INTERIM REMEDIAL MEASURE CORRECTIVE ACTION REPORT FOR FORMER LANDFILL 2 (SWMU 2) ELF ATOCHEM NORTH AMERICA, INC. WEST BRINE FIELD RIVERVIEW, MICHIGAN

Prepared for

ELF ATOCHEM NORTH AMERICA, INC.
Riverview, Michigan

October 1995

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Work Order No. 10096-003-001

VIA FACSIMILE AND
CERTIFIED MAIL

Ms. Nancy M. Cosmos
Senior Environmental Engineer
Elf Atochem North America, Inc.
2000 Market Street
Philadelphia, PA 19103-3222

RE: Elf Atochem North America, Inc.
West Brine Field
Riverview, Michigan
MID 005 363 114
RCRA Corrective Action Interim Measures Work Plan for Former Landfill 2 (SWMU 2) Drum Removal

Dear Ms. Cosmos:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the RCRA Corrective Action Interim Measures Work Plan for Former Landfill 2 (SWMU 2) Drum Removal, July 1994, Weston, ("the SWMU 2 Work Plan"). By this letter, U.S. EPA approves the SWMU 2 Work Plan in its entirety.

The approach considered in the SWMU 2 Work Plan for pre-excavation investigatory geophysical surveys, soil excavation and drum removal, waste transportation and disposal, sampling, and site restoration activities is thorough and well designed. Atochem and Weston have done a very good job in planning this particular interim measure.

As we discussed in several telephone conversations during the past three weeks, I am looking forward to meeting you on Thursday, September 1 in Riverview to oversee field activities at the West Brine Field SWMU 2, as well as at the East Plant Ponds No. 1 and No. 2, which are also scheduled to undergo interim removal measures.

Atochem's desire to expeditiously conduct the above-mentioned site activities is appreciated by this Agency. Also, your letter to me dated July 25, 1994, regarding further investigation at the East Plant Halowax Area is still under review; this review should be completed during the week of August 22.

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EXECUTIVE SUMMARY

This report presents the results of the remedial activities conducted by Roy F. Weston, Inc. (WESTON®) at the Elf Atochem North America, Inc. (ATOCHEM) Riverview, Michigan facility, West Brine Field SWMU 2. ATOCHEM is currently undergoing a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Riverview West Brine Field and West Plant under Consent Order (V-W-89R-45) with the United States Environmental Protection Agency (EPA). The removal of the contents from Solid Waste Management Unit 2 (SWMU 2) was not required by the Consent Order, but instead was a related action by ATOCHEM. Remedial activities were conducted during the period from 6 February through 23 June 1995.

The objectives of the remedial activities were to excavate and remove the wastes buried in the former disposal area known as SWMU 2 and to backfill the area with clean soil. The work was to be performed in accordance with the EPA-approved RCRA Corrective Action Interim Measures Work Plan for Former Landfill 2 (WESTON, July 1994).

During the late-1960s to early-1970s, it is believed that 55-gallon drums were buried in a trench in SWMU 2. The drums were believed to contain amylphenol still bottom residues and nonspecific Vultacs (tert-amylphenol disulfides), which are compounds that were produced at the former Pennwalt Riverview Plant during that time period. The drums were placed in the trench and covered with soil. The area was covered with grass, and there was no indication that a trench was present at the start of the remedial activities.

As required by the Work Plan, a pre-excavation investigation was performed to determine the physical limits of the trench, verify the presence of drums and analyze samples of the soil gas and surface soils. The RFI Corrective Action Interim Investigation Report for Former Landfill 2 (SWMU 2) (WESTON January 1995) presents the specific details of this pre-excavation investigation.

ATOCHEM retained WESTON to perform the remedial activities at SWMU 2 and Conestoga-Rovers & Associates (CRA) to oversee construction activities. Mobilization began on 6 February 1995 with the delivery of the site office trailers and the erection of a temporary structure to cover the excavation area. The temporary structure was fitted with a negative air carbon filtration system to control potential emissions. Once the mobilization was completed, ATOCHEM hosted a three-day open house presentation for ATOCHEM officials, regulatory agencies, local authorities, ATOCHEM employees, local residents and the media. The open house was conducted between 23 and 25 February 1995 as a part of a community relations plan that had began six months earlier and ran through to the project completion.

Digging of test pits began on 28 February 1995. Four pits were excavated along the length of the trench with the purpose of determining the depth to wastes, acquiring samples, and assessing the condition of the drums. The test pits revealed that intact drums were present in all areas, and the analytical data showed the presence of some hazardous waste.

After reviewing the test pit data, it was determined that the entire project excavation would be a drum removal and overpacking effort performed in level B personal protective equipment (PPE) (Supplied Air). All of the drums would be overpacked, sampled, labeled, inventoried, characterized by waste stream type, and disposed of according to regulatory requirements. Prior to full-scale excavation, geoprobe sampling of the overburden soils was conducted to help determine the overburden soils' final disposition. The analytical data showed that overburden could be utilized for clean backfill.

On 21 March 1995, the overburden removal to 4 feet below ground surface (bgs) was started in preparation for drum removal. Full-scale drum excavation and removal began on 24 March 1995. The drums were found at a depth between 5 feet and 11 feet bgs throughout the entire length of the trench, which was approximately 560 feet. The width of the trench varied from 6 to 12 feet.

The first 30 drums removed were sampled and analyzed to determine the characteristics of each waste stream. After this initial sampling regimen, every drum was sampled, but only every 10th

drum was anticipated to be analyzed, due to the consistency of the physical characteristics of each waste stream. There were the following six basic types of wastes, characterized by physical appearance:

- Dry, brown, granular powder.
- Thick & thin, black, tar-like material.
- Red/Brown, liquid material.
- White, granular, paste material.
- Light brown, watery fluid.
- Solid, black, glassy material.

The drum removal activities continued until 2 May 1995, when the end of the trench was reached. A total of 895 drums were removed, sampled, and labeled. Each drum was numbered, and a drum profile form was completed to log the contents. The drums were then stored in the West Brine Field within a secondary containment area constructed of 30-mil HDPE geomembrane liner, wood, and crushed stone. During the excavation activities, the soil surrounding the drums was removed, loaded into rolloff boxes, and sampled to determine the final disposition. A total of 1,942 tons of soil was removed from around the drums.

Once the limits of the trench had been attained during the excavation of the drums, the sidewalls and floor of the trench were sampled and analyzed to determine the extent of contamination, if any, in the surrounding soils. A sample of each trench wall was taken every 45 feet and of the trench floor every 60 feet. A total of 33 current condition soil samples was taken and analyzed. The analytical data from these samples show that all analyte concentrations are either below background or the Michigan DNR Residential Clean-up Criteria. This means all waste materials have been removed from the area and the project acheived clean closure in accordance with MDNR closure standards.

The trench was backfilled whenever the working limits within the temporary structure had been reached and all sampling was completed. The sequence of tasks prior to each backfilling cycle were: drum excavation would be halted; the overpacked drums would be sealed and moved to

the storage area; backfilling of the open excavation would be performed and the building would be moved to the next portion of the trench. At the completion of all the drum removal activities, the disturbed areas were regraded, topsoil applied, and reseeded with grass.

The disposal of all of the waste streams generated during this remedial project was arranged by CRA and reviewed and approved by ATOCHEM. Non-hazardous, solid wastes were disposed of at the BFI Arbor Hills Landfill in Northville, Michigan, and the liquid and/or hazardous wastes were sent to Michigan Recovery Services, Inc. in Romulus, Michigan, as well as Envotech Management Services, Inc. in Bellville, Michigan.

The last loads of waste materials were shipped on 22 June 1995, and the final demobilization was completed on 23 June 1995. All the analytical data, drum logs, current condition data, manifests and restoration data are provided in Appendices A through E of this report.

SECTION 1
INTRODUCTION

Roy F. Weston, Inc. (WESTON®) was contracted by Elf Atochem North America, Inc. (ATOCHEM) to implement an Interim Remedial Measure (IRM) at the West Brine Field in Riverview, Michigan.

ATOCHEM is currently undergoing a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Riverview West Brine Field and the West Plant under Consent Order (V-W-89R-45) with the U.S. Environmental Protection Agency (EPA). The Consent Order requires ATOCHEM to conduct an RFI at the Riverview West Brine Field and the West Plant to determine the nature and extent of possible releases of hazardous waste or hazardous constituents from regulated units, solid waste management units, or other source areas. Former Landfill 2, also referred to as Solid Waste Management Unit 2 (SWMU 2), was one of four SWMUs at the West Brine Field that were identified in the Consent Order. This report presents the information generated during the remedial portion of the SWMU 2 Interim Measure.

1.1 BACKGROUND

The West Brine Field is located on approximately 92 acres of generally undeveloped land in the City of Riverview, Michigan, as shown on Figures 1-1 and 1-2. SWMU 2 is located on a small parcel of land separated from the main property by Colvin Avenue. The parcel containing SWMU 2 is bounded by Colvin Avenue to the north, McKinley Street and Krause Street to the east and west, and residential dwellings to the south.

Information obtained from the ATOCHEM facility's environmental files indicated that during the 1960s, 55-gallon drums may have been buried in a trench in SWMU 2. The drums were reported to contain amylphenol still bottom residues generated during tertiary amylphenol production by Process 12 at the West Plant.

