APPENDIX B

Closure Documentation

B.1

CLOSURE AND POST - CLOSURE PLAN
FOR THE
KOPPERS COMPANY, INC.
HAZARDOUS WASTE MANAGEMENT FACILITY
SUPERIOR, WISCONSIN

SURFACE IMPOUNDMENTS
EPA I.D. NO. WID006179493

Submitted by:

KOPPERS COMPANY, INC.
PITTSBURGH, PENNSYLVANIA 15219

Prepared by:

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
440 COLLEGE PARK DRIVE
MONROEVILLE, PA 15146

May 29, 1987
Revised August 27, 1987

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

440 College Park Dr., Monroeville, PA 15146

RECEIVED

AUG 28 REC'D

ENVIRONMENTAL RESOURCES

August 27, 1987

Mr. Richard O'Hara
Chief, Hazardous Waste Management Section
Bureau of Solid Waste Management
Wisconsin Department of Natural Resources
101 S. Webster Street, GEF 11
Madison, WI 53707

RE: Koppers' Superior, Wisconsin Facility
Surface Impoundment Closure Plan
EPA I.D. No. WID006179493

Dear Mr. O'Hara:

Three copies of the revised closure plan for the surface impoundments at the Koppers' Superior facility are enclosed. The document was reprinted with revised pages indicated for reference. These revisions address the concerns of your staff as listed in Ms. Zellmer's letter dated July 28, 1987 and are summarized below:

Item Number 1

The plan is stamped by a professional engineer registered in Pennsylvania who has applied for Wisconsin registration. Mr. Lynch of your department stated that this would be acceptable for the present time.

Item Number 2

The sludge waste analysis was described in a confusing manner in the original closure plan which is now resolved on page 4 of the revised plan. Analysis of sludge samples taken from the impoundments at the Superior plant was performed at the Monroeville laboratory of Spectrix. Sample points are shown in Section VI, Attachment 3.0-1.

Item Number 3

The Closure Performance Standard, Section V, is more detailed and references Sections VII and VIII which includes specific clean-up levels.

If you have any comments during review of the enclosed document or need additional copies, please advise.

Sincerely,

Robert J. Anderson - DA

Robert J. Anderson
Staff Program Manager

RJA/lp
Enclosures

cc: J. Batchelder - Koppers

Mr. Gary Leroy - (Two (2) copies) - Wisconsin Department of Natural Resources
Highway 70 West
Spooner, Wisconsin 54801

D. Shaw - Koppers
R. Morosky - Keystone
C. Slaustas - EPA Region V

bcc:
Joe Uriah
D. Van Tassel
D. Smith
R. Ohlis
T. Kirchner

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LIST OF FIGURES

I. FACILITY/CONTACT INFORMATION

Owner/Operator's name:		Koppers Company, Inc.
Facility EPA ID No.:		WID006179493
Address:		Koppers Co., Inc. P.O. Box 397 Superior, Wisconsin 54880
Telephone Number:	Plant - Koppers (Pgh.) - Keystone -	(715) 392-2221 (412) 227-2000 (412) 733-9500

CONTACTS

Koppers Company, Inc., Superior, Wisconsin Plant

Mr. David Shaw - Plant Manager

Mr. Warren Dolsen - Assistant Plant Manager

Keystone Environmental Resources, Inc.

R. J. Anderson - Environmental Program Manager

R. M. Morosky - Project Manager

II. INTRODUCTION

This closure plan is submitted in accordance with the requirements of the Wisconsin Administrative Code Chapter 181 and 40 CFR 265 Subpart G. The Plan addresses activities associated with closure and post-closure care of the surface impoundments at the Koppers, Superior facility.

III GENERAL DESCRIPTION

1.0 Wood Preserving Operations

The plant began operation in 1928 and occupies approximately 112 acres. The wood treating facility and waste handling facility occupy a small portion near the north end of the site. The majority of the site is used for storage of treated and untreated wood. Currently, the plant uses creosote for the pressure treatment of railroad crossties. The use of pentachlorophenol preservative was discontinued in the early part of 1982. Other wood products, such as poles and piling, may also be produced.

2.0 Surface Impoundments

The surface impoundments were constructed in the mid 1970's. They generate only K001 waste (bottom sediment sludge from the treatment of wastewaters from wood preserving processes using creosote or pentachlorophenol). The surface impoundments are preceded by oil/water separation and flow equalization. Hydrocarbon material removed prior to the surface impoundments is reused in the wood treating process. As such, the amount of contaminates that flow into the surface impoundments is minimized.

Each impoundment is a regular shaped rectangle which measures approximately 127 feet by 170 feet based on inside top of the dike measurements. The bottom of the impoundments are about seven (7) feet below the top of the dike with side slopes of about three (3) horizontal to one (1) vertical (3:1). The total bottom area is roughly 40,672 square feet and the maximum hydraulic volume is 294,550 cubic feet (2,203,234 gallons).

3.0 Topographic and Other Maps

A map showing the location of the impoundments relative to the plant facilities is included as Attachment 3.0-1. The Koppers' Superior facility is located approximately two miles south east of Superior Wisconsin, in Sections 12 and 13, Twp. 48 N, Range 14 W on the USGS Superior, Wisconsin 7.5 minute topographic quadrangle (Figure 1).

The facility is located in an area generally designated as agricultural.

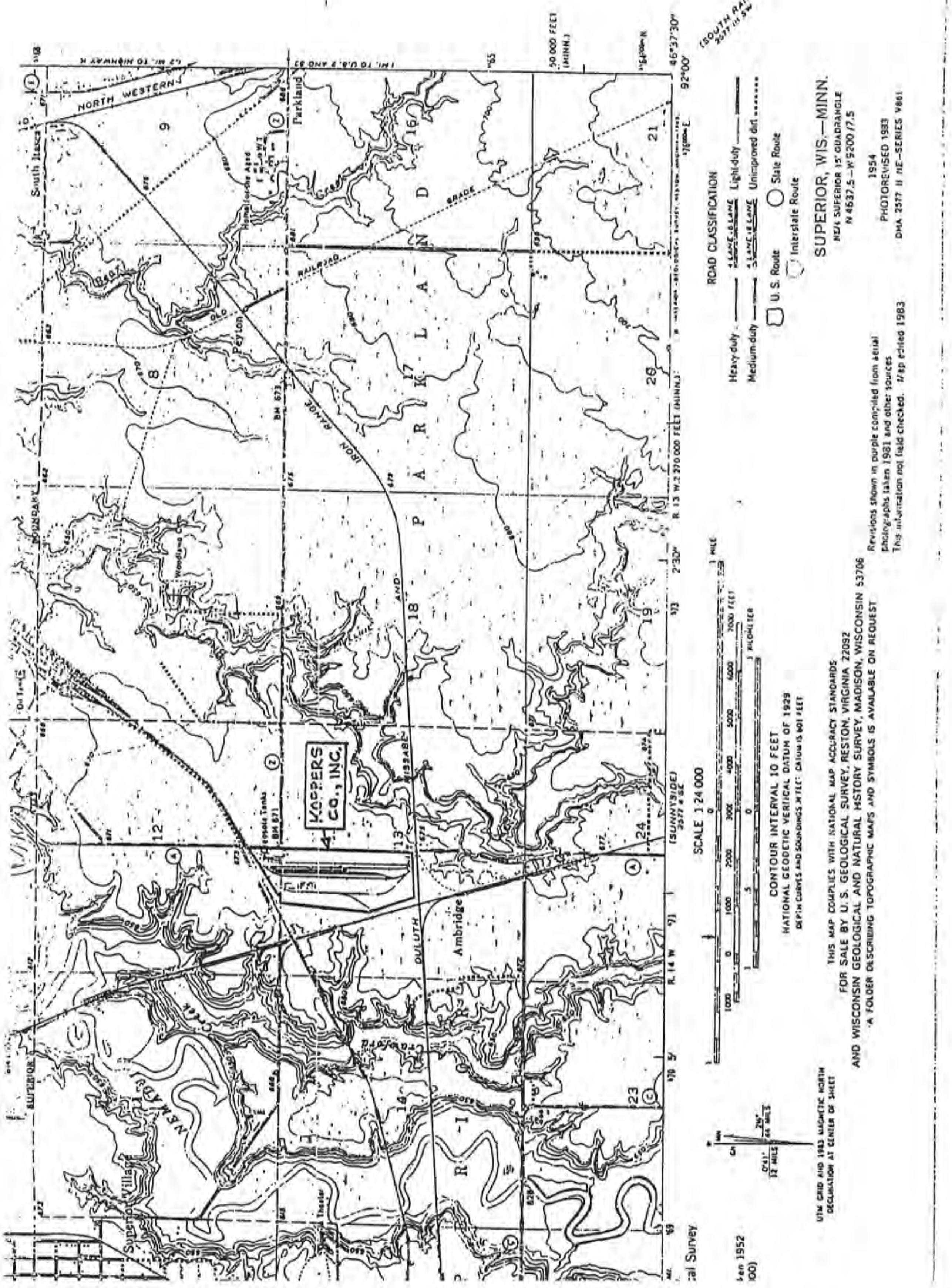
4.0 Chemical and Physical Analyses

The hazardous waste addressed in this plan is K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.

The results of chemical analyses performed at the Spectrix, Monroeville, Pennsylvania laboratory, on the bottom sediment sludge from the two surface impoundments at the Superior plant are listed in Attachment 4.0-1. (Attachment 3.0-1 in Section VI locates the individual sample points on a plant site map.)

Fig. 1.

LOCATION MAP OF KOPPERS, SUPERIOR, WI



SECTION III

Attachment 3.0-1

Topographic Map

WIND ROSE DESCRIPTION

NOTE: WIND ROSE NORTH NOT TRUE NORTH

NOTES
1. CLOSEST WIND ROSE RECORD AVAILABLE IS AT DULUTH, MN DATA FROM UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) ENVIRONMENTAL DATA AND INFORMATION SERVICE.
   NOAA DATA IN METERS PER SECOND, CONVERTED TO MILES PER HOUR FOR PRESENTATION ON WIND ROSE (1 MPH = 0.447 METER PER SECOND)
2. 100 YR FLOOD LEVEL IN NEMADJI RIVER, TO THE NORTHWEST, IS 619 FT APPROXIMATELY 50 FT BELOW SITE ELEVATION
3. DESIGNATION OF LOCATION OF UPPERMOST AQUIFER NOT FEASIBLE WITH LIMITED AVAILABLE DATA. MAY BE GENERALLY PRESENT IN SUBSURFACE OF SITE AND VICINITY

TOPOGRAPHIC MAP AND SITE FEATURES, KOPPERS CO. SUPERIOR WISCONSIN

USEPA PART B PERMIT APPLICATION
KOPPERS COMPANY SUPERIOR, WISCONSIN WOOD TREATING PLANT
USEPA ID No. WID006179493

TOPOGRAPHIC MAP PREPARED BY SEAWAY ENGINEERING CO., DULUTH, MINNESOTA
FIELD DATA OBTAINED JUNE, 1984

DRAWN BY L.O. | CHECKED BY RGB | SCALE AS SHOWN

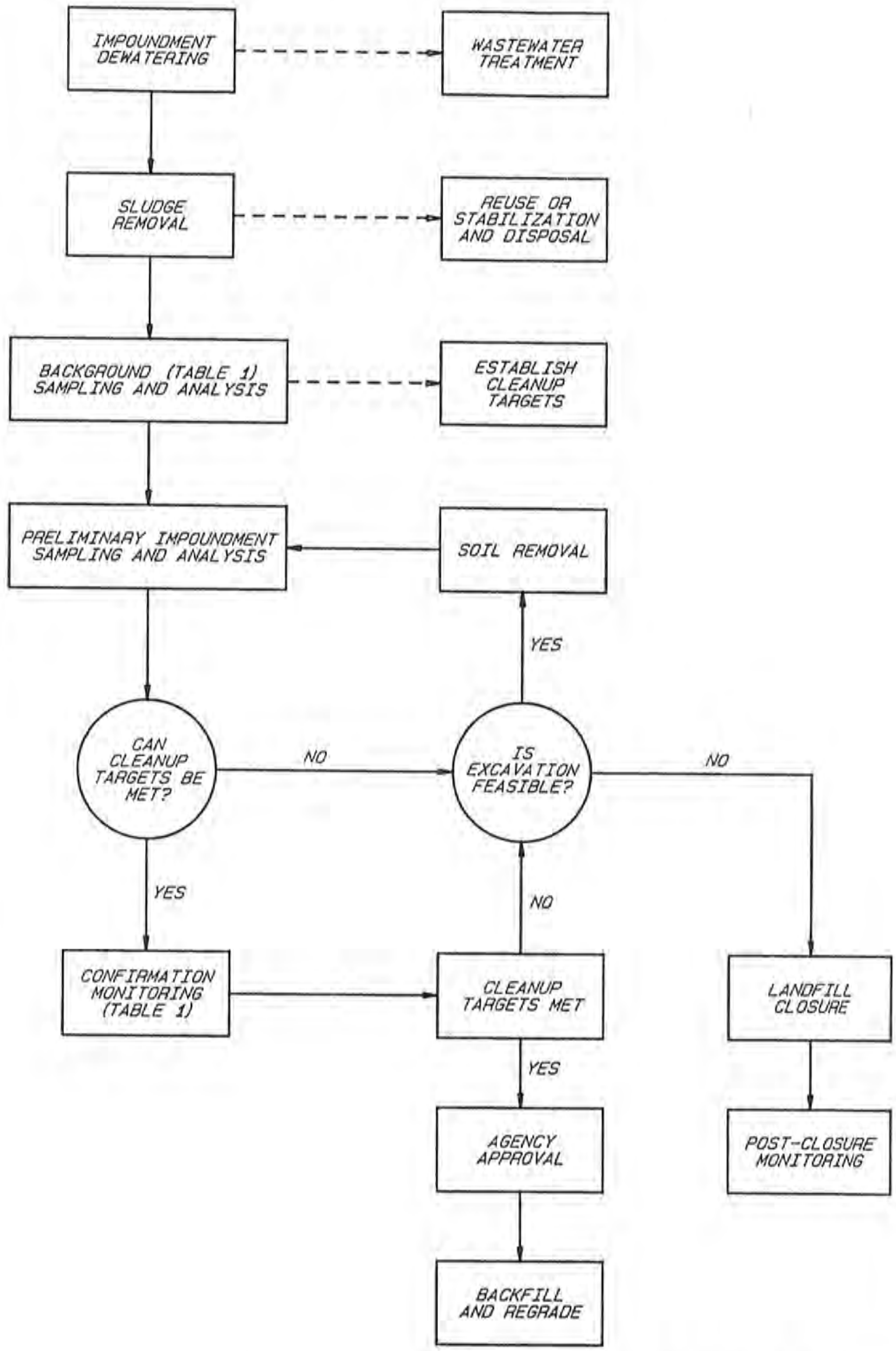
10/?? ADD SPRAY FIELD

Woodward-Clyde Consultants

JOB NO. 85C3134
SHEET 1 OF 1
Fig 1.14-1

IV PARTIAL AND FINAL CLOSURE ACTIVITIES

Koppers will discontinue use of the surface impoundments prior to November 8, 1988. The closure process includes removal of all liquids, K001 sediment, and, if feasible, any contaminated underlying soil. Step-by-step tasks are detailed, to the extent possible, in the following sections. These tasks relate to both clean and contingent closure. A closure process decision schematic is presented in Figure 2.0.



KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

FIGURE 2.0

CLOSURE PLAN
FLOW SCHEMATIC
SUPERIOR, WISCONSIN

KOPPERS COMPANY, INC. | C67631

V. CLOSURE PERFORMANCE STANDARD

Koppers will close the surface impoundments in a manner consistent with 40 CFR 265.111, and NR 181.42.

The need for further maintenance will be minimized, and the final design will control, minimize or eliminate any threat to human health or the environment. This will include any minimization of the possibility of any post closure escape of hazardous waste or hazardous constituents to groundwater, surface waters or to the atmosphere.

A detailed description of the procedures and the specific target levels can be found in successive sections of this plan. Criteria established for clean closure are described in Section VII, while contingent closure is described in Section VIII.

The performance standard will be achieved by removing, treating and/or disposing of surface impoundment water, bottom sludges and contaminated soil to the extent possible. If removal of all contaminates to target levels is not feasible, the contingent closure plan will be implemented.

VI. CONTENTS OF CLEAN CLOSURE PLAN

Following the final design of the site work and the installation of a new wastewater treatment facility, a contract and bid specification package will be prepared for the closure of the impoundments. Koppers will designate a Project Supervisor to coordinate the work and certify that all work is done in accordance with the approved Closure Plan. The closure procedure will consist of the following sections as described below.

1.0 PREPARATION

1.1 Mobilization

Once the design has been completed, bids received and contract awarded for the site work, the mobilization of required equipment will occur. Attachment 1.1-1 list the equipment and personnel requirements anticipated.

1.2 Personnel Protection Area

The personnel protection area, at a minimum, will include a clean change area, lockers and shower facilities for all personnel who will be handling waste materials. The workers entering the construction/work area must wear protective boots, coveralls and gloves. The area will be classified according to the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October, 1985, for Level "D" protection but may be upgraded to Level "C" if necessary. Workers will be required to wash or dispose of their boots, coveralls and gloves before leaving the work area.

The field workers will comply with the training and safety plan developed as part of the contract requirements.

1.3 Equipment Decontamination Area

The decontamination area will be located adjacent to the surface impoundments and be used for the decontamination of vehicles and equipment. No equipment will pass from the work area to a clean area without proper decontamination. Contaminated wash water will be collected as necessary and treated in the new wastewater treatment system.

All non-disposable equipment used for cleanup (including applicable empty containers) shall be decontaminated by steam cleaning, using the following method:

> Place equipment in a shallow plastic-lined sump constructed on-site, or place plastic film around and underneath larger equipment. Use standard steam cleaning procedures to clean working surfaces and collect the wastewater in the sump. Pump the collected water in the sump to the plant wastewater treatment system.

At the close of the project, Koppers will manifest plastic film, work clothes, gloves and rags off-site for disposal as K001 waste. These materials will be packaged in open head, DOT-approved drums or shipped with bulk loads.

Because steam cleaning is an effective measure to remove oils from equipment, and because the majority of the cleanup equipment will be re-used in normal plant operations involving wood-treating chemicals, Koppers proposes that decontamination verification be based upon visual inspection, rather than analytical data.

2.0 Description of Closure

Closure of the surface impoundments at the Superior site will include removal of all standing water, bottom K001 sediment and contaminated soils as feasible. All efforts will be made to minimize or prevent post-closure contaminant release and thus reduce future maintenance requirements. After removal of the water, sediments and soils, the area will be filled and regraded to acceptable contours.

3.0 Maximum Waste Inventory

Preliminary site investigation indicates that approximately 249 cubic yards of

K001 bottom sediments exist. Results of a recent site survey can be found in Attachment 3.0-1. It is anticipated that a maximum of 300 cubic yards of sludge will be present at the time of closure and an additional 1,887 cubic yards (1 foot depth) of soil will be removed.

4.0 Waste Removal Procedures

Koppers is currently designing a new wastewater treatment plant for the Superior facility. After the new wastewater facility is operational and the flow to the surface impoundments is stopped, suspended solids will be allowed to settle before final water removal steps begin. Waste removal will proceed as depicted in the closure process schematic (Attachment 4.0-1) and as discussed below.

4.1 Removal of Standing Water

The water level in the impoundments will be lowered as much as possible throughout the active life of the impoundments during 1988, without disturbing the bottom sediment layer. A floating skimmer, as illustrated in Attachment 4.1-1, will be used to lower the water level as close to the sediment layer as possible. The water will be discharged to the sprayfield in an amount such that it will not exceed maximum design capacity. Use of the skimmer will help prevent any accidental direct application of solid waste material to the sprayfield.

Once closure processes are initiated, the remainder of the water will be pumped to the new wastewater facility for treatment. When the water level is lowered to within one foot of the sediment layer, discharge to the sprayfield will be discontinued. However, pumping to the wastewater facility will continue until the sediment layer is reached. During this operation, any reusable preservatives will be recovered and reused by the Koppers Superior Plant.

4.2 Removal of Waste Inventory

Sludge will be removed from the bottom of the impoundments, if possible, using equipment available at the plant. Flyash or kiln dust may be mixed in as necessary for stabilization and handling. Any remaining liquid collected during this process will be routed to the plant wastewater treatment system.

The waste material will be placed in lined/sealed sump trailers or bulk lined storage bins that meet D.O.T. and EPA requirements established in 40 CFR 149.70 and will be sent to one of the following approved hazardous waste management facilities:

Peoria Disposal Company (secure hazardous waste landfill) 4349 Southport Road Peoria, Illinois 61615 EPA ID. # ILN 000805812	(499 miles)
Chemical Waste Management, Inc. (secure hazardous waste landfill) 4636 Adams Center Road Fort Wayne, Indiana 46806 EPA ID. # IND 078911146	(614 miles)
Cecos International (secure hazardous waste landfill) 5092 Aber Road Williamsburg, Ohio 45176 EPA ID. # OHD 087433744	(772 miles)

5.0 Closure Schedule

5.1 Closure Schedule

Closure is dependent upon construction and start-up of the wastewater treatment facility. The surface impoundment closure activities are to be initiated within 90 days of final discharge to the impoundment. Closure task durations are listed in Attachment 5.1-1.

Attachment 5.1-2 presents the schedule for design and start-up of the new wastewater treatment system based on a POTW discharge.

5.2 Extension for Closure

The exact amount and condition of materials and subsoil conditions encountered during the surface impoundment closure will impact the removal/work effort and could thereby affect the schedule. Also, weather conditions encountered during closure will likely make it necessary to extend the schedule beyond 180 days.

Closure tasks as outlined in Attachment 5.1-1 demonstrate that closure of the surface impoundments will require a minimum of 389 days. Koppers hereby request an extension of the time for closure of 209 days.

SECTION VI

Attachment 1.1-1

Typical Equipment and Personnel Requirements for Closure

Revised 08/27/87

Typical Equipment and Personnel Used for Closure

Equipment	Use
Pumps and Pipelines	To lower the water level in the impoundments.
Backhoe/Front End Loader	To remove sludge and contaminated soil and also backfill and compact.
Grader/Dozer	To regrade to appropriate contours and compact.
Hydroseeder	To seed and mulch the area.
Sheepsfoot Roller	To compact backfill

Personnel

Approximately 3-4 people will be required on-site to operate the equipment listed above.

SECTION VI

Attachment 3.0-1

Preliminary Site Survey

REV.	DESCRIPTION	CHECKED BY	DATE

	NAME	DATE
DRAWN BY	MARK BOSS	5-28-87
CHECKED BY		
APPROVED BY	R. Van Tassel	8/26/87

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

This drawing and all information thereon is the property of KEYSTONE ENVIRONMENTAL RESOURCES, INC., a subsidiary of KOPPERS COMPANY, INC. and is confidential and must not be made public or copied unless authorized by it and is subject to return upon demand.

SAMPLING LOCATIONS SUPERIOR, WISCONSIN

KOPPERS COMPANY INC.

A103028

ACTIVITY NO. 185700-20 SCALE 1" = 60'

A103028 REVISION 0

SURVEY DATA

Point	Depth to Sludge (1) (ft)	Thickness of Sludge (2) (ft)
1W1	6.0	0.4
1W2	6.0	0.2
1W3	6.1	0.2
1W4	6.0	0.2
1W5	5.8	0.3
1E1	7.0	0.4
1E2	5.8	0.3
1E3	7.8	0.5
1E4	6.9	0.3
1E5	5.7	0.2
2W1	5.8	0.1
2W2	6.2	0.1
2W3	6.1	0.1
2W4	5.8	0.1
2W5	6.0	0.3
2E1	5.9	0.1
2E2	6.2	0.1
2E3	5.8	0.3
2E4	6.1	0.4
2E5	6.2	0.5

(1) Measured from water level in impoundment.
(2) Measured to clay bottom of impoundment.

Volumes for Impoundments 1 and 2
Superior, Wis.

Volume of sludge

Impoundment 1	141 cu. yds.
Impoundment 2	108 cu. yds.
Total	249 cu. yds.

Volume of Soil to be excavated

	excavate to: 0.5 ft. depth (cu. yds.)	1.0 ft. depth (cu. yds.)	2.0 ft. depth (cu. yds.)
Impoundment 1	470	940	1,881
Impoundment 2	473	947	1,894
Total	943	1,887	3,775

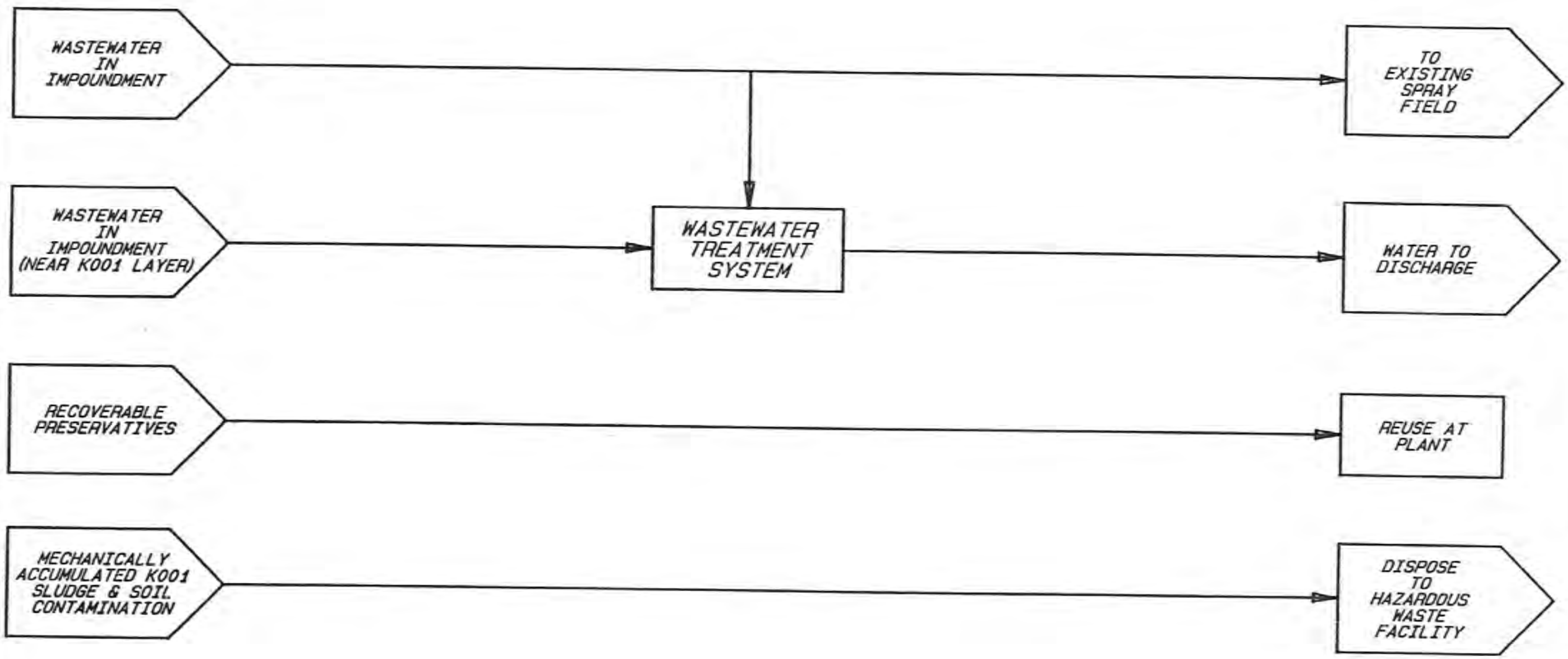
Volume of water to be removed

Impoundment 1	5,530 cu. yds. H_2O = 1,120,000 gal.
Impoundment 2	5,350 cu. yds. H_2O = 1,080,000 gal.
Total	10,880 cu. yds. H_2O = 2,200,000 gal.

