	2.800	-02	UGL		
S1137	A0073	5456	80190	80197	PPDDD	LT	6.300	-02	UGL		
S1137	A0073	5456	80190	80197	PPDDE	LT	1.100	-01	UGL		
S1137	A0073	5456	80190	80197	PPDDT	LT	9.200	-02	UGL		
S1137	A0073	5456	80190	80197	TXPHEN	LT	8.900	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: SETTLING PONDS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1201	D5018	0	80046	80084	NC		6.000	+04	UGG		
S1201	D5018	0	80046	80081	NO2	LT	6.300	-01	UGG		
S1201	D5018	0	80046	80081	NO3	LT	8.400	-01	UGG		
S1201	D5018	0	80046	80092	SO4		1.300	+03	UGG	+18	1
S1201	D5019L	457	80046	80222	DBP	LT	3.000	+00	UGG		
S1201	D5019L	457	80046	80222	DEP	LT	4.000	+00	UGG		
S1201	D5019L	457	80046	80218	24DNT		1.090	+02	NGG	+.46	4
S1201	D5019U	457	80046	80222	DBP	LT	3.000	+00	UGG		
S1201	D5019U	457	80046	80222	DEP	LT	4.000	+00	UGG		
S1201	D5019U	457	80046	80218	24DNT		8.700	+01	NGG	+3.7	5
S1202	D5020S	91	80050	80263	DBP	LT	3.000	+00	UGG		
S1202	D5020S	91	80050	80263	DEP		1.340	+03	UGG		
S1202	D5020S	91	80050	80249	24DNT		6.810	+02	NGG	+2.9	K9
S1202	D5020U	91	80050	80222	DBP	LT	3.000	+00	UGG		
S1202	D5020U	91	80050	80222	DEP	LT	4.000	+00	UGG		
S1202	D5020U	91	80050	80218	24DNT	LT	9.000	+00	NGG		
S1202	D5021	457	80050	80222	DBP	LT	3.000	+00	UGG		
S1202	D5021	457	80050	80222	DEP	LT	4.000	+00	UGG		
S1202	D5021	457	80050	80218	24DNT	LT	9.000	+00	NGG		
S1202	M0001	0	80050	80088	AL		9.750	+03	UGG		
S1202	M0001	0	80050	80088	PB		1.000	+02	UGG		
S1202	M0001	0	80050	80088	SN		4.500	-01	UGG		
S1202	M0001	0	80050	80092	SO4		3.440	+02	UGG	+4	.3
S1203	D5022	91	80051	80222	DBP	LT	3.000	+00	UGG		
S1203	D5022	91	80051	80222	DEP		1.060	+02	UGG		
S1203	D5022	91	80051	80218	24DNT		1.710	+04	NGG	+.72	C2
S1203	D5023	488	80051	80222	DBP	LT	3.000	+00	UGG		
S1203	D5023	488	80051	80222	DEP		1.100	+01	UGG		
S1203	D5023	488	80051	80218	24DNT		2.700	+02	NGG	+1.1	31
S1203	M0002	0	80051	80088	AL		1.020	+04	UGG		
S1203	M0002	0	80051	80222	DBP	LT	3.000	+00	UGG		
S1203	M0002	0	50H51	80222	DEP		4.600	+02	UGG		
S1203	M0002	0	80051	80088	PB		4.500	+01	UGG		
S1203	M0002	0	80051	80088	SN		2.800	+00	UGG		
S1203	M0002	0	80051	80092	SO4		6.610	+02	UGG	+8	.1
S1203	M0002	0	80051	80218	24DNT		1.720	+05	NGG	+.73	2
S1204	D5024C	152	80050	80222	DBP	LT	3.000	+00	UGG		
S1204	D5024C	152	80050	80222	DEP		5.600	+[illegible]	UGG		
S1204	D5024C	152	80050	80218	24DNT		[illegible].190	+02	NGG	3.05	59
S1204	D50[illegible]	579	80050	80222	DBP	LT	3.000	+00	UGG		
S1204	D50[illegible]	579	80050	80222	DEP	LT	4.000	+00	UGG		
S1204	D5026	579	80050	80218	24DNT		2.400	+01	NGG	+1.0	C4
S1204	M0003	0	80050	80086	AL		1.450	+04	UGG		
S1204	M0003	0	80050	80084	NC		3.360	+02	UGG		
S1204	M0003	0	80050	80081	NO2	LT	6.300	-01	UGG		

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1204	M0003	0	80050	80081	NO3	LT	8.890	-01	UGG		
S1204	M0003	0	80050	80086	PB		1.800	+02	UGG		
S1204	M0003	0	80050	80086	SN		1.200	+00	UGG		
S1204	M0003	0	80050	80092	SO4		5.820	+01	UGG	+.7	2
S1205	D5027	0	80050	80086	AL		3.750	+03	UGG		
S1205	D5027	0	80050	80222	DBP	LT	3.000	+00	UGG		
S1205	D5027	0	80050	80222	DEP	LT	4.000	+00	UGG		
S1205	D5027	0	80050	80081	NO2	LT	6.300	-01	UGG		
S1205	D5027	0	80050	80081	NO3	LT	8.400	-01	UGG		
S1205	D5027	0	80050	80086	PB		3.000	+01	UGG		
S1205	D5027	0	80050	80086	SN		4.700	+00	UGG		
S1205	D5027	0	80050	80092	SO4		2.020	+01	UGG	+.20	5
S1205	D5027	0	80050	80218	24DNT		4.000	+01	NGG	+1.7	11
S1205	D5028	457	80050	80222	DBP	LT	3.000	+00	UGG		
S1205	D5028	457	80050	80222	DEP	LT	4.000	+00	UGG		
S1205	D5028	457	80050	80218	24DNT	LT	9.000	+00	NGG		
S1205	M0050	18	80193	80222	DBP	LT	3.000	+00	UGG		
S1205	M0050	18	80193	80222	DBP	LT	3.000	+00	UGG		
S1205	M0050	18	80193	80222	DEP		1.350	+02	UGG		
S1205	M0050	18	80193	80222	DEP		6.800	+01	UGG		
S1205	M0050	18	80193	80218	24DNT		7.570	+03	NGG	3210	56
S1206	D5029	0	80053	80086	AL		1.750	+03	UGG		
S1206	D5029	0	80053	80222	DBP	LT	3.000	+00	UGG		
S1206	D5029	0	80053	80222	DEP	LT	4.000	+00	UGG		
S1206	D5029	0	80053	80084	NC		1.700	-01	UGG		
S1206	D5029	0	80053	80081	NO2	LT	6.300	-01	UGG		
S1206	D5029	0	80053	80081	NO3	LT	8.400	-01	UGG		
S1206	D5029	0	80053	80086	PB		2.000	+01	UGG		
S1206	D5029	0	80053	80086	SN		3.900	+00	UGG		
S1206	D5029	0	80053	80092	SO4		1.520	+01	UGG	+.20	7
S1206	D5029	0	80053	80218	24DNT		5.700	+01	NGG	+2.4	07
S1206	D5030	457	80053	80222	DBP	LT	3.000	+00	UGG		
S1206	D5030	457	80053	80222	DEP	LT	4.000	+00	UGG		
S1206	D5030	457	80053	80218	24DNT	LT	9.000	+00	NGG		
S1206	M0051	18	80193	80222	DBP	LT	3.000	+00	UGG		
S1206	M0051	18	80193	80222	DEP		4.400	+01	UGG		
S1206	M0051	18	80193	80218	24DNT		2.610	+03	NGG	1110	16
S1207	D5031	61	80053	80222	DBP	LT	3.000	+00	UGG		
S1207	D5031	61	80053	80222	DEP	LT	4.000	+00	UGG		
S1207	D5031	61	80053	80218	24DNT	LT	9.000	+00	NGG		
S1207	D5032	457	80053	80222	DBP	LT	3.000	+00	UGG		
S1207	D5032	457	80053	80222	DEP	LT	4.000	+00	UGG		
S1207	D5032	457	80053	80218	24DNT	LT	9.000	+00	NGG		
S1207	[illegible]	[illegible]	80053	80086	AL		1.900	+04	UGG		
S1207	[illegible]	[illegible]	80053	80084	NC		1.038	+03	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: SETTLING PONDS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1207	M0004	0	80053	80081	NO2		3.405	+00	UGG	+3.1	K1
S1207	M0004	0	80053	80081	NO3	LT	8.890	-01	UGG		
S1207	M0004	0	80053	80086	PB		1.650	+02	UGG		
S1207	M0004	0	80053	80086	SN		1.100	+00	UGG		
S1207	M0004	0	80053	80092	SO4		1.830	+02	UGG	+2.0	.5

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: LAKE WISCONSIN-WATER

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1301	W0016	60	80058	80084	AL		3.000	+02	UGL		
S1301	W0016	60	80058	80091	NC		1.290	+01	MGL	+0	3
S1301	W0016	60	80058	80066	NO2	LT	2.500	-01	MGL	27	21
S1301	W0016	60	80058	80066	NO3	LT	3.600	-01	MGL		
S1301	W0016	60	80058	80084	PB		4.800	+00	UGL	-0.2	16
S1301	W0016	60	80058	80084	SN	LT	1.800	+01	UGL		
S1307	W0017	60	80058	80084	AL	LT	3.000	+02	UGL		
S1307	W0017	60	80058	80091	NC		2.010	+00	MGL	+.01	18
S1307	W0017	60	80058	80066	NO2	LT	2.500	-01	MGL		
S1307	W0017	60	80058	80066	NO3		4.400	-01	MGL	-.28	27
S1307	W0017	60	80058	80084	PB	LT	1.700	+00	UGL		
S1307	W0017	60	80058	80084	SN	LT	1.800	+01	UGL		
S1307	W0017	60	80058	80078	SO4		2.100	+01	MGL	+6	11
S1312	W0018	60	80058	80084	AL	LT	3.000	+02	UGL		
S1312	W0018	60	80058	80091	NC		2.260	+00	MGL	+.01	16
S1312	W0018	60	80058	80066	NO2	LT	2.500	-01	MGL		
S1312	W0018	60	80058	80066	NO3		4.400	-01	MGL	-.28	27
S1312	W0018	60	80058	80084	PB	LT	1.700	+00	UGG		
S1312	W0018	60	80058	80084	SN	LT	1.800	+01	UGL		
S1312	W0018	60	80058	80092	SO4		2.300	+01	MGL	+7	10
S1314	W0019	60	79319	80091	NC		6.470	+00	MGL	+.03	6
S1314	W0019	60	79319	80084	SN	LT	1.800	+01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: LAKE WISCONSIN-SEDIMENT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1301	D5035	122	80049	80220	CEC		1.300	+01	MEQG		
S1301	D5035	122	80049	80262	COD		4.370	+04	UGG		
S1301	D5035	122	80049	80252	HN3N2		4.750	+02	UGG		
S1301	D5035	122	80049	80249	PH		7.200	+00			
S1301	D5036C	0	80049	80086	AL		9.500	+03	UGG		
S1301	D5036C	0	80049	80091	NC		3.800	+03	UGG		
S1301	D5036C	0	80049	80081	NO2	LT	6.300	-01	UGG		
S1301	D5036C	0	80049	80081	NO3	LT	8.400	-01	UGG		
S1301	D5036C	0	80049	80086	PB		9.500	+01	UGG		
S1301	D5036C	0	80049	80086	SN		1.500	+00	UGG		
S1301	D5036C	0	80049	80092	SO4		6.300	+01	UGG	+1	2
S1301	M0005C	0	80049	80260	COD		1.040	+05	UGG		
S1301	M0005C	0	80049	80249	PH		7.000	+00			
S1301-WDNR	D5036C	0	80049	80059	HN3N2		6.500	+01	UGG		
S1302	D5038	122	80049	80220	CEC		4.000	+00	MEQG		
S1302	D5038	122	80049	80254	COD		1.420	+04	UGG		
S1302	D5038	122	80049	80252	HN3N2		6.400	+01	UGG		
S1302	D5038	122	80049	80249	PH		6.700	+00			
S1302	D5039C	0	80049	80086	AL		9.750	+03	UGG		
S1302	D5039C	0	80049	80081	NO2		1.135	+00	UGG	+1.0	K2
S1302	D5039C	0	80049	80081	NO3	LT	8.400	-01	UGG		
S1302	D5039C	0	80049	80086	PB		9.000	+01	UGG		
S1302	D5039C	0	80049	80086	SN		4.000	-01	UGG		
S1302	D5039C	0	80049	80092	SO4		1.010	+02	UGG	+1	1
S1302	M0006	0	80049	80220	CEC		2.500	+01	MEQG		
S1302	M0006	0	80049	80260	COD		2.650	+05	UGG		
S1302	M0006	0	80049	80252	HN3N2		1.200	+02	UGG		
S1302	M0006	0	80050	80249	PH		6.800	+00			
S1303	D5041	305	80050	80253	COD		7.290	+04	UGG		
S1303	D5041	305	80050	80252	HN3N2		3.480	+02	UGG		
S1303	D5041	305	80050	80249	PH		7.600	+00			
S1303	D5042C	0	80050	80086	AL		1.750	+04	UGG		
S1303	D5042C	0	80050	80081	NO2		1.703	+00	UGG	+1.5	K1
S1303	D5042C	0	80050	80081	NO3	LT	8.400	-01	UGG		
S1303	D5042C	0	80050	80086	PB		1.700	+02	UGG		
S1303	D5042C	0	80050	80086	SN		6.000	-01	UGG		
S1303	D5042C	0	80050	80092	SO4		1.130	+02	UGG	+1	.9
[illegible]	[illegible]	274	80049	80220	CEC		1.000	+01	MEQG		
S1303	[illegible]	0	80050	80262	COD		2.560	+05	UGG		
S1303	[illegible]	0	80050	80252	HN3N2		1.930	+03	UGG		
[illegible]	[illegible]	0	80050	80249	PH		7.500	+00			
S130[illegible]	[illegible]	0	80049	80220	CEC		2.300	+01	MEQG		
S1304	D5044	10[illegible]	80050	80220	CEC		1.200	+01	MEQG		
S1304	D5044	10[illegible]	80050	80253	COD		2.700	+04	UGG		
S1304	D5044	10[illegible]	80050	8025[illegible]	HN3N2		2.240	+02	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: LAKE WISCONSIN-SEDIMENT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1304	D5044	183	80050	80249	PH		7.200	+00			
S1304	D5045C	0	80050	80086	AL		2.300	+04	UGG		
S1304	D5045C	0	80050	80081	NO2		1.362	+00	UGG	+1.2	K2
S1304	D5045C	0	80050	80081	NO3	LT	8.400	-01	UGG		
S1304	D5045C	0	80050	80086	PB		2.450	+02	UGG		
S1304	D5045C	0	80050	80086	SN		1.000	+00	UGG		
S1304	D5045C	0	80050	80092	SO4		3.800	+02	UGG	+5	.3
S1304	M0010	0	80050	80220	CEC		2.800	+01	MEQG		
S1304	M0010C	0	80050	80260	COD		4.830	+05	UGG		
S1304	M0010C	0	80050	80252	HN3N2		5.150	+02	UGG		
S1304	M0010C	0	80050	80249	PH		6.900	+00			
S1305	D5047	122	80050	80220	CEC		6.000	+00	MEQG		
S1305	D5047	122	80050	80260	COD		6.900	+03	UGG		
S1305	D5047	122	80050	80252	HN3N2		1.020	+02	UGG		
S1305	D5047	122	80050	80249	PH		6.000	+00			
S1305	D5048C	0	80050	80086	AL		1.000	+04	UGG		
S1305	D5048C	0	80050	80262	COD		1.250	+05	UGG		
S1305	D5048C	0	80050	80081	NO2	LT	6.300	-01	UGG		
S1305	D5048C	0	80050	80081	NO3	LT	8.400	-01	UGG		
S1305	D5048C	0	80050	80086	PB		1.500	+02	UGG		
S1305	D5048C	0	80050	80086	SN		7.000	-01	UGG		
S1305	D5048C	0	80050	80092	SO4		1.460	+02	UGG	+2	.7
S1305	M0012	0	80050	80220	CEC		2.990	+01	MEQG		
S1305	M0012	0	80050	80260	COD		5.110	+05	UGG		
S1305	M0012	0	80050	80252	HN3N2		2.860	+03	UGG		
S1305	M0012	0	80050	80249	PH		6.600	+00			
S1306	D5050	183	80050	80220	CEC		1.600	+01	MEQG		
S1306	D5050	183	80050	80254	COD		5.260	+04	UGG		
S1306	D5050	183	80050	80252	HN3N2		6.080	+02	UGG		
S1306	D5050	183	80050	80249	PH		7.300	+00			
S1306	D5051C	0	80050	80086	AL		2.550	+04	UGG		
S1306	D5051C	0	80050	80081	NO2	LT	6.300	-01	UGG		
S1306	D5051C	0	80050	80081	NO3	LT	9.400	-01	UGG		
S1306	D5051C	0	80050	80086	PB		[illegible].700	+02	UGG		
S1306	D5051C	0	80050	80086	SN		1.400	[illegible]	UGG		
S1306	D5051C	0	80050	80092	SO4		1.490	+02	UGG	+2	.7
S1306	M0013C	0	80050	80260	COD		[illegible].750	+05	UGG		
S1306	M0013C	0	80050	80252	HN3N2		3.[illegible]	+02	UGG		
S1306	M0013C	0	80050	80249	PH		6.[illegible]	+00			
S1307	M1013	0	80050	80220	CEC		1.500	+01	MEQG		
S1307	D5053	183	80050	80220	CEC		[illegible].000	+01	MEQG		
S1307	D5053	183	80050	80262	COD		4.950	+04	UGG		
S1307	D5053	183	80050	80252	HN3N2		1.020	+03	UGG		
S1307	D5053	183	80050	80249	PH		[illegible].600	+00			
S1307	D5054C	0	80050	80086	AL		6.380	+03	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: LAKE WISCONSIN-SEDIMENT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1307	D5054C	0	80050	80091	NC		1.700	+05	UGG		
S1307	D5054C	0	80050	80086	PB		9.000	+01	UGG		
S1307	D5054C	0	80050	80086	SN		4.000	+00	UGG		
S1307	D5054C	0	80050	80092	SO4		2.280	+02	UGG	+3	.4
S1307	M0015	0	80050	80254	COD		5.940	+05	UGG		
S1307	M0015	0	80050	80249	PH		7.000	+00			
S1307-WDNR	D5054C	0	80050	80059	HN3N2		1.450	+03	UGG		
S1308	D5055	0	80050	80220	CEC		9.000	+00	MEQG		
S1308	D5055	0	80051	80260	COD		2.090	+04	UGG		
S1308	D5055	0	80051	80252	HN3N2		8.400	+01	UGG		
S1308	D5055	0	80051	80249	PH		6.600	+00			
S1308	D5056	122	80051	80262	COD		1.240	+03	UGG		
S1308	D5056	122	80051	80252	HN3N2	LT	1.300	+01	UGG		
S1308	D5056	122	80051	80249	PH		6.200	+00			
S1308	D5057C	0	80051	80086	AL		4.250	+03	UGG		
S1308	D5057C	0	80051	80081	NO2		1.710	+00	UGG	+1.6	K1
S1308	D5057C	0	80051	80081	NO3	LT	8.400	-01	UGG		
S1308	D5057C	0	80051	80086	PB		1.500	+01	UGG		
S1308	D5057C	0	80051	80086	SN		1.300	+00	UGG		
S1308	D5057C	0	80051	80092	SO4		4.550	+01	UGG	+.5	2
S1308	D5156	61	80051	80220	CEC		1.500	+01	MEQG		
S1309	D5058	0	80051	80220	CEC		2.900	+01	MEQG		
S1309	D5058	0	80051	80252	HN3N2		3.180	+02	UGG		
S1309	D5058	0	80051	80249	PH		6.900	+00			
S1309	D5059	61	80051	80220	CEC		1.900	+01	MEQG		
S1309	D5059	61	80051	80253	COD		5.410	+04	UGG		
S1309	D5059	61	80051	80252	HN3N2		2.780	+02	UGG		
S1309	D5059	61	80051	80249	PH		7.000	+00			
S1309	D5060	0	80051	80036	AL		1.400	+04	UGG		
S1309	D5060C	0	80051	80081	NO2		1.362	+00	UGG	+1.2	K2
S1309	D5060C	0	80051	80081	NO3	LT	8.400	-01	UGG		
S1309	D5060C	0	80051	80086	PB		8.500	+01	UGG		
S1309	D5060C	0	80051	80086	SN		2.000	+01	UGG		
S1309	D5060C	0	80051	80092	SO4		1.930	+02	UGG	+2	.5
S1310	D5061	0	80051	80220	CEC		3.000	+01	MEQG		
S1310	D5061	0	80051	80254	COD		8.3[illegible]	+04	UGG		
S1310	D5061	0	80051	80252	HN3N2		1.020	+03	UGG		
S1310	D5061	0	80051	80249	PH		7.000	+00			
S1310	D5062	61	80051	80220	CEC		2.700	+01	MEQG		
S1310	D5062	61	80051	80254	COD		6.440	+04	UGG		
S1310	D5062	61	80051	80252	HN3N2		5.860	+02	UGG		
S1310	D5062	61	80051	80249	PH		6.800	+00			
S1310	D5063C	0	80051	80086	AL		1.550	+04	UGG		
S1310	D5063C	0	80051	80081	NO2		1.135	+00	UGG	+1.0	K2
S1310	D5063C	0	80051	80081	NO3	LT	8.400	-01	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: LAKE WISCONSIN-SEDIMENT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1310	D5063C	0	80051	80086	PB		4.500	+01	UGG		
S1310	D5063C	0	80051	80086	SN		1.000	+00	UGG		
S1310	D5063C	0	80051	80092	SO4		7.30	+01	UGG	+1	1
S1311	D5064	0	80051	80220	CEC		1.600	-01	MEQG		
S1311	D5064	0	80051	80254	COD		6.350	+04	UGG		
S1311	D5064	0	80051	80252	HN3N2		1.900	+02	UGG		
S1311	D5064	0	80051	80249	PH		6.900	+00			
S1311	D5065	61	80051	80220	CEC		1.100	+01	MEQG		
S1311	D5065	61	80051	80254	COD		1.190	+04	UGG		
S1311	D5065	61	80051	80252	HN3N2		1.720	+02	UGG		
S1311	D5065	61	80051	80249	PH		6.600	+00			
S1311	D5066C	0	80051	80086	AL		1.000	+04	UGG		
S1311	D5066C	0	80051	80081	NO2	LT	6.300	-01	UGG		
S1311	D5066C	0	80051	80081	NO3	LT	8.400	-01	UGG		
S1311	D5066C	0	80051	80086	PB		2.500	+01	UGG		
S1311	D5066C	0	80051	80086	SN		7.000	-01	UGG		
S1311	D5066C	0	80051	80092	SO4	LT	1.000	+01	UGG		
S1312	D5067	0	80051	80220	CEC		1.500	+01	MEQG		
S1312	D5067	0	80051	80254	COD		5.950	+04	UGG		
S1312	D5067	0	80051	80249	PH		6.500	+00			
S1312	D5068	61	80051	80220	CEC		1.400	+01	MEQG		
S1312	D5068	61	80051	80254	COD		2.590	+04	UGG		
S1312	D5068	61	80051	80252	HN3N2		8.800	+01	UGG		
S1312	D5068	61	80051	80249	PH		6.300	+00			
S1312	D5069C	0	80051	80086	AL		1.000	+04	UGG		
S1312	D5069C	0	80051	80091	NC		6.000	-02	UGG		
S1312	D5069C	0	80051	80081	NO2		1.13	+00	UGG	+1.0	K2
S1312	D5069C	0	80051	80081	NO3	LT	8.400	-01	UGG		
S1312	D5069C	0	80051	80086	PB		2.500	+01	UGG		
S1312	D5069C	0	80051	80086	SN		1.100	+00	UGG		
S1312	D5069C	0	80051	80092	SO4		6.700	+01	UGG	+1	1
S1312 WDNR	D5069C	0	80051	80059	HN3N2		2.97	+02	UGG		
S1313	M0018	0	79319	80260	COD		2.040	+05	UGG		
S1313	M0018	0	79319	80252	HN3N2		3.100	+02	UGG		
S1313	M0018	0	79319	80249	PH		6.40	+00			
S1314	M0017	0	79319	80086	AL		2.120	+03	UGG		
S1314	M0017	0	79319	80260	COD		1.47	+04	UGG		
S1314	M0017	0	79319	80091	NC		1.30	-01	UGG		
S1314	M0017	0	79319	80081	NO2	LT	6.300	-01	UGG		
S1314	M0017	0	79319	80081	NO3	LT	8.39	-01	UGG		
S1314	M0017	0	79319	80086	PB		3.000	+01	UGG		
S1314	M0017	0	79319	80249	PH		6.420	+00			
S1314	M0017	0	79319	80086	SN		7.000	-01	UGG		
S1314	M0017	0	79319	80092	SO4		6.32	+01	UGG	+.75	2

