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U.S. ENVIRONMENTAL PROTECTION AGENCY  
TECHNICAL ENFORCEMENT SUPPORT  
AT  
HAZARDOUS WASTE SITES

FIELD SAMPLING AND LABORATORY ANALYSIS REPORT  
FOR OVERSIGHT OF  
GROUND WATER AND SURFACE WATER SAMPLING  
AT  
THERMAL REDUCTION COMPANY, INC.  
FERNDALE, WASHINGTON

Prepared for

U.S. Environmental Protection Agency  
Region 10  
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## 1.0 INTRODUCTION

### 1.1 PURPOSE AND SCOPE

Science Applications International Corporation Technology Services Company (SAIC/TSC) conducted a ground water and surface water sampling program at the Thermal Reduction Company, Inc. (TRC), in Ferndale, Washington for RCRA oversight under the U.S. Environmental Protection Agency (EPA) Technical Enforcement Support (TES) Contract. Thermal Reduction Company, Inc., through its contractor Harding Lawson Associates (HLA), collected ground water, surface water, lagoon water, and leachate samples in June 1990. TRC is currently conducting a RCRA Facility Investigation in response to a 3013 Resource Conservation and Recovery Act Investigation Order; 42 U.S.C. Section 6934 No. 1089-11-03-3013 Modification of Administrative Order.

This report addresses sample collection procedures utilized by HLA and compares and discusses the results of the physical and chemical analyses performed by HLA and the oversight split samples collected by SAIC/TSC field personnel.

### 1.2 SITE DESCRIPTION

The Thermal Reduction Company, Inc., is a commercial solid waste disposal company which operates a municipal waste incinerator and energy recovery facility. The TRC site is located in the city of Ferndale, Washington, within the SE/4, SW/4, Section 33, T39N, R2E, Whatcom County, Washington (Figure 1). Slater Road borders the site to the south, a Burlington Northern railroad track parallels the site along the west boundary, and LaBounty Road borders the site to the east. An access road to the Friese Hide and Tallow facility borders the site to the north. From 1974 to the present, the site has been used for the disposal of wastes including ash from the TRC incinerator.

The general topographic gradient across the TRC site slopes from an approximate elevation of 50 feet along the east to 20 feet along the west. A commercial landfill has been constructed on-site with two landfill cells

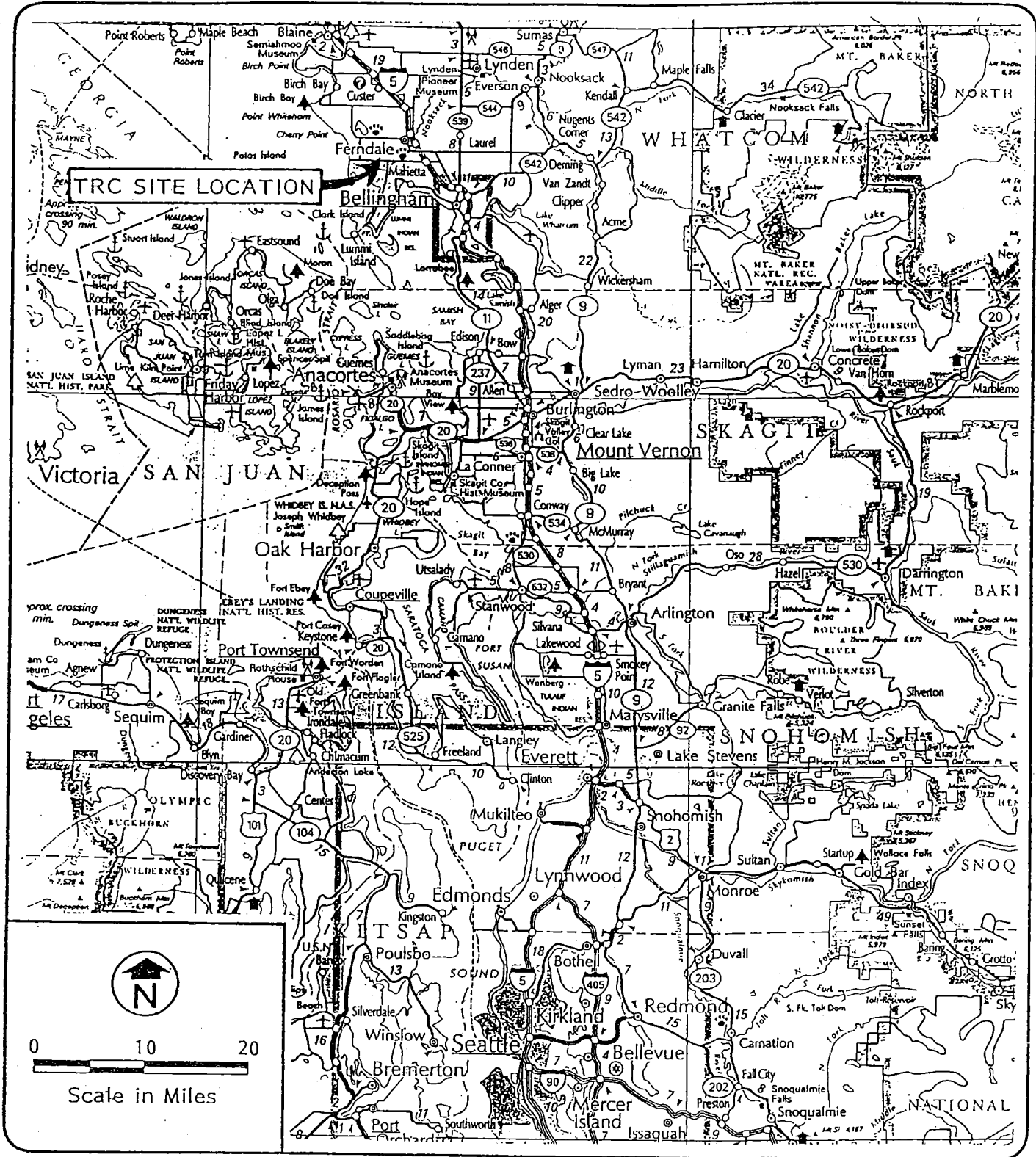


Figure 1

LOCATION MAP OF TRC SITE  
 FERNDALE, WASHINGTON

Source: Road Map, Washington State DOT, 1989.

covered with asphalt. The cell to the north is presently being used by the company, and the cell to the south is presently empty. The landfill design includes a leachate collection system that drains to the waste water treatment facility in Ferndale, Washington (see Photos A-3 and A-4).

## 2.0 SAMPLING ACTIVITIES

### 2.1 OVERVIEW

The primary objective of SAIC/TSC oversight program was to observe TRC field activities and to collect split samples and analyze samples for organic and inorganic parameters. HLA collected ground water from 10 on-site wells, leachate from the leachate collection system pond, surface water from two ditches, and surface water from the Claypit Pond. Analytical results from the TRC laboratory are compared in this report with results for samples collected by SAIC/TSC field personnel from MW-3, MW-9, MW-10, and SW-3 and submitted for analysis to the U.S. EPA Region 10 Laboratory in Manchester, Washington.

### 2.2 SAMPLING LOCATIONS

#### 2.2.1 Background

In June, 1987, SCS Engineers installed monitoring wells MW-1 and MW-3. The remaining wells were installed by Golder Associates in February and April 1988 (HLA, 1990). TRC's present contractor, Harding Lawson Associates, purged and collected samples from these wells as detailed in their Plans For Sample Collection, Analytical Methods and Quality Assurance, dated February 16, 1990 (HLA, 1990). SAIC/TSC collected split samples of ground water from wells MW-3, MW-9, and MW-10 (Figure 2) during the June 1990 sampling event. These wells were selected because they are located at the western edge of the TRC site immediately west and downgradient of the active landfill ash pile. Surface water sampling location SW-3 was selected because the surface water originating from the southern portion of the site and north of the site are conveyed via a 36-inch culvert beneath the railroad tracks into Claypit Pond.

