Assessment of PCB Contamination

Snoqualmie Falls Plywood Plant Fire Site

for

Weyerhaeuser Cascade Division

H D R

Attachment No. 4

ASSESSMENT OF PCB CONTAMINATION

WEYERHAEUSER'S CASCADE DIVISION
SNOQUALMIE FALLS
PLYWOOD PLANT FIRE SITE

for

THE WEYERHAEUSER COMPANY

by

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This project was conducted for the Weyerhaeuser Company to help expedite containment and removal of fire debris and contaminants at the Cascade Division's Snoqualmie Falls Mill. During the late evening hours of February 5th, 1989, a fire erupted at the plywood manufacturing facility located in the southeast portion of the mill grounds. The large, 160,000 square ft. wood-framed building was a complete loss; as fire fighting efforts were hampered by extreme cold weather and frozen water supply mains.

High voltage electrical equipment serving the plant's numerous industrial motors and lighting systems included three askarel-filled [polychlorinated biphenyl (PCB) - bearing cooling fluid] pad-mounted transformers. Although these transformers were located outdoors, they were sufficiently close to the building to be exposed to heat and falling debris. None of the transformers catastrophically ruptured, although two had some observed leakage (estimated to be 5 to 10 gallons) around the porcelain secondary bushings.

Other materials of concern involved in the plant fire included asbestos roofing felt, production materials (glues, patching compounds, etc.), waste oils, and inventories of small-container items (paints, lube oils, etc.).

On February 14, 1989, Weyerhaeuser Company contracted with HDR Engineering, Inc. (HDR) to assist in evaluating PCB-contaminated materials at the site.

1.1 PURPOSE

This report addresses three project objectives:

1) Evaluation of the results of field sampling conducted by HDR Engineering at three former PCB equipment locations,

2) Summary and evaluation of PCB sampling results provided by Weyerhaeuser,

30 Recommendation of additional measures to resolve the PCB contamination problem at locations where PCBs are present above acceptable levels.

The purpose of this project was to determine the residual levels of PCBs that remained in the spill areas after the initial emergency cleanup (stabilization) actions. If

warranted, additional cleanup and/or testing measures are to be recommended based on results of the field sampling and observations.

1.2 SITE DESCRIPTION

The mill is located near the town of Snoqualmie, Washington at the foot of the Cascade mountains in King County (Figure 1.1)

There are several surface water features in the vicinity of the mill, including the Snoqualmie River and the log pond to the south (Figure 1.2). Trenches and shallow excavations in the vicinity of the plywood plant indicate that a shallow (and possibly perched) groundwater aquifer exists under the site at a depth of approximately 2 ft at the two soil sampling sites. The piezometric gradient and direction of flow of this groundwater layer is currently unknown. However, it is likely that the extensive concrete foundations of the plywood plant create a slight depression in the piezometric surface, due to exclusion of infiltration by rainfall. This would result in a localized tendency for materials on or in the water to flow toward these areas.

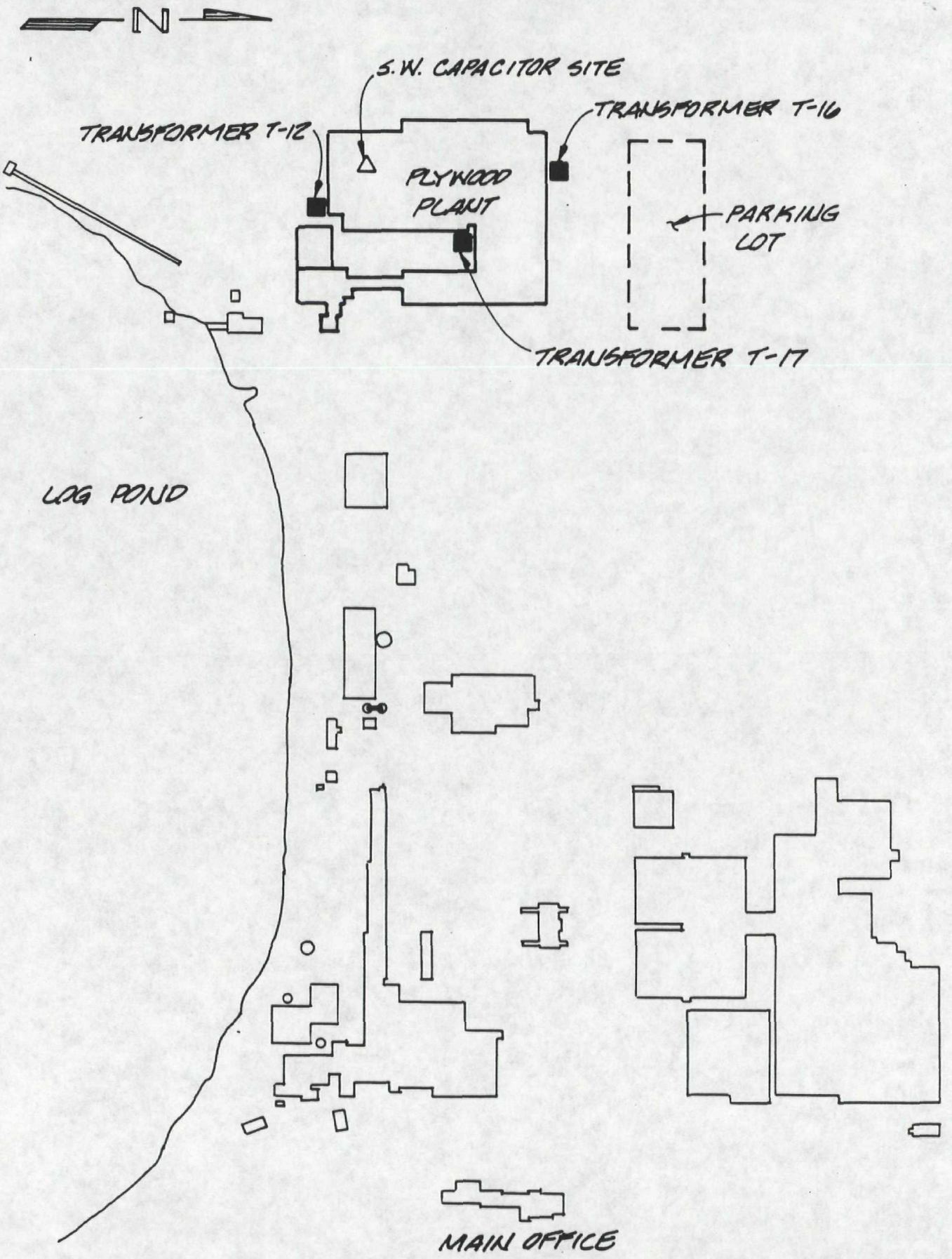
1.3 CLEANUP ACTIONS TO DATE

Three transformers serving the plywood plant contained varying amounts of askarel:

Device	Volume of Askarel (gallons)
Transformer T-17	454
Transformer T-12	454
Transformer T-16	270

Figure 1.2 shows the locations of these units. Transformer T-16 did not release any dielectric fluids and was removed as a PCB inventory reduction measure. Wipe sampling was conducted on the concrete pad at T-16 to verify the absence of PCBs.

A suspected PCB high-voltage capacitor at the plant was burned in the fire, although subsequent sampling by Weyerhaeuser did not show traces of PCB or PCB combustion products on or near this device. The unit was subsequently secured in a 55-gallon drum by the cleanup contractor and transported to General Electric's TSD facility for storage and disposal (Olympus Environmental, Inc. 1989).



SITE MAP FIGURE 1.2

After the fire was extinguished, Weyerhaeuser personnel installed emergency containment directly under the leaks to contain residual drippage. By February 13th, General Electric, Inc. in cooperation with Olympus Environmental Inc. (a cleanup contractor), drained the askarel from the three transformers. Carcasses and drummed fluids were released by Weyerhaeuser for transport to General Electric's facility in Portland Oregon in preparation for final disposal in accordance with the Toxic Substances Control Act (TSCA).

After removal of the transformers, the cleanup contractor removed debris in the interiors of the curbed areas surrounding the units. They removed the contaminated concrete curbing and soil immediately surrounding the structural (3 ft thick) concrete support pad. Since removal of the massive pads was not feasible at the time, the top 0.5 inch was removed using an air chisel. All waste was placed in DOT-approved drums and moved to the on-site hazardous material storage facility. The concrete and soil removal activities at Transformer Pads T-17 and T-12 generated approximately sixteen 55-gal drums full of assumed PCB-contaminated solids (Olympus Environmental, Inc. 1989). The excavated areas were covered with waterproof tarps to minimize infiltration.

A chronology of events occurring after the fire incident is included in Appendix A.

1.4 REGULATORY OVERVIEW

Regulations regarding accidental releases and cleanup of PCB fluids from in-service electrical equipment are set forth under the Toxic Substances Control Act, 40 CFR, Part 761. Subpart G defines the Spill Cleanup Policy for restricted access locations as follows:

> "...(iv) Low-contact, outdoor surfaces (both impervious and non-impervious) shall be cleaned to 100 ug/100 cm^2 ..... (v) soil contaminated by the spill will be cleaned to 25 ppm PCBs by weight."

According U.S. EPA Region 10, spills of PCB fluids that contaminate shallow groundwater systems may be of additional concern if such contamination could reasonably be expected to impact adjacent surface or groundwater resources, or drinking water wells. In such cases, remedial measures beyond the scope of that addressed under TSCA may be required. The need for additional monitoring or remedial measures would also be based on an assessment of:

- The effectiveness of removing the contaminant source (i.e. excavation of the contaminated soil)
- The estimated volume of residual PCBs and ability to migrate through the groundwater
- The feasibility, cost, and effectiveness of additional measures.

2.0 SAMPLING PROGRAM SUMMARY

2.1 PLANNED FIELD ACTIVITIES

The sampling program for the three transformer locations was devised to maximize the amount of data that could be obtained (both horizontally and vertically) with a minimum number of samples, while providing adequate coverage of the area. The proposed program was documented in the written sampling plan prepared prior to mobilization (HDR 1989).

The sampling locations at each transformer site were oriented in an "adjusted" grid system based on standard procedures for station positioning (U.S. EPA 1985 and 1986). Where soil sampling stations fell on concrete foundations, 1) a sample of ash was obtained for analysis, and 2) an additional (offset) station was located at the nearest soil area to obtain a sample.

Samples at depth were planned for stations immediately under and adjacent to the observed locations of askarel leakage.

The original inventory of planned samples included the following:

- Twenty-one surface soil samples (0 - 3 inches)
- Eight soil samples at 1 ft depth (9 - 12 inches)
- Eight soil samples at 2 ft depth (21 - 24 inches)
- Seven ash samples from stations within the fire site interior.

All samples were labeled according to the following format:

AA-NN-MM-LL-D

where:

A	=	Area (areas 12, 16 or 17)
N	=	Station Number
MM	=	Media type (SL = soil, AH = ash, WA = water)
L	=	Level (S = surface, SS = subsurface)
D	=	Depth (0 = 0 to 3 inches; 1 = 19 to 12 inches; 2 = 21 to 24 inches).

