SAMPLING AND ANALYSIS PLAN
Former Barksdale Works
Barksdale, Wisconsin

October 23, 1997 **DERS Project No.7191**

Prepared by

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1.0 INTRODUCTION

The former Barksdale facility, consisting of 1,800 acres, is located in Bayfield County, south of Washburn, Wisconsin on Lake Superior (see Figure 1). DuPont operated the plant from 1904 to 1971, producing mainly explosives. Metal cladding and industrial diamonds were also produced toward the end of the site's active operations. The site is situated on Chequamegon Bay, Lake Superior, between rich iron deposits found in the Gogebic range of Michigan's Upper Peninsula and those in the Mesabi range of northern Minnesota.

During World War I the Barksdale plant was the world's largest producer of TNT (trinitrotoluene), producing 130 million pounds of the explosive between 1913 and 1918. Production was scaled down substantially after the war and again during the depression, but it was increased during World War II, with an estimated 226 million pounds of TNT produced for the war effort. Once the war ended, the production of explosives at the Barksdale plant was decreased, once again, to meet regional mining needs.

DuPont ceased operations at the Barksdale plant in 1971, and most existing buildings were dismantled or demolished within the decade. The Barksdale property was sold in 1986 to Bretting Manufacturing Company, Inc. of Ashland, Wisconsin. The main manufacturing area is currently being used as a private game farm. The Bretting Residence and several other residences are located east of the main manufacturing area, between Route 13 and the Lake Superior Shoreline (see Figure 2).

The water-bearing unit of the area consists of a thick Precambrian sandstone sequence known as the Chequamegon Sandstone and locally as the Lake Superior Sandstone. This sandstone, which may contain some fracture porosity, constitutes the shallow local aquifer and is overlain by Pleistocene glacial fill varying in thickness from 3 feet near the bay to over 160 feet near the northwest corner of the site, based on available well logs.

Analysis of groundwater samples collected by the Wisconsin Department of Natural Resources (WDNR) in June 1997 from a drinking water well, located adjacent to the

Barksdale property at the Bretting Residence, showed possible contamination. As a result, groundwater samples from five wells, four residential wells (including the Bretting Residence well) and one temporarily abandoned water well on the main site are to be collected and analyzed, to determine if other wells have been adversely impacted and to confirm the results obtained from the Bretting well sample. The following is a list of the wells to be sampled.

- ☐ IW708, Former Power House Well
- ☐ IW707, Boy Scout Well
- ☐ CX533, Bretting Well
- ☐ IW709, Tim Smith Well
- ☐ IW711, Warren Smith Well

The locations of the wells to be sampled are shown in Figure 2.

2.0 OBJECTIVES

The objectives of the groundwater sampling activities are as follows:

- ☐ Collect samples to assess groundwater quality in five wells at and adjacent to the former Barksdale Works.
- ☐ Collect additional data for further evaluation of the proposed groundwater treatment system for the Tad Bretting Residence well.
- ☐ Collect data to assess the potential of microbial activity in the aquifer.

These objectives will be accomplished through a site visit and by conducting a round of groundwater sampling analysis.

3.0 SCOPE OF WORK

The sampling plan includes a round of groundwater sample collection and analysis of five wells — four residential wells and one water well (see Figure 2). A summary of the well construction data for wells at or near the site is provided in Table 1. Available well logs for the former plant site are provided in Appendix A. Well construction data which is not available is noted on Table 1 and, if possible, these data gaps (casing material, casing diameter, and well depth) will be reported during field activities.

Sampling will be conducted in accordance with the protocols described in the WDNR's September 1996 *Groundwater Sampling Field Manual* and the September 1996 *Groundwater Sampling Desk Reference* with modifications as indicated in the text of this work plan. These two documents have been provided to the field sampling team. However, field conditions may prevent following of the protocols described in this plan, and additional modifications may be required. Any modifications to the presented protocols will be discussed with the WDNR representative present on the day of the sampling. In addition, all modifications will be documented in field notes with a complete explanation of the reasons for deviations from the plan.

The groundwater samples will be analyzed by a WDNR-approved laboratory for inorganic and nitroaromatic/nitroamine constituents. See Section 8.0 for specifics of the analytical program.

DuPont Corporate Remediation Group and DuPont Environmental Remediation Services (DERS) will be responsible for organizing the sampling activities. Sampling will be conducted by a subcontractor under the guidance of DERS.

4.0 SAMPLING PROTOCOLS

4.1 Sampling Preparation

A WDNR-approved laboratory for explosives and residues analysis will provide the pre-preserved sample containers, coolers, and chain-of-custody forms. Chain-of-custody procedures are provided in the Quality Assurance Project Plan (QAPP) (See Appendix B). DERS will arrange for sample shipment to a WDNR-approved analytical laboratory and will be responsible for all laboratory coordination. The WDNR representative will be responsible for obtaining access to private residences. Procedures for well evacuation and sampling are described below.

In preparation for field activities checklists, such as the *Pre-Field Work Procedures Checklist -- Water Supply Wells, Equipment Checklist -- Water Supply Well Sampling, Pre-Field Work Procedures Checklist -- Monitoring Wells,* and *Equipment Checklist -- Monitor Well Sampling* provided in Appendix C, will be utilized as appropriate. In addition, the following list of equipment will be pre-assembled, as needed, in preparation for well purging and sampling:

- ☐ Preserved sample containers (laboratory provided)
- ☐ Ice for sample shipment
- ☐ Field sampling records (i.e. field logbooks, chain-of-custody forms)
- ☐ Decontamination solutions (e.g., *Alconox®,* brushes, wash basins, and deionized water
- ☐ pH meter, specific conductance meter, dissolved oxygen meter, turbidity meter, temperature probe (and appropriate buffer solutions for daily instrument calibration)
- ☐ Photoionization detector (PID) for organic vapor screening
- ☐ Water-level indicator/oil-water interface probe
- ☐ Polypropylene tubing (ASTM drinking water grade) with foot valves dedicated for use at a single well
- ☐ Helical-rotor Redi Flo2 submersible pump and/or centrifugal pumps
- ☐ Gas-powered generator

☐ Stopwatch

☐ Calibrated bucket (for estimating purge rates)

☐ Polyethylene sheeting

☐ Bottom-loading *Teflon*® bailers (laboratory-decontaminated and wrapped in foil for dedicated use at a single well)

☐ *Teflon*®-coated stainless-steel leader cable

☐ Filtration apparatus (with 0.45 micron filters)

☐ Camera and film

4.2 Well Sampling - Former Main Operating Area

The water well to be sampled is located on the site near the former Power House (building #48) and is reported to have been temporarily abandoned. The well abandonment record is provided in Appendix D. The WDNR reports that there are two wells adjacent to the former Power House. One well was sampled in June of 1997 by the WDNR and the other well, sampled in 1982 by the WDNR, is to be sampled in this event. However, whether the second well is really a well is uncertain. Only one well construction report was found in the historical data for the area of the former Power House and a retired employee of the site recalls only one well being located near the former Power House. This retired employee has suggested that this second "well" may actually be the remnants of a fire pump from a former fire pump house which was located adjacent to the former Power House. The WDNR will discuss the issue further and decide whether the bolted cap on the structure is to be removed and the structure further evaluated and sampled. The sampling subcontractors must be prepared to evaluate and sample this structure if the WDNR decides that these activities are required. In the event that these activities are required, the preceding procedures will be followed. These same procedures will be followed for the Boy Scout Well after the pump jack has been removed.

4.2.1 Well Water-Level Measurements

After initial removal of the well cap, the well headspace will be screened using a calibrated PID, and the results will be recorded in the field notes. Well cap removal and well casing access will be conducted in accordance with the site health and safety plan (HASP; see Appendix E). Before the well is purged, water-level and total well depth will be measured and recorded for use in calculating the well volume. All measurements will be referenced to the surveyor's mark located at the top of the inner casing and will be recorded to the nearest 0.01 foot. If a surveyor's mark is not observed, then the depth from the ground surface to the measuring point at the top of the casing will be measured to the nearest 0.01 foot, and will also be recorded in the field notes. The well location and elevation will be surveyed at a later time.

One measuring device will be used for all the residential wells and the water well. The water-level probe will be decontaminated prior to each water-level measurement using the decontamination procedures described in Section 7.0.

4.2.2 Well Evacuation

With the exception of the Boy Scout Camp well, evacuation will not be required for sampling of the residential wells.

The former Power House water well and the Boy Scout well to be are open hole completed below a surface casing. The former Power House well is 364 feet in depth with the lower 214 feet open hole and the Boy Scout well is 95 feet deep with the lower 55 feet open hole. Neither of the well log descriptions notes the presence of bedrock fractures and no information is available on the capacity of the former Power House well. Therefore, a purge rates approximately equal to recharge rates are recommended. However, because the presence or location of fracture zones in these well and the well capacities are not known, recharge rates may be variable within a well evacuation. Samplers will provide detailed notes on purge and recharge rates. All efforts will be made to remove stagnant water from the wells and to collect a sample that represent the physical and chemical composition of groundwater as required by WDNR (WDNR 1996A,B).

The Boy Scout well and the former Power House well will be evacuated using the following procedures. A submersible helical-rotor pump (rated from approximately 0.1 to 40 liters per minute [l/min]) or bladder pump (rated from 0 to 24 l/min) will be used to purge the wells. Every effort will be made to avoid purging the wells to dryness by lowering the pumping rate as much as possible to avoid dewatering the wells. If it is impossible to lower the purge rate enough to avoid dewatering the wells before field parameters have been stabilized, the wells will be purged to dryness at a low rate, to minimize disturbance, and sampled when they have recovered sufficiently to produce a sample. The time between purging and sampling should not exceed two hours unless more time is required to allow the wells to recover sufficiently for sampling.

Field parameters (temperature, pH, specific conductance, dissolved oxygen, and turbidity) will be monitored and recorded during purging (at a minimum, after purging of each well volume). Sampling will begin after purging of at least one well volume and the stabilization of these parameters. Stabilization is reached when three consecutive sets of field readings collected at three minute intervals are within 10 percent of each other. If stabilization is not reached, the well will be sampled when a maximum of three well volumes have been evacuated or when the well has been evacuated to dryness.

All equipment will be decontaminated properly after use at each well using procedures outlined in Section 7.0.

4.2.3 Well Sample Acquisition

The following procedures will be used for sampling of the former Power House well and the Boy Scout Well. Sampling of the residential wells is discussed in Section 4.3.

Plastic sheeting will be placed around the well for staging sampling equipment and sample containers. After well sampling is completed, the plastic and personal protective equipment (PPE) will be disposed of in accordance with the site's waste management plan (WMP; see Appendix F). Surgical gloves will be changed between sample locations.

Samples will be collected using dedicated bottom-loading *Teflon*® bailers or using helical-roter pumps. The following procedure will be employed if bailers are used. Dedicated bottom-loading *Teflon*® bailers (decontaminated according to approved procedures in the laboratory) with disposable polypropylene rope will be used for sample collection. Samples will be obtained by gently lowering the bailer into the water column until it is fully submerged, taking care to minimize sample agitation and aeration. The bailer will be subsequently retrieved from the well, and the sample will be transferred to appropriate containers.

If helical-roter pumps are used to collect the samples the following procedure will be used. The decontaminated dedicated helical-roter pump is lowered into the well. Water is purged from the well, as discussed Section 4.2.2, through a disposable *Teflon*® discharge line. When the field parameters have stabilized, as described previously, a sample is collected from the *Teflon*® discharge line directly into the sample container.

Samples will be collected in the following order: volatile organic constituents, semi-volatile organic constituents, total metals, filtered metals, anions, TSS and TDS. If at all possible, samples from the wells will be collected using the same sampling method. Samples will be placed on ice in a cooler immediately following collection.

Samples for filtered metals will initially be collected in laboratory-provided, nonpreserved polyethylene containers. The samples will be immediately field-filtered through an in-line, disposable, 0.45-micron metals filter after collection. The filter membrane and filtering device will be flushed with a minimum of 0.5 liters of reagent-grade water prior to use. Sample collection of the filtered water will take place after filtering approximately 150 milliliters of water. Filtered samples will be preserved and placed on ice in a sample cooler. The filtration apparatus will be disposed of according to the WMP (see Appendix F). In the event that the in-line filter does not function properly, more conventional methods for field filtering may be used.

Field sample measurements for pH, temperature, specific conductivity, dissolved oxygen, and turbidity will be taken during well evacuation procedures (see section 4.2.2) and will be recorded in the bound logbook. Specific conductivity will be measured prior to measuring pH. All instruments used for field sample measurements will be calibrated according to manufacturer's instructions. In addition, all instruments used for field sample measurements will be decontaminated prior to use as indicated in Section 7.0.

4.3 Residential Well Sampling

When collecting samples from the residential wells, samples will be collected from the port closest to the pumping well, prior to any storage tanks and treatment systems. If a sample is collected following a treatment unit, the type, size and purpose of the treatment system must be recorded in the field documentation. The residence owners must be consulted with prior to modifying the plumbing system in any way. A WDNR representative will be responsible for installing a proper port if one does not exist (as is the suspected case with the Tim Smith residence well [IW709]). In all cases, potential for contamination from existing plumbing will be noted in the field books.

The plumbing and storage tanks will be evacuated prior to sampling by running the water for approximately 15 minutes. Field parameters (temperature, pH, specific conductance, dissolved oxygen, and turbidity) will be monitored and recorded during. Sampling will begin after purging and the stabilization of these parameters. Stabilization is reached when three consecutive sets of field readings collected at three minute intervals are within 10 percent of each other.

All efforts will be made to collect a sample that represent the physical and chemical composition of groundwater as required by WDNR (WDNR 1996A,B) given the specific field conditions of the residential wells. If at all possible, samples from the wells will be collected using the same sampling method. Samples will be filtered as described in the previous section. All modifications to the sampling procedures due to field conditions will be discussed with the WDNR representative and documented in the field notes.

5.0 SAMPLE HANDLING AND STORAGE

After samples are collected, filtered (if required), properly labeled, and preserved (if necessary) they will immediately be placed on wet ice in a cooler. Samples will be maintained at a temperature at or below 4°C. Frozen cold packs (e.g., blue ice) will not be used.

Breakable sample containers will be packaged properly to prevent breakage during shipping, however, the packing will not insulate the sample from the ice.

6.0 SAMPLE TRACKING, SECURITY AND CHAIN-OF-CUSTODY

Samples will be labeled using waterproof labels and permanent waterproof markers for identification. Labels will not be placed on lids. Each sample label will include:

- ☐ A unique sample identifier
- ☐ Site/project name
- ☐ Date and time of sample collection
- ☐ Preservation and analysis required

Chain-of-custody documentation will be required for each sample collected. Chain-of-custody documentation will be included in the cooler with the samples. The laboratory chain-of-custody forms will be used to document sample possession and the requested analytical parameters. Samples will be shipped to the laboratory by a courier provided by the laboratory or overnight shipping. The cooler used for sample shipment to the laboratory will be sealed and will include a custody seal containing the sampler's name and the date and time of shipment.

7.0 EQUIPMENT DECONTAMINATION

When possible laboratory-cleaned or disposable sampling equipment will be used. In addition, dedicated sampling equipment will be used to minimize the need for field decontamination. However, in the event that field decontamination is necessary, the following procedures will be followed:

- ☐ Wash with *Alconox*® detergent and tap water.
- ☐ Rinse with distilled/deionized water.
- ☐ Rinse a second time with distilled/deionized water.
- ☐ Completely air dry.

Appropriate PPE will be worn during decontamination activities.

8.0 ANALYTICAL PARAMETERS AND METHODS

Table 2 summarizes the parameters being monitored at each well. Some of the parameters listed for the Bretting well (e.g., major cations and anions) will be used to define groundwater geochemistry, for evaluation of the water treatment system proposed for the Bretting residence. Parameter lists have been expanded further in the QAPP (see Appendix B). The QAPP also summarizes the bottle types, preservation methods, holding times, and analytical methods that will be used for each parameter or parameter group.

8.1 Quality Assurance and Quality Control

The following quality assurance and quality control (QA/QC) samples will be collected during the groundwater sampling event (see Appendix B for further definition of QA/QC samples):

- ☐ Field duplicate samples
- ☐ Equipment blanks for each day of sampling
- ☐ Trip blanks for volatile organic constituent sampling
- ☐ Matrix spike (MS) samples and matrix spike duplicate (MSD) samples

Equipment blanks will be obtained at a rate of one per day by pouring laboratory-supplied distilled/deionized water over the sampling equipment and transferring the water into sample containers. The blank sample will be shipped with the other samples collected that day.

The samples will be shipped to the laboratory on the day of collection. Samples and chain-of-custody forms will be placed in coolers with the original bottles, packed in wet ice, and sealed for custody purposes. The laboratory chain-of-custody forms will be used to document sample possession and the requested analytical parameters. Samples will be shipped to the laboratory by a courier provided by the laboratory or overnight shipping.

Field conditions and field activities associated with groundwater sample collection will be documented in the field logbooks. A copy of the notes will be provided to the team lead after sampling is completed. The field notes must contain sufficient detail to recreate field conditions and the sampling events. Field conditions documentation will be supplemented by sketches and photographs as needed. Specific information to be recorded in the field notes includes, but is not limited to, the following. In the case of the residential well sampling, all information below may not be obtainable.

- ☐ Well identification
- ☐ PID headspace and breathing-zone screening results
- ☐ Total well depth
- ☐ Height from ground surface to top of casing
- ☐ Well volume calculations
- ☐ Purge method
- ☐ Time of purging initiation
- ☐ Purge rate and duration (checked periodically with stopwatch and calibrated bucket)
- ☐ Field parameter measurements and description of purge water (i.e., color, turbidity) after evacuation of each well volume and following sampling
- ☐ Time of purging completion
- ☐ Total volume purged
- ☐ Sampling time
- ☐ Weather conditions at time of sampling

8.2 Data Evaluation and Reporting

Groundwater analytical results will be reviewed and evaluated with results obtained from previous sampling rounds. The analytical results will be reported, and data interpretation will be provided in a report. A description of field activities, completed field logbooks, and properly executed chain-of-custody forms will be provided in the report.

9.0 HEALTH AND SAFETY

The DERS HASP will be used to ensure overall site safety during groundwater sampling (see Appendix E). All field personnel will be required to comply with the health and safety procedures set forth in the site HASP.

10.0 WASTE MANAGEMENT

Purge water, disposable sampling equipment, and PPE disposal will be addressed in the site-specific WMP (see Appendix F) that will be prepared before any field activities begin.

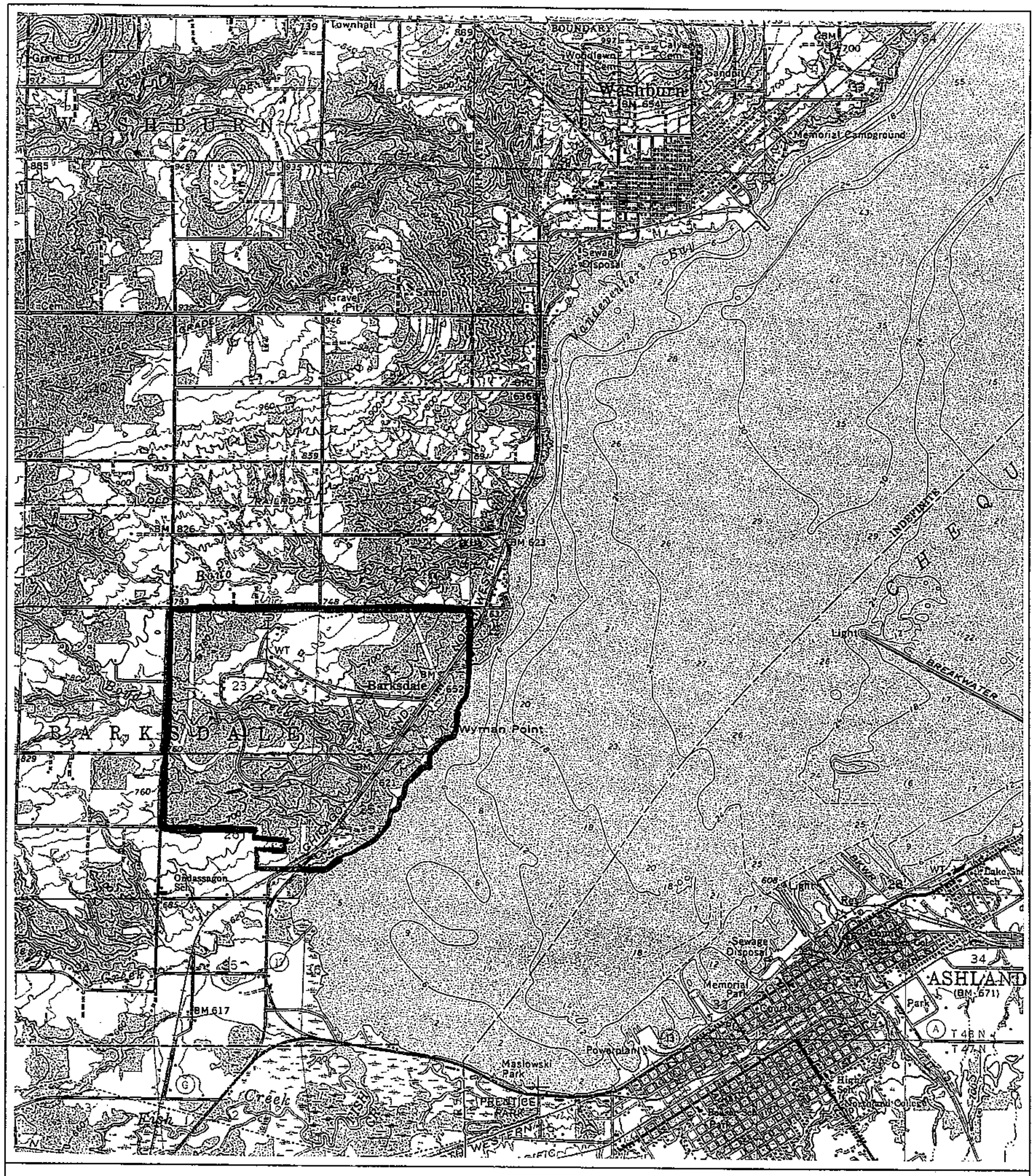
11.0 REFERENCES

DuPont. 1954. *The First 50 Years of Barksdale Works.*

WDNR. September 1996A. *Groundwater Sampling Desk Reference.* PUBL-DG-037 96.

WDNR. September 1996B. *Groundwater Sampling Field Manual.* PUBL-DG-038.

FIGURES



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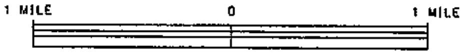
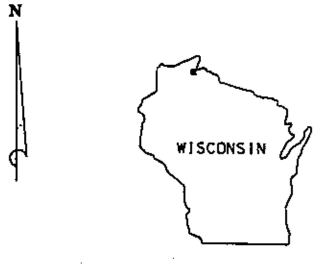



SOURCE: U.S.G.S. BARKSDALE WISCONSIN QUADRANGLE 7.5 SERIES

SITE LOCATION MAP

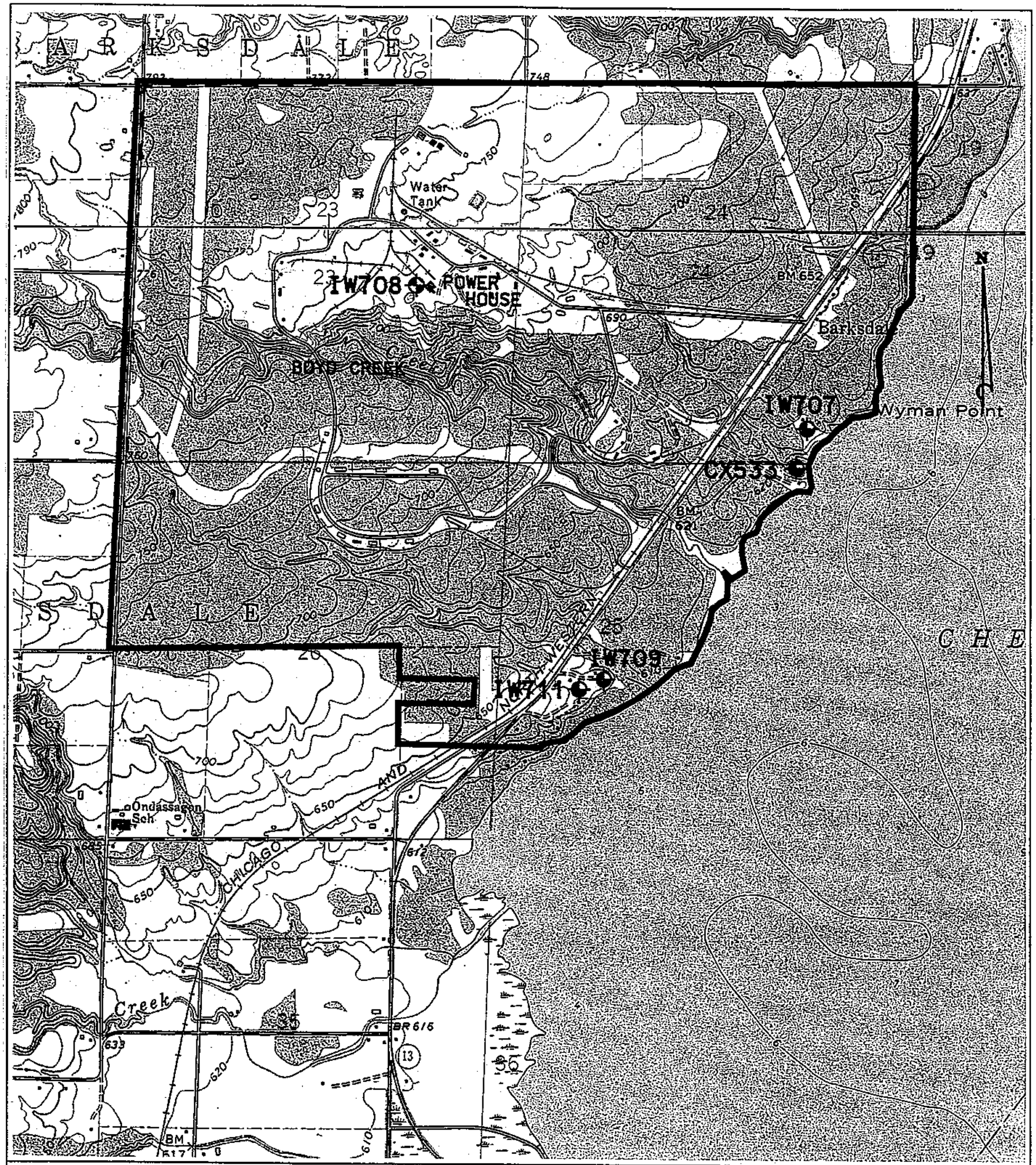
FIGURE 1

SCALE 1"= 2000'
DESIGNED BY
DRAWN BY DHB
CAD DRAWING NO SITEMAPS
DATE 10/16/97
CHECKED
APPROVED
PROJECT NO

FORMER E.I. DUPONT BARKSDALE WORKS
BARKSDALE, WISCONSIN

DU PONT

DuPont Environmental Remediation Services



LEGEND

⊕ TEMPORIARILY ABANDOONED WATER WELL

⊕ RESIDENCE WELL

SCALE

0 1 MILE

SOURCE: U.S.G.S. BARKSDALE WISCONSIN QUADRANGLE 7.5 SERIES

GROUNDWATER SAMPLE LOCATION MAP			FIGURE 2
SCALE 1"= 2000'	DESIGNED BY	DRAWN BY DHB	CAD DRAWING NO SITEMAPS
DATE 10/16/97	CHECKED	APPROVED	PROJECT NO
FORMER E.I. DUPONT BARKSDALE WORKS BARKSDALE, WISCONSIN			DUPONT
DuPont Environmental Remediation Services			

TABLES

Table 1

WELL CONSTRUCTION DATA
Former Barksdale Works
Barksdale, Wisconsin

WDNR #	Identifer	Total Depth (ft)	Lithology	Depth (ft	Casing Materia	Casing Depth (ft	Casing Diameter (in	Depth to Water (ft)	Other Information
IW709*	Tim Smith Well	105	drift sand	0-105 at 105				flowing (estimated elevation is 622 ft MSL)	Timothy and Nancy Smith Rt 3 Box 56 Ashland, WI 54806
IW711*	Warren Smith Well	NA	NA	NA	NA	NA	NA	NA	Warren and Edna Mae Smith Rt 3 Box 54 Ashland, WI 54806
CX533*	Bretting Well	103	clay sandstone	0-29 29-103	Taiwan Pipe open hole	+2-40 40-103	6 6	31	C/O Wayne Peterson Rt 3 Box 158 Ashland, WI 54806
IW707*	Boy Scout Well (Gitchegaunee Council)	95	clay brownstone	0-5 5-95	Std Steel Pipe open hole	0-40 40-95	4 6	16	at Boy Scout Camp off of Rt 13, north of Bretting Well
IW708 **	Former Power House Well	364	clay glacial drift red sandstone shale white sandstone	0-20 20-152 152-260 260-282 282-364	casing open hole	0-150.5 150.5-36	6 6	60	near former Power House Installed in 1905 by Atlantic Mfg. Co. as Well #5 exact location not known
IW710	Main Gate Well	103	sandy sub soil clay brownstone	0-3 3-8 8-103	Std Steel Pipe open hole	0-40 40-103	4 6	36	off of Rt 13 at former Main Gate, across from Barksdale Village
NA	Well No. 1	76	clay brownstone	0-5 5-76	Std Steel Pipe open hole	0-40 40-76	4 6	31	in Barksdale Village
NA	Well No. 2	80	clay brownstone	0-5 5-80	Std Steel Pipe open hole	0-38 38-80	4 6	31	in Barksdale Village
NA	Well No. 3	82	clay brownstone	0-5 5-82	Std Steel Pipe	0-82	4	31	in Barksdale Village
NA	Well No. 4	90	clay brownstone	0-5 5-90	Std Steel Pipe open hole	0-40 40-90	4 6	31	in Barksdale Village
NA	Well No. 5	94	clay brownstone	0-5 5-94	Std Steel Pipe	0-94	4	31	in Barksdale Village
NA	Well No. 6	96	clay brownstone	0-5 5-96	Std Steel Pipe open hole	0-41 41-90	4 6	31	in Barksdale Village
IW902	Robert Carlson well	100	clay brownstone	0-5 5-100	Std Steel Pipe open hole	0-41 41-100	4 6	31	in Barksdale Village
IW884	Scott Filbert well	105	clay brownstone	0-5 5-105	Std Steel Pipe open hole	0-4 40-105	4 6	31	in Barksdale Village

Note: Data from well construction records provided by the Wisconsin Geological and Natural Survey and in DuPont files.
* Wells to be sampled October 29-31, 1997
** Sampling of this well may not be conducted pending WDNR notification.
NA = not available
See Figure 2 for well locations.