#### 2.2.2 Ground Water and Surface Water Field Sampling

##### June 4, 1990

The HLA Project Manager was Mr. Tom Smayda and the engineering field assistant was Mr. Clane Jones. The SAIC Work Assignment Manager and field oversight manager was Mr. John Kane. Figure 2 shows ground water monitoring well and

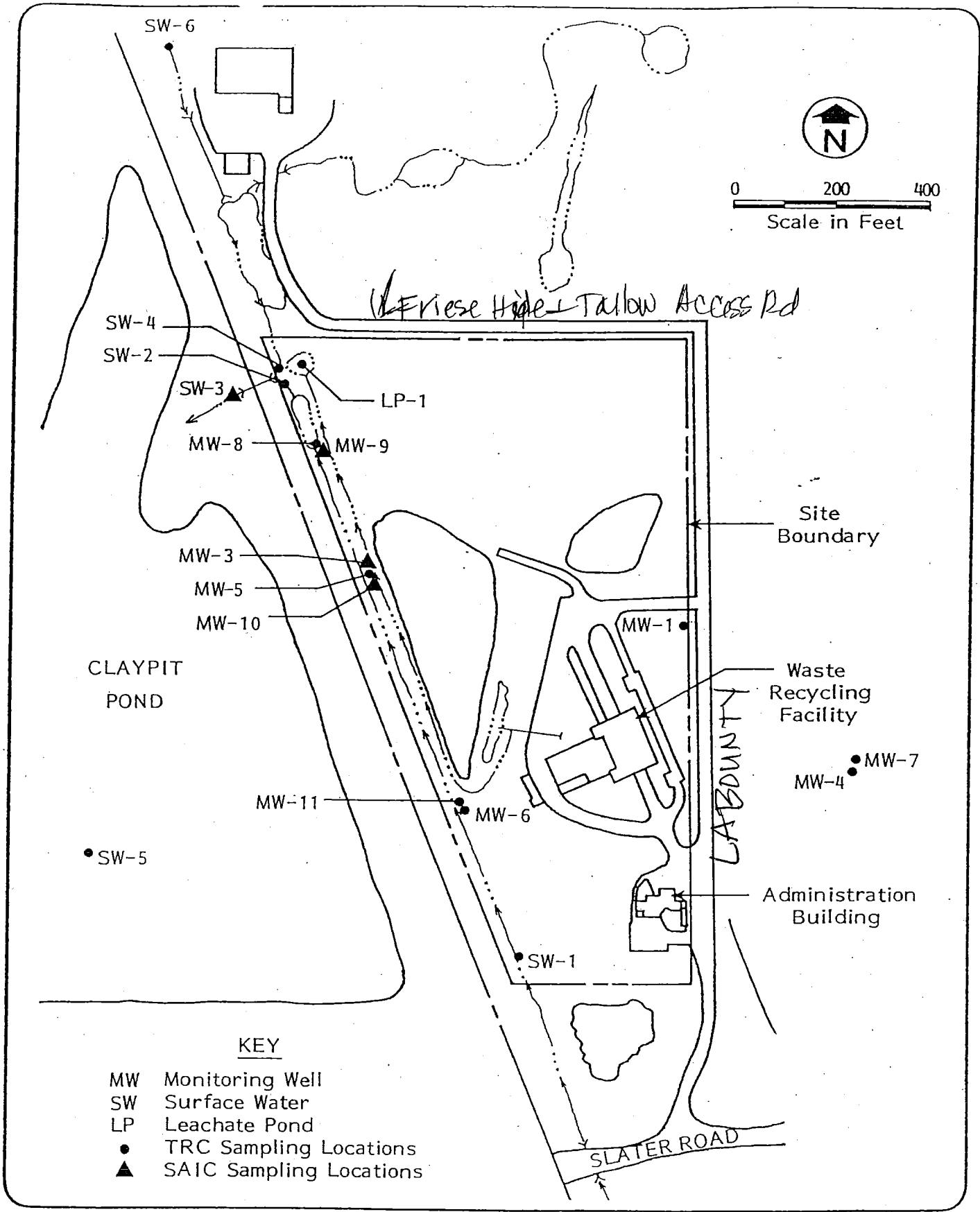


Figure 2

GROUND WATER AND SURFACE WATER SAMPLING LOCATIONS

surface water sampling locations. The sampling program began on June 4, 1990, checking for floating product with a translucent tube (Photos A-1 and A-2). None of the wells exhibited any visible floating product. Bailing of the ground water wells began in the afternoon of June 4, 1990. Ground water monitoring well MW-7 went dry after approximately 4 gallons of water was bailed from the well, MW-1 went dry at 12 gallons, and MW-3 went dry at 37 gallons. Slow recovery suggests very low permeability of subsurface soil for ground water recharge into the well.

#### June 5, 1990

Ground water sampling began on June 5, 1990. Total and dissolved ground water samples were collected at MW-1, MW-3, MW-7, MW-10 with filtering of ground water in the field (see Photos A-5 and A-6). Field sampling techniques were consistent with protocols in the SAP (HLA, 1990). The HLA field engineers cooperated with SAIG/TSC to provide EPA split samples. Mr. Glenn Bruck, EPA Region 10 Hydrogeologist, was on-site to observe ground water sampling at MW-1.

#### June 6, 1990

Ground water and surface water sampling continued on June 6, 1990 with Mr. Roy Jones from the EPA Region 10 QA/QC Office on-site to observe HLA sampling techniques. Ground water monitoring well MW-9 and surface water samples SW-2, SW-3 and 3D, and SW-4 were collected, with sampling at MW-9 and SW-3 observed by Mr. Jones and Mr. Kane. Mr. Jones stated that he approved the sampling technique used by HLA field personnel.

#### June 7, 1990

Sampling continued on June 7, 1990 with Mr. Tom Smayda requesting EPA to analyze a standard water sample containing a known concentration of cadmium, chromium, and lead. Mr. Smayda talked with Dennis Robinson of the Region 10 QA/QC Office in Seattle, and Mr. Robinson accepted the water sample and instructed SAIG field personnel to send the water sample to EPA Region 10 Manchester Laboratory as a QC sample and not representative of site conditions. This condition was accepted by Mr. Smayda and the sample was sent to the EPA Region 10 Laboratory in Manchester, Washington.



Another environmental engineer from HLA, Mr. Don Bachu, replaced Mr. Clane Jones in field sampling at TRC on this day. Ground water wells sampled included MW-4, MW-5, MW-6, MW-8, MW-11. Surface water samples included SW-1, SW-5, and SW-6; a leachate pond sample was also collected (Photos A-17 and A-21). An equipment blank was collected by pouring organic-free water into the bailer and then emptying the water from the bailer into a dedicated decontaminated glass jar (Photo A-14). The water was then poured through the filtering device into the sample jars, and submitted for analysis to TRC's environmental laboratory and EPA Region 10 Laboratory. Field sampling ended in the evening of June 7, 1990.

Pond water from Claypit Pond was collected by Mr. Smayda by taking a canoe into the middle of Claypit Pond, assisted by Mr. Roy Lundgren (TRC/RECOMP) and Mr. John Kane (SAIC). Mr. Smayda also determined the secchi depth (1.0 meter) in the middle of the pond (Photos A-10 and A-13).

All HLA sampling procedures and techniques followed the HLA Sampling and Analysis Plan (HLA, 1990).

### 3.0 SAMPLING RESULTS

#### 3.1 Volatile Organic Compounds

All of SAIC's VOC results were below detection limit except for trace amounts of acetone and 2-butanone due to laboratory contamination. HLA results were also below detection limit except for methylene chloride and acetone, with results either below or estimated below detection limit. One exception with HLA sampling results is an elevated concentration of acetone at SW-1 (18  $\mu\text{g/L}$ ; the detection limit is 5  $\mu\text{g/L}$ ). This analytical result is 3.6 times greater than the detection limit. The HLA laboratory detected acetone in a trip blank at 2.2  $\mu\text{g/L}$ . The HLA data validation report, dated October 11, 1990, states that "because acetone is a common lab contaminant, all sample results less than 10 times the Trip blank concentration (22  $\mu\text{g/L}$ ) were labeled as undetected (U)." This statement is consistent with the EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, February 1, 1988.