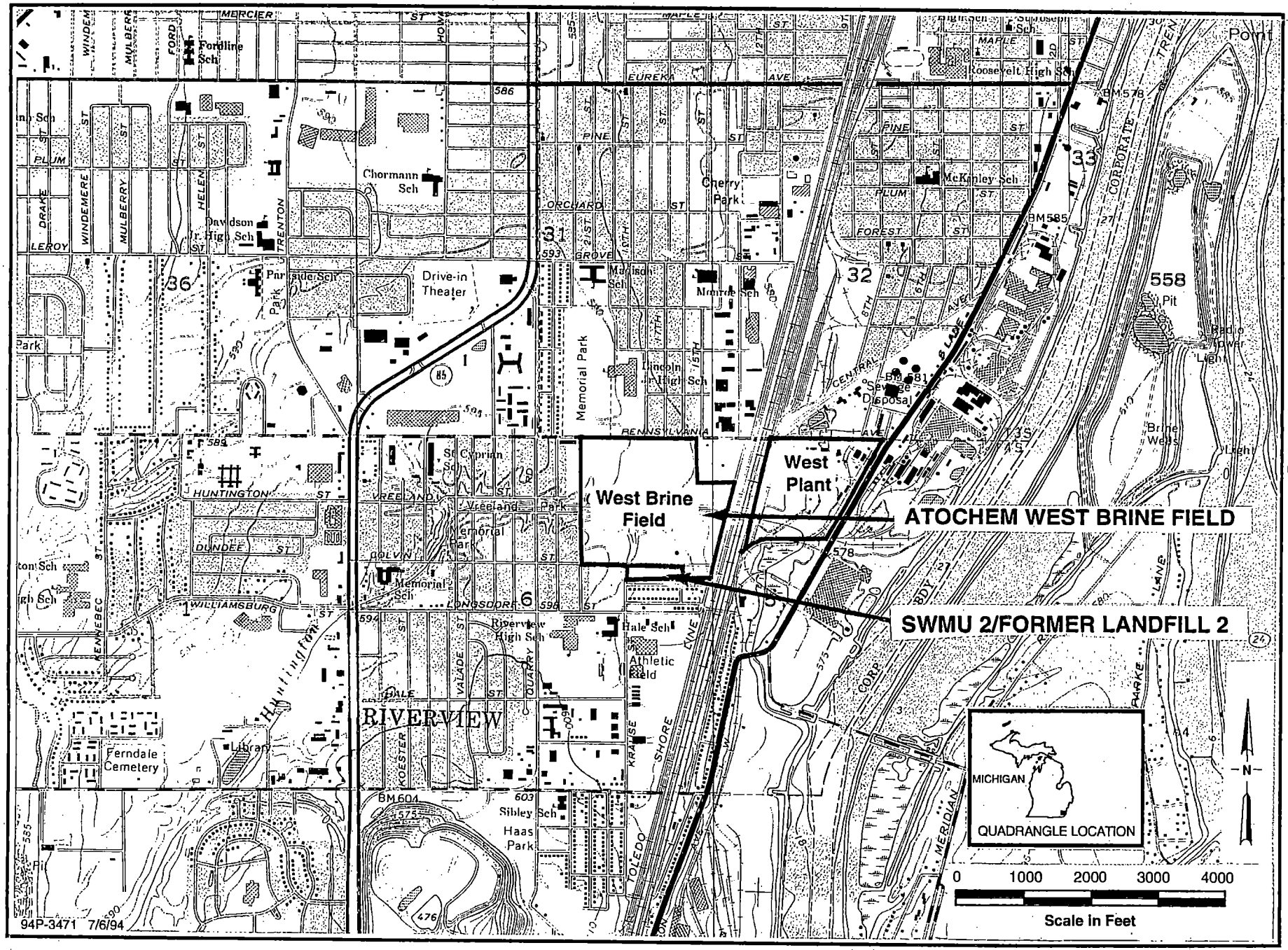

FIGURE 1-1 FACILITY LOCATION MAP, WEST BRINE FIELD, RIVERVIEW, MI

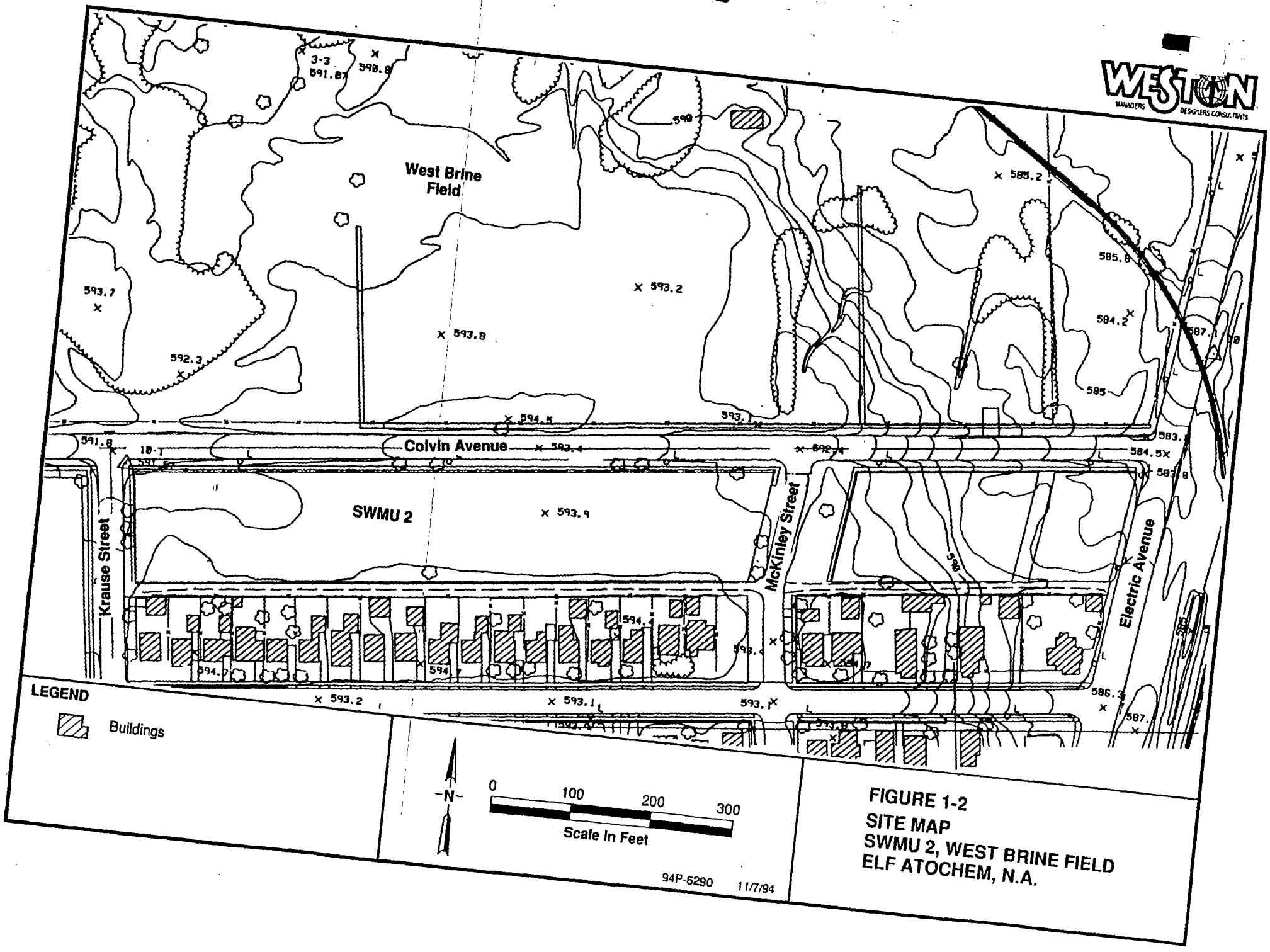

FIGURE 1-2
SITE MAP
SWMU 2, WEST BRINE FIELD
ELF ATOCHEM, N.A.

Some drums may also have contained nonspecific Vultacs (tert-amylphenol disulfides), which were produced by Process 22 at the West Plant.

ATOCHEM submitted a RCRA Corrective Action, Interim Measures Work Plan (Work Plan) for pre-excavation investigation activities and for the removal of buried drums in SWMU 2. The Interim Measures proposal for the removal of drums was not required by the Consent Order, but instead was an action by ATOCHEM to implement a portion of the RCRA Facility Investigation/Corrective Measure Study (RFI\CMS). In accordance with Section 3 of the Work Plan, pre-excavation investigation activities were completed by WESTON at SWMU 2 during September 1994.

1.2 OBJECTIVE

The objective of this IRM was to utilize the plant historical data, the Work Plan, and the pre-excavation investigation information to complete the following activities:

- Removal of the former SWMU 2 landfill contents.
- Disposal of the waste materials generated.
- Collection of current condition samples from the excavation sidewalls and floor.
- Backfilling of the excavated area with clean soils.
- Topsoil placement and revegetation of the disturbed area with grass.

WESTON performed these remedial tasks during the period of 6 February through 23 June 1995 in accordance with all federal, state, and local regulatory agencies requirements.