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: SURFACE SOILS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1402	D5002	0	79324	80086	AL		9.000	+03	UGG		
S1402	D5002	0	79324	80081	NO2		9.420	+00	UGG	+8.6	C2
S1402	D5002	0	79324	80081	NO3	LT	8.400	-01	UGG		
S1402	D5002	0	79324	80088	PB		5.800	+02	UGG		
S1402	D5002	0	79324	80086	SN		8.500	+00	UGG		
S1402	D5002	0	79324	80092	SO4		2.530	+01	UGG	+.3	4
S1404	D5033	0	80042	80086	AL		6.750	+03	UGG		
S1404	D5033	0	80042	80086	NG		4.460	+00	UGG		
S1404	D5033	0	80042	80086	SN		2.950	+00	UGG		
S1404	M0054	10	80192	80200	NG	LT	1.300	-01	UGG		
S1404	W0020	45	80042	80084	AL		1.500	+03	UGL		
S1404	W0020	45	80042	80086	NG	LT	1.100	+01	UGG		
S1404	W0020	45	80042	80066	NO2	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80056	NO2	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80066	NO2	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80056	NO2	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80066	NO3	LT	3.600	-01	MGL		
S1404	W0020	45	80042	80056	NO3	LT	3.600	-01	MGL		
S1404	W0020	45	80042	80056	NO3		4.400	-01	MGL	-.29	27
S1404	W0020	45	80042	80066	NO3		4.400	-01	MGL	-.29	27
S1404	W0020	45	80042	80084	PB		2.100	+02	UGL	-9	.4
S1404	W0020	45	80042	80084	SN	LT	1.800	+01	UGL		
S1404	W0020	45	80042	80058	SO4		1.800	+01	MGL	5	13
S1404	W0050	76	80192	80200	NG	LT	1.100	+01	UGL		
S1408	D5008	0	79324	80086	AL		3.500	+03	UGG		
S1408	D5008	0	79324	80081	NO2	LT	6.300	-01	UGG		
S1408	D5008	0	79324	80081	NO3		2.500	+00	UGG	+.42	14
S1408	D5008	0	79324	80088	PB		1.220	+02	UGG		
S1408	D5008	0	79324	80086	SN		6.650	+00	UGG		
S1408	D5008	0	79324	80092	SO4		3.140	+01	UGG	+.4	3
S1409	D5009	0	79325	80086	AL		6.500	+03	UGG		
S1409	D5009	0	79325	80081	NO2	LT	6.300	-01	UGG		
S1409	D5009	0	79325	80081	NO3	LT	8.400	-01	UGG		
S1409	D5009	0	79325	80088	PB		8.500	+01	UGG		
S1409	D5009	0	79325	80086	SN		2.500	+00	UGG		
S1409	D5009	0	79325	80092	SO4		2.530	+01	UGG	+.3	4
S1410	D5010	0	79325	80086	AL		1.000	+04	UGG		
S1410	D5010	[illegible]	79325	80091	NG		4.300	-01	UGG		
S1410	D5010	[illegible]	79325	80088	PB		1.250	+02	UGG		
S1410	D5010	0	79325	80086	SN		2.800	+00	UGG		
S1410	D5010	0	79325	80092	SO4		5.360	+01	UGG	+.6	2
S1411	D5011	0	79325	80086	AL		7.000	+03	UGG		
S1411	D5011	0	79325	80081	NO2		1.510	+01	UGG	+14	C2
S1411	D5011	0	79325	80081	NO3		1.420	+00	UGG	+.09	22
S1411	D5011	0	79325	80088	PB		1.585	+04	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY SITE IDENTIFICATION

SITE TYPE: SURFACE SOILS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	PARAMETER TEST NAME	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1411	D5011	0	79325	80086	SN		1.210	+03	UGG		
S1411	D5011	0	79325	80092	SO4		2.530	+01	UGG	+.3	4
S1413	D5013	0	79330	80086	AL		6.875	+03	UGG		
S1413	D5013	0	79330	80091	NC		3.400	+04	UGG		
S1413	D5013	0	79330	80088	PB		3.550	+02	UGG		
S1413	D5013	0	79330	80086	SN		2.400	+00	UGG		
S1413	D5013	0	79330	80092	SO4		4.680	+02	UGG	+5.5	.2
S1413	W0051	10	80185	80197	ALDRN	LT	3.300	-02	UGL		
S1413	W0051	10	80185	80197	PCB016	LT	1.100	+00	UGL		
S1413	W0051	10	80185	80197	PCB221	LT	3.000	+00	UGL		
S1413	W0051	10	80185	80197	PCB232	LT	2.400	+00	UGL		
S1413	W0051	10	80185	80197	PCB242	LT	1.300	+00	UGL		
S1413	W0051	10	80185	80197	PCB248	LT	7.000	-01	UGL		
S1413	W0051	10	80185	80197	PCB254	LT	2.400	+00	UGL		
S1413	W0051	10	80185	80197	PCB260	LT	2.300	+00	UGL		
S1413	W0051	10	80185	80197	ABHC	LT	1.700	-01	UGL		
S1413	W0051	10	80185	80197	BBHC	LT	3.500	-02	UGL		
S1413	W0051	10	80185	80197	DBHC		1.400	-01	UGL		
S1413	W0051	10	80185	80197	CLDAN	LT	1.100	-01	UGL		
S1413	W0051	10	80185	80197	DLDRN	LT	1.600	-01	UGL		
S1413	W0051	10	80185	80197	ENDRN		6.600	-02	UGL		
S1413	W0051	10	80185	80197	AENSLF	LT	2.500	-02	UGL		
S1413	W0051	10	80185	80197	BENSLF	LT	6.400	-02	UGL		
S1413	W0051	10	80185	80197	HPCL	LT	1.200	-01	UGL		
S1413	W0051	10	80185	80197	LIN	LT	2.800	-02	UGL		
S1413	W0051	10	80185	80197	PPDDD	LT	6.300	-02	UGL		
S1413	W0051	10	80185	80197	PPDDE	LT	1.100	-01	UGL		
S1413	W0051	10	80185	80197	PPDDT	LT	9.200	-02	UGL		
S1413	W0051	10	80185	80197	TXPHEN	LT	8.900	+00	UGL		
S1414	D5014	0	79330	80086	AL		6.750	+03	UGG		
S1414	D5014	0	79330	80081	NO2		2.610	+00	UGG	+2.4	C8
S1414	D5014	0	79330	80081	NO3	LT	8.400	-01	UGG		
S1414	D5014	0	79330	80088	PB		8.000	+01	UGG		
S1414	D5014	0	79330	80086	SN		6.000	-01	UGG		
S1414	D5014	0	79330	80092	SO4		2.990	+02	UGG	+4	.3
S1415	D5015	0	79330	80086	AL		5.625	+03	UGG		
S1415	D5015	0	79330	80091	NC		1.100	+01	UGG		
S1415	D5015	0	79330	80081	NO2		1.360	+00	UGG	+1.2	K2
S1415	D5015	0	79330	80081	NO3		9.630	-01	UGG	+.06	33
S1415	D5015	0	79330	80088	PB		4.500	+01	UGG		
S1415	D5015	0	79330	80086	SN		9.000	[illegible]	UGG		
S1415	D5015	0	79330	80092	SO4		1.520	+01	UGG	+.[illegible]	7

waste water treatment plant (see p. 45)

ANALYTICAL DATA
SUMMARIZED BY TEST NAME

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: ABHC

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.700	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.700	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.700	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.700	-01	UGL		
S1137	A0073	5456	80190	80197	LT	1.700	-01	UGL		
S1413	W0051	10	80185	80197	LT	1.700	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: AENSLF

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.500	-02	UGL		
S1104	A0068	2543	80183	80197	LT	2.500	-02	UGL		
S1107	A0063	1936	80184	80197	LT	2.500	-02	UGL		
S1123	A0052	3782	80190	80197	LT	2.500	-02	UGL		
S1137	A0073	5456	80190	80197	LT	2.500	-02	UGL		
S1413	W0051	10	80185	80197	LT	2.500	-02	UGL		

PARAMETER: AG

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	3.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	3.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	3.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	3.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	3.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	3.000	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: AL

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80084		2.500	+03	UGL		
S1104	A0002	2283	80051	80084		4.000	+02	UGL		
S1107	A0003	1453	80056	80086	LT	3.000	+02	UGL		
S1108	A0004	575	80056	80084	LT	3.000	+02	UGL		
S1109	A0005	2650	80057	80084	LT	3.000	+02	UGL		
S1111	A0008	2411	80058	80084	LT	3.000	+02	UGL		
S1112	A0006	1981	80057	80084	LT	3.000	+02	UGL		
S1115	A0007	2747	80057	80084	LT	3.000	+02	UGL		
S1117	A0009	2799	80058	80084	LT	3.000	+02	UGL		
S1119	A0010	3128	80058	80084		5.000	+02	UGL		
S1121	A0014	1206	80058	80084	LT	3.000	+02	UGL		
S1122	A0011	3914	80052	80084	LT	3.000	+02	UGL		
S1123	A0013	2652	80053	80084	LT	3.000	+02	UGL		
S1125	A0015	3609	80058	80084		1.200	+03	UGL		
S1127	A0012	1989	80052	80084	LT	3.000	+02	UGL		
S1130	A0020	2461	80058	80084		1.000	+03	UGL		
S1133	A0021	1944	80058	80084		3.000	+03	UGL		
S1134	A0022	4343	80058	80084		6.000	+02	UGL		
S1202	M0001	0	80050	80088		9.750	+03	UGG		
S1203	M0002	0	80051	80088		1.020	+04	UGG		
S1204	M0003	0	80050	80086		1.450	+04	UGG		
S1205	D5027	0	80050	80086		3.750	+03	UGG		
S1206	D5029	0	80053	80086		1.750	+03	UGG		
S1207	M0004	0	80053	80086		1.900	+04	UGG		
S1301	D5036C	0	80049	80086		9.500	+03	UGG		
S1301	W0016	60	80058	80084		3.000	+02	UGL		
S1302	D5039C	0	80049	80086		9.750	+03	UGG		
S1303	D5042C	0	80050	80086		1.750	+04	UGG		
S1304	D5045C	0	80050	80086		2.300	+04	UGG		
S1305	D5048C	0	80050	80086		1.000	+04	UGG		
S1306	D5051C	0	80050	80086		2.550	+04	UGG		
S1307	D5054C	0	80050	80086		6.380	+03	UGG		
S1307	W0017	60	80058	80084	LT	3.000	+02	UGL		
S1308	D5057C	0	80051	80086		4.250	+03	UGG		
S1309	D5060C	0	80051	80086		1.400	+04	UGG		
S1310	D5063C	0	80051	80086		1.550	+04	UGG		
S1311	D5066C	0	80051	80086		1.000	+04	UGG		
S1312	D5069C	0	80051	80086		1.080	+04	UGG		
S1312	W0018	60	80058	80084	LT	3.000	+02	UGL		
S1314	M0017	0	79319	80086		2.120	+03	UGG		
S1402	D5002	0	79324	80086		9.000	+03	UGG		
S1404	D5043	0	80042	80086		6.750	+03	UGG		
S1404	W0020	40	80042	80084		1.500	+03	UGL		
S1408	D5008	0	79324	80086		3.500	+03	UGG		
S1409	D5009	0	79325	80086		6.500	+03	UGG		
S1410	D5010	0	79325	80086		1.000	+04	UGG		
S1411	D5011	0	79325	80086		7.000	+03	UGG		

S1413	D5013	0	79330	80086	6.875	+03	UGG
S1414	D5014	0	79330	80086	6.750	+03	UGG
S1415	D5015	0	79330	80086	5.625	+03	UGG

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: ALDRN

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	3.300	-02	UGL		
S1104	A0068	2543	80183	80197	LT	3.300	-02	UGL		
S1107	A0063	1936	80184	80197	LT	3.300	-02	UGL		
S1123	A0052	3782	80190	80197	LT	3.300	-02	UGL		
S1137	A0073	5456	80190	80197	LT	3.300	-02	UGL		
S1413	W0051	10	80185	80197	LT	3.300	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: ALK

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80198		2.390	+02	MGL		
S1121-WDNR	A0056	1500	80189	80196		2.200	+02	MGL		
S1123-WDNR	A0052	3782	80190	80196		2.320	+02	MGL		
S1128-WDNR	A0057	1958	80189	80196		1.250	+02	MGL		
S1134-WDNR	A0070	4176	80194	80198		3.270	+02	MGL		
S1135-WDNR	A0071	4633	80194	80198		4.480	+02	MGL		
S1136-WDNR	A0072	4572	80194	80198		3.360	+02	MGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: AS

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	6.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	6.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	6.000	+00	UGL		
S1108	A0064	686	80184	80225	LT	6.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	6.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	6.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	6.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	6.000	+00	UGL		

PARAMETER: BBHC

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	3.500	-02	UGL		
S1104	A0068	2543	80183	80197	LT	3.500	-02	UGL		
S1107	A0063	1936	80184	80197	LT	3.500	-02	UGL		
S1123	A0052	3782	80190	80197	LT	3.500	-02	UGL		
S1137	A0073	5456	80190	80197	LT	3.500	-02	UGL		
S1413	W0051	10	80185	80197	LT	3.500	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: BE

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	4.700	+01	UGL		
S1104	A0068	2543	80183	80225	LT	4.700	+01	UGL		
S1107	A0063	1936	80184	80225	LT	4.700	+01	UGL		
S1108	A0064	886	80184	80225	LT	4.700	+01	UGL		
S1121	A0056	1500	80189	80225	LT	4.700	+01	UGL		
S1123	A0052	3782	80190	80225	LT	4.700	+01	UGL		
S1128	A0057	1958	80189	80225	LT	4.700	+01	UGL		
S1133	A0061	2878	80185	80225	LT	4.700	+01	UGL		

PARAMETER: BENSLF

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	E+F	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	6.400	-02	UGL		
S1104	A0068	2543	80183	80197	LT	6.400	-02	UGL		
S1107	A0023	1936	80184	80197	LT	6.400	-02	UGL		
S1123	A0052	3782	80190	80197	LT	6.400	-02	UGL		
S1137	A0073	5456	80190	80197	LT	6.400	-02	UGL		
S1413	W0051	10	80185	80197	LT	6.400	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: CCL4

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	3.000	-01	UGL		
S1104	A0068	2543	80183	80197	LT	3.000	-01	UGL		
S1107	A0063	1936	80184	80197	LT	3.000	-01	UGL		
S1108	A0064	886	80184	80197	LT	3.000	-01	UGL		
S1109	A0059	2961	80185	80197	LT	3.000	-01	UGL		
S1117	A0050	3321	80193	80197		1.200	+01	UGL		
S1121	A0056	1500	80189	80197	LT	3.000	-01	UGL		
S1123	A0052	3782	80190	80197	LT	3.000	-01	UGL		
S1130	A0053	3485	80190	80197	LT	3.000	-01	UGL		
S1133	A0061	2878	80185	80197		7.000	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: CD

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	1.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	1.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	1.000	+00	UGL		
S1108	A0064	986	80184	80225	LT	1.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	1.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	1.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	1.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	1.000	+00	UGL		

PARAMETER: CEC

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1301	D5035	122	80049	80220		1.300	+01	MEQG		
S1302	D5038	122	80049	80220		4.000	+00	MEQG		
S1302	M0006	0	80049	80220		2.500	+01	MEQG		
S1303	D5141	274	80049	80220		1.000	+01	MEQG		
S1303	M0789C	0	80049	80220		2.300	+01	MEQG		
S1304	D5044	183	80050	80220		1.200	+01	MEQG		
S1304	M0010	0	80050	80220		2.800	+01	MEQG		
S1305	D5047	122	80050	80220		6.000	+00	MEQG		
S1305	M0012	0	80050	80220		2.990	+01	MEQG		
S1306	D5050	183	80050	80220		1.600	+01	MEQG		
S1306	M1013	0	80050	80220		1.500	+01	MEQG		
S1307	D5053	183	80050	80220		2.000	+01	MEQG		
S1308	D5055	0	80050	80220		9.000	+00	MEQG		
S1309	D5156	61	80051	80220		1.500	+01	MEQG		
S1309	D5058	0	80051	80220		2.900	+01	MEQG		
S1309	D5059	61	80051	80220		1.900	+01	MEQG		
S1310	D5061	0	80051	80220		3.000	+01	MEQG		
S1310	D5065	61	80051	80220		2.700	+01	MEQG		
S1311	D5064	0	80051	80220		1.600	+01	MEQG		
S1311	D5065	61	80051	80220		1.100	+01	MEQG		
S1312	D5067	0	80051	80220		1.500	+01	MEQG		
S1312	D5068	61	80051	80220		1.400	+01	MEQG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: CHCL3

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.300	+00	UGL		
S1104	A0068	2543	80183	80197	LT	2.300	+00	UGL		
S1107	A0063	1936	80184	80197	LT	2.300	+00	UGL		
S1108	A0064	886	80184	80197	LT	2.300	+00	UGL		
S1109	A0059	2961	80185	80197	LT	2.300	+00	UGL		
S1117	A0050	3321	80193	80197		6.600	+01	UGL		
S1121	A0056	1500	80189	80197	LT	2.300	+00	UGL		
S1123	A0052	3782	80190	80197	LT	2.300	+00	UGL		
S1130	A0053	3485	80190	80197	LT	2.300	+00	UGL		
S1133	A0061	2878	80185	80197	LT	2.300	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: CLDAN

