

ORIGINAL
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Extent of Contamination Study
McClintic Wildlife Refuge
Point Pleasant, West Virginia

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AR305392

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Extent of Contamination Study
McClintic Wildlife Refuge
Point Pleasant, West Virginia

I. PURPOSE AND SCOPE OF WORK:

The purpose and scope of this study included the following:

- 1 - perform a historical search of available data to include maps depicting underground process lines, wastewater lines, manhole placement, and ponds.
- 2 - conduct a ground reconnaissance to physically locate underground wastewater collection/treatment lines.
- 3 - conduct soil sampling in the manholes, benthos cores from Pond 13 and soil core borings along the wastewater collection lines as well as the status of groundwater contamination.
- 4 - hazard assessment, i.e., determine degree of risk to human health and the environment.

A detailed Scope of Work statement is included in Attachment #9.

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II. INTRODUCTION

On May 6, 1981 Mr. Tom Dotson, District game biologist of the McClintic Wildlife Refuge, contacted the hazardous waste division of the West Virginia Department of Natural Resources (DNR) to report a seep of red colored material into Pond 13, one of the refuge's fishing ponds. DNR personnel sampled the seep water the day it was reported. The water analysis by their lab revealed the sample contained 25ppb dinitrotoluene (DNT). Additional sampling was done by DNR on May 27, 1981 with analysis showing DNT concentration of 252ppb (Table 1). Bioassay work performed with this sample, (see Attachment 1) indicated high toxicity for minnows and moderate toxicity for daphnia. No fish kills were observed during either of the site visits for sampling. A review of the site history indicated that forty years ago the seep area had been part of a process area for a trinitrotoluene (TNT) manufacturing plant. The seep was thought to be residual material from abandoned wastewater lines.

In September 1981 Mr. Ben Wilmoth, U.S. EPA, Wheeling West Virginia Field Office, inspected the seep area. Based on his initial site observations, plus background information provided by DNR, he determined that no immediate removal action under CERCLA was warranted. He did recommend that an engineering survey of the area be made to evaluate the extent of contamination. On September 21, 1981 a formal request was made by the director of DNR to the EPA Region III Administrator for this study.

In November 1981 EPA Enforcement Division personnel submitted a letter to the U.S. Army (the owners of the TNT plant) requesting that the Army prepare an extent of contamination study for the site and also perform any recommended clean-up actions. The Army subsequently refused this request.

Based on further information gathered from the site visits by both the Region III Technical Assistance Team (TAT) and the EPA Environmental Response Team (ERT) the on-scene coordinator (OSC), Ben Wilmoth, submitted a Ten-Point Document to EPA Headquarters for funding for an extent-of-contamination study including recommendations for any required clean-up activities. This request was made on December 30, 1981 and was denied by EPA Headquarters on January 12, 1982. Reason for the denial being a lack of sufficient demonstration of the need for an emergency action.

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II. INTRODUCTION (cont'd.)

In February 1982 the Environmental Emergency Branch (EEB) of EPA Region III submitted a request to EPA Headquarters for funding of the extent of contamination study under Section 104 (b) of CERCLA. Instead EPA Headquarters recommended that the Field Investigation Team (FIT) contractor be directed to perform the study. Since FIT contracting procedures necessitated very long lead time, to avoid further delays the project was assigned to the TAT contractor using EPA Special Projects funds. Work began in March 1982 and the following report is the culmination of the investigations. The program of study initially agreed with the OSC is presented in Attachment #9.

TABLE 1 WATER SAMPLING

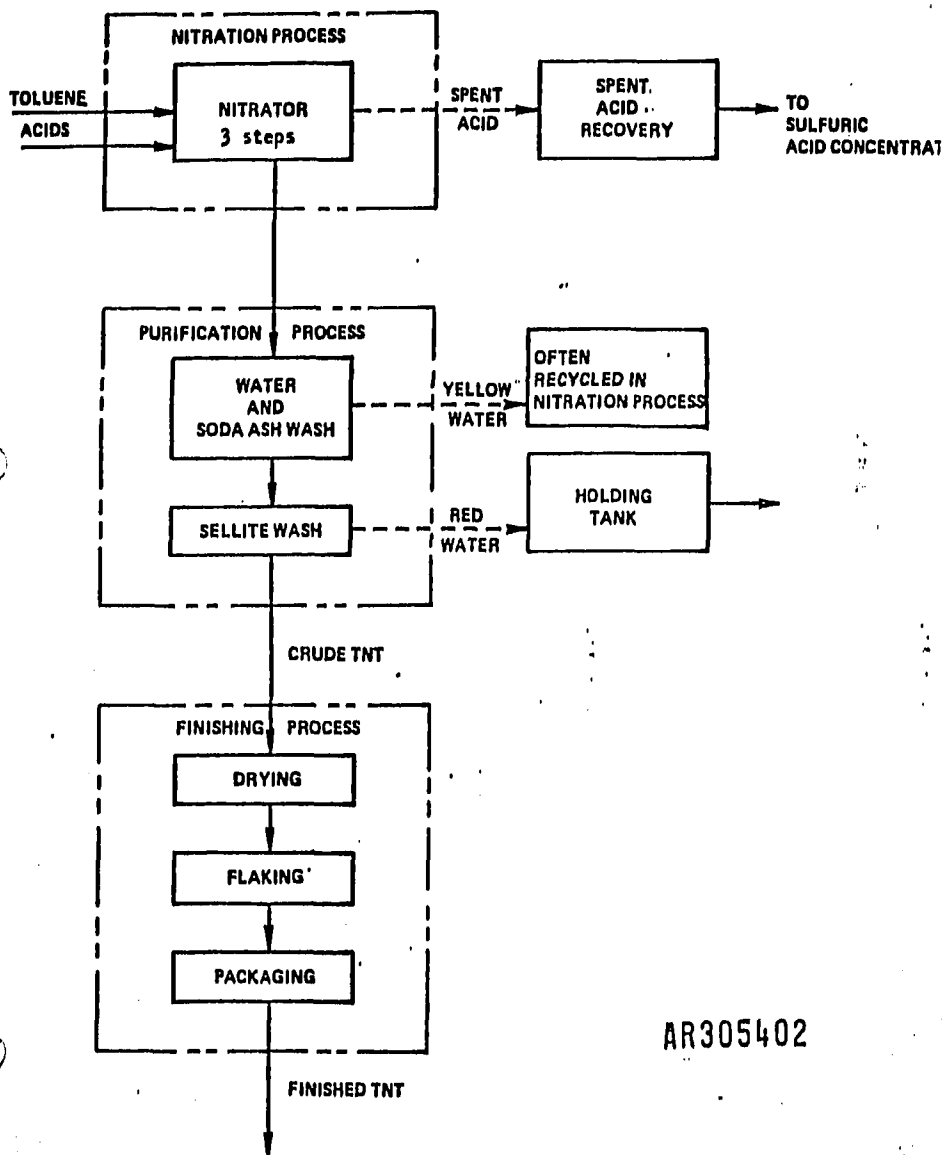
Location	2,4 DNT	2,6 DNT	Sampling Date	Sampling Agency	Laboratory
Water Supply Well-McClintic Office	BDL of 10ppb	BDL of 10ppb	2/24/81	WVA DNR	WVA DNR
Pond 13	25-58 ppb 252.0 ppb 7100 ppb	4.26 ppb 6550.4 ppb 1300 ppb	5/6/81 5/27/81 10/8/81	WVA DNR WVA DNR WVA DNR	WVA DNR WVA DNR WVA DNR
Pond 12	none detected	none detected	10/8/81	WVA DNR	WVA DNR
Pond 17	none detected	none detected	10/8/81	WVA DNR	WVA DNR
McClintic Well #1	2.85 ppb	7.15 ppb	8/24/82	TAT	WVA DNR
McClintic Well #2	91.92 ppb	28.20 ppb	8/24/82	TAT	WVA DNR
McClintic Well #3	490.49 ppb	149.45 ppb	8/24/82	TAT	WVA DNR
McClintic Well #4	18.19 ppb	4.37 ppb	8/24/82	TAT	WVA DNR

BDL - Below Detection Limit

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FIGURE /
Typical Batch TNT PRODUCTION SCHEMATIC



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III. HISTORICAL BACKGROUND

The study area was formerly the West Virginia Ordnance Works (WVOW). This plant was operated for the government by General Chemical Defense Corporation, a subsidiary of Allied Chemical and Dye Corporation, with its function being the production of Trinitrotoluene (TNT). Located approximately five miles North of Point Pleasant, West Virginia, the total facility encompassed over 8000 acres. Construction of the plant was completed in September 1943 and production of TNT continued until August 1945. A plot plan of the facility showing the TNT production area is included in Attachment 2.

There were 12 identical TNT process areas (see Attachment 2), ten were located South of the main road and two were located on the North side. The two areas north of the main road were never utilized. The process of manufacturing TNT at WVOW was a batch process and a typical schematic of this process is shown in Figure 1. A brief description is as follows:

Acids (sulfuric and nitric) and toluene are combined in the nitrator to form raw TNT in three steps going from mono, di- and finally to trinitrotoluene. The TNT thus produced goes through a purification process. In this process, the crude TNT is first subjected to water and soda ash washes which neutralize the excess acid and then to a sellite wash which preferentially removes the isomers of TNT and various oxidation products resulting from the nitration process. The impurities dissolve in the sellite washing operation and produce a wastewater stream commonly called "red water". The refined TNT is then sent to the finishing process (1).

All process wastewater from each of the 10 active TNT areas discharged to a main underground collection line which flowed by gravity to a pump station located just North of the main road. From this station the wastewater was pumped in a Northwesterly direction to a point on the plant where it could continue by gravity to the Red Water Reservoirs.

In 1949 approximately 2500 acres of the plant were deeded to the State of West Virginia for wildlife conservation purposes. Included in this deed was a "hold harmless" clause stating that the State of West Virginia agreed to remove the U.S. from any and all liability arising out of the possible contaminated condition of the deeded property.

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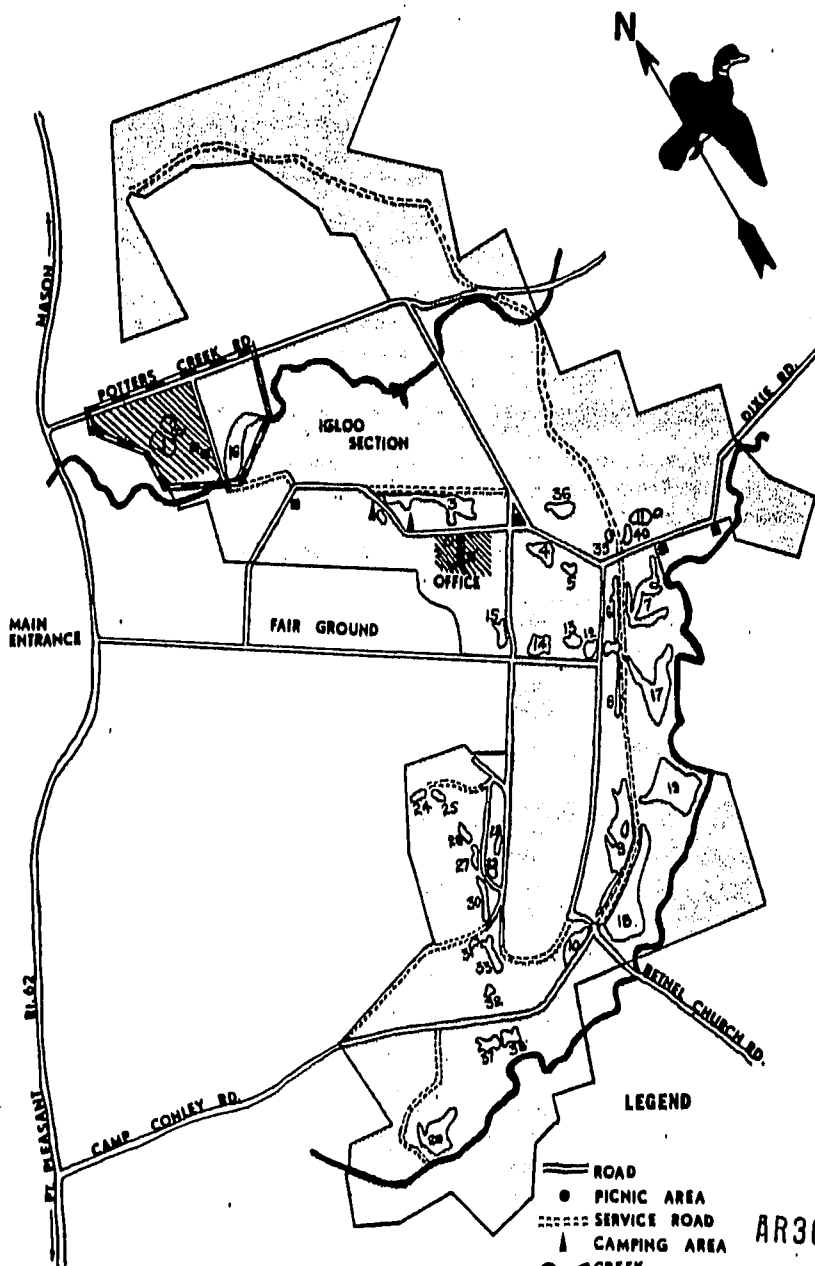
III. HISTORICAL BACKGROUND (cont'd.)

A review of old records pertaining to the facility was made by WV DNR personnel in 1981. This review, a copy of which is included as Attachment 3, contained information regarding inspection of the property from 1946 to 1966. From this data it appears that a complete decontamination of the TNT plant was never performed. The most recent report providing information regarding an overall site inspection was dated November 1956. This memorandum written by a safety engineer for the Army Ordnance Ammunition Command indicated surface contamination with TNT ranging from trace particles to 5 lb pieces. However, inspection of red water drain lines indicated no deposits of TNT.

Today the area deeded for wildlife conservation is referred to as Clifton F. McClintic Wildlife Station (see Figure 2) and is geared primarily towards recreational hunting and fishing. Thirty-six ponds have been constructed at the station and are used to manage waterfowl production and fish populations. A more detailed description of the wildlife station is provided in Attachment 4.

(1) "Development Document for Interim Final Effluent Limitations Guidelines, and Proposed New Source Performance Standards for the Explosives Manufacturing Point Source Category". U.S. Environmental Protection Agency 1976.