Table 2

SUMMARY OF SAMPLING PROGRAM
Former Barksdale Works
Barksdale, Wisconsin

Constituent		Method
PPL Metals (Total and Dissolved)	Antimony (GFAA)	7041
	Arsenic (GFAA)	7060
	Beryllium (ICP)	6010
	Cadmium (ICP)	7131
	Chromium (ICP)	6010
	Copper (ICP)	6010
	Lead (GFAA)	7421
	Mercury (Cold Vapor)	7470
	Nickel (ICP)	6010
	Selenium (GFAA)	7740
	Silver (ICP)	6010
	Thallium (GFAA)	7841
	Zinc (ICP)	6010
Nitroaromatics/Nitroamines	HMX	8321
	1,3,5-Trinitrobenzene	8321
	RDX	8321
	1,3-Dinitrobenzene	8321
	Nitrobenzene	8321
	2,4,6-Trinitrotoluene	8321
	Tetryl	8321
	2,4-Dinitrotoluene	8321
	2,6-Dinitrotoluene	8321
	2-Amino-4,6-DNT	8321
	4-Amino-2,6-DNT	8321
	2-Nitrotoluene	8321
	4-Nitrotoluene	8321
	3-Nitrotoluene	8321
	Nitroglycerin	8321
	PETN	8321
	EGDN	8321
	PGDN	8321
	Picric Acid	8321
	Picramic Acid	8321
Major Cations and Anions (see note below)	Chloride, total*	9056
	Bromide, total*	9056
	Iron, total	6010
	Iron, dissolved	6010
	Sodium, total*	6010
	Barium, total*	6010
	Calcium, total*	6010
	Magnesium, total*	6010
	Manganese, total*	6010
	Potassium, total*	6010

* indicates additional parameters to be analyzed for only in the Bretting Well (CX533)

Table 2

SUMMARY OF SAMPLING PROGRAM
Former Barksdale Works
Barksdale, Wisconsin

Constituent		Method
Inorganic Nutrients (see note below)	Ammonia-Nitrogen*	350.1
	Nitrate-Nitrite total	9056
	Kjedahl-Nitrogen*	351.3
	Phosphorus, total and dissolved*	365.4
	Sulfate	9056
	Sulfide	376.1
Final metabolic End Products (see note below)	Methane*	8015
	Ethane*	8015
	Ethene*	8015
Other (see note below)	Total Organic Carbon	415.1
	Total Dissolved Solids	160.1
	Total Suspended Solids	160.2
	Chemical Oxygen Demand*	410.4
	Bicarbonate Alkalinity*	310.1
	Carbonate Alkalinity*	310.1
	Total Alkalinity*	310.1
	Biological Oxygen Demand*	405.1
Field Parameters	Specific Conductivity	
	pH	
	Temperature	
	Dissolved Oxygen	
	Redox	
	Turbidity	

* indicates additional parameters to be analyzed for only in the Bretting Well (CX533)

APPENDICES

Appendix A

AVAILABLE WELL LOGS

BAYFIELD COUNTY BA-117-U

T48N R5W SW¼, Section 25

OWNER = Harris

WATER LEVEL = Flowing

FORMATIONS =	Drift	0-105
	Sand	AT 105

WDNR# IW709

WDNR # CX533

Well Construction Report For
WISCONSIN UNIQUE WELL NUMBER CX 533

OCT 31 1991

State of Wisconsin
Department of Natural Resources
Private Water Supply — WS/2
Box 7921
Madison, WI 53707

Property Owner: Tad Bretting
Telephone Number: ( ) N/A
Mailing Address: c/o Wayne Peterson
Rt 3 Box 158
City: Ashland
State: WI
Zip Code: 54806
County of Well Location: Bayfield
County Well Location Permit No.: W
Well Completion Date: 9, 9, 91 (MM DD YY)

04

Well Constructor (Business Name): Paul Anderson Wells
Registration #: 4681
Address: Rt 4 Box 152
City: Ashland
State: WI
Zip Code: 54806

1. Location (Please type or print using a black pen.)

☒ Town ☐ City ☐ Village of BARKSDALE
Fire # (if available):
Grid or Street Address or Road Name and Number (if available):
Subdivision Name:
Lot #:
Block #:
Gov't Lot # ____ or NW ¼ of NE ¼ of Section 26; T 48 N; R 5 ☐ E ☒ W

2. Mark well location in correct 40-acre parcel of section.

	N	
W	X (in NE quarter, NW 40)	E
	S	

3. Well Type ☒ New ☐ Replacement ☐ Reconstruction
of unique well # ____ constructed in 19 ____.
Reason for new, replaced or reconstructed well? NEW HOME

☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other

4. Well serves 1 # of homes and/or ____
(ex: barn, restaurant, church, school, industry, etc.)
High Capacity Well? ☐ Yes ☒ No
High Capacity Property? ☐ Yes ☒ No

5. Well Located on Highest Point of Property, Consistent with the General Layout and Surroundings? ☒ Yes ☐ No If no, explain on back side.
Well Located in Floodplain? ☐ Yes ☒ No
Distance In Feet From Well To Nearest:

____ 1. Landfill
70' 2. Building Overhang
____ 3. Septic or Holding Tank
____ 4. Sewage Absorption Unit
____ 5. Nonconforming Pit
____ 6. Buried Home Heating Oil Tank
____ 7. Buried Petroleum Tank
300' 8. Shoreline/Swimming Pool
____ 9. Downspout/Yard Hydrant
____ 10. Privy
____ 11. Foundation Drain to Clearwater
____ 12. Foundation Drain to Sewer
____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 15. Collector or Street Sewer
____ 16. Clearwater Sump
____ 17. Wastewater Sump
____ 18. Paved Animal Barn Pen
____ 19. Animal Yard or Shelter
____ 20. Silo — Type ____
____ 21. Barn Gutter
____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 23. Other Manure Storage ____
Other NR 112 Waste Source
____ 24. NO SEWER AT TIME

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
8"	surface	40'
6"	40	103'

Method of constructing upper enlarged drillhole only.

☒ 1. Rotary — Mud Circulation
☐ 2. Rotary — Air
☐ 3. Rotary — Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain ____
☐ 7. Other ____

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Mfg. & Method of Assembly	From (ft.)	To (ft.)
~~6~~ 6.625	OD 6" ID PE A53B	surface	↑
	TAIWAN PIPE	-	42'
	ROCK	42'	103'

Dia. (in.)	screen type and material	From	To
	ROCK	40	103

8. Grout or Other Sealing Material

Method ____

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
CEMENT	surface		8

9. Geology

DNR USE ONLY	Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
C	CLAY	surface	29'
N	SAND STONE	29	103

10. Static Water Level
____ ft. above ground level
71 ft. below ground surface

11. Pump Test
Pumping Level 42' ft. below surface
Pumping at 12 GPM for 24 hours

12. Well Is: 12 in. ☒ Above ☐ Below Grade
Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☐ No If no, explain N/A

14. Signature of Point Driver or Registered Driller: Paul R Anderson PRA
Date Signed: 9.18.91
Signature of Drill Rig Operator: Same PRA
Date Signed:

Make additional comments on reverse side about geology, etc.

DNR
WELL CONSTRUCTION REPORT
Form 3300-77A
Rev. 9-88

134

WGNHS ORIGINAL

BA-31-U Wel. 6-30M(6-50)

per USGS
SW, SE, Sec. 24 T48N R5W

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

See Instructions on Reverse Side

BA-31-U

RECEIVED
28 1951
BUREAU SAN. ENG.

1. County Bayfield ☑ Town ☐ Village ☐ City Barksdale
Check one and give name

2. Location S. of Village of Barksdale T 48 R5W
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☐ or Agent ☐ Gitchegaumee Council
Name of individual, partnership or firm

4. Mail Address Ashland, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ___ ft; drain ___ ft; septic tank ___ ft; ___
dry well or filter bed ___ ft; abandoned well ___ ft. ___

6. Well is intended to supply water for: ___

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	40			
4"	0	95			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std steel pipe	0	40

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumite Cement	20	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone 5	5	95

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 16 ft.

Water-level when pumping: 16 ft.

Water sample was sent to the state laboratory at:
Madison on Jan 20 1951
City

Construction of the well was completed on:
Jan 15 1951

The well is terminated 12 inches
☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?
Yes ✓ No ___

Was the well sealed watertight upon completion?
Yes ✓ No ___

Signature W. A. Gustafson
Registered Well Driller

Washburn Wis
Complete Mail Address

Please do not write in space below

Rec'd ___ No. ___

Ans'd ___

Interpretation ___

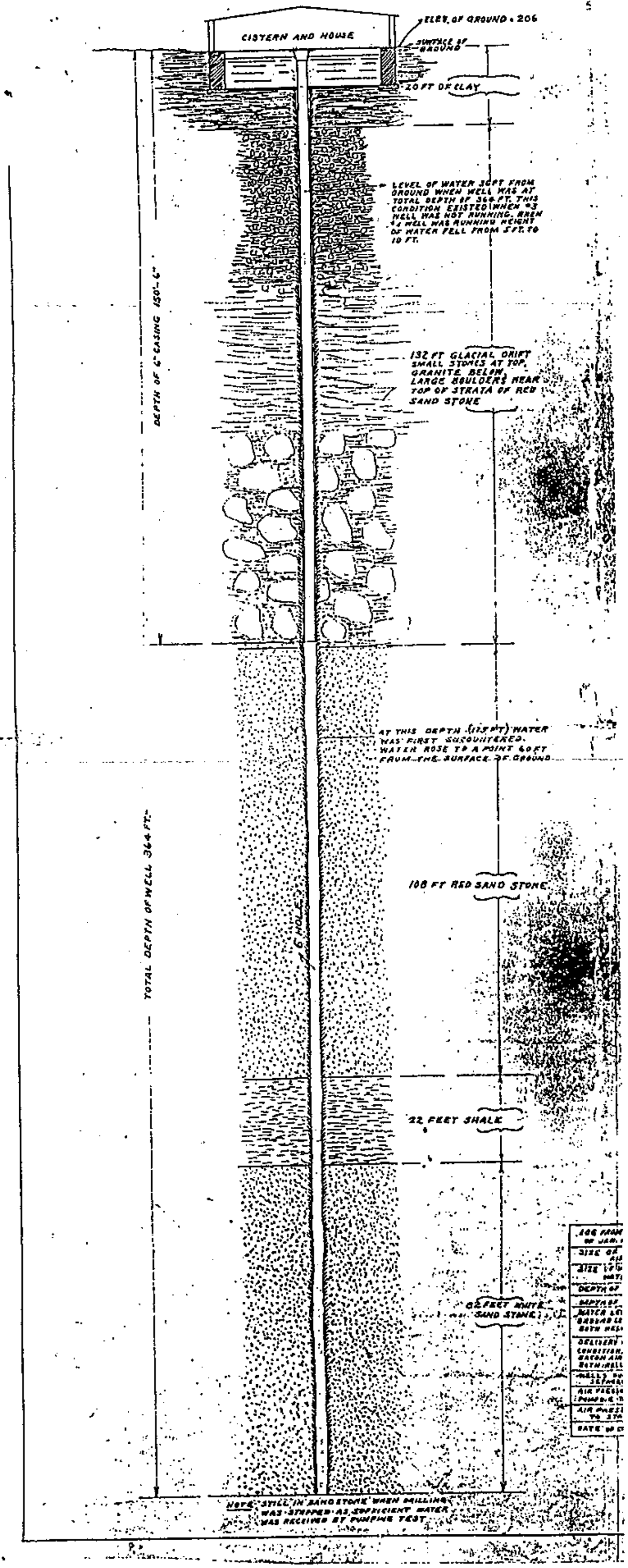
WDNR# IW707

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ___

Former Power House Well
(IW 708)

WELL #5



No I well

BA-35-u

Wel. 6-80M (6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

BA-35-u

NE, SE, Sec. 24 T48N, R5W

See Instructions on Reverse Side

RECEIVED FEB 23 1951 BUREAU SAN. ENG.

1. County Bayfield — Town ☐ Village ☑ City ☐ Barksdale (Check one and give name)
2. Location Well No I · Village of Barksdale, T 4 (Name of street and number of premise or Section, Town and Range numbers)
3. Owner ☑ or Agent ☐ E. I. Du Pont De Nemours Co (Name of individual, partnership or firm)
4. Mail Address Barksdale, Wis (Complete address required)
5. From well to nearest: Building 5 ft; sewer ___ ft; drain ___ ft; septic tank ___ ft; ___ dry well or filter bed ___ ft; abandoned well ___ ft.
6. Well is intended to supply water for: Home

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	40			
4"	0	76			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	std steel pipe	0	40

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumite Cement	20	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone Rock	5	76

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 26 ft.

Water sample was sent to the state laboratory at: Madison (City) on Jan 25 1951

Construction of the well was completed on: Jan 22 1951

The well is terminated 12 inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes ✓ No ___

Was the well sealed watertight upon completion? Yes ✓ No ___

Signature W. A. Gustafson (Registered Well Driller) — Washburn Wis (Complete Mail Address)

Please do not write in space below

Rec'd ___ No. ___

Ans'd ___

Interpretation ___

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ___

Well no 2

BA-55-U

Wel. 6-30M(6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24 T48N R5W See Instructions on Reverse Side BA-55-U

RECEIVED FEB 23 1951 BUREAU SAN. ENG.

1. County Bayfield Town ☐ Village ☑ City ☐ Barksdale
Check one and give name

2. Location Village of Barksdale 2 48 R 5
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☑ or Agent ☐ E. I. du Pont de Nemours Co
Name of individual, partnership or firm

4. Mail Address Barksdale, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ___ ft; drain ___ ft; septic tank ___ ft; dry well or filter bed ___ ft; abandoned well ___ ft.

6. Well is intended to supply water for: home

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	38			
4"	0	80			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std. Steel pipe	0	38

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumite Cement	18	38

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	80

Construction of the well was completed on: Jan 22 1951

The well is terminated 12 inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes ✓ No ___

Was the well sealed watertight upon completion? Yes ✓ No ___

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 25 ft.

Water sample was sent to the state laboratory at: Madison (City) on Jan 25 1951

Signature W. A. Gustafson (Registered Well Driller) Washburn Wis (Complete Mail Address)

Please do not write in space below

Rec'd ___ No. ___

Ans'd ___

Interpretation ___

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ___

Well no III

BA-56-u

Wel. 6-30M (6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24, T48N R5W See Instructions on Reverse Side BA-56-u

RECEIVED 23 1951 BUREAU SAN. ENG.

1. County Bayfield ☐ Town ☑ Village ☐ City Barksdale Check one and give name
2. Location Village of Barksdale T48 R5 Well No. (Name of street and number of premise or Section, Town and Range numbers)
3. Owner ☑ or Agent ☐ E. I. Du Pont de Nemours Co (Name of individual, partnership or firm)
4. Mail Address Barksdale, Wis (Complete address required)
5. From well to nearest: Building 7 ft; sewer ___ ft; drain ___ ft; septic tank ___ ft; dry well or filter bed ___ ft; abandoned well ___ ft.
6. Well is intended to supply water for: home

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	39			
4"	0	82			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std Steel pipe	0	82

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite Cement	19	39

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	82

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 25 ft.

Water sample was sent to the state laboratory at: Madison (City) on Jan 25 1951

Construction of the well was completed on: Jan 22 1951

The well is terminated 12 inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes ✓ No ___

Was the well sealed watertight upon completion? Yes ✓ No ___

Signature W. A. Gustafson (Registered Well Driller) Washburn Wis (Complete Mail Address)

Please do not write in space below

Rec'd ___ No. ___

Ans'd ___

Interpretation ___

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ___

well no IV.

BA - 57-u

Wel. 6-30M[(6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24 T48N R5W See Instructions on Reverse Side

BA-57-u

RECEIVED
FEB 23 1951
BUREAU SAN. ENG.

1. County Bayfield Town ☐ Village ☑ City ☐ Barksdale
Check one and give name

2. Location Village of Barksdale T 48 R 5 . Well 4
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☐ or Agent ☐ E. I. Du Pont de Nemours
Name of individual, partnership or firm

4. Mail Address Barksdale, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft;
dry well or filter bed ____ ft; abandoned well ____ ft.

6. Well is intended to supply water for: home

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	40			
4"	0	90			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std Steel pipe	0	40

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite Cement	20	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	90

Construction of the well was completed on:
Jan 22 1951

The well is terminated 12 inches
☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?
Yes — No ____

Was the well sealed watertight upon completion?
Yes ✓ No ____

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 27 ft.

Water sample was sent to the state laboratory at:
Madison on Jan 25 1951
City

Signature W. A. Gustafson Washburn Wis
Registered Well Driller Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

Well no 5

BA-58-u

Wel. 6-30M(6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24 T48N R5W See Instructions on Reverse Side

BA-58-u

RECEIVED
FEB 13 1951
BUREAU SAN. ENG.

1. County Bayfield Town ☐ Village ☑ City ☐ Barksdale
Check one and give name

2. Location Village of Barksdale T 48 R 5 Well 5
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☐ or Agent ☐ E. I. du Pont de Nemours
Name of individual, partnership or firm

4. Mail Address Barksdale, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ______ ft; drain ______ ft; septic tank ______ ft;
dry well or filter bed ______ ft; abandoned well ______ ft.

6. Well is intended to supply water for: ______

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	40			
4"	0	94			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std Steel pipe	0	94

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite cement	20	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	94

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 27 ft.

Water sample was sent to the state laboratory at:
Madison on Jan 25 1951
City

Construction of the well was completed on:
Jan 22 1951

The well is terminated 12 inches
☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?
Yes ✓ No ______

Was the well sealed watertight upon completion?
Yes ✓ No ______

Signature W. A. Gustafson Washburn Wis
Registered Well Driller Complete Mail Address

Please do not write in space below

Rec'd ______ No. ______

Ans'd ______

Interpretation ______

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ______

Well no F1

BA-59-u

Wel. 6-30M[(6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE Sec. 24 T48N R5W See Instructions on Reverse Side

BA-59-u

RECEIVED FEB 23 1951 BUREAU SAN. ENG.

1. County Bayfield Town ☐ Village ☑ City ☐ Barksdale
Check one and give name

2. Location Village of Barksdale T48 R5 Well 6
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☑ or Agent ☐ E. I. du Pont de Nemours & Co
Name of individual, partnership or firm

4. Mail Address Barksdale, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft;
dry well or filter bed ____ ft; abandoned well ____ ft.

6. Well is intended to supply water for: ____

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	41			
4"	0	96			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std steel pipe	0	41

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite Cement	20	41

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 27 ft.

Water sample was sent to the state laboratory at:
Madison on Jan 25 1951
City

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	96

Construction of the well was completed on:
Jan 22 1951

The well is terminated 12 inches
☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?
Yes ✓ No ____

Was the well sealed watertight upon completion?
Yes ✓ No ____

Signature W. A. Gustafson Washburn, Wis.
Registered Well Driller Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

Well No 7

BA-60-u

Wel. 6-80M (6-50)

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24 T48N R5W See Instructions on Reverse Side

BA-60-u

RECEIVED
13 FEB 1951
BUREAU SAN. ENG.

1. County Bayfield ☐ Town ☒ Village ☐ City Barksdale (Check one and give name)
2. Location Village of Barksdale T48R5 · Well (Name of street and number of premise or Section, Town and Range numbers)
3. Owner ☒ or Agent ☐ E. I. Du Pont de Nemours & Co (Name of individual, partnership or firm)
4. Mail Address Barksdale, Wis (Complete address required)
5. From well to nearest: Building 7 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft; ____ dry well or filter bed ____ ft; abandoned well ____ ft. ____
6. Well is intended to supply water for: ____

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	41			
4"	0	100			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std Steel pipe	0	41

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumite Cement	21	41

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	100

Construction of the well was completed on: Jan. 22 1951

The well is terminated 12 inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes – No ____

Was the well sealed watertight upon completion? Yes – No ____

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 28 ft.

Water sample was sent to the state laboratory at: Madison (City) on Jan 25 1951

Signature W. A. Gustafson (Registered Well Driller) Washburn, Wis (Complete Mail Address)

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

WDNR# IW902

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

Well no 8

BA-61-U

Wel. 6-30M (6-50)

RECEIVED MAR 2 1951 SAN. ENG.

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

SE, NE, Sec. 24 T48N R5W

See Instructions on Reverse Side

BA-61-U

1. County Bayfield   Town ☐ Village ☑ City ☐ Barksdale
Check one and give name

2. Location Village of Barksdale T 48 R 5 W Sec 8
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☑ or Agent ☐ E. I. Du Pont de Nemours Co
Name of individual, partnership or firm

4. Mail Address Barksdale, Wis
Complete address required

5. From well to nearest: Building 7 ft; sewer ft; drain ft; septic tank ft;
dry well or filter bed ft; abandoned well ft.

6. Well is intended to supply water for:

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6"	0	40			
4"	0	105			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4"	Std Steel pipe	0	40

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite cement	20	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay	0	5
Brownstone	5	105

Construction of the well was completed on:

Jan 22 1951

The well is terminated 12 inches
☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?

Yes ✓ No

Was the well sealed watertight upon completion?

Yes ✓ No

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 5 GPM.

Depth from surface to water-level: 31 ft.

Water-level when pumping: 29 ft.

Water sample was sent to the state laboratory at:

Madison on Jan 25 1951
City

Feb 2 - 1951 Safe

Signature W. A. Gustafson   Washburn Wis
Registered Well Driller   Complete Mail Address

Please do not write in space below

Rec'd No.

Ans'd

Interpretation WDNR#IW884

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner

BA-32-u

Wel. 6-30M.(6-50)

per USGS
NW, SE, Sec. 24 T48N R5W

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

See Instructions on Reverse Side

BA-32-u

RECEIVED
AUG 1 1952
ENVIRONMENTAL SANITATION

1. County Bayfield ☐ Town ☑ Village ☐ City Barksdale
Check one and give name

2. Location Main Gate - T-48 - R5
Name of street and number of premise or Section, Town and Range numbers

3. Owner ☑ or Agent ☐ E. I. Du Pont de Nemours Co
Name of individual, partnership or firm

4. Mail Address Barksdale, Wisc.
Complete address required

5. From well to nearest: Building 30 ft; sewer ____ ft; drain ____ ft; septic tank ____ ft; ____
dry well or filter bed ____ ft; abandoned well ____ ft. ____

6. Well is intended to supply water for: Guards at Gate

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6	0	40			
4	40	103			

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
4	Std Steel pipe	0	40

9. GROUT:

Kind	From (ft.)	To (ft.)
Lumnite Cement	28	40

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Sandy sub Soil	0	3
Clay	3	8
Brownstone	8	103

Construction of the well was completed on:
July 12 1952

The well is terminated 12 inches
☑ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion?
Yes ✓ No ____

Was the well sealed watertight upon completion?
Yes ✓ No ____

11. MISCELLANEOUS DATA:

Yield test: 10 Hrs. at 7 GPM.

Depth from surface to water-level: 36 ft.

Water-level when pumping: 39 ft.

Water sample was sent to the state laboratory at:
Madison on July 15 1952
City

Signature W. A. Gustafson Washburn Wisc
Registered Well Driller Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation

WDNR# IW710

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____

Appendix B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
DuPont Barksdale Works
Barksdale, Wisconsin

October 24, 1997 **DERS Project No. 7191**

Prepared by

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1.0 PROJECT DESCRIPTION

This project description outlines the overall scope of the groundwater investigation of the former Barksdale Works, Barksdale, Wisconsin.

1.1 Introduction

This Quality Assurance Project Plan (QAPP) was prepared using the manual entitled, *Region V Model RCRA Quality Assurance Project Plan*, May 1993 as guidance.

1.1.1 Overall Project Objectives

The objectives of the groundwater sampling activities are as follows:

- ☐ Collect samples to assess groundwater quality in five wells at and adjacent to the former Barksdale Works.
- ☐ Assess construction and quality of the six wells at and adjacent to the former Barksdale Works.
- ☐ Collect data for an evaluation of the proposed groundwater treatment system for the Tad Bretting residence.
- ☐ Collect data to determinate the extent, if any of biological activity in groundwater.