SECTION 2
REMEDIAL ACTIVITIES

The section describes the project work tasks that were completed by WESTON and Conestoga-Rovers & Associates (CRA) at SWMU 2.

2.1 PRELIMINARY ACTIVITIES

Prior to starting the site work, WESTON prepared a site-specific Health & Safety Plan according to OSHA standards, obtained building permits for the trailers and temporary structure, and set up a network of material suppliers and vendors. Once these initial tasks were completed, mobilization began with the delivery of the site office trailers and mobilization of site personnel on 6 February.

During the next three weeks, the following mobilization tasks were completed:

- Temporary electric power was installed.
- Sanitary facility services were made available.
- Trash dumpster was delivered.
- Drinking water service was initiated.
- Parking area was constructed.
- Temporary building was erected.
- Negative air/carbon filtration system was installed.
- Heavy equipment was delivered.
- The trench location was staked out.

The main task of the mobilization process was to erect a temporary movable building to house the excavation and sampling activities. WESTON leased a Clamshell® building 170 feet long, 62 feet wide, and 28 feet high, which was assembled on a set of movable steel beams. In addition, to control any emissions that might have been generated, an activated carbon filtration system was connected to the building. This system consisted of two 1,000-cfm blowers and two

Calgon® Vapor Packs mounted on a trailer. As the trench was excavated, the building and air filtration system were moved to ensure continuous coverage of the remedial activities within.

Upon the completion of the mobilization activities, ATOCHEM hosted open house presentations at the site for ATOCHEM officials; federal, state, and local authorities; local residents and ATOCHEM employees. The open house activities were geared toward explaining the project objectives in general and the specific activities to all interested parties. WESTON and CRA assisted in the presentations, answered questions, and displayed various types of protective and monitoring equipment. The open house activities were conducted between 23 and 25 February 1995. This was a major component of an ongoing, community relations plan that began in September of 1994 and continued beyond completion of the project.

2.2 INTRUSIVE ACTIVITIES

On 28 February 1995, the excavation of the test pits began. The objectives were to determine the depth to waste materials, to collect samples for disposal analyses, and to assess the presence and/or condition of buried drums. Four test pits were excavated along the length of the trench. Figure 2-1 shows the approximate locations and sequence number of each test pit. The test pits revealed that intact drums were present in all locations, and the analytical results of the samples collected indicated the presence of non-hazardous and hazardous wastes. The analytical results of the samples collected are shown in Appendix A.

The original scope of work for this project assumed that all of the wastes encountered would be non-hazardous and all of the drums would be deteriorated to the point where bulk excavation would be the only method of removal. After carefully reviewing all the test pit data, it was determined that the entire project excavation would be an individual drum removal and overpacking effort. Due to health and safety considerations, the work would be performed in level B personal protective equipment (PPE) (Supplied Air). All of the drums would be overpacked, sampled, labeled, inventoried, characterized by waste-stream type, and disposed of according to regulatory requirements.

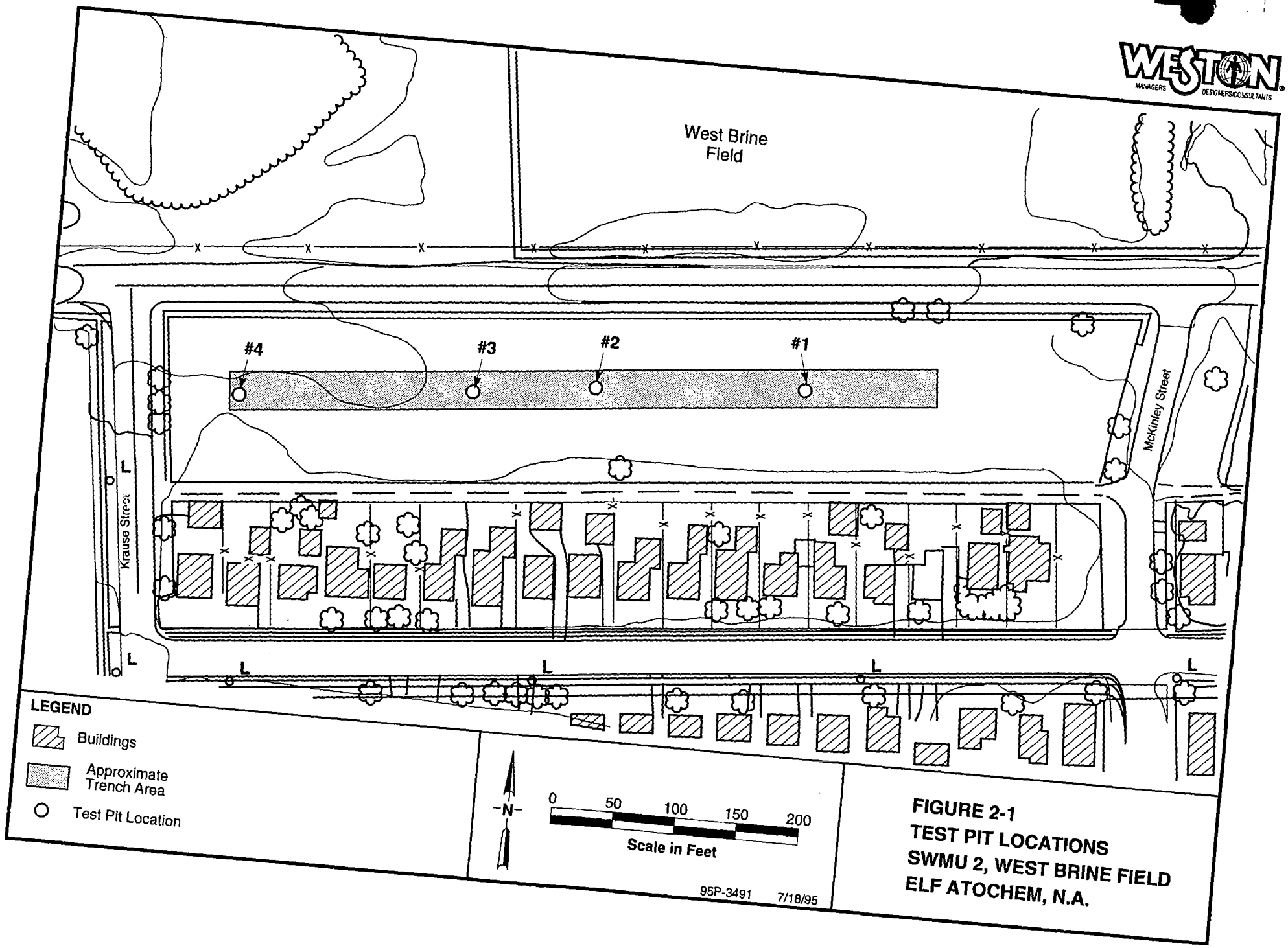

FIGURE 2-1
TEST PIT LOCATIONS
SWMU 2, WEST BRINE FIELD
ELF ATOCHEM, N.A.

Prior to beginning the drum removal activities, sampling of the overburden soils was conducted to determine their ultimate disposition. Figure 2-2 shows the approximate locations of the geoprobe sampling points. Each of the sample groups shown inside the boxed areas provided two composite samples. The first was a composite of the 0-to-2 foot depth, and the second sample was a composite of the 2-to-4 foot depth. Composite samples were not produced by homogenizing soil from each geoprobe; instead, individual slices from each geoprobe in a group were placed into the sample jar, and the laboratory used a piece of each in the analysis. This method was utilized to reduce the possibility of volatilizing any organic constituents. The analytical results of the overburden sampling are presented in Appendix B. A review of this data indicated that the overburden soils were suitable to be utilized as backfill. Overburden removal was started on 21 March 1995, after all the preliminary work and sampling was completed. The removal began at the eastern edge of the trench. The top 4 feet of soil was removed and stockpiled for later use.

Once overburden removal was completed inside the working area of the building, drum excavation began. The first drums were removed on 24 March 1995. The drums were located from 5 feet below ground surface (bgs) to 11 feet bgs throughout most of the approximately 560-foot length of the trench. The width of the trench varied from 6 to 12 feet. In some areas, drums were neatly stacked on their sides, and in other areas, they were strewn about randomly.

Drums were removed by an excavator using a specially designed bucket to handle the drums. A spotter assisted the person operating the excavator by constantly observing the trench and locating the drums as they were uncovered. The spotter also guided the operator during the placement of the drum into an overpack container. The overpacked drums were then removed to the sample staging area of the temporary building.

Real-time air monitoring was performed both inside and outside the temporary structures before, during, and after the drum excavation activities with an organic vapor meter (OVM). This was performed to insure that the proper level of worker protection was being used and to confirm that emissions from within the temporary structure were not being emitted to the surrounding atmosphere.

