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September 6, 1991

Alameda County Health Agency
Division of Hazardous Materials
80 Swan Way, Room 200
Oakland, California 94621

Attention: Ms. Pamela J. Evans
Hazardous Materials Specialist

Subject: Draft Final Report
Saklan Road Property, Hayward, California
Exceltech Project No. 3-50058-51

Dear Ms. Evans:

Enclosed is a draft copy of the Final Report on the Saklan Road property. The last outstanding issue was the PCBs, and the five samples we took all came back non-detect. The laboratory analysis sheets are included.

I made an attempt to put the document in a usable form for the variety of potential readers. Sections 1 (Introduction), 2 (Chronology), and 3 (Conclusions) are short, less than one page each, and to the point. These three sections actually comprise an executive summary. Following these sections is a section with figures, tables and all the details of the calculations. Finally, the original Health Risk Assessment, my Revised Health Risk Assessment, and all the applicable data are included in the Appendices.

Please review this draft and let me know if this format is acceptable, and if sufficient information is supplied. As soon as you have provided your comments I will finalize the document and provide as many copies as you need.

As always, if you have any questions, please do not hesitate to call.

Sincerely,

Jeff Willett, P.E., Manager
Assessment, Compliance and Training

Enclosure

cc: Mr. Hugh Murphy, City of Hayward Fire Department
Mr. Rob Robles
Mr. John Barbour

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DRAFT

FINAL REPORT

SAKLAN ROAD PROPERTY
HAYWARD, CALIFORNIA

Project No. 3-50058-52
September 1991

Table of Contents

EXCELTECH

SECTION 1
INTRODUCTION

This report is designed as a comprehensive, fully documented analysis of the risk from identified pesticides and polychlorinated biphenyls (PCBs) on the properties at 23830 and 23836 Saklan Road (also identified in the appendices as Saklan Avenue) in unincorporated Alameda County surrounded by Hayward, California. Briefly, this document includes (1) a chronology of events involved in this analysis, (2) conclusions reached as a result of the analysis, (3) figures, tables and calculations resulting from the analysis and supporting the conclusions, (4) appendices of interim documents produced during the analysis, and (5) appendices of data acquired during the analyses.

Under Section 25321(d) in Chapter 6.8 of the California Health and Safety Code, normal application of pesticides is excluded from the definition of a hazardous substance release. This means that unless the soil is excavated for disposal, the State of California does not consider it a hazardous waste. As the soil on this site is not expected to be excavated for disposal, the basis for this analysis is the health concerns of Alameda County and the City of Hayward. While the site is currently in unincorporated Alameda County, it is surrounded by the City of Hayward and is expected to be annexed. Under these conditions, the analysis was completed at the direction of Ms. Pamela Evans of the Alameda County Health Care Services Agency (County), with the concurrence of Mr. Hugh Murphy of the City of Hayward (City).

Based on the stated concerns of the County, this report concludes that there is less than a one-in-one million cancer risk from identified pesticides, and no evidence supports the presence of PCBs.

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SECTION 2
CHRONOLOGY

In September of 1989, a preliminary environmental assessment was conducted on the site. As part of that assessment, a review of historical aerial photographs indicated a history of greenhouses on the site. Based on that information, the County and City requested surface soil samples for pesticides. Initial samples were collected in October 1990, and subsequent samples collected in November 1990. The results of the analysis of these samples indicated the presence of Aldrin, Lindane, DDT (and it's daughter products, DDD and DDE, hereinafter identified with the DDT as DDTr), and PCBs. The consultant's reports, with site maps and laboratory analysis sheets are located in Appendix D. The analytical results are found in Table 1.

In light of these results, the County requested a health risk assessment to evaluate the health risk of the compounds identified. The health risk assessment was completed in April 1991 and submitted to the County. The health risk assessment is located in Appendix A, and the resume of the preparer is in Appendix B. The health risk assessment identified needs for further sampling to fully define the levels and extent of compound concentrations in the soil.

In May 1991, additional soil sampling was conducted, and water from the three on site wells was also sampled. No compounds were identified in the groundwater. The soil sampling indicated that the pesticides were confined to the top two and one half feet of the soil, and that the concentrations decreased rapidly beneath the surface. The sampling plan and laboratory analytical sheets are located in Appendix E, and the associated report, issued as a revision to the health risk assessment, is in Appendix C.

PCBs were identified only in one original sample taken in October 1990. As subsequent sampling through May 1991 found no other PCB concentrations, additional sampling was undertaken in an attempt to confirm any presence of PCBs. This sampling occurred in August 1991. One surface sample was taken at the site of the original positive sample (as indicated by measurements in the original report, Appendix D), and four additional samples were taken to the East, West, South, and North (as noted in Appendix F, with the laboratory analyses). No PCBs were detected in any of these samples, and no indication of oil staining was found.

Lab anomaly?

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SECTION 3
CONCLUSIONS

Based on the evaluations of the analytical results, the following increased cancer risks were identified:

Aldrin:	0.464 in one million	See Table 11
Lindane:	0.106 in one million	
DDTr:	0.755 in one million	

As no cancer risks were identified as equal to or greater than one-in-one million, no further investigation nor any remediation relative to pesticide concentrations is indicated.

Resampling and analysis of the area where PCBs were initially detected did not detect any presence of PCBs. Consequently, it is assumed that the original identification was either a false positive, or indicated such a limited areal extent that reidentification was not possible. Therefore, no further investigation nor any remediation relative to possible PCB presence is indicated.

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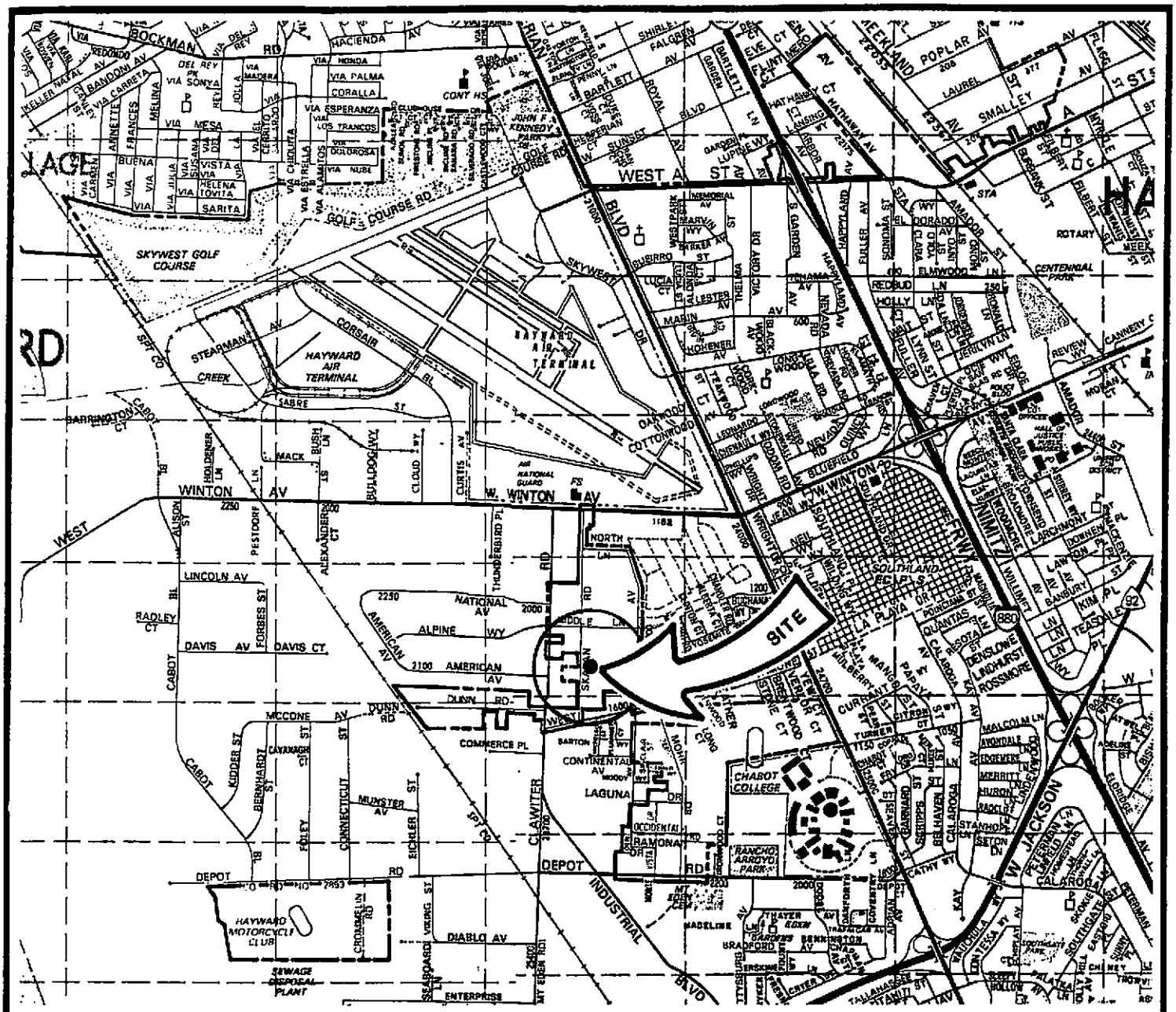
SECTION 4
FIGURES, TABLES, AND CALCULATIONS

This section is divided in to three parts. Immediately following this page are Figures 1 and 2. Figure 1 is an area map showing the location of the site. Figure 2 is a site map showing the site layout in conjunction with Saklan Road.

Following Figure 2 are Tables 1 through 4. Table 1 is a summary of the soil analytical data (laboratory sheets provided in the appendices). Table 2 includes actual data from Table 1 and entries for one-half of the detection limit in place of non-detect notation for the compounds of concern. The data from this table was used to carry out the calculations. Table 3 summarizes the results of statistical calculations based on Table 2. Note that Table 3 includes both current upper confidence limits (UCLs) and UCL used for 70 year calculations. Finally, Table 4 (1) summarizes the short term emissions and compares them to the U.S. Occupational Health and Safety Administration Permissible Exposure Limits, (2) summarizes the long term exposure rates, and (3) compares the one-in-one million cancer risk concentrations with actual concentrations.

Following these summary tables is a complete discussion and presentation of the equations used to complete the tables.

FIGURES



BASE MAP: THOMAS BROS. GUIDE, ALAMEDA CO. 1991

LEGEND

SITE LOCATION

0 1100 2200

SCALE IN FEET

N

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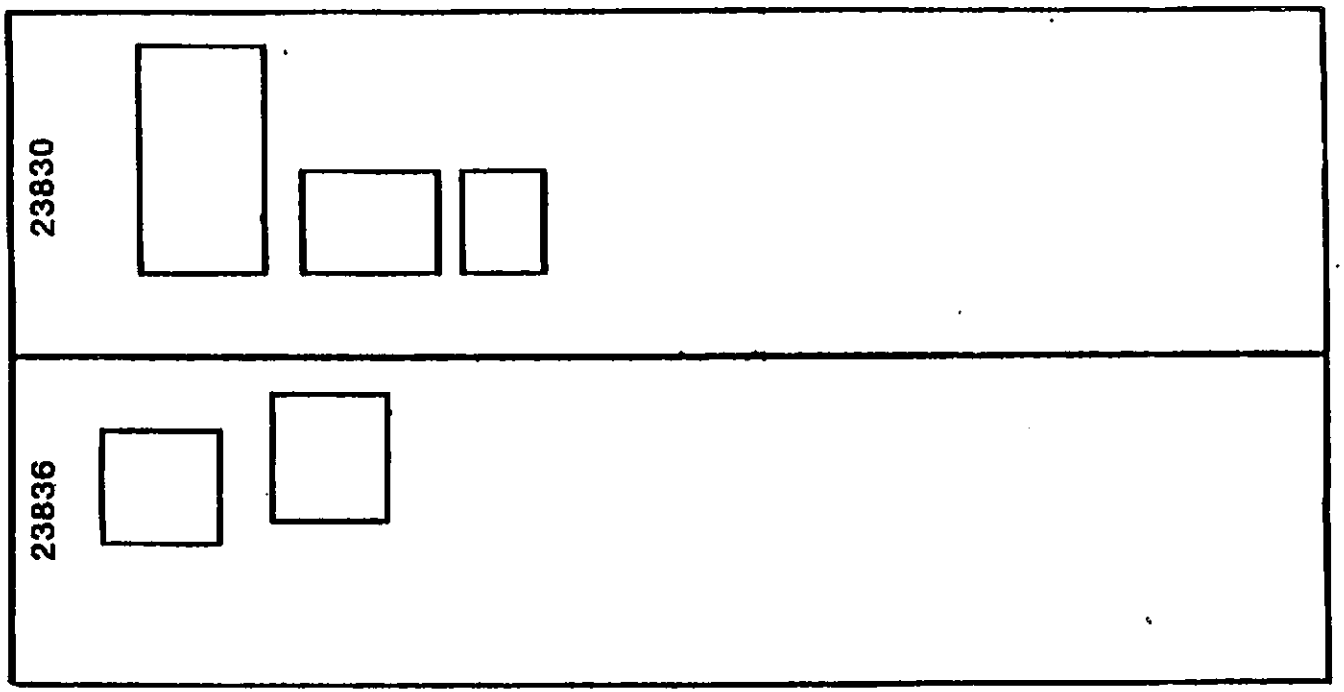
AREA MAP

ROBLES PROPERTY

23836 SAKLAN AVENUE

HAYWARD, CALIFORNIA

	REVIEWED BY:	APPROVED BY:
JOB #: 3-50058-51		DRAWN BY: J.D.S.
DATE: 9/5/91		DRAWING #: 1



SCALE

0 50' 100'

BASE MAP: CHIPS ENVIRONMENTAL CONSULTANTS 3/19/91

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SITE MAP

ROBLES PROPERTY

23836 SAKLAN AVENUE

HAYWARD, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB #: 3-50058-51	DRAWN BY: J.D.S.
DATE: 9/5/91	DRAWING #: 2

TABLES

Community West
Project No. 3-50058-51

September 3, 1991

TABLE 1

SUMMARY OF ANALYTICAL RESULTS
Sample concentrations in parts per million

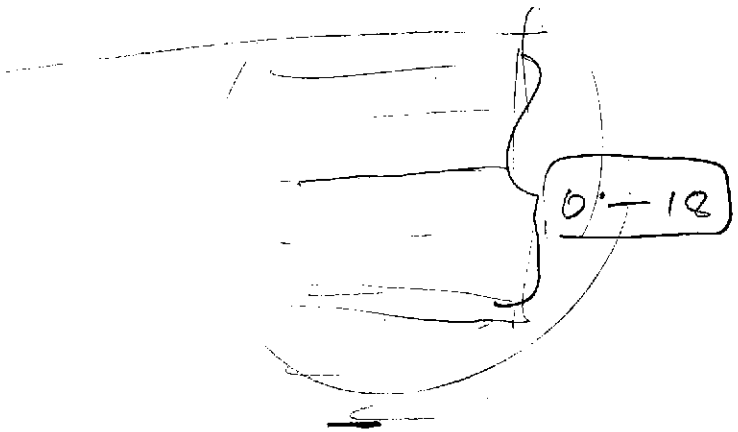
billion?

Compound	d1	d2	d3	d4	c1	c2	c3	c4	c5	c6	G-12	G-18	G-27	G-42	G-45	G-70	G-18A	G-27A	G-70A
Aldrin	ND	ND	ND	ND	ND	34	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-BHC	31	17	ND	25	ND	ND	ND	ND	ND	ND	ND	5.2	16	ND	ND	ND	ND	ND	ND
d-BHC	590	49	ND	610	14	210	54	ND	ND	ND	ND	ND	18	ND	ND	ND	ND	ND	ND
g-BHC	120	17	ND	24	13	79	33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT	2100	1400	5700	3100	550	6500	1400	5600	110	640	ND	ND	160	ND	ND	220	ND	ND	14
DDD	250	240	840	460	57	300	120	590	ND	220	ND	33	52	ND	ND	72	ND	ND	3.3
DDE	1100	1300	1500	1500	230	1900	630	830	120	740	ND	70	59	ND	ND	130	ND	ND	.12
PCBs	ND	ND	1900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

0-12" 12-18" 24-30"

2 1/2

1. d = discrete sample, c = composite sample
2. ND = analytical results below detection limit
3. d1-c6 were surface samples, G-12 - G-70 were at 12 to 18 inches deep, G-18A - G-70A were at 24 to 30 inches deep.



3000 ppb
4000 ppb

2000 ppb.

Community West
Project No. 3-50058-51

September 3, 1991

TABLE 2

SUMMARY OF ANALYTICAL RESULTS USED IN CALCULATIONS
Sample concentrations in parts per million

Compound	d1	d2	d3	d4	c1	c2	c3	c4	c5	c6	G-12	G-18	G-27	G-42	G-45	G-70	G-18A	G-27A	G-70A
Aldrin	2.5	2.5	2.5	2.5	2.5	34	15	10	10	10	0.5	2.5	2.5	2.5	0.5	2.5	0.5	0.5	0.5
Lindane	120	17	25	24	13	79	33	10	10	10	0.5	2.5	2.5	2.5	0.5	2.5	0.5	0.5	0.5
DDTr	3450	2940	8040	5060	837	8700	2150	7020	255	1600	7	118	271	35	7	422	7	7	29.3

1. d = discrete sample, c = composite sample
2. Underlined values are or include one-half of the detection limit in place of an "ND."
3. d1-c6 were surface samples, G-12 - G-70 were at 12 to 18 inches deep, G-18A - G-70A were at 24 to 30 inches deep.

Community West
Project No. 3-50058-51

September 3, 1991

TABLE 3

STATISTICAL RESULTS OF DATA
All concentrations shown in parts per billion

Compound	Mean	Variance	Std. Dev.	Std. Err.	UCL [1, 2]	UCL [3]
Aldrin	6.66	60.7	7.8	1.79	9.8	-
Lindane	18.6	706	26	6.1	29.2	0.62
DDTr	2156	4.88×10^6	2209	507	3034	901

1. UCL = Upper confidence limit.
2. Based on a 95% confidence that actual value will be lower.
3. For Lindane and DDTr, UCL includes half life calculations.

(1)

0 - 18"

UCL < SHC

Community West
Project No. 3-50058-51

September 3, 1991

TABLE 4

RISK DATA

Compound	Emmissions [1]	OSHA PEL [2]	Exposure Rate [3]	Actual Concentration	10^6 Cancer Concentration [4]
Aldrin	1.3×10^{-7} mg/m^3	0.25 mg/m^3	2.73×10^{-8}	9.8 ppb	21.1 ppb
Lindane	3.9×10^{-7} mg/m^3	0.5 mg/m^3	8.07×10^{-8}	29.2 ppb	276 ppb
DDTr	4.5×10^{-5} mg/m^3	1.0 mg/m^3	2.22×10^{-6}	901 ppb	1193 ppb

from adsorbent

1. Worst case air emmissions (short term exposure)
2. Occupational Health and Safety Administration limits (short term air exposure)
3. Exposure rate is in milligrams per day (mg/day) (total adsorbed compound - long term exposure)
4. Compound concentrations resulting in one additional cancer per one million people

UCL { }

90kg

150 ml/day

2 Ac

100%

CALCULATIONS

This section describes and illustrates the equations used to develop the previous tables. The basic statistical equations are taken from SW-846[1] (except for the half-life equation, which was from a calculus text[2]). The equation for the inhalation exposure rate is taken from the EPA document as footnoted below the equation, and the equations for oral and dermal exposure are taken EPA Superfund Public Health Evaluation Manual, EPA/540/1-86/060, October 1986.

The assumptions used in the calculations (taken from the Health Risk Assessment, Appendix A) include:

1. Receptor: Adult, 70 kg body weight
2. Daily soil ingestion: 150 milligrams
3. Adsorption of ingested toxicant: 10%
4. Daily skin loading rate: 450 milligrams
5. Dermal adsorption: 10% (5% for DDTr)
6. DDT half life in soil: 15 years
7. Lindane half life in soil: 378 days

Statistical Calculations

The mean, $\bar{x}$, for stratified sampling is defined as the sum of the products of each strata mean times the fraction of samples from that strata to the total number of samples:

$$\bar{x} = \sum_{n=1}^{n} W_k \quad \bar{x}_k$$

W_k is the fraction of samples in strata k and $\bar{x}_k$ is the mean of the samples in that strata. The surface sample fraction is 0.526 (10 surface samples divided by 19 samples total). The middle strata sample fraction is 0.316 and the bottom strata sample fraction is 0.158.

In the table below, the mean from the surface strata included samples d1 through c6. The mean from the middle strata included samples G18 through G70 and the mean from the bottom strata included G18A through G70A.