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CLIFTON F. McCLINTIC WILDLIFE STATION

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Pt. Pleasant, WV 25550

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FIGURE 2

AR305405

IV. SEARCH FOR ENGINEERING PLANS

DNR personnel were unsuccessful in locating any plans which would show the exact location of process wastewater lines and the main pump station. Since knowing the size and location of the process wastewater lines was necessary to properly perform the extent of contamination study, additional time was spent by TAT in an attempt to locate site plans. Contact with the Huntington Corps of Engineers was unsuccessful as their personnel agreed that they did at one time have the site plans but were presently unsure of their location or if these still existed. Names of two retired Corps of Engineer workers who had familiarity with the WVOW were provided to TAT. Both men were contacted at their Florida residences but also were unable to shed any light on whereabouts of the plans.

The plant was designed by E.B. Badger and Sons Co., Boston, Mass. and it was felt that if the company was still in operation they may have kept copies of the site plans. Attempts to contact the company determined that they have moved to Cambridge, MA. and the name had changed to Badger Corporation. Badger personnel informed TAT that many years earlier the engineering side of the company, along with all records, had been sold to Stone and Webster Co., Boston, Massachusetts. TAT contacted Stone and Webster Co., and was told that all plans and records for the WVOW plant had been destroyed.

TAT next contacted Allied Chemical Co. since they had been contracted to operate the plant. A formal request was made, by TAT (thru EPA), to Allied Chemical Company to have their records searched for information and/or plans regarding wastewater process lines and plant decontamination. This search also proved unsuccessful (see Attachment 5).

In April 1982 TAT placed an article in the Point Pleasant Register, the local newspaper, to try and locate any former workers of the TNT plant who had knowledge of the process wastewater lines. Only one person responded to the article, a plant formeman, Mr. Douglas Roush. Mr. Roush was hired as a consultant and was able to provide a limited amount of data regarding the type of manufacturing process employed and the location of wastewater lines. Mr. Roush had no knowledge of where plans for the facility could be located, however, he contacted a number of former plant employees and contractors (See attachment 6) in hopes of obtaining a set of plans but this search proved unsuccessful.

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V. FIELD INVESTIGATIONS

General

On April 7, 1982 TAT met on scene with the OSC and WV DNR personnel to make a walk thru of the site (both the seep area at Pond 13 and TNT process area) and to discuss the scope of the hydrogeologic and sampling phase of the investigation. Table 2 outlines the agreed upon investigation program.

The week of April 26, 1982 TAT returned to the site along with the OSC and a geologist from Ecology and Environment (the TAT contractor). Reasons for this visit were:

- to finalize the location of the four monitoring wells and four core borings.
- to perform a thorough examination of the TNT process area in hopes of locating the wastewater line(s).
- to conduct a pre-bidders conference for potential contractors for the hydrogeological phase of the fieldwork.

TABLE 2

Hydrogeologic and Sampling Program

- 4-2" PVC monitoring wells, adjacent to Pond 13
- 4 - Core borings, active TNT Process Area
- 4 - Sediment samples, Pond 13
- 2 - Sediment samples, Red Water Reservoir, Ponds 1 and 2
- 6 - Soil Samples, two burn area locations
- 4 - Soil Samples, two manholes, in the active TNT Process Area

V. FIELD INVESTIGATION (cont'd.)

All three of the trip's objectives were successful. Most important was the discovery of manholes running in a straight line through the TNT process area and assumed to be part of the wastewater system. A 12-inch clay pipe was found in the manholes extending from the TNT process area to a large junction manhole, approximately 15 feet from Pond 13. Manholes were also found identifying the sewer lines from the two unused TNT process areas with the junction manhole.

Additionally, two-manholes were found in the yard of the residence located 100 yards from the Red Water Reservoirs and in the Point Pleasant Landfill located approximately 1000 feet from the reservoirs. No other manholes between Pond 13 and the landfill were located at this time.

Discussions with the landfill operator revealed that in 1981 while digging in the landfill approximately 70 feet of 12 inch clay pipe was uncovered and ripped out of the ground. The pipe was noted as being clean inside and contained a clear liquid assumed to be water.

Coring and Sampling Program: Bids on the drilling phase of the contract were submitted the following week and the contract was awarded to Esmer and Associates, Inc., Boomer, West Virginia.

Both the drilling and sampling program took place during the week of June 7, 1982. The only change to the program shown in Table 2 was to eliminate one core boring from the TNT Process Area and move it to a cornfield located between Pond 13 and the landfill. During the first week of June TAT had located three manholes in this field and it was discussed with and agreed upon by the OSC that a boring near one of these manholes would be desirable.

Well drilling and core borings occurred on June 7, 8 and 9, 1982. Figure 3 is a site sketch showing the locations of sediment samples taken and the four wells drilled in relation to Pond 13. Sediment samples were obtained from Pond 13 on June 7, 1982 and from the Red Water Reservoirs on June 10, 1982. Hand augered soil samples were taken from the Burn Area on June 9, 1982 and from the TNT process area manholes on June 10, 1982. A copy of the drill log for the wells and core borings is provided in Attachment 7.

Sample Analysis Results: To minimize costs for the study, analysis of all samples taken was performed by the State of WV DNR laboratory at no charge to EPA. Analysis was performed for 2,4- and 2,6 - DNT. Capabilities were not available for TNT analysis, however, it was felt that since the primary constituent of the red water seep was DNT, then the DNT data would provide a good indicator as to extent of contamination. Results of the analysis of all soil and sediment samples taken are shown in Table 3.

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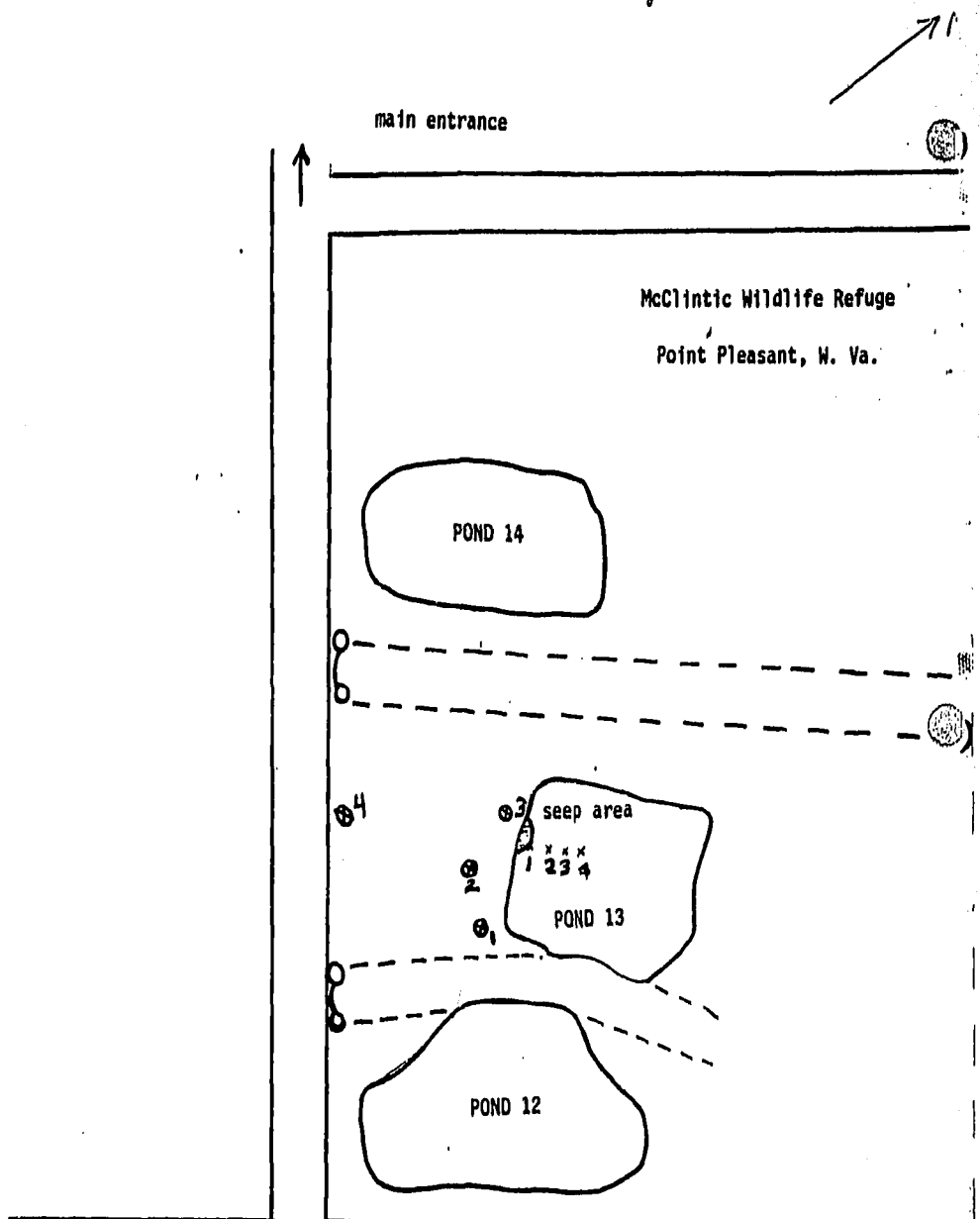


Figure 3 - Location of monitoring wells and sediment samples

Approximate Scale - 1" = 50'

LEGEND

-  cable gate
-  sediment samples
-  wells
-  main roads
-  service roads

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TABLE 3

Laboratory Report On Soil Sample Analysis
Guchrie Center Lab - Reported 7/19/82

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All results in nanogram/grams (ppb)

Laboratory Number	Location of Sample Point Soil	2,6-Dinitro-toluene	2,4-Dinitro-toluene
GCL-35-82	TB-1,0'-1.5'	.007	.125
GCL-36-82	TB-1,5'-6.5'	.11	2.27
GCL-37-82	TB-1,10'-11.5'	.095	1.19
GCL-38-82	Pond 13, Sample #1 8.4' from seep bottom sediment	.22	5.54
GCL-39-82	Pond #13, Sample #2 17'6" off shore	1.63	3.62
GCL-40-82	Pond #13, Sample #3 39' from seep	none detected	1.68
GCL-41-82	Pond #13, Sample #4 from seep 46'	.13	1.30
GCL-42-82	TB-2, 0"-6"	none detected	.017
GCL-43-82	TB-2, 5'-6.5'	.23	2.53
GCL-44-82	TB-2, 10"-11.5'	.005	.63
GCL-45-82	TB-3, 0'-1.5'	.17	2.41
GCL-46-82	TB-3, 5'-6.5'	.38	5.52
GCL-47-82	TB-3, 10'-11.5'	.36	5.08
GCL-48-82	TB-5, 0'-1.5'	none detected	.018
GCL-49-82	TB-5, 5'-6.5'	none detected	.014
GCL-50-82	TB-5, 10'-11.5'	none detected	.012
GCL-51-82	TB-5, 15'-16.5'	none detected	.012
GCL-52-82	TB-5, 20'-21.5'	.001	.019
GCL-53-82	TB-5, 25'-26.5'	.12	.27
GCL-54-82	TB-5, 30'-31.5'	.034	.32

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Table 3
Laboratory Report
Guthrie Center Lab
Reported 7/19/82

Page 2

All results in nanogram/grams (ppb)

Laboratory Number	Location of Sample Point Soil	2,6-Dinitro-toluene	2,4-Dinitro-toluene
GCL-55-82	TB-8, 0'-1.5'	none detected	.014
GCL-56-82	TB-8, 5'-6'	none detected	.012
GCL-57-82	TB-8, 10'-11.5'	none detected	.015
GCL-58-82	TB-8, 15'-16'	.012	.039
GCL-59-82	TB-8, 20'-21'	none detected	.018
GCL-60-82	TB-8, 24'-25'	.061	.02
GCL-61-82	TB-6, 0'-1'	.013	.31
GCL-62-82	TB-6, 2'	none detected	.24
GCL-63-82	TB-6, 5'-6.5'	.003	.13
GCL-64-82	TB-6, 10'-11.5'	.008	.16
GCL-65-82	TB-6, 15'-16.5'	.006	1.54
GCL-66-82	TB-6, 20'-21.5'	.021	.21
GCL-67-82	TB-6, 25' -26.5'	.016	.077
GCL-68-82	TB-4, 0'-1.5'	.047	.20
GCL-69-82	TB-4, 5'-6.5'	.006	.065
GCL-70-82	TB-4, 10'-11.5'	.045	1.50
GCL-71-82	TB-4, 15'-16.5'	.047	.41
GCL-72-82	TB-4, 20'-21.5'	.039	.22
GCL-73-82	TB-7, 0'-1.5'	.073	.76
GCL-74-82	TB-7, 5'-6.5'	.079	.62
GCL-75-82	TB-7, 10'-11.5'	.17	2.57
GCL-76-82	TB-7, 15'-16.5'	.16	1.63

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Table 3
Laboratory Report
Guthrie Center Lab
Reported 7/19/82

Page 3

All results in nanogram/grams (ppb)

Laboratory Number	Location of Sample Soil and Water	2,6-Dinitro-toluene	2,4-Dinitro-toluene
GCL-77-82	Auger hole BA-1, 0"-12" soil	32.2	30.2
GCL-78-82	Auger hole BA-1, 18"-24"	20.8	15.0
GCL-79-82	Auger hole BA-1, 30"-36"	3.05	10.3
GCL-80-82	Auger hole BA-2, 0"-12"	95	314
GCL-81-82	Auger hole BA-2, 18"-24"	16.4	93
GCL-82-82	Auger hole BA-2, 31"-36"	70	249
GCL-85-82	Manhole #6, 11:09	367	1247
GCL-86-82	Manhole #6, 11:04	1342	4581
GCL-87-82	Manhole #7, 10:38	2.81	16.1
GCL-88-82	Manhole #7, 10:47	1.51	11.2

Water Sample Results

All results in nanogram/grams (ppb)

Laboratory Number	Location of Sample Soil Point	2,6-Dinitro-toluene	2,4-Dinitro-toluene
GCL-83-82	Red Water Reservoir #1	.46	10.9
GCL-84-82	Red Water Reservoir #2	5.4	20.4

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IV. FIELD INVESTIGATION (cont'd.)

