ENVIRONMENTAL
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SOIL DISPOSITION REPORT

PG&E EMERYVILLE REPAIR FACILITY
4525 HOLLIS STREET
EMERYVILLE, CALIFORNIA

SEPTEMBER 30, 1996

Prepared for:
PG&E Emeryville Repair Facility
4525 Hollis Street
Emeryville, California

Prepared by:
AllPro Environmental Corporation
1125-B Arnold Drive, Suite #284
Martinez, California 94553

ALLPRO CORP ENVIRONMENTAL CORPORATION

October 3, 1996
Letter 0117.L4

Ms. Michelle Boscoe
Pacific Gas and Electric Company
4525 Hollis Street
Emeryville, CA 94608-2999

SUBJECT: SOIL DISPOSITION REPORT
PG&E Emeryville Repair Facility
Electric Shop B
4525 Hollis Street
Emeryville, California

Dear Ms. Boscoe:

AllPro Environmental Corporation (AllPro) is pleased to present four copies of the attached Soil Disposition Report dated October 3, 1996 for the subject site. The report documents construction activities and disposition of soil associated with the construction activities in the vicinity of the Machine Shop at the subject site. The activities included trenching and the installation of transformer washer recycling system piping, stockpiling of soil from the excavated areas, stockpiled soil sample collection with associated sample analysis, soil boring in or near the pipe trenches (Borings B1 thorough B5) with associated soil sample collection and analysis, removal and disposal of the stockpiled soil, Penetone-scrubbing of the concrete where the soil was stockpiled, collection of wipe samples from the location where the soil was stockpiled and associated analysis, and air monitoring both prior to and at the time of removal of the stockpiled soil.

Should you have any questions, please do not hesitate to call us at (510) 706-9308.

Sincerely,

AllPro Environmental Corporation

Michael F. Falk
Project Manager

Paul H. King

Paul H. King
California Registered Geologist #5901
Expiration Date: 12/31/97

PAUL H. KING
No. 5901

PHK
0117.L4

Attachment: Soil Disposition Report (4)

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SOIL DISPOSITION REPORT

PG&E EMERYVILLE REPAIR FACILITY
4525 HOLLIS STREET
EMERYVILLE, CALIFORNIA

1.0 INTRODUCTION

This report documents construction activities performed by AllPro Environmental Corporation (AllPro) and disposition of soil associated with the construction activities in the vicinity of the Machine Shop at the subject site. The activities included trenching and the installation of transformer washer/recycling system piping, stockpiling of soil from the excavated areas, stockpiled soil sample collection with associated sample analysis, soil boring in or near the pipe trenches (Borings B1 thorough B5) with associated soil sample collection and analysis, removal and disposal of the stockpiled soil, Penetone-scrubbing of the concrete where the soil was stockpiled, collection of wipe samples from the location where the soil was stockpiled and associated analysis, and air monitoring both prior to and at the time of removal of the stockpiled soil.

Prior to loading the stockpiled soil for removal from the site, a Health and Safety Plan (HASP) was prepared. A copy of the health and safety plan is attached with this report as Appendix A. A Site Location Map is attached with this report as Figure 1, a Site Plan is attached with this report as Figure 2, and a Site Plan Detail showing the work area is attached with this report as Figure 3.

The PG&E construction manager for this report was Mr. Gary Pforr. The PG&E environmental compliance officer for this project was Ms. Michelle Boscoe.

2.0 BACKGROUND

It is AllPro's understanding that the subject site has been used continuously for industrial activities since the 1920's. It is AllPro's understanding that PG&E has used the site since 1924. The construction area discussed in this report is located adjacent to a railroad right-of-way. The railroad tracks are no longer present, however the tracks were estimated by PG&E personnel to have been present beginning in the early 1900's.

The subject site is presently used by PG&E for transformer servicing. It is AllPro's understanding that transformers containing PCBs are presently processed exclusively at the northern end of the facility. It is also AllPro's understanding that portions of the construction area discussed in this report were formerly used as a corrosive dip tank area for preparation of transformers for repainting.

3.0 FIELD ACTIVITIES

Excavation and related construction activities were performed at the southeastern corner of the facility adjacent to Electric Shop B of the Machine Shop between August 5 and September 13, 1996. All field activities were performed between August 5 and September 25, 1996. A map showing the construction area at the site is presented as Figure 2.

Field activities included trenching and the installation of transformer washer/recycling system piping, stockpiling of soil from the excavated areas, stockpiled soil sample collection and analysis, soil boring in or near the pipe trenches (Borings B1 thorough B5) with associated soil sample collection and analysis, removal and disposal of the stockpiled soil, Penetone-scrubbing of the concrete where the soil was stockpiled and associated wipe sample collection and analysis, and air sample collection both prior to and at the time of removal of the stockpiled soil with associated air sample analysis. Each of these activities is discussed below in greater detail.

3.1 Trenching and Pipe Installation

Between August 5 and 29, 1996 construction activities at the subject site consisted of saw cutting existing concrete surfaces; excavating, loading and transportation of broken concrete; removal and disposal of subgrade concrete; removal of aggregate reinforced concrete; trenching for installation of the cast iron piping for the transformer washer/recycling system; excavation and location of existing piping for the tie-in-points for the transformer washer/recycling system; subgrade preparation; backfilling with Class II base rock and fill material; and resurfacing with concrete.

To provide a concrete pad which was structurally sound and which provided adequately sloped surface drainage, it was necessary to remove the existing concrete pad and some of the underlying soil. The existing concrete pad, footings, and underlying soil were removed to a depth of approximately two feet below grade, with removal to a depth of approximately four feet below grade along the western edge of the construction area. Excavation below a depth of two feet below grade was performed for footing removal and compaction purposes.

The excavated soil from the construction area was stockpiled on site on concrete adjacent to the excavation areas and covered with visqueen pending characterization and appropriate disposal. The final soil stockpile volume was initially estimated to be approximately 90 cubic yards.

Concrete removed from the area of excavation was removed from the site and approved for submittal to County Concrete in Concord, California for recycling. Pipe encountered during excavation was stored on the soil stockpile pending soil stockpile removal.

3.2 Stockpiled Soil Sample Collection and Sample Analysis

On August 19, 1996 AllPro personnel collected one 4-point composite soil sample designated as COMP A into four brass tubes directly from the soil stockpile. The locations of the samples were approximately equi-distantly spaced in the stockpile.

Following sample collection, the ends of the brass tubes for these samples were sealed with aluminum foil and plastic endcaps. The brass tubes were then labeled, placed into ziplock baggies, and stored in a cooler with ice pending delivery to McCampbell Analytical, Inc. in Pacheco, California. McCampbell Analytical, Inc. is a State-accredited hazardous waste testing laboratory. Chain of custody procedures was observed for all sample handling.

Soil sample COMP A was analyzed for Total Petroleum Hydrocarbons as Diesel (TPH-D) using EPA Method 3550 in conjunction with modified EPA Method 8015; Total Petroleum Hydrocarbons as Gasoline (TPH-G) using EPA Method 5030 in conjunction with modified EPA Method 8015; benzene, toluene, ethylbenzene and xylenes (BTEX) using EPA Method 8020; Fuel Fingerprint using EPA Method 3510 in conjunction with Modified EPA Method 8015; Volatile Organic Compounds using EPA Method 8240; Semi-Volatile Organic Compounds using EPA Method 8270; LUFT Metals (cadmium, total chromium, lead, nickel and zinc) using EPA Method 6010; PCBs using EPA Method 8080; and for RCI (reactivity, corrosivity, and ignitibility) using methods as specified in CCR Title 22, Section 66261.21-66261.23.

The laboratory analytical results of the analysis for soil sample COMP A showed that the petroleum TPH-G, xylenes and TPH-D were detected at concentrations of 23, 0.062, and 680 parts per million (ppm), respectively. The laboratory analytical results of the fuel fingerprint analysis for soil sample COMP A showed that the petroleum hydrocarbons were aged diesel or stoddard solvent compounds. Review of the laboratory analytical reports for the TPH-G and TPH-D results shows that the laboratory identified these results as indicative of aged diesel or stoddard solvent compounds. EPA Method 8240 compounds (Volatile Organic Compounds) were not detected except for styrene, which was detected at a concentration of 0.013 ppm.

Total PCBs were detected at a concentration of 1.4 ppm. The laboratory reported the PCB results in ug/kg or ppb. Review of the laboratory analytical report shows that the laboratory identified the PCBs as Aroclor 1260. EPA Method 8270 (Semi-Volatile Organic Compounds) were not detected.

LUFT metals were not detected in soil sample COMP A at concentrations exceeding 10 times their respective STLC values, except for lead which was detected at a concentration of 180 ppm. The STLC value for lead is 5 ppm. Because the lead concentration exceeded 10 times its respective STLC value of 50 ppm, COMP A was extracted and analyzed for STLC and TCLP values. The laboratory analytical results showed that the extracted STLC lead concentration was 6.4 ppm. No lead was detected in the extracted TCLP analysis.

The laboratory analytical results for soil sample COMP A are summarized in Table 1. Copies of the laboratory analytical results and chain of custody documentation are attached with this report in Appendix B.

3.3 Trench Soil Sample Collection and Sample Analysis

Based on the results of the soil stockpile sample, on August 29, 1996 PG&E instructed AllPro personnel to hand auger boreholes B1, B2, B3, B4, and B5 for the purposes of soil sample collection. The boreholes were located in or immediately adjacent to the pipe trenches and were hand augered to the depth below which the fill material had been placed for the water washer/recycling system pipe trenching excavation. The objective of the hand augering was to collect soil samples immediately beneath the fill material to characterize the soil which had not been removed during excavation. The borehole locations are shown on Figure 3.

The boreholes were hand augered with a 3.5-inch outside diameter hand auger. Boreholes B1, B2, B3, B4, and B5 were hand augered to total depths of approximately 3.4, 3.0, 2.0, 3.5, and 2.0 feet below grade, respectively. The depth of the boreholes was measured relative to the top of the concrete slab located adjacent to the area of excavation (the equivalent of the pre-excavation concrete surface). Groundwater was not encountered in any of the boreholes.

All of the soil samples were collected from the bottom of the boreholes at a depth of approximately six inches beneath the interface of the fill material and the underlying unexcavated material. The samples were collected using a percussion sampler lined with a 2-inch diameter, 6-inch long brass tube. Following sample collection, the ends of the brass tubes for these samples were sealed with aluminum foil and plastic endcaps. The brass tubes were then labeled, placed into ziplock baggies, and stored in a cooler with ice pending delivery to McCampbell Analytical, Inc. in Pacheco, California. McCampbell Analytical, Inc. is a State-accredited hazardous waste testing laboratory. Chain of custody procedures was observed for all sample handling.

The hand auger was thoroughly washed with an Alconox solution followed by a clean water rinse prior to use in each borehole. Following soil sample collection, the boreholes were filled with clean fill material. The soil generated during hand augering activities was placed onto the soil stockpile, pending appropriate disposal.

At the time that the soil samples were collected on August 29, 1996, an insulator oil sample designated as Oil-1 was obtained from PG&E construction manager Mr. Gary Pforr for the purposes of comparison with the soil stockpile and soil boring sample results. The oil sample was placed into a 1-liter glass amber bottle, labeled, and stored in a cooler with ice pending delivery to McCampbell Analytical, Inc. in Pacheco, California. Chain of custody procedures were observed for all sample handling.

Based on the stockpiled soil sample results, all of the soil samples collected from the boreholes (B1 through B5) were analyzed for CAM 17 metals using EPA approved methods, TPH-D using EPA Method 3510 in conjunction with Modified EPA Method 8015, and for PCBs using EPA Method 8080. In addition, at the request of Ms. Boscoe, two of the soil samples (B2 and B4) were analyzed for hexavalent chromium. A fuel fingerprint analysis was performed for the oil sample designated as Oil-1 using EPA Method 3510 in conjunction with Modified EPA Method 8015.

The laboratory analytical results of the soil samples (B1 through B5) collected from the boreholes show that no metals (including hexavalent chromium) were detected in any of the soil samples at concentrations exceeding 10 times their respective STLC values with the exception of lead in B4, which was detected at a concentration of 130 ppm. TPH-D was detected in boreholes B1 through B4 at concentrations of 22, 59, 550, and 780 parts per million (ppm), respectively. TPH-D was not detected in the soil sample from borehole B5. Review of the laboratory report for the TPH-D analysis shows that the TPH-D results for B2, B3 and B4 were identified as insulating oil, and that the TPH-D results for B1 were identified as diesel range or oil range compounds.

The laboratory analytical results of the fuel fingerprint for the insulator oil sample designated as Oil-1 shows that the laboratory identified the oil as being identical to the petroleum hydrocarbon compounds detected in the soil stockpile sample COMP A and in the soil boring soil samples B1 through B5.

PCBs were detected in boreholes B2, B3, and B4 at concentrations of 0.18, 0.64, and 1.4 ppm, respectively. The laboratory reported the PCB results in ug/kg or ppb. Review of the laboratory analytical report shows that the PCBs are identified as Aroclor 1260.

The TPH-D and PCB laboratory results of soil samples B1 through B5, are summarized in Table 2, and the CAM 17 metals laboratory results of soil samples B1 through B5 are summarized in Table 3. Copies of the laboratory analytical results and chain of custody documentation for soil samples B1 through B5 and for oil sample Oil-1 are attached with this report in Appendix B.

3.4 Air Monitoring

On September 5, 1996 AllPro personnel collected ambient air samples to characterize baseline air quality conditions for lead and chromium in the construction area where the transformer washer/recycling system piping was being installed. This work was performed in accordance with a request from PG&E. One air sample, designated as PG&E-1 was collected during the day immediately adjacent to the piping installation area on the western property line. In addition, on the same day a facility background air sample designated as PG&E-2 was collected for control purposes. The samples were collected to evaluate ambient air quality conditions during a full work shift. The sample collection locations are shown on Figure 2.

The samples were collected in accordance with NIOSH method 7082 and analyzed at Micro Analytical Laboratory, Inc. in Emeryville for total lead and total chromium. One blank sample was used for the PG&E-1 location. Micro Analytical Laboratory, Inc. is an AIHA-certified laboratory for lead and chromium analysis. Chain of custody documentation procedures was observed for all sample handling.

A weather station was also installed at the PG&E-1 location on September 5, 1996 to monitor wind direction and wind speed on an approximately hourly basis. The results of the monitoring showed the wind direction to be predominantly from the northwest with wind speeds of 3 to 5 mile per hour (MPH) in the morning, and wind speeds of 7 to 11 MPH in the afternoon.

The results of the air samples showed that lead was present in the air at both sample collection locations at concentrations less than the CalOSHA action level. Lead was not detected in the blank. Total chromium was not detected in the ambient air sample filters at either of the sample collection locations at concentrations exceeding the blank. Documentation of the air monitoring is presented in AllPro's Air Monitoring Report dated September 12, 1996. A copy of the Air Monitoring Report prepared by AllPro is attached with this report as Appendix C.

On September 25, 1996 air samples designated as PG&E-5-Pb and PG&E-5-PCB were collected during the day from adjacent to the facility driveway on the southern edge of the property to evaluate ambient lead and PCB air concentrations during the loading of the stockpiled soil. A weather station was also installed at the PG&E-5 location to monitor wind direction and wind speed. In addition, air samples designated as PG&E-4-Pb and PG&E-PCB were collected on the same day at the location where the background sample PG&E-2 was collected on September 5, 1996. The sample collection locations are shown on Figure 2.

Documentation of the sample collection and sample results will be presented as an addendum to this report.

During the day of the soil loading activities on September 25, 1996 real-time air monitoring for airborne dust was performed at the PG&E-5 sample location for health and safety purposes using an MIE PDM-3 Miniram dust monitor. The Miniram dust monitor is capable of detecting dust concentrations of up to 9.99 milligrams per cubic meter. The Miniram dust meter results ranged from 0.07 to 0.74 milligrams per cubic meter with an eight hour time weighted average of 0.27 milligrams per cubic meter. Documentation of the air dust monitoring will be provided with the Air Monitoring Report as an addendum to this report.

3.5 Soil Stockpile Removal and Disposal

On September 25, 1996, AllPro personnel loaded the stockpiled soil into a total of seven trucks for disposal. The estimated soil volume was 120 cubic yards, which was greater than the initial estimate of the stockpile based on visual analysis. Misting of the soil stockpile, the soil in the loader bucket, and the soil in the truck was performed to minimize dust resulting from the loading operation. No runoff occurred from the soil stockpile as a result of the misting activities. Personal protective equipment was used in accordance with the HASP in Appendix A during soil loading activities. Copies of the manifests for soil transportation and disposal will be provided as an addendum to this report. This will provide in addition to other data, exact soil volume disposed of.

3.6 Concrete Penetone Wash, Wipe Sample Collection and Analysis

Following removal of the stockpiled soil, the area where the soil had been stockpiled was scrubbed with Penetone. This work was performed at the request of PG&E. Penetone is an alkaline cleaner used for the removal of oil and PCBs. The water and Penetone were collected into a DOT-approved 55-gallon drum following the cleaning of the soil stockpile area. The area where the soil stockpile was located is shown on Figure 3.

Following the scrubbing of the soil stockpile area with Penetone, two wipe samples designated as WS1 and WS2 were collected from the concrete. The samples were collected onto cotton pads using hexane as a solvent. Each wipe sample area was approximately 100 square centimeters. The wipe sample collection locations are shown on Figure 3.

Photographs of the soil stockpile area were taken prior to and after cleaning the soil stockpile area with Penetone. Barricades and caution tape were left in place surrounding the stockpiled soil area pending receipt of the wipe sample results. The sample results for the wipe samples will be provided as an addendum to this report.

4.0 GEOLOGY AND HYDROGEOLOGY

Based on review of regional geologic maps from U.S. Geological Survey Professional Paper 943, "Flatland Deposits - Their Geology and Engineering Properties and Their Importance to Comprehensive Planning," by E.J. Helley and K.R. Lajoie, 1979 the subject site is underlain by fine grained alluvium (Qhaf). These deposits are described as typically consisting of unconsolidated plastic moderately to poorly sorted carbonaceous silt and clay.

Based on observations of the materials encountered in boreholes B1 through B5, the fill material in the area of investigation consists predominantly of gravel ranging from 0.25 to 1 inch in diameter to a depth of approximately 2.0 to 3.5 feet below grade. Underlying the fill material, the subsurface materials encountered in the boreholes consisted of dark brown silty clay with minor fine to medium sand.

It is AllPro's understanding that the depth to groundwater and the groundwater flow direction at the site are addressed in a report which was previously submitted to PG&E for the subject site.

5.0 DISCUSSION

Review of the laboratory analytical results for the soil stockpile sample indicates that the detected compounds which posed a potential health concern were insulator oil or stoddard solvent, PCBs and lead. The low concentration of xylenes reported by the laboratory is characteristic of stoddard solvent. Low concentrations of BTEX compounds may be present in stoddard solvent as a result of refinery distillation processes used for production or storage of stoddard solvent. Similarly, styrene is a common petroleum hydrocarbon compound and has been assumed to be associated with the stoddard solvent.

Review of the laboratory analytical results for the soil boring soil samples indicates that insulator oil and PCBs are present in the soil beneath the fill material in the area where excavation and pipe installation was performed.

An addendum will accompany this report which will include documentation of the transportation and disposal of the stockpiled soil, the wipe sample results for the area where the soil was stockpiled, and the results of the air monitoring which was performed on the day that the stockpiled soil was removed from the site.

It is AllPro's understanding that a work plan was submitted by PG&E to the Alameda County Department of Environmental Health for further investigation of petroleum hydrocarbons at the subject site. It is also AllPro's understanding that PG&E is presently waiting for agency approval of the work plan prior to proceeding with the proposed scope of work.

6.0 LIMITATIONS

This report was prepared solely for the use of PG&E. The content and conclusions provided by AllPro in this assessment are based on information collected during our investigation, which may include, but not be limited to, visual site inspections; interviews with the site owner, regulatory agencies and other pertinent individuals; review of available public documents; and our professional judgement based on said information at the time of preparation of this document. Any air samples results and observations presented herein are considered to be representative of the area of investigation.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information contained herein is brought to the attention of the appropriate regulatory agencies, where required by law.

This report has been prepared in accordance with generally accepted practices using standards of care and diligence normally practiced by recognized consulting firms performing services of a similar nature. AllPro is not responsible for the accuracy or completeness of information provided by other individuals or entities which is used in this report. This report presents our professional judgement based upon data and findings identified in this report and interpretation of such data based upon our experience and background, and no warranty, either express or implied, is made. The conclusions presented are based upon the current regulatory climate and may require revision if future regulatory changes occur.

September 30, 1996
Report 0117.R3

TABLE 1
STOCKPILE SOIL SAMPLE
SUMMARY OF LABORATORY ANALYTICAL RESULTS

Results in mg/kg (ppm)
(Sample Collected on August 19, 1996)

Analyte	COMP A Sample Result	STLC Value	TTLC Value
TPH-D	680	NA	NA
TPH-G	23	NA	NA
Benzene	ND	NA	NA
Toluene	ND	NA	NA
Ethylbenzene	ND	NA	NA
Xylenes	0.062	NA	NA
EPA 8240	ND, except styrene at 0.013	NA	NA
EPA 8270	ND	NA	NA
PCBs	1.4	NA	NA
LUFT Metals			
Cadmium	1.4	1.0	100
Chromium (total)	50	560	2500
Lead	180	5	1000
Nickel	54	20	2000
Zinc	220	250	5000
STLC Lead	6.4	NA	NA
TCLP Lead	ND	NA	NA

<u>Notes:</u>

TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
STLC = Soluble Threshold Limit Concentration.
TCLP = Toxicity Characteristic Leaching Procedure.
ND = Not Detected.
NA = Not Applicable.

TABLE 2
BOREHOLE SOIL SAMPLES
SUMMARY OF LABORATORY ANALYTICAL RESULTS

Results in mg/kg (ppm)
(Samples Collected on August 29, 1996)

Sample No.	TPH-D	PCBs
B1	22	ND
B2	59	0.18
B3	550	0.64
B4	780	1.4
B5	ND	ND

TPH-D = Total Petroleum Hydrocarbons as Diesel.
PCBs = Polychlorinated Biphenyls.
ND = Not Detected.
Results are reported in the laboratory report as ug/kg (ppb), and are reported in this summary table mg/kg (ppm).

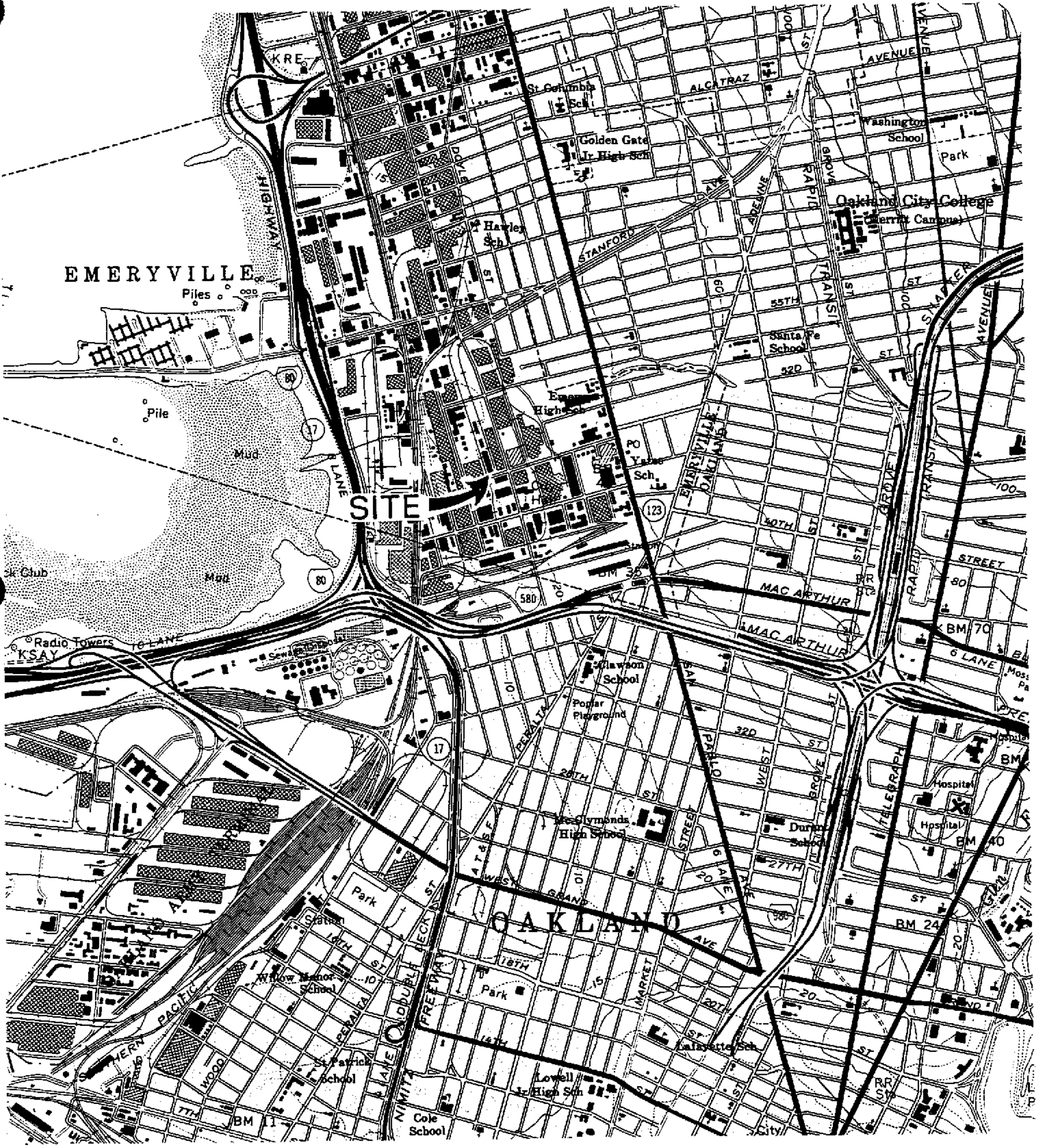
TABLE 3
BOREHOLE SOIL SAMPLES
SUMMARY OF LABORATORY ANALYTICAL RESULTS

Results in mg/kg (ppm)
(Samples Collected on August 29, 1996)

Analyte	Sample B1	Sample B2	Sample B3	Sample B4	Sample B5	STLC Value	TTLC Value
Antimony	ND	ND	ND	ND	ND	15	500
Arsenic	8.3	8.0	7.5	7.2	8.3	5	500
Barium	230	180	180	190	180	100	10000
Beryllium	ND	ND	ND	ND	ND	0.75	75
Cadmium	ND	ND	ND	0.92	ND	1.0	100
Chromium (total)	42	40	43	44	42	560	2500
Chromium (hexavalent)	NA	0.24	NA	0.17	NA	5	500
Cobalt	10	10	10	10	10	80	80000
Copper	33	35	32	38	33	25	2500
Lead	7.1	14	16	130	7.4	5	1000
Mercury	0.077	0.082	0.15	0.30	0.077	0.2	20
Molybdenum	ND	ND	ND	ND	ND	350	3500
Nickel	61	54	61	54	57	20	2000
Selenium	ND	ND	ND	ND	ND	1.0	100
Silver	ND	ND	ND	ND	0.97	5	5000
Thallium	ND	ND	ND	ND	ND	7	700
Vanadium	39	36	36	35	40	24	2400
Zinc	72	82	72	160	80	250	5000

STLC = Soluble Threshold Limit Concentration.
TCLP = Toxicity Characteristic Leaching Procedure.
ND = Not Detected.
NA = Not Analyzed.

ALLPRO ENVIRONMENTAL CORPORATION

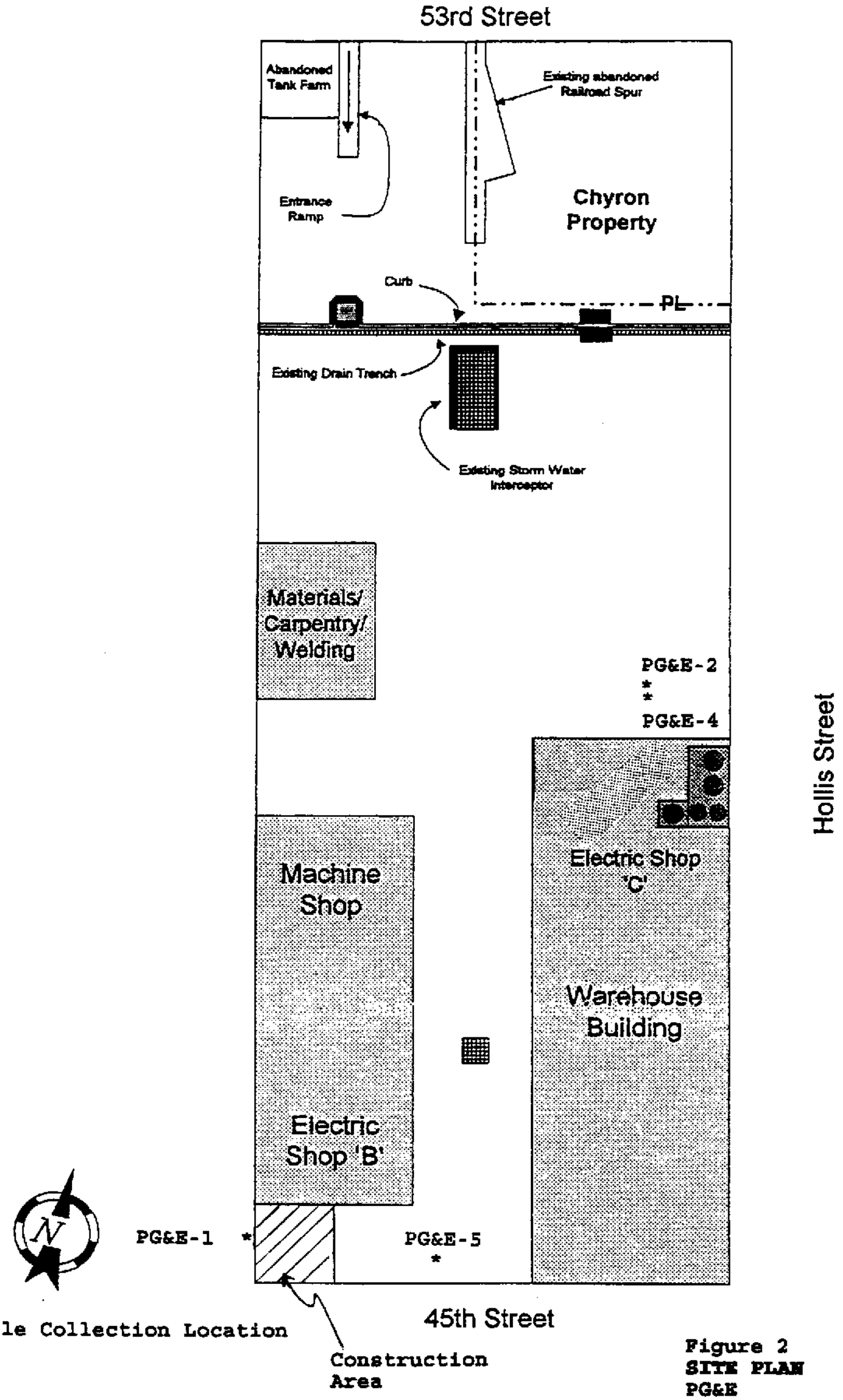


Base Map From
U.S. Geological Survey
Oakland West, Calif.
7.5 Minute Quadrangle
Photorevised 1980

North

0 1000 2000
Scale in Feet

Figure 1
SITE LOCATION MAP
PG&E
4525 Hollis Street
Emeryville, California

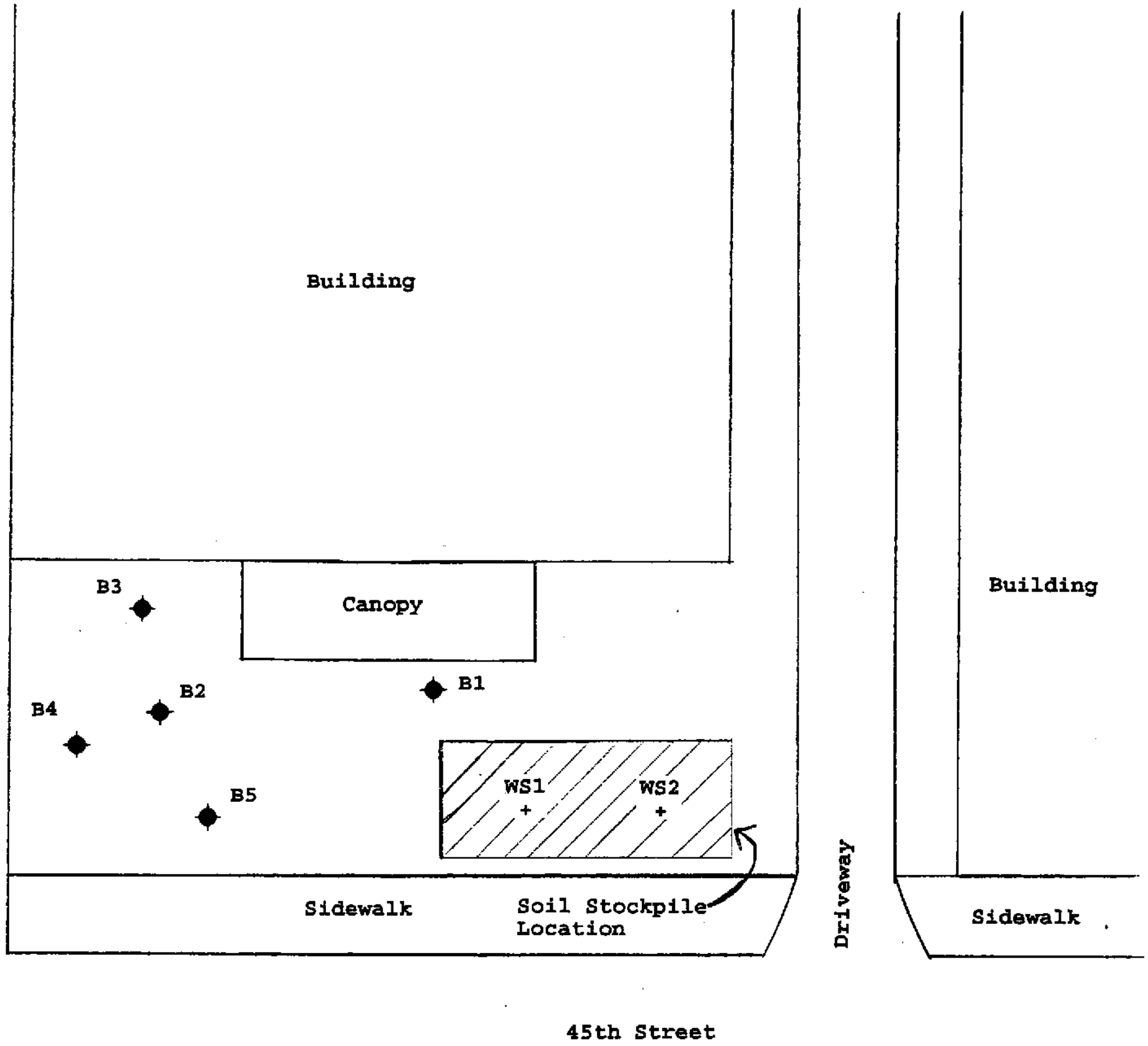


LEGEND

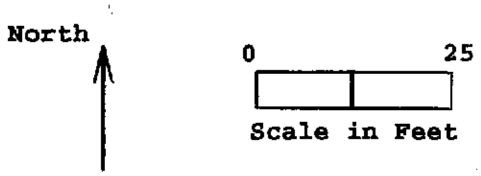
* Air Sample Collection Location

Base Map From
PG&E
Dated 3/14/95

Figure 2
SITE PLAN
PG&E
4525 Hollis Street
Emeryville, California



LEGEND
● Existing Soil Boring Location
\+ Wipe Sample Collection Location



Base Map From
AllPro Environmental
Corporation
Dated 8/29/96

Figure 3
SITE PLAN DETAIL
Borehole Sample
Collection Location
PG&E
4525 Hollis Street
Emeryville, California

HEALTH AND SAFETY PLAN
STOCKPILED SOIL LOADING, AIR MONITORING, CONCRETE CLEANING, AND WIPE SAMPLING

PG&E EMERYVILLE REPAIR FACILITY
4525 HOLLIS STREET
EMERYVILLE, CALIFORNIA

SEPTEMBER 20, 1996

Prepared for:
PG&E Emeryville Repair Facility
4525 Hollis Street
Emeryville, California

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- Material Safety Data Sheet: Lead
- Profile of Chemical of Concern: Lead
- Material Safety Data Sheet: Aroclor 1260 (PCB)
- Material Safety Data Sheet: Power Cleaner 155

APPENDIX C
- PG&E First Responders Guide to PCB/Mineral Oil Spills
- PG&E Line Crew's Response Guide to PCB/Mineral Oil Spills
- PG&E Supervisor's Response Guide to PCB/Mineral Oil Spills

APPENDIX D Polychlorinated Biphenyl (PCB) Information

September 20, 1996
HASP 0117.HSP

HEALTH AND SAFETY PLAN
STOCKPILE SOIL LOADING, AIR MONITORING, CONCRETE CLEANING, AND WIPE SAMPLING

PG&E EMERYVILLE REPAIR FACILITY
4525 HOLLIS STREET
EMERYVILLE, CALIFORNIA

1.0 INTRODUCTION

This Health and Safety Plan (HASP) addresses the hazards associated with the planned field activities associated with exposure to oil, lead, Polychlorinated Biphenyls (PCBs) and Penetone at the PG&E Emeryville repair facility site at 4525 Hollis Street, in Emeryville, California (the "Site").