1.1.2 Project Status/Phase

This site activity will consist of groundwater sampling to allow an evaluation of groundwater quality in the area of the former Barksdale Works. Groundwater sampled will be analyzed for specified nitroaromatics/nitroamines, Priority Pollutant List (PPL) metals (total and dissolved), and for the Bretting residence well, major anions and cations, gases, and other miscellaneous water quality parameters (see Tables 1 through 5).

1.1.3 QAPP Preparation Guidelines

As explained above, preparation of this QAPP was in accordance with the *Region V Model RCRA Quality Assurance Project Plan*, dated May 1993.

1.2 Site/Facility Description

A brief description of the site, its geological setting, and associated features is presented in the section below.

1.2.1 Location

The former Barksdale facility is located in Bayfield County, south of Washburn, Wisconsin on Lake Superior (see Figure 1 of the Sampling and Analysis Plan [SAP]).

1.2.2 Facility/Size and Borders

The former Barksdale facility occupies 1,800 acres on Chequamegon Bay, Lake Superior in Wisconsin. The Bretting residence and several other residences are located east of the former main manufacturing area, between Route 13 and the Lake Superior Shoreline (see Figure 2 of the SAP).

1.2.3 Natural and Manmade Features

This section will be completed should an expanded site investigation become necessary.

1.2.4 Topography

This section will be completed should an expanded site investigation become necessary.

1.2.5 Local Hydrology and Hydrogeology

The water-bearing unit of the area consists of a thick Precambrian sandstone sequence known as the Chequamegon sandstone and locally as the Lake Superior Sandstone. This formation, which may contain some fracture porosity constitutes the shallow local aquifer and is overlain by Pleistocene glacial fill varying in thickness from 3 to 132 ft. based on available well logs.

1.3 Site/Facility History

1.3.1 General History

DuPont operated the plant from 1904 to 1971, producing mainly explosives with some metal cladding and industrial diamond production toward the end of the site's active operations. The site is situated on Chequamegon Bay, Lake Superior, between rich iron deposits found in the Gogebic range of Michigan's Upper Peninsula and those in the Mesabi range of northern Minnesota.

During World War I the Barksdale plant was the world's largest source of trinitrotoluene (TNT), producing 130 million pounds of the explosive between 1913 and 1918. Production was scaled down substantially after the war and again during the depression, but it was increased during World War II, with an estimated 226 million pounds of TNT produced for the war effort. Once the war ended, the production of explosives at the Barksdale plant was decreased, once again, to meet regional mining needs.

DuPont ceased operations at the Barksdale plant in 1971, and most existing buildings were dismantled or demolished within the decade. The Barksdale property was sold in 1986 to Bretting Manufacturing Company, Inc. of Ashland. The main manufacturing area is currently being used as a private game farm.

1.3.2 Past Data Collection Activities

This section will be completed should an expanded site investigation become necessary.

1.3.3 Current Status

Analysis of groundwater samples collected by the Wisconsin Department of Natural Resources (WDNR) in June 1997 from a drinking water well, located adjacent to the

Barksdale property at the Bretting Residence, showed possible contamination. As a result, groundwater samples from five wells, four residential wells (including the Bretting Residence well) and one temporarily abandoned water well on the main site, are to be collected and analyzed to determine if other wells have been adversely impacted and to confirm the results obtained from the June 1997 Bretting well sample.

1.4 Project Objectives

Data quality objectives are qualitative and quantitative statements which specify the quality of the data required to support decisions made during site evaluation activities and are based on the end use of the data to be collected. As such, different data uses will require different levels of data quality.

1.4.1 Specific Objectives and Associated Tasks

For this project, it will be necessary to gather sufficient information to evaluate whether residual contamination exists at the site that resulted from operations. Information obtained will also be used to determine whether biological degradation of any residual contamination is possible.

The specific objectives of the data collection at the Barksdale site as follows:

- ☐ Screening level data will be obtained for health and safety purposes using a MicroTIP® photoionization detector groundwater for organic vapors. Additionally, pH, temperature, specific conductance, dissolved oxygen, oxidation reduction potential (Eh) and turbidity will be monitored in the field as groundwater samples are collected.
- ☐ Confirmation level data will be generated in the laboratory using SW-846 methodology to characterize groundwater from the site.

1.4.2 Project Target Parameters and Intended Data

Target parameters are listed in the tables referenced below. Intended data uses are to evaluate whether areas of potential environmental concern related to past manufacturing exists.

1.4.2.1 Field Parameters

Organic vapors, pH, temperature, specific conductance, dissolved oxygen, and turbidity are to be measured in the field.

1.4.2.2 Laboratory Parameters

Tables 1 through 5 include laboratory parameters (target compounds) and reporting thresholds to be analyzed during this site investigation. Reporting thresholds (practical quantitation limits [PQLs] and method detection limits [MDLs]) are provided for guidance only. Matrix effects, dilution factors, and other factors may preclude achieving these reporting thresholds.

1.4.3 Data Quality Objectives

Intended data quality objectives for this project are summarized in Table 6. Calibration requirements, spike recoveries, and other objectives are found in Exhibit A, which contains excepts from the Quanterra Laboratory Quality Assurance Plan (LQAP).

1.5 Sample Network Design and Rationale

The rationale for groundwater sample locations and proposed laboratory analysis is based on groundwater samples collected in the Spring 1997 and review of past operations at the Barksdale site, including information found in reports of previous site assessments. In addition, analytical parameters have been selected to allow an assessment of conditions present which may promote biological degradation of residual contamination.

1.6 Project Schedule

Sample collection at the Barksdale property is anticipated no earlier than October 30, 1997.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

DuPont Corporate Remediation Group (CRG) of Wilmington, Delaware will be lead organization to conduct the site investigation. Laboratory analytical testing will be conducted by Quanterra Laboratories, Denver, Colorado(Quanterra-Denver) or another DuPont approved laboratory.

A description of the program organization is provided in this section. The responsibilities associated with the positions are described in the following paragraphs. These are the persons charged with ensuring the collection of valid data and the assessment of measurement systems for precision and accuracy.

2.1 Project Organization Chart

The lines of authority for this specific project can be found in Figure 1 of this QAPP. This chart includes individuals discussed below.

2.2 Management Responsibilities

2.2.1 Project Manager

Ms. Nancy Grosso (DuPont CRG) is the project manager for the site. She will be the primary point of contact with DuPont and will be responsible for all technical, financial, and scheduling matters. Her other responsibilities are as follows:

- ☐ Assigning duties to the project team and orienting the team to project needs and requirements
- ☐ Disseminating project-related information from DuPont
- ☐ Acting as liaison with subcontractor organizations (unless specifically delegated to others)
- ☐ Interacting with the QA officer and health and safety officer to ensure that these programs are functioning effectively
- ☐ Serving as the collection point for project team reporting of nonconformance with QA procedures or changes in project documents and activities
- ☐ Providing strategic level review of technical activities

- ☐ Approving project-specific procedures and internally prepared plans, drawings, and reports

2.2.2 Project Geologist

Ms. Katherine Davis of DuPont Environmental Remediation Services (DERS) is the project geologist for the project. Her responsibilities as project geologist are as follows:

- ☐ Providing guidance to the project team
- ☐ Coordinating or leading the site investigation and sampling teams
- ☐ Interacting with the laboratory services coordinator (LSC) regarding sampling events
- ☐ Evaluating site groundwater and soil data
- ☐ Coordinating the preparation of reports and documentation

2.2.3 Health and Safety Officer

Ms. Mary L. Glowacki (CRG) is the health and safety officer for the project. She will be responsible for developing, reviewing, and approving of the project health and safety plan (HASP). She will ensure that the project HASP is consistent with all applicable state and federal regulations and will also be responsible for implementing the HASP.

2.2.4 Technical Consultants

Senior staff members with expertise in the disciplines associated with the site investigation are available to the project as needed. These individuals will participate in the project as directed by the project manager.

2.2.5 Technical and Support Staff

Individuals in this category will participate in the technical activities associated with the project. They will be coordinated by the project manager.

2.3 QA Responsibilities

2.3.1 Quality Assurance Officers

Ms. Jill Meuser (DERS) will be the QA officer for the project. Her responsibilities are as follows:

- ☐ Developing, and reviewing the QAPP
- ☐ Administering the QAPP
- ☐ Supervising day-to-day QA activities
- ☐ Notifying personnel of nonconformance or changes in procedures
- ☐ Determining the system and performance audit schedules, if required

2.3.2 Laboratory Services Coordinator

Mr. Michael Aucoin will be the DERS Laboratory Services Coordinator (LSC) for the project. The LSC will play a key role in the project. The LSC will schedule all sample containers orders and analytical requests with the laboratory. The LSC will also be the point of contact between the laboratory and project teams.

2.4 Laboratory Responsibilities

2.4.1 Laboratory Personnel

Quanterra-Denver or another DuPont network laboratory will provide analytical services for this project.

The key laboratory personnel for this project will be the laboratory project manager. The analytical laboratory project manager will be responsible for execution of the analytical testing program for the project. The laboratory project manager will be responsible for laboratory analyses and data processing. She/he will be the point of contact for the LSC and QA officer. She/he will be assisted by the laboratory QA director, who is responsible for ensuring that laboratory internal QA procedures are followed and for processing QA data.

The laboratory has signed a contract with DuPont detailing the terms and conditions for services. This contract includes a guarantee to dispose of samples following analysis, in accordance with all pertinent federal, state, and local laws and ordinances.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The primary purpose and objectives of the site investigation are presented in Section 1. To ensure that the data generated during the program are of adequate and consistent quality for the stated purpose, data quality objectives (DQOs)—in terms of precision, accuracy, and completeness—have been established and are summarized in Table 6.

The sampling and analysis and associated QA efforts are aimed at achieving these objectives in a safe, timely and cost-effective manner.

3.1 Precision

Precision is defined as the agreement between numeric values for two or more measurements that have been obtained in an identical fashion. Precision will be quantitatively assessed through the evaluation of %RPD values for matrix spikes, Laboratory Control Samples (LCS), field duplicates, and laboratory replicates. Blank and field duplicate samples will be prepared or collected. Field duplicate samples will be identified as a regular sample.

3.2 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted true value. Accuracy for this project will be quantitatively assessed through the evaluation of relative percent recoveries of matrix spikes and matrix spike duplicates, LCS and LCS duplicates, and surrogate standards. Accuracy will be qualitatively assessed through the evaluation of instrument performance checks such as surrogate recoveries and interelement interference checks, where applicable to a specific method.

3.3 Completeness

Completeness is a measure of the amount of the valid data obtained from the measurement system compared to the amount that was expected under normal conditions.

Completeness will be determined following periodic evaluation of the accuracy and precision results of the project data sets.

3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a selected characteristic of a population, parameter variations at the sampling point, a process condition, or an environmental condition.

The degree of representativeness is dependent on the objectives of the measurement results. Thus, representativeness can be classified into the following four objective levels:

- ☐ *Level 1*
  Sample is only representative of the point of sampling (e.g., drum, storage tank, single point within a stream or land area).
- ☐ *Level 2*
  Sample is part of a set and represents a defined area or portion of land or water—not just the point of sampling (e.g., a stream transect, sampling grid of a land area, underground aquifer).
- ☐ *Level 3*
  Sample represents a relationship between the source of contamination and the location sampled (e.g., source and monitoring well, source and stream).
- ☐ *Level 4*
  Sample is nonrepresentative. Sample is used for assessment purposes only (e.g., preliminary assessment, spot check).

The objective of sampling and analysis will be that results are representative of the medium monitored and its condition, to a degree consistent with the desired objective level. Objective Levels 1, 2, and 3 will be used to accomplish project objectives.

3.5 Comparability

Comparability expresses consistency in sampling and analytical procedures so that one data set can be compared to another. For this project, all measurement data will be calculated and reported in units consistent with standard practice to allow comparability of data. Data comparability also includes trends.

3.6 Level of Quality Control Effort

Field blank, trip blank, method blank, duplicate, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the facility which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion or extraction and measurement methodology. One matrix spike and duplicate (inorganic) and matrix spike/matrix spike duplicate (organic) will be collected for every 20 or fewer investigative samples.

The general level of the QC effort will be one field duplicate and one field blank for every 10 or fewer investigative samples. One trip blank for gases (methane, ethane, ethene) consisting of pretested ultra pure water will be included along with each shipment of samples for gas analysis.

4.0 SAMPLING PROCEDURES

This section presents a summary of the sampling procedures and field measurement techniques to be used during the field investigation at the Barksdale property. The work plan will adhere to the QA/QC policies and procedures outlined in this QAPP. The project geologist will be accountable for all field sampling and associated documentation procedures.

4.1 Field Sampling

Potential sample locations and analyses are summarized in Table 7.

Samples will be collected and containerized in order of decreasing volatility. The preferred collection for this project is as follows:

- ☐ Volatile organics (gases)
- ☐ Nitroaromatics/nitroamines
- ☐ Total/dissolved metals
- ☐ Miscellaneous parameters (anions, TOC, etc.)

4.1.1 Groundwater Sampling Procedures

Field parameter measurements will be collected during purging and will consist of temperature, pH, conductivity, dissolved oxygen, oxidation-reduction potential (Eh), and turbidity. After each parameter has stabilized, the groundwater sample will be collected for laboratory analysis.

Groundwater samples from the temporarily abandoned wells will be collected using a laboratory-cleaned or disposable Teflon small-diameter (1 inch) bailer or through a helical rotor pump used for evaluating the well. If the appropriate size Teflon bailer is not available, then a small-diameter stainless-steel bailer will be used.

The bailer will be introduced into the water column without disturbance. filtered and unfiltered samples will be collected. The samples will be filtered at the time of collection through a 0.45-micron membrane filter using a peristaltic pump and filter. The initial 100 to 200 ml of filtrate will be used to rinse the sampling system but will be discarded before a filtered sample is actually obtained. Equipment decontamination will be conducted between each sampling event in accordance with the decontamination procedures outlined in Section 4.4.

Additional details regarding well purging and sampling are found in section 4 of the Sampling and Analysis Plan (SAP).

4.2 Field QC Sample Collection/Preparation Procedures

The quality and integrity of samples collected at the facility will be monitored by routine preparation of various QA/QC blanks, equipment calibration documentation, and equipment decontamination documentation. Table 8 summarizes the frequency of QA/QC sample collection. The project geologist is responsible for ensuring that all field QC samples are properly collected, labeled, and shipped in the appropriate shipping containers.

Trip blanks will consist of a series of certified cleaned sample containers filled with analyte-free water and precertified by analysis at the laboratory providing the blank water. Trip blanks will be prepared by the laboratory analyzing the samples. The trip blanks will be contained in sample containers identical to the investigative samples. One trip blank per medium collected will be handled and transported in the same manner as the field samples going to the laboratory in a given ice chest. The trip blanks will be analyzed for volatile organic compounds only. There will be no hold time limitations for trip blanks. However, it is recommended that ice chests with trip blanks and unfilled sample containers not be stored at the site longer than necessary.

Equipment blanks will be prepared by passing deionized water through clean, nondedicated sampling equipment (e.g., bailers, trowels). The rinsate will be transferred to sample containers and handled as other samples. Equipment blanks will be analyzed for the same parameters as other samples collected using the same device. The source of any contaminants detected in the equipment blank will be identified and corrected. In the event that dedicated sampling equipment is used at each sampling location, one field blank consisting of the direct transfer of American Society for Testing and Materials (ASTM) Type II distilled water (or an equivalent) to the sample containers will be collected for each matrix (aqueous and solid). The frequency for equipment blanks is one per day per sampling event.

The project geologist is responsible for scheduling duplicate sample submission. Duplicate samples will be collected in the same manner as routine monitoring samples. The sample labels and COC forms will not indicate where the duplicate sample was collected. The sample will be analyzed for the same parameters as the original sample, and the analytical results will be compared with those of the original sample. The analytical results of the original sample and the duplicate sample should be used to evaluate the cumulative precision because of the limitations of the analytical method, sample matrix, and sample collection techniques. The frequency of duplicate sample collection is one-per twenty samples, or 5 percent.

4.3 Sample Containers, Preservatives, and Volume Requirements

Only new sample containers (i.e., I-CHEM 200, *Eagle-Picher*®, or the equivalent) will be used for sample collection. The appropriate size and type of container will be provided with the applicable preservative and analyzed within the specified holding times, as specified in Table 9. Containers will be supplied by the laboratory prior to use in accordance with EPA document SW-846, third edition, Chapters 2, 3, and 4.

Each sample aliquot may be analyzed for multiple parameters provided that the sample is of adequate volume and that identical container, preservation, and handling considerations have been satisfied.

Sample labels are prepared by Quanterra or another network laboratory and placed on bottles at the same time the preprinted chain-of-custody (COC) forms are prepared. This allows for the least confusion in the field. The preprinted COC forms and labeled bottles are sent to the field a day prior to sampling to allow samplers a final check on accuracy.

4.3.1 Sample Preservation

Water samples including field and trip blanks will be placed in sample containers that have been laboratory-prepared with the appropriate preservative, as specified in Table 9. Soil samples will be placed in laboratory-prepared sample containers, as specified in Table 9. Preservation procedures are those specified in EPA document SW-846, third edition, Chapters 2, 3, and 4, which reference water and solid matrices. In this manner, water samples may be preserved in the field immediately following collection.

4.4 Decontamination Procedures

Sampling equipment, such as the pump and bailers will be decontaminated prior to use in the field, between sampling points, and at the completion of sampling. The following procedures will be used:

- ☐ Prior to collection of the first sample, clean two buckets with potable water and detergent (e.g. Alconox®), and thoroughly rinse with potable water.
- ☐ Fill first bucket with detergent and potable water.
- ☐ Fill second bucket with potable water.
- ☐ Clean equipment thoroughly in detergent water. Use brushes as necessary.
- ☐ Rinse thoroughly with potable water.
- ☐ Rinse thoroughly with distilled water poured over equipment directly from the distilled water container.

The pump hose used in filtering will be decontaminated between each sample by triple-rinsing with deionized water.

4.5 Sample Packaging and Shipment Procedures

After collection and completion of the sample label, each containerized sample will be placed as soon as possible into an insulated sample cooler. The cooler will serve as a shipping container and should be provided by the laboratory along with the appropriate sample containers. If temperature preservation is required, the chest will be packed with wet ice.

The laboratory will provide reagents used on-site. The reagents will be of sufficient purity to yield blank results at levels below the practical quantitation limit (PQL) for each parameter. Preservation techniques will be documented on the COC records and in the field sampling logbook. This documentation includes the use of ice for temperature preservation. Samples will be transported to the laboratory promptly to provide ample time for analyses to be conducted within applicable holding times. The maximum interval between sample collection and shipment should be one day. The field team leader will arrange with the laboratory for sample pickup or sample shipment using an overnight delivery service. Samples will be shipped using an insulated sample cooler and wet ice to keep the samples cool. The shipper is responsible for ensuring adherence with current United States Department of Transportation (DOT) regulations concerning the shipment of environmental samples to a laboratory for analysis.

5.0 CUSTODY PROCEDURES

The sample custody procedures outlined in this section ensure the tracing of possession and handling of individual samples from the time of field collection through laboratory analysis.

5.1 Field Custody Procedures

Each sample container will have a sample label affixed to the outside of the container in an obvious location. The label will specify the sample identification number, name of the collector, location sampled, date and time sampled, preservatives used, and parameters to be analyzed. Information will be recorded on the sample label with waterproof ink.

Samples shipped from the facility to an outside laboratory by a commercial courier will be transported in a cooler or shuttle filled with ice. The cooler will be sealed with tamper-evident tape or a tamper-evident seal. If any security seal is received broken, that fact will be recorded on the COC form, and the LSC will be notified.

The field sampler will log the appropriate sample collection information for each sample location, noting the following information as required or applicable:

- ☐ Sample location
- ☐ Sample identification number
- ☐ Sample source, (e.g., monitoring well, hydropunch, stream)
- ☐ Sample type and collection equipment, (e.g., grab sample, composite sample, bailer, pump)
- ☐ Evacuation date and time
- ☐ Volume purged (note if purged to dry)
- ☐ Personnel present
- ☐ Depth to bottom, depth to water, and casing volume
- ☐ Weather conditions
- ☐ Date and time of sample withdrawal if different from time of purging

- ☐ Sample appearance (e.g., color, turbidity, odor, sediment)
- ☐ Weather conditions at time of sample withdrawal
- ☐ Field measurements for aqueous samples (e.g., temperature, pH, specific conductance)
- ☐ Number of containers for each aliquot collected
- ☐ Container size, type, and preservative used in each sample aliquot
- ☐ Parameters (analytes from each sample aliquot)
- ☐ Comments and observations at time of sample withdrawal
- ☐ Signature and date of field logbook completion

Each sample may consist of several individual sample aliquots contained in separate, sample containers. Each sample container will be logged in on the COC form prior to shipment to the laboratory. The COC form will be initiated at the laboratory when the sample containers are shipped to the field.

The following information will be recorded on the COC form:

- ☐ Origin of sample containers
- ☐ Collector's name
- ☐ Dates and times of sample collection
- ☐ Sample identification numbers
- ☐ Number of containers for each sample aliquot
- ☐ Container size
- ☐ Type of preservation (including ice)
- ☐ Parameters (analytes from each sample aliquot)
- ☐ Rush analyses (if requested)
- ☐ Special handling instructions
- ☐ Destination of samples
- ☐ Name, date, time, and signature of each individual possessing the samples

The COC form will be signed by each individual responsible for custody of the sample containers and will accompany the samples to the laboratory.

Custody of the samples will be defined as actual physical possession, in view after physical possession, or locked and/or sealed in a tamper-resistant container after physical possession. The original, signed COC form will accompany the samples to the laboratory and be returned to the DERS project manager once the sample analysis is complete. The project geologist or designate will be responsible for custody of the samples taken during the field investigation.

5.2 Laboratory Custody Procedures

The laboratory will designate a sample custodian for the project. This person is responsible for inspecting and verifying correctness of COC records when received and for verifying that all samples are received. The custodian is also responsible for verifying that sample temperatures when received are appropriate for the level of preservation required. When the samples are received, the sample custodian will sign the COC form and note the sample conditions on it. The sample custodian will immediately notify the QA officer of any discrepancies.

As samples are received by the laboratory, they will be entered into a sample management system. The following minimum information will be provided:

- ☐ Laboratory sample number/identification
- ☐ Field sample designation
- ☐ List of analyses requested for each sample container

Immediately after receipt, samples will be transferred to a secure storage area with appropriate temperature control (as established by EPA document SW-846, third edition, Chapters 2, 3, and 4), to await preparation and analysis. Only authorized laboratory personnel will have access to the locked storage area(s). The laboratory will maintain written records to show the handling chronology for each sample by various individuals at the laboratory during the analysis process. The laboratory sample custodian is responsible for providing a laboratory identification number for each trip blank so that comparison may be made later to the samples shipped at the same time. Field blanks must also be given unique laboratory identification numbers so that comparisons may be made to associated sample sets.

5.3 Final Evidence Files

A process will be in place to ensure that relevant documentation is at hand and can be expeditiously accessed. The project manager is accountable for maintaining project record files and storage archives to meet the requirements of the project. The project manager is also responsible for providing facilities for adequate storage space, security, and confidentiality.

The project manager will be responsible for indexing, issuing, and maintaining files for all field logbooks, field notebooks, project correspondence, system and performance audits, corrective action reports, data validation reports, sample data reports, QA reports to management, and other associated documentation. A centralized location will be identified for this purpose, and a document custodian will be chosen. DuPont will maintain this archived information for seven years following completion of the project. The laboratory will maintain all hard-copy documentation associated with the project for five years following completion of the program. The laboratory will also maintain disposal records for all project samples for thirty years.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

The manufacturers' instructions will be followed to calibrate analytical equipment. The technician assigned to maintain each unit will calibrate the equipment. The project geologist or designate will supervise field equipment calibration and maintenance, while the laboratory QA officer or designate will ensure calibration of laboratory equipment.

6.1 Field Instrument Calibration

The MicroTIP® PID will be calibrated daily prior to use in the field and calibration will be checked as necessary to ensure little or no calibration adjustment is required. Calibration of equipment will occur daily prior to its use in the field. The project geologist is responsible for ensuring adherence to the calibration schedule and each operator's understanding of the proper usage, maintenance, and storage of each instrument. A calibration logbook is kept with each instrument to record the field calibration. Each logbook contains the date of calibration, the operator's initials, the calibration measurements, and observations about the instrument or calibration procedures. A complete set of manufacturers' directions for equipment calibration should accompany the instruments on-site.

Brief summaries of the calibration procedures for the field instruments to be used follow:

☐ *MicroTIP® Photoionization Detector)*

Periodic calibration is required for photoionization detector (PID) output changes because of the potential for inlet filter restriction, lamp window cleanliness, sample pump wear, and other factors.

During calibration, the *MicroTIP®* PID is first exposed to zero gas. A small signal is generated, and this zero signal is stored by the microprocessor.

In high-sensitivity operation, the microprocessor subtracts the zero signal from the PID signal and multiplies the difference by 1,000. This number is then displayed.

When one of the 5 Cal Memories is selected, the *MicroTIP®* PID is next exposed to span gas. This span signal is stored. The microprocessor subtracts the zero signal from the span signal and divides the difference by the user-entered Span Gas concentration. The resulting sensitivity is stored in the selected Cal Memory with the zero signal. In operation, the microprocessor first subtracts the zero signal from the PID signal and then divides the difference by the sensitivity. The number is then displayed.

The microprocessor accumulates all readings over a 15-second interval and determines the minimum, average, and medium readings. It stores these numbers along with the highest-priority instrument status and the most recent time, date, and event number that occurred during the 15-second interval. The *MicroTIP*® PID automatically records these results for 12 hours of operation.

The recorded data can now be played back on the PID's display. The display is identical to the numeric or bar-graph display, but the instrument status is "Play" indicating that recorded data, not real-time data, are being displayed. During playback, the PID continues to analyze and record new data.

Recorded data can also be printed as either a table or a graph. The data may be automatically averaged to fit on one 8½-inch-by-11-inch page or all recorded; the data may be printed or graphed. The averaging interval and number of readings averaged are shown at the top of the page. (Note: For each averaging interval, the PID prints the minimum of all the minima, the average of all the averages, and the maximum of all the maxima.)

☐ *pH Meter*
Calibration is performed at the start of each sampling day using standard buffer solutions that bracket the pH range expected in the samples. To calibrate the instrument, place the pH electrode in pH 7.0 buffer solution and set the temperature control knob at the mark indicating the solution temperature. Turn the on/off switch to pH and adjust the ADJ knob until the meter reads 7.0 pH. Measure the temperature of the 4.0 buffer solution and set the temperature knob to agree. Then, rinse the electrode with distilled water and place it in the 4.0 buffer solution. Make the instrument read 4.0 by adjusting the SLOPE adjust with a screwdriver. Now test the known solutions. Calibrate with pH 10.00 buffer solution for accurate readings above 7.0.

☐ *Conductivity Meter*
Calibration is performed at the start of each sampling day using an instrument self-check and by using KCl standard solutions made by the instrument manufacturer. The levels of the standards are selected to bracket the range of value expected in the samples. The meter is calibrated in the same manner as the pH meter. The meter must read within 10 percent of the standards to be considered in control and should read within 5 percent (7 percent is considered a warning level) of the standard. If the calibration indicates that the meter is out of control, a backup unit should be employed; if now is not available, the data will be flagged to note the percent difference between the meter and standard. Readings from conductivity meters are normally stable; thus, calibration checks are usually limited to checks at the beginning and end of the sampling day.

