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# **Volume III of III**

## **DRAFT REMEDIAL ACTION PLAN**

# **APPENDIX B DRAFT FINAL SOIL CHARACTERIZATION REPORT**

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Prepared for:



**GENERAL MOTORS  
POWERTRAIN GROUP**

**BAY CITY, MICHIGAN**

September 1997

Prepared by:

**PTI Environmental  
Services, Inc.**

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**Draft**

**Volume III of III**

**Appendix B**

**Final Soil Characterization Report**

**Prepared for**

**General Motors Powertrain Group  
Bay City Plant  
Bay City, Michigan**

**PTI Contract C690-17-04**

**October 1997**

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## **ACRONYMS AND ABBREVIATIONS**

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CoPC	contaminant of potential concern
CV	coefficient of variance
EPA	U.S. Environmental Protection Agency
FRA	Former Residential Area
GM	General Motors Corporation
GMPTG	General Motors Powertrain Group
MDEQ	Michigan Department of Environmental Quality
NRD	natural resource damages
PCB	polychlorinated biphenyl



# **APPENDIX B—FINAL SOIL CHARACTERIZATION REPORT**

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The final soil characterization sampling event for soils from the Undeveloped Area at the General Motors Powertrain Group (GMPTG) Bay City Plant in Bay City, Michigan was performed from August 13 to August 15, 1997. This appendix describes the objectives, rationale, and approach used to develop the final soil characterization sampling strategy, provides the analytical results of the sampling, and presents an evaluation of the results.

## **INTRODUCTION**

In conformance with onsite Consent Judgment No. 92-3740-CE, dated December 14, 1992, General Motors Corporation (GM) has submitted a remedial investigation and feasibility study (McLaren/Hart 1996a,b), and an ecological assessment (PTI 1996) to the Michigan Department of Environmental Quality (MDEQ). GM completed the remedial activities in the Undeveloped Area that were proposed in the feasibility study (McLaren/Hart 1996b). GM also conducted a survey in the Undeveloped Area to identify areas containing industrial or demolition debris by digging approximately 300 exploratory test pits. Following approval by MDEQ, GM removed the debris and placed clean fill in areas identified in the survey. A more detailed review of historical sampling events and response actions in the Undeveloped Area is provided in Volume I of III, Section 3.7 of the Remedial Action Plan.

MDEQ requested the final soil characterization sampling to supplement the analytical data that were reported in the remedial investigation (McLaren/Hart 1996a) and were used in the draft ecological assessment (PTI 1996). The final soil characterization sampling was designed to provide additional information regarding the distribution of contaminants of potential concern (CoPCs) in the soil from the portion of the Undeveloped Area being

considered for transfer as part of the pending natural resources damage (NRD) litigation proposed settlement.

## **SAMPLING DESIGN AND METHODS**

A total of 42 samples from 21 stations was collected from areas where data gaps were present and in areas where MDEQ requested increased spatial characterization of CoPC distribution (PTI 1997). The sampling station locations were selected to complement the historical data set.

Figure 1 illustrates the location of final soil characterization sampling stations. Most of the 21 sampling stations are located in the northwestern (11 stations) and southeastern (6 stations) portions of the site. The remaining four stations are located in the eastern portion of the Undeveloped Area. Figure 1 also shows the stations sampled by McLaren/Hart (1996a) for which surface soil data are available. Surface soil concentrations at historical sampling stations located in areas that have been remediated and covered with native fill during voluntary removal activities are now representative of conditions expected in native, non-impacted Michigan soils, and the sample stations are shown on Figure 1 for reference purposes only.

At each station, soil samples were collected to a depth of 61 cm (24 in.) using a manual coring device. The samples were subdivided into two discrete samples, or vertical horizons, for analysis. One sample consists of the surface horizon (0- to 15-cm [0- to 6-in.] depth). The second sample was collected from the 15- to 61-cm (6- to 24-in.) depth interval (i.e., subsurface sample). The subsurface samples were requested by MDEQ and are intended to provide information regarding the vertical distribution of constituents.

Soil samples were visually examined in the field for the presence of anthropogenic material such as metal, cloth, or wood. Although anthropogenic material was noted in several borings, no stations were relocated due to excessive anthropogenic material.

## **ANALYTE LIST AND ANALYTICAL PROCEDURES**

The analyte list for the final soil characterization sampling was developed in consultation with MDEQ. The selected analyte list was approved by MDEQ and consists of barium, cadmium, chromium, copper, lead, mercury (total and methyl), tin, vanadium, zinc, and polychlorinated biphenyls (PCBs) (Aroclors<sup>®</sup>) (Kaelber-Matlock 1997, pers. comm.). These compounds were selected as analytes because they satisfy one or more of the following criteria:

- Occur with a frequency that may indicate potential site-related sources
- Occur at concentrations substantially elevated above Michigan Default Type A Background Criteria (MDNR 1995), indicating potential localized contributions from human activities
- Infrequently measured in the McLaren/Hart data set
- Non-naturally occurring and known onsite sources.

Table 1 summarizes the analytical methods and the target method reporting limits for the analysis of CoPCs in soil samples from the Undeveloped Area. The quality assurance procedures used for these analyses meet or exceed applicable U.S. Environmental Protection Agency (EPA) guidelines. The work plan for the final soil characterization sampling (PTI 1997) provides additional details on the analytical methods and quality assurance and quality control procedures used for this investigation.

## RESULTS

The analytical results for the final soil characterization sampling are presented in Table 3. Laboratory reports and the data validation report are presented in Attachment 2. Barium, cadmium, chromium, copper, lead, mercury, methylmercury, vanadium, and zinc were detected at all 21 stations in both surface and subsurface soil samples. Tin, however, was only detected at two stations (UA15 and UA17). The concentrations of CoPCs in the surface samples (0–15 cm [0–6 in.]) are generally similar to or higher than concentrations in the corresponding subsurface samples (15–61 cm [6–24 in.]). The results of the final soil characterization sampling are consistent with findings from previous investigations that indicate that, with minor exceptions, metals are within the range of values typical of background concentrations for Michigan. Metals above background concentrations and PCBs are observed at only a few locations.

Soil samples were also analyzed for several commercial PCB mixtures (Aroclors<sup>®</sup>). Aroclors<sup>®</sup> 1016, 1221, 1232, 1242, and 1254 were not detected at any station. Aroclors<sup>®</sup> 1248 and 1260 were detected in surface or subsurface soil samples at 81 and 33.3 percent of the stations, respectively. In contrast, McLaren/Hart (1996a) reported detecting Aroclors<sup>®</sup> 1248 and 1254, but not 1260. The reason for this discrepancy in detected Aroclors<sup>®</sup> is unclear; however, the analytical method used for Aroclor<sup>®</sup> analyses involves matching gas chromatogram peaks to standard Aroclor<sup>®</sup> patterns. This technique involves considerable subjectivity on the part of the analyst. The PCB congener composition of Aroclors<sup>®</sup> 1254 and 1260 is similar, and weathering of environmental PCB mixtures confounds positive identification of the parent Aroclor<sup>®</sup>. Therefore, it is likely that the discrepancy between the historical data and current results is due to interpretive differences between the analysts.

The subsurface (i.e., 15–61 cm [6–24 in.]) soil concentration data are not included in this discussion because humans and ecological receptors are unlikely to encounter the subsurface soil zone. U.S. EPA (1993, 1996) defines the top 2 cm (0.79 in.) as the depth of soil

where direct contact usually occurs. Because people in residential or commercial/industrial settings may occasionally contact deeper soils while gardening, landscaping, or preparing a site for building construction, surface soil sampling frequently encompasses the first 15 cm (6 in.) of soil. The surface sample is also believed to represent the zone of potential exposure for the ecological receptors selected in the ecological assessment (PTI 1996). MDEQ (MDNR 1995) also considers surface soils to be the top 0–15 cm (0–6 in.). Thus, although the subsurface concentration data provide information regarding the vertical distribution of constituents at the site, they do not represent a soil zone of likely exposure of humans or ecological receptors to CoPCs and are, therefore, not discussed further in this report.

The concentrations of CoPCs in soils is evaluated using a tiered screening approach. The analytical results from the final soil characterization stations and the relevant historical stations (i.e., McLaren/Hart [1996a] stations not covered during remedial activities) are included in this evaluation. Measured CoPC concentrations are compared to the following criteria (when available):

- Michigan Default Type A Background Criteria
- The concentration range reported in the Michigan Background Soil Survey
- Site-specific background concentrations.

If measured concentrations of a metal are less than any of the above background criteria, the metal is considered to be at background levels and below concentrations of potential concern. Metal concentrations above site-specific background levels are compared to Michigan Generic Industrial Criteria.

## Derivation of Site-Specific Background Values

Site-specific background values for metals were developed for the surface soil unit on the Undeveloped Area using the “Mean plus 3 Standard Deviation” approach provided by MDEQ (MDNR 1994). Surface soil data presented by McLaren/Hart (1996a) for the Former Residential Area (FRA) were used to develop the site-specific background values. The FRA is a flat area approximately 10.7 acres in size, with a land surface elevation of approximately 10 ft above the low water stage of the Saginaw River. The FRA is located east of the parking area and the manufacturing building, and is bounded on the west by Birney Street and the parking area, on the east by Johnson Street, and on the south by Ketchum Street and residential areas. The north boundary is Fitzgerald Street on the western half and Madison Street on the eastern. All structures in the FRA were removed before GM acquired the property in 1979. The FRA currently consists of maintained lawn and areas of trees crisscrossed by paved streets. Documentation indicates that the FRA was originally developed for and remained in residential use until the late 1970s. The FRA was never used for industrial or commercial purposes.

MDEQ (MDNR 1994) presents guidelines for establishing site-specific background values for soil, including guidelines pertaining to site use, data requirements, and a process for data compilation and statistical data analysis. Site-specific data are evaluated relative to these guidelines below.

MDEQ (MDNR 1994) states that the location selected for developing site-specific background values must be an area that has not been affected by environmental contamination and is representative of natural background conditions. MDNR (1994) acknowledges that regional factors such as atmospheric deposition from widely dispersed urban sources can influence background concentrations of metals in soils. The FRA has never been used for industrial or commercial purposes. Therefore, soils on the FRA have not been influenced by site activities, and concentrations of metals are expected to be representative of background conditions.

A minimum of four samples from each soil horizon is required by MDNR (1994) to establish site-specific background values. McLaren/Hart (1996a) reported metals data for surface soils at 11 locations in the FRA. Table 2 presents the results of the site-specific background values calculation using metals data for the surface soil horizon from the FRA. Attachment 1 presents the concentration data used to develop the site-specific background values.

MDEQ (MDNR 1994) states that the data should generally have a coefficient of variance (CV, or the standard deviation divided by the mean) of less than 0.5 for granular soils, and less than 0.75 for cohesive soils. The surface soil types in the FRA are predominately moderately granular, but include moderately cohesive soils as well. The CVs for barium (0.49), chromium (0.56), copper (0.64), lead (0.78), vanadium (0.74), and zinc (0.61) were calculated using the entire data set. With the exception of lead, the CVs for these metals are within the range of recommended CVs. The CV for lead is slightly above the recommended range of CVs, but is well below 1.0, the criterion for requiring a thorough evaluation of the data set. The initial CV for cadmium was 0.82 (i.e., the CV calculated using the entire data set). However, if the highest reported concentration of cadmium (2.0 mg/kg at BH 648) is removed from the sample population, the CV drops to 0.57, which is within the recommended range for CVs (the mean drops from 0.64 mg/kg to 0.51 mg/kg).

### **Comparison of Measured Concentrations to Michigan Background Values**

All of the metals analyzed for in this investigation are natural components of the earth's crust. Metal concentrations in soil vary geographically and commonly range over several orders of magnitude. To determine if metal concentrations at a site are elevated above naturally occurring levels, site-specific concentrations are often compared to regional background levels. MDEQ's Waste Management Division performed a background

survey for certain metals in soil collected from several geographical regions within the state (MDNR 1991), and developed acceptable default soil cleanup criteria (Default Type A Background Criteria) using this data set (MDNR 1993). Default Type A Background Criteria represent the mean plus one standard deviation for the combined background data set. The range of metal concentrations reported in the Michigan Background Soil Survey and the Default Type A Background Criteria are provided in Table 4.

Concentrations of barium, cadmium, chromium, copper, lead, mercury, and zinc measured in soil samples from the Undeveloped Area are compared to the Default Type A Background Criteria in Figures 2–7 and 9. Default Type A Background Criteria are not available for methylmercury, tin, or vanadium. A comparison of measured metal concentrations to the range of background concentrations reported in the Michigan Background Soil Survey (Slayton 1997, pers. comm.; Attachment 3) is also illustrated in these figures. With the exception of mercury, measured metal concentrations exceeded the range of background values reported in the Michigan Background Soil Survey at two or more stations in the Undeveloped Area. Similarly, metal concentrations exceed the Michigan Default Type A Background Criteria at two or more stations. Therefore, in conformance with MDEQ guidance (MDNR 1993) site-specific background concentrations were developed for metals other than mercury.

### **Comparison of Measured Concentrations To Site-Specific Background Concentrations**

Metal concentrations in soil samples from the portion of the Undeveloped Area being considered for ownership transfer are compared to the site-specific background concentrations in Figures 2–9. For most metals, a majority of the measured concentrations are well below the site-specific background levels, and elevated concentrations are only observed at a few stations. Zinc concentrations exceed the site-specific background values at 4 of 33 stations (12 percent), whereas cadmium, chromium, and copper only exceed site-specific background levels at 2 stations (6.1 percent). Barium, lead and vanadium con-

centrations exceed the site-specific background at only one station (3.0 percent). The stations with the most exceedances of site-specific background concentrations are UA17 and UA08. These stations exceed the criteria for 4 and 5 metals, respectively. Stations BH511, BH513, BH515, BH517, and BH519 have exceedances for only one metal, and no other stations have exceedances. Comparison of measured concentrations to site-specific background values are presented in Table 5.

Site-specific background concentrations were not calculated for tin or methylmercury because the metals were not analyzed for in soil samples from the FRA by McLaren/Hart (1996a). Tin, however, was only detected at two of 21 stations (9.5 percent) and the concentrations were 36 and 41 mg/kg. These measured tin concentrations are within the range of background concentrations (<0.5–48 mg/kg) reported in sandy soils from the Saginaw glacial lobe of the State of Michigan (Dragun and Chiasson 1991). Methylmercury concentrations in soil are rarely monitored in background surveys. Methylmercury concentrations in the organic horizon (5–15 cm [2–6 in.]) of pristine soils from southwest Quebec, however, are typically on the order of 0.004–0.005 mg/kg. The maximum concentration detected in soils from the Undeveloped Area is 0.00126 mg/kg (Chaire de Recherche en environnement 1993, as cited in Mucci et al. 1995).

### **Comparison to Michigan Generic Industrial Cleanup Criteria**

The Michigan Generic Industrial Cleanup Criteria are intended to expedite the preparation, review, and approval of remedial action plans by eliminating the development of site-specific cleanup levels (MDNR 1995). The soil direct contact values identified in these criteria (Table 4) are protective against long-term, systemic health effects from ingestion and dermal absorption of hazardous substances in soil. The measured analyte concentrations are compared to the soil direct contact criteria to identify areas of potential concern within the portion of the Undeveloped Area being considered for ownership transfer (Table 5). The only exceedances of these criteria are for lead and PCBs at Station UA17.

Lead and PCB concentrations at this station were approximately two-fold higher than the applicable generic industrial criteria.

## **PROPOSED REMEDIAL ACTION**

To date, MDEQ-approved remedial activities at the site have been based on exceedances of Michigan Generic Industrial Cleanup Criteria (McLaren/Hart 1996b). These remedial activities have consisted of the placement of at least 2 ft of clean fill with or without prior excavation. In addition, voluntary remedial activities have been completed in areas identified during the exploratory survey for industrial or demolition debris. During the course of the current site investigation, no additional areas containing industrial or demolition debris were identified. GM has placed at least 2 ft of clean soil at the UA17 location, which is consistent with previous remedial decisions.

The boundary for the remediation area is identified in Figure 14. The area of remediation is approximately 0.57 acre and is defined by the Thiessen polygon for Station UA17. The Thiessen polygon encompasses all points that are closer to Station UA17 than to any other station. Concentrations of PCBs and lead at all adjacent stations with contiguous Thiessen polygons are considerably lower than Michigan Generic Industrial Cleanup Criteria. Therefore, the concentrations at UA17 are most appropriately represented by the Thiessen polygon.

## **SUMMARY**

The objective of the final soil characterization sampling was to provide additional information regarding the distribution of CoPCs in the soil from the portion of the Undeveloped Area being considered for ownership transfer. The results of this investigation are consistent with historical data; for most substances, a majority of the concentrations are similar to background levels, and elevated concentrations are observed at only a few of the

stations (Figures 2–9). The only exceedances of the Michigan Generic Industrial Contact Criteria occurred at station UA17 for PCBs and lead (Table 5). On the basis of these exceedances, GM has placed a minimum of 2 ft of clean soil at this location. This decision process and proposed action is consistent with previous remedial decisions at the site.

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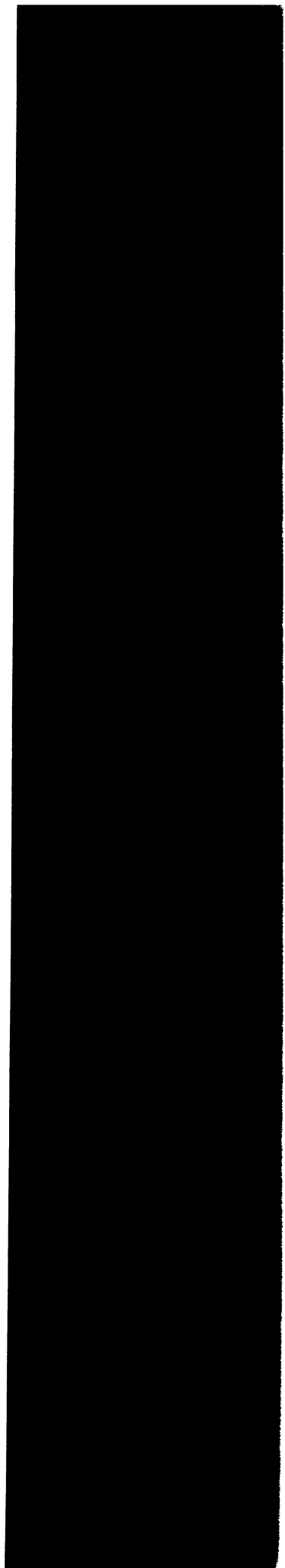
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## Figures





**LEGEND**

- Final soil characterization sampling locations
- Location of soil borings (RI/FS) where surface data were collected
- Location of soil borings (RI/FS) covered during remedial activities
- Proposed property boundary
- Pond area
- Areas of debris removal and backfilling under the GM Voluntary Removal Action
- Areas remediated and backfilled under RI/FS

Sources:  
 McLaren/Hart Environmental Engineering Services  
 OHM Phase II Samples (1987)  
 Advanced Mapping Technologies (April, 1997)

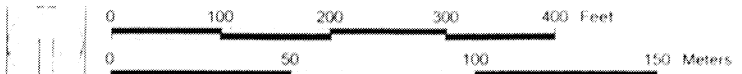


Figure 1. Final soil characterization and Remedial Investigation sampling locations.

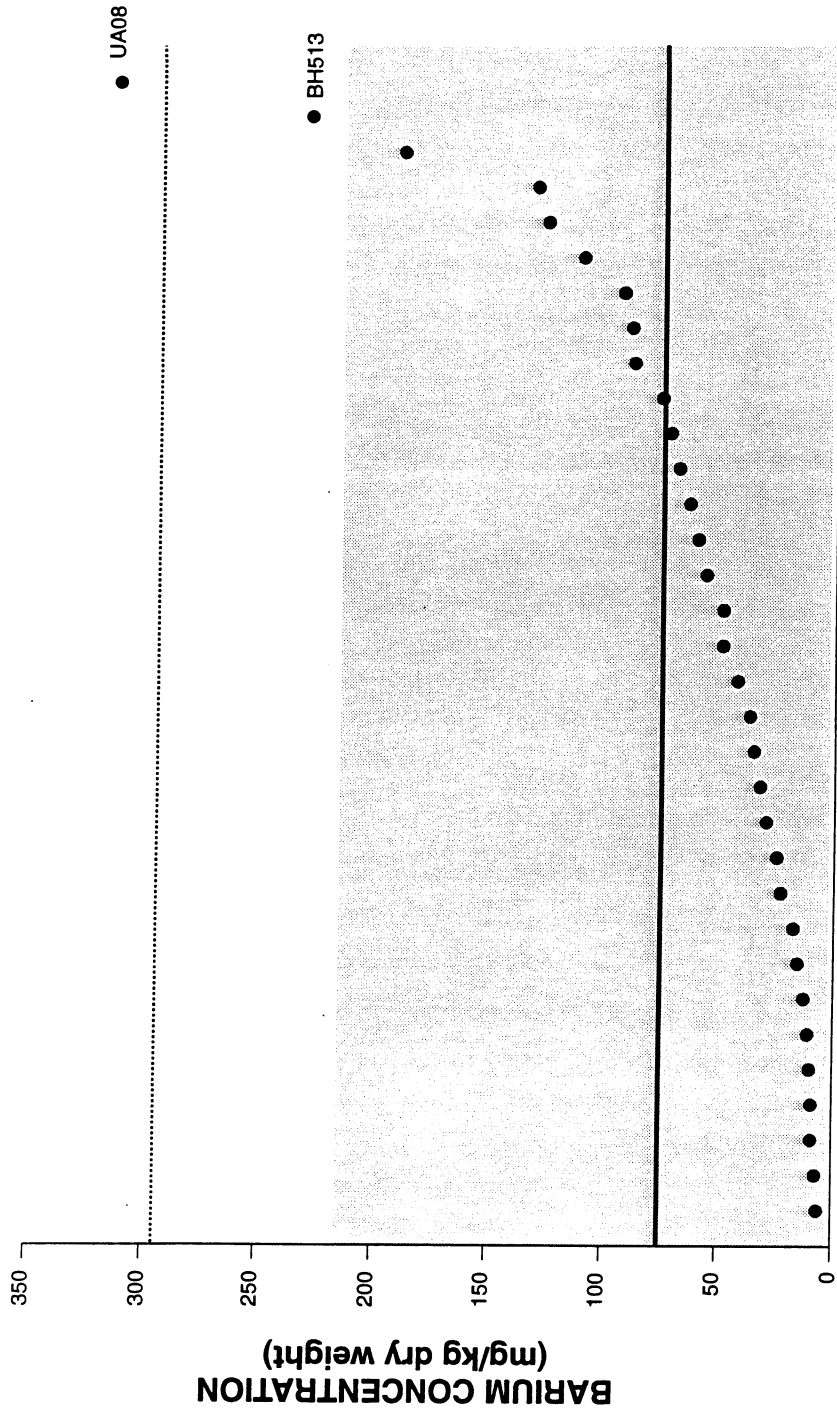


Figure 2. Comparison of measured barium concentrations to applicable criteria.

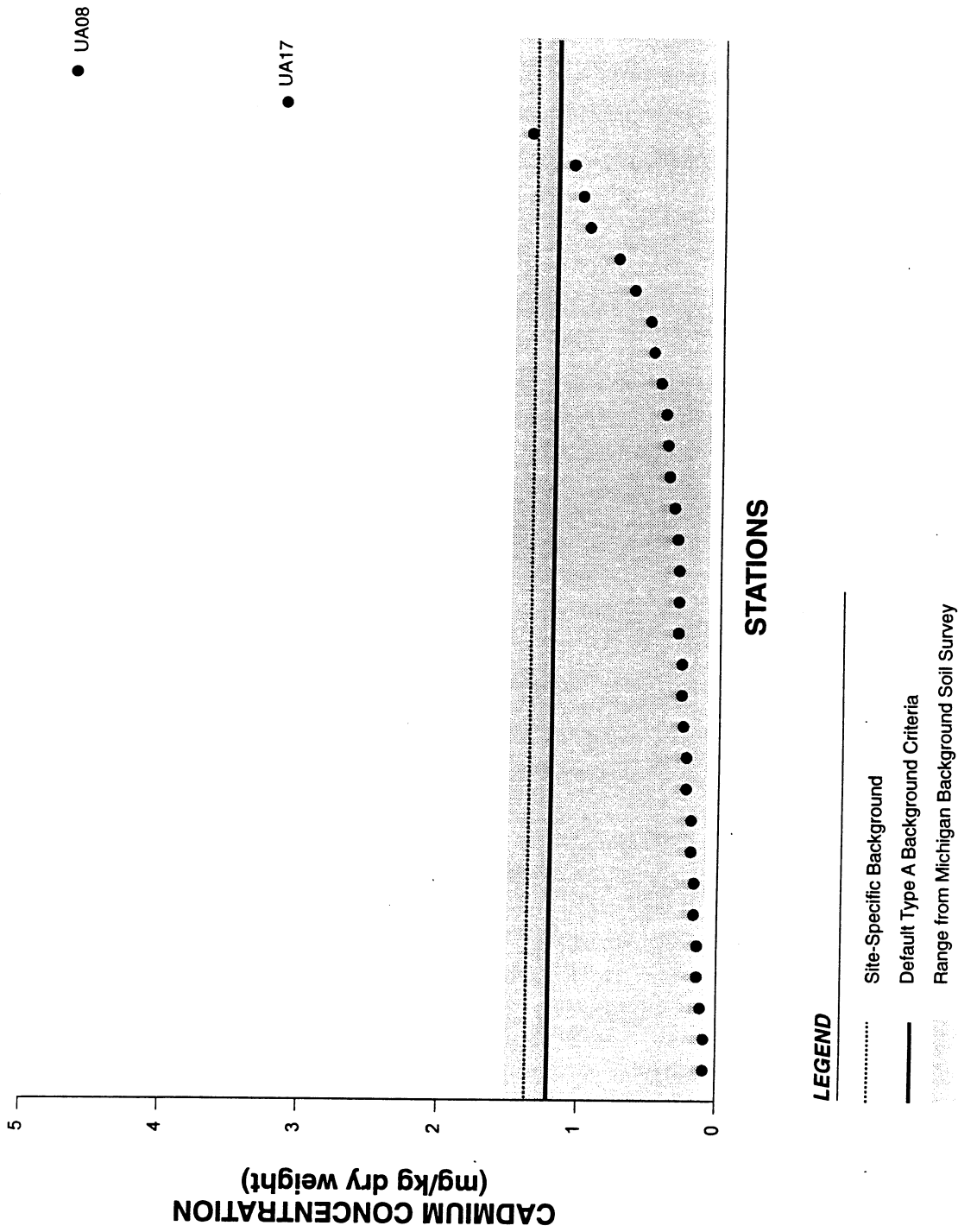
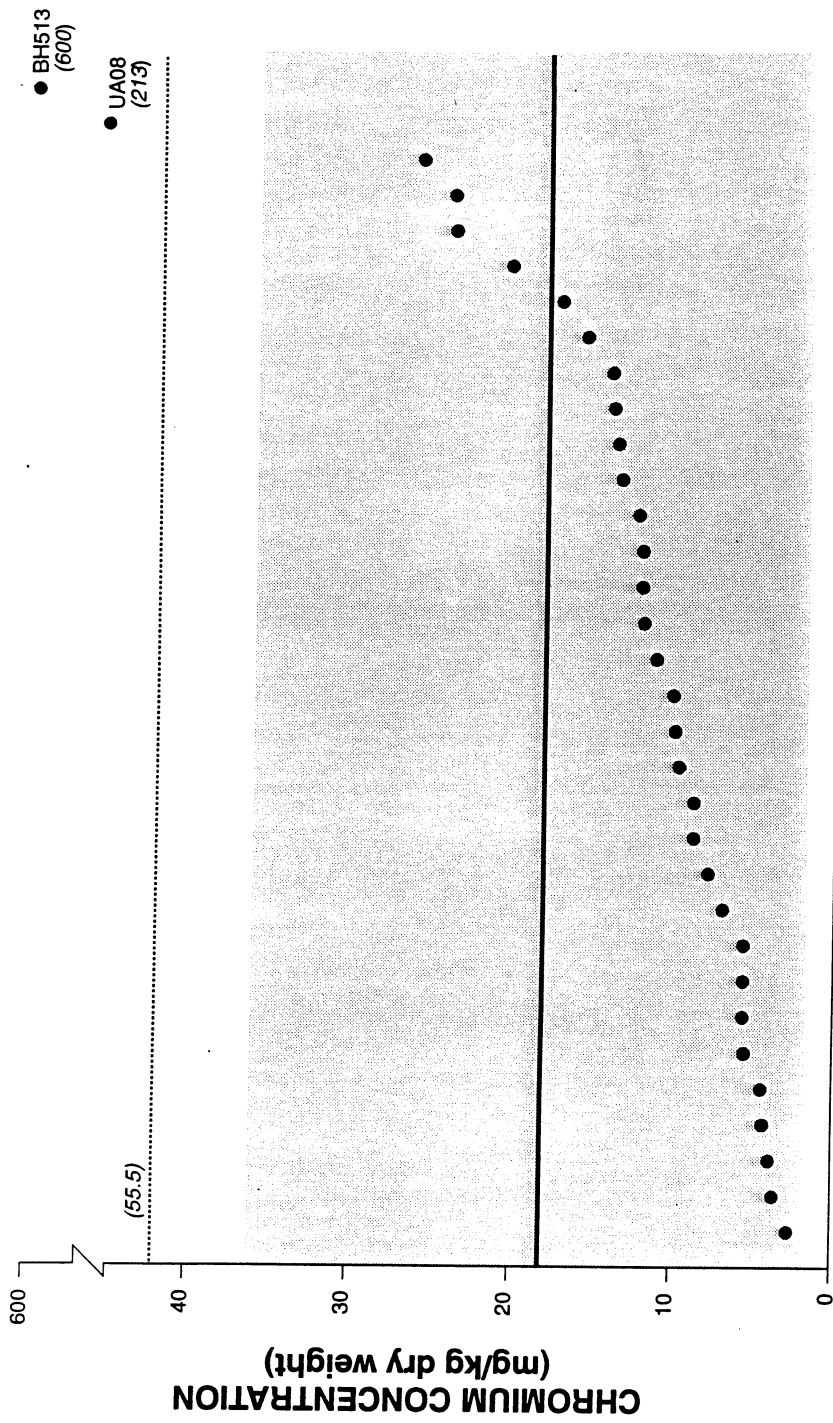


Figure 3. Comparison of measured cadmium concentrations to applicable criteria.