This HASP shall presents baseline health and safety requirements for establishing and maintaining a safe working environment during the course of work with respect to petroleum hydrocarbons, lead, and PCBs at the Site. The planned field activities at the Site include the loading of oil, lead and PCB-impacted soil, air monitoring during field activities, cleaning the concrete where the soil is presently stockpiled with Penetone, and the collection of wipe samples of the concrete from the area where the concrete is cleaned. These activities will be performed under the supervision of AllPro Environmental Corporation (AllPro) personnel.

If work plan specifications change during or after the preparation of this HASP, or if site conditions differ as the result of more information, the AllPro Health and Safety Director shall be informed immediately and appropriate changes shall be made to this HASP.

At a minimum, all contractor/subcontractor personnel working on site must:

- have read, understood, and signed this HASP
- have completed all required appropriate training in Title 8 of the Code of California Regulations (CCR) 1532.1 (Lead In Construction Standard) and 5194 (Hazard Communication Standard).

At a minimum, all subcontractor personnel working on site must:

- provide their own health and safety equipment as indicated in this HASP, and comply with the minimum requirements established by this HASP. If the subcontractor has prepared his/her own HASP, it must minimally meet requirements contained herein and all applicable Federal, State, and local health and safety requirements.

This HASP shall be read and approved by the AllPro Health and Safety Director and AllPro Project Manager. Copies of this HASP shall be kept on site, easily accessible to all employees and government inspectors, and in the PG&E, and AllPro files.

This HASP was prepared using the following documents:

- 29 CFR 1910 -- Occupational Safety and Health Standards, 1990
- 29 CFR 1926 -- Safety and Health Regulations for Construction
- 29 CFR 1910.1000 -- OSHA Air Contaminants - Permissible Exposure Limits, 1990
- 29 CFR 1910.1025 -- OSHA Lead Standard
- Title 8, California Code of Regulations, Occupation Health and Safety Standards.
- American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values and Biological Exposure Indices for 1990 - 1991. Cincinnati, Ohio, ACGIH.
- California Department of Health Services (DHS), Toxic Substances Control Division (TSCD), Technical and Support Unit, Region 3, Los Angeles, California, August 1988. Site Safety Plan Guidance Document.
- National Institute for Occupational Safety and Health (NIOSH); Occupational Safety and Health Administration (OSHA); U.S. Coast Guard (USCG); U.S. Environmental Protection Agency (EPA), October 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. Washington D.C.: U.S. Government Printing Office.
- NIOSH/OSHA, 1981. Occupational Health Guidelines for Chemical Hazards.

- Sax, N. Irving, 1984, Dangerous Properties of Industrial Materials, 6th edition, Van Nostrand Reinhold Company, Inc., New York, New York.
- U.S. EPA, Office of Emergency and Remedial Response, Hazardous Response Support Division, November 1984. Standard Operating Safety Guides.

2.0 SITE CHARACTERISTICS

Site Name: PG&E Emeryville Repair Facility Site
Site Address: 4525 Hollis Street, Emeryville, California

2.1 Background

The area of proposed activities is located at the southwestern corner of the facility, between 45th Street and the south side of the Machine shop.

It is AllPro's understanding that the subject site has been used continuously for industrial activities since the 1920's. It is also AllPro's understanding that PG&E obtained the site in approximately the 1920's. The area of activity discussed in this HASP is located adjacent to railroad tracks which have been estimated by PG&E personnel to have been at their present location since the early 1900's.

The subject site is presently used by PG&E for transformer servicing. It is AllPro's understanding that transformers containing PCBs are presently processed exclusively at the northern end of the facility. It is also AllPro's understanding that the construction area discussed in this HASP was formerly used as a corrosive dip tank area for removal of paint from transformers.

In August, 1996 AllPro personnel removed concrete and soil in the southwestern portion of the facility for the purpose of installing piping for a treatment system at the facility. Soil excavated during the trenching activities was stockpiled onsite on the concrete and covered with visqueen. Soil samples were collected from the soil stockpile and from the bottom of the trenches for the piping by AllPro personnel for contaminant presence evaluation. The analytical results of the soil samples showed that low concentrations of PCBs (less than 1.5 ppm), low concentrations of lead (less than 180 ppm) and petroleum hydrocarbons which resemble insulator oil were present at concentrations up to 780 ppm.

In addition, baseline air monitoring was performed for lead and chromium on September 5, 1996. The air monitoring results showed that airborne chromium and lead concentrations were below the action level for these compounds at the locations monitored.

3.0 WORK DESCRIPTION

The scope of work addressed by this HASP includes stockpiled soil loading for disposal purposes, air monitoring, concrete cleaning with Penetone, and wipe sampling of the area where the concrete was cleaned.

4.0 KEY PERSONNEL AND RESPONSIBILITIES

4.1 Site Safety Personnel

Name	Responsibilities
Pat Falk	Project Manager
Pat Falk	Site Safety Officer
Scott Williams	Corporate Health and Safety Director

4.2 AllPro Personnel and Responsibilities

The responsibilities of the AllPro personnel listed in Section 4.1 are outlined below.

4.2.1 AllPro Project Manager

The AllPro Project Manager, Pat Falk, has the ultimate responsibility for the health and safety of personnel on site. As part of his duties, Mr. Falk shall be responsible for:

- Keeping the AllPro Health and Safety Director informed of project developments.
- Ensuring that on-site AllPro personnel receive the proper training, and are informed of potential hazards anticipated at the Site and procedures and precautions to be implemented on the job.
- Ensuring that contractors and subcontractors are informed of the expected hazards and appropriate protective measures at the Site (Subcontractors should also be given a copy of AllPro's HASP for review).
- Ensuring that resources are available to provide a safe and healthy work environment for AllPro personnel.

4.2.2 Corporate Health and Safety Director

The AllPro Health and Safety Director, Scott Williams, shall be responsible for:

- Monitoring the health and safety impacts of this project for on-site AllPro personnel.
- Assessing the potential health and safety hazards at the Site.
- Recommending appropriate safeguards and procedures.
- Modifying the HASP, when necessary.
- Approving changes in safeguards used or operating procedures employed at the Site.

The AllPro Health and Safety Director shall have the authority to:

- Require that additional safety precautions or procedures be implemented.
- Order an evacuation of the Site, or portion of the Site, or shut down any operation, if he believes a health or safety hazard exists.
- Deny unauthorized personnel access to the Site.
- Require that any worker obtain immediate medical attention.
- Approve or disallow any proposed modifications to safety precautions or working procedures.

4.2.3 AllPro Site Safety Officer

The AllPro Site Safety Officer (SSO), Pat Falk, has fulfilled the health and safety training requirements pursuant to Title 8 CCR 1532.1 and 29 CFR 1910.120, as appropriate.

The SSO, or a trained designated alternate, will be present at the Site during work activities. The SSO shall be notified of and approve activities in which persons may be reasonably expected to be exposed to contaminated soils.

The SSO shall be responsible for:

- Ensuring that on-site AllPro personnel comply with the requirements of the HASP.
- Limiting access to the Site, as needed.
- Reporting unusual or potentially hazardous conditions to the AllPro Health and Safety Director.
- Reporting injuries, exposures, or illnesses to the AllPro Health and Safety Director.
- Communicating proposed changes in work scope or procedures to the AllPro Health and Safety Director for approval.
- Recommending to the AllPro Health and Safety Director additional safety procedures or precautions that might be implemented.

The SSO shall have the authority to:

- Order an evacuation of the Site, or portion(s) of the Site, or shut down any operation if he believes a health or safety hazard exists.
- Deny site access to unauthorized personnel.
- Require that any worker, including the contractor's or subcontractor's personnel, obtain immediate medical attention.

5.0 HAZARD ANALYSIS

Potential chemical and physical hazards associated with the stockpiled soil loading, air monitoring, concrete cleaning, and wipe sampling at the Site include the following:

- Chemical hazards (oil, lead, PCBs and Penetone)
  - respiratory
  - ingestion
  - dermal
- Physical hazards
  - traffic
  - heavy equipment

- noise
- heat stress

Characteristics and descriptions of the chemical and physical hazards are provided below. Procedures to protect workers from chemical and physical hazards are discussed in Section 6.0.

5.1 Chemical Hazards

Based on sample collection activities at the Site, the anticipated chemical hazards at the site result from exposure to soil containing petroleum hydrocarbons resembling insulating oil, and low levels of lead and PCBs. The use of Penetone to clean the concrete where the stockpiled soil was located provides an additional chemical exposure hazard. Inhalation, ingestion and dermal exposure are the primary exposure pathways.

The primary routes of exposure for petroleum hydrocarbons are dermal and ingestion, for lead are inhalation and ingestion, for PCBs are ingestion and dermal, and for Penetone is dermal.

A Material Safety Data Sheet (MSDS) for each of diesel oil, lead, PCBs and Penetone is attached with this HASP. In addition, a Chemical Of Concern Profile for lead is attached with this HASP.

5.1.1 Chemical Description and Effects of Exposure to Diesel Oil

Diesel oil is an oil fraction available in various grades as required by different engines or applications. The composition of diesel oil varies in ratios of predominantly aliphatic, olefinic, cycloparaffinic, and aromatic hydrocarbons, and additives.

Ingestion of diesel oil can lead to systemic effects such as gastrointestinal irritation, vomiting, diarrhea, and in severe cases drowsiness and central nervous system depression, progressing to coma and death. Dermal exposure may result in moderate irritation to the skin. Prolonged or repeated contact can result in defatting and drying of skin which may result in severe irritation and dermatitis, and may cause mild skin sensitization.

There is no action level or PEL for diesel oil. A Material Safety Data Sheet for diesel oil is attached with this HASP in Appendix B.

5.1.2 Chemical Description and Effects of Exposure to Lead

Inorganic lead is a bluish-white or grey, odorless, insoluble, metal solid.

Exposure to lead can cause loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremors, numbness, dizziness, hyperactivity and colic. A condition called acute encephalopathy may arise from acute exposures which develops quickly to seizures, coma and death. The target organs of lead are gastrointestinal tract, kidneys, blood and gingival tissue. Lead is considered a reproductive toxin.

The Action Level for lead is 30 ug/m^{3}. The PEL for lead is 50 ug/m^{3}. A Material Safety Data Sheet for lead is attached with this HASP in Appendix B. In addition, a Chemical Profile of Concern for lead is attached with this HASP in Appendix B.

5.1.3 Chemical Description and Effects of Exposure to PCBs

PCBs are clear, amber-colored, or dark oily liquids. They may have a faint smell like motor oil, and some contain chlorobenzenes which make them smell like mothballs.

Exposure to PCBs can cause swelling of the eyelids, burning of the eye, and excessive eye discharge, burning sensation and oedema of face and hands, simple erythematous eruptions with pruritus, acute eczematous contact dermatitis (vesiculo-erythematous eruptions) chloracne (an extremely refractory form of acne), hyperpigmentation of skin and mucous membranes (palpebral conjunctiva, gingiva), discoloration of fingernails and thickening of the skin. The target organ of PCBs are blood, and liver.

There is no action level or PEL for PCBs. Two Material Safety Data Sheets for the type of PCBs identified at the site (Aroclor 1260) are attached with this HASP in Appendix B. In addition, literature concerning the health affects of PCBs is attached as Appendix C.

5.1.4 Chemical Description and Effects of Exposure to Penetone

Penetone is a nonflammable, nontoxic, biodegradable, highly concentrated, low foaming clear liquid alkaline cleaner with a mild odor formulated for fast penetration and removal of PCB contaminants from a wide variety of surfaces. General cleanup application of Penetone usually involves diluting the Penetone with water. The potential health effects from exposure to Penetone include irritation to the eyes on contact only, dry skin and dermatitis from prolonged contact with the skin, aggravation of an existing dermatitis condition from prolonged contact, respiratory tract irritation if spray mist is inhaled, and irritation to the digestive tract and diarrhea if ingested.

There is no action level or PEL for Penetone. A Material Safety Data Sheet for Penetone is attached with this HASP in Appendix B.

5.2 Physical Hazards

The primary potential physical hazards at the Site during the planned activities result from traffic, noise, the use of heavy machinery and heat stress from the use of PPE.

Characteristics and descriptions of the physical hazards are provided below. Procedures to protect workers from physical hazards are discussed in Section 6.0.

5.2.1 Description Traffic Hazards

Trucks will be loaded with the stockpiled soil in the driveway between the Machine Shop and the Warehouse Building. The trucks will then exit the facility turning left onto 45th Street. Potential hazards associated with being struck by a moving vehicle exist at the time that the trucks are driving at the facility and at the time that the trucks are exiting the facility.

5.2.2 Description of Noise Hazards

Noise hazards result from exposure to elevated noise sources which will consist of the heavy equipment used to load the soil stockpile into the trucks at the facility.

5.2.3 Description of Heavy Equipment Hazards

Heavy equipment hazards are related to the use of a front end loader or backhoe to transfer the soil stockpile to the trucks for removal from the site. The potential hazards include being struck by the equipment bucket during loading activities, being buried by soil during loading of the truck, and being struck by the heavy equipment during loading activities.

5.2.4 Description of Heat Stress Hazards

Heat stress could pose a hazard to on-site personnel due to the need for personal protective equipment and the potentially high mid-day temperatures. Physical signs of heat stress include the following.

- Heat rash. Heat rash may be caused by continuous exposure to heat or humid air. Workers may develop rashes on body areas that are exposed to constant dampness caused by tight fitting gloves or boots. Heat rash is not usually serious and is most often transitory in nature.

- Heat cramps. Heat cramps are caused by heavy sweating with resultant loss of electrolytes. Heat cramps can be very painful but are usually short in duration and cause no permanent disability.

- Heat Exhaustion. Heat exhaustion results from increased stress on various body organs caused by reduced blood circulation due to fluid loss from dehydration and/or cardiovascular insufficiency, and electrolyte imbalance. Heat exhaustion may include nausea, dizziness, and fainting. In heat exhaustion, the worker sweats profusely and has cool, clammy or moist skin.

- Heat Stroke. Heat stroke is the most serious heat related illness. Heat stroke is <u>immediately life threatening.</u> Heat stroke results when all of the body's cooling mechanisms have been completely exhausted. The victim ceases to sweat and his body temperature escalates at a rapid rate. Signs and symptoms of heat stroke include: Red, hot, and <u>usually dry skin - lack of, or reduced perspiration</u> - nausea - dizziness and confusion - strong, rapid pulse - possible coma.

6.0 WORK REQUIREMENTS

The primary routes of exposure for petroleum hydrocarbons are dermal and ingestion, for lead are inhalation and ingestion, for PCBs are ingestion and dermal, and for Penetone is dermal. Based upon the existing data for petroleum hydrocarbons, lead, PCBs and Penetone in soil at the Site, it is not anticipated that these compounds will create a significant health issue.

Procedures to control exposure to potential chemical hazards are discussed below under the sections titled Respiratory Protection, Ingestion Protection, Dermal Protection and Personal Protective Equipment. Photographs of the soil stockpile area will be taken before and after soil stockpile removal.

6.1 Dust Control

To minimize airborne dust during soil loading, soil should be pre-misted as sections of tarp are removed for soil disposal. Only the soil section destined for immediate removal by earth moving equipment should be exposed at a time, so that removal soil can remain moist. If this is not practical and the entire tarp must be removed at once, the entire stockpile should be misted so that the surface remains moist while the entire removal job takes place.

During stockpiled soil loading, misting should continue for each section of soil loaded into waiting hazardous waste transporter vehicles. Truck drivers are required to move out of the stockpile area and upwind until the vehicle is loaded and ready for tarping.

Misting should be performed so that dust is controlled, but not so much as to create a water runoff issue. Water runoff which does occur at the site will be diked using a lipophilic boom or sock, which will be later disposed of as PCB-contaminated solids. The PCB concentration should be assumed less than 5 ppm, as is the case for the soil. All care should be taken to prevent an offsite release of water runoff from the site. In the event this happens the Construction Engineer (Gary Pforr) must be contacted as soon as possible, so that proper notification and cleanup measures can ensue.

Diking of the site perimeter will be performed as a preventive measure.

Truck beds to receive contaminated soil will be tarped to protect the truck bed from contamination. All precautions will be taken to prevent an over-road release of contaminated runoff from trucks.

Truckloads of soil must be securely tarped to prevent any release of substance over the road. PG&E, drivers and contractor will inspect each truck prior to leaving the site, to assure that tarps are secure. Trucks must have current DOT certification as a hazardous waste transporter.

Trucks will contain proper paperwork, including the DOT guide for PCBs, as well as proper materials for immediate containment of an over-road release or immediate access to over-road assistance to properly contain such a release.

6.2 Concrete Cleaning and Wipe Sample Collection

A Penetone scrubbing and rinse of the concrete will be performed for the area where the soil was stockpiled following removal of the soil stockpile. PG&E procedures will be followed, in accordance with Appendix D. Photographs of the stockpile area will be taken before and after cleanup. Post-cleanup grid sampling to verify clean concrete will not be required. However, two wipe samples will be collected to verify that the Penetone scrubbing activities were successful.

Once an employee has undergone dry decon, he can no longer enter the "hot zone" until it has been verified clean through wipe samples. The area must remain barricaded for the same period of time.

PG&E considers a site with PCB concentrations of less than 5 ppm to be designated as a non-PCB contaminated site. PG&E does not require that AllPro and subcontractor personnel follow PPE requirements for PCBs. However, the use of upgraded PPE will be used as a safety precaution.

Soil and other debris will be disposed of as oily-solids, or contaminated soil. AllPro will drum soils and debris following PG&E protocol, for subsequent disposal by PG&E.

6.3 Air Monitoring

Inhalation hazards due to dust will be continuously monitored with a dust monitor during soil loading operations.

6.4 Respiratory Protection

Based upon the anticipated hazards and the use of dust control procedures, respiratory protection will not be required. If desired, employees may don dust masks or respirators. All such employees will be properly fit tested, medically certified for respirator use, and shall conform to requirements of the employers written respiratory protection program.

6.5 Ingestion Protection

Eating, drinking, smoking, use of tobacco products and application of cosmetics will not be permitted in the work area so as to minimize the potential for ingestion of lead. Eating, drinking, smoking, use of tobacco products and application of cosmetics will be performed outside of the work area after dry decontamination and washing of hands and face.

6.6 Dermal Protection

Unless adequate precautions are taken, petroleum hydrocarbons, lead, PCBs or Penetone may contact the skin or clothing. When the potential physical contact with chemicals of concern is possible, protective clothing will be worn by Site personnel. Protective clothing to minimize dermal exposure will include Solvex gloves, tyvek coveralls, booties, and goggles.

6.7 Personal Protective Equipment

Employees engaged in excavation and truck loading work will be wearing tyvek suites, Solvex gloves, goggles and booties.

Respirators will be used in accordance with section 6.2 of this HASP.

6.8 Action Levels for a Temporary Stop Work

The SSO shall impose a temporary stop work and contact the AllPro Health and Safety Director immediately if the following conditions are observed, or if there is a question about site conditions:

- uncontrolled dust generation
- indications of heat stress
- changes in the general health profile of on-site personnel

6.7 Protection Against Physical Hazards

6.7.1 Protection Against Traffic Hazards

Drivers are to either remain in their cabs or outside of the exclusion zone during soil loading. Tarping of the truck will be performed after the soil has been loaded. A traffic control person will be present to direct traffic when trucks are entering onto 45th Street. The traffic control person will wear an orange traffic vest. All trucks will adhere to facility speed limits while on site.

6.7.2 Protection Against Noise Hazards

During heavy equipment operation, hearing protection will be worn by all personnel located within the work area.

6.7.3 Protection Against Heavy Equipment Hazards

To prevent injury from heavy equipment hazards, non-essential personnel will remain outside of the work area when soil is being loaded. All personnel are to watch for the soil loading equipment when in the work area, and to stay at least 15 feet away from the soil loading equipment when the soil loading equipment is being operated. Do not stand beneath the bucket of the soil loading equipment when the soil is being placed into the truck.

6.7.4 Protection Against Heat Stress Hazards

Heat stress could pose a hazard to on-site personnel due to the potential need for personal protective equipment and the potentially high mid-day temperatures. The best treatment for heat stress is prevention of heat stress. Watch for signs of heat stress and ensure that all employs subject to heat stress drink adequate quantities of fluids containing electrolytes.

6.8 Signs

The following warning signs will be posted on site in each work area where an employee may be exposed to petroleum hydrocarbons, lead or PCB's.

- Proposition 65 warning signs.

7.0 WORK ZONE AND DECONTAMINATION PROCEDURES

The site will be controlled to reduce the possibility of employee exposure to any contaminants present and to limit contaminant transport from the site by personnel or equipment. In addition, site control will be implemented to prevent unauthorized personnel from being exposed to potential hazards in the work areas.

Site control measures will be implemented for the following activities.

- stockpiled soil loading.
- air monitoring.
- concrete cleaning.
- wipe sampling.

7.1 Control

The area where work will take place, will be properly marked and cordoned off so that PG&E employees are discouraged from entering the work area. Three foot buffer zone around the working area will be cordoned off. The possibility of exposure or translocation of contaminants will be reduced or eliminated in a number of ways, including:

- setting security or physical barriers at control points to regulate access to and/or exclude unnecessary personnel from the general area,

- minimizing the number of personnel and equipment on site consistent with effective operations,

- minimizing the airborne dispersion of contaminants,

- implementing appropriate decontamination procedures for both equipment and personnel.

7.2 Field Operations Work Areas

Work areas (zones) will be established based on anticipated contamination. Within these zones, prescribed operations will occur utilizing appropriate Personal Protective Equipment (PPE). Movement between areas will be controlled at checkpoints. The zones are identified as the exclusion zone and the support zone.

7.2.1 Exclusion Zone

The Exclusion Zone is the area which contains potentially hazardous substances. Within this area, the prescribed protection must be worn by any personnel upon entering. An entry checkpoint will be established at the periphery of the exclusion zone to control the flow of personnel and equipment between contiguous zones, and to guarantee that the procedures established to enter and exit the zones are followed.

7.2.2 Support Zone

The Support Zone is the area which is considered to be free of potentially hazardous substances. It contains the Command Post for field operations and other elements necessary to support site activities. Normal street or work clothes are the appropriate apparel to be worn in this area.

Air monitoring has shown that with adequate dust control inhalation hazard can be considered to be not significant. Control of PCBs and lead via hygiene controls is recommended for the Support Zone.

7.3 Hygiene Facilities and Practices

PG&E will provide adequate hand washing facilities for use by employees exposed to dust or chemical hazards. AllPro will assure that employees wash their hands and face prior to eating and at the end of the work-shift. Dry decontamination will take place before using PG&E washing facilities.

7.4 Decontamination Procedures

Employees engaged in the soil removal and cleanup effort will be wearing protective equipment as described above. Dry decontamination will be performed in a predesignated area within, but just inside, the barricaded area. Dry decon can be accomplished by employees removing all protective equipment, and placing them into a DOT-approved drum designated for this wastestream. The drum will be immediately outside the decon area, and closed, labeled and placed in the PCB waste storage area. All contaminated solids used as runoff prevention, and other such contaminated materials will be drummed and stored for disposal in a similar manner.

Once an employee has undergone dry decon, he can no longer enter the "hot zone" until it has been verified clean through wipe samples. The area must remain barricaded for the same period of time.

After equipment decontamination has been performed, all personnel who were involved in work activities will perform dry decontamination procedures for PPE. Dry decontamination consists of taking off the PPE and putting it into DOT approved 55-gallon drums. Following dry decontamination, employees will wash their hands and faces.

8.0 EMERGENCY PROCEDURES

Medical/General Service Numbers

Police Department	911
Fire Department	911
Ambulance	911
PG&E (Gary Pforr) internal	455-5764

Hospitals

Two hospitals are identified in this HASP. They are as follows.

o Alta Bates Hospital 2450 Ashby Avenue Berkeley, California	(510) 204-4444
o Summit Medical Hospital 350 Hawthorne Avenue Oakland, California	(510) 655-4000

Figure 1 showing the Site location and the route to two different hospitals is presented in Appendix A.

The directions to ALTA BATES HOSPITAL are as follows.

From the Site, turn left onto 45th Street and proceed east on 45th Street to San Pablo Avenue. Turn left on San Pablo Avenue and proceed until you reach Ashby Avenue. Turn right on Ashby Avenue. The hospital is on the right hand side at 2450 Ashby Avenue, after crossing Telegraph Avenue.

The directions to SUMMIT MEDICAL HOSPITAL are as follows.

From the Site, turn left onto 45th Street and proceed east on 45th Street to San Pablo Avenue. Turn right on San Pablo Avenue and proceed until you reach West MacArthur Blvd. Turn left on West MacArthur Blvd. and proceed until you reach Telegraph Avenue. Turn right on Telegraph and proceed until you reach Hawthorne Avenue. Turn left on Hawthorne Avenue. The hospital is on the right hand side at 350 Hawthorne Avenue.

9.0 MEDICAL MONITORING

AllPro personnel performing work the work areas where hazards have been identified will be enrolled in a current medical monitoring program in accordance with 29 CFR 1910.120 requirements.

In the event that respiratory protection is required, a signed physician's statement qualifying the individual for the work to be performed will be required as part of the medical monitoring program.

10.0 TRAINING PROGRAM

1. For all employees who are subject to exposure to lead at or above the action level on any day, the employer shall provide a training program in accordance with Title 8 CCR 1532.1 (l).

2. The AllPro SSO shall have fulfilled all appropriate training requirements indicated by Title 8 CCR 1532.1 (l).

3. A site safety meeting to review this HASP will be held before field activities begin. All AllPro personnel and contractor/subcontractor employees shall receive, at a minimum, the following information:

- the names of personnel and alternates responsible for site safety and health
- safety, health, and other hazards at the Site
- instruction in the use of personal protective equipment
- employee work practices to minimize risks from on-site hazards
- instruction in the safe use of engineering controls and equipment on site
- site control measures
- emergency plans

11.0 SIGNATURES

11.1 Health and Safety Preparation

This HASP was prepared by Paul H.King on September 20, 1996.

11.2 AllPro Review and Approval

This HASP is approved by the following AllPro personnel:

Scott Williams
Corporate Health and Safety Director

9/24/96
Date

Pat Falk
Project Manager
& Site Safety Officer

9/21/96
Date

11.3 Contractor and Subcontractor Personnel

Contractor and Subcontractor Agreement:

1. Contractor certifies that the following personnel noted below to be employed have met the requirements set forth for worker health and safety identified in CCR Title 8 and other applicable standards.

2. Contractor certifies that in addition to meeting the Title 8 requirements, it has received a copy of this HASP, and will ensure that its employees are informed and will comply with both Title 8 requirements and the guidelines in this HASP.

3. Contractor further certifies that it has read, understands and will comply with all provisions of this HASP, and it will take full responsibility for the health and safety of its employees.

Contractor	Signature	Date
AllPro Env		9-25-96
AllPro Env		9-25-96
Allpro Env		9-25-96
AllPRO ENV. CORP		9/25/96
AllPro ENV. CORP.		9/25/96
	Paul H. King	9/25/96
PG&E		9/25/96
P&D		9/25/96

12.0 HASP AMENDMENTS

HASP amendments should include reference to the section being amended and the date of the amendment. Make additional copies of this page, as necessary.

12.1 HASP Amendment

1) Change Acting Project Manager / Site Safety Officer To Mr. Michael Frick

12.2 AllPro Review and Approval

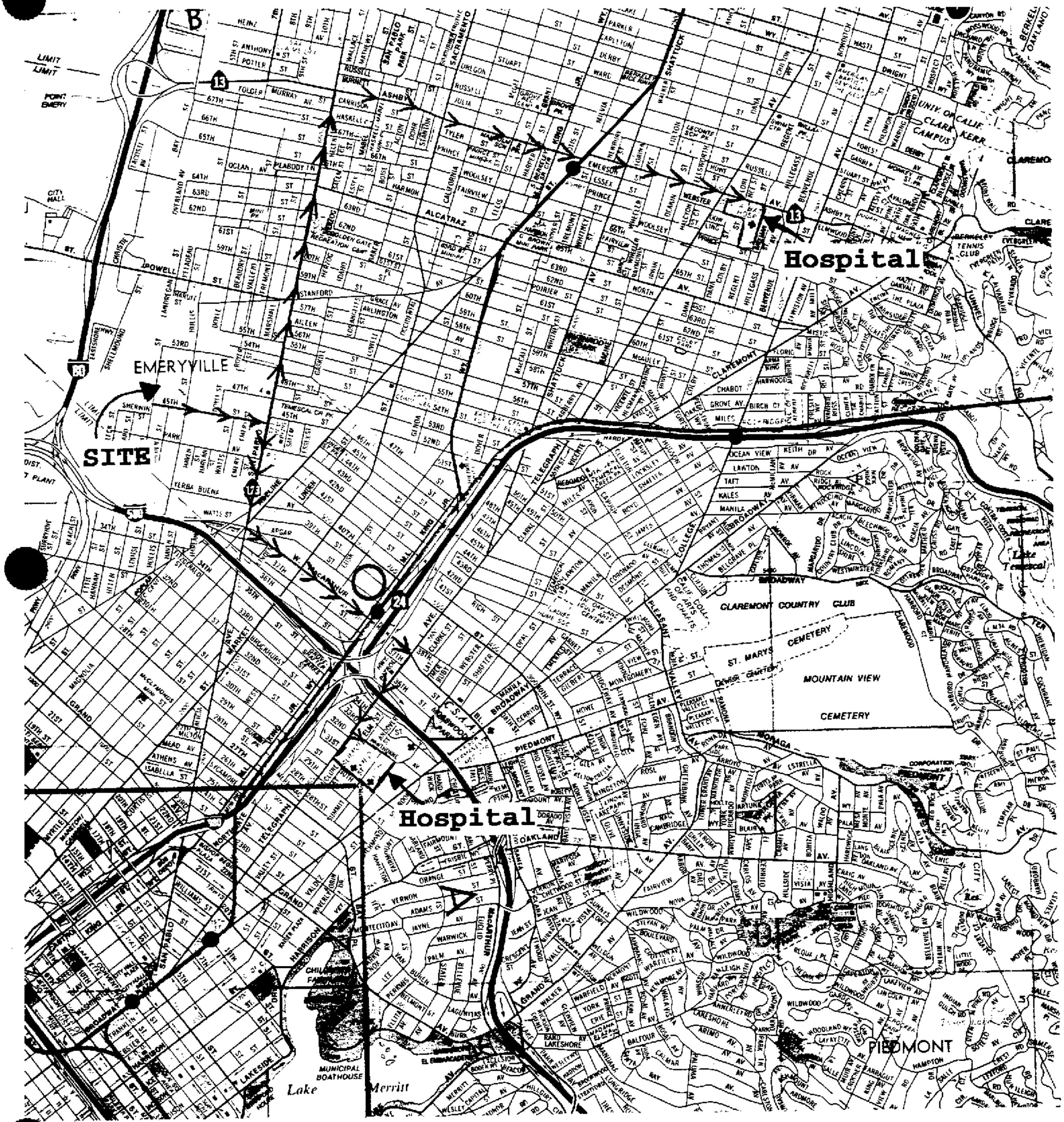
This HASP amendment is approved by the following AllPro personnel:

Scott Williams
Corporate Health and Safety Director

Date 9/24/96

Pat Falk
Project Manager
& Site Safety Officer

Date 9/24/96



Base Map From
California State
Automobile Association #2078
Oakland, California

North

0 2000
Scale in Feet

Figure 1
SITE LOCATION MAP
PG&E
Electric Shop C
4525 Hollis Street
Emeryville, California

APPENDIX B

MATERIAL SAFETY DATA SHEETS

- Diesel Oil
- Lead
- Aroclor 1260 (PCBs)
- Penetone

CHEMICAL PROFILE OF CONCERN

- Lead

Shell

MATERIAL SAFETY DATA SHEET

MSDS NUMBER ▶ 52,303-3 PAGE 1

97367 (4-85)

24 HOUR EMERGENCY ASSISTANCE	**GENERAL MSDS ASSISTANCE**
SHELL: 713-473-9461 CHEMTREC: 800-424-9300	SHELL: 713-241-4819

BE SAFE
READ OUR PRODUCT SAFETY INFORMATION
...AND
PASS IT ON
(PRODUCT LIABILITY LAW REQUIRES IT)

ACUTE HEALTH *	FIRE	REACTIVITY	HAZARD RATING ▶
2	2	0	LEAST - 0 SLIGHT - 1 MODERATE - 2 HIGH - 3 EXTREME - 4

*For acute and chronic health effects refer to the discussion in Section III

SECTION I NAME

PRODUCT ▶	SHELL AUTO DIESEL
CHEMICAL NAME ▶	DIESEL OIL
CHEMICAL FAMILY ▶	PETROLEUM HYDROCARBON
SHELL CODE ▶	31100

SECTION II-A PRODUCT/INGREDIENT

NO.	COMPOSITION	CAS NUMBER	PERCENT
P	SHELL AUTO DIESEL	68334-30-5	100

SECTION II-B ACUTE TOXICITY DATA

NO.	ACUTE ORAL LD50	ACUTE DERMAL LD50	ACUTE INHALATION LC50
P	NOT AVAILABLE		

SECTION III HEALTH INFORMATION

THE HEALTH EFFECTS NOTED BELOW ARE CONSISTENT WITH REQUIREMENTS UNDER THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200).

EYE CONTACT
BASED ON ESSENTIALLY SIMILAR PRODUCT TESTING LIQUID IS PRACTICALLY NONIRRITATING TO THE EYES.

SKIN CONTACT
BASED ON ESSENTIALLY SIMILAR PRODUCT TESTING LIQUID IS PRESUMED TO BE MODERATELY IRRITATING TO THE SKIN. PROLONGED OR REPEATED LIQUID CONTACT CAN RESULT IN DEFATTING AND DRYING OF THE SKIN WHICH MAY RESULT IN SEVERE IRRITATION AND DERMATITIS. MAY CAUSE MILD SKIN SENSITIZATION. RELEASE DURING HIGH PRESSURE USAGE MAY RESULT IN INJECTION OF OIL INTO THE SKIN CAUSING LOCAL NECROSIS.

INHALATION
INHALATION OF VAPORS OR MIST MAY CAUSE MILD IRRITATION TO THE UPPER RESPIRATORY TRACT. HIGH CONCENTRATIONS MAY RESULT IN CENTRAL NERVOUS SYSTEM DEPRESSION. INHALATION OF HIGH LEVELS OF MIST MAY RESULT IN CHEMICAL PNEUMONITIS.

INGESTION
INGESTION OF PRODUCT MAY RESULT IN VOMITING; ASPIRATION (BREATHING) OF VOMITUS INTO THE LUNGS MUST BE AVOIDED AS EVEN SMALL QUANTITIES MAY RESULT IN ASPIRATION PNEUMONITIS.

SIGNS AND SYMPTOMS
IRRITATION AS NOTED ABOVE. SKIN SENSITIZATION (ALLERGY) MAY BE EVIDENCED BY RASHES, ESPECIALLY HIVES. EARLY TO MODERATE CNS (CENTRAL NERVOUS SYSTEM) DEPRESSION MAY BE EVIDENCED BY GIDDINESS,

HEADACHE, DIZZINESS AND NAUSEA; IN EXTREME CASES, UNCONSCIOUSNESS AND DEATH MAY OCCUR. LOCAL NECROSIS IS EVIDENCED BY DELAYED ONSET OF PAIN AND TISSUE DAMAGE A FEW HOURS FOLLOWING INJECTION. ASPIRATION PNEUMONITIS MAY BE EVIDENCED BY COUGHING, LABORED BREATHING AND CYANOSIS (BLUISH SKIN); IN SEVERE CASES DEATH MAY OCCUR.

A[illegible]VATED MEDICAL CONDITIONS
PREEXISTING SKIN AND RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT. PREEXISTING SKIN OR LUNG ALLERGIES MAY INCREASE THE CHANCE OF DEVELOPING INCREASED ALLERGY SYMPTOMS FROM EXPOSURE TO THIS PRODUCT.

OTHER HEALTH EFFECTS
KIDNEY DAMAGE MAY RESULT FOLLOWING ASPIRATION PNEUMONITIS. THE RESULTS OF ANIMAL BIOASSAYS ON MIDDLE DISTILLATE FUELS SHOW THAT PROLONGED DERMAL CONTACT PRODUCES A WEAK TO MODERATE CARCINOGENIC ACTIVITY.

SEE SECTION VI FOR ADDITIONAL HEALTH INFORMATION.

SECTION IV OCCUPATIONAL EXPOSURE LIMITS

NO.	OSHA PEL/TWA	PEL/CEILING	ACGIH TLV/TWA	TLV/STEL	OTHER
P	*				

* NO OSHA PEL OR ACGIH TLV HAS BEEN ESTABLISHED.

SECTION V EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
FLUSH EYES WITH WATER. IF IRRITATION OCCURS, GET MEDICAL ATTENTION.

SKIN CONTACT
REMOVE CONTAMINATED CLOTHING/SHOES AND WIPE EXCESS FROM SKIN. FLUSH SKIN WITH WATER. FOLLOW BY WASHING WITH SOAP AND WATER. IF IRRITATION OCCURS, GET MEDICAL ATTENTION. DO NOT REUSE CLOTHING UNT[illegible]CLEANED. IF MATERIAL IS INJECTED UNDER THE SKIN, GET MEDICAL ATTENTION PROMPTLY TO PREVENT SE[illegible]S DAMAGE; DO NOT WAIT FOR SYMPTOMS TO DEVELOP.

INHALATION
REMOVE VICTIM TO FRESH AIR AND PROVIDE OXYGEN IF BREATHING IS DIFFICULT. GET MEDICAL ATTENTION.

INGESTION
DO NOT INDUCE VOMITING. IF VOMITING OCCURS SPONTANEOUSLY, KEEP HEAD BELOW HIPS TO PREVENT ASPIRATION OF LIQUID INTO THE LUNGS. GET MEDICAL ATTENTION.