To calibrate the conductivity meter, set the control switch to CON, the range switch to 1,000 (for Model 72) or 10,000 (for Model 76) and the temperature compensation knob to 35°C. Then, unplug the electrode. Adjust the STANDARDIZE control for a reading of 1,000 (for Model 72) or 10.00 (for Model 76).

☐ *Oxidation-Reduction Potential (ORP) Electrode*
Calibration is performed at the start of each sampling day using pH 7 standard buffer solution. Add a pinch of quinhydrone and stir it into the buffer for between 15 and 30 seconds. After stirring, solid quinhydrone should be visible floating in the butter solution. If no solid quinhydrone is seen, add an additional amount and repeat the stirring until solid quinhydrone is seen in the buffer solution. Rinse and dry an ORP electrode and place it in the pH 7 buffer. Stir and then allow the electrode to rest against the bottom of the beaker. For a new electrode, the reading should be +90 to +15 mV. Repeat with pH 4 buffer solution. The reading should quickly stabilize between +170 and +185 mV above the reading in pH 7 buffer solution. For example, if the reading in the pH 7 buffer solution was +90 mV, the reading in the pH 4 buffer solution should be between +260 and +275 mV.

☐ *Dissolved Oxygen Meter*
Calibration is performed at the start of each sampling day following manufacturer's calibration procedures exactly to obtain precision and accuracy. Generally, calibrate membrane electrodes by reading against air or a sample of known dissolved oxygen concentration, as well as in a sample with zero dissolved oxygen concentration. The oxygen electrolyte and the zero oxygen dilution will be obtained from Cole-Parmer. The manufacturer will be recorded in the logbook.

☐ *Turbidity Meter*
The manufacturer's instructions will be followed to calibrate this instrument, at a minimum of once daily.

6.2 Laboratory Instrument Calibration

Laboratory calibration of analytical equipment will be performed as specified by the respective EPA method. Specific laboratory calibration techniques are designed to demonstrate that the instrument is operating within design specifications and that the quality of the analytical data generated can be replicated.

7.0 ANALYTICAL PROCEDURES

DuPont will retain Quanterra-Denver or another network laboratory to conduct the analytical testing for the project. If a change in laboratory is required, DuPont will submit laboratory qualifications prior to their project involvement.

The LSC is responsible for communicating DQOs, required methods of analysis, and specific parameter lists to the laboratory. The project geologist is responsible for communicating sampling and analysis schedules to the LSC with sufficient lead time to meet contractual agreements with the laboratory.

The analytical program presented in this document describes the procedures that DuPont, its contractors, and its laboratories will use during project implementation. The laboratories will follow the QA/QC procedures listed in the methods referenced in this QAPP. Report deliverable requirements are discussed in Section 9.3.

7.1 Field Measurements

Each instrument used for field analyses will be calibrated according to the operation manual specifications described in Section 6.0. Organic vapors and other field parameters will be measured with appropriate devices. Malfunctioning field equipment will be quickly replaced to eliminate lengthy project delays.

7.2 Laboratory Analytical Methods

Groundwater samples collected during the site investigation will be analyzed for gases, nitroaromatics/nitroamines, metals (total and dissolved), major cations and anions, alkalinity, BOD, COD, TOC, ammonia, total Kjeldahl nitrogen, total and dissolved phosphorous, and sulfide using EPA document SW-846 methods. The analytical methodologies for each sample analysis are summarized in Table 6.

Method selection criteria for the project were determined by analytical methods used in past investigations and by the DQOs, coupled with the required method detection limits achievable for each parameter. Each analytical method was chosen to address the intended use of the data (generated at a particular sampling point) in a timely and cost-effective manner.

7.3 Laboratory Quality Control

The laboratory procedures for internal QC are described in the LQAP. The minimum acceptable level of laboratory QC procedures are defined by the methods and protocols cited for analysis, requirements for laboratory certification and operation mandated by the EPA, and any other requirements governing this project.

7.4 Reporting Limits

Quantitative reporting threshold limits are sample dependent and may vary as the sample matrix varies. Factors influencing the threshold limits include the actual method used, sample matrix, interferences, and high concentrations of analytes. Threshold limits presented in Exhibit A for the parameters are general estimates taken from PQLs listed in EPA document SW-846 methods. The actual PQLs may vary from sample to sample in accordance with standard laboratory practices (e.g., dilution resulting from high analyte concentration). Sample results will be reported down to PQL values, except as required to allow comparison to risk based criteria below the PQL, in which case parameters will be reported to the method detection limit (MDL).

8.0 INTERNAL QUALITY CONTROL CHECKS

QC checks are the operational techniques and activities that are used to fulfill the requirements of QA policies. QC is an integrated system of activities in the area of quality planning, quality assessment, and quality improvement included to provide the program with a measurable assurance that the required standards of quality are met. The QC checks described in this document generally fall into several categories: field practices, laboratory practices, system and performance audits, corrective action, and QA reports. The interrelation of these QC checks is described in the subsections that follow.

8.1 Field Quality Control

8.1.1 Field Quality Control Samples

Three types of field QC samples exist, including trip blanks, field blanks, and field duplicates. A detailed description and the frequency of collection for each is provided in Section 4.2. The analytical results for these QC samples become the quantitative focus of the field performance audits.

8.1.2 Field Measurement Checks

These checks include MicroTIP® PID meter verification checks with verified proficiency standards (see Section 10.1.2).

8.1.3 Field Data Integrity Checks

Field data integrity checks are described in Section 10.1.2. These checks are to be conducted randomly. Report summaries are kept in the project file.

8.1.4 Field Performance Audits

The nature of field performance audits are described in Section 10.1.2. Field QC sample results will be reviewed during data validation.

8.1.5 Field System Audits

Field system audits are an integral part of the internal QC process. The frequency, reporting, corrective action, and coverage of system audits is detailed in Section 10.1.1.

8.2 Laboratory Quality Control

8.2.1 Laboratory Quality Control Practices

Two levels of laboratory control exist, including internal QC practices documented in the LQAP and laboratory QC standards imposed by DuPont. In addition, the laboratory must provide at least three levels of data review prior to reporting the results to DuPont. These levels are as follows:

- ☐ Initial review of method compliance with respect to sample preparation, analysis, and QC acceptance criteria and a check of accuracy of calculations and presentation of results
- ☐ A second person's review of the raw data, which may be conducted by the laboratory supervisor or a designate and must be documented
- ☐ A check for completeness and appropriateness, which entails an overview by a third party to ensure that all requested tests are appropriate and that all requested sample results have been provided

Written reports must be signed by the laboratory manager or a designate. All supporting hard-copy documentation generated by the laboratory must be maintained in an archive for a period of five years and must not be disposed of without written consent from DuPont.

8.2.2 Laboratory Audits

The frequency and acceptance criteria for system and performance audits of the laboratory are detailed in Section 10.2.2.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 Data Reduction

Data reduction involves the process of generating qualitative and quantitative sample information through observations, field procedures, analytical measurements, and calculations.

Data reduction occurs with

- ☐ The work plan through sample locations and naming conventions.
- ☐ The field sampling process through use of field logs and field measurements.
- ☐ Field communications with the laboratory in sample analysis requests.
- ☐ Field operations with collection, preservation, and COC documentation.
- ☐ Laboratory operations with sample receipt and handling, sample preparation and analysis, collation of raw data, and generation of laboratory results.
- ☐ Post-laboratory operations with collation of analytical results in a format suitable for documents such as reports, maps, and trend plots.

Data reduction steps include field operations, laboratory operations, and report preparation operations.

Specific QC measures developed to ensure accuracy throughout the data reduction process are described in Sections 10.0 and 12.0.

9.2 Data Validation

Data evaluation is the process of verifying that qualitative and quantitative information generated relative to a given sample is complete and accurate. Data evaluation for the Barksdale groundwater project will be conducted using the internal DuPont quality control review process.

The internal DuPont quality control review process will be performed on 100 percent of the data received from the laboratory. This process includes verification of laboratory reports against the associated chains-of-custody to ensure completeness of all tests on all samples submitted; verification of accuracy of reports submitted; verification of representatives of field sample results by review of field and trip blank data; determination of data usability by review of matrix quality control sample results, and laboratory control sample results against laboratory quality control acceptance criteria; verification of quality control batch integrity to ensure method compliance; and verification of appropriateness of the Case Narrative comments accompanying the reports to ensure compliance.

Third party validation of the data set is not anticipated at this time.

9.3 Data Reporting

Significant figure conventions given in EPA document SW-846 or the *Handbook for Analytical Quality Control in Water and Wastewater Laboratories* (EPA-600/4-79-019, March 1979) will be followed. Reported concentrations will not be corrected for contaminants found in associated method and field blanks. Deliverables will be reduced level CLP-like packages for all analyses. Specifications used to obtain reduced level (summary) CLP-like deliverables are included in Appendix A.

10.0 PERFORMANCE AND SYSTEM AUDITS

The following subsections summarize procedures for laboratory and field system and performance audits that may be used during the course of a project. Field and laboratory performance will be assessed throughout the course of the project. System audits of the field team or laboratory, including submission of project-specific performance evaluation (PE) samples to the laboratory, are not anticipated during the Barksdale project. Procedures for performing system audits of the field and laboratory are included in this section, however, so that they may be performed should project management identify a need to conduct system audits during the course of the project.

10.1 Field Performance and System Audits

Results of field QC samples will be reviewed during DuPont's internal data review process. System audits of field operations are not anticipated by DuPont during this project.

10.1.1 System Audit

System audits are characterized by systematic on-site qualitative reviews and may be conducted in conjunction with all field-related QC activities. The project QA officer would be responsible for defining the system audit format, and the project manager would approve the format. The project manager would name the field system audit team including an individual with extensive experience in field sampling activities. The project QA officer would prepare the final system audit report, which would be directed to the project manager (see Section 14.0).

System audits may be conducted at the discretion of the technical lead in the event of a significant incident involving safety, an unfavorable performance audit, or another reason deemed appropriate. At a minimum, the on-site qualitative review will cover the following:

☐ *Organization and Responsibility*
Is the QA organization effective and efficient?

☐ *Sample Collection*
Are the written procedures for sample collection available and appropriate to meet regulatory requirements, and are they being followed?

☐ *Chain of Custody*
Have the appropriate steps been followed to ensure the tractability of sample origin and integrity?

☐ *Operational Procedures*
Are the appropriate checks being made in the field, and are records of these checks being properly maintained?

☐ *Equipment*
Is the specified equipment available and maintained in good working order?

☐ *Training*
Are field teams adequately trained?

☐ *Records*
Are record-keeping procedures adequate and functional?

☐ *Corrective Action*
Is the appropriate action being conducted in response to situations? Are these situations properly documented on the Corrective Action Form? Has follow-up been done to correct the situation after it has been reported?

☐ *Health and Safety*
Are the proper procedures, precautions, equipment, and training, being implemented to protect the team members adequately during the field operation?

10.1.2 Performance Audit

Performance audits are characterized by a quantitative check for accuracy in field measurements, field QC sample results, and field data transfer procedures. The field performance audits consist of the periodic evaluation of analytical results of field and trip blanks to assess the field procedures used, to check for and minimize nonsample-related contamination, and to ensure that representative samples are being provided for testing, evaluation, and interpretation.

The field performance audit format will be developed in the same manner described for field system audits. Performance audits will be conducted and reported as described for field system audits. The Technical Lead will be responsible to name the individual who will perform the field performance audits. This person should have a working knowledge of both the analytical techniques and field sampling procedures being used. All trip blanks and field blanks for the RFI should be reviewed. The verification samples are done on a spot check basis. The performance audits will include, as a minimum, the following:

- ☐ PID meter verification check with a certified sample from an outside vendor.
- ☐ Data Integrity Check - Random check to determine if field data has been accurately transferred to final reports; verification of well identifications, aquifers sampled, etc.
- ☐ Trip Blanks - Is there any evidence of significant trip blank contamination.
- ☐ Field Blanks - Is there an evidence of significant contamination of blanks and related samples from sampling equipment improperly cleaned?
- ☐ Field Duplicates - Is there a significant difference for reported results for any analytical parameters between the sample pairs?

10.2 Laboratory Performance and System Audits

Laboratories performing sample analysis under DuPont's lab partnering program participate in third party PE sample analysis on an ongoing basis. Laboratory system audits specific to the Barksdale project are not anticipated by DuPont for this project.

10.2.1 Laboratory System Audit

Laboratories that will be employed for this project have been prequalified by a satisfactory system audit performed by DuPont. An audit may be scheduled at the discretion of the technical lead or project manager if data evaluation and review suggest that a laboratory quality issue exists. The LQAP describes the QA/QC program in place at the laboratory. At a minimum, the QAPP and laboratory performance audits must address the

- ☐ Custody and storage of samples and sample aliquots within the laboratory.
- ☐ Procedures for sample preanalysis preparation.
- ☐ Techniques of calibration for each analytical method, including standards preparation.

☐ Procedures for raw data management and calculation of results.

☐ Policies and procedures for complying with methodologies and protocols, including required QC steps and acceptance criteria.

☐ Preventive and corrective maintenance of instrumentation.

☐ Methods for determining acceptable limits of detection, precision, and accuracy.

☐ Procedures for cross-checking calculated results.

☐ Procedures for notifying the client of method nonconformance situations that might arise at the laboratory or after samples are received.

10.2.2 Laboratory Performance Audit Checkpoints

The project QA officer may, at her discretion, send split samples to alternate laboratories and compare the results with those of the primary laboratory. Partner laboratories analyze double-blind samples from a supplier of certified reference samples on an ongoing basis.

On a random basis, a routine data review will be conducted on all laboratory results to determine if the DQOs stated in Table 6 are being met. Checkpoints to be reviewed include method blanks, laboratory replicates, matrix spikes, and matrix spike duplicates. Samples will be grouped into QC batches of not more than 20 samples of similar matrix type.

Accuracy will be evaluated for each batch using the corresponding matrix spike and surrogate standard recovery for each batch (see Table 6 and Section 12.1), coupled with acceptance criteria listed in the appropriate methods. Laboratory control sample (LCS) recovery data can be used to qualify corresponding batch data if matrix spike or surrogate standard recoveries do not meet method acceptance criteria or if insufficient sample material was received to complete the matrix spike duplicate assays. Data resulting from method blank contamination will be qualified based on professional judgment of the reviewer.

Precision will be evaluated for each batch using relative percent difference (%RPD) from either matrix spike duplicates or laboratory sample replicates (see Table 6 and Section 12.2). Again, LCS duplicate %RPD results can be used to qualify data if a matrix spike duplicate.

11.0 PREVENTATIVE MAINTENANCE PROCEDURES

Preventive maintenance of laboratory and field equipment is essential to obtaining accurate data. Unnecessary resampling and analysis can also be avoided if equipment is well maintained.

11.1 Field Instrument Preventative Maintenance

A calibration and maintenance checklist for each piece of equipment used on-site will be maintained by the field sampling team. In this manner, the frequency of calibration, the technician in charge of the calibration, and any notes regarding the maintenance of the instrument can be recorded. The field sampling team is ultimately responsible for ensuring that field equipment is cleaned and maintained according to procedures detailed by the manufacturer. Complete manufacturers' instructions for calibration and maintenance are found with each piece of equipment. The field equipment will be serviced when routine daily inspections indicate the need for maintenance.

Routine maintenance of field equipment includes

- ☐ Removing surface dirt and debris.
- ☐ Ensuring proper storage of equipment.
- ☐ Inspecting equipment prior to use.
- ☐ Calibrating equipment according to Section 6.0 or manufacturers specifications.
- ☐ Charging battery packs when not in use.
- ☐ Maintaining spare and replacement parts in the field to minimize downtime.

The following is a representative list of spare parts for this program:

- ☐ Batteries, as required, for all equipment used
- ☐ Extra sample containers and preservatives
- ☐ Health and safety equipment (i.e., gloves, filters, boots, *Tyvek*® clothing)
- ☐ Extra coolers and packing equipment and sample location stakes
- ☐ Locks

- ☐ Flagging tape
- ☐ Calibration solutions and gases
- ☐ Tubing
- ☐ Air filters

In the event that a piece of equipment needs to be repaired, a list of manufacturers' addresses, phone numbers, and contact persons will be kept on-site.

11.2 Laboratory Instrument Preventative Maintenance

Standard operating and maintenance procedures for any laboratory equipment used by the laboratory are provided in EPA document SW-846. A table excerpted from the LQAP is included in Exhibit A which summarizes the procedures and frequency of laboratory instrument preventative maintenance.

12.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The DQOs for the project were established in terms of precision, accuracy, and completeness of the data set. The following procedures will be used to assess data precision, accuracy, and completeness.

12.1 Accuracy

Accuracy means the nearness of a result or the mean of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. To determine the accuracy of an analytical method, a program of sample spiking will be followed. The spiking frequency is stated in the referenced methods. The results of sample spiking will be used to calculate the QC parameter percent recovery for accuracy evaluation. The following equation will be used:

$$\%\ Recovery = \frac{SSR - SR}{SA} X\ 100$$

where,
SSR = Spiked sample result
SR = Sample result
SA = Spike added

The frequency for the spiking is described in Exhibit A. In addition to a spiking program, samples, standards, and blanks subject to organic analyses will be spiked with surrogate compounds. Laboratory performance on individual samples will be established by the recovery of surrogate compounds.

12.2 Precision

Precision means the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analysis. To determine the precision of the analytical methods, a program of replicate analyses will be followed. The laboratory will split a sample into two subsamples and analyze each independently at the frequency listed in the appropriate method. This approach is followed for LCS, LCS duplicates, matrix spikes, matrix spike duplicates, and matrix replicates.

The results of the replicate analysis will be used to calculate the QC parameter (%RPD) for precision evaluation. The following equation is used to calculate relative %RPD:

$$RPD = \frac{D_2 - D_1}{(D_1 + D_2)/2} X\, 100 \tag{1}$$

where,

D_1 is defined as the first subsample value
D_2 is defined as the second subsample value

The frequency of laboratory replicates is described in Exhibit A. In addition to evaluation of the method precision, duplicate or split samples will be collected in the field and analyzed independently. The results will be used to evaluate the total system's variability, including sampling variations.

The analytical precision produced by laboratory replicate analyses will be evaluated by both the laboratory and DuPont, while field splits will be evaluated only by DuPont. Evaluation of both types of data will be in accordance with the referenced methods and this plan.

12.3 Completeness

Completeness for each parameter is calculated as follows:

$$\frac{Usable\ Data}{Total\ Data\ Generated} \times 100 = \%\ Complete$$

Usable data is defined as all results that are not rejected in the data validation process. The percent complete will be used to determine whether the data quality meets the objectives for the project.

If the completeness objectives are not met for individual parameters, the reasons for the invalid data will be reviewed by DuPont. Depending on the reasons and the effect of the incomplete data on the accomplishment of the project objectives, additional samples may be collected and analyzed. A subjective evaluation will also be conducted if a sample does not generate data for a parameter category (e.g., volatile organic constituents, metals). Such a data gap could result from sample container breakage or loss or sample custody not being maintained. If DuPont determines that the missing results are critical to accomplishing the work plan objectives, additional sampling will be conducted to obtain the missing data.

13.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out of quality control performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation and data assessment. All corrective action proposed and implemented should be documented in the regular quality assurance reports to management. Corrective action should only be implemented after approval by the project manager. If immediate corrective action is required, approvals secured by telephone from the project manager should be documented in an additional memorandum.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the project manager. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or Workplan will be identified and corrected in accordance with the QAPP.

13.1 Field Corrective Action

Corrective action in the field can be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the work plan) sampling procedures and/or field analytical procedures require modification, due to unexpected conditions.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective action are insufficient, work may be stopped.

13.2 Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentrations samples may be identified during sample log in or just prior to analysis. Following consultation with lab analysis and section leaders, it may be necessary for the laboratory Quality Control Coordinator to approve the implementation of corrective action. These corrective actions will be communicated to the LSC.

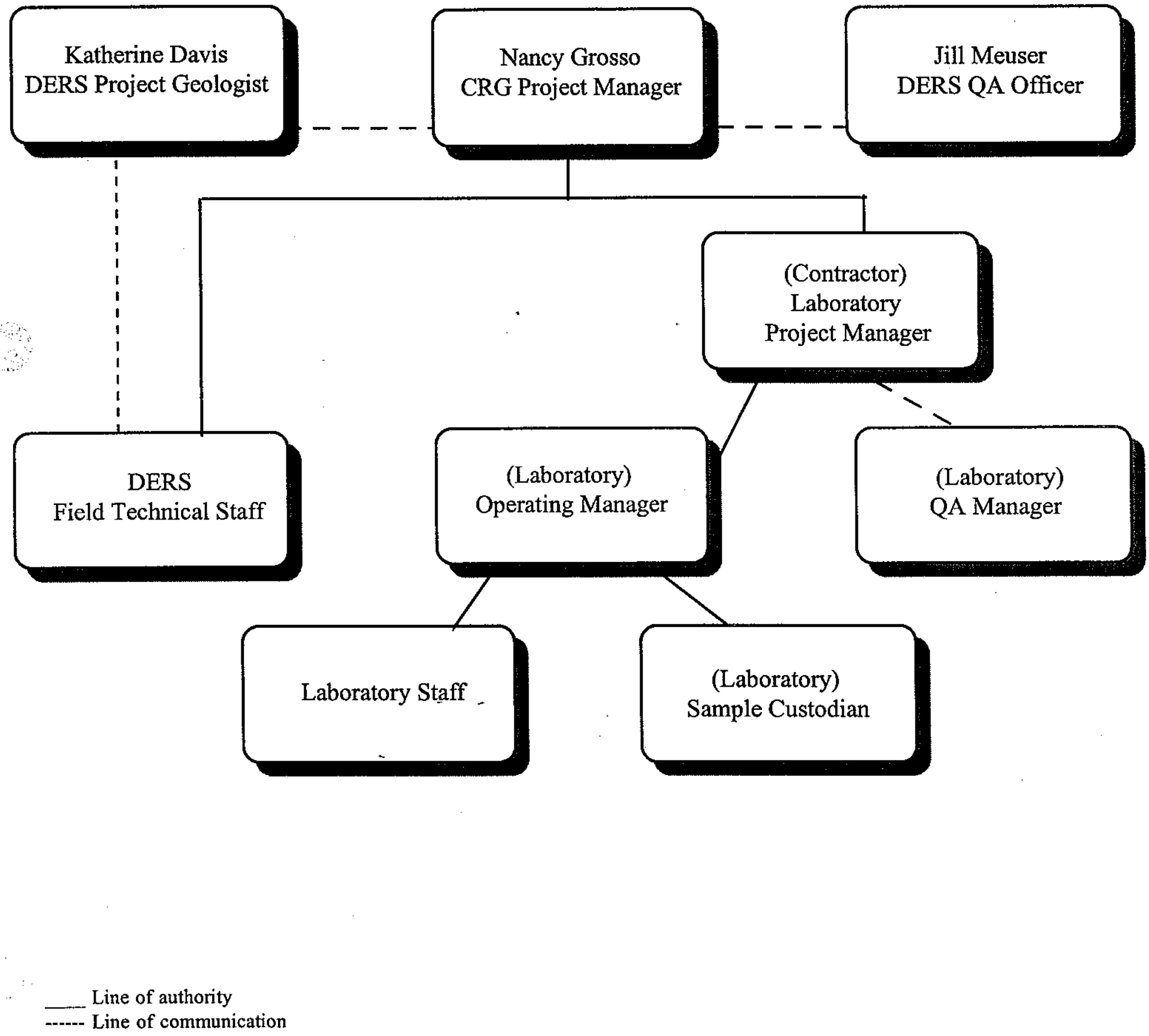
13.3 Corrective Action During Data Validation and Data Assessment

The project team may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include resampling by field team or reinjection/reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g., the holding time is not exceeded). The DuPont project manager is responsible for ensuring that the corrective actions adequately address root causes and are implemented in a responsible manner. He is also responsible for confirming that corrective actions have been effective.

FIGURES

Figure 1
PROJECT ORGANIZATION DIAGRAM



TABLES

Table 1

NITROAROMATICS/NITROAMINES

Analyte(1)	PQL* Water (µg/l)
Cyclotetramethylene tetranitramine (HMX)	0.25
1,3,5-Trinitrobenzene	0.25
Cyclotrimethylenetrinitramine (RDX)	0.25
1,3-Dinitrobenzene	0.1
2,4,6-Trinitrotoluene	0.1
Tetryl	0.5
Nitrobenzene	0.25
Nitroglycerin	2.5
2,4-Dinitrotoluene	0.0051**
2,6-Dinitrotoluene	0.0057**
2-Amino-4,6-dinitrotoluene	0.1
4-Amino-2,6-dinitrotoluene	0.1
2/4-Nitrotoluene	0.25
3-Nitrotoluene	0.25
Pentaerythritol Tetranitrate (PETN)	10

[1] Analyzed by LC-MS (Method 8321).

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Method detection limits are to be reported to meet Wisconsin Groundwater Quality Standards.

Table 2

PRIORITY POLLUTANTS LIST (PPL) METALS AND CATIONS

Analyte(1)	PQL* Water (mg/l)
Antimony[2]	0.0018**
Arsenic[2]	0.001**
Barium	0.2
Beryllium	0.0002**
Cadmium[2]	0.0002**
Calcium	5
Chromium	0.01
Copper	0.025
Iron	0.1
Lead[2]	0.0013**
Magnesium	5
Manganese	0.015
Mercury[3]	0.0002
Nickel	0.008**
Potassium	5
Selenium[2]	0.005
Silver	0.01
Sodium	5
Thallium[2]	0.0012**
Zinc	0.02

1Analyzed by ICP (Method 6010) unless noted.
2Analyzed by Graphite Furnace Atomic Absorption Spectroscopy (Method 7000 series)
3Analyzed by Cold Vapor Atomic Absorption Spectroscopy (Method 7470)
*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
**Method detection limits are to be reported to meet Wisconsin Groundwater Quality Standards.

Table 3

ANIONS

Analyte(1)	PQL* WATER (mg/L)
Bromide	0.5
Chloride	1
Nitrate & Nitrite	0.5
Sulfate	1

[1] Analyzed by Ion Chromatography (Method 9056)

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

Table 4

GASES

Analyte(1)	PQL* Water (ug/l)
Methane	.1
Ethane	1
Ethene	1

[1] Analyzed by Gas Chromatography (Method 8015 mod.)

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

Table 5

MISCELLANEOUS PARAMETERS

Parameter	Test Method (1)	PQL*
		Water (mg/l)
BOD	405.1	5
COD	410.4	10
TOC	415.1	1
Carbonate Alkalinity	310.1	5
Bicarbonate Alkalinity	310.1	5
Total Alkalinity	310.1	5
Ammonia Nitrogen	350.2	0.05
Total Kjeldahl Nitrogen	351.3	0.1
Total phosphorous	365.2	0.05
Dissolved Phosphorous	365.2	0.05
Sulfide	376.1	1

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

(1) Analytical methods are from Methods for Chemical Analysis of Water and Wastes (MCAWW).

