December 19, 1996

Mr. David Bennett
United States Environmental Protection Agency
1200 Sixth Avenue, Mail Stop ECL-115
Seattle, Washington 98101

Re: Contract No. 68-W6-0008
TDD No. 96-07-0005

Dear Mr. Bennett:

Enclosed please find a copy of the Site Inspection (SI) report for Cascade Chemical located in Clackamas, Oregon. The SI included limited sampling of potential contaminant source areas and groundwater.

Enclosed is also a CD-ROM containing the report except for Appendix C. If you have any questions regarding this deliverable, please call me at 206/624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

Jeffrey Fowlow,
Project Leader

Enclosures

cc: Gary Sink, START Project Leader, USEPA, Seattle (Mail Stop ECL-116) (letter only)
William Carberry, START Program Manager, E & E, Seattle (letter only)
Carl Palladino, START Project Manager, E & E, Seattle

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SITE INSPECTION REPORT
CASCADE CHEMICAL
Clackamas, Oregon

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1. INTRODUCTION

Ecology and Environment, Inc., (E&E) was tasked by the U.S. Environmental Protection Agency (EPA) to provide technical support for the completion of a site investigation (SI) at Cascade Chemical located in Clackamas, Oregon. E&E conducted SI activities under Technical Directive Document No. 96-07-0005, issued under EPA Region X Superfund Technical Assessment and Response Team (START) Contract Number No. 68-W6-0008. The specific goals for the SI were to:

- Determine whether a release to soil and/or groundwater has occurred;
- Evaluate the need for a removal action; and
- Determine whether additional sampling/investigation at the site is warranted.

Activities conducted as a part of this SI included: reviewing previous information concerning the site; gathering new information; conducting sampling activities; and preparing an SI report summarizing the findings. The SI sampling event was intended to be a limited investigation of potential on-site contaminant sources at the facility.

This document includes a discussion of background information regarding the site (Section 2); a description of field activities and analytical protocol (Section 3); quality assurance/quality control procedures (Section 4); a description of source sampling (Section 5); a description of migration/exposure pathways (Section 6); a summary of investigation findings and conclusions (Section 7); and a list of references (Section 8).

2. SITE BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Cascade Chemical (Cascade) facility is an inactive chemical company located in an industrial area of Clackamas, Oregon (Figure 2-1). Cascade manufactured a wide variety of chemicals including strippers, treatment chemicals, pet care products, photographic chemicals, and tire sealants from pure chemical products. The site property is approximately 40 feet wide and 70 feet deep with a single building which occupies most of the lot, leaving only a 5-foot easement between the southwest and northeast property boundaries, no easement northwest (behind) the building, and a 30-foot easement southeast (in front) of the building (Figure 2-2). The property is bounded on the southwest by Bill's Datsun Shoppe, on the northwest by Architectural Metalcrafters, on the northeast by All Star Machines and AJK Precision Sheet Metal, and on the southeast by Southeast Evelyn Street. The property containing Architectural Metalcrafters is the location of the former Carson Oil Company land-farm which treated petroleum-contaminated soils. The nearest residence is approximately 200 feet east of the facility. The on-site building was constructed in 1974 - 1975 by another chemical company which, for a short time, manufactured a variety of chemicals. Mr. Andrew Lambie purchased the company in 1976 and acted as president and operator of Cascade Chemical until August 1996 when the business was closed (ODEQ 1995). Mr. Lambie is currently the majority stockholder of Cascade.

2.2 SITE OPERATIONS AND WASTE CHARACTERISTICS

The company was in the business of chemical formulation from approximately 1976 until 1996. Mixing of chemical products predominately took place in one mixing tank located in the southwest area of the building. In 1994, an inventory of chemicals used at the facility showed the primary hazardous substances to be thousands of gallons of alcohols and petroleum-based solvents, stored in a variety of tanks and containers as follows; a 1,500-gallon tank of methylene chloride; 500-gallon tanks of toluene and acetone; and hundreds of gallons of inorganic acids, including hydrofluoric acid, hydrochloric acid, and sulfuric acid stored in numerous container types (Figure 2-3) (ODEQ 1995).

Figure 2-1

Figure 2-2

Figure 2-3

A 1,100-gallon underground storage tank (UST) containing methanol was removed from the area located adjacent and southwest of the parking lot in October 1990. A soil sample collected from under the tank contained 250 parts per million (ppm) oil-range petroleum hydrocarbons. A subsequent sample of this soil showed no detectable levels of methanol or other VOCs, however, the detection limit for methanol was relatively high at 300 ppm. Mr. Lambie stated in a letter to the Oregon Department of Environmental Quality (ODEQ) that the area of the UST was paved in 1990 and that the petroleum detection may have been caused by asphalt bits that had fallen into the tank excavation. The ODEQ UST Section accepted this explanation and closed the file on January 30, 1991 (ODEQ 1995).

In June 1995, a local resident notified the South Metro Fire Prevention Office (South Metro), the local fire department, of a chemical release occurring at Cascade, evidenced by "fuming barrels" and "two people running around with gas masks". South Metro responded to the scene and verified that an unknown liquid had been released from a drum labeled "poison" in front of the business. No cleanup of the spilled material was attempted since the situation appeared stable. The notifying resident indicated that over the past several years, he had witnessed other similar releases/disposal incidents (ODEQ 1995).