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1 Test Methods for Evaluating Solid Waste, Third Edition, 1986. United State Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, D.C.

2 Bittinger, Marvin, L., 1988. Calculus, Forth Edition. Addison-Wesley Publishing Company. Reading, Massachusetts.

Table 5

Strata Means by Strata
All concentrations in parts per billion

Compound	Surface Strata	Middle Strata	Bottom Strata
Aldrin	11.4	1.8	0.5
Lindane	34.1	1.8	0.5
DDTr	4005.0	143.3	14.4

The variance of the sample, s^2, is defined as:

$$s^2 = \frac{\sum_{n=1}^{n} x_i^2 - \frac{\left(\sum_{n=1}^{n} x_i\right)^2}{n}}{n-1}$$

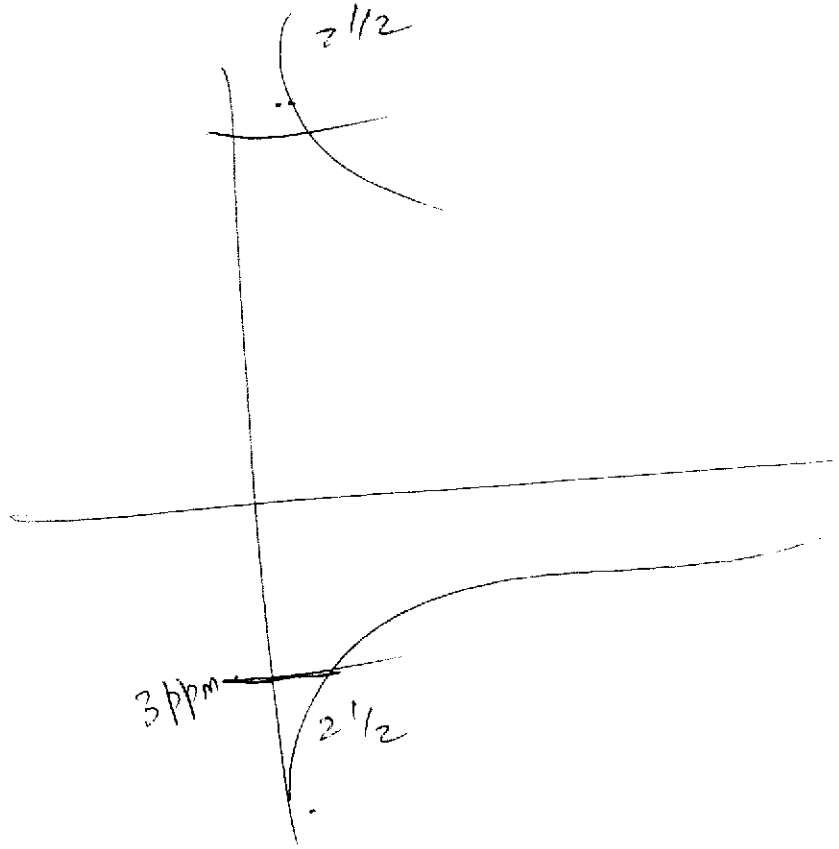
The variance of the sample for stratified sampling is defined as the sum of the products of each strata sample variance times the fraction of samples from that strata to the total number of samples:

$$s^2 = \sum_{n=1}^{n} W_k \, s_k^2$$

Table 6

Sample Variances
All concentrations in parts per billion

Compound	Surface	Middle	Bottom	Total
Aldrin	1.15×10^2	1.07	0.0	60.7
Lindane	1.34×10^3	1.07	0.0	7.06×10^2
DDTr	9.25×10^6	2.87×10^4	1.66×10^2	4.88×10^6


2 1/2
3 ppm
2 1/2

The standard deviation, s, is defined as the square root of the sample variance:

$$s = \sqrt{s^2}$$

The standard error, $s_{\bar{x}}$, is defined as the standard deviation divided by the square root of the total number of samples:

$$s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

The upper limit of the confidence interval, **UCL**, is defined as the mean plus the product of the Student t value and the standard error. SW-846 provides Student t values for a 90% upper limit confidence interval (that is to say that 90% of the values will fall below this limit). However, Ms. Evans indicated that the County requires a 95% confidence interval.

$$UCL = \bar{x} + \left(t_{value} \times s_{\bar{x}}\right)$$

For a one-tailed 95% confidence interval, the t_{value} is 1.734.

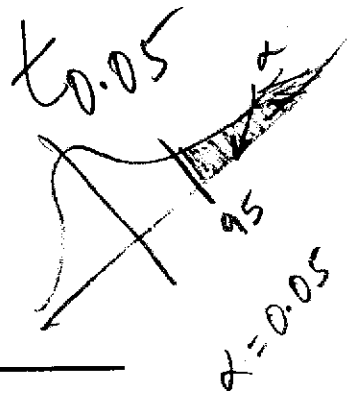


Table 7

Statistical Calculations
All concentrations in parts per billion

Compound	Standard Deviation	Standard Error	Upper Confidence Limit
Aldrin	7.8	1.79	9.8
Lindane	26.6	6.09	29.2
DDTr	2209	506.8	3034

The calculation for cancer risk is based on a 70 year exposure. Consequently, the concentration of the pesticide over the entire 70 years must be determined, based on the current concentration and the half life of the pesticide. The following calculations are based on the most conservative half life values given in the Health Risk Assessment (Appendix A) for Lindane and DDT.

The following equation yields the average value over a specified period from the half life equation.

$$\text{Average value} = \frac{1}{b-a}\int_{a}^{b} x_0 e^{-ct}$$

In the above equation, "a" is the starting time, "b" is the ending time, "x_0" is the initial value, "c" is a rate constant equal to the natural log of 2 divided by the half life in years, and "t" is the total time period. For a 70 year period, and an initial concentration of 3032 ppb (the 95% UCL for DDTr),

$$\frac{1}{70-0}\int_{0}^{70} 3032 \text{ ppb } e^{-0.0462t} = \underline{901 \text{ ppb DDTr}}$$

For a 70 year period, and an initial concentration of 0.623 ppb (the 95% UCL for Lindane),

$$\frac{1}{70-0}\int_{0}^{70} 0.623 \text{ ppb } e^{-0.669t} = \underline{0.623 \text{ ppb Lindane}}$$

Exposure Calculations

Short-Term Exposure

The following equations and methodology used to determine the short-term inhalation exposure is taken from the Health Risk Assessment (Appendix A, pages 16 and 17). The exposure rates are compared to the U.S. Occupational Health and Safety Administration Permissible Exposure Limits in Table 4 for comparison purposes. The line item numbers correspond to those in the Health Risk Assessment.

11. A worst case, 24-hour, PM_{10} emission factor of 12 grams/hour/meter^2

12. Worst case contaminant emission rate (based on mean concentrations in Table 1 of the assessment, Appendix A, Table 2, page 6):

    Aldrin:
    Current UCL concentration - 0.0098 milligrams per kilogram
    (0.0098 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = 0.00026 mg/sec

    Lindane:
    Mean concentration - 0.0292 milligrams per kilogram
    (0.0292 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = 0.00079 mg/sec

DDTr:
Mean concentration - 3.304 milligrams per kilogram
(3.304 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = 0.0891 mg/sec

14. Worst case contaminant emission factors at a distance of 0 kilometers (this calculation utilizes a number of 500 microseconds/$meter^3$, taken from an isopleth summing the worst-case mechanical and erosion emission rates, found on Figure 4-12, page 57, Cowherd, et al (1985) referenced in the health risk assessment, Appendix A):

Aldrin: (0.00026 mg/s) X (500 us/m^3) = 1.3 x 10^{-7} mg/m^3

Lindane: (0.00079 mg/s) X (500 us/m^3) = 3.9 x 10^{-7} mg/m^3

DDTr: (0.0891 mg/s) X (500 us/m^3) = 4.5 x 10^{-5} mg/m^3

Long-Term Exposure

This is dated 1986

The calculations for cancer risk are based on the Superfund Public Health Evaluation Manual Worksheet 7-3. The cancer risk is the sum of the risks from the various routes of exposure, and each route of exposure risk is the multiple of the concentration, the human intake factor and the carcinogenic potency factor (q_1*), a value that describes the degree of cancer-causing potential for the chemical.

Specifically, the carcinogenic potency is the upper-bound 95% confidence limit of the slope of the extrapolated cancer dose response curve. The carcinogenic potency factors are taken from a series of chemical-specific documents describing the toxicological profile of the chemical, produced by the U.S. Public Health Agency in collaboration with the U.S. EPA.[3]

Table 8

Carcinogenic Potency Factors

Compound	q_1*
Aldrin	17 (mg/kg-day)$^{-1}$
Lindane	1.3 (mg/kg-day)$^{-1}$
DDTr	0.34 (mg/kg-day)$^{-1}$

3 "Toxicological Profile for a-, b-, g-, and d-Hexachlorocyclohexane," Clement Associates, U.S. Public Health Service, December 1989.
"Toxicological Profile for Aldrin/Dieldrin," Dynamac Corporation, U.S. Public Health Service, May 1989.
"Toxicological Profile for p,p'-DDT, p,p'-DDE, and p,p'-DDD," U.S. Public Health Agency, 1989.

For consistency, the one-in-one-million cancer risk for DDTr is recalculated using these procedures. The original Health Risk Assessment used a value given in a 1991 publication by F. Martz.

In the original Health Risk Assessment, on page 16, it was noted that due to the clay content of the native soil, the area wind speed, and the predicted presence of pavement, structures, and vegetation, "inhalation exposure should not be a significant concern for the residents in the area." However, the County has requested that an inhalation exposure be calculated and included in the cumulative cancer risk. For purposes of this calculation, it is assumed that a 70 kg adult will be in the immediate vicinity of active soil disturbance 8 hours per day, every day for 70 years. Additionally, it is assumed that 90% of the soil of the developed property is covered by paving, structures or vegetation. An inhalation rate of 20 cubic meters per day is taken from the Superfund Public Health Evaluation Manual.

To determine the concentration of the compound (in this soil and based on these site specific conditions) that results in a one-in-one-million cancer risk, this risk is divided by the carcinogenic potency factor, and equated to a combined oral, dermal and inhalation exposure.

Exposure in mg/kg-day for a given soil concentration "C" in mg/kg:

Inhalation Exposure[4]

$$(C) \times (12\ gr/hr/m^2) \times (809.3\ m^2) \times (500\ us/m^3) \times (6.7\ m^3/day) / (70\ kg)$$

In this calculation, "C" is the compound concentration, "12 grams per hour per square meter of surface area" is taken from line 11, page 17 of the Health Risk Assessment (Appendix A), "809.3 square meters of surface" is assumed to be exposed, "500 microseconds per cubic meter" is identified in the footnote, "6.7 cubic meters per day" in the inhalation for 8 hours, and "70 kilograms" is the body weight. This calculation assumes that 100% of the inhaled compound is adsorbed.

Oral Exposure

$$(C) \times (0.15 \times 10^{-3}\ kg/day) / (70\ kg)$$

In this calculation, "0.15×10^{-3} kilograms per day" is the soil ingestion rate.[5] This calculation also assumes that 100% of the ingested compound is adsorbed.

---

[4] This calculation utilizes a number of 500 microseconds per cubic meter, taken from an isopleth summing the worst-case mechanical and erosion emission rates, found of Figure 4-12, page 57, Cowhead, et al, 1984. Rapid Assessment of Exposure to Particulate Emissions from surface Contamination Site. EPA/600/8-85-002. Inhalation exposure also uses a worst case PM_{10} emission factor of 12 grams/hour/square meter and assumes that a maximum of 10% of the site will be actively disturbed during the 8 hours per day of exposure over 70 years.

[5] Sedman, R.M. (California Department of Health Services, Toxics Substances Control Division), 1989. The Development of Applied Action Levels for Soil Contact: A Scenario for the Exposure of Humans to Soil in a Residential Setting. Environmental Health Perspectives, Vol. 79, pp 291-313.

Dermal Exposure[6]

$$(C) \times (0.450 \times 10^{-3} \text{ kg/day}) \times (10\%) / (70 \text{ kg})$$

In this calculation, "0.450×10^{-3} kilograms per day" is the dermal exposure rate (see footnote 5), and 10% of the Aldrin and Lindane are adsorbed (5% of the DDTr), as noted in the Table 5 of the Health Risk Assessment (Appendix A).

The following table was calculated by dividing the one-in-one million cancer risk by the appropriate carcinogenic potency factors, and back calculating from the above exposure route equations.

Table 9

One in One Million Cancer Risk
(Site Specific for Saklan Road Project, Hayward, California)

Compound	Concentration
Aldrin	0.021 mg/kg
Lindane	0.28 mg/kg
DDTr	1.19 mg/kg

The following table lists the calculated individual and total exposure rates based on the above equations and the concentrations listed in Table 3.

Table 10

Exposure Rates
Rates are in milligrams per day

Compound	Inhalation Rate	Ingestion Rate	Dermal Rate	Total Rate
Aldrin	1.26×10^{-11}	2.10×10^{-8}	6.30×10^{-9}	2.73×10^{-8}
Lindane	3.74×10^{-11}	6.21×10^{-8}	1.86×10^{-8}	8.07×10^{-8}
DDTr	1.16×10^{-9}	1.93×10^{-6}	2.88×10^{-7}	2.22×10^{-6}

[6] Assumes dermal adsorption of 10% and 5% for DDTr, as noted in original Health Risk Assessment.

The following table lists the calculated individual and total exposure route cancer risks based on the concentrations listed in Table 3.

Table 11

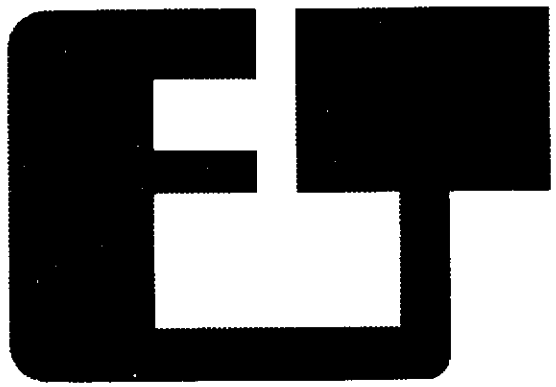
Actual Cancer Risks
Risks are given in additional cancers per person

Compound	Inhalation Risk	Ingestion Risk	Dermal Risk	Total Risk
Aldrin	2.15×10^{-10}	3.57×10^{-7}	1.07×10^{-7}	4.64×10^{-7}
Lindane	4.90×10^{-11}	8.12×10^{-8}	2.44×10^{-8}	1.06×10^{-7}
DDTr	3.95×10^{-10}	6.56×10^{-7}	9.80×10^{-8}	7.54×10^{-7}

APPENDIX A

HEALTH RISK ASSESSMENT

April 22, 1991



EXCELTECH

HEALTH RISK ASSESSMENT

FOR SAKLAN AVENUE PROPERTY

HAYWARD, CALIFORNIA

Prepared By Norman E. Riley
Exceltech Project No. 3-50058-51

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Tables

Appendix

EXCELTECH

HEALTH RISK ASSESSMENT FOR SAKLAN AVENUE PROPERTY HAYWARD, CALIFORNIA

BACKGROUND

The parcels of interest are located at 23830 and 23836 Saklan Avenue in the City of Hayward, California. The property is situated in the western portion of the city near the intersection with Middle Lane and is less than 1 mile south of the Hayward Air Terminal and approximately 2 miles east of the San Francisco Bay. The property is bounded on the north, east, and south by residential developments and on the west by light industrial business complexes situated across Saklan Avenue. The site is planned for residential development.

A preliminary environmental assessment of the property was conducted in 1989 by Ensco Environmental Services, Inc. Following a review of the subject property and other adjacent parcels (23718 through 23836 Saklan Avenue) to be developed concurrently, the consultants reported that no evidence of hazardous materials, hazardous waste, underground storage tanks, polychlorinated biphenyls (PCBs), asbestos containing materials (ACMs), surface stains, or spills were observed during a September 6, 1989 visual inspection of the area. In a summary dated September 22, 1989, the Ensco consultants noted that aerial photographs of the area taken as late as September 1979 showed that "several large greenhouses" were present on the property.

The events of the following year are unknown to the author of this report; however, on November 8, 1990, Chips Environmental Consultants, Inc., based in Sunnyvale, California, corresponded with the Alameda County Department of Environmental Health (ACDEH) regarding recent tests of surface soil within "the one existing greenhouse structure." Four discrete samples were collected from the surface to about 2 inches in depth at that location. The resulting analytical data from this phase of the investigation were said to indicate fairly uniform pesticide levels (1 to 6 parts per million [ppm]). DDT and associated degradation products (DDD and DDE) were detected along with lindane and several related stereoisomers. The consultants also reported the occurrence of PCBs (Arochlor 1242) in one sample at a concentration of 19 ppm. Based on these findings, the collection of six additional samples was proposed to characterize the areas of concern. According to the sampling plan provided to the ACDEH, five of these samples were to be collected from past greenhouse sites and one "background" sample was to be collected from an area where no greenhouses existed. The sample which was collected to ascertain background concentrations is not identified in the consultant's report or sampling plan.

Following these events, Exceltech, a Fremont-based environmental consulting firm, became involved in this project. A series of meetings were held and several letters

concerning the resolution of this case were prepared. In its letter of March 14, 1991 to Venture Properties, the ACDEH requested that a risk assessment be prepared for the site which addresses, at a minimum:

a. Routes of exposure to on-site contaminants, taking into consideration oral, dermal, and inhalation exposures to the soil for construction personnel, future residents, and other persons who might be affected by pesticide residues in soils at the site...[and]

b. The manner in which any significant health risks identified by the risk assessment will be mitigated.

The ACDEH noted that Section 22-12705, Title 26 of the California Code of Regulations, specifies regulatory levels deemed to pose no significant health risk for a number of chemicals, including some of those found to be present at the Saklan Avenue site. Where no regulatory level for a specific contaminant is listed in Section 22-12705, the ACDEH directed that the risk assessment specify the level of no significant risk.

The approach that will be taken to address these directives can be divided into three steps. These are: (1) hazard identification, (2) hazard evaluation, and (3) risk evaluation. Together, these three steps constitute risk assessment. The identity and concentrations of contaminants at the site will be addressed in the first step. Hazard evaluation will involve qualitative and quantitative assessments of these data with particular emphasis on environmental fate and health effects associated with exposure by various routes. The final phase, risk evaluation, will involve quantitation of the relevant health and environmental threats posed. This risk assessment will thus provide:

1. Characterization of the types of health effects associated with exposure to identified toxicants; and

2. A determination of whether the probability (risk) of occurrence of a specific health effect (cancer) in biological receptors of concern exceeds the level of acceptable risk.

The selection of a remedial action strategy is usually addressed in a feasibility study. Based on the conclusions reached in this report, an appropriate mitigative strategy will be suggested if corrective action is indicated. A complete evaluation of all possible remedial actions will not be attempted, nor will a risk management decision be made in this report.

1. HAZARD IDENTIFICATION

The investigative results for the Saklan Avenue property are summarized in Table 1. Samples collected from the surface soils at the site were analyzed by Trace Analysis Laboratory in Hayward. The results indicate that detectable concentrations of aldrin, alpha-BHC, delta-BHC, gamma-BHC (lindane), DDD, DDE, DDT and PCB (Arochlor 1242) are present in soil at the site. Copies of the analytical reports are included in the Appendix.

Aldrin (1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4:5,8-dimethanonapthalene) is an organochlorine insecticide. Lindane (hexachlorocyclohexane or gamma benzene hexachloride), also an organochlorine insecticide, is the effective agent among the eight well described stereoisomers of hexachlorocyclohexane, including alpha-BHC and delta-BHC. DDT is an organochlorine insecticide. The term DDT is generally understood throughout the world and refers to p,p'-DDT (1,1'-[2,2,2-trichloroethylidine] - bis [4-chlorobenzene]) although different isomeric forms, for example, o,p'-DDT, are usually associated with technical formulations of DDT. DDD and DDE are derivatives of DDT resulting from metabolism or environmental degradation. Arochlor 1242 is a PCB compound containing approximately 42 weight percent chlorine. Data concerning the physical and chemical properties of these substances are presented in Table 3.

No formation is available regarding whether the samples were randomly collected; however, the pattern of sampling (approximately 50 feet apart along the north/south axis and 50 feet apart along the east/west axis) and the fact that all sampling was confined to the uppermost horizon suggest that a judgmental approach was used. The sampling appears to have been conducted for purposes of contaminant identification rather than environmental fate determination or public health risk assessment. No data are available concerning other environmental media, in particular, groundwater. The physical and chemical properties of these contaminants do not necessarily suggest that contamination of other media should be suspected; however, confirmational data are absent.