Table 6

PRECISION, ACCURACY, AND COMPLETENESS OBJECTIVES FOR WATER SAMPLES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gases	SW-846 Method 8015 (mod.)	20	10-140	70
Nitroaromatics/Nitroamines	SW-846 Method 8321	20	20-140	70
Metals (ICP)	SW-846 Method 6010	20	70-130	70
Metals (GFAA)***	SW-846 Method 7000 series	20	50-150	70
Metals (CVAA)	SW-846 Method 7470	20	80-120	70
Alkalinity	MCAWW 310.1	20	80-120	70
BOD	MCAWW 405.1	20	80-120	70
COD	MCAWW 410.4	20	80-120	70
TOC	MCAWW 415.1	20	80-120	70
Anions	SW-846 Method 9056	20	80-120	70
Ammonia	MCAWW 351.2	20	80-120	70
Total kjeldhl nitrogen	MCAWW 351.3	20	80-120	70
Phosphorous	MCAWW 365.2	20	80-120	70
Sulfide	MCAWW 376.1	20	80-120	70

*See Tables 1-5 for compounds in each parameter list

**See actual method for recommended precent recoveries

***As (7060), Cd (7131), Pb (7421), Sb (7041), Se (7740), Tl (7841)

Tab [illegible]

SAMPLE ANALYSIS SUMMARY

Well	Nitroaromatics/ Nitroamines	PPL Metals* (total)	PPL Metals* (dissolved)	Cations and Anions	BOD	COD	TOC	Alkalinity**	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Nitrate/ Nitrite	Phosphorous (total)	Phosphorous (dissolved)	Sulfate	Sulfide	TDS	TSS
IW708	X	X	X				X				X			X	X	X	X
IW707	X	X	X				X				X			X	X	X	X
CX533	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
IW709	X	X	X				X				X			X	X	X	X
IW711	X	X	X				X				X			X	X	X	X

*plus iron

** Carbonate, bicarbonate, and total alkalinity

Table [illegible]

COLLECTION FREQUENCY FOR QA/QC SAMPLES

Matrix	Trip Blanks	Field Blanks	Blind Duplicates	MS/MSD
Aqueous	One aqueous	10 percent of total	Collect a minimum	Collect a minium
	per sample shipment	number of samples	samples collected for project	5 percent of total
	containing gases	collected for project,	10 percent of total	number of samples
		no more than one per day		collected for project

MS/MSD = Matrix spike/matrix spike duplicate

Table 9

SUMMARY OF CONTAINERS, HOLDING TIMES, AND PRESERVATION FOR WATER SAMPLES

Test	Test Method*	Container	Holding Time	Preservation**
Gases	SW-846	G	14 days	Cool 4°C
	Method 8015 (mod)			
Nitroaromatics/	SW-846	G	14 days	Cool°4C
Nitroamines	Method 8321			
Metals	SW-846	P, G	6 months	Cool°4C
(except Hg)	Method 6010			HNO_3 to pH<2
	and 7000[1]			
Mercury (Hg)	SW-846	P, G	28 days	Cool°4C
	Method 7470			HNO_3 to pH<2
Alkalinity	MCAWW 310.1	P, G	14 days	Cool°4C
BOD	MCAWW 405.1	P, G	48 hours	Cool°4C
COD	MCAWW 410.4	P, G	28 days	Cool°4C
				H2SO4 to pH<2
TOC	MCAWW 415.1	P, G	28 days	Cool°4C
				H2SO4 to pH<2
Anions	SW-846	P, G	28 days	Cool°4C
	Method 9056			H_2SO4 to pH<2
Ammonia	MCAWW 350.2	P, G	28 days	Cool°4C
				H2SO4 to pH<2
Total Kjeldahl nitrogen	MCAWW 351.3	P, G	28 days	Cool°4C
				H2SO4 to pH<2
Phosphorous	MCAWW 365.2	P, G	28 days	Cool°4C
				H2SO4 to pH<2
Sulfide	MCAWW 376.1	P, G	7 days	Cool°4C
				Zn Acetate,
				NaOH to pH>9

*See Tables 1 through 5 for individual target compounds.

**All samples are to be stored at 4°C

(1) As (7060), Cd (7131), Pb (7421), Sb (7041), Se (7740), Tl (7841)

P=Polyethylene

G=Glass

EXHIBIT

Exhibit A

LABORATORY QUALITY ASSURANCE PLAN

Quanterra
Quality Assurance Management Plan
Status Table

Updated: 6/7/96

Section Number/Title	Section Contents/ Description	Date Initiated	Current Revision No.	Current Revision Date
1 - 10	Narrative	March 20, 1995	1	May 15, 1996
Index	Index	March 20, 1995	1	May 15, 1996
Glossary	Glossary	March 20, 1995	1	May 15, 1996
Table Section	Table Section	March 20, 1995	1	May 15, 1996
Appendix A	Non-Operations Organizational Charts	March 20, 1995	1	May 15, 1996
Appendix B (formerly C)	Addresses of Quanterra Locations	March 20, 1995	1	May 15, 1996
Appendix C (formerly B)	Facility Appendix:			
	Anchorage	August 14, 1995	2	May 15, 1996
	Austin	March 20, 1995	2	May 15, 1996
	City of Industry	March 20, 1995	1	May 15, 1996
	Denver	March 20, 1995	2	May 15, 1996
	Knoxville	March 20, 1995	2	May 15, 1996
	North Canton	March 20, 1995	2	May 15, 1996
	Pittsburgh	March 20, 1995	2	May 15, 1996
	Richland	March 20, 1995	1	May 15, 1996
	Sacramento	March 20, 1995	2	May 15, 1996
	Santa Ana	March 20, 1995	2	May 15, 1996
	St. Louis	March 20, 1995	2	May 15, 1996
	Tampa	March 20, 1995	2	May 15, 1996

Date of status table origination: September 19, 1995

Quanterra
Quality Assurance Management Plan
for Environmental Services

Revision 1
May 15, 1996

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TABLE 8.5-7
Summary of Inorganic Method Calibrations

Analysis	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Acidity	Initial	305.1	2 point calibration of pH meter (± 0.05 pH units of true value)	--	Not Applicable
	Continuing	305.1	Not Applicable	--	Not Applicable
	Ending	305.1	Not Applicable	--	Not Applicable
Alkalinity	Initial	310.1	2 point calibration of pH meter (± 0.05 pH units of true value)	--	Not Applicable
	Continuing	310.1	Not Applicable	--	Not Applicable
	Ending	310.1	Not Applicable	--	Not Applicable
Ammonia	Initial	350.1	6 levels including blank, "r"[3] ≥ 0.995	--	Not Applicable
	Continuing	350.1	1 level or LCS every 10 samples ± 10% of true value	--	Not Applicable
	Ending	350.1	1 level or LCS every 10 samples ± 10% of true value	--	Not Applicable
Biochemical Oxygen Demand (BOD)	Initial	405.1	a. Winkler titration: Iodometric with standard thiosulfate b. Membrane electrode: Read in air and in water with zero dissolved oxygen	--	Not Applicable
	Continuing	405.1	Not Applicable	--	Not Applicable
	Ending	405.1	Not Applicable	--	Not Applicable
Bromide	Initial	300.0[4] 320.1	<u>Method 300.0</u>: 5 levels plus a blank, "r"[3] ≥ 0.995 <u>Method 320.1</u>: Not Applicable	9056	<u>Method 300.0</u>: 5 levels plus a blank, "r"[3] ≥ 0.995

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

		NPDES[(1)]		RCRA (SW846)[(2)]	
Analysis	**Calibration**	**Method**	**Requirement**	**Method**	**Requirement**
Bromide (continued)	Continuing	300.0[(4)] 320.1	Method 300.0: 5 levels plus a blank, "r"[(3)] ≥ 0.995 Method 320.1: Not Applicable	9056	Method 300.0: Not Applicable
	Ending	300.0[(4)] 320.1	Not Applicable	9056	Not Applicable
Chemical Oxygen Demand (COD)	Initial	410.1 410.2 410.4	Method 410.1/410.2: Standardize titrant Method 410.4: 5 levels plus a blank "r"[(3)] ≥ 0.995	--	Not Applicable
	Continuing	410.1 410.2 410.4	1 level every 10 samples ± 10% of true value	--	Not Applicable
	Ending	410.1 410.2 410.4	1 level ± 10% of true value	--	Not Applicable
Chloride	Initial	300.0[(4)] 325.1 325.2 325.3	Method 300.0, 325.1, and 325.2: 5 levels plus blank "r"[(3)] ≥ 0.995 Method 325.3: Standardize titrant	9056 9251 9252A	Method 9056: 3 levels plus a blank Method 9251: 5 levels plus blank "r"[(3)] ≥ 0.995 Method 9252A: Standardize titrant
	Continuing	300.0[(4)] 325.1 325.2 325.3	Method 300.0, 325.1, and 325.2: 1 level every 10 samples ± 10% of true value Method 325.3: Not Applicable	9056 9251 9252A	Method 9056: 1 per batch of 20 samples, ± 10% of true value Method 9251: 1 level every 10 samples ± 10% of true value Method 9252A: Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Chloride (continued)	Ending	300.0[4] 325.1 325.2 325.3	Method 300.0, 325.1, and 325.2: 1 level every 10 samples ± 10% of true value Method 325.3: Not Applicable	9056 9251 9252A	Method 9056 and 9252A: Not Applicable Method 9251: 1 level ± 10% of true value
Chromium Cr^{+6}	Initial	218.4 3500 Cr-D	Method 218.4: 5 levels plus blank "r"[3] ≥ 0.995 Method 3500 Cr-D: 3 levels plus blank	7196A	5 levels plus blank "r"[3] ≥ 0.995
	Continuing	218.4 3500 Cr-D	1 level every 10 samples ± 10% of true value	7196A	1 level every 10 samples ± 15%
	Ending	218.4 3500 Cr-D	1 level ± 10% of true value	7196A	1 level ± 15%
Chlorine, Residual	Initial	330.1 330.3	Standardize titrant	--	Not Applicable
	Continuing	330.1 330.3	Not Applicable	--	Not Applicable
	Ending	330.1 330.3	Not Applicable	--	Not Applicable
Color	Initial	110.2	3 levels plus blank	--	Not Applicable
	Continuing	110.2	1 level every 10 samples	--	Not Applicable
	Ending	110.2	1 level	--	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations (Continued)

		NPDES(1)		RCRA (SW846)(2)	
Analysis	**Calibration**	**Method**	**Requirement**	**Method**	**Requirement**
Conductivity	Initial	120.1	Standard KCl solution at 8 temperatures (21-28°C)	9050	1 level to determine cell constant
	Continuing	120.1	Not Applicable	9050	Not Applicable
	Ending	120.1	Not Applicable	9050	Not Applicable
Cyanide (Amenable)	Initial	335.1	7 levels plus blank "r"(3) ≥ 0.995	9010A 9012	7 levels plus blank "r"(3) ≥ 0.995
	Continuing	335.1	1 level every 10 samples ± 10% of true	9010A 9012	1 mid-level every 10 samples ± 15% of true value
	Ending	335.1	1 level ± 10 % of true value	9010A 9012	± 15% of true value
Cyanide (Total)	Initial	335.1 335.2 335.3	7 levels plus blank "r"(3) ≥ 0.995	9010A 9012	7 levels plus blank "r"(3) ≥ 0.995
	Continuing	335.1 335.2 335.3	1 mid-level every 10 samples ± 10 % of true value	9010A 9012	1 mid-level every 10 samples ± 15% of true value
	Ending	335.1 335.2 335.3	1 mid-level ± 10 % of true value	9010A 9012	± 15% of true value
Flashpoint	Initial	–	Not Applicable	1010	p-Xylene reference standard must have flashpoint of 27.2°C ± 1.1°C
	Continuing	–	Not Applicable	1010	Not Applicable
	Ending	–	Not Applicable	1010	Not Applicable
Fluoride	Initial	300.0(4) 340.2	Method 300.0: 5 levels plus a blank, "r"(3) ≥ 0.995 Method 340.2: 6 levels "r"(3) ≥ 0.995	9056	3 levels plus a blank
	Continuing	300.0(4) 340.2	1 mid-level every 10 samples ± 10% of true value	9056	1 per batch of 20 samples ± 10% of true value
	Ending	300.0(4) 340.2	1 mid-level ± 10% of true value	9056	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES[(1)]		RCRA (SW846)[(2)]	
		Method	Requirement	Method	Requirement
Hardness	Initial	130.2	Standardize titrant	--	Not Applicable
	Continuing	130.2	Not Applicable	--	Not Applicable
	Ending	130.2	Not Applicable	--	Not Applicable
Iodide	Initial	345.1 Dionex[(3)]	Method 345.1: Standardize titrant Dionex: 4 levels plus blank "r"[(3)] ≥ 0.995	--	Not Applicable
	Continuing	345.1 Dionex[(3)]	Method 345.1: Not Applicable Dionex: 1 mid-level every 10 samples ± 10 % of true value	--	Not Applicable
	Ending	345.1 Dionex[(3)]	Method 345.1: Not Applicable Dionex: 1 mid-level ± 10% of true value	--	Not Applicable
Methylene Blue Active Substances (MBAS)	Initial	425.1	4 levels plus blank "r"[(3)] ≥ 0.995	--	Not Applicable
	Continuing	425.1	1 level every 10 samples ± 10 % of true value	--	Not Applicable
	Ending	425.1	1 level ± 10 % of true value	--	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations (Continued)

Analysis	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Nitrate	Initial	300.0[4] 352.1	5 levels plus a blank "r"[3] ≥ 0.995	9056 9200	Method 9056: 3 levels plus a blank Method 9200: 5 levels plus a blank must be analyzed with each batch of 20 samples
	Continuing	300.0[4] 352.1	1 mid-level every 10 samples ± 10% of true value	9056 9200--	Method 9056: 1 per batch of 20 samples, ± 10% of true value Method 9200: Independently - prepared check standard every 15 samples
	Ending	300.0[4] 352.1	1 mid-level ± 10% of true value	9056 9200--	Not Applicable
Nitrite	Initial	300.0[4] 354.1	5 levels plus a blank "r"[3] ≥ 0.995	9056	3 levels plus a blank
	Continuing	300.0[4] 354.1	1 mid-level every 10 samples ± 10% of true value	9056	1 per batch of 20 samples, ± 10% of true value
	Ending	300.0[4] 354.1	1 mid-level ± 10% of true value	9056	Not Applicable
Nitrate-Nitrite	Initial	353.1 353.2 353.3	5 levels plus blank "r"[3] ≥ 0.995	--	Not Applicable
	Continuing	353.1 353.2 353.3	1 level every 10 samples ± 10% of true value	--	Not Applicable
	Ending	353.1 353.2 353.3	1 mid-level ± 10% of true value	--	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Odor	Initial	140.1	No calibration	--	Not Applicable
	Continuing	140.1	Not Applicable	--	Not Applicable
	Ending	140.1	Not Applicable	--	Not Applicable
Phosphorus (total and Ortho-phosphate)	Initial	300.0[4] 365.1 365.2 365.3 365.4	Method 300.0/365.3/365.4: 3 levels plus a blank Method 365.2: 8 levels plus a blank	--	Not Applicable
	Continuing	300.0[4] 365.1 365.2 365.3 365.4	Method 300.0/365.3/365.4: 1 level every 10 samples ± 10% of true value Method 365.2: Blank and 2 standards with each series of samples, ± 2% of true value or recalibrate	--	Not Applicable
	Ending	300.0[4] 365.1 365.2 365.3 365.4	Method 300.0/365.3/365.4: ± 10% of true value Method 365.2: Not Applicable	--	Not Applicable
pH	Initial	150.1	2 level calibration (± 0.05 pH units of true value)	9040B 9045C	2 point calibration (± 0.05 pH units of true value)
	Continuing	150.1	1 buffer check every 10 samples ± 5% of true value	9040B 9045C	Not Applicable
	Ending	150.1	1 buffer check ± 5% of true value	9040B 9045C	Not Applicable
	Other	150.1	Third point check pH 10 buffer ± 5% of true value	9040B 9045C	Third point check

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES(1)		RCRA (SW846)(2)	
		Method	Requirement	Method	Requirement
Phenolics	Initial	420.1 420.2	5 levels plus a blank "r"(3) ≥ 0.995	9065	5 levels plus a blank "r"(3) 0.995
	Continuing	420.1 420.2	1 mid-level every 10 samples ± 10% true value	9065	1 mid-level ± 15% true value
	Ending	420.1 420.2	1 mid-level ± 10% true value	9065	1 mid-level ± 15% true value
Phosphate	Initial	—	Not Applicable	9056	3 levels plus a blank
	Continuing	—	Not Applicable	9056	1 per batch of 20 samples, ± 15% of true value
	Ending	—	Not Applicable	9056	Not Applicable
Reactivity	Initial	—	Not Applicable	Chap 7	See Total Cyanide and Sulfide
	Continuing	—	Not Applicable		
	Ending	—	Not Applicable		
Settleable Solids	Initial	160.2	This is a gravimetric determination. Calibrate balance prior to analysis	—	Not Applicable
	Continuing	160.2		—	Not Applicable
	Ending	160.2		—	Not Applicable
Silica, Dissolved	Initial	370.1	Approximately 6 levels plus blank "r"(3) ≥ 0.995	—	Not Applicable
	Continuing	370.1	1 level ± 15% of true value	—	Not Applicable
	Ending	370.1	1 level ± 15% of true value	—	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

		NPDES[1]		RCRA (SW846)[2]	
Analysis	**Calibration**	**Method**	**Requirement**	**Method**	**Requirement**
Specific Conductance	Initial	120.1	Standardize meter with 0.01 M KCl	9050	Not Applicable
	Continuing	120.1	1 level every 10 samples ± 10% of true value	9050	Not Applicable
	Ending	120.1	1 level ± 10% of true value	9050	Not Applicable
Sulfate	Initial	300.0[4] 375.1 375.4	<u>Method 300.0/375.1</u>: 5 levels plus blank "r"[3] ≥ 0.995 <u>Method 375.4</u>: 3 levels plus blank "r"[3] ≥ 0.995	9038 9056	<u>Method</u> 9038: 3 levels plus a blank for every hour of continuous sample analysis. <u>Method</u> 9056: 3 levels plus a blank
	Continuing	300.0[4] 375.1 375.4	<u>Method 300.0/375.1</u>: 1 mid-level after every 10 samples ± 10% of true value <u>Method 375.4</u>: 1 level every 3 or 4 samples ± 10% of true value	9038 9056	<u>Method</u> 9038: Independent-prepared check standard every 15 samples <u>Method</u> 9056: 1 per batch of 20 samples, ± 10% of true value
	Ending	300.0[4] 375.1 375.4	± 10% of true value	9038 9056	Not Applicable
Sulfide	Initial	376.1 376.2	<u>Method 376.1</u>: This is a titration method. Therefore, calibrations are not applicable. <u>Method 376.2</u>: 5 levels plus a blank "r" [3] ≥ 0.995	9030A	This is a colorimetric titration. Therefore, calibrations are not applicable.

TABLE 8.5-7
Summary of Inorganic Method Calibrations (Continued)

		NPDES(1)		RCRA (SW846)(2)	
Analysis	**Calibration**	**Method**	**Requirement**	**Method**	**Requirement**
Sulfide (continued)	Continuing	376.1 376.2	Method 376.1: Not Applicable Method 376.2: 1 level every 10 samples ± 10% of true value	9030A	
	Ending	376.1 376.2	Method 376.1: Not Applicable Method 376.2: ± 10% of true value	9030A	
Sulfite	Initial	377.1	This is a colorimetric titration. Therefore, calibrations are not applicable.	–	Not Applicable
	Continuing	377.1		–	Not Applicable
	Ending	377.1		–	Not Applicable
Temperature	Initial	170.1	Not Applicable	–	Not Applicable
	Continuing	170.1	Not Applicable	–	Not Applicable
	Ending	170.1	Not Applicable	–	Not Applicable
Total Dissolved Solids	Initial	160.1	This is a gravimetric determination. Calibrate balance prior to analysis	–	Not Applicable
	Continuing	160.1		–	Not Applicable
	Ending	160.1		–	Not Applicable
Total Kjeldahl Nitrogen (TKN)	Initial	351.2 351.3	Method 351.2: 5 levels plus blank "r"(3) ≥ 0.995 Method 351.3: Titrimetric: Standardize titrant Colorimetric: 7 levels plus blank	–	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES(1)		RCRA (SW846)(2)	
		Method	Requirement	Method	Requirement
Total Kjeldahl Nitrogen (TKN) (continued)	Continuing	351.2 351.3	Method 351.2: 1 mid-level every 10 samples ± 10% of true value Method 351.3: Not Applicable	--	Not Applicable
	Ending	351.2 351.3	Method 351.2: ± 10% of true value Method 351.3: Not Applicable	--	Not Applicable
Total Organic Carbon (TOC)	Initial	415.1	3 levels plus blank	9060	3 levels plus blank "r"(3) ≥ 0.995
	Continuing	415.1	1 mid-level every 10 samples ± 15% of true value	9060	1 mid-level every 10 samples ± 15% of true value
	Ending	415.1	± 15% of true value	9060	± 15% of true value
Total Organic Halides (TOX)	Initial	SM 5320B	7 levels plus a blank ± 10% of true value	9020B	Daily instrument calibration standard and blank in duplicate ± 10% of true value (calibration std.) Verify with independently-prepared check standard
	Continuing	SM 5320B	± 10% of true value	9020B	CCV ± 10% of true value
	Ending	SM 5320B	± 10% of true value	9020B	CCV ± 10% of true value
Total Solids	Initial	160.3	This is a gravimetric determination. Calibrate balance before use.	--	Not Applicable
	Continuing	160.3		--	Not Applicable
	Ending	160.3		--	Not Applicable

TABLE 8.5-7
Summary of Inorganic Method Calibrations (Continued)

Analysis	Calibration	NPDES(1)		RCRA (SW846)(2)	
		Method	Requirement	Method	Requirement
Total Suspended Solids	Initial	160.2	This is a gravimetric determination. Calibrate balance before use.	--	Not Applicable
	Continuing	160.2		--	Not Applicable
	Ending	160.2		--	Not Applicable
Total Volatile Solids	Initial	160.4	This is a gravimetric determination. Calibrate balance before use.	--	Not Applicable
	Continuing	160.4		--	Not Applicable
	Ending	160.4		--	Not Applicable
Turbidity	Initial	180.1	Minimum of 1 level in each instrument range Follow manufacturer's instructions	--	Not Applicable
	Continuing	180.1	Not Applicable	--	Not Applicable
	Ending	180.1	Not Applicable	--	Not Applicable
Water Content	Initial	--	Calibrate Balance	--	Calibrate Balance
	Continuing	--	Not Applicable	--	Not Applicable
	Ending	--	Not Applicable	--	Not Applicable
GFAA Metals (excludes Hg)	Initial	200 series	3 levels plus blank "r"(3) ≥ 0.995	7000 series	3 levels plus blank "r"(3) ≥ 0.995
	Continuing	200 series	Every 10 samples ± 10% of true value	7000 series	Every 10 samples ± 20% of true value
	Ending	200 series	± 10% of true value	7000 series	± 20% of true value
	Other	200 series	Annually - Instrument detection limits	7000	Annually - Instrument detection limits

TABLE 8.5-7
Summary of Inorganic Method Calibrations
(Continued)

Analysis	Calibration	NPDES(1)		RCRA (SW846)(2)	
		Method	Requirement	Method	Requirement
ICAP Metals (excludes Hg)	Initial	200.7	1 level and blank Rerun high calibration standard: verify quantitation at ± 5% of true value	6010A	1 level and blank Rerun high calibration standard: verify quantitation at ± 5% of true value
	Continuing	200.7	Every 10 samples ± 5% of true value	6010A	Mid-level calibration standard Every 10 samples ± 10% of true value
	Ending	200.7	± 5% of true value	6010A	Mid-level calibration standard ± 10% of true value
	Other	200.7	ICSA, ICSAB: Analyze at beginning and end or every 8 hours whichever is more frequent Annually: ICP interelement correction factors Instrument detection limits	6010A	ICSA, ICSAB: Analyze at beginning and end or every 8 hours whichever is more frequent Annually: ICP interelement correction factors Instrument detection limits
ICP/MS Metals	Initial	200.8	1 level and blank, ICV: ± 10% of true	6020	1 level and blank, ICV: ± 10% of true
	Continuing	200.8	Mid-level calibration standard Every 10 samples, ± 10% of true value	6020	Mid-level calibration standard Every 10 samples, ± 10% of true value
	Ending	200.8	Not specified	6020	Mid-level calibration standard, ± 10% of true value
	Other	200.8	Initial tuning standard deviation ≤ 5% for five replicates; Mass calibration ≤ 0.1 amu from true; Resolution ≤ 0.75 amu full width at 5% peak height; Analyze ICSA and ICSAB at the beginning of each run and every 12 hours	6020	Initial tuning standard deviation ≤ 5% for four replicates; Mass calibration ≤ 0.1 amu from true; Resolution ≤ 0.9 amu full width at 10% peak height; Analyze ICSA and ICSAB at the beginning of each run and every 12 hours

TABLE 8.5-7
Summary of Inorganic Method Calibrations (Continued)

Analysis	Calibration	NPDES[(1)]		RCRA (SW846)[(2)]	
		Method	Requirement	Method	Requirement
Mercury by CVAA	Initial	245.1 245.5	5 levels plus blank "r"[(3)] ≥ 0.995	7470 7471	5 levels plus blank "r"[(3)] ≥ 0.995
	Continuing	245.1 245.5	Daily or every 10 samples, whichever is more frequent ± 20% of true value	7470 7471	Every 10 samples ± 20% of true value
	Ending	245.1 245.5	± 20% of true value	7470 7471	± 20% of original prepared standard
	Other	245.1 245.5	Annually: - Instrument detection limits	7470 7471	Annually - Instrument detection limits

Footnotes

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(1) National Pollutant Discharge Elimination System

(2) Resource Conservation and Recovery Act, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), and Final Update IIB (January 1995).

(3) "r" = correlation coefficient

(4) Method not listed in 40 CFR Part 136.

TABLE 8.5-8
Summary of Organic Method Calibrations

Analytical Parameter	Calibration	NPDES[1] Method	NPDES[1] Requirement	RCRA (SW846)[2] Method	RCRA (SW846)[2] Requirement
Aromatic Volatiles by GC	Initial	602	Minimum of 3 levels If % RSD < 10%, use avg RF. Otherwise, calibration curve employed	8020A	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	602	Analyze QC check sample and evaluate per method requirements	8020A	Mid-level calibration standard analyzed every 10 samples. Evaluate per method requirements.
	Ending	602	Not Applicable	8020A	Mid-level calibration standard Evaluate per method requirements.
	Other	602	Not Applicable	8020A	Not Applicable
Dioxins/ Dibenzofurans by HRGC/LRMS	Initial	613	3 levels If % RSD <10%, use mean RF. Otherwise calibration curve employed	8280	5 levels in triplicate % RSD ≤ 15%
	Continuing	613	1 level each working day. % D must be ≤ 15%.	8280	1 level every 12 hours after window performance mix Standard must have RFs with %D ≤ 30% from initial
	Ending	613	Not Applicable	8280	Window performance mix
	Other	613	Establish Single Ion Monitoring conditions described in method	8280	Window mix to set congener windows every 12 hours at beginning of sequence. Isotope ratios in standard must meet criteria in method. Valley between 2,3,7,8-TCDD[3] and 1,2,3,4-TCDD must be ≤ 25% of the 2,3,7,8-TCDD[3] peak height.