The START conducted a site visit at Cascade on August 29, 1996. During the visit, several tanks and drums and numerous small containers of chemicals were observed within the building. A comprehensive inventory of chemicals in the facility was not conducted, however, the general types of chemicals observed is provided below (E&E 1996):

- All-bright Germicidal Cleanser, manufactured by Cascade Chemical, contents: n-Alkyl (60% C_{14}, 30% C_{16}, 5% C_{12}, 5% C_{18}) dimethyl benzyl ammonium chlorides 2.25%, n-Alkyl (68% C_{12}, 32% C_{14}) dimethyl ethyl benzyl ammonium chlorides 2.25%, Inert ingredients, 95.5%;
- Chlorine Buffer Solution;
- FOSFAMIDE N, manufactured by Textilane, Division of Henkel;
- Bio-Slime Retardant (Methanol), manufactured by Bether Products;
- Miracle Cold Stripper, manufactured by Cascade Chemical, contents: Methylene chloride, Methanol, Toluene, organic acids;
- Miracle Aircraft Grade Remover or Super Stripper, manufactured by Cascade Chemical, contents: Methylene chloride, Methanol, Toluene, Hydrofluoric acid;
- Miracle Sander Wipe Off Paint Remover (Flammable), manufactured by Cascade Chemical, contents: Methylene chloride, Methanol, Toluene, organic acids;
- Amyl Acetate;

- Copper Etchant;
- Corrosives (Unknown species);
- Nitric Acid;
- Di-octyl phthalate, manufactured by Cascade Chemical; and
- Yippee Pet Shampoo, manufactured by Cascade Chemical, contents: Pyrethrins and other ingredients.

Mr. Lambie stated that these chemicals have been sold or were in the process of being sold to other manufacturers that make products formerly manufactured by Cascade. The concrete floor of the building was observed to be stained, corroded, and pitted, and to contain many small cracks. The area around and under the mixing tank was noted as having dark stains and a thick layer of unknown substances on the floor. Electrical conduits were observed to be corroded, as was most metal in the building consisting of light fixtures, carts, piping, and steel support structures. Some gaps in the floor to wall interface also were observed. Outside the building, the START observed two areas of stained soil: one on the southwest side of the building, below the vent for the large mixing tank, and one approximately 4 feet north of this location, below another vent. Further, two areas of stressed vegetation were observed on the northeast side of the building (E&E 1996). (See Section 5 for further discussion of these areas).

Mr. Lambie stated during the site visit that, historically, spills inside the building were cleaned up with absorbent and disposed in a dumpster, however, a hydrofluoric acid spill that occurred in 1996 was cleaned up with neutralizing powder.

2.3 PREVIOUS INVESTIGATIONS

In June 1990, ODEQ received a citizen complaint regarding odors and occasional "clouds of smoke" emanating from the facility prompting a visit by an ODEQ inspector in July 1990. The inspector noted "many barrels of chemicals strewn about". A formal ODEQ follow-up site visit was conducted in February 1993 by hazardous waste inspectors, however, this inspection was aborted because the inspectors believed conditions inside the building to be unsafe due to the presence of open containers and floor spills. Mr. Lambie stated during this site visit that Cascade did not generate any hazardous wastes. Following the site visit, ODEQ notified its Resource Conservation and Recovery Act (RCRA) program and the Occupational Safety and Health Administration (OSHA) in Oregon with regard to apparent hazards at the facility (ODEQ 1995).

An OSHA inspection conducted in May 1993 resulted in 24 safety violations and a fine of $11,070. Following this penalty, Mr. Lambie dismissed his one employee, allegedly so OSHA regulations would no longer apply to his business. A subsequent visit conducted by a South Metro Hazardous Materials Specialist in November 1994, determined that the facility could not continue its business and comply with fire and building codes. This office continued to work with Cascade to resolve fire safety and chemical storage issues until Cascade closed (ODEQ 1995).

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

Field sampling activities at Cascade conducted as part of this SI were performed by START members on October 13, 1996. A description of the SI field work, including: site activities; sampling rationale; sample types, quantities, and locations; and sample collection methods, is presented in the following section.

The numbers and types of samples collected, analytical methods, specific requirements for sample container size and type, and sample preservation and holding times, are presented in Table 3-1. SI field activities were conducted in accordance with a Quality Assurance Sampling Plan (QASP) that was approved by the EPA Task Monitor prior to field activities (E & E 1996). As stated in the QASP, the number of samples collected and the locations identified were, in some cases, dependent upon actual conditions encountered upon arrival at the site. Deviations from the QASP are discussed below. Further, an inventory of chemicals remaining in the building was not conducted as required in the QASP because the building could not be accessed since Mr. Lambie could not meet the field team during the sampling event. Photographic documentation of site activities is provided in Appendix A.

3.1 SAMPLE LOCATIONS AND METHODOLOGIES

Figure 3-1 depicts the general locations of samples collected during the SI. Table 3-2 provides a list of sample numbers, sample depths, collection date and time, and a brief description of sample locations. The following sections describe matrix-specific sample locations and rationale, and sampling methodologies employed.