#### 3.2 Semi-Volatile Organic Compounds

HLA's semi-volatile compound results were below the detection limit except for bis (2-ethylhexyl) phthalate in samples from MW-1 (10  $\mu\text{g/L}$ ) and MW-4 (11  $\mu\text{g/L}$ ). This compound is a common laboratory contaminant. SAIC's semi-volatile compound results were also below the detection limit except for bis (2-ethylhexyl) phthalate at MW-9 (2  $\mu\text{g/L}$ , laboratory contaminant). The EPA Region 10 Laboratory tentatively identified two compounds (TIC) from samples collected at MW-9; the tetraethyl ester of diphosphoric acid and 1,4,5,6,7,7'-hexachlorobicyclo [2.2.1]-hept-5-ene-2,3-dicarboxylic acid. SAIC conducted a literature search to identify the compound and according to the Merck Index, an Encyclopedia of Chemicals and Drugs, the compound is a synonym for Chlorendic Acid (Merck & Co., 1976). Chlorendic acid is used in manufacturing resins and plasticizers that retard flame; used in the synthesis of other organic chemicals; and used as an additive in certain petroleum products (Kehoe, 1965). Chlorendic acid is mainly soluble in solvents, such as benzene and toluene, and solvents were not found any of the ground water samples. When given orally as aqueous suspensions to rats, the  $\text{LD}_{50}$  of chlorendic acid was  $2.79 \pm 0.35$  grams/kilogram (Kehoe, 1965). A more recent study determined that the  $\text{LD}_{50}$  in

rats and mice by ingestion of 2300 and 2400 mg/kg caused no toxic reaction, and the median lethal concentration for inhalation was 1000 mg/cu m (Rumack, 1990). The compound detected in MW-9 was found at much lower concentrations than the toxic level determined by ingestion or inhalation by the laboratory animals.

### 3.3 Total and Dissolved Metals

There were no exceedances of primary inorganic maximum contaminant limits (MCL) in both HLA and SAIC ground water and surface water samples. However, there were exceedances of secondary MCL standards for total iron at MW-9, MW-10, and SW-3 from HLA and SAIC samples and total manganese at MW-3, MW-9, MW-10 and SW-3 from HLA and SAIC samples (Appendix B, Tables 1 & 2). Secondary MCL standards for dissolved iron were exceeded at SW-3 for HLA sample (334 µg/L) but not the SAIC sample (248 µg/L). Secondary MCL standards for dissolved manganese were exceeded at MW-3, MW-9, MW-10, and SW-3 for HLA and SAIC samples.

There were five additional inorganic analytes analyzed by the EPA Region 10 Laboratory that were not analyzed by HLA: aluminum, antimony, beryllium, thallium, and vanadium. Results of these analytes were either below detection limits or at low concentrations.

### 3.4 Pesticides/PCBs and Herbicides

There were no detected pesticides/PCBs and herbicides from the SAIC and HLA ground water and surface water samples. The equipment blank sample collected by SAIC contained enough water to run the pesticide/PCB analysis, but insufficient sample for analysis of herbicides. The HLA equipment blank sample had no detection of herbicides, which is consistent with all the ground water samples and surface water samples collected by HLA and the split samples collected by SAIC.

### 3.5 General Chemistry

Secondary MCL standards for alkalinity were exceeded at MW-9 and MW-10 for HLA and SAIC samples (Appendix B, Table 3). Secondary MCL standards for chloride were exceeded at MW-3, MW-9, MW-10, and SW-3, and for sulfate at MW-9 for HLA and SAIC samples. Cyanide was detected at MW-9 by HLA (0.014 mg/L) and SAIC (0.002 mg/L), by HLA at MW-10 (0.031 mg/L) and SAIC duplicate sample MW-10A (0.002 mg/L), and by HLA at SW-3 (0.102 mg/L). The SAIC cyanide results had the

"J" qualifier which is defined as "the compound is above instrument detection limit but below the contract required detection limit."

### 3.6 Quality Assurance/Quality Control

HLA and SAIC followed their required project QA plan procedures for collecting samples, collecting an equipment field blank, utilizing custody seals, and completing chain of custody forms. The HLA and SAIC data validation reports included acceptable results for all QA/QC procedures for this sampling event.

### 3.7 EPA Region 10 Laboratory Results of HLA Blind Sample Results

The analytical results of the blind sample submitted to EPA Region 10 Laboratory are as follows:

Total Cadmium	9.62 $\mu\text{g/L}$
Total Chromium	27.00 $\mu\text{g/L}$
Total Lead	undetected (detection limit 60 $\mu\text{g/L}$ )

#### 4.0 REFERENCES

- Harding Lawson Associates/Harper-Owes. 1990. Plans For Sample Collection, Analytical Methods and Quality Assurance. February 16, 1990.
- Kehoe, Robert A., M.D. 1965. The Toxicity of Chlorendic Acid and Chlorendic Anhydride. The Kettering Laboratory, University of Cincinnati, Cincinnati, Ohio. June 25, 1965.
- Merck & Co., Inc. 1976. The Merck Index, An Encyclopedia of Chemicals and Drugs, Ninth Edition, Martha Windholz, Editor, Rahway, New Jersey, 1976.
- Rumack B.H. and Spoerke D.G. 1990. Poisindex(R) Information System. Denver, CO. November, 1990.
- USEPA Data Review Work Group. 1988. Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses. Washington, D.C. February 1, 1988.

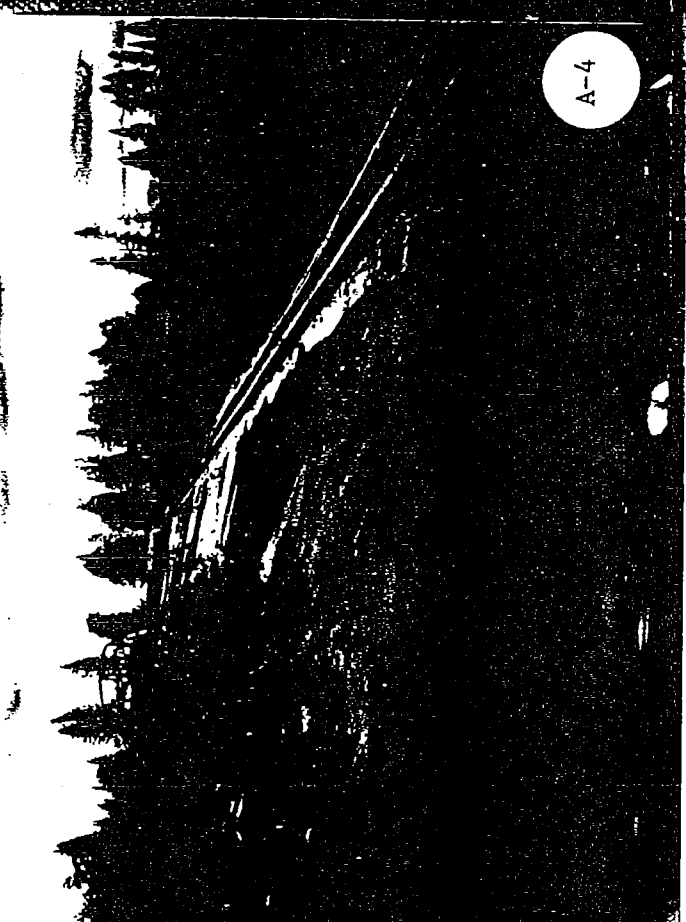
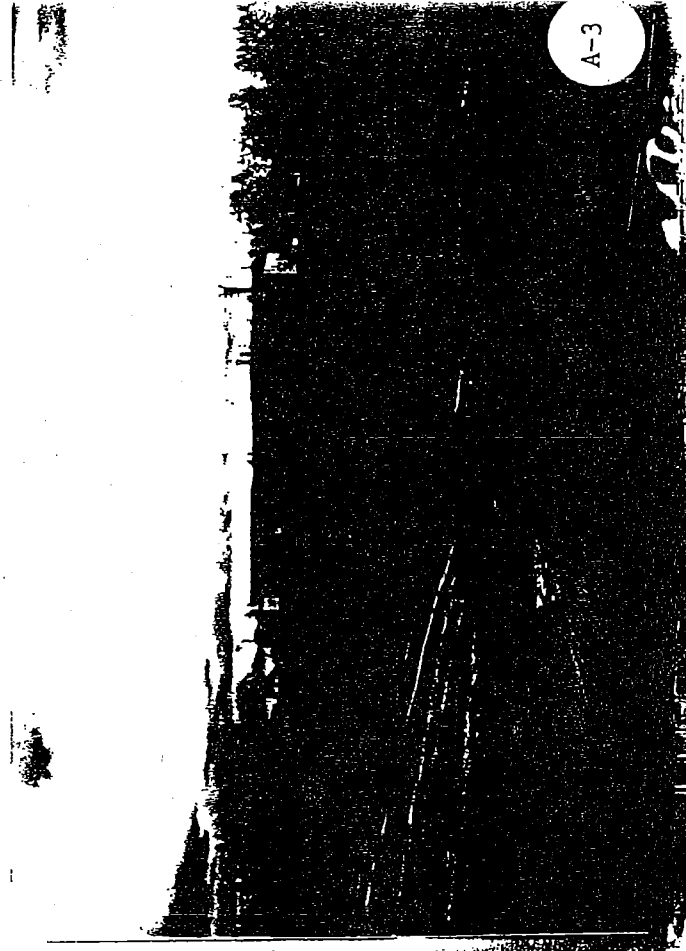
**APPENDIX A**