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Analytical Parameter	Calibration	NPDES(1)		RCRA (SW846) (2)	
		Method	Requirement	Method	Requirement
Dioxins/ Dibenzofurans by HRGC/HRMS	Initial	--	Not Applicable	8290	5 levels plus window defining solution. %RSD for natives ≤ 20% for RFs; %RSD for labeled compounds ≤ 30% for RFs.
	Continuing	--	Not Applicable	8290	1 level every 12 hours after window defining solution. RFs with %D ≤ 20% for natives; %D ≤ 30% for labeled compounds from initial
	Ending	--	Not Applicable	8290	1 level: RFs with %D ≤ 20% for natives; %D ≤ 30% for labeled compounds from initial
	Other	--	Not Applicable	8290	Isotope ratios in standard must meet criteria in method. Valley between 2,3,7,8-TCDD and all other TCDDs must be ≤ 25% of the 2,3,7,8-TCDD height
Herbicides by GC	Initial	615	Minimum of 3 levels If % RSD < 10%, use avg RF. Otherwise, calibration curve employed	8150B	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	615	1 or more calibration standards analyzed daily % D ± 15% of predicted response	8150B	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	615	Not Applicable	8150B	Mid-level calibration standard. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	615	Not Applicable	8150B	Not Applicable

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Analytical Parameter	Calibration	NPDES(1)		RCRA (SW846)(2)	
		Method	Requirement	Method	Requirement
Nitroaromatics by HPLC	Initial	--	Not Applicable	8330	Minimum of 5 levels. Curve should be linear with zero intercept.
	Continuing	--	Not Applicable	8330	Midpoint calibration standard at beginning and after the midpoint of sample run. %D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	--	Not Applicable	8330	Midpoint calibration standard. %D: ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	--	Not Applicable	8330	Not Applicable
Polyaromatic Hydrocarbons by GC or HPLC	Initial	610	Minimum of 3 levels If % RSD < 10%, use avg RF. Otherwise, calibration curve employed	8100	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	610	1 or more calibration standards analyzed daily % D ± 15% of predicted response	8100	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	610	Not Applicable	8100	Mid-level calibration standard. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	610	Not Applicable	8100	Not Applicable
	Initial	--	Not Applicable	8310	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.

TABLE 8.5-8
Summary of Organic Method Calibrations
(Continued)

Analytical Parameter	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Polyaromatic Hydrocarbons by GC or HPLC (continued)	Continuing	--	Not Applicable	8310	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	--	Not Applicable	8310	Mid-level calibration standard. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	--	Not Applicable	8310	Not Applicable
Pesticides/ PCBs by GC	Initial	608	Minimum of 3 levels If % RSD < 10%, use avg RF. Otherwise, calibration curve employed	8080A	Minimum of 5 levels. If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	608	1 or more calibration standards analyzed daily % D ± 15% of predicted response	8080A	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	608	Not Applicable	8080A	Mid-level calibration standard. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	608	Not Applicable	8080A	Not Applicable
Petroleum Hydrocarbons/ Oil and Grease	Initial	413.1 413.2 418.1	Method 413.1: This is a gravimetric determination. Calibrate balance before use. Method 413.2/418.1: 3 levels plus a blank "r" (3) ≥ 0.995	9070 9071A	This is a gravimetric determination. Calibrate balance before use
	Continuing	413.1 413.2 418.1	Not Applicable	9070 9071A	Not Applicable

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Analytical Parameter	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Petroleum Hydrocarbons/ Oil and Grease (continued)	Ending	413.1 413.2 418.1	Not Applicable	9070 9071A	Not Applicable
	Initial	1664[8]	Calibrate analytical balance at 2 mg and 1000 mg Calibration must be ± 10% at 2 mg and ± 0.5% at 1000 mg or recalibrate balance	--	--
	Continuing	1664[8]	Not Applicable	--	--
	Ending	1664[8]	Not Applicable	--	--
Organophos-phorous Pesticides by GC	Initial	--	Not Applicable	8140 8141A	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	--	Not Applicable	8140 8141A	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	--	Not Applicable	8140 8141A	Mid-level calibration standard % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	--	Not Applicable	8140 8141A	Not Applicable

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Analytical Parameter	Calibration	NPDES[1]		RCRA (SW846)[2]	
		Method	Requirement	Method	Requirement
Purgeable Halocarbons by GC	Initial	601	Minimum of 3 levels If % RSD < 10%, use avg RF. Otherwise, calibration curve employed	8010B	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	601	Analyze QC check sample and evaluate per method requirements	8010B	Mid-level calibration standard analyzed every 10 samples. Evaluate per method requirements.
	Ending	601	Not Applicable	8010B	Mid-level calibration standard Evaluate per method requirements.
	Other	601	Not Applicable	8010B	Not Applicable
Halogenated Volatiles by GC	Initial	–	Not Applicable	8021A	Minimum of 5 levels If % RSD < 20%, use avg RF. Otherwise, calibration curve employed.
	Continuing	–	Not Applicable	8021A	Mid-level calibration standard analyzed every 10 samples. % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Ending	–	Not Applicable	8021A	Mid-level calibration standard % D ± 15% of predicted response for any analyte quantitated and reported, %D + 30 to -15% for analytes not detected.
	Other	–	Not Applicable	8021A	Not Applicable

TABLE 8.5-8
Summary of Organic Method Calibrations
(Continued)

Analytical Parameter	**Calibration**	**NPDES(1)**		**RCRA (SW846) (2)**	
		Method	**Requirement**	**Method**	**Requirement**
Semivolatiles	Initial	625	Minimum of 3 levels, lowest near but above MDL If % RSD $\leq$ 35%, use avg RF Otherwise calibration curve employed.	8270B	Minimum of 5 levels, % RSD for RF for CCCs(4) $\leq$ 30% SPCCs(5): RF > 0.050
	Continuing	625	1 level every 24 hours %D < 20 % between RF from standard and avg RF from initial calibration	8270B	Mid-level standard every 12 hours (after tuning) %D for CCCs(4) < 20 % between RF from standard and avg RF from initial SPCCs(5): RF > 0.050
	Ending	625	Not Applicable	8270B	Not Applicable
	Other	625	DFTPP(7) tuning every 24 hours before standard or sample runs.	8270B	DFTPP(7) tuning at the beginning of every 12 hour shift.
Volatiles	Initial	624	Minimum of 3 levels, If % RSD $\leq$ 35%, can use mean RF Otherwise calibration curve employed	8240B	Minimum of 5 levels, % RSD for RF for CCCs(4) $\leq$ 30% SPCCs(5): RF > 0.300 (0.10 for Bromoform)
	Continuing	624	1 level every 24 hours %D < 20 % between RF from standard and avg RF from initial calibration	8240B	Mid-level standard every 12 hours (after tuning) %D for CCCs(4) < 20 % between RF from standard and avg RF from initial SPCCs(5): RF > 0.300 (0.10 for Bromoform

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Analytical Parameter	Calibration	NPDES[1]		RCRA (SW846) [2]	
		Method	Requirement	Method	Requirement
Volatiles (continued)	Ending	624	Not Applicable	8240B	Not Applicable
	Other	624	BFB[6] tuning every 24 hours before standard or sample runs.	8240B	BFB[6] tuning at the beginning of every 12 hour shift.
	Initial	–	Not Applicable	8260A	Minimum of 5 levels, %RSD for RF for CCCs[4] < 30% SPCCs[5]: RF ≥ 0.30 for Chlorobenzene and 1,1,2,2-tetrachloroethane, RF ≥ 0.10 for Chloromethane and 1,1-dichloroethane, RF > 0.10 for Bromoform
	Continuing	–	Not Applicable	8260A	Mid-level standard every 12 hours (after tuning) %D for CCCs[4] < 30% between RF from standard and avg RF from initial SPCCs[5]: RF ≥ 0.30 for Chlorobenzene and 1,1,2,2-tetrachloroethane, RF ≥ 0.10 for Chloromethane and 1,1-dichloroethane, RF > 0.10 for Bromoform
	Ending	–	Not Applicable	8260A	Not Applicable
	Other	–	Not Applicable	8260A	BFB[6]tuning at the beginning of every 12 hour shift.

TABLE 8.5-8
Summary of Organic Method Calibrations (Continued)

Footnotes

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(1) National Pollutant Discharge Elimination System

(2) Resource Conservation and Recovery Act, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), and Final Update IIB (January 1995).

(3) TCDD - 2,3,7,8-Tetrachlorodibenzo-p-dioxin

(4) CCC - Continuing Calibration Compounds

(5) SPCC - System Performance Check Compound

(6) BFB - Bromofluorobenzene

(7) DFTPP - Decafluorotriphenylphosphine

(8) Method 1664 is a proposed only method and has not been promulgated by the EPA.

TABLE 8.11-1
Instrument Maintenance Schedule
Ion Chromatograph$^{(1)}$

As Needed	Daily	Weekly	Monthly	Semi-annually
Clean micromembrane suppressor when decreases in sensitivity are observed.	Check plumbing/leaks.	Check pump heads for leaks.	Check all air and liquid lines for discoloration and crimping, if indicated.	Lubricate left hand piston.
Check fuses when power problems occur.	Check gases.	Check filter (inlet)	Check/change bed supports guard and analytical columns, if indicated.	Clean conductivity cell.
Reactivate or change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated.	Check pump pressure.			Check conductivity cell for calibration.
De-gas pump head when flow is erratic.	Check conductivity meter.			

TABLE 8.11-2
Instrument Maintenance Schedule
LACHAT Auto Analyzer$^{(1)}$

As Needed	Daily	Monthly	Semi-annually	Annually
Prepare fresh reagents.	Clean detector cell and make sure there are no trapped bubbles in detector cell.	Replace tubing.	Lubricate pump roller.	Clean pump rollers with steel wool and lubricate.
	Check tubing.	Clean pump, diluter, and XYZ Sampler.		
	Clean sample probe shaft.			

TABLE 8.11-3
Instrument Maintenance Schedule
Total Organic Halide Analyzer(1)

Daily	Weekly	Monthly
Check pyrolysis tube and quartz wool.	Change quartz wool in pyrolysis tube.	Examine and clean pyrolysis tube.
Check for gas bubbles in titration sidearm.	Measure gas flow.	Clean titration cell.
Check electrodes for damage; polish the electrodes.	Perform cell performance check.	Perform electronic test.
Replace cell fluid, dehydrating fluid and electrolyte if needed.		Replace agar bridge in the working electrode.
Clean quartz boat.		
Observe check valves during use for backfeed.		Replace O-rings.
At end of each day of use, wash out absorption module.		

TABLE 8.11-4
Instrument Maintenance Schedule
High Pressure Liquid Chromatograph(1)

Daily	As Needed
Check level of solution in reservoirs. If adding, verify that solvent is from the same source. If changing, rinse gas and delivery lines to prevent contamination of the new solvent.	Replace columns when peak shape and resolution indicate that chromatographic performance of column is below method requirements.
Check gas supply.	Oil autosampler slides when sample does not advance.
Flush with an appropriate solvent to remove all bubbles.	Rinse flow cell with 1N nitric acid if sensitivity low.
Pre-filter all samples.	Change pump seals when flow becomes inconsistent.
	Repack front end of column Backflush column.

TABLE 8.11-5
Instrument Maintenance Schedule
Flame Atomic Absorption Spectroscopy[1]

Daily	Monthly	As Needed
Verify proper safety precautions are working.	Clean all filters and fans.	Check drain receptacle.
Verify gas box operates properly and safely.	Change capillary tubing	Check background corrector for alignment.
Verify sensitivity using elements in UV/VIS spectrum.	Clean optical windows	Clean burner head.
		Clean nebulizer.
		Clean spray chamber.
		Check sample introduction O-rings.

TABLE 8.11-6
Instrument Maintenance Schedule
Inductively Coupled Argon Plasma/Mass Spectrometry (ICAP/MS)[1]

Daily	Weekly	Monthly	Quarterly	Annually	As Needed
Check sample waste container level.	Check peristaltic pump: proper roller pressure, sample introduction tubing, correct pump rotation, condition of drain tubing.	Clean all filters and fans.	Replace oil in roughing pumps.	Replace oil in turbo-molecular pump.	Check electronic settings for optimum sensitivity: resolution, mass calibration, ion optics, CEM, deflector voltage.
Check quartz torch condition.	Check condition of sampler and skimmer cones.	Check recirculator water level.			
Measure quartz torch for proper alignment.	Check and drain oil mist eliminator on roughing pumps.				
Clean spray chamber and nebulizer.					
Check oil level of roughing pumps.					

TABLE 8.11-7
Instrument Maintenance Schedule
ICP(1)

Daily	As Needed	Semi-annually	Annually
Check that argon tank pressure is 50-60 psi and that a spare tank is available.	Clean plasma torch assembly to remove accumulated deposits.	Change vacuum pump oil.	Notify manufacturer service engineer for scheduled preventive maintenance service.
Check vacuum pump gage. (<10 millitorr)	Clean nebulizer and drain chamber; keep free-flowing to maintain optimum performance.	Replace coolant water filter. (may require more or less frequently depending on the quality of water)	
Check that cooling water supply system is full and drain bottle is not full. Also that drain tubing is clear, tight fitting and has few bends.	Clean filters on back of power unit to remove dust.		
Check that nebulizer is not clogged.	Replace when needed: peristaltic pump tubing sample capillary tubing autosampler sipper probe		
Check that capillary tubing is clean and in good condition.	Check ytrium position.		
Check that peristaltic pump windings are secure.			
Check that high voltage switch is on.			
Check that exhaust screens are clean.			
Check that torch, glassware, aerosol injector tube, bonnet are clean.			

TABLE 8.11-8
Instrument Maintenance Schedule
Graphite Furnace Atomic Absorption(1)

Daily	Monthly	As Needed	Annually
Check gas lines and gas supply.	Check coolant level in cooling unit. Add coolant if error message appears.	Replace contact cylinder.	Notify manufacturer service engineer to clean optics.
Clean optical windows.		Adjust autosampler arm.	
Clean contact cylinders.			
Check tubes and platform; replace if corroded, faking, or if low absorbance results.			
PE4100ZL: clean fume extraction tip, replace fume extraction filter and H_2O trap.			
As needed, trim sampling capillary.			
Check drain lines and waste containers; empty as needed.			
Check acid rinse containers; fill as needed.			

TABLE 8.11-9
Instrument Maintenance Schedule
Cold Vapor Atomic Absorption (Leeman PS 200) (1)

Daily	As Needed	Annually
Change drying tube	Change pump tubing	Change Hg lamp.
Check pump tubing/drain tubing	Check/change Hg lamp	
Check gas pressure	Clean optical cell	
Check aperture reading	Lubricate pump	

TABLE 8.11-10
Instrument Maintenance Schedule
Cold Vapor Atomic Absorption (PE 5000) (1)

Daily	Monthly
Clean aspirator by flushing with DI water.	Clean cell in aqua regia.
Check tubing and replace if needed.	Clean aspirator in aqua regia.
Clean windows with methanol.	
Change silica gel in drying tube.	
Check argon gas supply.	
Adjust lamp.	

TABLE 8.11-11
Instrument Maintenance Schedule
Gas Chromatograph(1)

Daily	As Needed	Quarterly/Semi-annually/Annually
Check for sufficient supply of carrier and detector gases. Check for correct column flow and/or inlet pressures.	Replace front portion of column packing or break off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance (e.g. peak tailing, poor resolution, high backgrounds, etc.) indicates it is required.	Quarterly ELCD: change roughing resin, clean cell assembly.
Check temperatures of injectors and detectors. Verify temperature programs.	Change glass wool plug in injection port and/or replace injection port liner when front portion of column packing is changed or front portion of capillary column is removed.	Semi-annually ECD: perform wipe test.
Check inlets, septa.	Replace septum (approximately every 100 injections).	Annually ELCD: change finishing resin, clean solvent filter.
Check baseline level.	Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).	
Check reactor temperature of electrolytic conductivity detector.	Replace or repair flow controller if constant gas flow cannot be maintained.	
	Replace fuse.	
	Reactivate external carrier gas dryers.	
	Detectors: clean when baseline indicates contamination or when response is low. FID: clean/replace jet, replace ignitor. NPD: clean/replace collector assembly. PID: clean lamp window, replace seals. ELCD: check solvent flow weekly, change reaction tube, replace solvent, change reaction gas, clean/replace Teflon® transfer line. ECD: follow manufacturers suggested maintenance schedule	
	Reactivate flow controller filter dryers when presence of moisture is suspected.	

TABLE 8.11-11
Maintenance Schedule
Gas Chromatograph[1]
(Continued)

Daily	As Needed	Quarterly/Semi-annually/Annually
(continued)	HP 7673 Autosampler: replace syringe, fill wash bottle, dispose of waste bottle contents.	(continued)
	Purge & trap devices: periodic leak checks, replace/condition traps (when poor response or disappearance of reactive or poorly trapped compounds), clean sample lines, valves (if they become contaminated), clean glassware.	
	Purge & trap autosamplers: leak check system, clean sample lines, valves. PTA-30 autosampler also requires cleaning the syringes, frits, valves, and probe needles, adjustment of micro switches, replacement of Teflon® valve, and lubrication of components.	

TABLE 8.11-12
Instrument Maintenance Schedule
Mass Spectrometer(1)

Daily	As Needed(2)	Semi-Annually	Annually
Check for sufficient gas supply. Check for correct column flow and/or inlet pressure.	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Change oil in the mechanical rough pump. Relubricate the turbomolecular pump bearing wick.	Replace the exhaust filters on the mechanical rough pump every 1-2 years.
Check temperatures of injector, detector. Verify temperature programs.	Replace electron multiplier when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.		
Check inlets, septa.	Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination.		
Check baseline level.	Repair/replace jet separator.		
Check values of lens voltages, electron multiplier, and relative abundance and mass assignments of the calibration compounds.	Replace filaments when both filaments burn out or performance indicates need for replacement.		

TABLE 8.11-13
Instrument Maintenance Schedule
TRAACS 800 Auto Analyzer (1)

As Needed	Daily	Monthly	Semi-annually	Annually
Replaces air filter when progressive loss of air pressure is observed.	Check air pressure gauge (22 ± 2 psi)	Change all pump tubes (or after 200 hours of pumping time)	(or after 1000 hours of pumping time)	Lightly lubricate the Linear Sample Rails (use semi-fluid lubricant)
Replace air valve tubing when occlusion in tubing is observed	Use recommended washout procedure (at end of analysis operations)	Clean sample probe shaft	Replace pump platens	Replace colorimeter lamp (or after 2500 hours of use)

TABLE 8.11-14
Instrument Maintenance Schedule
Sonicator (1)

Daily	As Needed
Daily when used: Inspect probe tips for inconsistencies (etching/pitting).	Replace probe tip.
	Disassemble and clean sonicator probe tips.
	Tune sonicator assembly.

TABLE 8.11-15
Instrument Maintenance Schedule
Analytical/Top Loading Balances(1)

Daily	Annually
Daily when used: Calibrate with check weights.	Internal weight train serviced. Gears and electronics serviced.

TABLE 8.11-16
Instrument Maintenance Schedule
Refrigerators/Walk-in Coolers(1)

Daily	As Needed
Temperatures checked and logged.	Refrigerant system and electronics serviced.

TABLE 8.11-17
Instrument Maintenance Schedule
Ovens(1)

Daily	As Needed
Temperatures checked and logged.	Electronics serviced.

TABLE 8.11-18
Instrument Maintenance Schedule
Specific Digital Ion Analyzer(1)

Daily	As Needed
Daily when used: Calibrate with check standards.	Electronics serviced.

TABLE 8.11-19
Instrument Maintenance Schedule
Turbidimeter(1)

Daily	As Needed
Daily when used: Calibrate with check standards.	Electronics serviced.

TABLE 8.11-20
Instrument Maintenance Schedule
Dissolved Oxygen Meter(1)

Daily	As Needed
Daily when used: Calibrate with check standards.	Electronics serviced.

TABLE 8.11-21
Instrument Maintenance Schedule
Conductance Meter(1)

Daily	As Needed
Daily when used: Calibrate with check standards.	Electronics serviced.

TABLE 8.11-22
Instrument Maintenance Schedule
Chemical Oxygen Demand (COD) Reactor

Daily	As Needed
Daily when used: Calibrate with check standards.	Electronics serviced.

TABLE 8.11-23
Instrument Maintenance Schedule
Spectrophotometer(1)

As Needed	Daily	Monthly	Annually
Dust the lamp and front of the front lens.	Check the zero %T adjustment.	Perform wavelength calibration at 530 nm.	Oil bearings.

TABLE 8.11-24
Instrument Maintenance Schedule
pH Meter(1)

As Needed	Daily
Clean electrode.	Verify electrodes are properly connected and filled.
Refill reference electrode.	Make sure electrode is stored in buffer.

TABLE 8.11-25
Instrument Maintenance Schedule
Fourier Transform Infrared Spectrometry (FTIR)(1)

Check desiccant every 3 months.
Check KBr window every 3 months.

TABLE 8.11-26
Instrument Maintenance Schedule
Radiological Analysis Equipment(1)

Instrument	Items Checked/Service	Minimum Frequency
Alpha Proportional	Check gas flow	Daily
	Clean sample tray	Weekly
	Check bubbler oil level	Monthly
Beta Proportional	Check gas flow	Daily
	Clean sample holders	Weekly
Liquid Scintillation	Clean sample changer	Weekly
	Check condensate trays	Weekly
	Check air filters	Monthly
Quad aß Proportional	Check gas flow	Daily
	Clean sample holders	Weekly
Gamma Spectroscopy	Check LN_2 level	Bi-weekly
	Replace plastic liner	Weekly
Alpha Spectroscopy	Clean sample holder	As needed
	Change vacuum pump oil	Every six months
LIPA	Clean sample changer	Weekly
	Check laser dye performance	Weekly
Benzene Synthesizer	Check gas tubes	Weekly
	Clean instrument	Monthly
Electrolytic Enrichment	Check electrical leads	Monthly
	Clean system	Monthly
Fluorometer	Clean sample holder	Weekly

Footnotes to Preventive Maintenance Tables

(1) Refer to manufacturer's instructions for each instrument to perform maintenance operations.

(2) Also see Table C-11 for applicable "As Needed" GC maintenance.

APPENDIX

Appendix A

CLP LIKE DELIVERABLES SPECIFICATIONS

LABORATORY DELIVERABLES FOR SW846 DATA VALIDATION

A. Title Page

B. Table of Contents

C. Sample Analysis Request or Summary

D. Chain of Custody Documents and Laboratory Chronicles

E. Methodology Review

F. Data Summary Package

1. Case Narrative Report
2. Sample Data Package
    - a. Organics by GC/MS
        - i. Target analyte summary for samples and blanks
        - ii. Tentatively identified compound summary
        - iii. Total ion chromatograms, quantitation reports, and mass spectra for positive and negated hits for samples
    - b. Organics by GC
        - i. Target analyte summary for samples and blanks
        - ii. Chromatograms and quantitation reports for samples (primary and confirmatory, if any)
    - c. Metals
        - i. Target analyte summary for samples and blanks
    - d. PCDDs and PCDFs
        - i. Analyte quantitation summary for samples and blanks
        - ii. Raw sample data summary for samples and blanks
        - iii. Selected ion current profiles, mass spectra, and quantitation reports for all PCDDs and PCDFs

- e. 2,3,7,8 - TCDD
    - i. Analyte quantitation summary for samples and blanks
    - ii. Raw sample data summary for samples and blanks
    - iii. Selected ion current profiles, mass spectra, and quantitation reports for all samples
- f. Miscellaneous parameters
    - i. Results summary for samples and blanks
    - ii. Logbook pages and instrument outputs (if any)

3. Quality Control Summary
    - a. Organics by GC/MS
        - i. Surrogate recovery summary
        - ii. Matrix spike/spike duplicate summary
        - iii. Laboratory control sample summary
        - iv. Method blank summary
        - v. GC/MS tune summary
        - vi. Internal standard summary
    - b. Organics by GC
        - i. Surrogate recovery summary
        - ii. Matrix spike/spike duplicate summary
        - iii. Laboratory control sample summary
        - iv. Method blank summary
    - c. Metals
        - i. Matrix spike summary
        - ii. Duplicate (matrix spike duplicate optional) sample summary

iii. Laboratory control sample summary

iv. Method blank summary

v. Post digestion spike and Method of Standard Addition summary for GFAA (if any)

vi. Serial dilution summary for ICP

d. PCDDs and PCDFs

i. GC/MS tune summary

ii. System performance check summary

iii. Matrix spike/spike duplicate recovery summary

e. 2,3,7,8 - TCDD

i. GC/MS tune summary

ii. Method blank summary

iii. Matrix spike/spike duplicate recovery summary

f. Miscellaneous parameters (cyanide, phenolics, pH, etc.)

i. Method blank summary

ii. Matrix spike summary (if any)

iii. Laboratory control sample summary (if any)

iv. Duplicate (matrix spike duplicate optional) sample summary

G. Standards Data Package

1. Organics by GC/MS

a. Initial calibration data summary and verification

b. Continuing calibration data summary and verification

c. Reconstructed ion chromatograms, and quantitation reports for all standards analyses

2. Organics by GC
    a. Initial calibration data summary and verification
    b. Continuing calibration data summary and verification
    c. Chromatograms and quantitation reports for all standards analyses
    d. Retention time window summaries for all analytes
3. Metals
    a. Initial calibration data summary and verification
    b. Continuing calibration data summary and verification
    c. Instrument quantitation reports for all standards analyses
    d. ICP interelement interference check summary and verification
    e. Linear dynamic range summary
4. PCDDs and PCDFs
    a. Initial calibration data summary and verification
    b. Continuing calibration data summary and verification
    c. Selected ion current profiles for all PCDD and PCDF standards
    d. Quantitation reports and mass spectra for all standards analyses
5. 2,3,7,8 - TCDD
    a. Initial calibration data summary and verification
    b. Continuing calibration data summary and verification
6. Miscellaneous Parameters
    a. Initial calibration data summary and verification
    b. Continuing calibration data summary and verification
    c. Quantitation reports (or logbook sheets where appropriate) for all standards analyses

Appendix C

WDNR FORMS AND DOCUMENTATION

PRE-FIELD WORK PROCEDURES CHECKLIST - WATER SUPPLY WELLS

All the following procedures may not be necessary for each sampling event. Use those procedures applicable to your sampling protocol or customize this list.

LOGISTICS

___ Contact the well owner to confirm the location, sampling date and time, and to discuss any site access issues.
___ Determine if the well has been inventoried. If not, obtain a WDNR well inventory number (Wisconsin Unique Well Number - WUWN).
___ Locate the nearest post office, UPS office, Fedex drop off spot, etc., if you will need to ship samples from the field. (UPS has a 70 lb. restriction per container.)

LABORATORY ARRANGEMENTS

___ Select a qualified laboratory to perform the sample analysis. Check that the laboratory (and subcontracted lab) is certified to perform the required sample analysis.
___ Make sure you have sufficient numbers, types, and volumes of sample containers needed - **get extras!** Remember QA/QC sample containers and trip blanks.
___ Discuss sample preservation, holding time, shipping requirements, and QA/QC expectations with the laboratory.
___ Inform the lab of the date and number of samples you will send.
___ Familiarize yourself with chain of custody and other sample tracking procedures.

SITE HISTORY

___ Review past water quality data to determine the well sampling order.
___ Review the site hydrogeology and information available on the well.

EQUIPMENT AND FIELD PREPARATION

___ Organize equipment (Equipment Checklist - Water Supply Well Sampling).
___ Check that equipment is in good working condition:

- ✓ Test and recharge/replace batteries as necessary.
- ✓ Test equipment with tap water or calibration standards.
- ✓ Inspect the equipment for defects, loose bolts, frayed wiring, etc.
- ✓ Check the instruments' ability to calibrate and function properly.