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.100	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.100	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.100	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.100	-01	UGL		
S1137	A0073	5456	80190	80197	LT	1.100	-01	UGL		
S1413	W0051	10	80185	80197	LT	1.100	-01	UGL		

PARAMETER: COD

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80197		5.000	+00	MGL		
S1121-WDNR	A0056	1500	80189	80197		4.700	+01	MGL		
S1123-WDNR	A0052	3782	80190	80197	LT	5.000	+00	MGL		
S1128-WDNR	A0057	1958	80189	80197	LT	5.000	+00	MGL		
S1134-WDNR	A0070	4176	80194	80197		1.200	+01	MGL		
S1135-WDNR	A0071	4633	80194	80197		6.000	+00	MGL		
S1136-WDNR	A0072	4572	80194	80197		9.000	+00	MGL		
S1301	D5035	122	80049	80262		4.370	+04	UGG		
S1301	M0005C	0	80049	80260		1.040	+05	UGG		
S1302	D5038	122	80049	80254		1.420	+04	UGG		
S1302	M0006	0	80049	80260		2.650	+05	UGG		
S1303	D5041	305	80050	80253		7.290	+04	UGG		
S1303	M0007C	0	80050	80262		2.560	+05	UGG		
S1304	D5044	183	80050	80253		2.700	+04	UGG		
S1304	M0010C	0	80050	80260		4.830	+05	UGG		
S1305	D5047	122	80050	80260		6.900	+03	UGG		
S1305	D5048C	0	80050	80262		1.250	+05	UGG		
S1305	M0012	0	80050	80260		5.110	+05	UGG		
S1306	D5050	183	80050	80254		5.260	+04	UGG		
S1306	M0013C	0	80050	80260		6.350	+05	UGG		
S1307	D5053	183	80050	80262		4.950	+04	UGG		
S1307	M0015	0	80050	80254		5.940	+05	UGG		
S1308	D5055	0	80051	80260		2.090	+04	UGG		
S1308	D5056	122	80051	80262		1.240	+03	UGG		
S1309	D5059	61	80051	80253		5.410	+04	UGG		
S1310	D5061	0	80051	80254		8.310	+04	UGG		
S1310	D5062	61	80051	80254		6.440	+04	UGG		
S1311	D5064	0	80051	80254		6.350	+04	UGG		
S1311	D5065	61	80051	80254		1.190	+04	UGG		
S1312	D5067	0	80051	80254		5.950	+04	UGG		
S1312	D5068	61	80051	80254		2.590	+04	UGG		
S1313	M0018	0	79319	80260		2.040	+05	UGG		
S1314	M0017	0	79319	80260		1.470	+04	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: COND

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80197		5.500	+02	UMHC		
S1121-WDNR	A0056	1500	80189	80197		3.880	+02	UMHC		
S1123-WDNR	A0052	3782	80190	80197		3.470	+02	UMHC		
S1128-WDNR	A0057	1958	80189	80197		1.770	+02	UMHC		
S1134-WDNR	A0070	4176	80194	80197		1.190	+03	UMHC		
S1135-WDNR	A0071	4633	80194	80197		6.300	+02	UMHC		
S1136-WDNR	A0072	4572	80194	80197		4.800	+02	UMHC		

PARAMETER: CR

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	4.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	4.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	4.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	4.000	+00	UGL		
S1121	A0056	1500	80189	80225		5.000	+00	UGL		
S1123	A0052	3782	80190	80225		1.100	+01	UGL		
S1128	A0057	1958	80189	80225	LT	4.000	+00	UGL		
S1133	A0061	2878	80185	80225		7.000	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: CUTOT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225		3.400	+01	UGL		
S1104	A0068	2543	80183	80225		1.000	+01	UGL		
S1107	A0063	1936	80184	80225		1.000	+01	UGL		
S1108	A0064	886	80184	80225		7.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	5.000	+00	UGL		
S1123	A0052	3782	80190	80225		1.000	+01	UGL		
S1128	A0057	1958	80189	80225	LT	5.000	+00	UGL		
S1133	A0061	2878	80185	80225		1.100	+01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: DBHC

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.600	-02	UGL		
S1104	A0068	2543	80183	80197		6.000	-02	UGL		
S1107	A0063	1936	80184	80197	LT	2.600	-02	UGL		
S1123	A0052	3782	80190	80197	LT	2.600	-02	UGL		
S1137	A0073	5456	80190	80197	LT	2.600	-02	UGL		
S1413	W0051	10	80185	80197		1.400	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: DBP

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1201	D5019L	457	80046	80222	LT	3.000	+00	UGG		
S1201	D5019U	457	80046	80222	LT	3.000	+00	UGG		
S1202	D5020S	91	80050	80263	LT	3.000	+00	UGG		
S1202	D5020U	91	80050	80222	LT	3.000	+00	UGG		
S1202	D5021	457	80050	80222	LT	3.000	+00	UGG		
S1203	D5022	91	80051	80222	LT	3.000	+00	UGG		
S1203	D5023	488	80051	80222	LT	3.000	+00	UGG		
S1203	M0002	0	80051	80222	LT	3.000	+00	UGG		
S1204	D5024C	152	80050	80222	LT	3.000	+00	UGG		
S1204	D5026	579	80050	80222	LT	3.000	+00	UGG		
S1205	D5027	0	80050	80222	LT	3.000	+00	UGG		
S1205	D5028	457	80050	80222	LT	3.000	+00	UGG		
S1205	M0050	18	80193	80222	LT	3.000	+00	UGG		
S1205	M0050	18	80193	80222	LT	3.000	+00	UGG		
S1206	D5029	0	80053	80222	LT	3.000	+00	UGG		
S1206	D5030	457	80053	80222	LT	3.000	+00	UGG		
S1206	M0051	18	80193	80222	LT	3.000	+00	UGG		
S1207	D5031	61	80053	80222	LT	3.000	+00	UGG		
S1207	D5032	457	80053	80222	LT	3.000	+00	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: DEP

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1201	D5019L	457	80046	80222	LT	4.000	+00	UGG		
S1201	D5019U	457	80046	80222	LT	4.000	+00	UGG		
S1202	D5020S	91	80050	80263		1.340	+03	UGG		
S1202	D5020U	91	80050	80222	LT	4.000	+00	UGG		
S1202	D5021	457	80050	80222	LT	4.000	+00	UGG		
S1203	D5022	91	80051	80222		1.060	+02	UGG		
S1203	D5023	488	80051	80222		1.100	+01	UGG		
S1203	M0002	0	80051	80222		4.600	+02	UGG		
S1204	D5024C	152	80050	80222		5.000	.00	UGG		
S1204	D5026	579	80050	80222	LT	4.000	+00	UGG		
S1205	D5027	0	80050	80222	LT	4.000	+00	UGG		
S1205	D5028	457	80050	80222	LT	4.000	+00	UGG		
S1205	M0050	18	80193	80222		1.350	+02	UGG		
S1205	M0050	18	80193	80222		6.800	+01	UGG		
S1206	D5029	0	80053	80222	LT	4.000	+00	UGG		
S1206	D5030	457	80053	80222	LT	4.000	+00	UGG		
S1206	M0051	18	80193	80222		4.400	+01	UGG		
S1207	D5031	61	80053	80222	LT	4.000	+00	UGG		
S1207	D5032	457	80053	80222	LT	4.000	+00	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: DLDRN

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.600	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.600	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.600	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.600	-01	UGL		
S1413	W0051	10	80185	80197	LT	1.600	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: ENDRN

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	3.000	-02	UGL		
S1104	A0068	2543	80183	80197	LT	3.000	-02	UGL		
S1107	A0063	1936	80184	80197	LT	3.000	-02	UGL		
S1123	A0052	3782	80190	80197	LT	3.000	-02	UGL		
S1137	A0073	5456	80190	80197	LT	3.000	-02	UGL		
S1413	W0051	10	80185	80197		6.600	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: FE

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80197		9.600	-01	MGL		
S1121-WDNR	A0056	1500	80189	80197		4.800	-01	MGL		
S1123-WDNR	A0052	3782	80190	80197		1.540	+00	MGL		
S1128-WDNR	A0057	1958	80189	80197	LT	4.000	-02	MGL		
S1134-WDNR	A0070	4176	80194	80197		9.500	-01	MGL		
S1135-WDNR	A0071	4633	80194	80197		5.710	+00	MGL		
S1136-WDNR	A0072	4572	80194	80197		2.360	+00	MGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: HARD

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80197		4.350	+02	MGL		
S1121-WDNR	A0056	1500	80189	80197		2.570	+02	MGL		
S1123-WDNR	A0052	3782	80190	80197		3.410	+02	MGL		
S1128-WDNR	A0057	1958	80189	80197		1.430	+02	MGL		
S1134-WDNR	A0070	4176	80194	80197		1.030	+03	MGL		
S1135-WDNR	A0071	4633	80194	80197		6.780	+02	MGL		
S1136-WDNR	A0072	4572	80194	80197		3.390	+02	MGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: HGTOT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80200	LT	5.000	-01	UGL		
S1104	A0068	2543	80183	80200	LT	5.000	-01	UGL		
S1107	A0063	1936	80184	80200	LT	5.000	-01	UGL		
S1108	A0064	886	80184	80225	LT	5.000	-01	UGL		
S1121	A0056	1500	80189	80200	LT	5.000	-01	UGL		
S1123	A0052	3782	80190	80200	LT	5.000	-01	UGL		
S1128	A0057	1958	80189	80200	LT	5.000	-01	UGL		
S1133	A0061	2878	80185	80200	LT	5.000	-01	UGL		

PARAMETER: HN3N2

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1301	D5035	122	80049	80252		4.750	+02	UGG		
S1301-WDNR	D5036C	0	80049	80059		6.500	+01	UGG		
S1302	D5038	122	80049	80252		6.400	+01	UGG		
S1302	M0006	0	80049	80252		1.200	+02	UGG		
S1303	D5041	305	80050	80252		3.480	+02	UGG		
S1303	M0007C	0	80050	80252		1.930	+03	UGG		
S1304	D5044	183	80050	80252		2.240	+02	UGG		
S1304	M0010C	0	80050	80252		5.150	+02	UGG		
S1305	D5047	122	80050	80252		1.020	+02	UGG		
S1305	M0012	0	80050	80252		2.860	+03	UGG		
S1306	D5050	183	80050	80252		6.080	+02	UGG		
S1306	M0013C	0	80050	80252		3.270	+03	UGG		
S1307	D5053	183	80050	80252		1.020	+03	UGG		
S1307-WDNR	D5054C	0	80050	80059		1.450	+03	UGG		
S1308	D5055	0	80051	80252		8.400	+01	UGG		
S1308	D5056	122	80051	80252	LT	1.300	+01	UGG		
S1309	D5058	0	80051	80252		3.180	+02	UGG		
S1309	D5059	61	80051	80252		2.780	+02	UGG		
S1310	D5061	0	80051	80252		1.020	+03	UGG		
S1310	D5062	61	80051	80252		5.860	+02	UGG		
S1311	D5064	0	80051	80252		1.900	+02	UGG		
S1311	D5065	61	80051	80252		1.720	+02	UGG		
S1312	D5068	61	80051	80252		8.800	+01	UGG		
S1312-WDNR	D5069C	0	80051	80059		2.970	+02	UGG		
S1313	M0018	0	79319	80252		3.100	+02	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: HPCL

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.200	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.200	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.200	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.200	-01	UGL		
S1137	A0073	5456	80190	80197	LT	1.200	-01	UGL		
S1413	W0051	10	80185	80197	LT	1.200	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: LIN

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197		6.700	-01	UGL		
S1104	A0068	2543	80183	80197	LT	2.800	-02	UGL		
S1107	A0063	1936	80184	80197	LT	2.800	-02	UGL		
S1123	A0052	3782	80190	80197	LT	2.800	-02	UGL		
S1137	A0073	5456	80190	80197	LT	2.800	-02	UGL		
S1413	W0051	10	80185	80197	LT	2.800	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: NC

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1201	D5018	0	80046	80084		6.000	+04	UGG		
S1204	M0003	0	80050	80084		3.360	+01	UGG		
S1206	D5029	0	80053	80084		1.700	-01	UGG		
S1207	M0004	0	80053	80084		1.038	+03	UGG		
S1301	D5036C	0	80049	80091		3.800	+03	UGG		
S1301	W0016	60	80058	80091		1.290	+01	MGL	+0	3
S1307	D5054C	0	80050	80091		1.700	+05	UGG		
S1307	W0017	60	80058	80091		2.010	[illegible]	MGL	+.01	18
S1312	D5069C	0	80051	80091		6.000	-02	UGG		
S1312	W0018	60	80058	80091		2.260	+00	MGL	+.01	16
S1314	M0017	0	79319	80091		1.300	-01	UGG		
S1314	W0019	60	79319	80091		6.470	+00	MGL	+.H3	6
S1410	D5010	0	79325	80091		4.300	-01	UGG		
S1413	D5013	0	79330	80091		3.400	+04	UGG		
S1415	D5015	0	79330	80091		1.100	-01	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: NG

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1122	A0011	3914	80052	80086	LT	1.100	+01	UGL		
S1124	A0051	3619	80192	80200	LT	1.100	+01	UGL		
S1404	D5033	0	80042	80086		4.460	+00	UGG		
S1404	M0054	10	80192	80200	LT	1.300	-01	UGG		
S1404	W0020	45	80042	80086	LT	1.100	+01	UGL		
S1404	W0050	76	80192	80200	LT	1.100	+01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: NI

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225		1.300	+01	UGL		
S1104	A0068	2543	80183	80225	LT	8.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	8.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	8.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	8.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	8.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	8.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	8.000	+00	UGL		

PARAMETER: NO2

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80056	LT	2.500	-01	MGL		
S1102	A0060	1674	80183	80192	LT	2.500	-01	MGL		
S1103	A0067	3586	80182	80192	LT	2.500	-01	MGL		
S1104	A0002	2283	80051	80056	LT	2.500	-01	MGL		
S1105	A0062	3265	80184	80192	LT	2.500	-01	MGL		
S1106	A0069	4062	80183	80192	LT	2.500	-01	MGL		
S1107	A0003	1453	80056	80060	LT	2.500	-01	MGL		
S1107	A0063	1936	80184	80192	LT	2.500	-01	MGL		
S1108	A0004	575	80056	80060	LT	2.500	-01	MGL		
S1108	A0064	886	80184	80192		3.600	-01	MGL	-0.2	34
S1109	A0005	2650	80057	80060	LT	2.500	-01	MGL		
S1111	A0008	2411	80058	80060	LT	2.500	-01	MGL		
S1111	A0008	2411	80058	80060	LT	2.500	-01	MGL		
S1112	A0006	1981	80057	80060	LT	2.500	-01	MGL		
S1113	A0055	1708	80189	80192	LT	2.500	-01	MGL		
S1115	A0007	2747	80057	80060	LT	2.500	-01	MGL		
S1117	A0009	2799	80058	80060	LT	2.500	-01	MGL		
S1119	A0010	3128	80058	80060	LT	2.500	-01	MGL		
S1121	A0014	1206	80058	80060	LT	2.500	-01	MGL		
S1122	A0011	3914	80052	80060	LT	2.500	-01	MGL		
S1123	A0013	2652	80053	80060	LT	2.500	-01	MGL		
S1125	A0015	3609	80058	80060	LT	2.500	-01	MGL		
S1127	A0012	1989	80052	80060	LT	2.500	-01	MGL		
S1127	A0012	1989	80052	80060	LT	2.500	-01	MGL		
S1130	A0020	2461	80058	80066	LT	2.500	-01	MGL		
S1133	A0021	1944	80058	80066	LT	2.500	-01	MGL		
S1133	A0061	2878	80185	80192	LT	2.500	-01	MGL		
S1134	A0022	4343	80058	80066	LT	2.500	-01	MGL		
S1134	A0022	4343	80058	80066		3.200	-01	MGL	-.02	38
S1201	D5018	0	80046	80081	LT	6.300	-01	UGG		
S1204	M0003	0	80050	80081	LT	6.300	-01	UGG		
S1205	D5027	0	80050	80081	LT	6.300	-01	UGG		
S1206	D5029	0	80053	80081	LT	6.300	-01	UGG		
S1207	M0004	0	80053	80081		3.405	+00	UGG	+3.1	K1
S1301	D5036[illegible]	0	80049	80081	LT	[illegible]	-01	UGG		
S1301	W0016	60	80058	800[illegible]	LT	[illegible].500	[illegible]	MGL	72	1
S1302	D5039[illegible]	0	80049	80081		1.135	+00	UGG	-1.0	K2
S1303	D5042[illegible]	0	80050	80081		1.703	+00	UGG	+1.5	K[illegible]
S1304	D5045[illegible]	0	80050	80081		1.362	+00	UGG	+1.2	K2
S1305	D5048[illegible]	0	80050	80081	LT	6.300	-01	UGG		
S1[illegible]	D50[illegible]	0	[illegible]	800[illegible]	L[illegible]	[illegible]	[illegible]	UGG		
S1[illegible]	W001[illegible]	60	[illegible]	[illegible]	L[illegible]	[illegible]	[illegible]	MGL		
S1[illegible]	D50[illegible]	0	80051	80081		1.[illegible]10	+00	UGG	+1.6	K1
S1[illegible]	D50[illegible]	0	80051	80081		1.[illegible]	+00	UGG	+1.2	K2
S1310	D50[illegible]	0	80051	80081		1.13[illegible]	+00	UGG	+1.0	K2
[illegible]	D50[illegible]	0	80051	80081	LT	[illegible]	-01	[illegible]		
[illegible]	D50[illegible]	0	80051	80081		1.1[illegible]	+00	[illegible]	+1.0	K2

S1314	W0016	60	80058	80066	LT	2.500	-01	MGL		
S1314	M0017	0	79319	80081	LT	6.300	-01	UGG		
S1402	D5002	0	79324	80081		9.420	+00	UGG	+8.6	C2
S1404	W0020	45	80042	80056	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80066	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80056	LT	2.500	-01	MGL		
S1404	W0020	45	80042	80066	LT	2.500	-01	MGL		
S1408	D5008	0	79324	80081	LT	6.300	-01	UGG		
S1409	D5009	0	79325	80081	LT	6.300	-01	UGG		
S1411	D5011	0	79325	80081		1.510	+01	UGG	+14	C2
S1414	D5014	0	79330	80081		2.610	+01	UGG	+2.4	C8
S1415	D5015	0	79330	80081		1.360	+01	UGG	+1.2	N2

PARAMETER: NO3

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80056		1.600	+01	MGL	-10	2
S1102	A0066	1674	80183	80192		8.160	+00	MGL	-5.2	29
S1103	A0067	3586	80182	80192		3.320	+00	MGL	-2.1	36
S1104	A0002	2283	80051	80056		3.400	+00	MGL	-2.2	40
S1105	A0062	3265	80184	80192		2.480	+00	MGL	-1.6	48
S1106	A0069	4062	80183	80192		1.970	+00	MGL	-1.3	60
S1107	A0003	1453	80056	80060		3.000	-01	MGL	-.38	20
S1107	A0063	1936	80184	80192		4.300	+00	MGL	-2.8	55
S1108	A0004	575	80056	80060	LT	3.600	-01	MGL		
S1108	A0064	886	80184	80192		4.000	+01	MGL	-2.6	C3
S1109	A0005	2650	80057	80060		6.000	+00	MGL	-4	C2
S1111	A0008	2411	80058	80060		7.000	-01	MGL	-.50	16
S1111	A0008	2411	80058	80060		7.000	-01	MGL	-.50	16
S1112	A0006	1981	80057	80060		1.000	+00	MGL	-0.7	12
S1113	A0055	1708	80189	80192		1.920	+00	MGL	-1.2	62
S1115	A0007	2747	80057	80060		1.900	+00	MGL	-1.2	60
S1117	A0009	2799	80058	80060		3.000	+00	MGL	-2	C4
S1117-WDNR	A0050	3321	80193	80199		2.180	+00	MGL	-1.4	55
S1119	A0010	3128	80058	80060		1.500	+00	MGL	-0.9	80
S1121	A0014	1206	80058	80060		2.700	-01	MGL	-.17	44
S1121-WDNR	A0056	1500	80189	80192		3.300	+01	MGL	-2.1	72
S1122	A0011	3914	80052	80060		2.500	01	MGL	-.16	C5
S1123	A0013	2652	80053	80060		7.000	+00	MGL	-5	C2
S1123-WDNR	A0052	3782	80190	80192		3.910	+00	MGL	-2.5	61
S1125	A0015	3609	80058	80060		1.100	+00	MGL	-0.7	11
S1127	A0012	1989	80052	80060		3.200	-01	MGL	-.21	37
S1127	A0012	1989	80052	80060		3.200	-01	MGL	-.21	37
S1128-WDNR	A0057	1958	80189	80192		2.900	-01	MGL	-1.9	41
S1130	A0020	2461	80058	80066	LT	3.600	-01	MGL		
S1133	A0021	1944	80058	80066		4.000	+00	MGL	-3	15
S1133	A0061	2878	80185	80192		2.940	+00	MGL	-1.9	41
S1134	A0022	4343	80058	80066		1.300	+00	MGL	-0.8	45
S1134-WDNR	A0070	4176	80194	80199		2.470	+00	MGL	-1.6	40
S1135-WDNR	A0071	4633	80194	80199		8.900	+01	MGL	-5.7	C1
S1136-WDNR	A0072	4572	80194	80199		5.250	+00	MGL	-3.4	22
S1201	D5018	0	80046	80081	LT	8.400	-01	UGG		
S1204	M0003	0	80050	80081	LT	8.890	-01	UGG		
S1205	D5027	0	80050	80081	LT	8.400	-01	UGG		
S1206	D5029	0	80053	80081	LT	8.400	-01	UGG		
S1207	M0004	0	80053	80081	LT	8.890	-01	UGG		
S1301	D5036C	0	80049	80081	LT	8.400	-01	UGG		
S1301	W0014	60	80050	[illegible]	LT	3.600	-01	MGL		
S1302	D50[illegible]	0	80049	80081	LT	8.400	-01	UGG		
S1303	D504[illegible]	0	80050	80081	LT	8.400	-01	UGG		
S1304	D504[illegible]	0	80050	80081	LT	8.400	-01	UGG		
S1305	D504[illegible]	0	80050	80081	LT	8.400	-01	UGG		
S1306	D50[illegible]	0	80050	80081	LT	8.400	-01	UGG		