2.2 ACTUAL FIELD ACTIVITIES

The general sampling strategy proposed in the sampling plan was maintained to the greatest extent possible. However, some modifications were made in the field. Significant modifications involved the subsurface soil sampling activities. Since some of the selected stations were in areas of soil removal, sampling was initiated at the bottom of these cuts. Hence, some stations may indicate a sample from the two-foot level, with no samples obtained for the shallower 1-ft or surface levels. At some stations, adjustments were made to obtain soil samples from the faces of these excavations at the appropriate elevations. A listing of the actual soil samples obtained and submitted for analysis is included in Appendix B.

Another modification to the plan resulted when Weyerhaeuser requested wipe sampling at transformer pad T-16. This was performed using hexane-soaked gauze pads and wiping a measured square area of 100 sq. cm. The pads were immediately placed in the same type of glass sample jar used for soil samples and included in the sample inventory. The wipe tests were performed in accordance with Section 761.123 of TSCA.

The method for obtaining soil samples at depth was modified to more effectively penetrate past large cobbles. A digging bar was used to remove soil to the just above the desired sampling depth. A decontaminated trowel was then used to remove soil to the sampling depth. The sample was then obtained using the basket auger as specified in the sampling plan.

Sampling station locations were accurately located in the field in relation to the nearby plant foundations using a 100-ft surveyor's measuring tape.

2.3 GENERAL SITE ACTIVITIES

The HDR field sampling team arrived at the site on February 16, 1989. A visual survey was conducted to orient team members, and the planned effort was reviewed with the Weyerhaeuser Hazardous Waste Engineer. Sampling was performed at pad T-12 on the 16th of February. Samples from pad T-12 and T-16 were obtained on the 17th of February.

Soil or ash sample homogenization was accomplished using decontaminated stainless steel spoons and mixing bowls. During the soil homogenization process debris, rocks and other materials larger than 0.25 inch were discarded.

Homogenized soil was then spooned into the sample jars. The jars were labeled immediately at the point of sampling and logged on the chain of custody record.

2.4 SAMPLING ACTIVITIES CONDUCTED BY WEYERHAEUSER

In addition to the testing activities conducted by HDR Engineering, Weyerhaeuser personnel obtained ash, surface soil, water and wipe samples for PCB analysis. Solid matrix and water samples were obtained as non-homogenized grabs and placed in sample containers similar to those used by HDR. The analytical laboratory and protocol were also the same as those used by HDR. The results of these sampling activities are used herein to supplement the database. Test results are included in Appendix C.

3.0 SITE INVESTIGATION RESULTS

Analytical results for the HDR sampling program are included in Appendix B. Table 3.1 is a summary of the results showing PCB concentrations at the ground surface and at depth. Subsurface samples without overlying (shallower samples) were obtained from stations located in the excavation surrounding the transformer pads.

3.1 SOLID SURFACES

Wipe samples on concrete and metal surfaces were obtained by both HDR and Weyerhaeuser personnel. Samples were obtained at three former transformer locations around the perimeter of the plywood plant site. Results for each location are discussed below.

3.1.1 TRANSFORMER PAD T-12

Weyerhaeuser representatives obtained wipe samples from transformer PAD T-12 before and after the surface (approx. 0.5 inch) of the 3-ft thick slab was removed using an air chisel. Results indicated initial and final concentrations of 720,000 and 14,000 ug/100 cm^2 (Appendix C). The final level of PCBs exceeds the allowable cleanup goal of 100 ug/100 cm^2. Alternatives for further measures for this pad are discussed in Section 4.0.

3.1.2. TRANSFORMER PAD T-17

Transformer pad T-17 was treated in a similar manner as pad T-12. After removal of the upper 0.5 inch of concrete, the pad was wipe-tested by Weyerhaeuser personnel and submitted for analysis. The final concentration was 29,000 ug/100 cm^2. This 6 ft x 6 ft x 3 ft-thick concrete slab requires additional cleanup or disposal measures as discussed in Section 4.0

3.1.3 TRANSFORMER PAD T-16

Three wipe samples were obtained by HDR Engineering on February 17, 1989. The transformer at this location was drained and removed for disposal. The pad was cleaned, but not air-chiseled prior to testing. Rain drip lines, iron staining from support bars, and the location of the secondary switchgear accurately showed the previous position of the unit. Two samples (16-01 and 16-02) were obtained from 10 cm x 10 cm square areas located immediately under the former locations of the front and rear cooling fin banks. The latter sample was positioned to be as close as possible to the former location of the

TABLE 3.1 SUMMARY OF PCB ANALYTICAL RESULTS FOR SOIL AND TESTING: TRANSFORMER PADS T12, T16 AND T17

MATRIX	STATION	PCB CONCENTRATION (ppm) AS AROCLOR 1260 AT SURFACE AND DEPTH INTERVALS (DETECTION LIMIT: 0.6 ppm) 0 FT	1 FT	2FT	2.5 FT
TRANSFORMER PAD T-12					
soil	12-01	150	----	----	----
soil	12-02	35	----	----	----
soil	12-03	99	9.0	4.9	----
soil	12-04	64	----	----	----
soil	12-05	--	----	----	----
soil	12-05A	2,500	----	----	----
soil	12-06	--	----	----	----
soil	12-06A	120	----	----	----
soil	12-07	12	----	----	----
soil	12-08	16	2,200	350	----
soil	12-09	--	----	84,000	----
soil	12-09A	--	----	7,300	----
soil	12-09B	--	----	16,000	----
soil	12-10	5.0	75	38	----
ash	12-11	<0.6	----	----	----
soil	12-12	23	1.8	4.1	----
ash	12-W8	48	----	----	----
soil	12-W10	2.1	----	----	----
TRANSFORMER PAD T-17					
soil	17-01	4.2	----	----	----
soil	17-02	6.4	----	----	----
soil	17-03	20	----	----	----
soil	17-04	--	----	1.1	----
soil	17-05	--	----	36	----
soil	17-5A	170	----	----	----
soil	17-06	--	----	310	----
soil	17-6A	160	----	----	----
soil	17-07	18	----	----	----
soil	17-08	22	1.6	1.6	----
soil	17-09	--	----	4.7	3,300
soil	17-9A	--	----	270	----
soil	17-10	3.9	0.7	<0.6	----
ash	17-11	0.8	----	----	----
ash	17-12	2.7	----	----	----
ash	17-W8	4.7	----	----	----
ash	17-W09	4.3	----	----	----
ash	17-W09A	170	----	----	----
TRANSFORMER PAD T-16 (WIPE TESTS ONLY)					
wipe	16-01	13 ug/100 sq cm			
wipe	16-01	10 ug/100 sq cm			
wipe	16-03	110 ug/100 sq cm			

transformer drain valve. The third wipe sample (16-03) was obtained from the interior of the rainwater sump located in the front of the curbed area, approximately 1 ft from the west end of the trench. Results for these three samples were 13, 10, and 110 ug PCB/100 cm^2 respectively. Of these, only the sump area exceeded the 100 ug/100 cm^2 limit defined under TSCA. Additional cleanup measures for the sump are recommended in Section 5.2

3.2 SOILS

The analytical laboratory test results for PCB levels were received from the Weyerhaeuser laboratory on March 1, 1989 (Appendix B) and indicated elevated levels of PCB contamination at some of the sampling stations at both transformer locations. Figures 3.1 and 3.2 show the results at each station. Figures 3.3 and 3.4 show the PCB concentration gradients (areal extent of contamination) estimated from the station data at transformer pads T-12 and T-17, respectively. As expected, elevated levels of PCBs in soils coincided with the area of suspected askarel release from the north (secondary terminal) sides of both devices. Samples were tested for Aroclor 1221, 1016, 1232, 1242, 1248, 1254, and 1260. Aroclor 1260 (typical of transformer askarel dielectrics) was the predominant aroclor encountered.

3.2.1 TRANSFORMER PAD T-12

At Transformer pad T-12, the soil and the bottom of the excavated trench (2-ft deep - sample 12-09-SL-SS-02) contained 84,000 ppm PCB. This level decreased somewhat to adjacent (5-ft distant) stations 09A and 09B, where the bottom-of-trench PCB concentrations were 7,300 and 16,000 ppm, respectively. However, these levels of PCBs in soils still indicate direct contact concentrated released fluids. Elevated levels of PCB were also noted further to the west at station 08, which had concentrations of 2,200 and 350 ppm at the 1 and 2-ft levels. Station 5A also had a surface soil PCB concentration of 2,500. The remaining stations all exhibited PCB levels below 150 ppm, typical of secondary contamination in the immediate vicinity of a concentrated spill.

Stations having a PCB concentration between 25 and 150 ppm were 01, 02, 03 04, 5A and 6A. Samples obtained at depth at station 03 indicated PCB concentrations of 9.0 and 4.9 at the 1 and 2-ft levels.

Weyerhaeuser personnel obtained a soil sample in the vicinity of transformer pad T-12 (appendix C). Station