NOTE TO PHYSICIAN
IF MORE THAN 2.0 ML PER KG HAS BEEN INGESTED AND VOMITING HAS NOT OCCURRED, EMESIS SHOULD BE INDUCED WITH SUPERVISION. KEEP VICTIM'S HEAD BELOW HIPS TO PREVENT ASPIRATION. IF SYMPTOMS SUCH AS LOSS OF GAG REFLEX, CONVULSIONS OR UNCONSCIOUSNESS OCCUR BEFORE EMESIS, GASTRIC LAVAGE USING A CUFFED ENDOTRACHEAL TUBE SHOULD BE CONSIDERED.

ECTION VI SUPPLEMENTAL HEALTH INFORMATION

EPEATED DERMAL APPLICATION OF HIGH LEVELS OF MIDDLE DISTILLATE FUELS IN EXPERIMENTAL ANIMALS HAS RODUCED EXTREMELY SEVERE IRRITATION TO CORROSIVE ACTION ON THE SKIN. VARYING DEGREES OF LIVER AND IDNEY DAMAGE WERE NOTED IN THESE STUDIES, INCLUDING CONGESTION, ENLARGEMENT, MOTTLING, AND ULTIFOCAL NECROSIS.

IDDLE DISTILLATE FUELS HAVE BEEN DEMONSTRATED TO CAUSE CHROMOSOME DAMAGE IN THE IN VIVO RAT BONE ARROW CYTOGENETICS ASSAY, AND MUTAGENIC IN THE L5178Y MOUSE LYMPHOMA ASSAY. BASED ON AN INCREASED NCIDENCE OF VARIOUS TUMORS IN STUDIES WITH LABORATORY ANIMALS, THE NATIONAL INSTITUTE FOR CCUPATIONAL SAFETY AND HEALTH (NIOSH) REGARDS WHOLE DIESEL EXHAUST AS A POTENTIAL OCCUPATIONAL ARCINOGEN.

SECTION VII PHYSICAL DATA

BOILING POINT: 450 (APPROX.)
(DEG F)

SPECIFIC GRAVITY: 0.8762
(H2O=1)

VAPOR PRESSURE: NOT AVAILABLE
(MM HG)

MELTING POINT: NOT AVAILABLE
(DEG F)

SOLUBILITY: NEGLIGIBLE
(IN WATER)

VAPOR DENSITY: >1
(AIR=1)

EVAPORATION RATE (N-BUTYL ACETATE = 1): NOT AVAILABLE

APPEARANCE AND ODOR:
YELLOW LIQUID; STRONG HYDROCARBON ODOR.

SECTION VIII FIRE AND EXPLOSION HAZARDS

FLASH POINT AND METHOD:
130 DEG F (PMCC) MIN.

FLAMMABLE LIMITS /% VOLUME IN AIR
LOWER: N/AV UPPER: N/AV

EXTINGUISHING MEDIA
USE WATER FOG, FOAM, DRY CHEMICAL OR CO2. DO NOT USE A DIRECT STREAM OF WATER. PRODUCT WILL FLOAT AND CAN BE REIGNITED ON SURFACE OF WATER.

SPECIAL FIRE FIGHTING PROCEDURES AND PRECAUTIONS
CAUTION. COMBUSTIBLE. DO NOT ENTER CONFINED FIRE SPACE WITHOUT FULL BUNKER GEAR (HELMET WITH FACE SHIELD, BUNKER COATS, GLOVES AND RUBBER BOOTS), INCLUDING A POSITIVE PRESSURE NIOSH APPROVED SELF-CONTAINTED BREATHING APPARATUS. COOL FIRE EXPOSED CONTAINERS WITH WATER. IN THE CASE OF LARGE FIRES, ALSO COOL SURROUNDING EQUIPMENT AND STRUCTURES WITH WATER.

UNUSUAL FIRE AND EXPLOSION HAZARDS
CONTAINERS EXPOSED TO INTENSE HEAT FROM FIRES SHOULD BE COOLED WITH WATER TO PREVENT VAPOR PRESSURE BUILDUP WHICH COULD RESULT IN CONTAINER RUPTURE. CONTAINER AREAS EXPOSED TO DIRECT FLAME CONTACT SHOULD BE COOLED WITH LARGE QUANTITIES OF WATER AS NEEDED TO PREVENT WEAKENING OF CONTAINER STRUCTURE.

SECTION IX REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS AND MATERIALS TO AVOID:
AVOID HEAT, FLAME AND CONTACT WITH STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS
THERMAL DECOMPOSITION PRODUCTS ARE HIGHLY DEPENDENT ON THE COMBUSTION CONDITIONS. A COMPLEX MIXTURE OF AIRBORNE SOLID, LIQUID, PARTICULATES AND GASES WILL EVOLVE WHEN THIS MATERIAL UNDERGOES PYROLYSIS OR COMBUSTION. CARBON MONOXIDE AND OTHER UNIDENTIFIED ORGANIC COMPOUNDS MAY BE FORMED UPON COMBUSTION.

SECTION X EMPLOYEE PROTECTION

RESPIRATORY PROTECTION
USE A NIOSH-APPROVED RESPIRATOR AS REQUIRED TO PREVENT OVEREXPOSURE. IN ACCORD WITH 29 CFR 1910.134, USE EITHER A FULL-FACE, ATMOSPHERE-SUPPLYING RESPIRATOR OR AN AIR-PURIFYING RESPIRATOR FOR ORGANIC VAPORS.

PROTECTIVE CLOTHING
NO SPECIAL EYE PROTECTION IS ROUTINELY NECESSARY. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. WEAR CHEMICAL RESISTANT GLOVES AND OTHER CLOTHING AS REQUIRED TO MINIMIZE CONTACT.

AD[illegible]ONAL PROTECTIVE MEASURES
USE EXPLOSION-PROOF VENTILATION AS REQUIRED TO CONTROL VAPOR CONCENTRATIONS.

SECTION XI ENVIRONMENTAL PROTECTION

SPILL OR LEAK PROCEDURES
CAUTION. COMBUSTIBLE. *** LARGE SPILLS *** ELIMINATE POTENTIAL SOURCES OF IGNITION. WEAR APPROPRIATE RESPIRATOR AND OTHER PROTECTIVE CLOTHING. SHUT OFF SOURCE OF LEAK ONLY IF SAFE TO DO SO. DIKE AND CONTAIN. REMOVE WITH VACUUM TRUCKS OR PUMP TO STORAGE/SALVAGE VESSELS. SOAK UP RESIDUE WITH AN ABSORBENT SUCH AS CLAY, SAND, OR OTHER SUITABLE MATERIAL; PLACE IN NON-LEAKING CONTAINERS AND SEAL TIGHTLY FOR PROPER DISPOSAL. FLUSH AREA WITH WATER TO REMOVE TRACE RESIDUE; DISPOSE OF FLUSH SOLUTION AS ABOVE. *** SMALL SPILLS *** TAKE UP WITH AN ABSORBENT MATERIAL AND PLACE IN NON-LEAKING CONTAINERS FOR PROPER DISPOSAL.

SECTION XII SPECIAL PRECAUTIONS

KEEP LIQUID AND VAPOR AWAY FROM HEAT, SPARKS AND FLAME. SURFACES THAT ARE SUFFICIENTLY HOT MAY IGNITE EVEN LIQUID PRODUCT IN THE ABSENCE OF SPARKS OR FLAME. EXTINGUISH PILOT LIGHTS, CIGARETTES AND TURN OFF OTHER SOURCES OF IGNITION PRIOR TO USE AND UNTIL ALL VAPORS ARE GONE. VAPORS MAY ACCUMULATE AND TRAVEL TO IGNITION SOURCES DISTANT FROM THE HANDLING SITE; FLASH-FIRE CAN RESULT. KEEP CONTAINERS CLOSED WHEN NOT IN USE. USE (ONLY) WITH ADEQUATE VENTILATION. CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, CAN CONTAIN EXPLOSIVE VAPORS. DO NOT CUT, DRILL, GRIND, WELD OR PERFORM SIMILAR OPERATIONS ON OR NEAR CONTAINERS. WASH WITH SOAP AND WATER BEFORE EATING, DRINKING, SMOKING OR USING TOILET FACILITIES. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

SECTION XIII TRANSPORTATION REQUIREMENTS

DEPARTMENT OF TRANSPORTATION CLASSIFICATION:
COMBUSTIBLE LIQUID

D.O.T. PROPER SHIPPING NAME:
FUEL OIL, NA 1993

SECTION XIV OTHER REGULATORY CONTROLS

THIS PRODUCT IS LISTED ON THE EPA/TSCA INVENTORY OF CHEMICAL SUBSTANCES.

IN ACCORDANCE WITH SARA TITLE III, SECTION 313, THE EDS SHOULD ALWAYS BE COPIED AND SENT WITH THE MSDS.

SECTION XV STATE REGULATORY INFORMATION

THIS INFORMATION IS BEING SYSTEMATICALLY ADDED TO OUR MSDS. IT HAS PREVIOUSLY BEEN PROVIDED TO YOU IN VARIOUS WAYS, INCLUDING THE MSDS. THE NEW MSDS FORMAT IS INTENDED TO PROVIDE THE USER WITH THE INFORMATION IN A MORE CONVENIENT MANNER.

SECTION XVI SPECIAL NOTES

THIS REVISION INCORPORATES THE FINDINGS OF DIESEL EXHAUST CARCINOGENICITY INTO SECTION VI.

THE INFORMATION CONTAINED HEREIN IS BASED ON THE DATA AVAILABLE TO US AND IS BELIEVED TO BE CORRECT. HOWEVER, SHELL MAKES NO WARRANTY, EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF. SHELL ASSUMES NO RESPONSIBILITY FOR INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN.

DATE PREPARED: NOVEMBER 06, 1989

J. C. WILLETT

BE SAFE

READ OUR PRODUCT
SAFETY INFORMATION ...AND PASS IT ON
(PRODUCT LIABILITY LAW
REQUIRES IT)

SHELL OIL COMPANY
PRODUCT SAFETY AND COMPLIANCE
P. O. BOX 4320
HOUSTON, TX 77210

Mallinckrodt

LEAD METAL

Material Safety Data Sheet

Emergency Telephone Number
314-982-5000

Mallinckrodt Inc.
Science Products Division
P.O. Box M
Paris, Kentucky 40361

Effective Date: 08-08-85

PRODUCT IDENTIFICATION:

Synonyms: Granular lead, pigment metal

Formula CAS No.: 7439-92-1

Molecular Weight: 207.19

Hazardous Ingredients:
None.

Chemical Formula: Pb

PRECAUTIONARY MEASURES

WARNING! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. NEUROTOXIN.

Avoid breathing dust.
Keep container closed.
Wash thoroughly after handling.

EMERGENCY/FIRST AID

In all cases call a physician immediately.
If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
SEE SECTION 5.

DOT Hazard Class: Not Regulated

This substance is OSHA Regulated.
See section 5.

Physical Data SECTION 1

Appearance: Small, blue-gray granules.

Odor: Odorless.

Solubility: Insoluble in water.

Boiling Point: 1740°C (3164°F)

Vapor Density (Air=1): No information found.

Melting Point: 327.5°C (622°F)

Vapor Pressure (mm Hg): 1.77 @ 1000°C (1832°F)

Specific Gravity: 11.34

Evaporation Rate: No information found.

Fire and Explosion Information SECTION 2

Fire: Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

Reactivity Data SECTION 3

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization: This substance does not polymerize.

Incompatibilities: ammonium nitrate, chlorine trifluoride, hydrogen peroxide.

Leak/Spill Disposal Information SECTION 4

Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic dusts. Sweep, scoop or pick up spilled material. Vacuuming or wet sweeping may be used to avoid dust dispersal. Package for reclamation or recovery. Package unreclaimable material for disposal in a RCRA-approved waste facility.

Reportable Quantity (RQ)(CWA/CERCLA) : lbs.

Ensure compliance with local, state and federal regulations.

Health Hazard Information SECTION 5

A. Exposure/Health Effects

Inhalation:	Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.
Ingestion:	POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases. Soluble lead compounds, e.g., the acetate or nitrate, are the most dangerous. The reduced solubility of the chloride or materials forming the chloride in the stomach (metal, oxides, carbonate, etc.) while still toxic, may not act as rapidly.
Skin Contact:	Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation or redness.
Eye Contact:	Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.
Chronic Exposure:	Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness and irritability may also be noted.
Aggravation of Pre-existing Conditions:	Persons with pre-existing nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:	Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:	If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. CALL A PHYSICIAN IMMEDIATELY. Never give anything by mouth to an unconscious person.
Skin Exposure:	Wash exposed area with soap and water. Get medical advice if irritation develops.
Eyes Exposure:	Wash eyes with plenty of water for at least 15 minutes Call a physician.

C. TOXICITY DATA (RTECS, 1982)

No LD50/LC50 information found relating to normal routes of occupational exposure.
Mutagenic data cited.
Reproductive effects data cited.
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981)

Occupational Control Measures SECTION 6

Airborne Exposure Limits:	-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m^3 (TWA) -ACGIH Threshold Limit Value (TLV): 0.15 mg/m^3 (TWA); 0.45 $mg(Pb)/m^3$ (STEL)
Ventilation System:	A system of local exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the dust or vapor at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.
Pesonal Respirators: (NIOSH Approved)	If the PEL is exceeded, a half-mask air-purifying respirator equipped with a high-efficiency filter, or any half-mask supplied air respirator may be worn up to concetrations of 50 mg per cubic meter (1000X PEL). See OSHA Standard for additional information.
Skin Protection:	Wear impervious protective clothing, including boots gloves, lab coat, apron or coveralls to prevent skin contact.
Eye Protection:	Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Contact lenses should not be worn when working with this material.

Maintain eye wash fountain and quick-drench facilities in work area. Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing soluble lead compounds are handled, processed, or stored.

See OSHA Standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025)

Storage and Special Information SECTION 7

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons.

****

The information contained herein is provided in good faith and is believed to be correct as of the date hereof. However, Mallinckrodt, Inc. makes no representation as to the comprehensiveness or accuracy of the information. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular purpose. Accordingly, Mallinckrodt, Inc. will not be responsible for damages of any kind resulting from the use of or reliance upon such information. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

****

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer.............:

AccuStandard Inc.
25 Science Park, Suite 687
New Haven, CT 06511

Preparation Date.: 11/15/94
Date MSDS Printed.: Sep 19, 1996

Information Phone Number.: 203-786-5290
Hours: Mon. to Fri. 9-5
Emergency Phone Number 203-786-5290

Catalog Number(s):
C-260N

Product Name.....:
Aroclor 1260
Synonyms.........:
Polychlorinated Biphenyls (PCBs)
Chemical Family..: Chlorobiphenyl Congener
Formula..........:
N/A

Molecular Weight.: N/A

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS #	Appr %
Aroclor 1260	11096-82-5	100%

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS (ACUTE AND CHRONIC)

Symptoms of Exposure:
Harmful if inhaled, swallowed, or absorbed through the skin. The consistent finding in animal studies with PCBs is that they produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.
PCBs can cause irritation upon contact with eyes and skin.
Vapors can be irritating to the eyes.

Medical Cond. Aggravated by Exposure:
Liver conditions

Routes of Entry.....................:
Inhalation, ingestion or skin contact

(continued on next page)

Carcinogenicity......................:
PCBs are listed as a suspected human carcinogenic substance.
Suspect Cancer Hazard.

4. FIRST AID MEASURES

Emergency First Aid:
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.
Skin: Wash thoroughly with soap and water.
Contaminated clothing should be removed.
Note To Physician: Hot PCBs may cause thermal burns.
Eyes: Immediately flush thoroughly with water for at least 15 minutes.
A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.
Inhalation: Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician.
Ingestion: Consult a physician. Do not induce vomiting or give any oily laxatives.
Note To Physician: If large amounts are ingested, gastric lavage is suggested.

5. FIRE FIGHTING MEASURES

Flash Point (F)..........: None
Flammable Limits LEL (%).: N/A
Flammable Limits UEL (%).: N/A
Extinguishing Media......:
Use any suitable for adjacent material.
PCBs are very stable, fire-resistant compounds.

Fire Fighting Procedures.:
Wear self-contained breathing apparatus and protective clothing.
Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

Fire & Explosion Hazards.:
PCBs may decompose to form toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

6. ACCIDENTAL RELEASE MEASURES

Spill Response:
Wear suitable protective equipment listed under Expose /Personal Protection.
Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards.
Contain the release and eliminate its source, if this can be done without risk.
Dispose as hazardous waste.
Comply with Federal, State and local regulations.

(continued on next page)

7. HANDLING AND STORAGE

Handling & Storage:
Keep container tightly closed.
Store at controlled room temperature.
Do not breathe dust or vapor.
Do not get in eyes, on skin, or on clothing.
Retained residue may make empty containers hazardous; use caution!

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT:

Ventilation, Respiratory Protection, Protective Clothing, Eye Protection
Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.
Material must be handled or transferred in an approved fume hood or with equivalent ventilation.
Protective gloves must be worn to prevent skin contact
Safety glasses with side shields must be worn at all times.
Impervious protective clothing should be worn to prevent skin contact.

Work / Hygenic Practices:
Wash thoroughly after handling.
Do not take internally.
Eye wash and safety equipment should be readily available.

EXPOSURE GUIDELINES

OSHA - PEL:

	TWA		STEL		CL		
Component	**PPM**	**MG/M^3**	**PPM**	**MG/M^3**	**PPM**	**MG/M^3**	**Skin**
Aroclor 1260							

ACGIH - TLV:

	TWA		STEL		CL		
Component	**PPM**	**MG/M^3**	**PPM**	**MG/M^3**	**PPM**	**MG/M^3**	**Skin**
Aroclor 1260							

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point (C 760 mmHg).: N/A
Melting Point (C)..........: N/A
Specific Gravity (H20 = 1).: N/A
Vapor Pressure (mm Hg).....: N/A
Percent Volatile by Vol (%): N/A
Vapor Density (Air = 1)....: N/A
Evaporation Rate (BuAc = 1): N/A
Solubility in Water (%)....: Insoluble
Appearance.................:
Liquid

10. STABILITY AND REACTIVITY

Stability...............: Yes

Hazardous Polymerization:
Does not occur

Hazardous Decomposition.:
CO_x, HCl, phenolics, aldehydes

Conditions To Avoid.....:
Excessive heat or fire

Materials To Avoid......:
( ) Water
( ) Acids
( ) Bases
( ) Corrosives
( ) Oxidizers
(X) Other :
none indicated

11. OTHER INFORMATION

Comments:
The CAS number of this product is NOT listed on the TSCA Inventory. For reasearch and development use only. Not for manufacturing or commercial purposes.

| = Revised Section
N/A = Not Available
N/E = None Established

The statements contained herein are offered for informational purposes only and are based upon technical data that we believe to be accurate. It is intended for use only by persons having the necessary

STOCK NO: 19586, *19586
REVISION DATE: April 14, 1986

MATERIAL SAFETY DATA SHEET

SECTION I

COMPANY NAME: Alltech Associates, Inc.
ADDRESS: 2051 Waukegan Rd., Deerfield, IL 60015
EMERGENCY TELEPHONE NO: 312-948-8600

PRODUCT NAME: Aroclor 1260, solution in isooctane

REMARKS: The information contained in this MSDS is based on the primary ingredient in this mixture, the solvent. You may wish to request MSDS's on the individual components.

CHEMICAL NAME: 2,2,4-trimethylpentane
SYNONYMS: Isooctane
CHEMICAL FAMILY: aliphatic hydrocarbon
FORMULA: CH3C(CH3)2CH2CH(CH3)2
FORMULA WEIGHT: 114.23
CAS NUMBER: 540841
RTECS NUMBER: SA3320000

SECTION II HAZARDOUS INGREDIENTS

COMPOSITION	CONC.	SPECIES	HAZARD
2,2,4-trimethylpentane	99+%		No toxicity data found Flammable liquid
Aroclor 1260 (PE016)	1ug/ul		

SECTION III PHYSICAL DATA

MELTING POINT: -107oF
BOILING POINT (DEG. F): 210.6
VAPOR PRESSURE (mmHg): 40.6 at 20 deg. C
VAPOR DENSITY (AIR=1): 3.93
SOLUBILITY IN WATER: negligible
SPECIFIC GRAVITY (H2O=1): 0.696
PERCENT VOLATILE BY VOLUME (%): 100
EVAPORATION RATE (ether=1): <1
APPEARANCE AND ODOR: Colorless liquid; mild aliphatic hydrocarbon odor.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): 40 deg. F (ASTM D1310)
FLAMMABLE LIMITS: Lel 1.1 % Uel 6.0 %
EXTINGUISHING MEDIA: carbon dioxide, dry chemical, regular foam
SPECIAL FIRE FIGHTING PROCEDURES: Use self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and may travel along the ground and be ignited at locations distant from the source.

STOCK NO.: 19586, *19586

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 500 ppm; TWA= 350mg/cu.m
EFFECTS OF OVEREXPOSURE: High vapor concentrations may produce dizziness, nausea, intestinal upsets, incoordination, stupor, and unconsciousness.
EMERGENCY AND FIRST AID PROCEDURES: Call a physician. EYES - Immediately flush eyes with copious amounts of water for at least 15 minutes. SKIN - Immediately flush skin with copious amounts of water and wash with soap. INHALATION - Remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. INGESTION - If concious, rinse mouth with water. Call a physician. Wash contaminated clothing before reuse.

SECTION VI REACTIVITY DATA

STABILITY: stable
CONDITIONS TO AVOID: none
INCOMPATABILITY (Materials to avoid): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and/or carbon dioxide
HAZARDOUS POLYMERIZATION: will not occur.
CONDITIONS TO AVOID: none

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Shut off all sources of ignition. Evacuate area. Cover with an absorbent, pick up and place in a closed container. Transport outdoors. Ventilate area and wash spill site. Wear self-contained breathing apparatus, heavy rubber gloves and rubber boots for large spills.
WASTE DISPOSAL METHOD: Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extreme care in igniting as this material is highly flammable. Observe all federal, state and local regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify Type): Organic chemical canister or supplied air.
VENTILATION:
LOCAL EXHAUST: preferable
MECHANICAL (General): acceptable
PROTECTIVE GLOVES: Neoprene
EYE PROTECTION: chemical splash goggles
OTHER PROTECTIVE EQUIPMENT: eye wash, safety shower

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from heat sparks, and fire. Use non-sparking tools. Do not breathe vapor. Avoid contact with eyes, skin and clothing. Do not leave container open. Use adequate ventilation.
OTHER PRECAUTIONS: Extremely flammable

NOTICE: The information contained in this MSDS description is applicable exclusively to the chemical substances identified herein and for its intended use as an analytical reference standard or reagent and to the unit quantity intended for that purpose. The information does not relate to, and may not be appropriate for, any other application or larger quantity of the substance described. Our products are intended for use by individuals possessing sufficient technical skill and qualification to use the material with suitable discretion and understanding of risk of handling any potentially hazardous chemical. The information has been obtained from sources believed to be reliable and accurate but has not been independently verified by Alltech Associates, Inc. Accordingly, **NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE** is made with respect to the information contained herein.

ATTENTION: THIS PRODUCT IN TERMS OF CHEMICAL IDENTITY AND THE UNIT AMOUNT PROVIDED IS INTENDED FOR USE IN CHEMICAL ANALYSIS AND NOT FOR HUMAN CONSUMPION, NOR ANY OTHER PURPOSE.

penetone®

A Penetone PRODUCT

POWER CLEANER 155

POWER PACKED CLEANER DESIGNED FOR PCB CLEANUP

ECONOMICAL.....DILUTES WITH WATER ■ NONFLAMMABLE ■
BIODEGRADABLE ■ EASY TO USE ■ SAFE ON MOST SURFACES

Description:

POWER CLEANER 155 is a highly concentrated, low foaming, liquid alkaline cleaner formulated for fast penetration and removal of polychlorinated biphenyl contaminants from a wide variety of surfaces.

Features & Benefits:

■ *HIGHLY CONCENTRATED*	POWER CLEANER 155 is economical to use. When diluted with 5 to 7 parts of water, it provides outstanding cleanup at costs far less than commonly used solvents.
■ *DIVERSIFIED APPLICATIONS*	POWER CLEANER 155 can be applied manually, through power scrubbers, power sprayers and steam cleaners. Its versatility makes it the "all-around" cleaner.
■ *SAFER TO USE THAN SOLVENTS*	POWER CLEANER 155 contains no solvents..It has no flash or fire point and is completely biodegradable.
■ *RAPID SOIL PENETRATION — FREE RINSING*	POWER CLEANER 155 rapidly attacks soils, holds them in suspension and then rinses freely, leaving no dull streaks.
■ *WIDE VARIETY OF SURFACE APPLICATIONS*	POWER CLEANER 155 when used as directed is safe to use on the following surfaces:

aluminum
asphalt
brass
bronze
ceramic
chromium
concrete
copper
iron
lead
magnesium
nickel
plastic
rubber
steel

PENETONE CORPORATION ● A Subsidiary of West Chemical Products, Inc.
GENERAL OFFICES: 74 HUDSON AVENUE, TENAFLY, NEW JERSEY 07670 ● (201) 567-3000
OTHER LOCATIONS IN PRINCIPAL CITIES

P-248 (980)

POWER CLEANER 155

POWER PACKED CLEANER FOR PCB CONTAMINANTS

Methods of Use:

For general cleanup applications, POWER CLEANER 155 is usually diluted with 5 to 7 parts of water. Apply to the contaminated surface, agitate the cleaner and the contamination, and then pick up both the cleaner and the contamination by the use of an absorbent or adsorbent material. Dispose in an approved manner.

For power scrubbing, POWER CLEANER 155 is normally used at a concentration of 1 to 4 ounces per gallon of water, depending on the soil encountered. Be sure to dispose of all contamination and cleaner in an approved method.

POWER CLEANER 155 is an economical cleaner for use in other areas where PCB contamination is not encountered.

	Dilution Rate (per gallon of water)
Wax Stripping	1–4 ounces
All Purpose Cleaning	1–2 ounces
Windows	¼–½ ounce
Painted Walls	½–1 ounce
Garage Floors	2–4 ounces
Steam Cleaning	2–4 ounces
Pressure Washing	2–6 ounces
Engine Shampoo	3–8 ounces

Typical Characteristics:

Appearance	- Colorless liquid
Solubility	- Excellent in water at all proportions
Weight per Gallon	- 9.75 lbs.
pH - 10% solution	- 12.0
Specific Gravity @ 20° C	- 1.170
Flash Point (COC)	- None
Fire Point (COC)	- None
Rinsability	- Free rinsing...leaves no film deposit
Foaming Tendency	- Low foaming

Precautionary Note:

As with all alkaline cleaners, continuous or repeated contact with skin should be avoided. In case of eye contact, flush immediately with copious amounts of water. Do not take internally.

MATERIAL SAFETY DATA SHEET

Penetone® Corporation, 74 Hudson Ave., Tenafly, NJ 07670

POWER CLEANER™ 155

Page: 1 of 4
Date Prepared: May 17, 1994
MSDS No.: 1870-405L

SECTION 1 PRODUCT IDENTIFICATION & EMERGENCY INFORMATION

PRODUCT NAME: POWER CLEANER 155
GENERAL USE: Cleaner, degreaser
PRODUCT DESCRIPTION: Liquid alkaline cleaner
GENERIC INGREDIENTS: Water, builders, surfactants, chelate

EMERGENCY TELEPHONE NUMBERS:
PENETONE 201-567-3000
CHEMTREC 800-424-9300

SECTION 2 HAZARDOUS INGREDIENT SECTION

This product is nonhazardous as defined in 29 CFR1910 1200.

OSHA HAZARDOUS INGREDIENTS

		EXPOSURE LIMITS 8 hrs. TWA (mg/m³)		
	CAS#	OSHA PEL	ACGIH TLV	Supplier
Contains no hazardous ingredients				

SECTION 3 HEALTH INFORMATION & PROTECTION

EMERGENCY OVERVIEW:

Clear liquid with mild odor
Can be irritating to skin and eyes.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT:
Irritating to the eyes on contact only.

SKIN CONTACT:
Frequent or prolonged contact may irritateor dry the skin and cause dermatitis. Skin contact may aggravate an existing dermatitis condition.

INHALATION:
Inhalation of spray mist may cause irritation to the respiratory tract.

INGESTION:
Ingestion may cause irritation to the digestive tract and diarrhea.

FIRST AID MEASURES:

EYE CONTACT:
Flush eyes with large amounts of water See physician immediately.

SKIN CONTACT:
Flush skin with large amounts of water Remove contaminated clothing and launder before reuse. If skin irritation develops or persists, consult physician.

INHALATION:
Remove person to fresh air Administer oxygen or artificial respiration as needed Call a physician immediately.

INGESTION:
If swallowed, give plenty of water or milk. Call a physician immediately

WORKPLACE EXPOSURE CONTROLS:

PERSONAL PROTECTION:
Splash proof goggles are recommended for all workplace conditions. Rubber gloves are recommended. When spraying this product, rubber boots, aprons, gauntlets, or rain gear should be worn depending on operations

VENTILATION:
None needed under normal use conditions. If the product is being sprayed, a dust mask or particle respirator is recommended.

SECTION 4 FIRE & EXPLOSION HAZARDS

FLASHPOINT: None to boiling point (TCC, COC)
FLAMMABLE LIMITS: Not applicable
AUTOIGNITION TEMPERATURE: Not determined

GENERAL HAZARD:
This is a water based product and presents no unusual hazards in a fire

FIRE FIGHTING:
Cool containers with water.

HAZARDOUS COMBUSTION PRODUCTS:
Smoke, fumes, and oxides of carbon and nitrogen

SECTION 5 SPILL CONTROL MEASURES

LAND SPILL:
For small spills, use absorbent material such as towels or absorbent powders Put all material into proper waste disposal container with lid tightly covered For larger spills, dike spill, recover free liquid, and use absorbent material to dry area. Rinse area with water. Put all material into appropriate waste containers.

WATER SPILL:
Product is water based and water dilutable. Surfactants used in this product are biodegradable Localized high concentration of product may cause fish kills, but no persistant or long term effects will result. Check with local environmental regulatory agencies for reporting requirements.

SECTION 6 HANDLING & STORAGE

STORAGE TEMPERATURE, °F: ambient. DO NOT STORE ABOVE 120° F. KEEP FROM FREEZING

GENERAL: Do not store near strong acids

SECTION 7 TYPICAL PHYSICAL & CHEMICAL PROPERTIES

BOILING POINT, °F:
about 212

EVAPORATION RATE, Acetone = 1:
equal to water

SOLUBILITY IN WATER:
soluble

SPECIFIC GRAVITY at 75°F:
1.14

ODOR AND APPEARANCE:
Clear liquid with mild odor

VAPOR PRESSURE, mm Hg at 20°C:
equal to water

VAPOR DENSITY (Air = 1):
equal to water

WT% ORGANIC VOLATILES:
0

pH:
124-12.6

SECTION 8 REACTIVITY DATA

GENERAL:
This product is stable and hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:
Strong acids.

SECTION 9 REGULATORY INFORMATION

DEPARTMENT OF TRANSPORTATION (DOT):
PROPER SHIPPING NAME:
Non hazardous (nonregulated) material
HAZARD CLASS: none
IDENTIFICATION NUMBER: none
PACKING GROUP: not applicable
LABEL: not required

FLASHPOINT: None-to-boil

pH: 12.4-12.6

TSCA: The ingredients in this product are listed on the TSCA inventory.

CERCLA:
This product contains no reportable CERCLA materials. Contact local authorities to determine if there may be other local reporting requirements.

RCRA HAZARD CLASS:
Nonhazardous waste

SARA TITLE III:

311/312 HAZARD CATEGORIES:

Acute health

313 REPORTABLE INGREDIENTS:

None

NEW JERSEY RIGHT-TO-KNOW INFORMATION:

This product contains water (CAS 7732-18-5), sodium xylene sulfonate (CAS 1300-72-7), tripotassium phosphate (CAS 7778-53-2), tetrapotassium pyrophosphate (CAS 7320-34-5), and trisodium n-hydroxylethylethylenediamine triacetate

CALIFORNIA PROPOSITION 65 INFORMATION:

This product does not contain any chemicals recognized by the state of California to cause cancer and/or birth defects or reproductive harm.

SCAQMD INFORMATION:

Is there a photochemically reactive material present? No
What is the % by volume of photochemically reactive material? 0
What is the VOC content? 0
What is the vapor pressure of VOC's? 0

SECTION 10 NOTES

HAZARD RATING SYSTEMS:

	HMIS	NFPA
HEALTH	1	1
FLAMMABILITY	0	0
REACTIVITY	0	0

KEY
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

REVISION SUMMARY:

Change in Sections 7 and 9

SUPERCEDES ISSUE DATE:

October 28, 1993

FOR ADDITIONAL PRODUCT INFORMATION, CONTACT YOUR SALES ENGINEER
FOR ADDITIONAL HEALTH/SAFETY INFORMATION, CALL 201-567-3000

THE INFORMATION PRESENTED HEREIN HAS BEEN COMPILED FROM SOURCES CONSIDERED TO BE DEPENDABLE AND ACCURATE TO THE BEST OF PENETONE'S KNOWLEDGE. THE INFORMATION RELATES TO THIS SPECIFIC MATERIAL. IT MAY NOT BE VALID FOR THIS MATERIAL IF USED IN COMBINATION WITH ANY OTHER MATERIALS OR IN ANY PROCESS. IT IS THE USER'S RESPONSIBILITY TO SATISY ONESELF AS TO THE SUITABILITY AND COMPLETENESS OF THIS INFORMATION FOR HIS OWN PARTICULAR USE.

7.1 Profile of Chemical of Concern (Lead)

7.1.1 Fate and Transport

The integration of fate and transport data associated with lead is essential in evaluating which environmental media should be considered as sources of potential exposure. In general, chemicals introduced into the environment may sorb to soils, dissolve into bodies of water, leach from soil, volatilize from either soil or water into the atmosphere, or be sorbed from soil by vegetation. The fate and transport of chemicals detected at the site are governed by properties of the chemicals as well as by properties of the media in which they are found. The interaction of chemicals and media determines environmental processes that affect the migration of these chemicals. These processes include adsorption, ion exchange, precipitation and complexation of inorganic ions onto soils; equilibrium partitioning of compounds between water, air, and sorbed phases; and chemical migration through air dispersion, advection, and dissolution in water and volatilization.

Based on soil analytical sampling results, lead was determined as a chemical of concern at the site. Lead is typically used in its metallic form and is commonly found as an oxide or chloride, and as a base pigment in paint, which were present at the site.

7.1.2 Mobility in Soil

The ability of a chemical to move through soil is governed by its solubility and affinity to adsorb to soil. Although lead may become soluble under acidic conditions or in the presence of acetate, nitrate, or chloride ions, metallic lead and its common minerals are normally insoluble in water. Natural lead compounds are generally immobile in normal ground or surface water because lead leached from ores typically adsorbs to ferric hydroxide or forms insoluble carbonates or sulfates. Sorption appears to be the dominant process affecting the distribution of lead in the environment. Several factors influence sorption, including geological setting, pH, availability of ligands, and dissolved particulate iron concentrations. Research has further indicated that lead sorption to clay minerals is influenced by the organic content of the clays.

7.1.3 Leaching into the Ground Water

Leaching involves chemicals adsorbed to soil particles coming into contact with and dissolving into ground water. As a chemical's water solubility decreases, its potential to dissolve into percolating water and migrate through soil decreases. Lead is not soluble in water, and is not expected to leach into the groundwater at the Site.

Additionally, the results of the previous Limited Subsurface Investigation, performed by ARS in February 1995, have indicated that the lead-affected soil was only present to a maximum depths of 5-10 feet bgs. This was subsequently confirmed during excavation activities. Based on Certified's Phase II assessment, groundwater at the Site was encountered at a depth of 20 to 25 feet below grade. As a result, it is not expected for lead compounds to leach a distance of 10 feet in subsurface unsaturated soils.

7.1.4 Volatilization from Soil to Air

Soil type, moisture, and chemical vapor pressure influences the evaporation rate of a chemical from soil. The higher the vapor pressure, the higher the volatility or evaporation. Lead has a relatively low vapor pressure, close to 0 mm Hg in its metallic state at standard temperature and pressure, and is therefore not expected to volatilize.

7.1.5 Air Dispersion of Chemically Affected Soils

Residual levels of lead in surface soils at the site could be a potential source of chemically affected, airborne particulate matter. Subsequent air dispersion and deposition could result in downwind transport of lead. Lead concentrations associated with these sources have been measured in air samples for this investigation. The primary factors in evaluating these exposure pathways are the availability of erodible particulate matter, site surface conditions such as cover, weather, and the physical and chemical properties of lead itself.

Airborne lead may represent a potential source of inhalation exposure. Potential inhalation espousers were evaluated for on-site exposures.

7.1.6 Statement of Probable Fate

Sorption processes are effective in reducing the concentration of soluble lead in natural waters and result in enrichment of bed sediments near the source. The equilibrium solubility of lead with carbonate, sulfate, and sulfide is low. In severely contaminated areas, precipitation may be important in controlling the mobility of this metal, but under most circumstances, sorption predominates. The tendency of lead to form complexes with naturally occurring organic materials (e.g., humic and fulvic acids) increases its adsorptive affinity of clays and other mineral surfaces. Benthic microbes can methylate lead to form tetramethyl lead which is volatile and more toxic than inorganic lead. Biomethylation may, in this manner, also provide a mechanism for remobilization of lead in the bed sediments. Bioaccumulation of weakly sorbed lead phases also may result in remobilization. Lead is generally not biomagnified; bioconcentration factors tend to decrease as the trophic level increases.

7.1.7 Identification-Geochemistry of Lead

Lead is a naturally occurring element and is a major constituent of more than 200 identified minerals. Most of these are very rare, and only three are found in sufficient abundance to form mineral deposits: galena (PbS) the simple sulfide, angelesite ($PbSO_4$) the sulfate, and cerrusite ($PbCO_3$) the carbonate. By far the most abundant is galena which is the primary constituent of the sulfide ore deposits from which most lead is presently mined.