Site Mapping: As part of this study it was requested that a map be made showing the layout of the process wastewater line from the TNT area to the Red Water Reservoirs. The cost to survey in all the manholes uncovered to date would be very high due to the fact they stretched out over about two miles of wooded terrain. To reduce this cost TAT developed the scheme to mark each manhole site with a large white X and have an aerial photograph made of the entire area. This approach was approved by the OSC and EPA EPIC group provided the aerial photography. These aerial photographs were taken on June 8, 1982 and an overlay to the map provided in Attachment 2 was made by EPIC personnel showing the location of each white X. From this data TAT created a new map using Attachment 2 as a base. This map, Figure 4, shows pond 13, the main roads, the TNT process area, process wastewater line, pump station, Red Water Reservoirs, location of core borings 5 to 8, and the Burn Area.

Test Well Water Sampling & Results: Well samples were scheduled to be taken by WV DNR personnel during the week of June 14, 1982. Unfortunately due to a misunderstanding by DNR, the wells were not sampled. This fact did not come to light until mid-August and at this time a joint-sampling program between TAT and DNR was arranged for the last week of August. Samples were taken from the wells at this time and analyzed by the DNR laboratory. Results of the analysis are shown in Table 4.

Physical Inspection of Sewers: The original scope of work called for excavation of contaminated sewer pipelines for sampling. During inspection of pipes leading into manholes no material was discovered and it was decided there was no need to excavate the entire pipeline. During sediment sampling of pond 13, a cement pad approximately 45 feet by 20 feet was discovered submerged in the pond. This could possibly be the waste water pump station building number 412T (Attachment 2) in the TNT Process Area.

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TABLE 4

Guthrie Center Laboratory
Sample Report Sheet

Date: 9-16-82

Laboratory Number	Water Sample Collection Site	Compound or Target	Concentration µgms/liter
GCL-160-82	Sample Block	None found	
GCL-161-82	McClinton Wildlife Refuge Well # 3	2,4-DNT	440.49
		2,6-DNT	149.45
GCL-162-82	McClinton Wildlife Refuge Well # 2	2,4-DNT	91.92
		2,6-DNT	28.20
GCL-163-82	McClinton Wildlife Refuge Well # 1	2,4-DNT	2.85
		2,6-DNT	7.15
GCL-167-82	McClinton Wildlife Refuge Well # 4	2,4-DNT	13.19
		2,6-DNT	4.37

Laboratory Chief's Signature: Richard P. Armentrout
 Date Reported: 9-20-82

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 SEP 22 1982

Division of Water Resources
 Hazardous Waste
 Ground Water Branch

VI. SAMPLING RESULTS

On February 24, 1982 the West Virginia DNR sampled the McClintic Wildlife Station Water Supply well for priority pollutants. All levels were below the detectable limits (Attachment 8). This well is 175 feet deep and is the source of potable water for the entire Wildlife Refuge including the campground water supply.

Fish were taken from Ponds 1, 12, 13 and 30 (See figure 2) during August 1981. Fish flesh analysis was performed and results are presented in Table 5. It should be noted that all levels of DNT found were below detectable limits.

In December 1982 EPA/ERT personnel were on scene to take soil, sediment, and water samples from the seep area and surrounding ponds. Results of this sampling program are shown in Table 6. Analysis was for DNT and TNT and except for the seep area results were below detectable limits.

On June 7, 8 and 9, 1982, four wells were installed around the seep area near pond 13 (figure 3). Highest concentrations of 2,4, DNT showed up in the 5.0 feet to 6.5 feet depth soil samples in wells #1, #2, and #3. In well #4, 2,4 DNT levels were highest in the 10 feet to 11.5 feet soil sample. These depths seem to correlate with the water table in the area, however levels of DNT were detected throughout the soil column.

Concentrations of DNT in the sediments from pond 13 decrease away from the seep area (Table 3). See Figure 3 for the location of these samples.

Water samples taken on August 24, 1982 by the TAT, show highest concentration in Well #3 which is within 5 feet of the seep area.

Well #2 has the next highest concentrations followed by #1 and #4. Well #4 is furthest from the seep area but is close to the sewerline which leads into the old wastewater pump station.

AR305415

Guthrie Center Laboratory 7-27-81

Fish Sample Analysis - Sunfish

MCL-46-81 - Pond #1 - Fish Tissue
2,6-DinitroToluene - None Detected
2,4-DinitroToluene - 0.178 Ng/gram.

MCL-47-81 - Pond #30 - Fish Tissue
2,6-DinitroToluene - None Detected
2,4-DinitroToluene - 0.214 Ng/gram.

MCL-48-81 - Pond #12 - Fish Tissue
2,6-DinitroToluene - None Detected
2,4-DinitroToluene - 0.272 Ng/gram.

MCL-49-81 - Pond #13 - Fish Tissue
2,6-DinitroToluene - 0.089 Ng/gram.
2,4-DinitroToluene - 0.578 Ng/gram.

Note: ALL of the levels reported above
are below accurate quantifiable levels.

AR305416

Richard F. Armentrout 7-27-81

TABLE 6

ATTACHEMENT 1: Concentration of TNT and DNT in Water and Sediment Samples from McClintic Wildlife Station

SAMPLE No	DESCRIPTION	mg/l or mg/kg - (ppm)				
		TOTAL DNT PRIMARYLY 2,4 & 2,6	TOTAL TNT	BIS (2 Ethylhexyl) Phthalate	Diethyl Phthalate	Di-N-Butyl Phthalate
61862	DNR Surface Water Sample at Seep Taken 5/27/81	5.67	0.166			
61861	EPA/ERT Soil Sample at Seep Outside Fence Pond 13 - 12/2/81	1.03	14.0			
61860	Soil Sample at Center of Seep Inside Fenced Area	.782-17.9	.304- 28.2	0.6	0.33	0.37
61859- 61853	Reconstituted Sample from Pond 17 and Seep Water Sample * Also Isophorone @ .064 mg/l	0.556	0.038	0.034	0.198	
61858	Sediment Center Pond 13	< 1.0	< 1.0			
61857	Surface Water Center Pond 13	< 0.025	< 0.025			
61856	Sediment Sample Pond 12 Near Drainage Culbert From Pond 13	< 1.0	< 1.0			
61855	Surface Water Center Pond 12	< 0.025	< 0.025			
61854	Sediment Sample Center Pond 17	< 1.0	< 1.0			
61852	Sediment Sample Pond 15	< 1.0	< 1.0			
61851	Surface Water Sample	< 0.025	< 0.025			

* Assume Pond 17 water clean and 2x dilution factor for concentration levels.

AR305417

ORIGINAL
(100)

VII. TOXICITY DATA FOR DINITROTOLUENE

Segments of this section are borrowed from a US EPA Document, "Ambient Water Quality Criteria for Dinitrotoluene", October 1980.

General

Dinitrotoluene (DNT) is an ingredient of explosives for commercial and military use because of its waterproofing action and explosive potential. DNT is produced by nitration of toluene to nitrotoluene to dinitrotoluene in a nitric and sulfuric acid solution. There are six isomers of dinitrotoluene, with the 2,4-isomer being the most important. Table 7 lists some physiochemical constants for 2,4,-dinitrotoluene.

Except for their tendency to decompose at elevated temperatures, dinitrotoluenes are relatively stable. Dinitrotoluenes may burn safely if unconfined, but if confined may result in an explosion. Decomposition may occur at lower temperatures in the presence of impurities.

Aquatic Organisms

Forty-eight hour EC50 values for Daphnia magna for 2,4-dinitrotoluene is 35,000 ug/l. The 96-hour LC50 for the fathead minnow and 2,4-dinitrotoluene is 31,000 ug/l. Once (1) report indicated a limiting concentration for DNT, regarding toxicity to fish, of 10 mg/l.

Human Health

Dinitrotoluene affects the ability of blood to carry oxygen normally. At present, no standard for exposure to 2,4-DNT in drinking or ambient water has been set in the United States. However, a Russian study (Korolev, et al. 1977) recommends that a maximum permissible concentration in the surface waters should be set at a level of 0.5 mg/l for each DNT isomer.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value-time weighted average (TLV-TWA) concentration of 1.5 mg of 2,4-DNT per cubic meter of air (1.5 mg/m³) including dermal exposure for a normal eight-hour work-day of a 40-hour workweek (ACGIH, 1978). A threshold limit value short-term exposure level (TLV-STEL) of 5 mg of 2,4-DNT/m³ of air was also set by the ACGIH (1978). 100305418

(1) Industrie - Abwasser, 6, Heft 3, 176 (1952)

TABLE 7
Some Physiochemical Constants
of 2,4-Dinitrotoluene*

Property	Value
Molecular weight	182.14
Melting point	69.5 - 70.5°C
Boiling point	300°C (dec.)
Density d ₁₅ ⁴	1.521
d ₇₁ ⁴	1.321
Vapor density (air=1)	6.27
Vapor pressure at 25±2°C	1.4 X 10 ⁻⁴ torr
Refractive index (n _D)	1.442
Solubility, grams/liter	
Water, at 22°C	0.27
Ethanol, at 15°C	30.46
Diethyl ether, at 22°C	94
Carbon disulfide, at 17°C	21.9
Heat of fusion (H _f)	26.4 cal/gram
Log octanol/water partition coefficient (Calc. by method of Tute, 1971)	2.01

*Source: Kirk and Othmer, 1967; St. John, et al. 1975;
Weast, 1978

AR305419

ORIGINAL
(7-8)VII. TOXICITY DATA FOR DINITROTOLUENE (cont'd)

2,4-DNT is suspected of being a human carcinogen. Because there is no recognized safe concentration for a human carcinogen, the recommended concentration of 2,4-DNT in water for maximum protection of human health is zero. Because attaining a zero concentration level may be infeasible in some cases, the concentrations of 2,4-DNT corresponding to several incremental lifetime cancer risk levels have been estimated by EPA. A cancer risk level provides an estimate of the additional incidence of cancer that may be expected in an exposed population. A risk of 10^{-5} for example, indicates a probability of one additional case of cancer for every 100,000 people exposed, a risk of 10^{-6} indicates one additional case of cancer for every million people exposed, and so forth.

In the Federal Register notice of availability of draft ambient water quality criteria, EPA stated that it is considering setting criteria at an interim target risk level of 10^{-5} , 10^{-6} , or 10^{-7} as shown in the following table:

<u>Exposure Assumptions</u> (per day)	<u>Risk Levels and Corresponding Criteria</u>		
	10^{-7}	10^{-6}	10^{-5}
2 liters of drinking water and consumption of 6.5 grams fish and shellfish.	0.011 ug/l	0.11 ug/l	1.1 ug/l*
Consumption of fish	0.91 ug/l	9.1 ug/l	91 ug/l

Concentration levels were derived assuming a lifetime exposure to various amounts of 2,4-DNT, (1) occurring from the consumption of both drinking water and aquatic life grown in waters containing the corresponding 2,4-DNT concentrations and, (2) occurring solely from consumption of aquatic life grown in the waters containing the corresponding 2,4-DNT concentrations.

*This level is one five-hundredth the level of 0.5 mg/l for surface water recommended in the USSR.

AR305420

VIII. CONCLUSIONS

The exact cause/source of the seep is yet unknown; however, several possibilities exist. On Plot Plan Attachment 2 there are 2 large circles near the waste water pump station, which probably served as collection basins. Behind the seep area on Pond 13 there is a small structure in the ground. From this a cement channel leads towards a depression. It is surmised that the 2 circles on Attachment 2 were these collection basins and if water was allowed to stand in these, it would eventually seep into the ground and slowly contaminate the groundwater.

Another possibility could be the disposal of any sludges that settled out of this water, before pumping. Either the basins were unlined and the sludge collected on the bottom and were later covered over, or the basins were dredged and the sludges dumped and buried in the immediate area.

Groundwater contamination appears to be localized around the seep area with the highest concentrations of DNT in well TB-3 (Figure 5). Concentrations of 2,4 DNT decrease rapidly away from the seep area; however, levels in all wells are above the 1.1ppb risk level for human consumption, but below the risk level of 91ppb for fish mentioned in Section VI.

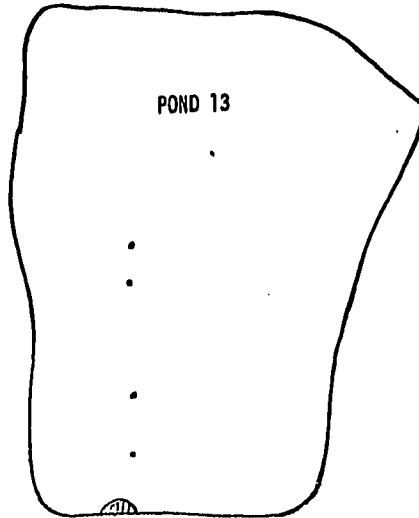
Pond sediment and surface soil samples taken around Pond 13 are in the ppb range, however pond sediments were the highest of these, decreasing in concentration with distance from the seep area (figure 6).

Soil samples from the 5' depth near the groundwater table, showed levels of DNT more closely related to those in the pond sediments (figure 7).

The wastewater treatment lines present a physical hazard to hunters; however, no contamination was evident in the pipeline upon examination from the manholes.

AR305421

ORIGINAL
(2-8)



TB-3
490.49

TB-2
91.92

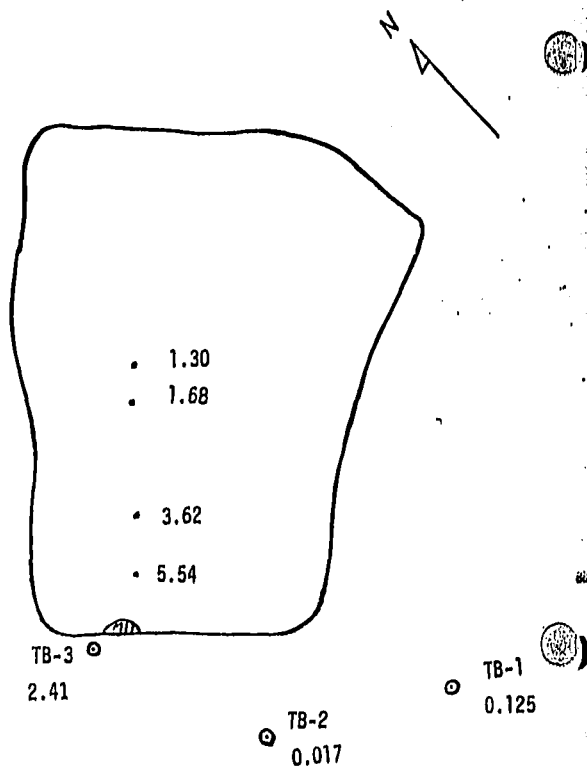
TB-1
2.85

TB-4
18.19

1" = 25'
pond sediment
well

AR305422

Figure 5: Concentrations of 2,4 DNT
in groundwater wells.