The California Department of Health Services (DHS) has established regulatory thresholds (STLCs and TLLCs) for aldrin, DDT and its derivatives, lindane, and PCBs. These criteria are presented in Section 66699(c), Title 22, California Code of Regulations. Only DDT and its residues (DDTr) are present at a concentration above the adopted TTLC. The application of these standards to the assessment of hazards associated with the contamination at the Saklan Avenue site is not appropriate at this point because no "waste" has been released at the site and no waste been generated. Health and Safety Code Section 25321(d) specifically excludes the normal application of pesticides from the definition of "release." While there is no evidence provided in the available record of this site which conclusively demonstrates that these residues resulted from the normal application of pesticides, the contamination is presumed to result from normal application given the historic use of the site. The occurrence of pesticide

TABLE 1

SUMMARY OF ANALYTICAL RESULTS FOR SOIL SURFACE SAMPLES COLLECTED AT THE SAKLAN AVENUE SITE

Sample concentration (parts per billion [ppb])

Compound	d1	d2	d3	d4	c1	c2	c3	c4	c5	c6
aldrin	2.5	2.5	25	2.5	2.5	34	15	10	10	10
a-BHC	31	17	25	25	4.5	10	4.5	25	25	25
d-BHC	590	49	25	610	14	210	54	10	10	10
g-BHC	120	17	25	24	13	79	33	10	10	10
DDD	250	240	840	460	57	300	120	590	25	220
DDE	1,100	1,300	1,500	1,500	230	1,900	630	830	120	740
DDT	2,100	1,400	5,200	3,100	550	6,500	1,400	5,600	110	640
PCB	2.5	2.5	19,000	2.5	3.0	5.0	3.0	15	15	15

1. d = discrete sample, c = composite sample

2. underlined values represent 1/2 the limit of detection (LOD) recorded by the laboratory. One-half values are recommended in statistical evaluation to avoid introducing a positive or negative bias that occurs when ND values are assumed to equal zero or the LOD (Nehls and Akland, 1973). All values shown in this Table are used in the statistical calculations.

residues in each of the samples tested tends to support this assumption. Had the contamination resulted from waste disposal (e.g., container rinseates) the pattern of distribution would probably not be so diffuse. Excavation and removal of soil from the site would constitute waste generation, thus activating the classification requirement established in Section 66471, Title 22, California Code of Regulations.

While various statistical methods of may be used to evaluate these data, regulations adopted by the California DHS require, for purposes of waste evaluation, that analytical data be treated according to the methods specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 2nd Edition, U.S. Environmental Protection Agency, 1982." The standard statistical tests used in this approach provide information concerning the mean, variance, standard deviation and standard error for any given set of data. Most importantly, these tests provide an indication of confidence which can be assigned to the data and the extent of any additional sampling which may be needed to achieve a desirable level of confidence. For characterization purposes, SW-846 specifies that a two-tailed, 80 percent confidence interval be used. A statistical analysis of the resulting data has been performed using these prescribed procedures and the results, summarized in Table 2, indicate the following:

1. The mean concentration of DDT residues (DDTr, the sum of DDT, DDD, and DDE compounds) is 3.95 parts per million (ppm). The concentration at the upper confidence limit (UCL) is 5.25 ppm. The concentration at the lower confidence limit (LCL) is 2.65 ppm.

2. Aldrin residues were only detected in two of the 10 samples analyzed. The mean concentration of aldrin is 0.01 ppm. The concentration at the 80 percent UCL is 0.016 ppm. The concentration of aldrin at the 80 percent LCL is calculated to be 0.006 ppm.

3. Lindane residues were detected in seven of the 10 samples tested. The mean concentration of lindane is 0.03 ppm. The concentrations at the upper and lower 80 percent confidence limits are 0.05 and 0.01 ppm, respectively.

4. Arochlor 1242 was found in one of the 10 samples analyzed. If the results are averaged over the entire site, the mean concentration of PCB is 1.9 ppm. The discovery of a single positive value is unexpected. Spot contamination due to leakage from a capacitor or transformer might be the cause. PCBs were also used in the formulation of lubricating and cutting oils, pesticides and as plasticizers in paints, adhesives, sealants, and various plastic products. The reported percent recovery for the sample is within acceptable limits, but the value should still be regarded as suspect. The concentration is not high (19 ppm) and the contamination is evidently

TABLE 2

STATISTICAL RESULTS FOR SAKLAN AVENUE DATA

(All concentrations shown in parts per billion)

1. Aldrin. (RT = 1400)

Raw Data: 2.5, 2.5, 25, 2.5, 2.5, 34, 15, 10, 10, 10, $n_1 = 10$

Mean =	11.4
Variance =	114.6
Standard deviation =	10.7
Standard error =	3.38
Tvalue =	1.383
UCL =	16.08
LCL =	6.71
n_2 =	0.00

2. Lindane. (RT = 4000)

Raw Data: 120, 17, 25, 24, 13, 79, 33, 10, 10, 10, $n_1 = 10$

Mean =	34.1
Variance =	1340.1
Standard deviation =	36.6
Standard error =	11.57
Tvalue =	1.383
UCL =	50.1
LCL =	18.0
n_2 =	0.00

3. DDTr. (RT = 1000)

Raw Data: 3450, 2940, 7540, 5060, 837, 8700, 2150, 7020, 255, 1600, $n_1 = 10$

Mean =	3955.2
Variance =	8831524.8
Standard deviation =	2971.7
Standard error =	939.7
Tvalue =	1.383
UCL =	5254.8
LCL =	2655.5
n_2 =	1.9

4. PCB. (RT = 50000)

Raw Data: 2.5, 2.5, 19000, 2.5, 3.0, 5.0, 3.0, 15,15,15, $n_1 = 10$

Mean =	1906.3
Variance =	36073225.9
Standard deviation =	6006.0
Standard error =	1899.2
Tvalue =	1.383
UCL =	4533.0
LCL =	-720.3
n_2 =	0.02

RT = Regulatory threshold (TTLC)
Tvalue = Value for n-1 degrees of freedom from standard Student's T-test table
UCL = 80 percent upper confidence limit
LCL = 80 percent lower confidence limit

not widespread; however, further investigation may be warranted. The result could be due to a number of extraneous factors. At a minimum, duplication of the results should be attempted if extraneous factors are ruled out as the cause.

The confidence interval of 80 percent assumes normal distribution of data about the mean and is effectively a one-tailed, 90 percent confidence test (i.e., given the observed variance, standard deviation and standard error, a randomly collected sample would be expected to exceed the concentration at the upper confidence limit less than 10 percent of the time).

With respect to the representativeness and adequacy of sampling, the statistical results using normalized data indicate that a sufficient number of samples have been collected and analyzed to conclude that the surface soils have been adequately characterized for lindane residues, DDT residues, PCB, and aldrin (N2 - N1 is less than one in each case tested).

While the data appear to be sufficiently representative of the surface soils, they are not necessarily representative of the entire site because they do not reflect concentrations of pesticide residues (and possibly PCBs) beneath the surface. This conclusion is unavoidable regardless of what level of confidence is used in the statistical calculations. Nothing is known about the depth of contamination at this location. Additional sampling would be needed to ascertain whether the contaminants are confined to the upper strata or whether these substances have migrated to significant depths beneath the surface layer. Assuming the contamination resulted from the normal surface application of pesticide, or in the case of PCB, leakage from a capacitor, for example, migration to significant depths below the surface would not be expected (see discussion of environmental fate in Section 2); however, the confinement of toxicants to the surface layer (which was evidently suspected by the Chips consultants) has not actually been confirmed. At a minimum, additional sampling would be necessary to confirm the effect, if not success, of most conventional remedial actions, if any are implemented. The preliminary results and nature of this particular problem suggest that a stratified random sampling approach should be used.

For purposes of this assessment, it will be assumed that the estimated mean concentrations are representative of the entire site. As the following discussions suggest, the true mean concentrations are probably much lower (assuming the contamination results from normal surface application) because the effect of lower concentrations beneath the surface will be to lower the mean values (and the level of risk associated with exposure to these soils). Reynolds, et al., (1990) suggested that the upper 10 feet of the soil profile should be considered available for exposure in residential settings because typical home construction projects in California frequently involve disturbance of soil to that depth. The construction plans for this site do not call for disturbance of soil to such depths, therefore, factoring the concentrations at those

depths into the statistical analyses would be unreasonable unless the soil is contaminated to that extent or is excavated to that depth after all. While a more limited assessment is made in this case, it is important to keep in mind that if the true mean concentrations of contaminants at the site are below those assumed in this report, the conclusions reached in this report regarding risk associated with exposure to the Saklan Avenue soils will be overestimated.

2. HAZARD EVALUATION

To effectively evaluate the risk associated with identified hazards; estimate acceptable concentrations; establish appropriate cleanup levels; and develop appropriate remedial strategies, the environmental fate of contaminants is critical to evaluating the risks associated with exposure to identified contaminants because the effects of exposure will be moderated by the concentrations of contaminants in any given medium of exposure (response is a function of dose). The concentrations of chemicals in various media to which individuals may be exposed (air, water, soil, food) must be known and these must be compared to the levels of exposure which will be product adverse effect. If the environmental levels are lower than the adverse-effect levels and are likely to remain below those levels given factors which influence the environmental fate of chemicals (e.g., adsorption, desorption, volatilization, solubilization and bioconcentration), concern may not be warranted because exposure would not result in any adverse effect.

A detailed procedure for environmental fate determinations has been outlined by the California Department of Health Services (CDHS, 1986). The environmental fate of a contaminant and specifically, its transfer between environmental media (air, soil, water, and biota) is influenced by a combination of site-specific factors (e.g., soil type, soil adsorption) and the physical and chemical characteristics of the contaminant(s), (e.g., soil/water distribution coefficients, octanol/water partition coefficients, vapor pressure, water solubility). To predict the environmental fate of chemicals it is necessary to know something about site-specific factors and the physical and chemical characteristics of the substances in question. With this information, reliable predictions can be made concerning the environmental fate of the chemicals and the risks associated with exposure to contaminated media. Most of these data are available in the scientific literature but some may have to be obtained by field measurements. Most of the information used in this assessment has been obtained directly from the literature.

Site-Specific Factors

The Alameda County area has a marine climate characterized by moderate temperatures which vary little throughout the year. The mean annual temperature is approximately 57 degrees Fahrenheit (range 104 to 22). In normal years the average annual precipitation in Hayward ranges between 20.38 inches and 25.42 inches according to measurements at two stations in the Hayward area. Rains fall primarily in the winter months. Strong winds are unusual in this area. Wind speed is less than 6 miles per hour (mph) more than 50 percent of the time and exceeds 12 mph only 10 percent of the time. The Saklan Avenue Property is situated on soils that are characterized as "Clear Lake clay" (0 to 2 percent slopes). Clear Lake clay is described by surveyors as a very deep, poorly drained soil. The surface layer is typically dark gray and is comprised of neutral and moderately alkaline clay about 37 inches thick. The underlying material is calcareous, dark gray and grayish brown clay and silty clay to a depth of 60 inches or more. The erodibility of this soil is poor (K factor = 0.24) and

the permeability is slow (USDA, 1975). The particle sizes for the Saklan Avenue soil are not precisely known; however, USDA surveyors report that clay particles are generally less than 0.004 mm in diameter. Other sources indicate that some clay fractions are below 10 microns in size. The depth to groundwater at the site is approximately 30 to 40 feet (Exceltech, personal communication, 3/26/91). The nearest principal body of water is the San Francisco Bay approximately 2.3 miles to the west. Alameda Creek runs approximately 3.5 miles to the south.

Environmental Fate — Soils

The environmental fate of compounds detected at the Saklan Avenue site has been investigated by many different researchers. With the possible exception of lindane, each of the identified contaminants at the site are considered resistant to breakdown and are readily adsorbed to sediments and soils which act as sinks and as long-term sources of exposure. The tendency to adsorb strongly to soils is consistent with the high solubility in lipids and comparatively low water solubility of these compounds. For example, Shin et al. (1970), investigated the adsorption of DDT by soils of various types and by isolated soil fractions. Strong adsorption was reported in clays and was closely related to the organic matter content. Wheatly (1965) estimated the half-times for loss of DDT applied to soils. After surface application, 50 percent of the DDT was lost within 16 to 20 days. The estimated time for loss of 90 percent of the surface applied DDT was 1.5 to 2 years. When DDT was mixed into the soil, 50 loss occurred in 5 to 8 years. It was estimated that 90 percent of the applied DDT would be lost in 25 to 40 years. Some researchers have estimated that the average time for 95 percent disappearance of DDT from soil would be 10 years (range 4 to 30 years) with an average of about 50 percent remaining after 3 years (WHO, 1989a). Other investigators have estimated that 50 percent of applied DDT would remain in soil for at least 15 years (Chisholm and MacPhee, 1972).

These findings suggest that the amount of DDT present in the Saklan Avenue soil was probably higher at one time and that further losses can reasonably be expected with a concomitant reduction in risk to long-term residents and persons entering the area (assuming no corrective action is taken). Such losses would be slow given the exponential (first order) nature of pesticide dissipation.

The environmental fate of PCBs is similar to that of DDT by virtue of the fact that they have similar structures. Higher chlorinated PCBs (e.g., Arochlor 1242) are not leached from soils by percolating water and those with lower chlorine contents are removed only slowly, particularly from soils with high clay content (Tucker, 1975). PCBs are considered to be refractory by many scientists. Losses can occur by volatilization from soil although no reports were found which describe such transfer as appreciable. The Environmental Protection Agency (EPA) has reported measuring 1 to 50 ng/m^3 in air (WHO, 1976).

TABLE 3

PHYSICAL AND CHEMICAL CHARACTERISTICS OF IDENTIFIED CONTAMINANTS

1. **DDT.** The relevant physical and chemical properties of DDT (for p,p'-DDT and o,p'-DDT) are reported as follows:

Vapor Pressure at 20 °C	1.9×10^{-7} mm Hg for p,p'-DDT (IARC, 1973, WHO, 1989a)
Water Solubility at 25 °C	1.2-25 ug/l for p,p'-DDT 26-85 ug/l for o,p'-DDT (Callahan, et al., 1979)
Bioconcentration Factor (BCF)	103 to 106 (Callahan, et al., 1979) variable (ranging up to 154,100) according to species, duration of exposure, concentration, flow rate, temperature and organ system examined (WHO, 1989a)
Half-life in Water	56-110 days in lake water (USEPA, 1984a)
Half-life in Soil	3-15 years (IARC, 1973) 5-8 years (Wheatly, 1965)

2. **Aldrin.** The relevant physical and chemical properties for aldrin are reported as follows.

Vapor Pressure	7.5×10^{-5} mm Hg at 20 °C 1.4×10^{-4} mm Hg at 25 °C (USEPA, 1987) 6.4×10^{-5} at 25 °C (WHO, 1989b)
Water Solubility	27 ug/l at 27 °C (USEPA, 1987, WHO, 1989b)
Log Octanol/Water Partition Coefficient	3.01 (USEPA, 1987) 7.4 (WHO, 1989b)
Half-life in Water (evaporation)	185 hours at 25 °C and 1 m depth (USEPA, 1987)

TABLE 3 — continued

3. **Lindane.** The relevant physical and chemical properties for lindane are reported as follows.

Vapor Pressure	1.6×10^{-4} mm Hg (Mabey, et al., 1981)
Water Solubility	7.8 mg/l at 25 °C (Horvath, 1982 [alpha and beta isomers are practically insoluble in water] IARC, 1973)
Log Octanol/Water Partition Coefficient	3.85 (Veith, et al., 1979)
Log BCF	2.26-2.67 (Veith, et al., 1979)
Half-life in Water	5-10 days (estimated) (USEPA, 1984b)
Half-life in Soil	56 days in clay loam (Callahan, et al., 1979) 378 days in sandy loam (Callahan, et al., 1979)

4. **PCB.** The relevant physical and chemical properties for Arochlor 1242 are reported as follows:

Vapor Pressure	4.06×10^{-4} (USEPA, 1984c)
Water Solubility	0.24 mg/l at 25 °C (Mackay and Leinonen, 1975)
Log Octanol/Water Partition Coefficient	4.11-5.58 (USEPA, 1984c)

Aldrin has a low propensity for movement away from soil either through volatilization or by leaching (WHO, 1989b). Aldrin rarely penetrates more than 20 cm beneath the top treated layer of soil. The compound adheres to soil particles to such an extent that only traces can be removed by water. For this reason, groundwater contamination does not generally occur (WHO, 1989b). There is a possibility of migration by way of soil erosion, wind drift, sediment transport and surface runoff.

The measured organic carbon/water partition coefficient for lindane (K_{oc}=735) suggests a low soil mobility (USEPA, 1984b), although there have been some reports of groundwater contamination by lindane where soils have been low in organic content (ibid). Among the contaminants identified at the Saklan Avenue site, lindane disappears from soil most quickly due to a combination of factors, principally faster evaporation and lesser adsorption by organic material (IARC, 1973).

Based on the preceding observation, the mobility of contaminants at the Saklan Avenue site can be predicted to be extremely slow. This conclusion is consistent with the hydrophobic and lipophillic character of these substances, and the type of soil present at the site. The limited mobility of these compounds suggests that most of the contaminants in the Saklan Avenue soils can be expected to remain in the soil. The tenacity of these compounds in soil means that contact via dermal, oral or inhalation exposure is an appropriate concern for risk assessment.

An additional potential source of chemical exposures for residents in the area which merits discussion might be exposure from locally grown garden fruits and vegetables absorbing contaminants from the soil. Experience suggests that such exposures are likely to be insignificant in this case. For example, it has been reported that very little DDT or related compounds are detected in foliage of plants grown in soils containing DDT. Fuhremann and Lichtenstein (1980) reported that the uptake of labelled DDT into oat plant tops was so low that it could not be analyzed. DDT was not translocated into the foliage of alfalfa when applied to the soil (Ware, 1968 and Ware, et al., 1970) or into soybeans (Eden and Arthur, 1965). Harris and Sans (1967) found only trace amounts of DDT and metabolites in the storage roots of carrots, radishes and turnips growing in soils containing up to 14 ppm DDT. These reports are consistent with the findings of a recent study conducted by the California Department of Food and Agriculture (CDFA) which examined the concentrations of DDT in various fruit and vegetable commodities grown in the state (CDFA, 1985). Concentrations of DDT were found in citrus fruits, squash, collards, onions, parsley, beets, carrots, peppers, potatoes, spinach, tomatoes, and many other plants. Generally, the commodities having the highest levels of DDT were those which grow on or in the soil (e.g., carrots). In all cases the levels of DDT were well below established tolerance limits. The investigators concluded that the source of this DDT was residual pesticide remaining in California soils 13 years after the use of DDT had been discontinued.

In assessing the extent of residual DDT contamination in California soils, the CDFA collected samples from various locations throughout the state where DDT was known to have been used. A total of 99 samples were collected from 32 counties. DDT residues were detected in every one of the samples tested. Concentrations exceeding the TTLC for DDT, DDE, and DDE adopted by the Department of Health Services (i.e., 1.0 ppm) were reported at many locations. A statewide average was not calculated. In Los Angeles County, samples were found to contain total DDT and degradation product concentrations of 27.4 and 31.0 ppm. The two samples collected in Alameda County were reported to contain total concentrations of .08 and 1.86 ppm (mean = 0.97 ppm).

The translocation of aldrin from soil into plants is influenced by the levels in soils, the strength of adsorption and the depth of application. The World Health Organization (1989b) reports that researchers have found food crops grown in the soil (e.g., carrots, radishes and turnips) generally take up more aldrin residue than other types of crops. The extent of uptake is likely to be insignificant in this case given the strong adsorptive character of the pesticide and low concentration of aldrin. Reports concerning the movement of PCBs and lindane to plants were not found.

Environmental Fate — Water

The movement of contaminants from the soil compartment to water is a principal concern which must be considered in environmental fate analyses. Contamination of waterways may result in adverse impacts to aquatic organisms, livestock, wildlife or human populations that rely on the water for drinking, recreation, agriculture, domestic, habitat or other uses. Aquatic organisms, wildlife and livestock will not be considered in this risk assessment because they have not been identified by the ACDEH as receptors of concern. This conclusion is consistent with the fact that there are no water courses in the immediate vicinity of the Saklan Avenue property, and consistent with the intended land use.

With respect to question of migration from soil to water and secondary impacts to human health, the two plausible scenarios ordinarily considered are (1) migration to groundwater and (2) migration to surface waters via surface runoff, or redeposition of volatilized compounds and contaminated particulates removed from the site.