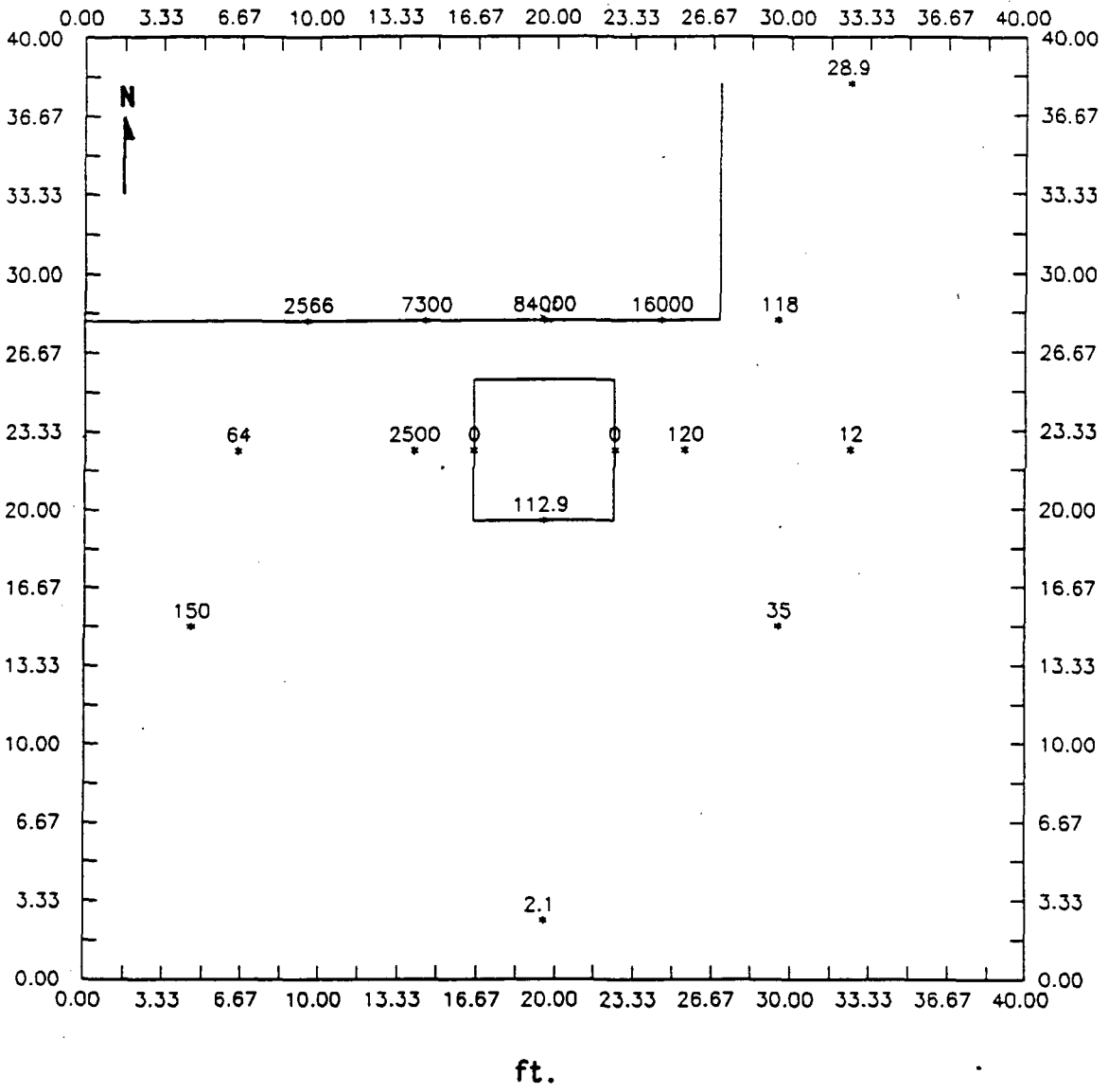


Figure 3.1 Transformer Pad T-12: PCB Concentrations at Sampling Stations (ppm)

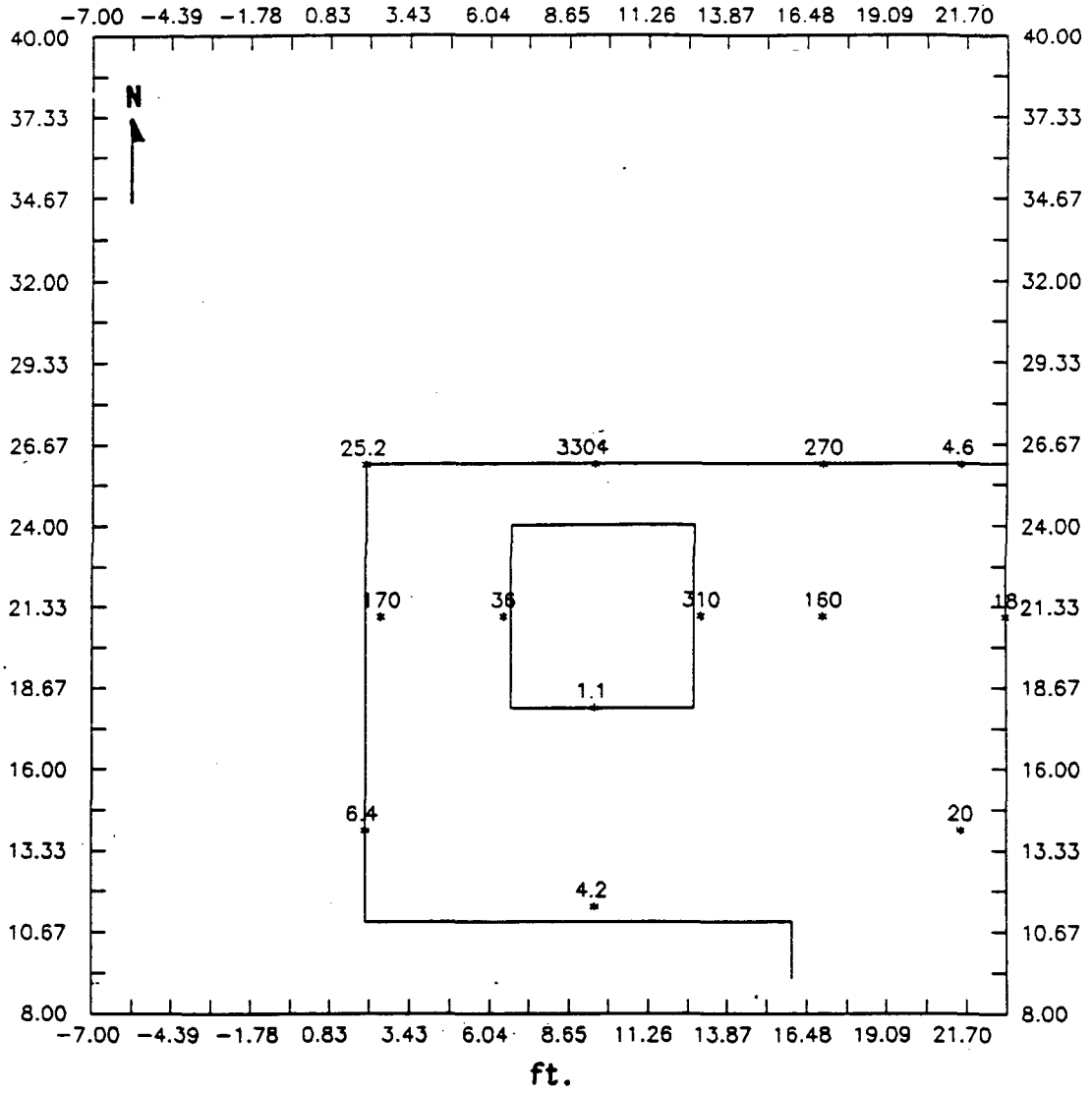


Figure 3.2 Transformer Pad T-17: PCB Concentrations at Sampling Stations (ppm)

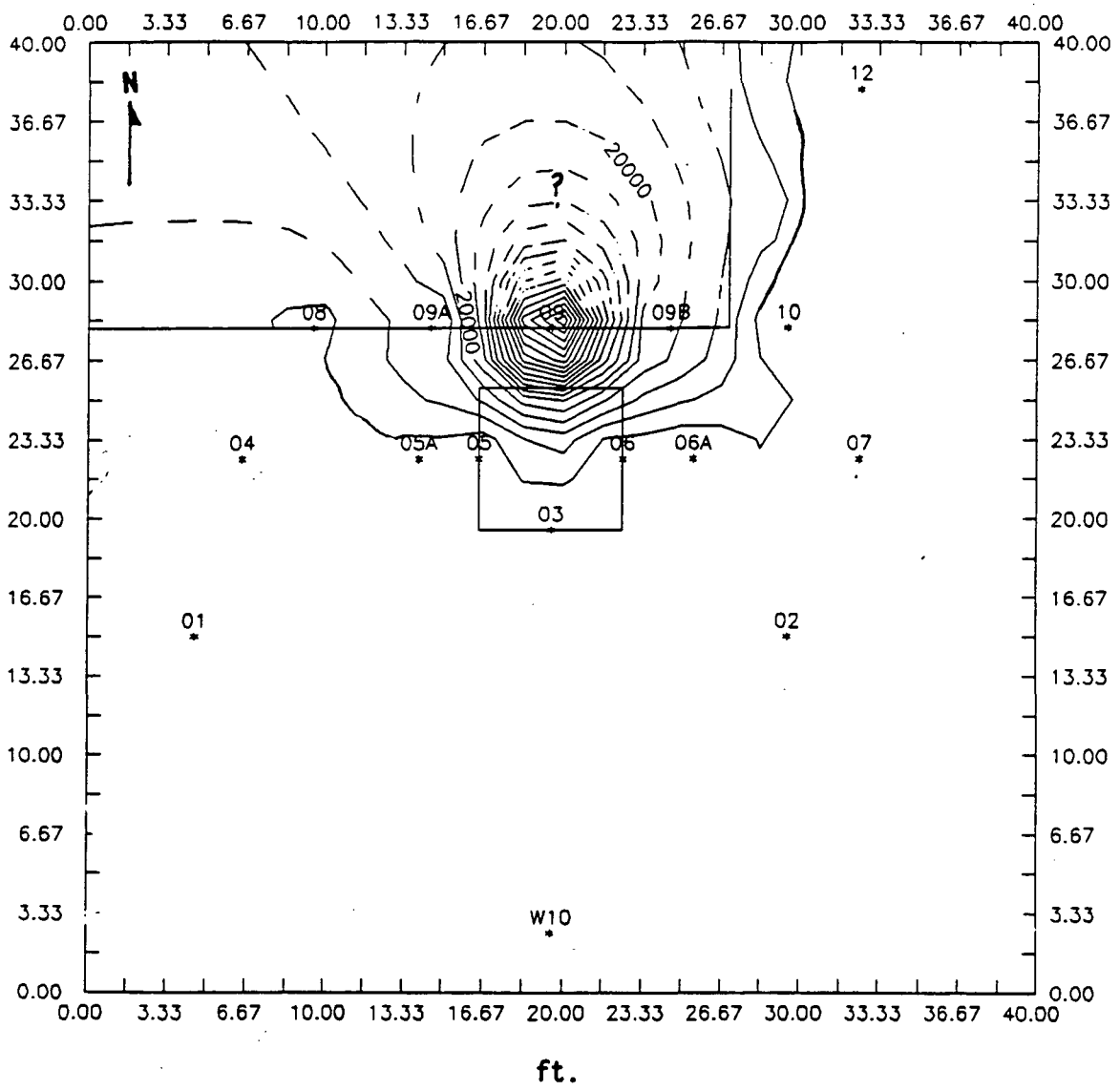


Figure 3.3 Transformer Pad T-12: Estimated PCB Concentration Gradients (summed over all sampling depths). Contour Interval: 4,000 ppm