### STATIONS

### LEGEND

- ..... Site-Specific Background
- Default Type A Background Criteria
- Range from Michigan Background Soil Survey

Figure 4. Comparison of measured chromium concentrations to applicable criteria.

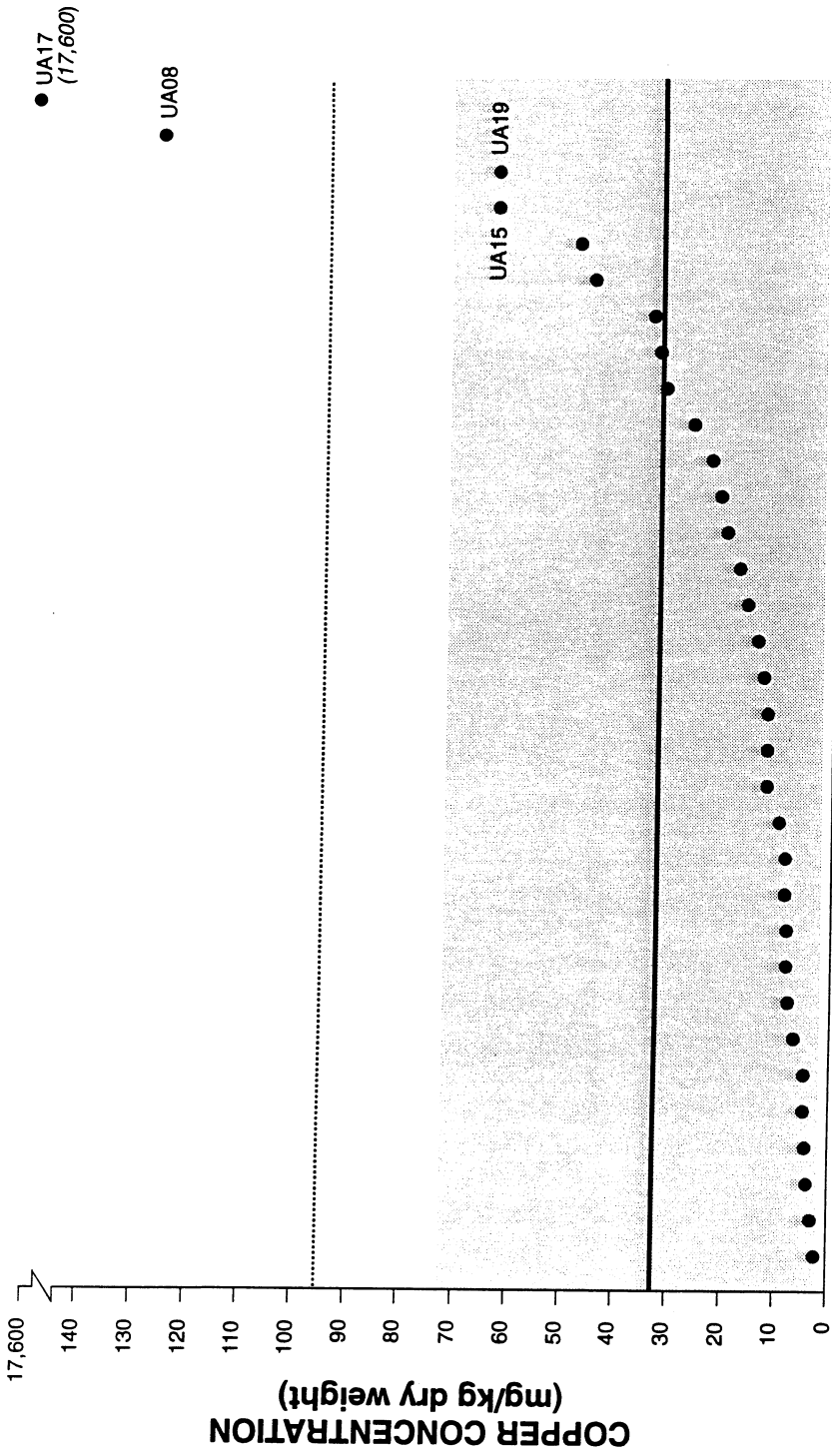
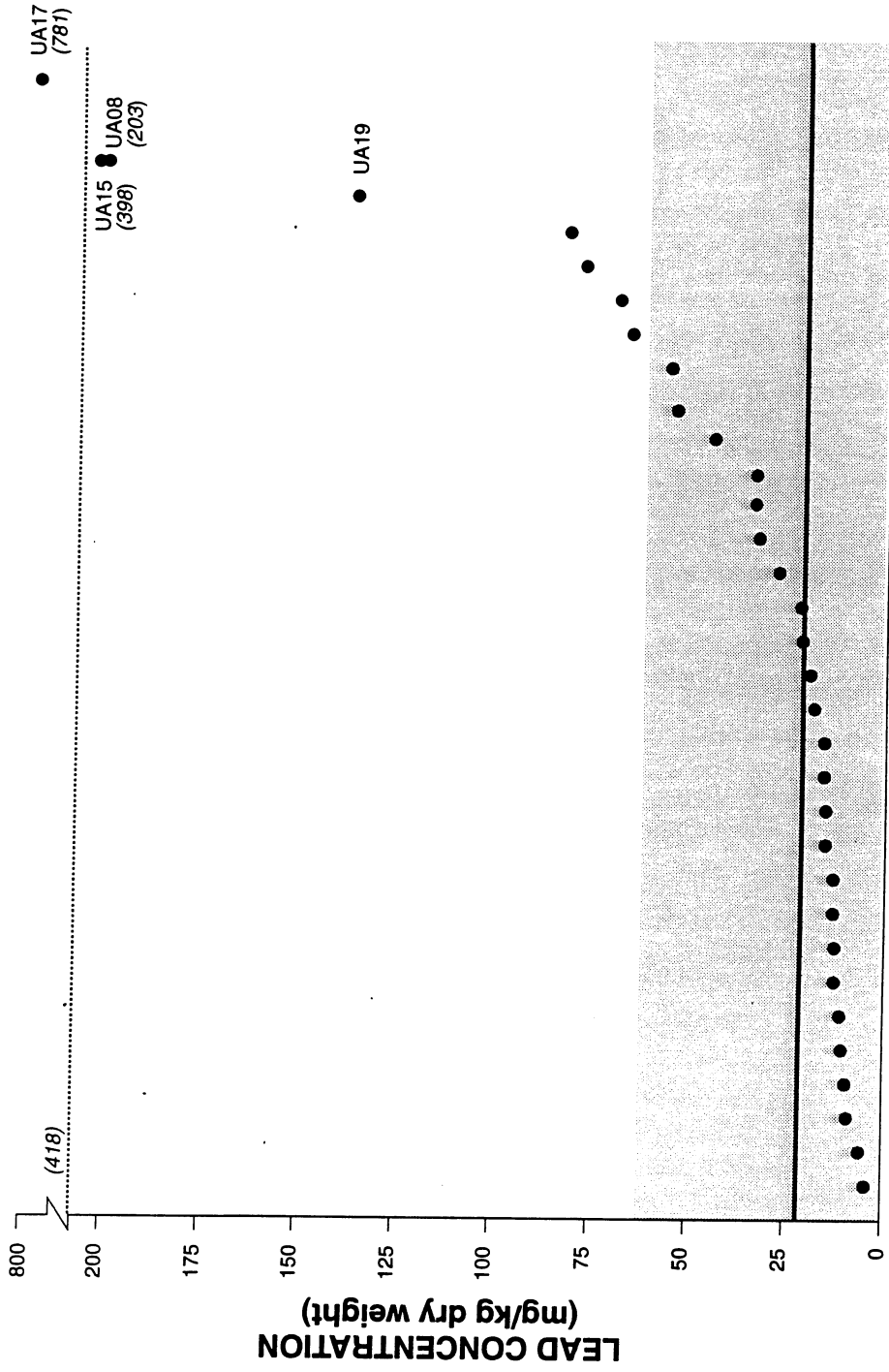


Figure 5. Comparison of measured copper concentrations to applicable criteria.



**STATIONS**

- LEGEND**
- ..... Site-Specific Background
  - Default Type A Background Criteria
  - Range from Michigan Background Soil Survey

Figure 6. Comparison of measured lead concentrations to applicable criteria.

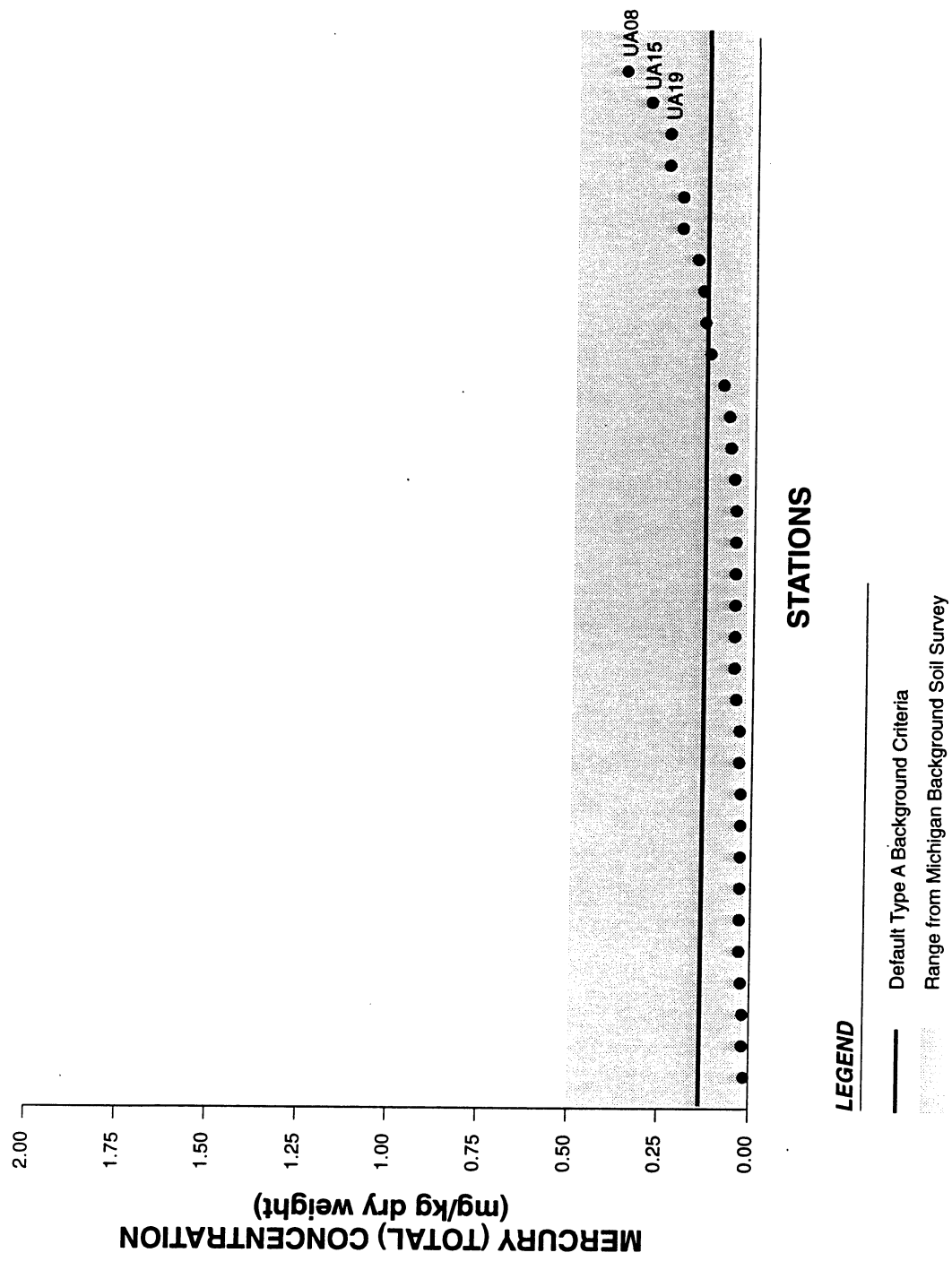


Figure 7. Comparison of measured mercury (total) concentrations to applicable criteria.

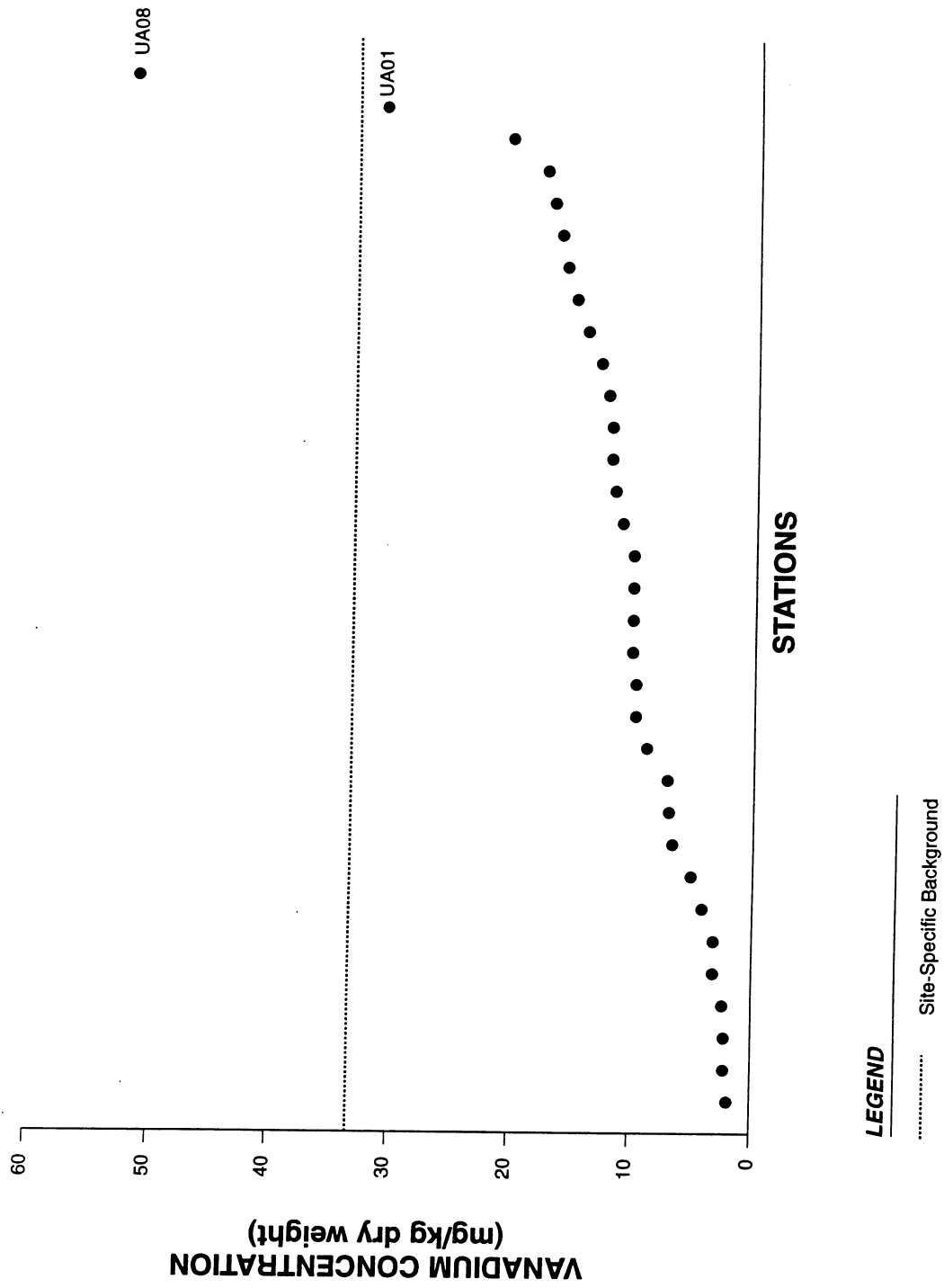


Figure 8. Comparison of measured vanadium concentrations to applicable criteria.

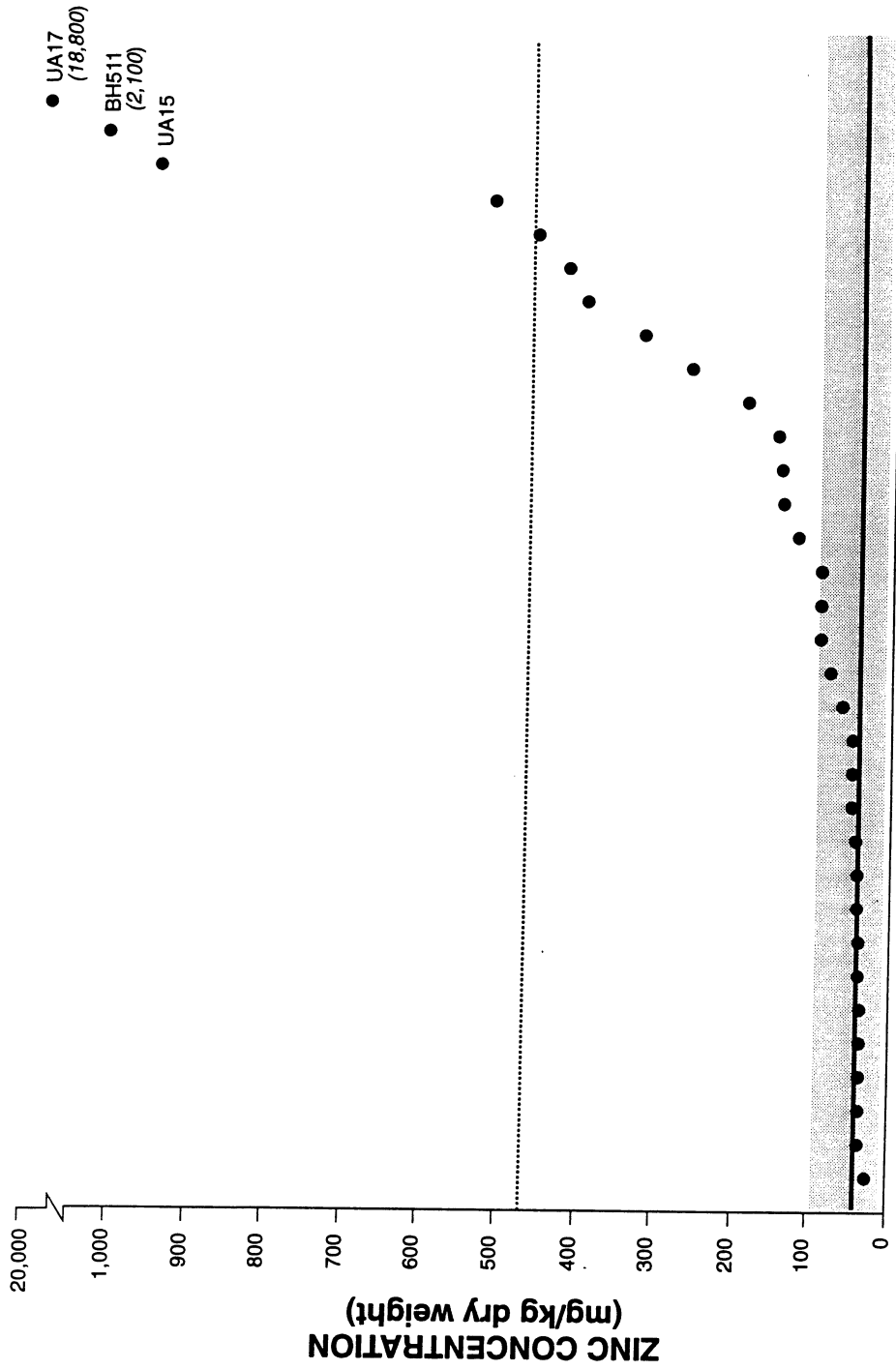
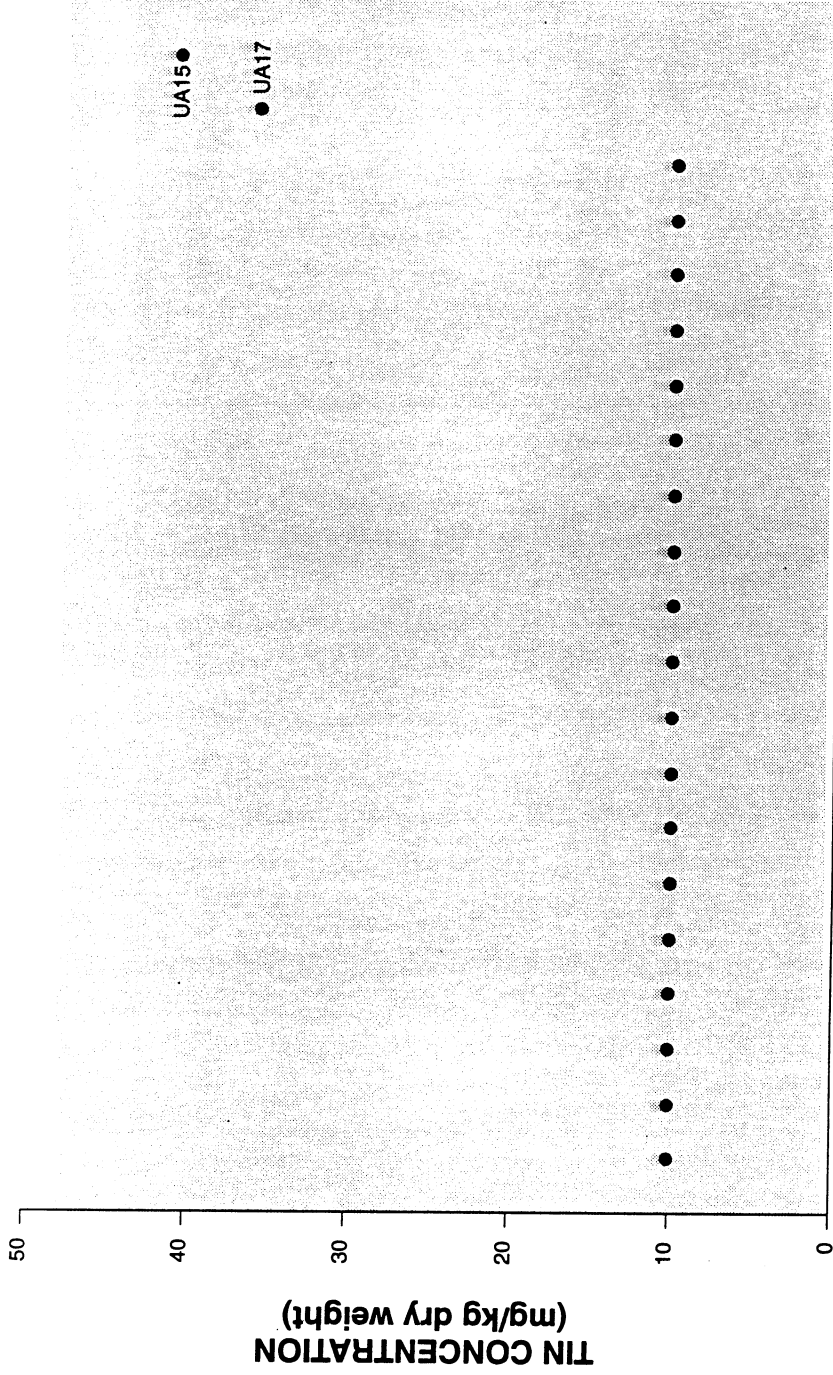


Figure 9. Comparison of measured zinc concentrations to applicable criteria.



**LEGEND**

Range from Saginaw glacial lobe sands  
(Dragun and Chiasson 1991)

**STATIONS**

Figure 10. Measured tin concentrations.

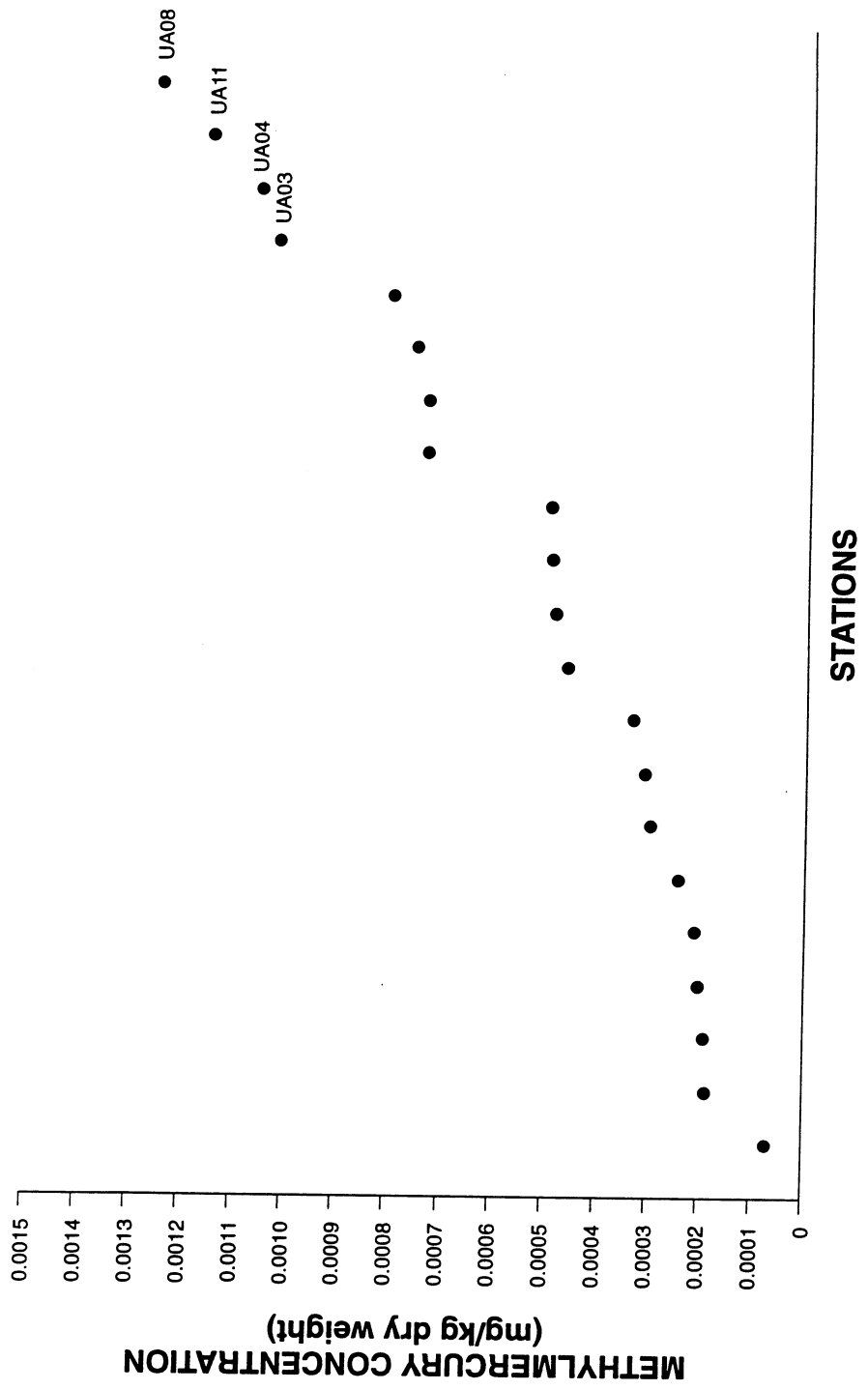


Figure 11. Measured methylmercury concentrations.