SECTION VI

Attachment 4.0-1

Closure Process Schematic



KEYSTONE ENVIRONMENTAL RESOURCES, INC.

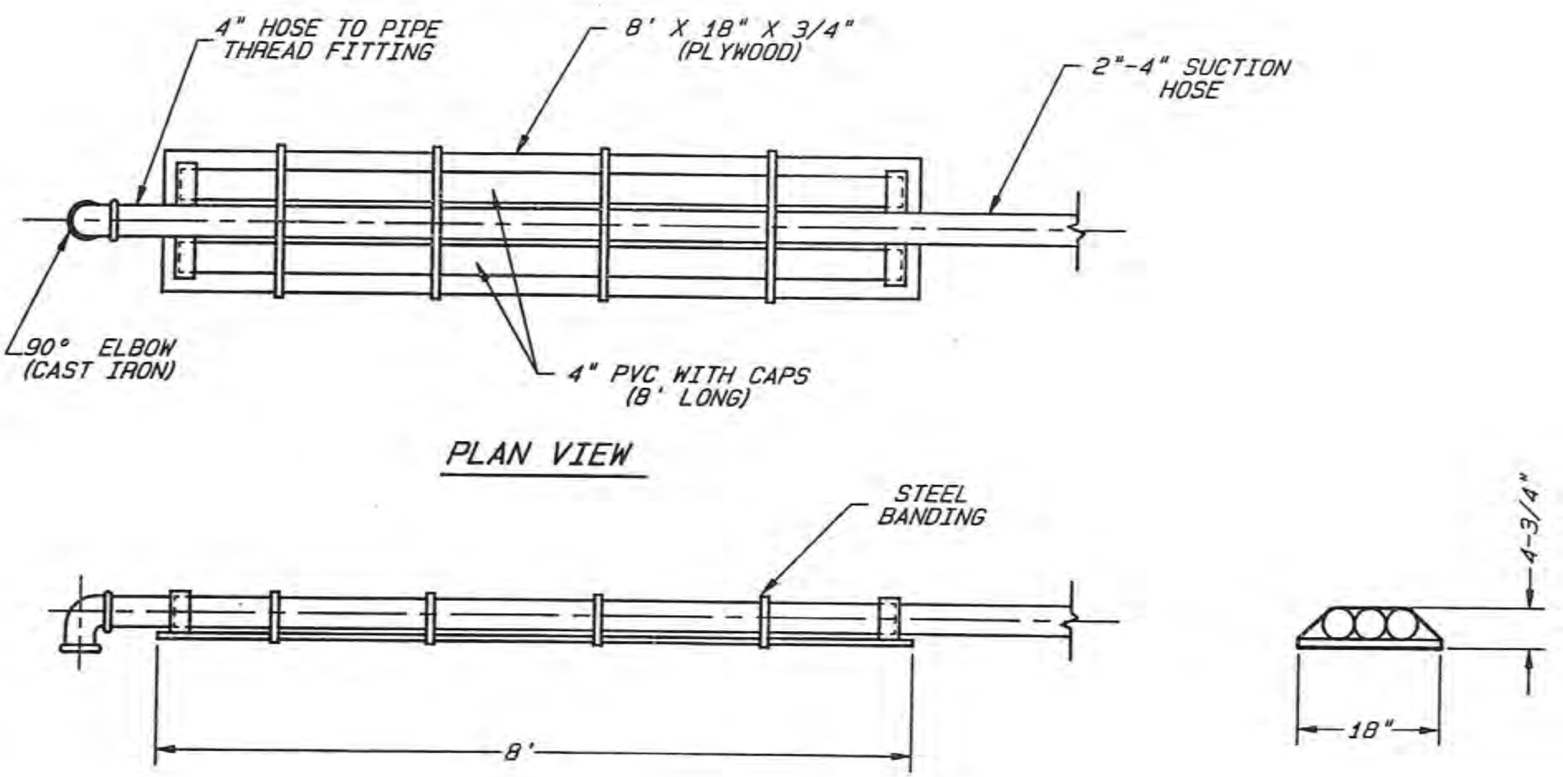
ATTACHMENT VI - 4.0.1
CLOSURE PROCESS SCHEMATIC
SURFACE IMPOUNDMENT
SUPERIOR, WISCONSIN

KOPPERS COMPANY INC. C67578

SECTION VI

Attachment 4.1-1

(Floating Skimmer)



ATTACHMENT VI - 4.1.1
FLOATING SKIMMER
SUPERIOR, WISCONSIN

KOPPERS COMPANY, INC. C67582

SECTION VI

Attachment 5.1-1

(Schedule for Closure)

Revised 08/27/87

SCHEDULE FOR CLOSURE OF SURFACE IMPOUNDMENTS

KOPPERS - SUPERIOR, WI PLANT

Task	Section of Text	Duration
Preliminary removal of standing liquid	VI - 4.0, 4.1	April 1-Aug. 15, 1988
Wastewater treatment system start-up and final receipt of waste in surface impoundments		Aug. 15 - Aug. 25,
Final removal of standing liquid	VI - 4.1	Aug. 25 - Sept. 15,
Accumulate and remove K001 sludge	VI - 4.2	Sept. 15 - Oct. 15,
Remove visibly contaminated subgrade soil	VI - 4.2	Oct. 15 - Nov. 15,
Impoundment subgrade preliminary soil sampling/analysis	VII - 1.0	Oct. 15 - Nov. 15,
Background soil sampling/analysis	VII - 1.1	Oct. 15 - Nov. 15,
Evaluate data and decide to pursue clean or contingent closure	VII - 1.0 & 3.0	Nov. 15 - Feb. 15, 1989
If clean closure, sample and analyze for Table 1.0 parameters	VII - 1.2	Feb. 15 - May 15
Regulatory response	VII - 3.0	May 15 - June 15
If clean closure: Remove additional subgrade (if necessary), backfill, cover, seed and decontaminate equipment	VII - 5.0	June 15 - Sept. 15
If contigent closure: Backfill, cover (RCRA cap) seed and decontaminate equipment	VIII - 4.0	June 15 - Sept. 15
Completion of Closure Certification		Sept. 15 - Oct. 15

SECTION VI

Attachment 5.1-2

Schedule for Wastewater

Treatment System Upgrade

VII. DECONTAMINATION PROCEDURES

1.0 Soil Investigation (preliminary sampling/analysis)

Once all water, K001 sludges and visually contaminated soils are removed from the two impoundments, eighteen soil samplings as located on the site map in Attachment 1.2-1 will be taken by qualified sampling personnel to determine the existence of any residual hazardous contaminants. Analysis of these samples will be limited to three parameters, naphthalene, phenols and oil and grease, which are typical indicators of K001 waste and will indicate the extent of soil contamination. A decision to pursue clean closure will be made based on the results of these analyses.

The soils testing procedures planned for confirmation and approval of clean closure are summarized below and are described in the Sampling and Analysis plan in Appendix D.

1.1 Background Soil Borings

At least four soil borings approximately 4 feet deep beginning at the same elevation as the impoundment bottom, are to be augered and/or split spoon sampled in an approved area assumed to be upgradient and unaffected by plant operations. Samples are to be taken continuously for the entire depth of the boring. These borings are to be used to determine background soil contamination. Exact locations will be determined during a detailed field reconnaissance and will be submitted to WDNR for approval prior to sampling.

1.2 Impoundment Soil Sampling to Confirm Clean Closure

If the decision is made to pursue clean closure, then soil samples will be taken from at least nine representative locations in each impoundment bottom and one from each sidewall. Representative locations will be determined by the use of a uniform grid system (see Attachment 1.2-1). Each hole is expected to be approximately 4 feet deep and soil samples are to be collected at½-foot intervals. The field sampling will be managed by an environmental professional familiar with standard sampling and analysis protocol. The project supervisor will be alerted to unexpected conditions and will make any needed adjustments to the protocol of the investigation. Refer to sampling and analysis plan in Appendix D.

1.3 Soil Sample Chemical Analyses (Clean Closure Confirmation)

To confirm clean closure, both impoundment and background soil samples will be analyzed for the parameters listed in Table 1. Results will be submitted to WDNR for final approval.

All laboratory analysis techniques shall conform to "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" U.S. EPA SW-846, 2nd Edition, July 1984 and 40 CFR 261 Appendix III - Chemical Analysis Test Methods. The laboratory QA/QC procedures in Appendix A will be followed for the sampling, transport and analyses of all samples.

1.4 Water Analysis

Discharge of impoundment water will be in compliance with all appropriate discharge limitations. Analysis will be performed as is necessary to verify that discharge limits are being achieved.

Groundwater will be monitored as described in Section IX of this document.

2.0 Procedures for Cleaning Equipment

The procedures described in section VI, 1.3 will be used to clean all of the equipment. Sampling equipment will be cleaned as described in Appendix A QA/QC procedures.

TABLE 1

ANALYTICAL PARAMETERS FOR SOIL SAMPLES
KOPPERS COMPANY, INC.
SUPERIOR, WI PLANT

Parameter	Test Method	Parameter	Test Method
pH	9045	arsenic	7060
conductivity	9050	barium	6010
Total Organic Carbon (TOC)	Walky-Black	cadmium	6010
phenol	8040	chromium	6010
pentachlorophenol	8040	lead	7421
2-chlorophenol	8040	magnesium	6010
p-chloro-m-cresol	8040	selenium	7740
2,4-dimethylphenol	8040	zinc	6010
2,4-dinitrophenol	8040	copper	6010
trichlorophenols	8040		
tetrachlorophenols	8040		
chrysene	8310		
naphthalene	8310		
fluoroanthene	8310		
benzo(b)fluoranthene	8310		
benzo(a)anthracene	8310		
dibenzo(a)anthracene	8310		
acenaphtalene	8310		
indeno(1,2,3-cd)pyrene	8310		
benzo(a)pyrene	8310		
Total polychlorinated dioxins	8280		
2,3,7,8-Tetrachlorodibenzo-p-dioxin	8280		
benzene	8020		

3.0 Data Evaluation and Regulatory Review

Results of subgrade soil sampling and analysis will be evaluated to determine the concentrations of the parameters listed in Table 1. The proposed criteria for establishing "clean" soil intervals and subsequent soil cleanup levels shall be established as being within two standard deviations of the background soil samples.

A report detailing the results of this evaluation will be submitted to WDNR for review. A thirty day review period has been incorporated into the closure schedule for this purpose. If the proposed and approved criteria for clean closure have not been attained, Koppers may either remove additional subgrade soil as previously described (in Section VI, 4.2) or implement the contingent closure plan as described in Section VIII of this document.

If Koppers chooses to remove additional soil to achieve clean closure, the soil sampling and analyses described above may again be utilized including the subsequent regulatory review process. Modifications to the sampling and analysis plan may be implemented at this time following WDNR approval. The modifications may limit the number of samples and/or reduce the number of parameters if deemed appropriate.

4.0 Methods for Sampling and Testing to Demonstrate Success of Equipment Decontamination

4.1 Decontamination Area

After all the closure activities at the surface impoundment are completed, materials in this area will be managed as appropriate. The plastic liner will be disposed of with the waste soils and any pumps and piping will be cleaned. Because equipment used during the closure process will be used in the everyday wood treating operation and be in contact with the same type of contaminants, it will be steam cleaned until visually clean and put back into service without sampling to verify decontamination.

5.0 Final Clean Closure

After documented and aproved verification of subgrade decontamination in the surface impoundments, the existing perimeter fence will be removed and the surrounding earth berms will be excavated to the lines shown on clean closure drawings in Attachment 5.0-1. During berm removal, topsoil will be segregated, and the clean inorganic soil materials will be blended as unclassified fill for impoundment grading. All additional clean soil fill for regrading will be obtained from an approved off-site backfill source.

Impoundment backfill will consist of two layers, unclassified soil fill (predominantly cohesive soils) and topsoil. The unclassified fill will be placed in eight inch lifts, compacted with sufficient energy to achieve 95 percent of maximum laboratory density as defined by ASTM D-698. Field (in-place) density tests will be performed on each lift to verify the above density. The top surface of the fill will be crowned about the center of the impoundments, as shown on the clean closure drawing in Attachment 5.0-1, to slope uniformly to the perimeter.

Immediately following fill placement, an 18-inch minimum thickness of topsoil material will be placed to the finished lines and grades shown on the above drawings. During grading and topsoil placement, the monitoring wells adjacent to the impoundments will be protected. Following topsoil placement, the exposed surface will be raked, seeded and mulched as described in Section VIII, 5.0 to minimize erosion and maintenance.

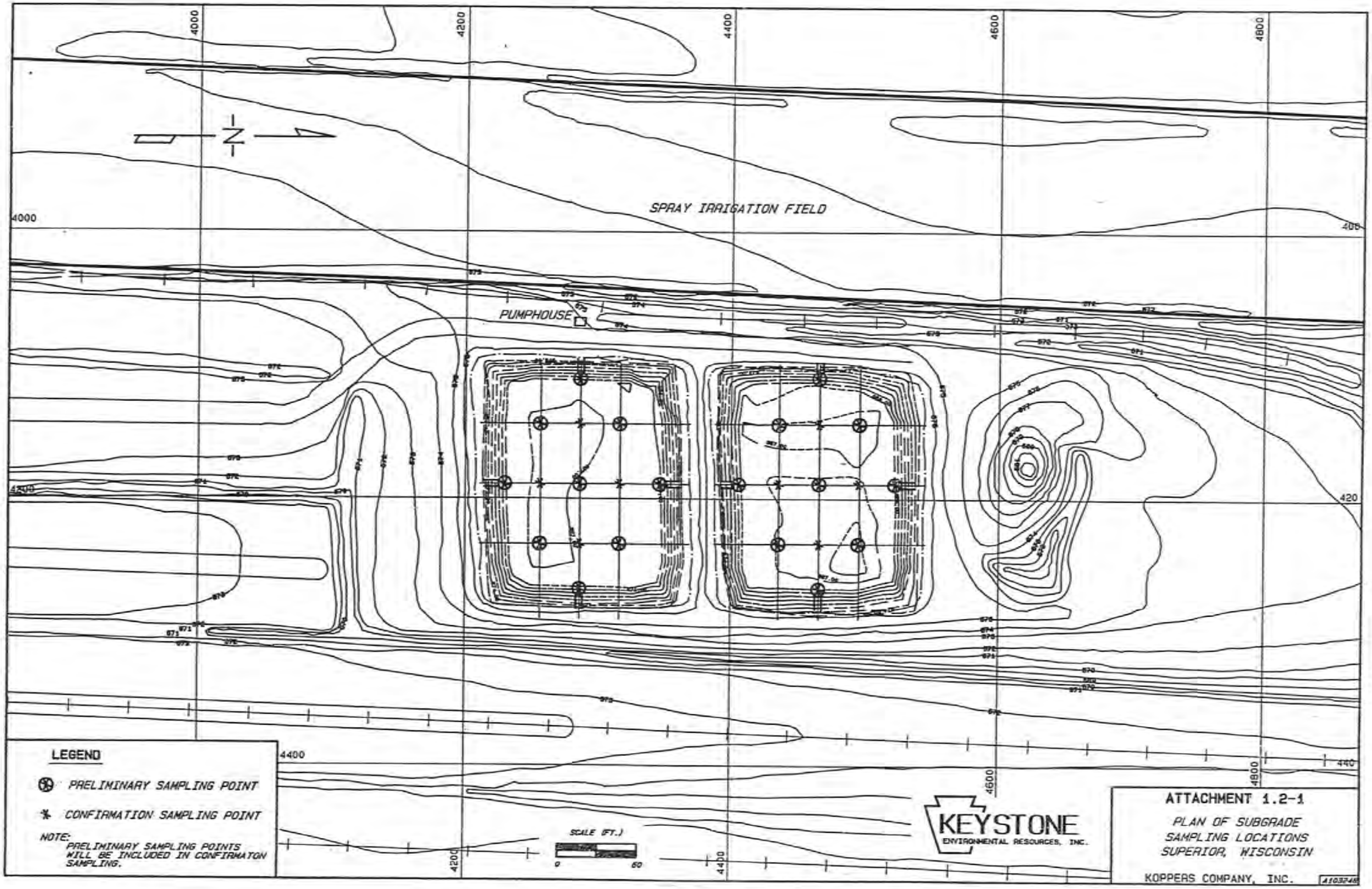
SECTION VII

Attachment 1.2-1

Plan of Subgrade Sampling Locations

(Clean Closure)

Revised 08/27/87

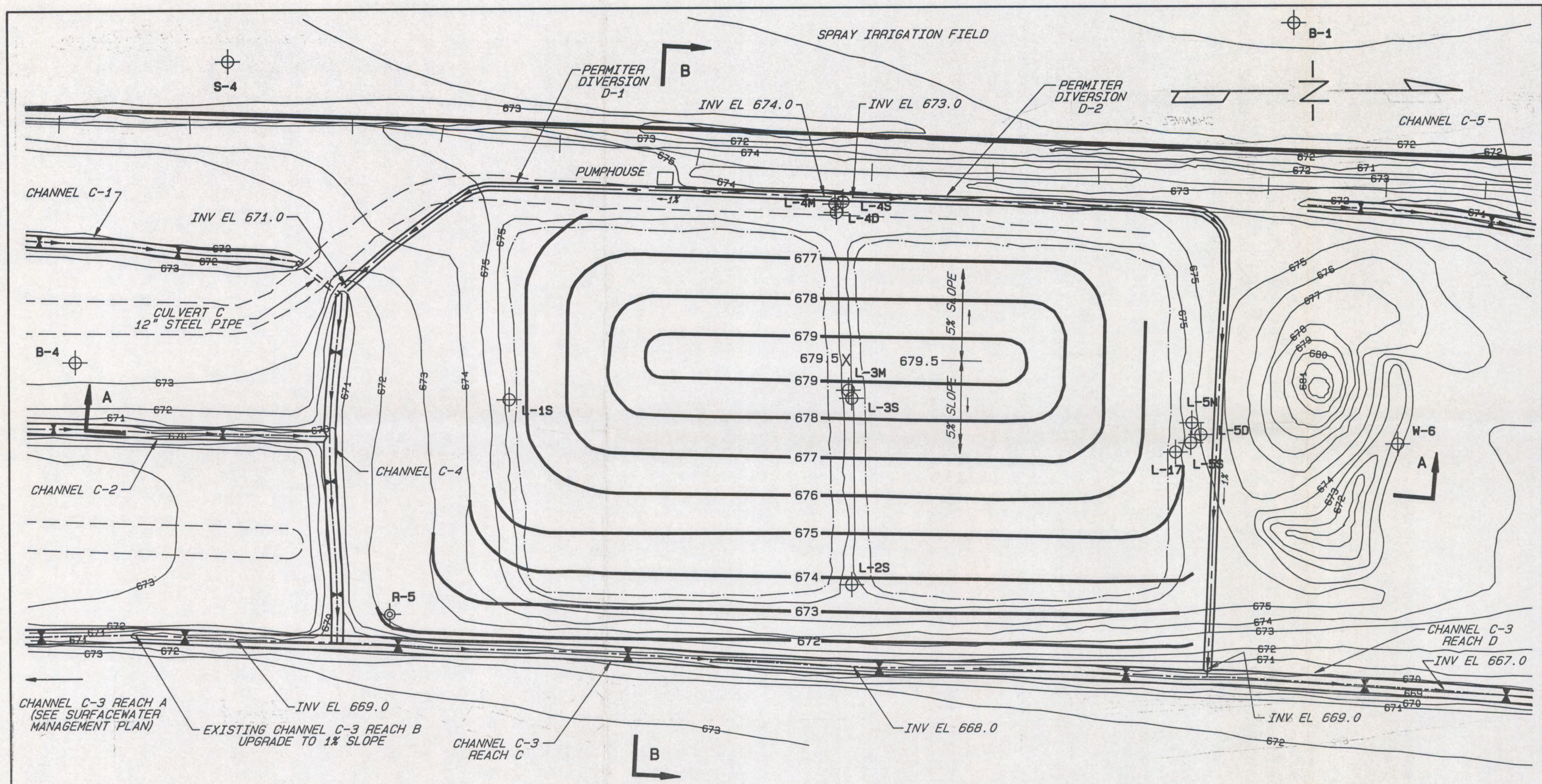

N
SPRAY IRRIGATION FIELD
PUMPHOUSE
4000
4200
4400
4600
4800
LEGEND
PRELIMINARY SAMPLING POINT
CONFIRMATION SAMPLING POINT
NOTE:
PRELIMINARY SAMPLING POINTS WILL BE INCLUDED IN CONFIRMATON SAMPLING.
SCALE (FT.)
0
60
KEYSTONE
ENVIRONMENTAL RESOURCES, INC.
ATTACHMENT 1.2-1
PLAN OF SUBGRADE
SAMPLING LOCATIONS
SUPERIOR, WISCONSIN
KOPPERS COMPANY, INC.

SECTION VII

Attachment 5.0 - 1

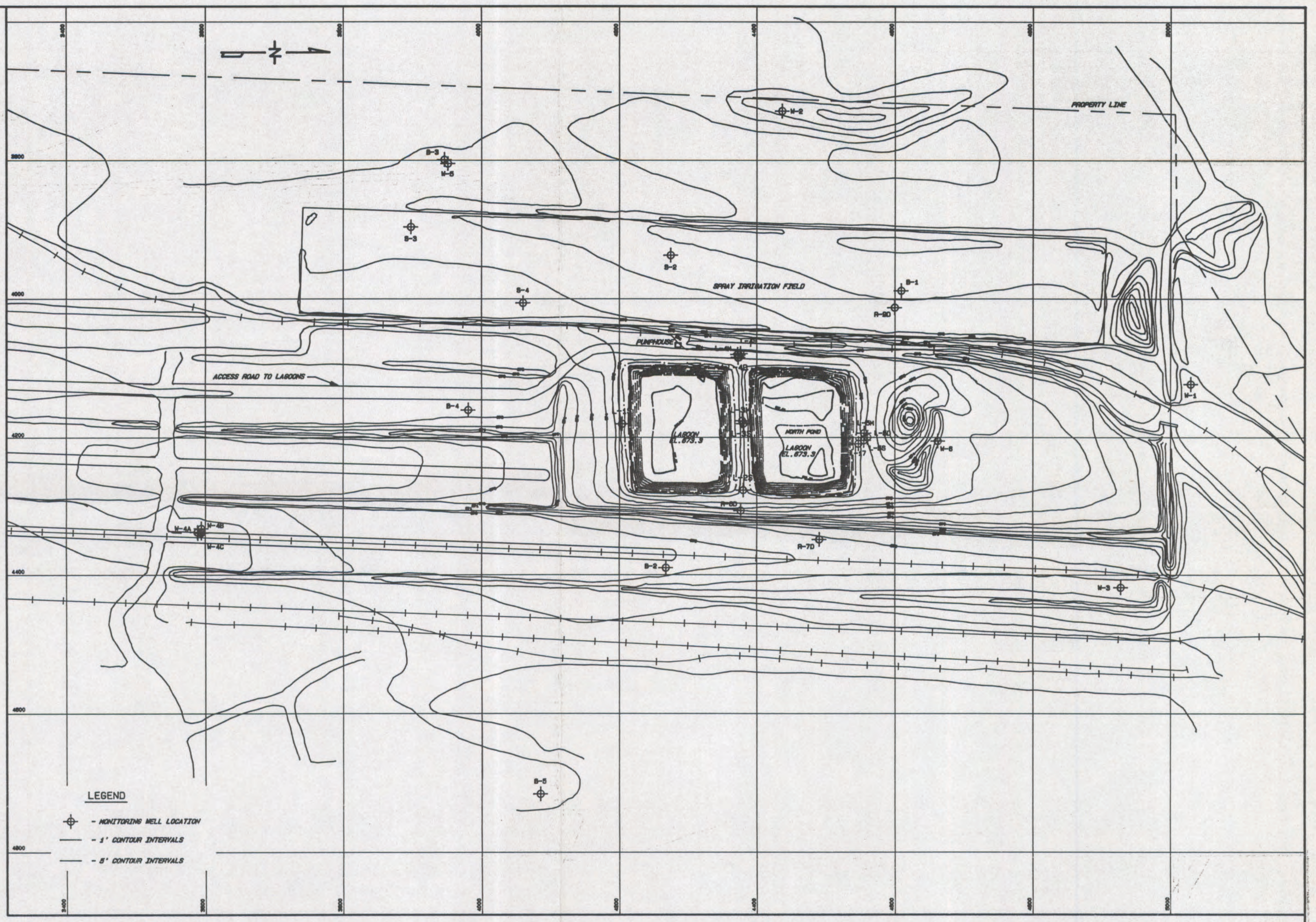
Final Contours

(Clean Closure)



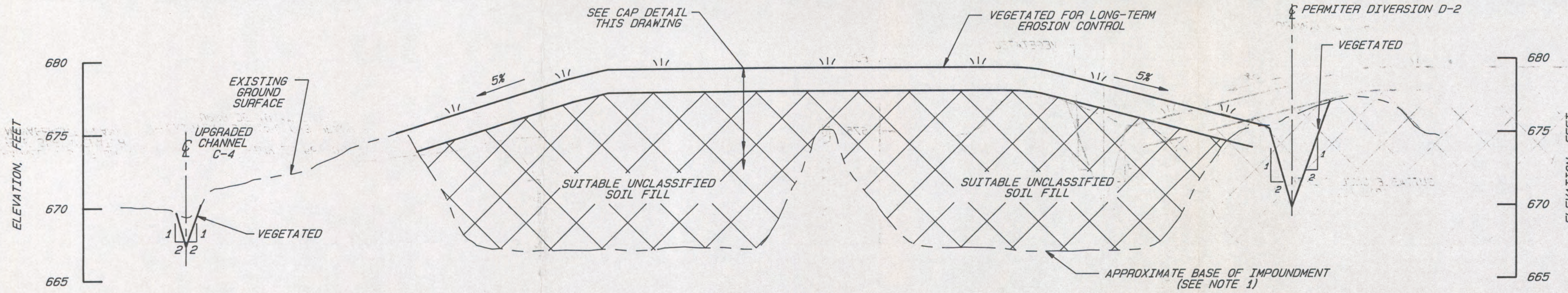
PLAN

SCALE 1" = 40'



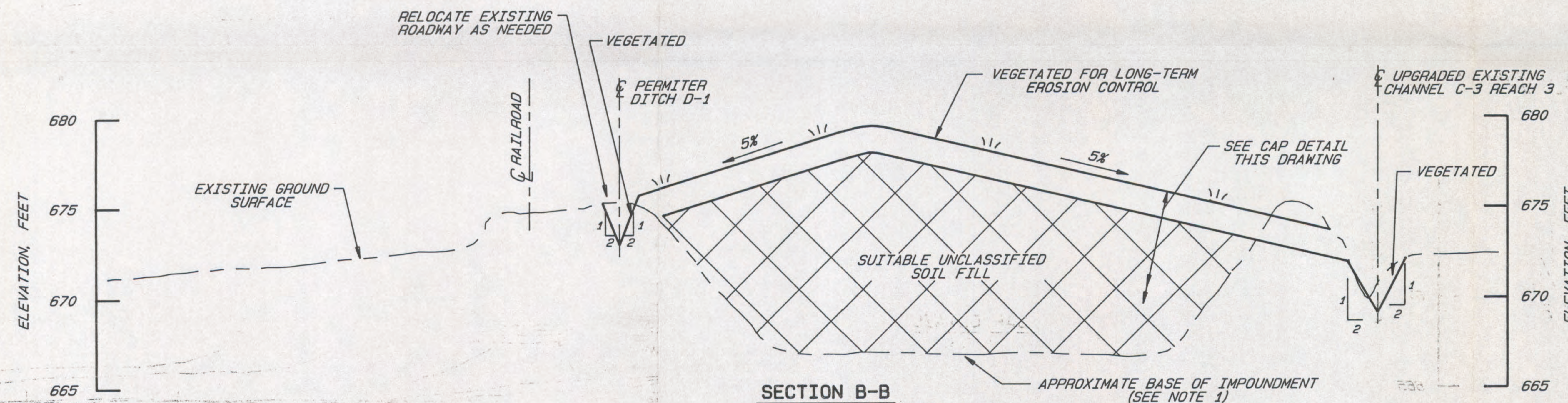
SITE LOCATION PLAN

SCALE 3/4"=100'



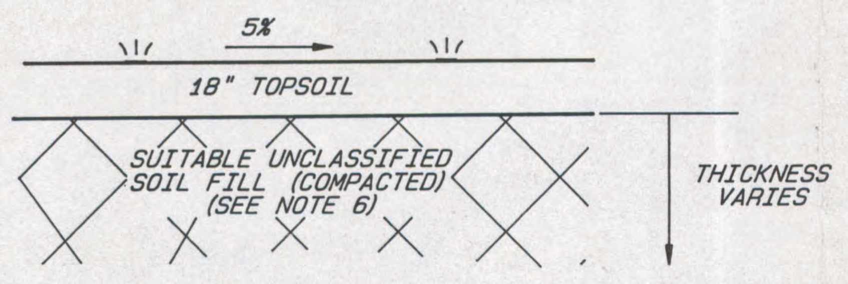
SECTION A-A

SCALE: 1" = 30' HORIZONTAL
1" = 5' VERTICAL



SECTION B-B

SCALE: 1" = 30' HORIZONTAL
1" = 5' VERTICAL



CAP DETAIL

N.T.S.