___ Check that all the equipment is properly decontaminated and stored for transport.

HEALTH AND SAFETY EQUIPMENT AND PREPARATION

___ If required, prepare and follow a safety and health plan (SHP).
___ Inform sub-contractors and other site personnel of contaminants and site hazards.

EQUIPMENT CHECKLIST - WATER SUPPLY WELL SAMPLING

All the following items may not be necessary for each sampling event.

GENERAL AND LOGISTICS

___ Permission/notification to well owner and site access keys
___ Directions to the site, access roads and location of wells
___ Contact names, addresses and phone numbers
___ ____

DOCUMENTATION AND REFERENCE MATERIALS

___ *Groundwater Sampling Procedures Field Manual*, sampling plan & QA/QC plan
___ Field note book, waterproof pens and clipboard
___ Inventory sheets or field data sheets
___ Chain of custody forms and other sample tracking forms
___ ____

EQUIPMENT AND SUPPLIES

___ Thermometer or temperature instrument
___ Conductivity meter and calibration standards (KCl)
___ pH meter, buffer solutions (pH 4, 7 and 10) and beakers
___ All meters and equipment fully charged/operational; spare batteries
___ Reagent grade water, gloves, ground cloth
___ Paper towels or disposable clean rags
___ Inert plastic bags to transport pump sample tubing, etc.
___ ____

PURGING AND SAMPLING

___ Special tap connection(s) and sampling tube for inaccesable sample taps
___ Calibrated buckets or similar device for purge water
___ Waterproof grease markers (Sharpies™ are a potential source of VOCs)
___ Sample containers (provided by lab) - **bring extra,** and waterproof labels/tags
___ QA/QC sample bottles (VOC trip blanks filled by lab)
___ ____

PRESERVATION AND SHIPPING

___ Sample preservatives, transfer pipettes and coolers with ice
___ Bubble wrap, Ziplock™ bags or equivalent to protect sample containers
___ Strapping tape, postage, Fedex or UPS shipping labels, etc

TOOLS AND MISCELLANEOUS

___ Flashlight and first aid kit
___ Adjustable wrench, screw drivers, hammer, scissors, knife, duct tape, etc.
___ ____

PRE-FIELD WORK PROCEDURES CHECKLIST - MONITORING WELLS

All the following procedures may not be necessary for each sampling event. Use those procedures applicable to your sampling plan or customize this list.

LOGISTICS

___ Arrange for site access with the land/home/facility owner and tenants.
___ Locate the nearest post office, UPS office, Fedex drop off spot, etc., if you will need to ship the samples from the field. (UPS has a 70 lb. restriction per container.)

LABORATORY ARRANGEMENTS

___ Select a qualified laboratory to perform the sample analysis. Check that the laboratory (and subcontracted lab) is certified to perform the required analysis.
___ Make sure you have sufficient numbers, types, and volumes of sample containers – **get extras!** Remember QA/QC sample containers and trip blanks.
___ Discuss sample preservation, holding time, shipping requirements, and QA/QC expectations with the laboratory.
___ Inform the laboratory of the date and number of samples you will send.
___ Familiarize yourself with chain of custody and other sample tracking procedures.

SITE HISTORY

___ Review past water quality data or SAP to determine the well sampling order.

EQUIPMENT AND FIELD PREPARATION

___ Review the sampling and analysis plan (SAP) and QA/QC plan.
___ Organize equipment (Equipment Checklist - Monitoring Well Sampling).
___ Check that equipment is in good working condition:

- ✓ Test and recharge/replace batteries as necessary.
- ✓ Test the equipment with tap water or calibration standards.
- ✓ Inspect the equipment for defects, loose bolts, frayed wiring, etc.
- ✓ Check the instruments' ability to calibrate and function properly.

___ Check that all equipment is properly decontaminated and stored for transport.
___ Fill out the Well Specific Field Sheet (WSFS) as much as possible before heading out to the field.

HEALTH AND SAFETY EQUIPMENT AND PREPARATION

___ If required, prepare and follow a health and safety plan (HSP).
___ Inform sub-contractors and other site personnel of contaminants and site hazards.

EQUIPMENT CHECKLIST - MONITORING WELL SAMPLING

All the following items may not be necessary for each sampling event. Check those items applicable to your sampling plan or customize this list.

GENERAL AND LOGISTICS

___ Permission/notification to land/home owner/tenant
___ Directions to the site and site access roads/site access keys
___ Contact names, addresses and phone numbers
___ Site map showing well locations, keys for well locks
___ Calculator and/or purge volume conversion tables
___ ____________________________________

DOCUMENTATION AND REFERENCE MATERIALS

___ *Groundwater Sampling Field Manual*
___ Sampling and analysis plan (SAP), QA/QC plan, and health and safety plan (HSP)
___ Well Specific Field Sheet (WSFS) and Field Procedures Documentation sheet
___ Well and boring logs
___ Field note book and waterproof pens
___ Clipboard with waterproof cover
___ Chain of custody forms and other sample tracking forms
___ Camera and film
___ ____________________________________

PURGING AND SAMPLING EQUIPMENT

___ Plastic sheet or equivalent ground cover
___ Purging pump or bailer and accessories (inert material)
___ Sampling pump or bailer and accessories (inert material)
___ Pump or bailer rope/cable (no cotton or cloth) and tripod
___ Pump sample tubing (inert material)
___ Pump power supply, air compressor, inert gas, etc.
___ Calibrated buckets or similar device for purge water
___ Waterproof grease markers or pens (Sharpies™ are a potential source of VOCs)
___ Sample containers (provided by lab) - **bring extra,** and water proof labels/tags
___ QA/QC sample bottles (VOC trip blanks filled by lab)
___ Sample transfer containers and wide mouth funnel
___ Filtering apparatus and all accessories
___ Filter membranes (0.45 micron) and pre-filters, or
___ Disposable in-line filters
___ 55 gallon drums for wastewater and drum labels
___ ____________________________________

FIELD MEASUREMENTS AND EQUIPMENT

___ Water level measuring instrument (0.01 foot increments) and backup device
___ Thermometer or temperature instrument
___ Conductivity meter and calibration standards (KCl)
___ pH meter, buffer solutions (pH 4, 7 and 10) and beakers
___ Dissolved oxygen meter and membrane replacement kit and/or Eh meter
___ Turbidity meter
___ All meters fully charged and operational; spare batteries
___ Closed flow through cell
___ Squirt bottles filled with reagent grade water
___ ______________________________

DECONTAMINATION EQUIPMENT

___ Non-phosphate cleaner and scrub brushes
___ Wash and rinse tubs or buckets and wastewater containers
___ Laboratory reagent grade water (two gallons/well usually sufficient)
___ Clean containers to transport equipment
___ ______________________________

SAMPLE PRESERVATION AND SHIPPING

___ Sample preservatives, transfer pipettes and pH paper
___ Coolers sufficiently large to hold all samples, including QA/QC samples
___ Crushed or cubed ice (frozen cold packs discouraged, need temp. blank)
___ Bubble wrap, Ziplock™ bags or equivalent to protect sample containers
___ Strapping tape, postage, Fedex or UPS shipping labels, COC forms, etc.,
___ ______________________________

TOOLS AND MISCELLANEOUS

___ Extra locks, keys for wells, flashlight, rain gear, etc.
___ Propane torch for frozen locks and bolt cutters for corroded locks
___ Adjustable wrench, screw drivers, hammer, scissors, knife, duct tape, etc.
___ Plastic garbage bags for contaminated waste
___ Bailer retrieval device (e.g., weighted hook)
___ Drum bung wrench and racket socket set (typ. 15/16" socket for 55 gallon drums)
___ ______________________________

PERSONAL PROTECTIVE EQUIPMENT

___ Respirators and cartridges (compatible for contaminants)
___ Safety glasses and/or splash shield
___ Inner and outer gloves (compatible for contaminants)
___ Hard hat and steel toed boots
___ Air monitoring equipment
___ First aid kit and eye wash kit
___ ______________________________

Appendix D

WELL ABANDONMENT REPORT

STATE OF WISCONSIN
EPARTMENT OF NATURAL RESOURCES
BOX 7921
MADISON, WISCONSIN 53707

WELL ABANDONMENT REPORT
Form 3300-5
Rev. 6-76

roperty Owner E. I. du Pont de Nemours & Co.

'. O. Address Barksdale, Wisconsin (Route 13 North of Ashland)

Vell Location Section 24, T48N, R5W (Powerhouse well)
Street and Number or Fractional Section, Town and Range

ype of Well N/A Drilled N/A Driven N/A Dug N/A Bored

otal Depth of Well N/A Feet Diameter 6 Inches Depth of Casing N/A Feet

epth to Rock 50 to 100 Feet Depth to Water ~150 Feet Limestone Formation N/A Yes or No

aterial Overlying Rock X Clay ___ Sand or Gravel ___ Mixed

Material and yardage used for fill or seal in rock section of well:

ormation*	Sealing Material Used	Cubic Yardage
	None	

*In mixed formations, list formations (if known) and sealing material according to Section NR 112.21 as indicated on the back of this page.

Material and yardage used for sealing above rock:

Formation	Sealing Material Used	Cubic Yardage
Sand or sand & gravel	Metal cap placed on casing.	
Clay		
Till		

To permit adequate grouting, the casing should remain in place but ungrouted liner pipes or any other obstructions need to be removed.

Was casing left in place? Yes

Vere liners and other obstructions removed? No

Name of Person or Firm doing Sealing Work Bruce M. Lawrence

Signature of Person doing the Work Bruce M Lawrence

Address 7700 West Du Pont Road, Morris, Illinois 60450

Appendix E

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

GROUNDWATER SAMPLING
Former DuPont Barksdale Works
Barksdale, Wisconsin

October 15, 1997 **DERS Project No. 7191**

Prepared by

DuPont Environmental Remediation Group &
DuPont Environmental Remediation Services
Barley Mill Plaza 27
P.O. Box 80027
Wilmington, Delaware 19880-0027

Mary L Glowacki
Nancy Grosso

Kathy Davis Project Geologist	Mary L. Glowacki, CHMM Health and Safety Manager	Nancy Grosso Project Manager

REVISION CHECKLIST

HASP Section	PM Initials	Mgr Initials	SSO Initials	Date	Comments

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(Continued)

CONTENTS
(Continued)

CONTENTS
(Continued)

FIGURE

TABLE

APPENDIXES

ATTACHMENT

1.0 PURPOSE

The purpose of this Health and Safety Plan (HASP) is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during groundwater sampling activities to be conducted at the former DuPont Barksdale site located in Barksdale, Wisconsin.

This HASP has been developed in accordance with the DuPont Environmental Remediation Services (DERS) safety and health standard operating procedures and is in compliance with the requirements set forth in 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. Specific programs, as required by site activities, may be found in the DERS *Safety and Health Standard Operating Procedures Manual* (see Table 1)

The site safety officer (SSO) has responsibility for the implementation and enforcement of this HASP. The SSO will evaluate this HASP for continuing adequacy throughout the course of field activities to incorporate changes necessitated as a result of changes in site activities. All proposed revisions to this HASP will be reviewed prior to implementation by the project team and annotated on the revision checklist provided at the beginning of this document.

All participants involved in the site investigation will be briefed on and afforded the opportunity to question this HASP. In addition, all personnel will sign the Initial HASP Review Sheet found in Attachment I at the end of this document.

ATTENTION CONTRACTORS:

You are responsible for compliance with this HASP and any other regulatory requirements set forth by the Occupational Safety and Health Act (OSHA) and other federal/state regulations.

2.0 PROJECT DESCRIPTION

2.1 General

Site Name: Former DuPont Barksdale
Site Address: Barksdale, Wisconsin

Site Description

The site, now owned by Bretting Manufacturing of Ashland is currently used as a private game farm.

Site History

The E.I. duPont de Nemours Company opened the 1,800 acre Barksdale explosives plant in 1904 for the purpose of producing dynamite. During World War I the Barksdale plant was the world's largest producer of TNT (trinitrotoluene), producing 130 million pounds of the explosive between 1913 and 1918. Production was down scaled substantially after the war and again during the depression, but it was increased during World War II, with an estimated 226 million pounds of TNT produced for the war effort. Once the war ended, the production of explosives at the Barksdale plant was decreased, once again, to meet regional mining needs.

DuPont ceased operations at the Barksdale plant in 1971, and most existing buildings were demolished within the decade. The Barksdale property was sold in 1986 to Bretting Manufacturing of Ashland, and is currently used as a private game farm.

2.2 Nature of DERS Activity

[ ] PRFI [ ] RFI [ ] Remedial Action [X] Other: Sampling Program

Project Name: DuPont Barksdale

Project Number: 7191

Project Manager: Nancy Grosso

Site Contact: Wayne Peterson **Phone No.** 715-682-5231

Contract Administrator: Jim Aker

3.0 SCOPE OF WORK

Analysis of a groundwater sample collected in June and August 1997 from a drinking water well, located adjacent to the Barksdale property at the Bretting Residence, showed possible contamination. As a result, groundwater samples from six wells, four residential wells and one temporarily abandoned DuPont water wells are to be sampled.

3.1 Water Well Sampling

After initial removal of the well cap at each location, the well headspace will be screened using a photo ionization detector. Water level measurements and total well depth will be measured in each well prior to the well being purged and sampled.

3.2 Residential Well Sampling

Samples of the residential wells will be collected from the port closest to the pumping well and prior to any storage tanks and treatment systems. Samples collection will be performed after the plumbing and storage tanks have been evacuated for approximately 15 minutes.

3.3 Decontamination

All equipment used in sample collection will be decontaminated using a Alconox wash and distilled/deionized water rinse.

4.0 PROJECT ORGANIZATION

4.1 Staffing

DERS personnel on-site: NA	Max. Number: NA
Contractor personnel on-site: 2	Max. Number: 2
Other on-site: N/A	Max. Number: N/A

4.2 Responsibilities

4.2.1 Project Manager: Nancy Grosso

Responsibilities include the overall coordination of site activities. The project manager has overall responsibility for the safety of operations and the health and safety of all personnel. The project manager is responsible for ensuring that the project is audited to verify compliance with the project health and safety program.

4.2.2 Health and Safety Manager: Mary L. Glowacki, CHMM

The Health and Safety manager is a resource for development of the site-specific HASP and will be consulted on all related health and safety issues that arise in the field, including any changes in the scope of work. The Health and Safety manager will make all final decisions regarding questions on the HASP.

4.2.3 Site Supervisor: Franklin Sampler

The site supervisor is responsible for field-related activities under the direction of the project manager and for maintaining field operations in accordance with project requirements. She is responsible for enforcing the daily implementation of the HASP and resolving health and safety issues with the SSO. She will also assist in conducting daily site briefings and documenting such in the field logbook.

4.2.4 Site Safety Officer: Franklin Sampler
Alternate: To be determined

Responsibilities of the SSO include the daily implementation of this HASP. The SSO is responsible for implementing and enforcing the HASP, overseeing the safety of daily operations, and coordinating safety with subcontractors. In particular, the SSO will

- ☐ Ensure that personnel are aware of the provisions of this HASP and are instructed in work practices, safety, waste management, and emergency procedures.
- ☐ Establish and ensure maintenance of site work zones.
- ☐ Monitor the work area and personnel breathing zone and ensure the compliance of workers relative to pre-established personal protection levels.
- ☐ Evaluate site conditions (i.e., weather, chemical, physical) and recommend any modifications to existing levels of protection.
- ☐ Ensure daily safety briefings are conducted with the assistance of the site supervisor.
- ☐ Initiate emergency response procedures with immediate communication to the project manager.
- ☐ Exercise stop-work authority in the event that there is imminent danger to project personnel.
- ☐ Resolve any noncompliance issues with the site supervisor.
- ☐ Conduct regular inspections to determine the effectiveness of the HASP.
- ☐ Maintain SSO logbook.
- ☐ Maintain copies of documents (e.g., training, medical, fit test).

5.0 HAZARD EVALUATION

5.1 Project Safety Analysis

Has a project safety analysis (PSA) been conducted for this project?

[ ] Yes [X] No

If yes attach, if no justify why:
A PSA will not be conducted for this phase of the project based on the tasks to be performed. All H&S issues related to the sampling are addressed in this HASP.

5.2 Chemical Hazards

Based on the historical use of the plant, trinitrotoluene (TNT), nitroglycerine (NG), and dinitrotoluene (DNT) are potential site contaminants. These constituents if present, are not expected to pose a health hazard to sampling personnel. However, depending on which constituents and their respective concentrations, dermal exposure would be of greater concern during sampling because of these constituents having the ability to be readily absorbed through the skin. NG and DNT are considered cyanosis causing compounds. Inhalation is a less likely pathway because of the matrix in which they are contained.

Though it is felt that the activity to be performed is considered a low hazard risk, caution must be exercise because of the lack of data and the fact that the site was a former explosives manufacturing facility.

Specific information regarding the aforementioned constituents can be found in Table 2.

Media in which present

[X] Water [ ] Soil [ ] Sediment [ ] Air

Any hazardous materials that will be brought on-site to facilitate this project (e.g., decontamination solutions, fuel for equipment operation) will require a material safety data sheet (MSDS), appropriate labeling, and approval by the DERS safety department.

MSDSs Attached [X] Yes [ ] No

Appendix A provides the MSDSs for *Alconox®*.

5.3 Physical Hazards

For the tasks to be performed, terrain poses a physical hazard because of the potential for slip/trip/fall if walking the site. Attention must also be given when driving through or parking in areas of ground cover such as grasses to prevent the potential for fire. Samplers need to exercise caution when handling equipment and during sampling to prevent pulls and strains. In addition, personnel must remain aware of the fact the site was a former explosives manufacturing facility.

[ ]overhead lines
[ ]buried utilities
[X] terrain
[ ]heat
[X] slip/trip/fall
[X] fire
[ ] OTHER

[ ] working overwater
[ ] heavy equipment
[ ] drill rig
[X] cold
[X] pinch points
[ ] radiation

[ ] vehicle traffic
[ ] train traffic
[X] noise
[ ] electrical
[ ] explosion
[ ] power tools

The following procedures will be used to monitor/reduce these hazards:

- Workers are encouraged to wear approved hearing protection when working around equipment that produces sound levels in excess of 85 decibels.
- Underground utilities must be located prior to the startup of intrusive activities.
- Good housekeeping practices should be employed to prevent slip/trip/fall hazards.
- Take ample breaks based on cold ambient conditions (see Appendix A).
- Personnel must always be aware of limb or body position in close proximity to moving equipment in order to reduce pinch-point hazards.
- Ground-fault circuit interrupters must be used with all portable equipment.
- The use of the required PPE listed in Section 7.0 will protect personnel from potential exposure to site contaminants.

- ☐ The use of the buddy system will be employed during field activities to provide rapid assistance in the event of an emergency.
- ☐ Grounding techniques will be used during the transfer of fuel and/or other flammable liquids.
- ☐ Backup alarms must be operable on all equipment.
- ☐ Fueling of any gas -or diesel-powered equipment shall be performed only after the equipment is cooled.

5.3.1 Overhead Obstructions

Note: Based on the tasks to be performed overhead obstructions will not be an issue.

The determination of overhead obstructions (OHOs) will be made prior to project initiation (OHOs include electrical and communications lines, piping, bridges, and crosswalks). If the electrical overhead hazards are present in the work area , an OHOP will be prepared by DuPont and reviewed by all project participants prior to the start of field activities.

	Yes	**No**	
a.	[ ]	[ ]	Are there OHOs within the confines of the project site?
b.	[ ]	[ ]	Are there OHOs on accessible adjoining area properties?
c.	[ ]	[ ]	Will trucks with raised beds (dumps, roll-offs) be used on the project?
d.	[ ]	[ ]	Will equipment with "high clearance" be brought on the site. If response to [a] or [b] is yes, and response to [c] or [d] is yes, an overhead obstruction work plan must be developed (see DERS procedure HS162; see Appendix D).
e.	[ ]	[ ]	Will cranes, drill rigs, excavators, or similar equipment be required to operate within 15 feet of OHOs on the project?

If response to [e] is yes, see procedure HS162. A "proximity permit" must be completed before work begins.

Name of person providing information in this section: N/A

5.4 Biological Hazards

The natural setting of the site lands itself to a number of biological hazards such as ticks, insects, and poisonous plants.

[ ] snakes
[ ] alligators
[X] ticks
[ ] rabid animals
[ ] wild dogs
[X] Other poisonous plants
[X] insects

Procedures to reduce these hazards will include the following:

- Ticks may also prevalent in the area. Specific information regarding precautions and symptoms of tick bites can be found in Appendix B.
- Poisonous plants such as poison ivy and/or insects may also be present. The use of *Tyvek*®, gloves, and tools will prevent skin contact.

If stung by a bee, carefully remove the stinger by gently scraping with a finger nail (do not squeeze). Wash the area with soapy water and apply a cold (ice) compress to decrease absorption and spreading of the venom. If excessive swelling or redness appears, seek immediate medical attention. **(Note: Allergic reactions to bee stings can be life threatening; therefore, identify susceptible persons prior to project start-up).**

6.0 AIR/WORKPLACE MONITORING

6.1 Real-time Monitoring

[ ] No [X] Yes

Air monitoring for volatile organic compounds will be conducted throughout the course of field activities. The data provides information to assist in determining worker protection levels. As a minimum, real time monitoring will be conducted in the Worker's Breathing Zone (WBZ), defined as the two-foot area around the worker's head and at the suspected source of contamination (i.e., well) using a Photovac Microtip . Measurements will be taken at each well location. Based on the fact that the constituents most likely to be present are semi volatile, any reading above background in the breathing zone will be used as the action level. Exceedance of the action level will require activities to cease and conditions to be re-evaluated.

CALIBRATION PROCEDURE (per manufacturers' suggestion): All monitoring equipment will be calibrated prior to the first use of the day and documented in the field log book (e.g., specify gal. gas/flow rates).

6.2 Air Sampling

[X] No [ ] Yes

Based on the activities to be conducted and the duration of the activities, an air sampling program will not be instituted for this phase of the project.

6.3 Noise Monitoring Required

[X] No [ ]Yes

Noise monitoring will not be conducted; however, noise levels generated from sampling equipment may require the use of hearing protection..

6.4 Heat/Cold Stress Monitoring Required

[X] No [ ] Yes

Cold stress monitoring will not be implemented; however, procedures to be followed are provided in Appendix A.

6.5 Monitoring Equipment

[ ] No [X] Yes

[X] Photoionization Detector Micro Tip 1000 Series (10.6eV Lamp)
[X] Other

7.0 WORKER PROTECTION

Task: **Location:** Entire Site

Groundwater sampling
Decontamination

Residential well sampling

Engineering/Administrative Controls: Yes [ ] No [X]

PPE Level: Modified Level D Action Level: An reading above background

Upgrade Req. Level C Downgrade Req. Modified Level D and Level D

Hazard Analysis: Modified Level D was selected for the groundwater sampling mainly to afford protection against direct contact and or splash. Again an inhalation hazard is not anticipated therefore respiratory protection is not required. Level D will be used when performing the residential well sampling.

Body Protection

[ ] Uniform/standard work clothes	[ ] Flotation device	[ ] Other ________
[X] *Tyvek®*	[ ] Hooded	[X] Taped glove-wrist
[ ]Polyethylene-coated *Tyvek®*	[ ] Hooded	[X] Taped cuff-boot
[ ] *Saranex®*	[ ] Hooded	[ ] Taped hood-mask
[ ] Raingear	[ ] Hooded	[ ] Other: ________

Gloves

[X] Latex/surgical rubber
[ ] Neoprene
[ ] *Viton®*
[ ] PVC
[ ] Other:
[X] Nitrile (outer glove)
[X] Leather (general activities)
[ ] Cotton

Head Protection

[X]Hard hat

Boots

[X] Leather-steel toed
[ ] Neoprene-steel toed
[ ] *Tyvek®* booties
[ ] PVC-steel toed
[ ] PVC-booties
[ ] Ranger overboots

Hearing Protection

[X] Ear muffs/plugs (as needed)
[ ] Other:________

[ ] No leather

[X] Other: latex booties

Respiratory Protection (Level C)

[ ] SCBA

[ ] Supplied air

[ ] Air purifying (full face)

[X] Cartridge type: MSA GMC-H

[ ] Escape pack

[ ] Air purifying (half face)

Eye Protection

[X] Safety glasses w/side shields

[ ] Chemical resistant goggles

[ ] Face shield

[ ]Other: ____________________

Note: See Appendix C for inspection checklist for MSA ultra-twin respirator and positive negative fit-test procedure.

8.0 PERSONNEL TRAINING

DERS personnel and contract employees associated with field activities will be required to participate in a health and safety training program that complies with criteria set forth by the OSHA as per 29 CFR 1910.120(e).

8.1 Preassignment and Annual Refresher Training

Prior to arrival on-site, each employer (contractor) will be responsible for certifying that his or her employees meet the requirements of 40/24-hour preassignment training. In addition, each employee must be able to document dates of attendance at annual eight-hour refresher training and three/one day(s) of fieldwork under a qualified supervisor. Failure to provide these documents will prohibit entry to the site.

8.2 Site Supervisor Training

Consistent with OSHA 29 CFR 1910.120(e)(4), prior to arrival on-site, individuals designated as site supervisors require an additional eight hours of specialized training.

8.3 Initial Site Briefing

In addition to 29 CFR 1910.120(e) training, all site employees will attend an initial HASP review prior to initiating field activities. This review must include the following:

- ☐ *Project Personnel Roles and Responsibilities*
  Personnel will understand the lines of authority regarding health and safety and site personnel roles and responsibilities.
- ☐ *Site-specific Health and Safety Hazards*
  Personnel will be informed of specific hazards related to the site and site operations, such as health hazards of site chemicals and specific safety hazards of process equipment.
- ☐ *Personal Protective Equipment*
  Personnel will be trained in the proper use of PPE.

☐ *Safe Work Practices/Engineering Controls*
Personnel will be informed of appropriate work practices and engineering controls that will reduce the risk of exposure to site hazards.

☐ *Communication Methods*
Personnel will be informed of means for normal site and emergency communication.

☐ *Air Monitoring*
Personnel will be informed of the frequency and types of air monitoring, personnel monitoring, and sampling techniques to be used on-site.

☐ *Medical Surveillance Program*
Personnel will be informed of the medical surveillance requirements including recognition of symptoms and signs of exposure; in addition, specific biological monitoring program requirements will be explained.

☐ *Site Control Methods*
Personnel will understand site methods used to reduce exposure to on-site and off site personnel.

☐ *Decontamination Procedures*
Personnel will be trained in proper decontamination procedures, including decontamination of PPE, equipment and vehicles.

☐ *Emergency Response*
Personnel will be trained to respond properly in the event of an emergency.

☐ *Confined-space Entry/Special Hazards*
Personnel involved in specific hazardous activities, such as confined space entry and/or drum handling, will receive training in the appropriate techniques to employ prior to commencing these operations.

8.4 Daily Briefings

Daily briefings will be conducted before each work shift at a location designated by the SSO or site supervisor. All personnel will attend this briefing in order to participate in the in-field activities for that day. Attendance at the briefing will be documented in the SSO's field logbook.

8.5 Special Facility Training

Plant Orientation	[ ] Yes	[X] No
Area Orientation	[ ] Yes	[X] No
Other	[X] Yes	[ ] No

If Yes, Specify: HASP Review

8.6 Visitor Procedures

All visitors on-site will be escorted by DERS site personnel or be required to review and agree to comply with the provisions of this HASP. Visitors will sign in and out of the site logbook. Only visitors who meet the training and medical monitoring requirements of 29 CFR 1910.120 will be allowed to enter the exclusion zone or contamination reduction zone and must participate in a HASP review.