Ores of lead, as well as those of zinc, are often closely associated in deposits formed by replacement of limestone or dolomite. Lead ore is commonly present together with ores of copper, zinc, silver, arsenic, and antimony in complex vein deposits, but lead ore also may occur in a variety of igneous, metamorphic, and sedimentary rocks.

Lead, atomic number 82, atomic weight 207.19, is a member of the group IV elements. Lead exists in three oxidation states, 0, +2, and +4. Although neither metallic lead nor the common lead minerals is classified as soluble in water, they can both be solubilized by some acids; in contrast, some of the lead compounds produced industrially are considerably water soluble. Therefore, natural compounds of lead are not usually mobile in normal ground or surface water because the lead leached from ores becomes adsorbed by ferric hydroxide or tends to combine with carbonate or sulfate ions to form insoluble compounds.

The average abundance of lead in the earth's crust is approximately 15 ppm (Lovering 1976) which is equivalent to one half ounce of lead per ton of rock. Shales and unconsolidated sediments have a mean lead abundance close to the crustal average, showing the fairly even distribution of lead in the environment.

Although no evidence was found concerning the photolysis of organo lead complexes in natural waters, photolysis of these compounds in the atmosphere has a great bearing on the form of lead which will enter the aquatic environment. For example, Hirschcler and Gilbert (1964) report that the chief constituents of the inorganic lead compounds leaving the exhaust system of automobiles burning leaded fuels are two forms of PbClBr, NH_4Cl-2PbClBr and $2N_4HCl$-PbClBr.

The species PbClBr (lead bromochloride)appears to be stable at ordinary temperatures and is isomorphous with $PbCl_2$ and $PbBr_2$. Both $PbCl_2$ and $PbBr_2$ darken on exposure to sunlight with the release of halogen.

The ultimate products of the photolysis of these lead compounds in the atmosphere would be PbO and the halogens. Since the majority of the lead emitted to the environment originates form the tailpipes of automobiles, these photolytic processes are quite important.

Also of importance, a Pierrard (1969) has pointed out, is that the halogens produced from the photolysis of he lead halides may be involved in chain reaction mechanisms with such atmospheric pollutants a CO, NO, SO_2.

Chemical Speciation

An outstanding characteristic of lead is its tendency to form complexes of low solubility with the major anions of natural environmental systems.

The hydroxide, carbonate, sulfide, and (more rarely) the sulfate of lead may act as solubility controls. Throughout most of he natural environment, the divalent form, Pb+2, is the stable ionic species of lead.

The more oxidized solid PbO_2, in which lead has a +4 charge, is stable only under highly oxidizing conditions, and probably has very little significance int eh aquatic environment (Cotton and Wilkerson 1972). If sulfur activity is very low, metallic lead can be a stable phase in alkaline or circumneutral reducing conditions.

Jackson and Skippen (1978) investigated the behavior of lead and organic materials at a simulated sediment-water boundary. The interactions involved sorption by clays, organic complexing, carbonate reactions, hydrolysis, and desorption of lead from clay and metal hydroxides. They found that organic acids decreased the solubility of lead in the presence of clay, particularly at acidic pH values. This organic complex is probably due to colloidal coagulation. The organic acids, moreover, proved capable of remobilizing lead from the solid phase. There is, however, a general kinetic hindrance to this desorption, particularly at basic pH values.

In summation, the transport of lead in the aquatic environment is influenced by the speciation of the ion. Although lead will exist mainly as the divalent cation in most unpolluted waters and become sorbed into particulate phases, organic material in polluted waters will have a great effect on the chemical form in which lead will be present.

Sorption

Sorption processes appear to exert a dominant effect on the distribution of lead in the environment. Several investigators have reported that in aquatic and estuarine systems, lead is removed to the bed sediments in close proximity to its source, apparently due to sorption onto the sediments (Helz et al. 1975; Valiela et al. 1974).

Different sorption mechanisms have been invoked by different investigators, and the relative importance of these mechanisms varies widely with such parameters as geological setting, pH, availability of ligands, dissolved and particulate iron concentration, salinity, composition of suspended and bed sediments, and initial lead concentration.

Pita and Hyne (1975) studied the depositional environment of lead in reservoir sediments and found that almost all of the lead in the sediments was in the fraction with specific gravity between 2.0 and 2.9. This fraction contains the clays. The authors suggested that formation of organo-lead complexes may play an important role in adsorption, noting that the same type of organic matter (negatively charged or polar) which tends to form organo-metallic compounds would also tend to adhere to clay minerals and would occur in the 2.0 to 2.9 specific gravity portion.

The paucity of lead in sediments with specific gravity less than 2.0 indicated that adsorption onto organic material not active in complex formation was insignificant; the lack of lead in the denser fraction (specific gravity >2.9) indicated that precipitation was not important.

The relative dominance of adsorption over precipitation is corroborated by calculations made by Hem (1976a), which indicate that precipitation is important only under relatively alkaline conditions.

The adsorption of lead to soils and oxides was studied by Huang et al. (1977). The data indicate that adsorption is highly pH dependent, but above pH 7, essentially all of the lead is in the solid phase. It should be noted that at low pH, lead is negatively sorbed (repelled from the adsorbent surface).

Gaddle and Laitmen (1973) demonstrated that hydrous iron oxides have a high sorption capacity for lead, sorbing as much as 0.28 moles lead per mole iron at pH 6. The ability of hydrous iron oxides to sorb lead increases with increasing pH. At pH 8.1, 91 % of the added lead was sorbed.

When the pH drops, however, lead may be desorbed. Although the relative importance of individual sorption processes varies widely, it appears that, in most circumstances, lead is effectively removed to the sediments by sorption.

Bioaccumulation

Bioaccumulation of lead has been demonstrated for a variety of organisms. The following table lists bioconcentration factors reported by various sources.

Bioconcentrations Factors for Lead*

Taxon	Bioconcentration Factor**
Freshwater plants	200
Freshwater invertebrates	200
Freshwater fish	60
Marine plants	200
Marine invertebrates	200
Marine fish	60

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* Chapman et al. (1968)

** Bioconcentration factors are the ratio derived from the concentration of the element in the aquatic organism (in ppm wet weight) divided by the concentration of the element in water (in ppm).

Microcosm studies indicate that lead is not biomagnified. Lu et al. (1975) studied the fate of lead in three ecosystems differing only in their soil substrate. The ecosystem contained algae, snails, mosquito, larvae, mosquito fish, and microorganisms.

Lead was concentrated most by the mosquito larvae and least by the fish. Furthermore, body burdens and aqueous lead concentration appeared to be strongly correlated to the percentage of organic matter and cation exchange capacity of the soils, indicating that the availability of lead in the systems was controlled by adsorption to the soils. Since pH was the same for all three soils, precipitation/dissolution of inorganically bound lead was probably not responsible for the differences in lead availability and uptake.

Based upon available information, fish accumulate very little lead in edible tissues; however, oysters and mussels are capable of accumulating high levels of lead. Decreasing pH increases the availability of divalent lead, the principle form accumulated by aquatic animals.

Biotransformation

As previously discussed, lead can be methylated by microorganisms present in lake sediments. The volatile compound resulting from biomethylation, i.e., tetramethyl lead, probably leaves the sediments and is either oxidized in the water column or enters the atmosphere. In any event, biomethylation represents a process which enables lead in the bed sediments to be reintroduced to the aqueous or atmospheric environment. In addition, biogenic ligands can play a significant role in complexing lead, especially in polluted waters, and will thereby have a significant impact on the aquatic fate of lead.

Data Summary

The dominant mechanism controlling the fate of lead appears to be sorption. Precipitation of $PbSO_4$, $PbCO_3$, and PbS and bioaccumulation may also be important. At low pH values, sorption and precipitation are not nearly as effective in removing lead form solution, so that lead is much more mobile in acidic waters than at higher pH values. In alkaline and circumneutral waters, removal of lead by sorption and precipitation may occur relatively quickly.

APPENDIX C

POLYCHLORINATED BIPHENYL
(PCB)

LITERATURE

- HESIS Fact Sheet No.13
- Polychlorinated Biphenyl Exposure and Human Disease
- Polychlorinated Biphenyls

H E S I S Fact Sheet No.13

Hazard Evaluation System & Information Service ☐ 2151 Berkeley Way Berkeley, CA 94704 ☐ ~~415-540-3138~~
510 540-2115

State of California: George Deukmejian, Governor; Department of Health Services: Kenneth W. Kizer, MD,MPH, Director; Department of Industrial Relations: Ron Rinaldi, Director.

Polychlorinated Biphenyls (PCBs)

PCBs (polychlorinated biphenyls) have been widely used since the 1930s, because of their excellent electrical- and temperature-insulating abilities. For many years, PCBs were considered to be almost non-toxic, since there were very few reports of illness even among industrial workers who were exposed to fairly large amounts. In 1978, the Environmental Protection Agency (EPA) began to impose bans on PCB manufacturing and sales and on most PCB uses. Nevertheless, it is still possible for workers to be exposed to PCBs, either through servicing and handling equipment that contains PCBs, or as a result of leaks, spills, and fires. This fact sheet answers some of the most frequently asked questions about PCBs.

• Why did the EPA ban PCBs?

The toxic effects of PCBs first drew attention in 1968, when over 1200 people in Japan were poisoned by eating food cooked in oil that was heavily contaminated with PCBs and other chemicals. This caused illnesses which became known as Yusho (rice oil) disease. Soon afterward, studies showed that PCBs cause cancer in test animals. Therefore, it is considered likely that PCBs can cause cancer in humans.

But why were PCBs banned, while many other chemicals which also cause cancer in test animals were not? PCBs remain in the environment for a long time, because they do not break down. Also, their elimination from the body is very slow, so that levels in body tissues may increase with time. Thus, PCBs build up in the food chain, so that the fish and animals we eat could contain significant amounts.

In short, the thing that sets PCBs apart from other equally toxic industrial chemicals is the ability of PCBs to persist in the environment and accumulate in the body and the food chain.

• Where are PCBs found?

PCBs were used mainly in electrical transformers and capacitors, heat transfer systems, and hydraulic systems. They were also used in inks and carbonless copy paper and for a variety of other purposes, but the LPA ban now prohibits almost all of these other uses. Nowadays, PCBs are found mostly in transformers and capacitors. These may be contained in industrial equipment (such as welding equipment), medical equipment (such as X-ray machines), and household appliances (such as refrigerators and microwave ovens).

The ballasts of some fluorescent light fixtures contain PCBs. During normal operation of a fluorescent light, the PCBs are entirely enclosed, and you cannot be exposed to them. However, when the capacitor wears out, sometimes it may burn or break and leak PCBs.

• How can I tell whether a piece of equipment contains PCBs?

Check for a manufacturer's label, which may give the date of manufacture and the trade name of the fluid. Some trade names that may refer to PCBs include Aroclor, Askarel, Eucarel, Pyranol, Dykanol, Clorphen, Clorinol, Chlorextol, Diaclor, Hyvol, Asbestol, Inerteen, Elemex, Saf-T-Kuhl, No-Flamol, Nepolin, EEC-18, and others.

Equipment manufactured after 1979 usually does not contain PCBs. Most pre-1979 capacitors do contain PCBs, while many pre-1979 transformers do not. Transformers within buildings or vaults are more likely to contain PCBs. New equipment should be labeled "No PCBs."

PCBs are clear, amber-colored, or dark oily liquids. They may have a faint smell like motor oil, and some contain chlorobenzenes which make them smell like mothballs. Fluorescent light ballasts may contain about an ounce of PCBs; a utility pole capacitor or transformer may contain much more. Usually what leaks from a burned-out light ballast is not PCBs but a black tarry material that is used to muffle noise from the capacitor. However, it is safest to assume that anything that leaks from a transformer, capacitor, or light ballast contains PCBs, unless there is a "No PCBs" label on the equipment.

• What should be done in case of a PCB leak or spill?

1. Rope the area off so that only cleanup workers will enter.

2. Use absorbent materials to soak up the spill. Avoid contact with these materials.

3. Do not allow PCBs to enter a water drainage system.

4. Use an organic solvent (kerosene, for example) to wipe off smooth hard surfaces of non-disposable objects. Surfaces such as cloth, wood, and concrete absorb PCBs; they cannot be completely cleaned.

5. Dispose of contaminated objects and cleanup materials (rags, absorbent particles, damaged equipment, disposable protective clothing, etc.) by wrapping them in layers of newspaper, then sealing them in impermeable containers such as heavy double-wrapped plastic bags. Contact the Environmental Protection Agency and the Toxic Substances Control Division (TSCD) at the telephone numbers below for instructions on how to dispose of them.

Environmental Protection Agency	415/974-7154
TSCD Southern California	213/620-2380
TSCD North Coast California	415/540-3045
TSCD Northern California	916/739-3145

• How might I be exposed to PCBs?

PCBs are easily absorbed through the skin, so direct contact with PCB oils is one way you could be exposed. Another way is by inhaling PCB vapors from overheated equipment that contains PCBs. PCBs normally don't evaporate much, so there are hardly any vapors to inhale unless the PCBs are heated. Finally, most of us absorb small amounts of PCBs from the food we eat. It is important to understand that PCBs are like most other cancer-causing agents – with small exposures, there is very little increase in cancer risk.

• What should I do if I get exposed to PCBs?

If PCBs contact your skin, remove any contaminated clothing and wash the skin immediately with soap and water. Don't use an organic solvent such as kerosene, paint thinner, or degreaser to wash PCBs off your skin; that could increase the absorption of PCBs through your skin. Dispose of heavily contaminated clothing as described above; very lightly contaminated clothing can be washed with detergent, separately from other clothes. You do not need to see a doctor unless you develop a severe skin rash, which is unlikely. If PCBs get in your eyes, flush your eyes with water for 15 minutes and then see a doctor.

• Is there any way to measure the effect of PCB exposure on my health?

No. There is no test that can measure or predict the health effects of a person's PCB exposure. PCB levels in blood or body fat can be measured, but no one knows what any given level of PCBs in the blood or fat means. Also, these tests are expensive and are not always accurate. Although PCBs can affect the levels in your blood of certain enzymes made by your liver, there is no reliable way to relate these levels to PCB exposure. Many other chemicals, especially alcohol, affect liver enzyme levels much more than PCBs do. Therefore, none of these tests is recommended as a test for PCB effects.

• Is there any treatment for PCB exposure?

No. Once PCBs enter your body, there is no way to remove them. They will naturally be slowly eliminated from your body. There is no evidence that weight-loss programs or saunas can speed up their elimination.

• Compared to other cancer-causing agents, how toxic are PCBs?

In terms of their ability to cause cancer in animals, PCBs are in the middle range. That is, small doses don't have any detectable effect, but very large doses clearly cause an increase in animal cancer rates. We don't know whether PCBs can cause cancer in humans. Some workers have been heavily exposed to PCBs, because for many years PCBs were believed to be among the safest of industrial chemicals. Victims of Yusho disease were exposed to even greater amounts. Studies of these groups of heavily exposed people have given limited evidence of an increased cancer risk. It seems clear that an occasional exposure to PCBs will not substantially increase your chance of getting cancer during your lifetime. However, it is sensible to avoid exposure whenever possible.

• Do PCBs have any other health effects?

Years ago, many workers were frequently exposed to PCBs without proper protection. Some of them developed chloracne, a painful and persistent form of acne. Other than the possible increase in cancer rates, this is the only health effect that has been found in people who work with PCBs.

Some people have reported skin and eye irritation, headaches, or nausea. These effects are usually associated with PCB fires, where other chemicals are involved.

A variety of other symptoms were seen in Yusho victims, but these people had eaten substantial amounts of PCBs and other more toxic chemicals, such as dioxins. Now that most PCB

• What can I do to prevent exposure to PCBs?

1. Check equipment labels to determine whether the equipment contains PCBs. Make sure that all equipment that contains PCBs is labeled according to Environmental Protection Agency requirements. For information on EPA's rules for labeling and handling of PCBs, call 415/974-7054.

2. Before you handle equipment that contains PCBs, inspect it for leaks or damage.

3. Avoid skin or eye contact with PCBs. If you might come in contact with PCBs, wear gloves, boots, goggles, or other protective clothing. Protective clothing should be made of materials that are resistant to PCBs, such as Viton®, Saranex®, polyethylene, polyvinyl alcohol, polytetrafluoroethylene, butyl rubber, nitrile rubber, or neoprene. Polyvinyl chloride and natural rubber (latex) are not recommended materials. PCBs will soak through almost any protective clothing material within hours, so disposable clothing is best. If dust contaminated with PCBs might be present, wear a respirator.

4. Wash carefully with soap and water after you remove your protective equipment or clothing.

5. Don't try to clean up a PCB leak yourself—notify someone who has been trained to handle PCB cleanups.

6. If electrical equipment containing PCBs is involved in a fire, PCB vapors and combustion products may be released (see below). Ventilate the area thoroughly before entering, or wear a NIOSH-approved respirator with a combined dust and organic vapor filter cartridge. Your sense of smell will not warn you that PCB vapors are present.

uses have been banned, no one is likely to be exposed to large amounts.

• Is PCB exposure especially hazardous for a pregnant woman?

PCBs do not cause birth defects, judging from animal experiments and from studies of Yusho victims who were exposed while pregnant. However, a pregnant woman's exposure to large amounts of PCBs could affect the subsequent health of her baby and could cause spontaneous abortion or miscarriage if the exposure levels are high enough to make the mother sick. In animals, high doses of PCBs can also reduce fertility. Exposure of humans to these large amounts of PCBs is very unlikely nowadays.

• What if PCBs are involved in a fire?

When PCBs are burned, they can form polychlorinated dibenzofurans (PCDFs) and polychlorinated dibenzodioxins (PCDDs). Some of these compounds are far more toxic and cancer-causing than PCBs, and they can be the main hazard from a PCB fire. Fortunately, only very small amounts of these compounds are usually created. Like PCBs, they usually cause no short-term health effects (except chloracne if exposure is very large). Also, as with PCBs, there is no useful way to measure or predict health effects; there is no treatment for an exposed person, and a single exposure would not substantially increase your lifetime risk of getting cancer.

RESOURCES

Some HESIS publications are available in Spanish or other languages. Also available from HESIS at no charge is *A Guide to Industrial Solvents*, in English and Spanish. For copies, call 415/540-3138.

For information about the health effects of workplace chemicals, contact HESIS at 415/540-3014 (you can call collect from within California).

State, county, and city government employees who need information or assistance concerning workplace health and safety regulations, or who want to file a complaint, can contact the nearest office of the California Division of Safety and Health (DOSH):

Sacramento	916/920-6123	573 573
San Francisco	415/557-~~1677~~ 3863 or 3864	
Van Nuys	818/901-5403	

Other employees who need information or assistance concerning workplace health and safety regulations or who want to file a complaint can contact one of the area offices of the federal Occupational Safety and Health Administration (OSHA):

Walnut Creek	415/943-1973	Not valid
West Covina	818/915-1558	
Long Beach	213/514-6387	
Sacramento	916/646-9220	
San Diego	619/569-9071	

Employers who want free assistance to evaluate and improve workplace health and safety can contact the nearest office of the DOSH Consultation Service:

Sacramento	916/920-6131	
San Francisco	415/557-1034	disconnected
Fresno	209-445-5072	
Downey	213/861-9993	
Panorama City	213/786-3870	
San Bernardino	714/383-4567	
San Diego	714/280-5304	

In a medical emergency, contact your local Poison Control Center. See your local phonebook under "Emergency Phone Numbers" on the inside front cover.

If you have questions about exposure to PCBs outside the workplace, contact the Toxic Info Center hotline at 800/233-3360. Fax

Polychlorinated Biphenyl Exposure and Human Disease

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Polychlorinated biphenyls (PCBs) continue to be of great environmental and occupational health interest. This review summarizes the major clinical findings reported in individuals incurring the greatest PCB exposure—those persons working in the manufacture or repair of electrical capacitors or transformers. The potential target organs addressed in the studies reviewed include the liver, lungs, skin, cardiovascular system, nervous system, certain endocrine systems, the blood/immune system, and the gastrointestinal and urinary tracts. After careful analysis, the weight of evidence suggests the only adverse health effects attributable to high, occupational PCB exposures are dermal. This review confirms and extends the observations of others, ie, that the collective occupational experience with PCB fluids provides no evidence for adverse PCB effects on any other organ systems.

Despite their discontinued manufacture, the persistence of polychlorinated biphenyls (PCBs) in the environment has caused them to remain a significant human health concern. Literature available to define the human toxicology of PCBs includes clinical and scientific reports spanning over 50 years. This literature, though extensive, is somewhat fragmented. While there are many studies of potential PCB effects within discrete study populations, little is available in the way of comprehensive reviews of the human health effects of PCBs.

Clinical studies of potential PCB health effects have been conducted in basically three types of study populations. The first represents a rather special population—individuals poisoned with rice oil contaminated with PCBs. Two widespread outbreaks of contaminated rice oil poisoning have occurred, one in Japan in 1968 and the other in Taiwan in 1979. The symptoms of these rice oil poisonings, termed "Yusho" in Japan and "Yu-Cheng" in Taiwan, were similar and originally attributed to PCBs present in the oil. However, further examination of the poisoning incidents found several lines of evidence indicating that the symptoms were most probably caused by the presence of the more potently toxic polychlorinated dibenzofurans (PCDFs). This evidence includes the observation that PCB levels in Yusho and Yu-Cheng victims with severe manifestations of disease were no greater than those of healthy PCB-exposed workers, while their PCDF levels were much higher.[1,2] Furthermore, studies in monkeys were able to duplicate Yusho-like symptoms with a mixture of PCBs and PCDFs resembling the toxic rice oil, or with the PCDF component

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the results are adjusted for alcohol consumption in the subjects.[28,36,37]

The third approach has been to measure urinary D-glucaric acid levels,[16] a test that purportedly reflects changes in hepatic microsomal glucuronidation. While PCB-exposed workers had a significantly increased D-glucaric acid excretion in this study, no correlation between this measurement and PCB blood levels was found, making it difficult to attribute these differences to PCBs.

Currently, there is no clinical evidence for toxic effects on the liver due to PCB exposure, even among electrical workers with extensive PCB body burdens. In general, the results of a number of studies conducted from 1976 through 1988 have revealed that occupationally exposed groups were within the expected normal limits, or that the number of persons falling outside the normal range was not significantly greater than that anticipated.[13,24,29,37–41] For example, studies by Ouw et al[13] and Emmett[29,39] either reported mean values for liver function tests that were shown to fall within the normal range for each test, or the mean values were not significantly different from that of the control population. The study of Fischbein et al,[24] one the largest study populations examined to date, is also illustrative as they reported the frequency of normal liver function test values for their PCB-exposed population to be 97.8% for serum aspartate aminotransferase (AST) activity, 92.8% for serum alanine aminotransferase (ALT) activity, 97.5% for serum lactate dehydrogenase (LHD) activity, 98.1% for serum GGT activity, 98.8% for serum alkaline phosphatase activity, and 94.7% for serum bilirubin levels. These high percentages are remarkably consistent with the fact that only about 95% of any normal population is expected to have values that fall within a "normal" range defined as two standard deviations about the mean value. Given that 66% of the population examined by Fischbein et al[24] was 40 years of age or older, and that 70% of this population had been exposed for more than 10 years, this study, perhaps more than any other, indicates that the occupational exposures to PCBs did not produce liver toxicity.

While correlations between serum PCB levels and the numerical value for one or more different liver function tests have been reported, there is no liver function test for which such correlations have been consistently found, and in each case the correlation was observed in a study where no excess number of abnormal test values was reported. For example, a correlation between serum PCB levels and serum AST activity (or its log-transformed value) has been reported in three studies,[24,37,38] but was not found in four similar studies.[23,29,39,40] The intermittent finding of these correlations, correlations that are being reported in populations with normal liver function tests, has no apparent toxicological or physiological meaning and may instead merely arise from the large number of statistical comparisons being performed in these studies.

An unusual observation of increased incidence of hepatomegaly among PCB-exposed workers was reported in one study.[15] A total of 16 workers from a cohort of 80 were regarded as having "hepatic involvement," either in the form of hepatomegaly or one or more elevated liver enzyme tests. Among workers in plant B, where exposure included PCBs dispersed by explosions during stress testing of capacitors, the incidence of hepatomegaly was especially high—more than 50% (7/13). While a relationship between serum PCB concentrations and the appearance of hepatomegaly was asserted in this study, there was no apparent relationship between serum PCB levels and severity of hepatomegaly. More importantly, the virtual absence of hepatomegaly among the numerous other clinical studies of PCB-exposed workers[13,23,24,29,30,32,37–41] makes it difficult to attribute this observation simply to PCB exposure. It is unlikely that the discrepancy between this study and others is a matter of degree of PCB exposure, since at least two other studies[23,24] have conducted physical examinations on study populations with serum PCB levels as high or higher (up to 3,850 ppb) than those in the Maroni et al[14–16] study group with no reported hepatomegaly. It is possible that the nature of the exposure of this Italia population of PCB workers was unique, perhaps including an unusually high exposure to PCDFs formed during capacitor explosions. With respect to liver function tests, abnormal results occurred randomly and were generally too small to be considered clinically significant. In no case were any of the small elevations in liver enzymes confirmed by retesting. Among the 67 workers in plant A, where exposures were not confounded by potential PCDF formation from capacitor explosions, the number of minimally elevated serum ALT, serum AST, and serum GGT values was that expected for a population of normal, healthy individuals (ie, <5%). Furthermore, no relationship was apparent between the occasional abnormal values and PCB exposure (Table 4); for individual liver tests, there were no significant differences in serum PCB levels between those with normal and abnormal test values.

In conclusion, while the results one study using antipyrine clearance have suggested hepatic enzyme induction in workers exposed occupationally to PCBs, other studies using this and other approaches have not found induction attributable to PCB exposure. The possibility of toxic effects in the liver associated with PCB exposure has been examined in detail in several studies. Clinical measurements reflective of liver toxicity from the various studies have been consistently negative.

In spite of evidence for hepatotoxic potential of PCBs in animal studies, the absence of adverse liver effects in PCB-exposed workers should not necessarily be considered a surprising finding. The early concern for workplace exposures was the prevention of liver and dermal toxicity,[42,43] and this is clearly reflected in the initial threshold limit values of 1.0 mg/m³ (42% chlorine mixtures) and 0.5 mg/m³ (54% chlorine mixtures) that were first established by the American Conference of Governmental and Industrial Hygienists in 1959. These guidelines were lower than those of 2.0 mg/m³ (42% chlorine mixtures) and 1.0

TABLE 1
PCB Capacitor Plant Cohort Study Information

Cohort Size and Location	PCB Usage Interval	Study Authors and Year	Study Type	Number of Study Subjects
Indiana				
3,588 total workers	1959–1977	Smith et al, 1982[38]	Broad clinical survey	228
		Sinks et al, 1992[52]	Mortality analysis (192 deaths)	3,588
Massachusetts				
1,559 workers in PCB-exposure jobs	1938–1977	Lawton et al, 1985[23]	Broad clinical survey	194
		Brown and Jones, 1981[26]	Mortality analysis (90 deaths)	1,599
		Brown, 1987[49]	Mortality analysis (179 deaths)	1,607
500 current workers	1941–1977	Acquavella et al, 1986[41]	Broad clinical survey	205
New York				
6,303 total workers at the two plant locations; 2,588 in PCB-exposure jobs	Plant 1: 1951–1977 Plant 2: 1946–1977	Alvares et al, 1977[27]	Liver function survey	5
		Fischbein et al, 1979[24]	Broad clinical survey	326
		Warshaw et al, 1979[28]	Lung function survey	326
		Brown and Jones, 1981[26]	Mortality analysis (73 deaths)	968
		Fischbein et al, 1982,[27a] 1985[29a]	Dermal/ocular effect survey	181–289
		Fischbein, 1985[40]	Liver function survey	261
		Lawton et al, 1986[53]	Lung function survey	194
		Nicholson et al, 1987[50]	Mortality analysis (188 deaths)	788
		Brown, 1987[49]	Mortality analysis (116 deaths)	981
		Taylor, 1988[51]	Mortality analysis (510 deaths)	6,303
Australia				
34 PCB-exposed workers	1951–1974	Ouw et al, 1976[13]	Dermal effects/liver function	34
Italy				
1,310–2,100 total workers	1946–1980	Maroni et al, 1981b[15]	Dermal effects/liver function	80
		Maroni et al, 1984[16]	Enzyme induction/porphyria	51
		Bertazzi et al, 1987[20]	Mortality analysis (64 deaths)	2,100
Japan				
155 possibly exposed workers	1948–1972	Hara, 1985[18]	Limited clinical survey	155
Sweden				
145 exposed workers	1965–1978	Gustavsson et al, 1986[17]	Mortality analysis (21 deaths)	142

were used as heat exchanger fluids. Last, the study of Jones and Alden[22] is confounded by the fact that an impure batch of benzene was used in the synthesis of the PCBs involved in that particular incident and the dermal lesions were ultimately attributed by the authors of this study to chlorinated contaminants rather than the PCBs.

In addition to PCDFs, other chemical exposures were associated with the use of PCB fluids and their presence should be considered a potential confounder of the results reported in the studies reviewed here. PCBs were commonly mixed with chlorinated benzenes (generally 30%–40% by volume) for use in large-capacity transformers and capacitors. Upon combustion, these chlorinated benzenes may form both PCDFs and polychlorinated dibenzo-p-dioxins. Investigators of the major PCB capacitor worker cohorts[23,24] noted the usage of chlorinated benzenes in the PCB fluids for capacitors, but other investigators of capacitor workers and transformer repair workers did not specify whether chlorinated benzenes were utilized. Unfortunately, in no case was exposure to chlorinated benzenes measured and compared to that of the PCBs.

Other likely but largely unspecified exposures to chemicals associated with PCB fluids include stabilizers like the alkylbenzenes or certain epoxides. Although these stabilizers were no doubt only a small component of the PCB fluids to which they were added, Lawrence[25] has pointed out that their much higher vapor pressures may have resulted in a substantial workplace exposure to these compounds. Another potentially confounding factor common to these studies was exposure to chlorinated organic solvents like trichloroethylene and/or 1,1,1-trichloroethane that were used to clean up PCB spills and to degrease equipment and final products. While some studies did address the potential confounder of exposure to other chemicals,[26–28] there is little indication that other investigators considered the potential importance of the cohort's exposures to solvents or other workplace chemicals.

In addition to contaminants and stabilizers, PCB substitutes were in-

TABLE 4

Comparison of Mean Serum PCB Levels between Individuals with and without Abnormal Liver Function Indicators in the Cohort of Maroni et al (1981b)[15]

Test (Group Results)	Number of Workers	Mean PCB Blood Level ± SEM (ppb)	*t*-test (*P* Value)*
Serum alanine aminotransferase			
Normal values	10	627 ± 123	
Elevated values	6	352 ± 76	NS (0.13)
Serum aspartate aminotransferase			
Normal values	13	542 ± 104	
Elevated values	3	411 ± 142	NS (0.58)
Serum ornithine-carbamoyl transferase			
Normal values	10	440 ± 110	
Elevated values	6	663 ± 136	NS (0.23)
Serum γ-glutamyl transpeptidase			
Normal values	8	648 ± 157	
Elevated values	8	400 ± 60	NS (0.16)

* Data derived from Maroni et al (1984)[16] was subjected to the Student's *t*-test for unpaired values. NS (no significant difference at $P < .05$).

mg/m^3 (54% chlorine mixtures) proposed earlier by Treon et al[44] as apparently protective of liver toxicity based on animal studies performed by these authors. The initial threshold limit values were also well below the 10.5 mg/m^3 measured-air PCB concentrations in Massachusetts plants that Elkins[41] reported as having produced no evidence of toxicity other than irritation. More recently, Lawton et al[23] have pointed out that the doses and tissue levels of PCBs causing liver damage in rodents are some three to four orders of magnitude greater than those experienced occupationally.

Effects on Serum Lipid or Lipoprotein Levels

Many of the clinical studies of both occupational and environmental exposure to PCBs have included measurements of serum lipids, but no adverse effect of PCB exposure on serum lipid levels has ever been demonstrated. Clear evidence of an absence of significant clinical abnormalities in lipid metabolism has been provided in five studies of PCB-exposed workers. Baker et al[32] studied 148 persons exposed to PCBs both occupationally and environmentally and found no excess clinical abnormalities in serum triglycerides, total cholesterol, or high-density lipoprotein (HDL)-cholesterol among exposed persons. Likewise, Smith et al[38] studied 274 capacitor/transformer workers who sustained high-level PCB exposures and found no excess clinical abnormalities in serum triglycerides, total cholesterol, or HDL-cholesterol among exposed persons. After comparing the mean values between PCB-exposed and matched control groups, no significant differences were found by Chase et al[37] in the mean serum triglycerides, total lipids, total cholesterol, or HDL-cholesterol of 120 locomotive repair workers, or by Emmett[29,39] in the mean serum triglycerides, total lipid, total cholesterol, HDL-cholesterol, low-density lipoprotein (LDL)-cholesterol, or very low-density lipoprotein (VLDL)-cholesterol of 55 transformer maintenance/repair workers.

As with the serum liver enzyme correlations, a statistical correlation between serum PCB levels and the levels of some component of serum lipids have been reported in a number of studies. The two most common correlations were between serum PCBs and serum triglyceride levels,[23,29,37,38,45] and serum cholesterol levels.[23,29,45] While some have postulated that these correlations suggest a possible effect of PCBs on lipid metabolism, a review of all available evidence finds several facts that argue strongly against this supposition. First, no consistent correlation has been found in the clinical studies of either occupational or environmental exposures. Instead, the type of correlation varies among the studies; some studies reported a correlation for PCBs with triglyceride levels and not cholesterol levels and others reported correlations for cholesterol levels and not triglyceride levels. Similar conflicting correlations are also found among the clinical studies of environmental exposures to PCB.[31-35,46] Second, of five studies examining PCBs and serum lipids, none noted a significant excess of abnormal lipid values or a significant difference between control and PCB-exposed groups in total lipid, serum triglyceride, total cholesterol, HDL-cholesterol, LDL-cholesterol, or VLDL-cholesterol levels.[29,32,37-39] Thus, as with the liver enzyme correlations, the correlations between serum PCB levels and serum lipid levels are found among persons with normal rather than elevated serum lipid values, and, consequently, these correlations have no toxicological significance. Third, conflicting correlations have been observed both among environmentally exposed persons (low exposure) and occupational (high exposure) studies, suggesting this phenomenon is unrelated to dose. As demonstrated by two recent studies,[23,39] these correlations can be explained by the natural partitioning of PCBs to serum lipids.

Emmett[39] examined 55 transformer maintenance workers and initially found statistical correlations between log serum PCBs and log triglyceride, total cholesterol, and log VLDL concentrations. These observations of Emmett were consistent with the various correlations between serum PCBs and lipid levels that have been reported by others. However, Emmett performed additional analyses to demonstrate that these correlations were of no medical consequence.

system, none of the major mortality studies completed to date have found any association between PCBs and cardiovascular disease including hypertension.[26,49–52] In fact, a less-than-expected mortality from heart diseases has been observed in two of these studies.[51,52]

Effects on the Lungs

The relationship between pulmonary function and PCB exposure has only been evaluated in some detail in three studies of two different populations occupationally exposed to PCBs. Pulmonary function tests and chest radiographs have been used, along with questionnaires dealing with respiratory-related symptoms. In an initial examination of pulmonary function in US (New York) capacitor workers, reported respiratory symptoms included upper respiratory tract irritation (50% of workers), wheezing (3%), tightness in the chest (10%), and "work-related" cough (14%).[24,28] In the absence of a comparison population matched for age and smoking status, it is unclear which of these might be in excess. Spirometric tests found 14% of examined workers with diminished vital capacity and 11% with restrictive impairment. Chest radiographs in all but one case of restrictive impairment were normal, an unusual finding if there was in fact pulmonary impairment due to occupational exposure.

In a follow-up study of the same population, no spirometric abnormalities were found.[53] In view of the absence of evidence of pulmonary impairment on follow-up, and the failure of chest radiographs to confirm restrictive impairment in the first examination, the authors concluded that the original restrictive impairment finding was "*artifactual due to test operator inexperience and inadequate expiratory efforts.*" No correlation of spirometric variables with past exposure or serum PCB levels was found in the follow-up study, and, from this cohort, no evidence of an association between PCBs and respiratory disease has emerged.

Emmett et al[29,30] reported that 40% of exposed transformer repair workers complained of wheezing compared to a 20% incidence among controls. However, the wheezing was not correlated with the extent of PCB exposure (in terms of exposure history, log serum PCB levels, or log adipose PCB levels) or with objective measurements of respiratory function. Among the respiratory parameters measured, only the forced expiratory volume in 1 second was significantly lower in the PCB-exposed workers compared with controls; but this difference did not correlate with PCB body levels and was eliminated when the results were corrected for smoking status. Therefore, this study of transformer repair workers was similar to those of capacitor workers in that it provided no indication that chronic, occupational PCB exposures adversely affect pulmonary function.

Clinical investigations of respiratory function or complaints related to environmental PCB exposure are consistent with the negative evidence provided by studies of occupationally exposed persons.[33,35] Furthermore, the available mortality analyses of PCB-exposed workers have not revealed a significant excess of deaths from nonmalignant respiratory diseases.[17,50,51,52,54] Therefore, with the possible exception of the irritation that might be produced at some levels with any halogenated compound, the collective evidence demonstrates that chronic PCB exposure is not associated with pulmonary dysfunction or respiratory diseases.