LEGEND

- PERIMETER DIVERSION (1% SLOPE)
- CHANNEL (SLOPE VARIES)
- 679 — EXISTING ELEVATION CONTOURS (U.S.G.S. MEAN SEA LEVEL DATUM)
- 679 — PROPOSED TOP OF FINAL COVER ELEVATION CONTOUR (U.S.G.S. M.S.L.)
- ACCESS ROADS (EXISTING)

NOTES-

1. THE BASE OF THE IMPOUNDMENT SHOWN IS APPROXIMATE. THE FINAL BACKFILLED BASE ELEVATION MAY VARY FROM THAT SHOWN.
2. MONITORING WELLS ADJACENT THE IMPOUNDMENT WILL BE PROTECTED DURING CONSTRUCTION.
3. CHANNELS/PERIMETER DIVERSIONS SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE SURFACE WATER MANAGEMENT PLANS AND IN GENERAL CONFORM TO EXISTING TOPOGRAPHY TO MINIMIZE THE AMOUNT OF CONSTRUCTION UPGRADING.
4. REFER TO DRAWING A103033 FOR THE SURFACEWATER MANAGEMENT PLAN.
5. REFER TO DRAWING A103032 FOR THE PLAN, SECTIONS AND DETAILS UNDER CONTINGENT CLOSURE CONDITIONS.
6. THE SUITABLE UNCLASSIFIED SOIL FILL SHALL BE APPROVED BY KOPPERS PROJECT SUPERVISOR.
7. REFER TO MATERIAL SPECIFCATIONS (NOTE 6) ON DRAWING NUMBER A103032.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — Richard L. Van Tassel — NO. 21092-E

A103034

TOPOGRAPHY REFERENCE:
MAP PREPARED BY SEAWAY ENGINEERING CO., DILUTH, MINN. DATED JUNE, 1984.

REV.	DESCRIPTION	CHECKED BY	DATE

	NAME	DATE
DRAWN BY	R. WINNERS	05/28/87
CHECKED BY		
APPROVED BY	R. Van Tassel	8/26/87

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

CLEAN CLOSURE
SURFACE IMPOUNDMENT CLOSURE
PLAN SECTIONS AND DETAILS
SUPERIOR, WI SITE
KOPPERS COMPANY INC.

ACTIVITY NO. 185700-20 | SCALE AS SHOWN

A103034 | REVISION 0

VIII. CONTINGENT CLOSURE PLAN

1.0 Contents of Plan

Although Koppers will make specific efforts to remove the hazardous waste and contaminated soil from the bottom of the impoundments, 40 CFR 265 requires that a Contingent Closure Plan be prepared to effect closure of the surface impoundment as a disposal unit in the event it is not practical to remove all contaminated soil.

2.0 Waste Removal

Koppers plans to use the procedures in Section VI - 4.0 for the elimination of the water, K001 sludge, and contaminated soil, in order to pursue clean closure. However, all waste removal procedures may not be necessary if it is decided to proceed with contingent closure.

3.0 Decontamination Procedures

Koppers plans to use the decontamination procedures described in Section VII.

4.0 Final Contingent Plan Cover Design and Construction

If it has been determined that clean closure is not feasible, then closure of the impoundments will proceed by in situ capping. Capping will consist of generally six layers. First, a general fill of unclassified soil materials (predominantly cohesive soils) will be placed on a prepared subgrade. Second, a clay barrier cap will be installed over the unclassified fill. Third, an impermeable synthetic membrane liner (20 ml PVC) will be installed over the clay barrier. Fourth, a free draining, granular, drainage layer will be placed on the clay barrier which will be overlain by another layer of suitable (unclassified) cohesive soil and finally, a layer of topsoil will be used to finish grade the impoundment backfill to the lines and grades shown on the contingency plan drawings accompanying these documents.

Initially, the exposed subgrade within the impoundment area will be proofrolled using a rubber-tired or tracked vehicle to stabilize the surface materials and locate any soft areas that require additional conditioning to accept compacted fill.

Areas requiring improvement will be over excavated, scarified and backfilled with suitable soils, and compacted as required prior to subsequent backfilling.

Shrubs, trees, and roots will be cleared and grubbed before keying fill into the dikes and excavating slopes. Suitable organic soils and topsoil will be stockpiled for use in the top layer. Lifts will be approximately 6 to 8 inches thick (before compaction). To minimize settlement, soils are to be compacted with equipment than can produce or exceed the Standard Proctor compaction energy or as approved by the project supervisor. Soils should be within 2 percent (plus or minus) of optimum moisture content to more efficiently achieve the desired density. Each lift will be compacted to 100 percent of the soils maximum dry density as determined by the Standard Proctor Compaction test (ASTM D-698). A field (in-place) density and moisture content test will be made on each lift at a rate of 1 test per 20,000 sf to verify that the required degree of compaction is achieved. More or less testing may be conducted as directed by the project supervisor. The final lifts are to be graded to contours shown on the contingency closure plan drawings.

A non-woven (8 oz/yd^2 minimum) geotextile will be placed on top of the fill material to provide separation and protect the relatively impermeable clay layer which will be placed and compacted on top of the compacted fill material. This clay layer will be 24 inches in final thickness, comprised of clay soil with a permeability less than 1.0×10^{-7} cm/sec and will extend 2 feet beyond the plan limits of the backfill excavation and be keyed into the excavation slope. The layer will be graded such that a minimum 5 percent slope exists along all slopes. The clay soils will be compacted to 100 percent of soils maximum dry density (ASTM D-698) maintaining moisture content between optimum and 3 percent above optimum moisture content. Field density and moisture content tests will be conducted on each lift at a rate of 1 test per 20,000 sf to verify that the required degree of compaction is achieved.

A 20 mil PVC synthetic membrane liner will be installed over the clay layer. The liner will be fabricated from 20 mil PVC sheeting having a minimum Hydrostatic Resistance (puncture resistance) of 60 psi (ASTM D751 Method A). The PVC liner will be factory fabricated by PVC-adhesive bonding of single ply sheeting, a minimum of 60 inches wide, into large panels to minimize field seaming requirements. Field seaming shall be accomplished by overlapping adjoining panels, applying appropriate PVC adhesive bonding agent and sealing the overlapped panel edges with a steel roller. All field seams will be inspected and tested for integrity with an air wand seam test. Seam tensile strength tests shall be performed on test specimens obtained from the field seam at a rate of one test per seaming crew per day or for every 500 lineal feet of field seam installed, whichever is greater. Liner installation and seaming will be performed by a contractor approved and licensed by the liner manufacturer. All factory and field seaming shall be performed in accordance with the manufacturers recommended procedures.

A second non-woven (8 oz./yd^2 minimum) geotextile will be placed on top of the PVC liner to cushion and protect the liner from puncture during construction of the 12-inch thick granular drainage layer. This layer shall have a permeability of at least 1 x 10^{-3}cm/sec as determined by the design calculations accompanying these plans. The layer should be a sand and/or gravel mix with a USGS classification of SP to GP. To collect the lateral drainage, a 4-inch perforated PVC drain pipe will be provided around the periphery of the layer. Appendix B details the calculations that show the efficiency of the final cap and percolation drainage system. Addition of the synthetic membrane will allow even less infiltration making the design more conservative. A zone of suitable (unclassified) cohesive fill (about 30 inches thick) will be placed above the granular drainage layer, underlain by a third layer of non-woven geotextile (8 oz./yd^2 minimum). This zone will be placed as outlined above for fill material. The purpose of this layer is to provide a stable zone for additional frost protection of the clay layer.

Finally, an 18-inch thick layer of topsoil will be placed on the final graded surface cover. This topsoil layer will also be graded to a minimum 3 percent slope and will be permanently seeded to prevent significant erosion of the impoundment cap. The thickness of the topsoil layer will be sufficient to prevent root penetration of the underlying clay layer and will provide 5 feet of insulation for the clay layer/drainage system against frost penetration and/or freeze/thaw effects.

5.0 Promotion of Drainage and Minimization of Erosion or Abrasion

To promote proper drainage of the surfacewater run-off at the impoundment area, the top surface of the impoundment backfill will be graded uniformly to blend with the relatively flat site topography. As presented on the accompanying plans, the clean closure and contingency plans provide essentially the same final configuration. The surfacewater drainage from the surface of the closed impoundment will then be conducted to existing channels and diversions around the impoundment area which have been evaluated and upgraded as required to convey stormwater runoff from the design storm event (25-year frequency/24-hour duration rainfall). Appendix B presents surfacewater management plan calculations related to erosion and sedimentation control. the 4-inch diameter perforated PVC drain system (contingency plan) also discharges to the existing channels. Refer to the design calculations in Appendix B for computations related to the granular drainage layer and piping system. Refer to the drawings presenting both the clean closure and contingency plans for plans, sections, and details of the closure drainage systems.

In addition to the channel/diversion systems for the promotion of proper drainage, erosion control is also provided by a grassy type vegetated surface. As stated previously, the 18-inch topsoil cover will be properly prepared and seeded. Pulverized limestone will be applied to the soil in an amount to be determined from analysis of the soil by a qualified soil sampling testing service. One week after the limestone has been spread, fertilizer will be added as needed unless determined otherwise by testing. Fertilizer in the amount of 5-10-5 nitrogen, phosphorus and potash, respectively, will be spread at the rate of 30 lb per 1,000 sq. ft., after which a 1/3 inch layer of peat moss or mushroom manure will be added. The fertilized area will then be properly tilled and hand-raked to a smooth, even grade. All stones and dirt clods over 3-inches in largest diameter will be removed from the topsoil.

Seed will be sown on the fertilized area in conformance with the following rates:

SUGGESTED HERBACEOUS SPECIES FOR EROSION CONTROL

		Temporary (quick cover annual) Species[1] (use one with permanent mix)		Permanent (Long Lived) Perennial Species	
Geographic Regions	Seeding Time	Name	Seeding Rate (lb/acre)	Name	Seeding Rate (lb/acre)
Northeast & North Central U.S. and Northern Appachalia	Early Spring to Mid Spring	Annual Ryegrass	25	Ky-31 Tall fescue and	75
		Perennial Ryegrass	50	Birdsfoot trefoil or	30
		Oats	75	Crownvetch or	50
		Weeping Lovegrass	10	Flatpea	80
	Mid Spring to Mid Summer	Foxtail Millet	40	Ky-31 Tall fescue and	75
		Japanese Millet	50	Birdsfoot trefoil or	30
		Weeping Lovegrass	10	Crownvetch or	50
				Flatpea	
	Late Summer to Early Fall	Rye	80	Ky-31 Tall fescue and	75
		Winter Wheat	80	Birdsfoot Trefoil or	30
		Annual Ryegrass	25	Crownvetch	50

1 Use only one of the temporary species at rates shown. If more than one is used, reduce seeding rate of each species in proportion to number used (i.e., for two species, use half the seeding rate of each).

Alternative mixtures may be suggested for approval by the project supervisor at the time of seeding. All grass seed shall have a germination rate of 80 percent or more and a purity of at least 95 percent. Crownvetch shall have a germination rate of 70 percent or more (35 percent hard seed, 35 percent ready germination) and a purity of 98 percent or more. Seeding shall be accomplished by broadcasting and subsequently covering the seeds with a thin veneer of soil or by hydroseeding. Crownvetch shall be inoculated with a specific legume inoculant to promote symbiotic nitrogen fixation. If hydroseeding is utilized, fertilization, liming, seeding, and mulching may be accomplished with one operation; providing adequate plant growth can be assured to result from this operation.

Broadcast seeding shall require rolling with a cultipacker or other suitable equipment in order that seeds are incorporated between 1/4 and 1/2 inch below the soil surface. Seeding operations will be inspected by Koppers project supervisor. Seeded areas should be kept moist for approximately 10 days following seeding to enhance germination rates.

Seeded areas shall be mulched in order to conserve soil moisture and retard soil erosion. Mulch material shall be clean hay or straw or cellulose wood-fiber material. Hay or straw will be applied at a rate of 2.0 to 2.5 tons per acre if needed. Hay or straw shall be primarily used as mulch where seeding has been accomplished by broadcasting. This mulch shall be stabilized following placement by a method approved by the project supervisor. Cellulose wood fiber may be utilized as mulch when seeding is accomplished by hydroseeding as approved by the project supervisor. This mulch shall be applied at the rate of 1,500 pounds per acre as part of the hydro-mulch slurry.

Design calculations (Appendix B) for the soil cover (by use of the Universal Soil Loss Equation) indicate that although the cap slope is not in excess of 5 percent, the anticipated soil loss is only about 0.7 tons/acre-year which is well below the maximum limit of 2.0 tons/acre-year. The cover system as designed is therefore judged to be adequate for soil erosion and sedimentation.

SECTION VIII
Attachment 5.0-1
Final Contours
(Contingent Closure)

NOTES:

1. THE BASE OF THE IMPOUNDMENT SHOWN IS APPROXIMATE. THE FINAL BACKFILLED BASE ELEVATION MAY VARY FROM THAT SHOWN.
2. MONITORING WELLS ADJACENT THE IMPOUNDMENT WILL BE PROTECTED DURING CONSTRUCTION.
3. CHANNELS/PERIMETER DIVERSIONS SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE SURFACE WATER MANAGEMENT PLANS AND IN GENERAL CONFORM TO EXISTING TOPOGRAPHY TO MINIMIZE THE AMOUNT OF CONSTRUCTION UPGRADING.
4. REFER TO DRAWING A103034 FOR THE PLAN, SECTIONS, AND DETAILS UNDER CLEAN CLOSURE CONDITIONS.
5. REFER TO DRAWING A103032 FOR THE PLAN, SECTIONS AND DETAILS UNDER CONTINGENT CLOSURE CONDITIONS.
6. WATERSHEDS SHOWN ARE THOSE IMMEDIATELY ADJACENT THE PROPOSED CLOSURE AREA WHICH ARE EXPECTED TO CONTRIBUTE SIGNIFICANT STORMWATER RUNOFF.

LEGEND

- CHANNEL/DIVERSION
- WATERSHED DIVIDE
- FINAL CLOSED IMPOUNDMENT ELEV. CONTOUR (FT) (675)

WATERSHED SUMMARY

WATERSHED NO.	AREA (ACRES)
I	0.66
II	0.55
III	0.35
IV	1.84
V	1.56
VI	1.44
VII	0.25
VIII	3.70
IX	3.60
X	2.25
XI	1.62
TOTAL	17.82

CHANNEL SCHEDULE

CHANNEL/ DIVERSION	REACH	DESIGN FLOW (cfs)	BOTTOM SLOPE (%)	TOTAL DESIGN DEPTH	FLOW VEL (fps)	MANNINGS n (No. UNITS)
C-1	–	6	0.2	3.0	1.6	0.03 (GRASS)
C-2	–	5	0.5	2.5	2.2	0.03
C-3	A	5	0.33	2.5	1.9	0.03
C-3	B	8	0.33	3.0	2.1	0.03
C-3	C	23	0.33	4.0	2.7	0.03
C-3	D	26	0.40	4.0	3.0	0.03
C-4	–	12	0.5	3.0	2.7	0.03
C-5	–	4	1	2.0	2.7	0.03
C-6	–	29	0.5	4.0	3.3	0.03
D-1	–	2	1	2.0	2.2	0.03
D-2	–	1	1	1.5	1.9	0.03

ALL SIDES SLOPES ARE 2H: 1V

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
Richard L. Van Tassel
NO. 21092-E

TOPOGRAPHY REFERENCE:
MAP PREAPRED BY SEAWAY ENGINEERING CO., DULUTH, MINN. DATED JUNE, 1984.

REV.	DESCRIPTION	CHECKED BY	DATE

	NAME	DATE
DRAWN BY	A.R. CONTRAEL	5-28-87
CHECKED BY		
APPROVED BY	Richard L. Van Tassel	8/26/87

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

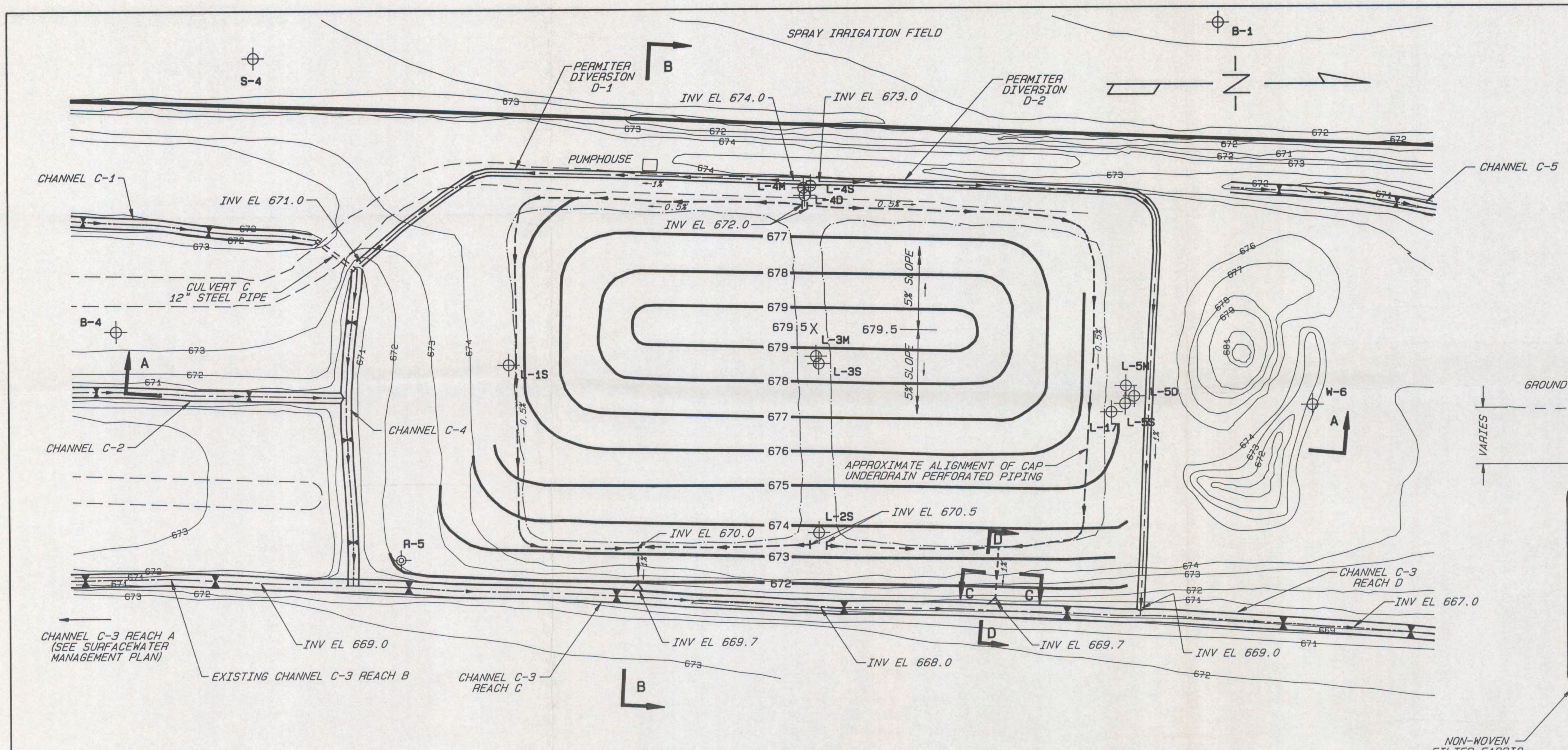
SURFACE WATER MANAGEMENT PLAN
SUPERIOR, WISCONSIN

KOPPERS COMPANY INC.

A103033

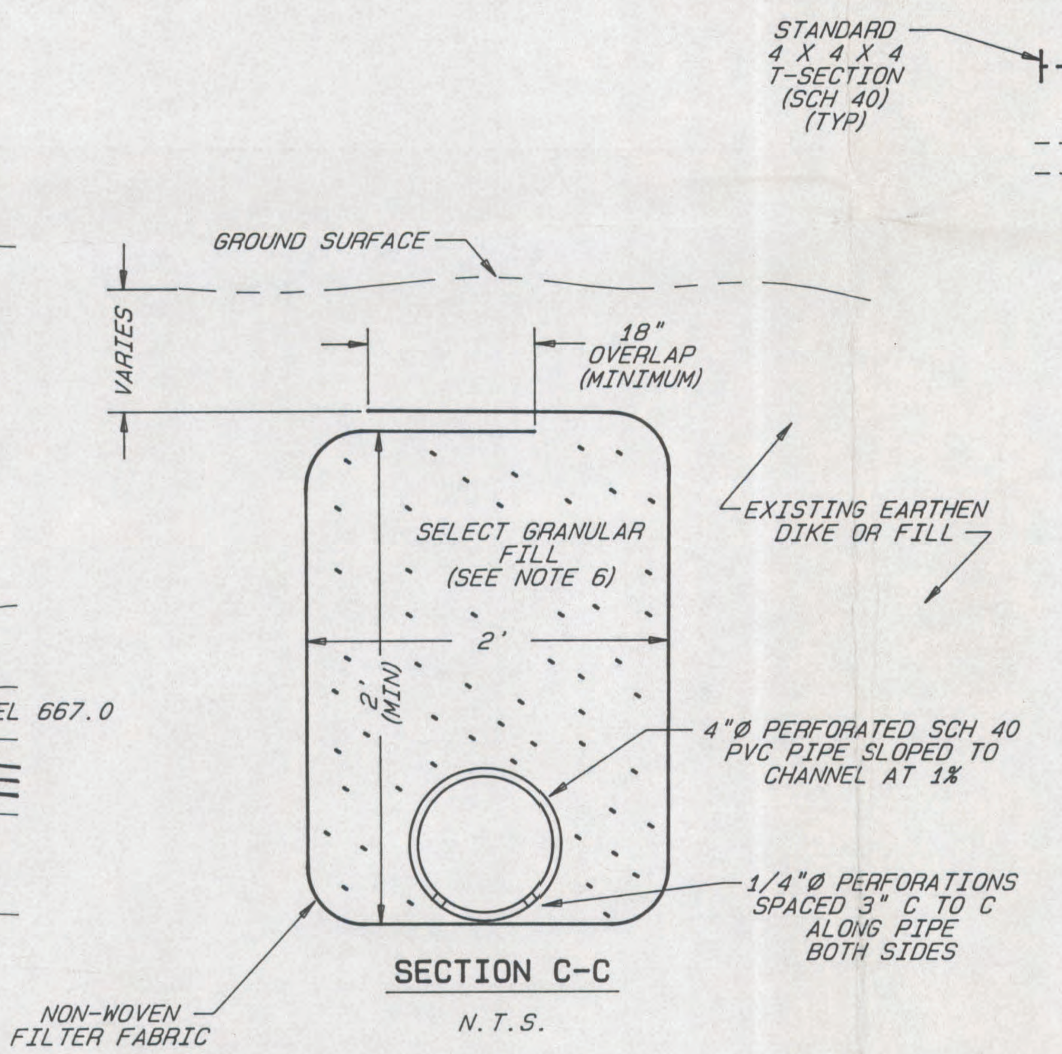
ACTIVITY NO. 185700-20 SCALE 1" = 60'

A103033 REVISION 0



PLAN

SCALE 1" = 40'



SECTION C-C

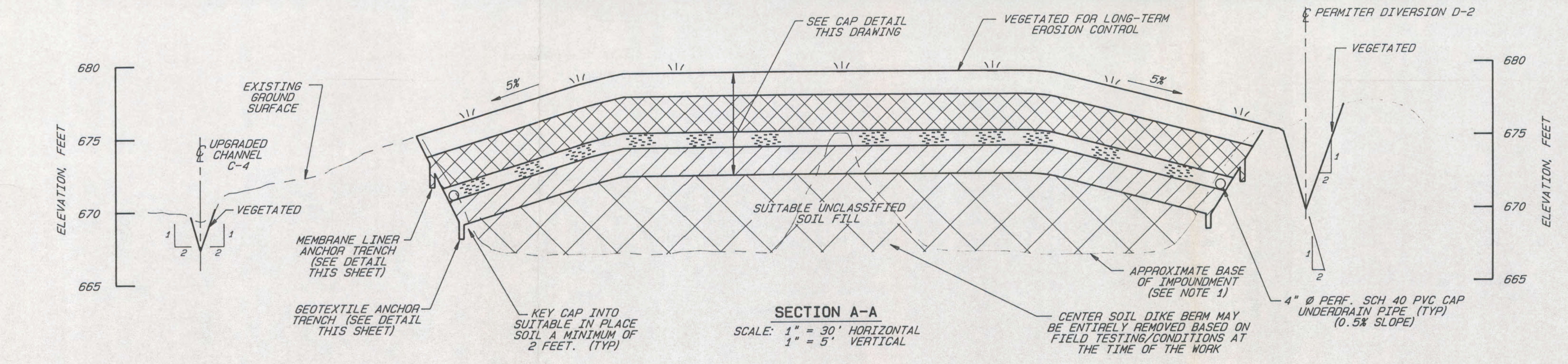
N.T.S.