1" = 25'

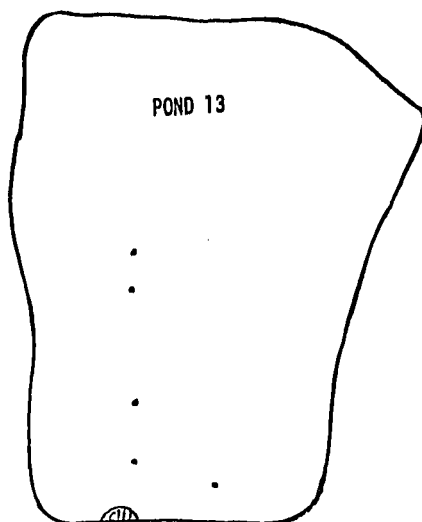
TB-4
0.20

pond sediment
well

AR305423

Figure 6: Concentrations 2,4 DNT in pond sediments and surface

ORIGINAL
(204)



POND 13

TB-3
5.52



TB-2
2.53



TB-1
2.27



1" = 25'

TB-4
0.065



• pond sediment
PR 05424

Figure 7: Concentrations of 2,4 DNT
in soil samples from wells at

IX. RECOMMENDATIONS

Several recommendations can be made as a result of this extent of contamination study.

- * The ban on using Pond 13 should continue and periodic sampling should continue in Pond 13 and Pond 12 to determine if there is any migration of the contaminant.
- * Although no contaminants were visible in the open manholes, they do present a physical hazard to hunters and hikers. These should be filled in with soil or concrete to prevent any accident.
- * The wells surrounding the seep area were sampled in August, when the water levels were low and recharge was very slow. These wells should be sampled in April or May when the water levels are higher.
- * In order to more closely define the area of contamination, more wells/borings should be installed. To test the hypothesis of overflow areas, additional bores/wells should be placed to the north-west of the wet well structure near Pond 13.
- * A drum of drill cuttings from the well installation project is stored behind the park office garage. This drum could be disposed of on the local landfill or used as fill material in a manhole upon approval from DNR.
- * Drinking water supply in the area should be monitored periodically for Dinitrotoluene.

AR305425

ORIGINAL
(174)

X. PHOTOGRAPHIC DOCUMENTAION

AR305426

ATTACHMENT 1
Bioassay Results

AR305427



1. Seep Area Pond 13



2. Building foundation, TNT Process Area

AR305428



3. Manhole, Process Wastewater Line



AR305429

4. Manhole no. 7



5. Burn Area



AR305430

6. Drilling with portable auger



7. Truck mounted drill rig, Well No. 4



8. Decontaminating auger between holes

05431



9. Preparing to sample at Burn Area

AR305432

ATTACHMENT 1
Bioassay Results

AR305433

Summary Results

West Virginia Department of Natural Resources

Permit Number: . Biologist: C.M. Murphy

Time Sample Collected: _____ Type Sample: Grab _____

Source Of Dilution Water: Filtered Tapwater

Test Species: *Daphnia pulex* Temp. Range: 23 degrees C.

Number of Individuals Per Concentration: 20

Number of Individuals Per Test Container: 10

eachate when examined one hour after the test was started. I do not

have an explanation for the unusual recovery. Results indicate adverse affects were not the result of low Dissolved Oxygen.

[Faint handwritten notes at the bottom of the page]

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ENVIRONMENTAL PROTECTION AGENCY
WHEELING

Primary References For Bioassay Methods:

Methods For Measuring The Acute Toxicity of Effluents to Aquatic

isms EPA 600/4-78-012

Standard Methods For Examination of Water and Wastewater, 14th. Edition

TM Annual Book of Standards Part 31

Assay For Toxic and Hazardous Materials Training Manual EPA 430/1-79-00

AR305434

Agent Vol	5.6	5.6R	10	10R	16	16R	32	32R	56	56R	100	100R	C
Unts.	7.4		7.4		7.6		7.6		7.8		8.2		7.2
s mg/l	7.1		7.0		7.0		6.9		6.9		6.8		7.2
C	23.0		23.0		23.0		23.0		23.0		23.0		23
mohs													

24 hrs. 1430 May 8

24 hrs.

ected	0	0	0	0	0	0	0	0	0	0	3	4	0
ected											30	40	
Units	7.4		7.4		7.6		7.2		6.8		6.4		7.4
	7.2		7.2		7.1		7.1		7.0		7.0		7.2
	23.0		23.0		23.0		23.0		23.0		23.0		23

48 hrs.

48 hrs.

ected													
ected													
Units													

72 hrs.

72 hrs.

ected													
ected													
Units													

96 hrs.

96 hrs.

ected													
ected													
Units													

AR305435

Agent Vol	10	10R	1S	1SR	32	32R	56	56R	106	106R	250
	7.8		7.8		7.6		7.6		7.4		8.6
Units.	6.8		6.7		6.6		6.5		6.3		6.0
S mg/l											
C	25.0		25.0		25.0		25.0		25.0		25.0
phs											

24 hrs. May 28

24 hrs.

	0	0	0	0	4	4	7	7	10	10	0
ected											
ected											
Units	7.6		7.6		7.2		6.4		5.8		7.6
C	7.3		7.2		7.1		7.1		7.0		7.4
	25.0		25.0		25.0		25.0		25.0		25.0

48 hrs.

48 hrs.

ected											
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Units											
C											

72 hrs.

72 hrs.

ected											
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Units											
C											

96 hrs.

96 hrs.

ected											
ected											
Units											
C											

AP 305437



LOG OF BORING

Job No. 82049

Client Ecology & Environment

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 2

Date 6/9/82

Boring No. TB-4

GROUNDWATER OBSERVATIONS	CASING HS	SAMPLER SS	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	Size I.D. <u>3 1/4"</u>	<u>1 3/8"</u>	Boring begun <u>6/9/82</u>
At _____ after _____ hours	Hammer Wt. _____	<u>140#</u>	_____	Boring completed <u>6/9/82</u>
	Hammer Fall _____	<u>30"</u>	_____	Engineer <u>Esmer</u>

Location of Bering

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
					0.0					0		
	6	6	11		1.5	SS	S-1	18"	18"	1		Brown & Gray Silty Clay
										2		
										3		
										4		
					5.0					5		
	4	7	13		6.5	SS	S-2	18"	18"	6		Brown & Gray Silty Sandy Clay
										7		
										8		
										9		
					10.0					10		
	3	6	8		11.5	SS	S-3	18"	18"	11		Brown & Reddish Sandy Clay, Damp
										12		
										13		Reddish Brown Sand
										14		
					15.0					15		
	14	13	11		16.5	SS	S-4	18"	18"	16		Wet @ 15' Brown Sand
										17		
										18		
										19		
										20		

Esmer & associates, inc. consulting engineers

LOG OF BORING

Job No. 82049

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 2 of 2

Date 6/9/82

Boring No. TB-4

GROUNDWATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.	Ground Elevation _____ Boring begun <u>6/9/82</u> Boring completed <u>6/9/82</u> Engineer <u>Esmer</u>
At _____ after _____ hours	Type	HS	SS		
At _____ after _____ hours	Size I.D.	<u>3 1/4"</u>	<u>1 3/8"</u>		
	Hammer Wt.		<u>140#</u>		
	Hammer Fall		<u>30"</u>		

Location of Boring _____

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
		4	7	8	20.0 21.5	SS	S-5	18"		20		Brown Sand & Gravel to Fine Brown Sand
										21		
										2		
										3		
										4		Boring Terminated @ 21.5'
										5		Installed 5' of Well Screen, 15' of Well Casing in Hole 4' Extended Above Ground Surface. Installed Protective Cover
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

AR305439

Analysis Request and Result Form

Analysis Request and Result Form

Water ☒ Sedmt. ☐ Infltr. ☐ Eff. ☐
 Sample No. Sampler M. C. G. G. G. Witness
 Water Temp. Cond. D. O. Flow

CHAIN OF CUSTODY

Date 02-02 Time 15:25 From (Name) M. C... To (Name) C. M. ...

Station No: SC, _____, ☐ Depth: D _____, (Date-Time as YYYYMMDDTTTT)
 Date-Time 51-05-07 1720, ☐ Comp. (2) _____, _____

ANALYSIS	RESULT	✓	ANALYSIS	RESULT	✓	ANALYSIS	RESULT
(Water) C			P1073, FEC, Sirep./100			P029, Tot. Na, mg/l	
			P500, Total, mg/l	S		P1105, Tot. Al, ug/l	
mbos/m			P70300, Dissol, mg/l	O L		P1097, Tot. Sb, ug/l	
SI			P530, Suspend, mg/l	I D		P1602, Tot. As, ug/l	
AT.			P505, Vol., mg/l	S		P1007, Tot. Ba, ug/l	
			P38760, HGA5, mg/l			P1027, Tot. Cd, ug/l	
cm			P32730, Phenols, ug/l			P1034, Tot. Cr, ug/l	
(H)			P720, Cyanide, mg/l			P1042, Tot. Cu, ug/l	
mg/l			P1032, Hex. Cr, ug/l			P1045, Tot. Fe, ug/l	
Mineral)			P550, Oil-Grease, mg/l			P1051, Tot. Pb, ug/l	
mg/l							
ty, mg/l			P950, Fluoride, mg/l			P1055, Tot. Mn, ug/l	
as Ca/l			P665, Total, mg/l	P		P71900, Tot. Hg, ug/l	
mg/l			P666, Dis., mg/l	H O		P1067, Tot. Ni, ug/l	
T.CO U.			P660, Ortho, PO4, mg/l	S		P1147, Tot. Se, ug/l	
ty, JCU			P625, TKN, mg/l			P1077, Tot. Ag, ug/l	
te, mg/l			P610, NH4-N, mg/l			P1087, Tot. V, ug/l	
mg/l			P605, ORG. N, mg/l			P1092, Tot. Zn, ug/l	
mg/l			P620, NO3-N, mg/l				
mg/l			P615, NO2-N, mg/l				
mg/l			P916, Tot. Ca, mg/l				
mg/100			P927, Tot. Mg, mg/l				
mg/100			P937, Tot. K, mg/l				

 Lieutenant/Chief Signature

AR305440

Analyst should note the analysis requested by placing the appropriate code for preservative used in the checked column:

re - determine on site

like

or ised

4. H₂SO₄/Water

5. 5 ml HNO₃/liter, iced

6. NaOH to pH > 12, i.e.

7. 1.0 gm. CuSO_4 plus 2 ml H_3PO_4 per liter, iced

8. Other (specify):

Bioassay Results

Water Resources Division
West Virginia Department of Natural Resources

Company: McClintic Wildlife Area Date: May 27-28, 81

Permit Number: _____ Biologist: C.H. Murphy

Material Being Tested: Leachate to Pond Starting Hour: _____

Time Sample Collected: _____ Type Sample: Grab

Source Of Tested Material: _____

Source Of Dilution Water: Filtered Tapwater

Dilution Water- Total Hardness _____ mg./l. Total Alkalinity _____

Test Species: Daphnia pulex
Pimephales promelas Temp. Range: 25 degrees C.

Number of Individuals Per Concentration: 20

Number of Individuals Per Test Container: 10

All fish were killed in 24 hours at all dilutions. The LC50 must be less than 10%. This would indicate extreme toxicity for these organisms.

The 24 hour EC50 for Daphnia is 41. This indicates moderate toxicity.

The differences in test results may be due to different methods of absorption into the organisms or different methods of action when affecting these two different organisms.

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ENVIRONMENTAL PROTECTION
AR305441

Primary References For Bioassay Methods:

Methods For Measuring The Acute Toxicity of Effluents to Aquatic Organisms EPA 600/4-79-012

Standard Methods For Examination of Water and Wastewater, 14th. Edition
APHA Annual Book of Standards Part 31

Bioassay For Toxic and Hazardous Materials Training Manual EPA 430/1-

10 9 8 7 6 5 4 3 2 1 0 10 9 8 7 6 5 4 3 2 1 0

10 9 8 7 6 5 4 3 2 1 0

10 9 8 7 6 5 4 3 2 1 0

10 9 8 7 6 5 4 3 2 1 0

10 9 8 7 6 5 4 3 2 1 0

10 9 8 7 6 5 4 3 2 1 0

ATTACHMENT 2
Plot Plan (Blue Print)

AR305443

ATTACHMENT 3

W.Va DNR Review of Available Files

AR305444

PRELIMINARY INVESTIGATION
OF
WEST VIRGINIA ORDNANCE WORKS
AT
POINT PLEASANT, WEST VIRGINIA

Prepared by:

Neilima Senjalia, Chemist
Marie Cinquegranna, Co-op Engineer
Ground Water/Hazardous Waste Section
Division of Water Resources

April, 1981

AR305445

CONTENTS

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2. Summary	5
3. Conclusions and Recommendations	5
4. Appendix	
Reference Numbers 1 - 21	

Note: Numbers in the text refer to references in the appendix of the report.

AR305446

The West Virginia Ordnance Works (WVOW) was located approximately six miles north of Point Pleasant on State Highway No. 62. The plant consisted of 8,294 acres of land, part of which borders on the Ohio River. The plant was used for the manufacturing of TNT with 93% of the by-product being sulfuric acid. The plant was operated for the government by the General Chemical Defense Corporation, which was a subsidiary of Allied Chemical and Dye Corporation.

The plant started construction in March of 1942 and was completed in September of 1943. Production of TNT and sulfuric acid started in October of 1942 and stopped in August of 1945.

In January of 1946 an inspection team visited WVOW to classify the land for disposal under the Surplus Property Act of 1944.¹ Six hundred sixty acres were classified for industrial use, seven thousand six hundred acres for farm, fourteen acres for on-site housing, and twenty acres for the West Virginia National Guard.