S1307	W0017	60	80058	80066		4.400	-01	MGL	-.28	27
S1308	D5057C	0	80051	80081	LT	8.400	-01	UGG		
S1309	D5090C	0	80051	80081	LT	8.400	-01	UGG		
S1310	D5063C	0	80051	80081	LT	8.400	-01	UGG		
S1311	D5066C	0	80051	80081	LT	8.400	-01	UGG		
S1312	D5069C	0	80051	80081	LT	8.400	-01	UGG		
S1312	W0018	60	80058	80066		4.400	-01	MGL	-.28	27
S1314	M0017	0	79319	80081	LT	8.890	-01	UGG		
S1402	D5002	0	79324	80081	LT	8.400	-01	UGG		
S1404	W0020	45	80042	80056	LT	3.600	-01	MGL		
S1404	W0020	45	80042	80066	LT	3.600	-01	MGL		
S1404	W0020	45	80042	80066		4.400	-01	MGL	-.29	27
S1404	W0020	45	80042	80066		4.400	-01	MGL	-.29	27
S1408	D5008	0	79324	80081		2.500	+00	UGG	+.42	14
S1409	D5009	0	79325	80081	LT	8.400	-01	UGG		
S1411	D5011	0	79325	80081		1.420	+00	UGG	+.09	22
S1414	D5014	0	79330	80081	LT	8.400	-01	UGG		
S1415	D5015	0	79330	80081		9.630	-01	UGG	+.06	33

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: N2KJEL

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80196	LT	1.000	+00	MGL		
S1121-WDNR	A0056	1500	80189	80196	LT	1.000	+00	MGL		
S1123-WDNR	A0052	3782	80190	80196	LT	1.000	+00	MGL		
S1128-WDNR	A0057	1958	80189	80196	LT	1.000	+00	MGL		
S1134-WDNR	A0070	4176	80194	80196		1.100	+00	MGL		
S1135-WDNR	A0071	4633	80194	80196	LT	1.000	+00	MGL		
S1136-WDNR	A0072	4572	80194	80196		1.100	+00	MGL		

PARAMETER: PB

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80084		9.600	+00	UGL	-0.4	8
S1102	A0066	1674	80183	80225	LT	1.700	+00	UGL		
S1104	A0002	2283	80051	80084	LT	1.700	+00	UGL		
S1107	A0003	1453	80056	80088		7.700	+00	UGL	-0.3	10
S1107	A0063	1936	80184	80225	LT	1.700	+00	UGL		
S1108	A0004	575	80056	80088	LT	1.700	+00	UGL		
S1108	A0064	886	80184	80225	LT	1.700	+00	UGL		
S1109	A0005	2650	80057	80084	LT	1.700	+00	UGL		
S1111	A0008	2411	80058	80084	LT	1.700	+00	UGL		
S1112	A0006	1981	80057	80088	LT	1.700	+00	UGL		
S1115	A0007	2747	80057	80088	LT	1.700	+00	UGL		
S1117	A0009	2799	80058	80084		7.700	+00	UGL	-0.3	10
S1119	A0010	3128	80058	80084		2.900	+00	UGL	-0.1	27
S1121	A0014	1206	80058	80084		3.800	+00	UGL	-0.2	20
S1121	A0056	1500	80189	80225		5.800	+00	UGL	-0.2	14
S1122	A0011	3914	80052	80088		2.900	+00	UGL	-0.1	27
S1123	A0013	2652	80053	80088	LT	1.700	+00	UGL		
S1123	A0052	3782	80190	80225		1.400	+01	UGL	-1	5
S1125	A0015	3609	80058	80084		1.400	+01	UGL	-1	5
S1127	A0012	1989	80052	80084		5.800	+00	UGL	-0.2	14
S1128	A0057	1958	80189	80225	LT	1.700	+00	UGL		
S1130	A0020	2461	80058	80084		2.900	+00	UGL	-0.1	27
S1133	A0021	1944	80058	80084	LT	1.700	+00	UGL		
S1133	A0061	2878	80185	80225		1.100	+01	UGL	-1	7
S1134	A0022	4343	80058	80084		1.800	+01	UGL	-1	4
S1202	M0001	0	80050	80088		1.000	+02	UGG		
S1203	M0002	0	80051	80088		4.500	+01	UGG		
S1204	M0003	0	80050	80086		1.800	+02	UGG		
S1205	D5027	0	80050	80086		3.000	+01	UGG		
S1206	D5029	0	80053	80086		2.000	+01	UGG		
S1207	M0004	0	80053	80086		1.650	+02	UGG		
S1301	D5036C	0	80049	80086		9.500	+01	UGG		
S1301	W0016	60	80058	80084		4.800	+00	UGL	-0.2	16
S1302	D5039C	0	80049	80086		9.000	+01	UGG		
S1303	D5042C	0	80050	80086		1.700	+02	UGG		
S1304	D5045C	0	80050	80086		2.450	+02	UGG		
S1305	D5048C	0	80050	80086		1.500	+02	UGG		
S1306	D5051C	0	80050	80086		2.700	+02	UGG		
S1307	D5054	0	80050	80086		9.000	+01	UGG		
S1307	W001[illegible]	60	80058	80084	LT	1.700	+00	UGL		
S1308	D505[illegible]	0	80051	80086		1.500	+0[illegible]	UGG		
S1309	D50[illegible]	0	80051	80086		[illegible].500	+01	UGG		
S1310	D50[illegible]	0	80051	80086		4.500	+0[illegible]	UGG		
S1311	D50[illegible]	0	80051	80086		2.500	+01	UGG		
S1312	D50[illegible]	0	80051	80086		[illegible].500	+01	UGG		
S131[illegible]	W00[illegible]	60	[illegible]	80084	LT	1.700	+00	UGG		
S131[illegible]	M00[illegible]	0	79319	[illegible]		[illegible].000	+01	[illegible]		

S1402	D5002	0	79324	80088	5.800	+02	UGG		
S1404	W0020	45	80042	80084	2.100	+02	UGL	-9	.4
S1408	D5008	0	79324	80088	1.220	+03	UGG		
S1409	D5009	0	79325	80088	8.500	+01	UGG		
S1410	D5010	0	79325	80088	1.250	+02	UGG		
S1411	D5011	0	79325	80088	1.585	+04	UGG		
S1413	D5013	0	79330	80088	3.550	+02	UGG		
S1414	D5014	0	79330	80088	8.000	+01	UGG		
S1415	D5015	0	79330	80088	4.500	+01	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB016

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOCL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.100	+00	UGL		
S1104	A0068	2543	80183	80197	LT	1.100	+00	UGL		
S1107	A0063	1936	80184	80197	LT	1.100	+00	UGL		
S1123	A0052	3782	80190	80197	LT	1.100	+00	UGL		
S1137	A0073	5456	80190	80197	LT	1.100	+00	UGL		
S1413	W0051	10	80185	80197	LT	1.100	+00	UGL		

PARAMETER: PCB221

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80197	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80197	LT	3.000	+00	UGL		
S1123	A0052	3782	80190	80197	LT	3.000	+00	UGL		
S1137	A0073	5456	80190	80197	LT	3.000	+00	UGL		
S1413	W0051	10	80185	80197	LT	3.000	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB232

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.400	+00	UGL		
S1104	A0068	2543	80183	80197	LT	2.400	+00	UGL		
S1107	A0063	1936	80184	80197	LT	2.400	+00	UGL		
S1123	A0052	3782	80190	80197	LT	2.400	+00	UGL		
S1137	A0073	5456	80190	80197	LT	2.400	+00	UGL		
S1413	W0051	10	80195	80197	LT	2.400	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB242

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.300	+00	UGL		
S1104	A0068	2543	80183	80197	LT	1.300	+00	UGL		
S1107	A0063	1936	80184	80197	LT	1.300	+00	UGL		
S1123	A0052	3782	80190	80197	LT	1.300	+00	UGL		
S1137	A0073	5456	80190	80197	LT	1.300	+00	UGL		
S1413	W0051	10	80185	80197	LT	1.300	+00	UGG		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB248

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	7.000	-01	UGL		
S1104	A0068	2543	80183	80197	LT	7.000	-01	UGL		
S1107	A0063	1936	80184	80197	LT	7.000	-01	UGL		
S1123	A0052	3782	80190	80197	LT	7.000	-01	UGL		
S1137	A0073	5456	80190	80197	LT	7.000	-01	UGL		
S1413	W0051	10	80185	80197	LT	7.000	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB254

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.400	+00	UGL		
S1104	A0068	2543	80183	80197	LT	2.400	+00	UGL		
S1107	A0063	1936	80184	80197	LT	2.400	+00	UGL		
S1123	A0052	3782	80190	80197	LT	2.400	+00	UGL		
S1137	A0073	5456	80190	80197	LT	2.400	+00	UGL		
S1413	W0051	10	80185	80197	LT	2.400	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PCB260

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	2.300	+00	UGL		
S1104	A0068	2543	80183	80197	LT	2.300	+00	UGL		
S1107	A0063	1936	80184	80197	LT	2.300	+00	UGL		
S1123	A0052	3782	80190	80197	LT	2.300	+00	UGL		
S1137	A0073	5456	80190	80197	LT	2.300	+00	UGL		
S1413	W0051	10	80185	80197	LT	2.300	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PH

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80198		7.100	+00			
S1121-WDNR	A0056	1500	80189	80196		7.200	+00			
S1123-WDNR	A0052	3782	80190	80196		7.000	+00			
S1128-WDNR	A0057	1958	80189	80196		7.200	+00			
S1134-WDNR	A0070	4176	80194	80198		7.100	+00			
S1135-WDNR	A0071	4633	80194	80198		6.700	+00			
S1136-WDNR	A0072	4572	80194	80198		7.200	+00			
S1301	D5035	122	80049	80249		7.200	+00			
S1301	M00050	0	80049	80249		7.000	+00			
S1302	D5038	122	80049	80249		6.700	+00			
S1302	M0006	0	80050	80249		6.800	+00			
S1303	D5041	305	80050	80249		7.600	+00			
S1303	M00070	0	80050	80249		7.500	+00			
S1304	D5044	183	80050	80249		7.200	+00			
S1304	M00100	0	80050	80249		6.900	+00			
S1305	D5047	122	80050	80249		6.800	+00			
S1305	M0012	0	80050	80249		6.600	+00			
S1306	D5050	183	80050	80249		7.300	+00			
S1306	M00130	0	80050	80249		6.900	+00			
S1307	D5053	183	80050	80249		7.600	+00			
S1307	M0015	0	80050	80249		7.000	+00			
S1308	D5055	0	80051	80249		6.600	+00			
S1308	D5056	122	80051	80249		6.200	+00			
S1309	D5058	0	80051	80249		6.900	+00			
S1309	D5059	61	80051	80249		7.000	+00			
S1310	D5061	0	80051	80249		7.000	+00			
S1310	D5062	61	80051	80249		6.800	+00			
S1311	D5064	0	80051	80249		6.900	+00			
S1311	D5065	61	80051	80249		6.600	+00			
S1312	D5067	0	80051	80249		6.500	+00			
S1312	D5068	61	80051	80249		6.300	+00			
S1313	M0018	0	79319	80249		6.400	+00			
S1314	M0017	0	79319	80249		6.400	+00			

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PPDDD

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	6.300	-02	UGL		
S1104	A0068	2543	80183	80197	LT	6.300	-02	UGL		
S1107	A0063	1936	80184	80197	LT	6.300	-02	UGL		
S1113	A0052	3782	80190	80197	LT	6.300	-02	UGL		
S1137	A0073	5456	80190	80197	LT	6.300	-02	UGL		
S1413	W0051	10	80185	80197	LT	6.300	-02	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PPDDE

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.100	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.100	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.100	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.100	-01	UGL		
S1137	A0073	5456	80190	80197	LT	1.100	-01	UGL		
S1413	W0051	10	80185	80197	LT	1.100	-01	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: PPDDT

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	9.200	-02	UGL		
S1104	A0068	2543	80183	80197	LT	9.200	-02	UGL		
S1107	A0063	1936	80184	80197	LT	9.200	-02	UGL		
S1123	A0052	3782	80190	80197	LT	9.200	-02	UGL		
S1137	A0073	5456	80190	80197	LT	9.200	-02	UGL		
S1413	W0051	10	80185	80197	LT	9.200	-02	UGL		

PARAMETER: SB

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	6.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	6.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	6.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	6.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	6.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	6.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	6.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	6.000	+00	UGL		

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: SE

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	2.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	2.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	2.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	2.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	2.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	2.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	2.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	2.000	+00	UGL		

PARAMETER: SN

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
					RESULTS					
S1102	A0001	1370	80051	80084	LT	1.800	+01	UGL		
S1104	A0002	2283	80051	80084	LT	1.800	+01	UGL		
S1107	A0003	1453	80056	80086	LT	1.800	+01	UGL		
S1108	A0004	575	80056	80084	LT	1.800	+01	UGL		
S1109	A0005	2650	80057	80084	LT	1.800	+01	UGL		
S1111	A0008	2411	80058	80084	LT	1.800	+01	UGL		
S1112	A0006	1981	80057	80086	LT	1.800	+01	UGL		
S1115	A0007	2747	80057	80084	LT	1.800	+01	UGL		
S1117	A0009	2799	80058	80084	LT	1.800	+01	UGL		
S1119	A0010	3128	80058	80084	LT	1.800	+01	UGL		
S1121	A0014	1206	80058	80084	LT	1.800	+01	UGL		
S1122	A0011	3914	80052	80084	LT	1.800	+01	UGL		
S1123	A0013	2652	80053	80084	LT	1.800	+01	UGL		
S1125	A0015	3609	80058	80084	LT	1.800	+01	UGL		
S1127	A0012	1989	80052	80084	LT	1.800	+01	UGL		
S1130	A0020	2461	80058	80084	LT	1.800	+01	UGL		
S1133	A0021	1944	80058	80084	LT	1.800	+01	UGL		
S1134	A0022	4343	80058	80084	LT	1.800	+01	UGL		
S1202	M0001	0	80050	80083		4.500	-01	UGG		
S1203	M0002	0	80051	80088		2.800	+00	UGG		
S1204	M0003	0	80050	80086		1.200	+00	UGG		
S1205	D5027	0	80050	80086		4.700	+00	UGG		
S1206	D5029	0	80053	80086		3.900	+00	UGG		
S1207	M1004	0	80053	80086		1.100	+00	UGG		
S1301	D5036C	0	80049	80086		1.500	+00	UGG		
S1301	W0016	60	80058	80084	LT	1.800	+01	UGL		
S1302	D5039C	0	80049	80086		4.000	-01	UGG		
S1303	D5042C	0	80050	80086		6.000	-01	UGG		
S1304	D5045C	0	80050	80086		1.000	+00	UGG		
S1305	D5048C	0	80050	80086		7.000	-01	UGG		
S1306	D5051C	0	80050	80086		1.400	+00	UGG		
S1307	D5054C	0	80050	80086		4.000	+00	UGG		
S1307	W0017	60	80058	80084	LT	1.800	+01	UGL		
S1308	D5057C	0	80051	80086		1.300	+00	UGG		
S1309	D5060C	0	80051	80086		2.000	-01	UGG		
S1310	D5063C	0	80051	80086		1.000	+00	UGG		
S1311	D5066C	0	80051	80086		7.000	-01	UGG		
S1312	D5069C	0	80051	80086		1.100	+00	UGG		
S1312	W0019	60	80058	80084	LT	1.800	+01	UGL		
S1314	M001?	0	79317	80086		7.000	-01	UGG		
S1314	W001?	60	7931?	80084	LT	1.800	+01	UGL		
S140?	D500?	0	79324	[illegible]		?.500	+0?	UGG		
S1404	D503?	0	80042	80086		2.950	+0?	UGG		
S1404	W00??	45	80042	80084	LT	1.800	+01	UGL		
S14?8	D5008	0	79324	80086		6.650	+0?	UGG		
[illegible]	[illegible]	0	79325	[illegible]		[illegible]	[illegible]	UGG		
[illegible]	[illegible]	0	79325	[illegible]		[illegible]	[illegible]	[illegible]		

S1411	D5011	0	79325	80086	1.210	+03	UGG
S1413	D5013	0	79330	80086	2.400	+00	UGG
S1414	D5014	0	79330	80086	3.000	-01	UGG
S1415	D5015	0	79330	80086	9.000	-01	UGG

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: S04

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0001	1370	80051	80059		1.420	+02	MGL	42	2
S1104	A0002	2283	80051	80059		9.200	+01	MGL	27	3
S1107	A0003	1453	80056	80059		1.600	+01	MGL	5.0	16
S1108	A0004	575	80056	80059		1.560	+02	MGL	46	2
S1109	A0005	2650	80057	80059		2.800	+01	MGL	8	9
S1111	A0008	2411	80058	80078		1.700	+01	MGL	+5	14
S1112	A0006	1981	80057	80059		3.300	+01	MGL	10	7
S1115	A0007	2747	80057	80059		1.800	+01	MGL	5	13
S1115	A0007	2747	80057	80059		1.800	+01	MGL	5	13
S1117	A0009	2799	80058	80078		4.030	+01	MGL	+12	6
S1119	A0010	3128	80058	80078		3.900	+01	MGL	+12	6
S1121	A0014	1206	80058	80078		2.000	+01	MGL	+6	12
S1122	A0011	3914	80052	80059		4.000	+01	MGL	12	6
S1123	A0013	2652	80053	80059		2.800	+01	MG2	8	9
S1127	A0012	1989	80052	80059		1.700	+01	MGL	5	14
S1130	A0020	2461	80058	80092		3.000	+01	MGL	+9.0	8
S1130	A0053	3485	80190	80193	LT	6.000	+00	MGL		
S1131	A0054	4599	80190	80193	LT	6.000	+00	MGL		
S1132	A0058	4496	80189	80193	LT	6.000	+00	MGL		
S1133	A0021	1944	80058	80092		6.300	+01	MGL	+20	4
S1134	A0022	4343	80058	80078		2.370	+02	MGL	+70	1
S1201	D5018	0	80046	80092		1.300	+03	UGG	+18	1
S1202	M0001	0	80050	80092		3.440	+02	UGG	+4	.3
S1203	M1002	0	80051	80092		6.610	+02	UGG	+8	.1
S1204	M0003	0	80050	80092		5.820	+01	UGG	+.7	2
S1205	D5027	0	80050	80092		2.020	+01	UGG	+.20	5
S1206	D5029	0	80053	80092		1.520	+01	UGG	+.20	7
S1207	M0004	0	80053	80092		1.930	+02	UGG	+2.0	.5
S1301	D5036C	0	80049	80092		6.300	+01	UGG	+1	2
S1302	D5039C	0	80049	80092		1.010	+02	UGG	+1	1
S1303	D5042C	0	80050	80092		1.130	+02	UGG	+1	.9
S1304	D5045C	0	80050	80092		3.800	+02	UGG	+5	.3
S1305	D5048C	0	80050	80092		1.460	+02	UGG	+2	.7
S1306	D5051C	0	80050	80092		1.490	+02	UGG	+2	.7
S1307	D5054C	0	80050	80092		2.280	+02	UGG	+3	.4
S1307	W0017	60	80058	80078		2.100	+01	MGL	+6	11
S1308	D5057C	0	80051	80092		4.550	+01	UGG	+.5	2
S1309	D5060C	0	81051	80092		1.730	+02	UGG		
S1310	D5063C	0	80051	80092		[illegible].900	+01	UGG	+1	1
S1311	D5066C	0	80051	80092	LT	1.000	+01	UGG		
S1312	D50[illegible]	0	80051	80092		6.700	+01	UGG	+1	1
[illegible]	W001	60	80058	[illegible]		[illegible]	+01	MGL	+7	10
[illegible]	M0[illegible]	0	79319	[illegible]		5.725	+01	UGG	+.75	2
[illegible]	D5[illegible]	0	79320	800[illegible]		2.530	+01	UGG	+.3	4
[illegible]	W00[illegible]	45	80042	80050		1.200	+01	MGL	5	13
[illegible]	D5[illegible]	0	79324	[illegible]		7.140	+[illegible]	UGG	+.4	3
[illegible]	D5[illegible]	0	79329	[illegible]		2.520	+[illegible]	UGG	+.3	4