**Photographs**

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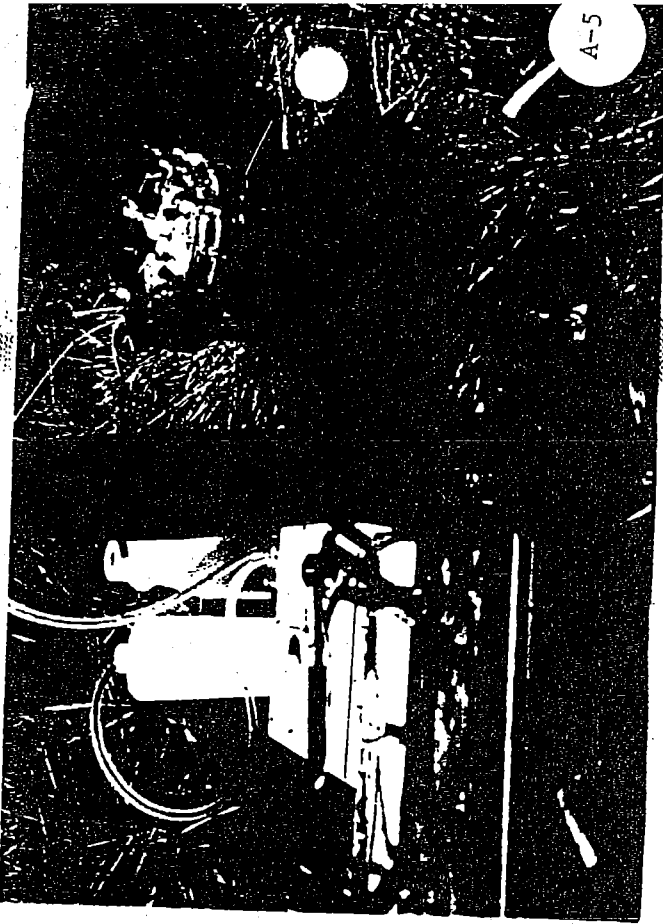
PHOTOLOG

- A-1 Translucent tube to check for floating product at MW-11
- A-2 Close-up shot checking for floating product
- A-3 Looking south toward plant with asphalt cover on waste cells and water draining into the leachate collection system
- A-4 Southwest culvert for leachate collection system
- A-5 Collecting filtered ground water samples at MW-7 for hexavalent chromium and dissolved metals
- A-6 Sampling equipment for filtered ground water samples
- A-7 Sampling at MW-1 for VOCs; Tom Smayda (HLA) collecting samples and Clane Jones (HLA) pouring ground water sample from bailer
- A-8 Herbicide spraying notice on speed limit sign west of I-5 exit near TRC entrance
- A-9 Close-up shot of herbicide spraying notice
- A-10 Determining secchi depth in canoe in Claypit Pond with Tom Smayda (HLA), Roy Lundgren (TRC/RECOMP), and John Kane (SAIC)
- A-11 Determining secchi depth
- A-12 Claypit Pond looking east
- A-13 Claypit Pond looking west
- A-14 Don Bachu (HLA) pouring organic-free water through bailer and through filtering equipment for equipment blank sample
- A-15 Tom Smayda (HLA) collecting surface water sample at SW-6
- A-16 Photo taken downstream from SW-6
- A-17 Tom Smayda (HLA) collecting leachate sample from leachate collection system outfall
- A-18 Photo of outfall at TRC leachate collection system
- A-19 Blackberry bushes possibly killed by herbicides applied by County Location on road north of site, near tannery
- A-20 TRC site looking south with leachate collection cell to the right and white canvas over ash waste
- A-21 Tom Smayda (HLA) collecting leachate sample from leachate system outfall

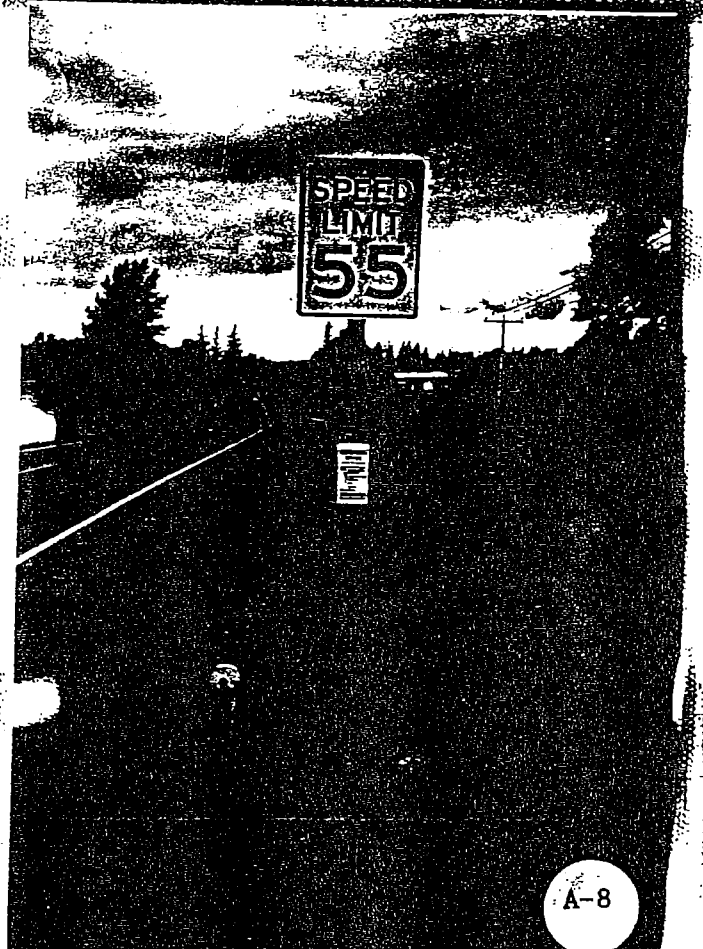
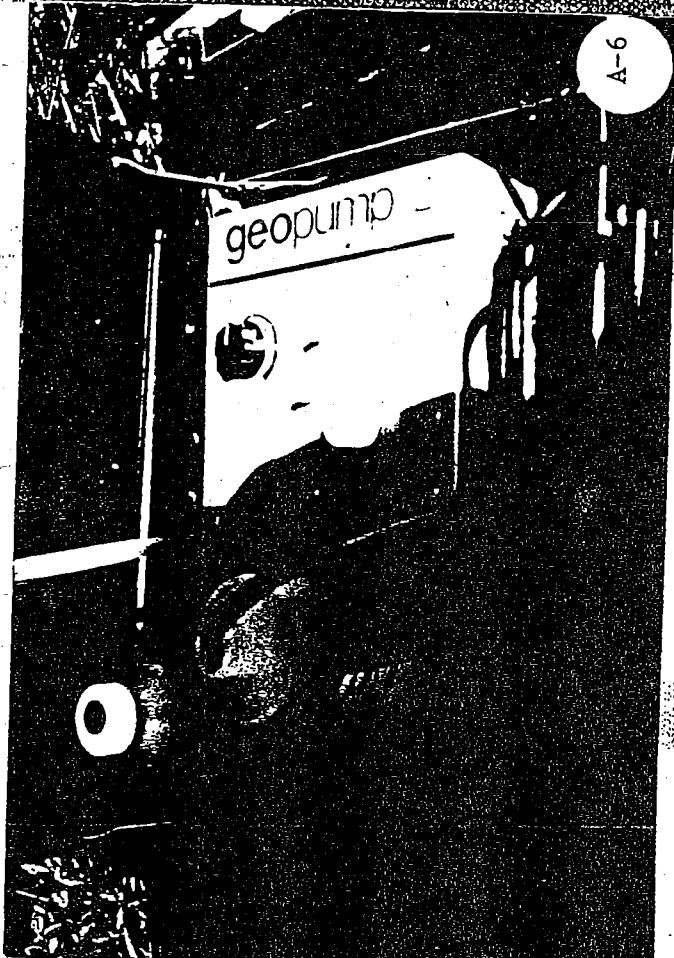