The mobility of DDT and related products in soils have been studied by various authors and has been reported to be extremely slow. Therefore, the leaching of these substances from soil is expected to be very slow, particularly from clay soil where these contaminants are strongly partitioned. The depth to groundwater at the site is reported to be 30 to 40 feet. The probability that any of these contaminant will migrate from the surface to groundwater is virtually nil given the tendency of these compounds to adsorb to soil, the low permeability of the soil, arid climate, low concentrations, and other factors present in this case. Any contaminants which might reach groundwater would be potentially subject to re-adsorption and to chemical as well as microbial

transformation (Mabey, 1985). The velocity of contaminants in groundwater can be calculated; however, information concerning flow velocity, soil porosity and other variables in the equation are not available in this case. The established or planned use of the underlying aquifer and its hydraulic characteristics were not available to this author. Practical considerations (e.g., the quality of the aquifer and whether it has domestic or other use) should also be taken into account in evaluating the real impacts of any such contamination. Experience has shown that the movement of compounds which are sparingly soluble in water is slow. For example, the movement of PCB in groundwater has been calculated to be on the order of 0.01 to 1 inch per year (Mabey, 1985). It is not unreasonable to expect that other compounds having similar structures and/or physical properties (e.g., DDT, DDD, DDE, lindane, and aldrin), will behave similarly; however, information concerning the measured velocity rates for these contaminants could not be located in the literature.

There are no surface waters in the immediate vicinity of the site. Moreover the site is level and there is consequently little potential for runoff, particularly when it is considered that soils at this location are assigned a low erodibility factor (K = 0.24), i.e., the susceptibility of the soil to erosion by water is considered to be low (USDA, 1975). Conversely, these soils drain poorly. The movement of DDT residues, aldrin, or Arochlor 1242 from soil to water pooling at the site or running over the site is likely to be insignificant given the distribution pattern of the contaminants and low water solubilities. Lindane has a higher water solubility but the concentrations are so low that the amount of lindane moving to water is likely to be very small. The solubility of aldrin in water is so low that it is characterized as "practically insoluble" (WHO, 1989b).

Environmental Fate — Air

The third major area of concern is airborne dispersal. The ACDEH has specifically directed that this be assessed as a potential route of exposure to construction workers, residents and other persons in the area. This concern is relevant because the presence of toxicants in the atmosphere may result in inhalation exposures to individuals on the property and neighboring residential properties. Also, airborne dispersal of toxic air contaminants may lead to secondary dermal exposures, or contamination of receiving lands and waters.

The presence of PCB and insecticide residues in the atmosphere due to soil contamination at the Saklan Avenue site is not likely to be significant. There are several factors which support this conclusion. First, the vapor pressure of these compounds is relatively low and second, each is strongly partitioned to the soil. This means that the volatile emissions of contaminants from the surface soils will be extremely slow and the resulting concentrations of contaminants in the atmosphere will be extremely low. The Department of Health Services (CDHS, 1986) has suggested that volatile emissions at hazardous waste sites be disregarded as insignificant when the vapor pressure of a given

contaminant is less than 10^{-5} mm Hg. The vapor pressures for DDT and aldrin are 1.9×10^{-7} mm Hg and 7.5×10^{-5} mm Hg, respectively. The vapor pressures for lindane and arochlor 1242 are only slightly higher at 1.6×10^{-4} and 4.06×10^{-4} mm Hg, respectively.

It is possible that particulate emissions may include chemical residues and that persons inhaling particulates could be exposed to toxicants by this mechanism. The probability and effect of such exposures is limited because an undisturbed soil with clay content above 20 percent is generally considered resistant to wind erosion due to the presence of a surface crust (CDHS, 1986) and the Clear Lake clay soil at this site has greater than 40 percent clay (USDA, 1975). Therefore, little dust is likely to be generated in the course of normal events. The presence of housing structures, pavements, and vegetation would be expected to obstruct wind flow to such an extent that particulate emissions would not be significant under normal conditions. Also, the wind speed necessary to initiate erosion of uncovered sol in unobstructed areas is about 12.5 mph (Cowherd, et al., 1985). Such wind speeds are only prevalent about 10 percent of the time in this area (USDA, 1975). Consequently, inhalation exposure should not be a significant concern for residents in the area. Under the prevailing conditions at the site, inhalation exposure is not likely to be significant to construction workers; however, some construction activities (e.g., grubbing and grading) may involve a number of activities that disturb large quantities of soil that can potentially result in the generation of airborne dust if the soil is dry.

The inhalation concern is only relevant to the extent that particulates generated during these construction activities, e.g., grading, will be respirable (i.e., less than 10 microns in size). The particle sizes of the Saklan Avenue soils have not been measured; however, clays are typically characterized by particle sizes less than 0.004 mm (Morris and Johnson, 1967). Some components of clay can be very small, in fact, well within the respirable range. The concentration of contaminants in the air can be estimated using a method developed by Cowherd, et al. (1985). Taking DDT as an example:

1. mean concentration = 3.95 ppm
2. area = 2 acres or (4840 y^2/acre) x (.8361 m^2/y^2) = 8093 m^2
3. assumed aggregate size distribution mode = 100 microns
4. threshold friction velocity = 25 cm/s
5. roughness height, Zo = 0.1
6. equivalent 7 m threshold wind speed = 22.5 (25 cm/s) = 5.62 m/s
7. mean annual wind speed = 6 mph (2.68 m/s)

8. The annual average PM_{10} emission factor is:
   $E_{10} = 0.036 \times (2.68/5.62)^3 F(.5) = 1.86 \times 10^{-3} = .001$ g/hr/m^2

9. The annual average PM_{10} emission rate is found by:
   (8093 m^2) (.001 g/hr/m^2) = 8.09 g/hr = 2.2×10^{-3} g/s = .002

10. The annual emission rate is:
    $3.95(10^{-6})$ (.002) = .0079 micrograms/s

11. The worst-case 24 conditions are:
    $E_{10} = 0.036\ (6.94)^3 = 12.0$ g/hr/m^2

12. Contaminant emission rate is:
    3.95 (10^{-6}) (12 g/hr/m^2) (8093) = .38 g/hr = 10.5 mg/s

13. Worst case emission factor:
    (10.5) (.8 micrograms/m^3) = 8.4 nanograms/m^3 at a distance of 3 km

14. (10.5) (5 micrograms/m^3) = 52.5 nanograms/m^3 at a distance of 1 km
    (10.5) (500 micrograms/m^3) = 5250 nanograms/m^3 at a distance of 0 km
    or .005 mg/m^3

    * DDT is used because it is present at the highest mean concentration in the soil. The concentration of other contaminants in the area under these conditions would be substantially lower.

The assumptions made in the preceding calculation are overly conservative, yet the resulting estimate is three orders of magnitude less than the TWA/TLV of 1 mg/m^3 established by the American Conference of Governmental Industrial Hygienists (1989) and the California Division of Occupational Safety and Health (Cal-OSHA). Therefore, the inhalation concern for construction workers can be discounted as insignificant. Even if 100 percent of the soil was respirable, adverse health effects associated with the inhalation of dust would more likely be due to inhalation of the dust itself rather than the pesticide residue. It should be noted that normal construction practices require wetting of dry soils to suppress fugitive dust emissions and protect workers. Although occupational health standards are not designed for application to the general population, the insignificant scope of such exposures combined with an absence of information in the scientific literature concerning chronic inhalation of these contaminates indicates that the inhalation concern should be disregarded.

With respect to the long-term and distant effects of fugitive dust emissions, the contamination of land and water resulting from airborne dispersal is likely to be insignificant due to the low probability of sustained airborne dispersal. The preceding calculation sustained airborne dispersal is likely to be insignificant due to the low probability of sustained airborne dispersal. The preceding calculation suggests that

under worst-case conditions the concentration of DDT and related products in atmospheric dust resulting from fugitive emissions at the Saklan Avenue site is likely to be so small that it would be virtually undetectable, even at short distances from the site. The redeposition of particles to distant land or water will not result in significant contamination.

Environmental Fate — Biota

The movement of contaminants from soil to various organisms by direct or secondary contact (e.g., via plants or airborne dispersal) has been mentioned within the context of the preceding sections. The principal biological receptors of concern in this instance are humans; specifically residents and construction workers sustaining oral, dermal, and inhalation exposures. The effects of DDT in plants, marine and freshwater microorganisms, terrestrial and aquatic invertebrates, birds, and mammals have been extensively studied; however, these receptors are not considered to be of concern in the problem presented at the Saklan Avenue site.

Exposure Characterization

Based on the preceding discussion of environmental fate, it appears that the only potentially significant health effects in this case would be associated with direct oral or dermal exposures to soil.

To focus on the question of who is potentially at risk, it is necessary to define who will be exposed, what the route(s) of exposure will be, and what the duration of exposure will be. To ensure adequate protection of the public's health, the upper estimates of exposure are frequently used. The effect of this approach is conservative and ensures that risk will not be underestimated; however, it is often unrealistic. Exposure to shallow soil over extended periods of time would not be expected to occur at a single location on a residential lot, but rather, can reasonably be expected to occur throughout accessible portions of the property. Therefore, the average concentration over a significant portion of a residential lot is judged to represent the toxicant level at the point of exposure and this average concentration should be used in assessing the risks associated with exposure. Hadley and Sedman (1990) have suggested a detailed procedure for estimating exposures from surface soils in residential areas based on parcel size and the configuration of development. This method will not be used in the current assessment because the exact configuration of the planned development is not known. An architectural map of the planned housing project suggests that the areas of greatest contamination will be covered by a roadway and sidewalks extending approximately 45 feet from the southern boundary of lot 23836; however, these data points have been included in the statistical calculations to derive mean concentrations (excluding these data would lower the calculated mean concentrations and affect conclusions regarding the risk associated with exposure to contaminated soil).

Generally speaking, all individuals exposed at levels above background concentrations comprise a risk group. For many toxicants not commonly found in the environment, there is no background level. Consequently, all individuals exposed at detectable levels would be considered at risk. In this case, the substances in question, principally DDT and its degradation products, are not naturally occurring; however, DDT residues are so persistent and widespread as a result of agricultural use that it would not be too far-fetched to consider some level of DDT as "background" and to assume that there is a certain level of inherent risk associated with residing in agricultural areas where DDT has been applied; particularly in areas where such property has been converted to residential use.

For purposes of this review and consistent with the directive from the ACDEH, it will be assumed that only residents and construction workers will be exposed. Since inhalation exposures have been determined to be unimportant, only dermal and oral exposures will now be considered. The degree of the exposure will be based on assumptions regarding the mean concentration of available contaminants in the soil, daily oral intake, daily skin loading rates, and the degree of absorption by these routes. The duration of exposure can be assumed to be less than 1 year for construction workers. This assumption is reasonable because the extent of their exposure will be limited to the period of housing construction which is typically less than 1 year. A 70-year lifetime exposure will be assumed for residents. It is usually necessary to know something about the behavior of the risk groups, e.g., whether affected person will travel to work or other activities away from their homes, what portion of time will be spent in the residential area, whether individuals will travel into the contaminated area, and so forth. Also, because a toxic response may be influenced by factors such as age, sex, body weight, hypersusceptibility, genetic composition, nutritional status, and other factors, knowledge of these characteristics is desirable. Since this information is frequently not available (it is not available in this case), certain standard assumptions regarding some of these variables will be used (see Table 4).

The Department of Environmental Health has also directed that other persons potentially at risk be considered. The only other persons who may be exposed would be visitors to the area and persons travelling though the area (e.g., pedestrians and vendors). It may be assumed that the brief nature of their visits will not entail a risk exceed that which lifetime residents will experience. If the risk associated with lifetime exposure is insignificant to residents it will certainly be insignificant to persons with less exposure.

Signs and Symptoms of Acute and Subacute Poisoning

Signs and symptoms of poisoning in humans and animals resulting from high doses of DDT include paresthesia of the tongue, lips, and face; apprehension; hypersusceptibility to stimuli; irritability; dizziness; disturbed equilibrium; tremor; and tonic and clonic convulsions. Motor unrest and fine tremors associated with voluntary movements progress to coarse tremors without interruption in moderate to severe poisoning.

Symptoms appear several hours after large doses, and in animals poisoned with fatal doses, death occurs in 24 to 72 hours. It has been estimated that a dose of 10 mg/kg of body weight will cause signs of poisoning in man (Casarett and Doull, 1975). Unlike many organophosphates, DDT is poorly absorbed after dermal exposure. Undissolved DDT is so poorly absorbed through the skin that its toxicity by this route is difficult to measure. Even dissolved DDT is poorly absorbed (WHO, 1979). This poor absorption from the skin may account for the remarkably good safety record of DDT in spite of its wide and occasionally careless use by applicators and formulators (Hayes, 1971).

Signs and symptoms associated with acute aldrin poisoning include headaches, dizziness, nausea, general malaise, and vomiting, followed by muscle twitching, myoclonic jerks, and convulsions. Death may result from cerebral anozaemia. The amount required to cause death in an adult male has been estimated to be 5 grams. Cases of poisoning have occurred as a result of accidents (e.g., children ingesting baited granules) or suicide attempts in adults. The World Health Organization (1989b) reported that a survey of the world literature for all cases of aldrin and dieldrin poisoning uncovered only 13 cases of such poisoning. No cases of fatal poisoning have been associated with the manufacture or formulation of the pesticides.

Clinical studies of Arochlor 1242 indicate an acute oral LD_{50} (median lethal dose) for rats between 4 and 10 g/kg. Severely poisoned animals show ataxia and diarrhea. In rats, vacuolation in the liver and kidneys have been observed and ulceration of the gastric and duodenal mucosa have been reported (WHO, 1976).

Humans appear to be the most sensitive species to PCBs. The consumption of relatively small amounts have resulted in severe disease. The most famous case of mass poisoning in humans occurred in Japan after rice oil contaminated with PCBs was consumed (Yusho rice disease). One brief report concerning inhalation of PCBs was reviewed by the EPA (1984c); however, the study did not quantify absorption factors and is therefore not useful in predicting the risks associated with inhalation exposures.

Lindane produces signs of poisoning that resemble those produced by DDT, i.e., tremors, ataxia, convulsions, and prostration, with stimulated respiration. Fatty changes in the liver and kidneys have been noted in fetal cases.

The most acutely toxic of the contaminants present in this soil is aldrin. Given the assumed average concentration of 0.01 mg/kg soil and the estimated toxicity of aldrin, an adult male would have to consume roughly 5×10^5 kg of soil to experience acute poisoning due to aldrin. The concentrations of contaminants in the Saklan Avenue soils do not appear to be sufficient to justify concern over acute or subacute poisoning.

Chronic Health Effects

A considerable number of studies have investigated the effects of chronic exposure to DDT in laboratory animals. Chronic feeding studies (rats and mice) have generally

demonstrated hepatic effects (e.g., liver lesions, hypertrophy, and increased enzyme activity) and increased mortality, particularly among neonates. Nervousness, tremors, and convulsions have been observed in some animals. Reproductive disturbances were generally not seen in rats, mice, and dogs although some decreases in fecundity and mammary gland development, delayed female estrus, and increased fetal mortality have been reported (USEPA, 1984a). DDT has been demonstrated to be carcinogenic in rats and mice, with virtually all tumors developing in the liver.

The evidence of carcinogenicity of DDT in humans is regarded to be insufficient. In a study of occupational exposures, 40 men employed in the manufacture or formulation of DDT were examined. Twenty-eight of the men were under 39 year of age, seven between 40 and 49 years of age, and five were over 50 years of age. Twenty-four of the workers had also been exposed to other pesticides. The length of exposure at the time of the study was less than 1 year for two workers, 1 to 4 years for 21 workers, and 5 to 8 years for 17 of the workers. The medical examination included a complete history, physical and neurological examinations, a sulpho-bromophthalein test, plasma and erthrocyte cholinesterase determinations, and measurement of urinary DDA concentration. DDT intake was calculated for 38 of the workers. In 10 cases, the calculated intake was 10 to 20 mg/man/day, 30 mg/man/day in 15 cases, and approximately 40 mg/man/day in 13 cases. No evidence of cancer was found among the 40 workers at the time of the investigation (Ortelee, 1958).

Another study was conducted on 35 workers with occupational exposure to DDT. The average age of this group was 43 years and the average length of exposure was 15 years (range 11 to 19 years). The investigation included medical histories, physical examinations, chest X-rays, blood and urine tests, and measurements of fat, urine, and serum concentrations of DDT residues. On the basis of DDT storage and metabolite excretion, the intake of DDT was estimated to be 3 to 6 mg/man/day in three workers with low exposure, 6 to 8 mg/man/day in 12 with moderate exposure, and 17 to 18 mg/man/day in 20 with high exposure. No cancer was reported in any of the workers (Laws, et al., 1967).

In a separate study, a group of prison volunteers ingested daily doses of DDT (35 mg/man/day) for 21.5 months. No ill effects ascribed to DDT ingestion were reported 4 to 5 years after the start of the experiment. During World War II, DDT was used extensively in the control of lice and other insects by application directly to humans. There is no evidence that harm to these people resulted from this direct application (Casarett and Doull, 1975).

Lindane is a known carcinogen in mice; however, other animal studies have been negative or equivocal in this respect. No morbidity was observed in rats exposed to diets containing up to 30 ppm lindane, and one researcher has estimated that rats can tolerate up to 50 ppm lindane in the diets (USEPA, 1984b). In other studies, administration of 10 ppm lindane in the diet of rats resulted in noxious effects in adults

and their offspring and both hepatic and adrenal changes have been noted. Administration of 100 ppm in the diet of dogs for 2 years resulted in slightly enlarged livers without hestopathological changes (USEPA, 1984b). No epidemiological studies of cancer in humans associated with exposure to lindane have been reported; however, lindane is considered to be a probable human carcinogen (IARC Group 2B) due to evidence of carcinogenicity in test animals. Tolerance levels established by the USEPA (in 40 CFR 180.133) for foods are quite high (e.g., 7 ppm in or on fat of meat from cattle, 4 ppm in or on fat of meat from hogs, 3 ppm in cucumbers, lettuce, mushrooms, tomatoes, and other vegetables, etc.). The levels of lindane in Saklan Avenue soils are well below those considered to be tolerable in foods for human consumption.

Human toxicity to lindane by inhalation in occupational settings has been reviewed (Sasinovich et al., 1974). Pathological liver changes were observed after exposures ranging from 11 to 23 years. Chronic pancreatitis was observed in some workers and unspecified "biochemical abnormalities" were observed in others.

PCBs have been shown to be carcinogenic in laboratory animals and therefore, are classified as probable human carcinogens (IARC group 2B). There are few data regarding the carcinogenicity of PCBs in humans. Thirty-five percent of deaths among Yusho patients who died by 1979 resulted from malignancies involving different body sites (Urabe et al., 1979). The significance of these data is uncertain because there were no control group regarding the expected incidence of cancer in this population. Two cases of malignant melanoma among 31 heavily exposed workers to Arochlor 1254 have been reported (USEPA, 1984c).

Aldrin has been reported to produce various reproductive effects in different species, including decreased fertility and decreased viability of the young; however, the dietary concentrations required for these effects were as high or higher than those producing other effects such as histologic changes in livers of adult animals and were thought to result from hormonal imbalance (Casarett and Doull, 1975). Aldrin is classified as a central nervous system stimulant and has been shown to be carcinogenic in laboratory animals. There is no convincing evidence that the compound is carcinogenic in humans.

In risk assessment, the use of epidemiological studies is preferable to animal studies because the biological systems of epidemiological subjects are similar to those of the risk group with respect to such factors as uptake, distribution, deposition, activation, detoxification, retention and excretion of contaminants. In this instance the characteristics of the study groups are similar to those of the construction workers who may be at Saklan Road site for a brief period of time. From a qualitative point of view, it would seem that the potential for health effects in these construction workers will be negligible given the absence of health effects in workers exposed to much higher levels of DDT and other contaminants for longer periods of time.

3. RISK EVALUATION

According to summaries prepared by USEPA (1984a, 1984b, 1984c) and IARC (1973) there is not sufficient evidence to classify any of the contaminants at the Saklan Avenue site as human carcinogens; however each is considered a probable human carcinogen based on evidence of carcinogenicity in test animals. DDT was identified by the Health and Welfare Agency as a chemical "known to the State to cause cancer" on October 1, 1987. DDD and DDE were similarly listed on January 1, 1989. Aldrin was added to the list on July 1, 1988; lindane on October 1, 1989; and PCBs on October 1, 1989. Pursuant to Sections 12705 and 12711, Title 22, California Code of Regulations, the agency has established the levels of daily exposure that do not pose a significant risk to exposed persons within the meaning set forth in Health and Safety Code Section 25249.10(c). This level of exposure is considered to pose no significant risk when all routes of exposure are considered and is regarded to be the risk level which represents no significant risk that is calculated to result in one excess case of cancer in an exposed population of 100,000.