9.0 MEDICAL MONITORING

All personnel involved in field activities must participate in a medical monitoring program as outlined in 29 CFR 1910.120(f).

Contractors will assume responsibility for obtaining the necessary medical monitoring for their employees, and will provide a medical clearance letter to DERS as requested. In addition, personnel will complete the Medical Data Sheet included as Appendix D.

9.1 Special Biological Monitoring

If any of the following contaminants are known to present on-site, a biological monitoring program may be required as outlined in the DERS Safety and Health SOP.

[ ] Asbestos
[ ] Beta-naphthylamine
[ ] 3,3 dichlorobenzidine
[ ] Ethyleneimine
[ ] 2-acetoaminofluorene
[ ] Lead
[ ] Methyl Chloromethyl Ether
[ ] Bis-chloromethyl Ether
[ ] 4-aminodiphenyl
[ ] Beta-propiolactone
[ ] Cotton Dust
[ ] Benzene
[ ] Benzidine
[ ] 2-acetoaminofluorene

Note: A biological monitoring program will not be performed.

10.0 SITE CONTROL

The following site control measures will be implemented:

- ☐ The job site is partitioned into three distinct work zones: Support Zone, Contamination Reduction Zone, and Exclusion Zone. Zones will be clearly delineated by the use of tape, barriers, signs, or whatever means is appropriate for the site.
- ☐ Workers will only enter and exit the Exclusion Zone via the Contamination Reduction Zone. Gross decontamination will occur in the established corridor.
- ☐ Only authorized personnel are allowed to enter the Exclusion Zone or the Contamination Reduction Zone.
- ☐ Figure 1 depicts a typical site layout defining the zones. The SSO will depict the actual site layout in the SSO logbook daily, and as needed thereafter.
- ☐ Appropriate containers will be used for the temporary collection of contaminated clothing and articles of PPE. The site supervisor will ensure that waste containers are clearly dated, contents identified, and managed in accordance with DERS Waste Management Plan.
- ☐ If the facility is not a controlled site (e.g., no guarded entry gate), the installation of fencing and use of a private guard service will be considered.
- ☐ Communications on-site will be conducted via direct communication or radio. In the event of an emergency, the SSO will alert all personnel to leave the Exclusion Zone and await further instructions.

11.0 DECONTAMINATION

11.1 Personnel Decontamination Procedures

Personnel decontamination will consist of removing PPE and containerizing it properly for final disposal in accordance with the Waste Management Plan.

11.2 Sample Equipment Decontamination Procedures

Equipment decontamination will be conducted in accordance with the sampling plan.

11.3 Heavy Equipment Decontamination Procedures

Heavy equipment will not be employed for the tasks to be performed.

ALL EQUIPMENT WILL BE INSPECTED BY DERS PRIOR TO DEPARTURE OFF SITE. MEANS OF APPROVAL WILL BE DETERMINED BY:

[ ] Visual
[ ] Wipe Test
[ ] Other (Explain) ____

11.4 Procedure to Clean and Store Respirators

Each employee will use his or her respirator exclusively and is responsible for inspecting it prior to use and cleaning after use.

Respirators will be stored on-site in a way to prevent contamination (i.e., plastic bag in accordance with 29 CFR 1910.134. Respirators will be field-cleaned in the contamination reduction zone after each use. Respirators will be washed and sanitized at the end of each week (see Appendix E for procedures for cleaning and disinfecting respirators).

12.0 ILLUMINATION

As required, adequate artificial lighting will be provided for all activities.

Hours of Field Operation: Field activities will be conducted between the hours of 8:00 AM and 4:30 PM.

Describe lighting source: N/A

13.0 SANITATION

13.1 General

Sanitation facilities will be provided in accordance with 29 CFR 1910.120(n).

Highest number of personnel (DERS and contractors) anticipated on-site: 2

13.2 Potable Water

[ ] Provided by DERS
[ ] Provided by site
[X] Provided by contractor

All potable water will be clearly marked, tightly closed, and equipped with a tap. Provisions will be made for the sanitary storage and proper disposal of cups.

13.3 Nonpotable Water (NA)

[ ] Provided by DERS
[ ] Provided by site
[ ] Provided by contractor

Sources of nonpotable water will be segregated and clearly marked as unsafe for drinking, cooking, and washing.

13.4 Toilet Facilities

[ ] Provided by DERS
[ ] Provided by site
[ ] Provided by contractor

13.5 Washing/Showering

Is project duration greater than six months? [X] No [ ] Yes

Are showering facilities necessary? [X] No [ ] Yes

[ ] Provided by DERS
[ ] Provided by site
[ ] Provided by contractor

Note: It is recommended that all persons engaged in site activities shower upon leaving the site as a means of practicing good personal hygiene.

13.6 Personal Hygiene

Prior to eating, drinking, or smoking, hands and face must be thoroughly washed.
Are hand-washing facilities necessary? [ ] No [X] Yes

[ ] Provided by DERS
[ ] Provided by site
[X] Provided by contractor

14.0 EMERGENCY CONTINGENCY PLAN

Has this contingency plan been reviewed/approved by the client/site:

[X] No [ ] Yes

14.1 Emergency Phone Numbers

Contact	Name	Number
Police/Security		373-6120
Fire		682-7062
Ambulance		682-7062
Hospital: Name: Address:		
Project Manager	Nancy Grosso	(302) 992-6783
Site Contact	Wayne Peterson	(715)682-5231
DERS Safety Manager	Mary Glowacki	(302) 992-5993
Regulatory Agency		

Evacuation Route Description: The evacuation route will be determined at the site prior to initiation of site activities.

Directions to the hospital: Memorial Medical Center
South on Highway 13 to Highway 2 East (Lake Shore Drive) toward Ashland.
Turn right onto Sanborn Avenue.
Turn left onto Maple lane, approximately 1/2 mile to Hospital.

14.2 Notification Procedure

In the even of an incident, contact the following people:

Project Manager: Nancy Grosso 302-992-6783

Health and Safety Manager: Mary Glowacki 302-992-5993
Beeper 1-800-759-7243 (PIN) 273-3102

Business Team Leader: Jim Aker 302-992-5829

Appendix F provides injury and incident reporting forms that can be copied and sent by facsimile (302-892-7644) to the Health and Safety Manager.

14.3 Injury Response

In the event a person becomes ill or injured while in the Exclusion Zone, the SSO will

- ☐ Ensure that all equipment has been shut off.
- ☐ Assess the nature of the injury.
- ☐ Phone for emergency assistance.
- ☐ Decontaminate the person to the maximum extent.
- ☐ Administer first aid (if certified to do so).
- ☐ Meet the emergency crew.
- ☐ Contact the DuPont office and ensure that the client has been notified.
- ☐ Begin injury investigation.

14.4 Fire/Explosion Response

In the event of a fire or explosion,

- ☐ Ensure that all equipment is shut off.
- ☐ Phone for emergency assistance.
- ☐ Rally at designated location and take head count.
- ☐ Secure the area until emergency assistance arrives.
- ☐ Meet the emergency crew and advise the fire chief of the location and nature of the situation.
- ☐ Contact the DuPont office and ensure that the client has been informed.

14.5 Spill/Release Response

In the event of a spill or leak,

- ☐ Ensure that all equipment is shut off.

- ☐ Phone for assistance
- ☐ Secure the area.
- ☐ Locate the spill and stop or contain the spill if it can be done safely (the proper PPE must be worn).
- ☐ Meet the spill response crew and advise them of the location and material that has spilled.
- ☐ Contact the DuPont office and ensure that the client has been informed.
- ☐ Begin investigation.

14.6 Volatile Organic

In the event that site-generated VOC's migrate from the Exclusion Zone and potentially endanger unprotected people, all on-site activities will cease and site conditions will be re-evaluated.

14.7 Other (Weather)

In the event of adverse weather conditions (e.g., rain, high winds, snow), the SSO may stop work until conditions improve.

14.8 Emergency Equipment

[X] First Aid Station
[ ] Decon Stations
[X] Fire Extinguisher
[X] Air Monitoring Equipment
[X] Emergency Eyewash
[ ] Outer Garment
[ ] Gloves (specify type)
[ ] Tape
Specify:____________________
[ ] Ventilation Equipment
[ ] Full-body Harness and Lifeline
[X] Respiratory Protection_________
[ ] Other Emergency Equipment Available

First Aid Locations: There will be a first aid kit available on-site for use by a trained individual but there will be no formal first aid locations.

FIGURE

TYPICAL SITE WORK ZONES

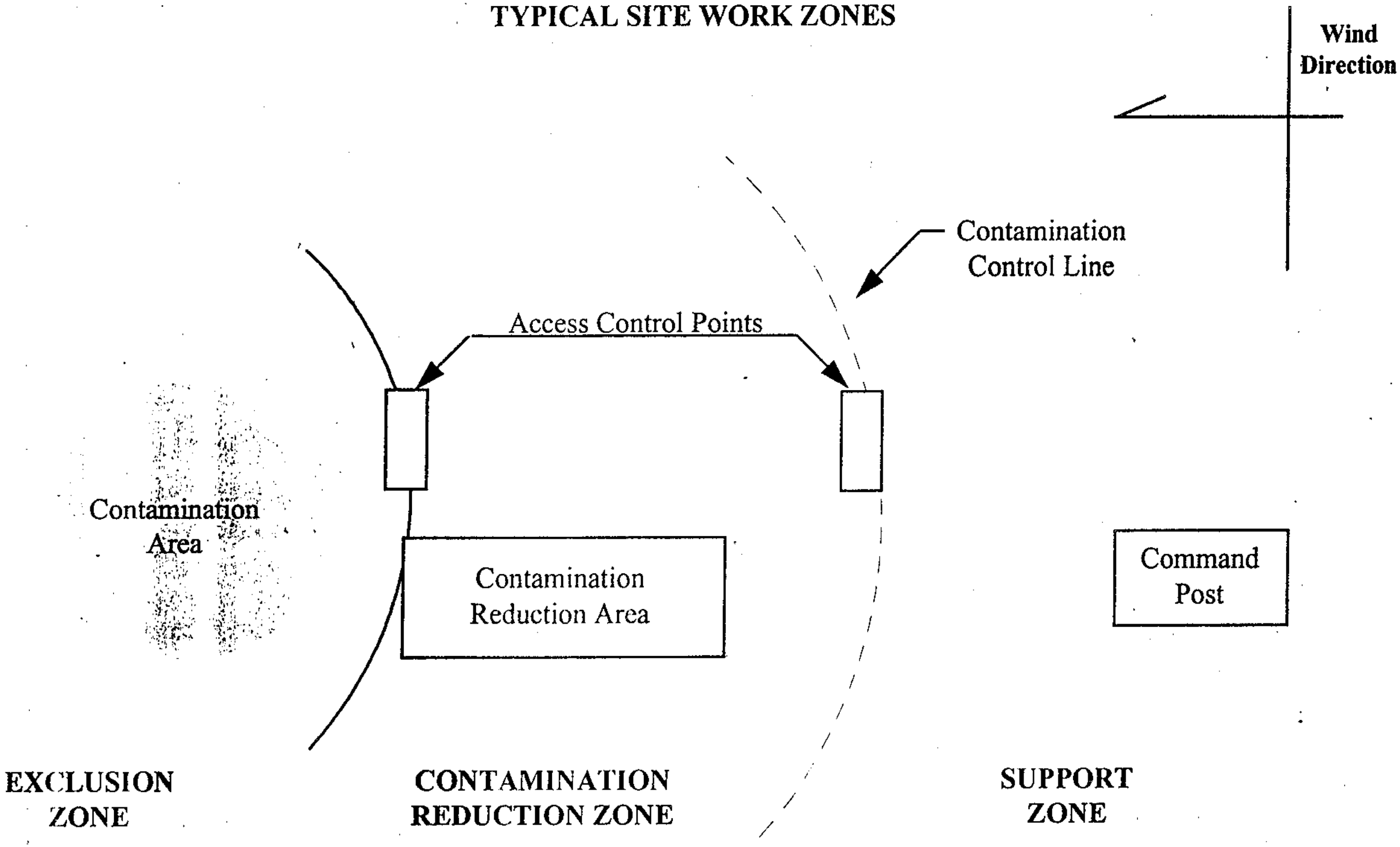

FIGURE 1

TABLES

Table 1

APPLICABLE DERS GUIDELINES/PROCEDURES

Check if applicable	Guideline/Procedure Name	H&S Number
X	Policy	HS-10
X	Position Statement	HS-20
	Contractor Safety Administration	HS-22
	Lock, Tag, Try	HS-103
	Permit-Required Confined Space Entry	HS-104
	Shallow Well Drilling Equipment Inspection Checklists	HS-105
	Process Equipment Inspection	HS-115
X	Project Team Safety Walk-Through	HS-200
	Line Manager Project Site Safety Walk-Through	HS-201
	Respirator Care, Inspection, Fit Test	NA
	Lead Awareness Program	NA
	Snakebite Information	NA
	Excavation Safety	NA
	Drilling Safety	NA
	Heavy Equipment Safety	NA
	Boating Safety	NA
	Lyme Disease	NA
	Heat Exposure	NA
	Contractor Safety Process	HS-2001
X	DERS Health and Safety Program	HS-2002
	Bloodborne Pathogen Program	HS-2003
	Drilling Safety Handbook	HS-2006

Table 2

CHEMICAL CONSTITUENTS

Chemical (CAS No.)	OSHA PEL ACGIH TLV DuPont AEL ACGIH STEL NIOSH IDLH Skin Designation	Characteristics	Route of Exposure	Symptoms of Exposure
Semivolatile Organic Compounds				
Dinitrotoluene (25321-14-6)	PEL: 1.5 mg/m^3 TLV: 0.15 mg/m^3 skin AEL: N/A STEL: N/A IDLH: 200 mg/m^3 (CA)	Orange-yello crystalline solid with a distinct odor. Air odor threshold unknown. LEL & UEL: Unknown	INH ABS	May cause anoxia, cyanosis, and anemia. Human carcinogen by dermal contact.
Nitroglycerine (55-63-0)	PEL: 0.2 ppm TLV: 0.05 mg/m^3 AEL: None STEL: None IDLH: 500 mg/m^3 Skin: Yes	Colorless to pale-yello viscous liquid or solid (solid below 56° F). Air odor threshold unknown. LEL & UEL: Unknown	INH ING ABS	Headache, nausea, vomiting, abdominal cramps, fainting, convulsions, and reduced blood pressure.
Trinitrotoluene (118-96-7)	PEL: 0.5 mg/m^3 TLV: 0.5 mg/m^3 AEL: N/A STEL: N/A IDLH: 500 mg/m^3	Colorless to pale yellow, odorless solid or crushed flakes.	INH ABS ING CON	Moderately toxic by ingestion. Severe eye irritant. May be absorbed through the skin. Can cause weakness, headache, anemia, and liver injury.

Table 2

CHEMICAL CONSTITUENTS

OSHA PEL = Occupational Safety and Health Administration Final Rule Limits, Permissible Exposure Limit for an eight-hour, time-weighted average

ACGIH TLV = American Conference of Governmental Industrial Hygienists, Threshold Limit Value for an eight-hour, time-weighted average

DuPont AEL = DuPont, Acceptable Exposure Limit

ACGIH STEL = American Conference of Governmental Industrial Hygienists, Short-term Exposure Limit for a 15-minute, time-weighted average

NIOSH IDLH = National Institute for Occupational Safety and Health, Immediately Dangerous to Life or Health concentration

ppm = Part of vapor or gas per million parts of air by volume at 25 degrees Celsius and 760 ton

mg/m^3 = Milligram of substance per cubic meter of air

µg/m3 = Microgram of substance per cubic meter of air

mg/kg = Milligram of substance per kilogram of soil

CAS = The Chemical Abstracts Service registry number is a numeric designation assigned by the American Chemical Society's Chemical Abstracts Service and uniquely identifies a specific chemical compound. This entry allows one to conclusively identify a substance regardless of the name or naming system used.

CA = NIOSH has identified numerous chemicals that it recommends be treated as potential or confirmed human carcinogens.

(c) = The (ceiling) concentration that should not be exceeded during any part of the working exposure.

Skin = The potential contribution to the overall exposure by the cutaneous route, including mucous membranes and eye, either by airborne or, more particularly, by direct contact with the substance.

UEL = Upper Explosive Limit—the highest concentration of a material in air that produces an explosion in fire or ignites when it contacts an ignition source. A higher concentration of the material in a smaller percentage or concentration of air may be too rich to be ignited.

LEL = Lower Explosive Limit—the lowest concentration of the material in air that can be detonated by spark, shock, fire, etc.

INH = Inhalation

ABS = Skin absorption

ING = Ingestion

CON = Skin and/or eye contact

Polynuclear Aromatic Hydrocarbons = Includes acenaphthene, ammonia, anthracene, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, chrysene, o-cresol, m-cresol, p-cresol, fluoranthene, fluorene, high-boiling tar acids, indene, medium-soft pitch, a-methylnaphthalene, b-methylinaphthalene, naphtha, naphthalene, phenanthrene, phenol, pyrene, tar bases, toluene, and xylenols

APPENDICES

Appendix A

COLD EXPOSURE

COLD EXPOSURE

Cold Stress

Cold injury such as frostbite and hypothermia may occur during field operations. The extent of injury caused by exposure to the cold will depend on such factors as wind velocity, temperature, and humidity. To guard against such injuries, personnel must wear appropriate clothing, have immediate access to warm shelter, carefully schedule work and rest periods, monitor workers' physical conditions, and learn to recognize warning symptoms, such as reduced coordination, drowsiness, impaired judgment, fatigue, and numbing of toes and fingers.

Frostbite

Frostbite is a localized injury that results from the freezing of tissue. It is most common to the fingers and toes (due to reduced circulation in the extremities), and on the face and ear (most commonly exposed to the weather).

For frostbite to occur, there must be subfreezing temperatures. It is most prevalent in very cold temperatures (20°F or less) or when cold temperatures are exacerbated by the wind (wind chill).

- ☐ *Symptoms*
  - Prefrostbite
    The affected area feels painfully cold, but is usually flushed (rosy-red in color)
  - First-Degree Frostbite (Frost Nip)
    Crystallization occurs in superficial tissues. The affected area no longer feels cold, is completely numb, and shows as a small white or grayish-yellow waxy patch. Immediate treatment will completely reverse the condition with no ill effects.
  - Second-Degree Frostbite (Deep)
    A deep freezing of the fluids in the underlying soft tissues. Symptoms and treatment are the same as for first-degree frostbite. It usually results in the death of tissue (e.g., blistering black skin or a loss of toes) with possible complications from gangrene.

☐ *First Aid*

- Cover and protect the affected area.
- Provide extra clothes.
- Bring the victim indoors as soon as possible.
- Give the victim warm drink
- Rewarm frozen tissue quickly by immersing it in warm water (if thawed and refrozen, warm at room temperature).
- Do not rub; rubbing causes death of tissue.
- Do not apply heat.
- Do not break blisters.
- Do not allow victim to walk after feet thaw.
- Discontinue warming as soon as the frostbitten body part becomes flushed.
- Exercise the thawed body part.
- Separate fingers and toes with sterile gauze.
- Elevate frostbitten parts.
- Seek medical attention because of chance of infection or gangrene.

Hypothermia

Hypothermia is a systemic lowering of the body temperature. Extreme cases (core temperature below 90°F) result in death. Hypothermia is the most common cause of death for persons involved in outdoor/wilderness activities. It does not require freezing temperatures and can occur in ambient air temperatures as high as 70°F. Wind and wetness greatly accentuate hypothermia by causing increased cooling. An example of a hypothermic condition is a rainy, windy day with 50°F air temperatures.

☐ *Symptoms*

- First Stage—"goose bumps," shivering, feeling chilly
- Second Stage—violent shivering, blue lips, pale complexion, feeling extremely cold
- Third Stage—no longer feeling cold, lack of coordination, mild unresponsiveness, drowsiness, stumbling
- Fourth Stage—failing eyesight, almost total lack of responsiveness, inability to speak, inability to walk
- Fifth Stage—coma or rapid death

☐ *Treatment*

For all levels, remove wet, frozen, or restrictive clothing. Dry and rewarm the victim using an external heat source that completely envelops the victim (e.g., placing the victim in a warm vehicle, a warm room, a tub of warm water, or a sleeping bag with another person). Do not use a source of radiant heat that will warm only one side of the victim. Be prepared to administer cardiopulmonary resuscitation (CPR). Do not give the victim alcohol.

- First Stage
  Put additional clothing on the victim such as a hat, shirt, or windbreaker; give food and drink; exercise tense muscles.

- Second Stage
  Follow the same steps listed for the first stage, only more so; give warm drinks and provide means of rewarming if possible.

- Third Stage
  Rewarm the victim; give warm food and drink. **Note: In hypothermia beyond the second stage, the victim can no longer warm himself and must have an external heat source.**

- Fourth Stage
  Remove wet or cold clothing and gradually rewarm the victim so that blood trapped in extremities is rewarmed before it is circulated back into the inner body, in order to prevent *afterdrop*. Afterdrop is a further lowering of the body core temperature that results from recirculation of cold blood. Avoid hot, radiant heat sources that will warm surface blood before the inner blood has been warmed. Do not give warm drinks that can fool the body internally into feeling it is warm. Fourth stage hypothermia victims are best treated by supervised, experienced medical help because complications can cause death. Place the victim in a warm vehicle and evacuate immediately to a medical facility.

- Fifth Stage
  Gradually rewarm the victim. Requires sophisticated medical help to prevent death from *aftershock* (a recirculation of chilled blood causing heart fibrillation).

Appendix B

LYME DISEASE

LYME DISEASE

Lyme disease is an identified hazard in the United States. The following information is provided to protect personnel.

- ☐ *Exposure*
  Lyme disease is a bacterial infection transmitted by the bite of a deer tick, found on all types of vegetation and animals, especially in the woods. The deer tick is most active in the spring and fall, but remains present throughout the summer.
- ☐ *Precaution*
  Personnel should wear long sleeves and pants. An insect repellent can help repel ticks. Clothing should be brushed off before going inside. Personnel should carefully check their bodies for ticks as well. An attached tick should be removed at once with fine-jawed tweezers by grasping the tick's head as closely to the skin as possible and gently pulling it straight out. Care must be taken not to squeeze the tick's body because this may cause it to inject fluid into the wound. The bite area should be washed and cleansed with antiseptic.
- ☐ *Symptoms*
  A ring-shaped rash may occur within four to 20 days after a bite. Symptoms may include fever, chills, headache, stiffness in joints, weakness, and fatigue. Common symptoms of Lyme disease may mimic arthritis. In some cases, no symptoms occur.
- ☐ *Diagnosis*
  A doctor should be contacted if Lyme disease is suspected.
- ☐ *Treatment*
  If detected early, Lyme disease is usually treatable with antibiotics.

Appendix C

INSPECTION CHEKCLIST FOR MSA® ULTRA-TWIN RESPIRATOR AND POSITIVE AND NEGATIVE FIT-TEST PROCEDURES

INSPECTION CHECKLIST FOR *MSA*® ULTRA-TWIN RESPIRATOR
(Insert appropriate checklist for your region)

1. Headbands—Check to see that the headbands still have their elasticity. Inspect for cracks or tears and make sure all buckles are in place and working properly.
2. Face piece—Check face piece for dirt, cracks, tears or holes. Inspect the shape of the face piece for possible distortion that may occur from improper storage and make sure the rubber is flexible, not stiff.
3. Inhalation and exhalation valves—Check for cracks, tears, distortion, dirt, or buildup of material between valve and valve seat.
4. Cartridge holders—Check to make sure gaskets are in place. Check for cracks and damage to threads.
5. Ensure that speaking diaphragm retainer ring is hand tight.
6. Ensure that a protective cover lens is attached to the lens.
7. Cartridges and/or filters—Make sure cartridges and filters are clean. Never try to clean a filter or cartridge by washing it or using compressed air. Inspect cartridges for dents, scratches, or other damage, particularly the metal sealing bead around the bottom.
8. Don the respirator and follow the Positive/Negative Pressure Fit-Test Procedures.

POSITIVE/NEGATIVE FIT-TEST PROCEDURES

Each respirator must be subjected to the following tightness test before each use:

1. Test respirator for leakage using a positive-pressure method. Lightly place palm over exhalation valve cover. Gently exhale. A slight positive pressure should build up inside the respirator. If any leakage is detected around the facial seal, readjust the head harness straps and repeat the test until there is no leakage. If other facial seal leakage is detected, the condition must be investigated and corrected before another test is made.
2. A negative pressure test may also be performed on certain types of respirators. Lightly place palms over cartridges or filter holders. Gently inhale and the face piece should collapse against the face. The respirator must pass the tightness tests before it is used. The respirator will not furnish protection unless all inhaled air is drawn through suitable cartridges or filters.

Appendix D

MEDICAL DATA SHEET

MEDICAL DATA SHEET

Name: ______________________________

Social Security: ______________ **Home Phone:** ______________

Home Address: ______________________________

____

Whom to Notify In Case of Emergency

Name: ______________________________

Daytime Phone No.: ______________________________

Personal Physician's Name: ______________________________

Medical Conditions: ______________________________

____

Allergies: ______________________________

____

Special Considerations: ______________________________

____

Appendix E

PROCEDURES FOR CLEANING AND DISINFECTING RESPIRATORS

PROCEDURES FOR CLEANING AND DISINFECTING RESPIRATORS

1. Remove cartridges and put in container provided.
2. Remove any gross contamination with water and paper towels, taking care not to scratch the plastic lens.
3. Mix 70 milliliters of concentrated cleaning solution into 3 gallons of water in the bucket provided.
4. Soak respirator in solution for about 10 minutes.
5. Rinse respirator with a large amount of fresh water.
6. Shake excess water from respirator; completely dry with paper towels; ensure that exhalation valve is clean, dry, and operable; and place into a new plastic bag.

Appendix F

INITIAL REPORT OF INCIDENT/INJURY

INITIAL REPORT OF INCIDENT/INJURY
Phone In/Fax In

Date and Time of this Report:

Date and Time of Incident:

Project Site and Location at Site:

What was the activity immediately before the incident (unexpected occurrence)?

Describe the incident:

Who on-site has been notified of this incident?

Name of person filing this report:

(The above information is preliminary, having been prepared before an investigation has been completed and may not be entirely factual.)

INITIAL REPORT OF INJURY
Phone In/Fax In

Date and Time of this Report:

Date and Time of Incident:

Project Site and Location at Site:

Injured' Name/Age/Job Title:

Injured's Employer

What was injured doing at the time of the injury?

Describe what appeared to happen to cause injury:

What is the nature and extent of injury?

What medical care has been rendered and where?

What is the name and phone number of the person rendering medical care?

Who on-site has been notified of this injury?

Name of person filing this report:

(The above information is preliminary, having been prepared before an investigation has been completed and may not be entirely factual.)

ATTACHMENT

Attachment 1

INITIAL HASP REVIEW SHEET

HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

I have read, understand, and agree with the health and safety protocols presented in the Health and Safety Plan (HASP) and the information discussed in the health and safety briefing. I also understand that noncompliance with the HASP may result in dismissal from the site.

PRINTED NAME	ORGANIZATION	SIGNATURE	DATE

Personnel Health and Safety Briefing Conducted by

Name	Signature	Date

Appendix F

WASTE MANAGEMENT PLAN

WASTE MANAGEMENT PLAN WILL BE FORWARDED PRIOR TO THE START OF FIELD ACTIVITIES