Effects on the Blood and Immune Systems

Clinical studies examining blood cell counts and red blood cell parameters in PCB-exposed individuals have not reported an increased prevalence of any particular abnormality or generalized syndrome which suggests hematotoxicity. The extent of analyses in these studies varied considerably, from simple determinations of hemoglobin content and hematocrit to complex statistical analyses of various hematologic parameters versus blood concentrations of higher chlorinated and lower chlorinated PCB homologs. In perhaps the most thorough study of its kind, Lawton et al[23] compared serum PCB levels in capacitor workers with a variety of hematological parameters. Data were available from examinations of the workers conducted in 1976 (n = 194) and 1979 (n = 174). No associations were found between PCB blood levels and parameters related to red blood cells. Elevated lymphocyte counts were noted in the first examination (1976), but of these only an elevation in monocytes was confirmed in the second examination (1979). This increase, while statistically significant, was small (seen only in 11 of 194 workers) and had no apparent clinical importance, since mean values for all of the hematologic parameters analyzed were well within the standard range reported. The authors concluded that serum PCB levels were related to "marginal" increases in monocyte counts that might have been related to the use of different analytical methods to assess this parameter in the two examination periods. Consistent with these negative findings, Taylor[51] reported that PCB capacitor worker mortality from diseases of the blood and blood-forming organs was not significantly different from that expected based on national mortality rates.

Only three clinical surveys involving persons environmentally exposed to PCBs have reported analyses of hematological parameters. None of these studies found an excess of hematological abnormalities.[33–35]

While studies examining immunocompetence in individuals exposed to PCBs are quite limited, what evidence is available does not suggest that occupational exposures to PCBs were immunotoxic. First, there is no evidence from existing studies that PCB exposure adversely affects the levels of circulating immunocytes. In fact, leukocyte count and differential blood cell counts from six clinical studies found no association between PCB exposure and these parameters.[15,24,32,34,37,38] Second, Emmett et al[30] have recently compared 55 workers exposed to PCBs and 56 nonexposed persons with respect to hypersensitivity reactions as measured by dermal responses to mumps and trichophyton antigens and found no sigcreas has been observed. Lawton et al[23] reported that five of 40 elevated blood glucose measurements during two clinical examinations of capacitor workers were probably related to diabetes while the remainder were apparently due to testing inconsistencies and/or methodological problems. Stehr-Green et al[33] reported that mean blood glucose and the relative risk of elevated blood glucose were not significantly altered in people with >20 ppb serum PCBs, although a weak trend in increase was observed. Smith et al[38] and Emmett et al[29] observed no alterations in blood glucose measurements among capacitor and transformer repair workers. Confirming the lack of endocrine effects reported in the clinical studies, no mortality study has revealed any excess of deaths related to endocrine organ effects, such as diabetes mellitus or pancreatitis. In fact, Taylor[51] specifically reported a lower than expected mortality from allergic, endocrine, metabolic, and nutritional diseases, and from diabetes. While the present data are limited, there is no evidence that PCB exposure results in endocrine dysfunction or disease of any kind in occupationally or environmentally exposed persons.

Conclusions

Studies of PCB-exposed populations collectively suggest that the only adverse health effects attributable to PCBs in humans are dermal: chloracne, hyperpigmentation, and sequelae of chronic dermal and ocular irritation. These conditions occurred only in worker populations with relatively high dermal and/or inhalation exposures. PCB-related dermal effects have not been clearly identified among worker populations receiving lesser exposure and were absent in populations environmentally exposed to PCBs through the consumption of contaminated fish, by living near PCB waste sites, or by potential contact with PCB-contaminated soils. The assignment of PCBs as the causative agent for chloracne among workers with high PCB exposures is only tentative. Reported incidences of chloracne were typically greatest for occupational environments in which PCBs were used as heat transfer fluids, raising the possibility, as was the case with Yusho and Yu-Cheng, of unusually high levels of contamination with potently chloracnegenic PCDFs. The relationship between PCB body burdens and chloracne is not necessarily consistent with PCBs as causative agents—chloracne was only found in workers with high body burdens of PCBs, but many workers with very high body burdens did not develop chloracne. In the absence of measurements of PCDF levels in these studies, a causative or contributing role of PCDFs in chloracne among PCB-exposed workers cannot be ruled out.

The collective occupational experience with PCB fluids provides no evidence for adverse effects for other organ systems, including the liver, the heart and circulatory system, the gastrointestinal and urinary tracts, the nervous system, the respiratory system, the immune/hematopoietic system, and some endocrine functions. The absence of adverse effects in humans despite a variety of toxic effects of PCBs demonstrated in animal studies is consistent with the conclusions of other recent reviews of PCB toxicology.[55-58] This divergence in the findings reported for animal and human studies may result from many factors including species differences in susceptibility or sensitivity to PCB effects, as well as dosages tested in animal studies that were far greater than those found in even the highest of the occupational exposures. Confidence in the apparent absence of PCB-related diseases in humans is strengthened by the observation that this information is based primarily on studies of individuals with chronic, very high exposures to PCBs in industries where PCB use spanned over a 50-year period. With the strictly regulated use and disposal of these chemicals, it is unlikely that human exposures to PCBs will ever again match those of workers in previous decades. Therefore, it would appear that there is little basis for concern for organ system toxicity, at least among the broad categories covered in this review, resulting from present day exposures to these compounds.

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Whales Again in Danger

The story of man's exploitation of the world's great whales is both short and bloody. In the space of just 300 years, thriving populations of whales were brought to the brink of extinction. As each species was all but wiped out, the whalers turned their attention to others. By 1986, when a world moratorium on commercial whaling was at last introduced, few species survived in sufficiently large numbers to be worth exploiting. The minke whale was one exception. Japan has carried on killing significant numbers of minke whales in the Antarctic under the premise of so-called "scientific" whaling.

Despite Japan's obvious flouting of the International Whaling Commission's ruling, the 1986 moratorium was a major victory for those countries which wanted to see commercial whaling stop, many of whom had joined the IWC with that aim in mind. Sadly, the IWC now looks certain to collapse, and when it does, commercial whaling seems sure to resume. To understand why the IWC is in danger of demise, it is essential to look at its history. It was created in 1946, by the whaling countries, in a bid to administer regulations for the exploitation and conservation of whale stocks. It took over its role from the League of Nations which, in 1937, had made the first efforts to control the whaling industry. The basis of the IWC has always been the assumption that commercial whaling is acceptable. That is understandable, when it is remembered that the IWC was set up by whalers for whalers. During the 1970s and 1980s, many countries joined the IWC because they believed that the organization was more interested in setting quotas for kills, rather than conserving stocks. It was due to the influence of these countries that the 1986 moratorium was introduced.

The whaling nations agreed to the moratorium only on the basis that there would be a thorough assessment of whale stocks, and that, if certain populations were found to be large enough, commercial whaling could recommence. But recent years have seen a marked change in world opinion: the justification for whaling has at last been questioned.

There is now a rift of interest within the IWC. The majority of members are unlikely ever to approve of the resumption of commercial whaling. This has led Iceland to announce its withdrawal, with Norway and Japan, the other remaining whaling nations, likely to follow suit. . . .To leave the IWC and resume whaling would bring diplomatic isolation and international condemnation to the countries concerned, but they may feel that it is a price worth paying, even with the possibility of US trade sanctions. Although international trade in whale products is banned under the Convention of International Trade in Endangered Species (CITES), it should be noted that Iceland has never joined CITES, and Norway and Japan maintain reservations on several whale species, and are thus not restricted by CITES either. Being unable to trade in whale products would not bother the Japanese, as home demand for whale meat is strong. . . .

There is no questioning the cruelty of whaling: killing an animal as large as a whale is exceedingly difficult. . . .In a world where humanitarian interests continue to gain support, the whole question of the morality of whaling is being challenged. None of the countries which wish to resume whaling have any reason to do so apart from financial gain. . . . Here is a real chance for the European Community (EC) to demonstrate its economic power and inflict trade embargoes on all three nations if they decide to resume whaling. Norway and Iceland would surely take notice of a blockade, for their economies are closely intertwined with the EC. If the public makes its views known, . . . then there is a strong possibility that whaling will, at last, be halted.

—From "Comment." by D. Tomlinson in *Country Life,*
January 30, 1992;186(5):28.

"Caprolactam and its toxicological effects" (Le caprolactam et [illegible] effets toxicologiques). Akbulut, T. *Arhiv za higijenu rada [illegible]ksikologiju* (Zagreb), 1979, 30/suppl. (453-455). 6 ref. (In French)

"ε-Caprolactam" (64-65). 9 ref. *Documentation of the Threshold Limit Values. Fourth edition* (Cincinnati, American Conference of Governmental Industrial Hygienists, 1980).

CIS 78-543 "Skin disorders in workers employed in polyamide fibre (vidlon) production" (Uvrědanija na kŏata sred rabotnicite, zaeti v proizvodstvoto na sintetični vlakna vidlon). Čurolinov, P.; Stamova, N.; Ginčeva, N. *Letopisi na higienno-epidemiologičnata slŭzba* (Sofia), Oct. 1977, 10/1 (38-42). 12 ref. (In Bulgarian)

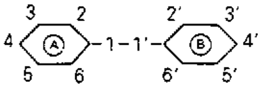
"Caprolactam and nylon 6" (115-130). 48 ref. *IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans.* Vol. 19. *Some monomers, plastics, and synthetic elastomers, and acrolein* (Lyons, International Agency for Research on Cancer, 1979). 513 p.

"Contact dermatitis caused by polyamide trouser pockets". Grimalt, F.; Romaguera, C. *Dermatosen in Beruf und Umwelt* (Aulendorf), 1981, 29/2 (35-39). 3 ref.

Polychlorinated biphenyls

CHLORINATED BIPHENYLS; CHLOROBIPHENYLS; PCBs

PCBs, a group of organochlorine compounds, have the structural formula:



[illegible] the molecular formula: $C_{12}\ H_{10-x}Cl_x$ (1-10 [illegible]gen atoms may be replaced by chlorine atoms). There are 209 possible isomers. Their molecular weight varies between 188.7 for monochlorobiphenyl and 398.5 for decachlorobiphenyl. They are clear, pale yellow, liquid, viscous or solid products, their consistency increasing with their chlorination percentage. They have a mild aromatic odour.

The first chlorobiphenyl (dichlorobiphenyl) was synthesised by Griefs in 1867 by heating 4,4'-biphenyl-*bis*-(diazonium)-platinum chloride salt with sodium carbonate. The first description of PCBs was published by Schmidt and Schultz, in 1881. The commercial production of technical PCBs increased in 1929, when PCBs began to be used as non-flammable oils in electrical transformers and condensers. During the 1930s and 1940s a number of mining accidents had occurred because of the poor insulation of cables. These accidents decreased dramatically after the introduction of PCB-insulated cables.

Production. PCBs are produced in France, the Federal Republic of Germany, Italy, Japan, the United States, the USSR, etc., under the trade names Phenchlor, Clophen, Fenchlor, Kanechlor, Arochlor, Sovol, etc.

The commercial PCBs are mixtures of PCB isomers with a mean percentage of chlorination indicated in the numerical constituent of their trade name. (For example: Arochlor 1254 is a biphenyl compound, indicated by the number 12, with a 54% chlorine content indicated by the last two digits of the numerical symbol.)

Technical PCB mixtures are prepared by chlorination of [illegible]henyl with anhydrous chlorine in the presence of a c[illegible]t. The degree of chlorination of the technical product depends on the duration of the chemical reaction.

Uses. The main properties of PCBs that account for their use in the production of a variety of items are: low solubility in water, miscibility with organic solvents and polymers, high dielectric constant, chemical stability (very slow break down), high boiling points, low vapour pressure, thermostability, flame resistance. PCBs are also bacteriostatics, fungistatics and pesticide synergists.

PCBs are used in "closed" or "semiclosed" systems, such as electrical transformers, capacitors, heat transfer systems, fluorescent light ballasts, hydraulic fluids, lubricating oils, insulated electric wires and cables, etc., and in "open end" applications, as plasticisers for plastic materials, adhesives for waterproof wall coatings, surface treatment for textiles, surface coating of wood, metal and concrete, caulking material, paints, printing inks, paper, carbonless copy paper, impregnated citrus fruit wrapping paper, cutting oils, microscopic mounting medium, microscope immersion oil, vapour suppressants, fire retardants, etc., and in insecticide and bactericide formulations.

Absorption and metabolism. During manufacture and/or handling of PCBs, these compounds may penetrate into the human body following cutaneous, respiratory or digestive exposure. The workers are also exposed to food and water PCB residues and to other occupational and domestic xenobiotics (that is synthetic compounds not known to occur as a natural product).

The highly chlorinated biphenyl isomers undergo a very slow metabolism in the animal body and are consequently excreted in very low percentages (less than 20% of 2,4,5,2',4',5'-hexachlorobiphenyl was excreted within the lifetime of rats that received a single intravenous dose of this compound). On the other hand, the presence of the higher chlorinated biphenyls in the body seems to delay the excretion of the lower chlorinated biphenyls.

HAZARDS

PCB mixtures are contaminated with other organochlorine compounds like polychlorinated dibenzofurans (PCDFs) and polychlorinated naphthalenes. The lowest concentration of PCDFs was found in Arochlors (0.8-2.0 ppm), followed by Phenchlor A60 (8.4 ppm), Phenchlor DP-6 (13.6 ppm) and Kanechlors (1.0-17.0 ppm). Samples of "Yusho" oil (the rice oil disease that occurred in 1968 in Western Japan, due to the consumption of rice oil accidentally contaminated during its manufacture by polychlorinated biphenyls leaking from a corroded coolant system) contaminated with Kanechlor-400, contained an unusually high concentration of PCDFs (5.0 ppm). This fact raised the question of the contribution of PCDFs to the "Yusho" symptomatology. PCDFs are highly toxic compounds (0.2 µg pentachlorodibenzofuran causes 100% mortality in hen embryos). There is no technical use for PCDFs. Part of the PCDF contaminants originate in the use of sodium hydroxide in the distillation of PCBs. Pyrolysis of technical PCB mixtures yield about 60 different chlorinated dibenzofurans. One of the main contaminants, 2,3,7,8-tetrachlorodibenzofuran, is the most toxic of the PCDF group.

Occupational exposure. People occupationally exposed to PCBs have relatively high PCB residue levels. Plasma levels ranged generally, from several tens to several hundreds of ppb. In a plant in the United States the PCB plasma levels of workers assembling capacitors and transformers ranged from 10.0 to 2 500 ppb. The plasma concentration increased with the intensity and duration of exposure. The gas-chromatographic pattern of PCB residues differed from that of the general population. In highly exposed workers pentachlorodiphenyl represented a higher percentage of their total PCB plasma level, as compared with that of a control group. The PCB gas-chromatographic pattern in the plasma of occupationally exposed persons differed also from that of the PCB mixture of the work environment, mainly because of the increased retention of the higher chlorinated biphenyls. Diet, concomitant exposure to other xenobiotics and features of biochemical individuality may also influence the PCB gas-chromatogram pattern. The decrease of plasma PCB levels after withdrawal from occupational exposure was relatively fast in workers exposed for short periods and very slow in those exposed for more than 10 years and/or in those exposed to highly chlorinated PCB mixtures.

In people occupationally exposed to PCBs a broad spectrum of adverse health effects have been reported. These effects may be generally explained by the induction or the inhibition of the activity of a large number of enzymes which upset quantitatively normal biological processes. The prevalence of the adverse health effects increased with the concentration of PCBs in the working environment and thus in the workers' tissues.

Skin and mucous membrane changes; swelling of the eyelids, burning of the eye, and excessive eye discharge, burning sensation and oedema of face and hands, simple erythematous eruptions with pruritus, acute eczematous contact dermatitis (vesiculo-erythematous eruptions), chloracne (an extremely refractory form of acne), hyperpigmentation of skin and mucous membranes (palpebral conjunctiva, gingiva), discolouration of finger nails and thickening of the skin were reported.

Herxheimer described in 1899 a chronic inflammatory disorder of the pilosebaceous apparatus in workers exposed to chlorobiphenyls and chloronaphthalenes. Because of the acneform characteristics of the skin disease he named it chloracne. In 1933, a few years after the beginning of large scale PCB production, 23 out of 24 workers developed chloracne following exposure in a PCB manufacturing plant for about 6 months. Over the years many other cases of PCB associated chloracne occurred. Chloracne may occur in nearly every worker exposed to PCBs, if the exposure is high enough. It occurred also in Yusho patients (after enteral exposure). Efficient safety measures may be judged by a low prevalence of skin lesion, while sudden outbreaks of skin disease indicate increased exposure.

Irritation of the upper respiratory ways is frequently seen. A decrease in forced vital capacity, without radiological changes, was reported in a relatively high percentage of the workers exposed in a capacitor factory.

Digestive symptoms such as abdominal pain, anorexia, nausea, vomiting, jaundice, with rare cases of coma and death, may occur. At autopsy, acute yellow atrophy of the liver was found in lethal cases. Sporadic cases of acute yellow atrophy of the liver were reported.

Neurological symptoms such as headache, dizziness, depression, nervousness, etc., and other symptoms such as fatigue, loss of weight, loss of libido and muscle and joint pains were found in various percentages of exposed people.

The carcinogenicity of PCBs was shown in animals, experimentally exposed. Benign and malignant liver cell tumours, lymphomas and leukaemias, and carcinomas of the gastrointestinal tract were obtained. Promotion of carcinogenic processes initiated by other substances was also obtained experimentally. PCBs led to a higher incidence of 3'-methyl-4-dimethyl aminoazobenzene, N-nitrosodiethylamine and alpha-BHC induced liver hepatomas in mice. Malignant melanomas (2/31) and pancreas neoplasias (2/31) were reported in a group of workers heavily exposed to PCBs, but also to other carcinogens. In deceased Yusho patients (accidentally exposed to PCBs) an excess of malignant tumours was reported (9/22). The findings demonstrating the carcinogenicity of PCBs in animal experimentation as well as the epidemiological data suggesting an excess of malignant tumours in persons occupationally exposed to PCBs and in Yusho patients led to the conclusion that PCBs have to be considered, for practical purposes, as representing a carcinogenic risk to humans.

An important contribution to the knowledge of the biological effects of PCBs in humans, especially with regard to the PCBs reproductive impairment, was achieved by thorough prospective and retrospective studies of Yusho patients, and by the study of PCB-associated diseases in the general population. Pathological pregnancies (toxaemia of pregnancy, abortions, stillbirths, underweight births, etc.) were frequently associated with increased PCB serum levels in Yusho patients and in the general population.

SAFETY AND HEALTH MEASURES

In the past, PCB air levels, in the workrooms of plants manufacturing or using PCBs, varied generally up to 10 mg/m^3 and often exceeded these levels. Because of the toxic effects observed at these levels, a TLV of 1 mg/m^3 for the lower chlorinated biphenyls (42%) and of 0.5 mg/m^3 for the higher chlorinated biphenyls (54%) in the working environment were adopted in the United States (US Code for Federal Regulations, 1974) and in several other countries. This TLV proved to be too high, since eczema and skin burning and systemic effects occurred even when the air PCB levels were below 1 mg/m^3. (Four months before an outbreak of dermatitis in a plant, the concentration of PCBs in air was shown to be 100 μg/m^3.)

The US National Institute of Occupational Safety and Health recommended recently a TLV of 1 μg/m^3 in the work environment, determined as a time-weighted average concentration for employees who work a 40-h week over a working lifetime. This TLV was considered low enough to prevent to a great extent the risk of reproductive and tumourigenic effects of PCBs as well as the other adverse effects in people occupationally exposed to these compounds.

The PCB concentration in the work environment should be controlled annually in order to check the efficacy of preventive measures in keeping these concentrations at recommended levels. The surveys should be repeated within 30 days of any change in the technological process likely to increase the occupational exposure to PCBs.

The manufacture and industrial use of PCBs in closed circuit was recommended. PCB materials should be stored in closed containers, in ventilated areas. PCBs should be handled in isolated areas of the plant, where efficient ventilation systems remove airborne PCBs (without recirculation or increase of the exposure of the neighbouring general population) maintaining PCB air concentrations in the breathing zones of employees below the TLV. Vapour leakage from close circuit installations should be controlled every day.

If PCBs leak or are spilled, the personnel should be evacuated from the area immediately. Emergency exits should be clearly marked. Instructions with regard to emergency procedures, appropriate to the specific features of the plant technology should be implemented. Only personnel trained in emergency procedures and adequately equipped should enter the area.

The duties of the emergency personnel are to repair leaks, clean up spills (dry sand or earth should be spread on the leak or spill area) and fight fires.

The entry into enclosed spaces such as tanks which have contained PCBs should be authorised only by gned permits. The PCB supply pipe should be sc[illegible]cted and adequate ventilation and oxygen pp[illegible]aintained during the stay of a worker in such ontainers. He should wear appropriate protective quipment and be connected by a lifeline harness to an utside worker. This stand-by worker should also be quipped for entry and have contact with a third person.

Employees should be informed on the adverse health ffects caused by occupational exposure to PCBs as well s on the carcinogenic effects in animals exposed xperimentally to PCBs and the reproductive impairment bserved in mammals and humans with relatively high PCB residue levels. Pregnant women must avoid PCB-olluted areas since exposure to PCBs may endanger heir health and that of the fetus, due to the placental ransfer of PCBs and their fetotoxicity. Nursing by these women should be discouraged because of the high amount of PCBs excreted with milk (the quantity of PCBs transferred to the infant by milk is higher than that transferred by the placenta). A significant correlation was found between plasma levels of PCBs in mothers occupationally exposed to these compounds and the PCB milk levels. It has been observed that if these mothers nursed their babies for more than three months, the PCB levels in the infants exceeded that of their mothers. These compounds were subsequently retained in the childrens' organism for many years. Extraction and discarding of the milk may, however, help in decreasing the mothers' PCBs body burden.

Access to PCB work areas should be limited to authorised personnel. These workers should be provided with suitable protective clothing: long-sleeved overalls, boo[illegible] overshoes and bib-type aprons that cover the bo[illegible]s. Gloves are needed to reduce skin absorption du[illegible]special tasks. The bare-handed handling of cold or heated PCB materials should be forbidden. (The quantity of PCBs absorbed through the intact skin may equal or exceed that absorbed by inhalation.) Clean working clothes should be provided daily (they should be periodically inspected for defects). Safety glasses with side shields should be worn for eye protection. Respirators (meeting legal requirements) should be used in areas with PCB vapours and during installation and repair of containers and emergency activities, when the air concentration of PCBs is unknown or exceeds the TLV. Ventilation will prevent accumulation of vapours. (The respirators must be cleaned after use and stored.)

The employees should wash their hands before eating, drinking, smoking, etc., and refrain from such activities in the polluted rooms. Street clothes should be stored during the work shift in separate lockers. These clothes should be put on at the end of the working day only after a shower bath. Showers, eye wash fountains and washroom facilities should be readily accessible to the workers.

Persons with skin diseases and chronic liver diseases and women of child-bearing age should not be employed in plants manufacturing or using PCBs. In particular, persons with Gibert's syndrome or Krigler-Najjar's syndrome—who have difficulties in glucuronidation processes—will retain more PCBs since they are excreted especially as glucuronide conjugates. Also persons suffering from liver insufficiency may not adapt to PCBs and the liver insufficiency may be aggravated.

[illegible]odical clinical examination of employees (at least a[illegible]lly) with special emphasis upon skin disorders, liver function and reproductive history is required. The laboratory tests should include the monitoring of PCB residues in air sampled in the breathing zone of the worker in each work area and in plasma. Liver function tests such as the plasma half-life of antipirine (a decrease of the half-life points to the induction of liver microsomal drug metabolising enzymes, i.e. the exceeding of the no-effect level), serum glutamic-pyruvic transaminase (SGPT), serum glutamic-oxalacetic transaminase (SGOT) and serum lactate dehydrogenase (SLDH) (an increase indicates liver parenchymatous cell necrosis and its degree), serum cholesterol and serum triglycerides (increased levels show changes in the lipid metabolism), urinary porphyrins (an increase may result from the induction of a rate limiting enzyme in the metabolic pathway of haem metabolism), may give an image of the functional state of the organ.

Medical records should be kept for the entire length of employment of each worker and the following 30 years.

Treatment. In case of skin or eye contact with PCBs, immediate washing with large quantities of running water for at least 15 min is recommended. (A drop of vegetable oil after thorough washing of the eye, may reduce irritation.) Afterwards medical advice should be obtained. If PCBs are splashed or spilled on the protective clothing, the contaminated clothes should be removed immediately and the skin washed with water and soap for at least 15 min.

Chloracne may improve gradually, over several years, after cessation of exposure. Antibiotics, manual expression of comedons and drainage of cysts may help. Extensive acne surgery may be needed for comedon treatment (the lesions penetrate deep into the dermis). The synthetic retinoid, 13-*cis*-retinoic acid is also recommended (animals that received PCBs required more vitamin A than the control group).

WASSERMANN, M.
WASSERMANN, D.

Polychlorinated biphenyls and terphenyls. Environmental health criteria 2 (Geneva, World Health Organisation, 1976), 85 p. 301 ref.

"World PCBs map: Storage and effects in man and his biologic environment in the 1970s". Wassermann, M.; Wassermann, D.; Cucos, S.; Miller, H. J. *Annals of the New York Academy of Sciences* (New York), 1979, Vol. 320 (69-124). Illus. 340 ref.

"Use and health effects of Arochlor 1214, a polychlorinated biphenyl, in an electrical industry". Ouw, K. H.; Simpson, G. R.; Siyali, D. S. *Archives of Environmental Health* (Washington, DC), July-Aug. 1976, 31/4 (189-194). 13 ref.

"Decrease in vital capacity in PCB-exposed workers in a capacitor manufacturing facility". Warshaw, R.; Fischbein, A.; Thornton, J.; Miller, A.; Selikoff, I. J. *Annals of the New York Academy of Sciences* (New York), 1979, Vol. 320 (277-283). 12 ref.

CIS 79-441 "Polychlorinated biphenyls and polybrominated biphenyls". *IARC monographs on the evaluation of carcinogenic risk of chemicals to humans.* Vol. 18 (Lyons, International Agency for Research on Cancer, 1978), 140 p. 390 ref.

Criteria for a recommended standard–Occupational exposure to polychlorinated biphenyls. DHEW (NIOSH) publication No. 77-225 (National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati) (Oct. 1978). 232 p. Ref.

Polycyclic aromatic hydrocarbons

Polycyclic aromatic hydrocarbons (PAH) are organic compounds consisting of three or more condensed aromatic rings, where certain carbon atoms are common to two or three rings. Such a structure is also referred to as a fused ring system. The rings can be arranged in a

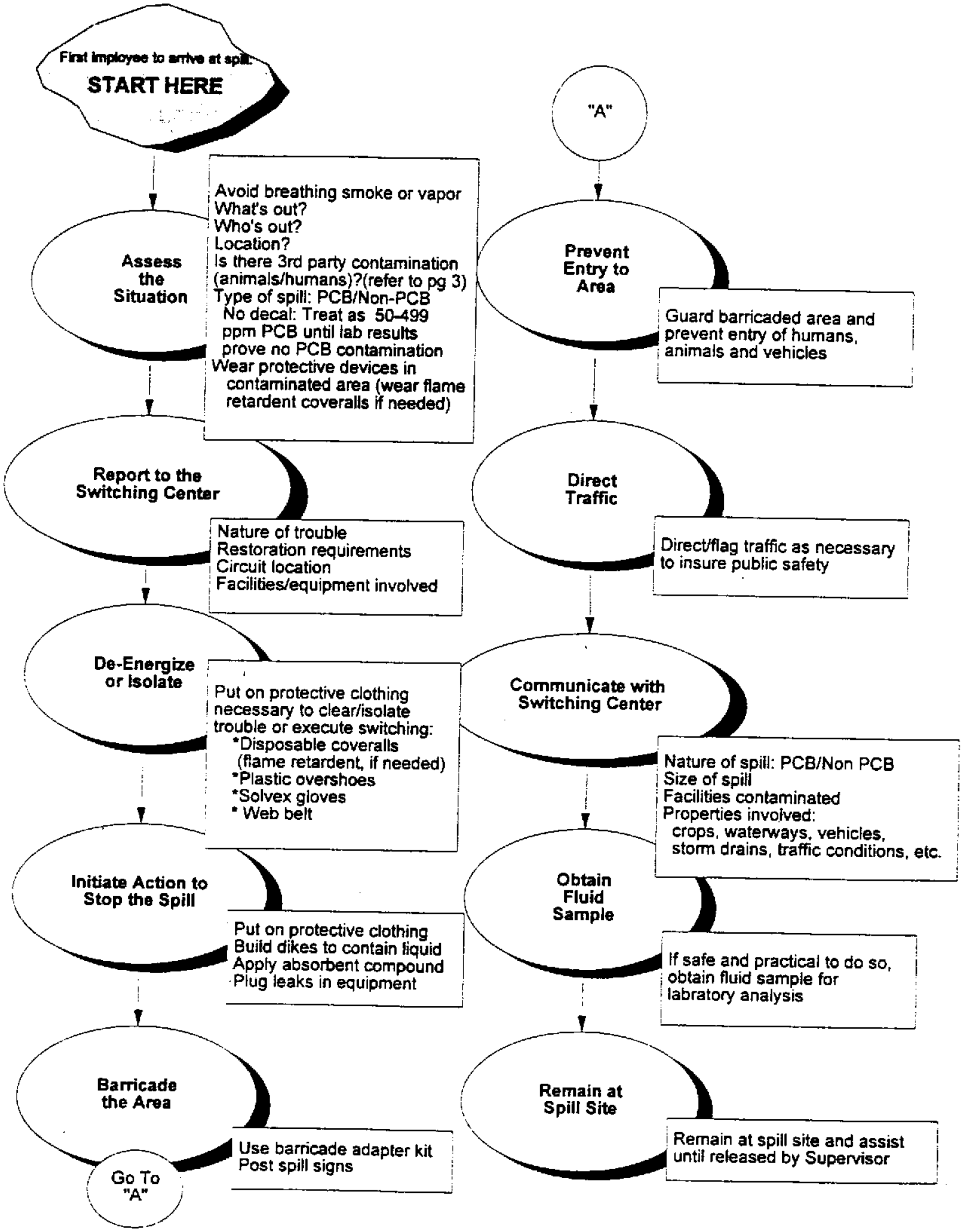
APPENDIX D

PG&E FIRST RESPONDERS GUIDE TO PCB/MINERAL OIL SPILLS

PG&E LINE CREW'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS

PG&E SUPERVISOR'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS

FIRST RESPONDERS GUIDE TO PCB/MINERAL OIL SPILLS



First imployee to arrive at spill:
START HERE

Assess the Situation

Avoid breathing smoke or vapor
What's out?
Who's out?
Location?
Is there 3rd party contamination (animals/humans)?(refer to pg 3)
Type of spill: PCB/Non-PCB
No decal: Treat as 50-499 ppm PCB until lab results prove no PCB contamination
Wear protective devices in contaminated area (wear flame retardent coveralls if needed)

Report to the Switching Center

Nature of trouble
Restoration requirements
Circuit location
Facilities/equipment involved

De-Energize or Isolate

Put on protective clothing necessary to clear/isolate trouble or execute switching:
- *Disposable coveralls (flame retardent, if needed)
- *Plastic overshoes
- *Solvex gloves
- * Web belt

Initiate Action to Stop the Spill

Put on protective clothing
Build dikes to contain liquid
Apply absorbent compound
Plug leaks in equipment

Barricade the Area

Use barricade adapter kit
Post spill signs

Go To "A"

"A"

Prevent Entry to Area

Guard barricaded area and prevent entry of humans, animals and vehicles

Direct Traffic

Direct/flag traffic as necessary to insure public safety

Communicate with Switching Center

Nature of spill: PCB/Non PCB
Size of spill
Facilities contaminated
Properties involved:
crops, waterways, vehicles, storm drains, traffic conditions, etc.

Obtain Fluid Sample

If safe and practical to do so, obtain fluid sample for labratory analysis

Remain at Spill Site

Remain at spill site and assist until released by Supervisor

Available From:
Technical Performance & Operations Support
Distribution Department - T&CS
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Your Actions

You're key

As the first PG&E employee on the scene of a possible PCB spill, you have several key priorities and responsibilities:

- Safety
- Communication
- Restoration

Treat as PCB

If you are unsure of the possible concentration of PCB, you **must** assume the PCB level is 50 to 499 ppm and you **must** take **all** protective measures until laboratory analysis proves that PCB concentration is not a hazard.

When there is any doubt, protect.

Protection first

Once the area is electrically safe, you may be able to minimize the damage caused by the oil spill by:

- Applying absorbent compound
- Building dikes to contain liquid
- Barricading the area

You must take initial steps to contain the spill and protect the public and the environment before beginning to restore power.

Required materials

You must have the following materials with you on your vehicle to be able to safely begin to contain a PCB spill:

- Disposable coveralls (standard and flame retardent)
- Plastic Overshoes
- Solvex Gloves
- Web Belt
- Absorbent Compound
- Barricade Tape
- Respirator (optional/as needed)

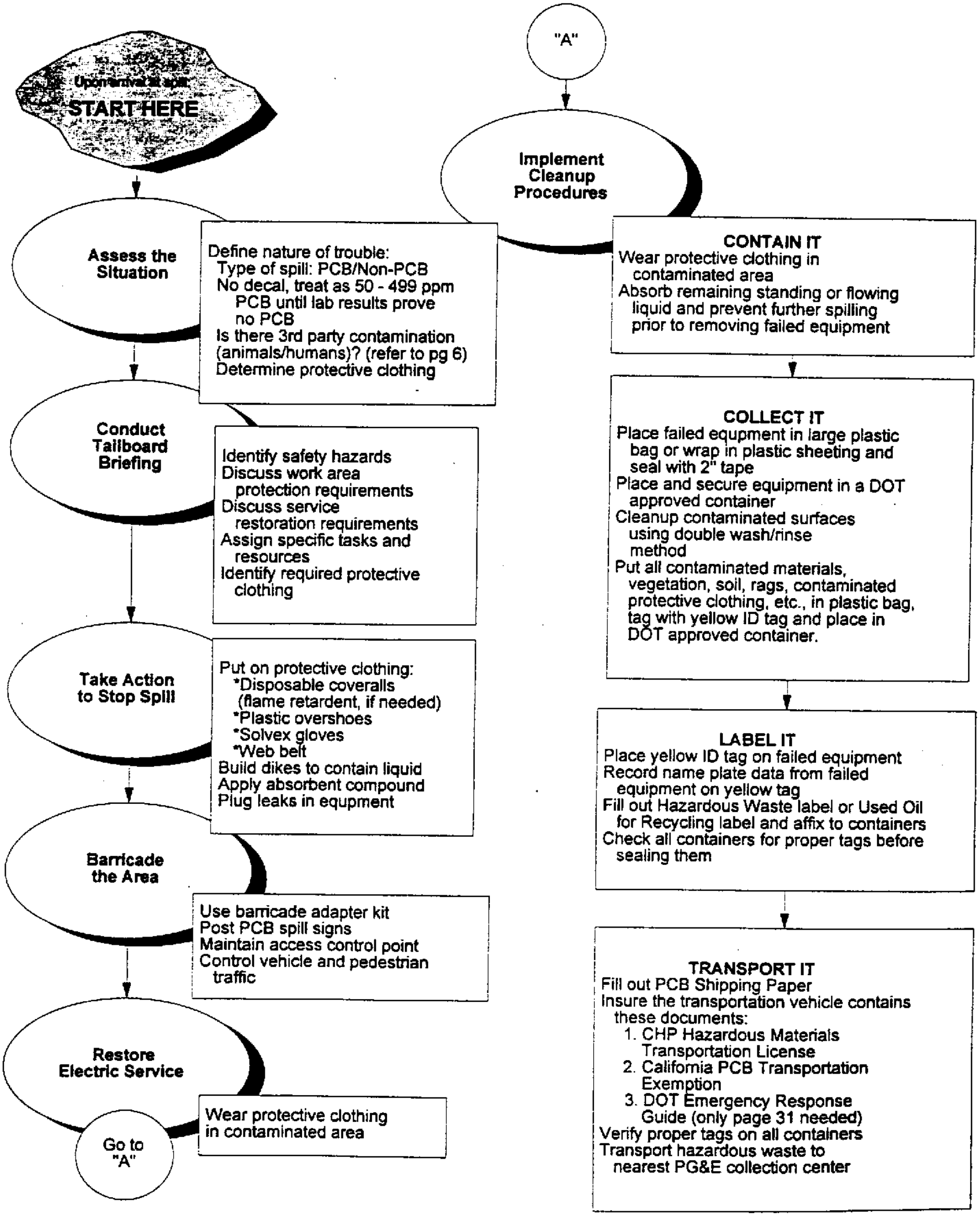
All of the above items can be found in the PCB Spill Kit, Code # 49-0679 (flame retardent coveralls must be ordered separately, MS Code **-**)**

FIRST RESPONDERS GUIDE TO PCB/MINERAL OIL SPILLS

Human Decontamination Procedures:

Steps	Decontamination Procedures
1.	Remove any affected personal articles, place them in a 6 mil plastic bag, tag with person's name, address, phone number. **Notify Safety Health and Claims.** If eye contact has occurred, call 911 immediately and begin flushing eye(s) with any available water.
2.	Provide privacy for the affected individual and remove affected clothing.
3.	Begin cleaning the affected areas by repeated applications of waterless hand cleaner. The cleaner should be completely wiped off with rags or towels between applications.
4.	Provide the person with standard disposable clothing, if needed.
5.	Get the person to a source of soap and water and allow them to wash thoroughly.
6.	Gather all clean-up rags, etc. in a 6 mil bag for return to headquarters. Follow appropriate transportation procedures.
7.	Deliver the bag containing the contaminated personal articles to Safety, Health and Claims for replacement purposes.

PG&E LINE CREW'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS



Define nature of trouble:
Type of spill: PCB/Non-PCB
No decal, treat as 50 - 499 ppm PCB until lab results prove no PCB
Is there 3rd party contamination (animals/humans)? (refer to pg 6)
Determine protective clothing

Identify safety hazards
Discuss work area protection requirements
Discuss service restoration requirements
Assign specific tasks and resources
Identify required protective clothing

Put on protective clothing:
- *Disposable coveralls (flame retardent, if needed)
- *Plastic overshoes
- *Solvex gloves
- *Web belt

Build dikes to contain liquid
Apply absorbent compound
Plug leaks in equipment

Use barricade adapter kit
Post PCB spill signs
Maintain access control point
Control vehicle and pedestrian traffic

Wear protective clothing in contaminated area

CONTAIN IT

Wear protective clothing in contaminated area
Absorb remaining standing or flowing liquid and prevent further spilling prior to removing failed equipment

COLLECT IT

Place failed equipment in large plastic bag or wrap in plastic sheeting and seal with 2" tape
Place and secure equipment in a DOT approved container
Cleanup contaminated surfaces using double wash/rinse method
Put all contaminated materials, vegetation, soil, rags, contaminated protective clothing, etc., in plastic bag, tag with yellow ID tag and place in DOT approved container.