LEGEND

(symbol)	PERIMETER DIVERSION (1% SLOPE)
(symbol)	CHANNEL (SLOPE VARIES)
672	EXISTING ELEVATION CONTOURS (U.S.G.S. MEAN SEA LEVEL DATUM)
679	PROPOSED TOP OF FINAL COVER ELEVATION CONTOUR (U.S.G.S. M.S.L.)
END CAP 0.5%	4 INCH DIAMETER PERFORATED PVC PIPE (SCH 40) CAP UNDER DRAIN PIPING (0.5% SLOPE)
1.0%	4 INCH DIAMETER PERFORATED PVC PIPE (SCH 40) DISCHARGE POINT (1.0% SLOPE)
(symbol)	ACCESS ROADS (EXISTING)

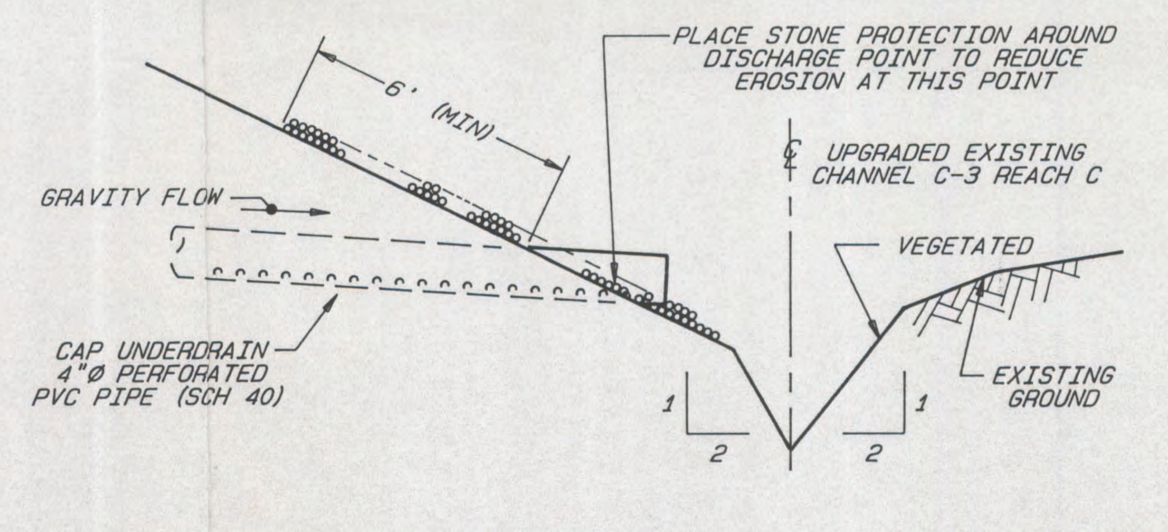
NOTES

1. THE BASE OF THE IMPOUNDMENT SHOWN IS APPROXIMATE. THE FINAL BACKFILLED BASE ELEVATION MAY VARY FROM THAT SHOWN.
2. MONITORING WELLS REQUIRED FOR POST CLOSURE MONITORING WILL BE PROTECTED DURING CONSTRUCTION.
3. CHANNELS/PERIMETER DIVERSIONS SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE SURFACE WATER MANAGEMENT PLANS AND IN GENERAL CONFORM TO EXISTING TOPOGRAPHY TO MINIMIZE THE AMOUNT OF CONSTRUCTION UPGRADING.
4. REFER TO DRAWING A103033 FOR THE SURFACE WATER MANAGEMENT PLAN.
5. REFER TO DRAWING A103034 FOR THE PLAN, SECTIONS, AND DETAILS UNDER CLEAN CLOSURE CONDITIONS.
6. SELECT GRANULAR FILL IN THE CAP UNDERDRAIN DISCHARGE PIPING (SECTION C-C) SHOULD BE CLEAN SAND AND/OR A SAND/GRAVEL MIX. THE GRANULAR DRAINAGE LAYER SHOULD BE A SAND/GRAVEL MIX WITH A U.S.C.S. CLASSIFICATION OF GP AND HAVING A PERMEABILITY OF BETWEEN 1 AND $5x10^{-3}$ cm/s. THE CLAY CAP SHALL HAVE A PERMEABLITY OF NOT MORE THAN $1x10^{-7}$ cm/s. THE GEOTEXTILE SHALL BE 8 oz./yd^2 MINIMUM WEIGHT AND SHALL BE MIRAFI 180N, SUPAC 8NP, BIDIM U34, OR AN APPROVED EQUAL. THE SYNTHETIC MEMBRANE LINER SHALL BE FABRICATED FROM SINGLE PLY 20 MIL PVC SHEETING. ALL SOIL (COHESIVE) MATERIALS SHALL BE COMPACTED TO AT LEAST 100 PERCENT MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST METHOD. THE GRANULAR LAYER SHALL BE LEFT UNCOMPACTED TO PREMOTE DRAINAGE. TOPSOIL SHALL BE PLACED TO HAVE A TOTAL UNIT WEIGHT OF BETWEEN 105 pcf AND 115 pcf TO PROMOTE GROWTH. THE USE OF ANY PROPOSED SOIL FILL MATERIAL, GEOTEXTILE OR SYNTHETIC MEMBRANE LINER SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.



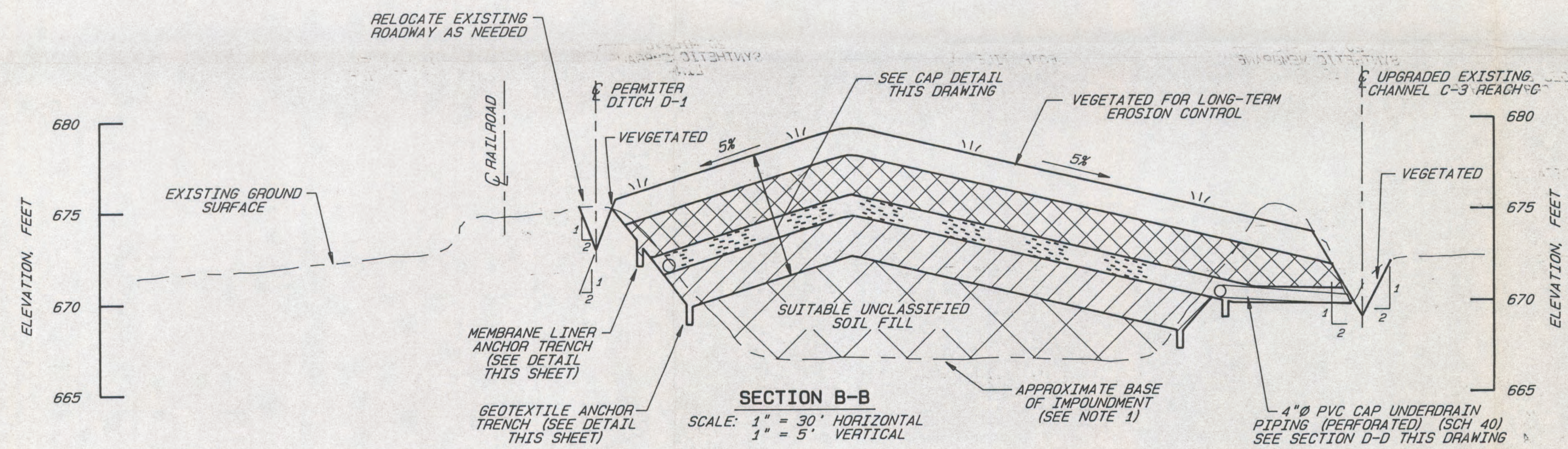
SECTION A-A

SCALE: 1" = 30' HORIZONTAL
1" = 5' VERTICAL



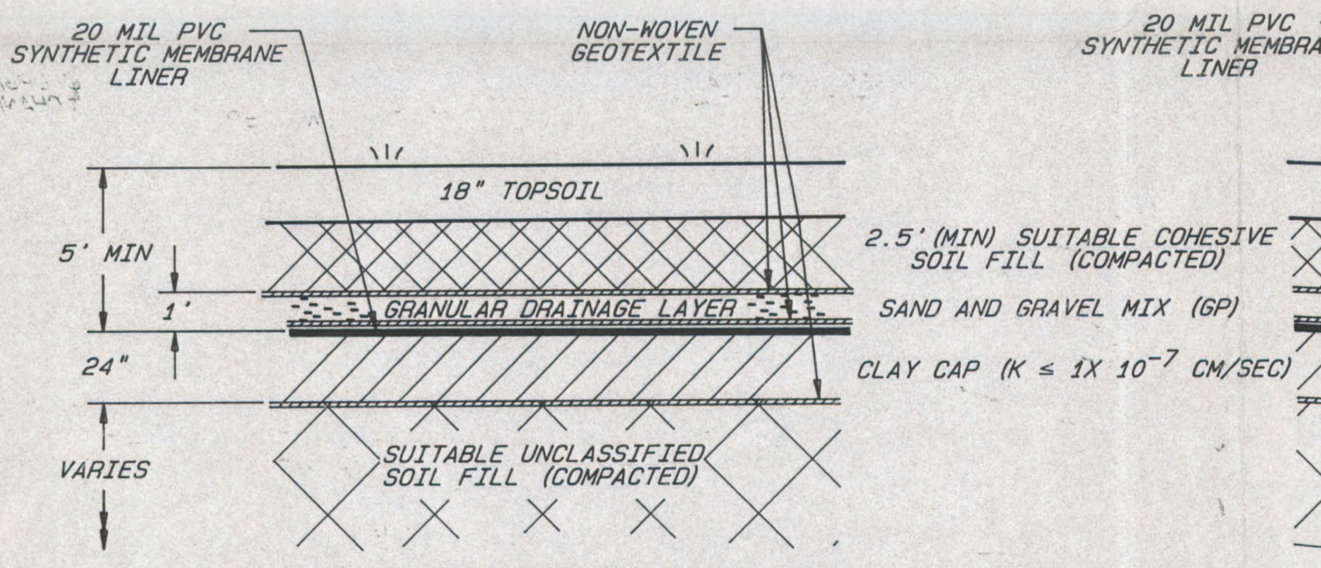
SECTION D-D

N.T.S.



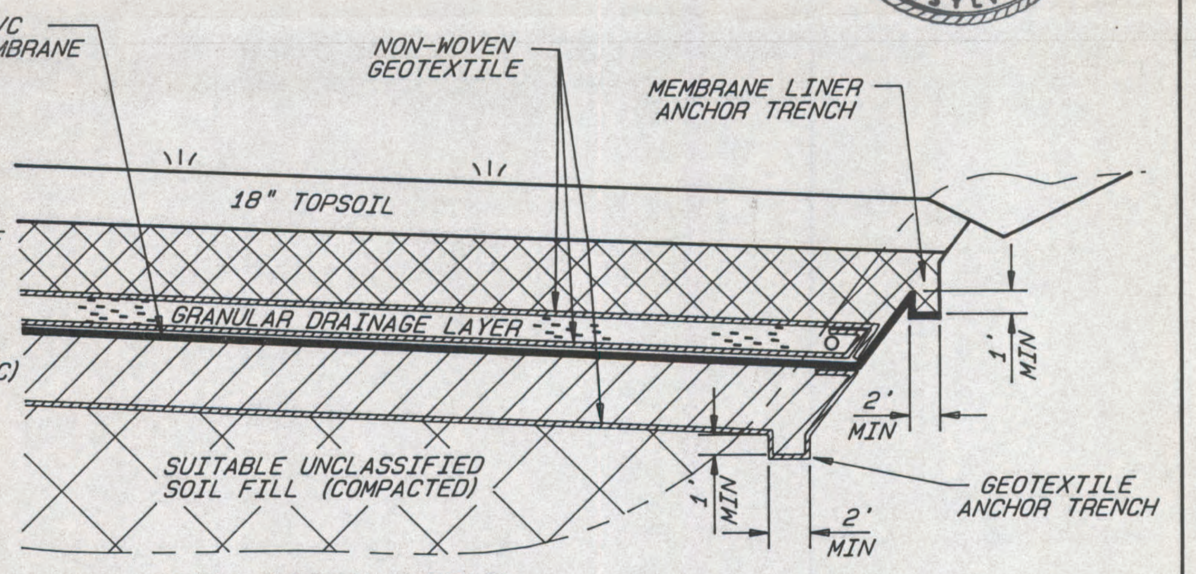
SECTION B-B

SCALE: 1" = 30' HORIZONTAL
1" = 5' VERTICAL



CAP DETAIL (SEE NOTE 6)

N.T.S.



ANCHOR TRENCH DETAIL

N.T.S.

TOPOGRAPHY REFERENCE:
MAP PREPARED BY SEAWAY ENGINEERING CO., DULUTH, MINN. DATED JUNE, 1984.

A103032

REV.	DESCRIPTION	CHECKED BY	DATE
1	ADD ANCHOR TRENCH DETAIL AND MISC REVISION	MWB	8-87

	NAME	DATE
DRAWN BY	T.D. BROLLEY	05/26/87
CHECKED BY	M. BOLLINGER	08/26/87
APPROVED BY	R. VAN TASSEL	08/26/87

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

CONTINGENCY PLAN
SURFACE IMPOUNDMENT CLOSURE
PLAN, SECTIONS AND DETAILS
SUPERIOR, WI SITE
KOPPERS COMPANY INC.

ACTIVITY NO. 185700-20 SCALE AS SHOWN

A103032 REVISION 1

IX POST-CLOSURE CARE REQUIREMENTS

The Post-Closure Care Plan for the Koppers facility includes the inspection, monitoring, and maintenance activities that are to be performed to prevent the post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall runoff or waste decomposition products to ground, surface waters or to the atmosphere. Post-closure maintenance pertains to the closed surface impoundments and groundwater monitoring system, in the event all wastes cannot be removed upon closure.

An annual photographic record of the site will be maintained on file with the inspection log sheets.

1.0 Inspection of Final Cover

The following features are to be subject to inspection during the post-closure care period:

- Site access and security systems,
- Internal and external road systems,
- Covers (including vegetative cover condition, erosion, settlement, and displacement), and
- Runon and runoff control systems.

(See inspection log sheet, Attachment 1.0-1)

The post-closure care of the closed surface impoundment will be conducted by Koppers during the operating life of the plant. After shut-down of the plant, the post-closure care for the closed facilities at the Superior site is to be conducted primarily by a post-closure contract person. During continued plant operation, the plant manager will function as the contact person. The current plant manager, Mr. Dave Shaw can be contacted at (715) 392-2211.

The contact person will be provided with necessary inspection equipment by Koppers. This equipment will be used by the contact person to perform the inspection, monitoring and maintenance tasks. Although additional assistance is not expected, outside assistance may be required if, for some reason, major maintenance activities become necessary. The post-closure cost estimates that are included are based on the assumption that some outside assistance will be necessary through the post-closure period.

The contact person will conduct monthly inspections of the overall site as well as the closed surface impoundment. The contact person will inspect site access and security systems (i.e., fences and gates) on the internal and external road system. For the closed surface impoundments, the contact person will inspect for cover integrity including vegetative cover condition, potential erosion damage and cover subsidence, and runon and runoff control system integrity. The result of the inspections will be placed on an inspection log sheet (see Attachment 1.0-1).

The monthly inspection frequency is justified because the forces of nature acting on the site are likely to cause relatively slow rates of change. For instance, the most likely natural force to affect change on the site is rainfall runoff. However, even if several large, closely-spaced rainstorms were to cause accelerated erosion, the monthly inspection schedule would still allow the contact person sufficient time to take appropriate action.

2.0 Inspection and Maintenance of the Groundwater Monitoring System

The following features are to be subject to inspection and maintenance during the post-closure care period:

- o Groundwater monitoring wells,
- o Monitoring well covers, and
- o Benchmark integrity.

(See inspection log sheet, Attachment 1.0-1)

If any excessive wear to the monitoring well covers occurs, they will be replaced. The established benchmarks will be inspected, and if need be repair work will be conducted to ensure the proper elevation has been retained.

The contact person will be responsible for maintenance activities of the site. Additional labor and equipment operators may be needed occasionally and their costs have been included in the post-closure cost estimate. Maintenance activities at the site will be triggered by problems/deficiencies which will be noted in the monthly inspections. Observation of the problems/deficiencies could result in initiation of one or more of the following maintenance activities (as appropriate):

- o Repair of security control devices,
- o Erosion damage repair,
- o Correction of settlement, subsidence and displacement,
- o Mowing, fertilization, and other vegetative cover maintenance,
- o Repair of runon and runoff control structures, or
- o Well replacement.

3.0 Groundwater Monitoring Program

During the interim status period, monitoring wells were installed to sample the site groundwater. Groundwater monitoring will continue during the post-closure period as required by RCRA regulations and/or the Post Closure Permit. It is anticipated that if contingent closure is necessary, the groundwater monitoring well network in place at the time of closure will suffice during the post-closure care period. It may be necessary to abandon four wells (L-2S, L-3S, L-3M and L-17) prior to capping the lagoons. If the abandonment of these wells does become necessary, WDNR will be notified prior to abandonment.

3.1 Groundwater Sample Collection

The sampling and analysis methods used at the Superior facility will follow SOP-201 that is contained in Attachment 3.0-1. This document describes methods utilized by Keystone Environmental Resources, Inc. personnel and was prepared by incorporating various EPA guidance documents. Discussed below are specific procedures to be used at the plant that vary slightly from the generic procedures presented in SOP-201.

The water level probe will be used to determine the depth to the well bottom and thus, any siltation problems will be identified by recording the total depth of the well. Water level measurements will be made to an accuracy of 0.01 foot. Well depth measurements will be made to an accuracy of 0.1 foot. Both of these measurements will be made before any well purging or sampling takes place.

Prior to sampling, water probe measurements will be used to calculate the volume of water stored in each well. Wells will be purged by removing a minimum of four casing volumes of water or until the well is purged dry. During purging the bailer will be periodically lowered to the bottom of the well to thoroughly mix the water. The surging action of the bailer also acts to loosen fine grained particles within the well screen and sand pack. If purged to dryness, the water level will be allowed to recover sufficiently to permit sampling by the bailer, not necessarily until complete recovery has occurred. Samples will be removed from the screened portion of the well whenever possible.

A separate stainless steel bailer with new nylon cord will be used to purge and sample each well. Top filling 1 1/2" diameter bailers 18 inches in length with a volume of 400 mls will be used. All of these bailers will be laboratory-cleaned as follows:

- o Non-phosphate Detergent Wash
- o Tap Water Rinse
- o Distilled Water Rinse (2x)
- o 20:1 HCl Rinse

- Acetone Rinse (Pesticide Quality)
- Hexane Rinse (Pesticide Quality)
- Air Dry With Pure Nitrogen
- Heat at 1200°F for One Hour
- Cool to Room Temperature
- Corks are Inserted into Bottom of Bailers
- Bailers are Wrapped in Aluminum Foil with the Shiny Side Out

To prevent cross contamination, new plastic sheeting is placed around the casing of each monitoring well and new surgical and cotton gloves are worn throughout the purging and sampling process. After purging has been completed, the bailer is gently lowered into the well to collect undisturbed groundwater samples at the top of the water column. The water sample is then carefully transferred into the appropriate containers to prevent degassification of water. The sample containers are filled in order of the volatilization sensitivity of the parameters according to the RCRA Technical Enforcement Guidance Document (TEGD) (EPA, 1986).

All measurements of pH, conductivity and temperature will be taken in the field. Each meter is calibrated with buffer solutions to ensure accurate measurements. Calibration of the meters will be performed before shipment, and before, during, and after all field measurements.

As recommended in the RCRA TEGD, water samples being analyzed for inorganic parameters will be filtered at the site using 0.45 micron filter paper.

3.2 Sample Preservation and Shipment

All groundwater samples will be placed in laboratory prepared glass containers. Samples to be analyzed for the following parameters will be placed in 8 oz jars and preserved with sodium bisulphate to lower the pH of the sample water to less than 2.0 (as measured in the field with litmus paper):

- o Total Organic Carbon (TOC)
- o Total Kjeldahl Nitrogen (TKN)
- o Ammonia (NH3-N)
- o Chemical Oxygen Demand (COD)
- o Phenol

Samples to be analyzed for arsenic, chromium, and copper will be preserved with nitric acid. All other parameters require no additional preservation beyond refrigeration.

Separate 8 oz. jars will be used for the collection of the field measurement samples (pH, conductivity) and the total dissolved solids samples. The K001 waste specific parameters (EPA methods 604 & 610) will be collected in 32 oz. amber glass bottles with a teflon-lined lid. These bottles are laboratory cleaned as follows:

- o Acetone Rinse (Pesticide Quality)
- o Hexane Rinse (Pesticide Quality)
- o Air Dry With Pure Nitrogen

All sample containers will be packed in coolers with ice and shipped via overnight delivery to the analytical laboratory.

A chain-of-custody form will be completed for each cooler. Chain-of-custody procedures as outlined in Attachment 3.0-1 will be maintained throughout the shipment process.

3.3 Analytical Procedures

Groundwater samples collected from monitoring wells W-2, W-4A, W-4B, W-4C, W-5, and W-6 for WPDES monitoring will be analyzed for the following parameters:

Parameter	Analytical Method
pH	EPA-150.1
Conductivity	EPA-120.1
Temperature	-
Total Dissolved Solids	EPA-160.1
Hardness	EPA-130.2
Nitrate	EPA-353.2
Chloride	EPA-325.3
Ammonia	EPA-350.1
Total Organic Carbon	EPA-420.2
Total Kjeldahl Nitrogen	EPA-351.1
Chemical Oxygen Demand	HACH 8000 (EPA approved)
Total Phenols	EPA-420.2
Phenols including Pentachlorophenol	EPA-604
Polynuclear Aromatic Hydrocarbons	EPA-610
Arsenic	EPA-206.2
Chromium	EPA-218.2
Copper	EPA-220.2

Groundwater samples collected from monitoring wells L-1S, L-4S, L-4D, R-6D, R-7D, R-9D, W-4A, W-4B, W-4C, and W-6 utilized for compliance monitoring, will be analyzed for the following parameters:

Parameter	Analytical Method
pH	EPA-150.1
Conductivity	EPA-120.1
Chloride	EPA-325.3
Total Organic Carbon	EPA-420.2

Total Organic Halogens	SW-9020
Chemical Oxygen Demand	HACH 8000 (EPA approved)
Phenols including Pentachlorophenol	EPA-604
Polynuclear Aromatic Hydrocarbons	EPA-610
Other Parameters*	

* **Any Appendix IX parameters detected at any well during the groundwater quality assessment at the Superior site will also be analyzed for during each quarter. This list will be available in its entirety after Appendix IX sampling is completed. A list of Appendix IX sampling to date can be found in Attachment 4.0.**

Analytical procedures will be in accordance with the above referenced methods and will include the analyses of field and trip blanks for each sampling event.

3.4 Chain-of-Custody

All sample transport will be in accordance with Keystone's strict chain-of-custody procedures which are outlined in Attachment 3.0-1.

3.5 Sampling Frequency

Existing wells which comprise the compliance monitoring system will be sampled on a quarterly basis during the post closure period. Four rounds of sampling for all Appendix IX constituents which were detected in the groundwater quality assessment program and the parameters specified above will be performed after lagoon closure in the wells included as part of the compliance monitoring program. These samples will be collected monthly at these points and used to establish background levels for each well. Appendix IX sampling remains to be performed for the three newly installed wells, R-6D, R-7D and R-9D. Analytical results obtained for these three wells will be forwarded to WDNR upon completion.

Wells 4A, 4B and 4C will probably be used to establish true background levels for detected Appendix IX constituents and for the other parameters to be included in compliance monitoring. It is understood that final determination of samples to be used in establishing background levels for selected indicator parameters will be at the final discretion of WDNR.

After the initial four monthly rounds of data for the detectable Appendix IX constituents and other parameters to be included in compliance monitoring are collected, monitoring for these same constituents will continue on a quarterly basis. Wells included in WPDES monitoring will be sampled on a biannual basis simultaneously with the second and fourth quarters of compliance sampling.

3.6 Compliance Point Groundwater Quality Values

After the background groundwater quality is established for the site after closure, analytical data from samples collected quarterly from each downgradient well versus the background data from upgradient wells will be statistically compared to determine whether there are any statistically significant differences between these two groups. The upgradient wells original background data will also be compared with current data from upgradient wells. These tests will be performed annually throughout the compliance period.

It is proposed that the Cochran's Approximation to the Behrens-Fisher T-test as described in NR 181.49 be used to perform the comparative tests. To make the statistical determination, four portions of each sample from each downgradient well will be analyzed separately. The mean of each parameter from each well will be compared to the background value of that parameter to determine if there is a statistically significant difference at the 0.05 alpha significance level.

All indicator parameters (specified by WDNR) will be included in the statistical testing. The procedure of replicate sampling and statistical testing will continue throughout the compliance period to be set by WDNR upon approval of the closure plan, and results of the testing will be submitted annually to WDNR.

If statistically significant increases over background are found, Koppers will repeat the analysis procedure with a fresh sample from the monitoring well. If the second round of analyses again shows a statistically significant difference compared to background, Koppers has the option of requesting an alternate concentration level (ACL) other than background to which the compliance point samples can be compared or proposing a corrective action program specific to the impoundments. WDNR would be notified if any statistically significant differences are found.

If a corrective action program is proposed, it would be subject to WDNR review and approval. Only upon implementation of the approved corrective action program and/or the return of groundwater to background levels (or possibly an approved ACL) would WDNR approve a clean closure.

3.7 Reporting Attainments of Groundwater Quality Standards

Throughout the compliance period, for parameters to be included in quarterly monitoring (which have Preventive Action Limits or Enforcement Standards set in NR 140, Wisconsin Administrative Code) that exceed the standards will be reported to WDNR. Both the Enforcement Standards and the Preventive Action Limits presented n NR 140 are shown on the following page.

Other established Preventive Action Limits are given below:

Parameter	Preventive Action Limit
pH	1 pH unit above or below background pH
Field Temperature	3 standard deviations or 10°F (whichever is greater) above or below background temperature.
Other indicator parameters *	Background water quality plus 3 standard deviations or the background water quality plus the increase of that parameter (whichever is greater).

* Other indicator parameters for the Superior site will be specified by WDNR.