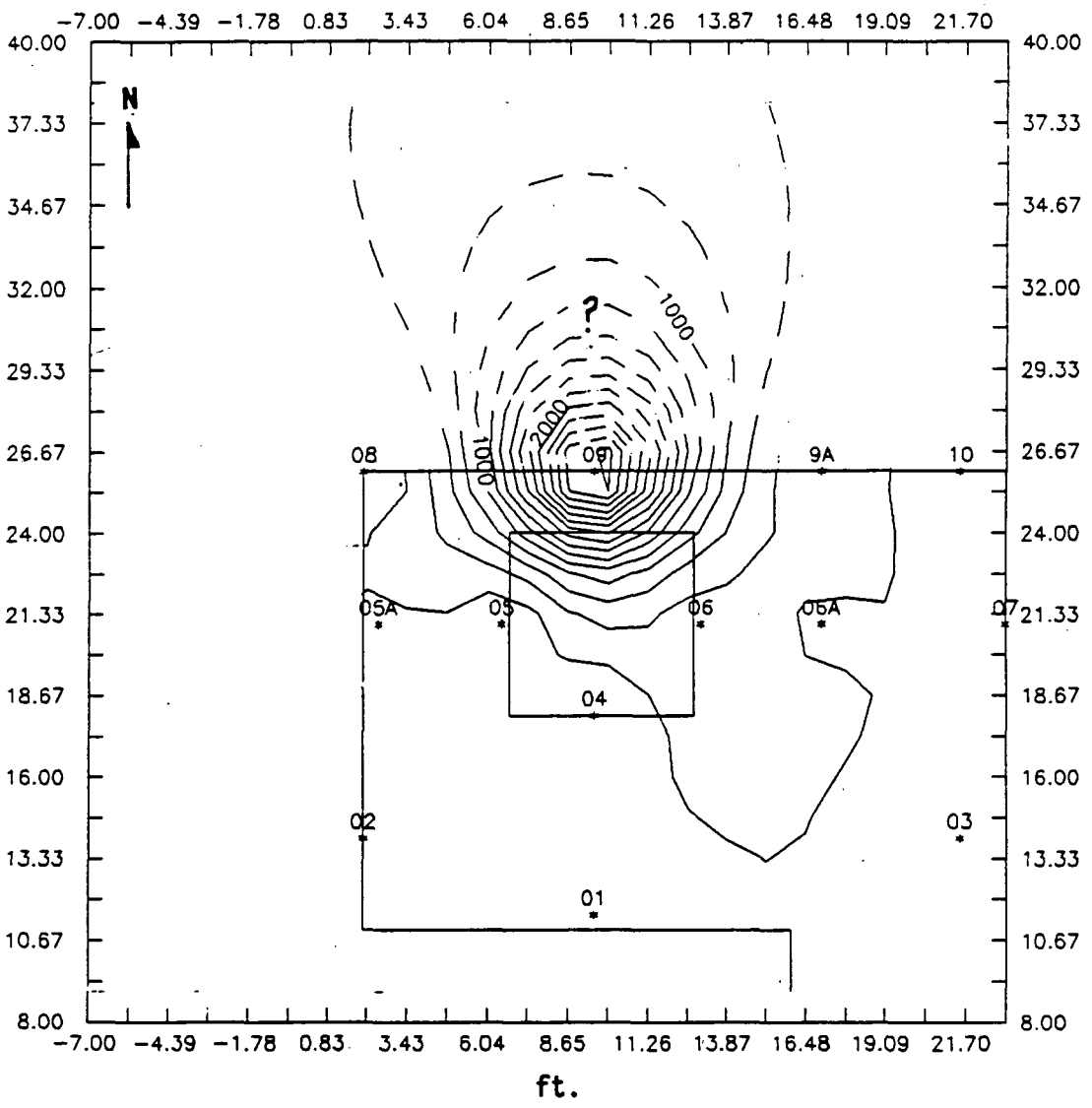


Figure 3.4 Transformer Pad T-17: Estimated PCB Concentration Gradients (summed over all sampling depths). Contour Interval: 200 ppm

number 10, located 17 ft south of the south side of the structural pad was found to contain 2.1 ppm PCB (service request no. 19013 - Appendix C). Samples obtained by Olympus Environmental (cleanup contractor) at stations 09, 09A and 09B contained 73,000, 32,000 and 10,000 ppm PCB, respectively (Appendix C - Service Request 19173. These results are comparable to those reported above.

3.2.2 TRANSFORMER PAD T-17

The levels of PCB contamination detected at transformer pad T-17 were lower than those encountered at T-12, yet still indicate the presence of spilled concentrated PCB fluids. The highest PCB level (3,300 ppm) was encountered immediately below the transformer secondary bushings (on the north side of the pad) at a depth of 2.5 ft below the original ground surface. A sample obtained immediately above at the 2 ft level (at the bottom of the trench) contained only 4.7 ppm PCBs. This overlying soil may have been dropped back into the trench during the removal of the transformer curbing.

Other sampling stations containing PCBs above 25 ppm were stations 5A, 6A 13 at the surface, and stations 05, 06, and 9A at the 2-ft depth level. All of the latter three samples were obtained at the bottom of the trench around the perimeter of the pad.

Samples obtained by Olympus Environmental (cleanup contractor) at stations 08, 09 and 09A contained 37, 2,400 and 270 ppm PCB, respectively (service request 19166 - Appendix C). These results are comparable to those reported above (25, 3,304 and 270 ppm) and further demonstrate the reproducibility of the soil testing activities.

3.3 ASH

Ash from the fire debris was sampled by HDR Engineering and submitted for PCB analysis. At transformer pad T-12, The ash from station 11 (located on the plant foundation ten feet north of soil sampling station 08 - Figure 3.1). contained less than 0.5 ppm PCB. Ash samples taken at pad T-17 from stations 11 and 12 and 14 (station 14 is a field split sample from station 12) also contained extremely low levels of PCBs: 0.8, 2.7 and 0.6 ppm, respectively.

Ash samples were also obtained by Weyerhaeuser personnel and tested for PCB content. Results for these samples are reported in Appendix C and summarized in Table 3.2 for Laboratory analysis request numbers 19013, 19039, and 10986.

TABLE 3.2 PCB CONCENTRATIONS IN ASH SAMPLES

ANALYSIS NUMBER	SAMPLE NUMBER	LOCATION	PCB CONC. (ppm)
[SAMPLES TAKEN PRIOR TO ANY CLEANUP (2/08/89)]			
10913	#1	T-12 - UNDER TRANSFORMER	550,000
10913	#5	NEAR BURNED CAPACITOR C-3	0.5
10913	#6	NEAR BURNED CAPACITOR C-3	0.5
10913	#7	T-17 - UNDER TRANSFORMER	340,000
10913	#8	15 FT WEST OF PAD T-17	4.7
10913	#9	15 FT NORTH OF PAD T-17	4.3
10913	#10	15 FT SOUTH OF PAD T-17	2.1
[SAMPLES TAKEN AT LOCATIONS IN BLDG (2/14/890]			
19039	A-1		1.6
19039	A-2		<0.1
19039	A-5		0.4
19039	A-8	T-12 ASH SOUTH OF SWITCHGR	48
19039	A-9	T-17 ASH SOUTH OF SWITCHGR	170
[SAMPLES TAKEN AT LOCATIONS IN BLDG (2/21/89)]			
19086	B-1	AREA 6 DEBRIS SITES	<0.6
19806	B-2	AREA 6 DEBRIS SITES	<0.6
19086	B-3	AREA 9 DEBRIS SITES	<0.6
19086	B-4	AREA 8 DEBRIS SITES	<0.6
19086	B-8	AREA 9 DEBRIS SITES	<0.6

Test results from the first round of testing indicate that ash materials immediately under the damaged bushings were soaked with leaked PCB fluids. These materials were subsequently cleaned up and disposed as PCB-contaminated solids. Ash outside the containment area, but immediately adjacent to the spill areas also showed elevated PCB levels of 48 and 170 ppm. These results indicate that additional wipe testing of foundations in this area may be warranted after ash cleanup (unless foundations are also removed and disposed as PCB-contaminated solids).

Results for all other stations indicate that spilled PCB fluids did not extend beyond the immediate vicinity of the localized releases at transformer pads T-12 and T-17.

3.4 GROUNDWATER

As indicated above, vertical penetration of spilled PCB fluids was evident at both transformer pad locations T-12 and T-17. At Transformer pad T-12, the highest concentration (8,400 ppm) was encountered at the 2-ft depth directly under the point of release and the next highest level (1,600 ppm) was at adjacent station 9B (5 ft to the east), also at the 2-ft depth. Similarly, at pad T-17, the highest PCB level was detected adjacent to the groundwater interface at the 2.5 ft depth, immediately below the point of leakage.

A water grab sample taken by Weyerhaeuser personnel (Appendix C - Service Request no. 19039) from the west side of pad T-12 showed a PCB level of 230 ppm. Oil-like sheens were observed on the surface of this water which was in direct contact with contaminated soil detected around the perimeter of the ditch. One grab sample of standing water in the excavated trench at pad T-17 (station 4) was obtained by HDR Engineering and submitted for PCB analysis. A concentration of 1.3 ppm PCB was detected. Olympus Environmental also obtained grab samples of water in the trench at pad T-12 and PCB concentrations were reported to be 770 and 1,310 ppm (Appendix C - Service Request 19173). These results indicate that PCB-contaminated soil in these areas is in contact with the shallow perched groundwater observed at or just below the 2-ft sampling depth. The variability in results may be due, in part, to the inclusion or exclusion of product sheens, silt, or globules at the top or bottom of the water column during sampling.

3.5 QUALITY ASSURANCE REVIEW OF PCB ANALYSES.

3.4.1 Shipping

Samples were delivered under chain-of-custody by the sampling team to Weyerhaeuser personnel on the same day they were obtained. Samples were kept cooled until analysis. The data package was received by HDR Engineering on March 15, 1989.

3.4.2 Analytical Method

Weyerhaeuser Analytical and Testing Services (Tacoma, Washington) used the U.S. EPA CLP cleanup method for medium-level soils to be tested for PCBs. The analytical method reference is EPA - 600/4/81/045 - September 1982.

3.4.3 Accuracy

Samples routinely analyzed for all aroclor matrix spikes during the same analytical period indicated a recovery ranging from 90 to 110 percent, with a mean of 100 percent.

3.4.4 Precision

To evaluate precision in the analysis of samples for PCB concentration, approximately 5 percent of the samples were collected in duplicate and analyzed "blind" by the laboratory. The following duplicate samples were obtained:

Matrix	Duplicate Samples	PCB Concentration (ppm)
Soil	17-6A-SL-S-0	160
	17-13-SL-S-0	280
Ash	17-12-AH-S-0	2.7
Ash	17-14-AH-S-0	0.6

Precision of the results are deemed acceptable under the analytical conditions and methods.

4.0 ESTIMATED EXTENT OF PCB CONTAMINATION

4.1 SOLID SURFACES

4.1.1 TRANSFORMER PAD T-12

Wipe test results presented in Section 3.1 indicate that the 6 ft x 6 ft structural concrete transformer pad at location T-12 is contaminated in excess of the allowable (TSCA) level of 100 ug/100 cm^2. The Wipe test indicated a PCB level of 14,000 ug/100 cm^2. Insufficient data exist to determine whether some or all of the slab surfaces exceed the cleanup standard and therefore the entire structure should be considered contaminated.

The concrete foundation north of transformer Pad T-12 is also likely to be contaminated above the allowable limit, although no wipe tests have been obtained to date from this area. Unlike PAD T-17, the joint between the secondary buswork duct and the transformer throat was positioned outside the containment curb at this location. Askarel released from the damaged bushings was free to drip down onto the south side of the concrete foundation under the secondary switchgear (formerly inside the building).