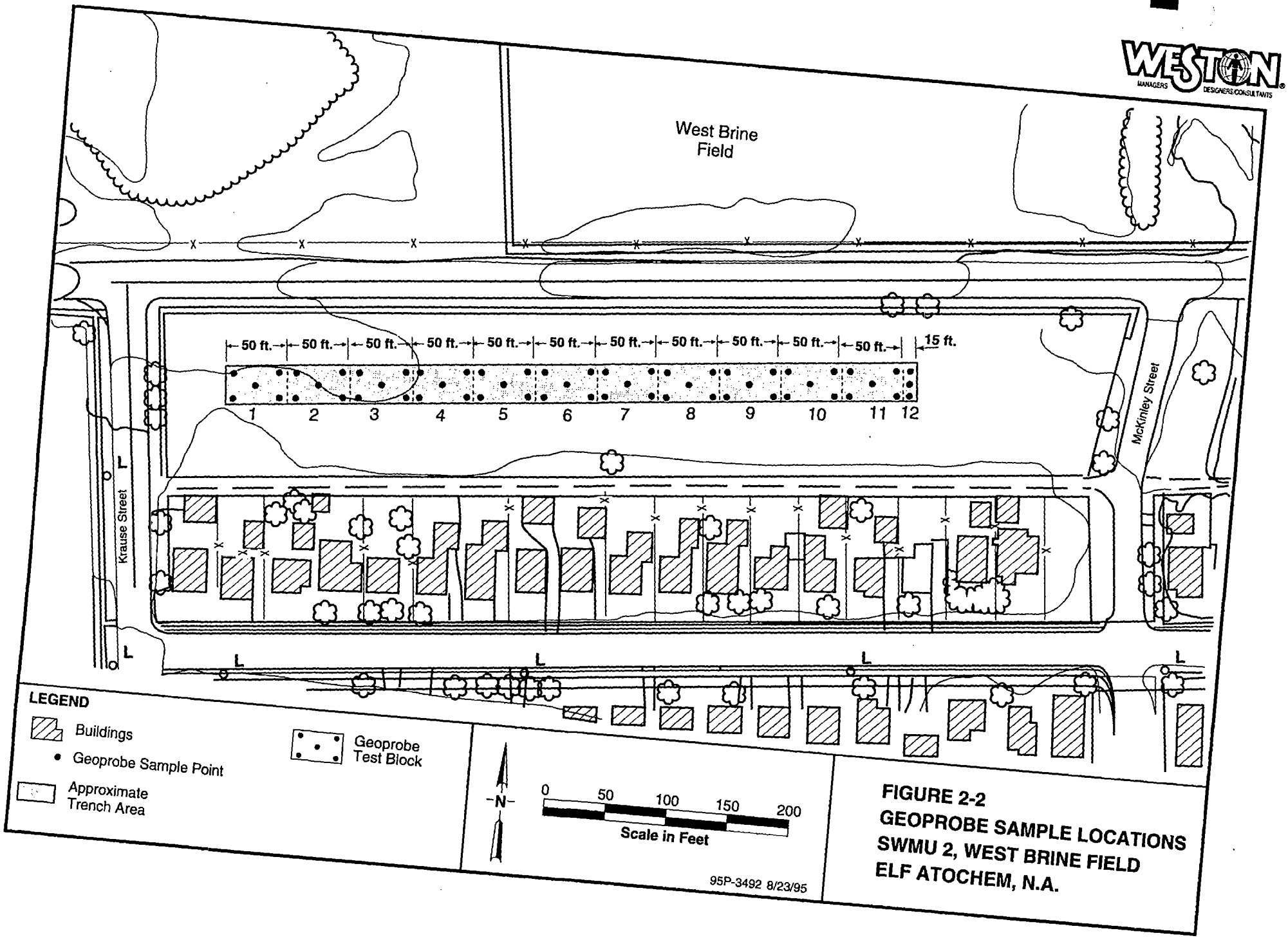

FIGURE 2-2
GEOPROBE SAMPLE LOCATIONS
SWMU 2, WEST BRINE FIELD
ELF ATOCHEM, N.A.

When the working area inside the temporary building was reduced and became too confined for safe operations, drum excavation was halted, all exposed drums were overpacked, sampling was completed, and all drums were sealed. Air monitoring was performed to insure that no vapors were released when the clamshell doors were opened, and the overpacked drums were transported to a secondary containment storage area across Colvin Avenue in the West Brine Field. The storage area was constructed of 30-mil polyethylene liner, wood, and crushed stone. The temporary structure could then be moved over the next segment of the trench, and the completed portion of the trench could be backfilled. This routine was repeated until the entire length of the trench was completed. Figure 2-3 is a rendering of what the work area looked like during full-scale operations. Each drum removed from the trench was labeled, sampled, and characterized, and a drum log sheet was also completed for each drum. All the drum log sheets are provided in Appendix B of this report. A total of 895 drums was removed from the trench, and the following six distinct physical types of waste material were noted:

- Dry, brown, granular powder.
- Thick & thin, black, tar-like material.
- Red/Brown, liquid material.
- White, granular, paste material.
- Light brown, watery liquid.
- Solid, black, glassy material.

The drums were grouped according to the above physical characteristics until analytical data was available. The majority of the drums were in the black materials groups. This is what the plant personnel identified as the amylphenol still bottom residues. The analytical results are discussed in Section 3 of this report. The drum excavation was completed on 2 May 1995, and the last portion of the trench area was backfilled by 4 May 1995.

From 5 May 1995 through 12 May 1995, the temporary building, storage trailers, office trailers, utilities, most of the equipment, and personnel were demobilized in preparation for restoration activities. The restoration of the site is presented in Section 5 of this report.

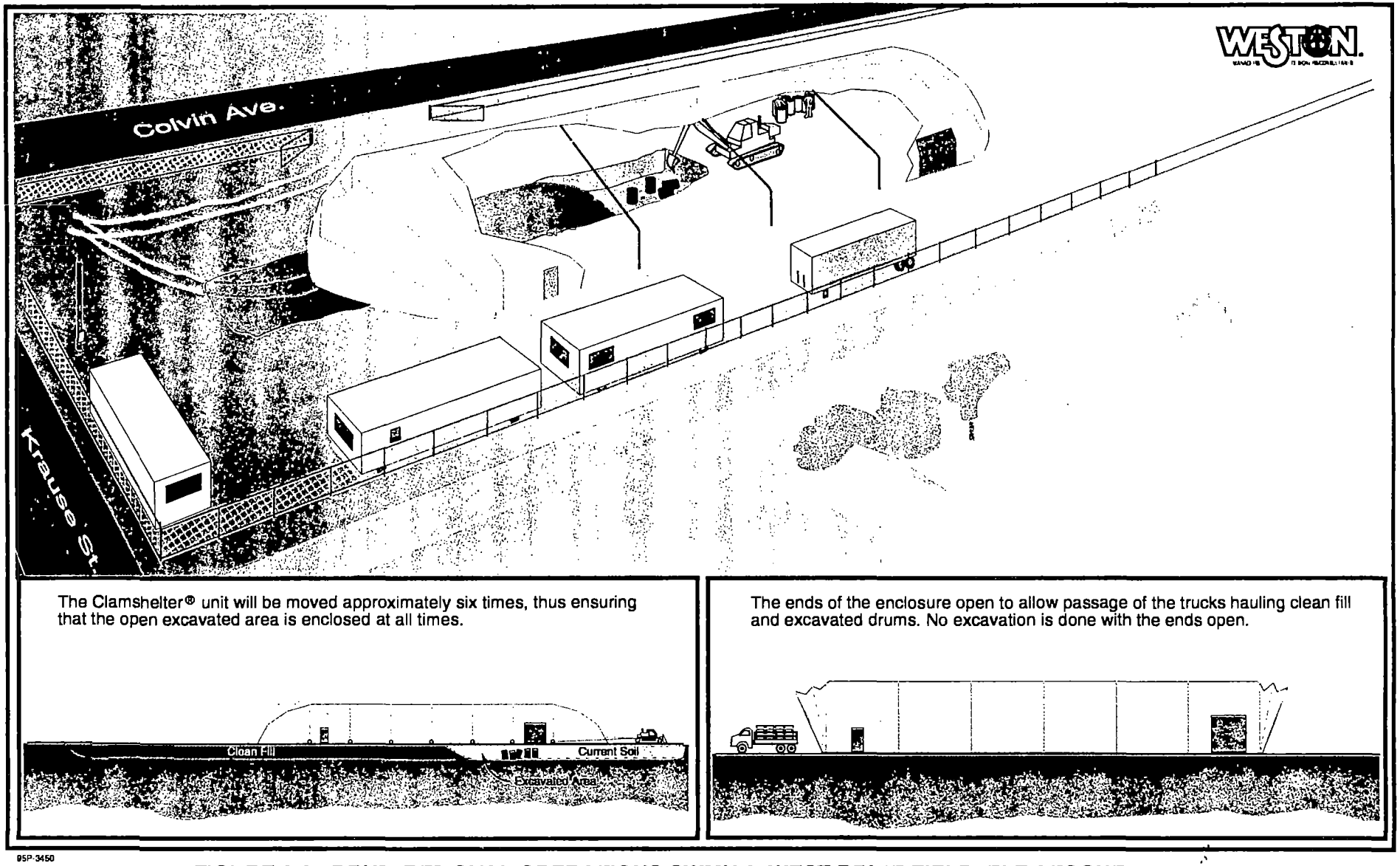

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FIGURE 2-3 DRUM REMOVAL OPERATIONS SWMU 2, WEST BRINE FIELD, ELF ATOCHEM, N.A.