3.1.1 Surface Soil Samples

A total of five surface soil samples were collected during the Cascade SI, including one background sample as defined in Table 3-2. The remaining four samples were from suspected contaminated sources. Grass, leaves, other organic material, and debris (when present) were removed from the samples prior to sample collection. All samples were grab samples collected from the upper 0 to 2 inches of soil from an approximately 6-inch diameter area and consisted of mostly sand. Samples were collected using a dedicated stainless steel spoon and large pieces of gravel were removed

TABLE 3-1

SAMPLE SUMMARY
CASCADE CHEMICAL
Clackamas, Oregon

Matrix	Analytical Parameter	Method	Required Detection Limits	Container Type and Sample Volume	Preservative	Holding Time	DQO Level	Quality Control Samples					Total Field Samples
								Blanks (1)	PE (2)	MS (3)	MSD (3)	Replicates (4)	
Soil	VOCs	8260A	Per Method	1 x 4 oz VOA glass jar	4°C	14 days	1	-	-	1	1	-	5
Water	VOCs	8260A	Per Method	4 x 40 ml VOA glass vials	pH < 2 with HCl, 4°C	7 days	1	-	-	1	1	-	1

(1) Specify type: trip, rinsate, transfer.
(2) Performance Evaluation Samples (optional for QA 1, mandatory for QA 2) if available.
(3) For organic analyses, a matrix spike and matrix spike duplicate are performed at a frequency of 1 set per 10 samples; for inorganic analyses, a matrix spike is performed at a frequency of 1 per 10 samples (no matrix spike duplicate is performed); QA 2 requires that one sample and it's corresponding matrix spike are analyzed in replicates of 8.
(4) The number of replicate samples that will be used to determine error and bias.

Key:
- C - Celsius
- DQO - Data Quality Objective
- HCl - Hydrochloric Acid
- ml - Milliliters
- MS - Matrix Spike
- MSD - Matrix Spike Duplicate
- oz - ounce
- PE - Performance Evaluation
- QA - Quality Assurance
- VOA - Volatile Organic Analyte
- VOCs - Volatile Organic Compounds

Figure 3-1

TABLE 3-2

SAMPLE DESCRIPTIONS
CASCADE CHEMICAL
Clackamas, Oregon

Sample No.	Sample Type	Depth Below Ground Surface	Date	Time	Location/Description
96100001	Background Soil	0-2"	10/13/96	1530	Behind Cascade approximately 4 feet from building
96100002	Surface Soil	0-2"	10/13/96	1533	Stained soil on southwest side of Cascade, approximately 18 feet from the south corner of the building
96100003	Surface Soil	0-2"	10/13/96	1535	Stained soil on southwest side of Cascade below the mixing tank vent, approximately 14 feet from the south corner of the building
96100004	Surface Soil	0-2"	10/13/96	1553	Area of stressed vegetation on northeast side of Cascade, approximately 32 feet from - east corner of building
96100005	Surface Soil	0-2"	10/13/96	1558	Area of stressed vegetation on northeast side of Cascade, approximately 11 feet from - east corner of building
96100006	Subsurface Soil	2'	10/13/96	1605	Stained soil on southwest side of Cascade below the mixing tank vent
96100007	Subsurface Soil	3.5'	10/13/96	1615	Stained soil on southwest side of Cascade below the mixing tank vent
96100008	Groundwater	7.75'	10/13/96	1645	Approximately 4 feet from the south corner of Cascade building

before placing the soil in the appropriate sample containers. Samples were stored on ice in coolers.

3.1.2 Subsurface Soil Samples

Two subsurface soil samples were collected from one boring during the Cascade SI as defined in Table 3-2. The subsurface samples were collected at 2 feet and 3.5 feet below ground surface (bgs). The boring was not advanced to groundwater as prescribed in the QASP due to auger refusal. Both samples were of sandy soils. Samples were collected using decontaminated stainless steel hand augers. Large pieces of gravel were removed before placing the soil in appropriate sample containers and samples were stored on ice in coolers.

3.1.3 Groundwater Samples

One groundwater sample was collected during the SI from a boring drilled near the south corner of the facility to determine whether groundwater beneath the site has been impacted from site activities. The boring was drilled using a truck-mounted cone penetrometer (Geoprobe™) with an inertia tube sampler to collect the groundwater. First, Geoprobe™ rods were hammered into the soil to groundwater depth which was encountered at approximately 7.75 feet bgs. The inertia tube was inserted into the rod and oscillated, thus causing a check valve to trap groundwater in the tube. Once the tube overflowed from its top, a groundwater sample was collected directly from the inertia tube into the appropriate sample containers. Samples were preserved with hydrochloric acid and stored on ice in coolers.

3.2 ANALYTICAL PROTOCOL

Samples collected during field activities were submitted to a fixed laboratory for volatile organic compound (VOCs) analysis (EPA Method 8260A). Further, all soil sample locations were field screening with a flame ionization detector (FID). All samples collected were submitted for non-routine, CLP-equivalent, fixed laboratory analysis to Maxim Analytical Laboratory in Billings, Montana.

4. QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) data are necessary to determine precision and accuracy, to demonstrate the absence of interferences, and to demonstrate the absence of contamination on sampling equipment, glassware, reagents, etc. Specific QC requirements for laboratory analyses are incorporated in the analytical method performed by the laboratory. The analytical method for all samples was EPA Method 8260A and the method QC requirements were followed for analytical work on the Cascade SI.

4.1 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

One matrix spike and matrix spike duplicate (MS/MSD) sample was collected for each matrix sampled during the SI. One soil (96100001) and one groundwater sample (96100008) was used for MS/MSD purposes (the MS/MSD samples did not constitute a separate sample). The analytical laboratory analyzed several QC samples for quality assurance purposes according to EPA Method 8260A. The QC samples analyzed were initial and continuing calibration, blanks, matrix spike and matrix spike duplicates, and laboratory control samples.

4.2 DATA VALIDATION

The START performed data validation according to EPA's OSWER Directive "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (EPA/540/G-90/004), and when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 540/R-94/012). The results of these reviews and the associated data validation memoranda are provided with the laboratory data forms in Appendix B.

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

The laboratory data was reviewed to ensure that data quality objectives (DQOs) specified in the QASP were met for the project. The laboratories' ability to meet the project DQOs for precision, accuracy, representativeness, comparability, and completeness is described below.