S1410	D5010	0	79325	80092	5.360	+01	UGG	+.6	2
S1411	D5011	0	79325	80092	2.530	+01	UGG	+.3	4
S1413	D5013	0	79330	80092	4.680	+02	UGG	+5.5	.2
S1414	D5014	0	79330	80092	2.990	+02	UGG	+4	.3
S1415	D5015	0	79330	80092	1.520	+01	UGG	+.2	7

PARAMETER: SULFID

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1117-WDNR	A0050	3321	80193	80224	LT	1.000	+00	MGL		
S1121-WDNR	A0056	1500	80189	80192	LT	1.000	+00	MGL		
S1123-WDNR	A0052	3782	80190	80192	LT	1.000	+00	MGL		
S1128-WDNR	A0057	1958	80189	80192	LT	1.000	+00	MGL		
S1134-WDNR	A0070	4176	80194	80224	LT	1.000	+00	MGL		
S1135-WDNR	A0071	4633	80194	80224	LT	1.000	+00	MGL		
S1136-WDNR	A0072	4572	80194	80224	LT	1.000	+00	MGL		

PARAMETER: TL

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80225	LT	3.000	+00	UGL		
S1104	A0068	2543	80183	80225	LT	3.000	+00	UGL		
S1107	A0063	1936	80184	80225	LT	3.000	+00	UGL		
S1108	A0064	886	80184	80225	LT	3.000	+00	UGL		
S1121	A0056	1500	80189	80225	LT	3.000	+00	UGL		
S1123	A0052	3782	80190	80225	LT	3.000	+00	UGL		
S1128	A0057	1958	80189	80225	LT	3.000	+00	UGL		
S1133	A0061	2878	80185	80225	LT	3.000	+00	UGL		

PARAMETER: TXPHEN

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	8.900	+00	UGL		
S1104	A0068	2543	80183	80197	LT	8.900	+00	UGL		
S1107	A0063	1936	80184	80197	LT	8.900	+00	UGL		
S1123	A0052	3782	80190	80197	LT	8.900	+00	UGL		
S1137	A0073	5456	80190	80197	LT	8.900	+00	UGL		
S1413	W0051	10	80185	80197	LT	8.900	+00	UGL		

PARAMETER: 24DNT

BADGER AAP - CHEMICAL ANALYSIS RESULTS BY TEST NAME

SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOCL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
S1102	A0066	1674	80183	80197	LT	1.300	-01	UGL		
S1103	A0067	3586	80182	80197	LT	1.300	-01	UGL		
S1104	A0068	2543	80183	80197	LT	1.300	-01	UGL		
S1105	A0062	3265	80184	80197	LT	1.300	-01	UGL		
S1107	A0063	1936	80184	80197	LT	1.300	-01	UGL		
S1108	A0064	886	80184	80197	LT	1.300	-01	UGL		
S1109	A0059	2961	80185	80197	LT	1.300	-01	UGL		
S1111	A0065	2709	80184	80197	LT	1.300	-01	UGL		
S1113	A0055	1708	80189	80197	LT	1.300	-01	UGL		
S1121	A0056	150H	80189	80197	LT	1.300	-01	UGL		
S1122	A0060	4082	80185	80197	LT	1.300	-01	UGL		
S1123	A0052	3782	80190	80197	LT	1.300	-01	UGL		
S1130	A0053	3485	80190	80197	LT	1.300	-01	UGL		
S1133	A0061	2878	80185	80197	LT	1.300	-01	UGL		
S1201	D5019L	457	80046	80218		1.090	+02	NGG	+.46	4
S1201	D5019U	457	80046	80218		8.700	+01	NGG	+3.7	5
S1202	D5020S	91	80050	80249		6.810	+02	NGG	+2.9	K9
S1202	D5020U	91	80050	80218	LT	9.000	+00	NGG		
S1202	D5021	457	80050	80218	LT	9.000	+00	NGG		
S1203	D5022	91	80051	80218		1.710	+04	NGG	+.72	C2
S1203	D5023	488	80051	80218		2.700	+02	NGG	+1.1	31
S1203	M0002	0	80051	80218		1.720	+05	NGG	+.73	2
S1204	D5024C	152	80050	80218		7.190	+02	NGG	3.05	59
S1204	D5026	579	80050	80218		2.400	+01	NGG	+1.0	C4
S1205	D5027	0	80050	80218		4.000	+01	NGG	+1.7	11
S1205	D5028	457	80050	80218	LT	9.000	+00	NGG		
S1205	M0050	18	80193	80218		7.570	+03	NGG	3210	56
S1206	D5029	0	80053	80218		5.700	+01	NGG	+2.4	07
S1206	D5030	457	80053	80218	LT	9.000	+00	NGG		
S1206	M0051	18	80193	80218		2.610	+03	NGG	1110	16
S1207	D5031	61	80053	80218	LT	9.000	+00	NGG		
S1207	D5032	457	80053	80218	LT	9.000	+00	NGG		

APPENDIX J
ANALYTICAL METHODS

METHOD FOR WATER - 2,4-DNT AND NITROGLYCERIN

Follow EPA Method 609 except use a 15/85 methylene chloride/hexane mixture as the extraction solvent. After extraction concentrate in a Kuderna-Danish evaporator to approximately 0.5 ml. Place the concentrate on a 1 cm x 8 cm neutral alumina column (20 percent deactivated) and elute with 60 ml of 15/85 methylene chloride/hexane. Concentrate the eluate to ml in a Kuderna-Danish evaporator and cool. Add 5 ml of hexene and reduce the volume to albout 1 ml. Measure the final volume and add sufficient acetone and hexane to bring the final volume up to 2 ml with 20 percent acetone in hexane.

Continue analysis as in Method 609 using these chromatographic conditions:

Column: 6 feet x 2 mm I.D. glass column with 1.5 percent SP2250/1.95 percent SP2401 on 100-120 mesh Supelcoport

Detector: Electron Capture

Injection Temperature: 110^{0}C

Column Temperature: 150^{0}C isothermal

Flow Rate: 40 ml/minute agron/methane

WATER AND FISH SAMPLES

Parameter	Water Samples Method(a)	Detection Level	Precision	Accuracy
Alkalinity	310.1			
COD	410.1			
Conductance	120.1			
Hardness	130.2	No Detection Level and Precision and Accuracy required		
pH	150.1			
Sulfide	376.1			
Iron	236.1 with prep according to EPA "Metals", 4.4.4.)			
Sulfate	375.2	5.7 mg/l	1.71	0.705
Nitrate	Army #NO3-WA-02	0.36 mg/l	0.196	1.64
Nitrite	Army #NO3-WA-02	0.25 mg/l	0.130	1.06
Metals - prep	"Metals" 4.1.4.			
Silver	272.2	2.5 μg/l	No Precision and Accuracy required	
Aluminum	202.1, 202.2			
Arsenic	206.2	6.3 μg/l		
Beryllium	210.2	47 μg/l		
Cadmium	213.2	1.2 μg/l		
Chromium	218.2	4.4 μg/l		
Copper	220.2	5.0 μg/l		
Nickel	249.2	8.1 μg/l		
Lead	239.1, 239.2	1.7 μg/l	0.818	1.04
Antimony	204.2	5.5 μg/l	No Precision and Accuracy required	
Selenium	270.2	2.0 μg/l	No Precision and Accuracy required	
Tin	282.1, 282.2	17.5 μg/l	8.95	1.18
Thallium	279.2	2.9 μg/l	No Precision and Accuracy required	
Zinc	289.2	15 μg/l	No Precision and Accuracy required	
Mercury	245.1	0.47 μg/l	0.086	0.985
TKN	351.3	No Detection Level and Precision and Accuracy required		

Pesticides and PCB's

EPA's Method for Organochlorine Pesticides in Industrial Effluents, published in the Federal Register, Vol. 38, No. 75, Part II.

Parameter	Method	Detection Level	Precision	Accuracy
α-BHC		0.17μg/l	No Precision and Accuracy required	
β-BHC		0.035μg/l		
γ-BHC		0.028μg/l		
δ-BHC		0.026μg/l		
aldrin		0.033μg/l		
chlordane		0.11μg/l		
toxaphene		8.9μg/l		
heptachlor		0.12μg/l		
endrin		0.030μg/l		
dieldrin		0.15μg/l		
DDE		0.11μg/l		
DDT		0.092μg/l		
DDD		0.063μg/l		
endosulfan I		0.025μg/l		
endosulfan II		0.064μg/l		
PCB 1016		1.1μg/l		
1221		3.0μg/l		
1232		2.4μg/l		
1242		1.3μg/l		
1254		2.4μg/l		
1248		0.70μg/l		
1260		2.3μg/l		
Chloroform	"Analysis of Trihalomethanes in Drinking Water by Liquid/Liquid Extraction", EPA, Federal Register, Vol. 44, No. 231, November 29, 1979, p.68683	2.3μg/l	No Precision and Accuracy required	
Carbon tetrachloride		0.26μg/l	No Precision and Accuracy required	

WATER AND FISH SAMPLES

(Continued)

Parameter	Water Samples Method	Detection Level	Precision	Accuracy
2,4-dinitrotoluene	EPA Method 609, Federal Register, Vol. 44, No. 233, December 3,	0.13µg/l	0.182	1.01
Nitroglycerin	1979	11µg/l	1.31	0.55
GC/MS Screen				
NVO	Sampling and Analysis Procedures for Screening of Industrial Effluents,		No Precision and Accuracy required	
VOA	EMSL, USEPA, April 1977.			
Nitrocellulose	Army #NC-WA-01	2.05µg/l	No Precision and Accuracy required	

Parameter	Fish Samples Method	Detection Level	Precision	Accuracy
GC/MS Screen	Sampling and Analysis Procedures for Screening of Industrial Effluents, EMSL, USEPA, April 1977. With preparation			

NOTES: [a]All methods are EPA except as noted

SAMPLE PREPARATION - GC/MS ANALYSIS - FISH

This method is intended for the extraction of a broad spectrum of environmentally significant organics from fatty tissue, and the separation of these organics from the natural fats and oils prior to GC/MS analysis. The method has been tested mainly with fish tissue, but should be applicable to other types of tissues. The analysis of fish tissue is used to describe the method, with optional sample handling for the analysis of the whole fish, or just the potentially edible portions. The advantage of the method is that it is based on a significant amount of experience of several investigators over a number of years. The detection limit for the method is not known, but is estimated at 1-10 ug per kg of fish tissue.

The analysis of a reagent blank is required for each group of fish specimens extracted on a given day. The reagent blank analysis provides information about background and solvent contamination. Recovery data are not available for the total procedure since it is not possible to spike fatty tissue with known concentrations of organics and simulate natural conditions for the incorporation of these materials. Perhaps the best method of measuring the effectiveness of the extraction is to re-extract with a fresh portion of solvent, or with an alternative solvent, such as acetone-methylene chloride.

Solvents and other reagents should be purified as described under low boiling solvent extraction. For the analysis of large whole fish, a meat grinder is required. In all cases, a laboratory blender of about one quart capacity is also required. A gel permeation chromatograph equipped with a 2.5 x 50 cm column packed with BIO-RAD SX-2 beads is used to separate the natural fats and oils from the organics of interest.

Fish at the sampling site should be wrapped in aluminum foil, shipped in an ice chest packed with dry ice (preferred) or ice, and preserved in a freezer until analyzed. Small fish must be combined by sampling site and species to obtain the weight required for analysis. For the analysis of whole fish, the entire fish (or fishes) are ground directly, or, if necessary, chopped into pieces small enough to fit into the meat grinder. Grind the fish several times and thoroughly mix the ground material. Clean out any material remaining in the grinder and add this to the sample. For an analysis of the edible portions only, fillet the fish or fishes, and cut these into small pieces no larger than about two cubic centimeters each.

Add enough dry ice to the blender to completely cover the blades. Homogenize the dry ice for about 30 seconds, and then add about 25 grams (weighed to the nearest 0.1 gram) of fish fillet chunks or ground whole fish along with more dry ice to the blender. Wait several minutes for the fish to freeze, homogenize for at least tow minutes, or until the mixture is free of lumps, and then add about 75 grams of purified anhydrous sodium sulfate to the blender. Homogenize for another two minutes, and pour the contents of the blender onto an aluminum foil sheet (one square foot). Homogenize additional dry ice and 25 grams of anhydrous sodium sulfate and transfer this to the same aluminum foil. This operation services to rinse the blender of residual fish residue. Mix the fish, sodium sulfate, and dry ice on the foil with a spatula. Carefully fold the aluminum foil into the form of an envelope, label, and place in a freezer at -15°C for 8-12 hours. The dry ice will sublime and the residue should be in the form of a granular lum-free material.

Extract the mxiture in a 250 ml Soxhlet extractor with 200 ml of a 1:1 mixture of a acetone-hexane for 8 hours. Cool the extract, transfer it to a Kuderna-Danish (K-D) apparatus, and concentrate it to about 3 ml. Remove the last traces of solvent with a gentle steam of dry nitrogen, and weigh the resulting oil. Dilute the oil with methylene chloride to a concentration of 100 mg/ml.

Inject the total amount of diluted extract, in 5 ml aliquots, into the gel permeation chromatographic system. Elute each 5 ml aliquot with 225 ml of methylene chloride, at a flow rate of 3.5 ml per minute, and discard the first 160 ml of each eluate (this contains the natural oils and fats). Collect the balance (about 65 ml) of each eluate from each aliquot in the same 500 ml K-D flask. Concentrate the combined eluate containing the organics of interest to 5 ml. Analyze by GC/MS using the same conditions as soils and water for B/N column.

SOIL SAMPLES

Parameter	Method	Detection Level	Precision	Accuracy
Pesticides and PCB's	"Method for Analyses of PCB's, Pesticides and Phthalates in Soils and Bottom Sediments," from Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing, EPA, Central Regional Laboratory, Method Nos. 198-207, March 1979			
Ammonia	"Ammonia Nitrogen in Bottom Sediments", Compiled by Great Lakes Region Committee on Analytical Methods, EPA, December 1969, pp. 28-31, with color development according to EPA 350.2, Section 7.4			
Metals				
prep	"Interim Method for the Analysis of Elemental Priority Pollutants in Sludge", EMSL - Cincinnati, December 1978			
Al	EPA 202.1, 202.2	Not able to establish		
Pb	EPA 239.1, 239.2	Not able to establish		
Sn	EPA 282.1, 282.2	Not able to establish		
Diethyl phthalate	EPA Method 606 preceded by sample prep and extraction according to "Method for Analyses of PCB's, Pesticides and Phthalates in Soils and Bottom Sediments", EPA, Central Regional Laboratory, Method Nos. 198-207, March 1979, steps 1-4	3.6µg/l	Precision and Accuracy not required	
Di-n-butyl phthalate		2.8µg/l	Precision and Accuracy not required	
pH	EPA 150.1 with prep	No Detection Level and Precision and Accuracy required		
2,4-DNT	EPA Method 609 with modifications	8.86	2.46	0.576
nitroglycerine	EPA Method 609 with modifications	No data	No data	No data
GC/MS Acid B/N	"Sampling and Analysis Procedures for Screening of Industrial Effluents", EMSL, USEPA, April 1977	No Detection Level and Precision and Accuracy required		
NO_3	Army #NO3-WA-02 plus prep	0.83µg/l	0.299	0.934
NO_2	Army #NO3-WA-02 plus prep	0.63µg/l	2.03	[illegible]
SO_4	EPA 375.2 plus prep	9.9µg/l	3.69	[illegible]
CEC	Methods of Soil Analysis, Part 2; C. A. Black, Editor; American Society of Agronomy, Inc., Madison, Wisconsin 1965	No Detection Level and Precision and Accuracy required		
COD	EPA Method 410.1 with modifications	Not required		
Nitrocellulose	Army #NC-WA-01 with prep	Not able to establish		

SOIL PREPARATION FOR 2,4-DNT AND NITROGLYCERIN

Soxhlet extract 75g of air-dried sample with methylene chloride for eight hours. After the extraction is complete and the solvent cools, measure and record the volume.

Concentrate the extract to approximately 0.5 ml using a Kuderna-Danish. Place on the alumina column and continue as in the method for water.

SOIL PREPARATION FOR NITROCELLULOSE

Extract 7.5g of air-dried sample with 200 ml methylene chloride in a soxhlet extraction for five hours. Discard the solvent extract. Re-extract the sample with 200 ml of acetone by soxhlet extractions for five hours. Evaporate to 20 ml under a stream of nitrogen. Continue as for water analyses at step 4 of Army Method NC-WA-01 (treat acetone extract with sodium hydroxide).

Reference: "Method Development Plan", Environmental Science and Engineering, Gainesville, Florida.

SOIL PREPARATION FOR pH

Slurry 20g of soil in a 50 ml beaker with 20 ml of deionized water. Stir the suspension several times during the next 30 minutes. Let the soil suspension settle for about one hour. Analyze for pH as in EPA 150.1.

Reference: "Methods of Soil Analysis", Part 2, Chemical and Microbiological Properties, C. A. Black, Editor, American Society of Agronomy, Inc., Madison, Wisconsin 1965.

SOIL PREPARATION FOR NITRATE, NITRITE AND SULFATE

Procedure

100g of soil was slurried in 250 ml of deionized water. The mixture is stirred twice over an eight hour period and allowed to settle out overnight. The sample is then filtered through a 0.45 micron filter and the filtrate is analyzed by Army Method #NO3-WA-02 for nitrate/nitrite or EPA #375.2 for sulfate.

ANALYSIS OF SOIL FOR COD

Weigh out a portion (0.2 - 1.0 g depending on the concentration) of well mixed wet soil/sediment. Transfer to the COD flask and add 50 ml of distilled water. Continue as for a water sample in EPA method 410.1.