In May of 1946 the Harris Board Report² was released stating where contamination was and what steps should be taken to decontaminate the equipment and land. In this report it was recommended that all equipment be dismantled and flashed before being sold. Also, it was recommended that the ten TNT lines be dug up and removed and that the red and yellow water reservoir be unplugged, drained and flashed. It further stated that contaminated soil should be dug up and taken to the burning grounds to be burned. In this report the board stated that 100% decontamination was almost impossible, but with proper care in carrying out decontamination, no significant hazard would remain.

By September of 1946 "stand-by" (clean up) decontamination was complete and further decontamination was in the process. Also this month, 72 Partial Decontamination Certificates³ were issued.

In April of 1947 contamination was found in tracts of land which were issued Decontamination Certificates.⁴ Also in April of 1947, more contamination was found that was not covered in the Harris Board Report.⁵ These areas included Waste Water Lines to the Red and Yellow Water Reservoirs, the Burning Ground Area, and the Old Yellow Water Reservoir. The waste water line to the Red Water Reservoir was broken and during heavy rain the main line overflowed covering the ground with sludge. This sludge was tested and found to be highly flammable. In the burning ground area it was estimated that approximately 500 truck loads of contaminated material were dumped. Also, dead vegetation and rabbits were found in this area. Areas near patrol roads that the

public might use were also found to be contaminated. At that time it was felt that decontamination of these areas for unrestricted agricultural use would cost more than the value of the land. The same situation existed with regard to the first ten TNT lines. So, it was proposed to permanently fence in the TNT area, burning grounds, and the Old Yellow Water Reservoir area.

In May of 1947 a survey was made by the Protection and Maintenance Contractor to arrive at an estimate of cost to decontaminate areas not mentioned in the Harris Board Report.⁶ They stated that complete decontamination would be practically impossible. Their estimate was based on work believed necessary to decontaminate to the extent that no serious fire or explosion hazard exists in the remaining plant and the surrounding community.

In June, 1947, another inspection of the WVOW was made. At this inspection the team found a swamp where the water was apparently toxic. It was recommended that this swamp be drained. Also, more contamination was found and it was recommended that these areas be flashed, drained, or permanently fenced.⁷

In December of 1948, the sale of land to the University of West Virginia⁸ and to Mr. George W. Windon⁹ of Mason, West Virginia was denied because of contamination. Also in these denials, it stated that the land was to be transferred to the State of West Virginia for wildlife conservation purposes.

A letter¹⁰ dated September 1, 1949 from the Assistant General Counsel to the Regional Director stated that since the land sold to the State of West Virginia was contaminated, a corrected deed should be executed. A corrected deed¹¹ stating that the land was contaminated was executed on October 12, 1949; this deed superseded the deed, executed in 1948. The corrected deed states that the land was subjected to contamination by the introduction of unexploded and dangerous bombs, shells, rockets, mines and charges either upon or below the surface. This deed also states that the land had been decontaminated. It is further stated in the deed that the state shall assume all risk for personal injuries and property damage arising out of ownership, maintenance, use and occupation of the said tract of land, and agrees to indemnify and save the government harmless.

A memo¹² dated September 7, 1954 stated that an inspection conducted on August 2, 1954 revealed that dangerous contamination existed on the property owned by the State of West Virginia. It is stated that the contamination consisted of the presence on the surface and in the soil of quantities of TNT which range in size from small particles to pieces up to two (2) inches in diameter. Contamination was observed in both the former TNT area and Burning

AR305448

Ground area. This report stated that contamination was believed to exist in the underground pipe lines which connect the TNT Area with the Red Water Reservoirs and in the reservoirs also. It is further stated that the contaminated area was open to the general public.

A memo¹³ dated February 3, 1955 suggested that the area mentioned above should be further decontaminated by the Ordnance Corps even at this late date since the area is used by general public. It was also suggested that the State of West Virginia should be alerted to the risk involved to those entering upon the premises.

An inspection report¹⁴ dated April 5, 1955 concluded that the areas released to the West Virginia Conservation Commission which included TNT lines, the burning grounds and the underground pipe lines are contaminated with explosives. Entrance of the general public to these areas exposes them to a potential hazard. Decontamination of the areas to make them acceptable for entry by the public is impractical.

It was recommended in this report that areas at and adjacent to the burning grounds, including the area formerly occupied by TNT lines, the land above and paralleling the underground contaminated piping and the red water reservoirs, be recaptured and fenced to exclude trespassers.

Another report¹⁵ dated April 12, 1955 and referring to the above inspection also concludes that the contaminated area should be recovered and fenced. This report further states that the State of West Virginia had taken action to post the area at conspicuous locations to reflect the hazardous conditions prevailing in these areas. Barricades had been provided across access roads in order to preclude entry to TNT manufacturing and burning ground areas.

A letter¹⁶ dated December 5, 1955 from the Army to the GSA stated that recent inspection of the land owned by the State of West Virginia established the fact that certain areas within that portion are contaminated with explosives and expose the public to a potential hazard.

The GSA replied¹⁷ to the above letter by saying that under the corrected deed dated October 12, 1949, the State of West Virginia assumed all risks for personal injuries and property damage arising out of or resulting from the possible contaminated condition of the land and agreed to indemnify and save the government harmless against any liability arising therefrom. The GSA responsibility with respect to this property, is limited to enforcement of the conditions of the deed restricting the use of property for wildlife

purposes. The letter also states that if the Department of the Army felt that protection of their interest would require recapture of the land, GSA would be glad to discuss that.

A survey report¹⁸ dated November 29, 1956 and referring to a survey conducted on November 19-20, 1956 gives the following information:

1. West Virginia Ordnance Works consisted of 12 TNT lines with necessary supporting facilities. Lines 1 through 10 were used in production of TNT during World War II. Lines 11 and 12 were not operated and were considered uncontaminated.
2. The contaminated area comprised of 230 acres of this installation of which 175 acres had been deeded to West Virginia while 55 acres were still property of United States government.
3. A large amount of surface TNT ranging in size from finely divided traces to pieces 5 pounds or more in weight were noted around the Tri and Wash Houses of lines 1 through 10. In several instances where TNT was found on the ground, larger accumulations were found under the surface layer of ground. The same condition was prevalent at the burning grounds, dumping grounds between the operating areas and burning grounds, and adjacent areas.
4. According to this report, the principal hazard of the restricted use of those areas for conservation were from visible TNT and the TNT that might be uncovered from the subsurface.

A travel report¹⁹ dated May 16, 1960 describes the decontamination process used to decontaminate the 50 acre parcel of land sold to Mr. Jerome Goldberg.

This area consisted of TNT lines 8, 9 and 10.

A trip report dated October 27, 1966²⁰ on the survey of eight explosive storage magazines utilized by West Virginia National Guard concluded that the hazards due to explosives contamination of the eight magazines included in the survey were negligible.

Sources contacted within the Department of Natural Resources, including the Wildlife Resources did not have any information on decontamination of the land owned by McClintic Wildlife Station.

Further review of the army files also revealed two other ordnance works locations in the state which are now under investigation by the Division of Water Resources. These two sites are the former Morgantown Ordnance Works at Morgantown, West Virginia and the New Martinsville Ordnance Works at New Martinsville, West Virginia.

AR305450

SUMMARY:

No document has been found to indicate what action, if any, was taken to decontaminate the land sold to the State of West Virginia or TNT lines 1 through 7.

A review of the properties of TNT and phone conversations with Mr. Gordon M. Boyd, one of the authors of the report, "The Federal Connection", indicates that TNT underground could still pose an explosion hazard.

Samples collected²¹ by the Ground Water/Hazardous Waste Section, Division of Water Resources for the 129 EPA priority pollutants and radioactivity from the Wildlife Station supply well and Mill Run did not reveal any contamination.

A field inspection of the McClintic Wildlife Station was conducted by the Ground Water/Hazardous Waste Section, Division of Water Resources on April 3, 1981. No fences or signs reflecting the contaminated condition of land and restricting public entry into such areas were found.

CONCLUSIONS:

From an inspection of available information, it can be concluded that a potential hazard to the public may still exist related to entry onto contaminated areas of the McClintic Wildlife Station. Based on water samples obtained from the supply well and Mill Run and based on a review of file, the hazard appears to be limited to explosion of TNT.

RECOMMENDATIONS:

It is recommended that a survey of the site be conducted by persons possessing the technical expertise to determine the extent and location of TNT contaminated areas. Any such areas should be either effectively decontaminated or properly fenced and identified to exclude the public from entering them.

AR305451

ATTACHMENT 4

Description of McClintic Wildlife Refuge

AR305452

HISTORY

The McClinic Wildlife Station was originally the site of a munitions plant during World War II. In 1948 it was deeded to the West Virginia Conservation Commission, now known as the West Virginia Department of Natural Resources. The deed gave use of the area to the State for wildlife conservation.

To obtain maximum wildlife potential from the facility, plans were made to develop the area according to soil capabilities and types. A farm plan was developed and a wildlife management plan followed. The wildlife plan was initiated in 1950. The plan included the planting of multiflora rose hedges, construction of check dams, strip planting of wildlife food shrubs, planting of small wildlife food patches, development of a seed nursery and construction of ponds for waterfowl, warmwater fisheries and furbearers. Rearing of bobwhite quail was practiced for restoration purposes from 1949 to 1955. Since 1951, 36 ponds have been constructed: twenty-two of the ponds are open to year-round fishing, ten are devoted to multiple use and four for the exclusive management of waterfowl.

The game and fish division has oriented the wildlife management plan towards waterfowl, farm game and fishing.



AR305453



MANAGEMENT

Approximately 14 ponds at McClinic are managed primarily to encourage waterfowl production. To accomplish this, nesting islands were constructed for Canada geese and boxes erected for woodduck nesting. Measures taken by the game section to encourage waterfowl usage and hunting are the planting of waterfowl foods and the restriction of human activities near specially designated ponds during nesting and brooding periods. (Note sign in picture on third panel.)

Strip plantings of viburnum, bush honeysuckle, holly, hazelnut, autumn olive and lespedeza bicolor have been made for the farm game. Borders of multiflora rose were also planted with openings at various intervals to facilitate hunter access. The creation of borders and edges provides necessary shelter, food, and cover for the wildlife on the area.

The fish section primarily depends upon aquatic vegetation control, reclamation and restocking to maintain the fisheries in the ponds open to fishing. Aquatic vegetation is controlled by the application of fertilizers and herbicides.

Fisheries biologists make periodic netting surveys to determine fish populations and balance. Measures to correct unbalanced populations include adjustment of water levels, regulations and species. At present all ponds open to fishing have a good population of largemouth bass, bluegill, and other species.

TRAPPING

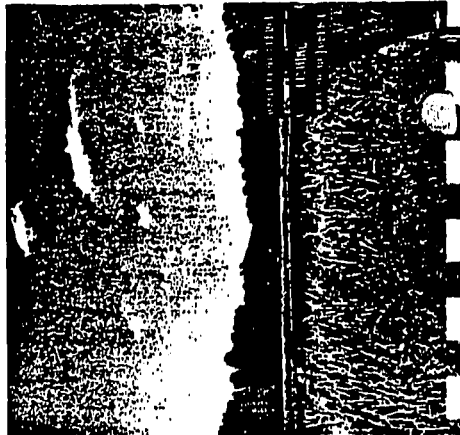
Experienced and amateur trappers alike annually trap muskrat, mink, weasel and raccoon at McClinic. Trappers must obtain permits from the area manager.

HUNTER AND FISHERMAN SUCCESS

Small game hunters enjoying the greatest success at McClinic are the cottontail, mourning dove, and waterfowl hunter. Other species of small game available to the hunter are bobwhite quail, grouse and woodcock.

The annual harvest of cottontails at McClinic is approximately 900.

The bass, crappie and bluegill fishermen enjoy good fishing in the more optimum months of April, May, June and October. Largemouth bass in the 3 pound class are not uncommon.



CAMPING

McClintic campers will find three campgrounds with a total of nine rustic tent or trailer sites equipped with grills, tables and rubbish containers. Drinking water and pit-type toilets are provided on each campground. There will be a charge for camping.

Persons wishing further information, hunting permits, trapping permits or maps of the facility, are urged to visit the area office.



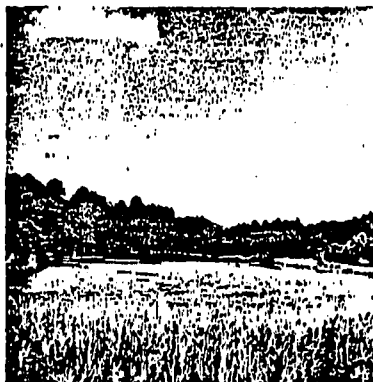
STATEMENT OF POLICY REGARDING THE EQUAL OPPORTUNITY TO USE FACILITIES AND PARTICIPATE IN PROGRAMS

"It is the policy of the Department of Natural Resources to provide its facilities, accommodations, services and programs to all persons without regard to sex, race, color, age, religion, national origin, or handicap. Proper licenses/registration and compliance with official rules and regulations are the only sources of restrictions for facility use or program participation."

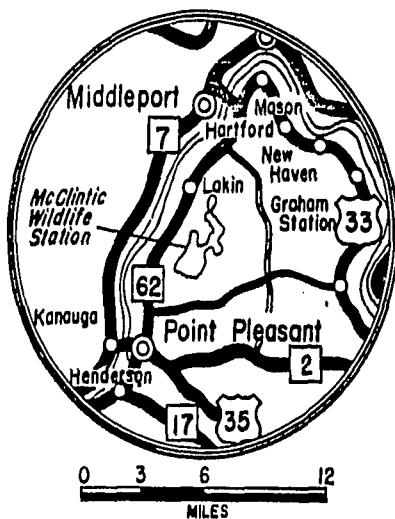
"The Department of Natural Resources is an equal opportunity employer."

Prepared by
WEST VIRGINIA
DEPARTMENT OF NATURAL RESOURCES

Wildlife Resources Division
Charleston, West Virginia 25305



LOCATION



McClintic Wildlife Station is located five (5) miles north of Point Pleasant, West Virginia, and one (1) mile east of State Route 62, in Mason County.