4.3.1 Precision and Accuracy

Precision and accuracy measures the reproducibility of the sampling and analytical methodology. Precision is defined as the relative percent difference (RPD) between duplicate samples analyses. Laboratory duplicate samples measure the precision of the analytical method; field duplicate samples measure the precision of the field and analytical methods. Accuracy is defined as the matrix spike percent recovery of the spiked samples' analytes. Laboratory matrix spike and matrix spike duplicate samples and native spike samples measure the accuracy of the analytical method.

Laboratory matrix spike/matrix spike duplicate samples were taken during the SI to measure accuracy of the analytical methods. A review of the data indicates that QC criteria was met.

4.3.2 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The number and selection of samples were determined in the field to accurately account for site variations and sample matrices. The DQOs for representativeness were met.

4.3.3 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Data produced for this site followed applicable field sampling techniques and specific analytical methodology. The DQOs for comparability were met.

4.3.4 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. The DQOs for completeness were met.

4.4 LABORATORY AND FIELD QA/QC PARAMETERS

Laboratory data was also reviewed for holding times. All sample analyses met holding time criteria. The complete data review can be found in the data quality assurance review memoranda located in Appendix B. In general, the laboratory and field QA/QC were considered acceptable.

5. POTENTIAL SOURCE SAMPLING

Potential waste sources, sample locations, and analytical results are described in this section. A discussion of the groundwater sample analytical results is provided in Section 6 (Migration/Exposure Pathways and Targets). Analytical data forms from laboratory analysis are provided in Appendix B.

5.1 SOURCE DESCRIPTIONS AND SAMPLING

Two areas of stained soil and two areas of stressed vegetation were investigated as potential sources of contamination at the site. The two areas of stained soil are located on the southwest side of the Cascade building: one approximately 14 feet northwest of the south corner of the building and one approximately 18 feet northwest of the south corner of the building. Both have approximate dimensions of 1 foot by 2 feet and both appear to be the result of spills originating from within the building that seeped through the foundation to wall interface, then ran down the side of the foundation to the soils. The stain located approximately 14 feet northwest of the south corner of the building was adjacent to the mixing tank vent. Further, the floor surrounding the mixing tank was heavily stained indicating numerous spills in the area and could have been the source of the soil stain. The extent of subsurface contamination is not known, but it is suspected that soils beneath the building foundation also may be contaminated. A surface soil sample was collected from each of these two areas (96100002 and 96100003, respectively). In addition, two subsurface soil samples were collected from one boring drilled in the stained soil area adjacent to the mixing tank vent (i.e., at the same location as surface soil sample 96100003) at 2 feet and 3.5 feet bgs (96100006 and 96100007, respectively).

The two areas of stressed vegetation are located on the northeast side of the Cascade building, one approximately 32 feet from the east corner of the building (covering an area approximately 4 feet by 1 foot) and one approximately 11 feet from the east corner of the building (covering an area approximately 3 feet by 1 foot). One surface soil sample was collected from each of these areas (96100004 and 96100005, respectively).

A background soil sample (96100001) was collected from soils approximately 4 feet from the northwest side (rear) of the Cascade building, between Cascade and Architectural Metalcrafters.

5.2 ANALYTICAL RESULTS

Analytical results of potential source samples are presented in Table 5-1 (laboratory data) and Table 5-2 (field screening data). Laboratory results indicating elevated concentrations of contaminants with respect to background are underlined in Table 5-1. Elevated concentrations are those concentrations that are:

- Equal to or greater than the sample's sample quantitation limit (SQL); and
- Equal to or greater than the background sample's SQL when the background concentration is not detected; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limit.

For analytical results that are qualified as estimated, the sample concentration was adjusted as described in "Using Qualified Data to Document an Observed Release" (OSWER Publication 9285.7-14FS, June 1994) (Appendix C) prior to determining whether the concentration is elevated. Estimated analytes not listed in this reference were not evaluated. The bias for estimated results was not determined because all such concentrations are sufficiently high to qualify as elevated with the most stringent divisor applied (i.e., that for analytical results that are biased high or for which the bias is unknown).

Elevated concentrations of VOCs were detected in samples from each source area. The samples collected from stained soil located 14 feet from the south corner of the building and beneath the mixing tank vent contained elevated concentrations for thirteen VOCs ranging up to 2,000,000 micrograms per kilogram (ug/Kg) (for toluene). All contaminant concentrations at this location were higher in samples collected at the 2 and 3.5 feet bgs than in the surface soil sample. The second stained soil area, located 18 feet from the south corner of the building, contained elevated concentrations of three VOCs ranging up to an estimated concentration of 2,400 ug/Kg (naphthalene). The area of stressed vegetation located 11 feet from the east corner of the building contained elevated concentrations of six VOCs ranging up to an estimated concentration of 242 ug/Kg (m- and p- xylene). The second area of stressed vegetation, located 32 feet from the east corner of the building, contained elevated concentrations of only one VOC at an estimated concentration of 8 ug/Kg (chloromethane).

Field screening results reflect laboratory results. The highest VOC concentrations observed in soils at depth from the stained soil area located 14 feet from the south corner of the building and the lowest VOC concentrations observed in the area of stressed vegetation located 32 feet from the east corner of the building.