4.1.2 TRANSFORMER PAD T-17

Wipe test results presented in Section 3.1 indicate that the structural concrete pad at location T-17 is contaminated above the acceptable level. The residual contamination (29,000 ug/100 cm^2) indicates that spilled PCB fluids have extensively penetrated the porous matrix. Additional washing or chipping of the slab surfaces would be ineffective and would result in the generation of contaminated rinsates. Insufficient data exist to determine whether some or all of the slab surfaces exceed the cleanup standard and therefore the entire structure should be considered contaminated.

4.1.3 TRANSFORMER PAD T-16

Wipe tests indicate that transformer pad T-16 does not contain PCBs above the TSCA-established level of 100 ug/100 cm^2. However, one wipe test in the drainage collection sump at the front (north side) of the installation indicated a level of 110 ug/100 cm^2. This level can be easily reduced by surface cleaning.

4.2 SOIL AND GROUNDWATER

As mentioned above, the fate of the PCB fluids released from the two transformers was highly dependent on the positioning of the secondary bushing housing on the north sides of the units relative to the curbing immediately below. For transformer pad T-12, the fluids were able to flow outside the perimeter of the curb and onto the adjacent soils between the transformer installation and the plywood plant foundation. At transformer pad T-17, portions of the released fluid were retained inside the secondary containment area.

The precise amount of fluid released is unknown. The contractor that drained the fluids from the units after the incident reported that 385 and 440 gallons of fluid were drained from transformers T-12 and T-17, respectively (Olympus Environmental, Inc. 1989). The nameplate fluid volume listed for both units was 454 gal. Researchers (Dunlop 1986) report that approximately 12 percent of the dielectric fluid in a transformer remains in the porous core materials after draining. Hence, it can be estimated that a maximum of 23 gallons could have been released from transformer T-12. However, experience indicates that transformers seldom contain their nominal volumes. Usually, no more than 5 to 10 gallons are in place above the level of the bushings and it is most likely that this is the volumetric range for both liquid spills. This estimate does not take into account past (historical) releases of fluid that may have occurred.

4.2.1 AREAL EXTENT OF PCB CONTAMINATION

The areal extent of both fluid releases onto adjacent soils shown in Figures 3.3 and 3.4 is estimated to be approximately 100 and 35 square ft. for transformers T-12 and T-17, respectively. The extent to which contamination extended northward, either onto or underneath the former plywood plant foundations is currently unknown. It is likely that PCB contamination extends at least 2 or 3 ft northward, to the location of the secondary switchgear. Much of this was cleaned up when ash and debris in this area was deposited into drums. The extent of contamination beneath the foundations is difficult to estimate and may only be determined during further cleanup (see "Recommendations" - Section 5.0).

The areal extent of surface soil PCB contamination above 25 ppm was well defined by the sampling program at transformer pad T-17. Transformer pad T-12 included some outlying stations at elevated levels. Section 5.2 includes

recommendations for additional sampling prior to excavation to better determine the limits of required cleanup.

4.2.2 ESTIMATED DEPTH OF PCB CONTAMINATION

The results presented in Section 3.0 indicate that PCB contamination has extended beyond the 2-ft depth at both transformer pads T-12 and T-17 directly below the point of fluid release. However, the residual concentrations (less than 500 ppm) at transformer T-17 at stations other than 09 under the bushings indicate that concentrated fluid has not flowed much beyond this depth. Data indicate that the spill at transformer T-17 was limited in quantity and penetration.

The extent of penetration of fluid below the 2 ft depth at transformer T-12 requires further evaluation. Penetration into the saturated zone can be estimated based on several assumptions about the initial size of the spill, soil porosity, and other factors. A computer version of a model for evaluating the release of hydrophobic fluids onto soil surfaces (Metcalfe and Zukovs, 1986) was applied using the following assumptions:

- Worst case spill volume of 23 gal. ($= 0.087\ M^3$)
- Askarel density = $1582\ Kg/M^3$
- Abs. Viscosity = 1.88×10^{-2} Pa.Sec.
- Soil permeability = $10^{-12}\ M^2$
- Water table depth = 0.61 M
- Area of spill pool = $1\ ft^2$ ($= 0.093\ M^2$)

A maximum spill penetration depth of 5.83 ft (1.78 M) was predicted by the model.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The following conclusions can be drawn from the results of the PCB sampling program conducted in conjunction with Weyerhaeuser personnel:

- PCB contamination in excess of allowable levels for restricted access areas exist on concrete surfaces and in the soils at transformer Pad locations T-12 and T-17 (maximum PCB levels of 84,000 and 3,300 ppm, respectively). Transformer pad T-16 was found to be free of elevated levels of PCBs, except in the sump. One cleaning should reduce the sump contamination to acceptable levels. Spillage at transformer pad T-12 resulted in higher concentrations and larger area due to 1) positioning of the leaking secondary bushings relative to the containment curbing, and 2) the estimated amount of fluids released.

- PCBs were detected in ash materials encountered at the fire site, but only in the immediate vicinity of transformers T-12 and T-17. These wastes have been removed and handled as PCB-contaminated solids. Ash in the general fire area (outside of the transformer installations) does not require special handling under 40 CFR 761.

- The extent of PCB contamination below the groundwater surface and under the plant foundation is currently unknown. It is estimated that penetration of PCB liquids to a depth greater than 2 ft has occurred at both locations. Predictive modeling based on worst-case assumptions indicates that fluids may have penetrated as deep as 6 ft at location T-12 (assuming the absence of a confining layer of low permeability materials). Lateral transport of this plume (if any) is unknown.

5.2 RECOMMENDATIONS

Additional cleanup measures should be undertaken to remove residual PCB contamination at transformer pads T-12 and T-17 to levels that are in compliance with the TSCA PCB Spill Cleanup Standards. The concrete support pads should be removed, sealed for transport, and disposed in accordance with controlling regulations. The cleanup contractor is currently developing a cleanup plan for the transformer

sites which includes the following elements:

- o remove the structural pad
- o obtain additional samples of water from the pad depression
- o apply absorbent material to the water (if warranted by test results) to reduce free product
- o pump down the water (if warranted by test results and infiltration is not excessive) - filter pumped water using activated carbon (Appendix D includes information on small-scale carbon treatment canisters that are appropriate for this use) and contain/monitor the discharge.
- o excavate contaminated soil for disposal.

In order to avoid multiple mobilizations of excavation equipment, Weyerhaeuser should consider conducting fast-turn around testing of soils as the excavation is progressing. This can be achieved by 1) contracting with a mobile laboratory to provide on-site gas chromatographic screening analysis, or 2) pre-arranging with Weyerhaeuser's in-house or contract laboratories for rapid turn-around. Once adjacent soils are found to contain acceptable levels of PCBs, the excavation can be backfilled with clean soil.

Immediately prior to conducting additional work at transformer pad T-12, several additional surface soil samples should be obtained west of stations 04 and 08, south of station 04, and east of stations 10 and 12 for further delineate the zone of PCB contamination above 25 ppm.

Because of the involvement of groundwater in direct contact with concentrated PCB fluids, Weyerhaeuser should consider installation of several shallow groundwater monitoring wells in the immediate vicinity of both transformer locations. During installation of the wells, a geologist will be able to determine whether there are impermeable confining layers (i.e. clay) that are retarding downward migration of dense materials. If necessary, such a layer may be useful in limiting groundwater flow into or out of the contaminated soil mass during excavation. An assessment should also be performed to determine whether there are drinking water wells in the area. An outline work plan for this effort will be provided under separate cover.

Upon completion of cleanup at the two transformer sites,

Weyerhaeuser should prepare a final cleanup report addressing all items called for under 40 CFR, Section 761.125 - Records:

- Identification of the source of the spill, e.g., type of equipment
- Estimated or actual date and time of the s pill occurrence
- The date and time cleanup was completed.
- A brief description of the spill location and the nature of the materials contaminated. This information should also indicate that the spill occurred in a restricted access location
- Pre-cleanup sampling data (as presented in this report) used to establish the spill boundaries if required because of insufficient visible traces and a brief description of the sampling methodology used to establish the spill boundaries.
- Description of the surfaces cleaned [or removed]
- Approximate depth of soil excavation and the amount of soil removed
- Post-cleanup verification sampling data and, if not otherwise apparent from the documentation, a brief description of the sampling methodology and analytical technique used.

The report should also include data on groundwater quality (testing for PCBs and chlorinated benzenes) and actions (if warranted) to reduce contaminant levels in groundwater. This report should be retained in the Weyerhaeuser Company files as evidence of rapid and responsible action as called for by regulation.

6.0 REFERENCES

HDR Engineering, Inc. 1989. Sampling Plan - Weyerhaeuser's Cascade Division Snoqualmie Falls Plywood Plant Fire Site. February 1989.

Metclafe, Douglas E, and George Zukovs. 1986. A Rapid Assessment Model for Spills on Soil of Oily Fluids that are Immiscible with Water. Proceedings of the National Water Well Association's Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Restoration. 1986.

Olympus Environmental, Inc. 1989. Letter from Kelly Tjaden to Mick McCourt regarding Emergency Response - PCB Transformers and Debris - Weyerhaeuser Plywood Mill Site, Snoqualmie, Washington. February 16, 1989.

U.S. Environmental Protection Agency. 1985. Verification of PCB Spill Cleanup by Sampling and Analysis. U.S.EPA Office of Toxic Substances, Washington DC. August 1985.

U.S. Environmental Protection Agency. 1986. Field Manual For Grid Sampling of PCB Spill Sites to Verify Cleanup. U.S. EPA Office of Toxic Substances, Washington DC. May 1986.

APPENDICES

A. CHRONOLOGY OF EVENTS FOLLOWING THE FIRE INCIDENT

B. ANALYTICAL RESULTS FROM HDR PCB SAMPLING PROGRAM

C. WEYERHAEUSER PCB SAMPLING - SUPPLEMENTARY ANALYTICAL RESULTS.

D. SMALL-SCALE ACTIVATED CARBON TREATMENT CANISTERS: EXAMPLE PRODUCT LITERATURE

APPENDIX A

CHRONOLOGY OF EVENTS FOLLOWING THE FIRE INCIDENT

Interoffice Communication

Weyerhaeuser

Date February 24, 1989

From J. E. 'Mick' McCourt

Location WTC 2H4

Subject INCIDENT REPORT SUMMARY FOR SNOQUALMIE FALLS PLYWOOD PLANT FIRE

To R. Proctor - CH 1M31

On February 5, 1989 about 7:00pm, the first response to the Plywood Plant fire was made to turn off the power to the plant and notify the Snoqualmie Fire Department about 7:04pm. The site was evacuated except for emergency response personnel. The fire protection system failed due to extreme cold weather that had frozen up the system. In fact, the surface water supplies were frozen in close proximity to the plant and were also unavailable to the fire fighting actions. By 11:00pm the Plywood Building was declared a complete loss and allowed to burn out by the emergency response personnel. Winds were gentle to the North, away from most local households and city center of Snoqualmie.