In its letter of March 14, 1991 to Venture Properties, the ACDEH suggested that these levels be used in evaluating risks associated with exposure to the Saklan Avenue soil. Where an established regulatory level is not available, the ACDEH directed that the level used be specified.

The no significant risk levels developed by the Health and Welfare Agency are derived from the use of a multilinearized model with the upper 95 percent confidence limit of the linearized term expressing the upper bound of potency. The same method and 95 percent confidence limit are used by the USEPA in developing oral slope factors (q_1^*, carcinogenic potency estimates) for known or suspected carcinogens and it is the method recommended by the California Department of Health Services as the most conservative among those that can be used for the evaluation of non-threshold (i.e., cancer-causing) agents. Table 4 summaries the selected no significant risk levels.

No regulatory level has been established by the Health and Welfare Agency for lindane. The World Health Organization has recommended an acceptable daily intake (ADI) of 1 mg/kg/day (i.e., 70 mg/day for an adult). For purposes of this report, a value of 1 mg/day will be used as the no significant risk level. Table 5 summarizes various thresholds which have been developed for different purposes.

TABLE 4

NO SIGNIFICANT RISK LEVELS FOR CONTAMINANTS AT THE SAKLAN AVENUE SITE

Compound	No Significant Risk Level
Aldrin	0.04 microgram/day[1]
Lindane	1.0 microgram/day[2]
DDTr	2.0 micrograms/day[1]
PCBs	0.09 microgram/day[1]

1. Health and Welfare Agency, No Significant Risk Level
2. Derived from ADI of 1.0 microgram/kg/day recommended by WHO (USEPA, 1984b)

TABLE 5

ASSUMPTIONS USED IN RISK ASSESSMENT FOR SAKLAN AVENUE SOILS

1.	Adult, 70 kg body weight	
2.	Daily soil ingestion =	150 mg/kg
3.	Absorption of ingested toxicant =	10%
4.	Daily skin loading rate =	450 mg
5.	Dermal absorption =	10% (5% for DDT based on findings of Wester, et. al., 1990)

TABLE 6

ADOPTED AND RECOMMENDED THRESHOLDS FOR CONTAMINANTS AT THE SAKLAN AVENUE SITE

Compound	Mean	Prop 65	q_1*	PEL	MCL
Aldrin	.01	0.04		0.25	
Lindane	.03	na	1.326	0.5	0.004
DDTr	3.9	2.0	0.34	1.0	
PCB	1.9	0.9	4.3396	1.0	

1. mean = mean concentration based on data in Table I
2. Prop 65 = no significant risk level in micrograms/day
3. q_1* = carcinogenic potency factor estimate developed by USEPA
4. PEL = permissible exposure limit, mg/m3, developed by Cal-OSHA Division of Industrial Safety (TWA-TLV equivalents), Title 3, CCR, Division 7, Article 3, Section 12125.
5. MCL = Maximum Contaminant Level, mg/l, (Drinking Water Standard) developed by California Department of Health Services, Title 22, CCR, Section 64444.5.

Whether individuals exposed to the Saklan Avenue soil will be at placed at significant risk of developing cancer as a result of lifetime exposure to the Saklan Avenue soil can be determined by comparing the anticipated extent of exposure to the prescribed no significant risk level. Using the assumptions for lifetime exposure outlined in Table 5 and the average concentrations of contaminants in the soil, the following exposures can be calculated:

1. **Exposure to Aldrin**

   a. Oral
   (.01 mg/kg soil) x (0.15 x 10^{-3} kg/day) =
   0.0015 x 10^{-3} mg/day = 0.0015 µg/day

   b. Dermal
   (.01 mg/kg soil) x (.450 x 10^{-3} kg soil/day) x 10% =
   0.00045 x 10^{-3} mg/day = 0.00045 µg/day

   Total Exposure = 0.0015 + 0.00045 = 0.00195 µg/day

2. **Exposure to Lindane**

   a. Oral
   (.03 mg/kg soil) x (0.15 x 10^{-3} kg/day)
   0.0045 x 10^{-3} mg/day = 0.0045 µg/day

   b. Dermal
   (.03 mg/kg soil) x (.450 x 10^{-3} kg soil/day) x 10% =
   0.00135 x 10^{-3} mg/day = 0.00135 µg/day

   Total Exposure = 0.0045 + 0.00135 = 0.00585 µg/day
   [assuming mean BHCr = .2 mg/kg, oral = .03 µg/day,
   dermal = .009 µg/day, **Total Exposure** = 0.039 µg/day]

3. **Exposure to DDTr**

   a. Oral
   (3.95 mg/kg soil) x (0.15 x 10^{-3} kg/day) =
   0.5925 x 10^{-3} mg/day = 0.5925 µg/day

   b. Dermal
   (3.95 mg/kg soil) x (.450 x 10-3 kg soil/day) x 5% =
   0.088 x 10-3 mg/day = 0.08 µg/day

   Total Exposure = 0.5925 = .08 = 0.67 µg/day

4. Exposure to PCBs

a. Oral

(1.9 mg/kg soil) x (0.15 x 10^{-3} kg/day) =
0.285 x 10^{-3} mg/day = .285 µg/day

b. Dermal

(1.9 mg/kg soil) x (.450 x 10^{-3} kg soil/day) x 10% =
0.085 x 10^{-3} mg/day = 0.08 µg/day

Total Exposure = 0.285 + 0.085 = 0.37 µg/day

The results indicate that lifetime residents (and therefore, individuals experiencing lesser exposures) would not be at significant risk of developing cancer due to oral or dermal exposure to the Saklan Avenue soil given the nature and extent of contamination thought to be present. Based on these calculations, the incidence of cancer due to exposures to Saklan Avenue soil would not be expected to exceed one case in a population of 100,000 (i.e., 10^{-5}) because the total exposure is less than the no significant risk level established in each of the respective cases. Other exposure scenarios outlined by Martz (1990), including exposures to children and adults spending varying amounts of time at residences, each involve lower levels of risk. The scenario selected above represents a reasonable maximal exposure.

A more conservative level of acceptable risk which is traditionally used in risk assessment is one-in-one-million (10^{-6}). The 10^{-6} level of risk is advisory in nature, not regulatory. For DDTr, an upperbound cancer risk from exposure dermal and oral exposure to soil containing 1 ppm DDTr has been estimated to be 6.5 x 10^{-7} (Martz, 1991). Because the estimate is based on a concentration of 1 ppm, the result can be taken as a "unit risk" value and the level of risk associated with higher DDT concentrations can be estimated by multiplying this factor by the concentration of interest. Thus, the risk associated with exposure to DDT in the Saklan Avenue soil may be estimated as (3.95) (6.5 x 10^{-7}) or 2.5 x 10^{-6}.

A similar evaluation of risk at the 10^{-6} level can be made using q_1* values developed by the USEPA; however, the results have little practical application because the oral slope factors do not consider dermal exposure and because they are usually derived on the basis of applied dose rather than absorbed dose. The conclusion reached regarding 10^{-6} risk does not take into account the inherent and unresolvable risk associated with exposure to background concentrations (CDFA, 1985 mean DDTr background for Alameda County = 0.97 ppm). When this is factored into the unit risk calculation, 3.95 - 0.97 = 2.98; and 2.98 x (6.5 x 10^{-7}) = 1.9 x 10^{-6}.

TABLE 7

COMPARISON OF ESTIMATED EXPOSURE AND ACCEPTABLE DAILY INTAKE FOR THE SAKLAN AVENUE CONTAMINANTS

Compound	Estimated daily exposure (in micrograms)	Acceptable daily exposure (in micrograms)
Aldrin	0.002	0.04
Lindane	0.006	1.0
BHCr	0.039	1.0*
DDTr	0.67	2.0
PCB	0.37	0.9

* assumes equivalent toxicity for stereoisomers

CONCLUSION

Based on information currently available and considering the level of acceptable risk prescribed by the ACDEH, there does not appear to be a significant health risk at this site. Consequently, it may be appropriate to conclude that the Saklan Avenue soils can remain in place. When a more conservative and traditional measure of significant risk is used, it appears that the probability of excess cancer is unacceptable and therefore, some form of remedial action is necessary. These conclusions are tentative because the true extent of the contamination at this site is not known due to the lack of adequate sampling. Additional samples need to be collected and analyzed to ascertain whether the contamination is confined to the surface layer or is more widespread. If the results of this sampling indicate that the underlying soils do not contain higher concentrations of contaminants than the surface horizon, the conclusions reached in this report may be regarded as valid with respect to associated risk. If the recalculated mean values are higher than indicated by the available data, further evaluation would be necessary. It is strongly recommended that the sampling and testing be completed and the results evaluated before any construction activities begin at the site. A stratified random sampling plan is suggested.

While the identification and selection of a final remedial strategy is not within the scope of this study or possible given the existing paucity of data, the following thoughts are offered for consideration by those who will make final decisions regarding the disposition of the Saklan Avenue property soil. In cases such as this, which involve competing interests, a strategy should be selected that is above all, consistent with the objectives of protecting human health and the environment; and then, is cost-effective and responsive to the needs of affected responsible parties. Solutions such as a pavement cap would not be given serious consideration because they would be incompatible with the interests of the developers and are unnecessary in this case. Conversely, the "no action" alternative might not be considered appropriate because it could result in exposures and some degree of incremental risk. Given the level of risk deemed acceptable, the conclusions reached in this report with respect to 10^{-5} and 10^{-6} risk, the nature and distribution of contaminants, and the proposed land use, there is no apparent reason why the soils cannot remain in place. Mixing the contaminated surface soils with underlying clean soils would be a cost-effective measure reducing the average concentrations of contaminants well below levels deemed to pose a significant risk. Additional protection might be gained by amending the soil with activated carbon; however, such steps are unnecessary given the expected retention in soil. The tangible benefit gained by requiring the excavation and removal of these soils would be extremely small and the monetary costs associated with achieving these meager benefits would be large, while the health and safety risks associated with alternative management strategies are low. The successful implementation of the suggested alternative would be sufficient to adequately protect human health and the environment in this case given the various factors reviewed in this report.

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DISCLAIMER

The statements contained in this report are solely those of the author and do not necessarily represent the official views of the California Department of Health Services.

APPENDIX B

NORMAN E. RILEY RESUME

NORMAN E. RILEY

Associate Hazardous Materials Specialist
California Department of Health Services

PROFESSIONAL WORK EXPERIENCE

Associate Hazardous Materials Specialist, California Department of Health Services, Toxic Substances Control Program, Hazardous Waste Management Branch, February 1989 to Present

Authored "permit-by-rule" regulations and supporting documents specifying technical, financial, and administrative operating requirements for treatment of hazardous waste and application of various treatment technologies to hazardous waste site cleanup projects. Provide related training and instruction to Department personnel, representatives of other governmental agencies, and affected industries. Analyze legislative bills and assess their impact on specific elements of the Department's programs. The position requires research and analysis of complex technical and legal issues, detailed writing and extensive interaction with both executive and branch and file staff, trade associates, industry groups, environmental interest groups, contractors, consultants, and the general public.

Associate Hazardous Materials Specialist, California Department of Health Services, Toxic Substances Control Program, Alternative Technology Division, September 1986 to February 1989.

Reviewed petitions submitted by the regulated community for determination of specific wastes as hazardous or nonhazardous. Using knowledge of industrial processes, chemistry, toxicology, state and federal laws, and regulations as well as information provided or obtained through research, determined whether such petitions should be granted or denied, and made recommendations to program managers. Serves as a technical consultant to Department staff, other regulatory agencies, industry, and the general public regarding state and federal regulatory requirements. Conducted site inspections and collected samples for analysis. Developed specific expertise regarding asbestos issues. The assignment involved extensive writing and oral communications.

Environmental Planner, California Department of Transportation (CalTrans), Office of Transportation Laboratory, Hazardous Waste Section, January 1985 to September 1986.

Provided technical advice and assistance to district offices and headquarters staff regarding the development and implementation of the Department's hazardous waste management program and policies. Prepared and reviewed contracts and plans for site investigations. Reviewed investigative reports and interpreted findings. Prepared and presented recommendations for additional studies and specific remedial actions as required. Conducted site inspections. Reviewed Environmental Impact Report prepared for transportation projects (e.g., freeway construction projects). Analyzed legislative bills and assessed their impact on the Department's programs. Developed the Department's computerized database for tracking progress on hazardous waste projects. Served on the Governor's Strike Force Subcommittee on Incident Reporting.

Management Services Technician, California Department of Transportation, Division of Mass Transportation, Bus Transportation Branch, January 1984 to January 1985.

Independent research and preparation of reports related to mass transit issues. Authored three publications related to crime in intercity bus terminals and intercity transportation service in California. Served on Regional Transit Association Security Committee. Participated in California Highway Patrol-sponsored Task Force Safety Inspections statewide.

PROFESSIONAL WORK EXPERIENCE - continued

Office Assistant, California Department of Transportation, Division of Maintenance, April 1981 to January 1984.

Performed routine office duties with responsibility for the accuracy and completeness of records used to establish funding priorities for the Department's pavement rehabilitation and emergency restoration programs.

Senior Laboratory Technician, International Shellfish Enterprises, Moss Landing, California, January 1978 to September 1979.

Performed water analyses by spectophotometry. Conducted bioassays and statistical analyses of resulting data to measure the toxicity of selected trace metals in aquatic species and identified the cause of high mortality observed in shellfish populations. Performed routine laboratory duties including calibration and maintenance of analytical instruments, algal culturing, and sample collection.

Laboratory Assistant, University of California, Davis.

Assisted in agricultural field experiments to measure the efficiency of experimental herbicides, September 1976 to June 1978.

EDUCTION

B.S. Environmental Toxicology, University of California, Davis, 1978

Certificate Program, Hazardous Materials Management, University of California, Davis, 1985-1986

APPENDIX C

REVISED HEALTH RISK ASSESSMENT

May 20, 1991

EXCELTECH

REVISED
HEALTH RISK ASSESSMENT

FOR

SAKLAN AVENUE PROPERTY
HAYWARD, CALIFORNIA

Project No. 3-50058-51

CONTENTS

EXCELTECH

SECTION 1
INTRODUCTION

This report describes the activities required by the Alameda County Health Agency (County) to respond to issues of pesticide residue on property proposed for development. Historical aerial photo review of two adjacent 1-acre residential parcels indicated greenhouses on the property. Consequently, the County required soil sampling to determine whether pesticides were present. Initial surface sampling indicated the presence of pesticides at sufficient concentrations for the County to require additional evaluation of the site.

Exceltech was retained by the potential developer to respond to requests by the County for an analysis of the risk potential of the identified pesticides on site. Subsequently, Exceltech prepared a Health Risk Assessment, undertook additional sampling, and evaluated other field and research data to prepare this report.

The property of concern is located at 23830 and 23836 Saklan Road in an unincorporated mixed residential/light industrial area surrounded by the City of Hayward. As the area is being considered for possible annexation to the City of Hayward, the City was also consulted during the planning of field activities and the preparation of this report.

EXCELTECH

SECTION 2
GROUNDWATER INVESTIGATION

In a letter dated March 14, 1991, the Alameda County Health Agency requested information about any on site wells, including age, construction, depth, and analytical results. Exceltech conducted a site reconnaissance and regulatory file search to respond to that request. In a letter to the client, Mr. Rob Robles, Community West Mortgage, dated April 23, Exceltech noted that one well was visible at 23836 Saklan Road. No information was found in regulatory files on this well, and surface access was not possible without pump disassembly.

In an April 30 meeting with Ms. Pamela Evans and Mr. Ravi Arulanantham of the Alameda County Health Agency, Ms. Evans requested further investigation into additional wells on site as well as sampling and analysis of all identified wells. Exceltech subsequently determined that two other wells existed, one on each of the lots. These two wells were not accessible, and were in use for non-consumptive purposes. It was also determined that the previously identified well was not in use.

On May 8, the pump and down-well piping was removed from the inactive well and the well depth and water level was determined. The well was found to be about 73 feet deep with the water level about 14 feet below the surface. The well casing was 8 inches in diameter. On May 9, the water from this well and the two operational wells was sampled. As the inoperative well contained approximately 155 gallons, no purging was done, and one grab sample was obtained. The samples from the two active, non-accessible wells were obtained via spigots. The three samples were analyzed for all analytes previously found in the soil, and nothing was detected in any sample. The laboratory analytical sheets are included in the Appendix D.

SECTION 3
HEALTH RISK ASSESSMENT

The Alameda County Health Agency letter of March 14 also requested a health risk assessment be prepared for the pesticides and PCBs found in previous sampling. That assessment was prepared and presented to Ms. Pamela Evans in April 1991. The health risk assessment is included in Appendix A, and the preparer's qualifications are in Appendix B.

In the April 30 meeting with Ms. Evans and Mr. Arulanantham, one question raised by Ms. Evans concerned the basis for the regulatory limit used for Lindane. This question was answered in a personal conversation between Ms. Evans and the preparer, Mr. Norman Riley.

Mr. Arulanantham asked about holding times for samples containing DDT. Soil samples to be analyzed for DDT have a holding time of 14 days before extraction and 40 days after extraction.

Ms. Evans asked to see a comparison of the inhalation hazards of Aldrin, Lindane, and polychlorinated biphenyls (PCBs), shown in a manner similar to the comparison for DDT and residues presented in the health risk assessment. The assessment provided both the site-specific applicable conditions and the methodology for estimating the concentrations of contaminants in the air (Appendix A, pages 16 and 17). Those site-specific conditions indicated (equation numbers correspond to the equations in the assessment):

11. A worst case, 24-hour, PM_{10} emission factor of 12 grams/hour/meter^2

12. Worst case contaminant emission rate (based on mean concentrations in Table 1 of the assessment, Appendix A, Table 2, page 6):

    Aldrin: Mean concentration - 0.0114 milligrams per kilogram
    (0.0114 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = <u>0.00031 mg/sec</u>

    Lindane: Mean concentration - 0.0341 milligrams per kilogram
    (0.0341 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = <u>0.00092 mg/sec</u>

    PCBs: Mean concentration - 1.906 milligrams per kilogram
    (1.906 mg/kg) X (12 g/hr/m^2) X (8093 m^2) = <u>0.0514 mg/sec</u>

14. Worst case contaminant emission factors at a distance of 0 kilometers:[1]

Worst Case Emissions		OSHA PEL
Aldrin:	(0.00031 mg/s) X (500 us/m^3) = 1.6 x 10^{-7} mg/m^3	0.25 mg/m^3
Lindane:	(0.00092 mg/s) X (500 us/m^3) = 4.6 x 10^{-7} mg/m^3	0.5 mg/m^3
PCBs:	(1.0514 mg/s) X (500 us/m^3) = 2.6 x 10^{-5} mg/m^3	1.0 mg/m^3

The above calculations clearly indicate potential inhalation hazards several orders of magnitude below the Occupational Safety and Health Administration Permissible Exposure Limits.

[1] This calculation utilizes a number of 500 microseconds/meter^3, taken from an isopleth summing the worst-case mechanical and erosion emission rates, found on Figure 4-12, page 57, Cowherd, et al (1985) referenced in the health risk assessment, Appendix A.

SECTION 4
SOIL SAMPLING AND ANALYSIS

The Health and Risk Assessment recommended additional sampling to further define the vertical extent of pesticide residues in the soil.

This final section evaluates the results of that soil sampling and recalculates the carcinogenic potential of the DDT, DDD and DDE (collectively DDTr) on the subject site. For purposes of calculations, all non-detectable levels are calculated on the basis of one-half the laboratory detection limit. All equations presented and used in this section are taken from SW-846[2] (except for the half-life equation, which was from a calculus text[3]).

The following tables restate the previously-submitted analytical results (Table 1) and present the additional analytical results (Tables 2 and 3). The sampling plan followed to collect the additional samples is presented in Appendix C and the additional analytical results and chain-of-custody are presented in Appendix D.

Table 1

Summary of Surface Analytical Results
(Restatement of Table 1 in the Health Risk Assessment)
Sample concentrations in parts per billion

	Sample									
Compound	**d1**	**d2**	**d3**	**d4**	**c1**	**c2**	**c3**	**c4**	**c5**	**c6**
Aldrin	ND	ND	ND	ND	ND	34	15	ND	ND	ND
a-BHC	31	17	ND	25	ND	ND	ND	ND	ND	ND
d-BHC	590	49	ND	610	14	210	54	ND	ND	ND
g-BHC	120	17	ND	24	13	79	33	ND	ND	ND
DDT	2100	1400	5700	3100	550	6500	1400	5600	110	640
DDD	250	240	840	460	57	300	120	590	ND	220
DDE	1100	1300	1500	1500	230	1900	630	830	120	740
DDTr	3450	2940	8040	5060	837	8700	2150	7020	230	1600
PCBs	ND	ND	1900	ND	ND	ND	ND	ND	ND	ND

1. d = discrete sample, c = composite sample
2. ND = analytical result below detection limit

---

2 Test Methods for Evaluating Solid Waste, Third Edition, 1986. United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, D.C.