LABEL IT

Place yellow ID tag on failed equipment
Record name plate data from failed equipment on yellow tag
Fill out Hazardous Waste label or Used Oil for Recycling label and affix to containers
Check all containers for proper tags before sealing them

TRANSPORT IT

Fill out PCB Shipping Paper
Insure the transportation vehicle contains these documents:
1. CHP Hazardous Materials Transportation License
2. California PCB Transportation Exemption
3. DOT Emergency Response Guide (only page 31 needed)

Verify proper tags on all containers
Transport hazardous waste to nearest PG&E collection center

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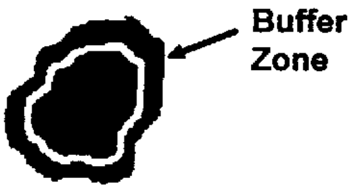
LINE CREW'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS

Soil Removal

If you are cleaning up...	and the PCB concentration is...			then you must remove...	plus a buffer zone that extends horizontally from the edges of the spill in all directions a distance of... 
	5 ppm or greater	50 to 499 ppm	500 ppm or more		
Soil	X	N/A	N/A	All soil that shows contamination	N/A
	N/A	X	N/A	All soil that shows contamination to a minimum depth of 6 inches	12 inches
	N/A	N/A	X	All soil that shows contamination to minimum depth of 10 inches	36 inches
Lawn and Vegetation	X	N/A	N/A	All lawn and vegetation that show contamination	N/A
	N/A	X	N/A	All lawn and vegetation that show contamination plus a minimum depth of 2 inches of soil	12 inches
	N/A	N/A	X	All lawn and vegetation plus minimum depth of 10 inches of soil	36 inches

Washing and Removal

If you are cleaning ...	and the PCB concentration is above 50 ppm, after removing the absorbent compound, you must...	Repeat process twice per EPA guidelines?
Concrete and Asphalt	Apply Pentone solution (4 ounces of Pentone to 1 gallon of water), swab with mops and brush with stiff brooms.	YES
Trees	Remove all contaminated branches and leaves. Wash trunk with Pentone solution. Dry with clean rags after second wash.	YES
Food and Feed	PCB contaminated crops, fruits, vegetables, animal forage, feed, etc. must be removed. Contact Environmental Consultant for assistance	NO
Structures	Buildings, retaining walls, signs, solid surfaces, etc., contaminated with PCBs must be scrubbed with both rags and brushes immersed in Pentone solution and wiped dry with clean rags.	YES
Vehicles	Rub down PCB contaminated painted surfaces with rags dampened with mineral spirits and dry with clean rags immediately after second cleaning to prevent damage to paint.	YES
Swimming Pools	Cleaning swimming pools contaminated with PCBs requires special equipment. **<u>An approved contractor must be called to clean the pool</u>**. Contact the Environmental Consultant for assistance. **CAUTION** Never drain the contaminated pool water.	NO

Cleanup Requirements, Continued

Sample Labels:
Use permanent adhesive, blank labels (3 1/2" x 1 7/16") code 61-6969:

Oil Sample Label (Actual Size)

124 - 126 Lucy Ln
Transformer Ser. # GX265497-3
Westinghouse 15 kVa
13 Feb 95

Vehicle Wipe Sample Label

Wipe Sample
124-126 Lucy Ln.
Veh. Lic # 2X0CFL
Right-front fender, top
Feb. 13, 1995

Soil Sample Label

Soil Sample
124-126 Lucy Ln.
Grid ID #1
Feb. 13, 1995

Blank Wipe Sample Label

Blank Wipe Sample
124 - 126 Lucy Ln.
Feb. 13, 1995

Sample Yellow Plastic ID Tag Code 01-2305

MATERIAL ID TAG
DATE *Feb. 13, 1995*
CONTENTS *Lineman's Belt and Climber Pads*
SERIAL NO. *N/A*
PCB LEVEL *43 ppm*
SAMPLE TEST DATE *Feb. 13, 1995*

FOR MORE INFORMATION CONTACT:
Foreman Bernie Morrison

Belt and Pads belong to Joe Dokes. Lightly
Soiled with Insulating Fluid.
Co. Phone 246-216-9475

Cleanup Requirements, Continued

Sample Hazardous Waste Identification Label

HAZARDOUS
WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES

GENERAL INFORMATION
NAME ① PG&E
ADDRESS ② PHONE
CITY STATE ZIP
EPA/MANIFEST ID NO./DOCUMENT NO. ③
EPA WASTE NO. ④ CA WASTE NO. ⑤ ACCUMULATION START DATE ⑥
CONTENTS COMPOSITION ⑦

PHYSICAL STATE HAZARDOUS PROPERTIES ☐ FLAMMABLE ⑧☒TOXIC
☐ SOLID ☐ LIQUID ☐CORROSIVE ☐ REACTIVITY OTHER

⑨

HANDLE WITH CARE!

INSTRUCTIONS FOR HAZARDOUS WASTE LABEL

① Facility Name: PG&E

② Facility Address: Your service center address (street, city, state, zip) and phone number

③ EPA/Manifest ID No.: Your facility EPA ID number

④ EPA Waste No.: Control number obtained from your Hazardous Waste Coordinator

⑤ California Waste No.: Control number obtained from your Hazardous Waste coordinator

⑥ Accumulation Start Date: The date the waste drum was filled and sealed

⑦ Contents: Use one of the following descriptions:

- Capacitors with PCB/Concentration of PCB (ppm)
- Solid debris containing PCB/Concentration of PCB (ppm)
- Oil containing PCB/Concentration of PCB (ppm)
- Electrical equipment containing PCB and concentration of PCB (ppm)

⑧ Physical State: Always check TOXIC (mineral oil would also be flammable), also check all additional blocks that apply.

⑨ Additional information: Repeat the information used in ⑦ above. Use exactly the same words. In addition, add one of the following

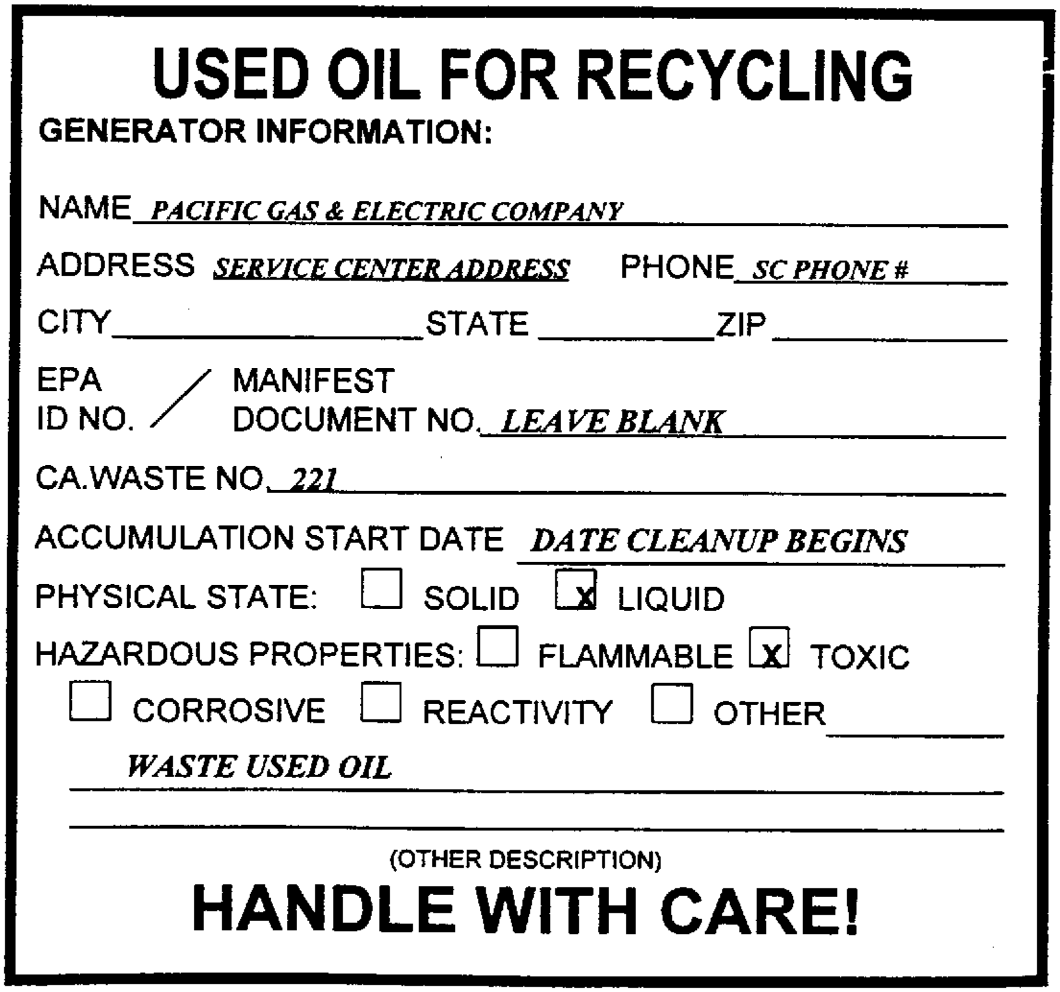
- If the container holds less than one pound of pure PCB state: Non RCRA Hazardous Waste Solid
- If the container holds one pound or more of pure PCB state: Polychlorinated Biphenyls, 9, UN2315, PGIII, RQ

End

Cleanup Requirements, Continued

When filling out the **USED OIL FOR RECYCLING** label, follow the guidelines below:

1. **NAME** is always Pacific Gas & Electric Company
2. **ADDRESS**, including **CITY, STATE** AND **ZIP** is your Service Center address.
3. Under **PHONE**, list your Service Center phone number.
4. **EPA ID NO. / MANIFEST DOCUMENT NO.** leave blank.
5. **CA. WASTE NO.** - 221 is all that is required.
6. **ACCUMULATION START DATE** is the date clean-up begins.
7. **PHYSICAL STATE:** Check LIQUID.
8. **HAZARDOUS PROPERTIES:** Check TOXIC. Under **OTHER DESCRIPTION** indicate *WASTE USED OIL.*



USED OIL FOR RECYCLING

GENERATOR INFORMATION:

NAME *PACIFIC GAS & ELECTRIC COMPANY*

ADDRESS *SERVICE CENTER ADDRESS* PHONE *SC PHONE #*

CITY ____ STATE ____ ZIP ____

EPA ID NO. / MANIFEST DOCUMENT NO. *LEAVE BLANK*

CA.WASTE NO. *221*

ACCUMULATION START DATE *DATE CLEANUP BEGINS*

PHYSICAL STATE: ☐ SOLID ☒ LIQUID

HAZARDOUS PROPERTIES: ☐ FLAMMABLE ☒ TOXIC

☐ CORROSIVE ☐ REACTIVITY ☐ OTHER ____

WASTE USED OIL

(OTHER DESCRIPTION)

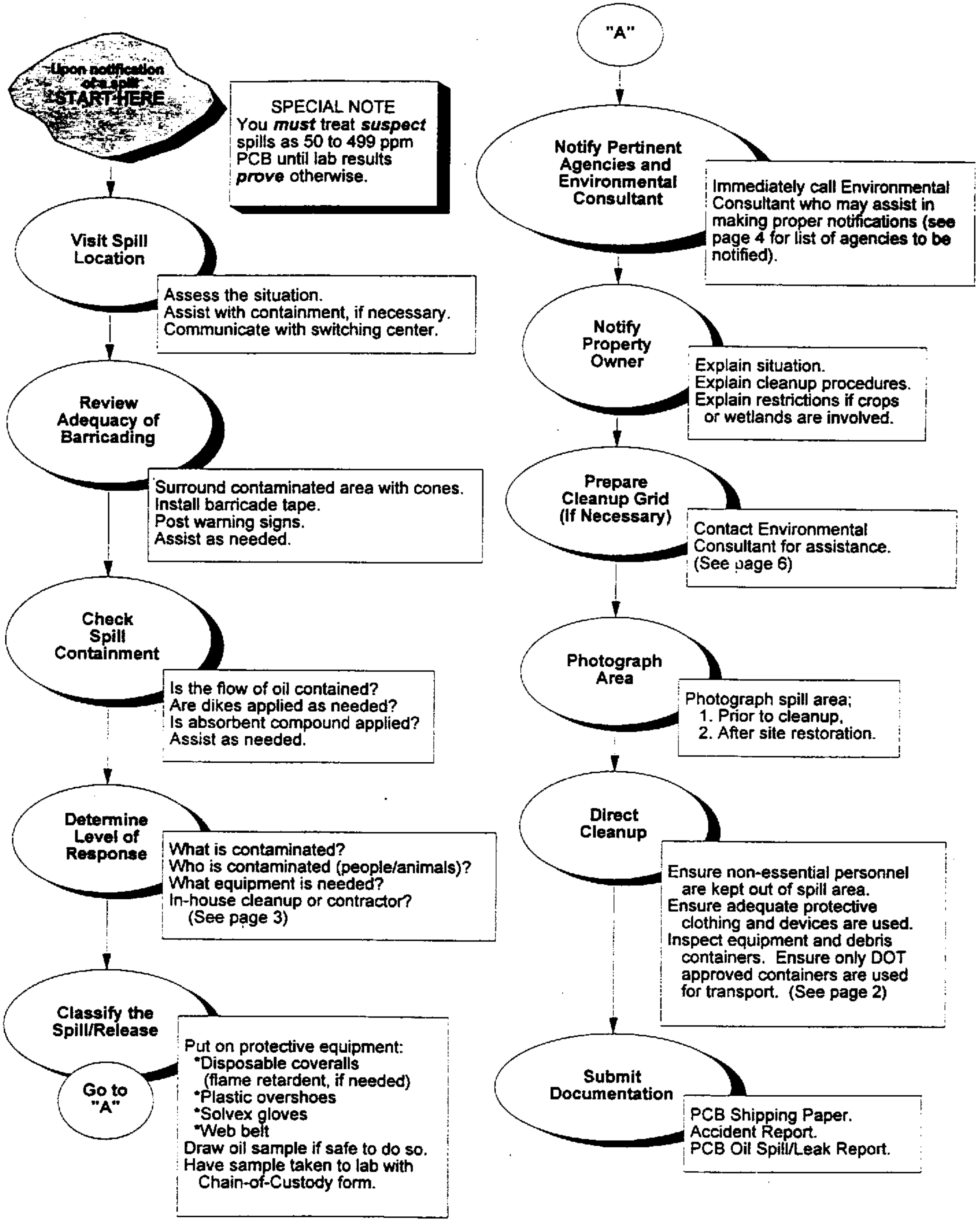
HANDLE WITH CARE!

Cleanup Requirements, Continued

Human Decontamination Procedures:

Steps	Decontamination Procedures
1.	Remove any affected personal articles, place them in a 6 mil plastic bag, tag with person's name, address, phone number. **Notify Safety Health and Claims.** If eye contact has occurred, call 911 immediately and begin flushing eye(s) with any available water.
2.	Provide privacy for the affected individual and remove affected clothing.
3.	Begin cleaning the affected areas by repeated applications of waterless hand cleaner. The cleaner should be completely wiped off with rags or towels between applications.
4.	Provide the person with standard disposable clothing, if needed.
5.	Get the person to a source of soap and water and allow them to wash thoroughly.
6.	Gather all clean-up rags, etc. in a 6 mil bag for return to headquarters. Follow appropriate transportation procedures.
7.	Deliver the bag containing the contaminated personal articles to Safety, Health and Claims for replacement purposes.

SUPERVISOR'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS



Upon notification of a spill START HERE

SPECIAL NOTE
You ***must*** treat ***suspect*** spills as 50 to 499 ppm PCB until lab results ***prove*** otherwise.

Visit Spill Location

Assess the situation.
Assist with containment, if necessary.
Communicate with switching center.

Review Adequacy of Barricading

Surround contaminated area with cones.
Install barricade tape.
Post warning signs.
Assist as needed.

Check Spill Containment

Is the flow of oil contained?
Are dikes applied as needed?
Is absorbent compound applied?
Assist as needed.

Determine Level of Response

What is contaminated?
Who is contaminated (people/animals)?
What equipment is needed?
In-house cleanup or contractor?
(See page 3)

Classify the Spill/Release

Go to "A"

Put on protective equipment:
- Disposable coveralls (flame retardent, if needed)
- Plastic overshoes
- Solvex gloves
- Web belt

Draw oil sample if safe to do so.
Have sample taken to lab with Chain-of-Custody form.

"A"

Notify Pertinent Agencies and Environmental Consultant

Immediately call Environmental Consultant who may assist in making proper notifications (see page 4 for list of agencies to be notified).

Notify Property Owner

Explain situation.
Explain cleanup procedures.
Explain restrictions if crops or wetlands are involved.

Prepare Cleanup Grid (If Necessary)

Contact Environmental Consultant for assistance.
(See page 6)

Photograph Area

Photograph spill area;
1. Prior to cleanup,
2. After site restoration.

Direct Cleanup

Ensure non-essential personnel are kept out of spill area.
Ensure adequate protective clothing and devices are used.
Inspect equipment and debris containers. Ensure only DOT approved containers are used for transport. (See page 2)

Submit Documentation

PCB Shipping Paper.
Accident Report.
PCB Oil Spill/Leak Report.

Available From:
Technical Performance & Operations Support
Distribution Department - T&CS
8 477-2530 (510) 606-2530 15-Mar-96

SUPERVISOR'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS

Partial List of Material Codes (consult CES Standard C-T&CS-S0320, Attachment 1 for complete list)

ITEM			CODE
DOT Approved Containers	55 gallon drum/removable lid		55-1004
	55 gallon drum/fixed lid (liquids only)		55-1008
	95 gallon Enpac polyethylene drum		55-0019
	200 gallon Enpac polyethylene drum		55-0021
	600 gallon Enpac polyethylene drum		55-0029
Personal Protective Devices	Disposable coveralls	Large	20-8598
		X-Large	20-8599
		XX-Large	20-8616
	Disposable coveralls - Fire Retardent	Large	**-****
		X-Large	**-****
		XX-Large	**-****
	Plastic overshoes	Large	20-6473
		X-Large	20-6471
	Solvex gloves	Medium (size 10)	20-8709
		Large (size 11)	20-8600
	Half-mask respirator, MSA Comfo II (excluding cartridge*)	Small	20-6938
		Medium	20-6584
		Large	20-6940
	Full mask respirator MSA Ultra-Twin (excluding cartridge*)	Small	20-8706
		Medium	20-7027
		Large	20-8707
	*Combination filter/cartridge for above (6 per box)		20-7573
	Face shields	Universal hat adapter w/ face shield for hard hat MSA catalogue # 458850	20-6264
		Chemgard faceshield frame (less visor for Topgard Caps) MSA catalogue # 469753	20-7764
		Visor, clear polycarbonate, 8-inch, catalogue # 468763	20-7766
	Web body safety belt, construction, type, 2 "O" rings		20-6145
Cleaners	Pentone Power Cleaner	1 gallon cans	49-2163
		6 gallon can	49-2157
	Waterless hand cleaner, 16-ounce tube		49-2999
Solvent	Hexane (mineral spirits) 1 liter		01-2255
Absorbants	Absorbant compound, SUPERFINE, 33.3-pound bag		49-5482
	Absorbent rags		20-9059
	3M "SORBENT" Type 100, selective oil absorbent, rolls, 100 sheets per bale		56-9389
	3M "SORBENT" Type 156, selective oil absorbent, 3/8" x 18" x 18" sheets, 100 sheets per bale		56-9415
	Entrol Sorbent Boom, oil and chemical		56-9413
Miscellaneous	Broom components	Handle	20-9043
		Brush	20-9003
	Mop components	Handle	20-3095
		Head	20-9101
	Scrub brushes		20-9024
	Plastic pails, 11 quart		20-1886
	Plastic bags	Large (9.6 mil., 38" x 65")	56-9278
		Extra large (10 mil., 56" x 50")	56-9379
	Portable Privacy Shower		51-0058
	Plastic sheet, clear, 4 min., one 10' x 100' roll		56-2192
	Tape, corrosive protection, 2" wide		56-2117

Available From:
Technical Performance & Operations Support
Distribution Department - T&CS
8 477-2530 (510) 606-2530 15-Mar-96

Begin immediately after notification of spill:

Step	Action	Check When Done	Details
1.	Visit spill location	☐	Assess the situation
		☐	Assist with containment, if necessary
		☐	Communicate with switching center
2.	Review adequacy of barricading	☐	Cone-off contaminated area
		☐	Install barricade tape
		☐	Post warning signs
		☐	Assist as needed
3.	Check spill containment	☐	Contain flow of oil
		☐	Apply dikes as needed
		☐	Apply absorbent as needed
		☐	Assist as needed
4.	Determine level of response	☐	What is contaminated?
		☐	Who is contaminated (people/animals)?
		☐	What equipment is needed? Due to the size and weight of the equipment and volume of fluid, it may be necessary to contract for rigging, hauling, and fluid hauling. Contact the Environmental Consultant for securing qualified contractors.
			In-house cleanup or contractor? Spills involving any of the following will require an outside contractor to cleanup: Waterways (ditch, canal, pond, rain runoff, etc.) Grazing land Agricultural crops Hard to decontaminate objects Large distribution transformers or other equipment

Time Limits for Starting and Completing Spill Cleanup

PCB Concentration	Start Cleanup	Complete Cleanup
49 ppm and below	Within 48 hours	As soon as practical
50 - 499 ppm and less than 1 pound of PCB	Within 24 hours	Within 48 hours
Greater than 500 ppm or more than 1 pound of PCB	Within 24 hours	As soon as possible

Continued next page

<table>
<tr><th>Step</th><th>Action</th><th>Check When Done</th><th>Details</th></tr>
<tr><td>5.</td><td>Classify the spill/release</td><td>☐</td><td>Put on protective equipment. For any spill, protective clothing and equipment must be used as necessary to avoid contact with oil by personnel, personal clothing, tools and other equipment. When anticipating contact with PCB/ mineral oil from distribution line equipment, you must wear protective clothing and equipment as shown below:
<table>
<tr><th>PCB Level (Lab Results)</th><th>Required Protective Equipment</th></tr>
<tr><td colspan="2">Initial Response - Before Lab Analysis Results Are Known</td></tr>
<tr><td>PCB levels not confirmed by laboratory analysis</td><td>Disposable coveralls
(fire retardent, if neccessary)
Plastic Overshoes
Solvex gloves
Web belt</td></tr>
<tr><td colspan="2">Cleanup Continues - After Lab Analysis Results Are Known</td></tr>
<tr><td>Minimal PCB oil spill
PCB less than 5 ppm, or</td><td rowspan="3">Solvex gloves
Overshoes
NOTE: Additional protective devices may be required based upon existing conditions.</td></tr>
<tr><td>California Regulated Spill
PCB between 5 and 49 ppm, or</td></tr>
<tr><td>Federal Low Concentration Spill
PCB between 50 and 499 ppm</td></tr>
<tr><td>Federal High Concentration Spill
PCB 500 ppm or greater</td><td>Disposable Coveralls
Plastic Overshoes
Solvex Gloves
Web Belt</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>☐</td><td>Draw oil sample if safe to do so</td></tr>
<tr><td></td><td></td><td>☐</td><td>Have sample and Chain-of-Custody form taken to lab</td></tr>
<tr><td>6.</td><td>Notify Proper Agencies and Environmental Consultant</td><td>☐</td><td>Call Environmental Consultant immediately.
Be prepared to provide the following information:

Date, location and time of release
Description of material released
Amount/quantity released
Cause of release
Brief description of response actions
Names of any agencies notified
Phone number of someone to talk to for more information later
All third parties involved (and injuries)
Any need for someone to act as a company spokesperson
Are any agencies already on site and if so, which one(s)

</td></tr>
</table>

Continued next page

PG&E SUPERVISOR'S RESPONSE GUIDE TO PCB/MINERAL OIL SPILLS

Step	Action	Check When Done	Details	
6.	Notify Proper Agencies and Environmental Consultant, cont.		**Key Telephone Numbers**	
		☐	EC On-Call (after hours)	(800) 874-4043
		☐	Local EC (regular hours)	
		☐	Local PCB Coordinator	
		☐	TES (Senior Chemist)	(510) 820-2000 (24-hr)
		☐	Local Notification	
		☐	County Environmental Health Dept.	
		☐	Safety, Health and Claims	
			Remember: External agencies must be notified as soon as practical, but in no case should notification be delayed more than 24 hours after event is discovered.	

Agencies to Notify

Spill Type	ppm PCB	Agency to Notify ①	②	③	④
Mineral oil spills (not regulated by state or federal agencies)	less than 5	X	X	▨	X
California regulated spills	5 to 49	X	X	▨	X
Federal low concentration (less than 1 pound of pure PCB) *	50 to 499	X	X	X	X
Federal high concentration (more than 1 pound of pure PCB) *	over 500	X	X	X	X

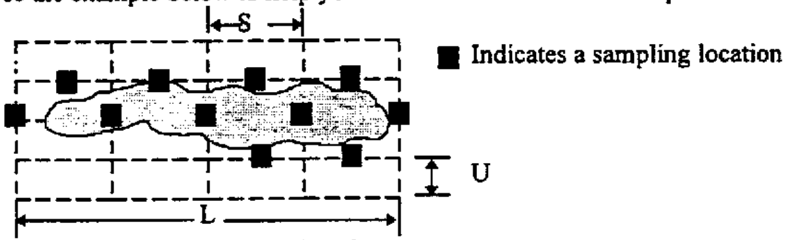
Check When Done		Agency	Phone Number
☐	①	Local Regional Water Quality Board	
☐	②	State office of Emergency Services	800 852-7550
☐	③	EPA Region IX	415 744-2000
☐	④	National Response Center	800 424-8802
☐	⑤	County Environmental Health Dept.	

* To compute total weight of PCB spilled:

$$\frac{\text{Gallons x ppm}}{135{,}000} = \underline{\qquad\qquad} \text{ Total weight (in pounds)}$$

Step	Action	Check When Done	Details
7.	Notify property owner	☐	Explain situation
		☐	Explain cleanup procedures
		☐	Explain restrictions if crops or wetlands are involved.

Continued next page

<table>
<tr><th>Step</th><th>Action</th><th>Check When Done</th><th>Details</th></tr>
<tr><td>8.</td><td>Prepare cleanup grid</td><td>☐
☐</td><td>Contact Environmental Consultant for assistance.
Determining Number of Spill Samples
<table>
<tr><th>Length of Spill</th><th>Usual Number of Samples</th></tr>
<tr><td>8 feet or less</td><td>7</td></tr>
<tr><td>8 fee to 22 feet</td><td>19</td></tr>
<tr><td>Over 22 feet</td><td>37</td></tr>
</table>
The number of required samples is determined by the size of the spill.
Calculate dimensions of grid cells:
L= Measured length of spill (always measure spill at longest point)
U= Calculated distance between grid lines parallel to long axis of spill
S = Calculated distance between vertical grid lines perpendicular to long axis of spill
<table>
<tr><th>Length of Spill</th><th>"S" factor</th><th>"U" factor</th></tr>
<tr><td>L = Less than 8 feet (approx. 7 samples)</td><td>S = 0.44 x L</td><td>U = 0.38 x L</td></tr>
<tr><td>L = 8' to 22 feet (approx. 19 samples)</td><td>S = 0.24 x L</td><td>U = 0.21 x L</td></tr>
<tr><td>L = Greater than 22 feet (approx. 37 samples)</td><td>S = 0.15 x L</td><td>U = 0.13 x L</td></tr>
</table>
Use the example below to help you calculate the number of samples.


Length of spill = 18 feet, therefore
L = 18, then the "S" factor is 0.24 which leads you to S = 0.24 x 18 and calculates S = 4.3 feet
L = 18, then the "U" factor is 0.21 which leads you to U = 0.21 x 18 and calculates U = 3.8 feet</td></tr>
<tr><td>9.</td><td>Photograph area</td><td>☐
☐</td><td>Photograph spill area:
Prior to cleanup
After site restoration</td></tr>
<tr><td>10.</td><td>Direct cleanup</td><td>☐
☐
☐</td><td>Ensure non-essential personnel are kept out of spill area.
Ensure adequate protective devices are available and are used.
Inspect equipment and debris containers. Ensure only DOT approved containers are used for transport. (See page 2)</td></tr>
<tr><td>11.</td><td>Submit reports and documents</td><td>☐
☐
☐</td><td>PCB Shipping Paper
Accident Report
PCB/Oil Spill/Leak Report</td></tr>
</table>

* **RCRA** - High Federal Spill (500 ppm PCB or 1 lb. pure PCB)

End

Available From:
Technical Performance & Operations Support
Distribution Department - T&CS
8 - 477-2530 (510) 606-2530 31-Jan-95

Appendix B

Laboratory Analytical Results and Chain of Custody Documentation

- Soil Stockpile Sample COMP A
- Soil Boring Samples B1-B5
- Oil Sample Fuel Fingerprint

Soil Stockpile

Laboratory Analytical Results and Chain of Custody Documentation

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: #0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/19/96
	Client P.O:	Date Analyzed: 08/20/96

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline*, with Methyl tert-Butyl Ether* & BTEX*

EPA methods 5030, modified 8015, and 8020 or 602; California RWQCB (SF Bay Region) method GCFID(5030)

Lab ID	Client ID	Matrix	TPH(g)$^+$	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	% Rec. Surrogate
68078	Comp A	S	23,g/e	---	ND	ND	ND	0.062	102
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W	50 ug/L	5.0	0.5	0.5	0.5	0.5	
	S	1.0 mg/kg	0.05	0.005	0.005	0.005	0.005	

* water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, and all TCLP extracts in mg/L

\# cluttered chromatogram; sample peak coelutes with surrogate peak

\+ The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent ?); f) one to a few isolated peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~ 5 vol. % sediment; j) no recognizable pattern.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: # 0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/19/96
	Client P.O:	Date Analyzed: 08/19/96

Fuel Fingerprint

EPA methods modified 8015, and 3550 or 3510; California RWQCB (SF Bay Region) method GCFID(3550) or GCFID(3510)

Lab ID	Client ID	Matrix	Fuel Fingerprint
68078	Comp A	S	This sample appears to contain aged diesel and stoddard solvent
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W		50 ug/L
	S		1.0 mg/kg

* water samples are reported in ug/L, soil and sludge samples in mg/kg, and all TCLP and STLC extracts in mg/L

\# cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

\+ The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) medium boiling point pattern that does not match diesel (?); f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~ 5 vol. % sediment.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: # 0117; PG&E-Emeryville	Date Sampled: 08/19/96
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	Client Contact: Paul King	Date Extracted: 08/19/96
	Client P.O:	Date Analyzed: 08/19/96

Diesel Range (C10-C23) and Oil-Range (C18+) Extractable Hydrocarbons as Diesel and Motor Oil*

EPA methods modified 8015, and 3550 or 3510; California RWQCB (SF Bay Region) method GCFID(3550) or GCFID(3510)

Lab ID	Client ID	Matrix	TPH(d)$^+$	TPH(mo)$^+$	% Recovery Surrogate
68078	Comp A	S	680,c,e	---	103
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W	50 ug/L	250 ug/L		
	S	1.0 mg/kg	5.0 mg/kg		

* water samples are reported in ug/L, soil and sludge samples in mg/kg, and all TCLP and STLC extracts in mg/L

\# cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

\+ The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) medium boiling point pattern that does not match diesel (Stoddards solvent?); f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~ 5 vol. % sediment.

DHS Certification No. 1644

__________Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.

110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: #0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/20/96
	Client P.O:	Date Analyzed: 08/24/96

Volatile Organics By GC/MS

EPA method 624 or 8240

Lab ID	68078		
Client ID	Comp A		
Matrix	S		
Compound	Concentration*	Compound	Concentration*
Acetone (b)	ND< 10	cis-1,3-Dichloropropene	ND< 10
Benzene	ND< 10	trans-1,3-Dichloropropene	ND< 10
Bromodichloromethane	ND< 10	Ethylbenzene	ND< 10
Bromoform	ND< 10	Methyl butyl ketone (d)	ND< 10
Bromomethane	ND< 10	Methylene Chloride (e)	ND< 10
Carbon Disulfide	ND< 10	Methyl ethyl ketone (f)	ND< 10
Carbon Tetrachloride	ND< 10	Methyl isobutyl ketone (g)	ND< 10
Chlorobenzene	ND< 10	Styrene (k)	13
Chloroethane	ND< 10	1,1,2,2-Tetrachloroethane	ND< 10
2-Chloroethyl Vinyl Ether (c)	ND< 10	Tetrachloroethene	ND< 10
Chloroform	ND< 10	Toluene (l)	ND< 10
Chloromethane	ND< 10	1,1,1-Trichloroethane	ND< 10
Dibromochloromethane	ND< 10	1,1,2-Trichloroethane	ND< 10
1,2-Dichlorobenzene	ND< 10	Trichloroethene	ND< 10
1,3-Dichlorobenzene	ND< 10	Trichlorofluoromethane	ND< 10
1,4-Dichlorobenzene	ND< 10	Vinyl Acetate (m)	ND< 10
1,1-Dichloroethane	ND< 10	Vinyl Chloride (n)	ND< 10
1,2-Dichloroethane	ND< 10	Xylenes, total (o)	ND< 10
1,1-Dichloroethene	ND< 10	**Surrogate Recoveries (%)**	
cis-1,2-Dichloroethene	ND< 10	Dibromofluoromethane	96
trans-1,2-Dichloroethene	ND< 10	Toluene-d8	98
1,2-Dichloropropane	ND< 10	4-Bromofluorobenzene	105

Comments: j

Reporting limits unless otherwise stated: water samples 5 ug/L; vapor samples 0.5 ug/L; solid and sludge samples 5 ug/kg

* water and vapor samples are reported in ug/L, soil and sludge samples in ug/kg and all TCLP extracts in ug/L

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis

(b) 2-propanone or dimethyl ketone; (c) (2-chloroethoxy) ethene; (d) 2-hexanone; (e) dichloromethane; (f) 2-butanone; (g) 4-methyl-2-pentanone or isopropylacetone; (h) lighter than water immiscible sheen is present; (i) liquid sample that contains greater than ~ 5 vol. % sediment; (j) sample diluted due to high organic content; (k) ethenylbenzene; (l) methylbenzene; (m) acetic acid ethenyl ester; (n) chloroethene; (o) dimethylbenzenes.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: # 0117; PG&E-Emeryville	Date Sampled: 08/19/96 Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/20/96
	Client P.O:	Date Analyzed: 08/20-08/21/96

Chlorinated Pesticides (including PCBs)

EPA method 608 and 3510 or 8080 and 3550

Lab ID	68078					Reporting Limit	
Client ID	Comp A						
Matrix	S					S	W,STLC, TCLP
Compound	Concentration*						
Aldrin	ND					5	0.075
α-BHC	ND					1	0.01
β-BHC	ND					5	0.05
γ-BHC (Lindane)	ND					5	0.2
σ-BHC	ND					5	0.05
Chlordane	ND					5	0.1
p,p'-DDD$^{(k)}$	ND					1	0.02
p,p'-DDE$^{(k)}$	ND					1	0.01
p,p'-DDT$^{(k)}$	ND					1	0.02
Dieldrin	ND					1	0.02
Endosulfan I	ND					1	0.01
Endosulfan II	ND					1	0.01
Endosulfan Sulfate	ND					5	0.05
Endrin	ND					5	0.1
Endrin Aldehyde	ND					5	0.05
Heptachlor	ND					1	0.01
Heptachlor Epoxide	ND					1	0.01
p,p'-Methoxychlor$^{(k)}$	ND					50	10
PCB-Total$^{(+)}$	1400,g					50	0.5
Toxaphene	ND					100	1
% Recovery Surrogate	81						
Comments							

* water and oil samples are reported in ug/L, soil and sludge samples in ug/kg and all TCLP and STLC extracts in ug/L

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis

\# surrogate diluted out of range or surrogate coelutes with another peak

\+ (a) PCB aroclor 1016; (b) PCB aroclor 1221; (c) PCB aroclor 1232; (d) PCB aroclor 1242; (e) PCB aroclor 1248; (f) PCB aroclor 1252; (g) PCB aroclor 1260; (h) a lighter than water immiscible sheen is present; (i) liquid sample that contains > ~ 5 vol. % sediment; (j) sample diluted due to high organic content; (k) p,p'- is the same as 4,4'- .