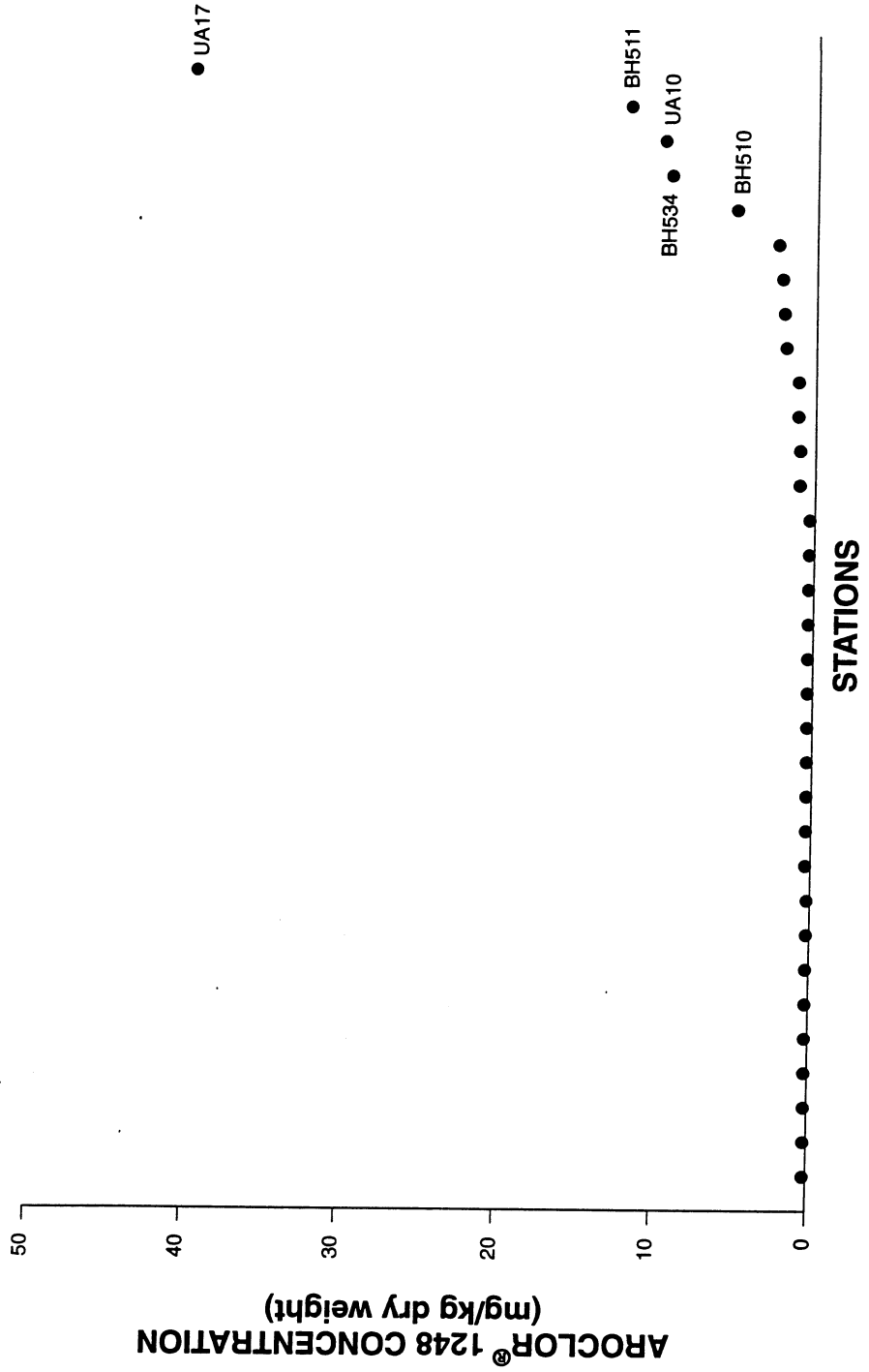


Figure 12. Measured Aroclor<sup>®</sup> 1248 concentrations.

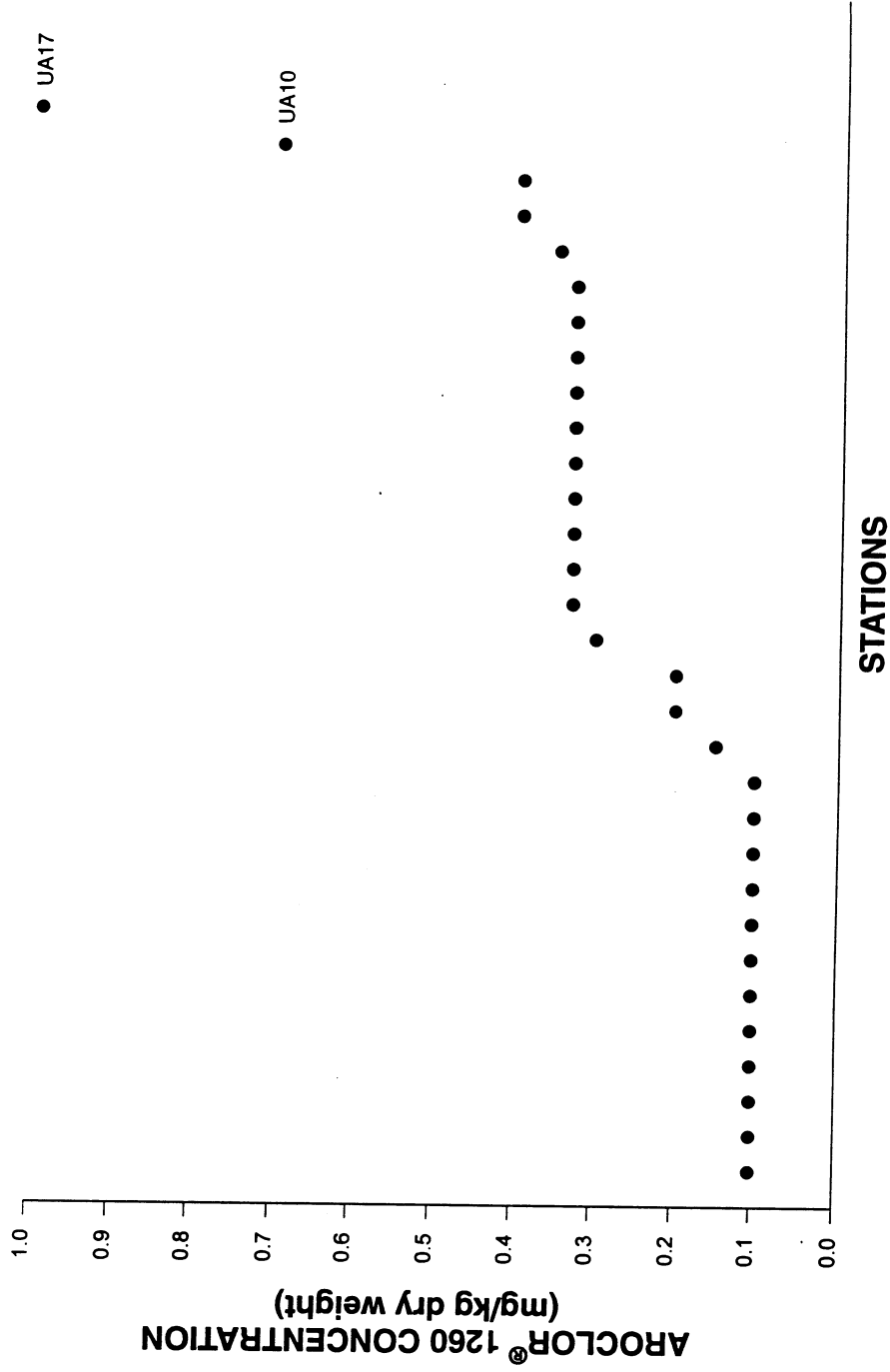


Figure 13. Measured Aroclor® 1260 concentrations.



Figure 14. Area of voluntary soil cover associated with station UA17.

## Tables

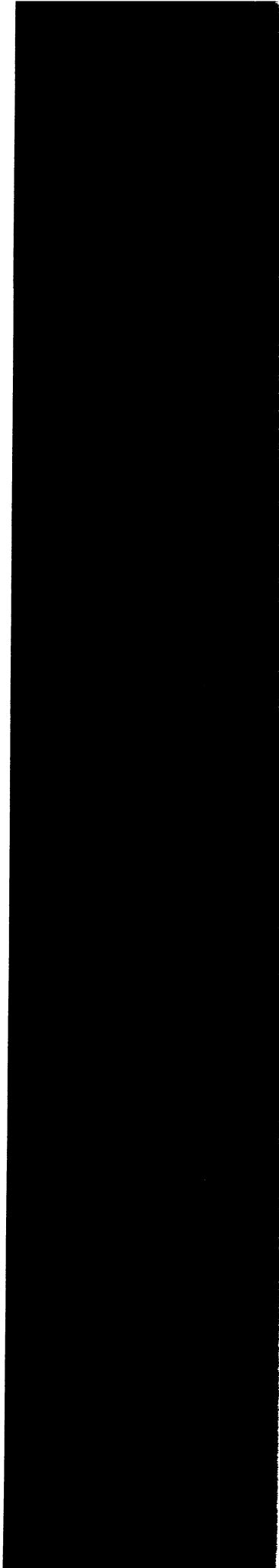


TABLE 1. SUMMARY OF DATA QUALITY OBJECTIVES

Analyte	Method Reference	Units (dry weight)	Method Reporting Limits <sup>a</sup>	Bias (percent)	Precision (RPD)	Completeness (percent)
<b>Organic Compounds</b>						
PCBs	EPA 8080a	mg/kg	0.1	50-150	±50	95
<b>Metals</b>						
Total mercury	Bloom and Fitzgerald (1988)	mg/kg	0.001	60-130	±35	95
Methylmercury	Bloom (1989)	µg/kg	0.05	50-150	±50	95
Barium	EPA 200.8	mg/kg	0.01	75-125	±35	95
Cadmium	EPA 200.8	mg/kg	0.01	75-125	±35	95
Chromium	EPA 200.8	mg/kg	0.1	75-125	±35	95
Copper	EPA 200.8	mg/kg	0.03	75-125	±35	95
Lead	EPA 200.8	mg/kg	0.01	75-125	±35	95
Tin	EPA 6010	mg/kg	10	60-130	±35	95
Vanadium	EPA 200.8	mg/kg	0.03	75-125	±35	95
Zinc	EPA 200.8	mg/kg	0.3	75-125	±35	95
<b>Conventional Analyses</b>						
Total organic carbon	Standard Method 5310B	percent	0.5	75-125	±35	95
Total solids	EPA 160.3	weight percent	0.1	75-125	±35	95
pH	EPA 150.1	pH units	NA	75-125	±35	95

Note: EPA - U.S. Environmental Protection Agency

NA - not applicable

PCB - polychlorinated biphenyl

RPD - relative percent difference

<sup>a</sup> Method reporting limits for metals and PCBs are on a dry weight basis.

**TABLE 2. CALCULATION OF SITE-SPECIFIC BACKGROUND CRITERIA**

	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
Mean	120	0.5	20.7	32.7	125	10.3	163
STD	58.5	0.5	11.6	20.8	97.7	7.60	100
Mean + 3*STD	295	1.4	55.5	95.0	0.418	33.1	463
CV	0.49	0.57	0.560	0.636	0.782	0.740	0.614

**Note:** N = 11 (BH-614, BH-615, BH-619, BH-620, BH-621, BH-622, BH-623, BH-624, BH-646, BH-647, and BH-648)

N = 10 for cadmium

Only data for surface samples used (0–0.5 ft).

Vanadium undetected values taken alternately at zero or 1/2 the method detection limit.

- CV - coefficient of variance
- Mean + 3\*STD - mean plus three times the standard deviation
- STD - standard deviation

TABLE 3. FINAL SOIL CHARACTERIZATION SAMPLING RESULTS

Station	Barium mg/kg (0-6 in.)	Barium mg/kg (6-24 in.)	Cadmium mg/kg (0-6 in.)	Cadmium mg/kg (6-24 in.)	Chromium mg/kg (0-6 in.)	Chromium mg/kg (6-24 in.)	Copper mg/kg (0-6 in.)	Copper mg/kg (6-24 in.)	Lead mg/kg (0-6 in.)	Lead mg/kg (6-24 in.)	Mercury mg/kg (0-6 in.)	Mercury mg/kg (6-24 in.)
UA01	87.7	24.8	0.3	0.09	6.8	10.1	12.7	5.6	27.8	16.3	0.032	0.024
UA02	29.3	38.1	0.37	0.43	11.8	12.3	26.3	34.6	44.9	44.5	0.084	0.130
UA03	9.02	3.73	0.29	0.06	3.5	2.8	4.1	1.7	10.4	2.31	0.029	0.012
UA04	8.49	4.085	0.385	0.095	5.4	3.4	4.45	1.6	12.7	3.8	0.028	0.006
UA05	5.79	4.17	0.19	0.06	4.1	3.3	2.91	1.38	8.71	3.18	0.014	0.005
UA06	9.86	3.59	0.33	0.07	5.4	3.2	6.39	1.56	15.5	2.99	0.016	0.007
UA07	8.23	5.82	0.26	0.14	4.3	4.7	4.37	2.77	12.8	7.1	0.024	0.018
UA08	313	69.3	4.68	0.73	213	24.4	126	18.4	203	25.5	0.360	0.102
UA09	36	39	0.13	0.16	12.2	11.9	9.65	10.5	5.53	6.37	0.009	0.015
UA10	32.1	36.8	0.19	0.12	9.8	8.1	12	9.17	19.1	10.1	0.062	0.048
UA11	6.61	4.08	0.29	0.08	3.7	3.1	3.66	1.69	12.3	3.4	0.146	0.067
UA12	16.9	6.26	0.29	0.04	8.7	3.4	7.63	1.63	21.4	2.09	0.025	0.004
UA13	75.5	7.51	0.64	0.05	17.2	2.8	32.9	2.56	32.9	9.11	0.045	0.010
UA14	63.1	39.7	1.09	0.29	13.8	10.9	31.6	13.3	82.4	22.9	0.053	0.030
UA15	189	834	0.97	1.23	20.4	24.9	63.4	216	398	722	0.290	0.142
UA16	34.8	38.5	0.11	0.08	10	11.4	12	9.85	9.12	6.68	0.019	0.012
UA17	15.3	28	3.18	0.26	25.9	6.6	17,600	396	781	54.3	0.070	0.041
UA18	48.2	36.4	0.27	0.24	13.3	12.2	17.6	12.3	15	11.3	0.033	0.027
UA19	126	13.7	1.02	0.18	15.6	3.3	63.3	8.86	137	15.1	0.238	0.074
UA20	22.8	21.45	0.16	0.155	7.65	5.95	8.45	5.625	15.4	9.03	0.028	0.033
UA21	42.1	40.5	0.23	0.09	13.5	11.9	15.9	9.81	14.9	7.87	0.024	0.015

TABLE 3. (cont.)

Station	Methylmercury		Aroclor® 1016		Aroclor® 1016		Aroclor® 1221		Aroclor® 1221		Aroclor® 1232		Aroclor® 1242	
	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (0-6 in.)
UA01	0.000482	0.000253	0.1 U	10 U	0.1 U	10 U	0.1 U	10 U	0.1 U	10 U	0.1 U	10 U	0.1 U	0.1 U
UA02	0.000758	0.000239	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA03	0.001030	0.000268	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA04	0.001310	0.000190	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.25 U	0.2 U	0.2 U	0.25 U	0.25 U
UA05	0.000457	0.000271	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA06	0.000297	0.000195	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA07	0.000495	0.000742	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA08	0.001310	0.000846	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA09	0.000330	0.000134	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA10	0.000735	0.000320	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA11	0.001160	0.000403	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U
UA12	0.000736	0.000051	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA13	0.000185	0.000165	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U
UA14	0.000491	0.000276	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U
UA15	0.000805	0.000261	0.7 U	0.3 U	0.1 U	0.1 U	0.2 U	0.2 U	0.2 U	1.3 U	0.1 U	0.1 U	0.1 U	0.1 U
UA16	0.000188	0.000097	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.9 U
UA17	0.000209	0.000266	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA18	0.000069	0.000189	0.1 U	0.2 U	0.1 U	0.2 U	0.1 U	0.2 U	0.2 U	1 U	1 U	1 U	1 U	1 U
UA19	0.000260	0.000358	0.6 U	0.1 U	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
UA20	0.000320	0.000220	0.6 U	0.35 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.3 U	0.3 U	0.2 U	0.2 U	0.7 U
UA21	0.000199	0.000059	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U

TABLE 3. (cont.)

Station	Aroclor® 1242		Aroclor® 1248		Aroclor® 1248		Aroclor® 1254		Aroclor® 1254		Aroclor® 1260		Aroclor® 1260		pH (0-6 in.)	pH (6-24 in.)	Total solids percent (0-6 in.)	Total solids percent (6-24 in.)
	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)	mg/kg (0-6 in.)	mg/kg (6-24 in.)				
UA01	10 U	2.4	110	1.1 U	10 U	0.4	10 U	7.8	8.31	87.1	94.7							
UA02	0.1 U	2	3.3	0.9 U	1.6 U	0.3	0.4	8.09	8.08	89.3	76.6							
UA03	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.78	8.43	87	93.4							
UA04	0.15 U	0.3	0.1	0.25 U	0.1 U	0.15	0.1 U	7.605	8.11	77.65	82.65							
UA05	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	8.27	8.83	92	94.8							
UA06	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.89	8.61	89.4	98.5							
UA07	0.1 U	0.1 U	0.3	0.1 U	0.3 U	0.1 U	0.1 U	7.78	7.88	95.8	96.9							
UA08	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.47	7.87	61.9	64.6							
UA09	0.2 U	0.1	0.5	0.1 U	0.1 U	0.1 U	0.1 U	8.18	8.25	87.9	85.5							
UA10	0.1 U	9.7	1.3	1 U	0.5 U	0.7	0.1	8.03	8.01	84.3	81							
UA11	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.38	7.93	92.8	83							
UA12	0.2 U	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.24	8.3	67.6	83.8							
UA13	0.1 U	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.8	7.95	68.4	85.6							
UA14	0.1 U	0.9	0.4	0.8 U	0.3 U	0.2	0.1 U	7.69	8.09	90.8	93.1							
UA15	0.4 U	1.1	0.5	0.7 U	0.3 U	0.2	0.2 U	7.23	7.08	49.5	51.6							
UA16	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	8.13	8.29	91.2	92.5							
UA17	1 U	40	9	1 U	1 U	1 U	1 U	7.86	8.17	95.9	97.9							
UA18	0.2 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.71	7.67	83.8	78.2							
UA19	0.2 U	0.9	0.2	0.8 U	0.2 U	0.4 U	0.1 U	6.89	7.03	66.1	84.1							
UA20	0.5 U	1.85	0.8	1.3 U	0.6 U	0.35	0.15	8.025	8.165	92.35	95.95							
UA21	0.1 U	0.2	0.1 U	0.2 U	0.1 U	0.1 U	0.1 U	7.72	7.97	90.3	93.4							

TABLE 3. (cont.)

Station	Tin		Tin mg/kg (6-24 in.)	Total organic carbon percent		Vanadium mg/kg (0-6 in.)	Vanadium mg/kg (6-24 in.)	Zinc mg/kg (0-6 in.)	Zinc mg/kg (6-24 in.)
	mg/kg (0-6 in.)	10 U		(0-6 in.)	(6-24 in.)				
UA01	10 U	10 U	10 U	3.04	1.64	31	3.2	144	39.7
UA02	10 U	10 U	10 U	2.96	1.84	8.8	6.3	321	1120
UA03	10 U	10 U	10 U	1.6	1.63	1.8	1.5	33.9	10.8
UA04	10 U	10 U	10 U	9	3.325	2.05	1.7	39.85	12.15
UA05	10 U	10 U	10 U	1.27	0.29	2.3	1.8	23.2	10.1
UA06	10 U	10 U	10 U	2.14	1.76	3	2	47.7	13.3
UA07	10 U	10 U	10 U	1.97	2.36	3.1	2.9	37	23.4
UA08	10 U	10 U	10 U	12.6	7.25	51.7	12	460	80.2
UA09	10 U	10 U	10 U	2.99	1.56	16.2	15.2	35.3	29.6
UA10	10 U	10 U	10 U	2.91	2.6	9.7	10	46.7	28.4
UA11	10 U	10 U	10 U	1.96	0.41	2.1	2.2	34.7	14.1
UA12	10 U	10 U	10 U	3.14	1.73	6.5	3.8	42.5	9.5
UA13	10 U	10 U	10 U	4.27	1.02	16.9	2.9	141	14.1
UA14	10 U	10 U	10 U	2.6	3.09	12.3	12.5	397	86.3
UA15	41	22	22	11.4	20.9	20.4	49.9	947	574
UA16	10 U	10 U	10 U	2.89	2.95	11.9	13.4	34.7	27.6
UA17	36	14	14	2.12	0.99	5	5.9	18,800	618
UA18	10 U	10 U	10 U	4.78	3.91	17.6	15.7	190	84.1
UA19	10 U	10 U	10 U	22.9	5.04	11.7	3.2	516	45.9
UA20	10 U	10 U	10 U	1.945	1.79	6.85	6.45	38.95	22.8
UA21	10 U	10 U	10 U	4.14	2.76	15.8	14.8	60	27.8

**TABLE 4. MICHIGAN SOIL CRITERIA**

Analyte	Michigan Type A Default Criteria <sup>a</sup> (ppm)	Range of	
		Concentrations From Michigan Background Soil Survey (ppm) <sup>b</sup>	Michigan Generic Industrial Direct Contact Soil Criteria (ppm) <sup>c</sup>
Barium	75	3.4–216.8	320,000
Cadmium	1.2	0.1–1.5	2,300
Chromium	18	1.7–36	1,000,000 (III) 22,000 (VI)
Copper	32	1.0–72.1	170,000
Lead	21	2.5–66.2	400
Mercury	0.13	0.02 -0.5	1,400
Methyl Mercury	NA	NA	NA
PCBs	NA	NA	21
Tin	NA	NA	NA
Vanadium	NA	NA	39,000
Zinc	47	2.5–99.0	1,000,000

**Note:** NA - not available

<sup>a</sup> MDNR (1993).

<sup>b</sup> Slayton (1997, pers. comm.).

<sup>c</sup> MDEQ (1995).

**TABLE 5. COMPARISON OF MEASURED CONCENTRATIONS TO VARIOUS CRITERIA**

Analyte (n)	Number of Stations That Exceed Type A Default Criteria <sup>a</sup>	Number of Stations That Exceed Range of Michigan Background Concentrations <sup>b</sup>	Stations That Exceed Site-Specific Background	Stations That Exceed Michigan Generic Industrial Direct Contact Soil Criteria (ppm) <sup>c</sup>	
				Stations That Exceed Site-Specific Background	Stations That Exceed Michigan Generic Industrial Direct Contact Soil Criteria (ppm) <sup>c</sup>
Barium (33)	9	2	UA08	0	0
Cadmium (33)	2	2	UA17, UA08	0	0
Chromium (33)	5	2	UA08, BH513	0	0
Copper (33)	8	2	UA17, UA08	0	0
Lead (33)	16	8	UA17	(UA17)	0
Mercury (33)	8	0	0	0	0
Methylmercury (21)	NA	NA	NA	NA	NA
PCBs					
1248 (33)	NA	NA	NA	UA17	0
1260 (31)	NA	NA	NA	0	0
Tin (21)	NA	NA	NA	NA	NA
Vanadium (33)	NA	NA	UA08	0	0
Zinc (33)	19	13	UA17, BH511, BH515, BH517,	0	0

Note: NA - not available

n - number of samples

<sup>a</sup> MDNR (1993).

<sup>b</sup> Slayton (1997, pers. comm.)

<sup>c</sup> MDEQ (1995).

**Attachment 1**

**Metals Data for FRA  
Stations**



**ATTACHMENT 1. METALS DATA FOR FRA STATIONS**

Sample ID	Upper		Lower		Date	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
	Depth (feet)		Depth (feet)										
BH614	0		0.5		05/25/93	260	0.59	26	80	300	1.8	19	320
BH615	0		0.5		05/16/93	120	0.52	23	36	87	0.17	15	170
BH619	0		0.5		05/26/93	190	0.82	11	35	300	0.52	10 U	310
BH620	0		0.5		05/25/93	110	0.39	7.5	19	150	0.21	10 U	19
BH621	0		0.5		05/16/93	65	0.15	9.6	12	46	0.1 U	10 U	67
BH622	0		0.5		05/16/93	51	0.27	4.7	5.4	26	0.1 U	10 U	78
BH623	0		0.5		05/26/93	110	0.3	38	40	65	0.1 U	10 U	110
BH624	0		0.5		05/26/93	110	0.64	25	20	100	0.14	12	180
BH646	0		0.5		05/23/93	82	0.29	29	28	43	0.1 U	10 U	89
BH647	0		0.5		06/09/93	110	1.1	17	30	180	0.8	15	240
BH648	0		0.5		06/09/93	110	2	37	54	78	0.2	22	210

Note: U - undetected

**Part A**

**Sample Delivery Group**

**#K9705870**

SEP 23 1997

PTI

**COLUMBIA ANALYTICAL SERVICES, INC.**

**Client:** PTI Environmental Services, Inc.  
**Project:** UA,BC,MI  
**Sample Matrix:** Soil

**Service Request No.:** K9705870  
**Date Received:** 8/18/97

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Laboratory Control Sample (LCS), Initial Continuing Calibration Verification Standards (ICV/CCV), and Initial Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

Method reporting limits have been elevated in some samples for EPA 8080 analyses due to matrix interferences.

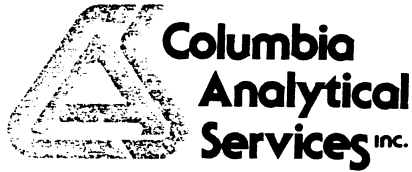
Samples appear to contain a weathered PCB, most closely resembling Aroclor 1248.

Approved by

*Amie Spielman*

Date

*9/20/97*



September 19, 1997

Service Request No: K9705870

Rex Robinson  
PTI Environmental Services, Inc.  
15375 SE 30th Place, Suite 250  
Bellevue, WA 98007

**Re: BC, MI, UA/C690-1704**

Dear Rex:

Enclosed are the results of the sample(s) submitted to our laboratory on August 18, 1997. Preliminary results were transmitted via facsimile on September 18, 1997. For your reference, these analyses have been assigned our service request number K9705870.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 246.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

A handwritten signature in cursive script, appearing to read "Abbie Spielman".