AR305454

ATTACHMENT 5

Letter from Allied Chemical

AR305455

P.O. Box 1139R
Morristown New Jersey 07960

April 2, 1982

ECOLOGY AND ENVIRONMENT, INC.
8021 Route 130
Pennsauken, New Jersey 08110

Attention: Mr. Dana Boyadjian

RE: West Virginia
Ordinance Works
Pt. Pleasant, WV, 1942-1945

Dear Mr. Boyadjian:

In response to the March 19, 1982 letter received from Mr. Phillip G. Retallick, Project Officer-USEPA Region III, concerning any information which Allied Corporation may have concerning the West Virginia Ordinance Works, we have undertaken a search to try to locate records for this facility. As requested in that letter, we have attempted to find information on underground process and wastewater lines, on-site waste disposal areas, and any decontamination procedures which took place before or after the facility was closed.

The lapse of over 35 years has made this search rather difficult. In checking with our Central Records Storage facility, the personnel there informed us that records concerning this facility have been destroyed. The titles of the files, and the approximate dates they were destroyed are indicated below:

1. General Chemical Defense Corporation - destroyed about 1954.
2. Correspondence relating to 1942 "qualification" to do business in West Virginia - destroyed on or about March 31, 1970, and
3. War Production Board Orders - destroyed on or about April 1, 1957.

AR305456

The only file located to date concerning the West Virginia Ordinance Works indicates that Allied purchased certain equipment from the Ordinance Works at the time of its demolition. Correspondence in that file indicates that plans and specifications for the Ordinance Works were owned and kept in storage by the Office of the Chief of Ordinance, U. S. War Department. Apparently, during the period of 1948 to 1949, to facilitate the dismantlement, removal and installation elsewhere of certain equipment, engineering drawings and blueprints were borrowed from and returned to the War Department. We have no knowledge of whether these documents have been destroyed or, if still in existence, as to their whereabouts.

I regret that we have been unable to find any documents that would assist in your investigation of this site.

Sincerely,

ALLIED CORPORATION
Allied Chemical Company

Edward J. Shields
Director-Environmental Services

EJS/lan

cc: Mr. Phillip G. Retallick
EPA III

AR305457

Drill Log - McClintic Wildlife Refuge, Pt. Pleasant, W.Va.

DR305458

Hole#	Time	Sample Depth	Blows	Description
1		0.0'	2,5,9	Brown-tan fine silty sand, some fine gravel, trace clay
1		below 0.5'		mottled gray, orange fine silty sand
1	16:43	0.0' - 1.5'	2,5,9	tan to light brown sandy clay some mottling
1	16:58	5.0' - 6.5'	3,3,4	dry mottled dark brown to brown sandy silt. At 6.2' changes to rounded semi-angular very coarse sand to fine gravel reddish in color.
1	17:10	10.0' - 11.5'	6,13,14	orange brown coarse sand to gravel rounded to subangular grades into dark brown medium sand to 11'4".
Hole TB-1, hollow steam auger w/split spoon samples No readings above background for entire hole. 6/17/82				
2		0.0' - 0.5'		brown silty clay
2	09:15	5.0' - 6.5'		orange brown fine sand, well sorted trace silt H ₂ O table at 5.5' 9' v. fine silty sand trace clay orange brown.

Drill Log - McClintic Wildlife Refuge, Pt. Pleasant, W. Va.

305459

Hole#	Time	Sample Depth	Blows	Description
2	09:29	10.0' - 11.5'		Brown saturated fine to coarse sand. semi angular trace silt
Hole TB-2, solid steam power auger. 6/8/82				
3	10:10	0.0' - 1.5'		Gray silty loam at 0.5' change to silty sand
3	10:12	5.0' - 6.5'		brown saturated fine to medium sand (some silt)
3		10.0' - 11.5'		dark brown saturated medium to coarse sand some silt.
Hole TB-3 solid steam power auger HNU readings over background - 0.2ppm. 6/8/82				
4	14:49	0.0' - 1.5'	6,6,11	dark brown soil, at 2" hit gray hard material (slag) grades into tan mottled clay not much sample.
4	15:04	5.0' - 6.5'	4,7,13	mottled tan. orange sandy clay at 5.0-6.0 brown clay with gray slag material throughout 6.0-6.5 mottled gray and orange fine - med. sand.
4	15:18	10.0' - 11.5'	3,6,8	*HNU readings - background 1-(1.0ppm) gray orange and brown mottled silty clay.

Drill Log - McClintic Wildlife Refuge, Pt. Pleasant, W.Va.

R305460

Hole#	Time	Sample Depth	Blows	Description
4	15:28	15.0' - 16.5'	14, 13, 11	brown gray orange mottled clay H ₂ O table 15.0'
				At 16.2" very coarse sand to gravel - semi angular
4	15:54	20.0' - 21.5'	4, 7, 8	Very coarse to gravelly sand At 20" - 20.2" brown sandy clay 20.4" very fine brown sand.
Hole TB-4 hollow stem auger w/split spoon samples 6/9/82				
5	12:55	0.0' - 1.5'	2, 3, 4	0.0'-5" dark brown to med. brown soil, changes to tan 18" silty loam trace clay tan, mottled
5	13:20	5.0' - 6.5'	1, 5, 10	5.0'-6.0' brown silty clay 6.0'-6.5' gray to brown dense mottled silt w/some clay.
5	12:55	10.0' - 11.5'	6, 10, 9	brown mottled, fine to medium well sorted sand, 11.0' medium sand.
				10-11' gray to brown mottled silty clay.
5	13:42	15.0' - 16.5'	5, 7, 8	brown medium to fine sand, well sorted 15.0' - 15.5' brown, uniform fine 15.5' - 16.5' lensing effect, same grain size, brown.

Drill Log - McClintic Wildlife Refuge, Ft. Pleasant, W.Va.

R305461

Hole#	Time	Sample Depth	Blows	Description
5	14:13	20.0' - 21.5'	8, 10, 131	20.0 - 21.0 fine medium sand 21.0' - light brown medium sand.
5	14:22	25.0' - 21.5'		brown medium sand H ₂ O cable 25'10"
5	14:32	30.0' - 31.5'	8, 14, 15	30' - 30'8" brown medium sand. 30'8" to 31'5"-orange brown medium sand, 31'5"reddish brown silty clay
Hole TB-5 hollow stem auger split spoon samples 6/8/82				
Hole T-B-6 hollow stem auger split spoon samples 6/8/82				
6	15:42	0.0' - 1.5'	3, 7, 7	tan to brown silty loam some clay gray powder in top 12 inches smells like gun powder.
NOTE: approximately 2' depth some gray material on side of hole approximately .5ppm above background.				
6	16:07	5.0' - 6.5'	4, 4, 5	5.0' - 6.0' brown silty clay 6.0' mottled silty clay grayish green material in chunks throughout section.
6	16:28	10.0' - 11.5'	4, 4, 7	brown to gray mottled clay last inch medium to fine sand, moist.
6	16:35	15.0' - 16.5'	6, 6, 6	15.0' to 15'8" gray brown clay 15'8"-16'5" orange brown fine to medium consistent sand. HNU reading background in hole.

Drill Log - McClintic Wildlife Refuge, Pt. Pleasant, W. Va.

Hole#	Time	Sample Depth	Blows	Description
6	16:45	20.0' - 21.5'		clay
7	14:49	0.0' - 1.5'	6,6,11	dark brown soil w/ grayish hardened slag like material some tan mottled clay.
7	15:04	5.0' - 6.5'	4,7,13	tan-orange mottled clay. 5-6' brown clay w/slag throughout 6.0-6.5' gray-orange mottled fine-med sand HNU readings background (1.0ppm)
7	15:18	10.0' 11.5'	3,6,8	gray orange and brown mottled silty clay.
7	15:28	15.0' - 16.5'	14,13,11	brownish gray to orange mottled clay. H ₂ O table 15'. At 16.2' very coarse sand to gravel semi-angular
7	15:54	20.0' - 21.5'	4,7,8	20'-20'2" brown sandy clay 20'2"-20'4" very fine brown sand 20'4"-21'5" very coarse to gravelly sand.
TB-7 hollow stem auger, split spoon samples 6/9/82				
8	08:47	0.0' - 1.5'		brown silty loam
8	08:55	5.0' - 6.0'		silty loam grayish brown
8	09:07	10.0' - 11.5'		orange brown fine silty sand. HNU reading 10ppm above background 1 foot downhole 6" from top of hole reading background.
8	09:20	15.0' - 16.5'		tan fine silty sand HNU reading downhole 13" above background 3-4ppm above hole.

DR305462

Drill Log - McClintic Wildlife Refuge, Pt. Pleasant, W.Va.

Hole#	Time	Sample Depth	Blows	Description
8	09:40	20.0' - 21.0'		brown silty sand & pe clay.
8	09:48	24.0' - 25.0'		brown silty sand & pe clay at 25.0' reddish brown clay.

TB-8 solid stem auger. 6/9/82

AR 05463

Esmer & associates, inc. **consulting engineers**

P.O. BOX 397

BOOMER, WEST VIRGINIA

TO Ecology & Environment, Inc.

DATE June 10, 1982

8021 Route 130

FILE _____

Pensauken, New Jersey 08110

Attn: Mr. Dana Boyadjian

THE FOLLOWING TRACING ()
 PRINTS (X) ARE (X) ENCLOSED () SENT UNDER SEPARATE COVER
 SEPIAS ()

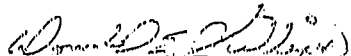
QUANTITY	DRAWING NUMBER	ISSUE	TITLE
1 Copy	82049		Boring Logs
			No. TB-1
			No. TB-2
			No. TB-3
			No. TB-4
			No. TB-5
			No. TB-6
			No. TB-7
			No. TB-8

- (X) FOR YOUR FILE
- () FOR REFERENCE
- () PER YOUR REQUEST
- () FOR FABRICATION
- () APPROVED AS NOTED
- () PLEASE ACKNOWLEDGE RECEIPT
- () RETURNED AFTER USE
- () REVISED TRACING
- () MARK NO.s ADDED

- () FOR YOUR APPROVAL
- () FOR ERECTION
- () REVISED - DESTROY PREVIOUS ISSUE
- () BORROWED PRINTS RETURNED
- ()

AR305464

SHEET 1 OF 1 SHEETS

BY: 
 Donald E. Phillips/



Esmer & Associates, Inc.
consulting engineers

LOG OF BORING

Job No. 82049

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 1

Date 6/7/82

Boring No. TB-1

GROUNDWATER OBSERVATIONS	Type	CASING	SAMPLER	CORE BAR.	Ground Elevation _____ Boring begun <u>6/7/82</u> Boring completed <u>6/7/82</u> Engineer <u>Esmer</u>	
	At _____ after _____ hours	HS	SS	_____		
	At _____ after _____ hours	Size I.D.	<u>3 1/4"</u>	<u>1 3/8"</u>		_____
	Hammer Wt.	_____	<u>140#</u>	_____		
	Hammer Fall	_____	<u>30"</u>	_____		

Location of Boring _____

Depth of Casing, ft. Blows / foot on Casing	Blows per ft. on Sampler			Sample depth from - to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
	0-6	6-12	12-18			No.	Pen.	Rec.			
				0.0					0		
	2	5	9	1.5	SS	S-1	18"	18"	1		Light Brown Sandy Clay w/Organic Material
									2		
									3		
									4		
				5.0					5		
	3	3	3	6.5	SS	S-2	18"	18"	6		Brown to Reddish Brown Sandy Clay, Wet @ 6.25'
									7		
									8		
									9		
				10.0					10		
	6	13	14	11.5	SS	S-3	18"	18"	11		Brown Medium Sand to Dark Brown Silty Sand
									12		Boring Terminated @ 11.5'
									13		Installed 5' of Well Screen, 4'-1 of Well Casing In Hole, 3'-11"
									14		Of Well Casing Extended Above Ground Surface.
									15		Installed Protective Cover.
									16		
									6		
									7		
									8		
									9		
									0		

AR305465



esmer & associates, inc.
consulting engineers

LOG OF BORING

Job No. 82049

Client Ecology & Environment, Inc

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 1

Date 6/8/82

Boring No. TB-2

GROUNDWATER OBSERVATIONS		CASING	SAMPLER	CORE BAR.	
At _____ after _____ hours	Type _____	_____	<u>Auger</u>	_____	Ground Elevation _____
	Size I.D. _____	_____	_____	_____	Boring begun <u>6/8/82</u>
	Hammer Wt. _____	_____	_____	_____	Boring completed <u>6/8/82</u>
At _____ after _____ hours	Hammer Fall _____	_____	_____	_____	Engineer <u>Esmer</u>

Location of Boring

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Req.			
										0		Brown Silty Clay w/ Organic Material
										1		
										2		
										3		
										4		
					5.0					5		Brown Silty Clay To
					6.5	Auger	S-1			6		Brown Sand, Wet @ 5.5'
										7		
										8		
										9		
					10.0					10		Brown Fine to Coarse
					11.5	Auger	S-2			11		Sand
										12		Boring Terminated @ 11.5'
										13		Installed 5' of Well
										14		Screen, 2' of Well Casing In Hole, 3' - 6"
										15		of Well Casing Extended Above Ground Surface,
										16		Installed Protective Cover. AR305466
										17		
										18		
										19		



LOG OF BORING

Boring No. TB-3

GROUNDWATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	<u>Auger</u>	_____	Boring begun <u>6/8/82</u>
	Size I.D. _____	_____	_____	Boring completed <u>6/8/82</u>
At _____ after _____ hours	Hammer Wt. _____	_____	_____	Engineer <u>Esmer</u>
	Hammer Fall _____	_____	_____	

Location of Boring

Depth of Casing, ft.	Blows /foot on Casing	Blows per 6" on Sampler			Sample depth from -1a (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
					0.0 1.5	Auger	S-1			0		Gray Brown Silty Sand
										1		
										2		
										3		
										4		
					5.0					5		Wet @ 5'
					6.5	Auger	S-2			6		Brown Fine to Medium Sand
										7		
										8		
										9		
					10.0					10		Dark Brown Medium to
					11.5	Auger	S-3			11		Coarse Sand W/Some Sil
										12		Boring Terminated @ 12'
										13		
										14		Installed 5' of Well
										15		Screen, 4'-4" of Well
										16		Casing In Hole, 3' of
										17		Well Casing Extended
										18		Above Annular Space
										19		Installed Protective
										20		Cover.