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: #0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/19/96
	Client P.O:	Date Analyzed: 08/20/96

LUFT Metals*

EPA analytical methods 6010/200.7, 239.2+

Lab ID	Client ID	Matrix	Extraction°	Cadmium	Chromium	Lead	Nickel	Zinc	% Rec. Surrogate
68078	Comp A	S	TTLC	1.4	50	180	54	220	100

Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	S	TTLC	0.5 mg/kg	0.5	3.0	2.0	1.0	
	W	TTLC	0.005 mg/L	0.005	0.005	0.05	0.05	
	---	STLC,TCLP	0.01 mg/L	0.05	0.2	0.05	0.05	

* soil samples and sludge are reported in mg/kg, and water samples and all STLC & TCLP extracts in mg/L

+ Lead is analysed using EPA method 6010 (ICP)for soils, STLC & TCLP extracts and method 239.2 (AA Furnace) for water samples

° EPA extraction methods 1311(TCLP), 3010/3020(water,TTLC), 3040(organic matrices,TTLC), 3050(solids,TTLC); STLC from CA Title 22

surrogate diluted out of range; N/A means surrogate not applicable to this analysis

& reporting limit raised due matrix interference

i) liquid sample that contains greater than ~ 2 vol. % sediment; this sediment is extracted with the liquid, in accordance with EPA methodologies and can significantly effect reported metal concentrations.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: #0117; PG&E-Emeryville	Date Sampled: 08/19/96 Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/22-08/24/96
	Client P.O:	Date Analyzed: 08/25/96

Lead*

EPA analytical methods 6010/200.7, 239.2+

Lab ID	Client ID	Matrix	Extraction°	Lead*	% Recovery Surrogate
68078	Comp A	S	STLC	6.4	NA
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	S	TTLC	3.0 mg/kg		
	W	TTLC	0.005 mg/L		
	---	STLC,TCLP	0.2 mg/L		

* soil and sludge samples are reported in mg/kg, and water samples and all STLC & TCLP extracts in mg/L

+ Lead is analysed using EPA method 6010 (ICP)for soils, sludges, STLC & TCLP extracts and method 239.2 (AA Furnace) for water samples

° EPA extraction methods 1311(TCLP), 3010/3020(water,TTLC), 3040(organic matrices,TTLC), 3050(solids,TTLC); STLC from CA Title 22

surrogate diluted out of range; N/A means surrogate not applicable to this analysis

& reporting limit raised due matrix interference

i) liquid sample that contains greater than ~ 2 vol. % sediment; this sediment is extracted with the liquid, in accordance with EPA methodologies and can significantly effect reported metal concentrations.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.
110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: # 0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/28-08/29/96
	Client P.O:	Date Analyzed: 08/29/96

Lead[*]

EPA analytical methods 6010/200.7, 239.2[+]

Lab ID	Client ID	Matrix	Extraction[°]	Lead[*]	% Recovery Surrogate
68078	Comp A	S	TCLP	ND	N/A

Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	S	TTLC	3.0 mg/kg	
	W	TTLC	0.005 mg/L	
	---	STLC,TCLP	0.2 mg/L	

[*] soil and sludge samples are reported in mg/kg, and water samples and all STLC & TCLP extracts in mg/L

[+] Lead is analysed using EPA method 6010 (ICP)for soils, sludges, STLC & TCLP extracts and method 239.2 (AA Furnace) for water samples

[°] EPA extraction methods 1311(TCLP), 3010/3020(water,TTLC), 3040(organic matrices,TTLC), 3050(solids,TTLC); STLC from CA Title 22

[#] surrogate diluted out of range; N/A means surrogate not applicable to this analysis

[&] reporting limit raised due matrix interference

i) liquid sample that contains greater than ~ 2 vol. % sediment; this sediment is extracted with the liquid, in accordance with EPA methodologies and can significantly effect reported metal concentrations.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

P & D Environmental 4020 Panama Court Oakland, CA 94611	Client Project ID: # 0117; PG&E-Emeryville	Date Sampled: 08/19/96
		Date Received: 08/19/96
	Client Contact: Paul King	Date Extracted: 08/20/96
	Client P.O:	Date Analyzed: 08/20/96

RCI (Reactivity, Corrosivity & Ignitability)

CA Title 22, Section 66261.21-66261.23

Lab ID	Client ID	Matrix	Reactivity[+]	Corrosivity (pH)	Ignitability[o]
68078	Comp A	S	negative	10.90	negative

[+] negative means no obvious reaction with water, no evolution of gas upon contact with water, appears to contain no reactive cyanide or sulfide (< ~ 5 mg/kg cyanide and 50 mg/kg sulfide by EPA SW-846, chapter 7, modified), and shows no indication of explosivity.

[o] negative for a soil means the absence of spontaneous combustion and the absence of flammability upon exposure to a naked flame.

DHS Certification No. 1644

Edward Hamilton, Lab Director

QC REPORT FOR HYDROCARBON ANALYSES

Date: 08/19/96 Matrix: Soil

Analyte	Concentration (mg/kg) Sample (#77777)	MS	MSD	Amount Spiked	% Recovery MS	MSD	RPD
TPH (gas)	0.000	1.845	1.842	2.03	91	91	0.2
Benzene	0.000	0.188	0.182	0.2	94	91	3.2
Toluene	0.000	0.190	0.184	0.2	95	92	3.2
Ethylbenzene	0.000	0.190	0.186	0.2	95	93	2.1
Xylenes	0.000	0.568	0.552	0.6	95	92	2.9
TPH (diesel)	0	292	296	300	97	99	1.3
TRPH (oil and grease)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR HYDROCARBON ANALYSES

Date: 08/20/96-08/21/96 Matrix: Soil

Analyte	Concentration (mg/kg) Sample (#67155)	MS	MSD	Amount Spiked	% Recovery MS	MSD	RPD
TPH (gas)	0.000	1.955	1.944	2.03	96	96	0.6
Benzene	0.000	0.162	0.176	0.2	81	88	8.3
Toluene	0.000	0.168	0.192	0.2	84	96	13.3
Ethylbenzene	0.000	0.166	0.170	0.2	83	85	2.4
Xylenes	0.000	0.490	0.502	0.6	82	84	2.4
TPH (diesel)	0	319	325	300	106	108	1.6
TRPH (oil and grease)	0.0	20.9	21.1	20.8	100	101	1.0

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR VOCs (EPA 624/8240/8260)

Date: 08/24/96-08/25/96 Matrix: Soil

Analyte	Concentration (ug/kg) Sample (#67153)			Amount Spiked	% Recovery		
		MS	MSD		MS	MSD	RPD
1,1-Dichloroethe	0.00	9.30	9.70	10.0	93	97	4.2
Trichloroethene	0.00	7.80	7.80	10.0	78	78	0.0
EDB	0.00	9.80	9.10	10.0	98	91	7.4
Chlorobenzene	0.00	10.40	10.40	10.0	104	104	0.0
Benzene	0.00	10.40	10.60	10.0	104	106	1.9
Toluene	0.00	10.40	10.40	10.0	104	104	0.0

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR CHLORINATED PESTICIDES and PCB (EPA 608/8080)

Date: 08/20/96-08/21/96 Matrix: Soil

Analyte	Concentration (ug/kg)			Amount Spiked	% Recovery		RPD
	Sample (#67156)	MS	MSD		MS	MSD	
PCB	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lindane	0.00	0.43	0.43	0.50	85	85	0.0
Heptachlor	0.00	0.43	0.51	0.50	85	103	18.7
Aldrin	0.00	0.51	0.44	0.50	103	88	15.8
Dieldrin	0.00	1.11	1.11	1.25	89	89	0.0
Endrin	0.00	1.18	1.26	1.25	94	101	7.2
4,4'-DDT	0.00	0.98	1.00	1.25	78	80	2.5

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

McCAMPBELL ANALYTICAL INC.

110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

QC REPORT FOR METALS

Date: 08/20/96

Matrix: Soil

Extraction: TTLC

Analyte	Concentration (mg/kg)			Amount Spiked	% Recovery		RPD
	Sample	MS	MSD		MS	MSD	
Arsenic	0.0	5.8	5.7	5.0	117	114	2.2
Selenium	0.0	5.5	5.4	5.0	110	109	1.5
Molybdenum	0.0	5.6	5.5	5.0	111	110	1.1
Silver	0.0	0.6	0.6	0.5	119	117	2.3
Thallium	0.0	5.2	5.2	5.0	103	104	0.8
Barium	0.0	5.1	5.0	5.0	102	99	2.6
Nickel	0.0	5.6	5.5	5.0	112	111	1.2
Chromium	0.0	5.6	5.5	5.0	112	110	2.0
Vanadium	0.0	5.6	5.5	5.0	112	109	2.9
Beryllium	0.0	6.1	5.9	5.0	121	118	2.8
Zinc	0.0	5.7	5.5	5.0	113	111	2.3
Copper	0.0	5.2	5.1	5.0	104	102	2.4
Antimony	0.0	5.8	5.7	5.0	116	113	2.4
Lead	0.0	5.5	5.4	5.0	110	107	2.7
Cadmium	0.0	5.9	5.7	5.0	117	114	2.8
Cobalt	0.0	5.5	5.3	5.0	110	107	3.2
Mercury	0.000	0.285	0.285	0.25	114	114	0.0

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

McCAMPBELL ANALYTICAL INC.

110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

QC REPORT FOR AA METALS

Date: 08/25/96

Matrix: Soil/STLC

Analyte	Concentration (mg/kg,mg/L)			Amount Spiked	% Recovery		RPD
	Sample	MS	MSD		MS	MSD	
Total Lead	0.0	4.34	4.28	5.0	87	86	1.5
Total Cadmium	0.0	4.61	4.57	5.0	92	91	0.9
Total Chromium	0.0	4.38	4.31	5.0	88	86	1.7
Total Nickel	0.0	4.33	4.29	5.0	87	86	0.9
Total Zinc	0.0	4.56	4.49	5.0	91	90	1.5
Total Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hexachrome	N/A	N/A	N/A	N/A	N/A	N/A	N/A

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR AA METALS

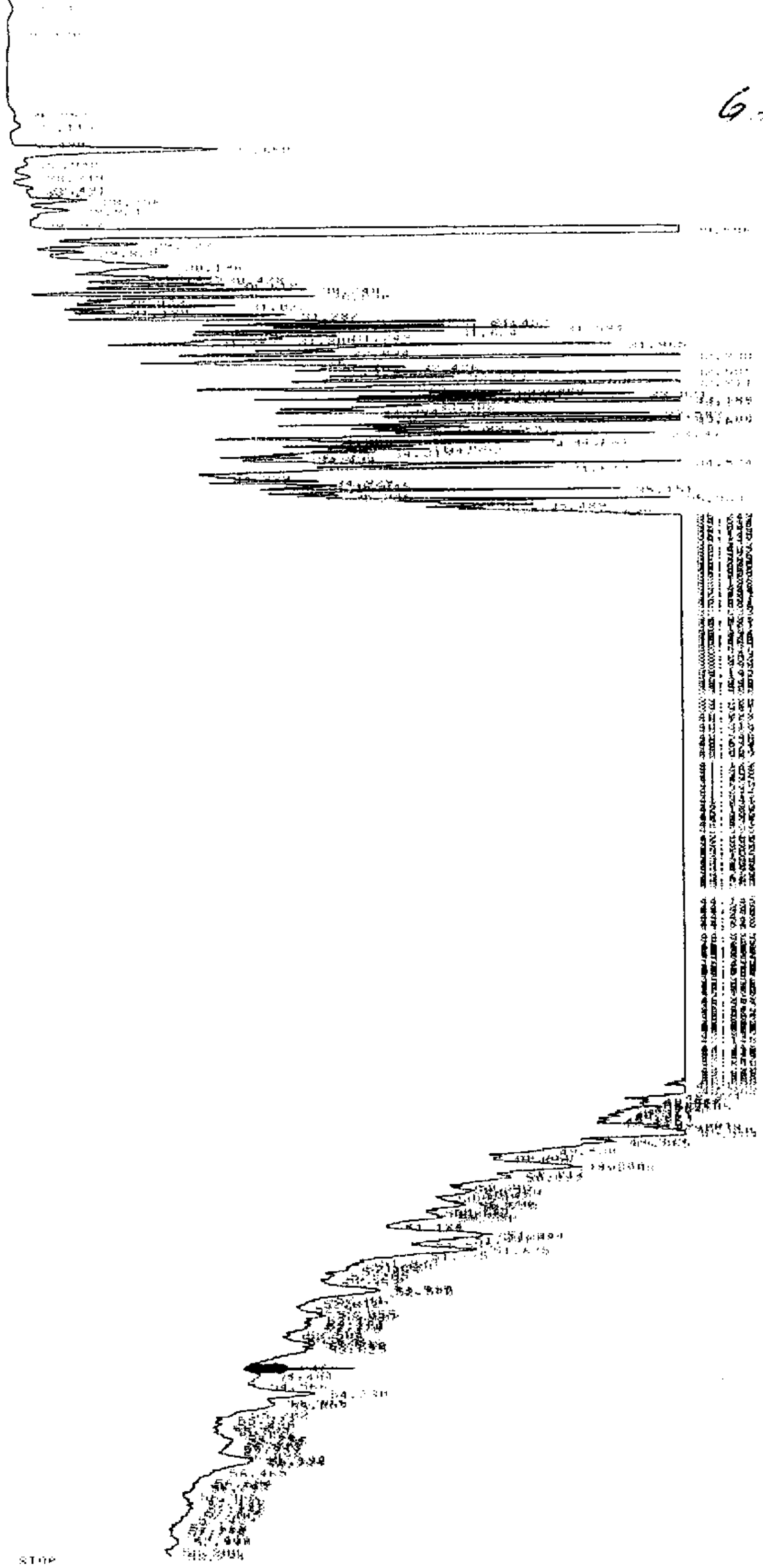
Date: 08/29/96 Matrix: Soil

Analyte	Concentration (mg/kg, mg/L)			Amount Spiked	% Recovery		RPD
	Sample	MS	MSD		MS	MSD	
Total Lead	0.0	5.19	5.24	5.0	104	105	1.0
Total Cadmium	0.0	5.33	5.38	5.0	107	108	0.9
Total Chromium	0.0	5.01	5.09	5.0	100	102	1.6
Total Nickel	0.0	5.12	5.16	5.0	102	103	0.8
Total Zinc	0.0	5.29	5.37	5.0	106	107	1.5
TCLP Lead	0.00	4.94	4.82	5.0	99	96	2.5
Hexachrome	N/A	N/A	N/A	N/A	N/A	N/A	N/A

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

G5078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  22.630   PB           189   .038           89              .053
  22.701   BB           351   .043          137              .098
  22.765   BB           466   .052          149              .130
  23.520   BP          3168   .279          189              .887
  24.515   PP          2462   .300          137              .689
  25.120   PB           384   .152           40              .107
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6807D
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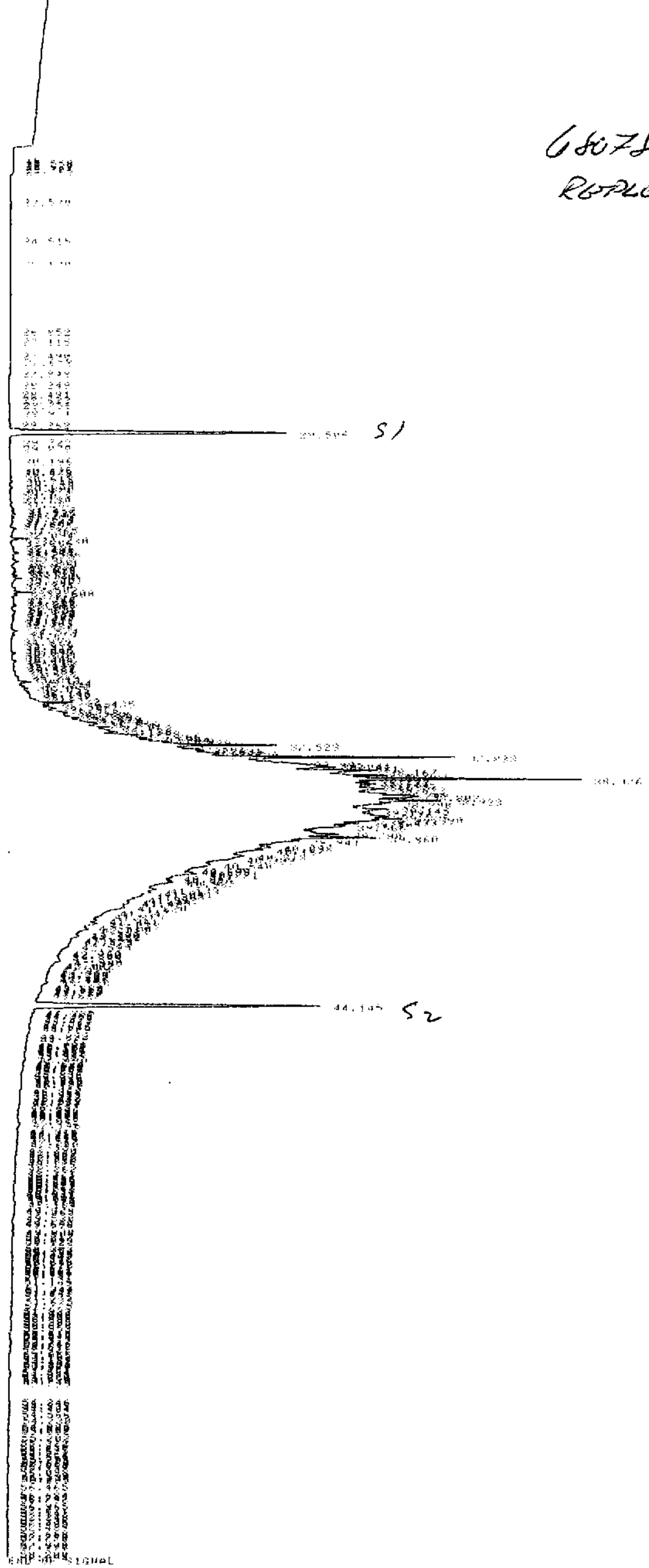

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CHROMALAB, INC.
Environmental Services (SDB)

August 21, 1996 *Submission #:* 9608248

MCCAMPBELL ANALYTICAL, INC.

Atten: Ed Hamilton

Project: PD-PGEE-0117 *Project#:* 7010
Received: August 19, 1996

re: One sample for Semivolatile Organic Compounds (B/NAs) analysis.
Method: *EPA 8270*

Client Sample ID: **COMP-A**
Spl#: 96540 *Matrix:* SOIL *Extracted:* August 20, 1996
Sampled: August 19, 1996 *Run#:* 2747 *Analyzed:* August 21, 1996

ANALYTE	**RESULT (mg/Kg)**	**REPORTING LIMIT (mg/Kg)**	**BLANK RESULT (mg/Kg)**	**BLANK SPIKE (%)**	**DILUTION FACTOR**
PHENOL	N.D.	0.10	N.D.	67.7	1
BIS(2-CHLOROETHYL)ETHER	N.D.	0.10	N.D.	--	1
2-CHLOROPHENOL	N.D.	0.10	N.D.	68.7	1
1,3-DICHLOROBENZENE	N.D.	0.10	N.D.	--	1
1,4-DICHLOROBENZENE	N.D.	0.10	N.D.	71.9	1
BENZYL ALCOHOL	N.D.	0.20	N.D.	--	1
1,2-DICHLOROBENZENE	N.D.	0.10	N.D.	--	1
[illegible]-METHYLPHENOL	N.D.	0.10	N.D.	--	1
BIS(2-CHLOROISOPROPYL)ETHER	N.D.	0.10	N.D.	--	1
4-METHYLPHENOL	N.D.	0.20	N.D.	--	1
N-NITROSO-DI-N-PROPYLAMINE	N.D.	0.10	N.D.	72.5	1
HEXACHLOROETHANE	N.D.	0.10	N.D.	--	1
NITROBENZENE	N.D.	0.10	N.D.	--	1
ISOPHORONE	N.D.	0.10	N.D.	--	1
2-NITROPHENOL	N.D.	0.10	N.D.	--	1
2,4-DIMETHYLPHENOL	N.D.	0.10	N.D.	--	1
BIS(2-CHLOROETHOXY)METHANE	N.D.	0.10	N.D.	--	1
2,4-DICHLOROPHENOL	N.D.	0.10	N.D.	--	1
1,2,4-TRICHLOROBENZENE	N.D.	0.10	N.D.	72.4	1
NAPHTHALENE	N.D.	0.10	N.D.	--	1
4-CHLOROANILINE	N.D.	0.20	N.D.	--	1
HEXACHLOROBUTADIENE	N.D.	0.10	N.D.	--	1
4-CHLORO-3-METHYLPHENOL	N.D.	0.20	N.D.	75.9	1
2-METHYLNAPHTHALENE	N.D.	0.10	N.D.	--	1
HEXACHLOROCYCLOPENTADIENE	N.D.	0.10	N.D.	--	1
2,4,6-TRICHLOROPHENOL	N.D.	0.10	N.D.	--	1
2,4,5-TRICHLOROPHENOL	N.D.	0.10	N.D.	--	1
2-CHLORONAPHTHALENE	N.D.	0.10	N.D.	--	1
2-NITROANILINE	N.D.	0.50	N.D.	--	1
DIMETHYL PHTHALATE	N.D.	0.50	N.D.	--	1
ACENAPHTHYLENE	N.D.	0.10	N.D.	--	1
3-NITROANILINE	N.D.	0.10	N.D.	--	1
ACENAPHTHENE	N.D.	0.10	N.D.	82.5	1
2,4-DINITROPHENOL	N.D.	0.50	N.D.	--	1
4-NITROPHENOL	N.D.	0.50	N.D.	55.4	1
DIBENZOFURAN	N.D.	0.10	N.D.	--	1
2,4-DINITROTOLUENE	N.D.	0.10	N.D.	66.9	1
[illegible],6-DINITROTOLUENE	N.D.	0.20	N.D.	--	1
DIETHYL PHTHALATE	N.D.	0.50	N.D.	--	1
4-CHLOROPHENYL PHENYL ETHER	N.D.	0.10	N.D.	--	1

CHROMALAB, INC.
Environmental Services (SDB)

August 21, 1996

Submission #: 9608248
page 2

MCCAMPBELL ANALYTICAL, INC.

Atten: Ed Hamilton

Project: PD-PGEE-0117 *Project#:* 7010
Received: August 19, 1996

re: One sample for Semivolatile Organic Compounds (B/NAs) analysis, continued.
Method: *EPA 8270*

Client Sample ID: **COMP-A**
Spl#: 96540 *Matrix:* SOIL *Extracted:* August 20, 1996
Sampled: August 19, 1996 *Run#:* 2747 *Analyzed:* August 21, 1996

ANALYTE	**RESULT (mg/Kg)**	**REPORTING LIMIT (mg/Kg)**	**BLANK RESULT (mg/Kg)**	**BLANK SPIKE (%)**	**DILUTION FACTOR**
FLUORENE	N.D.	0.10	N.D.	--	1
4-NITROANILINE	N.D.	0.50	N.D.	--	1
2-METHYL-4,6-DINITROPHENOL	N.D.	0.50	N.D.	--	1
N-NITROSO-DI-N-PHENYLAMINE	N.D.	0.10	N.D.	--	1
4-BROMOPHENYL PHENYL ETHER	N.D.	0.10	N.D.	--	1
HEXACHLOROBENZENE	N.D.	0.10	N.D.	--	1
PENTACHLOROPHENOL	N.D.	0.50	N.D.	61.5	1
PHENANTHRENE	N.D.	0.10	N.D.	--	1
ANTHRACENE	N.D.	0.10	N.D.	--	1
DI-N-BUTYL PHTHALATE	N.D.	0.50	N.D.	--	1
FLUORANTHENE	N.D.	0.10	N.D.	--	1
PYRENE	N.D.	0.10	N.D.	76.9	1
BUTYL BENZYL PHTHALATE	N.D.	0.50	N.D.	--	1
3,3'-DICHLOROBENZIDINE	N.D.	0.20	N.D.	--	1
BENZO(A)ANTHRACENE	N.D.	0.10	N.D.	--	1
BIS(2-ETHYLHEXYL)PHTHALATE	N.D.	0.50	N.D.	--	1
CHRYSENE	N.D.	0.10	N.D.	--	1
DI-N-OCTYL PHTHALATE	N.D.	0.50	N.D.	--	1
BENZO(B)FLUORANTHENE	N.D.	0.10	N.D.	--	1
BENZO(K)FLUORANTHENE	N.D.	0.20	N.D.	--	1
BENZO(A)PYRENE	N.D.	0.050	N.D.	--	1
INDENO(1,2,3 C,D)PYRENE	N.D.	0.20	N.D.	--	1
DIBENZO(A,H)ANTHRACENE	N.D.	0.20	N.D.	--	1
BENZO(G,H,I)PERYLENE	N.D.	0.20	N.D.	--	1
BENZOIC ACID	N.D.	0.50	N.D.	--	1

Michael Lee

Alex Tam for
Chemist

Chip Poalinelli
Operations Manager

C.L. 248/96540

29303

McCAMPBELL ANALYTICAL
110 2nd AVENUE, # D7
PACHECO, CA 94553

(510) 798-1620 FAX (510) 798-1622

CHAIN OF CUSTODY RECORD

TURN AROUND TIME: ☐ RUSH ☐ 24 HOUR ☒ 48 HOUR ☐ 5 DAY ☐ ROUTINE

SUBM #: 9608248 REP: MV
CLIENT: MCCAM
DUE: 08/21/96
REF #:29303

REPORT TO: Ed HAMiLtON BILL TO: MAI

PROJECT NUMBER: 7010 PROJECT NAME: PD - PGEE-0117

PROJECT LOCATION: Emeryville

SAMPLE ID	LOCATION	SAMPLING		# CONTAINERS	TYPE CONTAINERS	MATRIX					METHOD PRESERVED				ANALYSIS REQUEST												OTHER						COMMENTS
		DATE	TIME			WATER	SOIL	AIR	SLUDGE	OTHER	HCL	HNO_3	ICE	OTHER	EPA 601/8010	EPA 602/8020	EPA 608/8080	EPA 608/8080 - PCBs Only	EPA 624/8240/8260	EPA 625/8270	CAM - 17 Metals	EPA - Priority Pollutant Metals	LUFT Metals	LEAD (7240/7421/239.2/6010)	ORGANIC LEAD	RCI							
COMP-A		8/19/96	AM	1	VOA		X													X													68078

RUSH

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	8/19/96	1455	
RELINQUISHED BY:	**DATE**	**TIME**	**RECEIVED BY:**
	8/19/96	1635	
RELINQUISHED BY:	**DATE**	**TIME**	**RECEIVED BY LABORATORY:**

REMARKS: NEEd Results Wed. AM.

P & D ENVIRONMENTAL
4020 Panama Court
Oakland, CA 94611
Telephone (510) 658-6916

CHAIN OF CUSTODY RECORD

7010APD194

PAGE 1 OF 1

PROJECT NUMBER: 0117

PROJECT NAME: PG&E Emeryville

SAMPLED BY: (PRINTED AND SIGNATURE) Ahmad Ghandour

SAMPLE NUMBER	DATE	TIME	TYPE	SAMPLE LOCATION	NUMBER OF CONTAINERS	ANALYSIS(ES): TPH-G/BTEX	Fuel Finger Print	EPA 8240	EPA 8270	LUFT Metals (Cd, Cr, Ni, Pb, Zn)	PCB's 8080	RCI	PRESERVATIVE	REMARKS
COMP A	8/19/96		Soil		4	X	X	X	X	X	X	X	ice	48 Hour Turn Around
														68078
													X	STLC Pb Rush 8/22 pm per A.G.
													X	TCLP Pb Rush 8/28 pm Per A.G.

ICE/T° ✓
GOOD CONDITION ✓
HEAD SPACE ABSENT ___
VOAS O&G [illegible]
PRESERVATIVE ___
APPROPRIATE CONTAINERS ✓

RELINQUISHED BY: (SIGNATURE)	DATE 8/19/96	TIME 1205	RECEIVED BY: (SIGNATURE) Kent Hamilton
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE) Kent Hamilton	DATE 8/19/96	TIME 1035	RECEIVED FOR LABORATORY BY: (SIGNATURE)

TOTAL NO. OF SAMPLES (THIS SHIPMENT) 1
TOTAL NO. OF CONTAINERS (THIS SHIPMENT) 4
LABORATORY: McCampbell Analytical
LABORATORY CONTACT: Ed Hamilton
LABORATORY PHONE NUMBER: (510) 798-1620
SAMPLE ANALYSIS REQUEST SHEET ATTACHED: ( )YES [✓ ( )NO]

REMARKS: Please Composite Sample prior to Analysis.

Soil Boring

Laboratory Analytical Results and Chain of Custody Documentation

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30/96
	Client P.O:	Date Analyzed: 08/30/96

Diesel Range (C10-C23) Extractable Hydrocarbons as Diesel *

EPA methods modified 8015, and 3550 or 3510; California RWQCB (SF Bay Region) method GCFID(3550) or GCFID(3510)

Lab ID	Client ID	Matrix	TPH(d)$^+$	% Recovery Surrogate
68465	B1	S	22,g,b	104
68466	B2	S	59,e	100
68467	B3	S	550,e	105
68468	B4	S	780,e	99
68469	B5	S	ND	103
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W	50 ug/L	
	S	1.0 mg/kg	

* water samples are reported in ug/L, soil and sludge samples in mg/kg, and all TCLP and STLC extracts in mg/L

\# cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

\+ The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) medium boiling point pattern that does not match diesel (insulating oil or aged diesel?); f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~ 5 vol. % sediment.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30/96
	Client P.O:	Date Analyzed: 09/01-09/03/96

Polychlorinated Biphenyls (PCB)

EPA method 608 and 3510 or 8080 and 3550

Lab ID	Client ID	Matrix	PCB+	% Recovery Surrogate
68465	B1	S	ND	84
68466	B2	S	180,g	92
68467	B3	S	640,g	90
68468	B4	S	1400,g	88
68469	B5	S	ND	94
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W	0.5 ug/L	
	S	50 ug/kg	

* water and oil samples are reported in ug/L, soil and sludge samples in ug/kg and all TCLP and STLC extracts in ug/L

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis

surrogate diluted out of range or surrogate coelutes with another peak

+ PCB aroclors - the first two digits of the aroclor number convey general structural information, where 12 and 10 denote biphenyl compounds with the latter having one phenyl group that is Cl-free; the last two aroclor digits specify its Cl weight %; (a) PCB aroclor 1016; (b) PCB aroclor 1221; (c) PCB aroclor 1232; (d) PCB aroclor 1242; (e) PCB aroclor 1248; (f) PCB aroclor 1252; (g) PCB aroclor 1260; (h) a lighter than water immiscible sheen is present; (i) liquid sample that contains > ~ 5 vol. % sediment; (j)sample diluted due to high organic content.

DHS Certification No. 1644

Edward Hamilton, Lab Director

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AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30/96
	Client P.O:	Date Analyzed: 08/30-09/03/96

CAM / CCR 17 Metals*

EPA methods 6010/200.7; 7470/7471/245.1/245.5 (Hg); 7060/206.2 (As); 7740/270.2 (Se); 7841/279.2 (Tl); 239.2 (Pb, water matrix)

Lab ID	68465	68466	68467	68468	Reporting Limit		
Client ID	B1	B2	B3	B4			
Matrix	S	S	S	S	S	W	STLC / TCLP
Extraction°	TTLC	TTLC	TTLC	TTLC	TTLC	TTLC	
Compound	Concentration*				mg/kg	mg/L	mg/L
Antimony (Sb)	ND	ND	ND	ND	2.5	0.05	0.05
Arsenic (As)	8.3	8.0	7.5	7.2	2.5	0.005	0.25
Barium (Ba)	230	180	180	190	1.0	0.05	0.05
Beryllium (Be)	ND	ND	ND	ND	0.5	0.01	0.01
Cadmium (Cd)	ND	ND	ND	0.92	0.5	0.005	0.01
Chromium (Cr)	42	40	43	44	0.5	0.005	0.05
Cobalt (Co)	10	10	10	10	2.0	0.05	0.05
Copper (Cu)	33	35	32	38	2.0	0.05	0.05
Lead (Pb)	7.1	14	16	130	3.0	0.005	0.2
Mercury (Hg)	0.077	0.082	0.15	0.30	0.06	0.0008	0.0008
Molybdenum (Mo)	ND	ND	ND	ND	2.0	0.05	0.05
Nickel (Ni)	61	54	61	54	2.0	0.05	0.05
Selenium (Se)	ND	ND	ND	ND	2.5	0.005	0.25
Silver (Ag)	ND	ND	ND	ND	1.0	0.01	0.05
Thallium (Tl)	ND	ND	ND	ND	0.5	0.001	0.05
Vanadium (V)	39	36	36	35	2.0	0.05	0.05
Zinc (Zn)	72	82	72	160	1.0	0.05	0.05
% Recovery Surrogate	102	92	100	100			
Comments							

* water samples are reported in mg/L, soil and sludge samples in mg/kg and all TCLP & STLC extracts in mg/L

ND means not detected above the reporting limit

° EPA extraction methods 1311(TCLP), 3010/3020(water,TTLC), 3040(organic matrices,TTLC), 3050(solids,TTLC); STLC from CA Title 22

\# surrogate diluted out of range; N/A means surrogate not applicable to this analysis

& reporting limit raised due matrix interference

i) liquid sample that contains greater than ~ 2 vol. % sediment; this sediment is extracted with the liquid, in accordance with EPA methodologies and can significantly effect reported metal concentrations.

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30/96
	Client P.O:	Date Analyzed: 08/30-09/03/96

CAM / CCR 17 Metals*

EPA methods 6010/200.7; 7470/7471/245.1/245.5 (Hg); 7060/206.2 (As); 7740/270.2 (Se); 7841/279.2 (Tl); 239.2 (Pb, water matrix)

Lab ID	68469				Reporting Limit		
Client ID	B5						
Matrix	S				S	W	STLC / TCLP
Extraction°	TTLC				TTLC	TTLC	
Compound	Concentration*				mg/kg	mg/L	mg/L
Antimony (Sb)	ND				2.5	0.05	0.05
Arsenic (As)	8.3				2.5	0.005	0.25
Barium (Ba)	180				1.0	0.05	0.05
Beryllium (Be)	ND				0.5	0.01	0.01
Cadmium (Cd)	ND				0.5	0.005	0.01
Chromium (Cr)	42				0.5	0.005	0.05
Cobalt (Co)	10				2.0	0.05	0.05
Copper (Cu)	33				2.0	0.05	0.05
Lead (Pb)	7.4				3.0	0.005	0.2
Mercury (Hg)	0.077				0.06	0.0008	0.0008
Molybdenum (Mo)	ND				2.0	0.05	0.05
Nickel (Ni)	57				2.0	0.05	0.05
Selenium (Se)	ND				2.5	0.005	0.25
Silver (Ag)	0.97				1.0	0.01	0.05
Thallium (Tl)	ND				0.5	0.001	0.05
Vanadium (V)	40				2.0	0.05	0.05
Zinc (Zn)	80				1.0	0.05	0.05
% Recovery Surrogate	101						
Comments							

* water samples are reported in mg/L, soil and sludge samples in mg/kg and all TCLP & STLC extracts in mg/L

ND means not detected above the reporting limit

° EPA extraction methods 1311(TCLP), 3010/3020(water,TTLC), 3040(organic matrices,TTLC), 3050(solids,TTLC); STLC from CA Title 22

surrogate diluted out of range; N/A means surrogate not applicable to this analysis

& reporting limit raised due matrix interference

i) liquid sample that contains greater than ~ 2 vol. % sediment; this sediment is extracted with the liquid, in accordance with EPA methodologies and can significantly effect reported metal concentrations.

DHS Certification No. 1644

_____ Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30-09/01/96
	Client P.O:	Date Analyzed: 09/02/96

Hexachrome

Analytical methods			EPA 7196,CA Title 22
Lab ID	Client ID	Matrix	$Cr^{+6*,o}$
68466	B2	S	0.24
68468	B4	S	0.17
Reporting Limit unless otherwisestated; ND means not detected above the reporting limit		W	0.05 mg/L
		S	0.05 mg/L

* water samples are reported in mg/L and soil samples in mg/kg

\# flashpoint values are reported in °C

° solid samples are extracted in accordance with CA Title 22, Chapter 11, Appendix II

DHS Certification No. 1644

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.