3 Bittinger, Marvin L., 1988. Calculus, Fourth Edition. Addison-Wesley Publishing Company. Reading, Massachusetts.

Table 2

Summary of Mid-Depth Analytical Results
Sample concentrations in parts per billion

	Sample					
Compound	**G-12**	**G-18**	**G-27**	**G-42**	**G-45**	**G-70**
Aldrin	ND	ND	ND	ND	ND	ND
a-BHC	ND	5.2	16	ND	ND	ND
d-BHC	ND	ND	18	ND	ND	ND
g-BHC	ND	ND	ND	ND	ND	ND
DDT	ND	ND	160	ND	ND	220
DDD	ND	33	52	ND	ND	72
DDE	ND	70	59	ND	ND	130
DDTr		103	271			422
PCBs	ND	ND	ND	ND	ND	ND

Table 3

Summary of Deep Subsurface Analytical Results
Sample concentrations in parts per billion

	Sample		
Compound	**G-18A**	**G-27A**	**G-70A**
Aldrin	ND	ND	ND
a-BHC	ND	ND	ND
d-BHC	ND	ND	ND
g-BHC	ND	ND	ND
DDT	ND	ND	14
DDD	ND	ND	3.3
DDE	ND	ND	12
DDTr			29.3
PCBs	ND	ND	ND

In discussions with Ms. Evans, the question was raised about which edition of SW-846 should be used. Although the current edition is the third, Title 22 of the California Code of Regulations identifies the second edition as applicable. Consequently, a comparison was made of the sections in question by Ms. Brenda Bettencourt of EPA Region 9 in San Francisco. Ms. Bettencourt noted that the sections of concern were identical in the two editions, specifically she noted that the upper limit of the confidence interval was based on a 90% one tailed test in both the second and third editions.

The mean, $\bar{x}$, for stratified sampling is defined as the sum of the products of each strata mean times the fraction of samples from that strata to the total number of samples:

$$\bar{x} = \sum_{k=1}^{k} W_k \quad \bar{x}_k$$

W_k is the fraction of samples in strata k and $\bar{x}_k$ is the mean of the samples in that strata.

Table 4

Strata Means and Sample Fraction

Mean from the surface strata =	4005	Surface strata sample fraction =	0.526
Mean from the middle strata =	143.3	Middle strata sample fraction =	0.316
Mean from the bottom strata =	14.43	Bottom strata sample fraction =	0.158

Total sample mean for the entire site, all strata = 2.156 ppm

The variance of the sample, s^2, is defined as:

$$s^2 = \frac{\sum_{n=1}^{n} x_i^2 \quad - \quad \frac{\left(\sum_{n=1}^{n} x_i\right)^2}{n}}{n-1}$$

The variance of the sample for stratified sampling is defined as the sum of the products of each strata sample variance times the fraction of samples from that strata to the total number of samples:

$$s^2 = \sum_{k=1}^{k} W_k \, s_k^2$$

Table 5

Sample Variances

Sample variance of the surface strata =	9.25×10^6
Sample variance of the middle strata =	2.87×10^4
Sample variance of the bottom strata =	1.66×10^2
Total sample variance for the entire site, all strata =	4.88×10^6

The standard deviation, **s**, is defined as the square root of the sample variance:

$$s = \sqrt{s^2} = 2.209 \text{ ppm}$$

The standard error, $s_{\bar{x}}$, is defined as the standard deviation divided by the square root of the total number of samples:

$$s_{\bar{x}} = \frac{s}{\sqrt{n}} = .506 \text{ ppm}$$

The upper limit of the confidence interval, **UCL**, is defined as the mean plus the product of the Student t value and the standard error. As noted, SW-846 provides Student t values for a 90% upper limit confidence interval. However, Ms. Evans indicated that the County may require a 95% confidence interval. Consequently, both are calculated below:

$$UCL = \bar{x} + \left(t_{value} \times s_{\bar{x}}\right)$$

For a t_{value} of 1.330, corresponding to a 90% confidence interval,

$$UCL = 2.830 \text{ ppm}$$

For a t_{value} of 1.734, corresponding to a 95% confidence interval,

$$UCL = 3.034 \text{ ppm}$$

The calculation for cancer risk is based on a 70 year exposure. Consequently, the concentration of DDTr over 70 years must be determined, based on the current concentration and the half life of DDT. In the health risk assessment, two studies are quoted that provide ranges of half life for DDT. The following calculations are based on the most conservative half life given, 15 years.

The following equation yields the average value from Time a to Time b for a half life of 15 years and an initial value of x_o.

$$\frac{1}{b-a}\int_a^b x_0 e^{-0.0462t}$$

For a 70 year period, and an initial concentration of 2.828 ppm (the 90% UCL),

$$\frac{1}{70-0}\int_0^{70} 2.828 \text{ ppm } e^{-0.0462t} = \underline{0.840 \text{ ppm}}$$

For a 70 year period, and an initial concentration of 3.032 ppm (the 95% UCL),

$$\frac{1}{70-0}\int_0^{70} 3.032 \text{ ppm } e^{-0.0462t} = \underline{0.901 \text{ ppm}}$$

Using this average concentration over 70 years, a cancer risk can be found by using the same calculations as in the health risk assessment. The risk assessment noted that a 1 ppm concentration yielded an estimated risk level of 6.5 x 10-7. Consequently, the value of 6.5 x 10-7 was used as a "unit risk" and was multiplied by the actual concentration to determine the estimated cancer risk.

For a cancer risk based on the 90% UCL:

$$0.840 \times 6.5 \times 10\text{-}7 = 0.55 \times 10\text{-}6$$
or
0.55 cancers in one million people

For a cancer risk based on the 95% UCL:

$$0.901 \times 6.5 \times 10\text{-}7 = 0.59 \times 10\text{-}6$$
or
0.59 cancers in one million people

EXCELTECH

SECTION 5
CONCLUSIONS AND RECOMMENDATIONS

Exceltech has reached three conclusions as a result of the additional activities subsequent to the April 30, 1991 meeting with the Alameda County Health Agency:

1. No evidence exists that any pesticides or PCBs have contaminated the groundwater;

2. All inhalation risks are orders of magnitude below regulatory limits; and

3. The cancer risk for the primary pesticide residue, DDTr, is less than one-in-one million.

Consequently, we recommend that development be allowed to continue without further requirements based on pesticide and PCB concentrations.

APPENDIX D

CHIPS ENVIRONMENTAL CONSULTANTS' REPORTS

October 30, 1990

November 28, 1991

CHIPS
Environmental
Consultants, Inc.

718 E. Evelyn Avenue
Sunnyvale, CA 94086

(408)736-1380
FAX (408)736-0887

October 30, 1990

Dsk 17 1046.DOC

Venture Properties
ATTN: Mr. Rob Robles
9970-A Palm Court
Morgan Hill, California 95037

RE: Soil Samples from 23836 Saklan Avenue, Hayward, CA

Dear Mr. Robles:

Attached are the analytical reports for the soil samples that we recovered from the subject facility on 10-19-90.

The samples were taken from the locations as indicated on the attached map. The soil collected was obtained at the surface to about 2" total depth in an area approximately six inches square. The soil was packed in zero headspace condition into brass tubes, sealed with aluminum foil and plastic caps, labeled, logged and chilled for transport to the laboratory. Full chain of custody was maintained, a copy is attached.

NOTE: Several pesticides and pesticide residues were detected in small amounts (1-6 ppm). Pam Evans (County Health Department) requires cleanup action for anything over 1 ppm. We suggest that the topsoil in the area be scraped to 4-6" depth (dust respirators should be used during this process). This soil must be stockpiled for analysis. The pesticide levels in the excavated soils will be needed to determine proper disposal.

Also, assurance samples will have to be taken in at least two locations where the highest levels were found prior to the excavation.

If you have any questions concerning these findings or recommendations, please feel free to contact us at your convenience.

Sincerely,

Mark D. Chips

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (415) 783-6960
Facsimile (415) 783-1512

TAL

LOG NO.: 9224
DATE SAMPLED: 10/22/90
DATE RECEIVED: 10/22/90
DATE EXTRACTED: 10/25/90
DATE ANALYZED: 10/27/90 and 10/28/90
DATE REPORTED: 10/29/90

CUSTOMER: Chips Environmental Consultants

REQUESTER: Mark Chips

PROJECT: R. Robles

Sample Type: Soil

Method and Constituent:	Units	4450 Concentration	4450 Detection Limit	4451 Concentration	4451 Detection Limit
EPA Method 8080:					
Aldrin	ug/kg	< 5	5	< 5	5
Alpha-BHC	ug/kg	31	5	17	5
Beta-BHC	ug/kg	< 5	5	< 5	5
Delta-BHC	ug/kg	590	5	49	5
Gamma-BHC (Lindane)	ug/kg	120	5	17	5
Chlordane	ug/kg	< 5	5	< 5	5
4,4'-DDD	ug/kg	250	5	240	5
4,4'-DDE	ug/kg	1,100	5	1,300	5
4,4'-DDT	ug/kg	2,100	5	1,400	5
Dieldrin	ug/kg	< 5	5	< 5	5
Endosulfan I	ug/kg	< 5	5	< 5	5
Endosulfan II	ug/kg	< 5	5	< 5	5
Endosulfan Sulfate	ug/kg	< 5	5	< 5	5
Endrin	ug/kg	< 5	5	< 5	5
Endrin Aldehyde	ug/kg	< 5	5	< 5	5
Heptachlor	ug/kg	< 5	5	< 5	5
Heptachlor Epoxide	ug/kg	< 5	5	< 5	5
Methoxychlor	ug/kg	< 5	5	< 5	5
Toxaphene	ug/kg	< 5	5	< 5	5

LOG NO.: 9224
DATE SAMPLED: 10/22/90
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DATE EXTRACTED: 10/25/90
DATE ANALYZED: 10/27/90 and 10/28/90
DATE REPORTED: 10/29/90
PAGE: Two

Sample Type: Soil

Method and Constituent:	Units	4450 Concentration	4450 Detection Limit	4451 Concentration	4451 Detection Limit
EPA Method 8080 (Continued):					
Aroclor 1016	ug/kg	< 5	5	< 5	5
Aroclor 1221	ug/kg	< 5	5	< 5	5
Aroclor 1232	ug/kg	< 5	5	< 5	5
Aroclor 1242	ug/kg	< 5	5	< 5	5
Aroclor 1248	ug/kg	< 5	5	< 5	5
Aroclor 1254	ug/kg	< 5	5	< 5	5
Aroclor 1260	ug/kg	< 5	5	< 5	5

LOG NO.: 9224
DATE SAMPLED: 10/22/90
DATE RECEIVED: 10/22/90
DATE EXTRACTED: 10/25/90
DATE ANALYZED: 10/28/90 and 10/29/90
DATE REPORTED: 10/29/90
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	4452 Concentration	4452 Detection Limit	4453 Concentration	4453 Detection Limit
EPA Method 8080:					
Aldrin	ug/kg	< 50	50	< 5	5
Alpha-BHC	ug/kg	< 50	50	25	5
Beta-BHC	ug/kg	< 50	50	< 5	5
Delta-BHC	ug/kg	< 50	50	610	5
Gamma-BHC (Lindane)	ug/kg	< 50	50	24	5
Chlordane	ug/kg	< 50	50	< 5	5
4,4'-DDD	ug/kg	840	50	460	5
4,4'-DDE	ug/kg	1,500	30	1,500	5
4,4'-DDT	ug/kg	5,700	50	3,100	5
Dieldrin	ug/kg	< 50	50	< 5	5
Endosulfan I	ug/kg	< 50	50	< 5	5
Endosulfan II	ug/kg	< 50	50	< 5	5
Endosulfan Sulfate	ug/kg	< 50	50	< 5	5
Endrin	ug/kg	< 50	50	< 5	5
Endrin Aldehyde	ug/kg	< 50	50	< 5	5
Heptachlor	ug/kg	< 50	50	< 5	5
Heptachlor Epoxide	ug/kg	< 50	50	< 5	5
Methoxychlor	ug/kg	< 50	50	< 5	5
Toxaphene	ug/kg	< 50	50	< 5	5

LOG NO.: 9224
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DATE ANALYZED: 10/28/90 and 10/29/90
DATE REPORTED: 10/29/90
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	4452 Concentration	4452 Detection Limit	4453 Concentration	4453 Detection Limit
EPA Method 8080 (Continued):					
Aroclor 1016	ug/kg	< 60	60	< 5	5
Aroclor 1221	ug/kg	< 60	60	< 5	5
Aroclor 1232	ug/kg	< 60	60	< 5	5
Aroclor 1242	ug/kg	19,000	60	< 5	5
Aroclor 1248	ug/kg	< 60	60	< 5	5
Aroclor 1254	ug/kg	< 60	60	< 5	5
Aroclor 1260	ug/kg	< 60	60	< 5	5

QC Summary:

% Recovery: 112%
% RSD: 3.1%

Louis W. DuPuis
Quality Assurance/Quality Control Manager

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
	R. Rollos

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	9224
1	10-22-90	1320		X	4450-	1	
2	10-22-90	1325		X	4451-	1	
3	10-22-90	1330		X	4452-	1	
4	10-22-90	1335		X	4453-	1	

5 Day TAT

004450

004451

004452

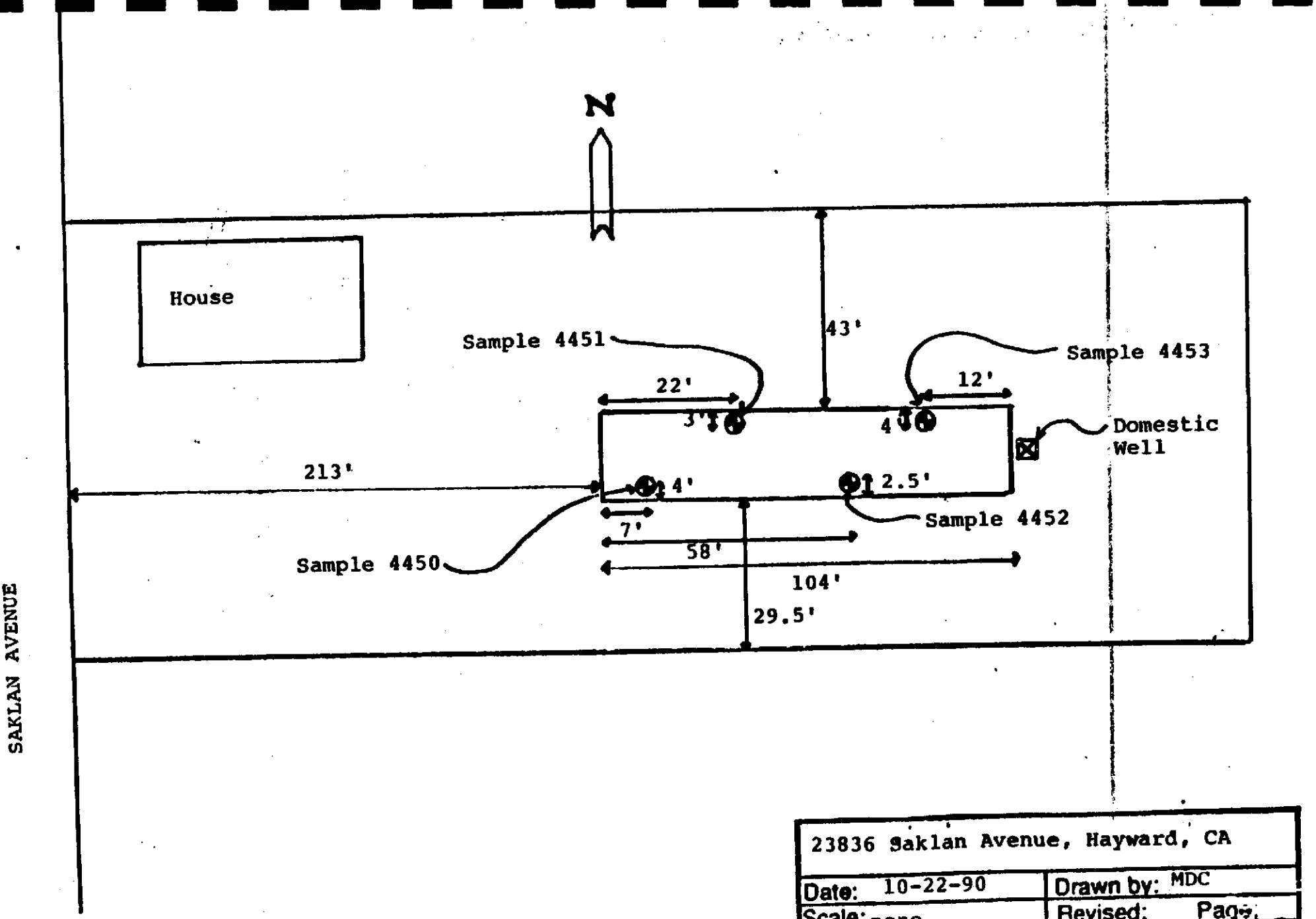
004453

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	10-22-90 1445				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
			10/22/90 14:45		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TRACE ANALYSIS LABORATORY
3423 INVESTMENT BLVD., UNIT 8
HAYWARD, CA 94545
(415) 783-6960

3-0605



23836 Saklan Avenue, Hayward, CA	
Date: 10-22-90	Drawn by: MDC
Scale: none	Revised: Page
Legend	CHIPS Environmental Consultants
Sample Location	

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (415) 783-6960
Facsimile (415) 783-1512

TAL

LOG NO.: 9317
DATE SAMPLED: 11/16/90
DATE RECEIVED: 11/16/90
DATE EXTRACTED: 11/21/90
DATE ANALYZED: 11/27/90
DATE REPORTED: 11/28/90

CUSTOMER: Chips Environmental Consultants, Inc.