Public Health Groundwater Quality Standards

Substance	Enforcement Standard (micrograms per liter - except as noted)	Preventive Action Limit (micrograms per liter - except as noted)
(1) Aldicarb	10	2
(2) Arsenic	50	5
(3) Bacteria, Total Coliform	Less than one in 100 ml for membrane filter method or not present in any 10 ml portion by fermantation tube method for both preventive action limit and enforcement standard	
(4) Barium	1 milligram/liter (mg/l)	.2 mg/l
(5) Benzene	.67	.067
(7) Cadmium	10	1
(8) Carbofuren	50	10
(9) Chromium	50	5
(10) Cyanide	460	92
(11) 1,2-Dibromoethane	.010	.001
(12) 1,2-Dibromo-3-chloropropane (DBCP)	.05	.005
(13) p-Dichlorobenzene	750	150
(14) 1,2-Dichloroethane	.5	.05
(15) 1,1-Dichloroethylene	.24	.024
(16) 2,4-Dichlorophenoxyacetic Acid	100	20
(17) Dinoseb	13	2.6
(18) Endrin	.2	.02
(19) Fluoride	2.2 mg/l	.44 mg/l
(20) Lead	50	5
(21) Lindane	.02	.002
(22) Mercury	2	.2
(23) Methoxychlor	100	20
(24) Methylene Chloride	150	15
(25) Nitrate + Nitrite (as N)	10 mg/l	2 mg/l
(27) Selenium	10	1
(28) Silver	50	10
(29) Simazine	2.15 mg/l	.43 mg/l
(30) Tetrachloroethylene	1	.1
(31) Toluene	343	68.6
(32) Toxaphene	.0007	.00007
(33) 1,1,1-Trichloroethane	200	40
(34) 1,1,2-Trichloroethane	.6	.06
(35) Trichloroethylene	1.8	.18
(36) 2,4,5-Trichlorophenoxypropionic Acid	10	2
(38) Vinyl Chloride	.015	.0015
(39) Xylene	620	124

History: Cr. Register, September, 1985, No. 357, eff. 10-1-85.

Public Welfare Groundwater Quality Standards

Substance	Enforcement Standard (milligrams per liter - except as noted)	Preventive Action Limit (milligrams per liter - except as noted)
(1) Chloride	250	125
(2) Color	15 color units	7.5 color units
(3) Copper	1.0	.5
(4) Foaming agents MBAS (Methylene-Blue Active Substances)	.5	.25
(5) Iron	.3	.15
(6) Manganese	.05	.025
(7) Odor	3 (Threshold Odor No.)	1.5 (Threshold Odor No.)
(8) Sulfate	250	125
(9) Total Dissolved Solids (TDS)	500	250
(10) Zinc	5	2.5

History: Cr. Register, September, 1985, No. 357, eff. 10-1-85.

Methodology for Establishing Preventive Action Limit for Indicator Parameters

Parameter	*Minimum Increase (mg/l)*
Alkalinity	100
Biochemical oxygen demand (BOD_5)	25
Boron	2
Calcium	25
Chemical oxygen demand (COD)	25
Magnesium	25
Nitrogen series	
—Ammonia nitrogen	2
—Organic nitrogen	2
—Total nitrogen	5
Potassium	5
Sodium	10
Field specific conductance	200 micromhos/cm
Total hardness	100
Total organic carbon (TOC)	1
Total organic halogen (TOX)	.25

History: Cr. Register, September, 1985, No. 357, eff. 10-1-85.

The standard deviation (s) of a sample (which approximates the standard deviation of a population when the sample is representative) is given by the positive square root of the sample variance:

$$s = \sqrt{s^2}$$

The sample variance (s^2) estimates the spread of the population:

$$s^2 = \frac{\sum(y - \bar{y})^2}{n - 1} = \frac{\sum y^2 - (\sum y)^2/n}{n - 1}$$

where
y = value of one element of the sample
$\bar{y}$ = mean value of the sample
n = number of elements in the sample

According to The Empirical Rule, in any collection of data:

Approximately this proportion of data:	Lies within this interval:	
	Population	Large Sample
0.682	$\mu \pm 1\sigma$	$\bar{y} \pm 1s$
0.954	$\mu \pm 2\sigma$	$\bar{y} \pm 2s$
0.997	$\mu \pm 3\sigma$	$\bar{y} \pm 3s$

Should attainment or exceedence of Preventive Action Limits or Enforcement Standards occur, Koppers must explain the cause and significance of the attainment or exceedence. It may be necessary for Koppers to exercise the option of requesting an alternate concentration level (ACL) other than background to which the compliance point samples can be compared or proposing a corrective action program specific to the impoundments.

If a corrective action program is proposed, it would be subject to WDNR review and approval. Only upon implementation of the approved corrective action program and/or the return of groundwater to background levels (or possibly an approved ACL) would WDNR approve a clean closure.

If, at the end of the compliance period (to be specified by WDNR), no statistically significant increases in levels of indicator parameters over background groundwater quality are found nor are any Preventive Action Limits or Enforcement Standards for groundwater exceeded, then WDNR <u>may</u> approve a clean closure and modify the closure plan approval to omit the groundwater monitoring requirements.

3.8 Annual Determination of Groundwater Flow Rate and Direction

Water level data obtained during the groundwater sampling will be reduced to a common elevation datum to facilitate site-wide correlation. The resulting water level elevations will be plotted on a well location plan and contoured at a 0.5-foot contour interval. Direction of groundwater flow will be shown on the contour map.

Rates of groundwater flow will be calculated using the following formula and assumptions:

$$v = \frac{Ki}{n}$$

Where v=average linear groundwater velocity
K=hydraulic conductivity
i=groundwater gradient
n=porosity

Groundwater gradients will be measured from the contoured groundwater elevation data. Hydraulic conductivities calculated from previous pump and slug test data, and porosities estimated (by reference to typical porosity values for specific geologic materials listed in standard groundwater textbooks) will be used in this equation.

4.0 Notice in Deed

If closure activities result in the removal of all hazardous wastes, residues and contaminated soil, such that the unit is not classified as a disposal unit, no notice in the deed will be required. If clean closure is not achieved and closure is certified as a disposal unit, Koppers will add a notification to its deed stating that this land has been used to manage hazardous waste and its use is restricted under 40 CFR 264.120.

If clean closure is not achieved within 90 days after closure is completed, a survey plat will be filed with the authority which has jurisdiction over land use and to the Regional Administrators. The survey plat will indicate the location and dimensions of the filled surface impoundment with respect to surveyed permanent benchmarks.

A record of the type, location, and quantity of hazardous waste disposed of within the surface impoundment will be submitted to the Regional Administration of US EPA, within 60 days after certification of closure. A certification that the required notation has been recorded in the deed and a copy of the document in which the notation has been placed will also be submitted at this time.

SECTION IX

Attachment 1.0-1

Typical Post Closure Inspection Log Sheet

Revised 08/27/87

POST-CLOSURE INSPECTION LOG SHEET

Inspector's Name/Title______________________________

Date of Inspection______________________________
(month/day/year)

Time of Inspection______________________________

Item	Types of Problems	Status ( ) Acceptable/Unacceptable	Observations/ Photograph	Date and nature of repairs/remedial action
Backfilled Cover	Depressions, cracks of erosion			
Final Vegetative Cover	Depressions, cracks or erosion and barren spots, grass cutting			
Benchmarks	Deterioration, cracks or depression			
Groundwater Monitoring Wells	Concrete collar needs replaced, signs of cracks, replacement of exposed casing and cap			
Security	Fence broken or deteriorated			
Run-off/Run-on	Watering Pond			
Signs	Destroyed or damaged			

SECTION IX

Attachment 3.0-1

(SOP-201)

KOPPERS ENVIRONMENTAL RESOURCES
STANDARD OPERATING PROCEDURE

TITLE: GROUNDWATER SAMPLE COLLECTION FROM MONITORING WELLS

1.0 PURPOSE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes methods for the collection of groundwater samples from monitoring wells. The scope of this SOP is limited to field operations and protocols.

This SOP provides general guidance in the collection of groundwater samples from monitoring wells. Several methods, e.g., bailing and pumping, can be used to collect groundwater samples. The method of choice is dependent on such factors as parameters to be measured and depth to groundwater. In general, bailing is preferred over pumping for several reasons. Some of the more important reasons are (1) pumping affords more of an opportunity to alter volatile component concentrations because of sample agitation, (2) pumps are not easily dedicated to a given well, and (3) pumps are more difficult to decontaminate after use than bailers. In either case, the project engineer/scientist should stipulate in the sampling plan which method should be used in the field on each project.

2.0 RELATED DOCUMENTS

- U.S. Environmental Protection Agency, 1984. Characterization of Hazardous Waste Sites, A Methods Manual. Volume 2 Available Sampling Methods EPA-600/4-84-076.

- Scalf, M. R., J. A. McNabb, W. J. Dunlap, R. L. Cosby and J. Fryberger, 1981. Manual of Groundwater Sampling Procedures U.S. EPA, Robert S. Kerr, Environmental Research Laboratory, Ada OK. NWWA/WPA Series 1981.

3.0 RESPONSIBILITIES

The site coordinator (field team leader) or his designee shall have the responsibility to oversee and ensure that all groundwater sampling is performed in accordance with the project specific sampling plan and this SOP. In addition, the site coordinator must ensure that all field workers are fully apprised of this SOP. The project engineer/scientist should be contacted for specific instructions.

4.0 REQUIRED MATERIALS

The list below identifies typical pieces of equipment that may be used for a wide range of groundwater sampling applications. From this list, project specific equipment should be selected based upon project objectives, the depth to groundwater, purge volumes, analytical requirements and well construction.

- Purging/Sample Collection Equipment

  Bailers
  Centrifugal pump
  Submersible pump
  Peristaltic pump
  Bladder pump

- Related Sampling Equipment

  Thermometer
  pH meter
  Specific conductance meter
  Filtration apparatus (vacuum or pressure)
  Water-level measurement equipment

- General Materials

  Goggles or equivalent eye protection

Distilled water and dispenser bottle
Decontamination liquids
Field data sheets and/or log book
Sample preservation solutions
Sample containers
Buckets and intermediate containers
Coolers
First aid kit
Key(s) for well locks
Stopwatch

- Expendable Materials

Pump tubing
Bailer cord
Gloves
Filters
Chemical-free paper towels
Protective coverall, e.g., Tyvek

5.0 SAFETY PRECAUTIONS

Creosote and PCP are two chemical constituents which are health and safety concerns when conducting groundwater sampling. To reduce the potential for skin contact with these constituents, it is advisable that polyvinyl or other similar gloves be worn when conducting sampling activities. Safety shoes, hard hat, and safety glasses should also be worn. A minimum of two people should be employed for all sampling.

6.0 PROCEDURE

6.1 Sample Bottle Preparation

Three general types of analyses are performed on groundwater samples (1) conventional pollutants, (2) metallic pollutants, and (3) priority pollutants and Appendix VIII constituents. The protocols for preparing the bottles for each type of analyses are discussed below.

6.1.1 Conventional Pollutants

1. Use new bottles with screw-type lids.

2. Prelabel and prepreserve (where appropriate) all bottles prior to shipping sample bottles to field. If bottles are being sent via air freight, do not add preservatives to bottles. Add preservative material at the job site.

3. Place bottles in suitable shipping packages, for example, ice chests with adequate packing material to reduce bottle breakage (see Packaging and Shipping Samples SOP).

6.1.2 Metallic Pollutants

1. Use new polyethylene collapsible containers with plastic screw-type lids.

2. Clean new container:

   - Rinse with 1:1 nitric acid.
   - Rinse with tap water.
   - Rinse with distilled water.

3. Prelabel all containers prior to shipping sample bottles to field. Add preservative material at the job site.

4. Place container in suitable shipping package, for example, ice chests with adequate packing material to reduce bottle breakage.

6.1.3 Priority Pollutants and Appendix VIII Parameters

1. Use new amber bottles with screw-type lids.

2. Clean new bottles:

   - Wash with hot soapy water.
   - Rinse with tap water.
   - Rinse with 1:1 nitric acid.
   - Rinse with distilled water.
   - Wash with acetone (pesticide grade).
   - Wash with hexane (pesticide grade).
   - Wash with methylene chloride (HPLC grade).
   - Dry glassware and equipment with pure nitrogen.

3. Lids must have Teflon liners.

4. Prelabel and prepreserve bottles unless bottles are being shipped via air freight.

6.2 Bailer Preparation

1. Clean stainless steel bailers for routine RCRA sampling:

   - Prewash bailer with acetone if it is coated with oils.
   - Wash with hot soapy water.

- Rinse with tap water.
- Rinse with distilled water.
- Place bailer in furnace at heat for one hour at 1200°F.
- Let bailer cool to room temperature then wrap bailer with aluminum foil (shiny side out).

2. Clean stainless steel bailers for PAH, priority pollutants, interim primary drinking water standards and Appendix VIII parameter analysis sampling:

- Wash with hot soapy water.
- Rinse with tap water.
- Rinse with 1:1 nitric acid.
- Rinse with distilled water.
- Wash with acetone (pesticide grade).
- Wash with hexane (pesticide grade).
- Wash with methylene chloride (HPLC Grade).
- Dry with pure nitrogen.
- Heat for one hour at 1200°F.
- Cool to room temperature.
- Wrap bailer with aluminum foil (shiny side out).

6.3 Well (Bladder) Pump Preparation

1. When cleaning, the pump should be disassembled according to the manufacturer's manual.

2. The metal parts may be cleaned using a 1:1 nitric acid wash as the first step. Do not perform this step on the actual parts (i.e., pump head).

3. All parts are to be washed according to the procedure outlined in 6.1.2.

4. Reassemble pump and wrap with aluminum foil (shiny side out). Place pump in a plastic covering.

5. The line assembly should be cleaned using hot soapy water and rinsed using tap water then distilled water. The tubing is then blown dry using very pure nitrogen. Place tubing on the spool and wrap in plastic.

6.4 Water Level Measurement

1. Unlock and/or open the monitoring well. Enter a description of condition of the security system and protective casing in the field notebook or on the field data sheet (Table 1).

2. Cut a slit in one side of a plastic sheet and slip it over and around the well, creating a clean surface onto which the sampling equipment can be placed. This clean work area should be a minimum of 8 square feet. Care should be taken not to kick, transfer, drop, or in any way let soil or other materials fall onto this sheet unless it comes from inside the well.

3. Establish the measuring point for the well. The measuring point location should be clearly marked on the well casing or identified in previous sample collection records. The measuring point should be a point which is, or can easily be transposed vertically to the survey control point for the well. Record the measuring point location on the field data sheet or in the field notebook.

6.4.1 Measuring Tape Method

1. Mark the first two (2) feet of measuring tape using water-soluble pen.

2. Lower tape into well to approximate depth (using last well reading as a reference).

3. Note tape reading at top of well to the nearest hundredth foot (0.01).

4. Retrieve tape from well noting that point at which the ink is washed off by the water. Clean tape thoroughly after each time it is used. Wipe free liquids and moisture from the tape with chemical-free towel as tape is being reeled in.

Depth Calculation:

Example:	25.00	feet - top of well
	1.64	feet - length of ink washed off
	23.36	feet - depth to water

Note: Record this number for each well and return it with the samples. Make sure it does not get wet.

6.4.2 Resistance Probe Method

1. Lower the weighted probe into the well casing (as soon as the probe touches the water the meter will indicate a reading). Raise and lower the probe slowly until the first indication that the probe is touching the water.

2. Mark the point on the cable at the top of the well when the probe is just touching the water. Measure the distance from the mark to the last foot mark and add this measurement to it. This is the depth to water.

6.5 Well Purging and Sample Collection

All monitoring wells shall be purged prior to sample collection. Depending upon the ease of purging, 3 to 10 volumes of groundwater present in a well shall be withdrawn prior to sample collection. The volume of water present in each well can be computed using the depth of water column and inside diameter of well casing. The water column depth shall be computed as shown in Item b of Figure 1. The monitoring well diameter may be obtained by direct measurement in the field or from the boring log. Figure 1 will be used to compute the well volume. The following calculation can be used to calculate purge volume if three casing volumes are required:

(measured) (listed below are volumes for casing)

$$\# \text{ of bails} = \frac{\text{ft of } H_2O \text{ in well} \times \text{gallons of } H_2O \text{ per linear ft of casing dia.} \times 3785 \text{ (mls/gal)} \times 3}{\text{volume of bailer}}$$

(listed below are volumes for bailer size)

Gallons of H_2O/linear foot of casing diameter:

1-1/2" = 0.1057
2" = 0.1623
4" = 0.6613
6" = 1.5003

Bailer Volume (per foot of bailer)

1-1/8" = 150 mls
1-1/2" = 267 mls
3" = 1333 mls

NOTE: Standard Koppers bailers are 1.5 feet long

Two general methods are used for well purging, bailing or pumping.

Purging using pumps located at the ground surface is commonly performed with centrifugal or peristaltic pumps. All applications of surface pumping will be governed by the depth to the groundwater surface. Peristaltic and centrifugal pumps are limited to conditions where groundwater need only be raised through approximately 20-25 feet of vertical distance. The lift potential of a surface pumping system will depend upon the net positive suction head of the pump and the friction losses associated with the particular suction line. In all cases, pumping cannot be used for the collection of samples to be analyzed for volatile organic compounds.

Peristaltic pumps provide a low rate of flow typically in the range of 0.02-0.2 gallons/minute (75-750 ml/minute). For this reason, peristaltic pumps are not particularly effective for well purging. They are suitable for purging situations where a relatively long time period is available for purging. Peristaltic pumps will lift water a maximum of approximately 20 to 25 feet. They are most often used for the field filtering of samples and therefore they are most often used to obtain water samples from purged monitoring wells for direct filtration.

Centrifugal pumps are designed to provide a high rate of pumping, in the range of 10-40 gallons per minute (gpm). Centrifugal pumps can be used to pump at lower rates (1-5 gpm) if friction losses in the suction line are large, the pump drive motor is maintained at low speeds, or a valve is used to regulate discharge.

Two methods, direct connection or down well suction line may be used for well purging and/or sample collection by centrifugal pumps.

The direct connection method is used to collect groundwater samples with centrifugal pumps. As with all pumping methods, sample turbulence precludes the use of pumping for the collection of samples for analyses of volatile organic compounds.

Direct connection requires that a suction line system be constructed which will allow that sample collection to be performed on the suction side of the pump so that sample contamination due to pump contact is eliminated. In addition, the valve system on the suction line will provide a mechanism for the control of pumping. Each time pumping stops a valve will be closed immediately to prevent the return of water to the well which has contacted the pump.

Down well suction lines are used where direct connection cannot be made to the well riser pipe. Down well suction lines are used for applications when purging should include raising and lowering the suction tubing throughout the entire length of the water column.

The down well suction line method basically requires that a continuous length of tubing be used from the pump to the end of the suction line. For this reason, the method is only used for well purging because samples can only be collected from the discharge side of the pump.

Submersible pumps provide an effective means for well purging and in some cases sample collection. Submersible pumps are particularly useful for situations where the depth to water table is greater than 20 to 30 feet and the depth or diameter of the well requires that a large purge volume be removed during purging. Submersible pumps also provide a continuous discharge which allows that less variability be encountered with samples collected by this method.

The well (bladder) pump is a gas operated positive displacement submersible well pump that uses inert compressed gas, i.e., nitrogen, helium, or argon, as well as clean compressed air to inflate an internal bladder which pumps water up the discharge line.

6.5.1 Bailing

1. Obtain a clean/decontaminated bailer (see Section 6.2). Tie bailer cord to bailer. Test the knot for adequacy by creating tension between the line and the bailer.

2. Remove the aluminum foil wrapping from the bailer, and, while holding the bailer, place it inside the well to verify that an adequate annulus is present between the bailer and the well casing to allow free movement of the bailer.

3. Lower the bailer to the bottom of the monitoring well and remove an additional 5 feet of cord from the spool. Cut the cord at the spool and secure the rope to the well head.

4. Raise the bailer by grasping a section of cord using each hand alternately. This bailer lift method will provide that the bailer cord will not come in contact with the ground or other potentially contaminated surfaces.

5. Bailed groundwater will be poured from bailer into a graduated bucket to measure the purged water volume.

6. Collect purged water in buckets and dispose of in plant wastewater treatment system, if available on site.

7. For sample collection, bailers shall be lowered to the middle of the screen of the monitoring wells and withdrawn slowly through the water column.

8. Fill VOA vials first, directly from the bailer.

9. Pour remaining groundwater into laboratory decontaminated glass jugs prior to distribution into individual sample bottles (see Section 6.2 for decontamination procedures).

6.5.2 Peristaltic Pump

1. Place a new suction and discharge line in the peristaltic pump. Silicon tubing must be used through the pump head. A second type of tubing may be attached to the silicon

tubing to create the suction and discharge lines. Tygon tubing shall not be used when collecting samples for organic analyses. The suction line must be long enough to extend to the static groundwater surface and reach further should drawdown occur during pumping.

2. Lower suction line to bottom of monitoring well then draw suction line up 1 to 2 feet. Start the pump and direct the discharge into a graduated bucket.

3. Measure the pumping rate in gallons per minute by recording the time required to fill a selected volume of a bucket. Flow measurement shall be performed three times to obtain an average rate.

4. The pumping shall be monitored to assure continuous discharge. If drawdown causes the discharge to stop, the suction line will be lowered very slowly further down into the well until pumping restarts.

5. Samples will be collected after the required purge volume has been withdrawn. Dispose of purged water in plant wastewater system, if available.

6. Sample bottles shall be filled directly from the discharge line of the peristaltic pump or filtered prior to sample bottle filling. Remember to fill VOA vials first and do not filter. Care will be taken to keep the pump discharge line from contacting the sample bottles. Groundwater samples requiring filtration prior to placement in sample containers, will be placed in intermediate containers for subsequent filtration or filtered directly using the peristaltic pump.

7. Dispose of all tubing including the suction line, pump head and discharge line after each well use. In some cases where sampling will be performed frequently at the same point, the peristaltic pump tubing may be retained between each use in a clean zip-lock plastic bag.

6.5.3 Centrifugal Pump

A. Direct Connection Method

1. Establish direct connection to the monitoring well using pipe connections, extensions, and elbows, with Teflon tape wrapping on all threaded connections. Pipe material may be steel or other suitable material. If the centrifugal pump will subsequently be used for sample collection, a sample isolation chamber will be placed in the suction line configuration as shown in Figure 2.

2. Prime the pump by adding tap water or water from the well to the pump housing until the housing begins to overflow.

3. Start the pump and direct the discharge into a graduated bucket or a bucket of known capacity.

4. Measure the pumping rate in gallons per minute by recording the time required to fill a selected volume of a bucket. Flow measurement should be performed three times to obtain an average rate. Pumping will be observed at all times to determine if pumping rates are continuous, fluctuating, or diminishing. If discharge stops, the pump will be throttled back to determine if pumping will restart at a lower rate. If pumping does not restart, the pump should be shut off to allow the well to recharge.

5. Collect purged water in buckets and dispose of in plant wastewater treatment systems, if available.

6. Collect samples after the required purge volume has been withdrawn. Remember to fill VOA vials first and do not filter VOA sample.

7. Decontaminate all suction line parts after each well use.

B. Down Well Suction Line Method

1. Lower a new suction line into the well. The suction line will have a total length at least great enough to extend to the water table and account for several feet of drawdown. All connections will be made using Teflon ferrules and Teflon thread wrapping tape.

2. Prime the pump by adding tap water or well water to the pump housing until the housing begins to overflow.

3. Start the pump and direct the discharge into a graduated bucket or a bucket of known capacity.

4. Measure the pumping rate in gallons per minute by recording the time required to fill a selected volume of a bucket. Flow measurement should be performed three times to obtain an average rate. Pumping will be observed at all times to determine if pumping rates are continuous, fluctuating or diminishing. If discharge stops, the pump will be throttled back to determine if pumping will restart at a lower rate. If pumping does not restart, the pump should be shut off to allow the well to recharge.

5. Collect purged water in buckets and dispose of in plant wastewater treatment system, if available.

6. Collect samples after the required purged volume has been withdrawn. Remember to fill VOA vials first and do not filter VOA sample.

7. Close valve at the pump on the line whenever pumping terminates or pumping is stopped. This practice will minimize the return to the well of water which has contacted the inside of the pump housing.

8. Decontaminate all suction line tubing after each use if tubing is to be reused or use new tubing.

6.5.4 Submersible Pump

1. Prior to using a submersible pump, a check will be made of well diameter and alignment. A 1.75-inch diameter decontaminated cylindrical tube about the length and diameter of the pump should be lowered to the bottom of each monitoring well to determine if the alignment or plumbness of a well is adequate to accommodate the submersible pump. The well alignment survey may also be used to determine the total depths of wells. All observations will be entered in the field log book.

2. Lower the submersible pump into the monitoring well taking notice of any roughness or restrictions within the riser.

3. Count the graduations on the pump discharge line and stop lowering when the stainless steel portion is below the uppermost section of the static water column and also within the middle to bottom screened portion of the monitoring well. Secure the safety line to the well casing.

4. Connect the power cord to the power source (for example, rechargeable battery pack or auto battery monitor) and turn the pump on (forward mode).

5. Monitor drawdown continuously by remaining near the well at all times and listening to the pump. If drawdown continues to the extent that the well is pumped dry, the well will be allowed to recharge. The rate of recharge will be approximately determined by re-starting the submersible pump after a ten (10) minute period with the pump off. The pumping rate shall be re-measured and/or the total discharge volume collected to determine the recharge volume.

6. Direct the pump discharge to a graduated bucket or a bucket of known capacity.

7. Measure the pumping rate in gallons per minute by recording the time required to fill the bucket. Flow measurements shall be performed three times to obtain an average rate.

8. Collect purged water in buckets and dispose of in plant wastewater treatment system, if available.

9. Collect samples after purging.

10. Fill VOA vials first and do not filter VOA samples. Fill bottles directly from the discharge line of the pump taking care not to touch sample bottles to the discharge line.

11. Decontaminate pump, discharge line and power cord after each use.

6.5.5 Well (Bladder) Pump

1. Using a cleaned pump and tubing assembly, connect the line assembly to the pump by first attaching the cable and then connecting the sample and gas lines.

2. Lower pump down the well by unrolling the line off the spool until the pump touches bottom. Raise the pump 3 to 5 feet off the bottom or until 6 to 8 feet of tubing remains out of the well.

3. Secure the cable to hold the pump at the desired depth.

4. Connect the gas line to the control box. The discharge line should be placed in a container to collect the purged water (i.e., a 55 gallon drum).

5. Connect the gas supply to the control box and adjust pressure according to the manufacturer's manual.

6. Turn on control box and adjust inflate delay to obtain the best pumping cycle.

7. The pumping rate should be calculated to determine the length of time the pump should run to purge the well. Conductance and pH may be used to determine when enough water has been purged.

8. After purging is completed, the pump should be removed and the sample collected as outlined in Section 6.5.1.

7.0 QUALITY CONTROL

Quality control begins with the preparation of a concise sampling plan which identifies the location, number, and specific methods to be employed by field personnel in the collection of groundwater samples. Second, the guidance provided in this SOP should be adhered to unless otherwise specified in the sampling plan. Both the sampling plan and this SOP should be reviewed by all personnel participating in field collection activities. Both documents should be available in the field for reference.