SECTION 3
ANALYTICAL

Analytical data was required for disposal and for determination of contaminant levels during the execution of this project. Disposal analyses were performed on the drums and soils immediately around the drums to establish disposal options. The overburden soil and the current condition samples of the sidewalls and floor of the trench were analyzed to assess the levels of contaminants contained in them, as well as to make decisions concerning future site use or future site restrictions. The different samples taken and the analyses performed on them are discussed in this section.

3.1 TEST PIT SAMPLES

There were seven samples taken from the four test pits excavated at the start of this project. Three were collected from wastes in drums, and four were collected from the soil surrounding the drums. Full Toxicity Characteristic Leaching Procedure(TCLP) analysis, reactivity, corrosivity and pH, (RCP), Target Analyte List(TAL), and Target Compound List(TCL) were performed on the samples to determine what could be anticipated during the full-scale operations. The results of these analyses showed that some of the amylphenol wastes were characteristically hazardous due to the presence of benzene. These results are shown in Appendix A of this report.

3.2 OVERBURDEN SAMPLES

The test pits revealed that the drums were present starting at a depth of approximately five feet. ATOCHEM decided then to test the surface soils to a depth of four feet to determine if they were suitable to be stockpiled and used for backfill. Five geoprobe samples were taken to a depth of four feet for each 50-foot of trench length. The samples were then made into composites of the zero to two foot and the two to four foot depth from each 50-foot of trench length. Composite samples were not produced by homogenizing the soil from each geoprobe; instead, individual slices from each geoprobe in a group were placed into the sample jar, and

the laboratory used a piece of each in the analysis. This method was utilized to reduce the possibility of volatilizing any organic constituents. Figure 2-1 shows the approximate locations of the geoprobe samples. Twenty-four samples were analyzed for the TAL and TCL criteria. The results showed that all compound levels were low enough to allow the soil to be used as clean backfill material. The analytical results are presented in Appendix A of this report.

3.3 DRUM AND SOIL SAMPLES

The drum and excavation soil samples were analyzed for the purpose of determining the disposal options for the materials. The types of analyses performed included:

- Full TCLP for metals and organics.
- Reactivity, corrosivity, and pH. (RCP)
- BTU and flashpoint.
- TCL and TAL.
- PCB, pesticide, and herbicide.
- Paint filter test.
- Total halogens.

A total of 191 drums and 38 excavation soil samples was analyzed during the course of this project. The soil samples included eight taken directly from the excavation face and 30 taken from rolloff boxes. All the analytical results from the sampling of the drums and excavation soils are presented in Appendix A. The consistent analyte that caused material to be handled as hazardous was benzene. There were other analytes that were sporadically above regulatory limits. These are identified in the waste profiles and manifests, Appendix C.

3.4 CURRENT CONDITIONS SAMPLES

The presence of the intact drums in the SWMU 2 trench and the heavy clay surrounding soils prompted ATOCHEM to execute a more in-depth sampling program of the sidewalls and floor of the excavation than was originally proposed in the Work Plan (WESTON, July 1994). Since

the drums still contained the wastes and the clay would not allow easy migration of waste it was believed that a clean closure could be achieved. Therefore it was decided to sample using the Michigan Department of Natural Resources (MDNR) cleanup guidelines. Each sidewall was sampled once for every 45 feet of length, and the floor was sampled once for every 60 feet of length. The criteria used to determine the verification sampling protocol was derived from the MDNR Guidance Document for Verification of Soil Remediation (MDNR ERD/WMD, April 1994). A total of 24 sidewall and nine floor samples was taken, and they were analyzed according to the TAL and the TCL criteria. The locations of the current conditions samples are provided in Appendix D of this report.

An initial review of the analytical data revealed that there were some discrepancies with the thallium results for samples N-5, S-5, S-4, and F-4. These four samples were inadvertently analyzed using method 6010, ICP without mass spectrometer, in which there were interference problems with the detection of this element. The samples should have been analyzed using method 6020, ICP-MS. The locations in question were re-sampled using a geoprobe on 9 August 1995 and analyzed using the proper method. The resulting data generated were consistent with all of the other confirmation samples. A letter from the analytical laboratory explaining this discrepancy can be found in Appendix A of this report.

A second review of all the analytical data showed that arsenic was the only analyte detected in concentrations above the direct contact soil values in the MDNR Generic Residential Cleanup Criteria (MDNR, OM #8, Rev 4, June 8, 1995). The direct soil values were used because:

- No groundwater was encountered.
- A confining clay soil was encountered.
- All drinking water is supplied by a public water supply.
- Wayne County, Michigan has an ordinance that prohibits well installation in an aquifer within 25 feet of ground surface.

The arsenic concentration values, although higher than these criteria, were actually more than

three times lower than the MDNR Background Soil Survey conducted in 1991. Table 3-1 shows the summery of the Current Conditions Soil Sampling Data compared to the cleanup criteria or background values.

These analytical results indicate that all waste materials were removed from the area and the project achieved clean closure of SWMU 2 in accordance with the MDNR closure standards.

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*												
	Generic Residential Cleanup Criteria *	W-1	N-1	S-1	F-1	N-2	S-2	F-2	N-3	S-3	F-3	N-4	S-4	F-4
Metals (mg/kg)														
Aluminum	ID	6400	6500	8100	5000	5700	4700	4500	5100	5600	4600	4500	7000	4600
Antimony	150	<0.5	1.5	2.2	<0.5	0.2	0.1	<0.1	<0.1	0.5	<0.1	<0.1	0.3	<0.1
Arsenic (5)	39.4	8.7	5.4	10.8	7.4	12.6	3.9	4.3	0.7	6		6.2	8.6	5
Barium	30000	48.9	51.7	79.4	58.3	26.9	39.7	54.4	10.2	56.3	54.5	43.8	91.1	50.7
Beryllium	2.3	1.5	1.6	1.8	1.5	0.4	0.3	0.4	0.3	0.5	0.2	0.4	1.5	1
Cadmium	210	3	3.1	3.3	3	2.4	0.1	0.1	<0.05	0.2	0.3	0.3	0.4	0.2
Calcium	NC	82000	75000	74000	82000	51000	80000	61000	64000	63000	65000	56000	61000	75000
Chrome, total (1)	2000	16.7	17	20.4	14.9	15.9	10.9	12.6	1.6	13.4	12.8	11.8	18.4	11.5
Cobalt	2100	8.5	18.6	13.3	10.8	6.5	7.3	3.7	6.8	8.1	5.9	3.4	14.1	9.9
Copper	15000	15.8	16.4	17.9	15	21.2	12.1	13.3	1.8	16	17.1	18.6	19.5	47.6
Cyanide	9300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5
Iron	ID	14000	15000	17000	15000	15000	11000	10000	12000	13000	10000	12000	15000	10000
Lead	400	20.8	23.7	23.5	24.8	14.6	13.8	15.5	1.5	8.6	14.2	11	11.8	9.1
Manganese	2,000	330	570	390	400	250	360	240	300	440	270	220	410	320
Mercury	130	0.1	<0.1	0.1	<0.1	0.5	0.02	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1
Nickel	32000	25.9	36.3	33.8	30.4	30.5	21.9	16.6	3.1	25.9	20.4	17.5	40.2	24.5
Potassium	--	860	1200	1100	640	940	670	680	750	760	650	700	1100	720
Selenium	2100	<0.5	<0.5	<0.5	<0.5	10.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	0.5
Silver	2000	6.6	7.7	8.9	7.7	0.2	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.5	<0.5
Sodium	1,000,000	210	280	330	280	200	47.5	220	220	240	270	220	240	120
Thallium	28	0.3	2	0.4	0.4	0.5	0.2	0.4	0.3	0.5	0.3	0.4	0.4	0.4
Vanadium	3700	21.8	22.7	26	20.1	14.6	10.6	9.9	11.4	12.1	11.8	11.1	23.7	18.4
Zinc	140000	48.6	53.1	52	48.8	58.5	44.1	37.7	5	42.6	51	40.1	66.1	39.5

Notes:

NA	Not Analyzed
NC	No Criteria Established
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(5)	MDNR Background Soil Survey (1991)

* Direct Contact Values in soil from MDNR Operational Memorandum #8, Revision 4, June 8, 1995

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*												
	Generic Residential Cleanup Criteria *	W-1	N-1	S-1	F-1	N-2	S-2	F-2	N-3	S-3	F-3	N-4	S-4	F-4
Volatile Organic Compounds (µg/kg)														
Acetone	11,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	88,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	**72**	<10	<10	<10
Bromodichloromethane	41,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	320,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	150,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	200,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	12,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	2,100,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorodibromomethane	31,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	670,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	ID	NA	NA	NA	NA	NA	NA	NA	<10	NA	NA	NA	<10	<10
Chloroform	420,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	200,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	13,000,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	28,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	110,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total cis-1,2 & trans-1,2-DCE	3100000 (3)	<20	<20	<20	<20	<20	<20	<20	--	<20	<20	<20	<20	<20
cis-1,2-Dichloroethene	1,200,000	--	--	--	--	--	--	--	<10	--	--	--	--	--
trans-1,2-Dichloroethene	1,900,000	--	--	--	--	--	--	--	<10	--	--	--	--	--
1,2-Dichloropropane	38,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	11,000,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	15,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Methylene Chloride	340,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	5,500,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Styrene	85,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	13,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethylene	50,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	24,000,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	3,100,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	45,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	160,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	38,000,000	NA	NA	NA	NA	NA	NA	NA	<10	NA	NA	NA	<10	<10