Abbie Spielman  
Client Services Manager

AS/td

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## Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

## **Sample Data**



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13 - 8/14/97  
Date Received: 8/18/97

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
SO0009	K9705870-001	8/25/97	92.0	
SO0010	K9705870-002	8/25/97	94.8	
SO0011	K9705870-003	8/25/97	89.4	
SO0012	K9705870-004	8/25/97	98.5	
SO0023	K9705870-005	8/25/97	67.6	
SO0024	K9705870-006	8/25/97	83.8	
SO0025	K9705870-007	8/25/97	68.4	
SO0008	K9705870-008	8/25/97	96.3	
SO0013	K9705870-009	8/25/97	95.8	
SO0014	K9705870-010	8/25/97	96.9	
SO0015	K9705870-011	8/25/97	61.9	
SO0016	K9705870-012	8/25/97	64.6	
SO0017	K9705870-013	8/25/97	87.9	
SO0018	K9705870-014	8/25/97	85.5	

Approved By: WJM Date: 8/27/97

TSSample/021397a

00003





COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0009 SO0010 SO0011  
Lab Code: K9705870-001 K9705870-002 K9705870-003  
Date Analyzed: 9/14/97 9/14/97 9/14/97

Analyte	EPA Method	MRL	SO0009	SO0010	SO0011
Barium	200.8	0.02	5.79	4.17	9.86
Cadmium	200.8	0.02	0.19	0.06	0.33
Chromium	200.8	0.2	4.1	3.3	5.4
Copper	200.8	0.05	2.91	1.38	6.39
Lead	200.8	0.02	8.71	3.18	15.5
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	2.3	1.8	3.0
Zinc	200.8	0.5	23.2	10.1	47.7

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/13/97

00006

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705870  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0012</b>	<b>SO0023</b>	<b>SO0024</b>
Lab Code:	K9705870-004	K9705870-005	K9705870-006
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		MRL		
	Method				
Barium	200.8	0.02	3.59	16.9	6.26
Cadmium	200.8	0.02	0.07	0.29	0.04
Chromium	200.8	0.2	3.2	8.7	3.4
Copper	200.8	0.05	1.56	7.63	1.63
Lead	200.8	0.02	2.99	21.4	2.09
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	2.0	6.5	3.8
Zinc	200.8	0.5	13.3	42.5	9.5

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

*9/18/97*

**00007**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0025	SO0008	SO0013
Lab Code:	K9705870-007	K9705870-008	K9705870-009
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA Method	MRL			
Barium	200.8	0.02	75.5	21.8	8.23
Cadmium	200.8	0.02	0.64	0.09	0.26
Chromium	200.8	0.2	17.2	5.9	4.3
Copper	200.8	0.05	32.9	5.49	4.37
Lead	200.8	0.02	32.9	11.5	12.8
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	16.9	6.9	3.1
Zinc	200.8	0.5	141	23.1	37.0

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/10/97

00008

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0014	SO0015	SO0016
Lab Code:	K9705870-010	K9705870-011	K9705870-012
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		MRL		
	Method				
Barium	200.8	0.02	5.82	313	69.3
Cadmium	200.8	0.02	0.14	4.68	0.73
Chromium	200.8	0.2	4.7	213	24.4
Copper	200.8	0.05	2.77	126	18.4
Lead	200.8	0.02	7.10	203	25.5
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	2.9	51.7	12.0
Zinc	200.8	0.5	23.4	460	80.2

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/13/97

00009

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0017	SO0018	Method Blank
Lab Code:	K9705870-013	K9705870-014	K9705870-MB
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA Method	MRL	SO0017	SO0018	Method Blank
Barium	200.8	0.02	36.3	39.0	ND
Cadmium	200.8	0.02	0.13	0.16	ND
Chromium	200.8	0.2	12.2	11.9	ND
Copper	200.8	0.05	9.65	10.5	ND
Lead	200.8	0.02	5.53	6.37	0.08
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	16.2	15.2	ND
Zinc	200.8	0.5	35.3	29.6	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0009	SO0010	SO0011
Lab Code:	K9705870-001	K9705870-002	K9705870-003
Date Analyzed:	8/30/97	8/30/97	8/30/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/12/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0012	SO0023	SO0024
Lab Code:	K9705870-004	K9705870-005	K9705870-006
Date Analyzed:	8/30/97	8/30-9/5/97	8/30/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	<0.2(B)
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	<0.2(B)	<0.2(B)
Aroclor 1248	0.1	ND	0.2	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By: \_\_\_\_\_



Date: 9/12/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13-14/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0025	SO0008	SO0013
Lab Code:	K9705870-007	K9705870-008	K9705870-009
Date Analyzed:	8/30-9/5/97	8/30/97	8/30-9/6/97

Analyte	MRL			
Aroclor 1016	0.1	<0.2(B)	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	<0.2(B)	ND	ND
Aroclor 1248	0.1	0.2	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By:



Date:

9/12/97

00013

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil


Service Request: K9705870  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0014	SO0015	SO0016
Lab Code:	K9705870-010	K9705870-011	K9705870-012
Date Analyzed:	8/30-9/6/97	8/30/97	8/30-9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	<0.2(B)
Aroclor 1248	0.1	0.3	ND	ND
Aroclor 1254	0.1	<0.3(B)	ND	ND
Aroclor 1260	0.1	ND	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/12/97

00014

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil


Service Request: K9705870  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0017	SO0018	Method Blank
Lab Code:	K9705870-013	K9705870-014	K970819-SB
Date Analyzed:	8/30-9/6/97	8/30/97	8/30/97

Analyte	MRL	SO0017	SO0018	Method Blank
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	<0.2(B)	ND
Aroclor 1248	0.1	0.1	0.5	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/12/97

00015

**Attachment 2**

**Laboratory Reports and  
Data Validation Report**



## **Laboratory QA/QC Results**



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705870  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97

Duplicate Summary

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
SO0009	K9705870-001DUP	8/25/97	92.0	92.1	92.1	<1	

Approved By: Wm

Date: 8/27/97

TSDup/021397a

00017

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705870  
**Date Collected:** 8/13-8/14/97  
**Date Received:** 8/18/97  
**Date Analyzed:** NA

**Carbon, Total Organic (%)**  
**ASTM Method D4129-82 Modified**  
**Units: Percent**  
**Dry Weight Basis**

**LABORATORY CONTROL SAMPLE**

	True Value	Measured Value	Percent Recovery
Source: ERA 542 Lot# 01125	0.62	0.63	102

**CALIBRATION VERIFICATION STANDARD**

	True Value	Measured Value	Percent Recovery
CCV 2 Result	20.0	19.3	96
CCV 3 Result	20.0	19.1	96
CCV 4 Result	20.0	19.1	96
CCV 5 Result	20.0	19.6	98

**LABORATORY BLANK**

	MRL	Blank Value
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND

**DUPLICATE ANALYSIS**

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
SO0009	K9705870-001D	0.05	1.27	1.28	1.28	<1

**MATRIX SPIKE ANALYSIS**

Sample Name	Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery
SO0009	K9705870-001MS	0.05	1.41	1.27	2.50	87

Approved By: \_\_\_\_\_ *mf* \_\_\_\_\_ Date: 9/8/97

COMBOQCD/042695

**00018**

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13-8/14/97  
Date Received: 8/18/97  
Date Analyzed: NA

pH (units)  
EPA Method 9045C

LABORATORY CONTROL SAMPLE

	True Value	Measured Value	Percent Recovery
Source: APD 3372 Lot# 18607	4.72	4.77	101

CALIBRATION VERIFICATION STANDARD

	True Value	Measured Value	Percent Recovery
pH Buffer Check 1	4.00	3.99	100
pH Buffer Check 2	10.00	10.00	100
pH Buffer Check 3	10.00	9.98	100

DUPLICATE ANALYSIS

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
SO0009	K9705870-001D	-	8.27	8.11	8.19	2

Approved By: \_\_\_\_\_

COMBOQCP/042695

*K* Date: 9/14/97

00019

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97  
Date Analyzed: 9/14/97

Duplicate Summary  
Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0009  
Lab Code: K9705870-001

Analyte	EPA Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Barium	200.8	0.02	5.79	6.52	6.16	12
Cadmium	200.8	0.02	0.19	0.17	0.18	11
Chromium	200.8	0.2	4.1	3.9	4.0	5
Copper	200.8	0.05	2.91	2.88	2.90	1
Lead	200.8	0.02	8.71	8.77	8.74	1
Tin	6010A	10	ND	ND	ND	-
Vanadium	200.8	0.2	2.3	2.3	2.3	<1
Zinc	200.8	0.5	23.2	23.4	23.3	1

Approved By: \_\_\_\_\_



Date: 9/18/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97  
Date Analyzed: 9/14/97

Matrix Spike Summary  
Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0009  
Lab Code: K9705870-001

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Barium	0.02	220	5.79	247	110	60-130
Cadmium	0.02	5.4	0.19	6.45	116	60-130
Chromium	0.2	22	4.1	26.0	100	60-130
Copper	0.05	27	2.91	33.5	113	60-130
Lead	0.02	54	8.71	72.2	118	60-130
Tin	10	54	ND	53	98	60-130
Vanadium	0.2	54	2.3	66.3	119	60-130
Zinc	0.5	54	23.2	88.5	121	60-130

Approved By: \_\_\_\_\_

Date: \_\_\_\_\_

00021

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
LCS Matrix: Soil

Service Request: K9705870  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 9/10/97

Laboratory Control Sample Summary  
Total Metals  
Units: mg/Kg (ppm)

Source: ERA Priority Pollutant/CLP Inorganic Soils

Analyte	EPA Method	Result	Control Limits
Barium	200.8	257	190-330
Cadmium	200.8	67.0	51.4-103
Chromium	200.8	76.4	59.4-94.6
Copper	200.8	51.6	45.9-70.4
Lead	200.8	128	82.7-160
Tin	6010A	102	63.3-145
Vanadium	200.8	146	89.2-195
Zinc	200.8	106	84.1-144

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

00022

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Initial Calibration Verification (ICV) Summary

Metals

Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	209	105
Cadmium	200.8	25.0	25.7	103
Chromium	200.8	20.0	21.2	106
Copper	200.8	25.0	26.1	104
Lead	200.8	50.0	52.7	105
Tin	6010A	5000	4930	99
Vanadium	200.8	50.0	54.5	109
Zinc	200.8	50.0	54.6	109

Approved By: \_\_\_\_\_ Date: 9/18/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

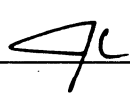
Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Barium	200.8	25.0	25.0	100	26.2	105	24.8	99
Cadmium	200.8	25.0	24.9	100	25.2	101	25.6	102
Chromium	200.8	25.0	25.3	101	26.4	106	25.2	101
Copper	200.8	25.0	24.7	99	25.3	101	24.8	99
Lead	200.8	25.0	25.0	100	25.4	102	25.0	100
Tin	6010A	20000	20900	105	19700	99	19700	99
Vanadium	200.8	25.0	25.2	101	26.6	106	25.3	101
Zinc	200.8	25.0	25.0	100	25.2	101	24.8	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00024

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97


Continuing Calibration Verification (CCV) Summary

Metals

Units:  $\mu\text{g/L}$  (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Barium	200.8	25.0	-	-	-	-	-	-
Cadmium	200.8	25.0	-	-	-	-	-	-
Chromium	200.8	25.0	-	-	-	-	-	-
Copper	200.8	25.0	-	-	-	-	-	-
Lead	200.8	25.0	-	-	-	-	-	-
Tin	6010A	20000	20100	101	20100	101	19700	99
Vanadium	200.8	25.0	-	-	-	-	-	-
Zinc	200.8	25.0	-	-	-	-	-	-

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV7 Result	Percent Recovery	CCV8 Result	Percent Recovery	CCV9 Result	Percent Recovery
Barium	200.8	25.0	-	-	-	-	-	-
Cadmium	200.8	25.0	-	-	-	-	-	-
Chromium	200.8	25.0	-	-	-	-	-	-
Copper	200.8	25.0	-	-	-	-	-	-
Lead	200.8	25.0	-	-	-	-	-	-
Tin	6010A	20000	19900	100	20000	100	20400	102
Vanadium	200.8	25.0	-	-	-	-	-	-
Zinc	200.8	25.0	-	-	-	-	-	-

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00026

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Barium	200.8	0.02	ND	ND	ND	-
Cadmium	200.8	0.02	ND	ND	ND	-
Chromium	200.8	0.2	ND	ND	ND	-
Copper	200.8	0.05	ND	ND	ND	-
Lead	200.8	0.02	ND	ND	ND	-
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	ND	ND	ND	-
Zinc	200.8	0.5	ND	ND	ND	-

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_



CCB4SMRL102194

00027

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result	CCB7 Result	CCB8 Result
Barium	200.8	0.02	-	-	-	-
Cadmium	200.8	0.02	-	-	-	-
Chromium	200.8	0.2	-	-	-	-
Copper	200.8	0.05	-	-	-	-
Lead	200.8	0.02	-	-	-	-
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	-	-	-	-
Zinc	200.8	0.5	-	-	-	-

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

CCB4SMRL/102194

00028

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB9 Result	CCB10 Result
Barium	200.8	0.02	-	-
Cadmium	200.8	0.02	-	-
Chromium	200.8	0.2	-	-
Copper	200.8	0.05	-	-
Lead	200.8	0.02	-	-
Tin	6010A	50	ND	ND
Vanadium	200.8	0.5	-	-
Zinc	200.8	0.5	-	-

Approved By: \_\_\_\_\_

*JL*

Date: \_\_\_\_\_

*9/18/97*

CCB4SMRL/102194

00029

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report


Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/13-14/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97  
Date Analyzed: 8/30/97

Surrogate Recovery Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
SO0009	K9705870-001	110
SO0010	K9705870-002	104
SO0011	K9705870-003	113
SO0012	K9705870-004	107
SO0023	K9705870-005	116
SO0024	K9705870-006	106
SO0025	K9705870-007	114
SO0008	K9705870-008	114
SO0013	K9705870-009	118
SO0014	K9705870-010	131
SO0015	K9705870-011	122
SO0016	K9705870-012	128
SO0017	K9705870-013	117
SO0018	K9705870-014	120
SO0010	K9705870-002MS	109
SO0010	K9705870-002DMS	104
Lab Control Sample	K970819-SL	97
Method Blank	K970819-SB	102

CAS Acceptance Limits: 54-144

Approved By: 

Date: 9/12/97

00030

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report


Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705870  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/19/97  
Date Analyzed: 8/30/97

Matrix Spike/Duplicate Matrix Spike Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0010  
Lab Code: K9705870-002MS, K9705870-002DMS

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS		
Aroclor 1242	1.9	1.9	ND	2.0	2.0	105	105	40-141	<1

Approved By: 

Date: 9/2/97

00031

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**LCS Matrix:** Soil

**Service Request:** K9705870  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** 8/19/97  
**Date Analyzed:** 8/30/97

Laboratory Control Sample Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Aroclor 1242	2.0	2.0	100	49-125

Approved By: 

LCS/121594

Date:

9/12/97

00032

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Calibration Date: 7/16/97  
Date Analyzed: 8/29-30/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND
Aroclor 1268	0.1	ND	ND	ND

Approved By: 

Date: 9/12/97

CCB4SMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Calibration Date: 7/16/97  
Date Analyzed: 8/29-30/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Aroclor 1016	1.0	0.9	90	1.0	100	1.1	110
Aroclor 1221	1.0	1.1	110	1.1	110	1.1	110
Aroclor 1242	1.0	1.1	110	0.9	90	0.9	90
Aroclor 1254	1.0	0.9	90	1.0	100	1.1	110
Aroclor 1260	1.0	1.0	100	1.1	110	1.1	110

Approved By:



Date:

9/12/97

CCV 1-4/042795

05870SVG.JS1 - ccv 9/12/97

00034

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Calibration Date: 7/16/97  
Date Analyzed: 8/30/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB1 Result	CCB2 Result
Aroclor 1016	0.1	ND	ND
Aroclor 1221	0.1	ND	ND
Aroclor 1232	0.1	ND	ND
Aroclor 1242	0.1	ND	ND
Aroclor 1248	0.1	ND	ND
Aroclor 1254	0.1	ND	ND
Aroclor 1260	0.1	ND	ND
Aroclor 1268	0.1	ND	ND

Approved By: \_\_\_\_\_



Date: 9/12/97

00035

CCB4SMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Calibration Date: 7/16/97  
Date Analyzed: 8/30/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units:  $\mu\text{g/mL}$  (ppm)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery
Aroclor 1016	1.0	0.9	90	1.0	100
Aroclor 1221	1.0	1.1	110	1.1	110
Aroclor 1242	1.0	0.9	90	0.9	90
Aroclor 1248	1.0	1.0	100	0.9	90
Aroclor 1254	1.0	1.0	100	1.0	100
Aroclor 1260	1.0	0.9	90	1.1	110

Approved By: 

Date: 9/12/97

00036

CCV 1-4/042795

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704

**Service Request:** K9705870  
**Calibration Date:** 9/4/97  
**Date Analyzed:** 9/6/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units:  $\mu\text{g/mL}$  (ppm)

Analyte	MRL	CCB1 Result
Aroclor 1016	0.1	ND
Aroclor 1221	0.1	ND
Aroclor 1232	0.1	ND
Aroclor 1242	0.1	ND
Aroclor 1248	0.1	ND
Aroclor 1254	0.1	ND
Aroclor 1260	0.1	ND
Aroclor 1268	0.1	ND

Approved By: 

CCB4SMRL/120594

Date: 9/12/97

00037

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705870  
Calibration Date: 9/4/97  
Date Analyzed: 9/6/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	True Value	CCV1 Result	Percent Recovery
Aroclor 1016	1.0	1.1	110
Aroclor 1242	1.0	1.0	100
Aroclor 1248	1.0	1.0	100
Aroclor 1254	1.0	0.8	80
Aroclor 1260	1.0	1.1	110

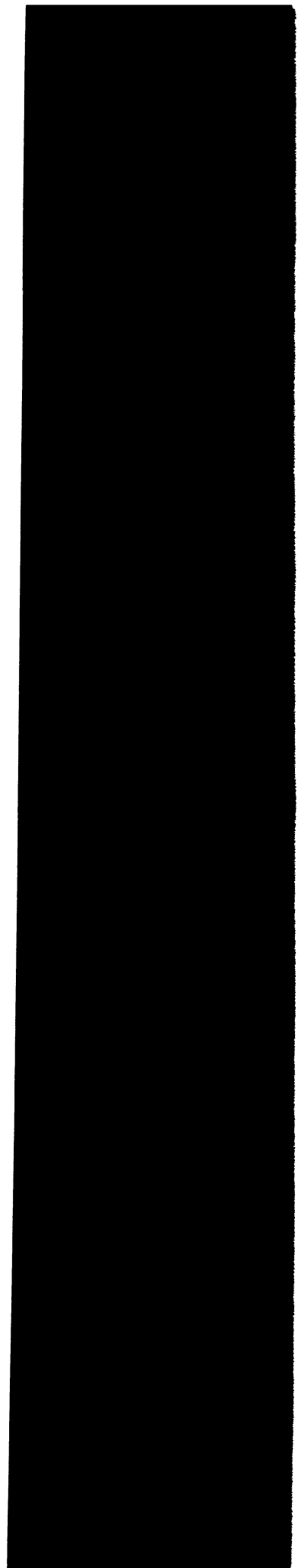
Approved By: 

Date: 9/12/97

CCV 1-4/042795

00038

**Chain-of-Custody**  
**Records/Sample Analysis**  
**Request Forms**





**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) UA, BC, MI 7.1.1.1 7.1.1.1  
C690-1704 7.1.1.1 7.1.1.1

Sampling Contact: REX ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: CAS  
KELSO, WA  
 Attn: ABBIE SPIELMAN

Remarks: \* METALS ⇒ EPA 200.8 (Ba, Cd, Cr, Cu, Pb, Vg, Zn) ⇒ EPA GOLD (TIN)  
⊕ PSEP ⇒ Particle Size Total Solids

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested				Archive	Remarks				
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	PCB EPA 8080	METALS *	SKA HD - TOC			5310 B	PSEP	Extra Container	
8	S00008	113208	8/13/97	1645									X	X	X	X	X		
	↓	113254	↓										X	X	X	X	X		
9	S00013	113213	1450										X	X	X	X	X		
	↓	113259	↓										X	X	X	X	X		
10	S00014	113214	1500										X	X	X	X	X		
	↓	113260	↓										X	X	X	X	X		
11	S00015	113215	1540										X	X	X	X	X		
	↓	113261	↓										X	X	X	X	X		
12	S00016	113216	1550										X	X	X	X	X		
	↓	113262	↓										X	X	X	X	X		
13	S00017	113217	1730										X	X	X	X	X		
	↓	113263	↓										X	X	X	X	X		
14	S00018	113218	1745										X	X	X	X	X		
	↓	113264	↓										X	X	X	X	X		

Condition of Samples Upon Receipt: \_\_\_\_\_

Method of Shipment: FEDEX

Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Reinquired by: Abbie Spielman 8/15/97 (Signature) Received by: FEDEX 8/15/97 (Signature)  
 Reinquired by: \_\_\_\_\_ (Signature) Received by: \_\_\_\_\_ (Signature)  
 Reinquired by: \_\_\_\_\_ (Signature) Received by: Mobile Lab for Field Analysis (Signature)  
 Received for Lab by: Abbie Spielman 08/19/97 CAS-1c (Signature) Received for Lab by: \_\_\_\_\_ (Signature)

**Part B**

**Sample Delivery Group**

**#K9705871**

SEP 23 1997

**COLUMBIA ANALYTICAL SERVICES, INC.**

PTI

**Client:** PTI Environmental Services, Inc.  
**Project:** UA,BC,MI  
**Sample Matrix:** Soil, Water

**Service Request No.:** K9705871  
**Date Received:** 8/18/97

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Laboratory Control Sample (LCS), Initial Continuing Calibration Verification Standards (ICV/CCV), and Initial Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

Additional calibration data associated with the PCB analyses EPA 8080 can be found with the data packages for K9705870.

The following difficulties were experienced during analysis of this batch:

Method reporting limits have been elevated in some samples for EPA 8080 analyses due to matrix interferences, and/or because the samples required dilutions.

Samples appear to contain a weathered PCB, most closely resembling Aroclor 1248.

The Relative Percent Difference (RPD) for the replicate analysis of Chromium and Tin in sample SO0033 were outside the normal CAS control limits. The variability in the results is attributed to the heterogeneous character of the sample. Mixing techniques within the scope of the EPA methodology were used, but were not sufficient for complete homogenization of this sample.

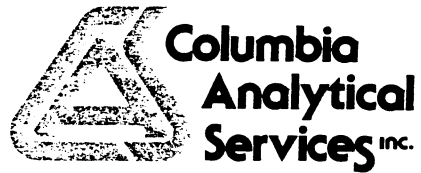
The Matrix Spike (MS) recoveries of Copper, Lead and Zinc for sample SO0033 were not calculated. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Approved by

*Amie Apfelman*

Date

*9/22/97*



September 19, 1997

Service Request No: K9705871

Rex Robinson  
PTI Environmental Services, Inc.  
15375 SE 30th Place, Suite 250  
Bellevue, WA 98007

**Re: UA, BC, MI/C690-1704**

Dear Rex:

Enclosed are the results of the sample(s) submitted to our laboratory on August 18, 1997. Preliminary results were transmitted via facsimile on September 18 and 19, 1997. For your reference, these analyses have been assigned our service request number K9705871.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 246.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Abbie Spielman  
Client Services Manager

AS/td

Page 1 of 470

## **Sample Data**



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, ML/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
SO0033	K9705871-001	8/25/97	95.9	
SO0034	K9705871-002	8/25/97	97.9	
SO0035	K9705871-003	8/25/97	83.8	
SO0036	K9705871-004	8/25/97	78.2	
SO0037	K9705871-005	8/25/97	66.1	
SO0038	K9705871-006	8/25/97	84.1	
SO0039	K9705871-007	8/25/97	92.5	
SO0040	K9705871-008	8/25/97	95.7	
SO0041	K9705871-009	8/25/97	90.3	
SO0042	K9705871-010	8/25/97	93.4	
SO0045	K9705871-011	8/25/97	92.2	
00046	K9705871-012	8/25/97	96.2	

Approved By: WJ

Date: 8/27/97

TSSample/021397a

00003

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: NA  
Date Analyzed: 8/25/97

pH  
EPA Method 9045C  
pH Units

Sample Name	Lab Code	Result
SO0033	K9705871-001	7.86
SO0034	K9705871-002	8.17
SO0035	K9705871-003	7.71
SO0036	K9705871-004	7.67
SO0037	K9705871-005	6.89
SO0038	K9705871-006	7.03
SO0039	K9705871-007	8.09
SO0040	K9705871-008	8.25
SO0041	K9705871-009	7.72
SO0042	K9705871-010	7.97
SO0045	K9705871-011	7.96
SO0046	K9705871-012	8.08

Approved By:                     *asp*                     Date:           9/8/97           **00004**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: NA  
Date Analyzed: 8/28/97

Carbon, Total Organic (%)  
ASTM Method D4129-82 Modified  
Units: Percent  
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
SO0033	K9705871-001	0.05	2.12
SO0034	K9705871-002	0.05	0.99
SO0035	K9705871-003	0.05	4.78
SO0036	K9705871-004	0.05	3.91
SO0037	K9705871-005	0.05	22.9
SO0038	K9705871-006	0.05	5.04
SO0039	K9705871-007	0.05	1.95
SO0040	K9705871-008	0.05	1.99
SO0041	K9705871-009	0.05	4.14
SO0042	K9705871-010	0.05	2.76
SO0045	K9705871-011	0.05	1.94
SO0046	K9705871-012	0.05	1.59
Method Blank	K9705871-MB	0.05	ND

Approved By: \_\_\_\_\_

*asp*

Date: \_\_\_\_\_

9/8/97

00005

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0033 SO0034 SO0035  
Lab Code: K9705871-001 K9705871-002 K9705871-003  
Date Analyzed: 9/14/97 9/14/97 9/14/97

Analyte	EPA Method	MRL	SO0033	SO0034	SO0035
Barium	200.8	0.02	15.3	28.0	48.2
Cadmium	200.8	0.02	3.18	0.26	0.27
Chromium	200.8	0.2	25.9	6.6	13.3
Copper	200.8	0.05	17600	396	17.6
Lead	200.8	0.02	781	54.3	15.0
Tin	6010A	10	36	14	ND
Vanadium	200.8	0.5	5.0	5.9	17.6
Zinc	200.8	0.5	18800	618	190

Approved By: \_\_\_\_\_

*[Signature]*

Date:

9/14/97

00006

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705871  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0036</b>	<b>SO0037</b>	<b>SO0038</b>
Lab Code:	K9705871-004	K9705871-005	K9705871-006
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		MRL		
	Method				
Barium	200.8	0.02	36.4	126	13.7
Cadmium	200.8	0.02	0.24	1.02	0.18
Chromium	200.8	0.2	12.2	15.6	3.3
Copper	200.8	0.05	12.3	63.3	8.86
Lead	200.8	0.02	11.3	137	15.1
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	15.7	11.7	3.2
Zinc	200.8	0.5	84.1	516	45.9

Approved By: \_\_\_\_\_

K Date: 9/14/97

**00007**

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil


**Service Request:** K9705871  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0039</b>	<b>SO0040</b>	<b>SO0041</b>
Lab Code:	K9705871-007	K9705871-008	K9705871-009
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		SO0039	SO0040	SO0041
	Method	MRL			
Barium	200.8	0.02	22.7	23.5	42.1
Cadmium	200.8	0.02	0.15	0.22	0.23
Chromium	200.8	0.2	8.0	6.7	13.5
Copper	200.8	0.05	8.68	5.70	15.9
Lead	200.8	0.02	14.0	9.34	14.9
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	7.4	7.2	15.8
Zinc	200.8	0.5	38.9	24.1	60.0

Approved By: \_\_\_\_\_


 Date: 9/19/97

**00008**

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

Client: PTI Environmental Services, Inc.  
 Project: BC, MI, UA/C690-1704  
 Sample Matrix: Soil

Service Request: K9705871  
 Date Collected: 8/13,14/97  
 Date Received: 8/18/97  
 Date Extracted: 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0042</b>	<b>SO0045</b>	<b>SO0046</b>
Lab Code:	K9705871-010	K9705871-011	K9705871-012
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		MRL		
	Method				
Barium	200.8	0.02	40.5	22.9	19.4
Cadmium	200.8	0.02	0.09	0.17	0.09
Chromium	200.8	0.2	11.9	7.3	5.2
Copper	200.8	0.05	9.81	8.22	5.55
Lead	200.8	0.02	7.87	16.7	8.72
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	14.8	6.3	5.7
Zinc	200.8	0.5	27.8	39.0	21.5

Approved By: \_\_\_\_\_

K Date: 9/14/97

**00009**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: NA  
Date Received: NA  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: Method Blank  
Lab Code: K9705871-MB  
Date Analyzed: 9/14/97

Analyte	EPA Method	MRL	
Barium	200.8	0.02	ND
Cadmium	200.8	0.02	ND
Chromium	200.8	0.2	ND
Copper	200.8	0.05	ND
Lead	200.8	0.02	0.12
Tin	6010A	10	ND
Vanadium	200.8	0.5	ND
Zinc	200.8	0.5	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00010

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Water

**Service Request:** K9705871  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: µg/L (ppb)

Sample Name:	<b>WA0001</b>	<b>WA0002</b>	<b>Method Blank</b>
Lab Code:	K9705871-013	K9705871-014	K9705871-MB
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA		WA0001	WA0002	Method Blank
	Method	MRL			
Barium	200.8	0.02	0.20	0.20	ND
Cadmium	200.8	0.02	ND	ND	ND
Chromium	200.8	0.2	0.3	1.7	ND
Copper	200.8	0.1	5.8	137	ND
Lead	200.8	0.02	0.10	0.10	ND
Tin	6010A	50	ND	ND	ND
Vanadium	200.8	0.2	ND	ND	ND
Zinc	200.8	0.5	40.9	56.4	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

**00011**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0033	SO0034	SO0035
Lab Code:	K9705871-001(D)	K9705871-002(D)	K9705871-003
Date Analyzed:	9/6/97	9/6/97	8/31/97

Analyte	MRL			
Aroclor 1016	0.1	<1	<1	ND
Aroclor 1221	0.1	<1	<1	ND
Aroclor 1232	0.1	<1	<1	ND
Aroclor 1242	0.1	<1	<1	ND
Aroclor 1248	0.1	40	9	0.1
Aroclor 1254	0.1	<1	<1	ND
Aroclor 1260	0.1	<1	<1	ND

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: 

Date: 9/12/97 00012

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0036	SO0037	SO0038
Lab Code:	K9705871-004	K9705871-005	K9705871-006
Date Analyzed:	8/31/97	8/31/97	8/31/97

Analyte	MRL	SO0036	SO0037	SO0038
Aroclor 1016	0.1	<0.2(B)	<0.6(B)	ND
Aroclor 1221	0.1	<0.2(B)	<0.2(B)	ND
Aroclor 1232	0.1	ND	<0.3(B)	<0.2(B)
Aroclor 1242	0.1	<0.2(B)	<0.7(B)	<0.2(B)
Aroclor 1248	0.1	ND	0.9	0.2
Aroclor 1254	0.1	ND	<0.8(B)	<0.2(B)
Aroclor 1260	0.1	ND	<0.4(B)	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/12/97

00013

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0039	SO0040	SO0041
Lab Code:	K9705871-007	K9705871-008	K9705871-009
Date Analyzed:	8/31/97	8/31/97	8/31/97

Analyte	MRL			
Aroclor 1016	0.1	<0.6(B)	<0.4(B)	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	<1(B)	<0.5(B)	<0.2(B)
Aroclor 1248	0.1	1.7	0.8	0.2
Aroclor 1254	0.1	<1(B)	<0.6(B)	<0.2(B)
Aroclor 1260	0.1	0.3	0.1	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/12/97

00014

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0042	SO0045	SO0046
Lab Code:	K9705871-010	K9705871-011	K9705871-012
Date Analyzed:	8/31/97	8/31/97	8/31/97

Analyte	MRL			
Aroclor 1016	0.1	ND	<0.6(B)	<0.3(B)
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	<1(B)	<0.5(B)
Aroclor 1248	0.1	ND	1.7	0.8
Aroclor 1254	0.1	ND	<1.6(B)	<0.6(B)
Aroclor 1260	0.1	ND	0.4	0.2

B The MRL is elevated because of matrix interferences.