A trip blank will accompany the sample bottle shipment and be returned to the laboratory for analysis as specified by the project engineer/scientist. One trip blank per sampling event is the minimum requirement.

A field blank will be collected by pouring laboratory distilled water into a laboratory cleaned bailer. The water is collected and distributed to the appropriate sample bottles. One field blank, each day groundwater monitoring wells are sampled, is the minimum requirement.

Other SOPs which discuss procedures for sample labeling, preservation, shipment, Chain-of-Custody and sampling equipment decontamination should be used and referred to frequently.

8.0 DOCUMENTATION

A number of different documents will be completed and maintained as a part of groundwater sampling. These documents will provide a summary of the sample collection procedures and conditions, shipment method, the analysis requested and the custody history. The list of documents is:

- Groundwater sample collection record
- Sample labels
- Chain-of-Custody forms
- Shipping receipts

Sample labels shall be completed at the time each sample is collected and will include the information listed below:

- Client or project name
- Sample number
- Designation (i.e., identification of sample point number)
- Analysis
- Preservative (e.g., filtration, acidified pH 2 HNO_3)
- Sample collection date
- Sampler's name

The Chain-of-Custody form is the record sample collection and transfer of custody. Information such as the sample collection date, sample identification and origination, and client or project name shall be entered on each Chain-of-Custody record. In accordance with 40 CFR 261.4(d) the following information must accompany all groundwater samples which are known to be non-hazardous and to which U.S. Department of Transportation and U.S. Post Office regulations do not apply. Such informaton is:

- Sample collector's name, mailing address and telephone number
- Analytical laboratory's name, mailing address and telephone number
- Quantity of each sample
- Date of shipment
- Description of sample.

The Chain-of-Custody form provides a location for entry of the above listed information.

djr/274-0/01/860

FIELD DATA SHEET FOR GROUNDWATER SAMPLING

TABLE

ANT:

OJECT:

DATE:

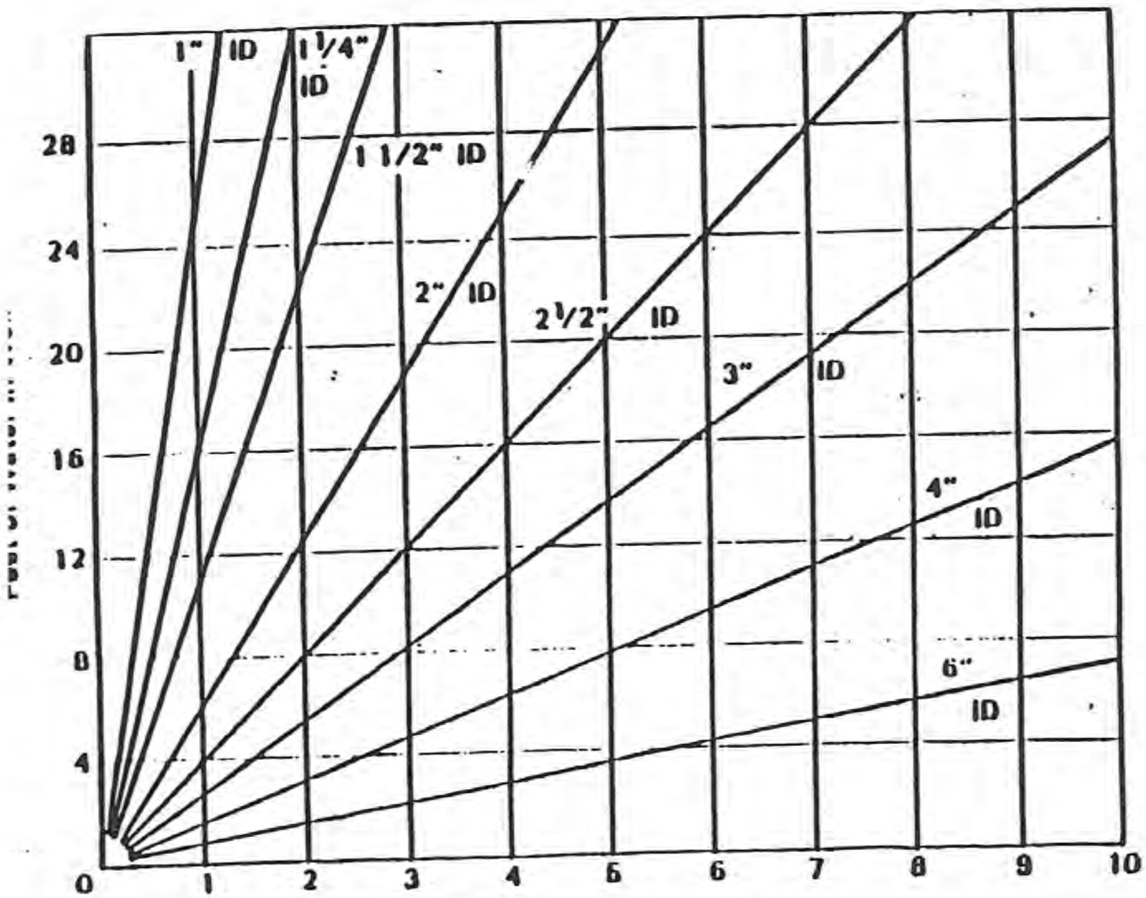
SAMPLING METHOD:

SAMPLED BY:

WEATHER:

:	Time	Well Dia. (in.)	Depth of Well (ft) (including stickup)	Depth to H_2O in Well (ft)	Depth of H_2O in Well (ft)	Number of Bails Removed	Dry at Number of Bails Removed	In-situ Measurements pH (units)				Conductivity (umhos/cm)				Temp. (C°)

NO.	OBSERVATIONS



(a) Graphical Explanation

Volume/Linear Ft. of Pipe		
ID(in)	Gal	Liter
1/4	0.003	0.010
3/8	0.006	0.022
1/2	0.010	0.038
3/4	0.023	0.087
1	0.041	0.164
2	0.163	0.618
3	0.367	1.39
4	0.653	2.47
6	1.47	5.56

(b) Volume Factors

Figure 1 Purge Volume Computation

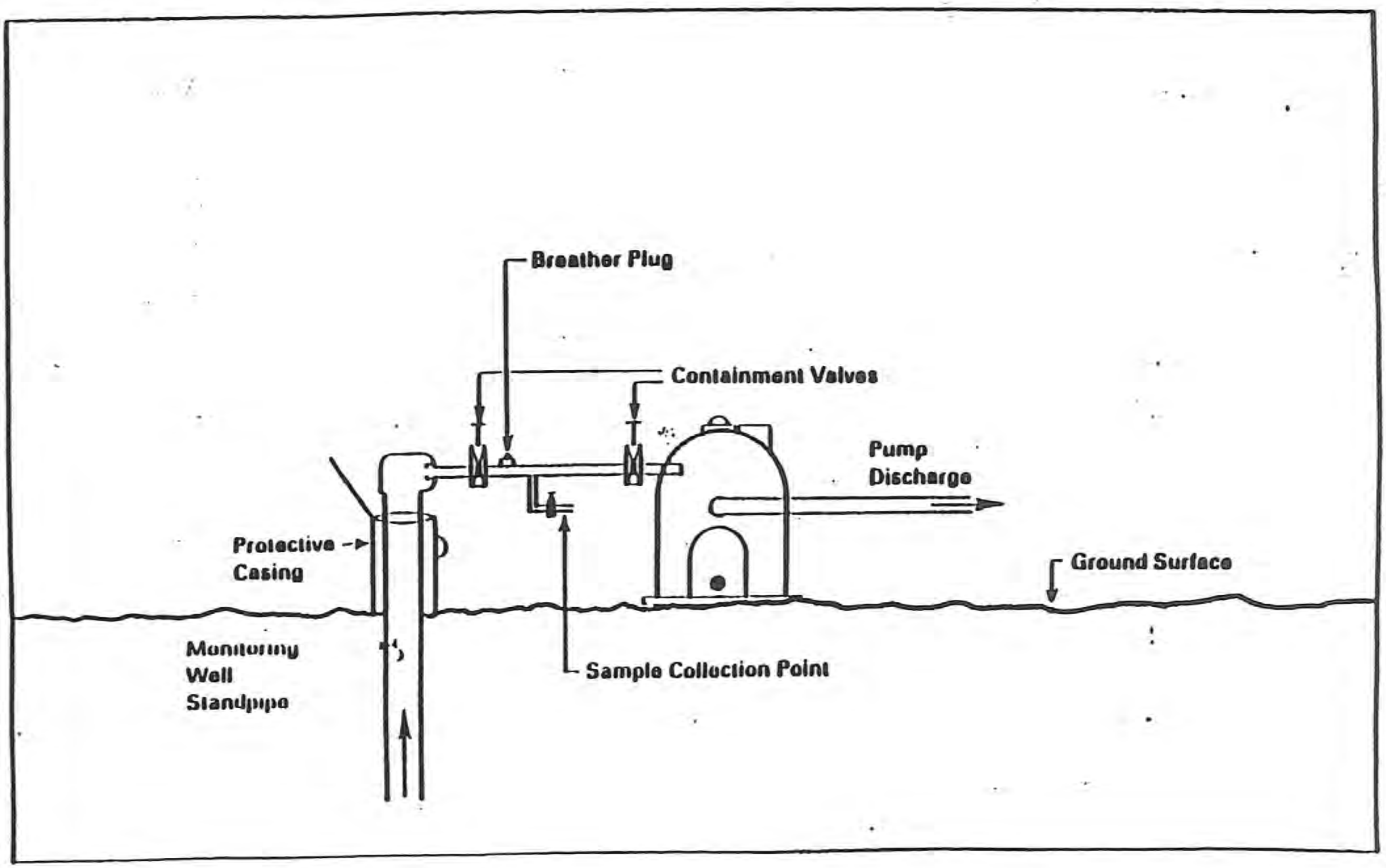


Figure 2 Down Well Suction Line Configuration

SECTION IX

Attachment 4.0
Well Information Forms, Well Location Plan Sheet, Well Construction Diagrams and Boring Logs for New Wells and Appendix IX Sampling Data.

(Revised 08/27/87)

State of Wisconsin
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM

Chapter 144, Wis. Stats.
Form 4400-89 2-84

Facility Name		Facility ID Number	Date	Completed By (Name and Firm)
Koppers Company, Inc.		WID006179493	8-28-85	David A. Shaw, Koppers Company, Inc.

Well Name	Well ID Number (DNR No.)	Well Location	N	S	E	W	Date Established	Well Casing Diam.	Well Casing Type	Elevations: Top of Well Casing	Elevations: Ground Surface	Elevations: Screen Top	Reference: MSL (✓)	Reference: Site Datum (✓)	Screen: Length	Screen: Material	Well Depth	Type of Well: PIEZ	OW	PW	LYS	Other
		3605.61	X																			
R-1		3914.39			X		8/31/82	2"	PVC	well abandoned							20 ft		X			
		3605.53	X																			
R-1D		3908.14			X		12/15/81	2"	PVC	//		//					23 ft		X			
		4950.47	X																			
R-2		3823.06			X		8/31/82	2"	PVC	//		//					20 ft		X			
		4952.01	X																			
R-2D		3818.68			X		12/15/81	2"	PVC	//		//					35 ft		X			
		5037.85	X																			
R-3		4269.99			X		8/31/82	2"	PVC	//		//					20 ft		X			
		5123.35	X																			
R-3D		4306.58			X		12/15/81	2"	PVC	//		//					45 ft	X				
		4458.92	X																			
R-4		4792.98			X		12/16/81	2"	PVC	//		//					34.5 ft		X			
		4203.94	X																			
L-1S		4180.65			X		6/18/84	2"	PVC	678.59	675	2 ft	X		10 ft	PVC	12 ft		X			
		4380.23	X																			
L-2S		4276.92			X		6-18-84	2"	PVC	678.58	675	2 ft	X		10 ft	PVC	12 ft		X			
		4380.50	X																			
L-3S		4180.59			X		6-15-84	2"	PVC	678.14	675	2 ft	X		10 ft	PVC	12 ft		X			
		4378.88	X																			
L-3M		4176.41			X		6-15-84	2"	PVC	677.22	675	14.8 ft	X		10 ft	PVC	25.5 ft	X				
		4376.15	X																			
L-4S		4079.66			X		6-14-84	2"	PVC	678.82	675	2 ft	X		10 ft	PVC	12 ft		X			

Location Coordinates Are:

☒ Grid System

State Plane Coordinate
☐ Northern
☐ Central

Received In:

District: ______ Area: ______ Bureau: ______

By: ______

SMS Use:

File Maint. Completed: ______ Date

Other: ______

State of Wisconsin
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM

Chapter 144, Wis. Stats.
Form 4400-89 2-84

Facility Name							Facility ID Number	Date			Completed By (Name and Firm)											
Koppers Company, Inc.							WID006179493	8-28-85			David A. Shaw, Koppers Company, Inc.											
								Well Casing			Elevations		Reference		Screen			Type of Well (✓)				
Well Name	Well ID Number (DNR No.)	Well Location	N	S	E	W	Date Established	Diam.	Type	Top of Well Casing	Ground Surface	Screen Top	MSL (✓)	Site Datum (✓)	Length	Material	Well Depth	PIEZ	OW	PW	LYS	Other
		4372.03	X																			
L-4M		4080.81			X		6-14-85	2"	PVC	677.64	675	15 ft	X		10 ft	PVC	25 ft	X				
		4372.78	X																			
L-4D		4085.14			X		6/13/85	2"	PVC	677.24	674	25 ft	X		10 ft	PVC	60 ft	X				
		4554.98	X																			
L-5S		4204.50			X		6-21-84	2"	PVC	678.41	675	5 ft	X		10 ft	PVC	18 ft		X			
		4555.50	X																			
L-5M		4194.05			X		6-20-84	2"	PVC	677.75	675	15 ft	X		10 ft	PVC	25 ft	X				
		4555.61	X				(replaced in August 1986)															
L-5D		4199.23			X		6-19-85	2"	PVC	677.82	675	37 ft	X		10 ft	PVC	60 ft	X				
		4542.10	X																			
L-17		4209.25			X		7-24-84	2"	PVC	676.72	674	5 ft	X		10 ft	PVC	15 ft	X				
		5029.51	X																			
W1		4123.58			X		10-3-85	2"	PVC	674.05	671.4	41.4 ft	X		3.1ft	PVC	44.5 ft		X			
		4436.51	X																			
W2		3728.83			X		9-27-85	2"	PVC	672.65	670.7	38 ft	X		5 ft	PVC	43 ft		X			
		4927.96	X																			
W3		4418.49			X		10-4-85	2"	PVC	674.29	671.4	36 ft	X		5 ft	PVC	41 ft		X			
		3588.77	X																			
W4A		4337.97			X		9-26-85	2"	PVC	677.69	674.9	20 ft	X		10 ft	PVC	30 ft		X			
		3594.10	X																			
W4B		4332.70			X		9-26-85	2"	PVC	677.23	674.6	36 ft	X		5 ft	PVC	41 ft		X			
		3594.26	X																			
W4C		4339.22			X		8-18-86	2"	PVC	657.22	675.0	5 ft	X		10 ft	PVC	17.5 ft		X			

Location Coordinates Are:

[X] Grid System

State Plane Coordinate
[ ] Northern
[ ] Central

Received In:

District: ______ Area: ______ Bureau: ______

By: ______

SMS Use:

File Maint. Completed: ______ Date

Other: ______

Sta Wisconsin
Department Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FO.
Chapter 144, Wis. Stats.
Form 4400-89

2-84

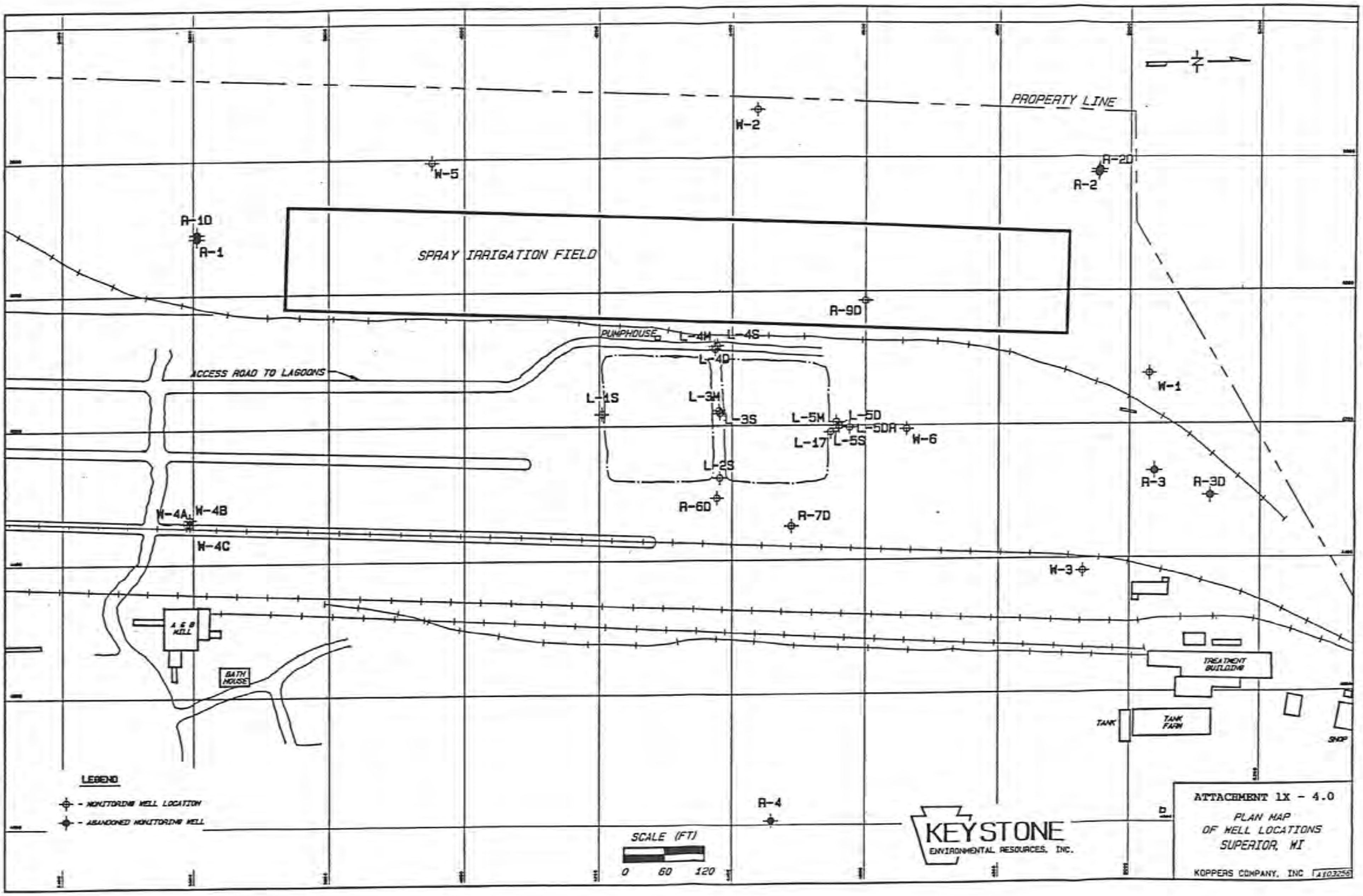
Facility Name	Facility ID Number	Date	Completed By (Name and Firm)
Koppers Company, Inc.	WID006179493		David A. Shaw, Koppers Comapny, Inc.

Well Name	Well ID Number (DNR No.)	Well Location	N	S	E	W	Date Established	Well Casing Diam.	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Elevations Screen Top	Reference MSL (✓)	Reference Site Datum (✓)	Screen Length	Screen Material	Well Depth	Type of Well PIEZ	OW	PW	LYS	Other
		3951.49	X																			
W-5		3804.91			X		8-19-86	2"	PVC	674.92	672.5	29 ft	X		10 ft	PVC	39.5 ft		X			
		4662.18	X																			
W-6		4205.48			X		8-20-86	2"	PVC	676.48	674.0	44 ft	X		5 ft	PVC	52.3		X			
		4560.19	X																			
L-5DR		4200.22			X		8-26-86	2"	PVC	676.48	674.0	35.5 ft	X		10 ft	PVC	46.5		X			
		4376.50	X																			
R-6D		4306.84			X		4-21-87	2"	PVC	675.73	673.03	37.9	X		5 ft	PVC	43.2		X			
		4490.39	X																			
R-7D		4348.73			X		4-21-87	2"	PVC	674.10	671.8	35.3	X		5 ft	PVC	40.6		X			
		4599.36	X																			
R-9D		4012.91			X		4-21-87	2"	PVC	673.13	671.4	40.35	X		5 ft	PVC	45.65		X			

Location Coordinates Are:
X Grid System
State Plane Coordinate
☐ Northern
☐ Central

Received In:
District: ______ Area: ______ Bureau: ______
By: ______

SMS Use:
File Maint. Completed: ______ Date
Other: ______


PROPERTY LINE
N
W-2
W-5
R-2D
R-2
R-1D
R-1
SPRAY IRRIGATION FIELD
R-9D
PUMPHOUSE
L-4M
L-4S
L-4D
ACCESS ROAD TO LAGOONS
W-1
L-1S
L-3M
L-3S
L-5M
L-5D
L-5DR
W-6
L-17
L-5S
L-2S
R-3
R-3D
R-6D
R-7D
W-4A
W-4B
W-4C
W-3
A & B MILL
TREATMENT BUILDING
BATH HOUSE
TANK
TANK FARM
SHOP
LEGEND
- MONITORING WELL LOCATION
- ABANDONED MONITORING WELL
R-4
SCALE (FT)
0 60 120
KEYSTONE
ENVIRONMENTAL RESOURCES, INC.
ATTACHMENT 1X - 4.0
PLAN MAP
OF WELL LOCATIONS
SUPERIOR, WI
KOPPERS COMPANY, INC
A103256

MONITORING WELL LOG

PROJECT Superior
WELL NO. R-6D
DRILLING METHOD Hollow Stem Auger/Wash Rotary
GEOLOGIST D. Smith/C. Cramer
DRILLER Wisconsin Test Drilling
DATE April 21, 1987

GROUND ELEVATION 673.03 ft.
TOP OF WELL 675.63 ft.
DEPTH OF WELL (ft) 42.9

GROUND WATER DEPTH (ft):
AT COMPLETION
AFTER ___ HOURS

GRAVEL PACK
BENTONITE
BACK FILL
CONCRETE
SCREEN

CASING MATERIAL 2" PVC
SCREEN 2" PVC

STRATA DEPTH	SAMPLE DEPTH	SPT	DESCRIPTION	CONSTRUCTION
			See log for L-2S for first 13.5 feet	
5				
10				
15		9,5,5	Hard, sticky red-brown CLAY (probably saturated)	
20		1,4,5	Set 6 inch ID PVC casing at 20 feet	
25		WH WH 6, 6,3		
30	Shelby tube	Shelby tube		
35				
		2,5,11	Hard red-brown SILTY CLAY to CLAY AND SILT Some very fine sand, trace light gray silt pockets	
40		7,13,18		

MONITORING WELL LOG

PROJECT: Superior

WELL NO. R-6D

DRILLING METHOD: Hollow Stem Auger/Wash Rotary

GEOLOGIST: D. Smith/C. Cramer

DRILLER: Wisconsin Test Drilling

DATE: April 21, 1987

GROUND ELEVATION: 673.03 ft.

TOP OF WELL: 675.63 ft.

DEPTH OF WELL (ft): 42.9

GROUND WATER DEPTH (ft):

AT COMPLETION ____

AFTER ____ HOURS ____

CASING MATERIAL: 2" PVC

SCREEN: 2" PVC

GRAVEL PACK / BENTONITE / BACK FILL / CONCRETE / SCREEN

STRATA DEPTH	SAMPLE DEPTH	SPT	DESCRIPTION	CONSTRUCTION
		22,33, 13	Very fine to coarse red-brown SAND little to some gravel @41.5-42.5 trace clay and silt	
45		6,9,9	red-brown hard CLAY trace light gray silt pockets	
			last sample = 43.5 - 45.0 feet drilled depth = 43.5 feet bottom of well = 43.2 feet bottom of screen = 42.9 feet	

MONITORING WELL LOG

PROJECT: Superior

WELL NO.: R-7D

DRILLING METHOD: Hollow Stem Auger/Wash Rotary

GEOLOGIST: D. Smith/C. Cramer

DRILLER: Wisconsin Test Drilling

DATE: April 21, 1987

GROUND ELEVATION: 671.52 ft.

TOP OF WELL: 674.02 ft.

DEPTH OF WELL (ft): 40.6

GROUND WATER DEPTH (ft):

AT COMPLETION ______

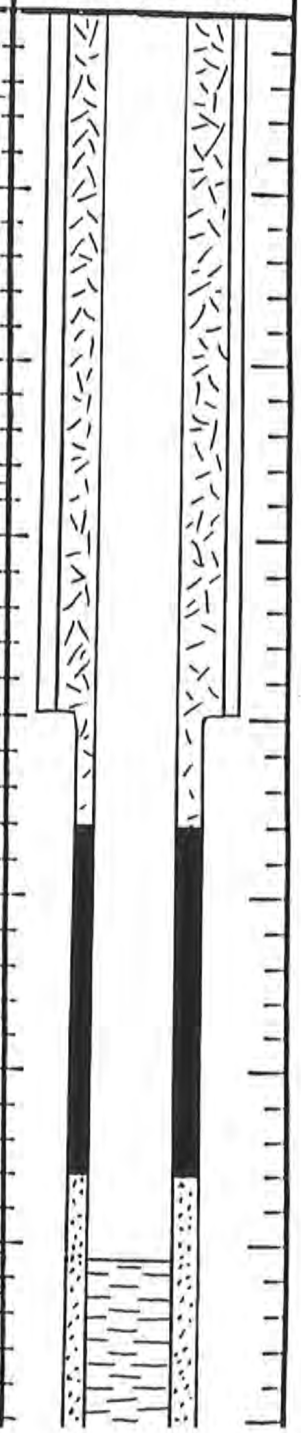
AFTER ______ HOURS ______

GRAVEL PACK
BENTONITE
BACK FILL
CONCRETE
SCREEN

CASING MATERIAL: 2" PVC   SCREEN: 2" PVC

STRATA DEPTH	SAMPLE DEPTH	SPT	DESCRIPTION
	X	4,4,3	black FILL (cinders) trace organics (wood, plant material)
5	X	4,7,7	red-brown hard CLAY trace organics trace light gray silt pockets
	X	4,5,6	
10	X	2,4,4	
	X	3,3,5	
15	X	3,3,2	plastic, sticky red-brown CLAY (probably saturated)
20	X	2,2,3	Set 6 inch ID PVC casing at 20 feet
25	X	1,2,3	red-brown CLAY (hard but very pliable) trace light gray silt pockets
30	X	9,12,13	medium to very coarse SAND (saturated) trace gravel trace clay
	X	1,1,3	red-brown CLAY trace light gray silt pockets
35	X	1,2,4	red-brown SILTY CLAY to CLAY AND SILT
	X	8,13,19	red-brown medium to coarse SAND trace clay trace to little gravel
40	X	35,46,47	

CONSTRUCTION



MONITORING WELL LOG

PROJECT Superior

WELL NO. R-7D

DRILLING METHOD Hollow Stem Auger/Wash Rotary

GEOLOGIST D. Smith/C. Cramer

DRILLER Wisconsin Test Drilling

DATE April 21, 1987

GROUND ELEVATION 671.52 ft.