ATTACHMENT 1
Bioassay Results

AR305468



AR305469



ATTACHMENT 1

Test Results
Water Resources Division
West Virginia Department of Natural Resources

Company: McClintic Wildlife Area Date: May 7-8, 81
Permit Number: _____ Biologist: C.M. Murphy
Material Being Tested: Leachate Starting Hour: 1430
Time Sample Collected: _____ Type Sample: Grab
Source Of Tested Material: Leachate to pond
Source Of Dilution Water: Filtered Tapwater
Dilution Water- Total Hardness _____ mg./l. Total Alkalinity _____
Test Species: Daphnia pulex Temp. Range: 23 degrees C.
Number of Individuals Per Concentration: 20
Number of Individuals Per Test Container: 10

At the end of the twenty-four hour test period 7 of 20 organisms were affected. However, all organisms appeared to be affected in 100% leachate when examined one hour after the test was started. I do not have an explanation for the unusual recovery. Results indicate adverse affects were not the result of low Dissolved Oxygen.

RECEIVED

MAY 21 1981

ENVIRONMENTAL PROTECTION AGENCY
CHARLOTTE

AR305470

Primary References For Bioassay Methods:
Methods For Measuring The Acute Toxicity of Effluents to Aquatic
Organisms EPA 600/4-78-012
Standard Methods For Examination of Water and Wastewater, 14th. Edition
TM Annual Book of Standards Part 31
Bioassay For Toxic and Hazardous Materials Training Manual EPA 430/1-79-00

Direct Vol	10	18	18R	32	56	56R	160	160R	Center
/1	7.8	7.6		7.6	7.4		7.4		7.8
t. Units.	6.6	6.5		6.4	6.4		6.3		6.9
ess m3/1									
OC	25.0	25.0		25.0	25.0		25.0		25.0
pmhs									

24 hrs.									
affected	10	10	10	10	10	10	10	10	0
ected									
/1	6.4								
Units	7.2	4.2		3.8	2.2		.8		7.6
OC	25.0	7.1		7.0	7.0		6.8		7.4
		25.0		25.0	25.0		25.0		25.0

48 hrs.									
affected									
ected									
/1									
Units									
OC									

72 hrs.									
affected									
ected									
/1									
Units									
OC									

96 hrs.									
affected									
ected									
/1									
Units									
OC									

96 hrs.
05472

Percent Vol	10	10R	1S	1SR	32	32R	56	56R	108	108R	160R
Units.	7.8		7.8		7.6		7.6		7.4		8.6
S ms/l	6.8		6.7		6.7		6.5		6.3		6.0
C	25.0		25.0		25.0		25.0		25.0		25.0
Units											

24 hrs. May 28

24 hrs.

Percent Vol	0	0	0	0	4	4	7	7	10	10	10	160R
Units.	7.6		7.6		7.2		6.4		5.8		7.8	
Units	7.3		7.2		7.1		7.1		7.0		7.4	
C	25.0		25.0		25.0		25.0		25.0		25.0	

48 hrs.

48 hrs.

Percent Vol												
Units.												
Units												
C												

72 hrs.

72 hrs.

Percent Vol												
Units.												
Units												
C												

96 hrs.

96 hrs.

Percent Vol												
Units.												
Units												
C												

96 hrs. 305473



consulting engineers

LOG OF BORING

Job No. 82049

Client Ecology & Environment

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 2

Date 6/9/82

Boring No. TB-4

GROUNDWATER OBSERVATIONS	CASING HS	SAMPLER SS	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	_____	_____	Boring begun <u>6/9/82</u>
	Size I.D. <u>3 1/4"</u>	<u>1 3/8"</u>	_____	Boring completed <u>6/9/82</u>
	Hammer Wt. _____	<u>140#</u>	_____	Engineer <u>Esmer</u>
At _____ after _____ hours	Hammer Fall _____	<u>30"</u>	_____	

Location of Boring

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from -10 (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
					0.0					0		
		6	6	11	1.5	SS	S-1	18"	18"	1		Brown & Gray Silty Clay
										2		
										3		
										4		
					5.0					5		
		4	7	13	6.5	SS	S-2	18"	18"	6		Brown & Gray Silty Sandy Clay
										7		
										8		
										9		
					10.0					10		
		3	6	8	11.5	SS	S-3	18"	18"	11		Brown & Reddish Sandy Clay, Damp.
										12		
										13		Reddish Brown Sand
										14		
					15.0					15		Wet @ 15'
		14	13	11	16.5	SS	S-4	18"	18"	16		Brown Sand
										17		AR305474
										18		
										19		
										20		



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consulting engineers

LOG OF BORING

Job No. 82049

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 2 of 2

Date 6/9/82

Boring No. TB-4

GROUNDWATER OBSERVATIONS			CASING	SAMPLER	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type	HS	SS			
	Size I.D.	<u>3 1/4"</u>	<u>1 3/8"</u>			Boring completed <u>6/9/82</u>
At _____ after _____ hours	Hammer Wt.		<u>140#</u>			Engineer <u>Esmer</u>
	Hammer Fall		<u>30"</u>			

Location of Boring _____

Depth of Casing ft.	Blows / Foot on Casing	Blows per 6"			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
		4	7	8	20.0					20		Brown Sand & Gravel to Fine Brown Sand
					21.5	SS	S-5	18"		21		
										2		
										3		
										4		Boring Terminated @ 21.5'
										5		Installed 5' of Well Screen, 15' of Well Casing In Hole 4' Extended Above Ground Surface. Installed Protective Cover
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

AR305475



Sheet 1 of 2
Date 6/8/82
Boring No. TB-5

Job No. 82049
Client Ecology & Environment, Inc.
Project McClintic Wildlife Station TDD No. SP3-8204-05

GROUNDWATER OBSERVATIONS	CASING HS	SAMPLER SS	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	Size I.D. <u>3 1/4"</u>	<u>1 3/8"</u>	Boring begun <u>6/8/82</u>
At _____ after _____ hours	Hammer Wit. _____	<u>140#</u>		Boring completed <u>6/8/82</u>
	Hammer Fall _____	<u>30"</u>		Engineer <u>Esmer</u>

Location of Boring

Depth of Casing, ft.	Blows /foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Req.			
					0.0					0		
		2	3	4	1.5	SS	S-1	18"	18"	1		Dark Brown to Brown Silty Clay
										2		
										3		
										4		
					5.0					5		
		1	5	10	6.5	SS	S-2	18"	18"	6		Gray to Brown Silty Clay
										7		
										8		
										9		
					10.0					10		
		6	10	9	11.5	SS	S-3	18"	18"	11		Gray to Brown Silty Clay to a Brown Fine to Medium Sand
										12		
										13		
										14		
					15.0					15		
		5	7	8	16.5	SS	S-4	18"	18"	16		Brown Fine to Medium Sand
										17		
										18		
										19		



LOG OF BORING

Job No. 82049

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TOD No. SP3-8204-05

Sheet 2 of 2

Date 6/8/82

Boring No. TB-5

GROUNDWATER OBSERVATIONS			CASING	SAMPLER	CORE BAR.	Ground Elevation
At _____ after _____ hours	Type	HS	SS			
At _____ after _____ hours	Size I.D.	3 1/4"	1 3/8"			Boring begun <u>6/8/82</u>
	Hammer Wt.		140#			Boring completed <u>6/8/82</u>
	Hammer Fall		30"			Engineer <u>Esmer</u>

Location of Boring _____

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from - to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
		8	10	13	20.0					20		Brown Fine to Medium
					21.5	SS	S-5	18"	18"	21		Sand
										22		
										23		
										24		
					25.0					25		Brown Fine to Medium
		7	8	10	26.5	SS	S-6	18"	18"	26		Sand wet @-25'-10"
										27		
										28		
										29		
					30.0					30		Brown Fine to Medium
		8	14	15	31.5	SS	S-7	18"	18"	31		Sand To a Reddish
										32		Brown Sand To a
										33		Reddish Brown Silty
										34		Clay.
										35		Boring Terminated
										36		@31.5'
										37		
										38		
										39		
										40		

AR305477



LOG OF BORING

Boring No. TB-6

GROUNDWATER OBSERVATIONS		CASING	SAMPLER	CORE BAR,	
At _____ after _____ hours	Type _____	HS	SS	_____	Ground Elevation _____
	Size I.D.	3 1/4"	1 3/8"	_____	Boring begun <u>6/8/82</u>
	Hammer Wt.	_____	140#	_____	Boring completed <u>6/8/82</u>
At _____ after _____ hours	Hammer Fall	_____	30"	_____	Engineer <u>Esmer</u>

Location of Boring

Depth of Casing, ft.	Blows /foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Res.			
					0.0					0		
		3	7	7	1.5	SS	S-1	18"	10"	1		Brown Sandy Clay
										2		
										3		
										4		
					5.0					5		
		4	4	5	6.5	SS	S-2	18"	18"	6		Brown Silty Sandy Clay
										7		
										8		
										9		
					10.0					10		
		4	4	7	11.5	SS	S-3	18"	18"	11		Brown Silty Sandy Clay
										12		
										13		
										14		
					15.0					15		
		6	6	6	16.5	SS	S-4	18"	18"	16		Brown Sandy Clay to a Fine Medium Sand
										17		
										18		
										19		
										20		



LOG OF BORING

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TDD No. SP3-8204-05

Date 6/8/82

Boring No. TB-6

Working No. 12-10-11

GROUNDWATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type <u>HS</u>	<u>SS</u>	_____	Boring begun <u>6/8/82</u>
	Size I.D. <u>3 1/4"</u>	<u>1 3/8"</u>	_____	Boring completed <u>6/8/82</u>
At _____ after _____ hours	Hammer Wt. _____	<u>140#</u>	_____	Engineer <u>Esmer</u>
	Hammer Fall _____	<u>30"</u>	_____	

Location of Boring

[illegible]

ATTACHMENT 8

Laboratory Analysis of Water Supply Well

AR305480



LOG OF BORING

Job No. 82049

Client Ecology Environment

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 2 of 2

Date 6/9/82

Boring No. TB-8

GROUNDWATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Ground Elevation
At _____ after _____ hours	Type _____	<u>Auger</u>	_____	Boring begun <u>6/9/82</u>
At _____ after _____ hours	Size I.D. _____	_____	_____	Boring completed <u>6/9/82</u>
	Hammer Wt. _____	_____	_____	Engineer <u>Esmer</u>
	Hammer Fall _____	_____	_____	

Location of Boring _____

Depth of Casing, ft.	Blows / foot on Casing	Blows per 6" on Sampler			Sample depth from - to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Res.			
					20.0					20		Brown Sandy Clay
					21.0	Auger	S-5			21		
										22		
										23		
										24		
					24.0					24		Red Brown Clay & Sand
					25.0	Auger	S-6			25		
										6		Boring Terminated @25'
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		

AR305481



Job No. 82049

Client Ecology & Environment, Inc.

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 1

Date 6/9/82

Boring No. TB-7

GROUNDWATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	<u>Auger</u>	_____	Boring begun <u>6/9/82</u>
	Size I.D. _____	_____	_____	Boring completed <u>6/9/82</u>
At _____ after _____ hours	Hammer Wt. _____	_____	_____	Engineer <u>Esmer</u>
	Hammer Fall _____	_____	_____	

Location of Boring

Depth of Casing, ft.	Blows / foot on Casing	Blows per " on Sampler			Sample depth from -10 (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Reg.			
					0.0					0		
					1.5	Auger	S-1			1		Brown Silty loam & Brown Clay
										2		
										3		
										4		
					5.0					5		
					6.5	Auger	S-2			6		Reddish Brown Sandy Clay
										7		
										8		
										9		
					10.0					10		
					11.5	Auger	S-3			11		Brown Sandy Clay
										12		
										13		
										14		
					15.0					15		
					16.5	Auger	S-4			16		Brown Silty Clay
										17		Boring Terminated @ 16.5'
										18		
										19		



LOG OF BORING

Job No. 82049

Client Ecology & Environment

Project McClintic Wildlife Station TDD No. SP3-8204-05

Sheet 1 of 2

Date 6/9/82

Boring No. TB-8

GROUNDWATER OBSERVATIONS	CASING	SAMPLER	CORE BAR.	Ground Elevation _____
At _____ after _____ hours	Type _____	<u>Auger</u>	_____	Boring begun <u>6/9/82</u>
	Size I.D. _____	_____	_____	Boring completed <u>6/9/82</u>
At _____ after _____ hours	Hammer Wt. _____	_____	_____	Engineer <u>Esmer</u>
	Hammer Fall _____	_____	_____	

Location of Boring

Depth of Casing, ft.	Blows /foot on Casing	Blows per 6" on Sampler			Sample depth from -to (in feet)	Type of Sample	SAMPLE			DEPTH IN FEET	SOIL GRAPH	DESCRIPTION
		0-6	6-12	12-18			No.	Pen.	Rec.			
					0.0 1.0	Auger	S-1			0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20		Brown Sandy Clay
					5.0 6.0	Auger	S-2					Brown Gray Silty Sandy Clay
					10.0 11.0	Auger	S-3					Brown Sandy Clay
					15.0 16.0	Auger	S-4					Brown Sandy Clay

Technical Testing Laboratories, Inc.

1265 GREENHURST STALEY
CHARLESTON, WV 25311
304-348-0728

D. B. SALUJA, P. E.
ANALYST

LABORATORY ANALYSIS REPORT

Sample Identification	Department of Natural Resources	Lnb No.	B6257
	Division of Water Resources	Date Sampled	2/24
	Station #1 WRD-PP-BO-004	Date Received	2/24
Analyst	MS & OL	Date Analyzed	2/24
	Station # 1: McClintic Wildlife Station Water Supply Well		3/11
			3/23

PARAMETERS

Total Antimony	< 0.01
Total Arsenic	< 0.01
Total Beryllium	< 0.01
Total Cadmium	< 0.01
Total Chromium	< 0.01
Total Copper	< 0.01
Total Lead	< 0.01
Total Mercury	< 0.001
Total Nickel	< 0.01
Total Selenium	< 0.01
Total Silver	< 0.01
Total Thallium	< 0.01
Total Zinc	< 0.01
Total Cyanide	< 0.001
Total Phosphate	< 0.001

AR305484

Respectfully submitted:

D. B. Saluja

D. B. Saluja, P.E.

All results expressed in mg/l unless otherwise designated < = Less than

CONSULTING ENGINEERS & ANALYSTS

SAMPLE IDENTIFIER: B6 257

1. ANALYTICAL METHODOLOGY

THE SAMPLES WERE PREPARED AND ANALYZED ACCORDING TO TWO (2) GENERAL PROCEDURES: (1) "SAMPLING AND ANALYSIS PROCEDURES FOR SCREENING OF INDUSTRIAL EFFLUENTS FOR PRIORITY POLLUTANTS," REVISED APRIL 1977, US-EPA, AND (2) EPA METHOD 624, "ORGANICS BY PURGE AND TRAP," AND METHOD 625, "BASE/NEUTRALS, ACIDS, AND PESTICIDES," US-EPA, REVISED DECEMBER 3, 1979, FEDERAL REGISTER (GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS). THE LABORATORY PROCEDURES USED FOLLOW THOSE IN METHODS 608, 624, OR 625. QUALITY ASSURANCE, SAMPLE CUSTODY, AND DOCUMENT CONTROL PROCEDURES WERE FOLLOWED WHICH MEET OR EXCEED EPA REQUIREMENTS.