REQUESTER: Mark Chips

PROJECT: No. 1056, R. Robles

Sample Type: Soil

Method and Constituent:	Units	Composite #1 of 4238, 4239, 4240, and 4245 Concentration	Composite #1 of 4238, 4239, 4240, and 4245 Reporting Limit	Composite #2 of 4241, 4242, 4246, and 4247 Concentration	Composite #2 of 4241, 4242, 4246, and 4247 Reporting Limit	Composite #3 of 4243, 4244, 4248 and 4249 Concentration	Composite #3 of 4243, 4244, 4248 and 4249 Reporting Limit
EPA Method 8080							
Aldrin	ug/kg	ND	5	34	7	15	5
Alpha-BHC	ug/kg	ND	9	ND	20	ND	9
Beta-BHC	ug/kg	ND	9	ND	20	ND	9
Delta-BHC	ug/kg	14	5	210	9	54	5
Gamma-BHC (Lindane)	ug/kg	13	5	79	8	33	5
Chlordane	ug/kg	ND	9	ND	20	ND	9
4,4'-DDD	ug/kg	57	9	300	20	120	9
4,4'-DDE	ug/kg	230	5	1,900	10	630	5
4,4'-DDT	ug/kg	550	8	6,500	20	1,400	8
Dieldrin	ug/kg	ND	9	ND	20	ND	9
Endosulfan I	ug/kg	ND	9	ND	20	ND	9
Endosulfan II	ug/kg	ND	9	ND	20	ND	9
Endosulfan Sulfate	ug/kg	ND	9	ND	20	ND	9
Endrin	ug/kg	ND	9	ND	20	ND	9
Endrin Aldehyde	ug/kg	ND	9	ND	20	ND	9
Heptachlor	ug/kg	ND	9	ND	20	ND	9
Heptachlor Epoxide	ug/kg	ND	9	ND	20	ND	9
Methoxychlor	ug/kg	ND	9	ND	20	ND	9
Toxaphene	ug/kg	ND	9	ND	20	ND	9

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NO.: 9317
DATE SAMPLED: 11/16/90
DATE RECEIVED: 11/16/90
DATE EXTRACTED: 11/21/90
DATE ANALYZED: 11/27/90
DATE REPORTED: 11/28/90
PAGE: Two

Sample Type: Soil

Method and Constituent:	Units	Composite #1 of 4238, 4239, 4240, and 4245 Concentration	Composite #1 of 4238, 4239, 4240, and 4245 Reporting Limit	Composite #2 of 4241, 4242, 4246, and 4247 Concentration	Composite #2 of 4241, 4242, 4246, and 4247 Reporting Limit	Composite #3 of 4243, 4244, 4248, and 4249 Concentration	Composite #3 of 4243, 4244, 4248, and 4249 Reporting Limit
EPA Method 8080 (Continued):							
Aroclor 1016	ug/kg	ND	6	ND	10	ND	6
Aroclor 1221	ug/kg	ND	6	ND	10	ND	6
Aroclor 1232	ug/kg	ND	6	ND	10	ND	6
Aroclor 1242	ug/kg	ND	6	ND	10	ND	6
Aroclor 1248	ug/kg	ND	6	ND	10	ND	6
Aroclor 1254	ug/kg	ND	6	ND	10	ND	6
Aroclor 1260	ug/kg	ND	6	ND	10	ND	6

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NO.: 9317
DATE SAMPLED: 11/16/90
DATE RECEIVED: 11/16/90
DATE EXTRACTED: 11/21/90
DATE ANALYZED: 11/27/90
DATE REPORTED: 11/28/90
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	Composite #4 of 4292, 4293, 4334, and 4335 Concentration	Composite #4 of 4292, 4293, 4334, and 4335 Reporting Limit	Composite #5 of 4294, 4295, 4336, and 4337 Concentration	Composite #5 of 4294, 4295, 4336, and 4337 Reporting Limit	Composite #6 (4296, 4297, 43 and 4339 Concentration	Composite #6 (4296, 4297, 43 and 4339 Report Limi
EPA Method 8080							
Aldrin	ug/kg	ND	20	ND	20	ND	20
Alpha-BHC	ug/kg	ND	50	ND	50	ND	50
Beta-BHC	ug/kg	ND	50	ND	50	ND	50
Delta-BHC	ug/kg	ND	20	ND	20	ND	20
Gamma-BHC (Lindane)	ug/kg	ND	20	ND	20	ND	20
Chlordane	ug/kg	ND	50	ND	50	ND	50
4,4'-DDD	ug/kg	590	50	ND	50	220	50
4,4'-DDE	ug/kg	830	20	120	20	740	20
4,4'-DDT	ug/kg	5,600	40	110	40	640	40
Dieldrin	ug/kg	ND	50	ND	50	ND	50
Endosulfan I	ug/kg	ND	50	ND	50	ND	50
Endosulfan II	ug/kg	ND	50	ND	50	ND	50
Endosulfan Sulfate	ug/kg	ND	50	ND	50	ND	50
Endrin	ug/kg	ND	50	ND	50	ND	50
Endrin Aldehyde	ug/kg	ND	50	ND	50	ND	50
Heptachlor	ug/kg	ND	50	ND	50	ND	50
Heptachlor Epoxide	ug/kg	ND	50	ND	50	ND	50
Methoxychlor	ug/kg	ND	50	ND	50	ND	50
Toxaphene	ug/kg	ND	50	ND	50	ND	50

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NO.: 9317
DATE SAMPLED: 11/16/90
DATE RECEIVED: 11/16/90
DATE EXTRACTED: 11/21/90
DATE ANALYZED: 11/27/90
DATE REPORTED: 11/28/90
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	Composite #4 of 4292, 4293, 4334, and 4335 Concentration	Composite #4 of 4292, 4293, 4334, and 4335 Reporting Limit	Composite #5 of 4294, 4295, 4336, and 4337 Concentration	Composite #5 of 4294, 4295, 4336, and 4337 Reporting Limit	Composite #6 of 4296, 4297, 4338, and 4339 Concentration	Composite #6 of 4296, 4297, 4338, and 4339 Reporting Limit
EPA Method 8080 (Continued):							
Aroclor 1016	ug/kg	ND	30	ND	30	ND	30
Aroclor 1221	ug/kg	ND	30	ND	30	ND	30
Aroclor 1232	ug/kg	ND	30	ND	30	ND	30
Aroclor 1242	ug/kg	ND	30	ND	30	ND	30
Aroclor 1248	ug/kg	ND	30	ND	30	ND	30
Aroclor 1254	ug/kg	ND	30	ND	30	ND	30
Aroclor 1260	ug/kg	ND	30	ND	30	ND	30

Concentrations reported as ND were not detected at or above the reporting limit.

QC Summary:

% Recovery: 103%
% RSD: 10.9%

Louis W. DuPuis
Quality Assurance/Quality Control Manager

CHIPS ENVIRONMENTAL CONSULTANTS INC.
718 E. Evelyn Ave.
Sunnyvale, CA. 94086 (408) 736-1380 CHAIN OF CUSTODY

PROJECT#	PROJECT NAME	PROJECT SITE ADRESS
1056	R. Rohler	SAKLAN AVE. HAYWARD

SAMPLER: B. McCABE

ANALYSIS REQ. BTEX 602 / EPA 8080

9317

DATE	TIME	GRAB	COMP	SAMPLE ID NUMBER	REMARKS
4/6/90		X	X	004238	#1
		X	X	004239	#2
		X	X	004240	#3 BRASS - ICE
		X	X	004241	#4 V-2
		X	X	004242	#5 GW
		X	X	004243	#6
		X	X	004244	#7

Relinquished by: | Recieved by Date Time | Relinquished by: | Recieved by: Date Time

PHIPS ENVIRONMENTAL CONSULTANTS INC.
18 E. Evelyn Ave.
Sunnyvale, CA. 94086 (408) 736-1380 CHAIN OF CUSTODY

PROJECT#	PROJECT NAME	PROJECT SITE ADRESS
SAMPLER		

BTEX 7050
ANALYSIS EDF 8080

DATE	TIME	GRAB	COMP							REMARKS
11-16-90		X	X	004245	✓	✓				#8
		X	X	004246	✓	✓				#9
		X	X	004247	✓	✓				#10
		X	X	004248	✓	✓				#11
		X	X	004249	✓	✓				#12
		X	X	004292	✓	✓				#13
		X	X	004293	✓	✓				#14

Relinquished by:	Recieved by Date Time	Relinquished by:	Recieved by: Date Time
6:15 P.M. 11-16-90			

Page 2

CHIPS ENVIRONMENTAL CONSULTANTS INC.
718 E. Evelyn Ave.
Sunnyvale, CA. 94086 (408) 736-1380 CHAIN OF CUSTODY

PROJECT#	PROJECT NAME	PROJECT SITE ADRESS
1056	N. Robles	Stockton Ave. Hayward

SAMPLER: B. McGuire

DATE	TIME	GRAB	COMP		BTEX 8020	BTEX 8020				REMARKS
11-16-90		X	X	004294	✓	✓				#15
"		X	X	004295	✓	✓				#16
"		X	X	004296	✓	✓				#17
"		X	X	004297	✓	✓				#18
"		X	X	004334	✓	✓				#19
"		X	X	004335	✓	✓				#20
"		X	X	004336	✓	✓				#21

Relinquished by:	Recieved by Date Time	Relinquished by:	Recieved by: Date Time
[signature] 6:15 P.M.	[signature]		

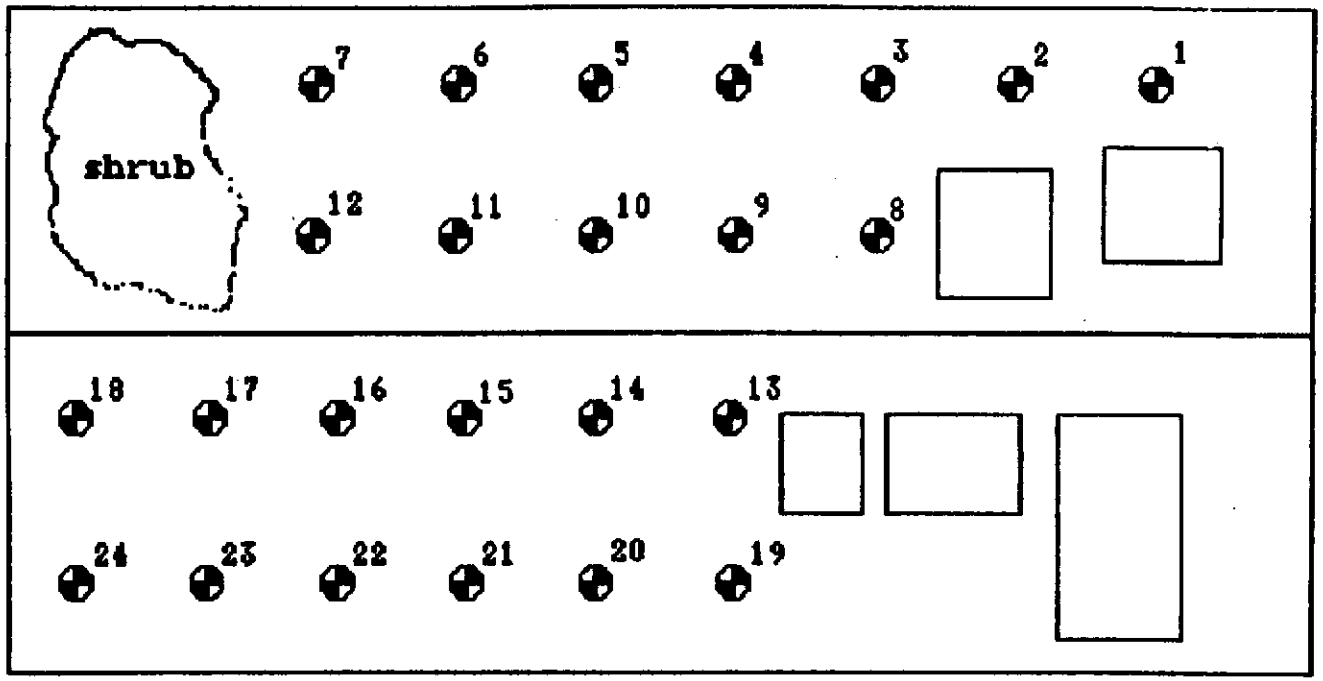
CHIPS ENVIRONMENTAL CONSULTANTS INC.
718 E. Evelyn Ave.
Sunnyvale, CA. 94086 (408) 736-1380 CHAIN OF CUSTODY

PROJECT#	PROJECT NAME	PROJECT SITE ADRESS	
SAMPLER			

DATE	TIME	GRAB	COMP.		NUMBER	MASS TUBES	ANALYSIS REQ. EPA 8080				REMARKS
11-16-90		X	X		004337	✓	✓				#22
		X	X		004338	✓	/				#23
		X	X		004339	✓	✓				#24

Mark Chips called 10:45 AM 11/29/90 asked to keep samples on HOLD until further notice GM

Relinquished by:	Recieved by Date Time	Relinquished by:	Recieved by: Date Time	Page



SCALE

0 50' 100'

Robles Property 23836 Saklan Avenue, Hayward, CA.	
Date: 3-19-91	Drawn By: B.D.M.
Scale:	Revised: Pp.:
Legend	
Sample location	CHIPS Environmental Consultants

APPENDIX E

EXCELTECH SOIL AND GROUNDWATER SAMPLING PLAN AND LABORATORY ANALYTICAL RESULTS

Northern California Regional Office 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Lic. # 596545

EXCELTECH

May 1, 1991

Ms. Pamela J. Evans
Hazardous Materials Specialist
Alameda County Health Agency
80 Swan Way, Room 200
Oakland, California 94621

SUBJECT: Sampling Plan
Robles Property, 23836 Saklan Avenue, Hayward
Exceltech Project No. 3-50058-51

Dear Ms. Evans:

Enclosed is a sampling map for six sampling locations. There will be one sample location from the center of each hatched grid. The grid numbers were randomly selected. Two samples will be taken at each location, from 12 to 18 inches below the surface and from 24 to 30 inches below the surface.

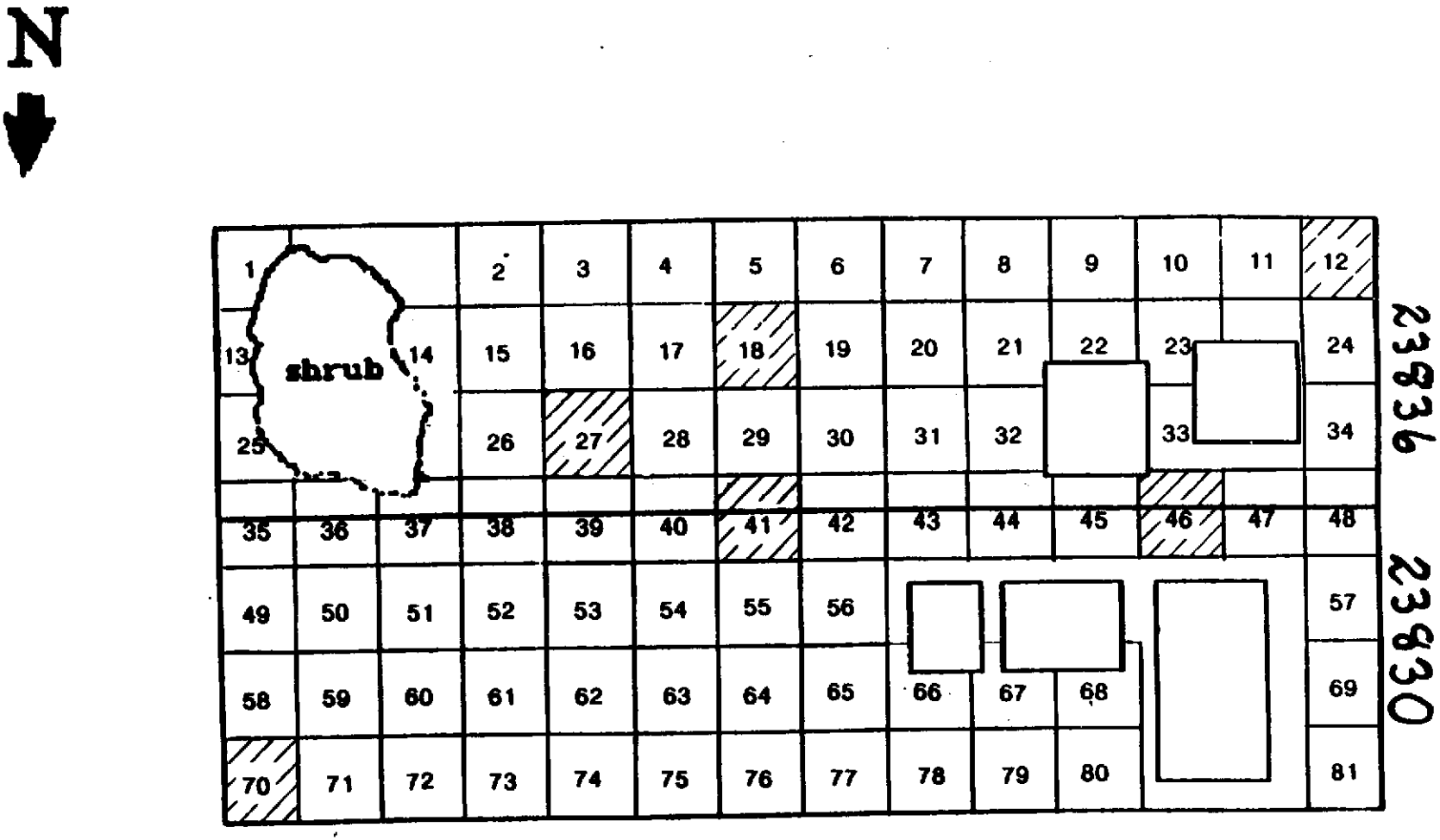
Also enclosed is our standard soil sampling protocol.

Sincerely,

Jeff Willett, P.E., Manager
Assessment, Compliance, and Training

Enclosure

cc: Mr. F. Rob Robles



BASE MAP: CHIPS ENVIRONMENTAL CONSULTANTS 3/19/91

EXCELTECH

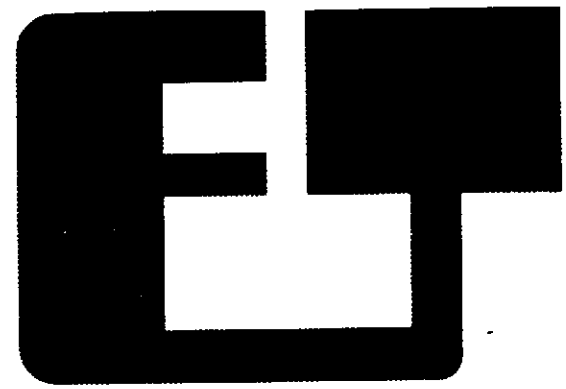
SAMPLING PLAN

ROBLES PROPERTY

23836 SAKLAN AVENUE

HAYWARD, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB # 3-50058-51	DRAWN BY: J.D.S.
DATE: 4/30/91	DRAWING #:



EXCELTECH

Soil Sampling Protocol

SOIL SAMPLING PROTOCOL

I. SOIL SAMPLING BY DRILLING RIG

1) Review site proposal for boring locations and special instructions. Confirm boring locations in field with client. Have Underground Service Alert (USA) mark utilities in area prior to drilling.

2) Prior to initiating an exploratory boring, all equipment to be used during drilling and sampling operation is steam cleaned. Such equipment includes, but is not limited to, augers, bits, drilling rod, samplers, and brass sampler liners. Additionally, between sampling intervals, the sampler is thoroughly cleaned with a dilute trisodium phosphate solution and rinsed with clean tap water or distilled water.

3) Each exploratory boring is drilled with a truck-mounted drilling rig using either solid flight or hollow stem augers. The boring is advanced to the desired sampling depth and the sampler is lowered to the bottom of the hole. The sampler is driven a maximum of 18 inches into the undisturbed soils ahead of the auger by a 140-pound, rig-operated hammer falling 30 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the boring log. When necessary, the sampler may be pushed by the drill rig hydraulics. In this case, the pressure exerted (in pounds per square inch) is recorded. After the sampler has penetrated the full depth, it is retrieved to the surface.

4) The samplers commonly used are either a California modified sampler (3 inch or 2.5 inch O.D.) or a standard penetrometer (2 inch O.D.). The standard penetrometer does not contain sample liners and is used to determine soil strength characteristics and visually characterize the subsurface materials. If samples are collected for laboratory analysis the California modified sampler, equipped with brass liners, is used except when the analysis will include copper or zinc. In this instance, the sample should be taken with the standard penetrometer and placed in a labeled plastic bag.

   Upon retrieval, the sampler is disassembled into its component parts. One or more of the liners is selected for chemical analysis. The ends of the selected liner(s) are sealed with aluminum foil or teflon tape, capped with plastic caps,

labeled, logged on chain-of-custody forms and stored in a chilled ice chest for preservation in the field and during transport to the analytical laboratory. All labels are pre-written with indelible ink to minimize handling time.

5) Samples are checked for the presence of contamination in the field by the geologist. Any discoloration or odor is noted on the boring log. Each sample is classified in the field by a geologist using the Unified Soil Classification System and a Munsell soil color chart. In addition, samples may also be field-screened with a photo ionization detector (calibrated daily) or threshold limit value sniffer. In either case, the instrument probe is held adjacent to freshly crumbled soil and the stabilized reading value is recorded on the log. Other visual screening techniques include examination of the sample under hand-lens magnification as-well-as floating sheen inspection resulting from immersion in water.

6) Samples are held in the possession of Exceltech personnel until transferred to the analytical laboratory. Transfer to the laboratory is accomplished with either delivery by Exceltech personnel, pick-up by laboratory personnel, or transfer by a personal delivery service. Each transfer of responsibility is recorded on a chain-of-custody log that accompanies the sample.

II. SOIL SAMPLING BY HAND

1) Some situations require that samples be collected by hand without the assistance of a drill rig (e.g., soil stock piles, excavation sidewall sampling, etc.). When possible, soil samples will be collected using a steel core sampler equipped with clean brass liners which is advanced into the soil with a slide hammer. In other cases, the outer surface of the soil is removed and a brass liner is driven into the soil by hand or with a hammer. To avoid damaging the liner, a block of wood is held next to the liner so that the hammer strikes the block rather than the liner. The liner is removed and handled as described above. In deep excavations where safety factors preclude the direct sampling of the bottom or side wall, soil is retrieved by a backhoe bucket and this soil is sampled.