110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

QC REPORT FOR HYDROCARBON ANALYSES

Date: 08/30/96

Matrix: Soil

Analyte	Concentration (mg/kg) Sample (#67153)	MS	MSD	Amount Spiked	% Recovery MS	MSD	RPD
TPH (gas)	0.000	2.002	1.913	2.03	99	94	4.5
Benzene	0.000	0.200	0.198	0.2	100	99	1.0
Toluene	0.000	0.202	0.196	0.2	101	98	3.0
Ethylbenzene	0.000	0.202	0.198	0.2	101	99	2.0
Xylenes	0.000	0.596	0.574	0.6	99	96	3.8
TPH (diesel)	0	287	288	300	96	96	0.2
TRPH (oil and grease)	0.0	20.5	19.6	20.8	99	94	4.5

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR CHLORINATED PESTICIDES and PCB (EPA 608/8080)

Date: 09/01/96-09/03/96 Matrix: Soil

Analyte	Concentration (ug/L)			Amount Spiked	% Recovery		
	Sample (#67155)	MS	MSD		MS	MSD	RPD
PCB	0.00	11.74	11.73	10.0	117	117	0.1
Lindane	0.00	0.44	0.44	0.50	88	88	0.0
Heptachlor	0.00	0.54	0.55	0.50	108	110	2.3
Aldrin	0.00	0.51	0.51	0.50	103	103	0.0
Dieldrin	0.00	1.05	1.05	1.25	84	84	0.0
Endrin	0.00	1.09	1.09	1.25	87	87	0.0
4,4'-DDT	0.00	1.25	1.40	1.25	100	112	11.3

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

QC REPORT FOR METALS

Date: 08/30/96 Matrix: Soil

Extraction: TTLC

Analyte	Concentration (mg/kg)			Amount Spiked	% Recovery		RPD
	Sample	MS	MSD		MS	MSD	
Arsenic	0.0	5.2	5.4	5.0	103	107	3.8
Selenium	0.0	4.9	5.0	5.0	97	99	2.0
Molybdenum	0.0	4.9	5.0	5.0	98	100	1.4
Silver	0.0	0.7	0.7	1.0	72	74	2.7
Thallium	0.0	4.9	4.9	5.0	97	99	1.4
Barium	0.0	4.5	4.5	5.0	89	90	1.3
Nickel	0.0	5.0	5.1	5.0	100	102	2.0
Chromium	0.0	5.1	5.0	5.0	101	100	1.0
Vanadium	0.0	4.9	5.0	5.0	98	99	1.0
Beryllium	0.0	5.1	5.1	5.0	101	102	1.4
Zinc	0.0	5.2	5.3	5.0	103	105	1.9
Copper	0.0	4.7	4.7	5.0	94	95	1.1
Antimony	0.0	5.1	5.2	5.0	102	103	1.8
Lead	0.0	4.9	5.0	5.0	99	100	1.6
Cadmium	0.0	5.1	5.2	5.0	102	103	1.0
Cobalt	0.0	4.8	4.8	5.0	96	97	1.0
Mercury	0.000	0.244	0.237	0.25	98	95	2.9

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

7086 APd 196

CHAIN OF CUSTODY RECORD

TURN AROUND TIME: ☐ RUSH ☐ 24 HOUR ☐ 48 HOUR ☒ 5 DAY

COMPA

REPORT TO: Paul King
AllPro Environmental

BILL TO:

PHONE NO.: (510) 658-6916

FAX NO.: (510) 658-9074

PROJECT NO.: 0117

PROJECT NAME: PG&E Emeryville

PROJECT LOCATION: 4525 Hollis Street

SAMPLE ID	LOCATION	SAMPLING		# CONTAINERS	TYPE CONTAINERS	MATRIX					METHOD PRESERVED				ANALYSIS REQUEST																				OTHER			COMMENTS
		DATE	TIME			WATER	SOIL	AIR	SLUDGE	OTHER	HCL	HNO_3	ICE	OTHER	BTEX & TPH as Gasoline (602/8020 & 8015)	TPH as Diesel (8015)	Total Petroleum Oil & Grease (5520 E&F/5520 B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 601/8010	BTEX & MTBE	EPA 608/8080	EPA 608/8080 – PCBs Only	EPA 624/8240/8260	EPA 525/8270	CAM – 17 Metals	EPA – Priority Pollutant Metals	LUFT Metals	LEAD (7240/7421/239.2/6010)	ORGANIC LEAD	RCI	Cr+6			
B1		8/29/96		1	Brass		X						X			X						X			X									
B2		"		1	"		X						X			X						X			X						X			
B3		"		1	"		X						X			X						X			X									
B4		"		1	"		X						X			X						X			X						X			
B5		"		1	"		X						X			X						X			X									

68465
68466
68467
68468
68469

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	8/29/96	1723	M. Wright Aelo
RELINQUISHED BY: M. Wright	8-29-96	1800	RECEIVED BY: DJ Hoffman
RELINQUISHED BY: DJ Hoffman	8-30-96	9:30	RECEIVED BY LABORATORY: Heidi Ricca

REMARKS:

ICE/T° ✓
GOOD CONDITION ✓
HEAD SPACE ABSENT ✓
PRESERVATIVE ___
APPROPRIATE CONTAINERS ✓

VOAS	O&G	METALS	OTHER

Oil Sample Fuel Fingerprint

Laboratory Analytical Results and Chain of Custody Documentation

McCAMPBELL ANALYTICAL INC.	110 2nd Avenue South, #D7, Pacheco, CA 94553 Tele: 510-798-1620 Fax: 510-798-1622

AllPro Environmental Corp. 1125B Arnold Drive, # 284 Martinez, CA 94553	Client Project ID: # 0117; PG&E Emeryville	Date Sampled: 08/29/96
		Date Received: 08/30/96
	Client Contact: Paul King	Date Extracted: 08/30/96
	Client P.O:	Date Analyzed: 08/30/96

Fuel Fingerprint

EPA methods modified 8015, and 3550 or 3510; California RWQCB (SF Bay Region) method GCFID(3550) or GCFID(3510)

Lab ID	Client ID	Matrix	Fuel Fingerprint+
68470	Oil-1	Oil	This chromatogram is very similar to that from sample 68078, i.e. it appears to be a slightly aged diesel but is in fact a transfomer oil.
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit	W		50 ug/L
	S		1.0 mg/kg

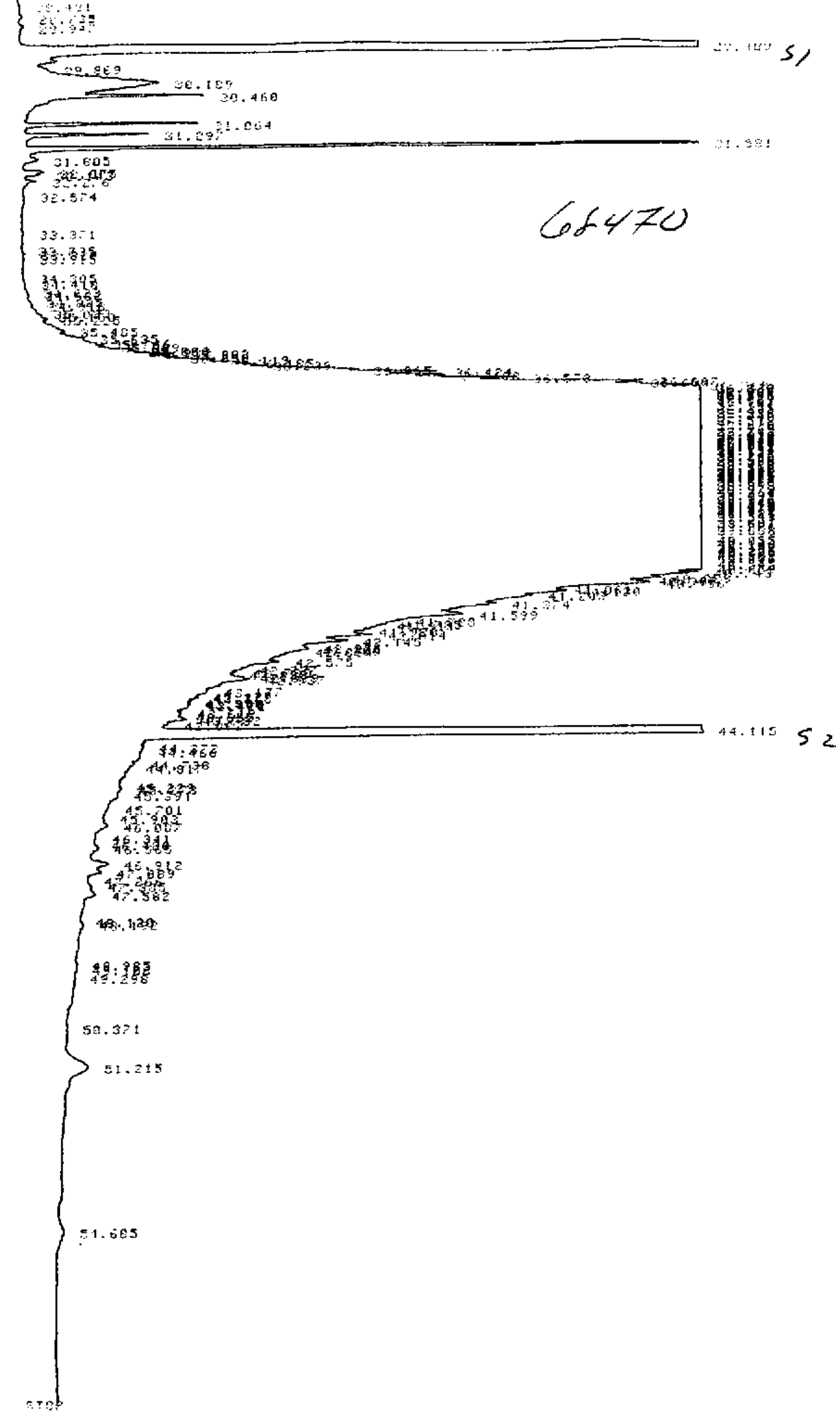
* water samples are reported in ug/L, soil and sludge samples in mg/kg, and all TCLP and STLC extracts in mg/L

cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

+ The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) medium boiling point pattern that does not match diesel (?); f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~ 5 vol. % sediment.

DHS Certification No. 1644

Edward Hamilton, Lab Director



68470

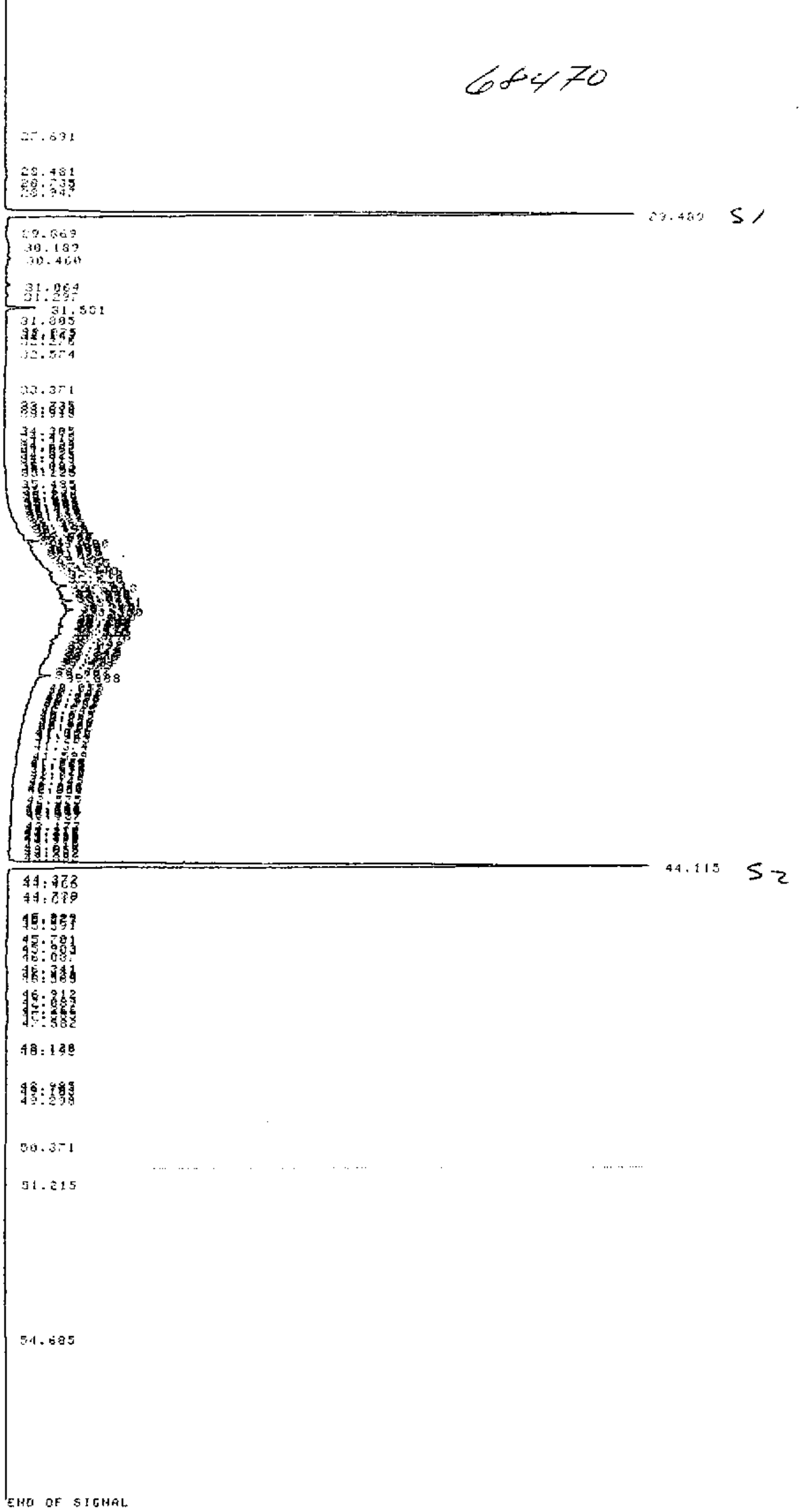
```
Closing signal file M:SIGNAL  .BNC

RUN#  2497           AUG 31, 1996  14:43:25

                              SAMPLE#   43
METHOD NAME: N:DC.MET

SIGNAL FILE: M:SIGNAL.BNC
ESTD-AREA
      RT TYPE          AREA  WIDTH       HEIGHT CAL#      AMOUNT  NAME
  22.708   HH           186   .033           53             .030
  23.439   PF          1983   .252          131             .555
  27.691   BH           567   .137           69             .159
  28.481   PH           159   .106           25             .045
  28.735   HP           615   .089          115             .172
  28.947   PH           888   .115          129             .249
  29.489   HH       2160454   .075       481514    1        99.165  S1(C9)
  29.869   HH          2857   .070          677             .800
  30.189   HH         62889   .324         3232           17.507
  30.460   HH         23919   .094         4252            6.697
  31.064   HH         12270   .050         4122            3.436
  31.297   HH          8960   .050         3009            2.509
  31.581   HH         60647   .043        23528           16.981
  31.605   HH          3773   .144          436            1.056
  32.075   HH          2743   .080          574             .768
  32.143   HH          1379   .047          490             .386
  32.276   HH          2048   .086          397             .573
```

68470



```
END OF SIGNAL

Error storing signal to M:SIGNAL  .BNA
ATTEMPTED WRITE PAST END OF FILE

 DIESEL RANGE,  31.49  -  41.33  MINS (C10-23) PEAKSUM= 6574490.

 TOTAL GAS,  4.63  - 34.4  MINS (C6..C12) PEAKSUM= 2349747.
 RATIO OF DIESEL/TOTALGAS=  3.64911

 LBP COMPOUNDS OF GAS RANGE, 4.63  -  6.79  MINS (C7-C8) PEAKSUM=  0  =  0
 % OF TOTAL GAS

 MBP COMPOUNDS OF GAS RANGE, 6.79  -  31.69  MINS (C8+..C10) PEAKSUM=  2336235.
 =  99  % OF TOTAL GAS

 HBP COMPOUNDS OF GAS RANGE,  31.69 - 34.4  MINS (C10+..C12) PEAKSUM= 13512.  =
 0  % OF TOTAL GAS

 OIL & GREASE RANGE,  38.42 + MINS (C18+) PEAKSUM= 8089227.
```

McCAMPBELL ANALYTICAL INC.

110 2nd Avenue South, #D7, Pacheco, CA 94553
Tele: 510-798-1620 Fax: 510-798-1622

QC REPORT FOR HYDROCARBON ANALYSES

Date: 08/29/96-08/30/96 Matrix: Water

Analyte	Concentration (ug/L) Sample (#68100)	MS	MSD	Amount Spiked	% Recovery MS	MSD	RPD
TPH (gas)	0.0	102.9	100.9	100.0	102.9	100.9	2.0
Benzene	0.0	11.0	10.7	10.0	110.0	107.0	2.8
Toluene	0.0	10.7	10.4	10.0	107.0	104.0	2.8
Ethyl Benzene	0.0	10.8	10.4	10.0	108.0	104.0	3.8
Xylenes	0.0	31.7	30.5	30.0	105.7	101.7	3.9
TPH (diesel)	0	145	144	150	97	96	1.0
TRPH (oil & grease)	0	23100	23400	23700	97	99	1.3

% Rec. = (MS - Sample) / amount spiked x 100

RPD = (MS - MSD) / (MS + MSD) x 2 x 100

7087 APd 195

CHAIN OF CUSTODY RECORD

TURN AROUND TIME: ☐ RUSH ☐ 24 HOUR ☐ 48 HOUR ☒ 5 DAY

Compa

REPORT TO: Paul King Allpro Environmental
BILL TO:
PHONE NO.: (510) 658-6916
FAX NO.: (510) 658-6916
PROJECT NO.: 0117
PROJECT NAME: PG&E Emeryville
PROJECT LOCATION: 4525 Hollis Street

SAMPLE ID	LOCATION	SAMPLING		# CONTAINERS	TYPE CONTAINERS	MATRIX					METHOD PRESERVED				ANALYSIS REQUEST																				OTHER			COMMENTS
		DATE	TIME			WATER	SOIL	AIR	SLUDGE	OTHER	HCL	HNO_3	ICE	OTHER	BTEX & TPH as Gasoline (602/8020 & 8015)	TPH as Diesel (8015)	Total Petroleum Oil & Grease (5520 E&F/5520 B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 601/8010	BTEX & MTBE	EPA 608/8080	EPA 608/8080 - PCBs Only	EPA 624/8240/8260	EPA 625/8270	CAM - 17 Metals	EPA - Priority Pollutant Metals	LUFT Metals	LEAD (7240/7421/239.2/6010)	ORGANIC LEAD	RCI	Fuel Figure Print			
Oil - 1		8/29/96		1	Glass					X																					X			

68470

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	8/29/96	3:50	
	8/29/96	1723	M. Wright ACRO
M. Wright	8-29-96	1800	

REMARKS:

ICE/T° ✓
GOOD CONDITION ✓
HEAD SPACE ABSENT ✓
PRESERVATIVE
APPROPRIATE CONTAINERS ✓

VOAS | O&G | METALS | OTHER

EL: D. Hoffman 8-30-96 Rec: Neidi Ruca 9:20 Am

Appendix C

Air Monitoring Report
for September 5, 1996 Activities

ALLPRO CORP ENVIRONMENTAL CORPORATION

September 12, 1996
Report 0117.R2

Ms. Michelle Boscoe
Pacific Gas and Electric Company
4525 Hollis Street
Emeryville, CA 94608-2999

SUBJECT: AIR MONITORING REPORT
PG&E Emeryville Repair Facility
Electric Shop 'B'
4525 Hollis Street
Emeryville, California

Dear Ms. Boscoe:

This report is written to document air monitoring activities performed by AllPro Environmental Corporation (AllPro) at the subject site on September 5, 1996. Air monitoring was performed at the south-western end of the Machine Shop building exterior (location PG&E-1), and at the north-eastern end of the warehouse building exterior (location PG&E-2). The objective of this monitoring was to characterize ambient airborne lead and chromium while construction personnel were present at the site during a full work shift. A Site Location Map is attached with this report as Figure 1, and a Site Plan showing the sample collection locations is attached as Figure 2.

I. PRE-MONITORING SITE VISIT

Prior to performing air monitoring, site conditions were reviewed and the air monitoring locations were determined.

II. SITE CONDITIONS

The site is a transformer repair facility. Construction activities at the subject site consisted of trenching, and the placement of piping for a waste treatment/recycling system.

III. WEATHER MONITORING

To evaluate prevailing wind direction and wind speed a Rainwise weather station was installed for the duration of the air sample collection activities at the PG&E-1 location. The wind direction and speed were recorded manually from a liquid crystal display.

The prevailing wind direction was from the northwest and was 3 to 5 miles per hour (MPH) prior to approximately noon, and 7 to 11 MPH from approximately noon to the end of the monitoring. The weather monitoring results for September 5, 1996 are summarized in Table 1.

IV. AIR SAMPLE COLLECTION

On September 5, 1996 air sample collection was performed by AllPro personnel at locations PG&E-1 and PG&E-2 using air pumps. The air pumps were MSA Escort Elf Personal Sampling Pumps equipped with air filters. The air filters used consisted of 37 millimeter diameter, 0.8 micrometer GN-4 membrane filters. Sample collection procedures were performed in accordance with NIOSH Method 7082.

Prior to placement of the pumps at locations PG&E-1 and PG&E-2, the pumps were calibrated using a Key Instruments rotameter. The rotameter had a range of 0.4 to 5.0 liters per minute (lpm) air flow in increments of 0.1 lpm. The pump at PG&E-1 was observed to operate at a flow rate of 2.6 lpm at the beginning and end of the day. The total time monitored at PG&E-1 was 497 minutes. The pump at PG&E-2 was observed to operate at a flow rate of 4.0 lpm at the beginning and end of the day. The total time monitored at PG&E-2 was 424 minutes.

Following collection of the air pumps and air filters from PG&E-1 and PG&E-2, the filters were sealed and labeled. A field blank labeled PG&E-3 was also collected at the PG&E-1 location. The samples were then transported directly to Micro Analytical Laboratories, Inc. (MAL) in Emeryville, California. MAL is an AIHA-approved laboratory for lead and chromium analysis. Chain of custody documentation procedures were observed for all sample handling.

The samples were analyzed at the laboratory for total lead, and total chromium in accordance with NIOSH Method 7082. The laboratory results show that lead was detected in air samples PG&E-1, and PG&E-2 at concentrations of 0.00009, and 0.00005 mg/m^3, respectively. Chromium was detected in air samples PG&E-1, and PG&E-2 at concentrations of 0.00087 mg/m^3 (a total of 0.001124 mg per sample), and 0.00062 mg/m^3 (a total of 0.001049 mg per sample), respectively.

In PG&E-3 (the blank) only chromium was detected at a concentration of 0.00113 mg per sample. Lead was not detected. The sample results are summarized in Table 2. Copies of the laboratory analytical report and chain of custody documentation are attached with this report.

IV. DISCUSSION

Based upon the laboratory results of the air sample filters, chromium was detected in PG&E-1, PG&E-2, and PG&E-3 at concentrations of 0.001124, 0.001049, and 0.00113 mg per sample, respectively. The highest chromium concentration was detected in the blank, indicating that the detected chromium concentrations were not the result of the presence of chromium in the ambient air.

Lead was detected in PG&E-1 and PG&E-2 at concentrations of 0.00005, and 0.00009 mg/m^3, respectively. However, lead was not detected in the blank. The detected lead concentrations are below the State action level for lead of 0.030 mg/m^3.

IV. LIMITATIONS

This report was prepared solely for the use of PG&E. The content and conclusions provided by AllPro in this assessment are based on information collected during our investigation, which may include, but not be limited to, visual site inspections; interviews with the site owner, regulatory agencies and other pertinent individuals; review of available public documents; and our professional judgement based on said information at the time of preparation of this document. Any air sample results and observations presented herein are considered to be representative of the area of investigation.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information contained herein is brought to the attention of the appropriate regulatory agencies, where required by law.

This report has been prepared in accordance with generally accepted practices using standards of care and diligence normally practiced by recognized consulting firms performing services of a similar nature. AllPro is not responsible for the accuracy or completeness of information provided by other individuals or entities which is used in this report. This report presents our professional judgement based upon data and findings identified in this report and interpretation of such data based upon our experience and background, and no warranty, either express or implied, is made. The conclusions presented are based upon the current regulatory climate and may require revision if future regulatory changes occur.

Should you have any questions, please do not hesitate to call us at (510) 706-9308.

Sincerely,

AllPro Environmental Corporation

Michael F. Falk
Project Manager

Paul H. King

Paul H. King
California Registered Geologist

PHK/aog
0117.R2

Attachments: Tables 1 and 2
Laboratory Analytical Report
Chain of Custody Documentation

TABLE 1

WEATHER MONITORING RESULTS
SEPTEMBER 5, 1996

Time	Wind Direction	Wind Speed (MPH)
9:33 AM	West-Northwest	3
11:03	North-Northwest	3 to 5
11:45	Northwest	5
12:40 PM	Northwest	9
1:45	Northwest	10
2:50	West-Northwest	11
4:30	Northwest	7

MPH = Miles Per Hour

TABLE 2

AIR SAMPLE LEAD RESULTS

Sample Number	Location	Lead Concentration (ug/m^3)	PEL Lead (ug/m^3)
PG&E-1	Southwestern end of Machine Shop	0.05	50
PG&E-2	Northeastern end of Warehouse	0.09	50
PG&E-3	Field Blank	N/A	50

Notes:

PEL = Permissible Exposure Limit
ND = Not Detected
N/A = Not Applicable
ug/m^3 = micrograms per cubic meter

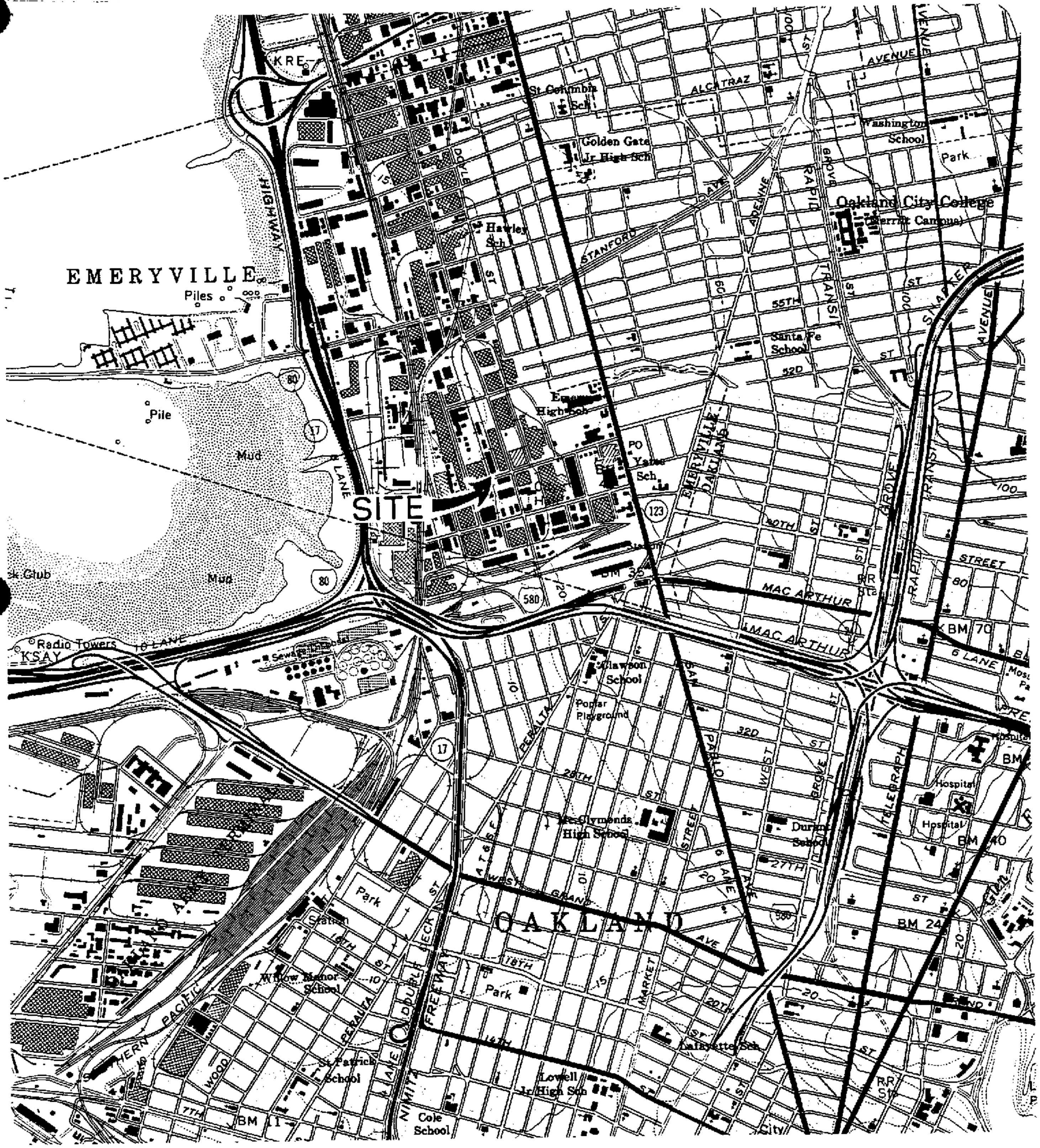
TABLE 2 (continued)

AIR SAMPLE CHROMIUM RESULTS

Sample Number	Location	Chromium Concentration (ug/m^3)	PEL Chromium (ug/m^3)
PG&E-1	Southwestern end of Machine Shop	0.87	500
PG&E-2	Northeastern end of Warehouse	0.62	500
PG&E-3	Field Blank	N/A	500

Notes:

PEL = Permissible Exposure Limit
ND = Not Detected
N/A = Not Applicable
ug/m^3 = micrograms per cubic meter

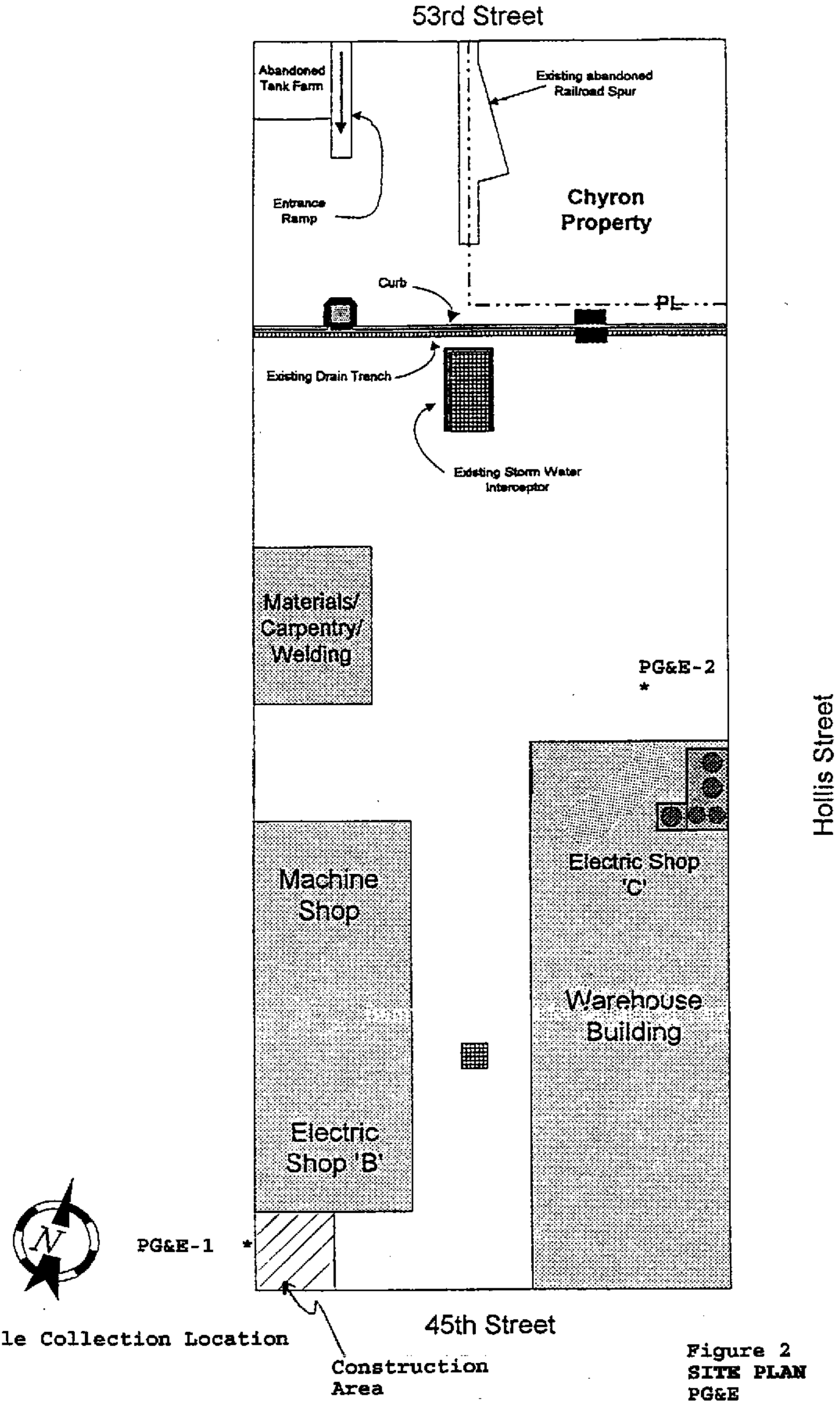


Base Map From
U.S. Geological Survey
Oakland West, Calif.
7.5 Minute Quadrangle
Photorevised 1980

North

0 1000 2000
Scale in Feet

Figure 1
SITE LOCATION MAP
PG&E
4525 Hollis Street
Emeryville, California



LEGEND
* Air Sample Collection Location

Base Map From
PG&E
Dated 3/14/95

Figure 2
SITE PLAN
PG&E
4525 Hollis Street
Emeryville, California

MICRO ANALYTICAL LABORATORIES, INC.

ICP-AES: METALS IN AIR SAMPLES

[illegible]144
P & D Environmental
4020 Panama Court
Oakland, CA 94611

JOB SITE:
PG & E - EMERYVILLE
PROJECT NO. 0117

Micro Log In 37515
Total Samples 3
Date Sampled 9/5/96
Date Received 9/9/96
Date Analyzed 9/9/96

SAMPLE ID / DESCRIPTION

Client Sample No.	PG&E-1	CONSTRUCTION AREA	Volume (L)
Micro Sample No.	37515-01		1292.2

Method NIOSH 7082 (Air)

Analyte	Concentration (mg / m^3)	Detection Limit (mg / m^3)	Comments
Aluminum (Al)			
Antimony (Sb)			
Arsenic (As)			
Barium (Ba)			
Beryllium (Be)			
Cadmium (Cd)			
Chromium (Cr)	0.00087	0.00001	
Cobalt (Co)			
Copper (Cu)			
Iron (Fe)			
Lead (Pb)	0.00009	0.00003	
Magnesium (Mg)			
Molybdenum (Mo)			
Nickel (Ni)			
Selenium (Se)			
Silicon (Si)			
Silver (Ag)			
Thallium (Tl)			
Vanadium (V)			
Zinc (Zn)			

Technical Supervisor: 9/10/96
Weiping Xia, M.S.

Analyst: WX

Samples are analyzed by Inductively Coupled Plasma Atomic Emission Spectrometry. This report must not be reproduced except in full, with the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed herein. Explanation: mg / m^3 = milligrams per cubic meter of air. ND = None Detected (concentration is less than detection limit).

MICRO ANALYTICAL LABORATORIES, INC.

ICP-AES: METALS IN AIR SAMPLES

[illegible]144
P & D Environmental
4020 Panama Court
Oakland, CA 94611

JOB SITE:
PG & E - EMERYVILLE
PROJECT NO. 0117

Micro Log In 37515
Total Samples 3
Date Sampled 9/5/96
Date Received 9/9/96
Date Analyzed 9/9/96

SAMPLE ID / DESCRIPTION

Client Sample No. PG&E-2 BACKGROUND
Micro Sample No. 37515-02
Volume (L) 1696

Method NIOSH 7082 (Air)

Analyte	Concentration (mg / m^3)	Detection Limit (mg / m^3)	Comments
Aluminum (Al)			
Antimony (Sb)			
Arsenic (As)			
Barium (Ba)			
Beryllium (Be)			
Cadmium (Cd)			
Chromium (Cr)	0.00062	0.00001	
Cobalt (Co)			
Copper (Cu)			
Iron (Fe)			
Lead (Pb)	0.00005	0.00002	
Magnesium (Mg)			
Molybdenum (Mo)			
Nickel (Ni)			
Selenium (Se)			
Silicon (Si)			
Silver (Ag)			
Thallium (Tl)			
Vanadium (V)			
Zinc (Zn)			

Technical Supervisor: 9/10/96
Weiping Xia, M.S.

Analyst: WX

Samples are analyzed by Inductively Coupled Plasma Atomic Emission Spectrometry. This report must not be reproduced except in full, with the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed herein. Explanation: mg / m^3 = milligrams per cubic meter of air. ND = None Detected (concentration is less than detection limit).

MICRO ANALYTICAL LABORATORIES, INC.
ICP-AES: METALS IN AIR SAMPLES

1144
P & D Environmental
4020 Panama Court
Oakland, CA 94611

JOB SITE:
PG & E - EMERYVILLE
PROJECT NO. 0117

Micro Log In 37515
Total Samples 3
Date Sampled 9/5/96
Date Received 9/9/96
Date Analyzed 9/9/96

SAMPLE ID / DESCRIPTION

Client Sample No. PG&E-3 BLANK
Micro Sample No. 37515-03
Volume (L)

Method NIOSH 7082 (Air)

Analyte	Concentration (mg / m^3)	Detection Limit (mg / m^3)	Comments
Aluminum (Al)			
Antimony (Sb)			
Arsenic (As)			
Barium (Ba)			
Beryllium (Be)			
Cadmium (Cd)			
Chromium (Cr)			0.00113 mg per sample
Cobalt (Co)			
Copper (Cu)			
Iron (Fe)			
Lead (Pb)			< 0.00006 mg per sample
Magnesium (Mg)			
Molybdenum (Mo)			
Nickel (Ni)			
Selenium (Se)			
Silicon (Si)			
Silver (Ag)			
Thallium (Tl)			
Vanadium (V)			
Zinc (Zn)			

Technical Supervisor: 9/10/96 Analyst: WX
Weiping Xia, M.S.

Samples are analyzed by Inductively Coupled Plasma Atomic Emission Spectrometry. This report must not be reproduced except in full, with the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed herein. Explanation: mg / m^3 = milligrams per cubic meter of air. ND = None Detected (concentration is less than detection limit).

1144

P & D ENVIRONMENTAL
Panama Court
Oakland, CA 94611
Telephone (510) 658-6916

37515 108.

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT NUMBER: 0117

PROJECT NAME: PG&E - Emeryville

SAMPLED BY: (PRINTED AND SIGNATURE) Paul H. King - Paul H. King

SAMPLE NUMBER	DATE	TIME	TYPE	SAMPLE LOCATION	NUMBER OF CONTAINERS	ANALYSIS(ES): Total Lead	Total Chromium					PRESERVATIVE	REMARKS
PG&E-1	9/5/96		Air	Construction Area	1	X	X					–	Normal Turn Around
PG&E-2	"		"	Background	1	X	X					–	" " "
PG&E-3	"		"	Blank	1	X	X					–	" " "

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
Paul H. King	9-6-96	930 AM	John Ayoub

RELINQUISHED BY: (SIGNATURE) / DATE / TIME / RECEIVED BY: (SIGNATURE)

RELINQUISHED BY: (SIGNATURE) / DATE / TIME / RECEIVED FOR LABORATORY BY: (SIGNATURE)

TOTAL NO. OF SAMPLES (THIS SHIPMENT): 3

TOTAL NO. OF CONTAINERS (THIS SHIPMENT): 3

LABORATORY: Micro Analytical Lab

LABORATORY CONTACT:

LABORATORY PHONE NUMBER: (510) 653-0824

SAMPLE ANALYSIS REQUEST SHEET ATTACHED: ( )YES (X)NO

REMARKS:

	Sample Location	Time On	Flow (lpm)	Time Off	Flow (lpm)	Tot Min	Tot Vol (l)
9/5/96	PG&E-1	0933	2.6	1750	2.6	497	1292
	PG&E-2	1058	4.0	1802	4.0	424	1696