Approved By: \_\_\_\_\_



Date: 9/12/97

00015

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report


Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: NA  
Date Received: NA  
Date Extracted: 8/21/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: **Method Blank**  
Lab Code: K970821-SB  
Date Analyzed: 8/30/97

Analyte	MRL	
Aroclor 1016	0.1	ND
Aroclor 1221	0.1	ND
Aroclor 1232	0.1	ND
Aroclor 1242	0.1	ND
Aroclor 1248	0.1	ND
Aroclor 1254	0.1	ND
Aroclor 1260	0.1	ND

Approved By: 

Date: 9/12/97

00016

**Laboratory QA/QC Results**



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97

Duplicate Summary

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
SO0033	K9705871-001DUP	8/25/97	95.9	95.5	95.7	<1	

Approved By: WM Date: 8/27/97

00018



**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705871  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97  
**Date Analyzed:** 8/25/97

pH (units)  
 EPA Method 9045C

**LABORATORY CONTROL SAMPLE**

	True Value	Measured Value	Percent Recovery
Source: APG 3372 Lot# 18607	4.72	4.78	101

**CALIBRATION VERIFICATION STANDARD**

	True Value	Measured Value	Percent Recovery
pH Buffer Check 1	4.00	4.01	100
pH Buffer Check 2	10.00	10.01	100
pH Buffer Check 3	4.00	4.00	100

**DUPLICATE ANALYSIS**

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
SO0033	K9705871-001D	-	7.86	7.98	7.92	2

Approved By: asp Date: 9/8/97

COMBOQCP/042695

00020

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Water

**Service Request:** K9705871  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97  
**Date Analyzed:** 9/15/97

Duplicate Summary  
 Total Metals  
 Units: µg/L (ppb)

**Sample Name:** WA001  
**Lab Code:** K9705871-013

Analyte	EPA Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Barium	200.8	0.02	0.20	0.08	0.14	86
Cadmium	200.8	0.02	ND	ND	ND	-
Chromium	200.8	0.2	0.3	0.3	0.3	<1
Copper	200.8	0.1	5.8	5.9	5.8	2
Lead	200.8	0.02	0.10	0.03	0.06	117
Tin	6010A	50	ND	ND	ND	-
Vanadium	200.8	0.2	ND	ND	ND	-
Zinc	200.8	0.5	40.9	39.7	40.3	3

Approved By: \_\_\_\_\_



Date: 9/18/97

**00021**

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Water

**Service Request:** K9705871  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97  
**Date Analyzed:** 9/15/97

Matrix Spike Summary  
 Total Metals  
 Units: µg/L (ppb)

**Sample Name:** WA001  
**Lab Code:** K9705871-013

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS
						Percent Recovery Acceptance Limits
Barium	0.02	20	0.20	20.6	102	75-125
Cadmium	0.02	20	ND	20.7	104	75-125
Chromium	0.2	20	0.3	20.0	98	75-125
Copper	0.1	20	5.8	26.6	104	75-125
Lead	0.02	20	0.10	20.3	101	75-125
Tin	50	4000	ND	3720	93	75-125
Vanadium	0.2	20	ND	20.5	102	75-125
Zinc	0.5	20	40.9	60.0	96	75-125

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00022

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
LCS Matrix: Water

Service Request: K9705871  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 9/14/97

Laboratory Control Sample Summary  
Total Metals  
Units: µg/L (ppb)

Source: CAS Spike Solution

Analyte	EPA Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Barium	200.8	20.0	20.3	102	85-115
Cadmium	200.8	20.0	20.7	104	85-115
Chromium	200.8	20.0	19.6	98	85-115
Copper	200.8	20.0	20.8	104	85-115
Lead	200.8	20.0	20.2	101	85-115
Tin	6010A	4000	3760	94	85-115
Vanadium	200.8	20.0	20.3	102	85-115
Zinc	200.8	20.0	20.2	101	85-115

Approved By: \_\_\_\_\_

*JC*

Date: \_\_\_\_\_

9/18/97

00023

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705871  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97  
**Date Analyzed:** 9/14/97

Duplicate Summary  
 Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name: SO0033  
 Lab Code: K9705871-001

Analyte	EPA Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Barium	200.8	0.02	15.3	18.7	17.0	20
Cadmium	200.8	0.02	3.18	3.80	3.49	18
Chromium	200.8	0.2	25.9	85.4	55.6	108 (A)
Copper	200.8	0.05	17600	20400	19000	2
Lead	200.8	0.02	781	879	830	12
Tin	6010A	10	36	74	55	69 (A)
Vanadium	200.8	0.2	5.0	7.6	6.3	41
Zinc	200.8	0.5	18800	22000	20400	16

NA Not Applicable; see case narrative.  
 A Outside acceptance limits; see case narrative.

Approved By: \_\_\_\_\_ *A* Date: 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97  
Date Analyzed: 9/14/97

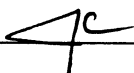
Matrix Spike Summary  
Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0033  
Lab Code: K9705871-001

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Barium	0.02	210	15.3	216	96	60-130
Cadmium	0.02	5.2	3.18	8.48	102	60-130
Chromium	0.2	21	25.9	52.0	124	60-130
Copper	0.05	26	17600	15600	NA	60-130
Lead	0.02	52	781	690	NA	60-130
Tin	10	52	36	92	108	60-130
Vanadium	0.2	52	5.0	55.6	97	60-130
Zinc	0.5	52	18800	15300	NA	60-130

NA Not Applicable: see case narrative.

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00025

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
LCS Matrix: Soil

Service Request: K9705871  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 9/10/97

Laboratory Control Sample Summary  
Total Metals  
Units: mg/Kg (ppm)

Source: ERA Priority Pollutant/CLP Inorganic Soils

Analyte	EPA Method	Result	Control Limits
Barium	200.8	243	190-330
Cadmium	200.8	68.2	51.4-103
Chromium	200.8	73.8	59.4-94.6
Copper	200.8	50.2	45.9-70.4
Lead	200.8	125	82.7-160
Tin	6010A	95.1	63.3-145
Vanadium	200.8	142	89.2-195
Zinc	200.8	101	84.1-144

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00026

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Initial Calibration Verification (ICV) Summary #1

Metals

Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	209	105
Cadmium	200.8	25.0	25.7	103
Chromium	200.8	20.0	21.2	106
Copper	200.8	25.0	26.1	104
Lead	200.8	50.0	52.7	105
Tin	6010A	5000	4930	99
Vanadium	200.8	50.0	54.5	109
Zinc	200.8	50.0	54.6	109

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00027

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Initial Calibration Verification (ICV) Summary #2

Metals

Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	197	99
Cadmium	200.8	25.0	25.3	101
Chromium	200.8	20.0	18.6	93
Copper	200.8	25.0	23.8	95
Lead	200.8	50.0	51.8	104
Tin	6010A	5000	-	-
Vanadium	200.8	50.0	49.3	99
Zinc	200.8	50.0	48.1	96

Approved By: \_\_\_\_\_

Date: \_\_\_\_\_

9/18/97

00028

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

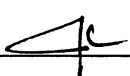
Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Barium	200.8	25.0	25.0	100	26.2	105	24.8	99
Cadmium	200.8	25.0	24.9	100	25.2	101	25.6	102
Chromium	200.8	25.0	25.3	101	26.4	106	25.2	101
Copper	200.8	25.0	24.7	99	25.3	101	24.8	99
Lead	200.8	25.0	25.0	100	25.4	102	25.0	100
Tin	6010A	20000	20900	105	19700	99	19700	99
Vanadium	200.8	25.0	25.2	101	26.6	106	25.3	101
Zinc	200.8	25.0	25.0	100	25.2	101	24.8	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

00029

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Barium	200.8	25.0	24.4	98	26.6	106	25.2	101
Cadmium	200.8	25.0	26.1	104	26.5	106	25.3	101
Chromium	200.8	25.0	24.9	100	28.4	114	24.6	98
Copper	200.8	25.0	25.2	101	26.3	105	24.8	99
Lead	200.8	25.0	25.2	101	24.2	97	25.1	100
Tin	6010A	20000	20100	101	20100	101	19700	99
Vanadium	200.8	25.0	24.8	99	28.3	113	24.6	98
Zinc	200.8	25.0	25.5	102	26.6	106	24.8	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00030

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary

Metals

Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV7 Result	Percent Recovery	CCV8 Result	Percent Recovery	CCV9 Result	Percent Recovery
Barium	200.8	25.0	25.0	100	-	-	-	-
Cadmium	200.8	25.0	24.8	99	-	-	-	-
Chromium	200.8	25.0	24.7	99	-	-	-	-
Copper	200.8	25.0	24.6	98	-	-	-	-
Lead	200.8	25.0	24.7	99	-	-	-	-
Tin	6010A	20000	19900	100	20000	100	20400	102
Vanadium	200.8	25.0	24.7	99	-	-	-	-
Zinc	200.8	25.0	24.3	97	-	-	-	-

Approved By: \_\_\_\_\_ Date: 9/16/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV10 Result	Percent Recovery
Barium	200.8	25.0	-	-
Cadmium	200.8	25.0	-	-
Chromium	200.8	25.0	-	-
Copper	200.8	25.0	-	-
Lead	200.8	25.0	-	-
Tin	6010A	20000	19500	98
Vanadium	200.8	25.0	-	-
Zinc	200.8	25.0	-	-

Approved By: \_\_\_\_\_ Date: 9/18/97



00032

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Barium	200.8	0.02	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.2	ND	ND	ND	ND
Copper	200.8	0.05	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00033

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary

Metals

Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result	CCB7 Result	CCB8 Result
Barium	200.8	0.02	ND	ND	ND	-
Cadmium	200.8	0.02	ND	ND	ND	-
Chromium	200.8	0.2	ND	ND	ND	-
Copper	200.8	0.05	ND	ND	ND	-
Lead	200.8	0.02	ND	ND	ND	-
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	ND	ND	ND	-
Zinc	200.8	0.5	ND	ND	ND	-

Approved By: \_\_\_\_\_



Date: 9/14/97

00034

CCB4SMRL102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705871  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB9 Result	CCB10 Result
Barium	200.8	0.02	-	-
Cadmium	200.8	0.02	-	-
Chromium	200.8	0.2	-	-
Copper	200.8	0.05	-	-
Lead	200.8	0.02	-	-
Tin	6010A	50	ND	ND
Vanadium	200.8	0.5	-	-
Zinc	200.8	0.5	-	-

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

CCB4SMRL/102194

00035

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report


Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97  
Date Analyzed: 8/30-31/97

Surrogate Recovery Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
SO0033	K9705871-001	105
SO0034	K9705871-002	111
SO0035	K9705871-003	111
SO0036	K9705871-004	115
SO0037	K9705871-005	113
SO0038	K9705871-006	112
SO0039	K9705871-007	113
SO0040	K9705871-008	120
SO0041	K9705871-009	115
SO0042	K9705871-010	118
SO0045	K9705871-011	118
SO0046	K9705871-012	119
SO0039	K9705871-007MS	116
SO0039	K9705871-007DMS	118
Lab Control Sample	K970821-SL	108
Method Blank	K970821-SB	104

CAS Acceptance Limits: 54-144

Approved By: 

Date: 9/12/97

00036

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report


Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705871  
Date Collected: 8/14/97  
Date Received: 8/18/97  
Date Extracted: 8/21/97  
Date Analyzed: 8/31/97

Matrix Spike/Duplicate Matrix Spike Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0039  
Lab Code: K9705871-007MS, K9705871-007DMS

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS		
Aroclor 1242	2.1	2.0	ND	2.3	2.3	110	115	40-141	4

Approved By: 

Date: 9/12/97

00037

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**LCS Matrix:** Soil

**Service Request:** K9705871  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** 8/21/97  
**Date Analyzed:** 8/30/97

Laboratory Control Sample Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Aroclor 1242	1.8	1.8	100	49-125

Approved By: 

LCS/121594

Date: 9/12/97

00038

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705871  
Calibration Date: 7/16/97  
Date Analyzed: 8/30-31/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Aroclor 1016	0.1	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND	ND

Approved By: 

Date: 9/12/97

00039

CCB4SMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705871  
Calibration Date: 7/16/97  
Date Analyzed: 8/30-31/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery	CCV4 Result	Percent Recovery
Aroclor 1016	1.0	0.9	90	1.0	100	1.0	100	1.0	100
Aroclor 1221	1.0	1.1	110	1.1	110	1.1	110	1.1	110
Aroclor 1242	1.0	0.9	90	0.9	90	1.0	100	1.0	100
Aroclor 1248	1.0	1.0	100	0.9	90	1.0	100	1.0	100
Aroclor 1254	1.0	1.0	100	1.0	100	1.1	110	1.1	110
Aroclor 1260	1.0	0.9	90	1.1	110	1.1	110	1.0	100

Approved By: 

Date: 9/12/97

00040

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705871  
Calibration Date: 9/4/97  
Date Analyzed: 9/6/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB1 Result
Aroclor 1016	0.1	ND
Aroclor 1221	0.1	ND
Aroclor 1232	0.1	ND
Aroclor 1242	0.1	ND
Aroclor 1248	0.1	ND
Aroclor 1254	0.1	ND
Aroclor 1260	0.1	ND

Approved By: 

Date: 9/12/97

00041

CCB4SMRL/120594

**COLUMBIA ANALYTICAL SERVICES, INC.**


**QA/QC Report**

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704

**Service Request:** K9705871  
**Calibration Date:** 9/4/97  
**Date Analyzed:** 9/6/97

**Continuing Calibration Verification (CCV) Summary**  
**Polychlorinated Biphenyls (PCBs)**  
EPA Method 8080A  
Units: µg/mL (ppm)

<b>Analyte</b>	<b>True Value</b>	<b>CCV1 Result</b>	<b>Percent Recovery</b>
Aroclor 1016	1.0	1.1	110
Aroclor 1242	1.0	1.0	100
Aroclor 1248	1.0	1.0	100
Aroclor 1254	1.0	0.8	80
Aroclor 1260	1.0	1.1	110

Approved By: 

Date: 9/12/97

**00042**

CCV 1-4/042795

**Chain-of-Custody**  
**Records/Sample Analysis**  
**Request Forms**



**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) 6690-1704 WA, BC, MT - Samplers: (Signature) M. J. Munn

Sampling Contact: Rex Robinson  
 Phone: 425-643-9803  
 Ship Samples to: CAS  
KELSO, WA  
 Attn: ABBIE SPIELMAN

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested				Remarks		
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	FB 8080	METALS * PH, HD, TDC, 5318, 5170	Extra Container		Archive	
500033	13239	8/14/97	1600	X								X	X	X	X	* METALS => EPA 200.8 (Ba, Cd, Cr, Cu, Pb, Va, Zn) => EPA 6010 (TIN)
500034	279		1610									X	X	X	X	
500035	280		1730									X	X	X	X	
500036	281		1745									X	X	X	X	
500037	282		1700									X	X	X	X	
500038	283		1715									X	X	X	X	
500039	284		1300/1450									X	X	X	X	
	239											X	X	X	X	
	285											X	X	X	X	

Method of Shipment: Fed X Condition of Samples Upon Receipt: \_\_\_\_\_  
 Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Relinquished by: M. J. Munn (Signature) Received by: Feed-X (Signature) Date/Time: 8/15/97 1521

Relinquished by: \_\_\_\_\_ (Signature) Received by: \_\_\_\_\_ (Signature) Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received by Mobile Lab for Field Analysis: \_\_\_\_\_ (Signature) Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received for Lab by: Lu-k. H (Signature) Date/Time: 081897 1030



8/15/97

To: Abbie Spelman  
 From: N. N. Nuno  
 Date: 8/15/97 Relinquished by  
 Project number: C690-1704  
 Subject: UA, BC, MT

Calculations by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Checked by: \_\_\_\_\_ Date: \_\_\_\_\_  
N. Nuno 8/15/97 1500  
Received by Ted X

**CHAIN OF CUSTODY | ANALYSES<sup>a</sup> | ARCHIVE**

<u>SAMPLE NO</u>	<u>Tag No</u>	<u>Date</u>	<u>Time</u>	<u>Matrix</u> <u>INFO</u>	<u>ANALYSES</u>	<u>ARCHIVE</u>
• S00040	113240	8/14/97	1500	Soil, Low Conc.	X	
• S00040	113286	↓	1500	↓		X
• S00041	113241		1430		X	
• S00041	113287		1430			X
• S00042	113242		1435		X	
• S00042	113288		1435			X
• S00045	113245		1570		X	
• S00045	113291		1570			X
• S00046	113246		1575		X	
• S00046	113292		1515			X
WA0001	115247		1410		Water, low Conc.	PCB-8080
• WA0002	115250	1655		Metals <sup>WIN</sup> (This is PCB-8080 bottle. UH/CAS)		
• WA0001	115248	1410		PCB-8080 (This is metals bottle UH/CAS)		
• WA0002	115251	1655		Metals <sup>WIN</sup>		

<sup>a</sup> All soil samples should be analyzed for PCB (8080), Metals (200.8 - Ba, Cd, Cr, Cu, Pb, Va, Zn) and (6010 - TIN) TOC 5310 B, PSEP (Particle Size, Total Solids)  
 WIN Same metals as for soil samples (water)

00045

RECEIVED BY: Loik. H CAS-K DATE: 081597

**Part C**

**Sample Delivery Group**

**#K9705873**

SEP 23 1997

PTI

**COLUMBIA ANALYTICAL SERVICES, INC.**

**Client:** PTI Environmental Services, Inc.  
**Project:** UA,BC,MI  
**Sample Matrix:** Soil

**Service Request No.:** K9705873  
**Date Received:** 8/18/97

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Laboratory Control Sample (LCS), Initial Continuing Calibration Verification Standards (ICV/CCV), and Initial Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

Additional calibration data associated with the PCB analyses EPA 8080 can be found with the data packages for K9705870.

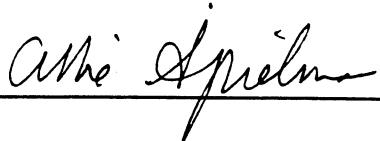
The following difficulties were experienced during analysis of this batch:

Method reporting limits have been elevated in some samples for EPA 8080 analyses due to matrix interferences, and/or because the samples required dilutions.

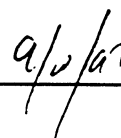
Samples appear to contain a weathered PCB, most closely resembling Aroclor 1248.

The Matrix Spike/Duplicate Matrix Spike (MS/DMS) recoveries of Aroclor 1242 for sample SO0002 was not calculated. Due to the high concentrations present in the sample, the chromatogram had overlapping components which prevented accurate quantitation of the target analytes. No further corrective action was taken.

Approved by



Date





**Columbia  
Analytical  
Services<sup>inc.</sup>**

September 19, 1997

Service Request No: K9705873

Rex Robinson  
PTI Environmental Services, Inc.  
15375 SE 30th Place, Suite 250  
Bellevue, WA 98007

**Re: UA, BC, M/C690-1704**

Dear Rex:

Enclosed are the results of the sample(s) submitted to our laboratory on August 18, 1997. Preliminary results were transmitted via facsimile on September 19, 1997. For your reference, these analyses have been assigned our service request number K9705873.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 246.

Respectfully submitted,

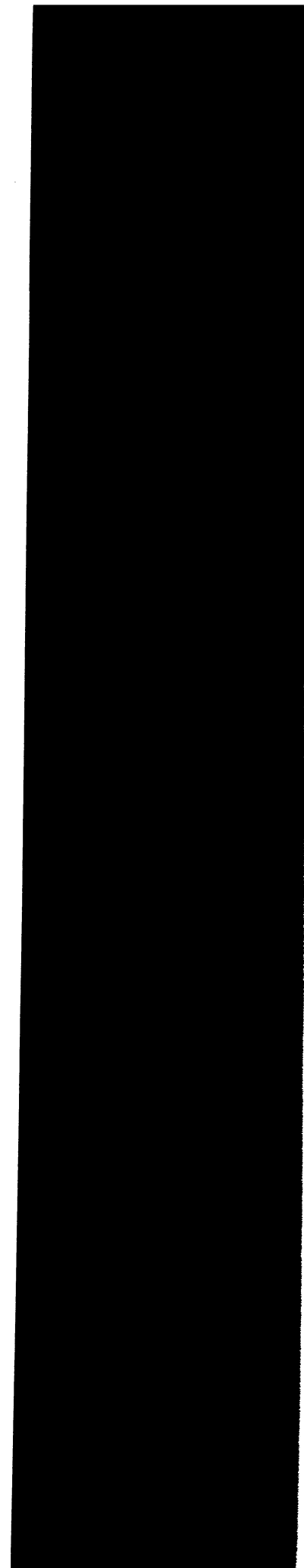
**Columbia Analytical Services, Inc.**

  
Abbie Spielman  
Client Services Manager

AS/td

Page 1 of 470

## **Sample Data**



**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13 - 8/14/97  
**Date Received:** 8/18/97

Total Solids

**Prep Method:** NONE  
**Analysis Method:** 160.3M  
**Test Notes:**

**Units:** PERCENT  
**Basis:** NA

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
SO0001	K9705873-001	8/25/97	87.1	
SO0002	K9705873-002	8/25/97	94.7	
SO0003	K9705873-003	8/25/97	89.3	
SO0004	K9705873-004	8/25/97	76.6	
SO0005	K9705873-005	8/25/97	87.0	
SO0006	K9705873-006	8/25/97	93.4	
SO0007	K9705873-007	8/25/97	92.2	
SO0026	K9705873-008	8/25/97	85.6	
SO0027	K9705873-009	8/25/97	90.8	
SO0028	K9705873-010	8/25/97	93.1	
SO0029	K9705873-011	8/25/97	49.5	
00030	K9705873-012	8/25/97	51.6	
00031	K9705873-013	8/25/97	91.2	
SO0032	K9705873-014	8/25/97	92.5	
SO0019	K9705873-015	8/25/97	84.3	
SO0020	K9705873-016	8/25/97	81.0	
SO0043	K9705873-017	8/25/97	63.1	
SO0044	K9705873-018	8/25/97	69.0	
SO0021	K9705873-019	8/25/97	92.8	
SO0022	K9705873-020	8/25/97	83.0	

Approved By: UM

Date: 8/26/97

TSSample/021397a

**00003**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13/97  
**Date Received:** 8/18/97  
**Date Extracted:** NA  
**Date Analyzed:** 8/27/97

pH  
EPA Method 9045C  
pH Units

Sample Name	Lab Code	Result
SO0001	K9705873-001	7.80
SO0002	K9705873-002	8.31
SO0003	K9705873-003	8.09
SO0004	K9705873-004	8.08
SO0005	K9705873-005	7.78
SO0006	K9705873-006	8.43
SO0007	K9705873-007	7.66
SO0026	K9705873-008	7.95
SO0027	K9705873-009	7.69
SO0028	K9705873-010	8.09
SO0029	K9705873-011	7.23
SO0030	K9705873-012	7.08
SO0031	K9705873-013	8.13
SO0032	K9705873-014	8.29
SO0019	K9705873-015	8.03
SO0020	K9705873-016	8.01
SO0043	K9705873-017	7.55
SO0044	K9705873-018	7.61
SO0021	K9705873-019	7.38
SO0022	K9705873-020	7.93
Method Blank	K9705873-MB	-

Approved By: \_\_\_\_\_



Date: 9-4-97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

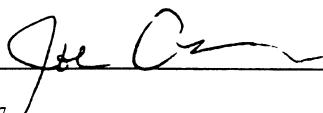
Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: NA  
Date Analyzed: 8/29/97

Carbon, Total Organic  
ASTM Method D4129-82 Modified  
Units: Percent (%)  
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
SO0001	K9705873-001	0.05	3.04
SO0002	K9705873-002	0.05	1.64
SO0003	K9705873-003	0.05	2.96
SO0004	K9705873-004	0.05	1.84
SO0005	K9705873-005	0.05	1.60
SO0006	K9705873-006	0.05	1.63
SO0007	K9705873-007	0.05	1.90
SO0026	K9705873-008	0.05	1.02
SO0027	K9705873-009	0.05	2.60
SO0028	K9705873-010	0.05	3.09
SO0029	K9705873-011	0.05	11.4
SO0030	K9705873-012	0.05	20.9
SO0031	K9705873-013	0.05	2.89
SO0032	K9705873-014	0.05	2.95
SO0019	K9705873-015	0.05	2.91
SO0020	K9705873-016	0.05	2.60
SO0043	K9705873-017	0.05	16.1
SO0044	K9705873-018	0.05	6.10
SO0021	K9705873-019	0.05	1.96
SO0022	K9705873-020	0.05	0.41
Method Blank	K9705873-MB	0.05	ND

Approved By:



Date:

9-4-97

00005

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0001 SO0002 SO0003  
Lab Code: K9705873-001 K9705873-002 K9705873-003  
Date Analyzed: 9/14/97 9/14/97 9/14/97

Analyte	EPA Method	MRL	SO0001	SO0002	SO0003
Barium	200.8	0.02	87.7	24.8	29.3
Cadmium	200.8	0.02	0.30	0.09	0.37
Chromium	200.8	0.2	6.8	10.1	11.8
Copper	200.8	0.05	12.7	5.60	26.3
Lead	200.8	0.02	27.8	16.3	44.9
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	31.0	3.2	8.8
Zinc	200.8	0.5	144	39.7	321

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00006

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

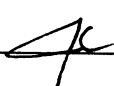
Service Request: K9705873  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0004 SO0005 SO0006  
Lab Code: K9705873-004 K9705873-005 K9705873-006  
Date Analyzed: 9/14/97 9/14/97 9/14/97

Analyte	EPA Method	MRL	SO0004	SO0005	SO0006
Barium	200.8	0.02	38.1	9.02	3.73
Cadmium	200.8	0.02	0.43	0.29	0.06
Chromium	200.8	0.2	12.3	3.5	2.8
Copper	200.8	0.05	34.6	4.1	1.70
Lead	200.8	0.02	44.5	10.4	2.31
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	6.3	1.8	1.5
Zinc	200.8	0.5	1120	33.9	10.8

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/14/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0007	SO0026	SO0027
Lab Code:	K9705873-007	K9705873-008	K9705873-009
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA Method	MRL			
Barium	200.8	0.02	7.22	7.51	63.1
Cadmium	200.8	0.02	0.30	0.05	1.09
Chromium	200.8	0.2	4.2	2.8	13.8
Copper	200.8	0.05	4.07	2.56	31.6
Lead	200.8	0.02	14.5	9.11	82.4
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	2.3	2.9	12.3
Zinc	200.8	0.5	36.7	14.1	397

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/14/97 00008

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0028 SO0029 SO0030  
Lab Code: K9705873-010 K9705873-011 K9705873-012  
Date Analyzed: 9/14/97 9/14/97 9/14/97

Analyte	EPA Method	MRL	SO0028	SO0029	SO0030
Barium	200.8	0.02	39.7	189	834
Cadmium	200.8	0.02	0.29	0.97	1.23
Chromium	200.8	0.2	10.9	20.4	24.9
Copper	200.8	0.05	13.3	63.4	216
Lead	200.8	0.02	22.9	398	722
Tin	6010A	10	ND	41	22
Vanadium	200.8	0.5	12.5	20.4	49.9
Zinc	200.8	0.5	86.3	947	574

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_



00009

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13,14/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97

Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0031	SO0032	SO0019
Lab Code:	K9705873-013	K9705873-014	K9705873-015
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA Method	MRL			
Barium	200.8	0.02	34.8	38.5	32.1
Cadmium	200.8	0.02	0.11	0.08	0.19
Chromium	200.8	0.2	10.0	11.4	9.8
Copper	200.8	0.05	12.0	9.85	12.0
Lead	200.8	0.02	9.12	6.68	19.1
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	11.9	13.4	9.7
Zinc	200.8	0.5	34.7	27.6	46.7

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

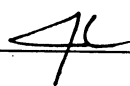
**Service Request:** K9705873  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0020</b>	<b>SO0043</b>	<b>SO0044</b>
Lab Code:	K9705873-016	K9705873-017	K9705873-018
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA	MRL			
	Method		SO0020	SO0043	SO0044
Barium	200.8	0.02	36.8	128	148
Cadmium	200.8	0.02	0.12	0.77	0.83
Chromium	200.8	0.2	8.1	6.4	16.7
Copper	200.8	0.05	9.17	31.7	29.9
Lead	200.8	0.02	10.1	92.8	79.0
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	10.0	5.9	19.2
Zinc	200.8	0.5	28.4	113	114