APPENDIX D

LABORATORY ANALYTICAL RESULTS

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-12	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1307	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	1.0	N.D.
alpha-BHC	1.0	N.D.
beta-BHC	1.0	N.D.
delta-BHC	1.0	N.D.
gamma-BHC (Lindane)	1.0	N.D.
4,4'-DDD	6.0	N.D.
4,4'-DDE	2.0	N.D.
4,4'-DDT	6.0	N.D.
PCB-1016	20	N.D.
PCB-1221	80	N.D.
PCB-1232	20	N.D.
PCB-1242	20	N.D.
PCB-1248	20	N.D.
PCB-1254	20	N.D.
PCB-1260	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

VMTague

Vickie Tague
Project Manager

1051307.ENS <1>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-18	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1309	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	5.0	N.D.
alpha-BHC	5.0	5.2
beta-BHC	5.0	68
delta-BHC	5.0	N.D.
gamma-BHC (Lindane)	5.0	N.D.
4,4'-DDD	30	33
4,4'-DDE	10	70
4,4'-DDT	30	N.D.
PCB-1016	100	N.D.
PCB-1221	400	N.D.
PCB-1232	100	N.D.
PCB-1242	100	N.D.
PCB-1248	100	N.D.
PCB-1254	100	N.D.
PCB-1260	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-27	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1311	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	5.0	N.D.
alpha-BHC	5.0	16
beta-BHC	5.0	240
delta-BHC	5.0	18
gamma-BHC (Lindane)	5.0	N.D.
4,4'-DDD	30	52
4,4'-DDE	10	59
4,4'-DDT	30	160
PCB-1016	100	N.D.
PCB-1221	400	N.D.
PCB-1232	100	N.D.
PCB-1242	100	N.D.
PCB-1248	100	N.D.
PCB-1254	100	N.D.
PCB-1260	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-42	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1315	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	5.0	N.D.
alpha-BHC	5.0	N.D.
beta-BHC	5.0	N.D.
delta-BHC	5.0	N.D.
gamma-BHC (Lindane)	5.0	N.D.
4,4'-DDD	30	N.D.
4,4'-DDE	10	N.D.
4,4'-DDT	30	N.D.
PCB-1016	100	N.D.
PCB-1221	400	N.D.
PCB-1232	100	N.D.
PCB-1242	100	N.D.
PCB-1248	100	N.D.
PCB-1254	100	N.D.
PCB-1260	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

VM Tague

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-45	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1317	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	1.0	N.D.
alpha-BHC	1.0	N.D.
beta-BHC	1.0	N.D.
delta-BHC	1.0	N.D.
gamma-BHC (Lindane)	1.0	N.D.
4,4'-DDD	6.0	N.D.
4,4'-DDE	2.0	N.D.
4,4'-DDT	6.0	N.D.
PCB-1016	20	N.D.
PCB-1221	80	N.D.
PCB-1232	20	N.D.
PCB-1242	20	N.D.
PCB-1248	20	N.D.
PCB-1254	20	N.D.
PCB-1260	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G-70	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1313	Analyzed: May 13, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	5.0	N.D.
alpha-BHC	5.0	N.D.
beta-BHC	5.0	7.4
delta-BHC	5.0	N.D.
gamma-BHC (Lindane)	5.0	N.D.
4,4'-DDD	30	72
4,4'-DDE	10	130
4,4'-DDT	30	220
PCB-1016	100	N.D.
PCB-1221	400	N.D.
PCB-1232	100	N.D.
PCB-1242	100	N.D.
PCB-1248	100	N.D.
PCB-1254	100	N.D.
PCB-1260	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Water, RW36	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1319	Analyzed: May 10, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/L	Sample Results µg/L
Aldrin	0.025	N.D.
alpha-BHC	0.025	N.D.
beta-BHC	0.025	N.D.
delta-BHC	0.025	N.D.
gamma-BHC (Lindane)	0.025	N.D.
4,4'-DDD	0.15	N.D.
4,4'-DDE	0.050	N.D.
4,4'-DDT	0.15	N.D.
PCB-1016	0.50	N.D.
PCB-1221	2.0	N.D.
PCB-1232	0.50	N.D.
PCB-1242	0.50	N.D.
PCB-1248	0.50	N.D.
PCB-1254	0.50	N.D.
PCB-1260	0.50	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

VM Tague

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Water, R36S	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1320	Analyzed: May 10, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/L	Sample Results µg/L
Aldrin	0.025	N.D.
alpha-BHC	0.025	N.D.
beta-BHC	0.025	N.D.
delta-BHC	0.025	N.D.
gamma-BHC (Lindane)	0.025	N.D.
4,4'-DDD	0.15	N.D.
4,4'-DDE	0.050	N.D.
4,4'-DDT	0.15	N.D.
PCB-1016	0.50	N.D.
PCB-1221	2.0	N.D.
PCB-1232	0.50	N.D.
PCB-1242	0.50	N.D.
PCB-1248	0.50	N.D.
PCB-1254	0.50	N.D.
PCB-1260	0.50	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-51/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Water, R-30	Received: May 9, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 10, 1991
Attention: Jeff Willett	Lab Number:	105-1321	Analyzed: May 10, 1991
			Reported: May 14, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/L	Sample Results µg/L
Aldrin	0.025	N.D.
alpha-BHC	0.025	N.D.
beta-BHC	0.025	N.D.
delta-BHC	0.025	N.D.
gamma-BHC (Lindane)	0.025	N.D.
4,4'-DDD	0.15	N.D.
4,4'-DDE	0.050	N.D.
4,4'-DDT	0.15	N.D.
PCB-1016	0.50	N.D.
PCB-1221	2.0	N.D.
PCB-1232	0.50	N.D.
PCB-1242	0.50	N.D.
PCB-1248	0.50	N.D.
PCB-1254	0.50	N.D.
PCB-1260	0.50	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
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Exceltech
41674 Christy Street
Fremont, CA 94538
Attention: Jeff Willett

Client Project ID: 350058-51/Robles Property/PO#23187

Q.C. Sample Group: 1051307-21

Reported: May 14, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Lindane	Aldrin	Dieldrin
Method:	EPA 8080	EPA 8080	EPA 8080
Analyst:	D. Tran	D. Tran	D. Tran
Reporting Units:	µg/L	µg/L	µg/L
Date Analyzed:	May 10, 1991	May 10, 1991	May 10, 1991
QC Sample #:	BLK051091	BLK051091	BLK051091
Sample Conc.:	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	20
Conc. Matrix Spike:	11	9.0	23
Matrix Spike % Recovery:	110	90	115
Conc. Matrix Spike Dup.:	11	9.3	23
Matrix Spike Duplicate % Recovery:	110	93	115
Relative % Difference:	0.0	3.3	0.0

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-57/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G18A	Relogged: May 14, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 14, 1991
Attention: Jeff Willett	Lab Number:	105-1310	Analyzed: May 14, 1991
			Reported: May 16, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	1.0	N.D.
alpha-BHC	1.0	N.D.
beta-BHC	1.0	N.D.
delta-BHC	1.0	N.D.
gamma-BHC (Lindane)	1.0	N.D.
4,4'-DDD	6.0	N.D.
4,4'-DDE	2.0	N.D.
4,4'-DDT	6.0	N.D.
PCB-1016	20	N.D.
PCB-1221	80	N.D.
PCB-1232	20	N.D.
PCB-1242	20	N.D.
PCB-1248	20	N.D.
PCB-1254	20	N.D.
PCB-1260	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

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680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-57/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G27A	Relogged: May 14, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 14, 1991
Attention: Jeff Willett	Lab Number:	105-1312	Analyzed: May 14, 1991
			Reported: May 16, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	1.0	N.D.
alpha-BHC	1.0	N.D.
beta-BHC	1.0	N.D.
delta-BHC	1.0	N.D.
gamma-BHC (Lindane)	1.0	N.D.
4,4'-DDD	6.0	N.D.
4,4'-DDE	2.0	N.D.
4,4'-DDT	6.0	N.D.
PCB-1016	20	N.D.
PCB-1221	80	N.D.
PCB-1232	20	N.D.
PCB-1242	20	N.D.
PCB-1248	20	N.D.
PCB-1254	20	N.D.
PCB-1260	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	350058-57/Robles Property/PO#23187	Sampled: May 9, 1991
41674 Christy Street	Sample Descript:	Soil, G70A	Relogged: May 14, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: May 14, 1991
Attention: Jeff Willett	Lab Number:	105-1314	Analyzed: May 14, 1991
			Reported: May 16, 1991

ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Aldrin	1.0	N.D.
alpha-BHC	1.0	N.D.
beta-BHC	1.0	N.D.
delta-BHC	1.0	N.D.
gamma-BHC (Lindane)	1.0	N.D.
4,4'-DDD	6.0	3.3
4,4'-DDE	2.0	12
4,4'-DDT	6.0	14
PCB-1016	20	N.D.
PCB-1221	80	N.D.
PCB-1232	20	N.D.
PCB-1242	20	N.D.
PCB-1248	20	N.D.
PCB-1254	20	N.D.
PCB-1260	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

1051307.ENS <3>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech
41674 Christy Street
Fremont, CA 94538
Attention: Jeff Willett

Client Project ID: 350058-57/Robles Property/PO#23187

Q.C. Sample Group: 1051310-14

Reported: May 16, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Lindane	Aldrin	Dieldrin
Method:	EPA 8080	EPA 8080	EPA 8080
Analyst:	M. Trujillo	M. Trujillo	M. Trujillo
Reporting Units:	µg/kg	µg/kg	µg/kg
Date Analyzed:	May 14, 1991	May 14, 1991	May 14, 1991
QC Sample #:	BLK051491	BLK051491	BLK051491
Sample Conc.:	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	20
Conc. Matrix Spike:	6.9	7.0	18
Matrix Spike % Recovery:	69	70	90
Conc. Matrix Spike Dup.:	6.7	6.7	18
Matrix Spike Duplicate % Recovery:	67	67	90
Relative % Difference:	2.9	4.4	0.0

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

% Recovery: $\frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$

PROJECT NO: 350058-51 | PROJECT NAME: Robles Property

SAMPLERS (Signature): Joe Mika

NO.	DATE	TIME	STATION AND LOCATION	EPA 8010	REMARKS
G-12	5-09-91	9:45	2"x 6" Brass liners	X	105307
G 12a	5-09-91	9:55	" " "	X	105308
G 18		10:15		X	105309
G 18a		10:20		X	105310
G 27		10:40		X	Hold 32, 32a
G 27a		11:00		X	105312
G 32		11:20		X	
G 32a		11:45		X	
G 70		1330		X	105313
G 70a		1345		X	105314
G 42		1420		X	105315
G 42a		1440		X	105316
G 45		1450		X	105317
G 45a		1500		X	105318
RW36		15:15	Amber liter	X	105319
R36S		1520	" "	X	105320
R30		1355	" "	X	105321

TEST REQUESTED

P.O. # 23187

LAB: SEQUOIA

TURN AROUND TIME: 48 hr.

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
Joe Mika	5-09-91	1650	Mark Dutton
Craig Lee	5/9/91	533 PM	K. Willett

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
James Dunlap	5/9/91	1700	Craig Lee 5/9/91 1535 PM

REMARKS:

Jeff Willett

EXCELTECH

41674 Christy Street
Fremont, C.A. 94538-3114

(415) 659-0404
Fax (415) 651 4677
Cont. Lic No 550205

10-89

APPENDIX F

EXCELTECH PCB SOIL SAMPLING PLAN AND LABORATORY ANALYTICAL RESULTS

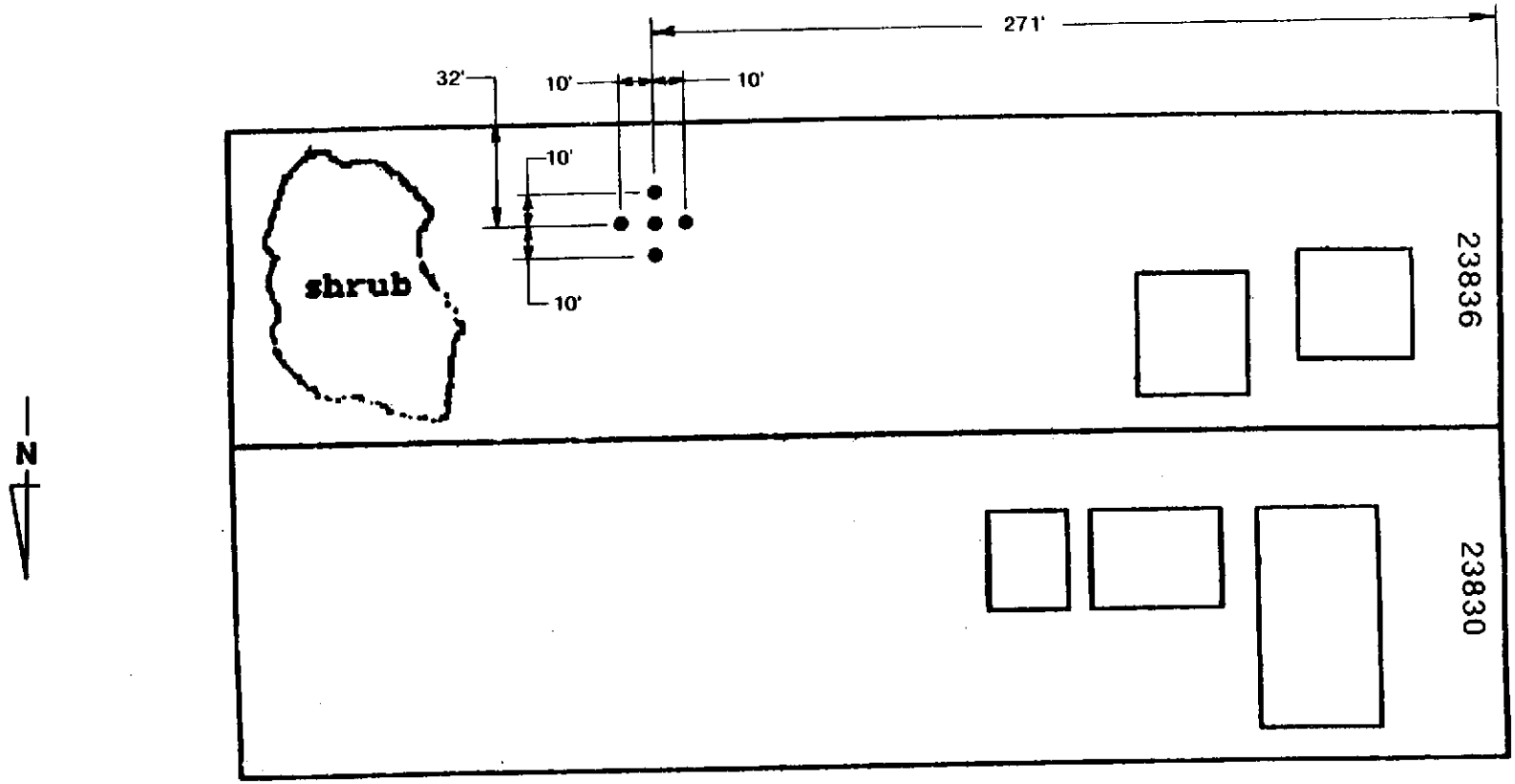
PCB Sampling Plan

As noted in the Addendum to the Revised Health Risk Assessment, only one sample taken from the site analyzed positive for PCBs. The comparison of that analytical result indicated a PCB exposure at that one point exceeding a one-in-one-million cancer risk. Prior to recommendations on any remedial action, the extent of the PCB concentrations must be established. This plan will detail the proposal to establish the lateral and vertical extent of the PCB concentrations.

The soil sample in which PCBs were identified was taken by CHIPS Environmental Consultants, Inc., with results presented in a CHIPS report dated October 30, 1990 (enclosed). This report indicated that the sample was taken within 2 inches of the surface, 271 feet from Saklan Avenue, and 32 feet from the south property line.

We are proposing to take five surface samples in this location (see enclosed map). Because of potential difficulties in determining exact measurement points, the samples will be taken at the original sample location (to our best determination), and 10 feet to the north, south, east and west of that point. The samples will be taken at the surface using the protocol attached to this report. Analysis of the samples will be for PCBs.

PCBs were used in electrical capacitor and transformer cooling oils, and lubricating and cutting oils, as well as other applications. Because of the use of PCBs in oils, we will perform a close visual check of the locations in and around the sample points for oil staining. Should oil staining be observed, the stain will be plotted on a site map and the stain will be sampled.



SCALE

0 50' 100'

BASE MAP: CHIPS ENVIRONMENTAL CONSULTANTS 3/19/91

EXCELTECH

PCB SAMPLING PLAN

ROBLES PROPERTY

23836 SAKLAN AVENUE

HAYWARD, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB #: 3-50058-51	DRAWN BY: J.D.S.
DATE: 7/26/91	DRAWING #:

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	#350058-51, Robles Property, PO#23987	Sampled:	Aug 2, 1991
41674 Christy Street	Sample Descript:	Soil, C	Received:	Aug 5, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted:	Aug 12, 1991
Attention: Jeff Willitt	Lab Number:	108-0481	Analyzed:	Aug 12, 1991
			Reported:	Aug 19, 1991

POLYCHLORINATED BIPHENYLS (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
PCB 1016	400	N.D.
PCB 1221	1,600	N.D.
PCB 1232	400	N.D.
PCB 1242	400	N.D.
PCB 1248	400	N.D.
PCB 1254	400	N.D.
PCB 1260	400	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

VM Tague

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	#350058-51, Robles Property, PO#23987	Sampled:	Aug 2, 1991
41674 Christy Street	Sample Descript:	Soil, N	Received:	Aug 5, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted:	Aug 12, 1991
Attention: Jeff Willitt	Lab Number:	108-0477	Analyzed:	Aug 12, 1991
			Reported:	Aug 19, 1991

POLYCHLORINATED BIPHENYLS (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
PCB 1016	400	N.D.
PCB 1221	1,600	N.D.
PCB 1232	400	N.D.
PCB 1242	400	N.D.
PCB 1248	400	N.D.
PCB 1254	400	N.D.
PCB 1260	400	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	#350058-51, Robles Property, PO#23987	Sampled:	Aug 2, 1991
41674 Christy Street	Sample Descript:	Soil, S	Received:	Aug 5, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted:	Aug 12, 1991
Attention: Jeff Willitt	Lab Number:	108-0478	Analyzed:	Aug 12, 1991
			Reported:	Aug 19, 1991

POLYCHLORINATED BIPHENYLS (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
PCB 1016	400	N.D.
PCB 1221	1,600	N.D.
PCB 1232	400	N.D.
PCB 1242	400	N.D.
PCB 1248	400	N.D.
PCB 1254	400	N.D.
PCB 1260	400	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

VMTague

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	#350058-51, Robles Property, PO#23987	Sampled: Aug 2, 1991
41674 Christy Street	Sample Descript:	Soil, E	Received: Aug 5, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted: Aug 12, 1991
Attention: Jeff Willitt	Lab Number:	108-0479	Analyzed: Aug 12, 1991
			Reported: Aug 19, 1991

POLYCHLORINATED BIPHENYLS (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
PCB 1016	400	N.D.
PCB 1221	1,600	N.D.
PCB 1232	400	N.D.
PCB 1242	400	N.D.
PCB 1248	400	N.D.
PCB 1254	400	N.D.
PCB 1260	400	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

VM Tague

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech	Client Project ID:	#350058-51, Robles Property, PO#23987	Sampled:	Aug 2, 1991
41674 Christy Street	Sample Descript:	Soil, W	Received:	Aug 5, 1991
Fremont, CA 94538	Analysis Method:	EPA 8080	Extracted:	Aug 12, 1991
Attention: Jeff Willitt	Lab Number:	108-0480	Analyzed:	Aug 12, 1991
			Reported:	Aug 19, 1991

POLYCHLORINATED BIPHENYLS (EPA 8080)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
PCB 1016	400	N.D.
PCB 1221	1,600	N.D.
PCB 1232	400	N.D.
PCB 1242	400	N.D.
PCB 1248	400	N.D.
PCB 1254	400	N.D.
PCB 1260	400	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Exceltech
41674 Christy Street
Fremont, CA 94538
Attention: Jeff Willitt

Client Project ID: #350058-51, Robles Property, PO#23987

QC Sample Group: 1080477-81

Reported: Aug 19, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	PCB 1260

Method:	EPA 8080
Analyst:	M. Trujillo
Reporting Units:	µg/kg
Date Analyzed:	Aug 12, 1991
QC Sample #:	BLK081291

Sample Conc.:	N.D.
Spike Conc. Added:	1,000
Conc. Matrix Spike:	970
Matrix Spike % Recovery:	97
Conc. Matrix Spike Dup.:	970
Matrix Spike Duplicate % Recovery:	97
Relative % Difference:	0.0

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

PROJECT NO. 350058-51 | PROJECT NAME Robles Property

SAMPLERS (Signature) S ADAMS

NO.	DATE	TIME	SAMPLE DESCRIPTION	TEST REQUESTED: PCB's
N	8-29	11:00	Soil (Top - Dry)	X
S		11:05		X
E		11:10		X
W		11:15		X
C		11:20		X

P.O. # 23987

LAB SEQUOIA

TURN AROUND TIME

REMARKS: STD - TURN AROUND

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RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
Scott Adams	8-2	1330	

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
	8.5.91	11:15AM	

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
	25 09 90		

REMARKS:

REPORT TO:

EXCELTECH
41674 Christy Street
Fremont, C.A. 94538-3114
(415) 659-0404
Fax (415) 651-4677
Contr. Lic. No. 550205

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