TABLE 5-1

SOIL LABORATORY ANALYTICAL RESULTS
CASCADE CHEMICAL
Clackamas, Oregon
(ug/Kg)

Sample No.: **Analyte**	**96100001** **0-2" bgs** **(Background)**	**96100002** **0-2" bgs** **(Stained soil 18' from south building corner)**	**96100003** **0-2" bgs** **(Stained soil 14' from south building corner)**	**96100006** **2' bgs** **(Stained soil 14' from south building corner)**	**96100007** **3.5' bgs** **(Stained soil 14' from south building corner)**	**96100004** **0-2" bgs** **(Stressed vegetation 32' from east building corner)**	**96100005** **0-2" bgs** **(Stressed vegetation 11' from east building corner)**
Chloromethane[1]	5 U	**33 J (24 AC)**	630 U	630 U	630 U	**8 J (6 AC)**	**36 J (26 AC)**
Methylene chloride[1]	10 UJ	130 U	3300 UJ	**440,000 J (314,000 AC)**	910,000 U	29 UJ	104 UJ
1,2-Dichloroethane[1]	5 U	25 U	630 U	630 U	630 U	5 UJ	**40 J (29 AC)**
Trichloroethene	5 U	25 U	630 U	**24,500**	**14,300**	5 UJ	10 UJ
Toluene[2]	5 U	**100 J (50 AC)**	**4700**	**990,000**	**2,000,000**	5 UJ	**193 J (97 AC)**
Tetrachloroethene	5 U	25 U	630 U	**3,300**	**3,900**	5 UJ	10 UJ
Ethylbenzene[3]	5 U	25 U	**5,100**	**230,000 J (153,000 AC)**	**198,000**	5 UJ	**26 J (17 AC)**
m&p Xylene[3]	5 U	25 U	**38,600**	**920,000 J (613,000 AC)**	**820,000**	5 UJ	**242 J (161 AC)**
o-Xylene[3]	5 U	25 U	**18,500**	**290,000 J (193,000 AC)**	**20,000**	5 UJ	**89 J (59 AC)**
Isopropylbenzene	5 U	25 U	630 U	**1,400**	**1,600**	5 UJ	10 UJ
n-Propylbenzene	5 U	25 U	630 U	**2,600**	**3,100**	5 UJ	10 UJ
1,3,5-Trimethylbenzene	5 U	25 U	630 U	**6,500**	**7,300**	5 UJ	**91 J**

TABLE 5-1

SOIL LABORATORY ANALYTICAL RESULTS
CASCADE CHEMICAL
Clackamas, Oregon
(ug/Kg)

Sample No.: **Analyte**	**96100001** **0-2" bgs** **(Background)**	**96100002** **0-2" bgs** **(Stained soil 18' from south building corner)**	**96100003** **0-2" bgs** **(Stained soil 14' from south building corner)**	**96100006** **2' bgs** **(Stained soil 14' from south building corner)**	**96100007** **3.5' bgs** **(Stained soil 14' from south building corner)**	**96100004** **0-2" bgs** **(Stressed vegetation 32' from east building corner)**	**96100005** **0-2" bgs** **(Stressed vegetation 11' from east building corner)**
1,2,4-Trimethylbenzene	5 U	25 U	**1,940**	**23,500**	**27,000**	5 UJ	**165 J**
sec-Butylbenzene	5 U	25 U	630 U	**1,400**	**1,700**	5 UJ	**30 J**
t-Butylbenzene	5 U	25 U	630 U	**2,300**	**2,900**	5 UJ	**25 J**
n-Butylbenzene	5 U	25 U	630 U	630 U	630 U	5 UJ	**24 J**
Naphthalene[4]	5 U	**2400 J** **(600 AC)**	630 U	630 UJ	630 UJ	5 UJ	10 UJ

Bold Highlight - The analyte was detected.
Underline - Elevated concentration.

(1) - The analyte divisor is 1.4.
(2) - The analyte divisor is 2.0.
(3) - The analyte divisor is 1.5.
(4) - The analyte divisor is 4.0.

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limit or because quality control criteria limits were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

UJ - The material was analyzed for, but not detected. The reported detection limit is estimated because Quality Control criteria were not met.

AC - Adjusted concentration.
bgs - Below ground surface.
ug/Kg - Micrograms per Kilogram.

TABLE 5-2

SOIL FIELD SCREENING ANALYTICAL RESULTS
CASCADE CHEMICAL
Clackamas, Oregon
(ppm)

Sample No.:	**96100001 0-2" bgs (Background)**	**96100002 0-2" bgs (North area of Stained Soil)**	**96100003 0-2" bgs (South area of stained soil near vent)**	**96100006 2' bgs (South area of stained soil near vent)**	**96100007 3.5' bgs (South area of stained soil near vent)**	**96100004 0-2" bgs (North area of Stressed Vegetation)**	**96100005 0-2" bgs (South area of Stressed Vegetation)**
FID Reading	0	10	100	>1,000	>1,000	1	180

bgs - Below ground surface.
FID - Flame ionization detector.
ppm - Parts per million.

6.0 MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following sections describe migration/exposure pathways and potential targets within the site's range of influence (Figure 6-1).

6.1 GROUNDWATER MIGRATION PATHWAY

The site is located within the Portland Basin on an alluvial terrace along the Clackamas River. The Portland Basin is bounded by the Cascade Range to the east, the Portland Hills to the west, the Lewis River to the north, and the Clackamas River to the south. The site is located within the Portland Terraces, a physiographic subunit of the Portland Basin. These terraces were formed by the ancestral Columbia and Willamette Rivers during a time when the rivers were flowing at higher elevations than at present (E & E 1996c).

The Portland Basin is filled with quaternary alluvial deposits, catastrophic flood sediments deposited during the Pleistocene, and undifferentiated sediments deposited during the Pliocene. These sediments overlie the Columbia River Basalt and the older Waverly Heights Basalt (E & E 1996c).