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13,14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97

Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0021</b>	<b>SO0022</b>	<b>Method Blank</b>
Lab Code:	K9705873-019	K9705873-020	K9705873-MB
Date Analyzed:	9/14/97	9/14/97	9/14/97

Analyte	EPA				
	Method	MRL			
Barium	200.8	0.02	6.61	4.08	ND
Cadmium	200.8	0.02	0.29	0.08	ND
Chromium	200.8	0.2	3.7	3.1	ND
Copper	200.8	0.05	3.66	1.69	ND
Lead	200.8	0.02	12.3	3.40	0.05
Tin	6010A	10	ND	ND	ND
Vanadium	200.8	0.5	2.1	2.2	ND
Zinc	200.8	0.5	34.7	14.1	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

*9/18/97*

**00012**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0001	SO0002	SO0003
Lab Code:	K9705873-001	K9705873-002	K9705873-003
Date Analyzed:	9/6/97	9/7/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	<10(D)	ND
Aroclor 1221	0.1	ND	<10(D)	ND
Aroclor 1232	0.1	ND	<10(D)	ND
Aroclor 1242	0.1	ND	<10(D)	ND
Aroclor 1248	0.1	2.4	110	2.0
Aroclor 1254	0.1	<1.1(B)	<10(D)	<0.9(B)
Aroclor 1260	0.1	0.4	<10(D)	0.3

D The MRL is elevated because of matrix interferences and because the sample required diluting.  
B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/15/97

00013

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0004	SO0005	SO0006
Lab Code:	K9705873-004	K9705873-005	K9705873-006
Date Analyzed:	9/6/97	9/6/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	3.3	ND	ND
Aroclor 1254	0.1	<1.6(B)	ND	ND
Aroclor 1260	0.1	0.4	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/15/97

00014

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705873  
Date Collected: 8/13-14/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0007	SO0026	SO0027
Lab Code:	K9705873-007	K9705873-008	K9705873-009
Date Analyzed:	9/6/97	9/6/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	0.9
Aroclor 1254	0.1	ND	ND	<0.8(B)
Aroclor 1260	0.1	ND	ND	0.2

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/15/97

00015

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 8/22/97

Polychlorinated Biphenyls (PCBs)  
 EPA Methods 3540B/8080A  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0028</b>	<b>SO0029</b>	<b>SO0030</b>
Lab Code:	K9705873-010	K9705873-011	K9705873-012
Date Analyzed:	9/6/97	9/6/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	<0.7(B)	<0.3(B)
Aroclor 1221	0.1	ND	<0.2(B)	<0.2(B)
Aroclor 1232	0.1	ND	<1.3(B)	<0.5(B)
Aroclor 1242	0.1	ND	<0.9(B)	<0.4(B)
Aroclor 1248	0.1	0.4	1.1	0.5
Aroclor 1254	0.1	<0.3(B)	<0.7(B)	<0.3(B)
Aroclor 1260	0.1	ND	0.2	<0.2(F)

B The MRL is elevated because of matrix interferences.  
 F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: \_\_\_\_\_



Date: 9/15/97

**00016**

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13-14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 8/22/97

Polychlorinated Biphenyls (PCBs)  
 EPA Methods 3540B/8080A  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

Sample Name:	<b>SO0031</b>	<b>SO0032</b>	<b>SO0019</b>
Lab Code:	K9705873-013	K9705873-014	K9705873-015
Date Analyzed:	9/6/97	9/6/97	9/6,7/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	<1.0(D)
Aroclor 1221	0.1	ND	ND	<1.0(D)
Aroclor 1232	0.1	ND	ND	<1.0(D)
Aroclor 1242	0.1	ND	ND	<1.0(D)
Aroclor 1248	0.1	ND	0.1	9.7
Aroclor 1254	0.1	ND	ND	<1.0(D)
Aroclor 1260	0.1	ND	ND	0.7

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

00017

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	SO0020	SO0043	SO0044
Lab Code:	K9705873-016	K9705873-017	K9705873-018
Date Analyzed:	9/6/97	9/6/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	<0.3(B)	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	<0.4(B)	<0.3(B)
Aroclor 1242	0.1	ND	<0.4(B)	<0.2(B)
Aroclor 1248	0.1	1.3	0.5	0.1
Aroclor 1254	0.1	<0.5(B)	<0.4(B)	ND
Aroclor 1260	0.1	0.1	0.2	ND

B The MRL is elevated because of matrix interferences.

Approved By: 

Date: 9/15/97

00018

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil


Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97

Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name:	<b>SO0021</b>	<b>SO0022</b>	<b>Method Blank</b>
Lab Code:	K9705873-019	K9705873-020	K970822-SB
Date Analyzed:	9/6/97	9/6/97	9/6/97

Analyte	MRL			
Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	<0.3(B)	ND
Aroclor 1242	0.1	ND	<0.2(B)	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

B The MRL is elevated because of matrix interferences.

Approved By:  Date: 9/15/97

## **Laboratory QA/QC Results**



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97

Duplicate Summary

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
SO0001	K9705873-001DUP	8/25/97	87.1	86.9	87.0	<1	

Approved By:         

Date: 8/26/97

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** UA, BC, MI/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13/97  
**Date Received:** 8/18/97  
**Date Analyzed:** 8/29/97

Carbon, Total Organic  
 ASTM Method D4129-82 Modified  
 Units: Percent (%)  
 Dry Weight Basis

**LABORATORY CONTROL SAMPLE**

	True Value	Measured Value	Percent Recovery
Source: ERA #542 Lot# 01125	0.62	0.64	103

**CALIBRATION VERIFICATION STANDARD**

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	20.7	104
CCV 2 Result	20.0	20.0	100
CCV 3 Result	20.0	19.1	96
CCV 4 Result	20.0	20.1	100

**LABORATORY BLANK**

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND

**DUPLICATE ANALYSIS**

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
SO0001	K9705873-001D	0.05	3.04	2.94	2.99	3

**MATRIX SPIKE ANALYSIS**

Sample Name	Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery
SO0001	K9705873-001MS	0.05	1.50	3.04	4.42	92

Approved By: \_\_\_\_\_

Date: 9-4-97

**00022**

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Analyzed: 8/27/97

pH (units)  
EPA Method 9045C

LABORATORY CONTROL SAMPLE


	True Value	Measured Value	Percent Recovery
Source: APG 3372 Lot# 18607	4.72	4.7	100

CALIBRATION VERIFICATION STANDARD

	True Value	Measured Value	Percent Recovery
pH Buffer Check 1	4.00	4.00	100
pH Buffer Check 2	10.0	10.0	100
pH Buffer Check 3	10.0	9.96	100
pH Buffer Check 4	4.00	4.00	100

DUPLICATE ANALYSIS

Sample Name	Lab Code	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
SO0001	K9705873-001D	-	7.80	8.01	7.90	3

Approved By: 

Date: 9-4-97 00023

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** PTI Environmental Services, Inc.  
**Project:** BC, MI, UA/C690-1704  
**Sample Matrix:** Soil

**Service Request:** K9705873  
**Date Collected:** 8/13.14/97  
**Date Received:** 8/18/97  
**Date Extracted:** 9/10/97  
**Date Analyzed:** 9/14/97

Duplicate Summary  
 Total Metals  
 Units: mg/Kg (ppm)  
 Dry Weight Basis

**Sample Name:** SO0021  
**Lab Code:** K9705873-019

Analyte	EPA Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Barium	200.8	0.02	6.61	7.11	6.86	7
Cadmium	200.8	0.02	0.29	0.31	0.30	7
Chromium	200.8	0.2	3.7	4.2	4.0	12
Copper	200.8	0.05	3.66	3.75	3.70	2
Lead	200.8	0.02	12.3	11.9	12.1	3
Tin	6010A	10	ND	ND	ND	-
Vanadium	200.8	0.2	2.1	2.6	2.4	21
Zinc	200.8	0.5	34.7	34.9	34.8	1

Approved By: \_\_\_\_\_

*Jc*

Date: \_\_\_\_\_

*9/18/97*

**00024**

DUP1SEPA/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 9/10/97  
Date Analyzed: 9/14/97

Matrix Spike Summary  
Total Metals  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0021  
Lab Code: K9705873-019

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Barium	0.02	220	6.61	224	99	60-130
Cadmium	0.02	5.4	0.29	5.73	101	60-130
Chromium	0.2	22	3.7	24.9	96	60-130
Copper	0.05	27	3.66	29.7	96	60-130
Lead	0.02	54	12.3	65.2	98	60-130
Tin	10	54	ND	59	109	60-130
Vanadium	0.2	54	2.1	56.6	101	60-130
Zinc	0.5	54	34.7	88.5	100	60-130

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
LCS Matrix: Soil

Service Request: K9705873  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 9/14/97

Laboratory Control Sample Summary  
Total Metals  
Units: mg/Kg (ppm)

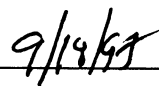
Source: ERA Priority Pollutant/CLP Inorganic Soils

Analyte	EPA Method	Result	Control Limits
Barium	200.8	255	190-330
Cadmium	200.8	67.8	51.4-103
Chromium	200.8	76.1	59.4-94.6
Copper	200.8	54.4	45.9-70.4
Lead	200.8	123	82.7-160
Tin	6010A	109	63.3-145
Vanadium	200.8	149	89.2-195
Zinc	200.8	102	84.1-144

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_



00025

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704  
LCS Matrix: Soil

Service Request: K9705873  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 9/14/97

Laboratory Control Sample Summary  
Total Metals  
Units: mg/Kg (ppm)

Source: ERA Priority Pollutant/CLP Inorganic Soils

Analyte	EPA Method	Result	Control Limits
Barium	200.8	255	190-330
Cadmium	200.8	67.8	51.4-103
Chromium	200.8	76.1	59.4-94.6
Copper	200.8	54.4	45.9-70.4
Lead	200.8	123	82.7-160
Tin	6010A	109	63.3-145
Vanadium	200.8	149	89.2-195
Zinc	200.8	102	84.1-144

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/13/97

00026

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14/97

Initial Calibration Verification (ICV) Summary #1

Metals

Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	209	105
Cadmium	200.8	25.0	25.7	103
Chromium	200.8	20.0	21.2	106
Copper	200.8	25.0	26.1	104
Lead	200.8	50.0	52.7	105
Tin	6010A	5000	4930	99
Vanadium	200.8	50.0	54.5	109
Zinc	200.8	50.0	54.6	109

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14/97

Initial Calibration Verification (ICV) Summary #2  
Metals  
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	197	99
Cadmium	200.8	25.0	25.3	101
Chromium	200.8	20.0	18.6	93
Copper	200.8	25.0	23.8	95
Lead	200.8	50.0	51.8	104
Tin	6010A	5000	-	-
Vanadium	200.8	50.0	49.3	99
Zinc	200.8	50.0	48.1	96

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00028

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/15/97

Initial Calibration Verification (ICV) Summary #3

Metals

Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Barium	200.8	200	202	101
Cadmium	200.8	25.0	24.3	97
Chromium	200.8	20.0	18.7	94
Copper	200.8	25.0	23.0	92
Lead	200.8	50.0	49.4	99
Tin	6010A	5000	-	-
Vanadium	200.8	50.0	48.6	97
Zinc	200.8	50.0	46.5	93

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

00029

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Barium	200.8	25.0	25.0	100	26.2	105	24.8	99
Cadmium	200.8	25.0	24.9	100	25.2	101	25.6	102
Chromium	200.8	25.0	25.3	101	26.4	106	25.2	101
Copper	200.8	25.0	24.7	99	25.3	101	24.8	99
Lead	200.8	25.0	25.0	100	25.4	102	25.0	100
Tin	6010A	20000	20900	105	19700	99	19700	99
Vanadium	200.8	25.0	25.2	101	26.6	106	25.3	101
Zinc	200.8	25.0	25.0	100	25.2	101	24.8	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00030

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Barium	200.8	25.0	24.4	98	26.6	106	25.2	101
Cadmium	200.8	25.0	26.1	104	26.5	106	25.3	101
Chromium	200.8	25.0	24.9	100	28.4	114	24.6	98
Copper	200.8	25.0	25.2	101	26.3	105	24.8	99
Lead	200.8	25.0	25.2	101	24.2	97	25.1	100
Tin	6010A	20000	20100	101	20100	101	19700	99
Vanadium	200.8	25.0	24.8	99	28.3	113	24.6	98
Zinc	200.8	25.0	25.5	102	26.6	106	24.8	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/14/97

00031

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14.15/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV7 Result	Percent Recovery	CCV8 Result	Percent Recovery	CCV9 Result	Percent Recovery
Barium	200.8	25.0	25.0	100	24.9	100	24.8	99
Cadmium	200.8	25.0	24.8	99	25.0	100	24.8	99
Chromium	200.8	25.0	24.7	99	24.4	98	25.1	100
Copper	200.8	25.0	24.6	98	24.8	99	24.7	99
Lead	200.8	25.0	24.7	99	24.8	99	24.9	100
Tin	6010A	20000	19900	100	20000	100	20400	102
Vanadium	200.8	25.0	24.7	99	24.4	98	25.1	100
Zinc	200.8	25.0	24.3	97	24.4	98	24.7	99

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

00032

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV10 Result	Percent Recovery	CCV11 Result	Percent Recovery
Barium	200.8	25.0	24.4	100	24.5	105
Cadmium	200.8	25.0	25.1	100	25.0	101
Chromium	200.8	25.0	26.0	101	25.6	106
Copper	200.8	25.0	25.0	99	25.1	101
Lead	200.8	25.0	24.4	100	24.3	102
Tin	6010A	20000	19500	100	-	-
Vanadium	200.8	25.0	25.6	101	25.4	106
Zinc	200.8	25.0	25.0	100	24.8	101

Approved By: \_\_\_\_\_ Date: 9/18/97

00033

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Barium	200.8	0.02	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.2	ND	ND	ND	ND
Copper	200.8	0.05	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/12/97

00034

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC, MI, UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14.15/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result	CCB7 Result	CCB8 Result
Barium	200.8	0.02	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.2	ND	ND	ND	ND
Copper	200.8	0.05	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Tin	6010A	50	ND	ND	ND	ND
Vanadium	200.8	0.5	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/13/97

00035

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: BC. MI. UA/C690-1704

Service Request: K9705873  
Date Analyzed: 9/14.15/97

Continuing Calibration Blank (CCB) Summary  
Metals  
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB9 Result	CCB10 Result	CCB11 Result
Barium	200.8	0.02	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND
Chromium	200.8	0.2	ND	ND	ND
Copper	200.8	0.05	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND
Tin	6010A	50	ND	ND	-
Vanadium	200.8	0.5	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/18/97

CCB4SMRL/102194

00036

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report


Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13-14/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97  
Date Analyzed: 9/6/97

Surrogate Recovery Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
SO0001	K9705873-001	93
SO0002	K9705873-002	101
SO0003	K9705873-003	87
SO0004	K9705873-004	84
SO0005	K9705873-005	89
SO0006	K9705873-006	70
SO0007	K9705873-007	78
SO0026	K9705873-008	81
SO0027	K9705873-009	76
SO0028	K9705873-010	97
SO0029	K9705873-011	80
SO0030	K9705873-012	92
SO0031	K9705873-013	80
SO0032	K9705873-014	95
SO0019	K9705873-015	103
SO0020	K9705873-016	96
SO0043	K9705873-017	89
SO0044	K9705873-018	87
SO0021	K9705873-019	94
SO0022	K9705873-020	98
SO0002	K9705873-002MS	89
SO0002	K9705873-002DMS	81
Lab Control Sample	K970822-SL	76
Method Blank	K970822-SB	70

CAS Acceptance Limits: 54-144

Approved By: 

Date: 9/6/97

00037

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
Sample Matrix: Soil

Service Request: K9705873  
Date Collected: 8/13/97  
Date Received: 8/18/97  
Date Extracted: 8/22/97  
Date Analyzed: 9/6/97


Matrix Spike/Duplicate Matrix Spike Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)  
Dry Weight Basis

Sample Name: SO0002  
Lab Code: K9705873-002MS, K9705873-002DMS

Percent Recovery

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS		
Aroclor 1242	2.1	2.1	ND	NA	NA	NC	NC	40-141	-

NA Not Applicable; see case narrative.

Approved By: 

Date: 9/6/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704  
LCS Matrix: Soil

Service Request: K9705873  
Date Collected: NA  
Date Received: NA  
Date Extracted: 8/22/97  
Date Analyzed: 9/6/97

Laboratory Control Sample Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Methods 3540B/8080A  
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Aroclor 1242	1.9	1.5	79	49-125

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

9/15/97

00039

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705873  
Calibration Date: 9/4/97  
Date Analyzed: 9/6/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Aroclor 1016	0.1	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND	ND

Approved By: 

Date: 9/15/97

CCB4SMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705873  
Calibration Date: 9/4/97  
Date Analyzed: 9/7/97

Continuing Calibration Blank (CCB) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	MRL	CCB5 Result
Aroclor 1016	0.1	ND
Aroclor 1221	0.1	ND
Aroclor 1232	0.1	ND
Aroclor 1242	0.1	ND
Aroclor 1248	0.1	ND
Aroclor 1254	0.1	ND
Aroclor 1260	0.1	ND

Approved By: 

Date: 9/5/97

CCB4SMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.


QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705873  
Calibration Date: 9/4/97  
Date Analyzed: 9/6/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery
Aroclor 1016	1.0	1.1	110	0.9	90
Aroclor 1242	1.0	1.0	100	0.9	90
Aroclor 1248	1.0	1.0	100	0.9	90
Aroclor 1254	1.0	0.8	80	0.8	80
Aroclor 1260	1.0	1.1	110	0.9	90

Approved By: 

Date: 9/6/97

CCV 1-4/042795

05873SVG.JS1 - ccv 9/15/97

00042

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

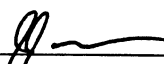
QA/QC Report

Client: PTI Environmental Services, Inc.  
Project: UA, BC, MI/C690-1704

Service Request: K9705873  
Calibration Date: 9/4/97  
Date Analyzed: 9/6,7/97

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)  
EPA Method 8080A  
Units: µg/mL (ppm)

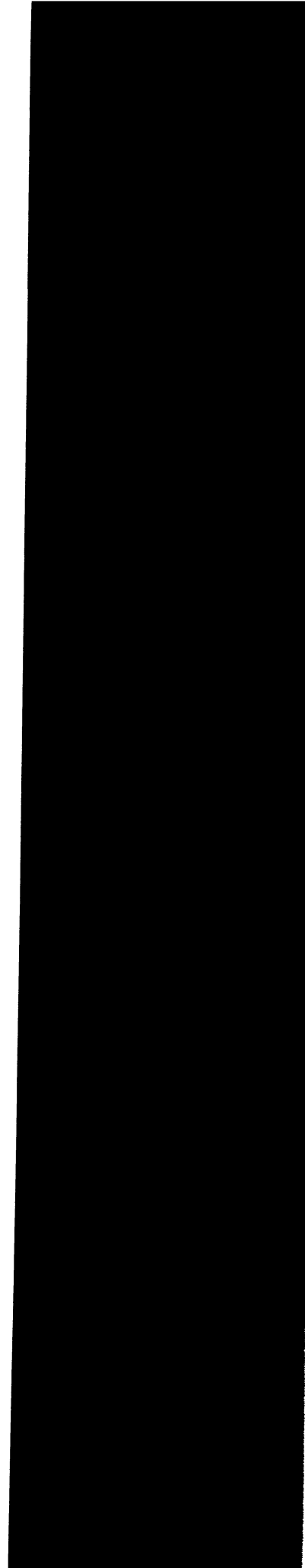
Analyte	True Value	CCV3 Result	Percent Recovery	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery
Aroclor 1016	1.0	1.0	100	1.1	110	1.0	100
Aroclor 1242	1.0	1.0	100	1.0	100	1.0	100
Aroclor 1248	1.0	1.0	100	1.0	100	0.9	90
Aroclor 1254	2.0	1.9	95	2.0	100	2.0	100
Aroclor 1260	1.0	1.0	100	1.1	110	1.0	100

Approved By: 

Date: 9/15/97

CCV 1-4/042795

**Chain-of-Custody**  
**Records/Sample Analysis**  
**Request Forms**



5536  
K 5873

**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) 690-1704 UA, BC, MI A. Naimmo Samplers: (Signature) [Signature]

Sampling Contact: Alex ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: CAS  
KELSO, WA  
 Attn: ABBIE SPIELMAN

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested				Remarks			
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	PCB 8080	METALS *	SH H.D. TC		5310B	Extra Container	Archive
Sample 1	113201	8/13/97	1150		X								X	X	X	X	* METALS ⇒ EPA 200.8 (Ba, Cd, Cr, Cu, Pb, Va, Zn) ⇒ EPA 6010 (TIN)
Sample 2	113247		1200										X	X	X	X	
Sample 3	113248		1220										X	X	X	X	
Sample 4	113249		1230										X	X	X	X	⊕ PSEP ⇒ Particle Size Total Solids
Sample 5	113250		1425										X	X	X	X	
Sample 6	113251		1435										X	X	X	X	
Sample 7	113252		1640										X	X	X	X	Sent to further Gas Science. UCH 081897
Sample 8	113253												X	X	X	X	

Method of Shipment: Feb. X Condition of Samples Upon Receipt: \_\_\_\_\_  
 Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Relinquished by: A. Naimmo (Signature) Received by: Fed. X (Signature) Date/Time: 8/19/97 1500

Relinquished by: \_\_\_\_\_ (Signature) Received by: \_\_\_\_\_ (Signature) Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received by Mobile Lab for Field Analysis: \_\_\_\_\_ (Signature) Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received for Lab by: [Signature] (Signature) Date/Time: 081897

**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) 090-1704 UA, BC, MI N. Nunez (Signature) Samplers:

Sampling Contact: RDX ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: CAS  
KALSO, WA  
 Attn: ABBIE SPIELMAN

Sample No.	Tag No.	Date	Time	Sample Matrix						Analytes Requested				Remarks		
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	PCB 8080	* METALS	Sid Md. TCC		5310 B	Extra Container
S00019	113219	8/13/97	1615		X					7		X	X	X	X	* METALS ⇒ EPA 200.8 (Ba, Cd, Cr, Cu, Pb, V, Zn) ⇒ EPA 6010 (TIN)
S00020	113265	8/13/97	1625								X	X	X	X	X	
S00043	113266										X	X	X	X	X	
S00044	113243		1630								X	X	X	X	X	
S00044	113289		1640								X	X	X	X	X	
S00044	113244		1635								X	X	X	X	X	
S00021	113290				X						X	X	X	X	X	
S00021	113221	8/13/97	1115		X						X	X	X	X	X	
S00022	113267										X	X	X	X	X	
S00022	113222		1130								X	X	X	X	X	
S00022	113268										X	X	X	X	X	

Method of Shipment: FedEx Condition of Samples Upon Receipt: \_\_\_\_\_  
 Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Relinquished by: (Signature) Date/Time: 8/15/97  
 Received by: FedEx (Signature)  
 Relinquished by: (Signature) Date/Time: \_\_\_\_\_  
 Received by: \_\_\_\_\_ (Signature)  
 Relinquished by: \_\_\_\_\_ (Signature)  
 Received by: Mobile Lab for Field Analysis: (Signature)  
 Received for Lab by: Ken K. H. (Signature) Date/Time: 08/18/97 1030

**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

00046

Project: (Name and Number) 690-1704 BC, MI, WA 9. Munnio Samplers: (Signature) [Signature]

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested				Remarks		
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	PCB 8080	METALS *	SA. Md. TOC 530R		Extra Contaminant	Archive
Samp 26	113 226	8/14/97	0935		X							X	X	X	X	* METALS → EPA 200.8 (Ba, Cd, Cr, Cu, Pb, Vg, Zn) → EPA 6010 (TIN)
Samp 27	272											X	X	X	X	⊙ PSEP → Particle Size Total Solids
Samp 28	227		0955									X	X	X	X	
Samp 29	273											X	X	X	X	
Samp 30	228		1000									X	X	X	X	
Samp 31	274											X	X	X	X	
Samp 32	229		1130									X	X	X	X	
Samp 33	275											X	X	X	X	
Samp 34	230		1140									X	X	X	X	
Samp 35	276											X	X	X	X	
Samp 36	231		1150									X	X	X	X	
Samp 37	277											X	X	X	X	
Samp 38	232		1200									X	X	X	X	
Samp 39	278											X	X	X	X	

Method of Shipment: Fedex Condition of Samples Upon Receipt: \_\_\_\_\_

Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Relinquished by: 9. Munnio (Signature) Received by: Fedex (Signature) Date/Time: 8/15/97 1500

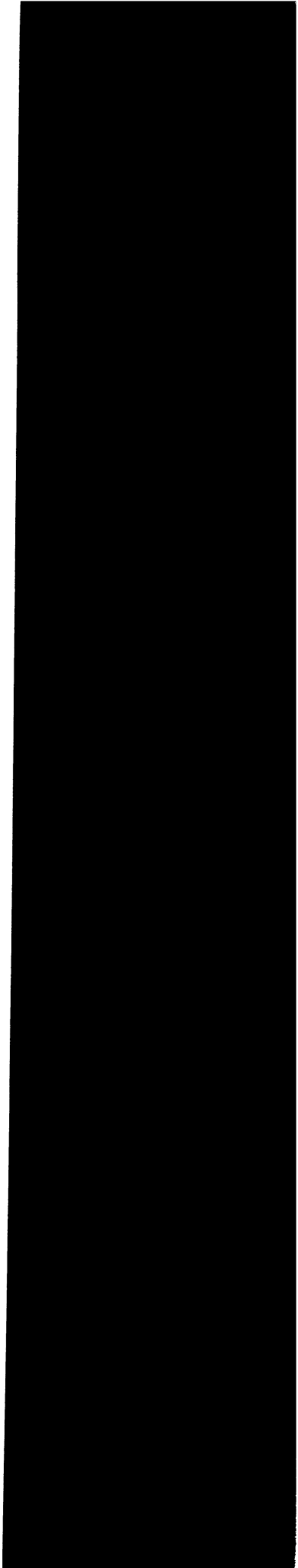
Relinquished by: \_\_\_\_\_ (Signature) Received by: \_\_\_\_\_ (Signature) Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received by: Mobile Lab for Field Analysis: [Signature] Date/Time: \_\_\_\_\_

Relinquished by: \_\_\_\_\_ (Signature) Received for Lab by: [Signature] Date/Time: 081897 1030

**Part D**

**Total Mercury and  
Methylmercury**





**FRONTIER  
GEOSCIENCES INC.**

ENVIRONMENTAL RESEARCH & SPECIALTY ANALYTICAL LABORATORY

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414 PONTIUS NORTH • SEATTLE, WA 98109

SEP 16 1997

PTI

September 15, 1997

Mr. Rex Robinson  
PTI Environmental Services  
15375 SE 30th Place, Suite 250  
Bellevue, WA 98007

Dear Rex:

Attached is the case narrative, sample results and summary QA/QC results for the water and soils received by us on August 16 & 19, 1997 for analysis of total and methyl Hg for a Level 3 deliverable. As appropriate to Level 3 I have not enclosed the extensive additional documentation which backs up this abbreviated report. The full documentation will be securely archived by us for three years and is available for inspection with appropriate authorization.

If you have any questions or concerns about this report or the results please do not hesitate to contact me.

Regards,

Ralph Turner  
Aquatic Group Leader

## Case Narrative: Total and Methyl Hg in Water and Soil

Client: PTI/ Rex Robinson

Contract No.: C690-1704

Forty seven samples (2 water and 45 soils) were received on August 16, 1997. Subsequently it was discovered that a 46th soil sample (SO 0006) had not been shipped. The missing sample arrived on August 19, 1997. All samples were chilled on arrival and there were no broken jars or lids. The soil samples were frozen after checking into the laboratory while water samples were preserved with 0.5% HCl.

Samples were processed using ultra-clean sample handling techniques in a laboratory known to be low in atmospheric Hg. Reagents, gases, and DI water are all reagent or ultra-pure grade, and previously analyzed for Hg and trace metals to ensure very low blanks. Mercury analysis were performed using cold vapor atomic fluorescence spectrometry (CVAFS) as a detector (Bloom and Fitzgerald, 1987), with dual pen chart recorders as output devices. The use of dual pens, offset by a factor of 20, allows access to 3.5 orders of magnitude of linear range with a single run. Total Hg (THg) standards are prepared by direct dilution of NIST certified NBS-3133 10.00 mg/mL Hg standard solution, and results independently verified by the analysis of NRCC DORM-2 (dogfish tissue SRM;  $4,640 \pm 260$  ng/g THg). Monomethyl mercury (MHg) standards were made up from the pure powder, and then accurately calibrated for MHg (equal to THg minus ionic Hg) against NBS-3133. MHg results were also cross-verified by daily analysis of NRCC DORM-2 ( $4,470 \pm 370$  ng/g MHg). Certified reference materials were digested and analyzed with each group of samples. For total Hg the reference material was NIST SRM-2709 ( $1.4 \pm 0.08$   $\mu\text{g/g}$ ) while IAEA-356 ( $5.46 \pm 0.71$  ng/g) was used for methyl Hg.