Notes:

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TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*												
	Generic Residential Cleanup Criteria *	W-1	N-1	S-1	F-1	N-2	S-2	F-2	N-3	S-3	F-3	N-4	S-4	F-4
Volatile Organic Compounds Continued (µg/kg)														
Vinyl Acetate	9,700,000	1,600	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	1,200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes	200,000,000	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Semivolatile Organic Compounds (µg/kg)														
Acenaphthene	76,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Acenaphthylene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Anthracene	420,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzoic Acid	1,000,000,000	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(a)anthracene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(b)fluoranthene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(k)fluoranthene	140,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(g,h,i)perylene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(a)pyrene	1,400	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzyl Alcohol	160,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethoxy)methane	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethyl)ether	2,300	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroisopropyl)ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-ethylhexyl)phthalate	700,000	<330	430	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Bromophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Butyl Benzyl Phthalate	68,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Chloroaniline	--	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-methylphenol	2,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Chloronaphthalene	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Chlorophenol	680,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Chlorophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Chrysene	1,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dibenzo(a,h)anthracene	1,400	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dibenzofuran	ID	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Di-n-butyl Phthalate	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,2-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,3-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,4-Dichlorobenzene	110,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
3,3'-Dichlorobenzidine	5,700	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000
2,4-Dichlorophenol	4,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330

Notes:

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Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*												
	Generic Residential Cleanup Criteria *	W-1	N-1	S-1	F-1	N-2	S-2	F-2	N-3	S-3	F-3	N-4	S-4	F-4
Semivolatile Organic Compounds Continued (µg/kg)														
Diethyl Phthalate	320,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,4-Dimethylphenol	21,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dimethyl Phthalate	1,000,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4,6-Dinitro-2-methylphenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrotoluene	15,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,6-Dinitrotoluene	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Di-n-octyl Phthalate	7,600,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluoranthene	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluorene	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorobenzene	6,200	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorobutadiene	130,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorocyclopentadiene	3,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachloroethane	180,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Indeno(1,2,3-cd)pyrene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Isophorone	2,700,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Methylnaphthalene	ID	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Methylphenol	5,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Methylphenol	2,100,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Naphthalene	15,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
3-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
4-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Nitrobenzene	51,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Nitrophenol	1,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Nitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
N-Nitrosodiphenylamine	520,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
N-Nitrosodi-n-propylamine	370	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Pentachlorophenol	82,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Phenanthrene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Phenol	66,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Pyrene	32,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,2,4-Trichlorobenzene	6,300,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,4,5-Trichlorophenol	42,000,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4,6-Trichlorophenol	900,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330

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	Soil Cleanup Criter	*Sample Locations*												
	Generic Residential Cleanup Criteria *	W-1	N-1	S-1	F-1	N-2	S-2	F-2	N-3	S-3	F-3	N-4	S-4	F-4
Pesticides/PCBs (µg/kg)														
Aldrin	580	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Aroclor-1016	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1221	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1232	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1242	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1248	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1254	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Aroclor-1260	1,100	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Alpha-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Beta-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Gamma-BHC (Lindane)	7,600	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Delta-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Chlordane	7,600	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
4,4'-DDD	41,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
4,4'-DDE	29,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
4,4'-DDT	29,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Dieldrin	620	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan I	97,000(4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan II	97,000 (4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan Sulfate	97,000 (4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin	72,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin Aldehyde	NC	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin Ketone	NC	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<3.3	<3.3	<3.3	<3.3	<3.3	<1.7	<1.7
Heptachlor	2,200	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Heptachlor Epoxide	1,000	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
4,4-Methoxychlor	2100000 (4)	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Toxaphene	2,300	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170

Notes:

NA	Not Analyzed
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(1)	Chromium VI criteria used for Total Chrome
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*	Direct Contact Values in soil from MDNR Operational Memorandum #8, Revision 4, June 8, 1995

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*											
	Generic Residential Cleanup Criteria *	N-5	S-5	F-5	N-6	S-6	F-6	S-7	F-7	N-8	S-8	F-8	N-9
Metals (mg/kg)													
Aluminum	ID	5500	4700	13000	8300	9500	10000	6100	5600	7000	7900	7100	7900
Antimony	150	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (5)	39.4	4.9	8.3	7.4	7.1	6.5	3.2	5.1	5.7	4.6	3	5.5	4.5
Barium	30000	65.7	62.7	140	180	79.4	96.1	55	43.9	59.5	33	78	120
Beryllium	2.3	1.2	1.3	2.7	0.3	0.3	0.3	0.2	0.1	0.4	0.3	0.1	0.3
Cadmium	210	0.1	0.09	<0.05	<0.5	<0.05	<0.05	<0.05	0.2	0.13	0.06	0.2	0.4
Calcium	NC	67000	68000	68000	10000	75000	98000	120000	83000	10000	86000	57000	55000
Chrome, total (1)	2000	11.7	11.4	24.9	13.9	16.2	18.3	10.6	13.2	14.2	12.6	15	19.2
Cobalt	2100	9.5	13.5	13.8	19.6	10	6	3.6	6.7	6.2	4.4	9.2	6.9
Copper	15000	17.6	17.3	25	20.1	17.4	22.4	16.3	20.1	19.7	15.3	15.7	16.6
Cyanide	9300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	ID	12000	13000	23000	20000	19000	19000	12000	13000	14000	15000	14000	14000
Lead	400	8.6	8.4	13.8	12.7	8.1	10.6	9.4	15.4	10	6.3	16.8	9
Manganese	2,000	320	380	700	1100	370	390	320	320	390	320	320	230
Mercury	130	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	32000	21.8	26.1	40.8	42.2	26.7	24	13.3	23.7	22.7	17.3	23.3	26
Potassium	--	850	770	2300	1100	1400	1700	880	930	890	1100	1000	1400
Selenium	2100	<0.5	<0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.7	<0.5	<0.5	0.8
Silver	2000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium	1,000,000	160	140	440	300	320	400	190	290	180	290	220	280
Thallium	28	0.3	0.5	<0.5	0.5	0.9	<0.5	<0.5	0.6	0.6	<0.5	0.5	0.6
Vanadium	3700	18.3	17.3	16.9	14.1	19.8	16.2	10.3	12.3	11.9	11	15.8	16
Zinc	140000	41.5	45.2	77.4	58.4	62.3	56.4	43.2	86.9	50.5	38.6	44.4	68.3

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TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*											
	Generic Residential Cleanup Criteria *	N-5	S-5	F-5	N-6	S-6	F-6	S-7	F-7	N-8	S-8	F-8	N-9
Volatile Organic Compounds (µg/kg)													
Acetone	11,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	88,000	<10	<10	<10	<10	<10	<10	<10	<10	15	<10	<10	<10
Bromodichloromethane	41,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	320,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	150,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	200,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	12,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	20,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	2,100,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorodibromomethane	31,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	670,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	ID	<10	<10	<10	<10	<10	<10	<10	NA	<10	<10	NA	NA
Chloroform	420,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	200,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	13,000,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	28,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	110,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total cis-1,2 & trans-1,2-DCE	3100000 (3)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
cis-1,2-Dichloroethene	1,200,000	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	1,900,000	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	38,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	11,000,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	15,000,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Methylene Chloride	340,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	5,500,000	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Styrene	85,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	13,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethylene	50,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	24,000,000	<10	<10	<10	<10	<10	<10	<10	<10	30	<10	<10	<10
1,1,1-Trichloroethane	3,100,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	45,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	160,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	38,000,000	<10	<10	<10	<10	<10	<10	<10	NA	<10	<10	NA	NA

Notes:

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TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*											
	Generic Residential Cleanup Criteria *	N-5	S-5	F-5	N-6	S-6	F-6	S-7	F-7	N-8	S-8	F-8	N-9
Volatile Organic Compounds Continued (µg/kg)													
Vinyl Acetate	9,700,000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	1,200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes	200,000,000	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	76,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Acenaphthylene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Anthracene	420,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzoic Acid	1,000,000,000	<3300	<3300	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000
Benzo(a)anthracene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(b)fluoranthene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(k)fluoranthene	140,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(g,h,i)perylene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo(a)pyrene	1,400	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzyl Alcohol	160,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethoxy)methane	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethyl)ether	2,300	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroisopropyl)ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Bis(2-ethylhexyl)phthalate	700,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Bromophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Butyl Benzyl Phthalate	68,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Chloroaniline	--	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-methylphenol	2,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Chloronaphthalene	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Chlorophenol	680,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Chlorophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Chrysene	1,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dibenzo(a,h)anthracene	1,400	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dibenzofuran	ID	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Di-n-butyl Phthalate	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,2-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,3-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,4-Dichlorobenzene	110,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
3,3'-Dichlorobenzidine	5,700	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000
2,4-Dichlorophenol	4,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330