By Monday afternoon, February 6, 1989, the Plywood Plant had cooled down enough to inspect the site. Two PCB transformers were found by L. Clark (shop operations) to have leaked an estimated one to ten gallons into their containment area (Transformers T-12 and T-17). It was later found that about one to five gallons was spilled from these transformers and that the transformers' temperature gauges' readings maximum were likely between 176 to 383°F. A third transformer, T-16, had not leaked and its temperature gauge reading maximum was 113°F. Mr. Clark notified R. Proctor, Weyerhaeuser's Regional Environmental Affairs Manager, of this condition which Mr. Proctor then reported to U.S. Environmental Protection Agency's National Response Center. Upon completing this notification, Mr. Proctor notified Mr. McCourt, Hazardous Waste/Materials Engineer, of the PCB spill event. Mr. McCourt began steps to identify qualified PCB cleanup contracts. Mr. Clark initiated efforts to remove overhanging debris site hazard associated with PCB transformers.

On February 7, 1989, a follow-up preliminary site investigation by L. Clark and J. McCourt discovered a suspected PCB capacitor (C-3) was burned in the fire near the Press Pit Area of the Plywood Plant. This site area was added to the PCB cleanup effort. Light ballasts were also noted in the fire debris, however, many of the light ballasts had nameplates that indicated non-PCB items.

Qualified PCB cleanup contractors were identified as well as overview sampling was conducted on February 7 and 8 1989. By February 9, 1989, General Electric Industry Sales and Service was selected to transport, cleanse and dispose of liquid PCBs, three transformer carcasses and suspected PCB capacitor. Olympus Environmental, Inc. was selected to decontaminate the PCB transformers and decontaminate the transformer pad and visual contaminated soils. HDR Engineering, Inc. was selected to do the site assessment work for the three initial phases of PCB cleanup. It is expected that additional PCB contaminated debris removal will be needed and that the completion of the PCB spill cleanup will be then certified.

The PCB cleanup emergency response was divided into four phases:

1. First Response: PCB transformers and suspect PCB capacitor removal completed on February 11, 1989, by GE and Olympus Environmental.

2. Second Response: Site assessment sampling and assessment work began February 8 through 16 with overview sampling. Grid sampling of PCB Transformers T-12, T-16, T-17 areas took place on February 16 and 20, 1989. HDR will be assessing the need for additional PCB debris removal or cleanup options before the certification of PCB spill cleanup.

3. Third Response: Additional PCB contaminated debris removal by Olympus Environmental and certification of PCB spill cleanup by HDR. This phase of the cleanup will depend on the findings of the site assessment.

4. Fourth Response: Identification and removal of other dangerous waste or hazardous material (HAZMAT). The findings to date suggest that chemical HAZMAT removal and asbestos HAZMAT removal will be necessary. A two step process will be used to remove these materials. The first step is removal of readily identifiable barrels, tanks and contaminated debris and asbestos sources. The second step will be the removal of roofing asbestos, contaminated ash and yet to be discovered HAZMAT chemicals.

Table 1 outlines the progress to date and schedules for remaining emergency response and HAZMAT removal actions.

It is anticipated that records and certification will be prepared to satisfy PCB regulations (40 CFR 761.125). Records and Certification Requirements include the following:

1. Identification of the source of the PCB spill which currently only includes Transformers T-12 and T-17.

2. Estimated or actual date and time of spill occurrence from February 5, 1989 7:00pm to February 11, 1989 with removal of both Transformers T-12 and T-17.

3. The date and time cleanup was completed or terminated. The first phase of PCB transformer and suspected PCB capacitor removal was completed on February 11, 1989. Subsequent Phases 2 and 3 of the Emergency Response are expected to be completed in the next few months or sooner.

4. A brief description of the spill location will be included in the HDR site assessment report.

5. Precleanup sampling data used to establish the spill boundaries, if required because of insufficient visible traces, and a brief description of sampling methodology used to establish the spill boundaries. First sampling to overview the site included sampling of the containment spill debris, 15 feet from the containment areas, general Plywood ash and asbestos sampling, and liquid wastes. Suspected PCB capacitor sampling was also initiated with PCB, dioxins and furans under the capacitor, C-3, and 15 feet west of the capacitor. Second sampling phases will include grid sampling of Transformers T-12 and T-17 and

wipe sampling of transformer pad areas. A third sampling phase using 6 to 12 point area composite ash sample was taken to profile the plywood plant ash debris as a nondangerous, potentially asbestos-contaminated waste.

6. A brief description of the solid surfaces cleaned and of the double wash/rinse method used. The contaminated surface was initially removed by chipping away the contaminated containment area and pad to reduce the penetration of PCB into the two- to three-foot-thick transformer pad.

7. Approximate depth of soil excavation and amount of soil removed was initially two to three feet under the containment perimeter.

8. A certification statement signed by the responsible party stating that the cleanup requirements have been met and that the information contained in the record is true to the best of our knowledge.

These requirements are anticipated to be part of the site assessment scheduled to be completed by HDR in the next few months or sooner.

Additional PCB cleanup reports and technical memorandum will follow to keep you informed on the PCB spill cleanup for Snoqualmie Falls Plywood Plant transformers and capacitor.

Mick McCourt

J. E. 'Mick' McCourt

esw/c10/0222

cc: J. Traylor - Springfield 85
L. Clark - Snoqualmie 81
V. Moore - Snoqualmie 81
D. Sjolseth - WTC 2H2
C. Carlson - WTC 1D2

Table 1
Chronology of Snoqualmie Falls Plywood Plant
Fire, PCB Cleanup and HAZMAT Emergency Response
February 5 to 16, 1989

2-5-89	Fire event and initial emergency response.
2-6-89	Discovery of PCB spill noted at Transformers T-12 and T-17. Notification made to National Response Center of PCB spill. PCB spillage appears to be contained by concrete floor and curbs at Transformers T-12 and T-17 and is estimated at one to five gallons per transformer.
2-7-89	Identification of PCB cleanup contractors and preliminary sampling site location survey. Suspected PCB capacitor, C-3, observed inside plant. Initial debris removal began to allow access to sites.
2-8-89	First series of soil and ash samples taken in or near Transformers T-12 and T-17 and Capacitor C-3 to overview PCB, dioxins and furans and dangerous waste criteria. Level C personnel protection gear used to obtain samples.
2-9-89	PCB cleanup contractors selected. Asbestos sampling initiated on site. Work plans submitted for PCB transformer removal effort including health and safety and sampling plans for PCB transformers.
2-10-89	Olympus Environmental initiates PCB transformer draining and pad cleanup at Transformer T-16, non leaking PCB transformer and T-12 and T-17.
2-11-89	GE removes drained and cleaned PCB transformers to their Portland TSDF. Manifested PCB items include three transformers, about 25,000 lbs; 19 drums of PCB liquid, about 12,550 lbs; seven drums of PCB contaminated cleanup debris, about 3,150 lbs; and one drum of suspected PCB capacitor, about 12 lbs.
2-12 to 16-89	PCB transformer pad and PCB contaminated soil removal continues. Contaminated debris placed in salvage drums and stored temporarily in Hazardous Waste/PCB Storage Area. Additional asbestos sampling takes place.
2-12 to 14-89	PCB, dioxin and furan wipe samples taken to certify the PCB transformer pads and suspected PCB capacitor debris cleaned to 40 CFR 761 requirements.
2-13-89	Second series of soil, hydraulic oil, water and ash samples taken to clarify and overview PCB contamination and dangerous waste issues.

2-14-89	Work plans for HAZMAT chemical removal submitted for general drums, tanks and chemical contaminated debris by Olympus Environmental.
2-15-89	Work plans submitted for five specific high concentration asbestos sites 23-1, 23-2, 23-3, 23-4 and 23-5 by Enviro-Comply. Press pit water sampled for PCB, BNA's and total metals scan.
2-16-89	PCB site assessment work began by HDR Engineering, Inc. according to submitted sampling and health and safety plans on Transformer Pad T-12. Chemical and asbestos HAZMAT removal is in progress.
2-21-89	Asbestos abatement work completed on with five areas. Third round of overview sampling of ash initiated to characterize waste for disposal at Cedar Hills landfill.
-	HAZMAT asbestos cleanup certification, HAZMAT drum consolidation and completion of HDR PCB cleanup site assessment sampling 2/22/89.
-	Gross asbestos contaminated ash removal, asbestos abatement and demolition to certify plywood plant cleared of HAZMAT chemical and asbesto hazards by 2/27/89 or sooner.
-	Complete HAZMAT chemical and asbestos abatement work by 3/17/89.
-	PCB cleanup site assessment reports by 4/1/89 or sooner.
-	Complete demolition of plywood plant to grade by 5/15/89.

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE CLEANUP SOIL/WATER/WIPES

Aroclor Analysis

Twenty two soils, three wipes and two waters were analyzed for Aroclor 1221, 1016, 1232, 1242, 1248, 1254, and 1260. Aroclor 1260 was found in the samples with the following results. The quantitation limit was 0.6 ppm in the soils and 0.06 ppm in the water.

Amount in PPM (ug/g)

17-5A-SL-S-0	170	
17-05-SL-SS-2	36	
17-6A-SL-S-0	160	
17-04-SL-SS-02	1.1	
17-07-SL-S-0	18	
17-13-SL-S-0	280	
17-02-SL-S-0	6.4	
17-03-SL-S-0	20	
17-01-SL-S-0	4.2	
17-06-SL-SS-02	310	
17-12-AH-S-0	2.7	
17-14-AH-S-0	0.6	
17-9A-SL-SS-2	270	
17-08-SL-S-0	22	
17-10-SL-S-0	3.9	
17-11-AH-S-0	0.8	
17-09-SL-SS-2.5	3300	
17-09-SL-SS-2	4.7	
17-10-SL-SS-2	<0.6	
17-08-SL-SS-2	1.6	
17-10-SL-SS-1	0.7	
17-08-SL-SS-1	1.6	
16-01-WP-S-0	13	ug in wipe
16-02-WP-S-0	10	ug in wipe
16-03-WP-S-0	110	ug in wipe
17-00-WA-B-0	<0.06	
17-04-WA-SS-2	1.3	

Approved _____ Date 3/10/89 Notebook _____

Page Number _____

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE FALLS PCB SURVEY/CLEANUP PROJECT

Aroclor Analysis

Twenty two soils and one water were analyzed for Aroclor 1221, 1016, 1232, 1242, 1248, 1254, and 1260. Aroclor 1260 was found in the samples with the following results. The quantitation limit was 0.6 ppm in the soils and 0.06 ppm in the water.