Dry Fraction. Aliquots of as received soil were weighed into pre-weighed aluminum trays, and dried overnight at 105°C. The loss of water was determined gravimetrically, and the dry fraction calculated as the dry mass divided by the wet mass (FGS-019).

Methyl Mercury Analysis. Aliquots of the soil samples (0.2 grams) were accurately weighed into 40 mL Teflon centrifuge tubes, and 5 mL of H<sub>2</sub>SO<sub>4</sub>/KBr solution plus 1 mL of 1 M CuSO<sub>4</sub> were added. After mixing, 10.0 mL of methylene chloride (CH<sub>2</sub>Cl<sub>2</sub>) was added to each tube, and the samples shaken for 1 hour. The samples were then centrifuged at 3000 RPM for 30 minutes to separate the solvent from the aqueous layer. Exactly 2.0 mL of CH<sub>2</sub>Cl<sub>2</sub> was removed from each sample and pipetted into a Teflon vial containing 57.6 mL of deionized water. The samples were heated to 45°C and purged with N<sub>2</sub> to volatilize the CH<sub>2</sub>Cl<sub>2</sub>, thus releasing the MHg to the pure aqueous phase.

Extracted samples were analyzed using aqueous phase ethylation, purging onto Carbotrap, isothermal GC separation, and cold vapor atomic fluorescence spectrometry (CVAFS) detection (Bloom, 1989; Liang, et. al, 1994; Bloom and Fitzgerald, 1987). The method detection limit (3  $\sigma$  of the method blank) is approximately 1.5 pg MHg, as Hg. Prior to ethylation, the distillate was diluted to 55 mL with DI water, and the pH brought to 4.9 with the addition of acetate buffer. Samples were ethylated by the addition of sodium tetraethyl borate, and then the volatile ethyl analogs purged with N<sub>2</sub> onto Carbotrap. After a trap drying step, the mercury ethyl analogs were thermally desorbed into a 1 m isothermal GC column (15% OV-3 on Chromasorb WAW-DMSC) held at 100°C for separation. The column resolves the following peaks: elemental Hg, dimethyl Hg, methyl ethyl Hg, and diethyl Hg. Because of the wet chemistry used, only methyl ethyl Hg, the MHg analog is quantified for this assay. The organo-Hg compounds are pyrolytically broken down to Hg<sup>0</sup> prior to entering the CVAFS detector for quantification. Peak heights are accessed by chart recorder, and recorded on bench sheets in "chart units" to the nearest 0.2 unit. Net MHg concentrations were calculated according to the following formulae, where **PH** is the chart recorder peak height, **V** is the aliquot size of water sample distilled, **bb** is the instrument (bubbler) blank, **B** is the mean method blank, in the same units as the sample, **V** is the total volume of sediment extract, **v** is the aliquot volume of sediment extract analyzed, **m** is the mass of sediment extracted, and **S** is the calibration curve slope in units/ng, for the set of samples. In the calculations below, 5 is a factor to account for the fact that 2 out of 10 mL of the CH<sub>2</sub>Cl<sub>2</sub> was back extracted into the aqueous phase.

$$[\text{MHg}] \text{ (ng/g)} = \{ [(((\text{PH}-\text{bb})/\text{S}) * 5 * (\text{V}/\text{v}))] - \text{B} \} / \text{m}$$

Total Hg analysis. For water samples, BrCl was added to an aliquot of the sample at a level of 5 mL per 100 mL of sample (FGS-012; EPA Method 1631). The samples were then allowed to digest overnight at room temperature (filtered samples) or at 70°C (unfiltered samples). Aliquots (approximately 1.0 grams wet weight) were digested on a hot plate in 7/3 v/v HNO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub> for 2 to 4 hours. After cooling the digests are diluted to volume with 5% v/v of 0.2 N BrCl.

Digests were analyzed for total Hg in accordance with the SOPs (FGS-011) described in the Frontier Geosciences QA manual. Aliquots of each digest (25 to 100 mL for whole water) were reduced in pre-purged DDW to Hg<sup>0</sup> with SnCl<sub>2</sub>, and then the Hg<sup>0</sup> purged onto gold traps as a preconcentration step. The Hg contained on the gold traps was then analyzed by thermal desorption into a cold vapor atomic fluorescence detector (CVAFS), using the dual amalgamation technique. Peak heights are accessed by chart recorder, and recorded on bench sheets in "chart units" to the nearest 0.2 unit. Net THg concentrations were calculated according to the

following formulae, where **PH** is the chart recorder peak height, **b** is the mean bubbler blank, **V** is the digest, **B** is the mean method blank and **S** is the calibration curve slope in units/ng:

$$[\text{THg}] (\text{ng/L}) = (\text{PH} - \text{b} / \text{S}) / (\text{V}) - \text{B}$$

$$[\text{THg}] (\text{ng/g}) = [ \{ ((\text{PH} - \text{b}) / \text{S}) * (\text{V} / \text{v}) - \text{B} \} / \text{m}$$

Analytical Problems Only a few analytical problems occurred and none was serious. The following lists this minor problems:

- 1) An inappropriate SRM (NIST SRM-2709) was extracted for methyl Hg with the first group (total of 5 samples) of soils processed on 8/25/97.
- 2) Both water samples (WA 0001 and WA 0002) were accidentally oxidized in their entirety for total Hg, thereby precluding analysis of methyl Hg on these two samples.
- 3) Initial results for method duplicates (SO 0005) for total Hg on 9/8/97 yielded an %RPD (36.8%) which was out of specifications. The sample digests were rerun during the same analytical run and yielded a %RPD of 23.2%.

All other QC/QA indicators were within the acceptable limits.

## **Sample Data**



**Total and Methyl Mercury in Water and Soil**

(PTI/Rex Robinson-C690-1704

Samples Analyzed: August 19 & 25, 1997 and September 4, 8 & 11 1997

Report: September 15, 1997

Frontier Geosciences Inc.  
414 Pontius North, Suite B  
Seattle, WA 98109

Sample ID	[Total Hg] ng/L	[Methyl Hg] ng/L	Total Hg Run ID	Methyl Hg Run ID
WA0001	1.98	sample lost	THG21.081997.19	
WA0002	1.47 1.45	sample lost	THG21.081997.25 THG21.081997.26	
	[Total Hg] ng/g*	[Methyl Hg] ng/g*		
SO 0001	32.4	0.482 0.494	THG21.091197.13	MMHG11.091197.17 MMHG11.091197.18
SO 0002	23.7	0.253	THG21.090897.12	MMHG11.090497.13
SO 0003	84.1	0.758	THG21.091197.25	MMHG11.091197.38
SO 0004	130	0.239	THG21.090897.44	MMHG11.090497.15
SO 0005	25.2 31.8	1.03	THG21.090897.26 THG21.090897.27	MMHG11.090497.27
SO 0006	12.1	0.268	THG21.091197.35	MMHG11.091197.22
SO 0007	27.5	1.31	THG21.091197.40	MMHG11.091197.16
SO 0008	6.31	0.194	THG21.091197.29	MMHG11.091197.33
SO 0009	13.7	0.457	THG21.091197.26	MMHG11.091197.28
SO 0010	4.63	0.271	THG21.091197.39	MMHG11.091197.09
SO 0011	16.4	0.297	THG21.090897.23	MMHG11.090497.34
SO 0012	6.79	0.195	THG21.090897.33	MMHG11.090497.32
SO 0013	24.1	0.495	THG21.090897.24	MMHG11.090497.28
SO 0014	17.7	0.742	THG21.090897.36	MMHG11.090497.35
SO 0015	360	1.26 1.36	THG21.090897.34	MMHG11.090497.23 MMHG11.090497.14
SO 0016	102	0.846	THG21.090897.29	MMHG11.090497.36
SO 0017	8.91	0.330	THG21.090897.22	MMHG11.090497.18
SO 0018	14.8	0.134	THG21.090897.28	MMHG11.091197.34
SO 0019	61.5	0.735	THG21.091197.33	MMHG11.091197.29
SO 0020	48.2	0.320	THG21.090897.40	MMHG11.090497.24
SO 0021	146	1.16	THG21.090897.42	MMHG11090497.37
SO 0022	67.2	0.403	THG21.090897.21	MMHG11.090497.29
SO 0023	25.2	0.736	THG21.091197.24	MMHG11.091197.26
SO 0024	4.27	0.051	THG21.090897.25	MMHG11.090497.33
SO 0025	45.0	0.185	THG21.090897.41	MMHG11.090497.20

**Total and Methyl Mercury in Water and Soil (Continued)**

(PTI/Rex Robinson-C690-1704)

Samples Analyzed: August 19 & 25, 1997 and September 4, 8 & 11, 1997

Report: September 15, 1997

Frontier Geosciences Inc.  
414 Pontius North, Suite B  
Seattle, WA 98109

Sample ID	[Total Hg] ng/g*	[Methyl Hg] ng/g*	Total Hg Run ID	Methyl Hg Run ID
SO 0026	9.23	0.165	THG21.091197.14	MMHG11.091197.20
	9.90		THG21.091197.15	
SO 0027	53.4	0.491	THG21.090497.24	MMHG11.082597.16
SO 0028	30.1	0.276	THG21.090497.29	MMHG11.082597.40
SO 0029	290	0.805	THG21.091197.31	MMHG11.091197.31
SO 0030	142	0.261	THG21.091197.37	MMHG11.091197.21
SO 0031	19.1	0.188	THG21.090897.18	MMHG11.090497.38
SO 0032	11.7	0.097	THG21.090897.28	MMHG11.090497.16
SO 0033	70.3	0.209	THG21.091197.30	MMHG11.091197.36
SO 0034	41.2	0.266	THG21.091197.20	MMHG11.091197.24
SO 0035	32.9	0.069	THG21.090497.25	MMHG11.082597.39
SO 0036	26.7	0.189	THG21.091197.22	MMHG11.091197.32
SO 0037	238	0.241	THG21.090497.17	MMHG11.082597.38
		0.274		MMHG11.082597.42
SO 0038	74.2	0.358	THG21.091197.38	MMHG11.091197.37
SO 0039	27.8	0.319	THG21.091197.21	MMHG11.091197.23
SO 0040	32.9	0.216	THG21.090897.30	MMHG11.090497.31
SO 0041	24.4	0.199	THG21.091197.36	MMHG11.091197.27
SO 0042	14.5	0.059	THG21.090497.33	MMHG11.082597.41
SO 0043	26.7	0.824	THG21.090897.35	MMHG11.090497.39
SO 0044	9.61	0.134	THG21.091197.27	MMHG11.091197.35
SO 0045	29.5	0.299	THG21.090897.39	MMHG11.090497.26
SO 0046	39.8	0.262	THG21.091197.32	MMHG11.091197.25

\*Blank corrected and dry weight basis.

**Laboratory QA/QC Results**



**Total and Methyl Mercury in Water and Soil  
QC Summary-Matrix Spikes\***

QC Parameter	Run ID	[Total Hg] ng/L	Comments
WA 0001 + 5.05 ng/L MS	THG21.081997.28	7.06	net: 5.08 ng/L 100.6% recovery
WA 0001 + 5.05 ng/L MSD	THG21.081997.29	6.92	net: 4.94 ng/L 97.8 % recovery
		[Total Hg]** ng/g	
SO 0037 + 461.3 ng/g MS	THG21.090497.18	549.2	net: 387.4 ng/g 84% recovery
SO 0037 + 522.3 ng/g MSD	THG21.090497.19	729.4	net: 567.6 ng/g 109 % recovery
SO 0002 + 50.39 ng/g MS	THG21.090897.36	75.60	net: 57.36 ng/g 113.8% recovery
SO 0002 + 57.13 ng/g MSD	THG21.090897.37	85.70	net: 67.46 ng/g 118.1% recover
SO 0001 + 95.08 ng/g MS	THG21.091197.41	136.6	net: 95.08 ng/g 113.9% recovery
SO 0001 + 94.95 ng/g MSD	THG21.091197.42	143.6	net: 94.95 ng/g 121.4% recovery
		[Methyl Hg] ng/g	
CALS-D2 + 27.6 ng/g MS*	MMHG11.082597.21	29.3	net: 23.9 ng/g 86.8 % recovery
CALS-D2 + 36.4 ng/g MSD*	MMHG11.082597.22	39.9	net: 34.6 ng/g 95.1 % recovery
SO 0002 + 1.01 ng/g MS	MMHG11.090497.21	1.084	net: 0.89 ng/g 88.1% recovery
SO 0002 + 0.892 ng/g MSD	MMHG11.090497.22	1.199	net: 1.005 ng/g 112.7% recovery
SO 0010 + 0.993 ng/g MS	MMHG11.091197.10	0.969	net: 0.714 ng/g 71.9% recovery
SO 0010 + 0.999 ng/g MSD	MMHG11.091197.11	1.357	net: 1.102 ng/g 110.3% recovery

\* for samples run in same analytical batch

\*\* wet weight basis

**Total and Methyl Mercury in Water and Soil  
QC Summary-Method Duplicates**

Sample	Run ID	[Total Hg], ng/g	Comments
SO 0005	THG21.090897.15	21.1	mean=25.8
	THG21.090897.16	30.6	36.8% RPD
SO 0005	THG21.090897.26	25.2	mean=28.5
	THG21.090897.27	31.8	23.1% RPD
SO 0026	THG21.091197.14	9.23	mean=9.56
	THG21.091197.15	9.90	6.9% RPD
		[Methyl Hg], ng/g	
SO 0037	MMHG11.082597.38	0.241	mean=0.258
	MMHG11.082597.42	0.274	12.8 % RPD
SO 0015	MMHG11.090497.23	1.26	mean=1.31
	MMHG11.090497.14	1.36	7.7% RPD
SO 0001	MMHG11.091197.17	0.492	mean=0.493
	MMHG11.091197.18	0.494	0.4% RPD
		[Total Hg], ng/L	
WA 0002	THG21.081997.17	1.19	mean=1.45 14.4% RSD
	THG21.081997.18	1.70	
	THG21.081997.25	1.47	
	THG21.081997.26	1.45	

**Total and Methyl Mercury in Water and Soil**  
**QC Summary-Blanks and SRMs**

QC Parameter	Total Hg] ng/L	Run ID	Comments
Blank-1 (8/19)	0.12	THG21.081997.13	
Blank-2 (8/19)	0.13	THG21.081997.14	
Blank-3 (8/19)	0.08	THG21.081997.15	
<b>Mean</b>	<b>0.11</b>		
<b>SD</b>	<b>0.03</b>		
Estimated MDL	0.09		
	[Total Hg], ng/g		
Blank-1 (9/8)	0.42	THG21.090897.09	
Blank-2 (9/8)	0.26	THG21.090897.10	
Blank-3 (9/8)	0.31	THG21.090897.11	
<b>Mean</b>	<b>0.33</b>		
<b>SD</b>	<b>0.08</b>		
Estimated MDL	0.24		
Blank-1 (9/11)	0.22	THG21.091197.17	
Blank-2 (9/11)	0.20	THG21.091197.18	
Blank-3 (9/11)	0.17	THG21.091197.19	
<b>Mean</b>	<b>0.19</b>		
<b>SD</b>	<b>0.022</b>		
Estimated MDL	0.07		
DORM-2 LCS (8/19)	4384	THG21.081997.07	94.5 % recovery
DORM-2 LCS (9/4)	4568	THG21.090497.06	98.5% recovery
DORM-2 LCS (9/8)	4394	THG21.090897.13	94.7% recovery
DORM-2 LCS (9/11)	4365	THG21.091197.06	94.1% recovery
Certified	4640 ± 260		
NIST-2709 (9/4)	1438	THG21.090497.16	102.7% recovery
NIST-2709 (9/8)	1460	THG21.090897.14	104.3% recovery
NIST-2709 (9/11)	1493	THG21.091197.16	106.7% recovery
Certified	1400 ± 80		

**Total and Methyl Mercury in Water and Soil  
QC Summary-Blanks and SRMs (continued)**

QC Parameter	[Methyl Hg] ng/g	Run ID	Comments
Blank-1 (8/25)	0.019	MMHG11.082597.07	
Blank-2 (8/25)	0.017	MMHG11.082597.08	
Blank-3 (8/25)	0.011	MMHG11.082597.09	
<b>Mean</b>	<b>0.016</b>		
<b>SD</b>	<b>0.004</b>		
Estimated MDL	<b>0.012</b>		
Blank-1 (9/4)	0.020	MMHG11.090497.09	
Blank-2 (9/4)	0.030	MMHG11.082597.10	<del>MMHG11.090497.10</del>
Blank-3 (9/4)	0.025	MMHG11.082597.11	<del>MMHG11.090497.11</del>
<b>Mean</b>	<b>0.025</b>		ER 9/13
<b>SD</b>	<b>0.005</b>		
Estimated MDL	<b>0.015</b>		
Blank-1 (9/11)	0.020	MMHG11.091197.13	
Blank-2 (9/11)	0.020	MMHG11.091197.14	
Blank-3 (9/11)	0.020	MMHG11.091197.15	
<b>Mean</b>	<b>0.020</b>		
<b>SD</b>	<b>0.000</b>		
Estimated MDL	<b>see above</b>		
DORM-2 LCS (8/25)	3587	MMHG11.082597.06	80.2 % recovery
DORM-2 LCS (9/4)	4469	MMHG11.090497.07	99.9 % recovery
DORM-2 LCS (9/11)	4473	MMHG11.091197.07	100.1 % recovery
Certified	4470 ± 320		
IAEA-356	5.22	MMHG11.090497.12	98.1 % recovery
IAEA-356	4.21	MMHG11.091197.12	79.1 % recovery
Certified*	5.46 ± 0.71		

\* SRM recently decertified due to artifact (See Bloom et al 1997). Value obtained by extraction preferred (4.81 ± 0.65 ng/g)

Conversion to dry weight basis							
PTI/Rex Robinson							
	Dry fraction	THg, wet ng/g	MHg, wet ng/g	THg, dry ng/g	MHg, dry ng/g	%MHg	%H2O
SO 0001	0.8718	28.288	0.429	32.45	0.492	1.52	12.82
	0.8718		0.431		0.494		12.82
SO 0002	0.7682	18.24	0.194	23.74	0.253	1.06	23.18
SO 0003	0.8828	74.271	0.669	84.13	0.758	0.90	11.72
SO 0004	0.8048	104.4	0.192	129.72	0.239	0.18	19.52
SO 0005	0.9045	22.77	0.93	25.17	1.028	4.08	9.55
	0.9045	28.76		31.80			9.55
SO 0006	0.9392	11.346	0.252	12.08	0.268	2.22	6.08
SO 0007	0.9244	25.442	1.212	27.52	1.311	4.76	7.56
SO 0008	0.7952	5.02	0.154	6.31	0.194	3.07	20.48
SO 0009	0.9161	12.568	0.419	13.72	0.457	3.33	8.39
SO 0010	0.9411	4.359	0.255	4.63	0.271	5.85	5.89
SO 0011	0.8801	14.48	0.261	16.45	0.297	1.80	11.99
SO 0012	0.9481	6.44	0.185	6.79	0.195	2.87	5.19
SO 0013	0.9578	23.14	0.474	24.16	0.495	2.05	4.22
SO 0014	0.9626	17.06	0.714	17.72	0.742	4.19	3.74
SO 0015	0.623	224	0.785	359.55	1.260	0.35	37.7
	0.623		0.848		1.361		37.7
SO 0016	0.5722	58.28	0.484	101.85	0.846	0.83	42.78
SO 0017	0.8629	7.69	0.285	8.91	0.330	3.71	13.71
SO 0018	0.908	13.448	0.122	14.81	0.134	0.91	9.2
SO 0019	0.8381	51.556	0.616	61.52	0.735	1.19	16.19
SO 0020	0.6194	29.83	0.198	48.16	0.320	0.66	38.06
SO 0021	0.6382	93.52	0.74	146.54	1.160	0.79	36.18
SO 0022	0.7346	49.38	0.296	67.22	0.403	0.60	26.54
SO 0023	0.761	19.154	0.56	25.17	0.736	2.92	23.9
SO 0024	0.8807	2.16	0.045	2.45	0.051	2.08	11.93
	0.8807	3.76		4.27			11.93
SO 0025	0.6915	31.12	0.128	45.00	0.185	0.41	30.85
SO 0026	0.7826	7.225	0.129	9.23	0.165	1.79	21.74
	0.7826	7.745		9.90			21.74
SO 0027	0.9085	48.47	0.446	53.35	0.491	0.92	9.15
SO 0028	0.9274	27.89	0.256	30.07	0.276	0.92	7.26
SO 0029	0.4768	138.5	0.384	290.48	0.805	0.28	52.32
SO 0030	0.5488	77.96	0.143	142.06	0.261	0.18	45.12
SO 0031	0.9091	17.34	0.171	19.07	0.188	0.99	9.09
SO 0032	0.9261	10.82	0.09	11.68	0.097	0.83	7.39
SO 0033	0.9456	66.517	0.198	70.34	0.209	0.30	5.44
SO 0034	0.9658	39.739	0.257	41.15	0.266	0.65	3.42
SO 0035	0.8548	28.12	0.059	32.90	0.069	0.21	14.52
SO 0036	0.7835	20.92	0.148	26.70	0.189	0.71	21.65
SO 0037	0.6813	161.8	0.164	237.49	0.241	0.10	31.87
	0.6813		0.187		0.274		31.87
SO 0038	0.8332	61.854	0.298	74.24	0.358	0.48	16.68
SO 0039	0.9093	25.28	0.29	27.80	0.319	1.15	9.07
SO 0040	0.9476	31.14	0.205	32.86	0.216	0.66	5.24
SO 0041	0.8992	21.972	0.179	24.44	0.199	0.81	10.08
SO 0042	0.935	13.53	0.055	14.47	0.059	0.41	6.5
SO 0043	0.9273	24.72	0.764	26.66	0.824	3.09	7.27
SO 0044	0.8302	7.982	0.111	9.61	0.134	1.39	16.98
SO 0045	0.9141	26.98	0.273	29.52	0.299	1.01	8.59
SO 0046	0.9536	37.96	0.25	39.81	0.262	0.66	4.64

**Chain-of-Custody**  
**Records/Sample Analysis**  
**Request Forms**



**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) UA, BC, ML 690-1704 N. Nunez 8/13/97

Sampling Contact: Rox ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: FRONTIER  
GEOSCIENCE  
SEATTLE, WA  
 Attn: NICOLAS BLOOM

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested			Remarks		
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	TOTAL Hg	METH Hg		Extra Container	Archive
S00001	115201	8/13/97	1150	X								X	X		
S00002	115202		1200												
S00003	115203		1220												
S00004	115204		1230												
S00005	115205		1425												
S00006	115206		1435												
S00007	115207		1640												
S00008	115208		1645												
S00013	115213		1450												
S00014	115214		1500												
S00015	115215		1540												
S00016	115216		1550												
S00017	115217		1730												
S00018	115218		1745												

Method of Shipment: FEDEX

Condition of Samples Upon Receipt: \_\_\_\_\_

Custody Seal Intact: Yes  No  None  Broken by: \_\_\_\_\_

Relinquished by: [Signature] Date/Time 8/15/97 1500

Relinquished by: [Signature] Date/Time 8/16/97 14:30x

Relinquished by: \_\_\_\_\_ Date/Time \_\_\_\_\_

Received by: [Signature] Date/Time \_\_\_\_\_

Received by: [Signature] Date/Time \_\_\_\_\_

Received by Mobile Lab for Field Analysis: \_\_\_\_\_ Date/Time \_\_\_\_\_

Received for Lab by: \_\_\_\_\_ Date/Time \_\_\_\_\_



**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) 690-1704 WA, BC, MI M. Nimmo Sample's: (Signature)

Sampling Contact: REX ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: FRONTIER GEOSCIENCE SEATTLE, WA  
 Attn: NICOLAS BLOOM

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested			Remarks	
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	TOTAL	METHYL		Extra Container
<del>SOPP09</del>	115209	8/14/97	0750		X							X	X	
<del>SOPP10</del>	210		0800											
<del>SOPP11</del>	211		0820											
<del>SOPP12</del>	212		0830											
<del>SOPP23</del>	223		0840											
<del>SOPP24</del>	224		0850											
<del>SOPP25</del>	225		0925											
<del>SOPP26</del>	226		0935											
<del>SOPP27</del>	227		0955											
<del>SOPP28</del>	228		1000											
<del>SOPP29</del>	229		1130											
<del>SOPP30</del>	230		1140											
<del>SOPP31</del>	231		1150											
<del>SOPP32</del>	232		1200											

Method of Shipment: Fed-X Condition of Samples Upon Receipt: \_\_\_\_\_  
 Custody Seal Intact: Yes  No  Broken by: \_\_\_\_\_

Relinquished by: (Signature) / 8/15/97 Date/Time 1500  
 Relinquished by: (Signature) / 8/16/97 Date/Time 1453  
 Relinquished by: (Signature) / 8/16/97 Date/Time \_\_\_\_\_  
 Received by: Fed-X Date/Time \_\_\_\_\_  
 Received by: (Signature) / 8/16/97 Date/Time \_\_\_\_\_  
 Received by Mobile Lab for Field Analysis: (Signature) Date/Time \_\_\_\_\_  
 Received for Lab by: (Signature) Date/Time \_\_\_\_\_

**CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM**

Project: (Name and Number) C690-1704 UA, BC, MI A. Amundson Samplers: (Signature) [Signature]

Sampling Contact: REX ROBINSON  
 Phone: 425-643-9803  
 Ship Samples to: FRONTIER GEOSCIENCE  
SEATTLE, WA  
 Attn: NICOLAS BLOOM

Sample No.	Tag No.	Date	Time	Sample Matrix						Analyses Requested			Remarks			
				Groundwater	Soil	Surface Water	Sediment	Other	Concentration (M H)	Composite or Grab	THAL	METHYL		Extra Container	Archive	
<del>500033</del>	115 233	8/14/97	1600		X								X			
<del>500034</del>	234		1610										X			
<del>500035</del>	235		1730										X			
<del>500036</del>	236		1745										X			
<del>500037</del>	237		1700										X			
<del>500038</del>	238		1715										X			
<del>500039</del>	239		1450										X			
<del>500040</del>	240		1500										X			
<del>500041</del>	241		1430										X			
<del>500042</del>	242		1435										X			
<del>500045</del>	245		1510										X			
<del>500046</del>	246		1515										X			

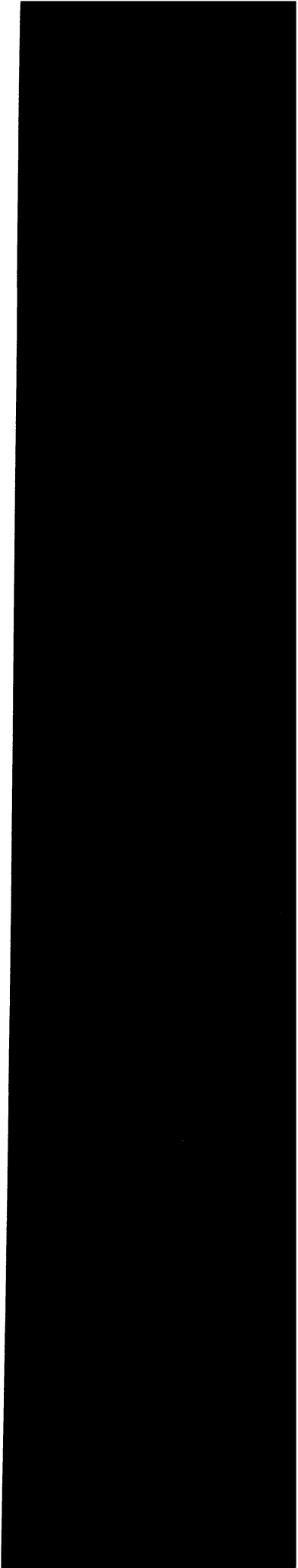
Method of Shipment: FedEx Condition of Samples Upon Receipt: \_\_\_\_\_  
 Custody Seal Intact: Yes  No  None  Broken by: \_\_\_\_\_

Relinquished by: [Signature] Date/Time: 8/15/97 152  
 Relinquished by: [Signature] Date/Time: 8/16/97 14:32  
 Relinquished by: [Signature] Date/Time: \_\_\_\_\_  
 Received by: [Signature] Date/Time: \_\_\_\_\_  
 Received by: [Signature] Date/Time: \_\_\_\_\_  
 Received by Mobile Lab for Field Analysis: [Signature] Date/Time: \_\_\_\_\_  
 Received for Lab by: [Signature] Date/Time: \_\_\_\_\_



**Part E**

**Data Validation Report**



## **ATTACHMENT 2**

### **PART E**

### **INTRODUCTION**

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The data validation of the Final Soil Characterization Sampling for the Undeveloped Area of the General Motors Power Train Group, (GMPTG) Bay City Facility was conducted to assess the laboratory quality assurance and quality control (QA/QC) procedures for chemical analyses. Data validation was completed according to U.S. Environmental Protection Agency (EPA) modified Level 3 specifications. Data validation procedures were based on EPA national functional guidelines for evaluating organic and inorganic analyses (U.S. EPA 1994a,b). Data qualifiers were assigned as necessary during the quality assurance review in accordance with U.S. EPA (1994a,b) and quality control requirements stated in the methods utilized. The following laboratory deliverables were reviewed during this data validation process:

- The case narrative discussing analytical problems (if any) and procedures
- Chain of-custody documentation to verify completeness of data
- Method blanks associated with each sample delivery group to check for laboratory contamination
- Results from all laboratory quality control check samples, including surrogate compounds, matrix spikes, and laboratory duplicate sample analyses, to assess analytical accuracy and precision
- Results of field quality control samples, including field duplicates and field blanks
- All reported sample data for analyses performed.