TOP OF WELL 674.02 ft.

DEPTH OF WELL (ft) 40.6

GROUND WATER DEPTH (ft):

AT COMPLETION

AFTER HOURS

GRAVEL PACK
BENTONITE
BACK FILL
CONCRETE
SCREEN

CASING MATERIAL 2" PVC SCREEN 2" PVC

STRATA DEPTH	SAMPLE DEPTH		DESCRIPTION	CONSTRUCTION
	X	8,12,13	red-brown CLAY trace light gray silt pockets	
			Last sample = 40.5 - 42.0 feet	
45			Drilled depth = 40.5 feet	
			Bottom of well = 40.6 feet	
			Bottom of screen = 40.3 feet	
50				

MONITORING WELL LOG

PROJECT: Superior

DRILLING METHOD: Hollow Stem Auger/Wash Rotary

DRILLER: Wisconsin Test Drilling

WELL NO. R-9D

GEOLOGIST: D. Smith/C. Cramer

DATE: April 21, 1987

GROUND ELEVATION: 670.85 ft.

TOP OF WELL: 673.05 ft.

DEPTH OF WELL (ft): 45.65

GROUND WATER DEPTH (ft):

AT COMPLETION ______

AFTER ______ HOURS ______

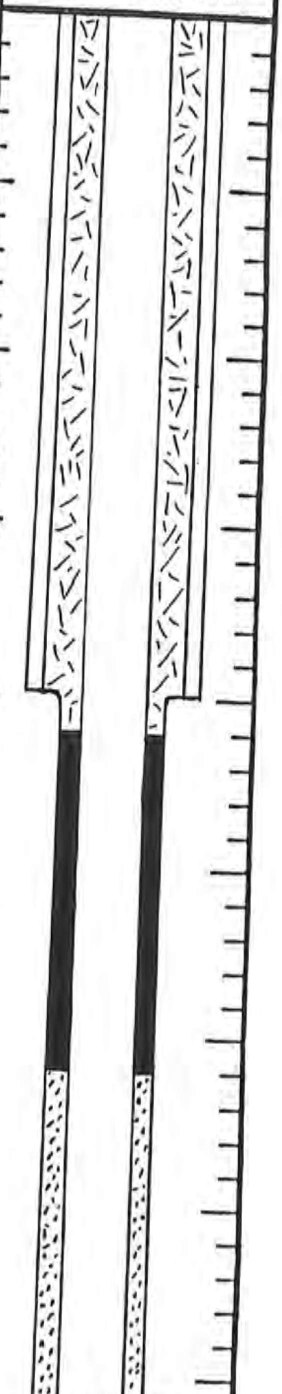
GRAVEL PACK / BENTONITE / BACK FILL / CONCRETE / SCREEN

CASING MATERIAL: 2" PVC

SCREEN: 2" PVC

STRATA DEPTH	SAMPLE DEPTH	SPT	DESCRIPTION
	X	1,4,5	hard red-brown CLAY, trace organics
5	X	3,5,7	
	X	5,7,9	hard red-brown CLAY, trace light silt pockets
10	X	3,4,6	
	X	3,4,4	hard red-brown CLAY
15	X	3,3,5	very plastic red-brown CLAY (saturated) trace light gray silt pockets 18.5-20 trace organics
20	X	2,2,3	Set 6 inch ID PVC casing at 20 feet
25	Shelby tube	Shelby tube	
30	X	0,0,1	
35	X	0,0,0	
	X	1,1,2	
40	X	0,0,0	

CONSTRUCTION



MONITORING WELL LOG

PROJECT: Superior
WELL NO.: R-9D
DRILLING METHOD: Hollow Stem Auger/Wash Rotary
GEOLOGIST: D. Smith/C. Cramer
DRILLER: Wisconsin Test Drilling
DATE: April 21, 1987

GROUND ELEVATION: 670.85 ft.
TOP OF WELL: 673.05 ft.
DEPTH OF WELL (ft): 45.65

GROUND WATER DEPTH (ft):
AT COMPLETION
AFTER ____ HOURS

GRAVEL PACK
BENTONITE
BACK FILL
CONCRETE
SCREEN

CASING MATERIAL: 2" PVC
SCREEN: 2" PVC

STRATA DEPTH	SAMPLE DEPTH	SPT	DESCRIPTION	CONSTRUCTION
	X	14,18, 21	fine to medium red-brown and gray SAND trace gravel	
45	X	10,12, 12	medium to coarse SAND some gravel tr silt	
	X	8,12,13	red-brown CLAY	
50			last sample = 46.0 - 47.5 feet drilled depth = 46.0 feet bottom of well = 45.65 feet bottom of screen = 45.35 feet	

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
VOLATILE ORGANICS (in ug/l)														
CHLOROMETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
BROMOMETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
VINYL CHLORIDE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYLENE CHLORIDE	EPA 8240	5 ug/l	NA	BDL	8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ACETONE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	24	BDL	BDL	BCL	BDL
CARBON DISULFIDE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-DICHLOROETHENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-DICHLOROETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRANS-1,2-DICHLOROETHENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-BUTANONE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
VINYL ACETATE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
BROMODICHLOROMETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROPROPANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRANS-1,3-DICHLOROPROPENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIBROMOCHLOROMETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-TRICHLOROETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
BENZENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CIS-1,3-DICHLOROPROPENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-CHLOROETHYL VINYL ETHER	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
BROMOFORM	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-HEXANONE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4-METHYL-2-PENTANONE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-TETRACHLOROETHANE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROBENZENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLBENZENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
STYRENE	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOTAL XYLENES	EPA 8240	5 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DIBROMO-3-CHLOROPROPENE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
ACETONITRILE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
IODOMETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ACRYLONITRILE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYL CYANIDE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
3-CHLOROPROPENE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ALLYL ALCOHOL	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIBROMOMETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHACRYLONITRILE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-DIOXANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-CHLORO-1,3-BUTADIENE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DIBROMOETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL METHACRYLATE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1,2-TETRACHLOROETHANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2,3-TRICHLOROPROPANE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-DICHLORO-2-BUTENE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-PICOLINE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYL METHACRYLATE	EPA 8240	10 ug/l	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOTAL VOLATILES DETECTED		(in ug/l)	0	0	8	0	5	0	0	24	0	0	0	0

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
SEMIVOLATILES (in ug/l)														
PHENOL	EPA 8270	10 ug/l	10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BIS (2-CHLOROETHYL) ETHER	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-CHLOROPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1,3-DICHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1,4-DICHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZYL ALCOHOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1,2-DICHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-METHYLPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BIS (2-CHLOROISOPROPYL) ETHER	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-METHYLPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSODIPROPYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
HEXACHLOROETHANE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
NITROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ISOPHORONE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-NITROPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4-DIMETHYLPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZOIC ACID	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BIS (2-CHLOROETHOXY) METHANE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4-DICHLOROPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1,2,4-TRICHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
NAPHTHALENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-CHLOROANILINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
HEXACHLOROBUTADIENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
P-CHLORO-M-CRESOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-METHYLNAPHTHALENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
HEXACHLOROCYCLOPENTADIENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4,6-TRICHLOROPHENOL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4,5-TRICHLOROPHENOL	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-CHLORONAPHTHALENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-NITROANILINE	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DIMETHYL PHTHALATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ACENAPHTHYLENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3-NITROANILINE	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ACENAPHTHENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4-DINITROPHENOL	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-NITROPHENOL	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DIBENZOFURAN	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
2,4-DINITROTOLUENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,6-DINITROTOLUENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DIETHYL PHTHALATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-CHLOROPHENYL PHENYL ETHER	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
FLUORENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-NITROANILINE	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4,6-DINITRO-2-METHYLPHENOL	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSODIPHENYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	10	BDL	BDL	BDL	NA	BDL	BDL
4-BROMOPHENYL PHENYL ETHER	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
HEXACHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PENTACHLOROPHENOL	EPA 8270	50 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PHENANTHRENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ANTHRACENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DI-N-BUTYL PHTHALATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
FLUORANTHENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PYRENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BUTYL BENZYL PHTHALATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3,3-DICHLOROBENZIDINE	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZ(A) ANTHRACENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BIS (2-ETHYLHEXYL) PHTHALATE	EPA 8270	10 ug/l	BDL	38	BDL	BDL	BDL	BDL	51	15	BDL	NA	BDL	BDL
CHRYSENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DI-N-OCTYL PHTHALATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZO (B) FLUORANTHENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZO (K) FLUORANTHENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZO (A) PYRENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
INDENO (1,2,3-CD) PYRENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DIBENZO (A,H) ANTHRACENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZO (G,H,I) PERYLENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSODIMETHYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BENZIDINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3-CHLOROPROPIONITRILE	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
MALONONITRILE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
METHYLMETHANE SULFONATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSODIETHYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
P-BENZOQUINONE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PENTACHLOROETHANE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ANILINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSOPYRROLIDINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ACETOPHENONE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
N-NITROSOMORPHOLINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1-NITROSOPIPERIDINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
HEXACHLOROPROPENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
N-NITROSODIBUTYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
RESORCINOL	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
SAFROLE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ISOSAFROLE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1,4-NAPHTHOQUINONE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PENTACHLOROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
1-NAPHTHYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-NAPHTHYLAMINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,3,4,6-TETRACHLOROPHENOL	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
5-NITRO-O-TOLUIDINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ACETOPHENETIDIN	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-AMINOBIPHENYL	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PENTACHLORONITROBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PRONAMIDE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-SEC-BUTYL-4,6-DINITROPHENOL	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
METHAPYRILENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ARAMITE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4-DIMETHYLAMINOAZOBENZENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
CHLOROBENZILATE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3,3-DIMETHYLBENZIDINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2-ACETYLAMINOFLUORENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4,4-METHYLENEBIS2-CHLOROANILINE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3,3-DIMETHOXYBENZIDINE	EPA 8270	20 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
7,12-DIMETHYLBENZ(A)ANTHRACENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
3-METHYLCHOLANTHRENE	EPA 8270	10 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
TOTAL SEMIVOLATILES DETECTED		(in ug/l)	10	38	0	0	0	10	51	15	0	0	0	0

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
DIOXINS AND FURANS (in ng/l)														
TETRACHLORODIBENZODIOXIN	EPA 8280	in ng/l	BDL(0.06)	BDL(0.09)	BDL(0.09)	BDL(0.12)	BDL(0.05)	BDL(0.05)	BDL(0.07)	BDL(0.04)	BDL(0.03)	BDL(0.16)	BDL(0.10)	BDL(0.02)
PENTACHLORODIBENZODIOXIN	EPA 8280	in ng/l	BDL(0.11)	BDL(0.93)	BDL(0.16)	BDL(0.10)	BDL(0.38)	BDL(0.22)	BDL(0.13)	BDL(0.56)	BDL(0.30)	BDL(0.11)	BDL(0.07)	BDL(0.52)
HEXACHLORODIBENZODIOXIN	EPA 8280	in ng/l	BDL(0.15)	BDL(0.39)	BDL(0.06)	BDL(0.09)	BDL(0.15)	BDL(0.14)	BDL(0.07)	BDL(0.46)	BDL(0.07)	BDL(0.13)	BDL(0.08)	BDL(0.06)
TETRACHLORODIBENZOFURAN	EPA 8280	in ng/l	BDL(0.06)	BDL(0.19)	BDL(0.06)	BDL(0.03)	BDL(0.01)	BDL(0.07)	BDL(0.05)	BDL(0.23)	BDL(0.03)	BDL(0.11)	BDL(0.15)	BDL(0.10)
PENTACHLORODIBENZOFURAN	EPA 8280	in ng/l	BDL(0.19)	BDL(0.16)	BDL(0.12)	BDL(0.11)	BDL(0.30)	BDL(0.21)	BDL(0.15)	BDL(0.45)	BDL(0.19)	BDL(0.23)	BDL(0.14)	BDL(0.08)
HEXACHLORODIBENZOFURAN	EPA 8280	in ng/l	BDL(0.19)	BDL(0.15)	BDL(0.06)	BDL(0.10)	BDL(0.21)	BDL(0.20)	BDL(0.07)	BDL(0.44)	BDL(0.11)	BDL(0.13)	BDL(0.13)	BDL(0.08)
TOTAL FURANS/DIOXINS DETECTED		(in ng/l)	0	0	0	0	0	0	0	0	0	0	0	[illegible]

NOTE: The value in parenthesis represents the detection limit.

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
PESTICIDES/HERBICIDES (in ug/l)														
ALPHA-BHC	EPA 8080	0.05 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
BETA-BHC	EPA 8080	0.05 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DELTA-BHC	EPA 8080	0.05 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
GAMMA-BHC (LINDANE)	EPA 8080	0.05 ug/l	0.19	0.19	0.19	BDL	0.19	0.19	BDL	0.19	0.19	NA	BDL	0.19
HEPTACHLOR	EPA 8080	0.05 ug/l	0.18	0.18	0.18	BDL	0.18	0.18	BDL	0.18	0.18	NA	BDL	0.18
ALDRIN	EPA 8080	0.05 ug/l	0.14	0.14	0.14	BDL	0.14	0.14	BDL	0.14	0.14	NA	BDL	0.14
HEPTACHLOR EPOXIDE	EPA 8080	0.05 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ENDOSULFAN I	EPA 8080	0.05 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DIELDRIN	EPA 8080	0.1 ug/l	0.5	0.5	0.5	BDL	0.5	0.5	BDL	0.5	0.5	NA	BDL	0.5
4,4-DDE	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ENDRIN	EPA 8080	0.1 ug/l	0.48	0.48	0.48	BDL	0.48	0.48	BDL	0.48	0.48	NA	BDL	0.48
ENDOSULFAN II	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4,4-DDD	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ENDRIN ALDEHYDE	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
KEPONE	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
4,4-DDT	EPA 8080	0.1 ug/l	0.37	0.37	0.37	BDL	0.37	0.37	BDL	0.37	0.37	NA	BDL	0.37
METHOXYCHLOR	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ISODRIN	EPA 8080	0.1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
CHLORDANE	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
TOXAPHENE	EPA 8080	1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1016	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1221	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1232	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1242	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1248	EPA 8080	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1254	EPA 8080	1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
AROCLOR-1260	EPA 8080	1 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
DISULFOTON	EPA 8140	0.4 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
FAMPHUR	EPA 8140	0.4 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PARATHION	EPA 8140	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
METHYL PARATHION	EPA 8140	0.2 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
PHORATE	EPA 8140	0.2 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
SULFOTEPP	EPA 8140	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
THIONAZIN	EPA 8140	0.4 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4-D	EPA 8150	2.4 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
SILVEX	EPA 8150	0.6 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
2,4,5-T	EPA 8150	0.5 ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	SAMPLE ID / DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
TOTAL PESTICIDES DETECTED		(in ug/l)	1.86	1.86	1.86	0	1.86	1.86	0	1.86	1.86	0	0	1.86

SUPERIOR WI, APPENDIX IX RESULTS

PARAMETER	METHOD	DETECTION LIMIT	W-4A 10/15/86	W-4B 10/15/86	W-4C 10/15/86	L-1S 10/15/86	L-2S 10/15/86	L-4S 10/15/86	L-4D 10/15/86	L-5DR 10/15/86	W-6 10/15/86	L-4M 10/15/86	FIELD BLANK 10/15/86	TRIP BLANK 10/15/86
METALS (in mg/l)														
ALUMINUM	EPA 200.7	0.2 mg/l	151	7.12	91.1	156	166	216	18.2	195	8.54	NA	6.15	1.35
ANTIMONY	EPA 200.7	0.5 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
ARSENIC	EPA 206.2	0.01 mg/l	BDL	BDL	BDL	0.047	NA	NA	BDL	NA	BDL	NA	BDL	BDL
BARIUM	EPA 200.7	0.2 mg/l	0.95	0.3	0.38	1.15	1.45	1.82	0.28	2.4	BDL	NA	BDL	BDL
BERYLLIUM	EPA 200.7	0.05 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
CADMIUM	EPA 200.7	0.005 mg/l	BDL	BDL	BDL	0.101	BDL	BDL	0.011	BDL	BDL	NA	0.007	BDL
CALCIUM	EPA 200.7	5 mg/l	128	59.1	23.1	88.7	BDL	88.7	877	88.7	BDL	NA	BDL	12.6
CHROMIUM	EPA 200.7	0.05 mg/l	0.056	BDL	0.08	0.26	0.247	0.309	BDL	0.246	BDL	NA	BDL	BDL
COBALT	EPA 200.7	0.05 mg/l	BDL	BDL	0.07	0.09	0.11	0.13	BDL	0.11	BDL	NA	BDL	BDL
COPPER	EPA 200.7	0.05 mg/l	0.15	BDL	0.35	0.46	0.48	0.68	BDL	0.49	BDL	NA	0.05	BDL
IRON	EPA 200.7	0.3 mg/l	46	1.1	71.8	89.9	226	197	9.7	198	5.26	NA	1.1	BDL
LEAD	EPA 200.7	0.005 mg/l	0.019	BDL	0.031	0.043	0.041	0.051	0.01	0.062	BDL	NA	BDL	BDL
MAGNESIUM	EPA 200.7	5 mg/l	102	73.4	88.4	97.4	79	76.3	102	97.6	17.1	NA	30.7	4.29
MANGANESE	EPA 200.7	0.02 mg/l	1.61	0.33	2.84	3.44	3.84	3.83	0.28	3.87	0.22	NA	0.42	0.15
MERCURY	EPA 245.1	0.00025 mg/l	BDL	BDL	0.0004	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
NICKEL	EPA 200.7	0.05 mg/l	0.16	0.1	0.25	0.25	0.36	0.45	BDL	0.38	0.11	NA	BDL	0.1
OSMIUM	EPA 200.7	0.06 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
POTASSIUM	EPA 200.7	1 mg/l	21.1	5	7.6	23.2	27	32	8.8	61.1	6	NA	BDL	BDL
SELENIUM	EPA 270.2	0.005 mg/l	0.012	0.014	0.014	0.009	0.01	0.015	0.008	0.114	0.022	NA	BDL	BDL
SILVER	EPA 200.7	0.05 mg/l	BDL	BDL	BDL	0.019	BDL	BDL	0.038	BDL	BDL	NA	BDL	BDL
SODIUM	EPA 200.7	1 mg/l	51.3	33.6	32.1	46.4	52.1	66.9	87.9	95	66.8	NA	BDL	BDL
THALLIUM	EPA 279.2	0.1 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
TIN	EPA 200.7	1 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	BDL	BDL
VANADIUM	EPA 200.7	0.05 mg/l	0.1	BDL	0.12	0.284	0.26	0.31	BDL	0.29	BDL	NA	BDL	BDL
ZINC	EPA 200.7	0.05 mg/l	0.15	BDL	0.22	0.09	0.41	0.55	BDL	0.52	BDL	NA	BDL	BDL
INORGANIC ANIONS (in mg/l)														
CYANIDE	EPA 335	0.005 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FLUORIDE	EPA 340.2	0.5 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
SULFIDE	EPA 376	0.2 mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

APPENDIX IX COMPOUNDS NOT MEASURED FOR SAMPLES FROM SUPERIOR WI.

ACROLIEN
BENZENTHIOL(*)
BENZO (A,E) PYRENE
BENZO (A,H) PYRENE
BENZO (A,I) PYRENE
DICHLOROFLUOROMETHANE(*)
2,6-DICHLOROPHENOL
alpha,alpha-DIMETHYL PHEMETHYLAMINE
m-DINIT.OBENZENE
DIPHENYLAMINE(*)
1,2-DIPHENYLHYDRAZINE
ENDOSULFAN SULFATE
ETHYLENE OXIDE(*)
HEXACHLOROPHENE(*)
ENDRIN KETONE
ISOBUTYL ALCOHOL
PHENACETIN
2-PROYN-1-OL
1,2,4,5-TETRACHLOROBENZENE
TRICHLOROMETHANETHIOL(*)
tris(2,3-DIBROMOPROPYL) PHOSPHATE(*)

(*)-COMPOUNDS NOT MEASUREABLE

X. CERTIFICATION OF CLOSURE

To ensure that the surface impoundment has been closed in accordance with the final approved closure plan, an engineer(s) will be present for two-day periods during the removal of all standing water, after the final removal of all excavated soils and at the time of closure certification (which includes certifying the impoundment is properly closed). The following additional procedures will be followed:

1. A construction documentation report certifying closure in accordance with the approved plan will be submitted to the agency within 60 days after completion of closure,

2. The professional engineers(s) will present documentation of his qualifications (i.e. registration in the State of Wisconsin).

3. The closure plan will be used as a check list to assure the proper procedures for closure have been incorporated, and

4. If clean closure cannot be attained, a survey plat will be submitted no later than the submission of the closure certification.

The following sample certification sheets are similar to those recommended by the U.S. EPA. The certification on page 54 will be signed by the owner, while the certification on page 55 will be signed by an independent professional engineer(s) registered in Wisconsin. Both of the sheets, or similar documents will be attached to the construction documentation report previously described. If clean closure is not attained and the contingent plan is implemented, then a long-term care plan will also be included with this document.

OWNER CERTIFICATION OF CLOSURE

I, ____
(Owner or Operator)

of ____
(Name and Address of Facility)

hereby state and certify that, to the best of my knowledge and belief, the

____
(Hazardous Waste Management Unit(s))

has been closed in accordance with the facility's closure plan, and that closure

was completed on the __________ day of ______________________, 19___.

______________________________ ____________________
Signature Date

PROFESSIONAL ENGINEER CERTIFICATION OF CLOSURE

I, ________________________________, a certified Professional Engineer hereby
(Name)

certify, to the best of my knowledge and belief, that I have verified that Professional Engineer Closure Certificates were issued for all prior closure activities at:

____
(Name and Address of Facility)

for ____,
(Hazardous Waste Management Unit)

and that I have made visual inspection(s) of the aforementioned facility, and closure of the aforementioned facility has been performed in accordance with the Facility's closure plan.

________________________________ ________________
Signature Date

________________________________ ________________
Professional Engineer License No. For State of

____
Business Address

____
City/State/Zip Code

____
Business Telephone (With Area Code)

XI. CLOSURE COST ESTIMATE

Closure cost estimates for the closure of the surface impoundments under clean and contingent closure are presented in Attachment 1.0 at the end of this section. These closure estimates are based on 1987 dollars and will be revised annually to reflect changes in closure cost brought about by inflation and changes in the quantity of work to be performed. The Annual Implicit Price Deflator for Gross National Products will be used to make this adjustment.

The annually adjusted closure cost will be submitted to state and federal agencies as required. The cost estimates can then be included in all files.

SECTION XI

Attachment 1.0

Closure Cost Estimates

(Clean and Non-Clean)

Revised 08/27/87

XII CERTIFICATION OF POST-CLOSURE CARE

To ensure that post-closure care is completed according to the post-closure plan, certification of post closure will be signed by the owner and an independent registered professional engineer after post closure is complete. Documentation of the professional engineer's qualification will be provided upon request.

XIII. POST-CLOSURE COST ESTIMATES

Post-closure cost estimates for the surface impoundments are presented in Attachment 1.0 at the end of this section. The post-closure cost estimates are based on 1987 dollars and will be revised annually to reflect changes in the post-closure cost brought about by inflation. The Annual Implicit Price Deflator for Gross National Products will be used to make this adjustment. As discussed in Section IX, these adjusted cost estimates will be submitted for inclusion in all files.

SECTION XIII

Attachment 1.0

Post-Closure Cost Estimates

(Non-Clean Closure)

Revised 08/27/87

XIV. FINANCIAL ASSURANCE MECHANISM FOR CLOSURE

This plant utilizes the corporate financial test to demonstrate Financial Assurance. A copy of the financial assurance mechanism is provided in Attachment 1.0 at the end of this section.

SECTION XIV

Attachment 1.0

Financial Assurance Mechanism

Revised 08/27/87

APPENDIX A

QA/QC Plan

PROJECT QUALITY ASSURANCE PLAN

FOR

CLOSURE OF THE SURFACE IMPOUNDMENTS

AT

KOPPERS COMPANY, INC.

SUPERIOR, WISCONSIN SITE

Prepared By:

Keystone Environmental Resources, Inc.
Spectrix / Monroeville Divsion

May 29, 1987

176900-00

1.0 INTRODUCTION

Koppers Company, Inc. is submitting a closure plan for the surface impoundment at its Superior, Wisconsin site. Provisions of the closure plan require the preparation of a Project Quality Assurance (QA) Plan for the required sampling and analyses. This plan presents, in specific terms, the policies, organizational objectives, functional activities, and specific quality control (QC) activities designed to achieve the data quality goals as stated for the project.

2.0 PROJECT DESCRIPTION

The Koppers Company, Inc.'s Superior plant uses creosote in the pressure treatment of wood products for railroads, utilities, and other companies. The plant's major product is treated railroad cross ties.

The proposed groundwater and soil analyses are part of a closure and post closure plan for the surface impoundment at the Koppers Company, Inc.'s Superior plant. These analyses will be used to ascertain whether clean closure has been accomplished or whether continued monitoring is necessary. The following list of parameters have been determined for analyses:

groundwater	soil
pH	pH
specific conductance	specific conductance
TOC	TOC
TDS	phenols
phenols	polynuclear aromatic hydrocarbons
polynuclear aromatic hydrocarbons	

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

An organizational chart showing discipline leaders for the Spectrix/ Monroeville Laboratory is presented in Figure 3.1.

The Laboratory Manager is responsible for effective day-to-day management of the laboratory staff as well as direct communication and liaison with the client. The laboratory Manager's specific QA function is to oversee all project procedures and QA/QC procedures used in conjunction with the project.