Amount in PPM (ug/g)

12-08-SL-SS-2	350
12-9B-SL-SS-2	16000
12-09-SL-SS-2	84000
12-08-SL-SS-1	2200
12-9A-SL-SS-2	7300
12-02-SL-S-0	35
12-01-SL-S-0	150
12-07-SL-S-0	12
12-04-SL-S-0	64
12-12-SL-S-0	23
12-6A-SL-S	120
12-10-SL-SS-2	38
12-10-SL-SS-2	75
12-08-SL-S-0	16
12-11-AH-S-0	0.5
12-10-SL-S-0	5.0
12-03-SL-SS-1	9.0
12-12-SL-SS-1	1.8
12-5A-SL-S-0	2500
12-03-SL-S-0	99
12-12-SL-SS-1.5	4.1
12-03-SL-SS-2	4.9
12-00-WA-B-0	1.1

Approved [signature] Date 3/6/89 Notebook_____

Page Number _____

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE SOIL/ASH SAMPLES

Aroclor Analysis

Three soil samples and one EPA reference transformer oil were analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254 and 1260 with a quantitation limit of 0.6ppm. Aroclor 1260 was detected in all the samples with the results summerized below.
The recovery of the EPA reference sample was 94%.

T-17	Soil	3/8/89 @3:30pm	23000 ppm
T-17W	Soil	3/8/89 @3:30pm	37 ppm
T-17E	Soil	3/8/89 @3:30pm	270 ppm

Approved _____ Date 3/6/89 Notebook _____

Page Number _____

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Report

SNOQUALMIE CLEANUP OIL

Aroclor Analysis

One oil sample (A-14 oil switch) was analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254 and 1260 at the quantitation limit of 0.1 ppm (ug/Kg). Aroclor 1260 was found at the level of 4.1 ppm.

An EPA reference transformer oil was also analyzed in duplicate. The recovery was 102% and 106%. The level of the reference was 18 ppm.

Approved _____ Date _____ Notebook_____

Page Number _____

APPENDIX C

WEYERHAEUSER PCB SAMPLING
SUPPLEMENTARY ANALYTICAL RESULTS

Tacoma, Washington

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	TASK	Samplers (signatures)
1 1 T 1 1 1	1	J. E. McCourt

Sample Designation	Lab Code	Collection Time	Collection Date	Analyses Required
★ #1 T-12 Under XFMR	2 —	4:58 PM	2-8-89	PCB
sent to I.T. 2-9-89 cc #2 C3 Snoe Falls		5:13 PM	2-8-89	Dioxins & Furans
#3 C3 Snoe Falls		5:13 PM	2-8-89	Dioxins & Furans
#4 C3 - 15ft W.		5:40 pm	2-8-89	Dioxins & Furans
★ #5 Surface Sample		5:45 PM	2-8-89	PCB
★ #6 Surface Sample same as 2 & 3		5:50 PM	2-8-89	PCB, Fish Bioassay
★ #7 Under Base of T-17 same as 4		6:50 PM	2-8-89	PCB
JCM #8 15ft W. of T-17		6:03 pm	2-8-89	PCB, Fish Bioassay
#9 15ft N of T-17		6:05 pm	2-8-89	PCB, Fish Bioassay,
#10 15ft S of T-12		6:10 pm	2-8-89	PCB, Fish Bioassay, E

Method of Shipment: Personal Vehicle

Dispatched by: (signature)	Time	Date	Received for Laboratory by: (signature)	Time	Date
J. E McCourt	8:00	2-8-89	Cathryn Conroy	9:28 am	2-9-

Comments: Held in Mr. McCourt's custody / stored at WTC headquarters

Relinquished by: (signature)	Received by: (signature)	Time	Date
Comments			
Comments			
Comments			
Comments			

RECORD BOOK
PAGE NUMBER

Weyerhaeuser Research and Development - Analysis and Testing | Request Number: 19013

Title: (7) SNOQUALMIE FALLS SOIL SAMPLES FOR PCB'S

Number of Samples: 7	Project Number: 046-5601	Groups: 1,3
Date Received: 02/09/89	Date Desired: 02/10/89	Estimated Completion Date:
Submitted By: MCCOURT, J.E.	Location: WTC 2H4	Telephone: 6513
Reviewed By: CATALANO, Dennis	Location: 2F 25	Telephone: 924-6242
Copy To:		

Sample Description and History:

PCB'S ON ALL; IF ENOUGH SAMPLE, BIOASSAY, THEN EPTOX-METALS IN THAT ORDER ON SPECIFIC SAMPLES. ***PLEASE TAKE MINIMUM AMOUNT OF SAMPLE BECAUSE DIOXIN ANALYSIS MAY BE REQUESTED LATER.***

Series	Test Code - Report Range - Test Description
Groups	Report Basis - Lower Limit of Sensitivity

1	A	PCB-S - -	PCB - Solid
0	B	BIOASSAY - -	Bioassay - Fish Lab
3	C	EPT-EM - -	EP Toxicity (Extraction and metals)

Sample Number	Series to Be Evaluated	Submitter's Designation
24392	A	#1 T-12 UNDER XFMR 2/8/89 @ 4:58 PM
24393	A	#5 SURFACE SAMPLE 2/8/89 @ 5:45 PM
24394	ABC	#6 SURFACE SAMPLE 2/8/89 @ 5:50 PM
24395	A	#7 UNDER BASE OF T-17 2/8/89 @ 6:00 PM
24396	ABC	#8 15 FT. E. OF T-17 2/8/89 @ 6:03 PM
24397	ABC	#9 15 FT. N. OF T-17 2/8/89 @ 6:05 PM
24398	ABC	#10 15 FT. S. OF T-12 2/8/89 @ 6:10 PM

Interim Report Desired?	Hazardous Samples? Yes		No		
Reference:					Record Book:
Results Approved:		Date: 2-16-89	Signature applies to attached pages		Page Number:

Printed on: 02/09/89 Page: 01

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE FALLS SOIL SAMPLES FOR PCB's

Aroclor Analysis

Seven oil in soil samples and an EPA trasformer reference oil were analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254, and 1260 by EPA CLP medium level soil analysis. All samples contained Aroclor 1260, with the results summerized bellow.

#1 T-12 Under Transformer	2-8-89 @4:58 pm	55%
#5 Surface Sample	2-8-89 @5:45 pm	0.5 ppm
#6 Surface Sample	2-8-89 @5:50 pm	0.5 ppm
#7 Under Base of Transformer	2-8-89 @6:00 pm	34%
#8 15 ft East of Transformer	2-8-89 @6:03 pm	4.7 ppm
#9 15 ft North of Transformer	2-8-89 @6:05 pm	4.3 ppm
#10 15 ft South of Transformer	2-8-89 @6:10 pm	2.1 ppm

The EPA reference was analyzed at 11.4 ppm. The recovery was 103%.

Approved _____ Date 2/13/89 Notebook _____

Page Number _____

ANALYTICAL LABORATORY SERVICES REQUEST

Weyerhaeuser Research and Development - Analysis and Testing

Request Number: 19039

Sample Number	Series to Be Evaluated	Submitter's Designation
24466	ABCD	A-1 COMPOSITE ASH
24467	ABCD	A-2 COMPOSITE ASH
24468	A C E	A-3 HYDRAULIC OIL *METALS - CR,CD,AS,PB
24469	ABCD	A-4 GLUE AREA SURFACE SAMPLE
24470	ABCD	A-5 ASH COMPOSITE
24471	ABCD	A-6 GLUE WASTE
24472	A F	A-7 WATER FROM T-12 WESTSIDE SLAB
24473	A	A-8 T-12 BASE ASH SAMPLE NEAR SWITCH GEAR
24474	A	A-9 T-17 BASE ASH SAMPLE NEAR SWITCH GEAR
24475	A	SNOQUALMIE CAPACITOR WIPE

ANALYTICAL LABORATORY SERVICES REQUEST

Weyerhaeuser Research and Development - Analysis and Testing

Request Number: 19039

Title: (10) SNOQUALMIE ASH/WASTE/OIL/WATER SAMPLES		
Number of Samples: 10	Project Number: 046-5601	Groups: 1,3,4,FISH LAB
Date Received: 02/14/89	Date Desired: 02/16/89	Estimated Completion Date:
Submitted By: MCCOURT, J.E.	Location: WTC 2H4	Telephone: 6513
Reviewed By: CATALANO, Dennis	Location: 2F 25	Telephone: 924-6242
Copy To:		

Sample Description and History:

CLP METALS TO INCLUDE HG, AS. PLEASE NOTE PCB'S WERE CODED AS PCB-S, HOWEVER, SAMPLE A-3 IS AN OIL, A-7 IS A WATER. THE CAPACITOR WIPE HAS BEEN SPLIT OUT TO I.T. FOR DIOXIN & FURAN ANALYSIS.

Series	Test Code - Report Range - Test Description
Groups	Report Basis - Lower Limit of Sensitivity

1	A	PCB-S - -	- PCB - Solid
0	B	BIOASSAY - -	- Bioassay - Fish Lab
3	C	CLPMET-S - -	- Metals - CLP in Soil or Sludge
3	D	CORR/3 - -	- Corrosivity
4	E	TX - OIL - -	-
4	E	IGNIT - -	- Ignitability - flash point
1	F	BNA-WW - -	- Base Neutral Acid - Water (625)

Interim Report Desired?	Hazardous Samples? Yes		No		
Reference:					Record Book:
Results Approved:		Date: 2-16-89	Signature applies to attached pages		Page Number:

Printed on: 02/14/89

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE ASH/WASTE/OIL/WATER SAMPELS

Aroclor Analysis

Eight soil/waste, one wipe, one water sample and an EPA transformer reference oil were analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254, and 1260 by EPA CLP medium level soil analysis. Aroclor 1260 was detected in some of the samples, with results summerized bellow.

Amount is in PPM (except capacitor wipe)

A-1 COMPOSITE ASH	1.6
A-2 COMPOSITE ASH	<0.1*
A-3 HYDRAULIC OIL	<0.1
A-4 GLUE AREA SURFACE SAMPLE	<0.1
A-5 ASH COMPOSITE	0.35
A-6 GLUE WASTE	<0.1
A-7 WATER FROM T-12 WESTSIDE SLAB	230
A-8 T-12 BASE ASH SAMPLE NEAR SWITCH GEAR	48
A-9 T-17 BASE ASH SAMPLE NEAR SWITCH GEAR	170
SNOQUALMIE CAPACITOR WIPE	0.3 ug/sample

*indicates Aroclor 1260 was detected below the quantitation limit

The capacitor wipe indicates that some Aroclor 1260 was detected but cannot be quantitated (the wipe is not a quantitative amount).

The water sample was cloudy with a small amount of an oily substance present - some appeared to be heavier than water.

The EPA reference transformer oil (WP 380 Concentrate #3) gave a recovery of 103% at a level of 18 PPM of Aroclor 1260.