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS - CHEMICAL

CARD PUNCH

INS (1)	FA (3)	T (6)	FIL (7)
BA	SA	C	

(1)	SAMPLE DATE (8)	SMPL PROGRM (13)	SITE TYPE (16)	SITE IDENTIFICATION (20)	SAMPLE DEPTH (30)	SC (34)	ANALYSIS DATE	LAB (40)	SAMPLE NUMBER (42)	TEST NAME (48)	MTH (54)	MEA BOO (56)	MEA MANTISSA (58)	MEA EXPON (63)	UNITS (66)	ACCUR (70)	PRE (74)	INSTR (76)	ANALYST (78–80)

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE

SC = SAMPLING TECHN. CODE
MTH = METHOD
MEA = MEASUREMENT
BOO = BOOLEAN

PRE = PRECISION
INSTR = INSTRUMENT
EXPON = EXPONENT
ACCUR = ACCURACY

REVISED 1-78

CDIR Form 13-2.1, 1 Sep 73

SAMPLING AND ANALYSIS VARIABLES FOR CHEMICAL ANALYSIS

Variable	Descriptions	Possible Entries
1.-3. Identification (Col. 1-5)	Plant/Data	BASAC
4. File (Col. 6-7)	Type of Sample	AT (animal-tissue) BE (benthic) BM (biota) CM (composite) DT (detritus) GW (ground water) PT (plant-tissue) QR (quality control primary standard) SE (sediment) SO (soil) SR (sewer) WD (wood) SW (surface water)
5. Sample Date (Col. 8-12)	5 number Julian date when sample is taken.	79275 thru 79365 80001 thru 80366
6. Sampling Program (Col. 13-15)	3 character (letter or number) abbreviation of the sampling program.	PR1 (preliminary survey - Phase I)
7. Site Type (Col. 16-19)	4 letter abbreviation to type of landmark, feature, or construction being identified. This description/identification will have grid coordinates associated with it; however, grid coordinates will be entered in map file.	BASN (basin) BORE (bore hole) CREK (creek) DAM (dam) DTCH (ditch, drainage) LAKE (lake) PIT (pit/tree spade) PLUG (shover sample) POND (pond) RVER (river) STRM (stream) STWA (standing water) SURF (surface-general) WELL (well)
8. Sample Point (Col. 20-24)	Biology hydrogeology/Geology	S0001 thru S0999 S1000 thru S1999
9. Sample Depth (Col. 30-33)	4 numbers (-sign for above ground sample) to designate depth from topographic surface to top of sample interval. Measurements in centimeters.	-999 thru 9999
10. Sampling Technique (Col. 34)	1 character (letter or number) used to differentiate critical sampling techniques.	A (clamshell) B (bail) C (composite grab) D (dredge) E (ekman grab) G (single grab) H (high volume sample) L (lysimeter) M (tensiometer) P (pump) S (split spoon core sample) T (shelby tube core sampling) A thru Z 0 thru 9
11. Analysis Date (Col. 35-39)	5 number Julian date when analysis was made.	79275 thru 79365 80001 thru 80366
12. Laboratory (Col. 40-41)	2 letter abbreviation for laboratory.	EN (EEI) WZ (Warzyn)

SAMPLING AND ANALYSIS VARIABLES FOR CHEMICAL ANALYSIS
(Continued)

	Variable	Descriptions	Possible Entries
13.	**Sample Number** **(Col. 42-46)**	Terrestrial Biology Aquatic Biology Soils or Parent Material Groundwater Sediment Water	B0001 thru B0199 B0200 thru B9999 D0001 thru D9999 A0001 thru A9999 M0001 thru M9999 W0001 thru W9999
14.	**Test Name**	6 character (numbers or letters) to identify the parameter being measured.	ALDRN (aldrin) ATNT (alpha trinitrotoluene 2,4,6 trinitrotoluene) BOD (biological oxygen demand) C6H6 (benzene) CD (cadmium) COD (chemical oxygen demand) COND (specific conductivity) CUTOT (copper total) DBP (dibutyl phthalate) DEP (diethyl phthalate) DLDRN (dieldrin) DO (dissolved oxygen) 24DNT (2,4-dinitrotoluene) ENDRN (endrin) HARD (total hardness) HGTOT (mercury total) NC (nitrocellulose) NG (nitroglycerine) NO2 (nitrite) NO3 (nitrate) SO4 (sulfate) SS (settleable solids) TDS (total dissolved solids) TOC (total organic carbon) TSS (total suspended solids) ZN (zinc) AG (silver) AL (alumimun) ALK (alkalinity) AS (arsenic) BE (beryllium) CLL4 (carbon tetrachloride) CHCL3 (chloroform) CLDAN (Chlordane) CR (chromium) FE (iron) HN3NZ (ammonia) HPCL (heptachlor) LIN (lindane) NZKJEL (nitrogen, by Kjeldahl) PB (lead) PH (pH) PPDDD (2,2-bis(parachlorophenyl)-1,1-dichloroethane) PPDDE (2,2-bid(parachlorophenyl)-1,1-dichloroethene) PPDDT (2,2-bis(parachlorophenyl)-1,1,1-trichloroethane) SB (antimony) SE (selenium)
15.	**Test Method #** (Col. 54-55)	2 character designation of the method as standardized by the ASC and described in the Methods File. T indicates temporary method.	01 thru 99; T1 thru T9 DCPD tested by odor - T2
16.	Measurement Boolean (Col. 56-57)	2 letters used when measured quantity is below detectable limits. Detection limit determined by ASC-QC method.	BB (below background) GT (greater than) LT (less than) ND (not detectable no odor) OD (positive odor test)

SAMPLING AND ANALYSIS VARIABLES FOR CHEMICAL ANALYSIS (Continued)

	Variable	Description	Possible Entries
17.	Measurement Mantissa (Col. 58-62)	5 numbers (4 digits plus decimal) for normal scientific notation.	1.000 thru 9.999
18.	Measurement Exponent (Col. 63-65)	3 numbers [+ or - sign plus 2 digit) exponent to base 10 (plus (+)/minus(-) sign mandatory]	-99 to +99
19.	Measurement Units (Col. 66-69)	4 letter abbreviation of units of measurement.	PPB (parts per billion) PPK (parts per thousand) PPM (parts per million) PPT (parts per trillion) blank (pH) MGL (milligrams/liter) MHC (micromho/cm - conductivity) MHO (micromho - conductance) Water GL (gram/liter) MGL (milligram/liter) UGL (microgram/liter) NGL (nanogram/liter) KG (kilograms) PGL (femtogram/liter) Soil GG (gram/gram) MGG (milligram/gram) UGG (microgram/gram) NGG (nanogram/gram) PGG (picogram/gram) FGG (femtogram/gram)
20.	Accuracy (Col. 70-73)	4 number estimate of systematic error and the direction by which the measurement has already been corrected	-999 thru +999
21.	Precision (Col. 74-75)	2 number estimate of variability caused by random error. Parameter developed by ASC. Measured in percent (%).	00 thru 99 C1 thru C9 (100%-900%) K1 thru K9 (1000%-9000%)
22.	Instrument # (Col. 76-77)	2 number code for lab instrument for differentiating same type in lab.	00 thru 99
23.	Analyst (Col. 78-80)	3 letter initials of individual responsible for measurement.	AAA thru ZZZ

WATER SAMPLING

FIELD NOTES

1–7	8 SAMPLE DATE	13 SMPL PRGRM	16 SITE TYPE	20 SAMPLE POINT	SAMPLE NUMBER	30 SAMPLE DEPTH	34 SC
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					
BASAC		PR1					

Col.	Variable	Entry
6-7	Sample source	GW-ground water SW-surface water
8-12	Sample date	79275-79365 to 8ØØ01-8Ø366
16-19	Site type	BASN(Basin), BORE(Bore hole), CREK(Creek), DAM(DAM), DTCH(Ditch, drainage), LAKE (Lake), PIT(Pit/Tree spade), PLUG(Shovel sample), POND(Pond), SPRG(Spring), STRM(Stream), STWA(Standing water), SURF(Surface water), RSER(Reservoir), RVER(River, WELL(Well)

Col.	Variable	Entry
20-24	Sample point	SØØØ1-S1999
25-29	Sample number	AØØØ1-A9999 for ground water WØØØ1-W9999 for surface water
30-33	Sample depth	Depth from topographic surface in centimeters
34	Sample technique	B(Bail); C(Composite grab); G(Single grab); P(Pump); H(High volume sample)

APPENDIX K
GC/MS RESULTS

SEDIMENT AND SOIL SAMPLES

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1201	Acid	1	0.9815	2,6-dinitrotoluene	5
			0.8662	1-phenyl-4-carboxy-4,5-dihydro-1H-1,2,3-triazole	
			0.8651	2,4-DNT	
			0.8638	2-phenyl-5-carboxy-2H-1,2,3,4-tetrazole	
			0.8565	dibenzyl ether	
		2	0.9815	2,4-dinitrotoluene	35
			0.9814	2,5-DNT	
		3	0.9760	diphenylamine	28
		4	0.9826	di-n-outylphthalate (DBP)	135
		5	0.9815	o-nitrodiphenylamine	2
			0.9797	2-nitro-N-nitroso-N-phenyl-benzenamine	
	B/N	1	0.9787	diacetone alcohol	420
		2	0.9817	2,6-DNT	38*
			0.8699	2,4-DNT	
			0.8591	o-nitrosobenzaldehyde	
		3	0.9817	2,4-DNT	998*
			0.9815	2,5-DNT	
		4	0.9808	diphenylamine	470*
			0.9808	o-amirobiphenyl	
			0.8710	N,N-diphenylhydrazine	
		5		no hits (phthalate)	8
		6		DBP	>1,300 (overloaded)*
		7	0.9816	o-nitrodiphenylamine	28
			0.8579	m-nitrodiphenylamine	
		8	0.9739	p-nitrodiphenylamine	5
		9		BEHP	8
S1204	Acid	1		no hits	<2
		2		no hits - probably 2,4-DNT	2
		3		no hits - probably diphenylamine	6
		4	0.9825	DBP	18
			0.8664	isobutyl o-phthalate	
	B/N	1		DBP	29*
		2	0.9786	citronellyl propionate	300
			0.8691	citronellyl formate	
			0.9780	thajylalcohol isomer	
			0.9776	camphane	
			0.8771	2-methene	
			0.8700	endo,endo-2,6-divinyl-cis-bicyclo(3.3.0)octane	
			0.8693	2-sec-butylcyclohexanol	
			0.8574	cyclohexene,3-methyl-6-(1-methylethyl)-,trans-	
			0.8551	P,1-dimethyl-1,3,5-trisidacyclohexane	
		*		diphenylamine	1.8*

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1206	Acid	1	0.9707	1-carbamoyl-3,5-dimethyl-2-pyrazoline	1
			0.8601	5-methyl-3-heptanol	
			0.8496	γ-valerolactone	
		2	0.9837	BEHP	<1
			0.9815	dioctylphthalate	
			0.8668	dioctylether	
			0.8641	2L-methyl-dodecanol-1	
			0.8572	1-decanol	
	B/N	1		no hits	<1
		2		diacetonealcohol (no l.s.)	NQ
		3		no hits	<1
		4		no hits	<1
		5		no hits	<1
		6		no hits	<1
		7		no library search - lack of detail (probably hydrocarbon)	<1
		8		no hits	<1
		9	0.9969	N6-(3-hydroxy-3-methylbutyl)adenine	<1
		10	0.9960	octahydro-1-(2-octyldecyl)-pentalene	1
			0.9958	1-hexacosanol	
			0.9957	6-octen-1-ol,3,7-dimethyl-propanate	
			0.9954	2L,4L-dihydroxycosanol	
		11		BEHP (no l.s.)	2
		*		DEP	0.02*
		*		DBP	0.14*
S1207	Acid	1		no hits	<2
		2	0.9820	DBP	2
			0.8691	isobutylphthalate	
		3	0.8543	2'-deoxyinosine	<2
	B/N	1	0.8657	diacetone alcohol	NQ
		2	0.8598	3-hexene-2,5-diol	<2
		3	0.9774	5-methoxy-2-pentanone	<2
			0.8605	diacetone alcohol	
		4		no hits	<2
		5	0.9782	ceclopentylcyclopentane	<2
			0.8733	1,9-nonadediol	
			0.8730	nitric acid, nonyl ester	
			0.8718	1-octadecanol	
			0.8694	bicyclo[3.1.1]heptane,2,6,6-trimethyl (pinane)	
		6		no hits	<2
		7		no hits	<2
		8		no hits	<2
		9		no hits	<2
		10		DBP (no l.s.)	5.9*

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1207	B/N	11	0.9819	1-eicosanol	<2
			0.9814	hexadecanol	
			0.9811	tridecanol	
			0.9810	2-methyl-1-dodecanol	
			0.9806	2H-cyclopropa[3,4]naphth[1,2-b]oxirene	
		12		BEHP (no l.s.)	<2
		*		DEP	0.11*
		*		diphenylamine	1.1*
		*		2,6-DNT	0.50*
S1301	Acid	1		no hits	<2
		2	0.9776	5-(2-propynyloxy)-2-pentanol	<2
			0.8659	oxonane (oxacyclononane)	
		3		no hits	<2
		4	0.9803	diphenylamine	1.5*
			0.9785	N,N-diphenylhydrazine	
			0.9782	o-aminobiphenyl	
			0.8552	N,N-diphtnylurea	
		5	0.9799	DBP	3.1*
			0.9769	N-butylisobutylphthalate	
		6	0.8655	1-methyl-4-(1-methylbutyl)-cyclohexane	<2
		7		no hits	<2
		8		BEHP (no l.s.)	<2
	B/N	1	0.9787	diacetone alcohol	52
		2	0.9801	bicyclo(4.2.0)octa-1,3,5-triene	<2
			0.9800	styrene	
			0.8697	cyclo octatetraene	
		3		no hits (hydrocarbon)	<2
		4		no hits	<2
		5		no hits	<2
		6	0.9814	1,1'-oxybis-octane (diactyl ether)	<2
			0.9801	3-chlorodecane	
			0.9792	2,6,11-trimethyldodecane	
			0.9792	1-eicosene	
			0.9789	1-octadecene	
		7		diphenylamine (no l.s.)	3.1*
		8	0.8520	1,2,3,4-tetrahydro-2-phenylnaphthalene	<2
		9		no hits	<2
		10		DBP (no l.s.)	3.1*
		11	0.9876	2-hydroxy-6-methyl-4-(phenylmethoxy)benzaldehyde	6; searched as a mixture, looks like it contains some BEHP
			0.9860	2-hydroxy-3,6-dimethyl-4(phenylmethoxy)benzenemethanol	
			0.9856	4-(β-phenylethyl)-6-methyl-3-cyanopyrid-2-one	
			0.9848	1,3-diphenyl-4-acetyl-delta 2-1,2,4-triazolin-5-one	
			0.9837	p-nitro-1,2,-diphenylamine	

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1301	B/N	12	0.9782	3-phenyl-2-methylindole	2
			0.9782	5-methyl-2-phoylindole	
			0.8686	1-methyl-2,2-diphenylcyclopropane phenysulfioc	
			0.8503	2-phenyl-5-methylbene(D)(1,3)oxazepine	
		*		DEP	0.31*
S1307	Acid	1		no hits	4
		2		no hits	4
		3		no hits	4
		4		no hits	4
		5		no hits	<4
		6		no hits	<4
		7	0.9812	o-aminobiphenyl	27
			0.9810	diphenylamine	
			0.9795	N,N,N'-triphenylurea	
			0.9788	N,N-diphenylhydrazine	
			0.8565	N,N-diphenylurea	
		8		no hits	4
		9	0.9815	DBP	12
			0.8756	isobutyl o-phthalate	
		10		no hits	4
		11		no hits	4
	B/N	1	0.9789	diacetone alcohol	NQ
		2	0.9776	diacetone alcohol	4
		3	0.8612	methyl-2-methyl-3-oxobutanoate	50
		4		no hits	<4
		5	0.9809	diphenylamine	24*
			0.8698	N,N-diphenylhydiazine	
			0.8592	N,N-diphenylurea	
		6	0.9771	o'-xylene	8
			0.8558	ethylbenzene	
			0.8557	phenylpropionic acid	
		7		no hits	4
		8		DBP (no l.s.)	17*
		9	0.8554	o'-xylene	27
		10	0.9801	4-phenyl-1,2-dihydronaphthalene	15
			0.8121	2-phenyl-methylbene(D)(1,3)oxatepine	
			0.8646	1-methyl-2,2-diphenylcyclopropane phenylsulfide	
		*		DEP	0.23*
S1312	Acid	1		no hits	<2
		2	0.9846	2-methyltridecane	<2
			0.9813	1,1-dlbromo-2-chloro-2-fluoro-cyclopropane	
			0.98[illegible]	methyl-11-bromo-undecanoate	
			0.97[illegible]	vincadifformine	
			0.97[illegible]	glycerol tributyrate	

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1312	Acid	3	0.9821	methyl palmitate	<2
			0.9816	methyl-14-methylpentadecanoate	
			0.9802	methyl laurate	
			0.9809	methyl stearate	
			0.8758	methyl myristate	
		4	0.9831	butyl(butoxycarbonyl)methyl phthalate	<2
			0.9824	DEP	
			0.8623	isobutyl o-phthalate	
		5	0.9801	tridecanol	<2
			0.9801	dimethyl-3,7-dimethyldecaredioate	
			0.9799	2-butyl-1-octanol	
			0.9797	hexadecanoic acid (palmitic acid)	
			0.9781	citronellol formaic	
		6	0.9813	1,2-dibromooctane	<1
			0.9812	tridecanol	
			0.9812	tetradecanol	
			0.9805	valeranone	
			0.9801	oleic acid	
	B/N	1		diacetone alcohol (no 1.s.)	NQ
		2		no hits	2
		3		no hits	4
		4	0.9818	diisobutylphthalate	4
			0.9813	dibutylphthalate	
		5		DBP (no 1.s.)	0.61*
		6		no hits	3
		7	0.9809	dioctyladipate	NQ
			0.8682	dioctylether	
		8	0.9807	1-hexacosene	3
			0.9805	tetracosanol	
			0.9802	1-docosanol	
			0.9801	1-docosene	
			0.9796	hexadeutenoaoctadecanol	
		9	0.9793	butyl butoxyethylphthalate	4
			0.8822	iso octylphthalate	
			0.8643	n-octacosane	
		10	0.9826	octacosane	6
			0.9822	pentacosane	
			0.9802	heptacosane	
			0.9799	7-hexyleicosane	
			0.9799	nor-pentacosane	
		11		no hits	3
		12		BEHP (no 1.s.)	NQ

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1312	B/N	13	0.9822	triacoutane	4
			0.9821	11-decyldocosane	
			0.9819	octacosane	
			0.9815	pentacosane	
			0.8809	1-iodohexadecane	
		14		no hits	3
		15	0.9817	10,11-benzfluoranthene[benzo(j)]	3
			0.9817	3,4-benzfluoranthene	
			0.9817	benzo(k)fluoranthene	
			0.9815	periylene	
			0.9792	benzo(e)pyrene	
		16	0.9743	8-nonenoicacid,9-(1,3,6-nonatrienyloxy)-,methylester	3
			0.9726	cholestan-3-ol,2-methylene	
			0.9706	4α-methyl-δ-8,24-cholesteradienol	
			0.8664	2-(2-octyldecyl)-cis-bicyclo[0.3.3]octane	
			0.8599	2(heptadec7-ynloxy)tetrahydropyran	
		17		no hits	3
		18		no hits	3
		*		DEP	140*
		*		diphenyiamine	91*
S1314	Acid	1		no hits	<1
		2	0.8664	trans-8-menthene	<1
			0.8528	methyl linolelaidate	
		3		no hits - probably DBP	<1
	B/N	1	0.9786	4-methyl-3-penten-2-one (mesityl oxide)	NQ
			0.8554	2,4-dimethyl-2-pentene	
		2		diacetone alcohol (no l.s.)	NQ
		3	0.8646	3-hexene-2,5-diol	NQ
		4		no hits	<1
		5	0.8337	2,3-dimethyl-2-hexene	<1
			0.8689	3,4-dimethyl-3-penten-2-one	
			0.8595	1,2,3,-trimethylcyclohexane	
			0.8550	2,5-dimethyl-3-hexene	
			0.8579	2,2-dimethyl-trans-hex-3-one	
		6		no hits	<1
		7		no hits	1
		8		no hits	<1
		9		no hits	<1
		10		no hits	<1
		11	0.9821	DEP	1.4*
			0.9737	propylphthalate	
		12	0.9784	2,6,6-trimethyl-bicyclo[3.1.1]heptane	<1
			0.8755	2-cyclohexylethyl N-amylether	
			0.8747	1,9-nonanediol	
			0.8[illegible]3	1,1'-bicyclopentyl	
			0.8620	3,5,5-trimethylcyclohexene	

NOTES: ([illegible] last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1314	B/N	13		no hits	<1
		14	0.8774	1,9-nononediol	<1
			0.8763	1-undecyne	
			0.8624	[2-(pentyloxy)ethyl]cyclohaxene	
			0.8519	1,12-trideondiene	
		15		no hits	<1
		16	0.9795	hexadecanol	<1
			0.9792	1-hexadecene	
			0.8733	3-chlorodecane	
			0.8673	dodecanol	
			0.8594	tetradecanol	
		17	0.9821	isobutyl o-phthalate	0.23*
			0.9618	DBP	
		18		no hits	<1
		19	0.9963	1-dodecanyl methyl ether	1
			0.9963	1-octadecanol	
			0.9962	hexadecanol	
			0.9962	1-hexadecanol	
			0.9962	2L-4D-dihydroxylicosane	
			0.9962	3,7-dimethyl-6-octen-1-ol	
			0.9962	1,12-tridecadiene	
		20	0.9811	1-eicosanol	<1
			0.9810	1-octadecanol	
			0.9809	nonadecanol	
			0.9804	1-heptadecanol	
			0.9801	tridecanol	
		21		BEHP (no l.s.)	<1
		22		no hits	<1
		23		farnesyl cyanide (no l.s.)	<1
		24	0.8744	1,2- ctadecanediol	<1
			0.8728	pentacoane	
			0.8705	1-hexacosanol	
		25		no hits	<1
		26		looks like a mixture - (no l.s.)	<1
S1402	Acid	1		no hits	<1
		2	0.9816	2,6-dinitrotoluene	2
			0.9787	2,4-DNT	
		3	0.9816	2,4-DNT	9
			0.9814	2,5-DNT	
		4	0.9828	butyl(butoxycarbonyl)methyl phthalate	6
			0.9624	DBP	
			0.8605	isobutyl phthalate	
		5		no hits	1

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1402	B/N	1		no hits	6
		2		diacetone alcohol (no l.s.)	NQ
		3		no hits	5
		4		no hits	1
		5		no hits	1
		6		no hits	2
		7		no hits	1
		8		no hits	1
		9		no hits	1
		10		no hits	1
		11	0.8691	methyl-13-tetradecynoate	4
			0.8758	2L,4L-dihydroxycicosane	
		12		BEHP	5
		13		no hits	
		*		DEP	0.9*
		*		DBP	0.8*
S1408	Acid	1		no hits	<1
		2		no hits - probably DBP	1
	B/N	1		diacetane alcohol (no l.s.)	NQ
		2		no hits	2
		3		no hits	3
		4		no hits	1
		5	0.9802	methyl palmitaic	3
			0.9776	methyl 14-methyl pentadecanoate	
		6	0.9822	diisobutylphthalate	2
		7	0.9992	methyl stearate	11
			0.9991	16-methyl methylheptadecanoate	
			0.9982	methyl aruchidate	
			0.9969	bicyclo[3.1.1]heptan-3-one,2,6,6-trimethyl	
			0.9965	4-ethyl-2-octene	
		8	0.9813	1-eicosanol	1
			0.9813	2L-4L-dihydroxycicosane	
			0.9811	1-octadecanol	
			0.9810	monadecanol	
			0.9807	heptadecanol	
		9	0.9803	butylbutoxyethylphthalate	1
		10		BEHP (no l.s.)	7
		11	0.9830	octacosane	2
			0.9826	pentacosane	
			0.9806	heptacosane	
			0.9805	1-heptadecanol	
			0.9805	3-ethyl-5-(2-ethylbutyl)-ocladecane	

rocket paste?