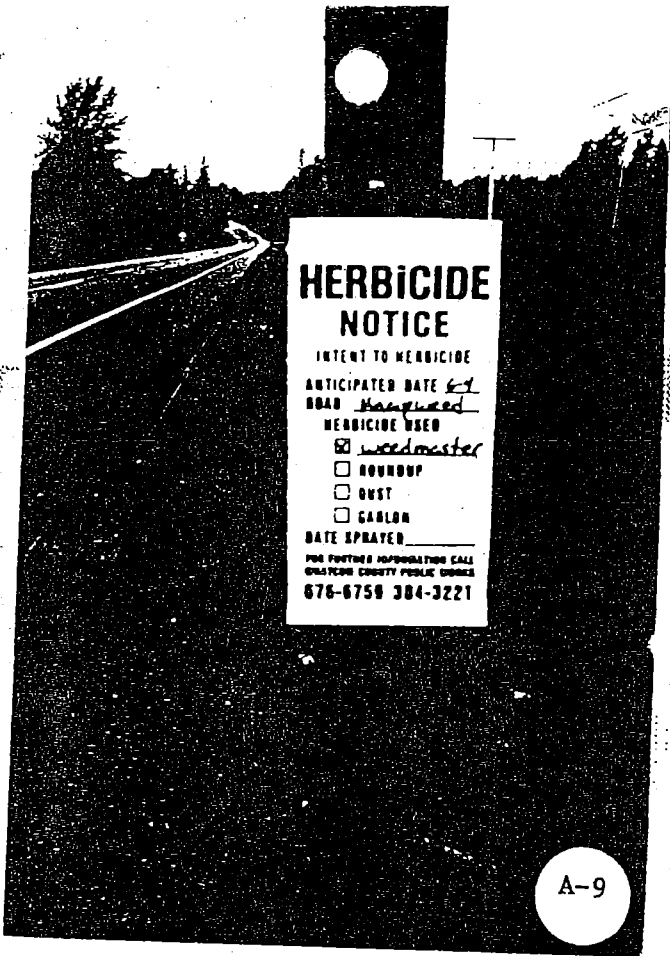
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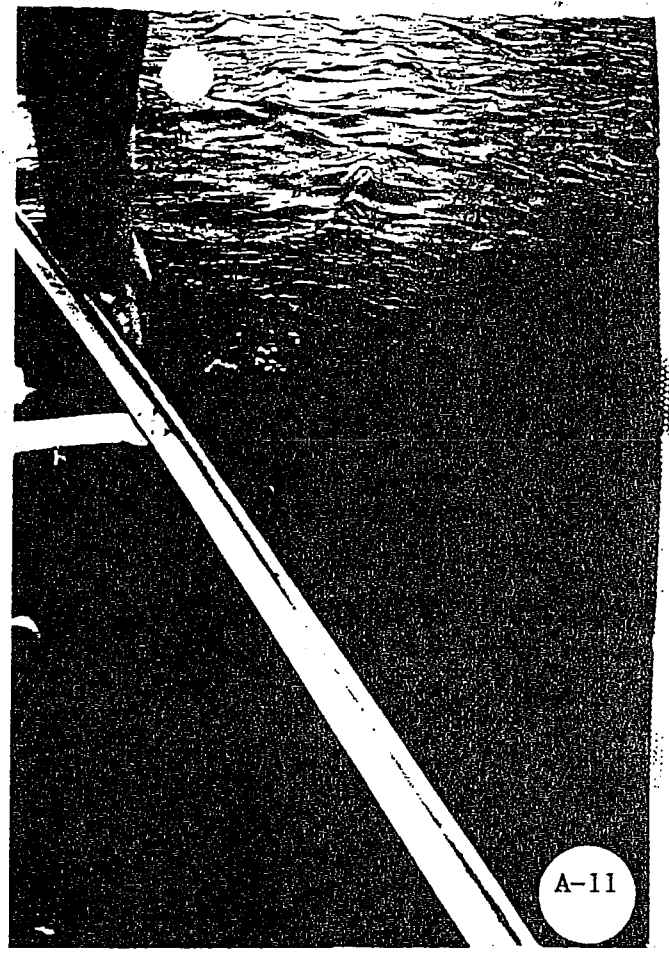


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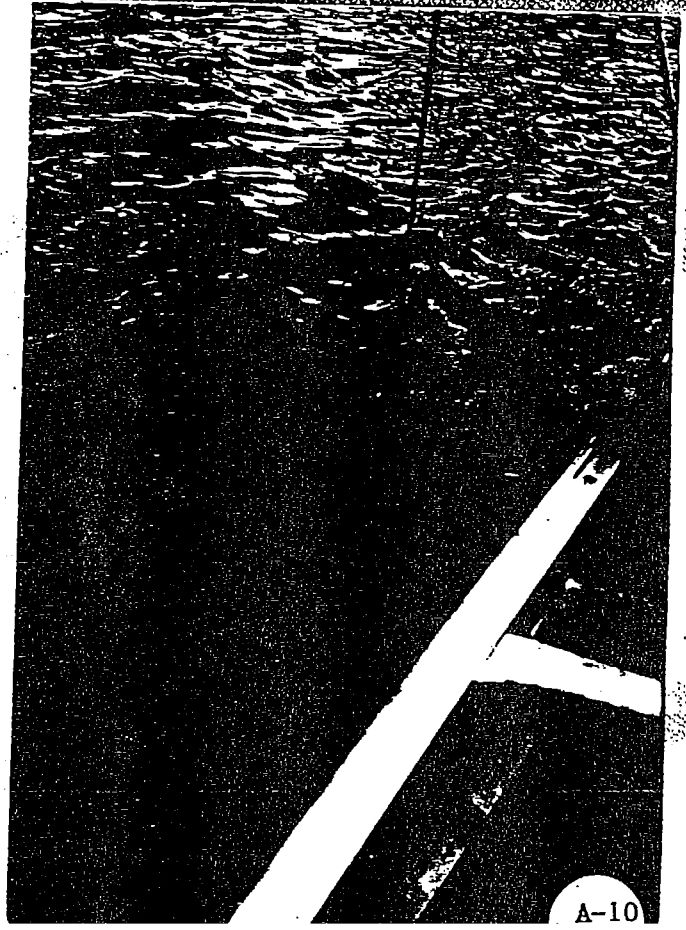