Approved _____ Date 2/16/89 Notebook_____

Page Number _____

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE PRESS PIT WATER

Aroclor Analysis

One water sample (PRESS WATER PIT 2-15-89 @2 PM) was analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254, and 1260. No Aroclors were detected at or below the following quantitation limits:

Aroclor 1221	1.0 PPM
Aroclor 1016	0.1 PPM
Aroclor 1232	0.1 PPM
Aroclor 1242	0.1 PPM
Aroclor 1248	0.1 PPM
Aroclor 1254	0.1 PPM
Aroclor 1260	0.1 PPM

Approved [signature] Date 2/17/89 Notebook _____

Page Number _____

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE FIRE CLEANUP PROJECT WATER AND SOIL

Aroclor Analysis

One soil sample and one water sample were analyzed for Aroclor 1221, 1016, 1232, 1242, 1248, 1254, and 1260. Aroclor 1260 was found in the samples with the following results. The quantitation limit was 0.6 ppm in the soil and 0.06 ppm in the water.

Amount in PPM (ug/g)

A-12 SOIL FROM NEAR NULOC	<0.6
A-13 SITE 6 PLYWOOD BLDG RUNOFF	<0.06

Approved _____ Date 2/27/89 Notebook_____

Page Number _____

Weyerhaeuser Research and Development - Analysis and Testing | Request Number: 19086

Title: (5) SNOQUALMIE CLEANUP ASH		
Number of Samples: 5	Project Number: 046-5601	Groups: 1,3 FISH LAB
Date Received: 02/22/89	Date Desired: 02/24/89	Estimated Completion Date:
Submitted By: MCCOURT, MICK	Location: WTC 2H4	Telephone: 6513
Reviewed By: CHRISTIAN, Jeff	Location: 2F 25	Telephone: 924-6013
Copy To:		

Sample Description and History:

BULK DEN= BULK DENSITY

Series	Test Code - Report Range - Test Description
Groups	Report Basis - Lower Limit of Sensitivity

A 3	EPT-EM	- -	- EP Toxicity (Extraction and metals)
A 3	CORR/3	- -	- Corrosivity
A 3	SOLIDS/3	- -	- Solids
A 3	BULK DEN	- -	-
B 1	PCB-S	- -	- PCB - Solid
C	BIOASSAY	- -	- Bioassay - Fish Lab

Sample Number	Series to Be Evaluated	Submitter's Designation
24757	ABC	B-1 AREA 6 SITES 7/8 2/21 10:00AM
24758	ABC	B-2 AREA 6 SITES 9/10 2/21 10:09AM
24759	ABC	B-3 AREA 9 SITE 36 2/21 10:50AM
24760	ABC	B-4 AREA 8 SITES 37/38/40 2/21 10:22AM
24761	ABC	B-8 AREA 9 SITES 31/33/35 2/21 11:00AM

Interim Report Desired?	Hazardous Samples? Yes		No		
Reference:					Record Book:
Results Approved: Jeff Christian	Date: 2-28-89	Signature applies to attached pages			Page Number:

Printed on: 02/22/89

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Report

SNOQUALMIE CLEANUP ASH

Aroclor Analysis

Five ash/water samples were analyzed for Aroclor 1221, 1016, 1232, 1242, 1248, 1254, and 1260. Aroclor 1260 was found in the samples with the following results. The quantitation limit was 0.6 ppm in the ash.

Amount in PPM (ug/g)

B-1 AREA 6 SITES 7/8 2/21 10:00 AM	<0.6
B-2 AREA 6 SITES 9/10 2/21 10:09 AM	<0.6
B-3 AREA 9 SITES 36 2/21 10:50 AM	<0.6
B-4 AREA 8 SITES 37/38/30 2/21 10:22 AM	<0.6
B-5 AREA 9 SITES 31/33/35 2/21 11:00 AM	<0.6

Approved _____ Date 2/22/89 Notebook_____

Page Number _____

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

5815 Middlebrook Pike • Knoxville, Tennessee 37921 • 615-588-6401

CERTIFICATE OF ANALYSIS

TO: Weyerhaeuser Analytical Chemistry
ATTN: Dennis Catalano
32901 Weyerhaeuser Way South, WTC 2F25
Federal Way, WA 98003

DATE REPORTED: February 21, 1989
PROJECT CODE: WEY 42825
ORDER NUMBER:

Sample Description: Five (5) extracts received February 17, 1989

Concentration units are total µg

	Aroclor 1016, 1232 1242† and/or 1248	Aroclor 1254	Aroclor 1260	Total Aroclors
BB1109,T-12 Slab Wipe	<12,000	<26,000	720,000	720,000
BB1110, Wipe Throat	<18,000	<25,000	1,500,000	1,500,000
BB1111,T-17 Clean	<360	<500	29,000	29,000
BB1112,T-12 Clean	<180	<250	14,000	14,000
Blk 1337, Reagent Blank	<10	<10	<10	<10

†Sample Aroclor pattern identified and/or calculated as Aroclor 1242.

Approved by: Alyce L. Moore
Laboratory Manager

Title

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Recd by HDR
3/22/89

Report

SNOQUALMIE SOIL/ASH SAMPLES

Aroclor Analysis

Three soil samples and one EPA reference transformer oil were analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254 and 1260 with a quantitation limit of 0.6ppm. Aroclor 1260 was detected in all the samples with the results summerized below.

The recovery of the EPA reference sample was 94%.

The soil T-17 gave a result much higher than expected from previous data (23000 compared to 3300). It was reextracted and upon reanalysis, gave a result comparable to the previous data. Because of the recovery of the internal standard on the high analysis (114%), the cause of the high value must be attributed to lack sample homogeniety

T-17	Soil	3/8/89 @3:30pm	2400 ppm
T-17W	Soil	3/8/89 @3:30pm	37 ppm
T-17E	Soil	3/8/89 @3:30pm	270 ppm

Approved Michael Grace Date 3/13/89 Notebook _____

Page Number _____

Weyerhaeuser
Analytical and Testing Services
Tacoma, Washington 98477

Recd by HDR.
3/22/89

Report

SNOQUALMIE SOIL SAMPLES

Aroclor Analysis

Three soil samples were analyzed for Aroclors 1221, 1016, 1232, 1242, 1248, 1254 and 1260 with a quantitation limit of 0.6ppm. Two of the samples contained a layer of water and that was analyzed also. Aroclor 1260 was detected in all the samples with the results summerized below.

T-12	Soil	3/9/89 @12:05pm	73000 ppm
T-12	Water		1310 ppm
T-12E	Soil	3/9/89 @12:05pm	10000 ppm
T-12W	Soil	3/9/89 @12:05pm	32000 ppm
T-12W	Water		770 ppm

Approved [signature] Date 3/13/89 Notebook _____

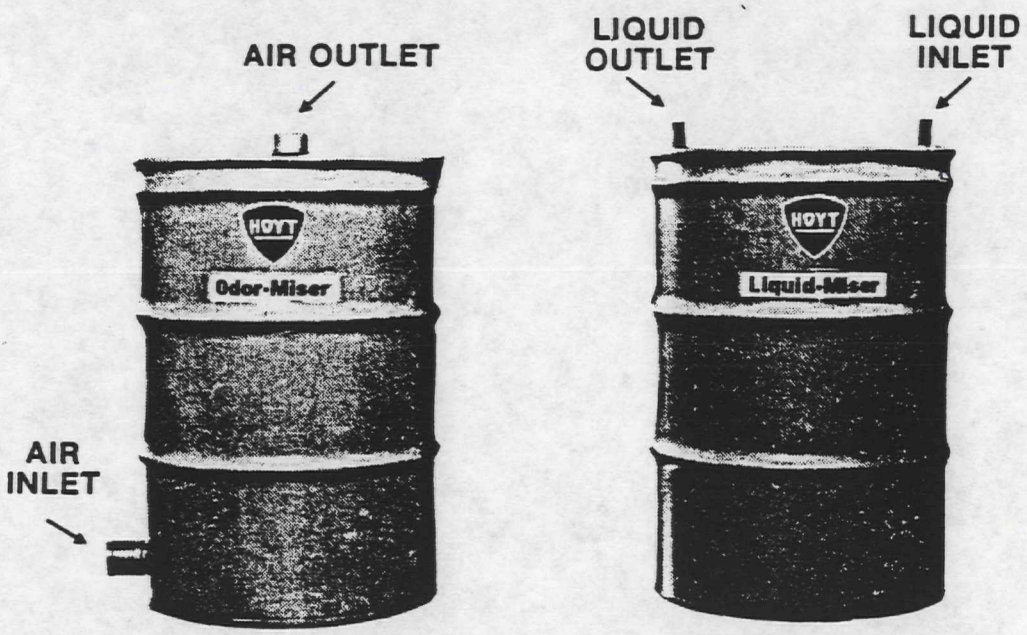
Page Number _____

APPENDIX D

SMALL-SCALE ACTIVATED CARBON TREATMENT CANISTERS: EXAMPLE PRODUCT LITERATURE

HOYT

Activated Carbon Canisters



The Hoyt Odor-Miser and Liquid-Miser are pre-engineered, low-cost, activated carbon canisters designed to provide an effective solution for purifying low flow rate air and water streams without the need for capital investment, dedicated personnel or complicated process equipment.

Hoyt Carbon Canisters are on the job 24 hours per day to clean up air emissions and water streams. Depending on flow rates, additional units can be installed in series or parallel.

The life of an Odor-Miser or Liquid-Miser will depend on the type, concentration and volume of contaminant in the air or water stream. In certain cases, these carbon canisters have been effective for up to eight months.

Some Typical Applications Include:

ODOR-MISER

- Capturing evaporated hydrocarbons and organics from storage tank vents
- Capturing odorous or toxic substances from reactor vents
- Capturing vented emissions from hood exhausts of chemical plants.
- Purifying air supplies for clean rooms

LIQUID-MISER

- Removing priority pollutants from industrial waste water
- Removal of organics from surface and ground water
- Treatment of decanter water from solvent recovery operations
- Liquid decolorization

- Determining the feasibility of installing a Hoyt solvent vapor recovery system

SPECIFICATIONS

	ODOR-MISER	LIQUID-MISER
DIMENSIONS:	36" H X 23" DIA.	36" H x 23" DIA.
FLOW RATE:	UP TO 100 CFM	UP TO 7.5 G.P.M.
CARBON:	165 LBS. OF GRANULATED ACTIVATED CARBON	165 LBS. OF GRANULATED ACTIVATED CARBON
INLET:	2" STANDARD THREAD	¾" N.P.T. NIPPLE
OUTLET:	2" STANDARD THREAD	1" STANDARD THREAD
CHARGING TIME:	NOT APPLICABLE	AT 2 G.P.M. CHARGING TIME IS 25 MINUTES
CONTACT TIME:	AT 20 C.F.M. CONTACT TIME IS 16 SECONDS	AT 2 G.P.M. CONTACT TIME IS 25 MINUTES
SHIPPING WEIGHT:	300 LBS.	250 LBS.

The Clean Air Company

In USA call toll-free 1-800-343-9411
in Massachusetts (617) 636-8811

HOYT CORPORATION
Forge Road, Westport, Mass. 02790
Hoyt Mfg. (Canada) Ltd., Montreal, Canada
Hoyt Corporation, Manchester, England