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1408	B/N	12	0.9823	1-hexacosanol	2
			0.9816	11-decycldocosane	
			0.9812	1-octadecanol	
			0.9811	1-eicosanol	
			0.9810	pentacosane	
		13	0.9837	11-decyldocosane	6
			0.9831	octacosane	
			0.9829	1-iodbexadecane	
			0.9834	squalane	
			0.9834	triacontane	
		14,15		similar to 13	1 each
		16	0.8589	farnesol CAS# 4602-84-0 MSDS says no health hazard	1
		*		DEP	0.10*
		*		DBP	0.17*
S1409	Acid	1		no hits	<1
		2		no hits	<1
		3	0.9794	DEP	1
		4	0.9787	DBP	<1
	B/N	1		diacetone alcohol (no l.s.)	NQ
		2		no hits	<1
		3		no hits	<1
		4		no hits	<1
		5		no hits	<1
		6	0.8532	2α,3α-dimethyl-4β-hydroxy-(δ/(b))-tetrahydrophthalide	<1
		7	0.9791	3-butyl-hexa-3-ene-2-one	<1
			0.8754	1,4-cinede	
			0.8544	2,2,4-trimethyl-4-nitrapentane	
		8	0.9786	2,5-dimethyldodecane	<1
			0.9782	5-butylnonane	
			0.8814	2-ethyl-1-hexanol	
			0.8618	n-dodecane	
			0.8604	2,6-diethylcyclohexanone	
		9		no hits	<1
		10		no hits	<1
		11	0.9806	5,-methyl-5-ethyldecane	<1
			0.9793	heptadecane	
			0.9789	pentadecane	
			0.9789	hexadecane	
			0.9786	tetradecane	
		12		DEP (no l.s.)	1*
		13		no hits	<1
		14		no hits	<1
		15		no hits	<1
		16	0.9819	methylpamlitate	<1
			0.8741	methyl,14-methyl pentadecanoate	
			0.8603	methyl,13-methyl pentadecanoate	

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1409	B/N	17	0.9822	di-isobutylphthalate	<1
			0.9821	dibutylphthalate	
		18		no hits	<1
		19	0.9818	methyl stearate	1
			0.9816	methyl-16-methyl(heptadecanoate)	
			0.9816	methyl behenate	
			0.9812	methyl alachidate	
			0.9800	2L,4L-dihydroxycicosane	
		20		no hits	<1
		21	0.9816	2L-4L-dihydroxycicosane	<1
			0.9812	nonadecanol	
			0.9797	1-docosanol	
			0.9795	1-docosene	
			0.9790	1,2-octadecanediol	
		22	0.9811	butylbutoxylethylphthalate	<1
			0.9793	2-butoxy-2-oxyethyl butyl phthalate	
			0.8824	butyl phthalyle butyl glycolate	
		23		BEHP (no l.s.)	<1
		24		farnesyl cyanide (no l.s.)	<1
		*		DBP	0.4*
S1410	Acid	1		no hits	1
		2		no hits - may be DEP	1
	B/N	1	0.8600	4-methyl-3-penten-2-one	25
		2		diacetone alcohol (no l.s.)	NQ
		3	0.8607	4-ethylresoreinol	19
		4		no hits	5
		5		no hits	9
		6		no hits (triacetone alcohol)	60
		7		no hits	4
		8	0.9798	DEP	1.9*
			0.9789	propylphthalate	
		9		no hits	6
		10		no hits	6
		11	0.9797	methyl 11-(2,3-dideuteiocyclopentan-1-yl)undecanoate	4
		12		no hits	2
		13		no hits	6
		14	0.9805	1-dodecanol	
			0.9799	methyl 11-(2,3-dideuterocyclopentan-1-yl)undecanoate	
			0.9788	hexadecanol	
			0.9794	1-(ethenyloxy)-octadecanol	6
			0.8739	1-eicosinel	
		15	0.9725	4-bromobutylbenzene	64
			0.9705	2-hydroxy-6-methyl-4-(phenylmetroxy)benzaldehyde	
		16		no hits	39
		17		no hits	16
		*		DBP	0.4*

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
S1411	Acid	1	0.9821	DEP	(cannot quantitate any of these peaks because on total ion profile, D-10 peak is lost in a larger, contaminating peak)
			0.9786	propyl phthalate	
		2	0.9813	2,4-DNT	
			0.9811	2,5-DNT	
		3	0.9847	DBP	
		4	0.9792	2-pentyl-1-heptene	
			0.8677	tridecanol	
			0.8639	2-(dodecyloxy)ethanol	
			0.8575	undecanedoic acid	
			0.8640	tetradecanol	
		5	0.9769	D_{10}-anthracene (plus some other unidentified cpd.)	
		6		no hits	
		7	0.9825	DBP	
			0.8581	isobutyl phthalate	
		8	0.9788	tridecanol	
			0.9783	nonanol	
			0.9683	2-methyl-1-dodecanol	
			0.8646	1-cyclopentylhereicosane	
			0.8748	octanol	
		9	0.9816	o-nitrodiphenylamine	
			0.9806	m-nitrodiphenylamine	
			0.9799	2-nitro-N-nitroso-N-phenylobenzenamine	
	B/N	1	0.9785	diacetone alcohol	NQ
		2		no hits	2
		3	0.9817	2,6-DNT	12*
			0.9788	o-nitrosobenzaldehyde	
		4	0.9815	2,4-DNT	118*
			0.9813	2,5-DNT	
			0.8518	2-ethyl-1,3-dimethylbenzene	
		5		DEP (no l.s.)	295*
		6		diphenylamine (no l.s.)	35*
		7	0.8501	N,N-dimethylaniline	34
		8		DBP (no l.s.)	389*
		9		no hits	6
		10	0.9815	o-nitrodiphenylamino	45
			0.9798	2-nitro-N-nitroso-N-phenylbenzenamine	
			0.8579	m-nitrodiphenylamine	
		11		no hits	4
		12	0.8686	2H-cyclopropa[3,4]naphth[1,2-b]oxirene	8
			0.8680	tridecanol	
		13		no hits (phthalate)	4
		14	0.8521	3-methyl-2-propyl-1-pentanol	32
		15		no hits	4
		16		no hits	12
		17		BEHP (no l.s.)	19
		18		no hits	6
		19		no hits	6

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration(a)
S1413	Acid	1		no hits	1
		2	0.9815	dimethyl terephthalate	1
			0.9815	dimethyl isophthalate	
			0.9785	dimethyl phthalate	
		3	0.9817	2,6-DNT	3
			0.8701	2,3-DNT	
			0.8725	1-azido-3-nitrobenzene	
			0.8686	2,4-DNT	
			0.8618	3-phenylpropyl nitrite	
		4	0.9814	2,5-DNT	31
			0.8794	2,4-DNT	
		5	0.9786	o-aminobiphenyl	19
			0.9785	diphenylamine	
		6	0.9809	butyl(butoxycarbonyl)methyl phthalate	2
			0.9800	DBP	
		7	0.9830	butyl(butoxycarbonyl)methyl phthalate	36
			0.9826	DBP	
			0.9788	propyl phthalate	
		8	0.9817	o-nitrodiphenylamine	2
			0.8765	2-nitro-N-nitroso-N-phenylbenzenamine	
			0.8750	phenazine	
	B/N	1	0.9755	diacetone alcohol	1,900
		2	0.9743	2,6-DNT	46*
		3	0.9816	2,4-DNT	697*
			0.9814	2,5-DNT	
		4	0.9810	[1,1'-biphenyl]-2-amine	140
			0.9807	diphenylamine	
			0.8710	1,1-diphenylhydrozine	318*
		5		DBP (no l.s.)	887*
		6		no hits (2-nitrodiphenylamine)	21
		7	0.8615	5-ethyl-2-methylheptant	63
			0.8663	2D,4D-dimethylheptanol	
			0.8663	2L,4D-dimethylheptanol	
		8		BEHP (no l.s.)	69
S1414	Acid	1		no hits	1
		2	0.8539	DEP	1
	B/N	1		diacetone alcohol (no l.s.)	NQ
		2		no hits	1
		3		no hits	1
		4	0.9817	2,6-DNT	35*
			0.8690	2,4-DNT	954*
			0.8607	2-phenyl-5-carboxy-2H-1,2,3,4-tetrazoic	
		5	0.9816	2,4-DNT	
			0.9815	2,5-DNT	
		6	0.9808	diphenylamine	255*
			0.9806	o-aminobiphenyl	
			0.9794	N,N-diphenylhydrazine	

NOTES: (See first page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1414	B/N	7		no hits (phthalate)	1
		8		DBP (no l.s.)	520*
		9		no l.s. - spectrum not detailed enough	1
		10	0.9817	o-nitrodiphenylamine	11
		11		no hits (phthalate)	1
		12		BEHP (no l.s.)	7
S1415	Acid	1		no hits	1
		2	0.9817	2,6-DNT	4
			0.9809	2,4-DNT	
			0.9804	2,3-DNT	
			0.8653	1-phenyl-4-carboxy-4,5-dihydro-1H-1,2,3-triazole	
			0.8644	phenylethane-1,2-diol cyclic corborate	
		3	0.9797	2,4-DNT	36
			0.9795	2,5-DNT	
			0.8715	diphenylamine	
			0.8699	o-aminobiphenyl	
			0.8638	diphenylnitrosamine	
			0.8612	1,1-diphenylhydrazine	
			0.8541	1-methyl-2,3-dinitrobenzene	
		4	0.9826	DBP	40
			0.9768	propyl phthalate	
			0.8611	isobutyl phthalate	
		5	0.9816	2-nitrodiphenylamine	1
			0.8812	m-nitrodiphenylamine	
			0.9799	2-nitro-N-nitroso-N-phenyl bencenamine	
	B/N	1		diacetone alcohol	NQ
		2		no hits	2
		3		no hits	1
		4		no l.s. - spectrum not detailed enough	1
		5		no hits	2
		6		no hits	1
		7	0.9791	2L,4D-dimethylheptanol	32
			0.9785	dioctyl adipate	
			0.9735	bis(1-methylpropyl)ester of carbonic acid	
			0.8703	2-ethyl-1-hexenethiol	
			0.8703	diocryl ether	
			0.8653	2D,4D-dimethylheptanol	
			0.8569	3-acetylheptan-2-one	
		8		BEHP (no l.s.)	20
		9		no hits (farnesyl cyanide)	1
		*		DEP	0.1*
		*		DBP	0.1*

NOTES: (See last page of table)

SEDIMENT AND SOIL SAMPLES
(Continued)

NOTES: [a] Concentration is reported as μg/g (ppm). Unless marked with as asterisk (*) the concentration is approximate. It was calculated assuming a response factor equal to that of the internal standard.

*Concentration was calculated using a calibration standard for this compound.

NQ = Not able to quantitate

DEP = diethylphthalate

DBP = di-n-butylphthalate

BEHP = bis(2-ethylhexyl)phthalate

RESAMPLED WELLS

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1113	Acid	1	0.9820	butyl(butoxy carbonyl)methylphthalate	4
			**0.9816	dibutylphthalate	
			0.9769	butyl isobutylphthalate	
	B/N	1		BEHP	5*
		Also:		anthracene/phenthrene	<1*
				DEP	<1*
				DLP	3*
S1124	Acid	1		phthalate (dibutyl)	6
			0.9783	butyl(butoxy carbonyl)methylphthalate	
			**0.9778	dibutylphthalate	
			0.9757	butyl,isobutylphthalate	
			0.9731	dirsobutylphthalate	
		2	0.9830	dioctylphthalate	9
			**0.9822	bisethylhexylphthalate	
			0.9786	dicyclohexylphthalate	
	B/N	1	0.9799	5-ethyl-5-methyldecane	7
			0.9793	2,2-dimethyl-1-octanol	
			0.9790	heneicosane	
			0.9786	heptadecane	
			0.9786	eicosane	
			0.9786	2,6,10,15-tetramethylheptadecane	
		2		BEHP	33
		3		DBP and hydrocarbon peaks	8
		4		DBP and hydrocarbon peaks	10
		5	0.9796	trans,trans-farnesol	9
			**0.9771	2-trans,6-trans-farnesyl cyanide	
			0.9757	3,7,11,15-tetramethyl-6,10,14-hexadecatrien-1-ol	
			0.9720	3-(2-propynyl)cyclohexane	
			0.9708	[1,1'-bicyclopentyl]-1-ol	
			0.9700	1-chloro-2-nitrosocyclohexane	
		Also:		DEP	<1*
				DBP	2*
				naphthalene	<1*
				anthracene/phenanthrene	<1*
S1135/ DNR#3	Acid	1	0.9795	2H-1-benzopyran-2-one (coumarin)	5
			0.8501	benzeneacetonitrile,alpha-ethyl-	
			0.8484	1,2-naphthalenedione,6-hydroxy	
			0.8526	4-phenyloxazole-2-D-	
		2		Same as S1124 #1 - DBP	9
		3	0.9725	isobornyl acetate	6
			0.9719	4-furfuryl-2-pentenoic acid-gammalactone	
			0.9712	3'-amino-3'-deoxyadenosine	
			0.9695	cyclopentylbromide	
			0.863[illegible]	2,6-dimethylene-7-octen-3-one	

NOTES: (See last page of table)

RESAMPLES WELLS
(Continued)

Site	Fraction	Peak No.	Similarity Index *	Identity	Concentration[a]
S1135/ DNR#3	Acid	4		Same as S1124 #2, BEHP	6
				pentachlorophenol	5
	B/N	1		DBP	4*
		2		fluoranthene	<1*
		3		pyrene	<1*
		4	0.9810	n-tridecane	16
			0.9809	5-methyl-5-ethyldecane	
			0.9800	7-ethyl-2-methyl-4-undecanol	
			0.9798	heptadecane	
			0.9796	octadecane	
		5	0.9800	5-methyl-5-ethyldecane	18
			0.9798	(2-ethylhexyl)ether	
			0.9795	n-dodecane	
			0.9794	2,2-dimethyl-1-octanol	
			0.9792	undecane	
		6	0.9802	5-methyl-5-ethyldecane	19
			0.9802	dioctylether	
			0.9798	2,2-dimethyl-1-octanol	
			0.9798	(2-ethylhexyl)ether	
			0.9797	tricosane	
		7		BEHP	14*
		8	0.9798	n-docosane	19
			0.9798	n-tetracosane	
			0.9795	docosane	
			0.9794	fricosane	
			0.9791	heneicosane	
		9	0.9803	dodecane	15
			0.9799	1-hexadecanol	
			0.9799	docosane	
			0.9797	tricosane	
			0.9795	2,2,4-(2H3)menthylacetate	
		10	0.9786	trans-transfarnesol	12
			0.9772	(+)-3D,7,11,15-tetramethylhexadeca-6-trans,10-trans, 14-triene-1-ol	
			**0.9762	2-trans,6-trans-farnesyl cyanide	
			0.9725	irone alpha B	
			0.9725	(+)-methyl3D,7,11,15-tetra methylhexadeca-6-trans,10-trans-14-trienoat	
		11	0.9790	docosane	13
			0.9787	10-methyleicosane	
			0.9786	heneicosane	
			0.9782	eicosane	
			0.9782	2,6,10,15-tetramethylheptadecane	

NOTES: (See last page of table)

RESAMPLED WELLS

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
S1135/ DNR#3	B/N	12	0.9799	5-ethyl-5-methyldecane	13
			0.9793	tricosane	
			0.9790	heneicosane	
			0.9786	eicosane	
			0.9780	2,6,11-trimethyldodecane	
		Also:		anthracene/phenanthrene	<1*
				DEP	<1*

NOTES: [a]Concentration is µg/l. Unless marked with an asterisk (*) concentration is approximate. It was calculated assuming a response factor equal to that of the internal standard.

*Concentration was calculated using calibration standards for this compound. Value is µg/l.

**Most likely identification.

NQ = Not able to quantitate.

FISH SAMPLES FOR GRUEBER'S GROVE BAY

Sample No.	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)]
B0210/B0218	B/N and	1		d-10 anthracene, ISTD	
Composite	Acid	2	0.9818	palmitic acid	16
(Walleye)			0.9813	oleic acid	
			0.9806	dihydroambrettolide	
			0.9804	2L,4L-dihydroxycecosane	
		3	0.9808	9,17-octadecadienal	13
			0.9805	methyl hexadec-11-ynoate	
			0.9803	1-nonadecene	
			0.9802	octadeca-9,12-dien-1-ol	
		4		no hits	3
		5		BEHP	
		6	0.9804	**2,trans,6-trans-farnesylcyanide	1
			0.9783	methyl 3-cis,7-trans-homofarnesate	
			0.9765	6,10,14-hexadecatrien-1-ol,3,7,11,15-tetramethyl	
			0.9765	6,10,14-hexadecatrienole acid,3,7,11,15-tetramethyl, methyl ester	
			0.9734	13-epitorulosol-lamba-8(17),14-diene-13-beta,19-diol	
		7	0.9741	methyl 13-oxo octadecanoate	11
			0.9738	1-H-pyrrolo[2,-1-b][1,3]benzodiazepine,2,3,5,6-tetrahydro-5(1-4-indol-3-yl)-3-methyl-	
			0.9716	dimethylandrostanolone	
			0.9713	1-bentyl-4-benzolsulfonylimeno-1,2,4-triazolium-ylid	
			0.9698	2-(phenylmethoxy)benzenepropanoic acid, methyl ester	
		8	0.9701	vimalin	11
		Also:		DEP	0.017*
				DBP	0.140*
				BEHP	0.820*
B0216 (Carp)		1	0.9816	pentadecane	0.3
			0.9808	5-methyl-5-ethyldecane	
			0.9790	2-ethyl-1-hexanol	
			0.9787	tetradecane	
			0.9786	2-methylundecane	
		2	0.9819	heptadecane	3
			0.9812	5-ethyl-5-propylundecane	
			0.9807	dioctyl ether	
			0.9800	7-ethyl-2-methyl-4-undecanol	
			0.9798	2,2,4-(2H3)-menthylacetate	
		3	0.9790	(2-ethylhexyl)ether	0.3
			0.9779	tetradecane	
			0.9779	pentadecane	
			0.9764	2-bromo octane	
			0.9740	5-methyl octadecane	

NOTES: (See last page of table)

FISH SAMPLES FROM GRUEBER'S GROVE BAY
(Continued)

Sample No.	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
B0216 (Carp)		4	0.9800	tetracosane	1
			0.9797	tricosane	
			0.9798	$C_{22}H_{46}$ standard	
			0.9792	2,6,10,14-tetramethyl hexadecane (phytane)	
			0.9770	10-methyleicosane	
		5		d_{10}-anthracene (ISTD)	
		6	0.9818	palmitic acid	16
			0.9813	oleic acid	
			0.9806	dihydroambrettolide	
			0.9804	2L,4L-dihydroxycecosane	
		7	0.9808	9,17-octadecadienol	13
			0.9805	methyl hexdec-11-ynoate	
			0.9803	1-nonadecene	
			0.9802	octadeca-9,12-dien-1-ol	
		8	0.9718	methyl 5,8-octadecadienoate	6
			0.8651	methyl-11,14,17-locosatrienoate	
			0.8580	methyl linoleate	
		9	0.9804	**2,trans,6-trans-farnesyl cyanide	3
			0.9783	methyl 3-cis,7-trans-homofarnesate	
			0.9765	6,10,14-hexadecatrien-1-ol,3,7,11,15-tetramethyl	
			0.9765	6,10,14-hexadecatrienole acid, 3,7,11,15-tetramethyl, methyl ester	
			0.9734	13-epitorulosol-lamba-8(17),14-diene-13 beta,19-diol	
		10	0.9741	methyl 13-oxo octadecanoate	11
			0.9738	1-H-Pyrrolo[2,-1-b][1,3]benzodiazepine,2,3,5,6-tetrahydro-5(1-4-indol-3-yl)-3-methyl-	
			0.9716	dimethylandrostanolone	
			0.9713	1-bentyl-4-benzolsulfonylimeno-1,2,4-triazolium-ylid	
			0.9698	2-(phenylmethoxy)benzenepropanoic acid, methyl ester	
		11	0.9701	vimalin	11
		Also:		DEP	0.017*
				DBP	0.140*
				BEHP	0.820*
		12	0.9752	hexacosanol-1	1
			0.9734	heptacosanol-1	
			0.9732	3-ethyl-5-(2-ethylbutyl)octadecane	
			0.9730	tetracosanol	
			0.9730	lanost-9(11)-en-12-one	
		Also:		pentachlorophenol	1.13*
				naphthalene	0.055*
				DEP	0.027*
				DBP	0.12*
				BEHP	0.15*
				anthracene/phenanthrene	0.027*

NOTES: (See last page of table)

FISH SAMPLES FOR GRUEBER'S GROVE BAY
(Continued)