Pleistocene fluvial deposits occur from the ground surface to a depth of approximately 100 feet below ground surface (bgs) in the site vicinity. The deposits consist of interlayered silts, sands, and gravels deposited during major flood events, glacial and interglacial periods, and fluvial systems. Undifferentiated sediments (Pliocene to Holocene), including the Troutdale Formation and Sandy River Mudstone, lie beneath the Pleistocene fluvial deposits. Total thickness of these sediments may exceed 200 feet. The Troutdale Formation consists of consolidated and unconsolidated sand and gravel deposits, cemented in places. Silt and clay layers within the Troutdale Formation are not typically laterally continuous. The Sandy River mudstone consists of silts, clays, and silty clays and may be a local aquitard (E & E 1996c).

Shallow groundwater in the area occurs at a depth of approximately 9 feet bgs and fluctuates from 5 to 10 feet bgs seasonally with precipitation. The shallow groundwater appears to be perched upon other sediments of lesser permeability. The upper sediments are believed to consist of catastrophic flood deposits of the Unconsolidated Sedimentary Aquifer of the Portland Basin (E & E 1996c). During the SI sampling event conducted in October 1996, groundwater was encountered at the site at 7.75 feet bgs.

Figure 6-1

Deeper aquifers in the area occur in fractured basalts and the Troutdale Formation gravels and sands. Hydrogeologic studies conducted in the area indicate that the groundwater flow in these units is directed to the west-southwest, towards the Willamette and Clackamas Rivers (E & E 1996c).

Several small water districts are located within 4 miles of the site generally consisting of one or two wells. One larger water system, the City of Milwaukee's public water works, operates eight drinking water wells. Water from the wells in blended in distribution lines and no one well contributes more than 40% of the total water supply (Hoffman 1996). The nearest municipal well is located approximately 0.7 miles west (downgradient) of the site. Populations using groundwater for drinking water are summarized in Table 6-1. Further, it is estimated that 400 to 500 domestic wells exist within 4 miles of the site, however, populations served by these wells are not included in Table 6-1 because actual well locations are not known and research to determine the domestic well locations would be addressed in a later phase of site work, if required.

Groundwater is assumed to be used for irrigation in the vicinity of the site. However, the site is not located within 1 mile of any Sole Source Aquifer areas (EPA 1996). The groundwater gradient at the site is not known. The direction of groundwater flow is believed to be southwest. Laboratory analytical results of the Geoprobe™ shallow groundwater sample detected one VOC, toluene, at an estimated concentration of 1,400 micrograms per liter (ug/L). The federal maximum contaminant level (MCL) for toluene in drinking water is 1,000 ug/L.

6.2 SURFACE WATER MIGRATION PATHWAY

The Clackamas River is located approximately 0.6 miles south of the site and flows approximately 3.5 miles southwest to its confluence with the Willamette River, which discharges to the Columbia River approximately 25 miles downstream. A small intermittent stream, Cow Creek, is located approximately 200 feet north of the site and this stream flows southwest approximately 1.5 miles to the Clackamas River. The Clackamas River's average annual flow rate is approximately 2,425 cubic feet per second (as measured at river mile 23.1) (USGS 1988). The Willamette River's average annual flow rate is approximately 3,197 cubic feet per second (as measured at river mile 12.8) (USGS 1988). The facility is located in a slight topographic depression (USGS 1984) and for this reason, surface water generated during rainfall events is expected to pool around the building and infiltrate the ground surface.

The 2-year, 24-hour rainfall event for the area of the site is 2.5 inches (NOAA 1973) with an average annual net precipitation of approximately 27 inches (NOAA 1968). The upgradient drainage area of the site is estimated from a topographic map to be 10 acres (USGS 1984). The ground surface

TABLE 6-1

GROUNDWATER DRINKING WATER POPULATION WITHIN A 4-MILE RADIUS
CASCADE CHEMICAL
Clackamas, Oregon

Distance (Miles)	Well Identification	Well Depth (bgs)	Population Served	Total Population per Distance Ring
0 - 1/4	Not Listed	--	--	0
1/4 - 1/2	Not Listed	--	--	0
1/2 - 1	Johnson City Well 1	160	300	600
	Johnson City Well 2 (Backup)	172	300	
1 - 2	Not Listed	--	--	0
2 - 3	City of Milwaukee Well 8	480	2,375	3,025
	River Bend Well 1	820	175	
	River Bend Well 2	800	175	
	Riverview Mobile Court	565	300	
3 - 4	City of Milwaukee Well 6	336	2,375	2,701
	Carver Mobile Ranch	118	186	
	Pearson Mobile Park	254	140	
Total				6,326

Source: EPA 1996

at the site is relatively flat with an estimated slope between 0 and 2 percent. Surficial soils at the site are sandy and appear to be fill material (i.e., not of native origin). Deeper lithology at the site has not been characterized, however, lithology at a site located approximately 0.7 miles east of Cascade is described as unconsolidated sand and gravel, with varying amounts of clay in certain areas from the ground surface to approximately 100 feet bgs (E & E 1996c).

The Willamette River is not used as a source of drinking water, however, it is used for recreational boating (EPA 1996). Approximately 135,195 pounds of fish are caught annually from the Clackamas River and approximately 47,756 pounds of fish are caught annually from the Willamette River (EPA 1996). It is estimated that 22 miles of wetlands exist within 15 miles downstream of the site.