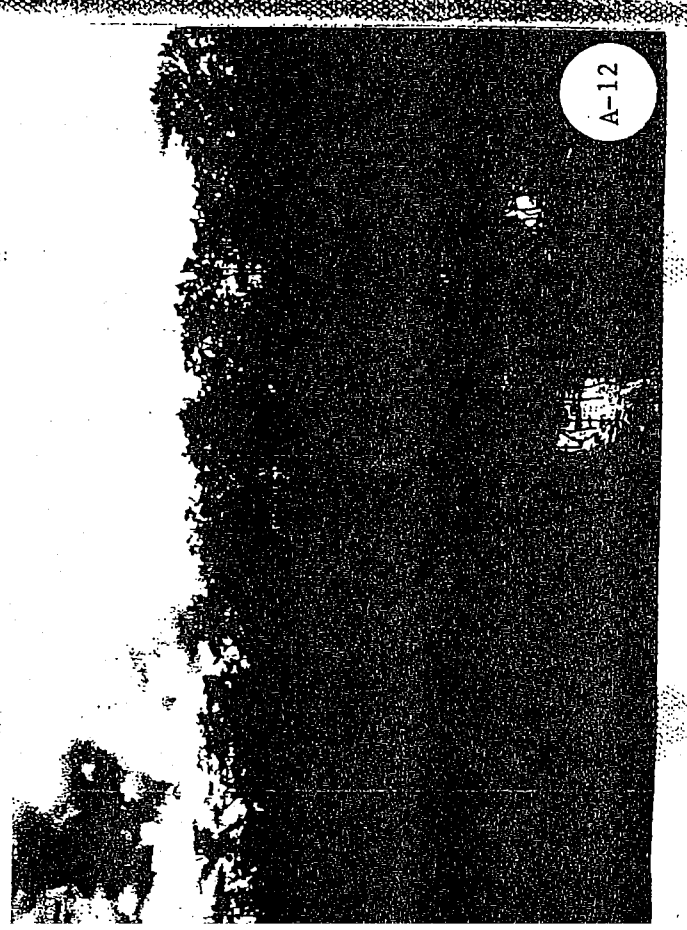
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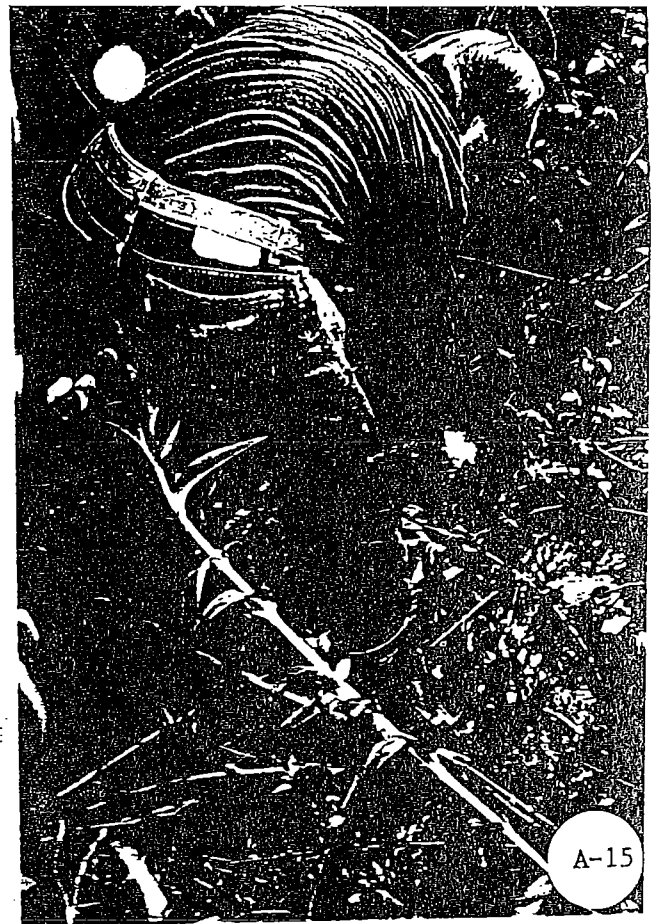
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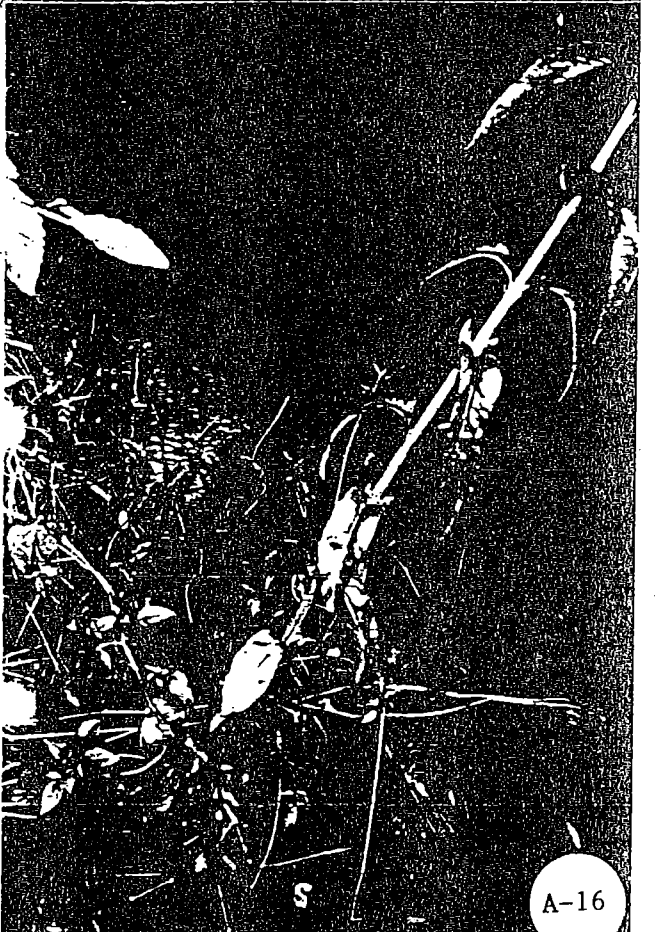
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