Sample No.	Fraction	Peak No.	Similarity Index	Identity	Concentration[a]
B0205/B0206		1		d-10 anthracene (ISTD)	
Composite		2	0.9818	palmitic acid	15
(Yellow			0.9813	oleic acid	
perch)			0.9806	dihydroambrettolide	
			0.9804	2L,4L-dihydroxycecosane	
		3	0.9808	9,17-octadecadienal	7
			0.9805	methyl hexadec-11-ynoate	
			0.9803	1-nonadecene	
			0.9802	octadeca-9,12-dien-1-ol	
		4	0.9783	trans-2,2-bis(trifluoromethyl)-4-ethyl-5-octyl-1,3-dioxolane (trans) (probably not)	<1
			0.9779	methyl oleate	
			0.9774	citronellyl propionate	
			0.9773	methyl palmitoleate	
			0.9760	2(1H)-naphthalenone, octahydro-4α,5-dimethyl-3-(1-methyl ethyl)(3α,4α,5α,8aα)	
		5		no hits over 0.85 similarity	1
		6		BEHP	1
		7	0.9717	DMP (wrong retention time)	<1
			0.9698	methyl vinyl terephthalate	
			0.9698	1,2-di-p-tolylethane	
				only hits over 0.85	
		8	0.9804	**2,trans,6-trans-farnesyl cyanide	1
			0.9783	methyl 3-cis,7-trans-homofarnesate	
			0.9765	6,10,14-hexadecatrien-1-ol,3,7,11,15-tetramethyl	
			0.9765	6,10,14-hexadecatrienole acid, 3,7,11,15-tetramethyl, methyl ester	
			0.9734	13-epitorulosol-lamba-8(17,),14-diene-13 beta, 19-diol	
		9	0.9741	methyl 13-oxo octadecanoate	15
			0.9738	1-H-pyrrolo[2,1-1-b][1,3]benzodiazepine,2,3,5,6-tetrahydro-5(1-4-indol-3-yl)-3-methyl-	
			0.9716	dimethylandrostanolone	
			0.9713	1-benzyl-4-benzolsulfonylimeno-1,2,4-triazolium-ylid	
			0.9698	2-(phenylmethoxy)benzenepropanoic acid, methyl ester	
			0.9701	vimalin	11
		Also:		DEP	0.017*
				DBP	0.140*
				BEHP	0.820*
		10	0.9752	hexacosanol-1	1
			0.9734	heptacosanol-1	
			0.9732	3-ethyl-5-(2-ethylbutyl)octadecane	
			0.9730	tetracosanol	
			0.9730	lanost-9(11)-en-12-one	
		Also:		DEP	0.020*
				DBP	0.15*
				BEHP	1.8*
				fluoranthene	0.067*
				pyrene	0.066*
				anthracene/phenanthrene	0.15*

NOTES: (See last page of table)

FISH SAMPLES FOR GRUEBER'S GROVE BAY
(Continued)

Sample No.	Fraction	Peak No.	Similarity Index	Identity	Concentration[a] (Calculations made using same dilution factor as fish)
Blank		1		d_{10}-anthracene (ISTD)	
		2		BEHP	0.13*
		3	0.9804	**2,trans,6-trans-farnesylcyanide	0.12
			0.9783	methyl 3-cis,7-trans-homofarnesate	
			0.9765	6,10,14-hexadecatrien-1-pl,3,7,11,15-tetramethyl	
			0.9765	6,10,14-hexadecatrienole acid,3,7,11,15-tetramethyl, methyl ester	
			0.9734	13-epitorulosol-lamba-8(17),14-diene-13-beta,19-diol	
		4	0.9741	methyl 13-oxo octadecanoate	0.52
			0.9738	1-H-pyrrolo[2,-1-b][1,3]benzodiazepine,2,3,5,6-tetrahydro-5(1-4-indol-3-yl)-3-methyl-	
			0.9716	dimethylandrostanolone	
			0.9713	1-bentyl-4-benzolsulfonylineno-1,2,4-triazolium-ylid	
			0.9798	2-(phenylmethoxy)benzenepropanoic acid, methyl ester	
			0.9701	vimalin	
		Also:		DEP	0.010*
				DBP	0.066*
				BBP	0.030*

NOTES: [a] Concentrations are µg/g (ppm). Unless marked with an asterisk (*) the concentration is approximate. It was calculated assuming a response factor equal to that of the internal standard and calculated by peak height.

*Concentration calculated against a calibration standard for this compound. Values are µg/g.

**Most probable identification.

NQ = Not able to quantitate.

no l.s. = No library search needed to identify compound.

DBP = di-n-butyl phthalate

DEP = diethyl phthalate

BEHP = bis(2-ethylhexyl)phthalate

BBP = butylbenzyl phthalate

SURFACE WATER

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1301	VOA	1	0.9756	dichloromethane	12
		2	0.9783	tetrahydrofuran	21
			0.9733	2-methoxy-1-propane	
			0.9733	2,2-dimethyloxirane	
	Acid	1		BEHP	10
	B/N	1		no hits	12
		2		no hits	15
		3		no hits (DEP)	
		4		no hits (DBP)	
		5		BEHP	85
		6		no hits (farnesyl cyanide)	8
		7		no hits	10
		*		DEP	6
		*		DBP	3
S1307	VOA	1	0.9735	dichloromethane	13
		2	0.9760	pentane	13
			0.9736	1-chloro-2-methylpropane (isobutyl chloride)	
			0.9736	3-methyl-2-pentanone	
			0.9735	1-hexyn-3-ol	
	Acid	1		no hits	1
		2		BEHP	2
	B/N	1		no hits	<1
		2	0.9806	2-methyl-1-dodecanol	<1
			0.8729	1-octadecanol	
			0.8693	nonadecanol	
			0.8644	decanol	
			0.8609	3-methyl-2,6-dioxo-4-hexenoic acid	
		3		DBP	-
		4		BEHP	NQ
		5		no hits	<1

NOTES: (a) Concentration for water samples is µg/l.

(b) Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD - Internal standard

NQ - Not able to quantitate

BEHP - bis(2-ethylhexyl)phthalate

DEP - diethylphthalate

DBP - di-n-butylphthalate

SURFACE WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration (a) (b)
S1307	B/N	6	0.8745	2-hydroxy-4-isopropyl-1-methylbenzene	<1
			0.8745	thymol	
			0.8644	methyl α-ketomyristate	
		*		DEP	2
		*		DBP	1
S1312	VOA	1	0.9756	dichloromethane	14
		2	0.9810	chloroform	11
		3	0.9758	pentane	12
			0.9734	isobutyl chloride	
			0.9711	3-methyl-2-pentanone	
	Acid	1		no hits	41
		2	0.9803	n-butyl-2-ethyl-o-phthalate	6
		3	0.9797	DBP	16
			0.8592	n-butyl-2-ethyl-o-phthalate	
		4	0.8646	DBP	23
		5		no hits - probably a phthalate	21
		6		no hits - probably a phthalate	12
		7		BEHP	19
	B/N	1		no hits	6
		2		no hits	4
		3	0.9803	dodecanol-1	7
			0.9768	citrenellyl propianate	
			0.9787	hexadecanol	
			0.9785	hexadecanol	
			0.9764	1,12-tridecadiene	
		4		BEHP (no l.s.)	16
		*		DEP	1
		*		DBP	<1
S1314	VOA	1	0.9753	dichloromethane	71

NOTES: (a) Concentration for water [illegible]

(b) Only DEP, DBP and [illegible] [illegible] using standards of these compounds. Other quantitations are approximate [illegible] peak heights were [illegible] from the total [illegible] profile and [illegible] response factor [illegible]

I.S. - Internal Standard

N.Q. - Not able to quantify

BEHP - bis(2-ethylhexyl) phthalate

DEP - Diethylphthalate

DBP - di-n-butylphthalate

SURFACE WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)(b)]
S1314	VOA	2	0.9784	pentane	12
			0.9759	1-hexyn-3-ol	
			0.9736	isobutyl chloride	
	Acid	1		no hits	2
		2		BEHP	3
	B/N	1		BEHP	34
		*		DEP	<1
		*		DBP	<1

NOTES: [illegible]

GROUND WATER

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1102	VOA	1		no hits - air peak	15
		2		no hits	4
		3		no hits - perhaps chloroform	2
		4		no hits	2
		5	0.9760	pentane	11
			0.9735	1-hexyn-3-ol	
	Acid	1		BEHP	6
	B/N	1		BEHP	29
		*		DEP	<1
		*		DBP	<1
S1104	VOA	1		no hits - air peak	10
		2	0.9785	furon,tetrahydro-	10
			0.9758	oxirane,2,2-dimethyl	
		3		no hits - perhaps freon	2
		4		no hits	5
		5	0.9715	pentane	13
			0.9738	pentane	
	Acid	1		BEHP	6
	B/N	1		BEHP	96
		*		DEP	1
S1107	VOA	1		no hits - probably methylene chloride	19
		2		no hits - probably tetrahydrofuran	10
		3	0.9606	pentane	11
	Acid			no peaks other than ISTD	

NOTES: [a] Concentration for water samples is µg/l. ug/l

[b] Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD - Internal standard

NQ - Not able to quantitate

BEHP - bis(2-ethylhexyl)phthalate

DEP - diethylphthalate

DBP - di-n-butylphthalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a] [b]
S1107	B/N	1		no hits	7
		2		BEHP	110
		3	0.9815	2-c,6-t-farnesyl cyanide	8
			0.8666	2,6-dimethylene-7-octen-3-one	
			0.8647	geranyl formate	
			0.8657	2,6,10-dodecatrien-1-ol,3,7,11-trimethyl-	
			0.8571	trans,trans-farnesol	
			0.8565	farnesol	
		*		DEP	8
		*		DBP	<1
S1108	VOA	1	0.9713	methylene chloride	10
		2	0.9690	1,1'-oxybisethane	14
			0.9690	ethyl ether	
			0.9690	diethyl ether	
	Acid			no peaks other than ISTD	
	B/N	1		BEHP	31
		2		no hits	3
		*		diphenylamine	1
		*		DEP	<1
		*		DBP	<1
S1109	VOA	1	0.9737	methylene chloride	11
	Acid			no peaks other than ISTD	
	B/N	1	0.9804	2-methylcyclopentanone	6
			0.9802	cyclohexanone	
			0.9773	3-hexene	
			0.9772	2-hexene	
			0.8740	5-methyl-2-oxo-2,3-dihydrofuran	
		2		BEHP (no l.s.)	71
		*		DEP	<1
		*		DBP	<1

NOTES: [a] Concentration for water samples is µg/l.

[b] Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD = Internal standard

NQ = Not able to quantitate

BEHP = bis(2-ethylhexyl)phthalate

DEP = diethylphthalate

DBP = di-n-butylphthalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[(a)(b)]
S1111	VOA	1	0.9756	methylene chloride (dichloromethane)	21
		2	0.9756	2,2-dimethyloxirane	15
			0.9783	tetrahydrofuran	
			0.9756	isobutylene oxide	
			0.9756	1,2-epoxy-2-methylprorpane	
		3	0.9456	2-butanone	16
			0.9782	2,3-pentanedione	
			0.9759	proponal,2-methyl-	
			0.9756	4-penten-2-one	
			0.9756	acetic acid ethenyl ester	
		4	0.9760	pentane	13
			0.9785	1-hexyn-3-ol	
	Acid			BEHP	3
	B/N	1	0.9838	dioctylphthalate	10
			0.9833	BEHP	
		*		DEP	3
		*		DBP	<1
S1112	VOA	1		no hits - probably methylene chloride	16
		2	0.9807	2-hydroxy-2-methylpropanenitrile	
			0.9783	2-propanone (acetone)	40
			0.9783	butane	
			0.9783	dimethyldiazene	
			0.9778	2-methyl-2-propanamine	
		3	0.9764	tetrahydrofuran	180
			0.9711	β-propioloctone	
		4	0.9763	methylethyl ketone	27
			0.9759	2,3-pentanedione	
			0.9747	2-methylpropanol	
			0.9733	4-pentene-2-one	
			0.9733	acetic acid ethenyl ether	
		5		no hits	13
	Acid	1	0.9805	benzothiazole	5
			0.9794	1,2-benzisothiazole-3-carboxylic acid	
		2		no hits	5

NOTES: (a) Concentration for water samples is μg/l.

(b) Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD Internal standard

NQ Not able to quantitate

BEHP bis(2-ethylhexyl)phthalate

DEP diethyl phthalate

DBP di-n-butyl phthalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration(a)(b)
S1112	B/N	1	0.8760	cyclohexanol	6
			0.8722	cis-hex-2-en-1-ol	
			0.8531	cis-3-hexenylbutyrate	
		2	0.9804	cyclohexanone	11
			0.8695	2-methylcyclopentanone	
			0.8648	5-methyl-2-oxo-2,3-dihydrofuran	
		3		no hits	10
		4		BEHP	56
		*		DEP	<1
		*		DBP	<1
S1115	VOA	1		no hits - probably methylene chloride	16
		2		no hits - probably tetrahydrofuran	11
		3	0.9735	1-hexyn-3-ol	12
	Acid	1		BEHP	2
	B/N	1		BEHP	225
		*		DBP	1
		*		DEP	<1
S1117	VOA	1		no hits - probably methylene chloride	14
		2	0.9783	tetrahydrofuran	
			0.9764	tetrahydrofuran	23
			0.9737	2-methoxy-1-propene	
			0.9737	2,2-dimethyloxirane	
			0.9737	methyl isopropenyl ether	
			0.9737	isobutylene oxide	
			0.9737	1,2-epoxy-2-methylpropane	
		3	0.9810	trichloromethane	16
		4	0.9812	carbon tetrachloride	69
			0.7557	trichloronitromethane	
	Acid	1		BEHP	18

NOTES: (a) Concentration for water samples is µg/l.

(b) Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD = Internal standard

NQ = Not able to quantitate

BEHP = Bis(2-ethylhexyl)phthalate

DEP = diethylphthalate

DBP = di-n-butylphthalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1117	B/N	1		BEHP	104
		*		DEP	<1
		*		DBP	<1
S1119	VOA	1	0.9756	methylene chloride	18
		2		no hits - probably tetrahydrofuran	11
		3	0.9783	2-butanone (methyl ethyl ketone)	14
			0.9759	2,3-pentanedione	
			0.9736	2-methylpropanol	
			0.9733	4-penten-2-one	
			0.9733	acetic acid ethenyl ester	
		4	0.9784	pentane	11
	Acid	1		BEHP	40
	B/N	1	0.9813	1,1'-oxybisoctane	8
			0.9799	3-chlorodecane	
			0.9799	hepta decane	
			0.9795	2-ethylhexanol	
			0.9794	hexadecane	
			0.9794	pentadecane	
		2	0.9815	(2-ethylhexyl)ether	9
			0.9815	1,1'-oxybis octane	
			0.9815	1,1'oxybis(2-ethyl)hexane	
			0.9804	n-heneicosane	
			0.9803	tetramethylheptadecane	
		3		BEHP (No I.S.)	36
		4		no hits (hydrocarbon)	12
		5	0.9835	11-decyldocosane	10
			0.9831	triacontane	
			0.9828	octacosane	
			0.9825	pentacosane	
			0.9810	dotriacontane	
		*		DEP	<1
		*		DBP	<1

NOTES: [a] Concentration for water samples is µg/l.

[b] Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD Internal standard

NQ - Not able to quantitate

BEHP - bis(2-ethylhexyl)phthalate

DEP diethyl phthalate

DBP di-n-butylphahalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1121	VOA	1		no hits - probably methylene chloride	15
		2	0.9806	tetrahydrofuran	23
			0.9779	methyl isopropanyl ether (2-methoxy-1-propene)	
			0.9779	2,2-dimethyloxirane (isobutylene oxide; 1,2-epoxy-2-methylpropene)	25
		3	0.9810	trichloromethane (chloroform)	11
		4	0.9762	pentane	
	Acid	1		BEHP	27
	B/N	1		BEHP	35
		*		DBP	1
		*		DEP	<1
S1122	VOA	1	0.9734	dichloromethane (methylene chloride)	39
		2	0.97[illegible]	2,2-dimethyloxirane	13
		3	0.9806	pentane	12
	Acid			no peaks other than ISTD	
	B/N	1		BEHP	33
		*		DEP	<1
		*		DBP	<1
S1123	VOA	1	0.97[illegible]	dichloromethane	20
		2	0.97[illegible]	pentane	10
	Acid	1	0.98[illegible]2	tridecanol	8
			0.97[illegible]	palmitic acid	
			0.8[illegible]	2-methyl-1-dodecanol	
			0.8[illegible]	1[illegible]-methyltetradecanoic acid, methyl ester	
			0.[illegible]	dioctyl ether	
		2	0.97[illegible]7	octadecanoic acid	10
			0.97[illegible]2	hexadecanoic acid	
			0.8[illegible]	14-pentadecynoic acid, methyl ester	
			0.9790	delc acid	
		3		BEHP (no I.S.)	4

NOTES: [a] Concentration for water samples is [illegible].

[b] Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

ISTD = Internal standard

NQ = Not able to quantitate

BEHP = bis(2-ethylhexyl)phthalate

DEP = diethylphthalate

DBP = di-n-butylphthalate

GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1123	B/N	1		BEHP	32
		*		DEP	<1
		*		DBP	<1
S1125	VOA	1		no hits - probably methylene chloride	12
		2	0.9762	pentane	11
	Acid	1		no hits	3
		2		BEHP	8
	B/N	1		BEHP	27
		*		DEP	<1
		*		DBP	<1
S1127	VOA	1	0.9734	dichloromethane	22
		2	0.9762	tetrahydrofuran	33
			0.9735	2-methoxy-1-propene	
			0.9735	2,2-dimethyloxirane	
		3	0.9732	pentane	12
	Acid			BEHP	90
	B/N	1		no hits	5
		2		BEHP	338
		*		DEP	<1
		*		DBP	<1
S1130	VOA	1	0.9733	dichloromethane	10
		2	0.9789	trichloromethane	11
	Acid	1		BEHP	44
	B/N	1		BEHP	225
		*		DEP	<1
		*		DBP	<1

NOTES: [a] Concentration for water samples is μg/l.

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GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1133	VOA	1	0.9756	dichloromethane	13
		2	0.9757	2,2-dimethyloxirane	11
			0.9806	tetrahydrofuran	
			0.9752	β-propioketone	
		3	0.9787	trichloromethane	17
		4	0.9785	2-butanone	19
			0.9761	2-methylpropanol	
			0.9761	2,3-pentanedione	
	Acid	1		BEHP	38
	B/N	1		BEHP	104
		*		DEP	<1
		*		DBP	<1
S1134	VOA	1		no hits - probably methylene chloride	13
		2	0.9788	tetrahydrofuran	300
			0.9725	β-propiolactone	
			0.9606	2-butanone	
			0.9758	2-methylpropanol	13
			0.9755	acetic acid ethenyl ester	
			0.9757	2,3-pentanedione	
			0.9755	vinyl acetate	
		4	0.8575	tetrachloroethylene	NQ
	Acid	1		BEHP	17
	B/N	1	0.9806	cyclohexanone	12
			0.8531	2-methyl-cyclopentanone	
			0.8694	5-methyl-2-oxo-2,3-dihydrofuran	
		2	0.9775	2-ethyl-4-methylol-1,3-dioxalane	10
			0.8647	1,1-diethoxybutane	
		3	0.9786	heptadecane	7
			0.9787	octadecane	
			0.9787	nonadecane	
			0.9783	3-chlorodecane	
			0.9782	hexadecane	

NOTES: (a) Concentration for water samples is µg/l.

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GROUND WATER
(Continued)

Site	Fraction	Peak No.	Similarity Index	Identity	Concentration[a][b]
S1134	B/N	4	0.9797	heptadecane	
			0.9794	hexadecane	
			0.9793	pentadecane	
			0.9792	2-ethyl-1-hexanol	
			0.9791	tetradecane	
			0.9791	2,5-dimethyltetradecane	
		5	0.9797	heptadecane	12
			0.9794	hexadecane	
			0.9793	pentadecane	
			0.9792	2-ethyl-1-hexanol	
			0.9791	tetradecane	
			0.9791	2,5-dimethyltetradecane	
		6	0.9825	butylbutoxyethyl phthalate	5
			0.9806	2-butyl-2-oxoethyl-butylphthalate	
			0.9825	butyl phthalyl butyl glycolate	
		7		no hits	6
		8	0.9797	heptadecane	11
			0.9794	hexadecane	
			0.9793	pentadecane	
			0.9792	2-ethyl-1-hexanol	
			0.9791	tetradecane	
			0.9791	2,5-dimethyltetradecane	
		9		BEHP	47
		10	0.9797	heptadecane	6
			0.9794	hexadecane	
			0.9793	pentadecane	
			0.9792	2-ethyl-1-hexanol	
			0.9791	tetradecane	
			0.9791	2,5-dimethyltetradecane	
		*		DEP	<1
		*		DBP	<1

NOTES: [a] Concentration for water samples is µg/l.

[b] Only DEP, DBP and diphenylamine were quantitated using standards of these compounds. Other quantitations are approximate and are calculated against the ISTD peak. Peak heights were measured from the total ion profile and a response factor equal to that of the ISTD was used.

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