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Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*											
	Generic Residential Cleanup Criteria *	N-5	S-5	F-5	N-6	S-6	F-6	S-7	F-7	N-8	S-8	F-8	N-9
Semivolatile Organic Compounds Continued (µg/kg)													
Diethyl Phthalate	320,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,4-Dimethylphenol	21,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dimethyl Phthalate	1,000,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4,6-Dinitro-2-methylphenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrotoluene	15,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,6-Dinitrotoluene	--	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Di-n-octyl Phthalate	7,600,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluoranthene	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluorene	51,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorobenzene	6,200	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorobutadiene	130,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachlorocyclopentadiene	3,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Hexachloroethane	180,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Indeno(1,2,3-cd)pyrene	14,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Isophorone	2,700,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Methylnaphthalene	ID	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Methylphenol	5,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Methylphenol	2,100,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Naphthalene	15,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
3-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
4-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Nitrobenzene	51,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Nitrophenol	1,200,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
4-Nitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
N-Nitrosodiphenylamine	520,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
N-Nitrosodi-n-propylamine	370	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Pentachlorophenol	82,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Phenanthrene	1,500,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Phenol	66,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Pyrene	32,000,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
1,2,4-Trichlorobenzene	6,300,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2,4,5-Trichlorophenol	42,000,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4,6-Trichlorophenol	900,000	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330

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Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*											
	Generic Residential Cleanup Criteria *	N-5	S-5	F-5	N-6	S-6	F-6	S-7	F-7	N-8	S-8	F-8	N-9
Pesticides/PCBs (µg/kg)													
Aldrin	580	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Aroclor-1016	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1221	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1232	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1242	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1248	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1254	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Aroclor-1260	1,100	<330	<330	<1000	<1000	<1000	<1000	<1000	<330	<1000	<1000	<330	<330
Alpha-BHC	--	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Beta-BHC	--	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Gamma-BHC (Lindane)	7,600	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Delta-BHC	--	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Chlordane	7,600	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
4,4'-DDD	41,000	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
4,4'-DDE	29,000	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
4,4'-DDT	29,000	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Dieldrin	620	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endosulfan I	97,000(4)	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endosulfan II	97,000 (4)	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endosulfan Sulfate	97,000 (4)	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endrin	72,000	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endrin Aldehyde	NC	<3.3	<3.3	<500	<500	<500	<500	<500	<3.3	<500	<500	<3.3	<3.3
Endrin Ketone	NC	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Heptachlor	2,200	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
Heptachlor Epoxide	1,000	<1.7	<1.7	<500	<500	<500	<500	<500	<1.7	<500	<500	<1.7	<1.7
4,4-Methoxychlor	2100000 (4)	<50	<50	<50000	<50000	<50000	<50000	<50000	<50	<50000	<50000	<50	<50
Toxaphene	2,300	<170	<170	<50000	<50000	<50000	<50000	<50000	<170	<50000	<50000	<170	<170

Notes:

NA	Not Analyzed
NC	No Criteria Established
--	Not Applicable
ID	Insufficient Data available to determine cleanup criteria
(1)	Chromium VI used for Total Chrome
(2)	Total Isomer criteria used
(3)	Sum of criteria for individual isomers
(4)	Criteria for related isomer used
(5)	MDNR Background Soil Survey (1991)

* Direct Contact Values in soil from MDNR Operational Memorandum #8, Revision 4, June 8, 1995

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*						
	Generic Residential Cleanup Criteria *	S-9	F-9	N-10	S-10	N-11	S-11	E-1
Metals (mg/kg)								
Aluminum	ID	13000	5200	6600	<100	5200	5700	5200
Antimony	150	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (5)	39.4	8.5	7.2	6.1	6.7	8.5	5.4	0.8
Barium	30000	130	59.8	130	47.6	70.4	39.1	6.7
Beryllium	2.3	0.2	0.1	0.1	0.5	0.2	0.4	8.3
Cadmium	210	0.3	<0.05	0.1	0.09	0.2	0.1	<0.05
Calcium	NC	200000	70000	72000	49000	78000	94000	50000
Chrome, total (1)	2000	20.9	12.3	15.5	20.4	14	11.4	1.5
Cobalt	2100	9.1	6.2	7.9	8.5	8.5	12.1	9.3
Copper	15000	26.8	18.1	18.9	22	20.8	42.2	20
Cyanide	9300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	ID	31000	14000	14000	16000	13000	12000	14000
Lead	400	18.3	10.8	9.5	8.6	11.7	8.1	1
Manganese	2,000	700	330	420	230	300	410	430
Mercury	130	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	32000	32.8	18.8	29.7	28.6	24.8	23.7	3.4
Potassium	--	4400	930	990	1100	840	1000	740
Selenium	2100	0.6	<0.5	0.6	0.6	<0.5	<0.5	<0.5
Silver	2000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium	1,000,000	1500	170	210	270	190	120	240
Thallium	28	0.8	<0.5	<0.5	0.8	0.7	0.5	3.8
Vanadium	3700	18.7	11.2	12.8	17.6	15	13	14.2
Zinc	140000	87.9	39.3	46.6	59.6	58	42.2	4.8

Notes:

NA	Not Analyzed
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(1)	Chromium VI used for Total Chrome
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(3)	Sum of criteria for individual isomers
(4)	Criteria for related isomer used
(5)	MDNR Background Soil Survey (1991)

* Direct Contact Values in soil from MDNR Operational Memorandum #8, Re

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*						
	Generic Residential Cleanup Criteria *	S-9	F-9	N-10	S-10	N-11	S-11	E-1
Volatile Organic Compounds (µg/kg)								
Acetone	11,000,000	<100	<100	<100	<100	<100	<100	<100
Benzene	88,000	<10	<10	<10	<10	<10	220	<10
Bromodichloromethane	41,000	<10	<10	<10	<10	<10	<10	<10
Bromoform	320,000	<10	<10	<10	<10	<10	<10	<10
Bromomethane	150,000	<10	<10	<10	<10	<10	<10	<10
2-Butanone	200,000,000	<100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	12,000,000	<100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	20,000	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	2,100,000	<10	<10	<10	<10	<10	<10	<10
Chlorodibromomethane	31,000	<10	<10	<10	<10	<10	<10	<10
Chloroethane	670,000	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	ID	NA	NA	NA	NA	NA	<10	NA
Chloroform	420,000	<10	<10	<10	<10	<10	<10	<10
Chloromethane	200,000	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	13,000,000	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	28,000	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	110,000	<10	<10	<10	<10	<10	<10	<10
Total cis-1,2 & trans-1,2-DCE	3100000 (3)	<20	<20	<20	<20	<20	<20	<20
cis-1,2-Dichloroethene	1,200,000	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	1,900,000	--	--	--	--	--	--	--
1,2-Dichloropropane	38,000	<10	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	14,000	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	11,000,000	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	15,000,000	<100	<100	<100	<100	<100	<100	<100
Methylene Chloride	340,000	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	5,500,000	<100	<100	<100	<100	<100	<100	<100
Styrene	85,000	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	13,000	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethylene	50,000	<10	<10	<10	<10	<10	<10	<10
Toluene	24,000,000	<10	<10	<10	<10	<10	10	<10
1,1,1-Trichloroethane	3,100,000	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	45,000	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	160,000	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	38,000,000	NA	NA	NA	NA	NA	<10	NA

Notes:

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(4)	Criteria for related isomer used
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* Direct Contact Values in soil from MDNR Operational Memorandum #8, Re

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*						
	Generic Residential Cleanup Criteria *	S-9	F-9	N-10	S-10	N-11	S-11	E-1
Volatile Organic Compounds Continued (µg/kg)								
Vinyl Acetate	9,700,000	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	1,200	<10	<10	<10	<10	<10	<10	<10
Xylenes	200,000,000	<30	<30	<30	<30	<30	<30	<30
Semivolatile Organic Compounds (µg/kg)								
Acenaphthene	76,000,000	<330	<330	<330	<330	<330	<330	<330
Acenaphthylene	1,500,000	<330	<330	<330	<330	<330	<330	<330
Anthracene	420,000,000	<330	<330	<330	<330	<330	<330	<330
Benzoic Acid	1,000,000,000	<5000	<5000	<5000	<5000	<5000	<5000	<5000
Benzo(a)anthracene	14,000	<330	<330	<330	<330	<330	<330	<330
Benzo(b)fluoranthene	14,000	<330	<330	<330	<330	<330	<330	<330
Benzo(k)fluoranthene	140,000	<330	<330	<330	<330	<330	<330	<330
Benzo(g,h,i)perylene	1,500,000	<330	<330	<330	<330	<330	<330	<330
Benzo(a)pyrene	1,400	<330	<330	<330	<330	<330	<330	<330
Benzyl Alcohol	160,000,000	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethoxy)methane	--	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroethyl)ether	2,300	<330	<330	<330	<330	<330	<330	<330
Bis(2-chloroisopropyl)ether	--	<330	<330	<330	<330	<330	<330	<330
Bis(2-ethylhexyl)phthalate	700,000	<330	<330	<330	<330	<330	<330	<330
4-Bromophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330
Butyl Benzyl Phthalate	68,000,000	<330	<330	<330	<330	<330	<330	<330
4-Chloroaniline	--	<1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-methylphenol	2,200,000	<330	<330	<330	<330	<330	<330	<330
2-Chloronaphthalene	--	<330	<330	<330	<330	<330	<330	<330
2-Chlorophenol	680,000	<330	<330	<330	<330	<330	<330	<330
4-Chlorophenyl Phenyl Ether	--	<330	<330	<330	<330	<330	<330	<330
Chrysene	1,400,000	<330	<330	<330	<330	<330	<330	<330
Dibenzo(a,h)anthracene	1,400	<330	<330	<330	<330	<330	<330	<330
Dibenzofuran	ID	<330	<330	<330	<330	<330	<330	<330
Di-n-butyl Phthalate	51,000,000	<330	<330	<330	<330	<330	<330	<330
1,2-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330
1,3-Dichlorobenzene	9,400,000	<330	<330	<330	<330	<330	<330	<330
1,4-Dichlorobenzene	110,000	<330	<330	<330	<330	<330	<330	<330
3,3'-Dichlorobenzidine	5,700	<2000	<2000	<2000	<2000	<2000	<2000	<2000
2,4-Dichlorophenol	4,200,000	<330	<330	<330	<330	<330	<330	<330