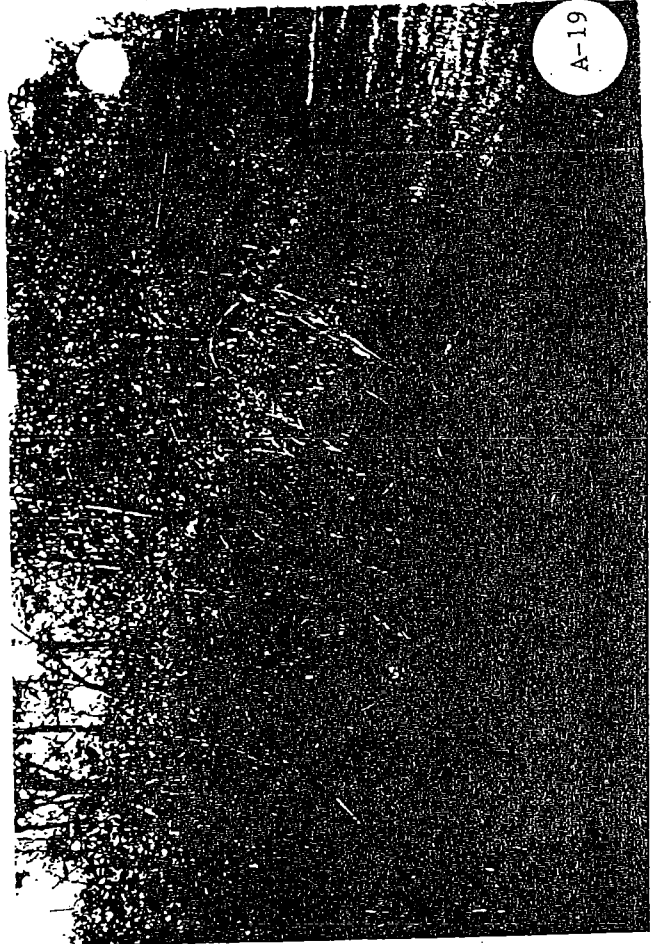
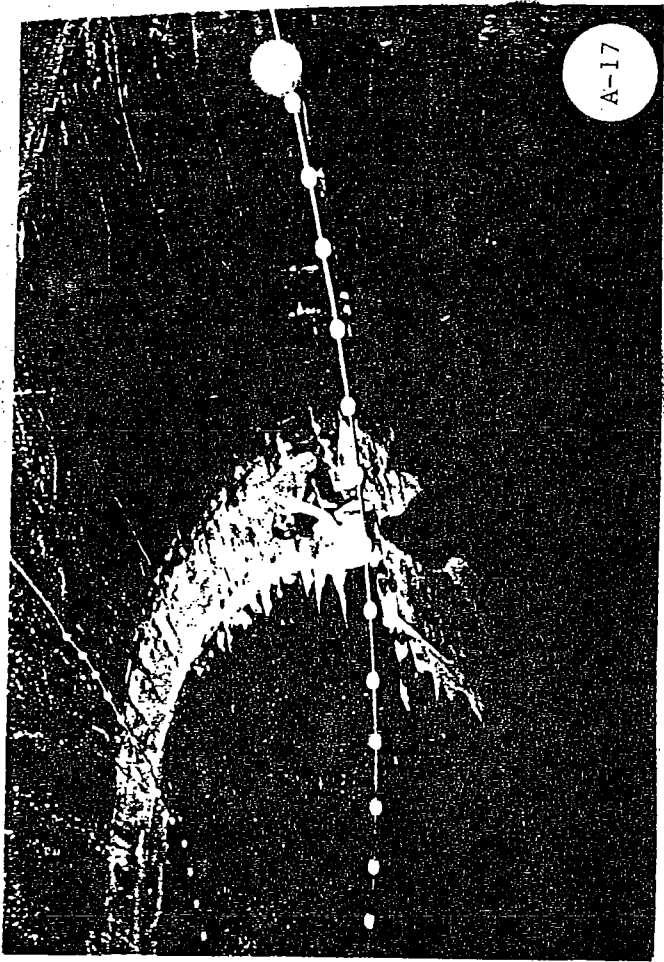
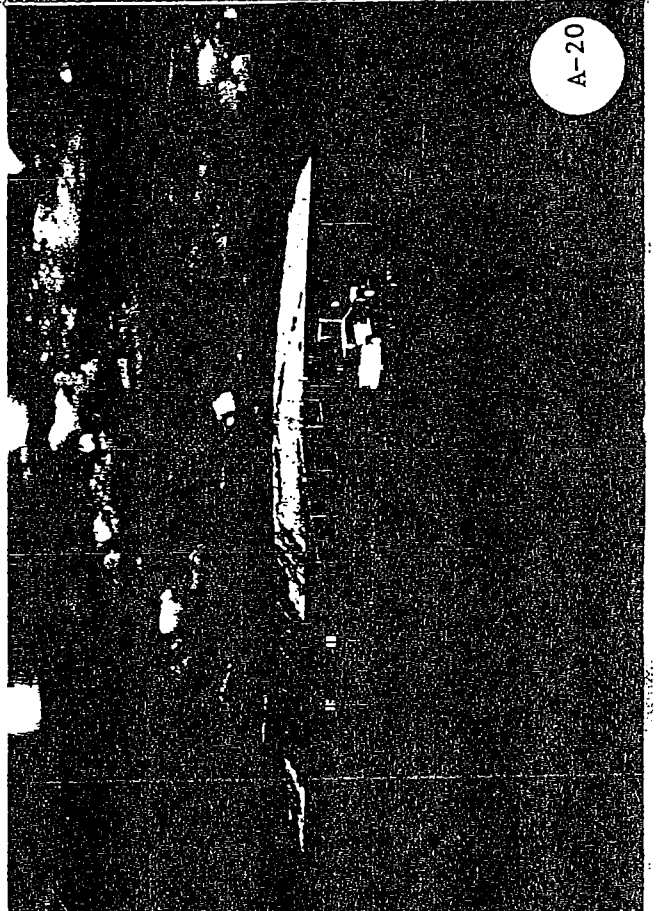
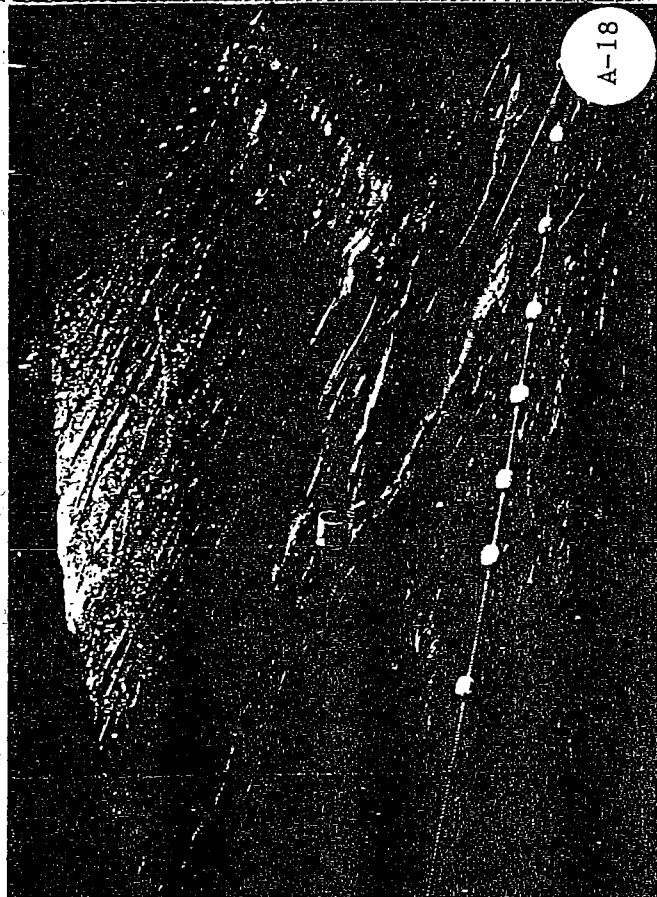
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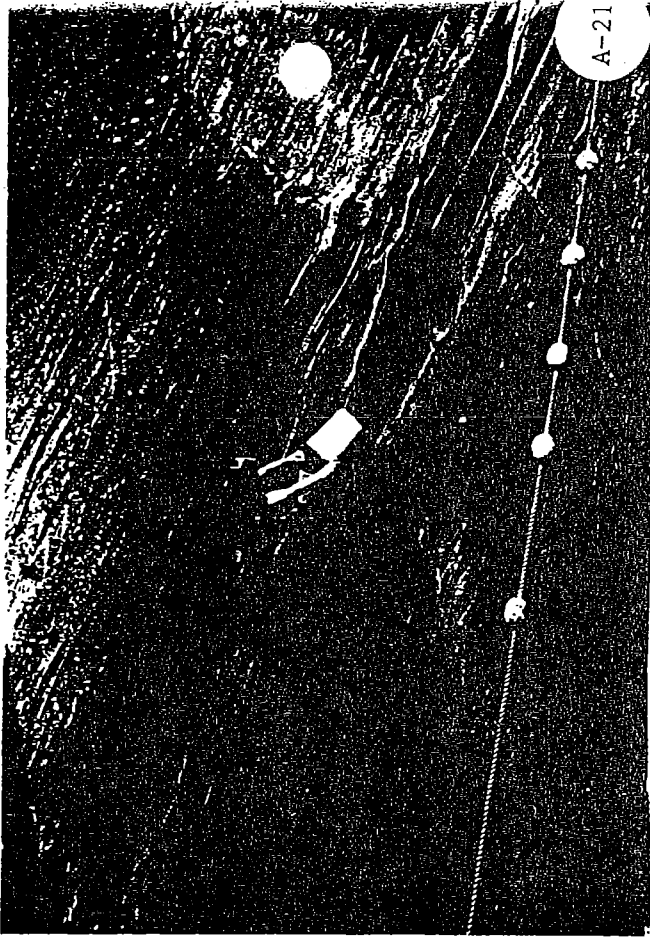