2. SAMPLE RECORD

DATE

A. RECEIVED/REFRIGERATED

02/25/81

B. ORGANICS

1. EXTRACTED

02/26/81

2. ANALYZED

VOLATILES
BASE/NEUTRALS
ACIDS
PESTICIDES/PCBS

03/05/81
03/02/81
02/27/81
03/02/81

C. METALS

ANALYZED

NOT REQUESTED

AR305485

SAMPLE IDENTIFIER: 86 257

3. PRIORITY POLLUTANT ANALYSIS REPORT

COMPOUNDS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V. ACROLEIN	BDL	100
2V. ACRYLONITRILE	BDL	100
3V. BENZENE	BDL	10
4V. BIS (CHLOROMETHYL) ETHER	BDL	10
5V. BROMOFORM	BDL	10
6V. CARBON TETRACHLORIDE	BDL	10
7V. CHLOROBENZENE	BDL	10
8V. CHLORODIBROMOMETHANE	BDL	10
9V. CHLOROETHANE	BDL	10
10V. 2-CHLOROETHYL VINYL ETHER	BDL	10
11V. CHLOROFORM	BDL	10
12V. DICHLOROBROMOMETHANE	BDL	10
13V. DICHLORODIFLUOROMETHANE	BDL	10
14V. 1,1-DICHLOROETHANE	BDL	10
15V. 1,2-DICHLOROETHANE	BDL	10
16V. 1,1-DICHLOROETHYLENE	BDL	10
17V. 1,2-DICHLOROPROPANE	BDL	10
18V. 1,3-DICHLOROPROPYLENE	BDL	10
19V. ETHYLBENZENE	BDL	10
20V. METHYL BROMIDE	BDL	10
21V. METHYL CHLORIDE	BDL	10
22V. METHYLENE CHLORIDE	26	10
23V. 1,1,2,2-TETRACHLOROETHANE	BDL	10
24V. TETRACHLOROETHYLENE	BDL	10
25V. TOLUENE	BDL	10
26V. 1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V. 1,1,1-TRICHLOROETHANE	BDL	10
28V. 1,1,2-TRICHLOROETHANE	BDL	10
29V. TRICHLOROETHYLENE	BDL	10
30V. TRICHLOROFLUOROMETHANE	BDL	10
31V. VINYL CHLORIDE	BDL	25
1A. 2-CHLOROPHENOL	BDL	25
2A. 2,4-DICHLOROPHENOL	BDL	25
3A. 2,4-DIMETHYLPHENOL	BDL	250
4A. 4,6-DINITRO-O-CRESOL	BDL	250
5A. 2,4-DINITROPHENOL	BDL	25
6A. 2-NITROPHENOL	BDL	25
7A. 4-NITROPHENOL	BDL	25
8A. P-CHLORO-M-CRESOL	BDL	25
9A. PENTACHLOROPHENOL	BDL	25
10A. PHENOL	BDL	25
11A. 2,4,6-TRICHLOROPHENOL	BDL	10
1B. ACENAPHTHENE	BDL	10
2B. ACENAPHTHYLENE	BDL	10
3B. ANTHRACENE	BDL	10

AR305485

SAMPLE IDENTIFIER: B6 257

COMPOUNDS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
	BDL	10
4B. BENZIDINE	BDL	10
5B. BENZO (A) ANTHRACENE	BDL	10
6B. BENZO (A) PYRENE	BDL	10
7B. 3,4-BENZOFLUORANTHENE	BDL	25
8B. BENZO (GHI) PERYLENE	BDL	10
9B. BENZO (K) FLUORANTHENE	BDL	10
10B. BIS (2-CHLOROETHOXY) METHANE	BDL	10
11B. BIS (2-CHLOROETHYL) ETHER	BDL	10
12B. BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
13B. BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
14B. 4-BROMOPHENYL PHENYL ETHER	BDL	10
15B. BUTYL BENZYL PHTHALATE	BDL	10
16B. 2-CHLORONAPHTHALENE	BDL	10
17B. 4-CHLOROPHENYL PHENYL ETHER	BDL	10
18B. CHRYSENE	BDL	25
19B. DIBENZO (A,H) ANTHRACENE	BDL	10
20B. 1,2-DICHLOROBENZENE	BDL	10
21B. 1,3-DICHLOROBENZENE	BDL	10
22B. 1,4-DICHLOROBENZENE	BDL	10
23B. 3,3'-DICHLOROBENZIDINE	BDL	10
24B. DIETHYL PHTHALATE	BDL	10
25B. DIMETHYL PHTHALATE	BDL	10
26B. DI-N-BUTYL PHTHALATE	BDL	10
27B. 2,4-DINITROTOLUENE	BDL	10
28B. 2,6-DINITROTOLUENE	BDL	10
29B. DI-N-OCTYL PHTHALATE	BDL	10
30B. 1,2-DIPHENYLHYDRAZINE	BDL	10
31B. FLUORANTHENE	BDL	10
32B. FLUORENE	BDL	10
33B. HEXACHLOROBENZENE	BDL	10
34B. HEXACHLOROBUTADIENE	BDL	10
35B. HEXACHLOROCYCLOPENTADIENE	BDL	10
36B. HEXACHLOROETHANE	BDL	25
37B. INDENO (1,2,3-CD) PYRENE	BDL	10
38B. ISOPHORONE	BDL	10
39B. NAPHTHALENE	BDL	10
40B. NITROBENZENE	BDL	10
41B. N-NITROSODIMETHYLAMINE	BDL	10
42B. N-NITROSODI-N-PROPYLAMINE	BDL	10
43B. N-NITROSODIPHENYLAMINE	BDL	10
44B. PHENANTHRENE	BDL	10
45B. PYRENE	BDL	10
46B. 1,2,4-TRICHLOROBENZENE	BDL	10
1P. ALDRIN	BDL	10
2P. ALPHA-BHC		

AR305487

ATTACHMENT 9

Scope of Work

AR305488

SCOPE OF WORK
SITE INVESTIGATION - McCLINTIC WILDLIFE REFUGE
POINT PLEASANT, WEST VIRGINIA

I. Historical Survey of Property

The contractor will perform an historical search of available site data from Department of Defense and the State of West Virginia archives, so that a reconstruction of the ordnance facility can be prepared. This reconstruction should include:

- A. General plant building layout.
- B. Location of underground process line, wastewater line and access manhole placement.
- C. Location of process plant outfalls and treatment ponds.
- D. Development of a series of map overlays depicting all information generated from the historical survey.

II. Geophysical Survey

Utilizing site information obtained from the historical survey, the contractor will devise a grid pattern of the site with coordinates which will be used as a guide for the geophysical survey.

Before a full scale geophysical project is undertaken, the contractor will attempt to locate manholes which would be a part of the underground piping system. If these manholes can be found, a sighting between manholes should aid significantly in locating the underground piping.

If this manhole search proves inconclusive the contractor will use ground penetrating radar and magnetometer equipment to confirm the exact location of sub-surface process lines and junction manholes, and TNT formulation activities at the ordnance works. Data obtained from this geophysical search will be incorporated on the historical map overlays.

44305489

III. Hazard Assessment Study

In order to determine threats to human health and the environment, a degree of risk assessment will have to be prepared. The contractors will be required to perform the engineering phases of this assessment. The specific tasks are noted below:

- A. Excavation and removal of a representative portion of process line to determine the nature and amounts of TNT process residuals remaining in the line. Three ten foot sections of line shall be removed and placed on a double layer of 6 mil polyethylene film to prevent contact with soils at the site.
 1. The contractor will utilize the historical survey and the geophysical survey results to locate a representative portion of process line which will be excavated and removed for inspection and investigation.
 2. A stratified sample of process line residual will be taken by the contractor from each end of the pipe and immediately packaged and stored in accordance with EPA samples management protocol (as per OSC's instructions on scene).
 3. A composite sample of excavated soils surrounding the process line will be taken and stored by the contractor in accord, with EPA Samples Management Protocol (as per OSC's instructions on scene).
 4. In lieu of the above three tasks, if manholes can be found that are part of the process line system, the OSC may allow samples to be taken from the pipes entering and leaving these manholes. This decision will be made after a visual inspection of the manhole is made by the contractor and results provided to the OSC.

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III. Hazard Assessment Study (cont'd)

- B. The contractor will obtain benthic core borings from four locations within Pond #13 for the purpose of determining the extent of sediment to a depth of four feet below the top of the benthic layer. The exact location of the coring points will be determined by the contractor in consultation with the OSC. Each core will be sampled at one foot intervals, using Piston-Shelby tubes if possible. Samples are to be prepared for shipment in accordance with established EPA Samples Management Protocols (as per OSC's instructions on scene).
- C. The contractor will obtain 8 core borings from the leaching zone adjacent to Pond #13. Core borings will be installed at 25 Ft. intervals and will be cored to a depth of 25 feet. Composite soil sampled will be taken at 5 foot intervals and packaged according to EPA Samples Management Protocol (as per OSC's instructions on scene). Two of these 8 holes will be cased using 2" threaded PVC pipe. Length of well screen will be determined by the OSC. One water sample will be obtained from each of these wells.
- D. The contractor will obtain 2 sediment samples from each of Ponds 1 and 2 (Old Red Water Reservoir). Location of the sample points will be provided by the OSC. All samples will be packaged in accordance with established EPA Samples Management Protocols (as per OSC's instructions on scene).
- E. The contractor will obtain 3 soil samples from each of two locations in the burn area. Surface sample and a hand augered sample at 3 and 5 foot depths will be taken. A composite of the 3 samples with the individual samples will be prepared. Location of the

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III. Hazard Assessment Study (cont'd)

sampling points will be provided by the OSC. All samples will be packaged in accordance with established EPA Samples Management Protocols (as per OSC's instructions on scene).

- F. All soil brought to the ground surface from the drilling or pipe excavation program will be temporarily stored on site at a location to be designated by the OSC, covered with plastic and disposed of in a proper, approved manner.

Personnel Requirements

The contractor will maintain the following personnel skills mix throughout the project:

- 1) Field Project Leader (Civil Engineer)
- 2) Lead Geophysicist
- 3) Lead Geologist

Safety Requirements

The contractor will prepare and submit a comprehensive site safety plan which will address all site investigatory aspects of the project to the EPA Project Officer and the OSC for review and concurrence. Throughout the term of the contractor's activity at the site, the site safety plan will be completely in force. All individuals on scene during the investigation will be required to conform to the site safety plan. The EPA on scene coordinator, or his representative, will be designated as the Site Safety Officer and will have ultimate responsibility for implementation of the Site Safety Plan.

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Technical and Administrative Data Reporting

The contractor will be required to maintain accurate records of all activities that occur on the site. These records will be divided into those that are technical in nature and records that document administrative aspects of site investigation activities.

A. Technical Reporting Requirements will consist of:

1. Accurate core boring records including a reading of the cores by a professional geologist.
2. Accurate documentation of the ground piercing radar and magnetometer surveys.
3. Technical observations during the geophysical and hazard assessment surveys including a detailed discussion of all activities associated with process line excavations and removal with emphasis on metallurgical condition of the process line.
4. Meteorological conditions during each segment of the field investigations.

B. Administrative Reporting Requirements will consist of:

1. Accurate records of personnel and materials used for each tasking assignment.
2. A weekly status report documenting all contractor activities connected with onsite and offsite investigation activities. This includes a Project Costs to Date summary (personnel and equipment). This status report will also detail any contractor deviations from the tasking assignments and an explanation for the deviation.
3. A final contractor's report which documents all activities associated with the historical survey, geophysical survey, and hazard assessment survey. This report will include:
 - a) project costs to date (personnel and equipment)
 - b) technical observations of each phase of the investigation
 - c) A complete list of all contractor personnel who were on-site during the investigation
 - d) summary of contractor deviations from Scope of Work with explanation for the occurrence.

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Estimated Project Costs

<u>Task</u>	<u>Cost</u>
Historical Survey	\$ 2,500
Geophysical Survey (may include ground penetrating radar in addition to magnetometer survey)	\$ 7,000 to \$50,000 ¹
*Hazard Assessment Survey	
- pipeline excavations, removal and sampling of contents or manhole entry and sampling	\$ 5,000 - \$15,000 ²
- core boring and well installations at leaching zone adjacent to Pond #13	\$ 8,000
- core boring into sediment of Pond #13	\$ 1,000
- sediment samples at Ponds #1 and 2 (old Red Water Reservoir)	\$ 250
- soil samples, hand augered, burn area	\$ 250
- disposal of contaminated soil	\$ 2,000
Report Preparation (includes administrative and technical data summaries, site safety plan, and any chart/map preparation)	\$ 2,500
TOTAL ESTIMATED COST	\$28,500 - \$81,500
(plus 10% contingency)	\$ 2,850 8,150
TOTAL	\$31,350 - \$89,650

1. Cost will depend on degree of sophistication required to satisfactorily complete job.
2. Cost will depend on which alternative chosen.

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SCHEDULE OF DELIVERABLES (estimated)

Week 1 2 3 4 5 6 7 8 9 10 11 12

Historical Survey

Geophysical Survey

Hazard Assessment Survey

*core boring s

*pipelining excavation and removal

Report Preparation and Data Summaries

Submittal of Report for Project Officer Review

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