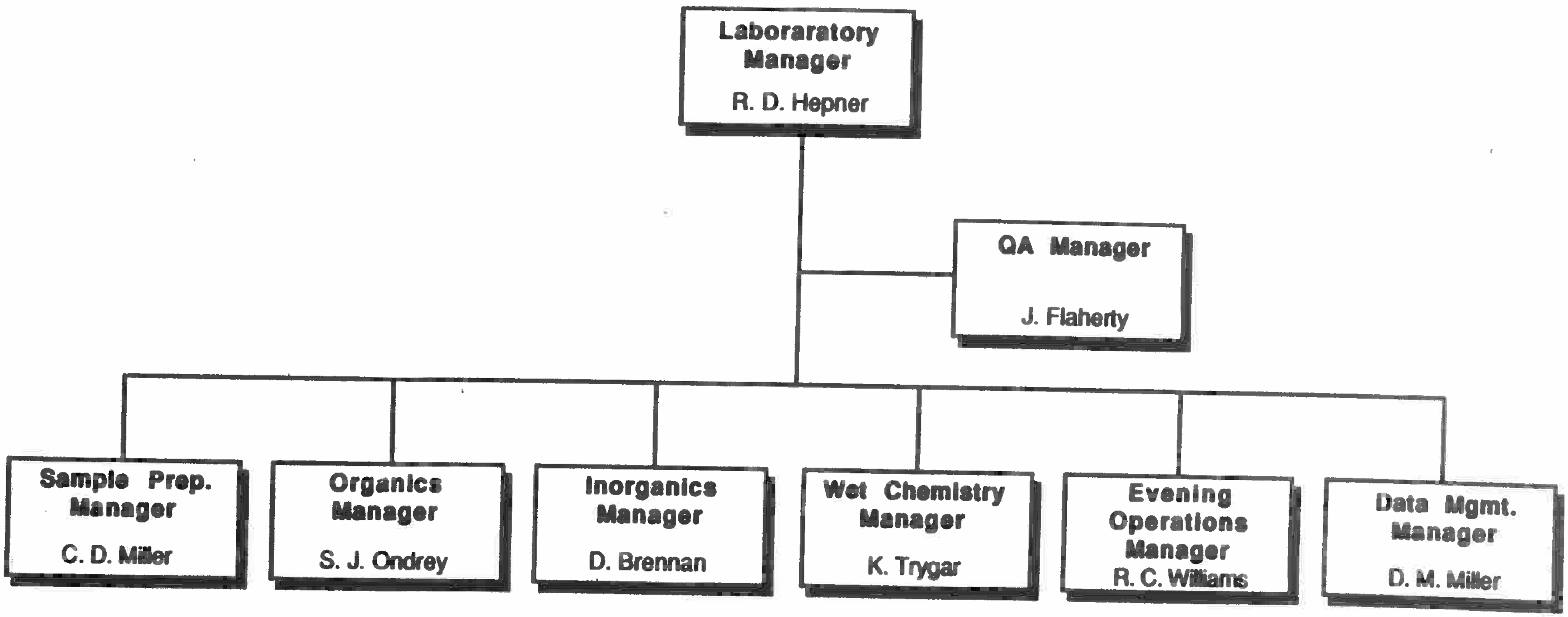
The laboratory QA Officer ensures that specific QA and primary technical operations are coordinated efficiently for the project. The laboratory QA Officer works independent of the laboratory staff and is responsible for the following:

1) Approval of all QA/QC procedures;
2) Development of the QA plan and defining the QA objectives;
3) Performance and System audits as specified in the QA plan;
4) Review and validation of laboratory data;
5) Introduction of performance evaluation samples as needed;
6) To be the official organizational contact for all QA matters for the project;
7) To actively identify and respond to QA needs, resolve problems, and answer requests for guidance or assistance;
8) Maintenance of all project QA records and assembly of project QA data for inspection by project management.

The Section Managers are responsible for provision of consistent and accurate laboratory data and technical reports produced by the personnel under their supervision. These individuals are responsible for ensuring that all personnel under their direction are knowledgeable of the QA/QC requirements of this project.

Spectrix - Monroeville

Organization Chart



KEYSTONE ENVIRONMENTAL RESOURCES, INC.

Figure 3 - 1

4.0 QA OBJECTIVES FOR MEASUREMENT DATA

Analyses performed for this project will use standard EPA analytical procedures. EPA precision and accuracy data will be used as the basis for developing acceptance criteria for assessing the precision and accuracy of the generated data. The criteria to be used in this project are given in Table 4.1. A minimum percent completeness (defined in Section 13.0) for each parameter is 75. The following is a brief description of the terms which appear in Table 4.1.

Reference: The reference of the standard analytical methodology used for each procedure.

Experimental Matrix: The type of matrix that will be used for spikes and duplicates and the target concentration level for each spike.

Precision: Evaluated based on the relative percent difference (RPD) of duplicate spikes. Both precision and RPD are defined in Section 13.1.

Accuracy: Evaluated based on the present recovery of each spike (see Section 13.2 for definition).

Detection Limit: Typical lowest reportable concentration.

TABLE 4-1

SUMMARY OF DETECTION LIMITS, PRECISION, AND ACCURACY - GROUNDWATER

Parameter	Reference	Detection Limit	Experimental Matrix (Spiking Level)	Precision (RPD)	Accuracy (Percent Recovery)
TOC	EPA 415.2	1.00 mg/l	water spiked with potassium hydrogen phthalate (20 mg/l TOC)	9	85-115
TDS	EPA 160.1	1.0 mg/l	*	15	*
pentachlorophenol (PCP)	EPA 604	1.00 ug/l	water spiked with PCP (100 ug/l)	50	9-103
phenol	EPA 604	1.00 ug/l	water spiked with phenol (100 ug/l)	42	12-89
2-chlorophenol	EPA 604	1,00 ug/l	water spiked with 2-chlorophenol (100 ug/l)	40	27-123
4-chloro-3-methylphenol	EPA 604	1.00 ug/l	water spiked with 4-chloro-3-methylphenol (100 ug/l)	42	23-97
4-nitrophenol	EPA 604	1.00 ug/l	water spiked with 4-nitrophenol (100 ug/l)	50	10-80
Acenaphthene	EPA 610	0.25 ug/l	water spiked with acenaphthene (50 ug/l)	31	46-118
Pyrene	EPA 610	0.25 ug/l	water spiked with pyrene (50 ug/l)	31	22-100
Naphthalene	EPA 610	0.50 ug/l	water spiked with naphthalene (50 ug/l)	40	40-140
benzo(k)fluoranthene	EPA 610	0.25 ug/l	water spiked with benzo(k) fluoranthene (50 ug/l)	50	40-140

*TOC soil samples and TDS water samples are not routinely spiked; duplicate samples are analyzed to determine precision.

Compounds considered as representative of each class of organics are chosen for spiking purposes. All compounds determined by EPA methods 604 and 610 are listed in Table 4-3.

TABLE 4-2

SUMMARY OF DETECTION LIMITS, PRECISION, AND ACCURACY - SOIL

Parameter	Reference	Detection Limit	Experimental Matrix (Spiking Level)	Precision (RPD)	Accuracy (Percent Recovery)
TOC	Walkey-Black	0.003%	*	15	*
pentachlorophenol (PCP)	EPA 8040	100 ug/kg	soil spiked with PCP (10,000 ug/kg)	50	9-103
phenol	EPA 8040	100 ug/kg	soil spiked with phenol (10,000 ug/kg)	42	12-89
2-chlorophenol	EPA 8040	100 ug/kg	soil spiked with 2-chlorophenol (10,000 ug/kg)	40	27-123
4-chloro-3-methylphenol	EPA 8040	100 ug/kg	soil spiked with 4-chloro-3-methylphenol (10,000 ug/kg)	42	23-97
4-nitrophenol	EPA 8040	100 ug/kg	soil spiked with 4-nitrophenol (10,000 ug/kg)	50	10-80
Acenaphthene	EPA 8310	25 ug/kg	soil spiked with acenaphthene (5,000 ug/kg)	31	46-118
Pyrene	EPA 8310	25 ug/kg	soil spiked with pyrene (5,000 ug/kg)	31	22-100
Naphthalene	EPA 8310	50 ug/kg	soil spiked with naphthalene (5,000 ug/kg)	40	40-140
Benzo(k)fluroanthene	EPA 8310	25 ug/kg	soil spiked with benzo(k)-fluoranthene (5,000 ug/kg)	50	40-140

*TOC soil samples and TDS water samples are not routinely spiked; duplicate samples are analyzed to determine precision.

Compounds considered as representative of each class of organics are chosen for spiking purposes. All compounds determined by EPA methods 604 and 610 are listed in Table 4-3.

TABLE 4-3

COMPOUNDS DETERMINED BY EPA METHODS 604/8040 and 610/8310

Method 604/8040 Compounds

2-Chlorophenol
2-Nitrophenol
Phenol
2,4-Dimethylphenol
2,4-Dichlorophenol
2,4,6-Trichlorophenol
4-Chloro-3-methylphenol
2-4-Dinitrophenol
2-Methyl-4,6-dinitrophenol
Pentachlorophenol
4-Nitrophenol
2,3,5,6-Tetrachlorophenol

Method 610/8310 Compounds

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Carbazole
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

References for Tables 4-1 to 4-3

Methods for the Chemical Analysis of Water + Wastes, EPA 600/4-79-20

Federal Register, Vol.49, No. 209, October 26, 1984

Test Methods for Evaluating Solid Waste, EPA-SW-846, second edition, July 1982 and 1984 addendum

5.0 SAMPLING PROCEDURES

A complete description of sampling procedures is provided in a separate Sampling Plan document. This section details the procedures to be used for preparing and labeling containers, preservation, and holding times. It also details Q.C. procedures for sampling soil.

5.1 Preparation

Prior to any field investigation involving the collection of laboratory samples, a sample analysis request sheet is submitted to the laboratory. This form contains pertinent information regarding the location, number, and type of samples to be collected as well as the specific analyses to be performed. (See Figure 5.1).

All new sample bottles with screw-type lids are used for holding and shipping samples. Table 5.1 describes the type of container and cleaning procedure. No preservatives are required for soil samples. The bottles are then labeled with color-coded labels to identify the site and specific parameters associated with that container.

The cleanliness of a batch of precleaned bottles is verified by the use of a trip blank. The trip blank is prepared by filling a batch of precleaned bottles with deionized water. The bottles are transported to the site and returned to the laboratory in the same manner used for the samples. The trip blank is subjected to the same analyses as the samples. Any contaminants found in the trip blank could be attributed to a) interaction between the sample and the container, b) contaminated deionized water, or c) a handling procedure which alters the sample. One trip blank per sampling event is collected.

The EPA recommended holding times for analyzing samples are given in Table 5.2. Results from analyses performed after the given time period should be considered suspect.

5.2 Field Sampling

The following procedures are followed when sampling soil:

1. Prior to sampling, surface vegetation, rocks, leaves, and debris will be removed where appropriate.
2. Appropriate point sampling or compositing techniques, as defined in the project sampling plan, will be used to ensure that the sample is representative of the area sampled and the type of information (e.g., depth of contamination) desired.
3. Soil samples will be placed in a glass wide-mouth jar with Teflon^{R}-lined lid. Sample containers will be labeled with a preprinted label, chilled to 4 ^{o}C, and shipped to the laboratory for analysis.
4. Sampling equipment will be thoroughly cleaned between sampling locations with uncontaminated water or steam. Sampling equipment will be rinsed with acetone and hexane after steam cleaning and allowed to air dry. The acetone and hexane rinses will not be allowed to contaminate the ground or samples.

5. The method for mixing of subsamples in the field to form a composite sample will be detailed in the Sampling Plan. No plastic should be allowed to contact soil samples requiring organic analysis to avoid phthalate contamination.

Groundwater

1. All observations and pertinent data developed during groundwater sampling are recorded in the field notebook.
2. The depth to water is measured and recorded in the field notebook immediately prior to sampling.
3. In order to remove stagnant water and flush the well, three casing volumes of water are removed from each well before sampling. If the well goes dry before three casing volumes are removed, the well is allowed to recover and then sampled.
4. In order to protect the wells from cross contamination during sampling, a separate bailer is attached to each well. All sampling equipment will be kept off contaminated soil.
5. To verify that no contaminants are introduced from sampling equipment, a field blank is collected by filling or pumping deionized water through the sampling device and analyzing for compounds of interest. One field blank per sampling day is collected.

FIGURE 5.1

ANALYTICAL REQUEST FORM

TO: D. M. Miller, MSTC
FROM: ____________________

PROJ. ENG./SCIENTIST: ____________
COPY REPORTS TO: ____________
PLANT/STUDY: ____________
PLANT #: ____________
PHASE #: ____________
COST CODE #: ____________

REQUESTED TURNAROUND TIME: ____________

STUDY DESCRIPTION:
Hydrostudy
RCRA Permitting
Characterization
Treatability Study
Drinking Water
NPDES Permitting
RIFS
Other: ____________

SAMPLE TYPE:
Soil
Sludge
Residue
Groundwater
Surface Water
Process Water

METHOD:
Composite
Grab
Bailer
Pump

EXTRACTIONS:
Total
EP-Toxicity
TCLP
ASTM

ANALYSES REQUIRED

PARAMETER	LIMS
1. pH (by EAL)	PH
2. pH (FIELD)	PHF
3. Conductivity (by EAL)	COND
4. Conductivity (FIELD)	CONDF
5. Acidity-(Total)	ACID
6. Alkalinity	ALK
7. Bicarbonate	HCO3
8. Carbonate	CO3
9. Color	COLOR
10. Chloride	CL
11. BOD-T	BOD5
12. BOD-S	BOD5S
13. COD-T	COD
14. COD-S	CODS
15. Fluoride	F
16. Hardness	HARD
17. Ammonia as N	NH3N
18. Nitrate as N	NO3N
19. Nitrite as N	NO2N
20. Kjeldahl - Nitrogen	TKN
21. Organic - Nitrogen	ORGN
22. Phosphorous - Total	PO4
23. Phosphorous - ortho	PO4O
24. Phosphorous - Total Dissolved	PO4TD
25. Turbidity	TURB

PARAMETER	LIMS
26. SOLIDS	
Dissolved (T-F-V)	TDS or DS
Evaporated (T-F-V)	TDS or ES
Suspended (T-F-V)	TSS or SS
27. Sulfate	SO4
28. Sulfite	SO3
29. Sulfide	S
30. Cyanide	
Total	CN
Amenable	CNAM
Free	CNF
31. Thiocyanate	SCN
32. Oil & Grease	OILS
ORGANICS	
33. Carbon (TOC)	TOC
34. Halogens (TOX)	TOX
35. Phenol	PHNOL
36. PCP	PCP
37. PCB	PCB
38. PAH	PAH
39. Purgeable Aromatics	PAR
40. Purgeable Hydrocarbons	PHAL
41. Acid Extractable Phenolics(EPA 604)	AEP
42. Surfactants	MBAS
METALS	
43. Aluminum (Al)	AL
44. Antimony (Sb)	SB

PARAMETER	LIMS
45. Arsenic(As)	AS
46. Barium(Ba)	BA
47. Beryllium(Be)	BE
48. Boron(B)	B
49. Cadmium (Cd)	CD
50. Calcium (Ca)	CA
51. Chromium (Cr)	
Total	CR
Hexavalent	CR6
52. Copper (Cu)	CU
53. Iron-Total(Fe)	FE
54. Ferrous Iron	FE2+
55. Lead (Pb)	PB
56. Magnesium(Mg)	MG
57. Manganese(Mn)	MN
58. Mercury(Hg)	HG
59. Molybdenum(Mo)	MO
60. Nickel(Ni)	NI
61. Potassium(k)	K
62. Selenium(Se)	SE
63. Silver(Ag)	AG
64. Sodium(Na)	NA
65. Thallium(Tl)	TL
66. Tin(Sn)	SN
67. Titanium(Ti)	TI
68. Zinc(Zn)	ZN
MISCELLANEOUS	
69. Radiation	RAD
70. Bacteria	COL
71. K-004	
72. Priority Pollutants (VOA,BN,AE,Pest Herb Metals)	
73. Other ____________	

SPECIAL INSTRUCTIONS
____

1138-Misc.#6

TABLE 5-1

SAMPLE CONTAINER CLEANING PROCEDURES AND PRESERVATION

Analysis/Parameter	Preservative	Cleaning Procedures
Phenols, PAH (groundwater)	none	1
TOC, COD (groundwater)	$NaHSO_4$ to pH 2	2
Soil Samples (all parameters) and TDS (groundwater)	none	2

*1. Use new bottle; rinse with (pesticide grade) acetone; rinse with (pesticide grade) hexane; air dry.

2. No cleaning required. Use new bottle.

TABLE 5-2

HOLDING TIMES

Parameter	Holding Time (water samples)	Holding Time (soil samples)
TDS	7 days	---
PAH/phenols	7 days (until extraction) 40 days (ntil completion)	10 days (until extraction) 40 days (until completion)
TOC	28 days	28 days

6.0 SAMPLE CUSTODY

The primary objective of sample custody is to create an accurate written verified record, which can be used to trace the possession and handling of the samples from the moment of collection through data analysis and reporting. A sample is under custody if:

a. it is in your possession, or
b. it is in your view, after being in your possession, or
c. it was in your possession and you locked it up, or
d. it is in a designated secure area.

6.1 Field Sample Documentation

The field sampler will be personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched. Samples will be accompanied by a Chain-of-Custody Record (see figure 6.1). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be taped and sealed for shipment to the laboratory.

6.2 Laboratory Sample Documentation

Upon arrival in the laboratory, samples will be checked in by the Sample/Analysis Coordinator or his designate. All samples contained in the shipment will be compared to the

Chain-of-Custody Record to ensure that all designated samples have been received. He will then check all samples for correct preservation and sample condition. Any abnormalities will be noted and recorded on the Chain-of-Custody Record.

The Sample/Analysis Coordinator will also examine whether the sample seal is intact or broken, since a broken seal may mean tampering and would make results inadmissible in court as evidence.

The Environmental Analysis Laboratory's LIMS (Laboratory Information Management System) computer is an integral part of the sample custody procedure. Upon verification of sample receipt at the laboratory, the Sample/Analysis Coordinator will assign a unique eight character ID number to the sample for entry into the LIMS computer. The first two characters reference the year, the next two the month, and the last four the actual number of samples received. For example:

Year	Month	Sample Number
87	02	0050

The computer will reference analyses from a pre-defined project code. It also monitors the progress of samples through the laboratory, tracking dates of analyses, results of analyses, and technicians performing analyses.

Once a sample is logged in, it is transferred to a walk-in coldroom for storage. All Chain-of-Custody records will be kept on file by the Sample/Analysis Coordinator.

FIGURE 6.1

CUSTODY RECORD

PLANT CODE	PROJECT NAME
SAMPLERS (Signature)	

STA. NO.	DATE	TIME	[illegible]	[illegible]	[illegible]	STATION LOCATION	NUMBER OF CONTAINERS						REMARKS OR OBSERVATIONS

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:	

DISTRIBUTION: Original accompanies shipment; Copy to Coordinator Field Files.

7.0 CALIBRATION CONTROLS AND FREQUENCY

All laboratory and field equipment are calibrated before use to ensure proper operating conditions. The following procedures are utilized for this purpose.

7.1 Laboratory Equipment

Organics by Liquid Chromatography or Gas Chromatography - Polynuclear Aromatics

a) prepare a standard curve consisting of a reagent blank and three calibration standards. To verify linearity, the regression coefficient must be > 0.995.

b) analyze the reagent blank and mid-range standard after every five samples; if any contaminants are found in the reagent blank, or if the mid-range standard differs from the true value by more than 20%, the previous results are invalidated.

c) if an undiluted sample falls outside the upper range of the standard curve, it must be diluted and reanalyzed; if the diluted sample gives a result less than five times the method detection limit, the sample must be reanalyzed at a lesser dilution.

TOC Analyzer

a) calibrate instrument with a standard at 400 mg/L.

b) verify linearity with standards at 100 mg/L, 40 mg/L, 10 mg/L, 1 mg/L and a reagent blank.

c) the standard calibration is next checked with an outside reference standard (EPA or ERA); the result must be within the acceptable range provided with the reference sample before any actual samples are processed.

d) analyze the reagent blank and 40 mg/L standard after every 10 samples; subtract the reagent blank value from each of the preceding samples. The 40 mg/L standard must agree within +10% of the true value or the preceding samples are invalidated.

e) if an undiluted sample reads greater than 400 mg/L it must be diluted and reanalyzed; if the diluted sample reads less than 20 mg/L, the sample must be reanalyzed at a lesser dilution.

7.2 Field Instrumentation

pH meter - The initial calibration is performed with three standard buffer solutions reading pH 4.0, 7.0, and 9.0. The calibration is checked after every ten samples. In addition, the meter is checked prior to use with an outside calibration reference standard.

conductivity meter - The conductivity meter used does not have an designated calibration knob. The meter is checked prior to use with an outside calibration standard.

A copy of a field instrument calibration sheet is given in Figure 7.1.

CALIBRATION SHEET

pH METER

Project: ______________________________ Date: ______

Meter: ______________________________

	Meter Reading	Buffer Solutions			Standard 6.5	Operator Initials
		4	7	9		
Initial Calibration	unadjusted					
	adjusted					
Calibration Check	unadjusted					
	adjusted					
	unadjusted					
	adjusted					
	unadjusted					
	adjusted					
Final Calibration	unadjusted					
	adjusted					

Calibration checks should be made after every 10 readings using the pH 7 buffer solution (unadjusted reading). If readings are within .1 unit of the solution no calibration adjustment is made, if greater than .1 a complete calibration is necessary (adjusted reading), if greater than .2 do a complete calibration and increase the frequency of calibration checks.

Operator Signature: ____________________

CONDUCTIVITY METER

Project: ______________________________ Date: ______

Meter: ______________________________

Is meter temperature compensated, (if no, see temp. adjustment) ______ Yes ______ No

Temperature Adjustments:

25°C - If the temperature of the sample is below 25°C, add 2% of the reading per degree.

25°C - If the temperature is above 25°C, subtract 2% of the reading per degree.

Standard (umhos/cm)	Meter Reading	Disregard if meter is temperature compensated: Sample Temp above or below 25°C (y or N)	Disregard if meter is temperature compensated: If Y, add or subtract temp. adjustment to meter reading
1. 300	______	______	Make sure adjusted readings are recorded on field sheet
2. 300	______	______	
3. 300	______	______	

8.0 ANALYTICAL PROCEDURES

The exact analytical procedures used are referenced in Table 4-1.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 Data Reduction

All data are calculated from standard curves which are prepared immediately prior to analysis. The exact procedures used for curve preparation were discussed in Section 7.1. The curves are made by fitting the raw data to a standard linear regression equation. In order to verify that the curves are within the linear working range of the method, the calculated regression coefficient must be $\geq$ 0.995. The accuracy of the curve is checked immediately after preparation and periodically during sample analysis by the analysis of standard reference material. The exact frequency was given in Section 7.1. Samples are diluted so that they fall into the linear working range of the curve. Results are then calculated directly from the curve taking any dilution factors into account.

9.2 Data Validation

All data is validated by the QA Officer prior to reporting. The following procedures are used:

1) Standard curve is prepared prior to sample analysis
2) Standard regression coefficient is > 0.995
3) Standard reference materials are analyzed at proper frequency with acceptable results
4) Reagent blanks are analyzed at the proper frequency
5) Precision requirements of this plan are met.
6) Accuracy requirements of this plan are met
7) Completeness requirements of this plan are met
8) Samples are analyzed within the proper holding time

9) All calculations are verified as correct
10) Proper units are reported
11) Proper methodology was used

The QA Officer will sign all raw data to verify that it is valid before reporting.

9.3 Data Reporting

Once data has been validated, it is returned to the laboratory technician who performed the analyses. The technician enters the result, data analyzed, method used, and his/her initials into the LIMS system where it is stored prior to reporting. When all analyses are completed the laboratory will issue a final report. The QA Officer will check the final report to ensure that no errors have been made in transcription from the raw data. He will then issue the report to the Laboratory Manager for distribution.

10.0 FIELD AND LABORATORY QUALITY CONTROL CHECKS

For analyses conducted on this project, the following QC checks will apply:

1) Standard curves are prepared and validated according to the procedures specified in this plan.
2) For all analyses, at least 10 percent of the samples are replicate spikes. Precision and accuracy of the data is calculated from the replicate spike results as described in Section 12 and compared to the criteria specified in Section 4.0.
3) Trip blanks are analyzed as specified in the plan to help identify possible sources of contamination.
4) A method blank is run with each set of analyses. Usually, compound responses observed in the method blank are subtracted from sample responses. Compounds present at a level greater than the detection limit are investigated to determine the source of contamination.
5) The detection limits determined for each parameter are checked to ensure that they meet the limits specified in Section 4.0.
6) 2-Methylnaphthalene is used as a surrogate spike in the analysis of PAHs by EPA method 8310. The acceptable recoveries in soil are from 30 - 130%.

11.0 PERFORMANCE AND SYSTEM AUDITS

Two types of audit procedures are used to assess and document performance; system audits and performance audits.

11.1 System Audits

System audits are performed by the Project QA Officer on a monthly basis. Audits cover field sheets, chain-of-custody records, laboratory notebooks, sample log-in, dispensing, and labeling, updating QC criteria and methodologies.

11.2 Performance Audits

Performance audits involve the analysis of check samples. Performance evaluation (PE) samples are periodically submitted with routine samples as blind samples. Results are documented by the Project QA Officer.

12.0 PREVENTIVE MAINTENANCE

All major instruments are under service contract so that trained professionals are available on call to minimize instrument downtime. The following routine maintenance is performed in house to prevent problems from occurring.

Liquid Chromatographs

The high-pressure liquid chromatographs will have pump check valves replaced every 3 months and pump seals replaced as needed. The pumps will be tested for flow rate accuracy before each lot of samples is analyzed. Analytical columns will be protected by use of 3 to 5 cm. pellicular guard columns.

Gas Chromatographs

Gas chromatograph septa are changed daily. In addition, detectors are periodically cleaned and columns are replaced when instrument response deteriorates.

TOC Analyzer

The pump tubing and tin scrubber are periodically changed. In addition the infrared detector is cleaned and recalibrated twice a year.

13.0 PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

The following methods are used to assess the validity of the generated data.

13.1 Precision

Precision is a measure of agreement among individual measurements of the same property, under prescribed similar conditions. Precision is assessed by calculating the relative percent difference (RPD) of replicate spike samples as follows:

$$RPD = \frac{R1 - R2}{(R1 + R2)/2} \times 100$$

R1 = % result of spike 1

R2 = % result of spike 2

13.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement to the true value. Accuracy is measured by calculating the percent recovery (R) of known levels of spike compounds as follows:

$$R = \frac{\text{determined value of spiked sample}}{\text{theoretical value of spiked sample}} \times 100$$

theoretical value of spiked sample =

(conc sample)(% sample) + (conc spike)(% spike)

13.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that should have been collected. It is calculated as follows:

$$\text{completeness (\%)} = \frac{\text{\# of valid values reported}}{\text{\# of samples analyzed}} \times 100$$

The minimum completeness for each parameter in this project is 75%.

14.0 CORRECTIVE ACTION

Corrective action is necessary when any section of the QA plan is not followed as specified. The following is a summary of required actions to be followed during any routine investigation.

a. Sample analysis request sheet is sent to laboratory.
b. Bottles are cleaned and prepared as necessary.
c. Samples are collected as specified in the Sampling Plan.
d. Field measurements are conducted and calibrations documented.
e. Samples and blanks are shipped with chain-of-custody record.
f. Samples are received at laboratory and chain-of-custody verified.
g. Samples are given unique number and logged into LIMS system.
h. Samples to receive QC analysis are randomly selected.
i. Samples are properly stored prior to analysis.
j. Laboratory instruments are standardized or calibrated as appropriate.
k. Sample analyses and internal QC checks are performed.
l. All QC procedures are verified.
m. Samples and results are reported.

If any of the above actions are not performed or performed incorrectly, the person(s) responsible will be notified to take the appropriate corrective action.

15.0 QA REPORTS TO MANAGEMENT

This QA plan provides a documentable mechanism for the assurance of quality work projects. Audit reports (Section 9.0) will be provided to management as a means of tracking program performance.