C-LINE #52581  
35MM PRINTS



C-LINE #52584  
36MM PRINTS





A-21

C-LINE #52584  
35MM PRINTS

APPENDIX B

Tabulated Data of SAIC and HLA Laboratory Results

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TABLE 1  
THERMAL REDUCTION COMPANY  
TOTAL METALS (ug/L)

Sampling dates:	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	HLA Detection Limits	SAIC Detection Limits
Sampling Team:	HLA	SAIC	HLA	SAIC	HLA	SAIC	SAIC	HLA	SAIC		
Sample Number:		90234595		90234601		90234597	90234598		90234603		
Well Name:	MW-3	MW-3	MW-9	MW-9	MW-10	MW-10	MW-10A	SW-3	SW-3		
Aluminum	na	231	na	3570	na	14600	11300	na	na	na	10
Antimony	na	-	na	-	na	-	-	na	na	na	200
Arsenic	15.2	-	1.5 B	-	-	-	-	na	na	1	100
Barium	65.1 B	61.9	111 B	205	123 B	174	125	37 B	41.8	1	1
Beryllium	na	-	na	-	na	-	-	na	na	na	2
Cadmium	-	-	0.7 B	0.7	0.4 B	0.6	0.4 J	-	-	0.1	0.1
Calcium	53400	68500	233000	290000	126000	163000	96000	21500	25600	10	5000
Chromium	-	-	-	5	-	15 J	11 J	-	-	3	5
Chromium (hexavalent)	-	-	-	-	-	-	-	-	-	10	5
Cobalt	-	-	na	-	na	-	-	-	-	10	5
Copper	10.4 B	-	8.5 B	5 J	19.9 B	33	24	12.8 B	6.8 J	na	15
Cyanide	-	-	14	2 J	31	-	-	-	-	2	2
Iron	139 E	157	367 E	10200	2320 E	26600	20400	1190 E	3420	10	0.002
Lead	1.2 B	-	8	-	8	-	-	3.3	-	-22.6	2
Magnesium	61000	69100	277000	293000	141000	158000	94.9	9760	10700	1	60
Manganese	77	64.3	928	907	151	315	235	199	200	50	2000
Mercury	-	-	-	-	-	-	-	-	-	1	1
Nickel	-	-	25.7 B	-	-	54 J	-	-	-	0.2	0.02
Potassium	31700	29100	4270 B	8730	6380	12000	7390	1340 B	2840	10	40
Selenium	-	-	-	-	-	-	-	-	-	700	300
Silver	-	-	-	-	-	-	-	-	-	2	200
Sodium	157000	1300000	398000	348000	602000	516000	319000	219000	187000	2	3
Thallium	na	-	na	-	na	-	-	na	na	60	15
Vanadium	na	-	-	-	-	-	-	na	na	na	250
Zinc	10 B	16 J	14.8 B	34.5	38	89.2	67.8	17.3 B	25.8 J	na	4
										2	5

- = Below Method Detection Limit

na = Not Analyzed

HLA Qualifiers:

B = compound above instrument detection limit but below contract required limit

E = matrix interference, estimated value

SAIC Qualifiers:

J = compound above instrument detection limit but below contract required detection limit

N = matrix spike recovery did not meet requirements (75%-125%)

TABLE 2  
THERMAL REDUCTION COMPANY  
DISSOLVED METALS (ug/L)

Sampling dates:	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	HLA Detection Limits	SAIC Detection Limits
Sampling Team:	HLA	SAIC	HLA	SAIC	HLA	SAIC	SAIC	HLA	SAIC			
Sample Number:		90234595		90234601		90234597	90234598		90234603			
Well Name:	MW-3	MW-3	MW-9	MW-9	MW-10	MW-10	MW-10A	SW-3	SW-3			
Aluminum	na	110	na	326	na	207	205	na	na	na	10	
Antimony	na	-	na	-	na	-	-	na	na	na	200	
Arsenic	na	-	na	-	na	-	-	na	na	na	100	
Barium	76 B	72	141 B	118	106 B	83.8	94.3	105 B	33.4	1	1	
Beryllium	na	-	na	-	na	-	-	na	na	na	2	
Cadmium	-	-	0.8 B	0.7	0.3 B	0.2 J	0.3 J	0.2 B	-	0.1	0.1	
Calcium	na	67500	na	320000	na	158000	158000	na	na	10	5000	
Chromium	-	-	-	-	-	-	-	5.2 B	-	3	5	
Chromium (hexavalent)	-	-	-	-	-	-	-	-	na	10	5	
Cobalt	na	-	na	-	na	-	-	na	na	10	5	
Copper	3.0 B	-	-	-	-	-	-	na	na	na	15	
Iron	13.7 B	25 J	53.3 B	7 J	58.8 B	61.6	34.8	8.2 B	3.7 J	2	2	
Lead	-	-	2 B	-	-	-	-	334	248	-22.6	2	
Magnesium	na	70800	na	320000	na	156000	154000	na	na	1	60	
Manganese	65.2	64	910	868	120	119	112	155	149	50	2000	
Mercury	-	-	-	-	-	-	-	-	-	1	1	
Nickel	-	-	10.4 B	-	-	-	-	-	-	0.2	0.02	
Potassium	na	29400	na	8290	na	9700	9420	na	na	10	40	
Selenium	na	-	na	-	na	-	-	na	na	700	300	
Silver	na	-	na	-	na	-	-	na	na	2	200	
Sodium	na	1300000	na	361000	na	532000	519000	na	na	2	3	
Thallium	na	-	na	-	na	-	-	na	na	60	15	
Vanadium	na	4.5 JN	na	-	na	-	-	na	na	na	250	
Zinc	3.1 B	8.8 J	17.3 B	22 J	11.8 B	7.3 J	16 J	16.5 B	20 J	2	5	

- = Below Method Detection Limit

na = Not Analyzed

HLA Qualifiers:

B = compound above instrument detection limit but below contract required detection limit

I = matrix interference, estimated value

SAIC Qualifiers:

J = compound above instrument detection limit but below contract required detection limit

N = matrix spike recovery did not meet requirements (75%-125%)



TABLE 3  
THERMAL REDUCTION COMPANY  
GENERAL CHEMISTRY (mg/L)

Sampling Dates:	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	June 1990	Detection Limits	Secondary MCLs
Sampling Team:	HLA	SAIC	HLA	SAIC	HLA	SAIC	SAIC	HLA	SAIC	HLA	SAIC
Well Name:	MW-3	MW-3	MW-9	MW-9	MW-10	MW-10	MW-10A	HLA SW-3	SAIC SW-3		
Alkalinity	131	134	409	412	390	383	382	73	73		
Chloride	2600	2764	1440	1498	1190	1264	1259	336	343		250
Sulfate	129	117	323	320	155	115	111	85	30.1		250
Chemical Oxygen Demand	12.9	38.8	20.2	41.2	21.5	48.6	45.4	26.7	36.9		250
Total Suspended Solids	10.2	10.8	304	220	944	900	920	52.5	29		
Nitrate + Nitrite (mg/L as N)	-	0.025	0.022	0.16	0.03	0.085	0.12	0.691	0.86		10
Ammonia (mg/L as N)	1.83	1.71	0.069	0.018	0.141	0.051	0.043	0.343	0.2		2.1
Cyanide	-	-	0.014	0.002 J	0.031	-	0.002 J	0.102	na	0.01	0.002

- = Analyte Below Indicated Detection Limit

na = not analyzed

SAIC Qualifiers:

J = compound above instrument detection limit but  
below contract required detection limit