A total of 21 soil core samples were collected by PTI staff utilizing a hand-held auger on August 13 and 14, 1997 and shipped to Frontier Geosciences Inc. (Frontier) and Columbia Analytical Services (CAS) on August 15, 1997, for analysis. Core samples were divided into surface (0–6 in.) and bottom (6–24 in.) for chemical analyses. The samples were analyzed for total mercury (EPA Method 245.5) and methylmercury (Bloom 1989). A total of 48 samples consisting of 42 natural samples, 4 field duplicate, and 2 equipment rinsate blanks were shipped to both laboratories. Samples were received by Frontier and CAS on August 16, 1997. Frontier performed analyses for total mercury (EPA 245.5) and methylmercury (Bloom 1989) on all samples received. CAS performed analyses for total metals (EPA Method 200.8), polychlorinated biphenyls (PCBs) (EPA Method 8080A), and conventionals (total solids) (EPA Method 160.3), total organic carbon (TOC) (EPA

Method 415.1), and pH (EPA Method 150.1) on all samples received. The data are summarized in Table 3 in the main body of this report

All samples were extracted and analyzed within method holding times.

## **SAMPLE DOCUMENTATION**

Field and laboratory chain of custody for sample collection, transport, and analyses was accurate and complete. Laboratories performing sample analyses provided complete chain-of-custody sheets documenting sample receipt. The following exception in the chain-of-custody documentation is noted:

- Sample SO-0006 designated for mercury and methylmercury analyses to be performed by Frontier Geoscience was not shipped from Bay City, MI. A split archive sample sent to CAS on August 16, 1997 was subsequently shipped from CAS on August 18, 1997 and received by Frontier Geoscience on August 19, 1997.

No problems in shipping were noted by CAS or Frontier Geosciences upon receipt of any project samples.

## **ANALYTICAL DATA**

### **Conventionals (TOC, Total Solids, pH)**

Sample data for all conventional analyses were reviewed and found to be accurate and complete. No data exceptions were noted in the case narrative or found during data reviewed. None of the conventional data were qualified during validation.

### **PCBs**

Sample data for PCB analyses were reviewed and found to be accurate and complete. Observations noted in case narratives and issues documented found during data review are as follows:

- Method reporting limits (MRLs) were elevated for some samples due to matrix interferences and/or sample dilutions, as indicated below.
- Matrix spike/matrix spike duplicate recoveries of Aroclor<sup>®</sup> 1242 for sample SO-0002 were not calculated. High concentrations of coeluting components prevented adequate resolution of this target analyte. The percent recovery of Aroclor<sup>®</sup> 1242 for both samples was indicated as not calculated (NC).

- Data for the following samples and aroclors were reported with elevated MRLs because of matrix interferences.

Sample Number	Aroclors®
SO-0001	1254
SO-0003	1254
SO-0014	1254
SO-0016	1254
SO-0018	1242
SO-0020	1242
SO-0022	1254
SO-0023	1232, 1242
SO-0024	1242
SO-0025	1221, 1242
SO-0027	1016, 1242
SO-0028	1254
SO-0029	1254
SO-0030	1016, 1221, 1232, 1242, 1254
SO-0036	1016, 1221, 1242
SO-0037	1016, 1221, 1232, 1242, 1254, 1260
SO-0038	1232, 1242, 1254
SO-0039	1016, 1242, 1254
SO-0040	1016, 1242, 1254
SO-0041	1242, 1254
SO-0043	1016, 1232, 1242, 1254
SO-0044	1232, 1242
SO-0045	1016
SO-0046	1242, 1254

- Data for the following samples and aroclors were reported with elevated MRLs because of matrix interferences requiring sample dilution.

Sample Number	Aroclors®
SO-0002	1016, 1221, 1232, 1242, 1254, 1260
SO-0019	1016, 1221, 1232, 1242, 1254
SO-0033	1016, 1221, 1232, 1242, 1248, 1254, 1260
SO-0034	1016, 1221, 1232, 1242, 1248, 1254, 1260

- Data for the following sample and aroclor were reported with an elevated MRL because of low percent solids in the sample received.

Sample Number	Aroclor®
SO-0030	1260

### Total Mercury and Methylmercury

Sample data for total mercury and methylmercury analyses were reviewed and found to be accurate and complete. Exceptions noted in the case narrative are as follows:

- The laboratory accidentally extracted the wrong standard reference material (SRM) (NIST SRM-2709) for methylmercury with the first group (total of 5 samples) of soils processed on August 25, 1997.
- Both equipment rinsate blanks (WA0001 and WA0002) were accidentally oxidized in their entirety for total Hg, thereby precluding analysis of methylmercury for these samples.
- Initial results for method duplicates (S0-0005) for total mercury on September 8, 1997 yielded a relative percent difference (RPD) (36.8 percent) that was out of specifications. The sample digestates were re-run during the same analytical run and yielded an RPD of 23.2 percent. No data qualification was made based on this result.

No additional data exceptions were noted in the case narrative or found during data review. No results were qualified during validation.

### Total Metals

Analyses for total metals were performed by inductively coupled plasma/mass spectrometry (ICP/MS) in accordance with EPA Method 200.8.

Sample data for total metal analyses was reviewed and found to be accurate and complete. The following exception is noted in the case narrative.

- The RPD for the duplicate analysis of Cr and Sn in sample SO-0033 was outside the normal CAS control limits. The variability in the results is attributed to the heterogeneous character of the sample. No data qualification was made based on this result.

## LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL

## **METHOD BLANKS**

### **Conventionals (TOC, Total Solids, pH)**

All method blanks associated with conventional analyses were undetected.

### **PCBs**

All method blanks associated with PCB analyses were undetected.

### **Total Mercury and Methylmercury**

The following exceptions were found in the total mercury and methylmercury data reviewed.

- Total mercury and methylmercury were detected in all laboratory method blanks analyzed. Reported concentrations of total mercury and methylmercury in all samples analyzed were greater than 10 times the mean concentration of total mercury and methylmercury detected in associated laboratory method blanks. No data were qualified because of the method blank results.
- Total mercury was detected in both of the equipment rinsate blanks. Analyses for methylmercury were not performed on these blanks because of the laboratory error previously mentioned. The concentration of total mercury detected in equipment rinsate blanks is not considered an indication of potential cross-contamination in samples collected. No data were qualified because of equipment blank results.

### **Total Metals**

The following exception was found in the total metals method blank data reviewed.

- Total lead (0.12 mg/kg dry weight) was detected in one method blank extracted on September 10, 1997. All reported values for lead exceeded this blank concentration by a factor of 10 at a minimum. No data qualification was required based on this result.

## **SURROGATE RECOVERIES**

All surrogate recoveries were within laboratory and project criteria (PTI 1997).

## **MATRIX SPIKES**

### **Conventionals (TOC)**

All matrix spike recoveries were within laboratory and project criteria (PTI 1997).

### **PCB**

The following exception in PCB matrix spike or matrix spike duplicate data was noted in the case narrative and verified in the data reviewed.

- Matrix spike/matrix spike duplicate recoveries of Aroclor<sup>®</sup> 1242 for sample SO-0002 were not calculated. High concentration of Aroclor<sup>®</sup> 1248 present in this sample prevented adequate resolution of the target analyte. The percent recoveries of Aroclor<sup>®</sup> 1242 for both samples (matrix spike/matrix spike duplicate) were indicated as not calculated (NC). Data were not qualified based on this result.

### **Total Mercury and Methylmercury**

All spike recoveries were within laboratory and project criteria.

### **Total Metals**

The following exception in total metals matrix spike data was noted in the case narrative of the data reviewed.

- Percent recoveries for Cr, Cu, and Zn were not available for matrix spike sample SO-0033. Elevated concentrations of these metals in the sample did not permit quantitation of spike recoveries. Data were not qualified based on this result.

## **LABORATORY DUPLICATE ANALYSES**

### **Conventionals (pH, TOC, Total Solids)**

All RPDs were within laboratory and project criteria (PTI 1997).

## **PCBs**

Exceptions noted in the matrix spike duplicate for PCB analyses were previously noted. No results were qualified because of matrix spike/matrix spike duplicate results.

## **Total Mercury and Methylmercury**

The following exception in duplicate RPD for total mercury was noted in the narrative provided by Frontier Geosciences. No other data exceptions were noted or found in the data reviewed.

- Initial results for method duplicates (SO-0005) for total mercury on September 8, 1997 yielded an RPD (36.8 percent), which exceeded laboratory control limits. The sample digests were re-run during the same analytical run and yielded an RPD of 23.2 percent. Data were not qualified based on these duplicate results.

## **Total Metals**

The following exception in duplicate RPDs for total metals analyses was noted in the case narrative and verified in the data reviewed.

- For duplicate sample SO-0033, extracted and analyzed on September 10, 1997, and September 14, 1997, respectively, the RPDs for Cr and Sn exceeded the laboratory control limits. This discrepancy was attributed to the non-homogeneity of the sample. Data were not qualified based on this result.

## **INITIAL AND CONTINUING CALIBRATION STANDARDS AND BLANKS**

Continuing calibration blanks (CCB), initial calibration validation (ICV), and continuing calibration validation standards (CCV) for PCB, TOC, and total metals analyses were provided by CAS. The calibrations were acceptable.

## **FIELD QA/QC**

### **Equipment Rinsate Blank**

No PCBs were detected in either equipment rinsate blank. The following exceptions were found in the metals data reviewed.

- Low-level total mercury (1.98 ng/L and 1.46 ng/L) was detected in both of the equipment rinsate blanks. Analyses for methylmercury were not performed because the entire sample was mistakenly processed for the total mercury analysis as previously noted. The concentration of total mercury detected is not considered an indication of potential cross-contamination in samples collected.
- The following total metals were detected at the concentrations ( $\mu\text{g/L}$ ) indicated in the equipment rinsate blanks. The levels of total metals detected are not significant relative to the concentrations of total metals detected in the samples project. Therefore, no data were qualified because of field blank results.

Metal	WA0001 ( $\mu\text{g/L}$ )	WA0002 ( $\mu\text{g/L}$ )
Barium	0.20	0.20
Chromium	0.3	1.7
Copper	5.8	137
Lead	0.10	0.10
Zinc	40.9	56.4

### Field Duplicates

Field duplicates were collected for two soil horizons (0–6 in., 6–24 in.) at two different stations (UA-4, UA-20). Results for station UA-20 were within project acceptance criteria (PTI QUAPP REFERENCE).

Analytical results for samples and duplicates associated with station UA-4 did not correlate well. It was suspected that the labels for these samples were incorrect. Reanalysis of frozen archive samples for this station did correlate well with the original results, and RPDs were all well within acceptance criteria. Therefore, no action was taken based on the original data. A copy of the metals results of the reanalysis of archive samples for this station are attached.

### DATA QUALIFICATION/SUMMARY

The overall data quality for all project data is acceptable. All project and laboratory acceptance criteria were met or exceeded.

## REFERENCES

Bloom, N.S. 1989. Determination of picogram levels of methylmercury by aqueous phase ethylation, followed by cryogenic gas phase ethylation with cold vapor atomic fluorescence detection. *Can. J. Fish Aq. Sci.* 7:1131.

PTI. 1997. Work plan. Final characterization sampling for soil on the GMPTG undeveloped area. PTI Environmental Services, Bellevue, WA.

U.S. EPA. 1994a. Contract Laboratory Program. National functional guidelines for organic data review. Office of Solid Waste and Emergency Response. EPA 540/R-94/012.

U.S. EPA. 1994b. Contract Laboratory Program. National functional guidelines for inorganic data review. Office of Solid Waste and Emergency Response. EPA 540/R-94/013.

U.S. EPA. 1995. SW-846 test methods for evaluating solid waste. Office of Solid Waste and Emergency Response.

**Attachment 3**

**Michigan Background Soil  
Survey Statistics**



MICHIGAN BACKGROUND SOIL SURVEY  
LOCATION COMPOSITE STATISTICS

	Aq	Al	As	Ba	Cl	Co	Cr	Cu	Fe	Hg	Li	Mn	Ni	Pb	Se	Zn	CN
<b>CLAYS</b>																	
locations	4	7	14	12	15	7	14	14	8	13	8	8	13	14	13	13	4
samples	60	41	178	111	204	44	178	175	47	121	47	47	174	199	114	153	71
MEAN	0.70	8876	5.9	82.0	0.8	8.8	20.8	17.9	16343	0.05	15.0	347.4	23.0	9.3	0.35	43.1	0.10
st. dev.	0.39	1388	4.8	49.0	0.4	1.9	8.7	4.3	3538	0.02	5.2	82.5	6.9	6.6	0.26	11.3	0.11
mean + 1 SD	1.10	10264	10.7	131.0	1.3	10.8	29.6	22.2	19881	0.08	20.2	430.0	29.9	15.9	0.61	54.4	0.22
mean + 2 SD	1.49	11652	15.6	180.0	1.7	12.7	38.3	26.5	23420	0.10	25.4	512.5	36.8	22.5	0.87	65.6	0.33
mean + 3 SD	1.89	13040	20.4	229.1	2.1	14.7	47.1	30.8	26958	0.12	30.6	595.0	43.7	29.2	1.12	76.9	0.44
<b>TOPSOILS</b>																	
locations		43	47	47	47	37	47	47	46	47	39	46	47	47	46	47	13
samples		62	74	74	74	59	74	74	73	74	66	73	74	74	73	74	26
MEAN		3216	2.8	29.2	1.0	3.1	7.2	15.1	4951	0.07	2.5	206.6	6.6	10.9	0.27	24.4	0.25
st. dev.		2579	1.8	21.5	0.0	2.2	6.7	21.7	3709	0.08	2.3	237.3	8.1	12.1	0.08	21.9	0.22
mean + 1 SD		5795	3.8	50.8	1.0	5.3	13.9	36.8	8660	0.15	4.8	443.9	14.7	23.1	0.35	46.3	0.47
mean + 2 SD		8374	5.6	72.3	1.0	7.4	20.6	58.5	12368	0.23	7.1	681.2	22.8	35.2	0.42	68.2	0.69
mean + 3 SD		10954	7.3	93.9	1.0	9.6	27.2	80.3	16077	0.31	9.4	918.4	30.9	47.3	0.59	90.2	0.91
<b>SANDS</b>																	
locations	3	4	9	8	10	4	11	11	5	7	5	5	10	9	8	10	6
samples	18	16	43	36	50	16	54	54	17	34	17	17	40	43	35	46	31
MEAN	0.44	1450	2.0	29.9	0.8	2.6	6.4	6.6	2972	0.04	2.1	92.4	7.4	8.9	0.23	15.7	0.14
st. dev.	0.49	209	1.7	43.3	0.4	0.3	4.2	4.3	1587	0.01	1.5	85.8	5.5	8.9	0.03	9.0	0.15
mean + 1 SD	0.93	1659	3.7	73.3	1.2	2.9	10.6	10.9	4559	0.05	3.5	178.3	12.9	17.8	0.26	24.7	0.29
mean + 2 SD	1.42	1868	5.4	116.6	1.6	3.2	14.8	15.2	6146	0.07	5.0	264.1	18.4	26.6	0.39	33.7	0.43
mean + 3 SD	1.90	2077	7.1	160.0	2.0	3.4	19.0	19.4	7734	0.08	6.5	349.9	24.0	35.5	0.33	42.7	0.58
<b>COMBINED CLAY-TOPSOIL-SAND SUMMARY</b>																	
locations	7	54	70	67	72	48	72	72	59	67	52	59	70	70	67	70	23
samples	78	119	295	221	328	129	306	303	137	229	130	137	288	316	222	273	128
minimum	0.11	340	0.3	3.4	0.1	2.5	1.2	1.0	320	0.02	1.0	3.0	2.1	2.5	0.16	2.5	0.01
maximum	1.09	10814	20.8	216.8	1.5	14.0	36.0	72.1	21418	0.50	22.8	1100.0	45.0	66.7	1.15	99.0	0.71
MEAN	0.59	3819	2.8	38.8	0.9	3.9	9.8	14.3	6328	0.07	4.4	216.1	9.7	10.4	0.28	26.6	0.20
st. dev.	0.42	3096	3.0	36.6	0.3	2.9	8.7	18.0	5354	0.07	5.4	220.8	9.8	10.8	0.13	20.6	0.19
mean + 1 SD	1.01	6915	5.8	75.3	1.2	6.8	18.4	32.3	11682	0.13	9.8	436.9	19.6	21.1	0.41	47.2	0.39
mean + 2 SD	1.43	10012	8.9	111.9	1.5	9.7	27.1	50.3	17036	0.20	15.1	657.7	29.4	31.9	0.55	67.8	0.58
mean + 3 SD	1.85	13108	11.9	148.5	1.7	12.5	35.8	68.3	22390	0.27	20.5	878.6	39.2	42.7	0.68	88.5	0.77

THIS DATA IS BASED ON THE AVERAGE VALUE FROM EACH LOCATION. THE DATA USED TO CALCULATE STATISTICS REPRESENTS EITHER THE "LOCATION AVERAGE" OR A SINGLE SAMPLE TAKEN AT THAT LOCATION.

MICHIGAN BACKGROUND SOIL SURVEY  
 CLAY - SAMPLE LOCATION AVERAGES (mg/kg)

CLAY	Aq	Al	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Li	Mn	Ni	Pb	Se	Zn	CN
Compave1	1.09		20.8	117.8	0.7		28.5	18.6		0.03			27.6	8.8	0.53	54.9	
Compave2					0.1								17.3				
Compave3	0.98		5.8	59.2	1.4		18.7	19.3		0.08			25.1	16.8	0.27	46.9	0.26
Compave4	0.28		4.7	216.8	0.2		5.3	14.0		0.02				6.2	0.20	47.6	
Compave5		10013	7.2	82.1	1.6	11.6	34.1	28.8	21418	0.05	22.8	460.0	38.3	6.1	0.25	58.6	
Compave6		7493	8.8	48.9	1.0	7.9	18.4	14.9	19327	0.05	15.8	334.7	18.9	4.0	0.25	60.6	
Compave7			8.0		1.5		11.9	16.2					25.2	23.5			0.01
Compave8		10814	3.2	71.7	1.0	10.8	31.8	18.8	16540	0.05	19.6	314.0	19.8	5.9	0.25	34.2	
Compave9		7830	6.7	43.4	1.0	9.7	23.6	15.6	19280	0.05	19.2	354.0	21.2	2.5	1.15	37.0	
Compave10		8063	3.3	40.1	1.0	7.2	20.7	11.8	15633	0.05	11.0	336.7	13.4	3.6	0.25	25.2	
Compave11			3.2	95.5	0.4		28.2	23.0		0.04				14.0	0.44	51.6	
Compave12			4.0	71.0	1.0		13.5	14.6	12730	0.05	7.7	473.3	20.0	6.8	0.25	40.3	
Compave13	0.45		2.2		0.2		8.5	16.1		0.12			33.6	19.1	0.20	40.6	0.05
Compave14		9180	2.7	42.5	1.0	8.3	21.7	18.0	14800	0.05	13.0	250.0	18.0	10.5	0.25	32.0	
Compave15		9538	2.0	94.7	1.0	6.3	27.0	20.7	11017	0.05	11.0	254.7	20.0	2.5	0.25	30.7	0.10

MICHIGAN BACKGROUND SOIL SURVEY  
TOPSOIL - SAMPLE LOCATION AVERAGES (mg/kg)

TOPSOIL	Ag	Al	As	Ba	Cl	Co	Cr	Cu	Fe	Hg	Li	Mn	Ni	Pb	Se	Zn	CN
BC-2-48			11.0	73.7	1.0		13.0	17.0		0.10			16.0	6.0		61.5	0.71
BC-1	4820	4.2	55.0	1.0		21.0	14.0	7300		0.50		290.0	7.5	24.0	0.25	79.0	0.36
BC-2	3380	1.0	30.8	1.0		8.0	11.0	5900		0.05		110.0	5.0	18.0	0.25	31.0	0.20
BC-3	4340	2.2	39.8	1.0		9.0	4.5	6180		0.05		210.0	5.0	7.0	0.25	21.0	0.10
BC-4	4390	4.1	30.7	1.0		11.0	10.0	8250		0.05		230.0	8.0	6.0	0.25	27.0	0.10
BC-5	3790	4.2	46.1	1.0		10.0	14.0	7150		0.05		230.0	8.0	7.0	0.50	46.0	0.10
BC-6	5000	4.0	43.2	1.0		13.0	15.0	20160		0.05		270.8	9.0	8.5	0.25	35.0	0.23
BC-8	6160	4.2	49.1	1.0		15.0	11.0	10500		0.05		310.0	9.0	9.5	0.25	27.0	0.10
CompAveA	3838	2.0	26.2	1.0	2.5	12.5	7.0	6400		0.05	4.4	78.0	2.5	2.5	0.25	14.3	0.10
CompAveB		3.1	35.8	1.0		11.1	5.9	8518		0.05	5.1	247.3	8.4	9.1	0.25	27.2	
CompAveC	987	0.9	20.8	1.0	2.5	2.5	2.5	1164		0.13	1.8	64.3	2.5	19.3	0.25	34.6	
CompAveD	3430	2.1	23.3	1.0	2.5	7.4	4.0	5315		0.05	2.3	45.7	2.5	6.8	0.25	18.0	
CompAveE		2.3	45.8	1.0	2.5	12.0	10.4	4850		0.05	2.1	561.3	6.8	12.5	0.25	21.5	
CompAveF	477	0.5	3.4	1.0	2.5	2.5	1.0	1040		0.05	1.0	30.3	2.5	2.5	0.25	2.5	0.10
CompAveG	1008	0.9	15.6	1.0	2.5	3.1	2.4	2412		0.05	1.0	146.0	2.5	5.2	0.32	14.6	0.10
SS/4	1070	0.3	5.5	1.0	2.5	2.5	1.0	2370		0.05	1.0	8.5	2.5	2.5	0.25	2.5	
SS/5	1850	1.1	24.3	1.0	2.5	5.7	5.1	5810		0.11	1.0	278.0	2.5	10.0	0.25	24.0	
SS/6	1090	0.5	5.7	1.0	2.5	2.5	1.0	1370		0.05	1.0	36.0	2.5	2.5	0.25	2.5	
SS/7	2140	1.0	13.1	1.0	2.5	3.9	1.0	2800		0.05	3.5	28.0	2.5	9.6	0.25	17.0	
SS/8	670	0.5	5.5	1.0	2.5	2.5	1.0	786		0.05	1.0	23.0	2.5	5.1	0.25	6.1	
SS/9	1270	0.6	8.3	1.0	2.5	2.5	1.0	1320		0.05	1.0	23.0	2.5	2.5	0.25	5.9	
TS-1	2480	3.1	23.0	1.0	2.5	2.5	4.0	3700		0.05	2.5	190.0	2.5	11.0	0.25	18.0	
TS-2	1640	1.9	24.0	1.0	2.5	2.5	2.4	2500		0.05	1.0	370.0	2.5	14.0	0.25	15.0	
TS-3	2360	1.3	17.0	1.0	2.5	2.5	2.5	3000		0.05	2.0	140.0	2.5	2.5	0.25	12.0	
TS-5	1580	1.3	11.0	1.0	2.5	2.5	2.9	2100		0.05	1.0	100.0	2.5	20.0	0.25	13.0	
TS-7	340	0.3	8.0	1.0	2.5	2.5	1.0	320		0.05	1.0	3.0	2.5	2.5	0.25	2.5	
TS-8	1750	3.3	28.0	1.0	2.5	2.5	2.0	2600		0.05	1.0	360.0	2.5	11.0	0.25	15.0	
TS-9	1060	2.3	26.0	1.0	2.5	2.5	1.0	1510		0.05	1.0	380.0	2.5	18.0	0.25	11.0	
UP-12	859	1.1	3.0	1.0	2.5	2.5	4.1	1520		0.05	2.0	46.0	2.5	9.2	0.25	18.0	
UP-13	3760	2.5	25.0	1.0	2.5	7.8	7.4	5490		0.05	5.4	110.0	2.5	21.0	0.25	19.0	
UP-14	1090	0.5	6.0	1.0	2.5	2.5	4.4	1250		0.05	1.0	58.3	2.5	10.0	0.25	5.4	
UP-15	1710	0.8	32.0	1.0	2.5	2.5	1.0	2700		0.05	1.0	390.0	2.5	2.5	0.25	14.0	
CompAveH	1610	0.8	49.7	1.0	2.5	6.9	42.1	2475		0.05	1.0	177.5	3.3	24.0	0.25	61.0	0.43
CompAveI	4730	0.8	36.3	1.0	2.5	12.0	18.0	5400		0.10	2.5	110.0	14.0	10.5	0.25	35.0	0.65
CompAveJ		2.0	82.0	1.0		14.0	14.0	15050		0.12	3.3	138.5	45.0	10.5	0.65	83.5	
SS/1	1500	1.5	12.3	1.0	2.5	2.5	2.0	2310		0.05	1.0	63.1	2.5	7.1	0.25	15.0	
SS/2	1240	1.1	8.3	1.0	2.5	2.5	1.0	2180		0.05	1.0	34.0	2.5	2.5	0.25	5.1	
UP-1	3990	1.7	19.0	1.0	2.5	6.6	32.0	5820		0.37	3.6	120.0	8.2	2.5	0.25	17.0	
UP-2	9750	3.4	88.0	1.0	7.8	16.0	71.6	14100		0.05	5.9	569.0	16.0	55.4	0.50	51.0	
UP-3	3100	1.1	23.0	1.0	2.5	2.5	12.0	4100		0.05	1.0	200.0	2.5	2.5	0.25	14.0	
UP-4	8430	1.5	29.0	1.0	6.4	17.0	72.1	9900		0.05	7.4	140.0	20.0	6.4	0.25	27.0	
UP-5	9950	2.8	81.0	1.0	14.0	36.0	63.1	13000		0.05	12.0	1100.0	31.0	66.2	0.25	99.0	
UP-6	7300	2.6	52.0	1.0	5.1	11.0	68.4	10100		0.05	4.1	200.0	12.0	15.0	0.25	34.0	
UP-7	8430	1.0	13.0	1.0	2.5	2.5	4.0	5790		0.05	4.0	28.0	2.5	2.5	0.25	8.4	
UP-9	6100	1.7	23.0	1.0	2.5	2.5	63.6	4900		0.05	3.0	150.0	7.6	5.6	0.25	18.0	
UP-10	3490	1.9	46.0	1.0	2.5	2.5	64.0	5700		0.05	3.0	1100.0	2.5	13.0	0.25	21.0	
UP-11	419	1.0	6.0	1.0	2.5	2.5	4.5	785		0.05	1.0	17.0	2.5	9.0	0.25	2.5	

7/12/93

7/12/93

7/12/93

MICHIGAN BACKGROUND SOIL SURVEY  
 SAND - SAMPLE LOCATION AVERAGES (mg/kg)

SAND	Aq	Al	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Li	Mn	Ni	Pb	Se	Zn	CN
CompAve1	0.11		2.1	134.0	0.1		2.4	8.3		0.02				3.3	9.20	24.9	
CompAve2	1.00		5.5	13.0	1.0		16.0	15.0					18.0	20.0	0.16	30.0	
CompAve3			2.7		1.4		3.0	5.8					9.9	14.0			0.01
CompAve4		1686	0.5	16.1	1.0	2.5	6.9	1.9	2228	0.05	1.0	21.8	2.5	2.5	0.25	3.5	0.10
CompAve5		1560	3.6	9.5	1.0	3.0	6.9	6.1	5668	0.05	3.3	172.0	5.8	2.5	0.25	23.2	0.10
CompAve6			1.1	39.0	1.0		8.9	5.9	2300	0.05	4.0	32.0	5.9	2.5	0.25	12.0	
CompAve7				6.5			5.1	7.7					2.1			6.2	
CompAve8	0.20		0.5		0.2		1.7	4.1		0.04			15.8	7.0	0.20	15.0	
CompAve9		1317	1.2	15.7	1.0	2.5	2.5	1.0	1430	0.05	1.0	199.3	2.5	25.7	0.25	14.3	0.10
CompAve10					0.6		8.6	13.0					8.9			21.9	0.43
CompAve11		1237	0.5	5.6	1.0	2.5	8.8	4.2	3033	0.05	1.0	37.0	3.3	2.5	0.25	6.3	0.10

03/17/93  
 WED/EMR