Notes:

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* Direct Contact Values in soil from MDNR Operational Memorandum #8, Re

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*						
	Generic Residential Cleanup Criteria *	S-9	F-9	N-10	S-10	N-11	S-11	E-1
Semivolatile Organic Compounds Continued (µg/kg)								
Diethyl Phthalate	320,000,000	<330	<330	<330	<330	<330	<330	<330
2,4-Dimethylphenol	21,000,000	<330	<330	<330'	<330	<330	<330	<330
Dimethyl Phthalate	1,000,000,000	<330	<330	<330	<330	<330	<330	<330
4,6-Dinitro-2-methylphenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrotoluene	15,000	<330	<330	<330	<330	<330	<330	<330
2,6-Dinitrotoluene	--	<330	<330	<330	<330	<330	<330	<330
Di-n-octyl Phthalate	7,600,000	<330	<330	<330	<330	<330	<330	<330
Fluoranthene	51,000,000	<330	<330	<330	<330	<330	<330	<330
Fluorene	51,000,000	<330	<330	<330	<330	<330	<330	<330
Hexachlorobenzene	6,200	<330	<330	<330	<330	<330	<330	<330
Hexachlorobutadiene	130,000	<330	<330	<330	<330	<330	<330	<330
Hexachlorocyclopentadiene	3,000,000	<330	<330	<330	<330	<330	<330	<330
Hexachloroethane	180,000	<330	<330	<330	<330	<330	<330	<330
Indeno(1,2,3-cd)pyrene	14,000	<330	<330	<330	<330	<330	<330	<330
Isophorone	2,700,000	<330	<330	<330	<330	<330	<330	<330
2-Methylnaphthalene	ID	<330	<330	<330	<330	<330	<330	<330
2-Methylphenol	5,500,000	<330	<330	<330	<330	<330	<330	<330
4-Methylphenol	2,100,000	<330	<330	<330	<330	<330	<330	<330
Naphthalene	15,000,000	<330	<330	<330	<330	<330	<330	<330
2-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
3-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
4-Nitroaniline	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Nitrobenzene	51,000	<330	<330	<330	<330	<330	<330	<330
2-Nitrophenol	1,200,000	<330	<330	<330	<330	<330	<330	<330
4-Nitrophenol	--	<1700	<1700	<1700	<1700	<1700	<1700	<1700
N-Nitrosodiphenylamine	520,000	<330	<330	<330	<330	<330	<330	<330
N-Nitrosodi-n-propylamine	370	<330	<330	<330	<330	<330	<330	<330
Pentachlorophenol	82,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700
Phenanthrene	1,500,000	<330	<330	<330	<330	<330	<330	<330
Phenol	66,000,000	<330	<330	<330	<330	<330	<330	<330
Pyrene	32,000,000	<330	<330	<330	<330	<330	<330	<330
1,2,4-Trichlorobenzene	6,300,000	<330	<330	<330	<330	<330	<330	<330
2,4,5-Trichlorophenol	42,000,000	<1700	<1700	<1700	<1700	<1700	<1700	<1700
2,4,6-Trichlorophenol	900,000	<330	<330	<330	<330	<330	<330	<330

Notes:

NA	Not Analyzed
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* Direct Contact Values in soil from MDNR Operational Memorandum #8, Re

TABLE 3-1
ANALYTICAL RESULTS
Elf Atochem Site, Riverview MI

	Soil Cleanup Criter	*Sample Locations*						
	Generic Residential Cleanup Criteria *	S-9	F-9	N-10	S-10	N-11	S-11	E-1
Pesticides/PCBs (µg/kg)								
Aldrin	580	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Aroclor-1016	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1221	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1232	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1242	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1248	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1254	1,100	<330	<330	<330	<330	<330	<330	<330
Aroclor-1260	1,100	<330	<330	<330	<330	<330	<330	<330
Alpha-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Beta-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Gamma-BHC (Lindane)	7,600	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Delta-BHC	--	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Chlordane	7,600	<3.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3
4,4'-DDD	41,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
4,4'-DDE	29,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
4,4'-DDT	29,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Dieldrin	620	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan I	97,000(4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan II	97,000 (4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endosulfan Sulfate	97,000 (4)	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin	72,000	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin Aldehyde	NC	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Endrin Ketone	NC	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Heptachlor	2,200	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Heptachlor Epoxide	1,000	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
4,4-Methoxychlor	2100000 (4)	<50	<50	<50	<50	<50	<50	<50
Toxaphene	2,300	<170	<170	<170	<170	<170	<170	<170

Notes:

NA	Not Analyzed
NC	No Criteria Established
--	Not Applicable
ID	Insufficient Data available to determine cleanup criteria
(1)	Chromium VI used for Total Chrome
(2)	Total Isomer criteria used
(3)	Sum of criteria for individual isomers
(4)	Criteria for related isomer used
(5)	MDNR Background Soil Survey (1991)

* Direct Contact Values in soil from MDNR Operational Memorandum #8, Re

SECTION 4
DISPOSAL

The disposal of all wastes generated during the execution of this project were coordinated by CRA and approved by ATOCHEM. All manifests were signed by ATOCHEM and were completed by the CRA on-site representative, who reviewed the analytical data. WESTON supplied the transportation, labor, and equipment to load the wastes. All the waste materials were disposed of according to federal, state, and local regulations.

4.1 NONHAZARDOUS WASTE

A large portion of the materials required to be disposed was classified and disposed of as non-hazardous. The materials included:

- 399 Drums.
- 1,345 tons of soil.
- 77 cubic yards of debris, which also included the activated carbon from the air purification units.

Some of the materials were taken to the BFI Arbor Hills Landfill located in Northville, Michigan. These materials had to test as non-hazardous and had to pass a paint filter test to be landfilled. All of the non-hazardous soils, debris, and 307 drums that fell into this category were landfilled. Those drums which contain non-hazardous but liquid material (which could not be landfilled) were disposed of through Michigan Recovery Systems, Inc., located in Romulus, Michigan. A total of 92 drums fell into this category. These drums were shipped using the MDNR Uniform Hazardous Waste Manifest even though this a non- regulated waste.

A copy of each of the manifests can be found in Appendix C of this report.

4.2 HAZARDOUS WASTE

The remainder of the waste removed from this site was handled and disposed of at hazardous waste facilities. These waste materials included drums and the soil surrounding some of the drums. The materials disposed of as hazardous waste were:

- **416 drums.** This total included 12 drums of excess sample materials from the laboratory that performed the analyses. The drums were disposed of at Michigan Recovery Systems, Inc., located in Romulus, Michigan.

- **597 tons of soil.** The soil was disposed of at Envotech Management Services, Inc., located in Bellville, Michigan.

A copy of each of the manifests can be found in Appendix C of this report.

SECTION 5
RESTORATION

Upon completion of the backfilling, removal of the trailers and the temporary building, and removal of the temporary roadways, the excavation site was regraded to its original slope in preparation for revegetation. Topsoil was imported and placed over the disturbed areas, and the areas were then hydro-seeded with a grass seed mixture specified by the City of Riverview Building Department. The seeding was completed on 19 June 1995, after a delay that was due to a mild drought in the local region. Seeding would not have been successful if it had been performed earlier than this time. The seed blend information and the certification of origin letters from the supplier for all the stone, backfill, and topsoil materials are provided in Appendix E of this report.

The drum storage area was dismantled upon completion of all the drum disposal activities. The HDPE liner and scrap wood were disposed of as debris, and the crushed stone was placed in the temporary roadways in the West Brine Field. All reusable materials were stockpiled neatly and left on site at the West Brine Field.

SECTION 6

REFERENCES

WESTON, July 1994, RCRA Corrective Action Interim Measures Work Plan for Former Landfill 2 (SWMU) Drum Removal, Elf Atochem North America, Inc., West Brine Field, Riverview, Michigan, July 1994.

WESTON, January 1995, RCRA Facility Investigation/Corrective Action Interim Investigation Report for Former Landfill 2 (SWMU) Drum Removal, Elf Atochem North America, Inc., West Brine Field, Riverview, Michigan, January 1995.

WESTON, April 1994, RCRA Facility Investigation Phase I Report, Elf Atochem North America, Inc., East Plant, Wyandotte, Michigan, January 1995.