6.3 SOIL EXPOSURE PATHWAY

Four areas of contaminated soil are present on-site: two adjacent to the southwest side of the Cascade building and two adjacent to the northeast side of the building. The total area of contaminated soil at the site is expected to measure approximately 11 square feet. The site is not fenced. The southeast section of the Cascade lot is paved, from the building to the street, as shown in Figure 2-2 (Section 2). Mr. Lambie currently works on a part-time basis at the site and the nearest resident to the site is located approximately 100 feet southeast. Table 6-2 provides population figures for people residing within 1 mile of the site. No terrestrial sensitive environments are known to occur at the site.

TABLE 6-2

POPULATIONS WITHIN A 1-MILE RADIUS
CASCADE CHEMICAL
Clackamas, Oregon

Distance Ring	Population
0 - 1/4 mile	59
1/4 - 1/2 mile	752
1/2 - 1 mile	4,379
Total	5,190

Source: EPA 1996

6.4 AIR MIGRATION PATHWAY

No people are currently employed at the site, although Mr. Lambie uses an office in the building on a part-time basis. Active facilities border the site property on the southwest, northwest, and northeast (see Figure 2-2, Section 2). A total of 86,793 people live within 4 miles of the site and no wetlands exist within 4 miles of the site (EPA 1996). Federally- and State-listed species that exist within 5 miles of the sites is provided in an EPA Geographic Information Query System printout (EPA 1996). The printout categorizes species by location from 0 to 1 mile and from 1 to 5 miles of the site. A species location within an actual distance ring can not be determined from this information, thus all species in the 0 to 1 mile category were assigned to the 0 to 1/4 mile ring and all species in the 1 to 5 miles category were assigned to the 1 to 2 miles ring as a conservative estimate of the site's impact to sensitive environments. Table 6-3 provides populations and sensitive environments by distance ring within 4 miles of the site.

TABLE 6-3

POPULATIONS AND SENSITIVE ENVIRONMENTS WITHIN A 4-MILE RADIUS
CASCADE CHEMICAL
Clackamas, Oregon

Distance (Miles)	Residents	Sensitive Environment	Listing Status	
			Federal	State
On a source	0	Not Listed	--	--
0 - 1/4	59	Not Listed	--	--
1/4 - 1/2	752	Not Listed	--	--
1/2 - 1	4,379	Not Listed	--	--
1 - 2	16,752	Oregon Sullivantia	Candidate	Candidate
		White Rock Larkspur	Candidate	Threatened
		Willamette Valley Daisy	Candidate	Endangered
		Oregon Chub	Endangered	Candidate
		Northwestern Pond Turtle	Candidate	Candidate
		White-Topped Aster	Candidate	Threatened
2 - 3	29,218	Not Listed	--	--
3 - 4	35,633	Not Listed	--	--
Total Population	86,793			

Source: EPA 1996

7. SUMMARY AND CONCLUSIONS

Cascade is an inactive chemical formulation facility located in an industrial area of Clackamas, Oregon. The facility was operational from 1974 to August 1996. Large quantities of solvents and corrosives were used in chemical manufacturing.

Several citizen complaints regarding releases/disposal of hazardous chemicals by Cascade have been received by ODEQ. ODEQ observed spills to the floor of the Cascade building and an OSHA inspection resulted in the 24 safety violations and a fine. During the SI site visit, the building foundation was observed to be stained, corroded, and pitted, and to contain many small cracks. The floor around the primary mixing tank was heavily contaminated with a thick layer of unknown substances. Further, two areas of stained soil were observed on the southwest side of the building that appear to be the result of spills originating within the building that seeped through the foundation to wall interface, then down the side of the foundation. Elevated concentrations of several VOCs were detected in soil samples from each of these stained soil areas. VOC concentrations increased with depth in the one soil boring drilled on site (at sample location 96100003 near the mixing tank vent). Elevated concentrations of VOCs also were observed in two areas of stressed vegetation located on the northeast side of the building.

The nearest municipal well to the site is located approximately 0.7 miles downgradient (west) of the facility. This backup well serves approximately 600 people when in use and is 172 feet deep. Groundwater at the site was encountered at 7.75 feet bgs, however, neither the groundwater gradient nor direction of flow have been determined. A groundwater sample collected with a Geoprobe™ system contained toluene at an estimated concentration of 1,400 ug/L which is above the federal MCL of 1,000 ug/L.

The average annual net precipitation is approximately 27 inches in the area of the site. The nearest perennially-flowing surface water body to the site is the Clackamas River located approximately 1.5 miles southwest, however, an overland route to this river is not expected to exist because Cascade is located in a slight topographic depression and it is likely that rainfall pools around the building and then infiltrates the ground surface.

No persons currently work full-time at the site, however, Mr. Lambie, the major shareholder in Cascade Chemical, uses an office in the building on a part-time basis. Approximately 5,190 people

reside within 1 mile of the site and approximately 86,793 people reside within 4 miles of the site. The site is bounded on three sides by active facilities, but is not fenced. No terrestrial sensitive environments are known to occur at the site. Six Federally- or State-listed species may exist within 1 to 2 miles of the site. The surficial area of contaminated soils at the site is expected to total approximately 11 square feet.

8.0 REFERENCE LIST

Ecology and Environment, Inc., (E & E), August 11, 1996 through November 5, 1996, Field logbook for Cascade Chemical site.

_____, September 1996b, Quality Assurance sampling Plan, Cascade Chemical, TDD # 96-07-0005.

_____, August 1996c, Site Investigation Report and Interim Remedial Action Measure Evaluation, Surgichrome, Inc., Clackamas, Oregon.

Hoffman, Tom, Oakridge Water Works, September 12, 1996, telephone conversation with Linda Foster, Ecology and Environment, Inc., regarding the City of Milwaukee water supply.

Oregon Department of Environment Quality (ODEQ), Site Assessment Program, November 29, 1995, Strategy Recommendation, Cascade Chemical.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), 1973, Precipitation-Frequency Atlas of the Western United States, Volume X-Oregon.

_____, June 1968, Climatic Atlas of the United States.

U.S. Environmental Protection Agency (EPA), September 4, 1996, Geographic Information Query System, Cascade Chemical.

U.S. Geological Survey (USGS), 1988, Water Resources Data, Oregon, Volume 2, Western Oregon.

_____, 1984, Topographic Map, 7.5 minute series, Gladstone Quadrangle, Oregon.

APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 645404 **TDD No.: 96-07-0005**

Lens Type: 50 mm **Site Name: Cascade Chemical**

Photo No.	Date	By	Description
1	8/29/96	CP	Front of Cascade Chemical, Inc. building. Facing NW.
2	8/29/96	CP	Southwest side of Cascade Chemical, Inc. building. Facing NW.
3	8/29/96	CP	Southwest side of Cascade Chemical, Inc. building. Shows the location of the stained wooden mud plate and soils. This stain is located beneath a vent with is used for the missing tank. Facing NE.
4	8/29/96	CP	Southwest side of building. Shows the location of the soil stain beneath the mixing tank vent. Facing N.
5	8/29/96	CP	Northeast side of the building. Shows a fence marking the property line between Cascade Chemical and AJK Precision Sheet Metal. Facing NW.
6	8/29/96	CP	Area of stressed vegetation on the northeast side of building. Facing W.
7	8/29/96	CP	Area located between Cascade Chemical and Architectural Metalcrafters. Facing NE.
8	8/29/96	CP	Northeast section of inside building. Note numerous containers against wall. Facing N.
9	8/29/96	CP	Closeup of containers shown in Photo 8. Note container with corrosive label and floor stains. Facing NE.
10	8/29/96	CP	Closeup of containers stored against NE wall of building. Note containers with a corrosive label and Di-octyl phthalate marking, and floor stains. Facing NE.
11	8/29/96	CP	Northwest side of building (rear wall) with containers stored on shelves. Note the white residue and other floor stains. Facing NE.
12	8/29/96	CP	Southwest portion of inside building. Facing SE.
13	8/29/96	CP	Drums with piping running between them, located on the SW wall of building. This setup was used for mixing some chemicals. Facing W.
14	8/29/96	CP	Large vat with ventilation hood located on the SW wall of building. This setup was used for mixing most chemicals. Facing S.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 645404 **TDD No.: 96-07-0005**

Lens Type: 50 mm **Site Name: Cascade Chemical**

Photo No.	Date	By	Description
15	8/29/96	CP	Fiftyfive-gallon drum located on the southwest section of building. The drum was labeled Miracle Aircraft Grade Remover or Super Stripper, manufactured by Cascade Chemical, contents: Methylene chloride, methanol, toluene, and hydrofluoric acid.
16	8/29/96	CP	Nearest residence, across SE Evelyn street, approximately 200 feet east of Cascade Chemical and north of ABC Metals. Facing E.
17	8/29/96	CP	Intermittent stream located NW of site. Shows culverts coming from under-neath the parking lot of Architectural Metalcrafters, the stream is running southwest to a culvert under SE Violet Ave. Facing NE.
18	10/13/96	CP	START Lyle Diediker observes location of the background sample 96100001 collected behind Cascade Chemical. Facing NE.
19	10/13/96	CP	Location of surface soil samples 96100002 and 96100003 collected from stained soils along the SE side of building. Note the location of sample 96100003, nearest the south corner of building, which is under the mixing tank vent. Facing E.
20	10/13/96	CP	Location of surface soil sample 96100004 collected from stressed vegetation area located on the NE side of building. Facing S.
21	10/13/96	CP	START collects surface soil sample 96100005 from an area with stressed vegetation, located on the NE side of building. START Alexis Naiknimbalker monitors the ambient air with a flame ionization detector instrument for volatile organic compounds. Facing S.
22	10/13/96	CP	Borehole at the location of the soil stain beneath the mixing tank vent. Two subsurface soil samples, 96100006 and 96100007, were collected from this location.
23	10/13/96	CP	START utilizes a Geoprobe™ System sampler to collect groundwater sample 96100008, located near the south corner of the building. Facing E.

APPENDIX B

QUALITY ASSURANCE REVIEWS

MEMORANDUM

DATE: November 15, 1996

TO: Carl Palladino, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-Chemist, E & E, Seattle, WA

THRU: Michael Boykin, START-Chemist, E & E, Seattle, WA

SUBJ: **Organic Data Quality Assurance Review, Cascade Chemical Site, Clackamas, Oregon**

REF: TDD: 96-07-0005 PAN: AG-05-01-SI

The data quality assurance review of one water and seven soil samples collected from the Cascade Chemical site located in Clackamas, Oregon, has been completed. Analysis for Volatile Organic Compounds (EPA Method 8260A) was performed by Maxim Analytical Laboratory, Billings, Montana.

The samples were numbered:

Soil - 96100001 96100002 96100003 96100004 96100005 96100006 96100007
Water - 96100008

Data Qualifications:

1. Sample Holding Times: Satisfactory.

All samples were maintained at 4EC (± 2EC). The samples were collected on October 13, 1996, and were analyzed by October 23, 1996, therefore meeting QC criteria of less than 7 days between collection and analysis for non-acid preserved aromatic water samples and less than 14 days between collection and analysis for soil, waste, and preserved water samples, except the following:

SAMPLE #	HOLDING TIME	PRESERVED (Y/N)	QUALIFIER
96100008	10 Days	N	J/UJ

